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The NUBASE evaluation of nuclear and decay properties*

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Abstract

This paper presents the NUBASE evaluation of nuclear and decay properties of nuclides in their ground- and isomeric-states. All nuclides for which some experimental information is known are considered. NUBASE uses extensively the information given by the “Evaluated Nuclear Structure Data Files” and includes the masses from the “Atomic Mass Evaluation” (AME, second part of this issue). But it also includes information from recent literature and is meant to cover all experimental data along with their references. In case no experimental data is available, trends in the systematics of neighboring nuclides have been used, whenever possible, to derive estimated values (labeled in the database as non-experimental). Adopted procedures and policies are presented.

AMDC: <http://csnwww.in2p3.fr/AMDC/>

1. Introduction

The present evaluation responds to the needs expressed by the nuclear physics community, from fundamental physics to applied nuclear sciences, for a database which contains values for the main basic nuclear properties such as masses, excitation energies of isomers, half-lives, spins and parities, decay modes and their intensities. A

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requirement is that all the information should be properly referenced in that database to allow checks on their validity.

One of the applications of such a database is the “Atomic Mass Evaluation” (AME) in which it is essential to have clear identification of the states involved in a decay, a reaction or a mass-spectrometric line. This is the main reason for which these two evaluations are coupled in the present issue. Furthermore, calculations requiring radioactive parameters for nuclear applications (e.g. reactors, waste management, nuclear astrophysics) need to access this basic information on any nuclide. In the preparation of a nuclear physics experiment, such a database could also be quite useful.

Most of the data mentioned above are in principle already present in two evaluated files: the “Evaluated Nuclear Structure Data Files” (ENSDF) [1] and the “Atomic Mass Evaluation” (AME2003, second part of this issue). The demand for a database as described above could be thus partially fulfilled by combining them in a ‘horizontal’ structure (which exists in the AME, but not in ENSDF). NUBASE is therefore, at a first level, a critical compilation of these two evaluations.

While building NUBASE, we found it necessary to examine the literature, firstly, to revise several of the collected results in ENSDF and ensure that the mentioned data are presented in a more consistent way; secondly, to have as far as possible all the available experimental data included, not only the recent ones (updating requirement), but also those missed in ENSDF (completeness requirement). This implied some evaluation work, which appears in the remarks added in the NUBASE table and in the discussions below. Full references are given for all of the added experimental information (cf. Section 2.7).

There is no strict cut-off date for the data from literature used in the present NUBASE2003 evaluation: all data available to us until the material was sent (November 19, 2003) to the publisher have been included. Those which could not be included for special reasons, like the need for a heavy revision of the evaluation at a too late stage, are added in remarks to the relevant data.

The contents of NUBASE are described below, along with some of the policies adopted in this work. Updating procedures of NUBASE are presented in Section 3. Finally, the electronic distribution of NUBASE and an interactive display of its contents with a World Wide Web Java program or with a PC-program are described in Section 4.

The present publication updates and includes all the information given in the previous and very first evaluation of NUBASE [2], published in 1997.

2. Contents of NUBASE

NUBASE contains experimentally known nuclear properties together with some values estimated by extrapolation of experimental data for 3177 nuclides. NUBASE also

contains data on isomeric states. We presently know 977 nuclides having one or more excited isomers according to our definition below. In the present evaluation we extended the definition of isomers compared to NUBASE'97 where only states with half-lives greater than 1 millisecond were considered. In present mass spectrometric experiments performed at accelerators, with immediate detection of the produced nuclei, isomers with half-lives as short as 100 ns may be present in the detected signals. We aimed at including as much as possible all those which play or might play in the near future a *rôle* in such experiments. We include also the description of those states that are involved in mass measurements and thus enter the AME2003.

For each nuclide (A, Z), and for each state (ground or excited isomer), the following quantities have been compiled, and when necessary evaluated: mass excess, excitation energy of the excited isomeric states, half-life, spin and parity, decay modes and intensities for each mode, isotopic abundances of the stable nuclei, and references for all experimental values of the above items.

In the description below, references to papers that are also quoted in the NUBASE table are given with the same Nuclear Structure Reference key number style [3]. They are listed at the end of this issue (AME2003, Part II, p. 579).

In NUBASE'97, the names and the chemical symbols used for elements 104 to 109 were those recommended then by the Commission on Nomenclature of Inorganic Chemistry of the International Union of Pure and Applied Chemistry (IUPAC). Since then, unfortunately for the resulting confusion, the names were changed and moreover two of them were displaced [4] (see also AME2003, Part I, Section 6.5). The user should therefore be careful when comparing results between NUBASE'97 and the present NUBASE2003 for nuclides with $Z \geq 104$. The finally adopted names and symbols are: 104 rutherfordium (Rf), 105 dubnium (Db), 106 seaborgium (Sg), 107 bohrium (Bh), 108 hassium (Hs), and 109 meitnerium (Mt), while the provisional symbols Ea, Eb, . . . , Ei are used for elements 110, 111, . . . , 118.

Besides considering all nuclides for which at least one piece of information is experimentally available, we also included unknown nuclides - for which we give estimated properties - in order to ensure continuity of the set of the considered nuclides at the same time in N , in Z , in A and in $N - Z$. The chart of the nuclides defined this way has a smooth contour.

As far as possible, one standard deviations (1σ) are given to represent the uncertainties connected with the experimental values. Unfortunately, authors do not always define the meaning of the uncertainties they quote; under such circumstances, the uncertainties are assumed to be one standard deviations. In many cases, the uncertainties are not given at all; we then estimated them on the basis of the limitations of the method of measurement.

Values and errors that are given in the NUBASE table have been rounded, even if unrounded values were found in ENSDF or in the literature. In cases where the two

furthest-left significant digit in the error were larger than a given limit (30 for the energies, to maintain strict identity with AME2003, and 25 for all other quantities), values and errors were rounded off (see examples in the ‘Explanation of table’). In very few cases, when essential for traceability, we added a remark with the original value.

When no experimental data exist for a nuclide, values can often be estimated from observed trends in the systematics of experimental data. In the AME2003, masses estimated from systematic trends were already flagged with the symbol ‘#’. The use of this symbol has been extended in NUBASE to all other quantities and has the same meaning of indicating non-experimental information.

2.1. Mass excess

The mass excess is defined as the difference between the atomic mass (in mass units) and the mass number, and is given in keV for each nuclear state, together with its one standard deviation uncertainty. The mass excess values given in NUBASE are exactly those of the AME2003 evaluation, given in the second part of this issue.

It sometimes happens that knowledge of masses can yield information on the decay modes, in particular regarding nucleon-stability. Such information has been used here, as can be seen in the table for ^{10}He , ^{19}Na , ^{39}Sc , ^{62}As or ^{63}As . In some cases we rejected claimed observation of decay modes, when not allowed by energetic consideration. As an example, ENSDF2000 compiles for ^{142}Ba five measurements of delayed neutron decay intensities, whereas $Q(\beta^-n) = -2955(7)$ keV.

Figure 1 complements the main table in displaying the precisions on the masses, in a color-coded chart, as a function of N and Z .

2.2. Isomers

In the first version of NUBASE in 1997 [2], a simple definition for the excited isomers was adopted: they were states that live longer than 1 millisecond. Already in NUBASE97, we noticed that such a simple definition had several drawbacks, particularly for alpha and proton decaying nuclides: whereas for β -decay a limit of 1 millisecond was acceptable (the shortest-lived known β -decaying nuclide (^{35}Na) has a half-life of 1.5 millisecond), for α or proton decay, several cases are known where an isomer with a half-life far below 1 millisecond lives still longer than the ground-state.

As mentioned earlier, the definition of isomers is now extended to include a large number of excited states, with half-lives as short as 100 ns, that are of interest for mass spectrometric works at accelerators. Isomers are given in order of increasing excitation energy and identified by appending ‘ m ’, ‘ n ’, ‘ p ’ or ‘ q ’ to the nuclide name, e.g. ^{90}Nb for the ground-state, $^{90}\text{Nb}^m$ for the first excited isomer, $^{90}\text{Nb}^n$ for the second

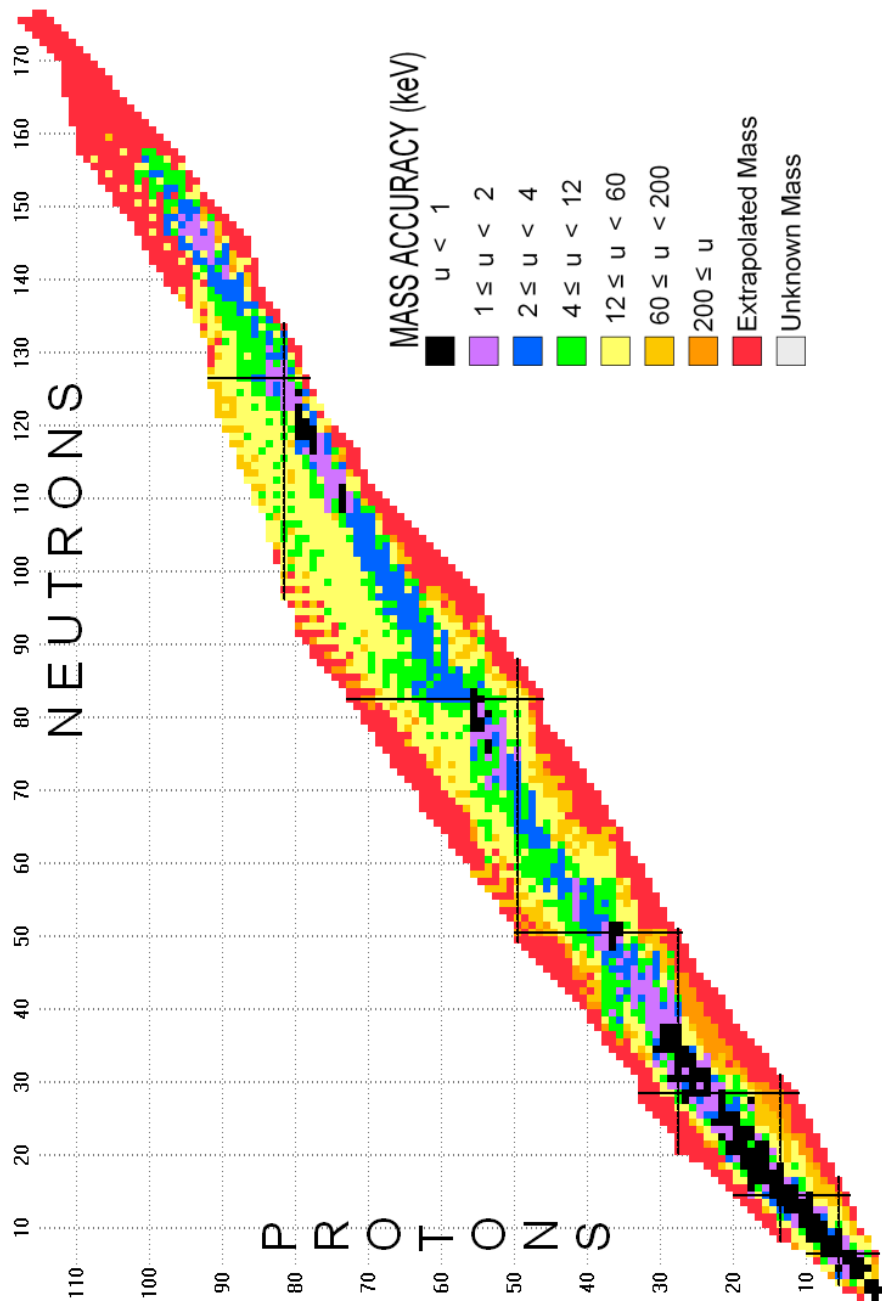


Figure 1: Chart of the nuclides for the precision 'u' on masses (created by NUCLEUS-AMDC).

one, $^{90}\text{Nb}^p$ and $^{90}\text{Nb}^q$ for respectively the third and fourth. In NUBASE97 we could not report in a normal way the third excited isomer of ^{178}Ta with half-life 59 ms, because of poorness of notation; the new notation adopted here removes also such a limitation.

The excitation energy can be derived from a number of different experimental methods. When this energy is derived from a method other than γ -ray spectrometry, the origin is indicated by a two-letter code and the numerical value is taken from AME. Otherwise, the code is left blank and the numerical value is taken from ENSDF or from literature update.

When the existence of an isomer is under discussion (e.g. $^{141}\text{Tb}^m$) it is flagged with ‘EU’ in the origin field to mean “existence uncertain”. A comment is generally added to indicate why its existence is questioned, or where this matter has been discussed. Depending on the degree of our confidence in this existence, we can still give a mass excess value and an excitation energy, or omit them altogether (e.g. $^{138}\text{Pm}^n$). In the latter case, the mention “non-existent” appears in place of that excitation energy.

When an isomer has been reported, and later proved not to exist (e.g. $^{184}\text{Lu}^m$), it is flagged with ‘RN’ in the origin field to mean “reported, non-existent”. In such case we give of course no mass excess value and no excitation energy, and, as in the case of the ‘EU’s above, they are replaced by the same mention “non-existent”.

Note: we have extended the use of the two flags ‘EU’ and ‘RN’ to cases where the discovery of a nuclide (e.g. ^{260}Fm) is questioned. In this case however we always give an estimate, derived from systematic trends, for the ground state masses.

In several cases, ENSDF gives a lower and a higher limit for an isomeric excitation energy. A uniform distribution of probabilities has been assumed which yields a value at the middle of the range and a 1σ uncertainty of 29% of that range (cf. Appendix B of the AME2003, Part I, for a complete description of this procedure). An example is ^{136}La for which it is known that the excited isomer lies above the level at 230.1 keV, but, as explained in ENSDF, there are good experimental indications that the difference between these two levels lies between 10 and 40 keV. We present this information as $E = 255(9)$ keV. However, if that difference would have been derived from theory or from systematics, the resulting E is considered as non-experimental and the value flagged with the ‘#’ symbol.

In case that the uncertainty σ on the excitation energy E is relatively large compared to the value, the assignment to ground state and isomeric state is uncertain. If $\sigma > E/2$ a flag is added in the NUBASE table.

As a result of this work, the orderings of several ground-states and isomeric-states have been reversed compared to those in ENSDF. They are flagged in the NUBASE table with the ‘&’ symbol. In several cases we found evidence for a state below the adopted ENSDF ground-state. Also, in many other cases, the systematics of nuclides with the same parities in N and Z strongly suggest that such a lower state should exist.

They have been added in the NUBASE table and can be located easily, since they are also flagged with the ‘&’ symbol. In a few cases, new information on masses can also lead to reversal of the level ordering. Thanks to the coupling of the NUBASE and the AME evaluations, all changes in level ordering are carefully synchronized.

News on isomeric excitation energies

Interestingly, the technique of investigating proton decay of very proton-rich nuclides gives information on isomeric excitation energies. Thus, such work on ^{167}Ir [1997Da07] shows that it has an isomeric excitation energy $E = 175.3(2.2)$ keV. This information is displayed by the ‘p’ symbol following the excitation energy. In addition, study of the α -decay series of these activities not only showed that a number of α lines earlier assigned to ground-states belong in reality to isomers, but also allowed to derive values for their excitation energies.

Another case of such a change is ^{181}Pb . The α decay half-life that was previously assigned to $^{181}\text{Pb}^m$ is now assigned to the ground-state, following the work of Toth *et al.* [1996To01] who showed, first, that contrary to a previous work, there is no α line at higher energy than the one just mentioned, and second, that the observed α is in correlation with the decay of the daughter ^{177}Hg , which is also most probably a $5/2^-$ state.

2.3. Half-life

For some light nuclei, the half-life ($T_{1/2}$) is deduced from the level total width (Γ_{cm}) by the equation $\Gamma_{\text{cm}} T_{1/2} \simeq \hbar \ln 2$:

$$T_{1/2} (\text{s}) \simeq 4.562 \cdot 10^{-22} / \Gamma_{\text{cm}} (\text{MeV}).$$

Quite often uncertainties for half-lives are given asymmetrically T_{-b}^{+a} . If these uncertainties are used in some applications, they need to be symmetrized. Earlier (cf. AME’95) a rough symmetrization was used: take the central value to be the mid-value between the upper and lower 1σ -equivalent limits $T + (a - b)/2$, and define the uncertainty to be the average of the two uncertainties $(a + b)/2$. A strict statistical derivation (see Appendix) shows that a better approximation for the central value is obtained by using $T + 0.64 \times (a - b)$. The exact expression for the uncertainty is given in the Appendix.

When two or more independent measurements have been reported, they are averaged, while being weighed by their reported precision. While doing this, we consider the NORMALIZED CHI, χ_n (or ‘consistency factor’ or ‘Birge ratio’), as defined in AME2003, Part I, Section 5.2. Only when χ_n is beyond 2.5, do we depart from the statistical result, and adopt the external error for the average, following the same

policy as discussed and adopted in AME2003, Part I, Section 5.4. Very rarely, when the Birge ratio χ_n is so large that we consider all errors given as non-relevant, do we adopt the arithmetic average (unweighed) for the result and the corresponding error (based on the dispersion of values). In all such cases, a remark is added to the data, giving the list of values that were averaged, and, when relevant, the value of the Birge ratio χ_n and the reason for our choice.

In the case of experiments in which extremely rare events are observed, and where the results are very asymmetric, we did not average directly the half-lives derived from different works, but instead, when the information given in the papers was sufficient (e.g. ^{264}Hs or ^{269}Hs), we combined the delay times of the individual events, as prescribed by Schmidt *et al* [1984Sc13].

Some measurements are reported as a range of values with most probable lower and upper limits. They are treated, as explained above (cf. Section 2.2), as a uniform distribution of probabilities with a value at the middle of the range and a 1σ uncertainty of 29% of that range (cf. Appendix B of the AME2003 for a complete description of this procedure).

For some nuclides identified by using a time-of-flight spectrometer, an upper or a lower limit on the half-life is given.

i) For *observed* species, we give this important but isolated piece of information (lower limit) in place of the uncertainty on the half-life, and within brackets (e.g. ^{36}Mg , p. 34). The user of our table should be careful in that this limit can be very far below the eventually measured half-life. To help to avoid confusion, we now give, in addition, an estimate (as always in the present two evaluations, flagged with #) for the half-life derived from trends in systematics.

ii) For nuclides sought for but *not observed*, we give the found upper limit in place of the half-life. Upper limits for undetected nuclides have been evaluated for NUBASE by F. Pougheon [1993Po.A], based on the time-of-flight of the experimental setup and the yields expected from the trends in neighboring nuclides (e.g. ^{19}Na).

When half-lives for nuclides with the same parities in Z and N are found to vary smoothly (see Fig. 2), interpolation or extrapolation is used to obtain reasonable estimates.

2.4. Spin and parity

As in ENSDF, values are presented without and with parentheses based upon strong and weak assignment arguments, respectively (see the introductory pages of Ref. [5]). Unfortunately, the latter include estimates from systematics or theory. Where we can distinguish them, we use parentheses if the so-called “weak” argument is an experimental one, but the symbol ‘#’ in the other cases. The survey might have not been complete, and the reader might still find non-flagged non-experimental cases (the

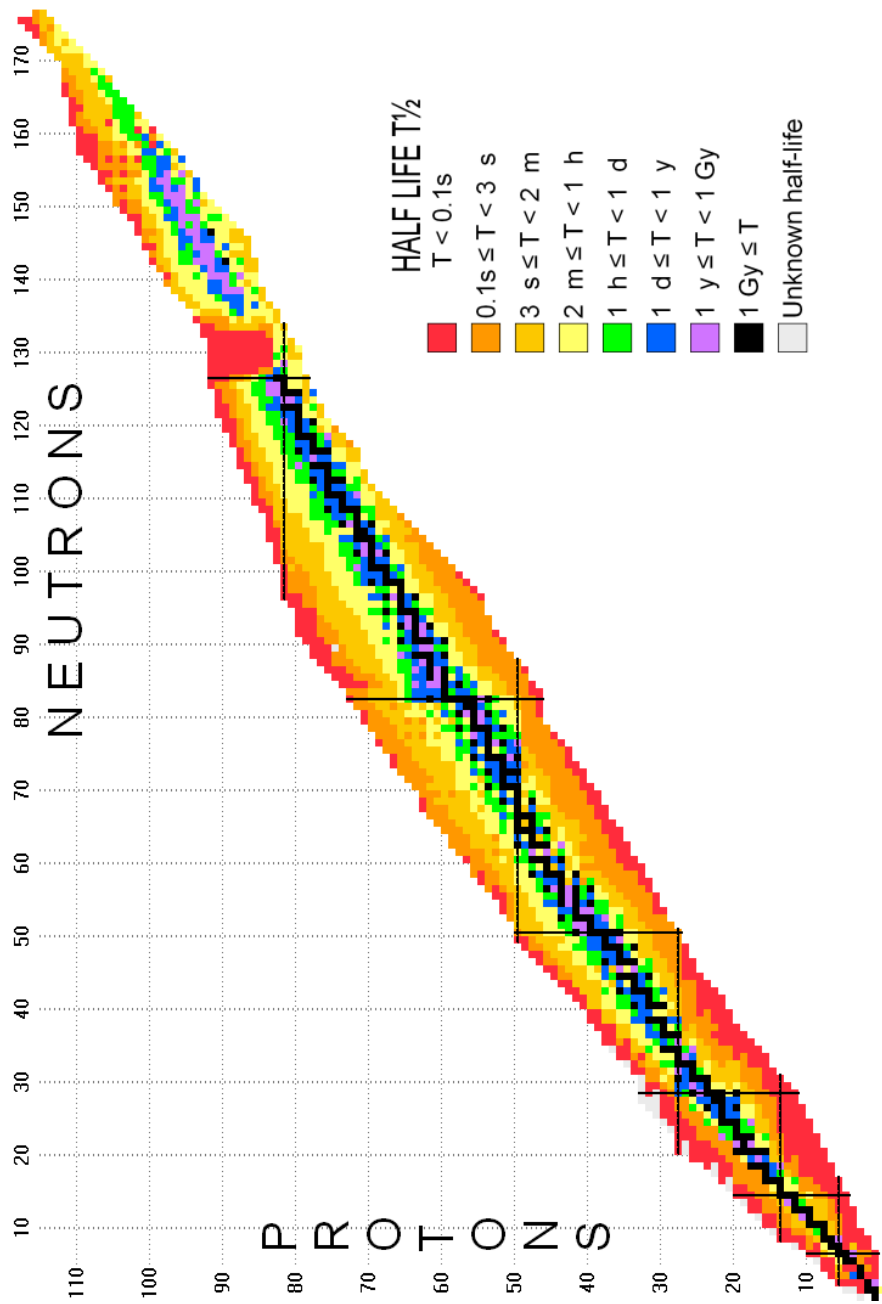


Figure 2: Chart of the nuclides for half-lives (created by NUCLEUS-AMDC).

authors will gratefully appreciate mention of such cases to improve future versions of NUBASE).

If spin and parity are not known from experiment, they can be estimated, in some cases, from systematic trends in neighboring nuclides with the same parities in N and Z . This is often true for odd- A nuclides (see Fig. 3 and Fig. 4), but also, not so rarely, for odd–odd ones, as can be seen in Fig. 5. These estimated values are also flagged with the ‘#’ symbol. In several cases we replaced the ENSDF systematics by our own.

The review of nuclear radii and moments of Otten [1989Ot.A], in which the spins were compiled, was used to check and complete the spin values in NUBASE.

2.5. Decay modes and intensities

The most important policy, from our point of view, in coding the information for the decay modes, is in establishing a very clear distinction between a decay mode that is energetically allowed but not yet experimentally observed (represented by a question mark alone, which thus refers to the decay mode itself), and a decay mode that is actually observed but for which the intensity could not be determined (represented by ‘=?’, the question mark referring here to the quantity after the equal sign).

As in ENSDF, no corrections have been made to normalize the primary intensities to 100%.

Besides direct updates from the literature, we also made use of partial evaluations by other authors (with proper quotation). They are mentioned below, when discussing some particular decay modes.

The β^+ decay

In the course of our work we refined some definitions and notations for the β^+ decay, in order to present more clearly the available information. We denote with β^+ the decay process that includes both electron capture, denoted ε , and the decay by positron emission, denoted e^+ . One can then symbolically write: $\beta^+ = \varepsilon + e^+$. As is well known, for an available energy below 1022 keV, only electron capture ε is allowed; above that value both processes compete.

Remark: this notation is **not** the same as the one implicitly used in ENSDF, where the combination of both modes is denoted “EC+B+”.

When both modes compete, the separated intensities are not always available from experiment. Most of the time, separated values in ENSDF are calculated ones. In continuation of one of our general policies, in which we retain whenever possible only experimental information, we decided not to retain ENSDF’s calculated separated values (which are scarce and not always updated). Most often, it is in some very particular cases that the distinction is of importance, like in the case of rare or extremely rare processes (e.g. ^{91}Nb , ^{54}Mn , $^{119}\text{Te}^m$). Then, the use of our notation is useful.

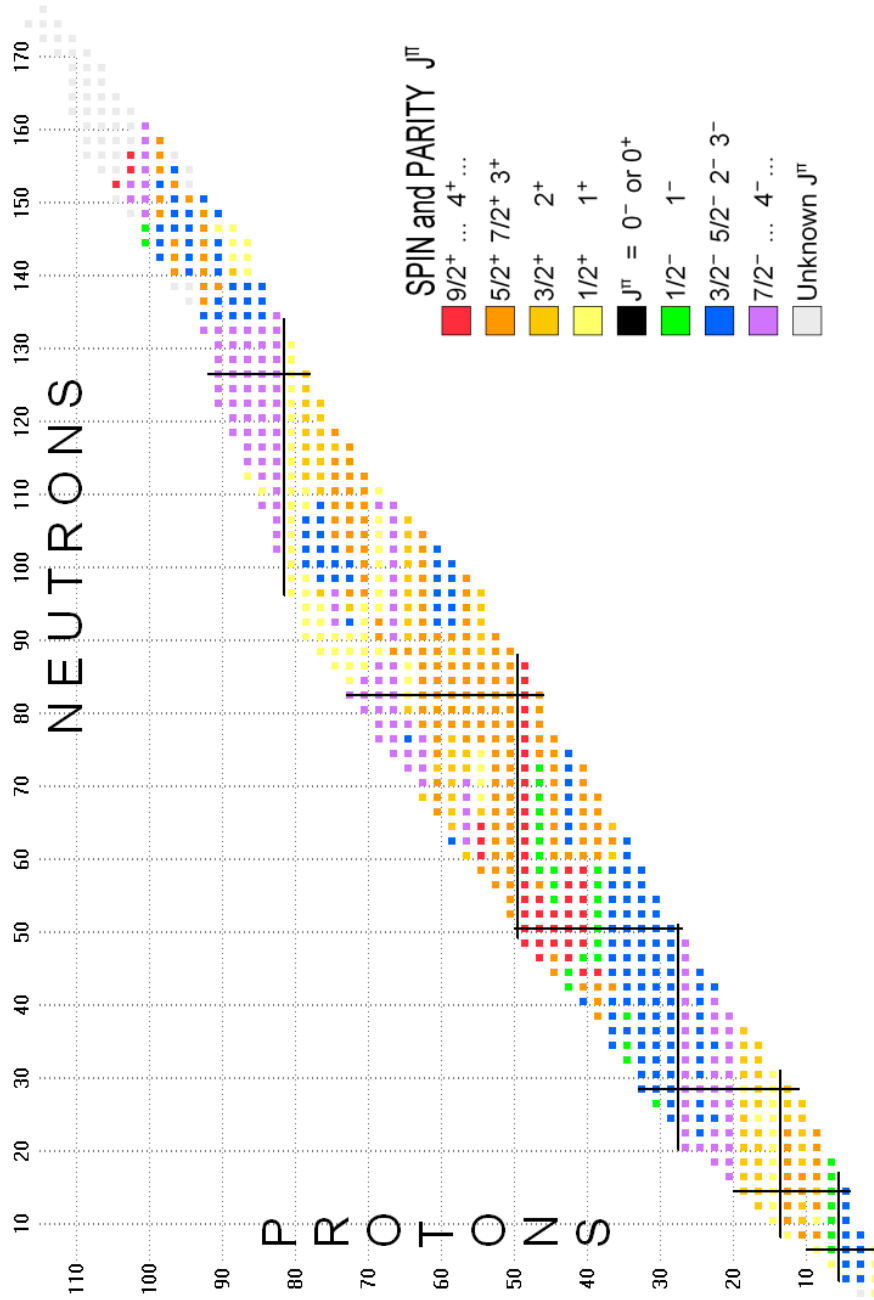


Figure 3: Chart of the nuclides for spins and parities. Shown are only the odd-Z even-N nuclides (created by NUCLEUS-AMDC).

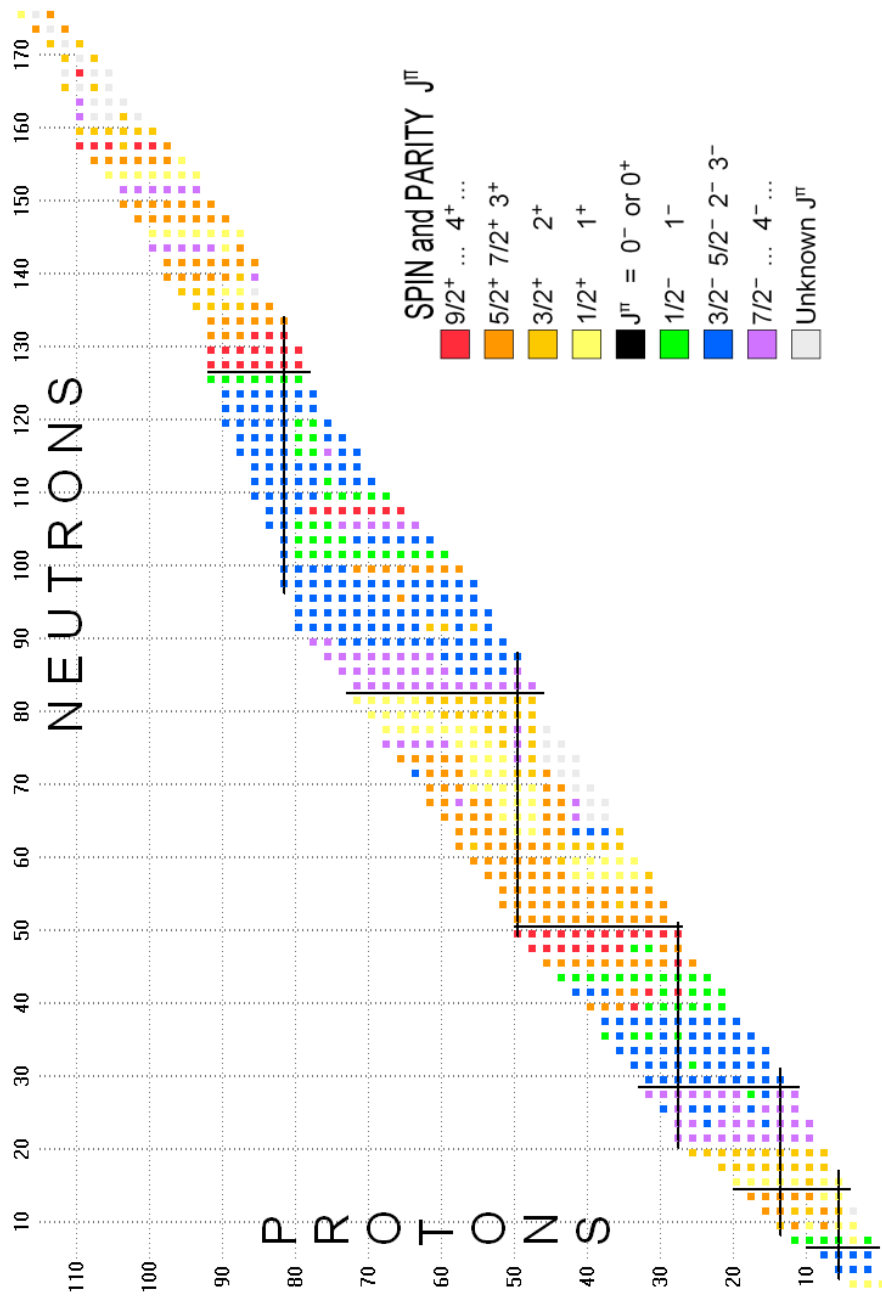


Figure 4: Chart of the nuclides for spins and parities. Shown are only the even- Z odd- N nuclides (created by NUCLEUS-AMDC).

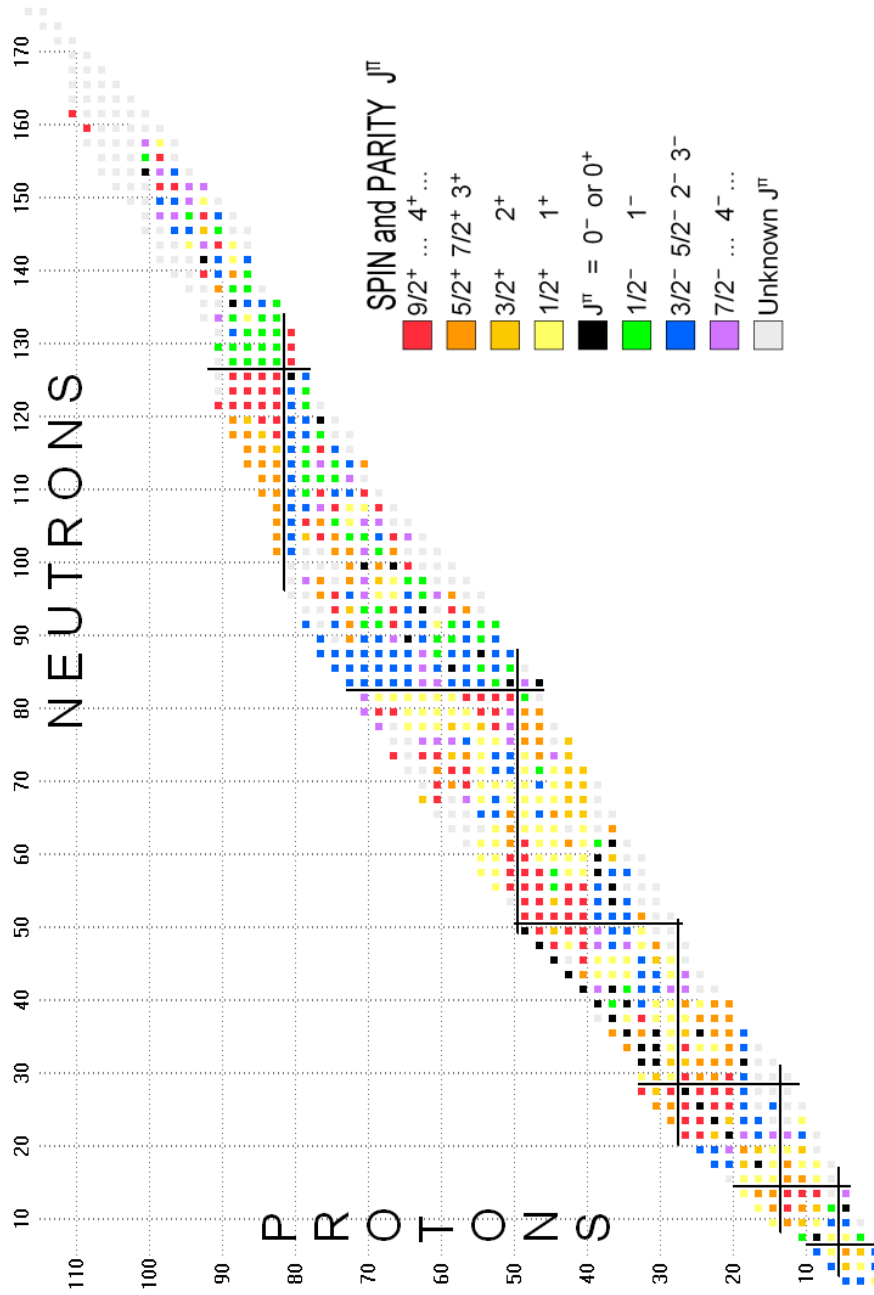


Figure 5: Chart of the nuclides for spins and parities. Shown are only the odd-Z odd-N nuclides (created by NUCLEUS-AMDC).

In the same line, we give both electron capture ε -delayed fission and the positron e^+ -delayed fission with the same symbol β^+ SF.

The double- β decay

In the course of our work we found that half-lives for double- β decay were not always given in a consistent way in ENSDF. For NUBASE we decided to give only half-life values or upper-limits related to the dominant process, which is in general the two-neutrino gs-gs transition (one exception may be ^{98}Mo , for which the neutrinoless decay is predicted to be faster, see [2002Tr04]). No attempt was made to convert to the same statistical confidence level (CL) upper limit results given by different authors.

The excellent recent compilation of Tretyak and Zdesenko [2002Tr04] was of great help in this part of our work.

The β -delayed decays

For delayed decays, intensities have to be considered carefully. By definition, the intensity of a decay mode is the percentage of decaying nuclei in that mode. But traditionally, the intensities of the pure β decay and of those of the delayed ones are summed to give an intensity that is assigned to the pure β decay. For example, if the (A,Z) nuclide has a decay described, according to the tradition, by ' $\beta^-=100$; $\beta^-n=20$ ', this means that for 100 decays of the parent (A,Z) , 80 $(A,Z+1)$ and 20 $(A-1,Z+1)$ daughter nuclei are produced and that 100 electrons and 20 delayed-neutrons are emitted. A strict notation, following the definition above, would have been in this case ' $\beta^-=80$; $\beta^-n=20$ '. However we decided to follow the tradition and use in our work the notation: ' $\beta^-=100$; $\beta^-n=20$ '.

This also holds for more complex delayed emissions. A decay described by: ' $\beta^-=100$; $\beta^-n=30$; $\beta^-2n=20$; $\beta^-\alpha=10$ ' corresponds to the emission of 100 electrons, $(30+2\times 20=70)$ delayed-neutrons and 10 delayed- α particles; and in terms of residual nuclides, to 40 $(A,Z+1)$, 30 $(A-1,Z+1)$, 20 $(A-2,Z+1)$ and 10 $(A-4,Z-1)$. More generally, P_n , the number of emitted neutrons per 100 decays, can be written:

$$P_n = \sum_i i \times \beta_{in}^-;$$

and similar expressions for α or proton emission. The number of residual β daughter $(A,Z+1)$ is:

$$\beta^- - \sum_i \beta_{in}^- - \sum_j \beta_{j\alpha}^- - \dots$$

Another special remark concerns the intensity of a particular β -delayed mode. The primary β -decay populates several excited states in the β -daughter, that will further decay by particle emission. However, in the case where the daughter's ground state also decays by the same particle emission, some authors included its decay

in the value for the concerned β -delayed intensity. We decided not to do so for two reasons. Firstly, because the energies of the particles emitted from the excited states are generally much higher than that from the ground-state, implying different subsequent processes. Secondly, because the characteristic times for the decays from the excited states are related to the parent, whereas those for the decays from the daughter's ground state are due to the daughter. For example ${}^9\text{C}$ decays through β^+ mode with an intensity of 100% of which 12% and 11% to two excited p-emitting states in ${}^9\text{B}$, and 17% to an α -emitting state. We give thus $\beta^+_{\text{p}}=23\%$ and $\beta^+_{\alpha}=17\%$, from which the user of our table can derive a 60% direct feeding of the ground-state of ${}^9\text{B}$. In a slightly different example, ${}^8\text{B}$ decays only to two excited states in ${}^8\text{Be}$ which in turn decay by α and γ emission, but not to the ${}^8\text{Be}$ ground-state. We write thus $\beta^+=100\%$ and $\beta^+_{\alpha}=100\%$, the difference of which leaves 0% for the feeding of the daughter's ground state.

Finally, we want to draw to the attention of the user of our table, that the percentages are, by definition, related to 100 decaying nuclei, not to the primary beta-decay fraction. An illustrative example is given by the decay of ${}^{228}\text{Np}$, for which the delayed-fission probability is given in the original paper as 0.020(9)% [1994Kr13], but this number is relative to the ϵ process, the intensity of which is 59(7)%. We thus renormalized the delayed-fission intensity to 0.012(6)% of the total decay.

In collecting the delayed proton and α activities, the remarkable work of Hardy and Hagberg [1989Ha.A], in which this physics was reviewed and discussed, was an appreciable help in our work. The review of Honkanen, Äystö and Eskola [6] on delayed-protons has also been verified.

Similarly, the review of delayed neutron emission by Hansen and Jonson [1989Ha.B] was carefully examined and used in our table, as well as the evaluation of Rudstam, Aleklett and Sihver [1993Ru01].

2.6. Isotopic abundances

Isotopic abundances are taken from the compilation of K.J.R. Rosman and P.D.P. Taylor [1998Ro45] and are listed in the decay field with the symbol IS. They are displayed as given in [1998Ro45], i.e. we did not even apply our rounding policy.

2.7. References

The year of the archival file is indicated for the nuclides evaluated in ENSDF; otherwise, this entry is left blank.

References for all of the experimental updates are given by the NSR key number [3], and listed at the end of this issue (p. 579). They are followed by one, two or three one-letter codes which specify the added or modified physical quantities (see the

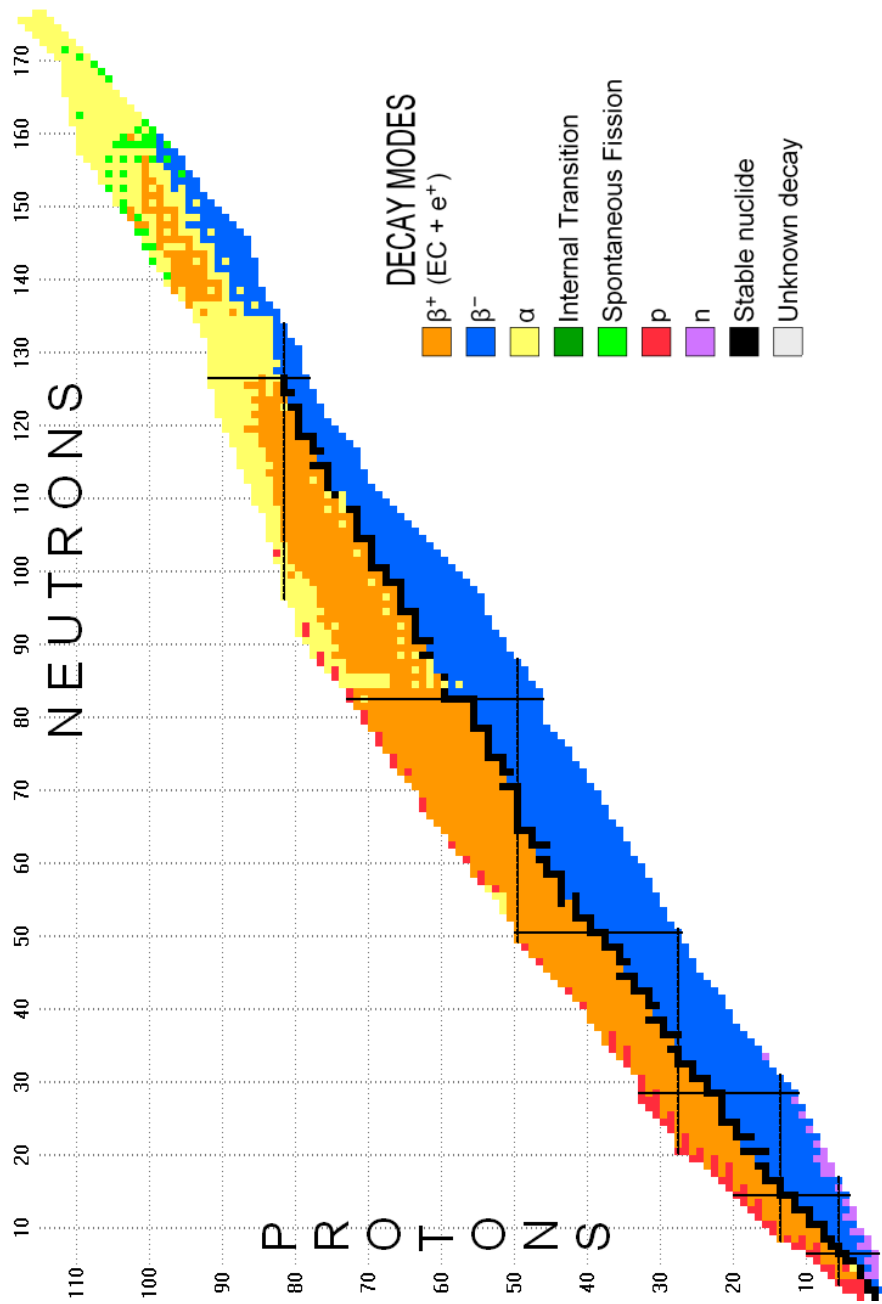


Figure 6: Chart of the nuclides for decay modes (created by NUCLEUS-AMDC).

Explanation of Table). In cases where more than one reference is needed to describe the updates, they are given in a remark. No reference is given for systematic values. The ABBW reference key is used in cases where it may not appear unambiguously that re-interpretations of the data were made by the present authors.

3. Updating procedure

NUBASE is updated via two routes: from ENSDF after each new A -chain evaluation (or from the bi-annual releases), and directly from the literature.

ENSDF files are retrieved from NNDC using the on-line service [1] and transferred through the Internet. Two of the present authors [7] developed programs to successively:

- check that each Z in the A -chain has an ‘adopted levels’ data set; if not, a corresponding data set is generated from the ‘decay’ or ‘reaction’ data set,
- extract the ‘adopted levels’ data sets from ENSDF,
- extract from these data sets the required physical quantities, and convert them into a format similar to the NUBASE format.

The processed data are used to update manually the previous version of NUBASE. This step is done separately by the four authors and cross-checked until full agreement is reached.

The ENSDF is updated generally by A -chains, and, more recently, also by individual nuclides. Its contents however is very large, since it encompasses all the complex nuclear structure and decay properties. This is a huge effort, and it is no wonder that some older data (including annual reports, conference proceedings, and theses) are missing, and that some recent data have not yet been included. Where we notice such missing data, they are analyzed and evaluated, as above, independently by the four authors and the proposed updates are compared. Most often these new data are included in the next ENSDF evaluation and the corresponding references can be removed from the NUBASE database.

4. Distribution and displays of NUBASE

Full content of the present evaluation is accessible on-line at the web site of the Atomic Mass Data Center (AMDC) [8] through the *World Wide Web*. An electronic ASCII file for the NUBASE table, for use with computer programs, is also distributed by the AMDC. This file will **not** be updated, to allow stable reference data for calculations. Any work using that file should make reference to the present paper and not to the electronic file.

The contents of NUBASE can be displayed by a Java program JVNUBASE [9] through the *World Wide Web* and also with a PC-program called “NUCLEUS” [10]. Both can

be accessed or downloaded from the AMDC. They will be updated regularly to allow the user to check for the latest available information in NUBASE.

5. Conclusions

A ‘horizontal’ evaluated database has been developed which contains most of the main properties of the nuclides in their ground and isomeric states. These data originate from a critical compilation of two evaluated datasets: the ENSDF, updated and completed from the literature, and the AME. The guidelines in setting up this database were to cover as completely as possible all the experimental data, and to provide proper reference for those used in NUBASE and not already included in ENSDF; this traceability allows any user to check the recommended data and, if necessary, undertake a re-evaluation.

As a result of this ‘horizontal’ work, a greater homogeneity in data handling and presentation has been obtained for all of the nuclides. Furthermore, isomeric assignments and excitation energies have been reconsidered on a firmer basis and their data improved.

It is expected to follow up this second version of NUBASE with improved treatments. Among them, we plan to complete the extension due to the new definition of isomer to states with half-lives between 100 ns and 1 millisecond that are available at the large-scale facilities. Another foreseeable implementation would be to provide the main α , γ , conversion and X-ray lines accompanying the decays. NUBASE could also be extended to other nuclear properties: energies of the first 2^+ states in even-even nuclides, radii, moments . . . An interesting feature that is already implemented, but not yet checked sufficiently to be included here, is to give for each nuclide, in ground or isomeric-state, the year of its discovery.

6. Acknowledgements

We wish to thank our many colleagues who answered our questions about their experiments and those who sent us preprints of their papers. Continuous interest, discussions, suggestions and help in the preparation of the present publication by C. Thibault were highly appreciated. We appreciate the help provided by J.K. Tuli in solving some of the puzzles we encountered. Special thanks are due to S. Audi for the preparation of the color figures from the NUCLEUS program, and to C. Gaulard and D. Lunney for careful reading of the manuscript. A.H.W. expresses his gratitude to the NIKHEF-K laboratory and especially to Mr. K. Huyser for his continual help, and J.B. to the ISN-Grenoble and DRFMC-Grenoble laboratories for permission to use their facilities.

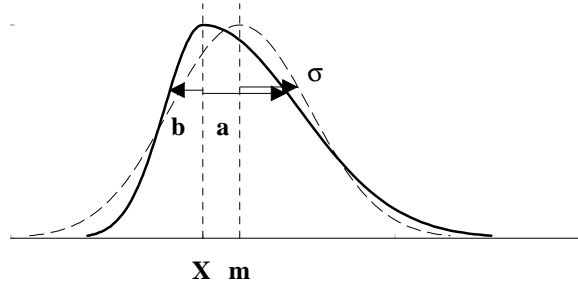


Figure 7: Simulated asymmetric probability density function (heavy solid line) and the equivalent symmetric one (dashed line).

Appendix A. Symmetrization of asymmetric uncertainties

Experimental data are sometimes given with asymmetric uncertainties, X_{-b}^{+a} . If these data are to be used with other ones in some applications, their uncertainties may need to be symmetrized. A simple method (Method 1), used earlier, consisted in taking the central value to be the mid-value between the upper and lower 1σ -equivalent limits $X + (a - b)/2$, and define the uncertainty to be the average of the two uncertainties $(a + b)/2$.

An alternative method (Method 2) is to consider the random variable x associated with the measured quantity. For this random variable, we assume the probability density function to be an asymmetric normal distribution having a modal (most probable) value of $x = X$, a standard deviation b for $x < X$, and a standard deviation a for $x > X$ (Fig. 7). Then the average value of this distribution is

$$\langle x \rangle = X + \sqrt{2/\pi} (a - b),$$

with variance

$$\sigma^2 = (1 - 2/\pi) (a - b)^2 + ab. \quad (1)$$

The median value m which divides the distribution into two equal areas is given, for $a > b$, by

$$\operatorname{erf}\left(\frac{m - X}{\sqrt{2}a}\right) = \frac{a - b}{2a}, \quad (2)$$

and by a similar expression for $b > a$.

We define the equivalent symmetric normal distribution we are looking for as a distribution having a mean value equal to the median value m of the previous distribution with same variance σ .

Table A. Examples of treatment of asymmetric uncertainties for half-lives. Method 1 is the classical method, used previously, as in the AME'95. Method 2 is the one developed in this Appendix and used for half-lives and intensities of the decay modes.

Nuclide	Original $T_{1/2}$	Method 1	Method 2
^{76}Ni	240+550–190 ms	420 ± 370	470 ± 390
^{222}U	1.0+1.0–0.4 μs	1.3 ± 0.7	1.4 ± 0.7
^{264}Hs	327+448–120 μs	490 ± 280	540 ± 300
^{266}Mt	1.01+0.47–0.24 ms	1.1 ± 0.4	1.2 ± 0.4

If the shift $m - X$ of the central value is small compared to a or b , expression (2) can be written [11]:

$$m - X \simeq \sqrt{\pi/8} (a - b) \simeq 0.6267 (a - b).$$

In order to allow for a small non-linearity that appears for higher values of $m - X$, we adopt for Method 2 the relation

$$m - X = 0.64 (a - b).$$

Table A illustrates the results from both methods. In NUBASE, Method 2 is used for the symmetrization of asymmetric half-lives and of asymmetric decay intensities.

References

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Table I. Table of nuclear and decay properties**EXPLANATION OF TABLE**

Data are presented in groups ordered according to increasing mass number A .

Nuclide	Nuclidic name: mass number $A = N + Z$ and element symbol (for $Z > 109$ see Section 2). Element indications with suffix ‘ m ’, ‘ n ’, ‘ p ’ or ‘ q ’ indicate assignments to excited isomeric states (defined, see text, as upper states with half-lives larger than 100 ns). Suffixes ‘ p ’ and ‘ q ’ indicate also non-isomeric levels, of use in the AME2003. Suffix ‘ r ’ indicates a state from a proton resonance occurring in (p, γ) reactions (e.g. $^{28}\text{Si}^r$). Suffix ‘ x ’ applies to mixtures of levels (with relative ratio R , given in the ‘Half-life’ column), e.g. occurring in spallation reactions (indicated ‘spmix’ in the ‘ J^π ’ column) or fission (‘fsmix’).
Mass excess	Mass excess [$M(\text{in u}) - A$], in keV, and its one standard deviation uncertainty as given in the ‘Atomic Mass Evaluation’ (AME2003, second part of this volume). Rounding policy: in cases where the furthest-left significant digit in the error is larger than 3, values and errors are rounded off, but not to more than tens of keV. (Examples: $2345.67 \pm 2.78 \rightarrow 2345.7 \pm 2.8$, $2345.67 \pm 4.68 \rightarrow 2346 \pm 5$, but $2346.7 \pm 468.2 \rightarrow 2350 \pm 470$). # in place of decimal point: value and uncertainty derived not from purely experimental data, but at least partly from systematic trends (cf. AME2003).
Excitation energy	For excited isomers only: energy difference, in keV, between levels adopted as higher level isomer and ground state isomer, and its one standard deviation uncertainty, as given in AME2003 when derived from the AME, otherwise as given by ENSDF. The rounding policy is the same as for the mass excess (see above). # in place of decimal point: value and uncertainty derived from systematic trends. The excitation energy is followed by its origin code when derived from a method other than γ -ray spectrometry: MD Mass doublet RQ Reaction energy difference AD α energy difference BD β energy difference p proton decay XL L X-rays Nm estimated value derived with help of Nilsson model When the existence of an isomer is questionable the following codes are used: EU existence of isomer is under discussion (e.g. $^{141}\text{Tb}^m$). If existence is strongly doubted, no excitation energy and no mass are given. They are replaced by the mention “non-existent” (e.g. $^{138}\text{Pm}^n$). RN isomer is proved not to exist (e.g. $^{184}\text{Lu}^m$). Excitation energy and mass are replaced by the mention “non-existent”. Remark: codes EU and RN are also used when the discovery of a nuclide (e.g. ^{260}Fm) is questioned. In this case however we always give an estimate, derived from systematic trends, for the ground state mass. Isomeric assignment: * In case the uncertainty σ on the excitation energy E is larger than half that energy ($\sigma > E/2$), these quantities are followed by an asterisk (e.g. ^{130}In and $^{130}\text{In}^m$). & In case the ordering of the ground- and isomeric-states are reversed compared to ENSDF, an ampersand sign is added (e.g. ^{90}Tc and $^{90}\text{Tc}^m$).

- Half-life s = seconds; m = minutes; h = hours; d = days; y = years;
 1 y = 31 556 926 s or 365.2422 d
 adopted values for NUBASE (see text)
 STABLE = stable nuclide or nuclide for which no finite value for half-life
 has been found.
 # value estimated from systematic trends in neighboring nuclides with the same Z
 and N parities.
 subunits:
 ms: 10^{-3} s millisecond ky: 10^3 y kiloyear
 μ s: 10^{-6} s microsecond My: 10^6 y megayear
 ns: 10^{-9} s nanosecond Gy: 10^9 y gigayear
 ps: 10^{-12} s picosecond Ty: 10^{12} y terayear
 fs: 10^{-15} s femtosecond Py: 10^{15} y petayear
 as: 10^{-18} s attosecond Ey: 10^{18} y exayear
 zs: 10^{-21} s zeptosecond Zy: 10^{21} y zettayear
 ys: 10^{-24} s yoctosecond Yy: 10^{24} y yottayear
 For isomeric mixtures: R is the production ratio of excited isomeric state to ground-state.
- J^π Spin and parity:
 () uncertain spin and/or parity.
 # values estimated from systematic trends in neighboring nuclides with the same Z
 and N parities.
 high high spin.
 low low spin.
 am same J^π as α -decay parent;
 For isomeric mixtures: mix (spmix and fsmix if coming from spallation and fission respec-
 tively).
- Ens Year of the archival file of the ENSDF
 (in order to reduce the width of the Table, the two digits for the centuries are omitted).
- Reference Reference keys:
 (in order to reduce the width of the Table, the two digits for the centuries are omitted; at
 the end of this volume however, the full reference key-number is given: 1992Pa05 and not
 92Pa05)
 92Pa05 Updates to ENSDF derived from regular journal. These keys are taken from
 Nuclear Data Sheets. Where not yet available, the style 03Ya.1 is provisionally
 adopted.
 95Am.A Updates to ENSDF derived from abstract, preprint, private communication, con-
 ference, thesis or annual report.
 ABBW Re-interpretation by the present authors.
 The reference key-numbers are followed by one, two or three letter codes which specifies
 the added or modified physical quantities:
 T for half-life
 J for spin and/or parity
 E for the isomer excitation energy
 D for decay mode and/or intensity
 I for identification

Decay modes and intensities	Decay modes followed by their intensities (in %), and their one standard deviation uncertainties. The special notation 1.8e-12 stands for 1.8×10^{-12} . The uncertainties are given - only in this field - in the ENSDF-style: $\alpha=25.9\ 23$ stands for $\alpha=25.9 \pm 2.3\ %$ The ordering is according to decreasing intensities.	
	α	α emission
	p 2p	proton emission 2-proton emission
	n 2n	neutron emission 2-neutron emission
	ε	electron capture
	e^+	positron emission
	β^+	β^+ decay ($\beta^+ = \varepsilon + e^+$)
	β^-	β^- decay
	$2\beta^-$	double β^- decay
	$2\beta^+$	double β^+ decay
	β^-n	β^- delayed neutron emission
	β^-2n	β^- delayed 2-neutron emission
	β^+p	β^+ delayed proton emission
	β^+2p	β^+ delayed 2-proton emission
	$\beta^- \alpha$	β^- delayed α emission
	$\beta^+ \alpha$	β^+ delayed α emission
	β^-d	β^- delayed deuteron emission
	IT	internal transition
	SF	spontaneous fission
	β^+SF	β^+ delayed fission
	β^-SF	β^- delayed fission
	^{24}Ne	heavy cluster emission
	...	list is continued in a remark, at the end of the A-group
	For long-lived nuclides:	
	IS	Isotopic abundance

* A remark on the corresponding nuclide is given below the block of data corresponding to the same A.

Remarks. For nuclides indicated with an asterisk at the end of the line, remarks have been added. They are collected in groups at the end of each block of data corresponding to the same A. They start with a code letter, like the ones following the reference key-number, as given above, indicating to which quantity the remark applies. They give:

- i) Continuation for the list of decays. In this case, the remark starts with three dots.
- ii) Information explaining how a value has been derived.
- iii) Reasons for changing a value or its uncertainty as given by the authors or for rejecting it.
- iv) Complementary references for updated data.
- v) Separate values entering an adopted average.

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^1_0n	8071.3171	0.0005	613.9 s	0.6	1/2 ⁺	00 02PaDG T	β^- =100
^1_1H	7288.9705	0.0001	STABLE		1/2 ⁺	00 98Ro45 D	IS=99.9885 70
* ^1_1H	D : all isotopic abundances in NUBASE are from 98Ro45						
^2_1H	13135.7216	0.0003	STABLE		1 ⁺	99	IS=0.0115 70
^3_1H	14949.8060	0.0023	12.32 y	0.02	1/2 ⁺	00	β^- =100
^3_2He	14931.2148	0.0024	STABLE		1/2 ⁺	98	IS=0.000137 3
^3_3Li	28670#	2000#	RN	p-unstable		98	p ?
^4_1H	25900	100	139 ys	10	2 ⁻	98 03Me11 T	n=100
^4_2He	2424.9156	0.0001	STABLE		0 ⁺	98	IS=99.999863 3
^4_3Li	25320	210	91 ys	9	2 ⁻	98 65Ce02 T	p=100
* ^4_1H	T : width=3.28(0.23) MeV; also 91Go19=4.7(1.0) outweighed, not used						
^5_1H	32890	100	> 910 ys		(1/2 ⁺)	02 03Go11 T	2n=100
^5_2He	11390	50	700 ys	30	3/2 ⁻	02	n=100
^5_3Li	11680	50	370 ys	30	3/2 ⁻	02	p=100
^5_4Be	38000#	4000#			1/2 ⁺ #	02	p ?
* ^5_1H	T : from width < 0.5 MeV; at variance with 01Ko52=280(50)ys, width=1.9(0.4)						
* ^5_2He	T : (same authors) but with instrumental resolution=1.3 MeV						
* ^5_3Li	T : others 91Go19=66(25) ys 95Al31=110 ys probably for higher state						
* ^5_4Be	J : from angular distribution consistent with $l = 0$						
^6_1H	41860	260	290 ys	70	2 ⁻ #	02	n ?; 3n ?
^6_2He	17595.1	0.8	806.7 ms	1.5	0 ⁺	02 90Ri01 D	β^- =100; β^- d=0.00028 5
^6_3Li	14086.793	0.015	STABLE		1 ⁺	02	IS=7.59 4
^6_4Be	18375	5	5.0 zs	0.3	0 ⁺	02	2p=100
^6_5B	43600#	700#	p-unstable#		2 ⁻ #		2p ?
^7_1H	49140#	1010#	23 ys	6	1/2 ⁺ #	03Ko11 T	2n ?
^7_2He	26101	17	2.9 zs	0.5	(3/2 ⁻)	03 02Me07 T	n=100
^7_3Li	14908.14	0.08	STABLE		3/2 ⁻	03	IS=92.41 4
^7_4Be	15770.03	0.11	53.22 d	0.06	3/2 ⁻	03	ϵ =100
^7_5B	27870	70	350 ys	50	(3/2 ⁻)	03	p=100
* ^7_1H	T : from estimated width 20(5) MeV in Fig. 5						
* ^7_2He	T : from 159(28) keV, average 02Me07=150(80) 69St02=160(30)						
^8_2He	31598	7	119.0 ms	1.5	0 ⁺	99 88Aj01 D	β^- =100; β^- n=16 1; β^- t=0.9 1
^8_3Li	20946.84	0.09	840.3 ms	0.9	2 ⁺	99 90Sa16 T	β^- =100; β^- α =100
^8_4Be	4941.67	0.04	67 as	17	0 ⁺	99	α =100
^8_5B	22921.5	1.0	770 ms	3	2 ⁺	99 88Aj01 D	β^+ =100; β^+ α =100
^8_6C	35094	23	2.0 zs	0.4	0 ⁺	99	2p=100
* ^8_2He	D : β^- n intensity is from 88Aj01; β^- t intensity from 86Bo41						
* ^8_3Li	D : β^- decay to first 2 ⁺ state in ^8Be , which decays 100% in 2 α						
* ^8_5B	D : β^+ to 2 excited states in ^8Be , then α and γ , but not to ^8Be ground-state						
^9_2He	40939	29	7 zs	4	1/2 ^(-#)	99 99Bo26 T	n=100
^9_3Li	24954.3	1.9	178.3 ms	0.4	3/2 ⁻	99 95Re.A D	β^- =100; β^- n=50.8 2
^9_4Be	11347.6	0.4	STABLE		3/2 ⁻	99	IS=100.
^9_5B	12415.7	1.0	800 zs	300	3/2 ⁻	99	p=100
^9_6C	28910.5	2.1	126.5 ms	0.9	(3/2 ⁻)	99 88Aj01 D	β^+ =100; β^+ p=23; β^+ α =17
* ^9_2He	T : derived from width 100(60) keV J : from 01Ch31						
* ^9_3Li	D : also 92Te03 β^- n=51(1)% 81La11=49(5) outweighed, not used						
* ^9_6C	D : β^+ =12% and 11% to 2 excited p-emitting states in ^9B , and 17% to α emitter						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{10}He	48810	70	2.7 zs	1.8	0^+	99 94Os04 T	2n=100	*
^{10}Li	33051	15	2.0 zs	0.5	$(1^-, 2^-)$	99 94Yo01 TJ	n=100	
$^{10}\text{Li}^m$	33250	40	200 40 RQ	3.7 zs	1.5	97Zi04 T	IT=100	*
$^{10}\text{Li}^n$	33530	40	480 40 RQ	1.35 zs	0.24	94Yo01 T	IT=100	*
^{10}Be	12606.7	0.4	1.51 My	0.06	0^+	99	β^- =100	
^{10}B	12050.7	0.4	STABLE		3^+	99	IS=19.9 7	
^{10}C	15698.7	0.4	19.290 s	0.012	0^+	99 90Ba02 T	β^+ =100	
^{10}N	38800	400	200 ys	140	(2^-)	99 02Le16 TJ	p ?	
* ^{10}He	D : most probably 2 neutron emitter from $S_{2n} = -1070(70)$ keV							**
* $^{10}\text{Li}^m$	T : average 97Zi04=120(+100-50) 94Yo01=100(70) keV							**
* $^{10}\text{Li}^n$	T : average 94Yo01=358(23) 93Bo03=150(70) keV, Birge ratio $B=2.8$							**
^{11}Li	40797	19	8.75 ms	0.14	$3/2^-$	00 97Mo35 T	β^- =100; β^- n=84.9 8; ...	*
^{11}Be	20174	6	13.81 s	0.08	$1/2^+$	00 81Al03 D	β^- =100; β^- n=2.9 4	
^{11}B	8667.9	0.4	STABLE		$3/2^-$	00	IS=80.1 7	
^{11}C	10650.3	1.0	20.39 m	0.02	$3/2^-$	00	β^+ =100	
^{11}N	24300	50	590 ys	210	$1/2^+$	00 03Gu06 T	p=100	*
$^{11}\text{N}^m$	25040	80	740 60	690 ys	80	96Ax01 ETJ	p=100	
* ^{11}Li	D : ... ; β^- 2n=4.1 4; β^- 3n=1.9 2; β^- n α =1.00 6; β^- t=0.014 3; β^- d=0.013 5							**
* ^{11}Li	D : β^- n, β^- 2n and β^- 3n intensities are from 89Ha.B's evaluation;							**
* ^{11}Li	D : β^- n α intensity is from 84La27; β^- d intensity from 96Mu19;							**
* ^{11}Li	D : β^- t: average 84La27=0.010(4)% 96Mu19=0.020(5)%							**
* ^{11}Li	T : average 97Mo35=8.99(0.10) 96Mu19=8.2(0.2) 95Re.A=8.4(0.2)							**
* ^{11}Li	T : 81Bj01=8.83(0.12) and 74Ro31=8.5(0.2)							**
* ^{11}N	T : unweighed average 03Gu06=0.24(0.24) 00Ma62=1.44(0.2) MeV 00OI01=0.4(0.1)							**
* ^{11}N	T : and 96Ax01=0.99(0.20) MeV (Birge ratio $B=3.03$)							**
^{12}Li	50100#	1000#	< 10 ns			00 74Bo05 I	n ?	
^{12}Be	25077	15	21.50 ms	0.04	0^+	00 01Be53 T	β^- =100; β^- n=0.50 3	*
^{12}B	13368.9	1.4	20.20 ms	0.02	1^+	00 66Sc23 D	β^- =100; β^- n=1.6 3	
^{12}C	0.0	0.0	STABLE		0^+	00	IS=98.93 8	
^{12}N	17338.1	1.0	11.000 ms	0.016	1^+	00 66Sc23 D	β^+ =100; β^+ n=3.5 5	
^{12}O	32048	18	580 ys	30	0^+	00 95Kr03 T	2p=60 30; β^+ ?	
* ^{12}Be	D : from 99Be53; also 95Re.A=0.52 9% outweighed, not used							**
^{13}Be	33250	70	0.5 ns	0.1	$(1/2^+)$	01Th01 TJ	n ?	
$^{13}\text{Be}^p$	33950	90	700 120 RQ	2.7 zs	1.8	$(1/2^-)$	00	
$^{13}\text{Be}^q$	35160	50	1910 90 RQ			$(5/2^+)$		
^{13}B	16562.2	1.1	17.33 ms	0.17	$3/2^-$	00	β^- =100; β^- n=0.28 4	
^{13}C	3125.0113	0.0009	STABLE		$1/2^-$	01	IS=1.07 8	
^{13}N	5345.48	0.27	9.965 m	0.004	$1/2^-$	00	β^+ =100	
^{13}O	23112	10	8.58 ms	0.05	$(3/2^-)$	00 70Es03 D	β^+ =100; β^+ p=10.9 20	
^{14}Be	39950	130	4.35 ms	0.17	0^+	01 02Je11 D	β^- =100; β^- n=98 2; ...	*
$^{14}\text{Be}^p$	41470	60	1520 150			(2^+)	95Bo10	
^{14}B	23664	21	12.5 ms	0.5	2^-	01 95Re.A D	β^- =100; β^- n=6.04 23	
^{14}C	3019.893	0.004	5.70 ky	0.03	0^+	01	β^- =100	
^{14}N	2863.4170	0.0006	STABLE		1^+	01	IS=99.632 7	
^{14}O	8007.36	0.11	70.598 s	0.018	0^+	01 01Ga59 T	β^+ =100	*
^{14}F	32660#	400#			2^- #		p ?	
* ^{14}Be	D : ... ; β^- 2n=0.8 08; β^- 3n=0.2 2; β^- t=0.02 1; β^- n α <0.004							**
* ^{14}Be	D : supersedes 99Be53, same group							**
* ^{14}O	T : average 01Ga59=70.560(0.049) 78Wi04=70.613(0.025) 73Cl12=70.590(0.030)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁵ Be	49800#	500#	< 200 ns			03Ba47 I	n ?
¹⁵ B	28972	22	9.87 ms	0.07	3/2 ⁻	93 95Re.A TD	β^- =100; β^- n=93.6 12; β^- 2n=0.4 2 *
¹⁵ C	9873.1	0.8	2.449 s	0.005	1/2 ⁺	94	β^- =100
¹⁵ N	101.4380	0.0007	STABLE		1/2 ⁻	94	IS=0.368 7
¹⁵ O	2855.6	0.5	122.24 s	0.16	1/2 ⁻	94	β^+ =100
¹⁵ F	16780	130	410 ys	60	(1/2 ⁺)	93 01Ze.A T	p=100 *
* ¹⁵ B	D : β^- 2n intensity is from 89Re.A		J : given in 91Aj01				**
* ¹⁵ B	T : four other outweighed results, see ENSDF'93, ranging 10.1 - 10.8 ms **						
* ¹⁵ F	T : average 01Ze.A=1.23(0.22)MeV 78Be16=1.2(0.3) 78Ke06=0.8(0.3) **						
¹⁶ Be	57680#	500#	< 200 ns		0+	03Ba47 I	2n ? *
¹⁶ B	37080	60	< 190 ps		0-	99	n ?
¹⁶ C	13694	4	747 ms	8	0+	99 89Re.A D	β^- =100; β^- n=97.9 23
¹⁶ N	5683.7	2.6	7.13 s	0.02	2-	99 74Ne10 D	β^- =100; β^- α =0.00100 7
¹⁶ O	-4737.0014	0.0001	STABLE		0+	99	IS=99.757 16
¹⁶ F	10680	8	11 zs	6	0-	99	p=100
¹⁶ Ne	23996	20	9 zs		0+	99	2p=100
* ¹⁶ Be	I : 100 events expected, none observed **						
¹⁷ B	43770	170	5.08 ms	0.05	(3/2 ⁻)	99 88Du09 D	β^- =100; β^- n=63 1; ... *
¹⁷ C	21039	17	193 ms	5	(3/2 ⁺)	99 01Ma08 J	β^- =100; β^- n=28.4 13 *
¹⁷ N	7871	15	4.173 s	0.004	1/2 ⁻	99 94Do08 D	β^- =100; β^- n=95 1; ... *
¹⁷ O	-808.81	0.11	STABLE		5/2 ⁺	99	IS=0.038 1
¹⁷ F	1951.70	0.25	64.49 s	0.16	5/2 ⁺	99	β^+ =100
¹⁷ Ne	16461	27	109.2 ms	0.6	1/2 ⁻	99 88Bo39 D	β^+ =100; β^+ p=96.0 9; β^+ α =2.7 9
* ¹⁷ B	D : ... ; β^- 2n=11 7; β^- 3n=3.5 7; β^- 4n=0.4 3 **						
* ¹⁷ C	T : average 95Sc03=193(6) 95Re.A=188(10) 86Cu01=202(17) **						
* ¹⁷ C	D : β^- n intensity is from 95Re.A **						
* ¹⁷ N	D : ... ; β^- α =0.0025 4 **						
¹⁸ B	52320#	800#	< 26 ns		4-#	93Po.A I	n ?
¹⁸ C	24930	30	92 ms	2	0+	96	β^- =100; β^- n=31.5 15
¹⁸ N	13114	19	622 ms	9	1-	96 95Re.A D	β^- =100; β^- n=10.9 9; ... *
¹⁸ O	-781.5	0.6	STABLE		0+	96	IS=0.205 14
¹⁸ F	873.7	0.5	109.771 m	0.020	1+	96 02Un02 T	β^+ =100
¹⁸ F ^m	1995.1	0.5	1121.36	0.15	234 ns		5+
¹⁸ Ne	5317.17	0.28	1.672 s	0.008	0+	96	β^+ =100
¹⁸ Na	24190	50	1.3 zs	0.4	1-#	01Ze.A TD	p=?; β^+ ?
* ¹⁸ N	D : ... ; β^- α =12.2 6 **						
* ¹⁸ N	D : β^- n intensity is from 95Re.A; β^- α intensity from 89Zn04 **						
* ¹⁸ N	T : average 99Og03=620(14) 82O101=624(12) **						
¹⁹ B	59360#	400#	2.92 ms	0.13	3/2 ⁻ #	96 03Yo02 T	β^- =100; β^- n \approx 75; ... *
¹⁹ C	32420	100	46.2 ms	2.3	(1/2 ⁺)	96 88Du09 TD	β^- =100; β^- n=47.3; ... *
¹⁹ N	15862	16	271 ms	8	(1/2 ⁻)	96	β^- =100; β^- n=54.6 14 *
¹⁹ O	3334.9	2.8	26.464 s	0.009	5/2 ⁺	96 94It.A T	β^- =100
¹⁹ F	-1487.39	0.07	STABLE		1/2 ⁺	96	IS=100.
¹⁹ Ne	1751.44	0.29	17.296 s	0.005	1/2 ⁺	96 94Ko.A T	β^+ =100
¹⁹ Na	12927	12	< 40 ns		5/2 ⁺ #	96 93Po.A I	p=100 *
¹⁹ Mg	33040	250			1/2 ⁻ #	96	2p ?
* ¹⁹ B	D : ... ; β^- 2n \approx 25 **						
* ¹⁹ B	T : others: 99Re16=4.5(1.5) 98Yo06=3.3(0.2) statistics + 2.0 systematics estimated by NUBASE) **						
* ¹⁹ B	D : deduced from $P_n = \beta^- n + 2 \times \beta^- 2n + \dots = 125(32)\%$ in 98Yo06 and assuming **						
* ¹⁹ B	D : $\beta^- n + \beta^- 2n = 100\%$ **						
* ¹⁹ C	D : ... ; β^- 2n=7 3 **						
* ¹⁹ C	T : average 88Du09=49(4) 95Re.A=44(4) 95Oz02=45.5(4.0) **						
* ¹⁹ C	J : from 01Ma08, 99Na27 and 95Ba28 **						
* ¹⁹ N	J : 95Oz02=(1/2, 3/2, 5/2)- 89Ca25=(1/2-) **						
* ¹⁹ Na	D : most probably proton emitter from $S_p = -333(12)$ keV **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
²⁰ C	37560	240	16 ms	3	0 ⁺	98 90Mu06 T	β^- =100; β^- n=72 14	*	
²⁰ N	21770	60	130 ms	7		98 95Re.A TD	β^- =100; β^- n=57.0 25		
²⁰ O	3797.5	1.1	13.51 s	0.05	0 ⁺	98	β^- =100		
²⁰ F	-17.40	0.08	11.163 s	0.008	2 ⁺	98 98Ti06 T	β^- =100		
²⁰ Ne	-7041.9313	0.0018	STABLE		0 ⁺	98	IS=90.48 3		
²⁰ Na	6848	7	447.9 ms	2.3	2 ⁺	98 89Cl02 D	β^+ =100; β^+ α =25.0 4		
²⁰ Mg	17570	27	90 ms	6	0 ⁺	98 95Pi03 TD	β^+ =100; β^+ p=30.4 16	*	
* ²⁰ C	T : average 90Mu06=14(+6-5) 95Re.A 16.7(3.5)							**	
* ²⁰ Mg	T : average 95Pi03=95(3) 92Go10=82(4), with Birge ratio B=2.6							**	
²¹ C	45960#	500#	< 30 ns		1/2 ⁺ #	00 93Po.A I	n ?		
²¹ N	25250	100	87 ms	6	1/2 ⁻ #	00	β^- =100; β^- n=80 6		
²¹ O	8063	12	3.42 s	0.10	(1,3,5)/2 ⁺	00	β^- =100		
²¹ F	-47.6	1.8	4.158 s	0.020	5/2 ⁺	00	β^- =100		
²¹ Ne	-5731.78	0.04	STABLE		3/2 ⁺	00	IS=0.27 1		
²¹ Na	-2184.2	0.7	22.49 s	0.04	3/2 ⁺	00	β^+ =100		
²¹ Mg	10911	16	122 ms	2	(5/2,3/2) ⁺	00	β^+ =100; β^+ p=32.6 10; ...	*	
²¹ Al	26120#	300#	< 35 ns		1/2 ⁺ #	00 93Po.A I	p ?		
* ²¹ Mg	D : ... ; β^+ α <0.5							**	
* ²¹ Mg	J : from mirror ²¹ F, there is a preference for 5/2 ⁺							**	
²² C	53280#	900#	6.2 ms	1.3	0 ⁺	00 03Yo02 TD	β^- =100; β^- n=99 39; ...	*	
²² N	32040	190	13.9 ms	1.4		00 03Yo02 T	β^- =100; β^- n=35 5	*	
²² O	9280	60	2.25 s	0.15	0 ⁺	00	β^- =100; β^- n<22		
²² F	2793	12	4.23 s	0.04	4 ⁺ , (3 ⁺)	00	β^- =100; β^- n<11		
²² Ne	-8024.715	0.018	STABLE		0 ⁺	00	IS=9.25 3		
²² Na	-5182.4	0.4	2.6019 y	0.0004	3 ⁺	00	β^+ =100		
²² Na ^m	-4599.4	0.4	583.03	0.09	244 ns	6	1 ⁺	00 IT=100	
²² Mg	-397.0	1.3	3.857 s	0.009	0 ⁺	00	β^+ =100		
²² Al	18180#	90#	59 ms	3	(3) ⁺	00 97B103 D	β^+ =100; β^+ p=44 3; ...	*	
²² Si	32160#	200#	29 ms	2	0 ⁺	00 96B111 D	β^+ =100; β^+ p=32 4	*	
* ²² C	D : ... ; β^- 2n ? D : from 98Yo06							**	
* ²² N	D : from 90Mu06							**	
* ²² Al	D : ... ; β^+ 2p=0.9 5; β^+ α =0.31 9							**	
²³ N	38400#	300#	14.5 ms	2.4	1/2 ⁻ #	00 98Yo06 T	β^- =100; β^- n=80 21; β^- 2n ?	*	
²³ O	14610	120	90 ms	40	1/2 ⁺ #	00 90Mu06 T	β^- =100; β^- n=31 7		
²³ F	3330	80	2.23 s	0.14	(3/2,5/2) ⁺	00	β^- =100; β^- n<14		
²³ Ne	-5154.05	0.10	37.24 s	0.12	5/2 ⁺	00	β^- =100		
²³ Na	-9529.8536	0.0027	STABLE		3/2 ⁺	00	IS=100		
²³ Mg	-5473.8	1.3	11.317 s	0.011	3/2 ⁺	00	β^+ =100		
²³ Al	6770	19	470 ms	30	5/2 ⁺ #	00 95Ti08 D	β^+ =100; β^+ p=8 4	*	
²³ Si	23770#	200#	42.3 ms	0.4	3/2 ⁺ #	00 97B104 TD	β^+ =100; β^+ p \approx 88; ...	*	
* ²³ N	T : statistical error 1.4, systematics 2.0 estimated by NUBASE							**	
* ²³ Al	D : β^+ p=3.5(1.9)% from the IAS. Total=3.5 \times 4.8/2.2=7.6%							**	
* ²³ Si	D : ... ; β^+ 2p=3.6 3							**	
²⁴ N	47540#	400#	< 52 ns			00 93Po.A I	n ?		
²⁴ O	19070	240	65 ms	5	0 ⁺	00	β^- =100; β^- n=18 6		
²⁴ F	7560	70	400 ms	50	(1,2,3) ⁺	00	β^- =100; β^- n<5.9		
²⁴ Ne	-5951.5	0.4	3.38 m	0.02	0 ⁺	00	β^- =100		
²⁴ Na	-8418.11	0.08	14.9590 h	0.0012	4 ⁺	00	β^- =100		
²⁴ Na ^m	-7945.90	0.08	472.207	0.009	20.20 ms	0.07	1 ⁺	00 IT \approx 100; β^- =0.05	
²⁴ Mg	-13933.567	0.013	STABLE		0 ⁺	00	IS=78.99 4		
²⁴ Al	-56.9	2.8	2.053 s	0.004	4 ⁺	00	β^+ =100; β^+ α =0.035 6; ...	*	
²⁴ Al ^m	368.9	2.8	425.8	0.1	131.3 ms	2.5	1 ⁺	00 IT=82 3; β^+ =18 3; ...	*
²⁴ Si	10755	19	140 ms	8	0 ⁺	00 98Cz01 D	β^+ =100; β^+ p=37.6 25		
²⁴ P	32000#	500#			1 ⁺ #		p ?; β^+ ?		
* ²⁴ Al	D : ... ; β^+ p=0.0016 3							**	
* ²⁴ Al ^m	D : ... ; β^+ α =0.028 6							**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁵ N	56500#	500#	< 260 ns	1/2 ⁻ #		99Sa06 ID	n ?; 2n ?; β ⁻ =0	*
²⁵ O	27440#	260#	< 50 ns	3/2 ⁺ #	00	93Po.A I	n ?	
²⁵ F	11270	100	50 ms	6 5/2 ⁺ #	00		β ⁻ =100; β ⁻ n=14.5	
²⁵ Ne	-2108	26	602 ms	8 (3/2) ⁺	00		β ⁻ =100	
²⁵ Na	-9357.8	1.2	59.1 s	0.6 5/2 ⁺	00		β ⁻ =100	
²⁵ Mg	-13192.83	0.03	STABLE	5/2 ⁺	00		IS=10.00 1	
²⁵ Al	-8916.2	0.5	7.183 s	0.012 5/2 ⁺	00		β ⁺ =100	
²⁵ Si	3824	10	220 ms	3 5/2 ⁺	00		β ⁺ =100; β ⁺ p=36.81 5	
²⁵ P	18870#	200#	< 30 ns	1/2 ⁺ #	00	93Po.A I	p ?	
* ²⁵ N	D : in 99Sa06 experiment, 240 ²⁵ N events expected, none observed							**
²⁶ O	35710#	260#	< 40 ns	0 ⁺	00	93Po.A I	2n ?; n=30#; β ⁻ =0	*
²⁶ F	18270	170	10.2 ms	1.4 1 ⁺	00	99Re16 T	β ⁻ =100; β ⁻ n=11 4	*
²⁶ Ne	430	27	197 ms	1 0 ⁺	00		β ⁻ =100; β ⁻ n=0.13 3	
²⁶ Na	-6862	6	1.077 s	0.005 3 ⁺	00		β ⁻ =100	
²⁶ Mg	-16214.582	0.027	STABLE	0 ⁺	00		IS=11.01 3	
²⁶ Al	-12210.31	0.06	717 ky	24 5 ⁺	00		β ⁺ =100	
²⁶ Al ^m	-11982.01	0.06	228.305	0.013 6.3452 s	0.0019 0 ⁺	00	β ⁺ =100	
²⁶ Si	-7145	3	2.234 s	0.013 0 ⁺	00		β ⁺ =100	
²⁶ P	10970#	200#	30 ms	25 (3 ⁺)	00		β ⁺ =100; β ⁺ 2p≈1; ...	*
²⁶ S	25970#	300#	10# ms	0 ⁺			2p ?	
* ²⁶ O	D : in 96Fa01 and 99Sa06, several 100s of ²⁶ O events expected, none observed							**
* ²⁶ F	T : other not used 99DI01=9.6(0.8): same data							**
* ²⁶ P	D : ... ; β ⁺ p≈0.9							**
²⁷ O	44950#	500#	< 260 ns	3/2 ⁺ #		99Sa06 I	n ?; 2n ?	
²⁷ F	24930	380	4.9 ms	0.2 5/2 ⁺ #	01	98No.A T	β ⁻ =100; β ⁻ n=77 21	*
²⁷ Ne	7070	110	32 ms	2 3/2 ⁺ #	01		β ⁻ =100; β ⁻ n=2.0 5	
²⁷ Na	-5517	4	301 ms	6 5/2 ⁺	01	84Gu19 D	β ⁻ =100; β ⁻ n=0.13 4	
²⁷ Mg	-14586.65	0.05	9.458 m	0.012 1/2 ⁺	01		β ⁻ =100	
²⁷ Al	-17196.66	0.12	STABLE	5/2 ⁺	01		IS=100.	
²⁷ Si	-12384.30	0.15	4.16 s	0.02 5/2 ⁺	01		β ⁺ =100	
²⁷ P	-717	26	260 ms	80 1/2 ⁺	01		β ⁺ =100; β ⁺ p=0.07	
²⁷ S	17540#	200#	21 ms	4 (5/2 ⁺)	01		β ⁺ =100; β ⁺ 2p=2.0 10;...	*
* ²⁷ F	T : others not used: 99Re16=6.5(1.1) and 97Ta22=5.3(0.9) outweighed; and							**
* ²⁷ P	T : 99DI01=5.2(0.3) same data as in 99Re16							**
* ²⁷ S	D : ... ; β ⁺ p=?							**
²⁸ O	53850#	600#	< 100 ns	0 ⁺		98Po.A I	n ?; 2n ?; β ⁻ =0	*
²⁸ F	33230#	510#	< 40 ns		01	93Po.A I	n ?	
²⁸ Ne	11240	150	18.3 ms	2.2 0 ⁺	01	99Re16 T	β ⁻ =100; β ⁻ n=16 6	*
²⁸ Na	-989	13	30.5 ms	0.4 1 ⁺	01		β ⁻ =100; β ⁻ n=0.58 12	
²⁸ Mg	-15018.6	2.0	20.915 h	0.009 0 ⁺	01		β ⁻ =100	
²⁸ Al	-16850.44	0.13	2.2414 m	0.0012 3 ⁺	01		β ⁻ =100	
²⁸ Si	-21492.7968	0.0018	STABLE	0 ⁺	01		IS=92.2297 7	
²⁸ Si ^r	-8951.55	0.12	12541.25	0.12 RQ			3 ⁺	
²⁸ P	-7159	3	270.3 ms	0.5 3 ⁺	01	79Ho27 D	β ⁺ =100; β ⁺ p=0.0013 4;...	*
²⁸ S	4070	160	125 ms	10 0 ⁺	01	89Po10 D	β ⁺ =100; β ⁺ p=20.7 19	
²⁸ Cl	26560#	500#		1 ⁺ #			p ?	
* ²⁸ O	D : in 97Ta22 and 99Sa06, 11 and 37 ²⁸ O events expected, none observed							**
* ²⁸ Ne	T : average 99Re16=18(3) 97Ta22=21(5) 92Te03=17(4). Others not used:							**
* ²⁸ Ne	T : 95Re.A=8.2(2.5) at variance, 99DI01=20(3) same data as in 99Re16							**
* ²⁸ P	D : ... ; β ⁺ α=0.00086 25							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁹ F	40300#	580#	2.6 ms	0.3	5/2 ⁺ #	01 99Re16 T	β^- =100; β^- n=60.40; ... *	
²⁹ Ne	18060	270	15.6 ms	0.5	3/2 ⁺ #	01 01Be53 D	β^- =100; β^- n=19.4; ... *	
²⁹ Na	2665	13	44.9 ms	1.2	3/2 ⁽⁺⁾ #	01 95Re.A D	β^- =100; β^- n=25.9 23 *	
²⁹ Mg	-10619	14	1.30 s	0.12	3/2 ⁺	01	β^- =100	
²⁹ Al	-18215.3	1.2	6.56 m	0.06	5/2 ⁺	01	β^- =100	
²⁹ Si	-21895.046	0.021	STABLE		1/2 ⁺	01	IS=4.6832 5	
²⁹ P	-16952.6	0.6	4.142 s	0.015	1/2 ⁺	01	β^+ =100	
²⁹ S	-3160	50	187 ms	4	5/2 ⁺	01 79Vi01 D	β^+ =100; β^+ p=46.4 10	
²⁹ Cl	13140#	200#	< 20 ns		3/2 ⁺ #	01 93Po.A I	p ?	
* ²⁹ F	D : ... ; β^- 2n ?							**
* ²⁹ F	T : average 99Re16=2.9(0.8) 98No.A=2.6(0.4) 97Ta22=2.4(0.8). Others not							**
* ²⁹ F	T : used: 99D101=2.4(0.4) same data as in 99Re16							**
* ²⁹ F	D : β^- n from 99D101=100(80)%							**
* ²⁹ Ne	D : ... ; β^- 2n<2.2							**
* ²⁹ Ne	D : average 01Be53=17 5 99Re16=27 9; other not used: 99D101=27(9)%, same							**
* ²⁹ Ne	D : data as in 99Re16. β^- 2n limit is from 01Be53							**
* ²⁹ Na	D : β^- n: average 95Re.A=27.1(1.6)% 84La03=21.5(3.0)%							**
³⁰ F	48900#	600#	< 260 ns			99Sa06 I	n ?	
³⁰ Ne	23100	570	5.8 ms	0.2	0 ⁺	01 99D101 D	β^- =100; β^- n=13 8 *	
³⁰ Na	8361	25	48.4 ms	1.7	2 ⁺	01 99D101 T	β^- =100; β^- n=30.4; ... *	
³⁰ Mg	-8911	8	335 ms	17	0 ⁺	01 84La03 D	β^- =100; β^- n<0.06	
³⁰ Al	-15872	14	3.60 s	0.06	3 ⁺	01	β^- =100	
³⁰ Si	-24432.928	0.030	STABLE		0 ⁺	01	IS=3.0872 5	
³⁰ P	-20200.6	0.3	2.498 m	0.004	1 ⁺	01	β^+ =100	
³⁰ S	-14063	3	1.178 s	0.005	0 ⁺	01	β^+ =100	
³⁰ Cl	4440#	200#	< 30 ns		3 ⁺ #	01 93Po.A I	p ?	
³⁰ Ar	20080#	300#	< 20 ns		0 ⁺	01 93Po.A I	2p ?	
* ³⁰ Ne	D : from 9(17)%							**
* ³⁰ Na	D : ... ; β^- 2n=1.17 16; β^- α =5.5e-5 20							**
* ³⁰ Na	T : average 99D101=50(4) 97Ta22=48(5) 84La02=48(2)							**
* ³⁰ P	D : first observed radionuclide, in 1934							**
³¹ F	56290#	600#	1# ms (>260 ns)		5/2 ⁺ #	99Sa06 I	β^- ?; β^- n ?	
³¹ Ne	30840#	900#	3.4 ms	0.8	7/2 ⁻ #	01	β^- =100; β^- n ?	
³¹ Na	12650	210	17.0 ms	0.4	(3/2 ⁺)	01 93K102 J	β^- =100; β^- n=37.5; ... *	
³¹ Mg	-3217	12	230 ms	20	3/2 ⁺	01 95Re.A D	β^- =100; β^- n=6.2 20 *	
³¹ Al	-14954	20	644 ms	25	(5/2, 3/2) ⁺	01	β^- =100; β^- n<1.6 *	
³¹ Si	-22949.01	0.04	157.3 m	0.3	3/2 ⁺	01	β^- =100	
³¹ P	-24440.88	0.18	STABLE		1/2 ⁺	01	IS=100.	
³¹ S	-19044.6	1.5	2.572 s	0.013	1/2 ⁺	01	β^+ =100	
³¹ Cl	-7070	50	150 ms	25	3/2 ⁺	01 85Ay02 D	β^+ =100; β^+ p=0.7 *	
³¹ Ar	11290#	210#	14.4 ms	0.6	5/2 ⁽⁺⁾ #	01 00Fy01 T	β^+ =100; β^+ p=63.7; ... *	
* ³¹ Na	D : ... ; β^- 2n=0.9 2; β^- 3n<0.05							**
* ³¹ Na	D : all from 84Gu19							**
* ³¹ Mg	D : strongly conflicting with earlier 84La03=1.7(0.3)%							**
* ³¹ Al	J : from systematics there is a preference for 5/2 ⁺							**
* ³¹ Cl	D : β^+ p=0.44% for 986 keV protons. Total: 165/100×0.44=0.726%							**
* ³¹ Ar	D : ... ; β^+ 2p=7.2 11; β^+ 3p<1.4; β^+ p α <0.38; β^+ α <0.03							**
* ³¹ Ar	D : from 98Ax02							**
* ³¹ Ar	T : average 00Fy01=14.1(0.7) 92Ba01=15.1(+1.3-1.1) J : from 99Th09							**
³² Ne	37280#	800#	3.5 ms	0.9	0 ⁺	01	β^- =100; β^- n ?	
³² Na	19060	360	12.9 ms	0.7	(3 ⁻ , 4 ⁻)	01 93K102 J	β^- =100; β^- n=24.7; ... *	
³² Mg	-955	18	95 ms	16	0 ⁺	01	β^- =100; β^- n=2.4 5	
³² Al	-11060	90	31.7 ms	0.8	1 ⁺	01 95Re.A TD	β^- =100; β^- n=0.7 5	
³² Al ^m	-10100	90	955.7 0.4	200 ns	20	(4 ⁺)	01 96Ro02 ETJ	
³² Si	-24080.91	0.05	132 y	13	0 ⁺	01	β^- =100	
³² Si ^m	-18497.9	1.0	5583.0 1.0	27 ns	2	(5 ⁻)	97Fo01 ETJ	

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
³² P	-24305.22	0.19	14.263 d	0.003	1 ⁺	01 02Un02 T	β^- =100	
³² S	-26015.70	0.14	STABLE		0 ⁺	01	IS=94.93 31	
³² Cl	-13330	7	298 ms	1	1 ⁺	01 79Ho27 D	β^+ =100; $\beta^+\alpha$ =0.054 8; ... *	
³² Ar	-2200.2	1.8	98 ms	2	0 ⁺	01	β^+ =100; β^+p =43.3	
³² Ar ^m	3400#	100#	5600#	100#	5 ⁻ #		IT?	
³² K	20420#	500#			1 ⁺ #		p?	
³² K ^m	21370#	510#	950#	100#	4 ⁺ #		p?	
* ³² Na	D: ...; $\beta^-2n=8.2$							**
* ³² Na	T: average 98No.A=11.5(0.8) 84La03=13.2(0.4)							**
* ³² Cl	D: ...; $\beta^+p=0.026.5$							**
³³ Ne	46000#	800#	< 260 ns		7/2 ⁻ #	02No11 I	n?	
³³ Na	24890	870	8.2 ms	0.2	3/2 ⁺ #	01 02Ra16 TD	β^- =100; $\beta^-n=47.6$; ... *	
³³ Mg	4894	20	90.5 ms	1.6	7/2 ⁻ #	01 02Mo29 T	β^- =100; $\beta^-n=17.5$	
³³ Al	-8530	70	41.7 ms	0.2	5/2 ⁺ #	01 02Mo29 T	β^- =100; $\beta^-n=8.7$	
³³ Si	-20493	16	6.18 s	0.18	(3/2 ⁺)	01	β^- =100	
³³ P	-26337.5	1.1	25.34 d	0.12	1/2 ⁺	01	β^- =100	
³³ S	-26585.99	0.14	STABLE		3/2 ⁺	01	IS=0.76 2	
³³ Cl	-21003.4	0.5	2.511 s	0.003	3/2 ⁺	01	β^+ =100	
³³ Ar	-9384.1	0.4	173.0 ms	2.0	1/2 ⁺	01	β^+ =100; $\beta^+p=38.7$ 10	
³³ K	6760#	200#	< 25 ns		3/2 ⁺ #	01 93Po.A I	p?	
* ³³ Ne	T: estimated half-life 1# ms for β^- decay I: also 02Le.A < 1.5 μ s							**
* ³³ Na	D: ...; $\beta^-2n=13.3$							**
³⁴ Ne	53120#	810#	1# ms (>1.5 μ s)		0 ⁺	02Le.A I	β^- ?; β^-n ?	
³⁴ Na	32760#	900#	5.5 ms	1.0	1 ⁺	01 ABBW D	β^- =100; $\beta^-2n\approx 50$; $\beta^-n\approx 15$ *	
³⁴ Mg	8810	230	20 ms	10	0 ⁺	01	β^- =100; β^-n ?	
³⁴ Al	-2930	110	56.3 ms	0.5	4 ⁻ #	01 01Nu01 T	β^- =100; $\beta^-n=12.5$ 25 *	
³⁴ Si	-19957	14	2.77 s	0.20	0 ⁺	01	β^- =100	
³⁴ P	-24558	5	12.43 s	0.08	1 ⁺	01	β^- =100	
³⁴ S	-29931.79	0.11	STABLE		0 ⁺	01	IS=4.29 28	
³⁴ Cl	-24439.78	0.18	1.5264 s	0.0014	0 ⁺	01	β^+ =100	
³⁴ Cl ^m	-24293.42	0.18	146.36	0.03	32.00 m	0.04	β^+ =55.4 6; IT=44.6 6	
³⁴ Ar	-18377.2	0.4	845 ms	3	0 ⁺	01	β^+ =100	
³⁴ K	-1480#	300#	< 40 ns		1 ⁺ #	01 93Po.A I	p?	
³⁴ Ca	13150#	300#	< 35 ns		0 ⁺	01 93Po.A I	2p?	
* ³⁴ Ne	I: also 02No11 > 260 ns							**
* ³⁴ Na	D: $\beta^-n\approx 15\%$, $\beta^-2n\approx 50\%$ estimated from $P_n = \beta^-n + 2 \times \beta^-2n=115(20)\%$ in 84La03							**
* ³⁴ Na	D: assuming $\beta^-n/\beta^-2n=0.3$ from trends in the ³⁰ Na- ³³ Na series: 26 41 3 4							**
* ³⁴ Al	D: from 95Re.A; strongly conflicting with 89Ba50=27(5)% and 88Mu08=54(12)%							**
* ³⁴ Al	T: also 95Re.A=42(6) ms							**
³⁵ Na	39580#	950#	1.5 ms	0.5	3/2 ⁺ #	01	β^- =100; $\beta^-n=?$	
³⁵ Mg	16150#	400#	70 ms	40	7/2 ⁻ #	01 95Re.A D	β^- =100; $\beta^-n=52.46$	
³⁵ Al	-130	180	38.6 ms	0.4	5/2 ⁺ #	01 01Nu01 TD	β^- =100; $\beta^-n=41.13$ *	
³⁵ Si	-14360	40	780 ms	120	7/2 ⁻ #	01 95Re.A D	β^- =100; $\beta^-n<5$	
³⁵ P	-24857.7	1.9	47.3 s	0.7	1/2 ⁺	01	β^- =100	
³⁵ S	-28846.36	0.10	87.51 d	0.12	3/2 ⁺	01	β^- =100	
³⁵ Cl	-29013.54	0.04	STABLE		3/2 ⁺	01	IS=75.78 4	
³⁵ Ar	-23047.4	0.7	1.775 s	0.004	3/2 ⁺	01	β^+ =100	
³⁵ K	-11169	20	178 ms	8	3/2 ⁺	01	β^+ =100; $\beta^+p=0.37$ 15	
³⁵ Ca	4600#	200#	25.7 ms	0.2	1/2 ⁺ #	01	β^+ =100; $\beta^+p=95.7$ 14; ... *	
* ³⁵ Al	T: also 95Re.A=30(4); both strongly conflicting with 89Le16=170(70) and							**
* ³⁵ Al	T: 88Mu08=130(+100-50)							**
* ³⁵ Al	D: also 95Re.A=26(4)% 89Le16=40(10)% and 88Mu08=87(+37-25)%							**
* ³⁵ Ca	D: ...; $\beta^+2p=4.2.3$							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens Reference	Decay modes and intensities (%)	
³⁶ Na	47950#	950#	< 260 ns		02No11 I	n ?	*
³⁶ Mg	21420#	500#	5# ms(>200 ns)	0 ⁺	01 89Gu03 I	β^- ?	
³⁶ Al	5780	210	90 ms 40		01	β^- =100; β^- -n<30	
³⁶ Si	-12480	120	450 ms 60	0 ⁺	01 95Re.A D	β^- =100; β^- -n=12 5	
³⁶ P	-20251	13	5.6 s 0.3	4 ⁻ #	01	β^- =100	
³⁶ S	-30664.07	0.19	STABLE	0 ⁺	01	IS=0.02 1	
³⁶ Cl	-29521.86	0.07	301 ky 2	2 ⁺	01	β^- =98.1 1; β^+ =1.9 1	
³⁶ Ar	-30231.540	0.027	STABLE	0 ⁺	01	IS=0.3365 30; 2 β^+ ?	
³⁶ K	-17426	8	342 ms 2	2 ⁺	01	β^+ =100; β^+ p=0.048 14; ...	*
³⁶ Ca	-6440	40	102 ms 2	0 ⁺	01 95Tr02 D	β^+ =100; β^+ p=56.8 13	
³⁶ Sc	13900#	500#				p ?	
* ³⁶ Na	I : also 02Le.A < 1.5 μ s						**
* ³⁶ K	D : ... ; β^+ α =0.0034 13						**
³⁷ Na	55280#	960#	1# ms(>1.5 μ s)	3/2 ⁺ #	02Le.A I	β^- ?; β^- -n ?	*
³⁷ Mg	29250#	900#	40# ms(>260 ns)	7/2 ⁻ #	01 96Sa34 I	β^- ?; β^- -n ?	
³⁷ Al	9950	330	20# ms (>1 μ s)	3/2 ⁺ #	01 91Or01 I	β^- ?	
³⁷ Si	-6580	170	90 ms 60	7/2 ⁻ #	01 95Re.A D	β^- =100; β^- -n=17 13	
³⁷ P	-18990	40	2.31 s 0.13	1/2 ⁺ #	01	β^- =100	
³⁷ S	-26896.36	0.20	5.05 m 0.02	7/2 ⁻	01	β^- =100	
³⁷ Cl	-31761.53	0.05	STABLE	3/2 ⁺	01	IS=24.22 4	
³⁷ Ar	-30947.66	0.21	35.04 d 0.04	3/2 ⁺	01	ϵ =100	
³⁷ K	-24800.20	0.09	1.226 s 0.007	3/2 ⁺	01	β^+ =100	
³⁷ Ca	-13162	22	181.1 ms 1.0	(3/2 ⁺)	01 95Tr03 D	β^+ =100; β^+ p=82.1 7	
³⁷ Sc	2840#	300#		7/2 ⁻ #		p ?	
* ³⁷ Na	I : also 02No11 > 260 ns						**
³⁸ Mg	35000#	500#	1# ms(>260 ns)	0 ⁺	01 97Sa14 I	β^- ?	*
³⁸ Al	16050	730	40# ms(>200 ns)		01 89Gu03 I	β^- ?	
³⁸ Si	-4070	140	90# ms (>1 μ s)	0 ⁺	01 91Zh24 I	β^- ?; β^- -n ?	
³⁸ P	-14760	100	640 ms 140		01 95Re.A D	β^- =100; β^- -n=12 5	
³⁸ S	-26861	7	170.3 m 0.7	0 ⁺	01	β^- =100	
³⁸ Cl	-29798.10	0.10	37.24 m 0.05	2 ⁻	01	β^- =100	
³⁸ Cl ^m	-29126.74	0.10	671.361 0.008	715 ms 3	5 ⁻	IT=100	
³⁸ Ar	-34714.6	0.3	STABLE	0 ⁺	01	IS=0.0632 5	
³⁸ K	-28800.7	0.4	7.636 m 0.018	3 ⁺	01	β^+ =100	
³⁸ K ^m	-28670.2	0.4	130.50 0.28 RQ	923.9 ms 0.6	0 ⁺	β^+ =100	
³⁸ K ⁿ	-25342.7	0.4	3458.0 0.2	21.98 μ s 0.11	(7 ⁺), (5 ⁺)	IT=100	
³⁸ Ca	-22059	5	440 ms 8	0 ⁺	01	β^+ =100	
³⁸ Sc	-4940#	300#	< 300 ns	2 ⁻ #	01 94B110 I	p ?	
³⁸ Sc ^m	-4270#	320#	670# 100#	5 ⁻ #	01	IT ?; p ?	
³⁸ Ti	9100#	250#	< 120 ns	0 ⁺	01 96B121 I	2p ?	
* ³⁸ Mg	I : 18 events reported						**
³⁹ Mg	43570#	510#	< 260 ns	7/2 ⁻ #	02No11 I	n ?	*
³⁹ Al	21400	1470	10# ms(>200 ns)	3/2 ⁺ #	01 89Gu03 I	β^- ?	
³⁹ Si	1930	340	90# ms (>1 μ s)	7/2 ⁻ #	01 90Au.A I	β^- ?	
³⁹ P	-12870	100	190 ms 50	1/2 ⁺ #	01 95Re.A TD	β^- =100; β^- -n=26 8	
³⁹ S	-23160	50	11.5 s 0.5	(3,5,7)/2 ⁻	01	β^- =100	
³⁹ Cl	-29800.2	1.7	55.6 m 0.2	3/2 ⁺	01	β^- =100	
³⁹ Ar	-33242	5	269 y 3	7/2 ⁻	01	β^- =100	
³⁹ K	-33807.01	0.19	STABLE	3/2 ⁺	01	IS=93.2581 44	
³⁹ Ca	-27274.4	1.9	859.6 ms 1.4	3/2 ⁺	01	β^+ =100	
³⁹ Sc	-14168	24	< 300 ns	7/2 ⁻ #	01 94B110 I	p=100	*
³⁹ Ti	1500#	210#	31 ms 4	3/2 ⁺ #	01 90De43 TD	β^+ =100; ...	*
* ³⁹ Mg	T : estimated half-life 1# ms for β^- decay						**
* ³⁹ Sc	D : most probably proton emitter from $S_p=-602(24)$ keV						**
* ³⁹ Ti	D : ... ; β^+ p=85 15; β^+ 2p=15# D : β^+ 2p decay observed by 92Mo15						**
* ³⁹ Ti	T : average 90De43=26(+8-7) 01Gi01=31(+6-4)						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
⁴⁰ Mg	50240#	900#	1# ms	0 ⁺		02No11 I	$\beta^- ?; \beta^- n ?$	*	
⁴⁰ Al	29300#	700#	10# ms (>260 ns)		02	97Sa14 I	$\beta^- ?; \beta^- n ?$	*	
⁴⁰ Si	5470	560	20# ms (>200 ns)	0 ⁺	02	89Gu03 I	$\beta^- ?; \beta^- n ?$		
⁴⁰ P	-8110	140	153 ms 8	(2 ⁻ , 3 ⁻)	02		$\beta^- =100; \dots$	*	
⁴⁰ S	-22870	140	8.8 s 2.2	0 ⁺	02		$\beta^- =100$		
⁴⁰ Cl	-27560	30	1.35 m 0.02	2 ⁻	02		$\beta^- =100$		
⁴⁰ Ar	-35039.8960	0.0027	STABLE	0 ⁺	02		IS=99.6003 30		
⁴⁰ K	-33535.20	0.19	1.251 Gy 0.011	4 ⁻	02		IS=0.0117 1; ...	*	
⁴⁰ K ^m	-31891.56	0.19	1643.639 0.011	336 ns 12	0 ⁺	02	IT=100		
⁴⁰ Ca	-34846.27	0.21	STABLE (>5.9Zy)	0 ⁺	01	99Be64 T	IS=96.941 156; 2 β^+ ?		
⁴⁰ Sc	-20523.2	2.8	182.3 ms 0.7	4 ⁻	02		$\beta^+ =100; \dots$	*	
⁴⁰ Ti	-8850	160	53.3 ms 1.5	0 ⁺	02		$\beta^+ =100; \beta^+ p=100$		
⁴⁰ V	10330#	500#		2 ⁻ #			p ?		
* ⁴⁰ Mg	I : one event expected, none observed; similar search in 02Le.A							**	
* ⁴⁰ Al	I : 34 events reported in 97Sa14; also one event in 96Sa34							**	
* ⁴⁰ P	D : ... ; $\beta^- n=15.8$ 21							**	
* ⁴⁰ K	D : ... ; $\beta^- =89.28$ 13; $\beta^+ =10.72$ 13							**	
* ⁴⁰ Sc	D : ... ; $\beta^+ p=0.44$ 7; $\beta^+ \alpha=0.017$ 5							**	
⁴¹ Al	35700#	800#	2# ms (>260 ns)	3/2 ⁺ #	02	97Sa14 I	$\beta^- ?$	*	
⁴¹ Si	13560	1840	30# ms (>200 ns)	7/2 ⁻ #	02	89Gu03 I	$\beta^- ?$		
⁴¹ P	-5280	220	150 ms 15	1/2 ⁺ #	02		$\beta^- =100; \beta^- n=30$ 10		
⁴¹ S	-19020	120	1.99 s 0.05	7/2 ⁻ #	02		$\beta^- =100; \beta^- n ?$		
⁴¹ Cl	-27310	70	38.4 s 0.8	(1/2, 3/2 ⁺)	02		$\beta^- =100$		
⁴¹ Ar	-33067.5	0.3	109.61 m 0.04	7/2 ⁻	02		$\beta^- =100$		
⁴¹ K	-35559.07	0.19	STABLE	3/2 ⁺	02		IS=6.7302 44		
⁴¹ Ca	-35137.76	0.24	102 ky 7	7/2 ⁻	02		$\epsilon=100$		
⁴¹ Sc	-28642.39	0.23	596.3 ms 1.7	7/2 ⁻	02		$\beta^+ =100$		
⁴¹ Sc ^r	-25760.10	0.23	2882.30 0.05 RQ	7/2 ⁺	02		P=59 2; IT=41 2		
⁴¹ Ti	-15700#	100#	80.9 ms 1.2	3/2 ⁺	02	98Bh12 T	$\beta^+ =100; \beta^+ p \approx 100$	*	
⁴¹ V	-210#	210#		7/2 ⁻ #			p ?		
* ⁴¹ Al	I : reported 4 events							**	
* ⁴¹ Ti	T : average 98Bh12=81.3(2.0) 98Li46=82(3) 96Fa09=81(4) 74Se11=80(2)							**	
⁴² Al	43680#	900#	1# ms				$\beta^- ?; \beta^- n ?$		
⁴² Si	18430#	500#	5# ms (>200 ns)	0 ⁺	01	90Le03 I	$\beta^- ?; \beta^- n ?$	*	
⁴² P	940	450	120 ms 30		01	89Le16 T	$\beta^- =100; \beta^- n=50$ 20		
⁴² S	-17680	120	1.013 s 0.015	0 ⁺	01		$\beta^- =100; \beta^- n < 4$		
⁴² Cl	-24910	140	6.8 s 0.3		01		$\beta^- =100$		
⁴² Ar	-34423	6	32.9 y 1.1	0 ⁺	01		$\beta^- =100$		
⁴² K	-35021.56	0.22	12.360 h 0.012	2 ⁻	01		$\beta^- =100$		
⁴² Ca	-38547.07	0.25	STABLE	0 ⁺	01		IS=0.647 23		
⁴² Sc	-32121.24	0.27	681.3 ms 0.7	0 ⁺	01		$\beta^+ =100$		
⁴² Sc ^m	-31504.96	0.28	616.28 0.06	61.7 s 0.4	(7, 5, 6) ⁺	01	$\beta^+ =100$		
⁴² Sc ^r	-26044.91	0.26	6076.33 0.08 RQ	199 ms 6	(1 ⁺ to4 ⁺)	01	IT=100		
⁴² Ti	-25122	5		0 ⁺	01		$\beta^+ =100$		
⁴² V	-8170#	200#	< 55 ns	2 ⁻ #	01	92Bo37 I	p ?		
⁴² Cr	5990#	300#	14 ms 3	0 ⁺	01	01Gi01 TD	$\beta^+ \approx 100; \beta^+ p=?; 2p ?$		
* ⁴² Si	TD : ENSDF reports preliminary values from 98Yo.A: half-life=20 ms 10 and							**	
* ⁴² Si	TD : % $\beta^- n=103$ 48, subject to further analysis according to the authors							**	
⁴³ Si	26700#	700#	15# ms (>260 ns)	3/2 ⁻ #		02No11 I	$\beta^- ?; \beta^- n ?$		
⁴³ P	5770	970	33 ms 3	1/2 ⁺ #	01		$\beta^- =100; \beta^- n=100$		
⁴³ S	-11970	200	260 ms 15	3/2 ⁻ #	01	98Wi.A T	$\beta^- =100; \beta^- n=40$ 10		
⁴³ S ^m	-11650	200	319 5	480 ns 50	(7/2 ⁻)	01	00Sa21 EJ	IT=100	*
⁴³ Cl	-24170	160	3.07 s 0.07	3/2 ⁺ #	01		$\beta^- =100; \beta^- n ?$		
⁴³ Ar	-32010	5	5.37 m 0.06	(5/2 ⁻)	01		$\beta^- =100$		
⁴³ K	-36593	9	22.3 h 0.1	3/2 ⁺	01		$\beta^- =100$		
⁴³ Ca	-38408.6	0.3	STABLE	7/2 ⁻	01		IS=0.135 10		

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...							
⁴³ Sc	-36187.9	1.9	3.891 h	0.012		7/2 ⁻ 01	$\beta^+=100$
⁴³ Sc ^m	-36036.5	1.9 151.4	0.2	438 μ s	7	3/2 ⁺ 01	IT=100
⁴³ Ti	-29321	7		509 ms	5	7/2 ⁻ 01	$\beta^+=100$
⁴³ Ti ^m	-29008	7 313.0	1.0	12.6 μ s	0.6	(3/2 ⁺) 01	IT=100
⁴³ Ti ⁿ	-26255	7 3066.4	1.0	560 ns	6	(19/2 ⁻) 01	IT=100
⁴³ V	-18020#	230#		80# ms		7/2 ⁻ # 01	$\beta^+?$ *
⁴³ Cr	-2130#	220#		21.6 ms	0.7	(3/2 ⁺) 01	$\beta^+=100; \beta^+p=23\ 6; \dots$ *
* ⁴³ S ^m	J : from comparison of B(E2) and half-life with theoretical ones **						
* ⁴³ V	T : >800 ms reported by 92Bo37 and adopted in ENSDF'01. To be confirmed. **						
* ⁴³ Cr	D : ... ; $\beta^+2p=6\ 5; \beta^+\alpha?$ **						
⁴⁴ Si	32840#	800#		10# ms		0 ⁺	$\beta^-?; \beta^-n?$
⁴⁴ P	12100#	700#		30# ms (>200 ns)		99 89Gu03 I	$\beta^-?$
⁴⁴ S	-9120	390		123 ms	10	0 ⁺ 99	$\beta^-=100; \beta^-n=18\ 3$
⁴⁴ Cl	-20230	110		560 ms	110	99	$\beta^-=100; \beta^-n<8$
⁴⁴ Ar	-32673.1	1.6		11.87 m	0.05	0 ⁺ 99	$\beta^-=100$
⁴⁴ K	-35810	40		22.13 m	0.19	2 ⁻ 99	$\beta^-=100$
⁴⁴ Ca	-41468.5	0.4		STABLE		0 ⁺ 99	IS=2.086 110
⁴⁴ Sc	-37816.1	1.8		3.97 h	0.04	2 ⁺ 99	$\beta^+=100$
⁴⁴ Sc ^m	-37545.2	1.8 270.95	0.20	58.61 h	0.10	6 ⁺ 99	IT=98.80 7; $\beta^+=1.20\ 7$
⁴⁴ Sc ⁿ	-37669.9	1.8 146.224	0.022	50.4 μ s	0.7	0 ⁻ 99	
⁴⁴ Ti	-37548.5	0.7		60.0 y	1.1	0 ⁺ 99	$\epsilon=100$ *
⁴⁴ V	-24120	120		* 111 ms	7	(2 ⁺) 99	$\beta^+=100; \beta^+\alpha=?$
⁴⁴ V ^m	-23850#	160# 270#	100#	* 150 ms	3	(6 ⁺) 99	$\beta^+=100$
⁴⁴ V ⁿ	-23970#	160# 150#	100#			0 ⁻ #	
⁴⁴ Cr	-13460#	50#		54 ms	4	0 ⁺ 99 96Fa09 D	$\beta^+=100; \beta^+p=7\ 3$
⁴⁴ Mn	6400#	500#		< 105 ns		2 ⁻ # 99	p?
* ⁴⁴ Ti	T : also 01Ha21=59(2) **						
⁴⁵ P	17900#	800#		8# ms (>200 ns)		1/2 ⁺ # 93 90Le03 I	$\beta^-?$
⁴⁵ S	-3250	1740		82 ms	13	3/2 ⁻ # 97	$\beta^-=100; \beta^-n=54$
⁴⁵ Cl	-18360	120		400 ms	40	3/2 ⁺ # 95	$\beta^-=100; \beta^-n=24\ 4$
⁴⁵ Ar	-29770.6	0.5		21.48 s	0.15	(1,3,5)/2 ⁻ 95	$\beta^-=100$ *
⁴⁵ K	-36608	10		17.3 m	0.6	3/2 ⁺ 95	$\beta^-=100$
⁴⁵ Ca	-40812.0	0.4		162.67 d	0.25	7/2 ⁻ 95 94Lo04 T	$\beta^-=100$
⁴⁵ Sc	-41067.8	0.8		STABLE		7/2 ⁻ 95	IS=100.
⁴⁵ Sc ^m	-41055.4	0.8 12.40	0.05	318 ms	7	3/2 ⁺ 95	IT=100
⁴⁵ Ti	-39005.7	1.0		184.8 m	0.5	7/2 ⁻ 95	$\beta^+=100$
⁴⁵ V	-31880	17		547 ms	6	7/2 ⁻ 95	$\beta^+=100$
⁴⁵ Cr	-18970	500		* 50 ms	6	7/2 ⁻ # 95	$\beta^+=100; \beta^+p>27$
⁴⁵ Cr ^m	-18920#	510# 50#	100#	* 1# ms		3/2 ⁺ #	IT?; $\beta^+?$
⁴⁵ Mn	-5110#	300#		< 70 ns		7/2 ⁻ # 97 92Bo37 I	p?
⁴⁵ Fe	13580#	220#		4.9 ms	1.5	3/2 ⁺ # 97 02Gi09 TD	2p=75 5; $\beta^+=25\ 5; \dots$ *
* ⁴⁵ Ar	J : 7/2 ⁻ # is expected from theory and from systematics. See ENSDF. **						
* ⁴⁵ Fe	D : ... ; $\beta^+p=25\ 5$ **						
* ⁴⁵ Fe	T : average 02Gi09=4.7(+3.4-1.4) 02Pf02=3.2(+2.6-1.0) D : β^+p from 01Gi01 **						
⁴⁶ P	25500#	900#		4# ms (>200 ns)		00 90Le03 I	$\beta^-?$
⁴⁶ S	700#	700#		30# ms (>200 ns)		00 89Gu03 I	$\beta^-?$
⁴⁶ Cl	-14710	720		220 ms	40	00	$\beta^-=100; \beta^-n=60\ 9$
⁴⁶ Ar	-29720	40		8.4 s	0.6	0 ⁺ 00	$\beta^-=100$
⁴⁶ K	-35418	16		105 s	10	2 ⁽⁻⁾ 00 82To02 J	$\beta^-=100$
⁴⁶ Ca	-43135.1	2.3		STABLE (>100 Ey)		0 ⁺ 00 99Be64 T	IS=0.004 3; 2 $\beta^-?$ *
⁴⁶ Sc	-41757.1	0.8		83.79 d	0.04	4 ⁺ 00	$\beta^-=100$
⁴⁶ Sc ^m	-41614.6	0.8 142.528	0.007	18.75 s	0.04	1 ⁻ 00	IT=100
⁴⁶ Ti	-44123.4	0.8		STABLE		0 ⁺ 00	IS=8.25 3
⁴⁶ V	-37073.0	1.0		422.50 ms	0.11	0 ⁺ 00	$\beta^+=100$
⁴⁶ V ^m	-36271.5	1.0 801.46	0.10	1.02 ms	0.07	3 ⁺ 00	IT=100
... A-group is continued on next page ...							

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
⁴⁶ Cr	-29474 20		260 ms	60	0 ⁺	00	$\beta^+=100$	
⁴⁶ Mn	-12370# 110#	*	37 ms	3	(4 ⁺)	00	$\beta^+=100; \beta^+p=22\ 2; \dots$ *	
⁴⁶ Mn ^m	-12220# 150# 150# 100#	*	1# ms		1 ⁻ #		$\beta^+?$	
⁴⁶ Fe	760# 350#		9 ms	4	0 ⁺	00	$\beta^+=100; \beta^+p=36\ 20$	
* ⁴⁶ Ca	T: limit is for neutrinoless $\beta\beta$ decay							**
* ⁴⁶ Mn	D: ...; $\beta^+2p\approx 18; \beta^+\alpha?$							**
* ⁴⁶ Mn	T: average $92\text{Bo}37=41(+7-6)$ $01\text{Gi}01=34.0(+4.5-3.5)$							**
* ⁴⁶ Mn	D: $\beta^+2p\approx 18\%$ estimated from $P_p = \beta^+p + 2\times\beta^+2p=58(9)\%$ in $01\text{Gi}01$							**
⁴⁷ S	8000# 800#		20# ms	(>200 ns)	3/2 ⁻ #	95	$\beta^-?$	
⁴⁷ Cl	-10520# 600#		200# ms	(>200 ns)	3/2 ⁺ #	95	$\beta^-=100; \beta^-n<3$	
⁴⁷ Ar	-25910 100		580 ms	120	3/2 ⁻ #	95	$\beta^-=100; \beta^-n<1$ *	
⁴⁷ K	-35696 8		17.50 s	0.24	1/2 ⁺	95	$\beta^-=100$	
⁴⁷ Ca	-42340.1 2.3		4.536 d	0.003	7/2 ⁻	95	$\beta^-=100$	
⁴⁷ Sc	-44332.1 2.0		3.3492 d	0.0006	7/2 ⁻	95	$\beta^-=100$	
⁴⁷ Sc ^m	-43565.3 2.0	766.83 0.09	272 ns	8	(3/2 ⁺)	95	IT=100	
⁴⁷ Ti	-44932.4 0.8		STABLE		5/2 ⁻	95	IS=7.44 2	
⁴⁷ V	-42002.1 0.8		32.6 m	0.3	3/2 ⁻	95	$\beta^+=100$	
⁴⁷ Cr	-34558 14		500 ms	15	3/2 ⁻	95	$\beta^+=100$	
⁴⁷ Mn	-22260# 160#		100 ms	50	5/2 ⁻ #	95	$\beta^+=100; \beta^+p=3.4\ 9$	
⁴⁷ Fe	-6620# 260#		21.8 ms	0.7	7/2 ⁻ #	97	$\beta^+=100; \beta^+p=87\ 7$	
⁴⁷ Fe ^m	-5850# 280#	770# 100#			3/2 ⁺ #		IT?	
⁴⁷ Co	10700# 500#				7/2 ⁻ #		p?	
* ⁴⁷ Ar	D: from $95\text{So}03$							**
⁴⁸ S	13200# 900#		10# ms	(>200 ns)	0 ⁺	90Le03 I	$\beta^-?$	
⁴⁸ Cl	-4700# 700#		100# ms	(>200 ns)		89Gu03 I	$\beta^-?$	
⁴⁸ Ar	-23720# 300#		500# ms		0 ⁺		$\beta^-?$	
⁴⁸ K	-32124 24		6.8 s	0.2	(2 ⁻)	95	$\beta^-=100; \beta^-n=1.14\ 15$	
⁴⁸ Ca	-44214 4		53 Ey	17	0 ⁺	95	IS=0.187 21; ... *	
⁴⁸ Sc	-44496 5		43.67 h	0.09	6 ⁺	95	$\beta^-=100$	
⁴⁸ Ti	-48487.7 0.8		STABLE		0 ⁺	95	IS=73.72 3	
⁴⁸ V	-44475.4 2.6		15.9735 d	0.0025	4 ⁺	95	$\beta^+=100$	
⁴⁸ Cr	-42819 7		21.56 h	0.03	0 ⁺	95	$\beta^+=100$	
⁴⁸ Mn	-29320 110		158.1 ms	2.2	4 ⁺	97	$\beta^+=100; \beta^+p=0.28\ 4; \dots$ *	
⁴⁸ Fe	-18160# 70#		44 ms	7	0 ⁺	95	$\beta^+=100; \beta^+p=3.6\ 11$	
⁴⁸ Co	1640# 400#				6 ⁺ #		p?	
⁴⁸ Ni	18400# 500#		10# ms	(>500 ns)	0 ⁺	01	00B101 I	
* ⁴⁸ Ca	D: ...; $2\beta^-=?; \beta^-?$							**
* ⁴⁸ Ca	T: average $00\text{Br}63=42(33-13)$ $96\text{Ba}80=43(+24-11)$ statistics + 14 systematics							**
* ⁴⁸ Ca	T: also $T>36$ Ey from $70\text{Ba}61$. Single β^- decay: $T>6$ Ey (95% CL), from $85\text{Al}17$							**
* ⁴⁸ Mn	D: ...; $\beta^+\alpha=6e-4$							**
* ⁴⁸ Mn	D: one $\beta^+\alpha$ event was observed, versus $437\ \beta^+p$, in fig.4 of $87\text{Se}07$							**
⁴⁹ S	22000# 950#		< 200 ns		3/2 ⁻ #	97	n?	
⁴⁹ Cl	300# 800#		50# ms	(>200 ns)	3/2 ⁺ #	95	$\beta^-?$	
⁴⁹ Ar	-18150# 500#		170 ms	50	3/2 ⁻ #	95	$\beta^-=100; \beta^-n=65\ 20$	
⁴⁹ K	-30320 70		1.26 s	0.05	(3/2 ⁺)	95	$\beta^-=100; \beta^-n=86\ 9$	
⁴⁹ Ca	-41289 4		8.718 m	0.006	3/2 ⁻	95	$\beta^-=100$	
⁴⁹ Sc	-46552 4		57.2 m	0.2	7/2 ⁻	95	$\beta^-=100$	
⁴⁹ Ti	-48558.8 0.8		STABLE		7/2 ⁻	95	IS=5.41 2	
⁴⁹ V	-47956.9 1.2		330 d	15	7/2 ⁻	95	$\epsilon=100$	
⁴⁹ Cr	-45330.5 2.4		42.3 m	0.1	5/2 ⁻	95	$\beta^+=100$	
⁴⁹ Mn	-37616 24		382 ms	7	5/2 ⁻	01	$\beta^+=100$	
⁴⁹ Fe	-24580# 150#		70 ms	3	(7/2 ⁻)	01	$\beta^+=100; \beta^+p=52\ 10$	
⁴⁹ Co	-9580# 260#		< 35 ns		7/2 ⁻ #	97	p?	
⁴⁹ Ni	9000# 400#		13 ms	4	7/2 ⁻ #	97	$\beta^+=100; \beta^+p=?$	
* ⁴⁹ S	I: statistics precludes any conclusion, say authors							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
⁵⁰ Cl	7300#	900#	20# ms				β^- ?	
⁵⁰ Ar	-14500#	700#	85 ms	30	0 ⁺	95 03We09 TD	β^- =100; β^- n=35 10	
⁵⁰ K	-25350	280	472 ms	4	(0 ⁻ , 1, 2 ⁻)	95	β^- =100; β^- n=29 3	
⁵⁰ Ca	-39571	9	13.9 s	0.6	0 ⁺	95	β^- =100	
⁵⁰ Sc	-44537	16	102.5 s	0.5	5 ⁺	95	β^- =100	
⁵⁰ Sc ^m	-44280	16	256.895 0.010	350 ms	40	2 ⁺ , 3 ⁺	95 IT>97.5; β^- <2.5	
⁵⁰ Ti	-51426.7	0.8	STABLE		0 ⁺	95	IS=5.18 2	
⁵⁰ V	-49221.6	1.0	150 Py	40	6 ⁺	95	IS=0.250 4; β^+ =83 11;... *	
⁵⁰ Cr	-50259.5	1.0	STABLE (>1.3 Ey)		0 ⁺	95 03Bi05 T	IS=4.345 13; 2 β^+ ?	
⁵⁰ Mn	-42626.8	1.0	283.9 ms	0.5	0 ⁺	95	β^+ =100	
⁵⁰ Mn ^m	-42398	7	229 7	1.75 m	0.03	5 ⁺	95 β^+ =100	
⁵⁰ Fe	-34480	60	155 ms	11	0 ⁺	01	β^+ =100; β^+ p≈0	
⁵⁰ Co	-17200#	170#	44 ms	4	(6 ⁺)	01 96Fa09 JD	β^+ =100; β^+ p=54 12	
⁵⁰ Ni	-3790#	260#	9.1 ms	1.8	0 ⁺	97 01Ma.A T	β^+ ?	
* ⁵⁰ V	D : ... ; β^- =17 11							**
⁵¹ Cl	13500#	1000#	2# ms (>200 ns)		3/2 ⁺ #	97 90Le03 I	β^- ?	
⁵¹ Ar	-7800#	700#	60# ms (>200 ns)		3/2 ⁻ #	97 89Gu03 I	β^- ?	
⁵¹ K	-22000#	500#	365 ms	5	3/2 ⁺ #	97	β^- =100; β^- n=47 5	
⁵¹ Ca	-35860	90	10.0 s	0.8	3/2 ⁻ #	97	β^- =100; β^- n ?	
⁵¹ Sc	-43218	20	12.4 s	0.1	(7/2) ⁻	97	β^- =100	
⁵¹ Ti	-49727.8	1.0	5.76 m	0.01	3/2 ⁻	97	β^- =100	
⁵¹ V	-52201.4	1.0	STABLE		7/2 ⁻	97	IS=99.750 4	
⁵¹ Cr	-51448.8	1.0	27.7025 d	0.0024	7/2 ⁻	97	ϵ =100	
⁵¹ Mn	-48241.3	1.0	46.2 m	0.1	5/2 ⁻	97	β^+ =100	
⁵¹ Fe	-40222	15	305 ms	5	5/2 ⁻	97	β^+ =100	
⁵¹ Co	-27270#	150#	60# ms (>200 ns)		7/2 ⁻ #	97 87Po04 I	β^+ ?	
⁵¹ Ni	-11440#	260#	30# ms (>200 ns)		7/2 ⁻ #	97 87Po04 I	β^+ ?	
⁵² Ar	-3000#	900#	10# ms		0 ⁺	00	β^- ?	
⁵² K	-16200#	700#	105 ms	5	2 ⁻ #	00 ABBW D	β^- =100; β^- n≈64; ... *	
⁵² Ca	-32510	700	4.6 s	0.3	0 ⁺	00	β^- =100; β^- n<2	
⁵² Sc	-40360	190	8.2 s	0.2	3 ⁽⁺⁾	00	β^- =100	
⁵² Ti	-49465	7	1.7 m	0.1	0 ⁺	00	β^- =100	
⁵² V	-51441.3	1.0	3.743 m	0.005	3 ⁺	00	β^- =100	
⁵² Cr	-55416.9	0.8	STABLE		0 ⁺	00	IS=83.789 18	
⁵² Mn	-50705.4	2.0	5.591 d	0.003	6 ⁺	00	β^+ =100	
⁵² Mn ^m	-50327.7	2.0	377.749 0.005	21.1 m	0.2	2 ⁺	00 β^+ =98.25 5; IT=1.75 5	
⁵² Fe	-48332	7	8.275 h	0.008	0 ⁺	00	β^+ =100	
⁵² Fe ^m	-41520	130	6810 130 BD	45.9 s	0.6	12 ⁺ #	00 β^+ ≈100; IT<0.004	
⁵² Co	-33920#	70#	115 ms	23	(6 ⁺)	00	β^+ =100	
⁵² Co ^m	-33540#	120#	380# 100#	104 ms	11	2 ⁺ #	97Ha04 TD β^+ =?; IT ? *	
⁵² Ni	-22650#	80#	38 ms	5	0 ⁺	00	β^+ =100; β^+ p=17.0 14	
⁵² Cu	-2630#	260#			3 ⁺ #	00	p ?	
* ⁵² K	D : ... ; β^- 2n≈21							**
* ⁵² K	D : β^- n≈64%, β^- 2n≈21% estimated from $P_n = \beta^-n + 2 \times \beta^-2n = 107(20)\%$ in ⁸³ La23							**
* ⁵² K	D : and assuming $\beta^-n/\beta^-2n=3$ as in ³² Na							**
* ⁵² Co ^m	I : tentative: no specific evidence for ⁵² Co ^m , say authors in 97Ha04							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)			
⁵³ Ar	4600#	1000#	3# ms	5/2 ⁻ #	99		$\beta^- ?; \beta^- n ?$			
⁵³ K	-12000#	700#	30 ms	5	3/2 ⁺ #	99 ABBW D	$\beta^- =100; \beta^- n \approx 67; \dots$ *			
⁵³ Ca	-27900#	500#	90 ms	15	3/2 ⁻ #	99 83La23 D	$\beta^- =100; \beta^- n > 30$ *			
⁵³ Sc	-37620#	300#	> 3 s		7/2 ⁻ #	99 98So03 TD	$\beta^- =100; \beta^- n ?$			
⁵³ Ti	-46830	100	32.7 s	0.9	(3/2) ⁻	99	$\beta^- =100$			
⁵³ V	-51849	3	1.60 m	0.04	7/2 ⁻	99	$\beta^- =100$			
⁵³ Cr	-55284.7	0.8	STABLE		3/2 ⁻	99	IS=9.501 17			
⁵³ Mn	-54687.9	0.8	3.7 My	0.4	7/2 ⁻	99	$\epsilon =100$			
⁵³ Fe	-50945.3	1.8	8.51 m	0.02	7/2 ⁻	99	$\beta^+ =100$			
⁵³ Fe ^m	-47904.9	1.8	3040.4	0.3	2.526 m	0.024	19/2 ⁻	99 97Ge11 T	IT=100 *	
⁵³ Co	-42645	18	242 ms	8	7/2 ⁻ #	99	02Lo13 T	$\beta^+ =100$ *		
⁵³ Co ^m	-39447	22	3197	29	p	247 ms	12	(19/2 ⁻)	99	$\beta^+ \approx 98.5; p \approx 1.5$
⁵³ Ni	-29370#	160#	45 ms	15	7/2 ⁻ #	99	76Vi02 D	$\beta^+ =100; \beta^+ p \approx 45$		
⁵³ Cu	-13460#	260#	< 300 ns		3/2 ⁻ #	99	93Bl.A I	p ?; $\beta^+ ?$		
* ⁵³ K	D : ... ; $\beta^- 2n \approx 17$							**		
* ⁵³ K	D : $\beta^- n \approx 67\%$, $\beta^- 2n \approx 17\%$ estimated from $P_n = \beta^- n + 2 \times \beta^- 2n = 100(30)\%$ in ⁸³ La23							**		
* ⁵³ K	D : and assuming $\beta^- n / \beta^- 2n = 4$ as in ³³ Na							**		
* ⁵³ Ca	D : $\beta^- n = 40(10)\%$ is a lower limit (see ENSDF)							**		
* ⁵³ Ca	T : expected $T = 2\#$ s from systematics of Ca isotopes							**		
* ⁵³ Fe ^m	T : average 97Ge11=2.48(0.05) 68De27=2.51(0.02) 67Es06=2.58(0.03)							**		
* ⁵³ Co	T : average 02Lo13=240(9) 89Ho13=240(20) 73Ko10=262(25)							**		
⁵⁴ K	-5400#	900#	10 ms	5	2 ⁻ #	01		$\beta^- =100; \beta^- n = ?$		
⁵⁴ Ca	-23890#	700#	50# ms	(>300 ns)	0 ⁺	01	97Be70 I	$\beta^- ?; \beta^- n ?$		
⁵⁴ Sc	-34220	370	260 ms	30	3 ⁺ #	01	02Ja16 T	$\beta^- =100; \beta^- n ?$ *		
⁵⁴ Sc ^m	-34110	370	110	3	7 μ s	5	(5 ⁺)	01 98Gr14 EJ	IT=100	
⁵⁴ Ti	-45590	120	1.5 s	0.4	0 ⁺	01		$\beta^- =100$		
⁵⁴ V	-49891	15	49.8 s	0.5	3 ⁺	01		$\beta^- =100$		
⁵⁴ V ^m	-49783	15	108	3	900 ns	500	(5 ⁺)	98Gr14 EJ	IT=100	
⁵⁴ Cr	-56932.5	0.8	STABLE		0 ⁺	01		IS=2.365 7		
⁵⁴ Mn	-55555.4	1.3	312.03 d	0.03	3 ⁺	01	02Un02 T	$\epsilon =100; \beta^- < 2.9e-4; \dots$ *		
⁵⁴ Fe	-56252.5	0.7	STABLE		0 ⁺	01		IS=5.845 35; $2\beta^+ ?$		
⁵⁴ Fe ^m	-49725.6	0.9	6526.9	0.6	364 ns	7	10 ⁺	01	IT=100	
⁵⁴ Co	-48009.5	0.7	193.23 ms	0.14	0 ⁺	01		$\beta^+ =100$		
⁵⁴ Co ^m	-47812.1	0.9	197.4	0.5	1.48 m	0.02	(7) ⁺	01	$\beta^+ =100$	
⁵⁴ Ni	-39210	50	104 ms	7	0 ⁺	01	02Lo13 T	$\beta^+ =100$ *		
⁵⁴ Cu	-21690#	210#	< 75 ns		3 ⁺ #	01	94Bl10 I	p ?		
⁵⁴ Zn	-6570#	400#			0 ⁺			2p ?		
* ⁵⁴ Sc	T : average 02Ja16=360(60) 98So03=225(40)							**		
* ⁵⁴ Mn	D : ... ; $e^+ = 1.28e-7 25$							**		
* ⁵⁴ Mn	D : e^+ average 98Wu01=1.20(0.26) 97Za07=2.2(0.9)							**		
* ⁵⁴ Ni	T : average 02Lo13=103(9) 99Re06=106(12)							**		
⁵⁵ K	-270#	1000#	3# ms		3/2 ⁺ #			$\beta^- ?; \beta^- n ?$		
⁵⁵ Ca	-18120#	700#	30# ms	(>300 ns)	5/2 ⁻ #		97Be70 I	$\beta^- ?$		
⁵⁵ Sc	-29580	740	120 ms	40	7/2 ⁻ #	01		$\beta^- =100; \beta^- n ?$		
⁵⁵ Ti	-41670	150	490 ms	90	3/2 ⁻ #	01	98Am04 T	$\beta^- =100$ *		
⁵⁵ V	-49150	100	6.54 s	0.15	7/2 ⁻ #	01		$\beta^- =100$		
⁵⁵ Cr	-55107.5	0.8	3.497 m	0.003	3/2 ⁻	01		$\beta^- =100$		
⁵⁵ Mn	-57710.6	0.7	STABLE		5/2 ⁻	01		IS=100.		
⁵⁵ Fe	-57479.4	0.7	2.737 y	0.011	3/2 ⁻	01		$\epsilon =100$		
⁵⁵ Co	-54027.6	0.7	17.53 h	0.03	7/2 ⁻	01		$\beta^+ =100$		
⁵⁵ Ni	-45336	11	204.7 ms	1.7	7/2 ⁻	01	02Lo13 T	$\beta^+ =100$ *		
⁵⁵ Cu	-31620#	300#	40# ms	(>200 ns)	3/2 ⁻ #	01	87Po04 I	$\beta^+ ?; p ?$		
⁵⁵ Zn	-14920#	250#	20# ms	(>1.6 μ s)	5/2 ⁻ #	01	01Gi10 I	$\beta^+ ?$		
* ⁵⁵ Ti	T : unweighed average 98Am04=320(60) 96Do23=600(40) and 95So.A=545(95)							**		
* ⁵⁵ Ti	T : (Birge ratio $B=2.75$)							**		
* ⁵⁵ Ni	T : average 02Lo13=196(5) 99Re06=204(3) 87Ha.A=212.1(3.8) 84Ay01=208(5)							**		
* ⁵⁵ Ni	T : and 77Ho25=189(5) 76Ed.A=219(6); 97Wo06=204(3) superseded by 99Re06							**		

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
⁵⁶ Ca	-13440#	900#	10# ms (>300 ns)	0 ⁺	99	97Be70 I	β^- ?	
⁵⁶ Sc	-25270#	700#	80# ms (>300 ns)	3 ⁺ #	99	97Be70 I	β^- ?	
⁵⁶ Ti	-38940	200	164 ms	24	0 ⁺	99 98Am04 TD	β^- =100; β^- n ? *	
⁵⁶ V	-46080	200	216 ms	4	(1 ⁺)	99 03Ma02 TJ	β^- =100; β^- n ?	
⁵⁶ Cr	-55281.2	1.9	5.94 m	0.10	0 ⁺	99	β^- =100	
⁵⁶ Mn	-56909.7	0.7	2.5789 h	0.0001	3 ⁺	99	β^- =100	
⁵⁶ Fe	-60605.4	0.7	STABLE		0 ⁺	99	IS=91.754 36	
⁵⁶ Co	-56039.4	2.1	77.23 d	0.03	4 ⁺	99	β^+ =100	
⁵⁶ Ni	-53904	11	6.075 d	0.010	0 ⁺	99	β^+ =100	
⁵⁶ Cu	-38600#	140#	93 ms	3	(4 ⁺)	99 01Bo54 TJD	β^+ =100; β^+ p=0.40 12	
⁵⁶ Zn	-25730#	260#	36 ms	10	0 ⁺	01 95Wa.A T	β^+ ?; β^+ p ? *	
⁵⁶ Ga	-4740#	260#			3 ⁺ #		p ?	
* ⁵⁶ Ti	T : average 98Am04=190(40) 96Do23=150(30)							**
* ⁵⁶ Zn	T : half-life is derived from experimental (p,n) cross sections							**
* ⁵⁶ Zn	I : identified by time-of-flight 01Gi10 with $T > 1.6 \mu$ s							**
⁵⁷ Ca	-7120#	1000#	5# ms		5/2 ⁻ #		β^- ?; β^- n ?	
⁵⁷ Sc	-20690#	700#	13 ms	4	7/2 ⁻ #	98 02So.A TD	β^- =100; β^- n=33#	
⁵⁷ Ti	-33540	460	60 ms	16	5/2 ⁻ #	98 99So20 T	β^- =100; β^- n=0.3# *	
⁵⁷ V	-44190	230	350 ms	10	(3/2 ⁻)	98 03Ma02 TJ	β^- =100; β^- n=0.4#	
⁵⁷ Cr	-52524.1	1.9	21.1 s	1.0	(3/2 ⁻)	98	β^- =100	
⁵⁷ Mn	-57486.8	1.8	85.4 s	1.8	5/2 ⁻	98	β^- =100	
⁵⁷ Fe	-60180.1	0.7	STABLE		1/2 ⁻	98	IS=2.119 10	
⁵⁷ Co	-59344.2	0.7	271.74 d	0.06	7/2 ⁻	98	ϵ =100	
⁵⁷ Ni	-56082.0	1.8	35.60 h	0.06	3/2 ⁻	98	β^+ =100	
⁵⁷ Cu	-47310	16	196.3 ms	0.7	3/2 ⁻	98	β^+ =100	
⁵⁷ Zn	-32800#	100#	38 ms	4	7/2 ⁻ #	98 02Lo13 T	β^+ =100; β^+ p \approx 65 *	
⁵⁷ Ga	-15900#	260#			1/2 ⁻ #		p ?	
* ⁵⁷ Ti	T : average 99So20=67(25) 96Do23=56(20); 98Am04=180(30) at variance not used							**
* ⁵⁷ Zn	T : average 02Lo13=37(5) 76Vi02=40(10)							**
⁵⁸ Sc	-15170#	800#	12 ms	5	3 ⁺ #	02So.A TD	β^- =100	
⁵⁸ Ti	-30770#	700#	54 ms	7	0 ⁺	97 99So20 TD	β^- =100	
⁵⁸ V	-40210	250	191 ms	8	3 ⁺ #	97 03Ma02 TD	β^- =100; β^- n ? *	
⁵⁸ Cr	-51830	200	7.0 s	0.3	0 ⁺	97	β^- =100	
⁵⁸ Mn	-55910	30	3.0 s	0.1	1 ⁺	97	β^- =100	
⁵⁸ Mn ^m	-55840	30	71.78	0.05	65.2 s	0.5	(4 ⁺) 97	β^- =?; IT=20#
⁵⁸ Fe	-62153.4	0.7	STABLE		0 ⁺	97	IS=0.282 4	
⁵⁸ Co	-59845.9	1.2	70.86 d	0.06	2 ⁺	00	β^+ =100	
⁵⁸ Co ^m	-59821.0	1.2	24.95	0.06	9.04 h	0.11	5 ⁺ 00	IT=100
⁵⁸ Co ⁿ	-59792.8	1.2	53.15	0.07	10.4 μ s	0.3	4 ⁺ 00	IT=100
⁵⁸ Ni	-60227.7	0.6	STABLE		(>700 Ey)	0 ⁺	01	IS=68.0769 89; 2 β^+ ? *
⁵⁸ Cu	-51662.1	1.6	3.204 s	0.007	1 ⁺	01	β^+ =100	
⁵⁸ Zn	-42300	50	84 ms	9	0 ⁺	99 02Lo13 T	β^+ =100; β^+ p<3 *	
⁵⁸ Ga	-23990#	210#			2 ⁺ #		p ?	
⁵⁸ Ga ^m	-23960#	230#	30#	100#	*		5 ⁺ #	
⁵⁸ Ge	-8370#	320#			0 ⁺		2p ?	
* ⁵⁸ Ti	T : average 02So.A=59(9) 99So20=47(10)							**
* ⁵⁸ V	T : average 03Ma02=185(10) 98Am04=200(20) 98So03=205(20)							**
* ⁵⁸ Ni	T : >400 Ey to 2 ⁺ level of ⁵⁸ Fe, >700 Ey to ground-state							**
* ⁵⁸ Zn	T : average 02Lo13=83(10) 98Jo18=86(18)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
⁵⁹ Sc	-10040# 900#		10# ms				β^- ?; β^-n ?	
⁵⁹ Ti	-25220# 700#		30 ms	3		02 02So.A T	β^- =100 *	
⁵⁹ V	-37070 310		75 ms	7		02	β^- =100; β^-n ?	
⁵⁹ Cr	-47890 240		460 ms	50		02	β^- =100	
⁵⁹ Cr ^m	-47390 240	503.0 1.7	96 μ s	20		02 (9/2 ⁺)	IT=100	
⁵⁹ Mn	-55480 30		4.59 s	0.05		02 (5/2) ⁻	β^- =100	
⁵⁹ Fe	-60663.1 0.7		44.495 d	0.009		02 3/2 ⁻	β^- =100	
⁵⁹ Co	-62228.4 0.6		STABLE			02 7/2 ⁻	IS=100.	
⁵⁹ Ni	-61155.7 0.6		101 ky	13		02 94Ru19 T	β^+ =100 *	
⁵⁹ Cu	-56357.2 0.8		81.5 s	0.5		02 3/2 ⁻	β^+ =100	
⁵⁹ Zn	-47260 40		182.0 ms	1.8		02 3/2 ⁻	β^+ =100; β^+p =0.10 3	
⁵⁹ Ga	-34120# 170#						p ?	
⁵⁹ Ge	-17000# 280#						2p ?	
* ⁵⁹ Ti	T : supersedes 99So20=58(17) same group							**
* ⁵⁹ Ni	T : unweighed average 94Ru19=108(13) 94Ru19(meteorite)=120(22) 81Ni08=76(5)							**
* ⁵⁹ Ni	T : (Birge ratio B=2.05)							**
⁶⁰ Sc	-4000# 900#		3# ms				β^- ?	
⁶⁰ Ti	-21650# 800#		22 ms	2		02So.A TD	β^- =100	
⁶⁰ V	-32580 470		122 ms	18		97 99So20 TD	β^- =100; β^-n ? *	
⁶⁰ V ^m	-32580# 490#	0# 150#	40 ms	15		03So02 TD	β^- =?; IT ?	
⁶⁰ V ⁿ	-32480 470	101 1				99So20 EI	IT=100	
⁶⁰ Cr	-46500 210		560 ms	60		93 96Do23 T	β^- =100 *	
⁶⁰ Mn	-53180 90		51 s	6		94	β^- =100	
⁶⁰ Mn ^m	-52910 90	271.90 0.10	1.77 s	0.02		94 92Sc.A E	β^- =88.5 8; IT=11.5 8	
⁶⁰ Fe	-61412 3		1.5 My	0.3		93	β^- =100	
⁶⁰ Co	-61649.0 0.6		5.2713 y	0.0008		00	β^- =100	
⁶⁰ Co ^m	-61590.4 0.6	58.59 0.01	10.467 m	0.006		00	IT \approx 100; β^- =0.24 3	
⁶⁰ Ni	-64472.1 0.6		STABLE			96	IS=26.2231 77	
⁶⁰ Cu	-58344.1 1.7		23.7 m	0.4		93	β^+ =100	
⁶⁰ Zn	-54188 11		2.38 m	0.05		02	β^+ =100	
⁶⁰ Ga	-40000# 110#		70 ms	10		02 01Ma96 TJ	β^+ =100; β^+p =1.6 7; ... *	
⁶⁰ Ge	-27770# 230#		30# ms				β^+ ?	
⁶⁰ As	-6400# 600#						p ?	
⁶⁰ As ^m	-6340# 600#	60# 20#					p ?	
* ⁶⁰ V	T : also 98Am04=200(40), not used							**
* ⁶⁰ Cr	T : weighed average 96Do23=510(150) 88Bo06=570(60); other 95Am.A=380(30)							**
* ⁶⁰ Ga	D : . . . ; $\beta^+ \alpha < 0.023$ 20							**
* ⁶⁰ Ga	T : average 02Lo13=70(13) 01Ma96=70(15)							**
⁶¹ Ti	-15650# 900#		10# ms	(>300 ns)		99 97Be70 I	β^- ?; β^-n ?	
⁶¹ V	-29360# 400#		47.0 ms	1.2		99 03So02 TD	β^- =100; $\beta^-n < 6$	
⁶¹ Cr	-42180 250		261 ms	15		99 99So20 TD	β^- =100; β^-n ? *	
⁶¹ Mn	-51560 230		670 ms	40		99 99Ha05 D	β^- =100; β^-n =?	
⁶¹ Fe	-58921 20		5.98 m	0.06		99 3/2 ⁻ , 5/2 ⁻	β^- =100	
⁶¹ Fe ^m	-58060 20	861 3	250 ns	10		99 98Gr14 E	IT=100	
⁶¹ Co	-62898.4 0.9		1.650 h	0.005		99	β^- =100	
⁶¹ Ni	-64220.9 0.6		STABLE			99	IS=1.1399 6	
⁶¹ Cu	-61983.6 1.0		3.333 h	0.005		99	β^+ =100	
⁶¹ Zn	-56345 16		89.1 s	0.2		99	β^+ =100	
⁶¹ Zn ^m	-56257 16	88.4 0.1	< 430 ms			99	IT=100	
⁶¹ Zn ⁿ	-55927 16	418.10 0.15	140 ms	70		99	IT=100	
⁶¹ Zn ^p	-55589 16	756.02 0.18	< 130 ms			99	IT=100	
⁶¹ Ga	-47090 50		168 ms	3		99 02We07 TD	β^+ =100; $\beta^+p \approx 0$	
⁶¹ Ga ^m	-47000# 110#	90# 100#					1/2 ⁻ #	
⁶¹ Ge	-33730# 300#		39 ms	12		99 02Lo13 T	β^+ =100; $\beta^+p \approx 80$ *	
⁶¹ As	-18050# 600#						p ?	
* ⁶¹ Cr	T : average 99So20=251(22) 98Am04=270(20)							**
* ⁶¹ Ge	T : average 02Lo13=36(21) 87Ho01=40(15)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{62}Ti	-11650#	900#	10# ms				β^- ?	
^{62}V	-24420#	500#	33.5 ms	2.0	3 ⁺ #	01 03So02 TD	β^- =100	
^{62}Cr	-40410	340	199 ms	9	0 ⁺	01 02So.A TD	β^- =100; β^-n ? *	
^{62}Mn	-48040	220	671 ms	5	(3 ⁺)	01 99Ha05 TD	β^- =100; β^-n =?	
$^{62}\text{Mn}^m$	-48040#	270#	92 ms	13	(1 ⁺)	99So20 TJD	β^- =100; β^-n ≈0	
^{62}Fe	-58901	14	68 s	2	0 ⁺	01	β^- =100	
^{62}Co	-61432	20	1.50 m	0.04	2 ⁺	01	β^- =100	
$^{62}\text{Co}^m$	-61410	21	13.91 m	0.05	5 ⁺	01	β^- >99; IT<1	
^{62}Ni	-66746.1	0.6	STABLE		0 ⁺	01	IS=3.6345 17	
^{62}Cu	-62798	4	9.673 m	0.008	1 ⁺	01 02Un02 T	β^+ =100 *	
^{62}Zn	-61171	10	9.186 h	0.013	0 ⁺	01	β^+ =100	
^{62}Ga	-52000	28	115.99 ms	0.17	0 ⁺	01 03Hy02 T	β^+ =100 *	
$^{62}\text{Ga}^m$	-51183	28	4.6 ns	0.5	(3 ⁺)	01 98Vi06 ETJ	IT=100	
^{62}Ge	-42240#	140#	130 ms	40	0 ⁺	01 02Lo13 TD	β^+ =100 *	
^{62}As	-24960#	300#			1 ⁺ #	01	p ? *	
* ^{62}Cr	T : average 02So.A=209(12) 99So20=187(15) 98Am04=190(30)							**
* ^{62}Cu	T : others 97Zi06(LS method)=9.68(0.04) 97Zi06(IC method)=9.673(0.026)							**
* ^{62}Cu	T : 69Jo07=9.73(0.02) 69Bo11=9.7(0.1) 65Li11=9.79(0.06) 65Eb01=9.76(0.02)							**
* ^{62}Ga	T : average 03Hy02=115.84(0.25) 79Da04=116.34(0.35) 78Al23=115.95(0.30)							**
* ^{62}Ge	I : T=113(+6-5) ms in 93Wi03 (table 1) is a misprint for ^{62}Ga							**
* ^{62}As	D : p-unstable from estimated S_p =-1476#(422#) keV							**
^{63}Ti	-5200#	1000#	3# ms		1/2 ⁻ #		β^- ?; β^-n ?	
^{63}V	-20910#	600#	17 ms	3	7/2 ⁻ #	01 03So02 TD	β^- =100; β^-n <35	
^{63}Cr	-35530#	300#	129 ms	2	1/2 ⁻ #	01 02So.A TD	β^- =100; β^-n ? *	
^{63}Mn	-46350	260	275 ms	4	5/2 ⁻ #	01 99Ha05 TD	β^- =100; β^-n =?	
^{63}Fe	-55550	170	6.1 s	0.6	(5/2 ⁻)	01	β^- =100	
^{63}Co	-61840	20	26.9 s	0.4	7/2 ⁻	01 94It.A T	β^- =100 *	
^{63}Ni	-65512.6	0.6	100.1 y	2.0	1/2 ⁻	01	β^- =100	
$^{63}\text{Ni}^m$	-65425.5	0.6	1.67 μ s	0.03	5/2 ⁻	01	IT=100	
^{63}Cu	-65579.5	0.6	STABLE		3/2 ⁻	01	IS=69.17 3	
^{63}Zn	-62213.0	1.6	38.47 m	0.05	3/2 ⁻	01	β^+ =100	
^{63}Ga	-56547.1	1.3	32.4 s	0.5	(3/2 ⁻)	01	β^+ =100	
^{63}Ge	-46910#	200#	142 ms	8	3/2 ⁻ #	01 02Lo13 TD	β^+ =100 *	
^{63}As	-33820#	500#			3/2 ⁻ #	01	p ? *	
* ^{63}Cr	T : also 99So20=113(16) and 98Am04=110(70) outweighed, not used							**
* ^{63}Mn	T : also 99So20=322(23) 95Am.A=290(20) 85Bo49=250(40) outweighed, not used							**
* ^{63}Co	T : average 94It.A=26.41(0.27) 72Jo08=27.5(0.3) 69Wa15=26(1)							**
* ^{63}Ge	T : average 02Lo13=150(9) 93Wi03=95(+23-20)							**
* ^{63}As	D : p-unstable from estimated S_p =-1132#(522#) keV							**
^{64}V	-15400#	700#	10# ms (>300 ns)			97 97Be70 I	β^- ?	
^{64}Cr	-33150#	400#	43 ms	1	0 ⁺	02So.A TD	β^- =100 *	
^{64}Mn	-42620	270	88.8 ms	2.5	(1 ⁺)	96 99So20 TJD	β^- =100; β^-n =?	
$^{64}\text{Mn}^m$	-42490	270	> 100 μ s			98Gr14 ET	IT=100 *	
^{64}Fe	-54770	280	2.0 s	0.2	0 ⁺	96	β^- =100	
^{64}Co	-59793	20	300 ms	30	1 ⁺	96	β^- =100	
^{64}Ni	-67099.3	0.6	STABLE		0 ⁺	96	IS=0.9256 9	
^{64}Cu	-65424.2	0.6	12.700 h	0.002	1 ⁺	96	β^+ =61.0 3; β^- =39.0 3	
^{64}Zn	-66003.6	0.7	STABLE	(>2.3 Ey)	0 ⁺	96 85No03 T	IS=48.63 60; 2 β^+ ?	
^{64}Ga	-58834.3	2.0	2.627 m	0.012	0(+ [#])	96	β^+ =100	
$^{64}\text{Ga}^m$	-58791.5	2.0	21.9 μ s	0.7	2 ⁺	96 99Ta29 TJ	IT=100	
^{64}Ge	-54350	30	63.7 s	2.5	0 ⁺	96	β^+ =100	
^{64}As	-39520#	360#	40 ms	30	0 ⁺ #	02Lo13 TD	β^+ =100	
* ^{64}Cr	T : also 99So20=44(12) outweighed, not used							**
* ^{64}Mn	T : average 02So.A=91(4) 99So20=85(5) 99Ha05=89(4); 98Am04=140(30) not used							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{65}V	-11250# 800#		10# ms			5/2 ⁻ #	β^- ?; β^-n ?
^{65}Cr	-27800# 500#		27 ms	3		1/2 ⁻ # 97	β^- =100; β^-n ?
^{65}Mn	-40670 540		92 ms	1		5/2 ⁻ # 93	β^- =100; β^-n ? *
^{65}Fe	-50880 240		1.3 s	0.3		1/2 ⁻ # 93	β^- =100 *
$^{65}\text{Fe}^m$	-50520 240	364 3	430 ns	130		(5/2 ⁻) 98Gr14	IT=100
^{65}Co	-59170 13		1.20 s	0.06		(7/2 ⁻) 93	β^- =100
^{65}Ni	-65126.1 0.6		2.5172 h	0.0003		5/2 ⁻ 97	β^- =100
$^{65}\text{Ni}^m$	-64113.1 1.2	1013 1	26.7 ns	1.0		9/2 ⁺ 95Bi01	ETJ
^{65}Cu	-67263.7 0.7		STABLE			3/2 ⁻ 93	IS=30.83 3
^{65}Zn	-65911.6 0.7		244.06 d	0.10		5/2 ⁻ 00	β^+ =100
$^{65}\text{Zn}^m$	-65857.7 0.7	53.928 0.010	1.6 μs	0.6		(1/2 ⁻) 00	IT=100
^{65}Ga	-62657.2 0.8		15.2 m	0.2		3/2 ⁻ 93	β^+ =100
^{65}Ge	-56410 100		30.9 s	0.5		(3/2 ⁻) 93	β^+ =100; β^+p =0.011 3
^{65}As	-46980# 300#		170 ms	30		3/2 ⁻ # 93	β^+ =100 *
^{65}Se	-32920# 600#		< 50 ms			3/2 ⁻ # 93	β^+ =100; β^+p ? *
* ^{65}Mn	T : others 99Ha05=88(4) 99So20=100(8) 98Am04=110(20) outweighed, not used **						
* ^{65}Fe	T : 95Am.A=760(50) ms supersedes 94Cz02=450(150) from same group, none used **						
* ^{65}As	T : average 02Lo13=126(16) 95Mo26=190(11) with Birge ratio B=3.3 **						
* ^{65}Se	D : from 93Ba12 **						
^{66}Cr	-24800# 600#		10 ms	6	0 ⁺	98 02So.A	TD β^- =100
^{66}Mn	-36250# 400#		64.4 ms	1.8		98 02So.A	TD β^- =100; β^-n ? *
^{66}Fe	-49570 300		440 ms	40	0 ⁺	98 99So20	TD β^- =100; β^-n ? *
^{66}Co	-56110 250		194 ms	17	(3 ⁺)	98 00Mu10	TJ β^- =100 *
$^{66}\text{Co}^m$	-55940 250	175 3	1.21 μs	0.01		(5 ⁺) 98Gr14	ETJ IT=100
$^{66}\text{Co}^n$	-55470 250	642 5	> 100 μs			(8 ⁻) 98Gr14	ETJ IT=100
^{66}Ni	-66006.3 1.4		54.6 h	0.4	0 ⁺	98	β^- =100
^{66}Cu	-66258.3 0.7		5.120 m	0.014	1 ⁺	98	β^- =100
^{66}Zn	-68899.4 0.9		STABLE		0 ⁺	98	IS=27.90 27
^{66}Ga	-63724 3		9.49 h	0.07	0 ⁺	98	β^+ =100
^{66}Ge	-61620 30		2.26 h	0.05	0 ⁺	98	β^+ =100
^{66}As	-51500 680		95.77 ms	0.23	(0 ⁺)	98 98Gr12	J β^+ =100
$^{66}\text{As}^m$	-50140 680	1356.70 0.17	1.1 μs	0.1	(5 ⁺)	01Gr07	TJ IT=100 *
$^{66}\text{As}^n$	-48480 680	3023.9 0.3	8.2 μs	0.5	(9 ⁺)	01Gr07	TJ IT=100 *
^{66}Se	-41720# 300#		33 ms	12	0 ⁺	98 02Lo13	TD β^+ =100
* ^{66}Mn	T : average 02So.A=64(2) 99Ha05=66(4) **						
* ^{66}Mn	T : also 99So20=62(14) 98Am04=90(20) outweighed, not used **						
* ^{66}Fe	T : average 99So20=440(60) 98Am04=440(60) **						
* ^{66}Co	T : average 00Mu10=180(10) 94Cz02=240(30) 85Bo49=230(20) **						
* $^{66}\text{As}^m$	J : 3 ⁺ # from systematics **						
* $^{66}\text{As}^n$	T : supersedes 98Gr12=17.5(1.5) E : from 98Gr12 **						
^{67}Cr	-19050# 700#		10# ms (>300 ns)			1/2 ⁻ # 97Be70	I β^- ?
^{67}Mn	-33400# 500#		45 ms	3		5/2 ⁻ # 97	02So.A TD β^- =100; β^-n ? *
^{67}Fe	-45690 420		394 ms	9		1/2 ⁻ # 91	02So.A TD β^- =100; β^-n ? *
$^{67}\text{Fe}^m$	-45320 420	367 3	64 μs	17		(5/2 ⁻) 03Sa02	ET IT=100 *
^{67}Co	-55060 320		425 ms	20		7/2 ⁻ # 91	99We07 T β^- =100 *
^{67}Ni	-63742.7 2.9		21 s	1		1/2 ⁻ 01	00Ri14 J β^- =100
$^{67}\text{Ni}^m$	-62736 4	1007 3	13.3 μs	0.2		9/2 ⁺ 01	98Gr14 E IT=100
^{67}Cu	-67318.8 1.2		61.83 h	0.12		3/2 ⁻ 91	β^- =100
^{67}Zn	-67880.4 0.9		STABLE			5/2 ⁻ 91	IS=4.10 13
^{67}Ga	-66879.7 1.3		3.2612 d	0.0006		3/2 ⁻ 96	ϵ =100
^{67}Ge	-62658 5		18.9 m	0.3		1/2 ⁻ 91	β^+ =100
$^{67}\text{Ge}^m$	-62640 5	18.2 0.05	13.7 μs	0.9		5/2 ⁻ 91	IT=100
$^{67}\text{Ge}^n$	-61906 5	751.70 0.06	110.9 ns	1.4		91	IT=100
^{67}As	-56650 100		42.5 s	1.2		(5/2 ⁻) 91	β^+ =100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
⁶⁷ Se	-46490# 200#		133 ms	11	5/2 ⁻ #	97 95B123	TD $\beta^+=100; \beta^+p=0.5$	1 *
⁶⁷ Br	-32800# 500#				1/2 ⁻ #		p?	
* ⁶⁷ Mn	T: average 02So.A=47(4) 99Ha05=42(4)							**
* ⁶⁷ Fe	T: others 99So20=500(100) 98Am04=470(50) outweighed, not used							**
* ⁶⁷ Fe ^m	T: average 03Sa02=75(21) 98Gr14=43(30), same authors, different experiment							**
* ⁶⁷ Co	T: others 99Pr10=440(70) 99So20=440(80) 85Bo49=420(70) outweighed, not used							**
* ⁶⁷ Co	T: and 95Am.A=310(20) at variance, not used							**
* ⁶⁷ Se	T: average 02Lo13=136(12) 94Ba50=107(35)							**
* ⁶⁷ Se	T: values from 95B123 for ⁶⁷ Se=60(+17-11) and ⁷¹ Kr questioned by 97Oio1							**
⁶⁸ Mn	-28600# 600#		28 ms	4		02 02So.A	T $\beta^-=100; \beta^-n=?$	*
⁶⁸ Fe	-43130 700		187 ms	6	0 ⁺	02 02So.A	T $\beta^-=100; \beta^-n?$	*
⁶⁸ Co	-51350 320		* 200 ms	21	(7 ⁻)	02 00Mu10	T $\beta^-=100$	*
⁶⁸ Co ^m	-51200# 350#	150# 150#	* 1.6 s	0.3	(3 ⁺)	02 00Mu10	JD $\beta^-=?; IT?$	
⁶⁸ Ni	-63463.8 3.0		29 s	2	0 ⁺	02	$\beta^-=100$	
⁶⁸ Ni ^m	-61694 3	1770.0 1.0	276 ns	65	0 ⁺	02	IT=100	
⁶⁸ Ni ⁿ	-60615 3	2849.1 0.3	860 μ s	50	5 ⁻	02	IT=100	
⁶⁸ Cu	-65567.0 1.6		31.1 s	1.5	1 ⁺	02	$\beta^-=100$	
⁶⁸ Cu ^m	-64845.4 1.7	721.6 0.7	3.75 m	0.05	(6 ⁻)	02	IT=84 1; $\beta^-=16$ 1	
⁶⁸ Zn	-70007.2 1.0		STABLE		0 ⁺	02	IS=18.75 51	
⁶⁸ Ga	-67086.1 1.5		67.71 m	0.09	1 ⁺	02	$\beta^+=100$	
⁶⁸ Ga ^m	-65856.2 1.5	1229.87 0.04	62.0 ns	1.4	7 ⁻	02	IT=100	
⁶⁸ Ge	-66980 6		270.95 d	0.16	0 ⁺	02	$\epsilon=100$	
⁶⁸ As	-58900 40		151.6 s	0.8	3 ⁺	02	$\beta^+=100$	
⁶⁸ As ^m	-58470 40	425.21 0.16	111 s	20	1 ⁺	02	IT=100	
⁶⁸ Se	-54210 30		35.5 s	0.7	0 ⁺	02	$\beta^+=100$	
⁶⁸ Br	-38640# 360#		< 1.5 μ s		3 ⁺ #	02 95B106	I p?	
* ⁶⁸ Mn	T: average 02So.A=28(8) 99Ha05=28(4)							**
* ⁶⁸ Fe	T: others 99So20=155(50) 91Be33=100(60) outweighed, not used							**
* ⁶⁸ Co	T: average 00Mu10=230(30) 99So20=170(30); not used 95Am.A=310(30)							**
* ⁶⁸ Co	T: 95Am.A supersedes 91Be33=180(100) from same group							**
⁶⁹ Mn	-25300# 800#		14 ms	4	5/2 ⁻ #	00	$\beta^-=100; \beta^-n=24$ #	*
⁶⁹ Fe	-38400# 500#		109 ms	9	1/2 ⁻ #	00 02So.A	T $\beta^-=100; \beta^-n=7$ #	*
⁶⁹ Co	-50000 340		227 ms	13	7/2 ⁻ #	00 02So.A	T $\beta^-=100; \beta^-n=1$ #	*
⁶⁹ Ni	-59979 4		11.5 s	0.3	9/2 ⁺	00 99Pr10	T $\beta^-=100$	*
⁶⁹ Ni ^m	-59658 4	321 2	3.5 s	0.4	(1/2 ⁻)	00 98Gr14	E $\beta^-\approx 100; IT?$	*
⁶⁹ Ni ⁿ	-57278 11	2701 10	439 ns	3	(17/2 ⁻)	00	IT=100	
⁶⁹ Cu	-65736.2 1.4		2.85 m	0.15	3/2 ⁻	00	$\beta^-=100$	
⁶⁹ Cu ^m	-62994.4 1.7	2741.8 1.0	360 ns	30	(13/2 ⁺)	00	IT=100	
⁶⁹ Zn	-68418.0 1.0		56.4 m	0.9	1/2 ⁻	00	$\beta^-=100$	
⁶⁹ Zn ^m	-67979.4 1.0	438.636 0.018	13.76 h	0.02	9/2 ⁺	00	IT \approx 100; $\beta^-=0.033$ 3	
⁶⁹ Ga	-69327.8 1.2		STABLE		3/2 ⁻	00	IS=60.108 9	
⁶⁹ Ge	-67100.6 1.3		39.05 h	0.10	5/2 ⁻	00	$\beta^+=100$	
⁶⁹ Ge ^m	-67013.8 1.3	86.765 0.014	5.1 μ s	0.2	1/2 ⁻	00	IT=100	
⁶⁹ Ge ⁿ	-66702.7 1.3	397.944 0.018	2.81 μ s	0.05	9/2 ⁺	00	IT=100	
⁶⁹ As	-63090 30		15.2 m	0.2	5/2 ⁻	00	$\beta^+=100$	
⁶⁹ Se	-56300 30		27.4 s	0.2	(1/2 ⁻)	00 95Po01	J $\beta^+=100; \beta^+p=0.045$ 10	
⁶⁹ Se ^m	-56260 30	39.4 0.1	2.0 μ s	0.2	5/2 ⁻	00	IT=100	
⁶⁹ Se ⁿ	-55730 30	573.9 1.0	955 ns	16	9/2 ⁺	00 00Ch07	T IT=100	*
⁶⁹ Br	-46480# 110#		* < 24 ns		1/2 ⁻ #	00 96Pr01	I p?	*
⁶⁹ Br ^m	-46440# 150#	40# 100#			5/2 ⁻ #			
⁶⁹ Br ⁿ	-45910# 150#	570# 100#			9/2 ⁺ #			
... A-group is continued on next page ...								

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
⁶⁹ Kr	-32440# 400#		32 ms	10	5/2 ⁻ #	00	$\beta^+=100; \beta^+p=?$	
* ⁶⁹ Mn	D: β^-n observed by 99Ha05							**
* ⁶⁹ Co	T: average 02So.A=232(17) 99Mu17=220(20); other 99So20=190(40), not used							**
* ⁶⁹ Ni	T: average 99Pr10=11.7(0.6) 85Bo49=11.4(0.3); not used 98Fr15=11.2(0.9)							**
* ⁶⁹ Ni ^m	T: average 99Mu17=3.5(0.5) 99Pr10=3.4(0.7)							**
* ⁶⁹ Ni ^m	E: 9/2 ⁺ level in isotones: ⁷³ Ge=-66 ⁷¹ Zn=157(1) 69Ni=-321(2) exhibits							**
* ⁶⁹ Ni ^m	E: unusual strong variations							**
* ⁶⁹ Se ⁿ	T: average 00Ch07=950(21) 95Po01=960(23)							**
* ⁶⁹ Br	T: in contradiction with 450 keV protons, 50<T<100 μ s reported in 88Ho.A							**
⁷⁰ Fe	-35900# 600#		94 ms	17	0 ⁺	97 02So.A	TD $\beta^-=100$	
⁷⁰ Co	-45640 840		* 125 ms	7	(6 ⁻ , 7 ⁻)	93 00Mu10	TJD $\beta^-=100; \beta^-n?$	*
⁷⁰ Co ^m	-45440# 860# 200# 200#		* 500 ms	180	(3 ⁺)	00Mu10	TJD $\beta^-\approx 100; IT?; \beta^-n?$	
⁷⁰ Ni	-59150 350		6.0 s	0.3	0 ⁺	03 98Fr15	TD $\beta^-=100$	
⁷⁰ Ni ^m	-56290 350 2860 2		232 ns	1	8 ⁺	03	IT=100	
⁷⁰ Cu	-62976.1 1.6		& 44.5 s	0.2	(6 ⁻)	93 02We03	TJ $\beta^-=100$	
⁷⁰ Cu ^m	-62875.4 2.0 100.7 2.6 MD		33 s	2	(3 ⁻)	02We03	TJ $\beta^-\approx 50; IT\approx 50$	
⁷⁰ Cu ⁿ	-62734.1 2.1 242.0 2.7 MD &		6.6 s	0.2	1 ⁺	93 02We03	TD $\beta^-\approx 95; IT\approx 5$	*
⁷⁰ Zn	-69564.6 2.0		STABLE		0 ⁺	93	IS=0.62 3; 2 $\beta^-?$	*
⁷⁰ Ga	-68910.1 1.2		21.14 m	0.03	1 ⁺	93	$\beta^-\approx 100; \epsilon=0.41 6$	
⁷⁰ Ge	-70563.1 1.0		STABLE		0 ⁺	93	IS=20.84 87	
⁷⁰ As	-64340 50		52.6 m	0.3	4 ⁽⁺⁾	93	$\beta^+=100$	
⁷⁰ As ^m	-64310 50 32.06 0.03		96 μ s	3	2 ⁽⁺⁾	93	IT=100	
⁷⁰ Se	-62050 60		41.1 m	0.3	0 ⁺	93	$\beta^+=100$	
⁷⁰ Br	-51430# 310#		79.1 ms	0.8	0 ⁺ #	93	$\beta^+=100$	
⁷⁰ Br ^m	-49140# 310# 2292.2 0.8		2.2 s	0.2	(9 ⁺)	93 00Pi15	J $\beta^+=?; IT?$	*
⁷⁰ Kr	-41680# 390#		57 ms	21	0 ⁺	97 00Oi02	TD $\beta^+?$	
* ⁷⁰ Co	T: average 02So.A=121(8) 98Am04=150(20); others 00Mu10=120(30) 99So20=92(25)							**
* ⁷⁰ Cu ⁿ	D: IT=few percent E: post deadline 03Va.2 101.1(0.3) and 242.4(0.3)							**
* ⁷⁰ Zn	T: >500 Ty in ENSDF is for 0v-2 β^- decay alone							**
* ⁷⁰ Br ^m	E: from 2002Je07							**
⁷¹ Fe	-31000# 800#		30# ms (>300 ns)		7/2 ⁺ #	97 97Be70	I $\beta^-?$	
⁷¹ Co	-43870 840		97 ms	2	7/2 ⁻ #	93 02So.A	T $\beta^-=100; \beta^-n?$	*
⁷¹ Ni	-55200 370		2.56 s	0.03	1/2 ⁻ #	93 98Fr15	T $\beta^-=100$	
⁷¹ Cu	-62711.1 1.5		19.4 s	1.4	(3/2 ⁻)	93 99Pr10	T $\beta^-=100$	*
⁷¹ Cu ^m	-59955 10 2756 10		271 ns	13	(19/2 ⁻)	98Gr14	ETJ IT=100	*
⁷¹ Zn	-67327 10		2.45 m	0.10	1/2 ⁻	93	$\beta^-=100$	
⁷¹ Zn ^m	-67169 10 157.7 1.3		3.96 h	0.05	9/2 ⁺	93	$\beta^-\approx 100; IT\leq 0.05$	
⁷¹ Ga	-70140.2 1.0		STABLE		3/2 ⁻	93	IS=39.892 9	
⁷¹ Ge	-69907.7 1.0		11.43 d	0.03	1/2 ⁻	93	$\epsilon=100$	
⁷¹ Ge ^m	-69709.3 1.0 198.367 0.010		20.40 ms	0.17	9/2 ⁺	93	IT=100	
⁷¹ As	-67894 4		65.28 h	0.15	5/2 ⁻	93	$\beta^+=100$	
⁷¹ Se	-63120 30		4.74 m	0.05	5/2 ⁻	93	$\beta^+=100$	
⁷¹ Se ^m	-63070 30 48.79 0.05		5.6 μ s	0.7	1/2 ⁻ to 9/2 ⁻	93	IT=100	
⁷¹ Se ⁿ	-62860 30 260.48 0.10		19.0 μ s	0.5	(9/2 ⁺)	93 00Ch07	T IT=100	
⁷¹ Br	-57060 570		21.4 s	0.6	(5/2 ⁻)	93	$\beta^+=100$	
⁷¹ Kr	-46920 650		100 ms	3	(5/2 ⁻)	97 97Oi01	TJD $\beta^+=100; \beta^+p=2.1 7$	*
⁷¹ Rb	-32300# 500#				5/2 ⁻ #		p?	
⁷¹ Rb ^m	-32250# 510# 50# 100#				1/2 ⁻ #			
⁷¹ Rb ⁿ	-32040# 510# 260# 100#				9/2 ⁺ #			
* ⁷¹ Co	T: other not used: 98Am04=210(40)							**
* ⁷¹ Cu	T: average 99Pr10=19(3) 83Ru06=19.5(1.6)							**
* ⁷¹ Cu ^m	T: average 98Is11=250(30) 98Gr14=275(14)							**
* ⁷¹ Kr	T: average 97Oi01=100(3) 81Ew01=97(9); 95Bi23=64(+8-5) at variance not used							**
* ⁷¹ Kr	T: values from 95Bi23 for ⁶⁷ Se and ⁷¹ Kr questioned by 97Oi01							**
* ⁷¹ Kr	D: 95Bi23=5.2(0.6) at variance not used							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{72}Fe	-28300# 800#		10# ms (>300 ns)	0^+	97	97Be70 I	$\beta^- ?$	
^{72}Co	-39300# 600#		90 ms	20		98Am04 TD	$\beta^-=100; \beta^-_n ?$	
^{72}Ni	-53940 440		1.57 s	0.05	0^+	98Fr15 TD	$\beta^-=100; \beta^-_n ?$ *	
^{72}Cu	-59783.0 1.4		6.6 s	0.1	(1^+)	95	$\beta^-=100$	
$^{72}\text{Cu}^m$	-59513 3 270	3	1.76 μs	0.03	(4^-)	98Gr14 ETJ	IT=100	
^{72}Zn	-68131 6		46.5 h	0.1	0^+	95	$\beta^-=100$	
^{72}Ga	-68589.4 1.0		14.10 h	0.02	3^-	95	$\beta^-=100$	
$^{72}\text{Ga}^m$	-68469.7 1.0 119.66	0.05	39.68 ms	0.13	(0^+)	95	IT=100	
^{72}Ge	-72585.9 1.6		STABLE		0^+	95	IS=27.54 34	
$^{72}\text{Ge}^m$	-71894.5 1.6 691.43	0.04	444.2 ns	0.8	0^+			
^{72}As	-68230 4		26.0 h	0.1	2^-	95	$\beta^+=100$	
^{72}Se	-67894 12		8.40 d	0.08	0^+	97	$\epsilon=100$	
^{72}Br	-59020 60		78.6 s	2.4	1^+	95 03Pi03 J	$\beta^+=100$	
$^{72}\text{Br}^m$	-58920 60 100.92	0.03	10.6 s	0.3	1^-	95	IT \approx 100; $\beta^+ ?$	
^{72}Kr	-53941 8		17.16 s	0.18	0^+	95 03Pi03 T	$\beta^+=100$ *	
^{72}Rb	-38120# 500#		* < 1.5 μs		$3^+\#$	97 95Bi06 I	p ?	
$^{72}\text{Rb}^m$	-38020# 510# 100#	100#	* 1# μs		1^-		p ?	
* ^{72}Ni	T : not used 95Am.A=1.30(0.10) and 92Be.A=2.06(0.30) (the two of same group)							**
* ^{72}Kr	T : average 03Pi03=17.1(0.2) 73Da22=17.4(0.4)							**
^{73}Co	-37040# 700#		80# ms (>300 ns)	$7/2^- \#$	02	97Be70 I	$\beta^- ?$	
^{73}Ni	-49860# 300#		840 ms	30	$(9/2^+)$	02	$\beta^-=100; \beta^-_n ?$	
^{73}Cu	-58987 4		4.2 s	0.3	$(3/2^-)$	02 98Fr15 J	$\beta^-=100; \beta^-_n ?$	
^{73}Zn	-65410 40		23.5 s	1.0	$(1/2^-)$	02	$\beta^-=100$	
$^{73}\text{Zn}^m$	-65210 40 195.5	0.2	13.0 ms	0.2	$(5/2^+)$	02	IT=100	
$^{73}\text{Zn}^m$	-65170 40 237.6	2.0 EU	5.8 s	0.8	$(7/2^+)$	02	IT=?; $\beta^- ?$ *	
^{73}Ga	-69699.3 1.7		4.86 h	0.03	$3/2^-$	02	$\beta^-=100$	
^{73}Ge	-71297.5 1.6		STABLE		$9/2^+$	02	IS=7.73 5	
$^{73}\text{Ge}^m$	-71284.2 1.6 13.2845	0.0015	2.92 μs	0.03	$5/2^+$	02	IT=100	
$^{73}\text{Ge}^n$	-71230.8 1.6 66.726	0.009	499 ms	11	$1/2^-$	02	IT=100	
^{73}As	-70957 4		80.30 d	0.06	$3/2^-$	93	$\epsilon=100$	
^{73}Se	-68218 11		7.15 h	0.08	$9/2^+$	03	$\beta^+=100$	
$^{73}\text{Se}^m$	-68192 11 25.71	0.04	39.8 m	1.3	$3/2^-$	03	IT=72.6 3; $\beta^+=27.4$ 3	
^{73}Br	-63630 50		3.4 m	0.2	$1/2^-$	02	$\beta^+=100$	
^{73}Kr	-56552 7		28.6 s	0.6	$3/2^-$	02 99Mi17 T	$\beta^+=100; \beta^+p=0.25$ 3 *	
$^{73}\text{Kr}^m$	-56118 7 433.66	0.12	107 ns	10	$(9/2^+)$	03	IT=100	
^{73}Rb	-46050# 150#		< 30 ns		$3/2^- \#$	03 96Pf01 I	p ?	
$^{73}\text{Rb}^m$	-45620# 180# 430#	100#			$9/2^+ \#$			
^{73}Sr	-31700# 600#		> 25 ms		$1/2^- \#$	03	$\beta^+=100; \beta^+p=?$	
* $^{73}\text{Zn}^n$	E : if 42.1 keV γ feeds $^{73}\text{Zn}^m$, EU: see discussion in ENSDF'02							**
* ^{73}Kr	T : average 99Mi17=29.0(1.0) 81Ha44=28.4(0.7); 73Da22=25.9(0.6) at variance,							**
* ^{73}Kr	T : not used							**
^{74}Co	-32250# 800#		50# ms (>300 ns)		03	97Be70 I	$\beta^- ?$	
^{74}Ni	-48370# 400#		680 ms	120	0^+	03 98Fr15 T	$\beta^-=100; \beta^-_n ?$ *	
^{74}Cu	-56006 6		1.594 s	0.010	$1^+\#$	95	$\beta^-=100$	
^{74}Zn	-65710 50		95.6 s	1.2	0^+	95	$\beta^-=100$	
^{74}Ga	-68050 4		8.12 m	0.12	(3^-)	95	$\beta^-=100$	
$^{74}\text{Ga}^m$	-67990 4 59.571	0.014	9.5 s	1.0	(0)	95	IT=?; $\beta^- =25\#$	
^{74}Ge	-73422.4 1.6		STABLE		0^+	95	IS=36.28 73	
^{74}As	-70860.0 2.3		17.77 d	0.02	2^-	95	$\beta^+=66$ 2; $\beta^- =34$ 2	
^{74}Se	-72212.7 1.7		STABLE		0^+	95	IS=0.89 4; $2\beta^+ ?$	
^{74}Br	-65306 15		25.4 m	0.3	(0^-)	95	$\beta^+=100$	
$^{74}\text{Br}^m$	-65292 15 13.58	0.21	46 m	2	$4^{(++)}$	95	$\beta^+=100$	
^{74}Kr	-62331.5 2.0		11.50 m	0.11	0^+	95	$\beta^+=100$	
$^{74}\text{Kr}^m$	-61824 10 508	10	29 ns	6	0^+	00Ch07 ETJ	IT=100	
^{74}Rb	-51917 4		64.76 ms	0.03	(0^+)	95 01Ba12 T	$\beta^+=100$	
^{74}Sr	-40700# 500#		50# ms (>1.5 μs)		0^+	97 95Bi06 I	$\beta^+ ?$	
* ^{74}Ni	T : average 98Fr15=900(200) 98Am04=540(160)							**

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⁷⁵ Co	-29500# 800#		40# ms (>300 ns)	7/2 ⁻ #	99	97Be70 I	β^- ?
⁷⁵ Ni	-43900# 400#		600 ms	200	7/2 ⁺ #	99 85Re01 D	β^- =100; β^- -n=1.6# *
⁷⁵ Cu	-54120 980		1.224 s	0.003	3/2 ⁻ #	99	β^- =100; β^- -n=3.5 6
⁷⁵ Zn	-62470 70		10.2 s	0.2	7/2 ⁺ #	99	β^- =100
⁷⁵ Ga	-68464.6 2.4		126 s	2	(3/2) ⁻	99	β^- =100
⁷⁵ Ge	-71856.4 1.6		82.78 m	0.04	1/2 ⁻	99	β^- =100
⁷⁵ Ge ^m	-71716.7 1.6	139.69 0.03	47.7 s	0.5	7/2 ⁺	99	IT \approx 100; β^- =0.030 6
⁷⁵ As	-73032.4 1.8		STABLE		3/2 ⁻	99	IS=100.
⁷⁵ As ^m	-72728.5 1.8	303.9241 0.0007	17.62 ms	0.23	9/2 ⁺	99	IT=100
⁷⁵ Se	-72169.0 1.7		119.779 d	0.004	5/2 ⁺	99	ϵ =100
⁷⁵ Br	-69139 14		96.7 m	1.3	3/2 ⁻	99	β^+ =100
⁷⁵ Kr	-64324 8		4.29 m	0.17	5/2 ⁺	99	β^+ =100
⁷⁵ Rb	-57222 7		19.0 s	1.2	(3/2 ⁻)	99	β^+ =100
⁷⁵ Sr	-46620 220		88 ms	3	(3/2 ⁻)	99 03Hu01 TJD	β^+ =100; β^+ -p=5.2 9
* ⁷⁵ Ni	D : β^- -n=1.6%#	estimated by 85Re01					**
⁷⁶ Ni	-41610# 900#		470 ms	390	0 ⁺	97 98Am04 T	β^- =100; β^- -n ?
⁷⁶ Cu	-50976 7		* 641 ms	6	(3,5)	95 90Wi12 J	β^- =100; β^- -n=3 2
⁷⁶ Cu ^m	-50980# 200#	0# 200#	* 1.27 s	0.30	(1,3)	95 90Wi12 J	β^- =100
⁷⁶ Zn	-62140 80		5.7 s	0.3	0 ⁺	95	β^- =100
⁷⁶ Ga	-66296.6 2.0		32.6 s	0.6	(2 ⁺ , 3 ⁺)	95	β^- =100
⁷⁶ Ge	-73213.0 1.7		1.58 Zy	0.17	0 ⁺	95 01K111 T	IS=7.61 38; 2 β^- =100 *
⁷⁶ As	-72289.5 1.8		1.0778 d	0.0020	2 ⁻	95	β^- \approx 100; ϵ <0.02
⁷⁶ As ^m	-72245.1 1.8	44.425 0.001	1.84 μ s	0.06	(1) ⁺		
⁷⁶ Se	-75252.1 1.7		STABLE		0 ⁺	95	IS=9.37 29
⁷⁶ Br	-70289 9		16.2 h	0.2	1 ⁻	95	β^+ =100
⁷⁶ Br ^m	-70186 9	102.58 0.03	1.31 s	0.02	(4) ⁺	95	IT>99.4; β^+ <0.6
⁷⁶ Kr	-69014 4		14.8 h	0.1	0 ⁺	95	β^+ =100
⁷⁶ Rb	-60479.8 1.9		36.5 s	0.6	1 ⁽⁻⁾	95 78Ha08 D	β^+ =100; β^+ - α =3.8e-7 10
⁷⁶ Rb ^m	-60162.9 1.9	316.93 0.08	3.050 μ s	0.007	(4) ⁺	95 00Ch07 T	IT=100
⁷⁶ Sr	-54240 40		8.9 s	0.3	0 ⁺	95	β^+ =100
⁷⁶ Y	-38700# 500#		500# ns (>170 ns)			00We.A I	β^+ ?; p ? *
* ⁷⁶ Ge	T : from 01K111=1.55(+0.19-0.15); other results from same group:						**
* ⁷⁶ Ge	T : ⁹⁷ Ga13=1.77(+0.13-0.11) ⁹⁴ Ba15=1.42(0.13)						**
* ⁷⁶ Ge	T : other groups ⁹³ Br22=0.84(+0.10-0.08)(2 σ) ⁹⁰ Va18=0.90(0.10)						**
* ⁷⁶ Ge	T : and ⁹⁰ Mi23=1.1(+0.6-0.3)(2 σ)						**
* ⁷⁶ Ge	TD : claim for 0 ν - $\beta\beta$ 01K113=15 Yy not trusted. See also 02Aa.1 and 02Zd02						**
* ⁷⁶ Y	I : also 01Ki13>200 ns, same group						**
⁷⁷ Ni	-36750# 500#		300# ms (>300 ns)	9/2 ⁺ #	97	97Be70 I	β^- ?
⁷⁷ Cu	-48580# 400#		469 ms	8	3/2 ⁻ #	97	β^- =100
⁷⁷ Zn	-58720 120		2.08 s	0.05	7/2 ⁺ #	97	β^- =100
⁷⁷ Zn ^m	-57950 120	772.39 0.12	1.05 s	0.10	1/2 ⁻ #	97	IT>50; β^- <50
⁷⁷ Ga	-65992.3 2.4		13.2 s	0.2	(3/2 ⁻)	97	β^- =100
⁷⁷ Ge	-71214.0 1.7		11.30 h	0.01	7/2 ⁺	97	β^- =100
⁷⁷ Ge ^m	-71054.3 1.7	159.70 0.10	52.9 s	0.6	1/2 ⁻	97	β^- =81 2; IT=19 2
⁷⁷ As	-73916.6 2.3		38.83 h	0.05	3/2 ⁻	97	β^- =100
⁷⁷ As ^m	-73441.2 2.3	475.443 0.016	114.0 μ s	2.5	9/2 ⁺	97	IT=100
⁷⁷ Se	-74599.6 1.7		STABLE		1/2 ⁻	97	IS=7.63 16
⁷⁷ Se ^m	-74437.7 1.7	161.9223 0.0007	17.36 s	0.05	7/2 ⁺	97	IT=100
⁷⁷ Br	-73235 3		57.036 h	0.006	3/2 ⁻	97	β^+ =100
⁷⁷ Br ^m	-73129 3	105.86 0.08	4.28 m	0.10	9/2 ⁺	97	IT=100
⁷⁷ Kr	-70169.4 2.0		74.4 m	0.6	5/2 ⁺	97	β^+ =100
⁷⁷ Rb	-64825 7		3.77 m	0.04	3/2 ⁻	97	β^+ =100
⁷⁷ Sr	-57804 9		9.0 s	0.2	5/2 ⁺	97	β^+ =100; β^+ -p<0.25
⁷⁷ Y	-46910# 60#		63 ms	17	5/2 ⁺ #	97 01Ki13 T	β^+ =?; β^+ -p ?; p<10 *
* ⁷⁷ Y	D : limit for p is from 00We.A						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{78}Ni	-34300# 1100#		200#	ms (>300 ns)	0 ⁺	97 97Be70 I	β^- ?	
^{78}Cu	-44750# 400#		342	ms	11	97 91Kr15 T	β^- =100	
^{78}Zn	-57340 90		1.47	s	0.15	91	β^- =100	
$^{78}\text{Zn}^m$	-54670 90	2673 1	319	ns	9 (8 ⁺)	00Da07 ET	IT=100	
^{78}Ga	-63706.6 2.4		5.09	s	0.05 (3 ⁺)	91	β^- =100	
^{78}Ge	-71862 4		88	m	1	91	β^- =100	
^{78}As	-72817 10		90.7	m	0.2	2- 91	β^- =100	
^{78}Se	-77026.1 1.7		STABLE			0+ 91	IS=23.77 28	
^{78}Br	-73452 4		6.46	m	0.04	1+ 91	β^+ ≈100; β^- <0.01	
$^{78}\text{Br}^m$	-73271 4	180.82 0.13	119.2	μs		4+	*	
^{78}Kr	-74179.7 1.1		STABLE	(>110 Ey)	0 ⁺	91 94Sa31 T	IS=0.35 1; 2 β^+ ?	
^{78}Rb	-66936 7		17.66	m	0.08	0(+) 91	β^+ =100	
$^{78}\text{Rb}^m$	-66825 7	111.20 0.10	5.74	m	0.05	4(-) 91	β^+ =90 2; IT=10 2	
$^{78}\text{Rb}^x$	-66862 14	74 12	R = 2.0 0.5			spmix		
^{78}Sr	-63174 7		159	s	8	0+ 91	92Gr09 T β^+ =100	
^{78}Y	-52530# 400#		54	ms	5 (0 ⁺)	97 01Ga24 TJD	β^+ =100; β^+ p ?	
$^{78}\text{Y}^m$	-52530# 640#	0# 500#	5.8	s	0.5	5+# 01Ki13 TD	β^+ =100; β^+ p ?	
^{78}Zr	-41700# 500#		50#	ms (>170 ns)	0 ⁺	00We.A I	β^+ ?; β^+ p ?	
* ^{78}Br	D : β^- branch is uncertain. See ENSDF							**
* ^{78}Kr	T : limit given here is for the K-e ⁺ decay (theoretically faster)							**
* ^{78}Y	T : average 01Ga24=50(8) 01Ki13=55(+9-6)							**
* $^{78}\text{Y}^m$	T : average 01Ki13=5.7(0.7) 98Uu01=5.8(0.6)							**
* ^{78}Zr	I : also 01Ki13>200 ns same group							**
^{79}Cu	-42330# 500#		188	ms	25	3/2-# 02	β^- =100; β^- n=55 17	
^{79}Zn	-53420# 260#		995	ms	19	(9/2 ⁺) 02	β^- =100; β^- n=1.3 4	
^{79}Ga	-62510 100		2.847	s	0.003	3/2-# 02	β^- =100; β^- n=0.089 19	
^{79}Ge	-69490 90		18.98	s	0.03	(1/2)- 02	β^- =100	
$^{79}\text{Ge}^m$	-69300 90	185.95 0.04	39.0	s	1.0	7/2 ⁺ # 02	β^- =96 1; IT=4 1	
^{79}As	-73637 6		9.01	m	0.15	3/2- 02	β^- =100	
$^{79}\text{As}^m$	-72864 6	772.81 0.06	1.21	μs	0.01	(9/2 ⁺) 02	98Gr14 T IT=100	
^{79}Se	-75917.6 1.7		295	ky	38	7/2 ⁺ 02	β^- =100	
$^{79}\text{Se}^m$	-75821.8 1.7	95.77 0.03	3.92	m	0.01	1/2- 02	IT≈100; β^- =0.056 11	
^{79}Br	-76068.5 2.0		STABLE			3/2- 02	IS=50.69 7	
$^{79}\text{Br}^m$	-75860.9 2.0	207.61 0.09	4.86	s	0.04	(9/2 ⁺) 02	IT=100	
^{79}Kr	-74443 4		35.04	h	0.10	1/2- 02	β^+ =100	
$^{79}\text{Kr}^m$	-74313 4	129.77 0.05	50	s	3	7/2 ⁺ 02	IT=100	
$^{79}\text{Kr}^n$	-74296 4	147.06 0.06	78.7	ns	1.0	(5/2-) 02	IT=100	
^{79}Rb	-70803 6		22.9	m	0.5	5/2 ⁺ 02	β^+ =100	
^{79}Sr	-65477 8		2.25	m	0.10	3/2(-) 02	β^+ =100	
^{79}Y	-58360 450		14.8	s	0.6	5/2 ⁺ # 02	β^+ =100; β^+ p ?	
^{79}Zr	-47360# 400#		56	ms	30	5/2 ⁺ # 02	β^+ =100; β^+ p ?	
* $^{79}\text{As}^m$	T : 98Ho15=0.87(0.06) outweighed, not used							**
^{80}Cu	-36450# 600#		100#	ms (>300 ns)		97 97Be70 I	β^- ?	
^{80}Zn	-51840 170		545	ms	16	0+ 92	β^- =100; β^- n=1.0 5	
^{80}Ga	-59140 120		1.697	s	0.011	(3) 92 93Ru01 D	β^- =100; β^- n=0.89 6	
^{80}Ge	-69515 28		29.5	s	0.4	0+ 92	β^- =100	
^{80}As	-72159 23		15.2	s	0.2	1+ 92	β^- =100	
^{80}Se	-77759.9 2.0		STABLE			0+ 92	IS=49.61 41; 2 β^- ?	
^{80}Br	-75889.5 2.0		17.68	m	0.02	1+ 92	β^- =91.7 2; β^+ =8.3 2	
$^{80}\text{Br}^m$	-75803.7 2.0	85.843 0.004	4.4205	h	0.0008	5- 92	IT=100	
^{80}Kr	-77892.5 1.5		STABLE			0+ 92	IS=2.28 6	
^{80}Rb	-72173 7		33.4	s	0.7	1+ 92	93Al03 T β^+ =100	
$^{80}\text{Rb}^m$	-71679 7	494.4 0.5	1.6	μs	0.02	6+ 92Do10 E		
^{80}Sr	-70308 7		106.3	m	1.5	0+ 99	β^+ =100	
^{80}Y	-61220 180		30.1	s	0.5	4- 92	98Do04 TJ β^+ =100	
$^{80}\text{Y}^m$	-60990 180	228.5 0.1	4.8	s	0.3	(1-) 98Do04 ETJ	IT=81 2; β^+ =19 2	
$^{80}\text{Y}^n$	-60910 180	312.5 1.0	4.7	μs	0.3	(2+) 00Ch07 ETJ	IT=100	

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...							
⁸⁰ Zr	-55520	1490	4.6 s	0.6	0 ⁺	92 01Ki13 T	$\beta^+=100; \beta^+p?$ *
* ⁸⁰ Y	T : differences with 82De36=38(1) 81Li12=33.8(0.6) explained in 98Do04 **						
* ⁸⁰ Y ^m	T : average 01No07=5.0(0.5) 98Do04=4.7(0.3) D : from 98Do04 **						
* ⁸⁰ Y ^m	E : 00Ch07=84(1) above 228.5 level **						
* ⁸⁰ Zr	T : average 01Ki13=5.3(+1.1-0.9) 00Re03=4.1(+0.8-0.6) **						
⁸¹ Zn	-46130#	300#	290 ms	50	5/2 ⁺ #	97	$\beta^-=100; \beta^-n=7.5$ 30
⁸¹ Ga	-57980	190	1.217 s	0.005	(5/2 ⁻)	97	$\beta^-=100; \beta^-n=11.9$ 7
⁸¹ Ge	-66300	120	8 s	2	9/2 ⁺ #	97	$\beta^-=100$ *
⁸¹ Ge ^m	-65620	120	679.13	0.04	8 s	2 (1/2 ⁺)	97 $\beta^-\approx 100; IT < 1$
⁸¹ As	-72533	6	33.3 s	0.8	3/2 ⁻	97	$\beta^-=100$
⁸¹ Se	-76389.5	2.0	18.45 m	0.12	1/2 ⁻	97	$\beta^-=100$
⁸¹ Se ^m	-76286.5	2.0	102.99	0.06	57.28 m	0.02	7/2 ⁺ 97 $IT\approx 100; \beta^-=0.052$ 14
⁸¹ Br	-77974.8	2.0	STABLE		3/2 ⁻	97	IS=49.31 7
⁸¹ Br ^m	-77438.6	2.0	536.20	0.09	34.6 μ s		9/2 ⁺
⁸¹ Kr	-77694.0	2.0	229 ky	11	7/2 ⁺	97	$\epsilon=100$
⁸¹ Kr ^m	-77503.4	2.0	190.62	0.04	13.10 s	0.03	1/2 ⁻ 97 $IT\approx 100; \epsilon=0.0025$ 4
⁸¹ Rb	-75455	6	4.576 h	0.005	3/2 ⁻	97	$\beta^+=100$
⁸¹ Rb ^m	-75369	6	86.31	0.07	30.5 m	0.3	9/2 ⁺ 97 $IT=97.6$ 6; $\beta^+=2.4$ 6
⁸¹ Sr	-71528	6	22.3 m	0.4	1/2 ⁻	99	$\beta^+=100$
⁸¹ Y	-66020	60	70.4 s	1.0	(5/2 ⁺)	98	$\beta^+=100$
⁸¹ Zr	-58490	170	5.5 s	0.4	3/2 ⁻ #	00	$\beta^+=100; \beta^+p=0.12$ 2
⁸¹ Nb	-47480#	1500#	< 44 ns		3/2 ⁻ #	97 00We.A I	$p?; \beta^+?; \beta^+p?$ *
* ⁸¹ Ge	T : derived from 7.6(0.6), for mixture of ground-state and isomer with almost same half-life **						
* ⁸¹ Nb	I : also 99Ja02<80 01Ki13<200 ns T : estimated half-life for β^+ : 100# ms **						
⁸² Zn	-42460#	500#	100# ms (>300 ns)		0 ⁺	03 97Be70 I	$\beta^-?$
⁸² Ga	-53100#	300#	599 ms	2	(1,2,3)	03 93Ru01 D	$\beta^-=100; \beta^-n=21.3$ 13 *
⁸² Ge	-65620	240	4.55 s	0.05	0 ⁺	03	$\beta^-=100$
⁸² As	-70320	200	19.1 s	0.5	(1 ⁺)	03	$\beta^-=100$
⁸² As ^m	-70075	25	250	200	BD *	13.6 s	0.4 (5 ⁻) 03 $\beta^-=100$
⁸² Se	-77594.0	2.0			97 Ey	5	0 ⁺ 03 99Pi08 T $IS=8.73$ 22; $2\beta^-=100$ *
⁸² Br	-77496.5	1.9			35.282 h	0.007	5 ⁻ 03 $\beta^-=100$
⁸² Br ^m	-77450.6	1.9	45.9492	0.0010	6.13 m	0.05	2 ⁻ 03 $IT=97.6$ 3; $\beta^-=2.4$ 3
⁸² Kr	-80589.5	1.8	STABLE		0 ⁺	03	IS=11.58 14
⁸² Rb	-76188.2	2.8			1.273 m	0.002	1 ⁺ 03 $\beta^+=100$
⁸² Rb ^m	-76119.1	2.4	69.1	1.5	MD	6.472 h	0.006 5 ⁻ 03 $\beta^+\approx 100; IT < 0.33$
⁸² Sr	-76008	6			25.36 d	0.03	0 ⁺ 03 87Ho06 T $\epsilon=100$ *
⁸² Y	-68190	100			8.30 s	0.20	1 ⁺ 03 $\beta^+=100$
⁸² Y ^m	-67790	100	402.63	0.14	268 ns	25	4 ⁻ 03 $IT=100$
⁸² Zr	-64190#	230#			32 s	5	0 ⁺ 03 $\beta^+=100$
⁸² Nb	-52970#	300#			51 ms	5	0 ⁺ 03 01Ga24 T $\beta^+=100; \beta^+p?$ *
* ⁸² Ga	D : average 93Ru01=31.1(4.4) 86Wa17=19.8(1.7) 80Lu04=21.4(2.2) **						
* ⁸² Se	T : average 99Pi08=83(+9-7) 98Ar10=83(12) 92El07=108(+26-6) 88Li11=120(10) **						
* ⁸² Sr	T : average 87Ho06=25.36(0.03) 87Ju02=25.342(0.053) **						
* ⁸² Nb	T : average 01Ga24=52(6) 01Ki13=48(+8-6) **						
⁸³ Zn	-36300#	500#	80# ms (>300 ns)		5/2 ⁺ #	01 97Be70 I	$\beta^-?$
⁸³ Ga	-49390#	300#	308 ms	1	3/2 ⁻ #	01	$\beta^-=100; \beta^-n=37$ 17
⁸³ Ge	-60900#	200#	1.85 s	0.06	5/2 ⁺ #	01	$\beta^-=100$
⁸³ As	-69880	220	13.4 s	0.3	3/2 ⁻ #	01	$\beta^-=100$
⁸³ Se	-75341	4	22.3 m	0.3	9/2 ⁺	01	$\beta^-=100$
⁸³ Se ^m	-75113	4	228.50	0.20	70.1 s	0.4	1/2 ⁻ 01 $\beta^-=100$
⁸³ Br	-79009	4			2.40 h	0.02	3/2 ⁻ 01 $\beta^-=100$
⁸³ Br ^m	-75940	4	3068.8	0.6	700 ns	100	(19/2 ⁻) 01 $IT=100$
⁸³ Kr	-79981.7	2.8	STABLE		9/2 ⁺	01	IS=11.49 6
⁸³ Kr ^m	-79972.3	2.8	9.4053	0.0008	154.4 ns	1.1	7/2 ⁺ 01 $IT=100$
⁸³ Kr ⁿ	-79940.1	2.8	41.5569	0.0010	1.83 h	0.02	1/2 ⁻ 01 $IT=100$
... A-group is continued on next page ...							

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...									
^{83}Rb	-79075	6		86.2	d	0.1	5/2 ⁻	01	$\epsilon=100$
$^{83}\text{Rb}^m$	-79033	6	42.11 0.04	7.8	ms	0.7	9/2 ⁺	01 68Et01 T	IT=100
^{83}Sr	-76795	10		32.41	h	0.03	7/2 ⁺	01	$\beta^+=100$
$^{83}\text{Sr}^m$	-76536	10	259.15 0.09	4.95	s	0.12	1/2 ⁻	01	IT=100
^{83}Y	-72330	40		7.08	m	0.06	9/2 ⁺	01 92Bu10 J	$\beta^+=100$
$^{83}\text{Y}^m$	-72270	40	61.98 0.11	2.85	m	0.02	(3/2 ⁻)	01	$\beta^+=60.5$; IT=40.5
^{83}Zr	-66460	100		41.6	s	2.4	1/2 ⁻ #	01	$\beta^+=100$; $\beta^+p=?$
$^{83}\text{Zr}^m$	-66410	100	52.72 0.05	530	ns	0.12	(5/2 ⁻)	01	IT=100
$^{83}\text{Zr}^i$			non existent	8	s	1	high	01	$\beta^+=100$; $\beta^+p=?$
^{83}Nb	-58960	310		4.1	s	0.3	(5/2 ⁺)	01	$\beta^+=100$
^{83}Mo	-47750#	500#		23	ms	19	3/2 ⁻ #	01 01Ki13 TD	$\beta^+=100$; $\beta^+p?$
$^{83}\text{Zr}^i$	D : 6(4)% of total β^+p go to first excited state in ^{82}Sr								
$^{83}\text{Zr}^i$	I : misassigned: absence of radiations suggests no isomer with E>18 keV								
^{84}Ga	-44110#	400#		85	ms	10		97	$\beta^-=100$; $\beta^-n=70.15$
^{84}Ge	-58250#	300#		954	ms	14	0 ⁺	97 93Ru01 T	$\beta^-=100$; $\beta^-n=10.8.6$
^{84}As	-66080#	300#		4.02	s	0.03	(3)(+)	97 93Ru01 T	$\beta^-=100$; $\beta^-n=0.28.4$
$^{84}\text{As}^m$	-66080#	320#	0# 100#	650	ms	150		97	$\beta^-=100$
^{84}Se	-75952	15		3.1	m	0.1	0 ⁺	97	$\beta^-=100$
^{84}Br	-77799	15		31.80	m	0.08	2 ⁻	97	$\beta^-=100$
$^{84}\text{Br}^m$	-77460	100	340 100	6.0	m	0.2	(6 ⁻)	97	$\beta^-=100$
$^{84}\text{Br}^i$	-77391	15	408.2 0.4	< 140	ns		1 ⁺	97	IT=100
^{84}Kr	-82431.0	2.8		STABLE			0 ⁺	97	IS=57.00.4
$^{84}\text{Kr}^m$	-79195.0	2.8	3236.02 0.18	1.89	μs	0.04	8 ⁺	97	IT=100
^{84}Rb	-79750.0	2.8		32.77	d	0.14	2 ⁻	97	$\beta^+=96.2.5$; $\beta^-=3.8.5$
$^{84}\text{Rb}^m$	-79286.4	2.8	463.62 0.09	20.26	m	0.04	6 ⁻	97	IT \approx 100; $\beta^+=0.0012$
^{84}Sr	-80644	3		STABLE			0 ⁺	97	IS=0.56.1; 2 $\beta^+?$
^{84}Y	-74160	90		4.6	s	0.2	1 ⁺	97	$\beta^+=100$
$^{84}\text{Y}^m$	-74230	170	-80 190	39.5	m	0.8	(5 ⁻)	97	$\beta^+=100$
^{84}Zr	-71490#	200#		25.9	m	0.7	0 ⁺	97	$\beta^+=100$
^{84}Nb	-61880#	300#		9.8	s	0.9	3 ⁺	97 03Do01 T	$\beta^+=100$; $\beta^+p?$
$^{84}\text{Nb}^m$	-61540#	300#	338 10	103	ns	19	(5 ⁻)	00Ch07 ETJ	IT=100
^{84}Mo	-55810#	400#		3.8	ms	0.9	0 ⁺	97 01Ki13 T	$\beta^+=100$; $\beta^+p?$
^{84}Ge	T : average 93Ru01=947(11) 91Kr15=984(23)								
^{84}Nb	T : average 03Do01=9.5(1.0) 77Ko05=12(3)								
^{85}Ga	-40050#	500#		50#	ms (>300 ns)		3/2 ⁻ #	97 97Be70 I	$\beta^-?$
^{85}Ge	-53070#	400#		540	ms	50	5/2 ⁺ #	97	$\beta^-=100$; $\beta^-n=14.3$
^{85}As	-63320#	200#		2.021	s	0.010	3/2 ⁻ #	97	$\beta^-=100$; $\beta^-n=59.4.24$
^{85}Se	-72428	30		31.7	s	0.9	5/2 ⁺ #	97	$\beta^-=100$
^{85}Br	-78610	19		2.90	m	0.06	3/2 ⁻	91	$\beta^-=100$
^{85}Kr	-81480.3	1.9		10.776	y	0.003	9/2 ⁺	91 02Un02 T	$\beta^-=100$
$^{85}\text{Kr}^m$	-81175.4	1.9	304.871 0.020	4.480	h	0.008	1/2 ⁻	91	$\beta^-=78.6.4$; IT=21.4.4
$^{85}\text{Kr}^i$	-79488.5	2.3	1991.8 1.3	1.6	μs	0.7	(17/2 ⁺)	91	IT=100
^{85}Rb	-82167.331	0.011		STABLE			5/2 ⁻	91	IS=72.17.2
^{85}Sr	-81102.6	2.8		64.853	d	0.008	9/2 ⁺	91 02Un02 T	$\epsilon=100$
$^{85}\text{Sr}^m$	-80863.9	2.8	238.66 0.06	67.63	m	0.04	1/2 ⁻	91	IT=86.6.4; $\beta^+=13.4.4$
^{85}Y	-77842	19		2.68	h	0.05	(1/2 ⁻)	94	$\beta^+=100$
$^{85}\text{Y}^m$	-77822	19	19.8 0.5	4.86	h	0.13	9/2 ⁺	94	$\beta^+\approx 100$; IT<0.002
^{85}Zr	-73150	100		7.86	m	0.04	7/2 ⁺	94	$\beta^+=100$
$^{85}\text{Zr}^m$	-72860	100	292.2 0.3	10.9	s	0.3	(1/2 ⁻)	94	IT \leq 92; $\beta^+>8$
^{85}Nb	-67150	220		20.9	s	0.7	(9/2 ⁺)	91	$\beta^+=100$
$^{85}\text{Nb}^m$	-66390	220	759.0 1.0	12	s	5	(1/2 ⁻)	91 98Oi.A ETJ	$\beta^+=100$
^{85}Mo	-59100#	280#		3.2	s	0.2	1/2 ⁻ #	97 97Hu15 TD	$\beta^+=100$; $\beta^+p=?$
^{85}Tc	-47670#	400#		< 110	ns		1/2 ⁻ #	00We.A I	p?; $\beta^+?$; $\beta^+p?$
^{85}Tc	I : also 99Ja02<100 ns T : estimated half-life for β^+ decay: 100# ms								

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{86}Ga	-34350#	800#	30# ms (>300 ns)		01	97Be70 I	β^- ?
^{86}Ge	-49840#	500#	300# ms (>300 ns)	0^+	01	94Be24 I	β^- ?; β^-_n ?
^{86}As	-59150#	300#	945 ms	8	01		β^- =100; β^-_n =33 4
^{86}Se	-70541	16	15.3 s	0.9	0^+	01	β^- =100
^{86}Br	-75640	11	55.1 s	0.4	(2^-)	01	β^- =100
^{86}Kr	-83265.57	0.10	STABLE		0^+	01	IS=17.30 22; $2\beta^-$?
^{86}Rb	-82747.02	0.20	18.642 d	0.018	2^-	01	$\beta^- \approx 100$; $\epsilon=0.0052$ 5
$^{86}\text{Rb}^m$	-82190.97	0.27	556.05	0.18	6 $^-$	01	IT \approx 100; $\beta^- < 0.3$
^{86}Sr	-84523.6	1.1	STABLE		0^+	01	IS=9.86 1
$^{86}\text{Sr}^m$	-81567.9	1.1	2955.68	0.21	455 ns	7	IT=100
^{86}Y	-79284	14	14.74 h	0.02	4 $^-$	97	β^+ =100
$^{86}\text{Y}^m$	-79066	14	218.30	0.20	48 m	1	IT=99.31 4; $\beta^+=0.69$ 4
$^{86}\text{Y}^n$	-78982	14	302.2	0.5	125 ns	6	IT=100
^{86}Zr	-77800	30	16.5 h	0.1	0^+	01	β^+ =100
^{86}Nb	-69830	90	88 s	1	(6^+)	01	β^+ =100
$^{86}\text{Nb}^m$	-69580#	180#	250#	160#	56 s	8	high 01 94Sh07 JD β^+ =100
^{86}Mo	-64560	440	19.6 s	1.1	0^+	01	β^+ =100
^{86}Tc	-53210#	300#	55 ms	6	(0^+)	01	01Ga24 TJ β^+ =100; β^+p ?
$^{86}\text{Tc}^m$	-51710#	340#	1500	150	1.11 μs	0.21	$(5^+, 5^-)$ 01 00Ch07 EJ IT=100
$^{86}\text{Nb}^m$	I : existence considered as uncertain in ENSDF'01; needs confirmation						
^{86}Tc	T : average 01Ga24=44(12) 01Ki13=59(+8-7)						
$^{86}\text{Tc}^m$	E : above the 4^+ state at 1328 or 1445 keV						
^{87}Ge	-44240#	500#	150# ms (>300 ns)	$5/2^+$	# 02	97Be70 I	β^- ?; β^-_n ?
^{87}As	-55980#	300#	610 ms	120	$3/2^-$	# 02	93Ru01 T β^- =100; β^-_n =15.4 22
^{87}Se	-66580	40	5.50 s	0.12	$5/2^+$	# 02	β^- =100; β^-_n =0.20 4
^{87}Br	-73857	18	55.65 s	0.13	$3/2^-$	02	β^- =100; β^-_n =2.60 4
^{87}Kr	-80709.43	0.27	76.3 m	0.5	$5/2^+$	02	β^- =100
^{87}Rb	-84597.795	0.012	49.23 Gy	0.22	$3/2^-$	02	82Mi14 T IS=27.83 2; β^- =100
^{87}Sr	-84880.4	1.1	STABLE		$9/2^+$	02	IS=7.00 1
$^{87}\text{Sr}^m$	-84491.9	1.1	388.533	0.003	2.815 h	0.012	$1/2^-$ 02 IT \approx 100; $\epsilon=0.30$ 8
^{87}Y	-83018.7	1.6	79.8 h	0.3	$1/2^-$	02	β^+ =100
$^{87}\text{Y}^m$	-82637.9	1.6	380.82	0.07	13.37 h	0.03	$9/2^+$ 02 IT=98.43 10; $\beta^+=1.57$ 10
^{87}Zr	-79348	8	1.68 h	0.01	$(9/2)^+$	02	β^+ =100
$^{87}\text{Zr}^m$	-79012	8	335.84	0.19	14.0 s	0.2	$(1/2)^-$ 02 IT=100
^{87}Nb	-74180	60	3.75 m	0.09	$(1/2^-)$	02	β^+ =100
$^{87}\text{Nb}^m$	-74180	60	3.84	0.14	2.6 m	0.1	$9/2^+$ 02 β^+ =100
^{87}Mo	-67690	220	14.05 s	0.23	$7/2^+$	# 02	97Hu07 TD β^+ =100; β^+p =15 5
^{87}Tc	-59120#	300#	2.18 s	0.16	$1/2^-$	# 02	00We.A TD β^+ =100; β^+p ?
$^{87}\text{Tc}^m$	-59100#	310#	2#	s	$9/2^+$	#	β^+ ?; IT ?
^{87}Ru	-47340#	600#	50# ms (>1.5 μs)	$1/2^-$	# 02	95Ry03 I	β^+ ?
^{87}As	T : unweighed average 93Ru01=485(40) 78Cr03=730(60) (Birge ratio $B=3.4$)						
^{87}Rb	T : average 82Mi14=49.44(0.28) 74Ne14=48.8(0.8) 77Da22=48.9(0.4) obtained by						
^{87}Rb	T : three methods, respectively: geochronology, decay counting, chemical						
^{87}Rb	T : 77Da22 supersedes 66Mc12=47.2(0.4) using the same material						
^{87}Mo	T : average 97Hu07=13.6(1.1) 91Mi15=14.5(0.3) 83Ha06=13.3(0.4)						
^{87}Mo	D : average 97Hu07=15(6)% (through 3 levels) 83Ha06=15(8)% first 2^+ state						

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{88}Ge	-40140#	700#		80# ms (>300 ns)	0^+	97	97Be70 I	$\beta^- ?$
^{88}As	-51290#	500#		300# ms (>300 ns)		97	94Be24 I	$\beta^- ?; \beta^-_n ?$
^{88}Se	-63880	50		1.53 s	0^+	97		$\beta^- = 100; \beta^-_n = 0.99$ 10
^{88}Br	-70730	40		16.36 s	$(2^-, 1^+)$	98	93Ru01 T	$\beta^- = 100; \beta^-_n = 6.58$ 18 *
$^{88}\text{Br}^m$	-70460	40	272.7	5.4 μs		98		IT=100
^{88}Kr	-79692	13	0.3	2.84 h	0^+	88		$\beta^- = 100$
^{88}Rb	-82609.00	0.16		17.78 m	2^-	88		$\beta^- = 100$
^{88}Sr	-87921.7	1.1		STABLE	0^+	88		IS=82.58 1
^{88}Y	-84299.1	1.9		106.65 d	4^-	88		$\beta^+ = 100$
$^{88}\text{Y}^m$	-83624.6	1.9	674.55	13.9 ms	$(8)^+$	88		IT=100
$^{88}\text{Y}^n$	-83906.2	1.9	392.86	300 μs	1^+	88		
^{88}Zr	-83623	10		83.4 d	0^+	88		$\epsilon = 100$
^{88}Nb	-76070	100		14.5 m	(8^+)	88		$\beta^+ = 100$
$^{88}\text{Nb}^m$	-76030	100	40	7.8 m	(4^-)	88		$\beta^+ = 100$
^{88}Mo	-72700	20		8.0 m	0^+	97		$\beta^+ = 100$
^{88}Tc	-62710#	200#		5.8 s	$(2, 3)$	97		$\beta^+ = 100$
$^{88}\text{Tc}^m$	-62710#	360#	0#	6.4 s	$(6, 7, 8)$	97		$\beta^+ = 100$
^{88}Ru	-55650#	400#	300#	1.3 s	0^+	97	01Ki13 TD	$\beta^+ = 100; \beta^+_p ?$
* ^{88}Br	T : average 93Ru01=16.34(0.08) 74Gr29=16.5(0.2)				J : systematics prefers (2^-)			**
^{89}Ge	-33690#	900#		50# ms (>300 ns)	$3/2^+\#$	98	97Be70 I	$\beta^- ?$
^{89}As	-47140#	500#		200# ms (>300 ns)	$3/2^-\#$	98	94Be24 I	$\beta^- ?$
^{89}Se	-59200#	300#		410 ms	$5/2^+\#$	98		$\beta^- = 100; \beta^-_n = 7.8$ 25
^{89}Br	-68570	60		4.40 s	$(3/2^-, 5/2^-)$	98		$\beta^- = 100; \beta^-_n = 13.8$ 4 *
^{89}Kr	-76730	50		3.15 m	$3/2^{(+\#)}$	98	95Ke04 J	$\beta^- = 100$
^{89}Rb	-81713	5		15.15 m	$3/2^-$	98		$\beta^- = 100$
^{89}Sr	-86209.1	1.1		50.53 d	$5/2^+$	98		$\beta^- = 100$
^{89}Y	-87701.7	2.6		STABLE	$1/2^-$	98		IS=100.
$^{89}\text{Y}^m$	-86792.7	2.6	908.97	15.663 s	$9/2^+$	98	94It.A T	IT=100
^{89}Zr	-84869	4		78.41 h	$9/2^+$	98		$\beta^+ = 100$
$^{89}\text{Zr}^m$	-84281	4	587.82	4.161 m	$1/2^-$	98		IT=93.77 12; ... *
^{89}Nb	-80650	27		2.03 h	$(9/2^+)$	98		$\beta^+ = 100$
$^{89}\text{Nb}^m$	-80650#	40#	0#	1.10 h	$(1/2)^-$	98		$\beta^+ = 100$
^{89}Mo	-75004	15		2.11 m	$(9/2^+)$	98		$\beta^+ = 100$
$^{89}\text{Mo}^m$	-74617	15	387.5	190 ms	$(1/2^-)$	98		IT=100
^{89}Tc	-67840#	200#		12.8 s	$(9/2^+)$	98		$\beta^+ = 100$
$^{89}\text{Tc}^m$	-67780#	200#	62.6	12.9 s	$(1/2^-)$	98		$\beta^+ \approx 100; \text{IT} < 0.01$
^{89}Ru	-59510#	500#		1.38 s	$(7/2)^{(+\#)}$	98	00We.A T	$\beta^+ = 100; \beta^+_p = ?$ *
^{89}Rh	-47660#	450#		10# ms (>1.5 μs)	$7/2^+\#$	98	95Ry03 I	$\beta^+ ?$ *
* ^{89}Br	T : ENSDF averages 8 values. Also 93Ru01=4.348(0.022)							**
* $^{89}\text{Zr}^m$	D : ... ; $\beta^+ = 6.23$ 12							**
* ^{89}Ru	T : average 00We.A=1.45(0.13) 99Li33=1.2(0.2); same group 01Ki13=1.5(0.2)							**
* ^{89}Rh	I : unobserved in 00We.A, at detection limit							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
⁹⁰ As	-41450# 800#		80# ms (>300 ns)			97Be70 I	β^- ?	
⁹⁰ Se	-55930# 400#		300# ms (>300 ns)	0 ⁺		94Be24 I	β^- ?; β^-n ?	
⁹⁰ Br	-64620 80		1.910 s 0.010		98	93Ru01 T	β^- =100; β^-n =25.2 9 *	
⁹⁰ Kr	-74970 19		32.32 s 0.09	0 ⁺	98		β^- =100	
⁹⁰ Rb	-79362 7		158 s 5	0 ⁻	98		β^- =100	
⁹⁰ Rb ^m	-79255 7	106.90 0.03	258 s 4	3 ⁻	98		β^- =97.4 4; IT=2.6 4	
⁹⁰ Rb ^x	-79291 14	71 12	R = 2 1				fsmix	
⁹⁰ Sr	-85941.6 2.9		28.79 y 0.06	0 ⁺	98		β^- =100	
⁹⁰ Y	-86487.5 2.6		64.00 h 0.21	2 ⁻	98		β^- =100	
⁹⁰ Y ^m	-85805.8 2.6	681.67 0.10	3.19 h 0.06	7 ⁺	98		IT≈100; β^- =0.0018 2	
⁹⁰ Zr	-88767.3 2.4		STABLE	0 ⁺	98		IS=51.45 40	
⁹⁰ Zr ^m	-86448.3 2.4	2319.000 0.010	809.2 ms 2.0	5 ⁻	98		IT=100	
⁹⁰ Zr ⁿ	-85177.9 2.4	3589.419 0.016	131 ns 4	8 ⁺	98		IT=100	
⁹⁰ Nb	-82656 5		14.60 h 0.05	8 ⁺	98		β^+ =100	
⁹⁰ Nb ^m	-82534 5	122.370 0.022	63 μ s 2	6 ⁺	98		IT=100	
⁹⁰ Nb ⁿ	-82531 5	124.67 0.25	18.81 s 0.06	4 ⁻	98		IT=100	
⁹⁰ Nb ^p	-82485 5	171.10 0.10	< 1 μ s	7 ⁺	98		IT=100	
⁹⁰ Nb ^q	-82274 5	382.01 0.25	6.19 ms 0.08	1 ⁺	98		IT=100	
⁹⁰ Nb ^r	-80776 5	1880.21 0.20	472 ns 13	(11 ⁻)	98		IT=100	
⁹⁰ Mo	-80167 6		5.56 h 0.09	0 ⁺	98		β^+ =100	
⁹⁰ Mo ^m	-77292 6	2874.73 0.15	1.12 μ s 0.05	8 ⁺ #	98		IT=100	
⁹⁰ Tc	-71210 240		* & 8.7 s 0.2	1 ⁺	98		β^+ =100	
⁹⁰ Tc ^m	-70900 300	310 390	BD * & 49.2 s 0.4	(8 ⁺)	98	93Ru03 J	β^+ =100 *	
⁹⁰ Ru	-65310# 300#		11 s 3	0 ⁺	98		β^+ =100	
⁹⁰ Rh	-53220# 500#		* 15 ms 7	0 ⁺ #	98	01Ki13 TD	β^+ =100; β^+p ?	
⁹⁰ Rh ^m	-53220# 710#	0# 500#	* 1.1 s 0.3	9 ⁺ #	98	01Ki13 TD	β^+ =100; β^+p ?	
* ⁹⁰ Br	T : supersedes 80A115=1.92(0.02) from same group							**
* ⁹⁰ Tc ^m	E : arguments are given in 93Ru03 for the (8 ⁺) level to be the ground-state							**
⁹¹ As	-36860# 900#		50# ms (>300 ns)	3/2 ⁻ #	99	97Be70 I	β^- ?	
⁹¹ Se	-50340# 500#		270 ms 50	1/2 ⁺ #	99		β^- =100; β^-n =21 10	
⁹¹ Br	-61510 70		541 ms 5	3/2 ⁻ #	99		β^- =100; β^-n =20 3	
⁹¹ Kr	-71310 60		8.57 s 0.04	5/2 ⁽⁺⁾	01		β^- =100	
⁹¹ Rb	-77745 8		58.4 s 0.4	3/2 ⁽⁻⁾	99		β^- =100	
⁹¹ Sr	-83645 5		9.63 h 0.05	5/2 ⁺	01		β^- =100	
⁹¹ Sr ^x	-83599 11	47 11	R = 6				mix	
⁹¹ Y	-86345.0 2.9		58.51 d 0.06	1/2 ⁻	99		β^- =100	
⁹¹ Y ^m	-85789.4 2.9	555.58 0.05	49.71 m 0.04	9/2 ⁺	99		IT>98.5; β^- <1.5	
⁹¹ Zr	-87890.4 2.3		STABLE	5/2 ⁺	01		IS=11.22 5	
⁹¹ Zr ^m	-84723.1 2.3	3167.3 0.4	4.35 μ s 0.14	(21/2 ⁺)	01		IT=100	
⁹¹ Nb	-86632 4		680 y 130	9/2 ⁺	99	91Hi.A D	ϵ ≈100; e^+ =0.0138 25	
⁹¹ Nb ^m	-86527 4	104.60 0.05	60.86 d 0.22	1/2 ⁻	99	91Hi.A D	IT=96.6 5; ϵ =3.4 5; ... *	
⁹¹ Nb ⁿ	-84598 4	2034.35 0.19	3.76 μ s 0.12	(17/2 ⁻)	99		IT=100	
⁹¹ Mo	-82204 11		15.49 m 0.01	9/2 ⁺	99		β^+ =100	
⁹¹ Mo ^m	-81551 11	653.01 0.09	64.6 s 0.6	1/2 ⁻	99		IT=50.0 16; β^+ =50.0 16	
⁹¹ Tc	-75980 200		3.14 m 0.02	(9/2 ⁺)	99		β^+ =100	
⁹¹ Tc ^m	-75840 200	139.3 0.3	3.3 m 0.1	(1/2 ⁻)	99		β^+ >99; IT<1	
⁹¹ Ru	-68660# 580#		* 9 s 1	(9/2 ⁺)	99		β^+ =100	
⁹¹ Ru ^m	-68580 500	80# 300#	* 7.6 s 0.8	(1/2 ⁻)	99		β^+ ≈100; β^+p ?; IT ?	
⁹¹ Rh	-59100# 400#		1.74 s 0.14	7/2 ⁺ #	99	00We.A TD	β^+ =100; β^+p ?	
⁹¹ Pd	-47400# 570#		10# ms (>1.5 μ s)	7/2 ⁺ #	99	95Ry03 I	β^+ ?	
* ⁹¹ Nb ^m	D : ... ; e^+ =0.0028 2							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
⁹² As	-30930#	900#	30# ms (>300 ns)		01	97Be70 I	β^- ?	
⁹² Se	-46650#	600#	100# ms (>300 ns)	0 ⁺	01	97Be70 I	β^- ?	
⁹² Br	-56580	50	343 ms 15	(2 ⁻)	01		β^- =100; β^- n=33.1 25	
⁹² Kr	-68785	12	1.840 s 0.008	0 ⁺	01		β^- =100; β^- n=0.0332 25	
⁹² Rb	-74772	6	4.492 s 0.020	0 ⁻	01		β^- =100; β^- n=0.0107 5	
⁹² Sr	-82868	3	2.66 h 0.04	0 ⁺	03		β^- =100	
⁹² Y	-84813	9	3.54 h 0.01	2 ⁻	01		β^- =100	
⁹² Zr	-88453.9	2.3	STABLE	0 ⁺	01		IS=17.15 8	
⁹² Nb	-86448.3	2.8	34.7 My 2.4	(7 ⁺)	01		β^+ ≈100; β^- <0.05	
⁹² Nb ^m	-86312.8	2.8 135.5 0.4	10.15 d 0.02	(2 ⁺)	01		β^+ =100	
⁹² Nb ⁿ	-86222.6	2.8 225.7 0.4	5.9 μs 0.2	(2 ⁻)	01		IT=100	
⁹² Nb ^p	-84245.0	2.8 2203.3 0.4	167 ns 4	(11 ⁻)	01		IT=100	
⁹² Mo	-86805	4	STABLE (>190 Ey)	0 ⁺	01	97Ba35 T	IS=14.84 35; 2 β^+ ?	
⁹² Mo ^m	-84045	4 2760.46 0.16	190 ns 3	8 ⁺	01		IT=100	
⁹² Tc	-78935	26	4.25 m 0.15	(8 ⁺)	01		β^+ =100	
⁹² Tc ^m	-78665	26 270.15 0.11	1.03 μs 0.07	(4 ⁺)	01		IT=100	
⁹² Ru	-74410#	300#	3.65 m 0.05	0 ⁺	01		β^+ =100	
⁹² Rh	-63360#	400#	4.3 s 1.3	(6 ⁺)	01	01Xu05 TJD	β^+ =100; β^+ p=?	
⁹² Pd	-55500#	500#	1.1 s 0.3	0 ⁺	01	01Ki13 TD	β^+ =100; β^+ p ?	
* ⁹² Mo	T : T > 190 Ey (2σ)							**
* ⁹² Rh	T : unweighed average 01Xu05=3.0(0.8) 01Ki13=5.6(0.5) (Birge ratio B=2.76)							**
* ⁹² Rh	J : from 97Ka07; 01Xu05>4							**
⁹³ Se	-40720#	800#	50# ms (>300 ns)	1/2 ⁺ #	97	97Be70 I	β^- ?	
⁹³ Br	-53050#	300#	102 ms 10	3/2 ⁻ #	01		β^- =100; β^- n=68 7	
⁹³ Kr	-64020	100	1.286 s 0.010	1/2 ⁺	01		β^- =100; β^- n=1.95 11	
⁹³ Rb	-72618	8	5.84 s 0.02	5/2 ⁻	97		β^- =100; β^- n=1.39 7	
⁹³ Rb ^m	-72365	8 253.38 0.03	57 μs 15	(3/2 ⁻ , 5/2 ⁻)	97		IT=100	
⁹³ Sr	-80085	8	7.423 m 0.024	5/2 ⁺	97		β^- =100	
⁹³ Y	-84223	11	10.18 h 0.08	1/2 ⁻	97		β^- =100	
⁹³ Y ^m	-83464	11 758.719 0.021	820 ms 40	7/2 ⁺	97		IT=100	
⁹³ Zr	-87117.0	2.3	1.53 My 0.10	5/2 ⁺	97		β^- =100	
⁹³ Nb	-87208.3	2.4	STABLE	9/2 ⁺	97		IS=100.	
⁹³ Nb ^m	-87177.5	2.4 30.77 0.02	16.13 y 0.14	1/2 ⁻	97		IT=100	
⁹³ Mo	-86803	4	4.0 ky 0.8	5/2 ⁺	97		ϵ =100	
⁹³ Mo ^m	-84378	4 2424.89 0.03	6.85 h 0.07	21/2 ⁺	97		IT≈100; β^+ =-0.12 1	
⁹³ Tc	-83603	4	2.75 h 0.05	9/2 ⁺	01		β^+ =100	
⁹³ Tc ^m	-83211	4 391.84 0.08	43.5 m 1.0	1/2 ⁻	01		IT=76.6 11; β^+ =23.4 11	
⁹³ Tc ⁿ	-81418	4 2185.16 0.15	10.2 μs 0.3	(17/2 ⁻)	01			
⁹³ Ru	-77270	90	59.7 s 0.6	(9/2 ⁺)	97		β^+ =100	
⁹³ Ru ^m	-76540	90 734.40 0.10	10.8 s 0.3	(1/2 ⁻)	97	83Ay01 D	β^+ =78.0 23; ...	
⁹³ Ru ⁿ	-75190	90 2082.6 0.9	2.20 μs 0.17	(21/2 ⁺)	97		IT=100	
⁹³ Rh	-69170#	400#	13.9 s 1.6	9/2 ⁺ #	01	01Ki13 TD	β^+ =100; β^+ p ?	
⁹³ Pd	-59700#	400#	1.07 s 0.12	(9/2 ⁺)	01	01Ki13 TJD	β^+ =100; β^+ p=?	
⁹³ Ag	-46780#	600#	5# ms (>1.5 μs)	9/2 ⁺ #	97	95Ry03 I	p ?; β^+ ?	
* ⁹³ Ru ^m	D : ... ; IT=22.0 23; β^+ p=0.027 5							**
* ⁹³ Pd	T : average 01Ki13=1000(200) 01Xu05=1300(200) 00Sc31=900(200)							**
* ⁹³ Ag	I : the few events reported in 94He28 are not trusted by NUBASE							**
* ⁹³ Ag	T : estimated half-life is for β^+ decay; p-decay would be much shorter							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁹⁴ Se	-36800# 800#		20# ms (>300 ns)	0 ⁺	97	97Be70 I	β^- ?
⁹⁴ Br	-47800# 400#		70 ms	20	92		β^- =100; β^- n=70 15
⁹⁴ Kr	-61140# 300#		210 ms	4	0 ⁺	01 03Be05 TD	β^- =100; β^- n=1.11 7 *
⁹⁴ Rb	-68553 8		2.702 s	0.005	3 ⁽⁻⁾	92 93Ru01 D	β^- =100; β^- n=10.01 23
⁹⁴ Sr	-78840 7		75.3 s	0.2	0 ⁺	92	β^- =100
⁹⁴ Y	-82348 7		18.7 m	0.1	2 ⁻	92	β^- =100
⁹⁴ Zr	-87266.8 2.4		STABLE	(>110 Py)	0 ⁺	92 99Ar25 T	IS=17.38 28; 2 β^- ?
⁹⁴ Nb	-86364.5 2.4		20.3 ky	1.6	(6) ⁺	92	β^- =100
⁹⁴ Nb ^m	-86323.6 2.4	40.902	6.263 m	0.004	3 ⁺	92	IT=99.50 6; β^- =0.50 6
⁹⁴ Mo	-88409.7 1.9		STABLE		0 ⁺	97	IS=9.25 12
⁹⁴ Tc	-84154 4		293 m	1	7 ⁺	92	β^+ =100
⁹⁴ Tc ^m	-84079 4	75.5	52.0 m	1.0	(2) ⁺	92	β^+ ≈100; IT<0.1
⁹⁴ Ru	-82568 13		51.8 m	0.6	0 ⁺	92	β^+ =100
⁹⁴ Ru ^m	-79923 13	2644.55	71 μ s	4	(8) ⁺	92	IT=100
⁹⁴ Rh	-72940# 450#		* 70.6 s	0.6	(2 ⁺ , 4 ⁺)	92 96Jo06 J	β^+ =100; β^+ p=1.8 5
⁹⁴ Rh ^m	-72640 400	300#	* 25.8 s	0.2	(8) ⁺	92	β^+ =100
⁹⁴ Pd	-66350# 400#		9.0 s	0.5	0 ⁺	02	β^+ =100
⁹⁴ Pd ^m	-61470# 400#	4884.4	530 ns	10	(14) ⁺	02	IT=100
⁹⁴ Ag	-53300# 500#		37 ms	18	0 ⁺ #	02	β^+ =100; β^+ p ?
⁹⁴ Ag ^m	-51950# 640#	1350#	422 ms	16	(7) ⁺	02 02La18 TJ	β^+ =100; β^+ p=?
⁹⁴ Ag ⁿ	-46800# 500#	6500#	300 ms	200	(21) ⁺	02 02La18 TJ	β^+ =100; β^+ p=?
* ⁹⁴ Kr	T : average 03Be05=212(5) 72Am01=200(10); others outweighed not used: **						
* ⁹⁴ Kr	T : 03Be05=210(20) 75As04=220(20) and 96Me09=330(100) **						
* ⁹⁴ Ag ^m	T : average 02La18=360(30) 01Ki13=450(20) 94Sc35=420(50) **						
⁹⁵ Br	-43900# 500#		50# ms (>300 ns)	3/2 ⁻ #	97	97Be70 I	β^- ?
⁹⁵ Kr	-56040# 400#		114 ms	3	1/2 ⁽⁺⁾	95 03Be05 TD	β^- =100; β^- n=2.87 18 *
⁹⁵ Rb	-65854 21		377.5 ms	0.8	5/2 ⁻	95	β^- =100; β^- n=8.73 20
⁹⁵ Sr	-75117 7		23.90 s	0.14	1/2 ⁺	94	β^- =100
⁹⁵ Y	-81207 7		10.3 m	0.1	1/2 ⁻	94	β^- =100
⁹⁵ Zr	-85657.8 2.4		64.032 d	0.006	5/2 ⁺	00	β^- =100
⁹⁵ Nb	-86781.9 2.0		34.991 d	0.006	9/2 ⁺	00	β^- =100
⁹⁵ Nb ^m	-86546.2 2.0	235.690	3.61 d	0.03	1/2 ⁻	00	IT=94.4 6; β^- =5.6 6
⁹⁵ Mo	-87707.5 1.9		STABLE		5/2 ⁺	00	IS=15.92 13
⁹⁵ Tc	-86017 5		20.0 h	0.1	9/2 ⁺	95	β^+ =100
⁹⁵ Tc ^m	-85978 5	38.89	61 d	2	1/2 ⁻	95	β^+ =96.12 32; IT=3.88 32
⁹⁵ Ru	-83450 12		1.643 h	0.014	5/2 ⁺	94	β^+ =100
⁹⁵ Rh	-78340 150		5.02 m	0.10	(9/2) ⁺	94	β^+ =100
⁹⁵ Rh ^m	-77800 150	543.3	1.96 m	0.04	(1/2) ⁻	94	IT=88 5; β^+ =12 5
⁹⁵ Pd	-70150# 400#		10# s		9/2 ⁺ #	95 97Sc30 TD	β^+ =100 *
⁹⁵ Pd ^m	-68290 300	1860#	13.3 s	0.3	(21/2 ⁺)	95	β^+ =?; IT=5#; ... *
⁹⁵ Ag	-60100# 400#		1.74 s	0.13	(9/2 ⁺)	95 94Sc35 TJD	β^+ =100; β^+ p=? *
⁹⁵ Ag ^m	-59760# 400#	344.2	< 0.5 s		(1/2 ⁻)	03Do.1 ETJ	IT=100
⁹⁵ Ag ⁿ	-57570# 400#	2531	< 16 ms		(23/2 ⁺)	03Do.1 ETJ	IT=100
⁹⁵ Ag ^p	-55240# 400#	4859	< 40 ms		(37/2 ⁺)	03Do.1 ETJ	IT=100
⁹⁵ Cd	-46700# 600#		5# ms		9/2 ⁺ #		β^+ ?; β^+ p ?
* ⁹⁵ Kr	J : from 95Ke04 **						
* ⁹⁵ Pd	T : 1.35(0.26) s in 97Sc30, if the 1219.3 keV γ originates from ground-state; **						
* ⁹⁵ Pd	T : 1.7 s < T < 7.5 s in Schmidt's thesis 1995 cited in 97Sc30 **						
* ⁹⁵ Pd ^m	D : ... ; β^+ p=0.90 16 **						
* ⁹⁵ Ag	T : from 97Sc30 for β^+ γ activity; supersedes 94Sc35=2.0(0.1) by same authors **						
* ⁹⁵ Ag	T : also 03Do.1=1.85(0.34), same group **						

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
⁹⁶ Br	-38630# 700#				20#	ms (>300 ns)		97	97Be70 I	β^- ?
⁹⁶ Kr	-53030# 500#				80	ms	7	0+	97 03Be05 TD	β^- =100; β^- n=3.7 4
⁹⁶ Rb	-61225 29			*	203	ms	3	2+	95 93Ru01 D	β^- =100; β^- n=13.4 4 *
⁹⁶ Rb ^m	-61230# 200#	0#	200#	*	200#	ms (>1 ms)	1(-#)		81Bo30 JI	β^- ?; IT ?; β^- n ? *
⁹⁶ Sr	-72939 27				1.07	s	0.01	0+	93	β^- =100
⁹⁶ Y	-78347 23				5.34	s	0.05	0-	93	β^- =100
⁹⁶ Y ^m	-77206 21	1140	30	BD	9.6	s	0.2	(8)+	93	β^- =100
⁹⁶ Zr	-85442.8 2.8				24	Ey	6	0+	98 99Ar25 T	IS=2.80 9; 2 β^- =100 *
⁹⁶ Nb	-85604 4				23.35	h	0.05	6+	93	β^- =100
⁹⁶ Mo	-88790.5 1.9				STABLE			0+	93	IS=16.68 2
⁹⁶ Tc	-85817 5				4.28	d	0.07	7+	93	β^+ =100
⁹⁶ Tc ^m	-85783 5	34.28	0.07		51.5	m	1.0	4+	93	IT=98.0 5; β^+ =2.0 5
⁹⁶ Ru	-86072 8				STABLE	(>67 Py)		0+	01 85No03 T	IS=5.54 14; 2 β^+ ?
⁹⁶ Rh	-79679 13				9.90	m	0.10	(6+)	93	β^+ =100
⁹⁶ Rh ^m	-79627 13	52.0	0.1		1.51	m	0.02	(3+)	93	IT=60 5; β^+ =40 5
⁹⁶ Pd	-76230 150				122	s	2	0+	93	β^+ =100
⁹⁶ Pd ^m	-73700 150	2530.8	0.1		1.81	μ s	0.01	8+	93 98Gr.B TD	IT=100 *
⁹⁶ Ag	-64570# 400#			*	4.45	s	0.04	(8+)	93 03Ba39 TJ	β^+ =100; β^+ p=9.7 17 *
⁹⁶ Ag ^m	-64570# 400#	0#	50#	*	6.9	s	0.6	(2+)	03Ba39 TJD	β^+ =100; β^+ p=18 5
⁹⁶ Ag ⁿ	-64570# 400#				700	ns	200		97Gr02 T	IT ?
⁹⁶ Cd	-56100# 500#				1#	s		0+		β^+ ?
* ⁹⁶ Rb	T : ENSDF average of 8 values. There is also 93Ru01=201(1) **									
* ⁹⁶ Rb ^m	I : non-observation by 81Th04 is not in contradiction with 81Bo30 experiment **									
* ⁹⁶ Rb ^m	I : existence of this isomer is discussed in ENSDF **									
* ⁹⁶ Zr	T : from 21(+8-4 statistics + 2 systematics); other 93Ka12=39(9) in geochemical **									
* ⁹⁶ Zr	T : experiment, not used: observation of 2 β^- decay questioned by 96Ba37 **									
* ⁹⁶ Pd ^m	T : supersedes 97Gr02=1.7(0.1); other 83Gr01=2.2(0.3) outweighed **									
* ⁹⁶ Ag	T : average 03Ba39=4.40(0.06) 97Sc30=4.50(0.06) **									
* ⁹⁶ Ag	D : average β^+ p 97Sc30=11.9(2.6) 82Ku15=8.0(2.3); 96He25=3.7(0.9) not used **									
⁹⁷ Br	-34650# 800#				10#	ms (>300 ns)	3/2-#	97	97Be70 I	β^- ?
⁹⁷ Kr	-47920# 500#				63	ms	4	3/2+#	03Be05 TD	β^- =100; β^- n=6.7 6
⁹⁷ Rb	-58360 30				169.9	ms	0.7	3/2+#	93 93Ru01 D	β^- =100; β^- n=25.7 8
⁹⁷ Sr	-68788 19				429	ms	5	1/2+	93	β^- =100; β^- n<0.05
⁹⁷ Sr ^m	-68480 19	308.13	0.11		170	ns	10	(7/2)+	93	IT=100
⁹⁷ Sr ⁿ	-67957 19	830.8	0.2		255	ns	10	11/2-#	93	IT=100
⁹⁷ Y	-76258 12				3.75	s	0.03	(1/2-)	93 93Ru01 D	β^- =100; β^- n=0.058 7
⁹⁷ Y ^m	-75590 12	667.51	0.23		1.17	s	0.03	(9/2)+	93	β^- >99.3; IT<0.7; ... *
⁹⁷ Y ⁿ	-72735 12	3523.3	0.4		142	ms	8	(27/2-)	93	IT \geq 80; β^- \leq 20
⁹⁷ Zr	-82946.6 2.8				16.90	h	0.05	1/2+	93	β^- =100
⁹⁷ Nb	-85605.6 2.6				72.1	m	0.7	9/2+	93	β^- =100
⁹⁷ Nb ^m	-84862.3 2.6	743.35	0.03		52.7	s	1.8	1/2-	93	IT=100
⁹⁷ Mo	-87540.4 1.9				STABLE			5/2+	93	IS=9.55 8
⁹⁷ Tc	-87220 5				2.6	My	0.4	9/2+	93	ϵ =100
⁹⁷ Tc ^m	-87123 5	96.56	0.06		90.1	d	1.0	1/2-	93	IT \approx 100; ϵ <0.34
⁹⁷ Ru	-86112 8				2.9	d	0.1	5/2+	93	β^+ =100
⁹⁷ Rh	-82590 40				30.7	m	0.6	9/2+	93	β^+ =100
⁹⁷ Rh ^m	-82330 40	258.85	0.17		46.2	m	1.6	1/2-	93	β^+ =94.4 6; IT=5.6 6
⁹⁷ Pd	-77800 300				3.10	m	0.09	5/2+#	01	β^+ =100
⁹⁷ Ag	-70820 320				25.3	s	0.3	(9/2+)	93 97Sc30 T	β^+ =100
⁹⁷ Ag ^m	-68480 320	2343	49		5	ns	(21/2+)			
⁹⁷ Cd	-60600# 400#				2.8	s	0.6	9/2+#	93 97Sc30 T	β^+ =100; β^+ p=?
⁹⁷ In	-47000# 600#				5#	ms		9/2+#		p ?; β^+ ? *
* ⁹⁷ Y ^m	D : ... ; β^- n<0.08 **									
* ⁹⁷ In	T : estimated half-life is for β^+ decay; p-decay would be much shorter **									

Nuclide	Mass excess (keV)	Excitation energy(keV)				Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁹⁸ Kr	-44800#	600#				46 ms	8	0 ⁺	03	β^- =100; β^- -n=7.0 10
⁹⁸ Rb	-54220	50				114 ms	5	(0, 1) ^(-#)	03	β^- =100; β^- -n=13.8 6; ... *
⁹⁸ Rb ^m	-53940	120	290	130	BD	96 ms	3	(3, 4) ^(+#)	03	β^- =100
⁹⁸ Sr	-66646	26				653 ms	2	0 ⁺	03	β^- =100; β^- -n=0.25 5
⁹⁸ Y	-72467	25				548 ms	2	(0) ⁻	03	β^- =100; β^- -n=0.331 24
⁹⁸ Y ^m	-72050	30	410	30	BD	2.0 s	0.2	(5 ⁺ , 4 ⁻)	03	β^- =?; IT=10#; ... *
⁹⁸ Y ⁿ	-71971	25	496.19	0.15		7.6 μ s	0.4	(2 ⁻)	03	IT=100
⁹⁸ Y ^p	-72296	25	170.74	0.6		620 ns	80	(2) ⁻	03	IT=100
⁹⁸ Zr	-81287	20				30.7 s	0.4	0 ⁺	03	β^- =100
⁹⁸ Nb	-83529	6				2.86 s	0.06	1 ⁺	03	β^- =100
⁹⁸ Nb ^m	-83445	7	84	4		51.3 m	0.4	(5 ⁺)	03	β^- \approx 100; IT=0.1#
⁹⁸ Mo	-88111.7	1.9				STABLE (>100 Ty)		0 ⁺	03	52Fr23 T IS=24.13 31; 2 β^- ? *
⁹⁸ Tc	-86428	4				4.2 My	0.3	(6) ⁺	03	β^- =100; β^+ =0
⁹⁸ Tc ^m	-86337	4	90.76	0.16		14.7 μ s	3	(2) ⁻	03	IT=100
⁹⁸ Ru	-88224	6				STABLE		0 ⁺	03	IS=1.87 3
⁹⁸ Rh	-83175	12			*	8.72 m	0.12	(2) ⁺	03	β^+ =100
⁹⁸ Rh ^m	-83120#	50#	60#	50#	*	3.6 m	0.2	(5 ⁺)	03	IT=89 5; β^+ =11 5
⁹⁸ Pd	-81300	21				17.7 m	0.3	0 ⁺	03	β^+ =100
⁹⁸ Ag	-73060	70				47.5 s	0.3	(5 ⁺)	03	ABBW03 J β^+ =100; β^+ -p=0.0012 5 *
⁹⁸ Ag ^m	-72890	70	167.83	0.15		220 ns	20	(3 ⁺)	03	98Gr.B ETD IT=100
⁹⁸ Cd	-67630	80				9.2 s	0.3	0 ⁺	03	β^+ =100; β^+ -p<0.025
⁹⁸ Cd ^m	-65200	80	2427.5	0.6		190 ns	20	8 ⁺ #	98 98Gr.B TD	IT=100 *
⁹⁸ In	-53900#	200#			*	45 ms	23	0 ⁺ #	03	01Ki13 TD β^+ =100; β^+ ?
⁹⁸ In ^m	-53900#	540#	0#	500#	*	1.7 s	0.8		03	01Ki13 TD β^+ =100; β^+ ?
* ⁹⁸ Rb	D : ... ; β^- -2n=0.051 7 **									
* ⁹⁸ Y ^m	D : ... ; β^- -n=3.4 10 **									
* ⁹⁸ Y ^m	J : 94St31=(5 ⁺) 95Ha.B=(4-) **									
* ⁹⁸ Mo	T : limit given here is for 0v-2 β^- decay (theoretically faster, see text) **									
* ⁹⁸ Ag	J : (5 ⁺) with experimental basis preferred to (6 ⁺), see discussion in ENSDF **									
* ⁹⁸ Cd ^m	T : supersedes 97Gr02=200(+300-170); other 97Go18=480(160) outweighed **									
⁹⁹ Kr	-39500#	600#				40 ms	11	3/2 ⁺ #	97 03Be05 TD	β^- =100; β^- -n=11 7
⁹⁹ Rb	-50880	130				50.3 ms	0.7	(5/2 ⁺)	98	β^- =100; β^- -n=15.9 20
⁹⁹ Sr	-62190	80				269 ms	1	3/2 ⁺	95	β^- =100; β^- -n=0.100 19
⁹⁹ Y	-70201	24				1.470 s	0.007	(5/2 ⁺)	95	β^- =100; β^- -n=1.9 4
⁹⁹ Y ^m	-68059	24	2141.65	0.19		8.6 μ s	0.8	(17/2 ⁺)	95	IT=100
⁹⁹ Zr	-77768	20				2.1 s	0.1	1/2 ⁺	95 02Ca37 J	β^- =100
⁹⁹ Nb	-82327	13				15.0 s	0.2	9/2 ⁺	95	β^- =100
⁹⁹ Nb ^m	-81962	13	365.29	0.14		2.6 m	0.2	1/2 ⁻	95	β^- =?; IT<3.8
⁹⁹ Mo	-85965.8	1.9				65.94 h	0.01	1/2 ⁺	95	β^- =100
⁹⁹ Mo ^m	-85868.0	1.9	97.785	0.003		15.5 μ s	0.2	5/2 ⁺	95	IT=100
⁹⁹ Tc	-87323.1	2.0				211.1 ky	1.2	9/2 ⁺	01	β^- =100
⁹⁹ Tc ^m	-87180.4	2.0	142.6832	0.0011		6.015 h	0.009	1/2 ⁻	01	IT \approx 100; β^- =0.0037 6
⁹⁹ Ru	-87617.0	2.0				STABLE		5/2 ⁺	95	IS=12.76 14
⁹⁹ Rh	-85574	7				16.1 d	0.2	(1/2 ⁻)	95	β^+ =100
⁹⁹ Rh ^m	-85510	7	64.3	0.4		4.7 h	0.1	9/2 ⁺	95	β^+ \approx 100; IT<0.16
⁹⁹ Pd	-82188	15				21.4 m	0.2	(5/2 ⁺)	95	β^+ =100
⁹⁹ Ag	-76760	150				124 s	3	(9/2 ⁺)	95	β^+ =100
⁹⁹ Ag ^m	-76250	150	506.1	0.4		10.5 s	0.5	(1/2 ⁻)	95	IT=100
⁹⁹ Cd	-69850#	210#				16 s	3	(5/2 ⁺)	95	β^+ =100; β^+ -p=0.21 8;... *
⁹⁹ In	-61270#	400#				3.1 s	0.8	9/2 ⁺ #	97 01Ki13 TD	β^+ =100; β^+ ?
⁹⁹ In ^m	-60870#	430#	400#	150#		1#	s	1/2 ⁻ #		β^+ ?; IT ?
⁹⁹ Sn	-47200#	600#				5#	ms	9/2 ⁺ #		β^+ ?; β^+ p ? *
⁹⁹ Sn ^m	-46800#	610#	400#	100#				1/2 ⁻ #		
* ⁹⁹ Cd	D : ... ; β^+ α <1e-4 **									
* ⁹⁹ Sn	I : the 3 events reported in 95Ry03 are not trusted by NUBASE **									

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁰⁰ Kr	-36200#	500#		10# ms (>300 ns)	0 ⁺	97	97Be70 I	β^- ?	
¹⁰⁰ Rb	-46700#	300#		51 ms	8	(3 ⁺)	97 93Ru01 D	β^- =100; β^- -n=5.6 12;... *	
¹⁰⁰ Sr	-60220	130		202 ms	3	0 ⁺	97	β^- =100; β^- -n=0.78 13	
¹⁰⁰ Y	-67290	80		735 ms	7	1 ⁻ , 2 ⁻	97	β^- =100; β^- -n=0.92 8	
¹⁰⁰ Y ^m	-67090#	220#	200#	* 940 ms	30	(3, 4, 5) ⁺ #	97	β^- =100	
¹⁰⁰ Zr	-76600	40		7.1 s	0.4	0 ⁺	97	β^- =100	
¹⁰⁰ Nb	-79939	26		1.5 s	0.2	1 ⁺	97	β^- =100	
¹⁰⁰ Nb ^m	-79471	28	470 40	BD 2.99 s	0.11	(4 ⁺ , 5 ⁺)	97	β^- =100	
¹⁰⁰ Mo	-86184	6		8.5 Ey	0.5	0 ⁺	97 97A102 T	IS=9.63 23; 2 β^- =100 *	
¹⁰⁰ Tc	-86016.2	2.2		15.8 s	0.1	1 ⁺	97	β^- ≈100; ϵ =0.0018 9	
¹⁰⁰ Tc ^m	-85815.5	2.2	200.67 0.04	8.32 μ s	0.14	(4) ⁺	97		
¹⁰⁰ Tc ⁿ	-85772.2	2.2	243.96 0.04	3.2 μ s	0.2	(6) ⁺	97		
¹⁰⁰ Ru	-89219.0	2.0		STABLE		0 ⁺	97	IS=12.60 7	
¹⁰⁰ Rh	-85584	18		20.8 h	0.1	1 ⁻	97	β^+ =100	
¹⁰⁰ Rh ^m	-85476	18	107.6 0.2	4.6 m	0.2	(5 ⁺)	97	IT≈98.3; β^+ ≈1.7	
¹⁰⁰ Pd	-85226	11		3.63 d	0.09	0 ⁺	97	ϵ =100	
¹⁰⁰ Ag	-78150	80		2.01 m	0.09	(5) ⁺	97	β^+ =100	
¹⁰⁰ Ag ^m	-78130	80	15.52 0.16	2.24 m	0.13	(2) ⁺	97	β^+ =?; IT ?	
¹⁰⁰ Cd	-74250	100		49.1 s	0.5	0 ⁺	97	β^+ =100	
¹⁰⁰ Cd ^m	-71700	100	2548.6 0.5	60 ns	3	(8) ⁺	97	IT=100	
¹⁰⁰ In	-64170	250		5.9 s	0.2	(6, 7) ⁺	97 02PI03 TJ	β^+ =100; β^+ p>3.9 *	
¹⁰⁰ Sn	-56780	710		1.1 s	0.4	0 ⁺	97	β^+ =100; β^+ p<17 *	
* ¹⁰⁰ Rb	D : ... ; β^- 2n=0.15 5							**	
* ¹⁰⁰ Rb	T : ENSDF average of 3 values. See also 53(2) of 85Pf.A				J : from 95Pf04			**	
* ¹⁰⁰ Rb	D : β^- 2n intensity is derived from β^- 2n/ β^- n=0.027(7), in 81Jo.A							**	
* ¹⁰⁰ Mo	T : average 97A102=7.6(+2.2-1.4) 97De40=6.82(+0.38-0.53 statistics + 0.68 systematics)							**	
* ¹⁰⁰ Mo	T : 95Da37=9.5(0.9) 91Ej02=11.5(+3-2) and 91El04=11.6(+3.4-0.8)							**	
* ¹⁰⁰ In	T : others: 95Sz01=6.1(0.9) 95Fa.A=6.3(+1.0-9); 95Fa.A supersedes 95Sc33=7.8(.8)							**	
* ¹⁰⁰ Sn	D : from 97Su06 β^+ p/ β^+ <20%							**	
¹⁰¹ Rb	-43600	170		32 ms	4	3/2 ⁺ #	98	β^- =100; β^- -n=28 4	
¹⁰¹ Sr	-55410	120		118 ms	3	(5/2 ⁻)	98	β^- =100; β^- -n=2.37 14	
¹⁰¹ Y	-64910	100		426 ms	20	(5/2 ⁺)	98 96Me09 T	β^- =100; β^- -n=1.94 18 *	
¹⁰¹ Zr	-73460	30		2.3 s	0.1	3/2 ⁺	98 02Ca37 J	β^- =100	
¹⁰¹ Nb	-78942	19		7.1 s	0.3	(5/2#) ⁺	98	β^- =100	
¹⁰¹ Mo	-83511	6		14.61 m	0.03	1/2 ⁺	98	β^- =100	
¹⁰¹ Tc	-86336	24		14.22 m	0.01	9/2 ⁺	98	β^- =100	
¹⁰¹ Tc ^m	-86128	24	207.53 0.04	636 μ s	8	1/2 ⁻	98	IT=100	
¹⁰¹ Ru	-87949.7	2.0		STABLE		5/2 ⁺	98	IS=17.06 2	
¹⁰¹ Ru ^m	-87422.2	2.0	527.5 0.4	17.5 μ s	0.4	11/2 ⁻	98	IT=100	
¹⁰¹ Rh	-87408	17		3.3 y	0.3	1/2 ⁻	98	ϵ =100	
¹⁰¹ Rh ^m	-87251	17	157.32 0.04	4.34 d	0.01	9/2 ⁺	98	ϵ =93.6 2; IT=6.4 2	
¹⁰¹ Pd	-85428	18		8.47 h	0.06	5/2 ⁺	98	β^+ =100	
¹⁰¹ Ag	-81220	100		11.1 m	0.3	9/2 ⁺	98	β^+ =100	
¹⁰¹ Ag ^m	-80950	100	274.1 0.3	3.10 s	0.10	1/2 ⁻	98	IT=100	
¹⁰¹ Cd	-75750	150		1.36 m	0.05	(5/2 ⁺)	98	β^+ =100	
¹⁰¹ In	-68610#	300#		15.1 s	1.1	9/2 ⁺ #	98	β^+ =100; β^+ p=?	
¹⁰¹ In ^m	-68060#	320#	550# 100#	10# s		1/2 ⁻ #		β^+ =95#; IT=5#	
¹⁰¹ Sn	-59560#	300#		3 s	1	5/2 ⁺ #	98	β^+ =100; β^+ p=?	
* ¹⁰¹ Y	T : average 96Me09=400(20) 86Wa17=440(20) and 83Wo10=500(50)							**	
* ¹⁰¹ Y	T : 93Ru01=279(9) at variance, not used							**	

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
^{102}Rb	-38310#	500#			37	ms	5		98	$\beta^- = 100; \beta^- n = 18.8$		
^{102}Sr	-53080	110			69	ms	6	0^+	98	$\beta^- = 100; \beta^- n = 5.5, 15$		
^{102}Y	-61890	90			* &	300	ms	10	low	98	$\beta^- = 100; \beta^- n = 4.9, 12$	
$^{102}\text{Y}^m$	-61690#	220#	200#	200#	* &	360	ms	40	high	98	$\beta^- = 100; \beta^- n = 4.9, 12$	
^{102}Zr	-71740	50			2.9	s	0.2	0^+	98	$\beta^- = 100$		
^{102}Nb	-76350	40			1.3	s	0.2	1^+	98	$\beta^- = 100$		
$^{102}\text{Nb}^m$	-76220	50	130	50	BD	4.3	s	0.4	high	98	$\beta^- = 100$	
^{102}Mo	-83557	21			11.3	m	0.2	0^+	01	$\beta^- = 100$		
^{102}Tc	-84566	9			*	5.28	s	0.15	1^+	98	$\beta^- = 100$	
$^{102}\text{Tc}^m$	-84546	13	20	10	*	4.35	m	0.07	(4,5)	98	$\beta^- = 98.2; IT = 2.2$	
^{102}Ru	-89098.0	2.0				STABLE			0^+	98	IS=31.55, 14	
^{102}Rh	-86775	5				207.0	d	1.5	($1^-, 2^-$)	98	$\beta^+ = 78.5; \beta^- = 22.5$ *	
$^{102}\text{Rh}^m$	-86634	5	140.75	0.08		3.742	y	0.010	6^+	98	$\beta^+ \approx 100; IT = 0.233, 24$ *	
^{102}Pd	-87925.1	3.0				STABLE			0^+	98	IS=1.02, 1; $2\beta^+ ?$	
^{102}Ag	-82265	28				12.9	m	0.3	5^+	98	$\beta^+ = 100$	
$^{102}\text{Ag}^m$	-82256	28	9.3	0.4		7.7	m	0.5	2^+	98	$\beta^+ = 51.5; IT = 49.5$	
^{102}Cd	-79678	29				5.5	m	0.5	0^+	98	$\beta^+ = 100$	
^{102}In	-70710	110				23.3	s	0.1	(6^+)	98	$\beta^+ = 100; \beta^+ p = 0.0093, 13$ *	
^{102}Sn	-64930	130				4.6	s	1.4	0^+	98	$\beta^+ = 100; \beta^+ p ?$ *	
$^{102}\text{Sn}^m$	-62910	130	2017	2		720	ns	220	(6^+)	98	IT=100	
* ^{102}Rh	T : average 98Sh21=207.3(1.7) 61Hi06=206(3)											
* $^{102}\text{Rh}^m$	J : from 99Gi14											
* ^{102}In	J : from 95Sz01											
* ^{102}Sn	T : 95Fa.A, supersedes 95Sc28=4.5(0.7), preliminary from same group											
* $^{102}\text{Sn}^m$	T : average 98Li50=620(+430-190) 97Gr02=300(+500-200) 96Li50=1000(500)											
^{103}Sr	-47550#	500#			50#	ms (>300 ns)			01	97Be70	I	$\beta^- ?$
^{103}Y	-58940#	300#			224	ms	19	$5/2^+ \#$	01	96Me09	T	$\beta^- = 100; \beta^- n = 8.3$ *
^{103}Zr	-68370	110			1.3	s	0.1	($5/2^-$)	01			$\beta^- = 100$
^{103}Nb	-75320	70			1.5	s	0.2	($5/2^+$)	01			$\beta^- = 100$
^{103}Mo	-80850	60			67.5	s	1.5	($3/2^+$)	01			$\beta^- = 100$
^{103}Tc	-84597	10			54.2	s	0.8	$5/2^+$	01			$\beta^- = 100$
^{103}Ru	-87258.8	2.0			39.26	d	0.02	$3/2^+$	01			$\beta^- = 100$
$^{103}\text{Ru}^m$	-87020.6	2.1	238.2	0.7	1.69	ms	0.07	$11/2^-$	01			IT=100
^{103}Rh	-88022.2	2.8				STABLE			$1/2^-$	01		IS=100.
$^{103}\text{Rh}^m$	-87982.4	2.8	39.756	0.006	56.114	m	0.009	$7/2^+$	01			IT=100
^{103}Pd	-87479.1	2.9			16.991	d	0.019	$5/2^+$	01			$\epsilon = 100$
$^{103}\text{Pd}^m$	-86694.3	2.9	784.79	0.10	25	ns	2	$11/2^-$	01			IT=100
^{103}Ag	-84791	17			65.7	m	0.7	$7/2^+$	01			$\beta^+ = 100$
$^{103}\text{Ag}^m$	-84657	17	134.45	0.04	5.7	s	0.3	$1/2^-$	01			IT=100
^{103}Cd	-80649	15			7.3	m	0.1	$5/2^+$	01			$\beta^+ = 100$
^{103}In	-74599	25			60	s	1	$9/2^+ \#$	01	97Sz04	T	$\beta^+ = 100$
$^{103}\text{In}^m$	-73967	25	631.7	0.1	34	s	2	$1/2^- \#$	01	97Sz04	ETD	$\beta^+ = 67; IT = 33$
^{103}Sn	-66970#	300#			7	s	3	$5/2^+ \#$	01			$\beta^+ = 100; \beta^+ p = ?$
^{103}Sb	-56180#	300#			100#	ms (>1.5 μs)		$5/2^+ \#$	01	95Ry03	I	$\beta^+ ?$
* ^{103}Y	T : average 96Me09=230(20) 96Lh04=190(50)											

Nuclide	Mass excess (keV)	Excitation energy(keV)				Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁰⁴ Sr	-44400# 700#					30# ms (>300 ns)	0 ⁺	00	97Be70 I	β^- ?
¹⁰⁴ Y	-54910# 400#					180 ms	60	00	99Wa09 D	β^- =100; β^- n=?
¹⁰⁴ Zr	-66340# 400#					1.2 s	0.3	0 ⁺	00	β^- =100
¹⁰⁴ Nb	-72220 100					4.9 s	0.3	(1 ⁺)	00	β^- =100; β^- n=0.06 3 *
¹⁰⁴ Nb ^m	-72010 100	220	120		BD *	940 ms	40	high	00	β^- =100; β^- n=0.05 3
¹⁰⁴ Mo	-80330 50					60 s	2	0 ⁺	00	β^- =100
¹⁰⁴ Tc	-82490 50					18.3 m	0.3	3 ⁺ #	00	β^- =100
¹⁰⁴ Tc ^m	-82420 50	69.7	0.2			3.5 μ s	0.3	2 ⁽⁺⁾	00	IT=100
¹⁰⁴ Ru	-88089 3					STABLE		0 ⁺	00	IS=18.62 27; 2 β^- ?
¹⁰⁴ Rh	-86949.8 2.8					42.3 s	0.4	1 ⁺	00	β^- ≈100; β^+ =0.45 10
¹⁰⁴ Rh ^m	-86820.8 2.8	128.967	0.004			4.34 m	0.03	5 ⁺	00	IT≈100; β^- =0.13 1
¹⁰⁴ Pd	-89390 4					STABLE		0 ⁺	00	IS=11.14 8
¹⁰⁴ Ag	-85111 6					69.2 m	1.0	5 ⁺	00	β^+ =100
¹⁰⁴ Ag ^m	-85104 6	6.9	0.4			33.5 m	2.0	2 ⁺	00	β^+ ≈100; IT<0.07
¹⁰⁴ Cd	-83975 9					57.7 m	1.0	0 ⁺	00	β^+ =100
¹⁰⁴ In	-76110 80					1.80 m	0.03	5, 6 ⁽⁺⁾	00	β^+ =100
¹⁰⁴ In ^m	-76020 80	93.48	0.10			15.7 s	0.5	(3 ⁺)	00	IT=80; β^+ =20
¹⁰⁴ Sn	-71590 100					20.8 s	0.5	0 ⁺	00	β^+ =100
¹⁰⁴ Sb	-59180# 360#					470 ms	130		00	95Fa.A D β^+ ?; β^+ p<7; p<7; α ? *
* ¹⁰⁴ Nb	D : β^- n=0.71% of 83En03, at variance, not used **									
* ¹⁰⁴ Sb	D : 95Fa.A supersedes 95Sc28 p<1 **									
¹⁰⁵ Sr	-38580# 700#					20# ms (>300 ns)			97 97Be70 I	β^- ?
¹⁰⁵ Y	-51350# 500#					60# ms (>300 ns)	5/2 ⁺ #	97	94Be24 I	β^- ?
¹⁰⁵ Zr	-62360# 400#					600 ms	100	97		β^- =100; β^- n ?
¹⁰⁵ Nb	-70850 100					2.95 s	0.06	5/2 ⁺ #	94	96Me09 D β^- =100; β^- n=1.7 9
¹⁰⁵ Mo	-77340 70					35.6 s	1.6	(5/2 ⁻)	93	β^- =100
¹⁰⁵ Tc	-82290 60					7.6 m	0.1	(3/2 ⁻)	93	β^- =100
¹⁰⁵ Ru	-85928 3					4.44 h	0.02	3/2 ⁺	93	β^- =100
¹⁰⁵ Rh	-87846 4					35.36 h	0.06	7/2 ⁺	93	β^- =100
¹⁰⁵ Rh ^m	-87716 4	129.781	0.004			45 s		1/2 ⁻	93	IT=100 *
¹⁰⁵ Pd	-88413 4					STABLE		5/2 ⁺	93	IS=22.33 8
¹⁰⁵ Ag	-87068 11					41.29 d	0.07	1/2 ⁻	93	β^+ =100
¹⁰⁵ Ag ^m	-87043 11	25.465	0.012			7.23 m	0.16	7/2 ⁺	93	IT≈100; β^+ =0.34 7
¹⁰⁵ Cd	-84330 12					55.5 m	0.4	5/2 ⁺	93	β^+ =100
¹⁰⁵ In	-79481 17					5.07 m	0.07	9/2 ⁺	93	87Eb02 J β^+ =100
¹⁰⁵ In ^m	-78807 17	674.1	0.3			48 s	6	(1/2 ⁻)	93	IT=?; β^+ =25#
¹⁰⁵ Sn	-73260 80					34 s	1	(5/2 ⁺)	93	95Pf01 T β^+ =100; β^+ p=? *
¹⁰⁵ Sb	-63820 100					1.12 s	0.16	(5/2 ⁺)	02	β^+ ?; p≈1; β^+ p ?
¹⁰⁵ Te	-52500# 500#					1# μ s		5/2 ⁺ #		α ?; β^+ ? *
* ¹⁰⁵ Rh ^m	T : no error given; other value: 30 s (see ENSDF: remeasurement recommended) **									
* ¹⁰⁵ Sn	J : from 85De08 **									
* ¹⁰⁵ Te	I : the 3 events reported in 95Ry03 are not trusted by NUBASE **									
¹⁰⁶ Y	-46770# 700#					50# ms (>300 ns)			97 97Be70 I	β^- ?
¹⁰⁶ Zr	-59700# 500#					200# ms (>300 ns)	0 ⁺	97	94Be24 I	β^- ? *
¹⁰⁶ Nb	-67100# 200#					920 ms	40	2 ⁺ #	94	96Me09 TD β^- =100; β^- n=4.5 3 *
¹⁰⁶ Mo	-76255 18					8.73 s	0.12	0 ⁺	94	95Jo02 T β^- =100
¹⁰⁶ Tc	-79775 13					35.6 s	0.6	(1, 2)	94	β^- =100
¹⁰⁶ Ru	-86322 8					373.59 d	0.15	0 ⁺	94	β^- =100
¹⁰⁶ Rh	-86361 8					29.80 s	0.08	1 ⁺	94	β^- =100
¹⁰⁶ Rh ^m	-86225 11	136	12		BD	131 m	2	(6 ⁺)	94	β^- =100
¹⁰⁶ Pd	-89902 4					STABLE		0 ⁺	94	IS=27.33 3
¹⁰⁶ Ag	-86937 5					23.96 m	0.04	1 ⁺	94	β^+ ?; β^- ≈0.5
¹⁰⁶ Ag ^m	-86847 5	89.66	0.07			8.28 d	0.02	6 ⁺	94	β^+ =100; IT≤4.2e-6

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
¹⁰⁶ Cd	-87132	6	STABLE	(>410 Ey)	0 ⁺	94 02Tr04 T	IS=1.25 6; 2 β^+ ?	
¹⁰⁶ In	-80606	12	6.2 m	0.1	7 ⁺	94	β^+ =100	
¹⁰⁶ In ^m	-80577	12	28.6	0.3	5.2 m	0.1 (3 ⁺)	94 β^+ =100	
¹⁰⁶ Sn	-77430	50	1.92 m	0.08	0 ⁺	94	β^+ =100	
¹⁰⁶ Sb	-66330#	310#	600 ms	200	(4 ⁺)	97 94Se01 J	β^+ =100 *	
¹⁰⁶ Sb ^m	-65330#	590#	1000#	500#	220 ns	20 98Li50 T	IT=100	
¹⁰⁶ Te	-58210	130	70 μ s	20	0 ⁺	94 94Pa11 T	α =100 *	
* ¹⁰⁶ Zr	I : and $T > 240$ ns in 97So07							**
* ¹⁰⁶ Nb	T : average 96Me09=900(20) 83Sh06=1020(50)							**
* ¹⁰⁶ Sb	T : from 95Le.C, Fig. 4, preliminary							**
* ¹⁰⁶ Te	T : average 94Pa11=60(+40-20) 81Sc17=60(+30-10)							**
¹⁰⁷ Y	-42720#	500#	30# ms	(>300 ns)	5/2 ⁺ #	00 97Be70 I	β^- ?	
¹⁰⁷ Zr	-55190#	300#	150# ms	(>300 ns)		00 94Be24 I	β^- ? *	
¹⁰⁷ Nb	-64920#	400#	300 ms	9	5/2 ⁺ #	00 96Me09 TD	β^- =100; β^- n=6.0 15 *	
¹⁰⁷ Mo	-72940	160	3.5 s	0.5	(7/2 ⁻)	00	β^- =100	
¹⁰⁷ Mo ^m	-72870	160	66.3	0.2	470 ns	30 (5/2 ⁻)	00 IT=100	
¹⁰⁷ Tc	-79100	150	21.2 s	0.2	(3/2 ⁻)	00	β^- =100	
¹⁰⁷ Tc ^m	-79030	150	65.7	1.0	184 ns	3 (5/2 ⁻)	00 IT=100	
¹⁰⁷ Ru	-83920	120	3.75 m	0.05	(5/2 ⁺)	00	β^- =100	
¹⁰⁷ Rh	-86863	12	21.7 m	0.4	7/2 ⁺	00	β^- =100	
¹⁰⁷ Rh ^m	-86595	12	268.36	0.04	> 10 μ s	1/2 ⁻	00 IT=100	
¹⁰⁷ Pd	-88368	4	6.5 My	0.3	5/2 ⁺	00	β^- =100	
¹⁰⁷ Pd ^m	-88153	4	214.6	0.3	21.3 s	0.5 11/2 ⁻	00 IT=100	
¹⁰⁷ Ag	-88402	4	STABLE		1/2 ⁻	00	IS=51.839 8	
¹⁰⁷ Ag ^m	-88309	4	93.125	0.019	44.3 s	0.2 7/2 ⁺	00 IT=100	
¹⁰⁷ Cd	-86985	6	6.50 h	0.02	5/2 ⁺	00	β^+ =100	
¹⁰⁷ In	-83560	11	32.4 m	0.3	9/2 ⁺	00	β^+ =100	
¹⁰⁷ In ^m	-82882	11	678.5	0.3	50.4 s	0.6 1/2 ⁻	00 IT=100	
¹⁰⁷ Sn	-78580	80	2.90 m	0.05	(5/2 ⁺)	00	β^+ =100	
¹⁰⁷ Sb	-70650#	300#	4.6 s	0.8	5/2 ⁺ #	00	β^+ =100	
¹⁰⁷ Te	-60540#	300#	3.1 ms	0.1	5/2 ⁺ #	00	α =70 30; β^+ =30 30	
* ¹⁰⁷ Zr	I : and $T > 240$ ns in 97So07							**
* ¹⁰⁷ Nb	T : average 96Me09=300(30) 91Hi02=300(10)							**
¹⁰⁸ Y	-37740#	800#	20# ms	(>300 ns)		00 95Cz.A I	β^- ?; β^- n ?	
¹⁰⁸ Zr	-52200#	600#	80# ms	(>300 ns)	0 ⁺	00 97Be70 I	β^- ?; β^- n ?	
¹⁰⁸ Nb	-60700#	300#	193 ms	17	(2 ⁺)	00	β^- =100; β^- n=6.2 5	
¹⁰⁸ Mo	-71300#	200#	1.09 s	0.02	0 ⁺	00	β^- =100	
¹⁰⁸ Tc	-75950	130	5.17 s	0.07	(2 ⁺)	00	β^- =100	
¹⁰⁸ Ru	-83670	120	4.55 m	0.05	0 ⁺	00	β^- =100	
¹⁰⁸ Rh	-85020	110	16.8 s	0.5	1 ⁺	00	β^- =100	
¹⁰⁸ Rh ^m	-85080	40	-60	110	BD *	6.0 m 0.3 (5) ^(+#)	00 β^- =100	
¹⁰⁸ Pd	-89524	3	STABLE		0 ⁺	00	IS=26.46 9	
¹⁰⁸ Ag	-87602	4	2.37 m	0.01	1 ⁺	00	β^- =97.15 20; β^+ =2.85 20	
¹⁰⁸ Ag ^m	-87493	4	109.440	0.007	418 y	21 6 ⁺	00 β^+ =91.3 9; IT=8.7 9 *	
¹⁰⁸ Cd	-89252	6	STABLE	(>410 Py)	0 ⁺	02 95Ge14 T	IS=0.89 3; 2 β^+ ?	
¹⁰⁸ In	-84116	10	58.0 m	1.2	7 ⁺	00	β^+ =100	
¹⁰⁸ In ^m	-84086	10	29.75	0.05	39.6 m	0.7 2 ⁺	00 β^+ =100	
¹⁰⁸ Sn	-82041	20	10.30 m	0.08	0 ⁺	00	β^+ =100	
¹⁰⁸ Sb	-72510#	210#	7.4 s	0.3	(4 ⁺)	00	β^+ =100; β^+ p ?	
¹⁰⁸ Te	-65720	100	2.1 s	0.1	0 ⁺	00 85Ti02 D	β^+ =51 4; α =49 4; ... *	
¹⁰⁸ I	-52650#	360#	36 ms	6	1 ⁺ #	00 94Pa12 D	α =?; β^+ =9#; p<1 *	
* ¹⁰⁸ Ag ^m	T : discrepant results: 418(7) 310(130) 127(21), see ENSDF							**
* ¹⁰⁸ Te	D : ... ; β^+ p=2.4 10; β^+ α <0.065							**
* ¹⁰⁸ I	D : β^+ =9%# estimated by 94Pa12 using theoretical β^+ half-life \approx 400 ms							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)			
^{109}Zr	-47280#	500#	60# ms (>300 ns)		99	97Be70 I	β^- ?			
^{109}Nb	-58100#	500#	190 ms	30	5/2 ⁺ #	99	β^- =100; β^- -n=31 5			
^{109}Mo	-67250#	300#	530 ms	60	7/2 ⁻ #	99	β^- =100			
^{109}Tc	-74540	100	860 ms	40	3/2 ⁻ #	99	β^- =100; β^- -n=0.08 2			
^{109}Ru	-80850	70	34.5 s	1.0	5/2 ⁺ #	99	β^- =100			
^{109}Rh	-85011	12	80 s	2	7/2 ⁺	99	β^- =100			
^{109}Pd	-87607	3	13.7012 h	0.0024	5/2 ⁺	99	β^- =100			
$^{109}\text{Pd}^m$	-87418	3	4.696 m	0.003	11/2 ⁻	99	IT=100			
^{109}Ag	-88722.7	2.9	STABLE		1/2 ⁻	99	IS=48.161 8			
$^{109}\text{Ag}^m$	-88634.7	2.9	39.6 s	0.2	7/2 ⁺	99	IT=100			
^{109}Cd	-88508	4	461.4 d	1.2	5/2 ⁺	99	ϵ =100			
$^{109}\text{Cd}^m$	-88448	4	59.6	0.4	12 μs	2	1/2 ⁺	99	IT=100	
$^{109}\text{Cd}^n$	-88045	4	463.0	0.5	10.9 μs	0.5	11/2 ⁻	99	IT=100	
^{109}In	-86489	6	4.2 h	0.1	9/2 ⁺	99	β^+ =100			
$^{109}\text{In}^m$	-85839	6	650.1	0.3	1.34 m	0.07	1/2 ⁻	99	IT=100	
$^{109}\text{In}^n$	-84387	6	2101.8	0.2	209 ms	6	(19/2 ⁺)	99	IT=100	
^{109}Sn	-82639	10	18.0 m	0.2	5/2 ⁽⁺⁾	99	β^+ =100			
^{109}Sb	-76259	19	17.0 s	0.7	5/2 ⁺ #	99	β^+ =100			
^{109}Te	-67610	60	4.6 s	0.3	(5/2 ⁺)	99	β^+ =?; α =3.9 13; ... *			
^{109}I	-57610	100	103 μs	5	(5/2 ⁺)	02	87Gi02 J	p=100		
* ^{109}Te	D : ... ; β^+ p=9.4 31; β^+ α <0.005							**		
^{110}Zr	-43900#	800#	30# ms (>300 ns)		0 ⁺	00	97Be70 I	β^- ?		
^{110}Nb	-53620#	500#	170 ms	20	2 ⁺ #	00		β^- =100; β^- -n=40 8		
^{110}Mo	-65460#	400#	300 ms	40	0 ⁺	00		β^- =100; β^- -n ?		
^{110}Tc	-70960	80	920 ms	30	(2 ⁺)	00	96Me09 D	β^- =100; β^- -n=0.04 2		
^{110}Ru	-79980	50	11.6 s	0.6	0 ⁺	00		β^- =100		
^{110}Rh	-82780	50	28.5 s	1.5	(> 3) ⁽⁺⁾	00		β^- =100		
$^{110}\text{Rh}^m$	-82839	22	3.2 s	0.2	1 ⁺	00		β^- =100		
^{110}Pd	-88349	11	STABLE		(>600 Py)	0 ⁺	52Wi26 T	IS=11.72 9; 2 β^- ?		
^{110}Ag	-87460.6	2.9	24.6 s	0.2	1 ⁺	00		β^- \approx 100; ϵ =0.30 6		
$^{110}\text{Ag}^m$	-87343.0	2.9	117.59	0.05	249.950 d	0.024	6 ⁺	00	02Un02 T	β^- =98.64 6; IT=1.36 6
^{110}Cd	-90353.0	2.7	STABLE			0 ⁺	00	IS=12.49 18		
^{110}In	-86475	12	4.9 h	0.1	7 ⁺	00		β^+ =100		
$^{110}\text{In}^m$	-86413	12	62.1	0.5	69.1 m	0.5	2 ⁺	00	β^+ =100	
^{110}Sn	-85844	14	4.11 h	0.10	0 ⁺	00		ϵ =100		
^{110}Sb	-77540#	200#	23.0 s	0.4	(4 ⁺)	00	97La13 J	β^+ =100		
^{110}Te	-72280	50	18.6 s	0.8	0 ⁺	00		β^+ \approx 100; α =0.003#		
^{110}I	-60320#	310#	650 ms	20	1 ⁺ #	00		β^+ =83 4; α =17 4; ... *		
^{110}Xe	-51900	130	310 ms	190	0 ⁺	00	02Ma19 TD	α =64 35; β^+ ?		
* ^{110}I	D : ... ; β^+ p=11 3; β^+ α =1.1 3							**		

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
¹¹¹ Nb	-50630#	500#	80# ms (>300 ns)	5/2 ⁺ #	97	97Be70 I	β^- ?	
¹¹¹ Mo	-61100#	400#	200# ms (>300 ns)		97	94Be24 I	β^- ? *	
¹¹¹ Tc	-69220	110	290 ms	20	3/2 ⁻ #	96 96Me09 TD	β^- =100; β^- n=0.85 20 *	
¹¹¹ Ru	-76670	70	2.12 s	0.07	(5/2 ⁺)	96 98Lh02 J	β^- =100	
¹¹¹ Rh	-82357	30	11 s	1	(7/2 ⁺)	96	β^- =100	
¹¹¹ Pd	-86004	11	23.4 m	0.2	5/2 ⁺	96	β^- =100	
¹¹¹ Pd ^m	-85832	11	172.18 0.08	5.5 h	0.1	11/2 ⁻	IT=73 3; β^- =27 3	
¹¹¹ Ag	-88221	3	7.45 d	0.01	1/2 ⁻	96	β^- =100	
¹¹¹ Ag ^m	-88161	3	59.82 0.04	64.8 s	0.8	7/2 ⁺	IT=99.3 2; β^- =0.7 2	
¹¹¹ Cd	-89257.5	2.7	STABLE		1/2 ⁺	00	IS=12.80 12	
¹¹¹ Cd ^m	-88861.3	2.7	396.214 0.021	48.50 m	0.09	11/2 ⁻	IT=100	
¹¹¹ In	-88396	5	2.8047 d	0.0004	9/2 ⁺	00	ϵ =100	
¹¹¹ In ^m	-87859	5	536.95 0.06	7.7 m	0.2	1/2 ⁻	IT=100	
¹¹¹ Sn	-85945	7	35.3 m	0.6	7/2 ⁺	96	β^+ =100	
¹¹¹ Sn ^m	-85690	7	254.72 0.08	12.5 μ s	1.0	1/2 ⁺		
¹¹¹ Sb	-80888	28	75 s	1	(5/2 ⁺)	96	β^+ =100	
¹¹¹ Te	-73480	70	19.3 s	0.4	5/2 ⁺ #	97	β^+ =100; β^+ p=?	
¹¹¹ I	-64950#	300#	2.5 s	0.2	5/2 ⁺ #	96	β^+ \approx 100; α =0.088	
¹¹¹ I ^m	-63550#	300#	1398 1	21 ns	2	(11/2 ⁻)		
¹¹¹ Xe	-54400#	300#	740 ms	200	5/2 ⁺ #	96 94Pa11 D	β^+ ?; α =10 7	
¹¹¹ Xe ^m		non existent	RN	900 ms	200	90Tu.A T		
* ¹¹¹ Mo	I : and T>240 ns in 97So07							**
* ¹¹¹ Tc	T : supersedes 88Pe13=300(30) from same group							**
* ¹¹¹ Xe ^m	I : from assigning α decay to isomer in older version of ENSDF							**
¹¹² Nb	-45800#	700#	60# ms (>300 ns)	2 ⁺ #	97	97Be70 I	β^- ?	
¹¹² Mo	-58830#	600#	150# ms (>300 ns)	0 ⁺	97	94Be24 I	β^- ?	
¹¹² Tc	-66000	120	290 ms	20	2 ⁺ #	97 99Wa09 TD	β^- =100; β^- n=1.5 2	
¹¹² Ru	-75480	70	1.75 s	0.07	0 ⁺	97	β^- =100	
¹¹² Rh	-79740	50	3.4 s	0.4	1 ⁺	97 99Lh01 T	β^- =100 *	
¹¹² Rh ^m	-79410	60	330 70 BD	6.73 s	0.15	> 3	97 99Lh01 T	β^- =100 *
¹¹² Pd	-86336	18	21.03 h	0.05	0 ⁺	97	β^- =100	
¹¹² Ag	-86624	17	3.130 h	0.009	2 ⁽⁻⁾	97	β^- =100	
¹¹² Cd	-90580.5	2.7	STABLE		0 ⁺	97	IS=24.13 21	
¹¹² In	-87996	5	14.97 m	0.10	1 ⁺	97	β^+ =56 3; β^- =44 3	
¹¹² In ^m	-87839	5	156.59 0.05	20.56 m	0.06	4 ⁺	IT=100	
¹¹² In ⁿ	-87645	5	350.76 0.09	690 ns	50	7 ⁺	IT=100	
¹¹² In ^p	-87382	5	613.69 0.14	2.81 μ s	0.03	8 ⁻	97 87Eb02 J	IT=100
¹¹² Sn	-88661	4	STABLE		0 ⁺	97	IS=0.97 1; 2 β^+ ?	
¹¹² Sb	-81601	18	51.4 s	1.0	3 ⁺	97	β^+ =100	
¹¹² Te	-77300	170	2.0 m	0.2	0 ⁺	97	β^+ =100	
¹¹² I	-67100#	210#	3.42 s	0.11	1 ⁺ #	97 78Ro19 D	β^+ \approx 100; α =0.0012; ... *	
¹¹² Xe	-59970	100	2.7 s	0.8	0 ⁺	97 94Pa11 D	β^+ \approx 100; α =0.9 8 *	
¹¹² Cs	-46290#	300#	500 μ s	100	1 ⁺ #	02	p=100	
* ¹¹² Rh	T : supersedes 91Jo11=2.1(0.3) and 88Ay02=3.8(0.6) of same group							**
* ¹¹² Rh ^m	T : supersedes 88Ay02=6.8(0.2)							**
* ¹¹² I	D : ... ; β^+ p=0.88 10; β^+ α =0.104 12							**
* ¹¹² I	D : β^+ p and β^+ α are derived from β^+ p/ α =735(80) β^+ p/ β^+ α =8.5(2), in 85Ti02							**
* ¹¹² Xe	D : α intensity is estimated from 94Pa11=0.8(+1.1-0.5)% and 78Ro19=0.84%							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{113}Nb	-42200# 800#		30# ms (>300 ns)	$5/2^+$ #	98	97Be70	I $\beta^- ?$
^{113}Mo	-54140# 600#		100# ms (>300 ns)		98	94Be24	I $\beta^- ?$
^{113}Tc	-63720# 300#		170 ms 20	$3/2^-$ #	98	99Wa09	TD $\beta^- = 100; \beta^- n = 2.13$ *
^{113}Ru	-72200 70		800 ms 50	$(5/2^+)$	98	98Ku17	J $\beta^- = 100$
$^{113}\text{Ru}^m$	-72070 70	130 18	510 ms 30	$(11/2^-)$		98Ku17	ETJ IT=?; $\beta^- = ?$ *
^{113}Rh	-78680 50		2.80 s 0.12	$(7/2^+)$	98	93Pe11	J $\beta^- = 100$
^{113}Pd	-83690 40		93 s 5	$(5/2^+)$	98		$\beta^- = 100$
$^{113}\text{Pd}^m$	-83610 40	81.1 0.3	300 ms 100	$(9/2^-)$	98		IT=100
$^{113}\text{Pd}^n$		non existent	RN > 100 s		98	81Me17	I *
^{113}Ag	-87033 17		5.37 h 0.05	$1/2^-$	98		$\beta^- = 100$
$^{113}\text{Ag}^m$	-86990 17	43.50 0.10	68.7 s 1.6	$7/2^+$	98		IT=64.7; $\beta^- = 36.7$
^{113}Cd	-89049.3 2.7		7.7 Py 0.3	$1/2^+$	98		IS=12.22 12; $\beta^- = 100$
$^{113}\text{Cd}^m$	-88785.8 2.7	263.54 0.03	14.1 y 0.5	$11/2^-$	98		$\beta^- \approx 100; IT=0.14$
^{113}In	-89370 3		STABLE	$9/2^+$	99		IS=4.29 5
$^{113}\text{In}^m$	-88978 3	391.699 0.003	1.6579 h 0.0004	$1/2^-$	99		IT=100
^{113}Sn	-88333 4		115.09 d 0.03	$1/2^+$	00		$\beta^+ = 100$
$^{113}\text{Sn}^m$	-88256 4	77.386 0.019	21.4 m 0.4	$7/2^+$	00		IT=91.1 23; $\beta^+ = 8.9 23$
^{113}Sb	-84420 18		6.67 m 0.07	$5/2^+$	98		$\beta^+ = 100$
^{113}Te	-78347 28		1.7 m 0.2	$(7/2^+)$	98		$\beta^+ = 100$
^{113}I	-71130 50		6.6 s 0.2	$5/2^+$ #	98		$\beta^+ = 100; \alpha = 3.31e-7; \dots$ *
^{113}Xe	-62090 80		2.74 s 0.08	$5/2^+$ #	98	85Ti02	D $\beta^+ \approx 100; \alpha = 0.011 5; \dots$ *
^{113}Cs	-51700 100		16.7 μs 0.7	$5/2^+$ #	02		p=100; $\alpha=0$
* ^{113}Tc	T : 98Ku17=110(30) and 92Ay02=130(50) are from same authors **						
* $^{113}\text{Ru}^m$	E : above the 99 keV level and below 160 keV **						
* $^{113}\text{Pd}^n$	I : existence is not possible since discovery of $^{113}\text{Pd}^m$ by 93Pe11 **						
* ^{113}I	D : ... ; $\beta^+ \alpha ?$ **						
* ^{113}Xe	D : ... ; $\beta^+ p = 7.4; \beta^+ \alpha \approx 0.007 4$ **						
* ^{113}Xe	D : $\alpha = 0.0024-0.0204\%$ from estimated limit for the reduced width, see 85Ti02 **						
* ^{113}Xe	D : $\beta^+ p$ and $\beta^+ \alpha$ derived from $\beta^+ p/\alpha = 605(35)$ and $\beta^+ p/\beta^+ \alpha = 500-1500$ in 85Ti02 **						
^{114}Mo	-51310# 700#		80# ms (>300 ns)	0^+	03	97Be70	I $\beta^- ?$
^{114}Tc	-59730# 600#		150 ms 30	2^+ #	03		$\beta^- = 100; \beta^- n = ?$
^{114}Ru	-70530# 230#		530 ms 60	0^+	03		$\beta^- = 100; \beta^- n ?$
^{114}Rh	-75630 110		1.85 s 0.05	1^+	03		$\beta^- = 100; \beta^- n ?$
$^{114}\text{Rh}^m$	-75430# 190#	200# 150#	1.85 s 0.05	(4,5)	03		$\beta^- = 100$
^{114}Pd	-83497 24		2.42 m 0.06	0^+	03		$\beta^- = 100$
^{114}Ag	-84949 25		4.6 s 0.1	1^+	03		$\beta^- = 100$
$^{114}\text{Ag}^m$	-84750 25	199 5	1.50 ms 0.05	($< 7^+$)	03		IT=100
^{114}Cd	-90020.9 2.7		STABLE (>92 Py)	0^+	03	95Ge14	T IS=28.73 42; $2\beta^- ?$
^{114}In	-88572 3		71.9 s 0.1	1^+	03		$\beta^- = 99.50 15; \beta^+ = 0.50 15$
$^{114}\text{In}^m$	-88382 3	190.29 0.03	49.51 d 0.01	5^+	03		IT=96.75 24; $\beta^+ = 3.25 24$
$^{114}\text{In}^n$	-88070 3	501.94 0.03	43.1 ms 0.6	(8^-)	03		IT=100
$^{114}\text{In}^p$	-87930 3	641.72 0.03	4.3 μs 0.4	(7^+)	03		IT=100
^{114}Sn	-90561 3		STABLE	0^+	03		IS=0.66 1
$^{114}\text{Sn}^m$	-87474 3	3087.37 0.07	733 ns 14	7^-	03		IT=100
^{114}Sb	-84515 28		3.49 m 0.03	(3^+)	03		$\beta^+ = 100$
$^{114}\text{Sb}^m$	-84020 28	495.5 0.07	219 μs 12	(8^-)	03		IT=100
^{114}Te	-81889 28		15.2 m 0.7	0^+	03		$\beta^+ = 100$
^{114}I	-72800# 300#		2.1 s 0.2	1^+	03		$\beta^+ = 100; \beta^+ p ?$
$^{114}\text{I}^m$	-72530# 300#	265.9 0.5	6.2 s 0.5	(7)	03	ABBW96	D $\beta^+ = 91.2; IT=9.2$ *
^{114}Xe	-67086 11		10.0 s 0.4	0^+	03		$\beta^+ = 100$
^{114}Cs	-54540# 310#		570 ms 20	(1^+)	03		$\beta^+ \approx 100; \alpha = 0.018 6; \dots$ *
^{114}Ba	-45950 140		530 ms 230	0^+	03	02Ma19	D $\beta^+ \approx 100; \beta^+ p = 20.10; \dots$ *
* $^{114}\text{I}^m$	D : evaluated for NUBASE by J. Blachot, based on ^{114}I IT decay **						
* ^{114}Cs	D : ... ; $\beta^+ p = 8.7 13; \beta^+ \alpha = 0.19 3$ **						
* ^{114}Ba	D : ... ; $\alpha = 0.9 3; ^{12}\text{C} < 0.038$ **						
* ^{114}Ba	D : ^{12}C intensity is from 95Gu10 **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)					
^{115}Mo	-46310#	800#	60#	ms (>300 ns)		99	β^- ?; β^-n ?					
^{115}Tc	-57110#	700#	100#	ms (>300 ns)	3/2 ⁻ #	99	β^- ?; β^-n ?					
^{115}Ru	-66430	130	740	ms	80	99	β^- =100; β^-n ?					
^{115}Rh	-74210	80	990	ms	50	7/2 ⁺ #	β^- =100					
^{115}Pd	-80400	60	25	s	2	5/2 ⁺ #	β^- =100					
$^{115}\text{Pd}^m$	-80310	60	89.18	0.25	50	s	3	11/2 ⁻ #	99	β^- =92.0 20; IT=8.0 20	*	
^{115}Ag	-84990	30	20.0	m	0.5	1/2 ⁻	99	β^- =100				
$^{115}\text{Ag}^m$	-84950	30	41.16	0.10	18.0	s	0.7	7/2 ⁺	99	β^- =79.0 3; IT=21.0 3		
^{115}Cd	-88090.5	2.7	53.46	h	0.10	1/2 ⁺	99	β^- =100				
$^{115}\text{Cd}^m$	-87909.5	2.7	181.0	0.5	44.56	d	0.24	(11/2 ⁻)	99	β^- \approx 100; IT<0.003		
^{115}In	-89537	4	441	Ty	25	9/2 ⁺	99	IS=95.71 5; β^- =100				
$^{115}\text{In}^m$	-89201	4	336.244	0.017	4.486	h	0.004	1/2 ⁻	99	IT=95.0 7; β^- =5.0 7		
^{115}Sn	-90036.0	2.9	STABLE					1/2 ⁺	99	IS=0.34 1		
$^{115}\text{Sn}^m$	-89423.2	2.9	612.81	0.04	3.26	μ s	0.08	7/2 ⁺	99	IT=100		
$^{115}\text{Sn}^n$	-89322.4	2.9	713.64	0.12	159	μ s	1	11/2 ⁻	99	IT=100		
^{115}Sb	-87003	16	32.1	m	0.3	5/2 ⁺	99	β^+ =100				
^{115}Te	-82063	28	5.8	m	0.2	7/2 ⁺	99	β^+ =100				
$^{115}\text{Te}^m$	-82053	29	10	7	6.7	m	0.4	(1/2 ⁺)	99	ABBW E	β^+ \approx 100; IT<0.06	*
$^{115}\text{Te}^n$	-81783	28	280.05	0.20	7.5	μ s	0.2	11/2 ⁻	99	IT=100		
^{115}I	-76338	29	1.3	m	0.2	5/2 ⁺ #	99	β^+ =100				
^{115}Xe	-68657	12	18	s	4	(5/2 ⁺)	99	β^+ =100; β^+p =0.34 6; ...				
^{115}Cs	-59700#	300#	1.4	s	0.8	9/2 ⁺ #	99	β^+ =100; β^+p \approx 0.07				
^{115}Ba	-49030#	600#	450	ms	50	5/2 ⁺ #	99	97Ja12 D	β^+ =100; β^+p >15			
* $^{115}\text{Pd}^m$	J : E3 transition to ground-state							**				
* $^{115}\text{Te}^m$	E : less than 20 keV, from ENSDF							**				
* ^{115}Xe	D : ... ; $\beta^+ \alpha$ =0.0003 1							**				
^{116}Tc	-52750#	700#	90#	ms (>300 ns)	2 ⁺ #	01	97Be70 I	β^- ?				
^{116}Ru	-64450#	700#	400#	ms (>300 ns)	0 ⁺	01	94Be24 I	β^- ?				
^{116}Rh	-70740	140	680	ms	60	1 ⁺	01	β^- =100; β^-n ?				
$^{116}\text{Rh}^m$	-70540#	210#	200#	150#	570	ms	50	(6 ⁻)	01	β^- =100		
^{116}Pd	-79960	60	11.8	s	0.4	0 ⁺	01	β^- =100				
^{116}Ag	-82570	50	2.68	m	0.10	(2 ⁻)	01	β^- =100				
$^{116}\text{Ag}^m$	-82490	50	81.90	0.20	8.6	s	0.3	(5 ⁺)	01	β^- =94.0 15; IT=6.0 15		
^{116}Cd	-88719	3	30	Ey	4	0 ⁺	01	03Da09 T	IS=7.49 18; 2 β^- =100			
^{116}In	-88250	4	14.10	s	0.03	1 ⁺	01	98Bh04 D	β^- \approx 100; ϵ =0.23 6			
$^{116}\text{In}^m$	-88123	4	127.267	0.006	54.29	m	0.17	5 ⁺	01	β^- =100		
$^{116}\text{In}^n$	-87960	4	289.660	0.006	2.18	s	0.04	8 ⁻	01	IT=100		
^{116}Sn	-91528.1	2.9	STABLE					0 ⁺	01	IS=14.54 9		
^{116}Sb	-86821	6	15.8	m	0.8	3 ⁺	01	β^+ =100				
$^{116}\text{Sb}^m$	-86440	40	380	40	BD	60.3	m	0.6	8 ⁻	01	β^+ =100	
^{116}Te	-85269	28	2.49	h	0.04	0 ⁺	01	β^+ =100				
^{116}I	-77490	100	2.91	s	0.15	1 ⁺	01	β^+ =100				
$^{116}\text{I}^m$	-77090#	110#	400#	50#	3.27	μ s	0.16	(7 ⁻)	01	IT=100		
^{116}Xe	-73047	13	59	s	2	0 ⁺	01	β^+ =100				
^{116}Cs	-62070#	100#	700	ms	40	(1 ⁺)	01	β^+ =100; β^+p =0.28 7;...				
$^{116}\text{Cs}^m$	-61970#	120#	100#	60#	3.85	s	0.13	4 ⁺ ,5,6	01	β^+ =100; β^+p =0.51 15;...		
^{116}Ba	-54600#	400#	1.3	s	0.2	0 ⁺	01	β^+ =100; β^+p =3 1				
* ^{116}Ru	I : and $T > 240$ ns in 97So07							**				
* ^{116}Cd	T : from 29(1 statistics +4-3 systematics); supersedes 00Da27=26(1 statistics +7-4 systematics)							**				
* ^{116}Cs	D : ... ; $\beta^+ \alpha$ =0.049 25							**				
* $^{116}\text{Cs}^m$	D : ... ; $\beta^+ \alpha$ =0.008 2							**				

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{117}Tc	-49850#	700#	40# ms (>300 ns)	$3/2^-$	#	02 97Be70 I	β^- ?	
^{117}Ru	-60010#	700#	300# ms (>300 ns)			02 94Be24 I	β^- ? *	
^{117}Rh	-68950#	500#	440 ms	40		02	β^- =100	
^{117}Pd	-76530	60	4.3 s	0.3		02	β^- =100	
$^{117}\text{Pd}^m$	-76330	60	203.2	0.3		02	IT=100	
^{117}Ag	-82270	50	73.6 s	1.4		02	β^- =100	
$^{117}\text{Ag}^m$	-82240	50	28.6	0.2		02	β^- =94.0 15; IT=6.0 15	
^{117}Cd	-86425	3	2.49 h	0.04		02	β^- =100	
$^{117}\text{Cd}^m$	-86289	3	136.4	0.2		02	β^- ≈100; IT≈0	
^{117}In	-88945	6	43.2 m	0.3		02	β^- =100	
$^{117}\text{In}^m$	-88630	6	315.302	0.012		02	β^- =52.9 15; IT=47.1 15	
^{117}Sn	-90400.0	2.9	STABLE			02	IS=7.68 7	
$^{117}\text{Sn}^m$	-90085.4	2.9	314.58	0.04		02	IT=100	
^{117}Sb	-88645	9	2.80 h	0.01		02	β^+ =100	
^{117}Te	-85097	13	62 m	2		02	β^+ =100; e^+ =25 1	
$^{117}\text{Te}^m$	-84801	13	296.1	0.5		02	IT ?	
$^{117}\text{Te}^n$	-84823	13	274.4	0.1		02	IT=100	
^{117}I	-80435	28	2.22 m	0.04		02	β^+ =100; e^+ ≈77	
^{117}Xe	-74185	10	61 s	2		02	β^+ =100; β^+ p=0.0029 6	
^{117}Cs	-66440	60	* 8.4 s	0.6		02	β^+ =100	
$^{117}\text{Cs}^m$	-66290#	100#	150#	80#	*	02	β^+ =100	
$^{117}\text{Cs}^x$	-66390	80	50	50			$R=?$	
^{117}Ba	-57290#	300#	1.75 s	0.07		02 97Ja12 D	β^+ =100; β^+ p=13 3; ... *	
^{117}La	-46510#	400#	23.5 ms	2.6		02	$p=?$; β^+ =6#	
$^{117}\text{La}^m$	-46370#	400#	138	15	p	02	$p=?$; β^+ =3#	
* ^{117}Ru	I : and $T > 240$ ns in 97So07							**
* ^{117}Ba	D : ... ; β^+ α =0.024 8							**
* ^{117}Ba	D : β^+ p from 97Ja12. β^+ p/ β^+ α =350-1200 from 85Ti02 yields β^+ α =0.011-0.037							**
^{118}Tc	-45200#	900#	30# ms (>300 ns)	2^+	#	97 95Cz.A I	β^- ?	
^{118}Ru	-57920#	800#	200# ms (>300 ns)	0^+		94Be24 I	β^- ?	
^{118}Rh	-65140#	500#	310 ms	30		97 00Jo18 TJD	β^- =100	
^{118}Pd	-75470	210	1.9 s	0.1		95	β^- =100	
^{118}Ag	-79570	60	3.76 s	0.15		95 93Ja03 J	β^- =100	
$^{118}\text{Ag}^m$	-79440	60	127.49	0.05		95 95Ap.A E	β^- =59; IT=41	
^{118}Cd	-86709	20	50.3 m	0.2		95	β^- =100	
^{118}In	-87230	8	* 5.0 s	0.5		95	β^- =100	
$^{118}\text{In}^m$	-87130#	50#	100#	50#	*	95 94It.A T	β^- =100	
$^{118}\text{In}^n$	-86990#	50#	240#	50#	*	95	IT=98.6 3; β^- =1.4 3 *	
^{118}Sn	-91656.1	2.9	STABLE			95	IS=24.22 9	
^{118}Sb	-87999	4	3.6 m	0.1		95	β^+ =100	
$^{118}\text{Sb}^m$	-87749	6	250	6	BD	95	β^+ =100	
$^{118}\text{Sb}^n$	-87948	4	50.814	0.021		95	β^+ =100	
^{118}Te	-87721	15	6.00 d	0.02		95	ϵ =100	
^{118}I	-80971	20	13.7 m	0.5		95	β^+ =100	
$^{118}\text{I}^m$	-80781	20	190.1	1.0		95 94Ka39 E	β^+ ≈100; IT=?	
^{118}Xe	-78079	10	3.8 m	0.9		95	β^+ =100	
^{118}Cs	-68409	13	* 14 s	2		95	β^+ =100; β^+ p=0.021 14;... *	
$^{118}\text{Cs}^m$	-68310#	60#	100#	60#	*	95 93Be46 J	β^+ =100; β^+ p=0.021 14;... *	
$^{118}\text{Cs}^x$	-68404	12	5	4			$R < 0.1$	
^{118}Ba	-62370#	200#	5.2 s	0.2		97 97Ja12 TD	β^+ =100; β^+ p ?	
^{118}La	-49620#	300#	200# ms				β^+ ?	
* $^{118}\text{In}^n$	E : 138.2(0.5) keV above $^{118}\text{In}^m$, from ENSDF							**
* ^{118}Cs	D : ... ; β^+ α =0.0012 5							**
* ^{118}Cs	D : derived from β^+ p=0.042(6)%, β^+ α =0.0024(4)% for mixture of ground-state and isomer.							**
* ^{118}Cs	D : Replaced by uniform distributions from zero to values for each isomer							**
* $^{118}\text{Cs}^m$	D : ... ; β^+ α =0.0012 5							**

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
¹¹⁹ Ru	-53240#	700#			170#	ms (>300 ns)			97Be70 I	β^- ?
¹¹⁹ Rh	-63240#	600#			300#	ms (>300 ns)	7/2 ⁺ #		94Be24 I	β^- ?
¹¹⁹ Pd	-71620#	300#			920	ms	130	00		β^- =100
¹¹⁹ Ag	-78560	90			6.0	s	0.5	1/2 ⁻ #	00	β^- =100
¹¹⁹ Ag ^m	-78540#	90#	20#	20#	2.1	s	0.1	7/2 ⁺ #	00	β^- =100
¹¹⁹ Cd	-83910	80			2.69	m	0.02	(3/2 ⁺)	00	β^- =100
¹¹⁹ Cd ^m	-83760	80	146.54	0.11	2.20	m	0.02	11/2 ⁻ #	00	β^- =100
¹¹⁹ In	-87704	8			2.4	m	0.1	9/2 ⁺	00	β^- =100
¹¹⁹ In ^m	-87393	8	311.37	0.03	18.0	m	0.3	1/2 ⁻	00	β^- =94.4 15; IT=5.6 15
¹¹⁹ Sn	-90068.4	2.9			STABLE			1/2 ⁺	00	IS=8.59 4
¹¹⁹ Sn ^m	-89978.9	2.9	89.531	0.013	293.1	d	0.7	11/2 ⁻	00	IT=100
¹¹⁹ Sb	-89477	8			38.19	h	0.22	5/2 ⁺	00	ϵ =100
¹¹⁹ Sb ^m	-86625	11	2852	7	850	ms	90	27/2 ⁺ #	00	IT=100
¹¹⁹ Te	-87184	8			16.05	h	0.05	1/2 ⁺	00	β^+ =100
¹¹⁹ Te ^m	-86923	8	260.96	0.05	4.70	d	0.04	11/2 ⁻	00	ϵ =99.59 4; e^+ =0.41 4; ...
¹¹⁹ I	-83766	28			19.1	m	0.4	5/2 ⁺	00	β^+ =100
¹¹⁹ Xe	-78794	10			5.8	m	0.3	5/2 ⁽⁺⁾	00	90Ne.A J e^+ =79 5; ϵ =21 5
¹¹⁹ Cs	-72305	14			43.0	s	0.2	9/2 ⁺	00	β^+ =100; $\beta^+\alpha$ <2e-6
¹¹⁹ Cs ^m	-72260#	30#	50#	30#	30.4	s	0.1	3/2 ⁽⁺⁾	00	β^+ =100
¹¹⁹ Cs ^s	-72289	9	16	11	R = .5 .25			spmix		
¹¹⁹ Ba	-64590	200			5.4	s	0.3	(5/2 ⁺)	00	β^+ =100; β^+p <25
¹¹⁹ La	-54970#	400#			1#	s		11/2 ⁻ #		β^+ ?
¹¹⁹ Ce	-44000#	600#			200#	ms		5/2 ⁺ #		β^+ ?
* ¹¹⁹ Ag ^m	E : estimated from 7/2 ⁺ level in isotopes ¹¹³ Ag=43 ¹¹⁵ Ag=41 ¹¹⁷ Ag=28									
* ¹¹⁹ Sb ^m	E : estimated less than 20 keV above 2841.7 level									
* ¹¹⁹ Te ^m	D : ... ; IT<0.008									
¹²⁰ Ru	-50940#	800#			80#	ms (>300 ns)		0 ⁺	02 95Cz.A I	β^- ?
¹²⁰ Rh	-59230#	600#			200#	ms (>300 ns)			94Be24 I	β^- ?
¹²⁰ Pd	-70150	120			500	ms	100	0 ⁺	02	β^- =100
¹²⁰ Ag	-75650	70			1.23	s	0.04	3 ⁽⁺⁾ #	02 93Ru01 D	β^- =100; β^-n <0.003
¹²⁰ Ag ^m	-75450	70	203.0	1.0	371	ms	24	6 ⁽⁻⁾	02 03Wa13 T	β^- ≈63; IT≈37
¹²⁰ Cd	-83974	19			50.80	s	0.21	0 ⁺	02	β^- =100
¹²⁰ In	-85740	40			3.08	s	0.08	1 ⁺	02	β^- =100
¹²⁰ In ^m	-85690#	50#	50#	60#	46.2	s	0.8	5 ⁺	02 87Eb02 J	β^- =100
¹²⁰ In ⁿ	-85440#	200#	300#	200#	47.3	s	0.5	8 ⁽⁻⁾	02 79Fo10 J	β^- =100
¹²⁰ Sn	-91105.1	2.5			STABLE			0 ⁺	02	IS=32.58 9
¹²⁰ Sn ^m	-88623.5	2.5	2481.63	0.06	11.8	μ s	0.5	(7 ⁻)	02	IT=100
¹²⁰ Sn ⁿ	-88202.9	2.5	2902.22	0.22	6.26	μ s	0.11	10 ⁺ #	02	IT=100
¹²⁰ Sb	-88424	8			15.89	m	0.04	1 ⁺	02	β^+ =100
¹²⁰ Sb ^m	-88420#	100#	0#	100#	5.76	d	0.02	8 ⁻	02	β^+ =100
¹²⁰ Sb ⁿ	-88346	8	78.16	0.05	246	ns	2	(3 ⁺)	02	IT=100
¹²⁰ Sb ^p	-86096	8	2328.3	0.6	400	ns	8	(6)	02	IT=100
¹²⁰ Te	-89405	10			STABLE			0 ⁺	02	IS=0.09 1; 2 β^+ ?
¹²⁰ I	-83790	18			81.6	m	0.2	2 ⁻	02	β^+ =100
¹²⁰ I ^m	-83717	18	72.61	0.09	228	ns	15	(1 ⁺ , 2 ⁺ , 3 ⁺)	02	IT=100
¹²⁰ I ⁿ	-83470	23	320	15	53	m	4	(7 ⁻)	02	β^+ =100
¹²⁰ Xe	-82172	12			40	m	1	0 ⁺	02	β^+ =100
¹²⁰ Cs	-73889	10			61.2	s	1.8	2 ⁽⁻⁾ #	02	β^+ =100; $\beta^+\alpha$ <2.0e-5 4; ...
¹²⁰ Cs ^m	-73790#	60#	100#	60#	57	s	6	(7 ⁻)	02 75Ho09 D	β^+ =100; $\beta^+\alpha$ <2.0e-5 4; ...
¹²⁰ Cs ^s	-73884	9	5	4	R < 0.1			spmix		
¹²⁰ Ba	-68890	300			24	s	2	0 ⁺	02 92Xu04 T	β^+ =100
¹²⁰ La	-57690#	500#			2.8	s	0.2		02	β^+ =100; β^+p =?
¹²⁰ Ce	-49710#	700#			250#	ms		0 ⁺		β^+ ?
* ¹²⁰ Ag ^m	T : average 03Wa13=400(30) 71Fo22=320(40)									
* ¹²⁰ Cs	D : ... ; β^+p <7e-6 3									
* ¹²⁰ Cs	D : isomers not distinguished by 75Ho09 in $\beta^+\alpha$ and β^+p . Values replaced									
* ¹²⁰ Cs	D : ... by upper limits for both (cf. ENSDF evaluation of ¹¹⁸ Cs)									
* ¹²⁰ Cs ^m	D : ... ; β^+p <7e-6 3									

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
¹²¹ Rh	-57080#	900#	100# ms (>300 ns)	7/2 ⁺ #		94Be24 I	β^- ?		
¹²¹ Pd	-66260#	500#	400# ms (>300 ns)		00	94Be24 I	β^- ? *		
¹²¹ Ag	-74660	150	790 ms	20	7/2 ⁺ #	00	β^- =100; β^- n=0.080 13		
¹²¹ Cd	-81060	80	13.5 s	0.3	(3/2 ⁺)	00	β^- =100		
¹²¹ Cd ^m	-80850	80	214.86	0.15	8.3 s	0.8	(11/2 ⁻) 00	β^- =100	
¹²¹ In	-85841	27	23.1 s	0.6	9/2 ⁺	00	β^- =100		
¹²¹ In ^m	-85528	27	312.98	0.08	3.88 m	0.10	1/2 ⁻ 00	β^- =98.8 2; IT=1.2 2	
¹²¹ Sn	-89204.1	2.5	27.03 h	0.04	3/2 ⁺	00	β^- =100		
¹²¹ Sn ^m	-89197.8	2.5	6.30	0.06	43.9 y	0.5	11/2 ⁻ 00	IT=77.6 20; β^- =22.4 20	
¹²¹ Sn ⁿ	-87205.3	2.7	1998.8	0.9	5.3 μ s	0.5	19/2 ⁺ # 00	IT=100	
¹²¹ Sb	-89595.1	2.2			STABLE		5/2 ⁺ 00	IS=57.21 5	
¹²¹ Te	-88551	26	19.16 d	0.05	1/2 ⁺	00	β^+ =100		
¹²¹ Te ^m	-88257	26	293.991	0.022	154 d	7	11/2 ⁻ 00	IT=88.6 11; β^+ =11.4 11	
¹²¹ I	-86287	10	2.12 h	0.01	5/2 ⁺	00	β^+ =100		
¹²¹ I ^m	-83910	10	2376.9	0.4	9.0 μ s	1.5	00	IT=100	
¹²¹ Xe	-82473	11	40.1 m	2.0	(5/2 ⁺)	00	β^+ =100		
¹²¹ Cs	-77100	14	155 s	4	3/2 ⁽⁺⁾	00	β^+ =100		
¹²¹ Cs ^m	-77032	14	68.5	0.3	122 s	3	9/2 ⁽⁺⁾ 00	β^+ =83; IT=17	
¹²¹ Ba	-70740	140	29.7 s	1.5	5/2 ⁽⁺⁾	00	β^+ =100; β^+ p=0.02 1		
¹²¹ La	-62400#	500#	5.3 s	0.2	11/2 ⁻ #	00	β^+ =100; β^+ p ?		
¹²¹ Ce	-52700#	500#	1.1 s	0.1	(5/2) ⁽⁺⁾ #	00	99Li46 J	β^+ =100; β^+ p \approx 1	
¹²¹ Pr	-41580#	700#	600 ms	300	(3/2 ⁻)	00	90Bo39 TJD	p=?; β^+ ?; β^+ p ? *	
* ¹²¹ Pd	I : and T>240 ns in 97So07							**	
* ¹²¹ Pr	T : T=1.4(0.8) s in ENSDF: not trusted to belong to this nuclide							**	
¹²² Rh	-52900#	700#	50# ms (>300 ns)			97Be70 I	β^- ?		
¹²² Pd	-64690#	400#	300# ms (>300 ns)		0 ⁺	98 94Be24 I	β^- ? *		
¹²² Ag	-71230#	210#	* 520 ms	14	(3 ⁺)	94 95Fe12 T	β^- =100; β^- n=0.186 10 *		
¹²² Ag ^m	-71150#	220#	* 1.5 s	0.5	8 ⁻ #	94	β^- =100; β^- n ?		
¹²² Cd	-80730	40	* 5.24 s	0.03	0 ⁺	94	β^- =100		
¹²² In	-83580	50	* 1.5 s	0.3	1 ⁺	94	β^- =100		
¹²² In ^m	-83540#	80#	* 10.3 s	0.6	5 ⁺	94	β^- =100		
¹²² In ⁿ	-83290	130	290	140	BD	10.8 s	0.4	8 ⁻ 94	β^- =100
¹²² Sn	-89945.9	2.7			STABLE		0 ⁺ 94	IS=4.63 3; 2 β^- ?	
¹²² Sb	-88330.2	2.2	2.7238 d	0.0002	2 ⁻	94	β^- =97.59 12; ... *		
¹²² Sb ^m	-88166.6	2.2	163.5591	0.0017	4.191 m	0.003	(8) ⁻ 94	IT=100	
¹²² Sb ⁿ	-88192.7	2.2	137.472	0.001	530 μ s		5 ⁺		
¹²² Te	-90314.0	1.5			STABLE		0 ⁺ 94	IS=2.55 12	
¹²² I	-86080	5	3.63 m	0.06	1 ⁺	94	β^+ =100		
¹²² Xe	-85355	11	20.1 h	0.1	0 ⁺	94	ϵ =100		
¹²² Cs	-78140	30	21.18 s	0.19	1 ⁺	96 93Al03 T	β^+ =100; β^+ α <2e-7 *		
¹²² Cs ^m	-78005	9	140	30	MD	3.70 m	0.11	8 ⁻ 96	β^+ =100
¹²² Cs ⁿ	-78010	30	127.0	0.5	360 ms	20	(5) ⁻ 96	IT=100	
¹²² Ba	-74609	28	1.95 m	0.15	0 ⁺	94	β^+ =100		
¹²² La	-64540#	300#	8.7 s	0.7		94	β^+ =100; β^+ p=?		
¹²² Ce	-57840#	400#	2# s		0 ⁺	94	β^+ ?; β^+ p ? *		
¹²² Pr	-44890#	500#	500# ms				β^+ ?		
* ¹²² Pd	I : and T>240 ns in 97So07							**	
* ¹²² Ag	D : β^- n intensity is from 93Ru01							**	
* ¹²² Sb	D : ... ; β^+ =2.41 12							**	
* ¹²² Cs	T : average 93Al03=21.2(0.2) 69Ch18=21.0(0.7)							**	
* ¹²² Cs	D : β^+ α intensity upper limit is from 75Ho09							**	
* ¹²² Ce	I : T=8.7(0.7) s in NDS 71 (1994) was misprint for ¹²² La; corrected in ENSDF							**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
¹²³ Pd	-60610# 600#		200# ms (>300 ns)			94Be24 I	β^- ?	
¹²³ Ag	-69960# 210#		296 ms	6	(7/2 ⁺)	94 95Fe12 T	β^- =100; β^- -n=0.55 5 *	
¹²³ Cd	-77310 40		2.10 s	0.02	(3/2 ⁺)	94	β^- =100	
¹²³ Cd ^m	-76990 40	316.52 0.23	1.82 s	0.03	(11/2 ⁻)	94	β^- =?; IT=?	
¹²³ In	-83426 24		5.98 s	0.06	9/2 ⁺	94	β^- =100	
¹²³ In ^m	-83099 24	327.21 0.04	47.8 s	0.5	1/2 ⁻	94	β^- =100	
¹²³ Sn	-87820.5 2.7		129.2 d	0.4	11/2 ⁻	94	β^- =100	
¹²³ Sn ^m	-87795.9 2.7	24.6 0.4	40.06 m	0.01	3/2 ⁺	94	β^- =100	
¹²³ Sb	-89224.1 2.1		STABLE		7/2 ⁺	94	IS=42.79 5	
¹²³ Te	-89171.9 1.5		> 600 Ty		1/2 ⁺	94 96Al30 T	IS=0.89 3; ϵ =100 *	
¹²³ Te ^m	-88924.3 1.5	247.55 0.04	119.25 d	0.15	11/2 ⁻	94	IT=100	
¹²³ I	-87943 4		13.2235 h	0.0019	5/2 ⁺	94 02Un02 T	β^+ =100	
¹²³ Xe	-85249 10		2.08 h	0.02	1/2 ⁺	94 90Ne.A J	β^+ =100	
¹²³ Xe ^m	-85064 10	185.18 0.22	5.49 μ s	0.26	7/2 ⁽⁻⁾			
¹²³ Cs	-81044 12		5.87 m	0.04	1/2 ⁺	94 93Al03 T	β^+ =100 *	
¹²³ Cs ^m	-80887 12	156.74 0.21	1.64 s	0.12	(11/2 ⁻)	94	IT=100	
¹²³ Cs ^x	-81037 13	7 4	$R < 0.1$		spmix			
¹²³ Ba	-75655 12		2.7 m	0.4	5/2 ⁺	94	β^+ =100	
¹²³ La	-68710# 200#		17 s	3	11/2 ⁻ #	94	β^+ =100	
¹²³ Ce	-60180# 300#		3.8 s	0.2	(5/2) ⁽⁺⁾ #	94	β^+ =100; β^+ p=?	
¹²³ Pr	-50340# 600#		800# ms		3/2 ⁺ #		β^+ ?	
* ¹²³ Ag	T : average 95Fe12=293(7) 86Ma42=300(20) 83Re05=300(10)				D : from 93Ru01		**	
* ¹²³ Te	T : and T=24(9) Ey for ϵ (K), same authors							**
* ¹²³ Te	I : this nuclide is not considered 'stable' since K ϵ has been observed							**
* ¹²³ Cs	T : average 93Al03=5.87(0.05) 68Ch18=5.87(0.05)							**
¹²⁴ Pd	-58800# 500#		100# ms (>300 ns)	0 ⁺		97Be70 I	β^- ?	
¹²⁴ Ag	-66470# 200#		* 172 ms	5	3 ⁺ #	97	β^- =100; β^- -n>0.1	
¹²⁴ Ag ^m	-66470# 220#	0# 100#	* 200# ms		8 ⁻ #	95Kr.A I	β^- ?; IT ? *	
¹²⁴ Cd	-76710 60		1.25 s	0.02	0 ⁺	97	β^- =100	
¹²⁴ In	-80880 50		* 3.11 s	0.10	3 ⁺	97	β^- =100	
¹²⁴ In ^m	-80900 50	-20 70	BD * 3.7 s	0.2	(8) ⁽⁻⁾ #	97	β^- \approx 100; IT ?	
¹²⁴ Sn	-88236.8 1.4		STABLE	(>100 Py)	0 ⁺	97 52Ka41 T	IS=5.79 5; 2 β^- ?	
¹²⁴ Sn ^m	-85911.8 1.4	2325.01 0.04	3.1 μ s	0.5	7 ⁻	97	IT=100	
¹²⁴ Sn ⁿ	-85580.2 1.5	2656.6 0.5	45 μ s	5	10 ⁺ #	97	IT=100	
¹²⁴ Sb	-87620.3 2.1		60.20 d	0.03	3 ⁻	98	β^- =100	
¹²⁴ Sb ^m	-87609.4 2.1	10.8627 0.0008	93 s	5	5 ⁺	97	IT=75 5; β^- =25 5	
¹²⁴ Sb ⁿ	-87583.5 2.1	36.8440 0.0014	20.2 m	0.2	(8) ⁻	97	IT=100	
¹²⁴ Sb ^p	-87579.5 2.1	40.8038 0.0007	3.2 μ s	0.3	(3 ⁺ , 4 ⁺)	97	IT=100	
¹²⁴ Te	-90524.5 1.5		STABLE		0 ⁺	97	IS=4.74 14	
¹²⁴ I	-87365.0 2.4		4.1760 d	0.0003	2 ⁻	97	β^+ =100	
¹²⁴ Xe	-87660.1 1.8		STABLE	(>48 Py)	0 ⁺	97 89Ba22 T	IS=0.09 1; 2 β^+ ?	
¹²⁴ Cs	-81731 8		30.9 s	0.4	1 ⁺	97 93Al03 T	β^+ =100 *	
¹²⁴ Cs ^m	-81268 8	462.55 0.17	6.3 s	0.2	(7) ⁺	97	IT=100	
¹²⁴ Cs ^x	-81701 22	30 20	$R=?$		spmix			
¹²⁴ Ba	-79090 12		11.0 m	0.5	0 ⁺	97	β^+ =100	
¹²⁴ La	-70260 60		* 29.21 s	0.17	(7 ⁻ , 8 ⁻)	97 97As05 T	β^+ =100 *	
¹²⁴ La ^m	-70160# 120#	100# 100#	* 21 s	4	low ⁽⁺⁾ #	97 97As05 T	β^+ =100	
¹²⁴ Ce	-64820# 300#		9.1 s	1.2	0 ⁺	98 97As05 T	β^+ =100 *	
¹²⁴ Pr	-53130# 600#		1.2 s	0.2		97	β^+ =100; β^+ p=?	
¹²⁴ Nd	-44500# 600#		500# ms		0 ⁺		β^+ ?	
* ¹²⁴ Ag ^m	I : "There is some evidence for a low-spin and a high-spin isomer in ¹²⁴ Ag"							**
* ¹²⁴ Cs	T : average 93Al03=30.9(0.5) 78Ek05=30.8(0.5)							**
* ¹²⁴ La	J : for ¹²⁴ La and ¹²⁴ La ^m are from 92Id01							**
* ¹²⁴ Ce	T : average 97As05=10.8(1.5) 78Bo32=6(2)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
¹²⁵ Ag	-64800# 300#				166	ms	7	7/2 ⁺ #	99	β^- =100; β^-n =?
¹²⁵ Cd	-73360 70				* 650	ms	20	3/2 ⁺ #	99	β^- =100
¹²⁵ Cd ^m	-73310 50	50	70	BD *	570	ms	90	11/2 ⁻ #	99 89Hu03 T	β^- =100 *
¹²⁵ In	-80480 30				2.36	s	0.04	9/2 ⁺	99	β^- =100
¹²⁵ In ^m	-80120 30	360.12	0.09		12.2	s	0.2	1/2 ⁽⁻⁾	99	β^- =100
¹²⁵ Sn	-85898.5 1.5				9.64	d	0.03	11/2 ⁻	99	β^- =100
¹²⁵ Sn ^m	-85871.0 1.5	27.50	0.14		9.52	m	0.05	3/2 ⁺	99	β^- =100
¹²⁵ Sb	-88255.5 2.6				2.75856	y	0.00025	7/2 ⁺	99	β^- =100
¹²⁵ Te	-89022.2 1.5				STABLE			1/2 ⁺	99	IS=7.07 15
¹²⁵ Te ^m	-88877.4 1.5	144.772	0.009		57.40	d	0.15	11/2 ⁻	99	IT=100
¹²⁵ I	-88836.4 1.5				59.400	d	0.010	5/2 ⁺	99	ϵ =100
¹²⁵ Xe	-87192.1 1.9				16.9	h	0.2	1/2 ⁽⁺⁾	99	β^+ =100
¹²⁵ Xe ^m	-86939.5 1.9	252.60	0.14		56.9	s	0.9	9/2 ⁽⁻⁾	99	IT=100
¹²⁵ Cs	-84088 8				45	m	1	1/2 ⁽⁺⁾	99	β^+ =100
¹²⁵ Cs ^m	-83821 8	266.6	1.1		900	ms	30	(11/2 ⁻)	99 98Su16 TJ	IT=100
¹²⁵ Ba	-79668 11				3.5	m	0.4	1/2 ⁽⁺⁾ #	99	β^+ =100
¹²⁵ La	-73759 26				64.8	s	1.2	(11/2 ⁻)	99	β^+ =100 *
¹²⁵ La ^m	-73652 26	107.0	0.1		390	ms	40	(3/2 ⁺)	99 99Ca21 ETJ	IT=100 *
¹²⁵ Ce	-66660# 200#				9.3	s	0.3	(7/2 ⁻)	99 02Pe15 J	β^+ =100; β^+p =? *
¹²⁵ Pr	-57910# 400#				3.3	s	0.7	3/2 ⁺ #	02	β^+ =100; β^+p ? *
¹²⁵ Nd	-47620# 400#				600	ms	150	5/2 ⁽⁺⁾ #	02	β^+ =100
* ¹²⁵ Cd ^m	T : unweighed average 89Hu03=480(30) 86Ma42=660(30) (Birge ratio B=4.24) **									
* ¹²⁵ La	J : ENSDF'99 says ground-state spin unknown; a (11/2 ⁻) level lies at 8-9 keV above ground-state **									
* ¹²⁵ La ^m	J : 3/2 ⁺ # from systematics; low spin and even-parity from 99Ca21 **									
* ¹²⁵ Ce	T : average 99Ca21=9.6(0.4) 86Wi15=9.2(1.0) 83Ni05=8.9(0.5) **									
¹²⁶ Ag	-61010# 300#				107	ms	12	3 ⁺ #	03	β^- =100; β^-n =?
¹²⁶ Cd	-72330 50				515	ms	17	0 ⁺	03	β^- =100
¹²⁶ In	-77810 40				* 1.53	s	0.01	3 ⁽⁺⁾ #	03	β^- =100
¹²⁶ In ^m	-77710 50	100	60	BD *	1.64	s	0.05	8 ⁽⁻⁾ #	03 79Fo10 J	β^- =100
¹²⁶ Sn	-86020 11				230	ky	14	0 ⁺	03	β^- =100
¹²⁶ Sn ^m	-83801 11	2218.99	0.08		6.6	μ s	1.4	7 ⁻	03	IT=100
¹²⁶ Sn ⁿ	-83456 11	2564.5	0.5		7.7	μ s	0.5	10 ⁺ #	03	IT=100
¹²⁶ Sb	-86400 30				12.35	d	0.06	(8 ⁻)	03	β^- =100
¹²⁶ Sb ^m	-86380 30	17.7	0.3		19.15	m	0.08	(5 ⁺)	03	β^- =86 4; IT=14 4
¹²⁶ Sb ⁿ	-86360 30	40.4	0.3		11	s		(3 ⁻)	03	IT=100
¹²⁶ Sb ^p	-86300 30	104.6	0.3		553	ns	5	(3 ⁺)	03	IT=100
¹²⁶ Te	-90064.6 1.5				STABLE			0 ⁺	03	IS=18.84 25
¹²⁶ I	-87911 4				12.93	d	0.05	2 ⁻	03	β^+ =52.7 5; β^- =47.3 5
¹²⁶ Xe	-89169 6				STABLE			0 ⁺	03	IS=0.09 1; 2 β^+ ?
¹²⁶ Cs	-84345 12				1.64	m	0.02	1 ⁺	03	β^+ =100
¹²⁶ Cs ^m	-84072 12	273.0	0.7		> 1	μ s			03	IT=100
¹²⁶ Cs ⁿ	-83749 12	596.1	1.1		171	μ s	14		03	IT=100
¹²⁶ Ba	-82670 12				100	m	2	0 ⁺	03	β^+ =100
¹²⁶ La	-74970 90				* 54	s	2	(5 ⁽⁺⁾)	03	β^+ =100
¹²⁶ La ^m	-74760 400	210	410	BD *	20	s	20	(0 ⁻ , 1 ⁻ , 2 ⁻)	03	β^+ =100 *
¹²⁶ Ce	-70821 28				51.0	s	0.3	0 ⁺	03	β^+ =100
¹²⁶ Pr	-60260# 200#				3.12	s	0.18	(4, 5, 6)	03 88Ba42 T	β^+ =100; β^+p =? *
¹²⁶ Nd	-52890# 400#				1#	s (>200 ns)		0 ⁺	03 00So11 I	β^+ ? *
¹²⁶ Pm	-39570# 500#				500#	ms				β^+ ?
* ¹²⁶ La ^m	T : 97As05: "by far shorter than 50 s" **									
* ¹²⁶ Pr	T : average 95Os03=3.14(0.22) 88Ba42=3.0(0.4) and 83Ni05=3.2(0.6) **									

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
¹²⁷ Ag	-58900# 300#				79	ms	3	7/2 ⁺ #	98	96Wo.A	TD	β^- =100; β^- -n=? *
¹²⁷ Cd	-68520 70				370	ms	70	(3/2 ⁺)	96			β^- =100
¹²⁷ In	-76990 40				1.09	s	0.01	9/2 ⁽⁺⁾	96	87Eb02	J	β^- =100; β^- -n≤0.03
¹²⁷ In ^m	-76520 70	460	70	BD	3.67	s	0.04	(1/2 ⁻)	96			β^- =100; β^- -n=0.69 4
¹²⁷ Sn	-83499 25				2.10	h	0.04	(11/2 ⁻)	96			β^- =100
¹²⁷ Sn ^m	-83494 25	4.7	0.3		4.13	m	0.03	(3/2 ⁺)	96			β^- =100
¹²⁷ Sb	-86700 5				3.85	d	0.05	7/2 ⁺	96			β^- =100
¹²⁷ Te	-88281.1 1.5				9.35	h	0.07	3/2 ⁺	96			β^- =100
¹²⁷ Te ^m	-88192.8 1.5	88.26	0.08		109	d	2	11/2 ⁻	96			IT=97.6 2; β^- =2.4 2
¹²⁷ I	-88983 4				STABLE			5/2 ⁺	96			IS=100.
¹²⁷ Xe	-88321 4				36.345	d	0.003	1/2 ⁺	96	02Un02	T	ϵ =100
¹²⁷ Xe ^m	-88024 4	297.10	0.08		69.2	s	0.9	9/2 ⁻	96			IT=100
¹²⁷ Cs	-86240 6				6.25	h	0.10	1/2 ⁺	96			β^+ =100
¹²⁷ Cs ^m	-85788 6	452.23	0.21		55	μ s	3	(11/2 ⁻)	96			IT=100
¹²⁷ Ba	-82816 11				12.7	m	0.4	1/2 ⁺	96			β^+ =100
¹²⁷ Ba ^m	-82736 11	80.33	0.12		1.9	s	0.2	7/2 ⁻	96			IT=100
¹²⁷ La	-77896 26				5.1	m	0.1	(11/2 ⁻)	96			β^+ =100
¹²⁷ La ^m	-77881 26	14.8	1.2		3.7	m	0.4	(3/2 ⁺)	96			β^+ ≈100; IT ?
¹²⁷ Ce	-71980 60			*	29	s	2	5/2 ⁺ #	98	96Ge07	T	β^+ =100
¹²⁷ Ce ^m	-71980# 120#	0#	100#	*	34	s	2	(1/2 ⁺)	98	96Ge07	TJD	β^+ =100
¹²⁷ Pr	-64430# 200#				4.2	s	0.3	3/2 ⁺ #	98			β^+ =100
¹²⁷ Pr ^m	-63830# 280#	600#	200#		50#	ms		11/2 ⁻	98	98Mo30	J	β^+ ?; IT ?
¹²⁷ Nd	-55420# 400#				1.8	s	0.4	5/2 ⁺ #	96			β^+ =100; β^+ p=?
¹²⁷ Pm	-45060# 600#				1#	s		5/2 ⁺ #				β^+ ?; p ?
* ¹²⁷ Ag	T : supersedes 95Fe12=109(25) from same group											
¹²⁸ Ag	-54800# 300#				58	ms	5		01			β^- =100; β^- -n=?
¹²⁸ Cd	-67290 290				280	ms	40	0 ⁺	01			β^- =100
¹²⁸ In	-74360 50				840	ms	60	(3) ⁺	01	93Ru01	D	β^- =100; β^- -n=0.038 3
¹²⁸ In ^m	-74110 50	247.87	0.10		10	ms	7	(1) ⁻	01			IT=100 *
¹²⁸ In ⁿ	-74040 50	320	60	BD	720	ms	100	(8 ⁻)	01			β^- =100
¹²⁸ Sn	-83335 27				59.07	m	0.14	0 ⁺	01			β^- =100
¹²⁸ Sn ^m	-81244 27	2091.50	0.11		6.5	s	0.5	(7 ⁻)	01			IT=100
¹²⁸ Sb	-84609 25			*	9.01	h	0.04	8 ⁻	01			β^- =100
¹²⁸ Sb ^m	-84599 24	10	7	*	10.4	m	0.2	5 ⁺	01			β^- =96.4 10; IT=3.6 10 *
¹²⁸ Te	-88992.1 1.7				2.2	Yy	0.3	0 ⁺	01	96Ta04	T	IS=31.74 8; 2 β^- =100 *
¹²⁸ Te ^m	-86201.4 1.7	2790.7	0.4		370	ns	30	10 ⁺	01			IT=100
¹²⁸ I	-87738 4				24.99	m	0.02	1 ⁺	01			β^- =93.1 8; β^+ =6.9 8
¹²⁸ I ^m	-87600 4	137.850	0.004		845	ns	20	4 ⁻	01			IT=100
¹²⁸ I ⁿ	-87571 4	167.367	0.005		175	ns	15	(6) ⁻	01			IT=100
¹²⁸ Xe	-89860.0 1.4				STABLE			0 ⁺	01			IS=1.92 3
¹²⁸ Xe ^m	-87072.7 1.5	2787.3	0.4		83	ns	2	8 ⁻	01			IT=100
¹²⁸ Cs	-85931 5				3.640	m	0.014	1 ⁺	01	93Al03	T	β^+ =100 *
¹²⁸ Ba	-85402 10				2.43	d	0.05	0 ⁺	01			ϵ =100
¹²⁸ La	-78630 50			*	5.18	m	0.14	(5 ⁺)	01			β^+ =100
¹²⁸ La ^m	-78530# 110#	100#	100#	*	< 1.4	m		(1 ⁺ , 2 ⁻)	01			β^+ =100
¹²⁸ Ce	-75534 28				3.93	m	0.02	0 ⁺	01			β^+ =100
¹²⁸ Pr	-66331 30				2.84	s	0.09	(3 ⁺)	01	99Xi03	J	β^+ =100; β^+ p=? *
¹²⁸ Nd	-60180# 200#				5#	s		0 ⁺	01			β^+ ?; β^+ p ? *
¹²⁸ Pm	-48050# 400#				1.0	s	0.3	6 ⁺ #	01	93Li40	D	β^+ ≈100; β^+ p ?; p=0 *
¹²⁸ Sm	-39050# 500#				500#	ms		0 ⁺				β^+ ?; p ? *
* ¹²⁸ In ^m	T : 10 μ s < half-life < 20 ms, cf. ENSDF											
* ¹²⁸ Sb ^m	E : less than 20 keV above ground state, cf. ENSDF											
* ¹²⁸ Te	T : see also 92Be30=7.7(0.4) not used for consistency with ¹³⁰ Te (see below)											
* ¹²⁸ Cs	T : average 93Al03=3.66(0.02) 76He04=3.62(0.02)											
* ¹²⁸ Pr	D : from 85Wi07											
* ¹²⁸ Nd	T : 83Ni05 gave 4(2) s. Proved, by 85Wi07, to be due to ¹²⁸ Pr, not to ¹²⁸ Nd											
* ¹²⁸ Pm	D : p=0 from 93Li40 J : as calculated by 02Xu11											

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{129}Ag	-52450# 400#		44 ms	7/2 ⁺ #	03		$\beta^- = 100; \beta^- n = ?$	
$^{129}\text{Ag}^m$	-52450# 450#	0# 200#	160 ms	1/2 ⁻ #	03		$\beta^- ?; \beta^- n ?$ *	
^{129}Cd	-63200# 300#		242 ms	3/2 ⁺ #	96	03Pf.A	TD $\beta^- = 100; \beta^- n = ?$	
$^{129}\text{Cd}^m$	-63200# 360#	0# 200#	104 ms	11/2 ⁻ #	96	03Pf.A	TD $\beta^- = 100; \beta^- n = ?$	
^{129}In	-72940 40		611 ms	9/2 ⁺ #	96	93Ru01	T $\beta^- = 100; \beta^- n = 0.25 \ 5$ *	
$^{129}\text{In}^m$	-72560 70 380 70	BD	1.23 s	0.03	1/2 ⁻ #	96	$\beta^- \approx 100; IT < 0.3; \dots$ *	
$^{129}\text{In}^n$	-71250 40 1688.0	0.5	8.5 μs	0.5	17/2 ⁻	03Ge04	ETJ IT=100	
^{129}Sn	-80594 29		2.23 m	0.04	3/2 ⁺ #	96	$\beta^- = 100$	
$^{129}\text{Sn}^m$	-80559 29 35.2	0.3	6.9 m	0.1	11/2 ⁻ #	96	$\beta^- \approx 100; IT \approx 0.002$	
^{129}Sb	-84628 21		4.40 h	0.01	7/2 ⁺	96	$\beta^- = 100$	
$^{129}\text{Sb}^m$	-82777 21 1851.05	0.10	17.7 m	0.1	(19/2 ⁻)	96	$\beta^- = 85; IT = 15$	
$^{129}\text{Sb}^n$	-82767 21 1860.90	0.10	> 2 μs		(15/2 ⁻)	96	IT=100	
$^{129}\text{Sb}^p$	-82489 21 2138.9	0.5	1.1 μs	0.1	(23/2 ⁺)	03Ge04	ETJ IT=100	
^{129}Te	-87003.2 1.8		69.6 m	0.3	3/2 ⁺	96	$\beta^- = 100$	
$^{129}\text{Te}^m$	-86897.7 1.8 105.50	0.05	33.6 d	0.1	11/2 ⁻	96	IT=63 17; $\beta^- = 37 \ 17$	
^{129}I	-88503 3		15.7 My	0.4	7/2 ⁺	96	$\beta^- = 100$	
^{129}Xe	-88697.4 0.7		STABLE		1/2 ⁺	96	IS=26.44 24	
$^{129}\text{Xe}^m$	-88461.3 0.7 236.14	0.05	8.88 d	0.02	11/2 ⁻	96	IT=100	
^{129}Cs	-87500 5		32.06 h	0.06	1/2 ⁺	96	$\beta^+ = 100$	
^{129}Ba	-85065 11		2.23 h	0.11	1/2 ⁺	96	$\beta^+ = 100$	
$^{129}\text{Ba}^m$	-85057 11 8.42	0.06	2.16 h	0.02	7/2 ⁺ #	96	$\beta^+ \approx 100; IT = ?$	
^{129}La	-81326 21		11.6 m	0.2	3/2 ⁺	96	$\beta^+ = 100$	
$^{129}\text{La}^m$	-81154 21 172.1	0.4	560 ms	50	11/2 ⁻	96	IT=100	
^{129}Ce	-76287 28		3.5 m	0.3	(5/2 ⁺)	97	93A103 T $\beta^+ = 100$ *	
$^{129}\text{Ce}^m$	-76179 28 107.6	0.1	62 ns	5	(7/2 ⁻)	96	IT=100	
^{129}Pr	-69774 30		& 30 s	4	(3/2 ⁺)	96	96Gi08 J $\beta^+ = 100$	
$^{129}\text{Pr}^m$	-69390 30 382.7	0.5	& 1# ms		(11/2 ⁻)	97Gi07	EJD IT=100	
^{129}Nd	-62240# 200#		4.9 s	0.2	5/2 ⁺ #	96	$\beta^+ = 100; \beta^+ p = ?$	
^{129}Pm	-52950# 400#		3# s	(>200 ns)	5/2 ⁺ #	00So11	I $\beta^+ ?$	
^{129}Sm	-42250# 500#		550 ms	100	5/2 ⁺ #	99Xu05	TD $\beta^+ = 100$	
* ^{129}Ag	I : the evaluators are not convinced by the identification arguments							**
* ^{129}In	T : average 93Ru01=611(5) 86Wa17=610(10)							**
* $^{129}\text{In}^m$	D : ... ; $\beta^- n = 2.5 \ 5$							**
* ^{129}Ce	J : from 96Gi08 (5/2 ⁺ in ENSDF was from theory)							**
^{130}Ag	-46160# 330#		50 ms	0 ⁺	01		$\beta^- = 100; \beta^- n ?$	
^{130}Cd	-61570 280		162 ms	7	0 ⁺	01	01Ha39 TD $\beta^- = 100; \beta^- n = 3.5 \ 10$	
^{130}In	-69890 40		290 ms	20	(1 ⁻)	01	$\beta^- = 100; \beta^- n = 0.93 \ 13$	
$^{130}\text{In}^m$	-69840 40 50 50	BD *	538 ms	5	10 ⁻ #	01	93Ru01 T $\beta^- = 100; \beta^- n = 1.65 \ 15$ *	
$^{130}\text{In}^n$	-69490 50 400 60	BD	540 ms	10	(5 ⁺)	01	$\beta^- = 100; \beta^- n = 1.65 \ 15$	
^{130}Sn	-80139 11		3.72 m	0.07	0 ⁺	01	$\beta^- = 100$	
$^{130}\text{Sn}^m$	-78192 11 1946.88	0.10	1.7 m	0.1	7 ⁻ #	01	$\beta^- = 100$	
^{130}Sb	-82292 17		39.5 m	0.8	8 ⁻ #	01	$\beta^- = 100$	
$^{130}\text{Sb}^m$	-82287 17 4.80	0.20	6.3 m	0.2	(4,5 ⁺)	01	$\beta^- = 100$	
^{130}Te	-87351.4 1.9		790 Ey	100	0 ⁺	01	96Ta04 TD IS=34.08 62; $2\beta^- = 100$ *	
$^{130}\text{Te}^m$	-85205.0 1.9 2146.41	0.04	115 ns	8	(7 ⁻)	01	IT=100	
$^{130}\text{Te}^n$	-84690 7 2661 7		1.90 μs	0.08	(10 ⁺)	01	IT=100 *	
$^{130}\text{Te}^p$	-82976.0 2.6 4375.4	1.8	261 ns	33	01		IT=100	
^{130}I	-86932 3		12.36 h	0.01	5 ⁺	01	$\beta^- = 100$	
$^{130}\text{I}^m$	-86892 3 39.9525	0.0013	8.84 m	0.06	2 ⁺	01	IT=84 2; $\beta^- = 16 \ 2$	
^{130}Xe	-89881.7 0.7		STABLE		0 ⁺	01	IS=4.08 2	
^{130}Cs	-86900 8		29.21 m	0.04	1 ⁺	01	$\beta^+ = 98.4; \beta^- = 1.6$	
$^{130}\text{Cs}^m$	-86737 8 163.25	0.11	3.46 m	0.06	5 ⁻	01	IT \approx 100; $\beta^+ = 0.16 \ 2$	
$^{130}\text{Cs}^x$	-86873 17 27 15		R = .2 .1		fsmix			
^{130}Ba	-87261.6 2.8		STABLE	(>4.0 Zy)	0 ⁺	01	96Ba24 T IS=0.106 1; $2\beta^+ ?$	
$^{130}\text{Ba}^m$	-84786.5 2.8 2475.12	0.18	9.54 ms	0.14	8 ⁻	01	02Mo31 T IT=100 *	

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...											
¹³⁰ La	-81628	26			8.7	m	0.1	3(+)	01	$\beta^+=100$	
¹³⁰ Ce	-79423	28			22.9	m	0.5	0+	01	$\beta^+=100$	
¹³⁰ Ce ^m	-76969	28	2453.6	0.3	100	ns	8	(7-)	01	IT=100	
¹³⁰ Pr	-71180	60			40.0	s	0.4	(6,7)(+ [#])	01	88Ba42 J $\beta^+=100$	
¹³⁰ Pr ^m	-71080#	120#	100#	100#	10#	s		2+ [#]	01	88Ba42 J $\beta^+?$ *	
¹³⁰ Nd	-66596	28			21	s	3	0+	01	01Gi17 T $\beta^+=100$ *	
¹³⁰ Pm	-55470#	300#			2.6	s	0.2	(5+,6+,4+)	01	99Xi03 J $\beta^+=100; \beta^+p=?$	
¹³⁰ Sm	-47580#	400#			1#	s		0+	01	$\beta^+?$	
¹³⁰ Eu	-33940#	500#			1.1	ms	0.5	2+ [#]	02Ma61	TD $p=?; \beta^+=1\#$	
* ¹³⁰ In ^m	T : average 93Ru01=542(9) 85Re.A=532(6) and 86Wa17=550(10)										
* ¹³⁰ In ^m	T : ⁷⁶ Lu02=580(10) at variance, not used										
* ¹³⁰ Te	T : see also numerous (not used) results in 95Tr07										
* ¹³⁰ Te	T : treated by ENSDF'01 as a lower limit (not accepted by NUBASE)										
* ¹³⁰ Te ⁿ	E : less than 25 keV above 2648.57(0.22) (8+) level, see ENSDF'01										
* ¹³⁰ Ba ^m	T : others 66Br14=8.8(0.2) 69Wa.A=13.5(1.0) not used										
* ¹³⁰ Pr ^m	J : 88Ba42: there is also a low-spin component in ¹³⁰ Pr activity										
* ¹³⁰ Pr ^m	J : see also the discussion in 01Gi17 on three isomeric states in ¹³⁰ Pr										
* ¹³⁰ Nd	T : other conflicting data, not used: 00Xu08=13(3) 77Bo02=28(3)										
¹³¹ Cd	-55270#	300#			68	ms	3	7/2- [#]	00Ha55	TD $\beta^-=100; \beta^-n=3.5$ 10	
¹³¹ In	-68137	28			280	ms	30	(9/2+)	94	93Ru01 D $\beta^-=100; \beta^-n=2.2$ 3	
¹³¹ In ^m	-67790	40	350	40	BD	350	ms	50	(1/2-)	94	$\beta^-\approx 100; \dots$ *
¹³¹ In ⁿ	-64040	70	4100	70	BD	320	ms	60	(19..23/2+)	94	$\beta^->99; \dots$ *
¹³¹ Sn	-77314	21			56.0	s	0.5	(3/2+)	94	$\beta^-=100$	
¹³¹ Sn ^m	-77230#	40#	80#	30#	58.4	s	0.5	(11/2-)	94	01Si.A E $\beta^-=100; IT<0.0004\#$ *	
¹³¹ Sb	-81988	21			23.03	m	0.04	(7/2+)	94	$\beta^-=100$	
¹³¹ Te	-85209.5	1.9			25.0	m	0.1	3/2+	94	$\beta^-=100$	
¹³¹ Te ^m	-85027.3	1.9	182.250	0.020	30	h	2	11/2-	94	$\beta^-=77.8$ 16;IT=22.2 16	
¹³¹ I	-87444.4	1.1			8.02070	d	0.00011	7/2+	94	$\beta^-=100$	
¹³¹ Xe	-88415.2	1.0			STABLE			3/2+	94	IS=21.18 3	
¹³¹ Xe ^m	-88251.3	1.0	163.930	0.008	11.84	d	0.07	11/2-	94	IT=100	
¹³¹ Cs	-88060	5			9.689	d	0.016	5/2+	94	$\epsilon=100$	
¹³¹ Ba	-86683.8	2.8			11.50	d	0.06	1/2+	94	$\beta^+=100$	
¹³¹ Ba ^m	-86496.7	2.8	187.14	0.12	14.6	m	0.2	9/2-	94	IT=100	
¹³¹ La	-83769	28			59	m	2	3/2+	94	$\beta^+=100$	
¹³¹ La ^m	-83464	28	304.52	0.24	170	μ s	10	11/2-	94	IT=100	
¹³¹ Ce	-79720	30			10.2	m	0.3	(7/2+)	99	$\beta^+=100$	
¹³¹ Ce ^m	-79660	30	61.8	0.1	5.0	m	1.0	(1/2+)	99	96Gi08 E $\beta^+=100$	
¹³¹ Ce ⁿ	-79560	30	162.00	0.09	70	ns	5	(9/2-)			
¹³¹ Pr	-74280	50			1.50	m	0.03	(3/2+)	94	96Gi08 T $\beta^+=100$ *	
¹³¹ Pr ^m	-74130	50	152.4	0.2	5.7	s	0.2	(11/2-)	94	96Ge12 ED IT=96.4 12; $\beta^+=3.6$ 12	
¹³¹ Nd	-67769	28			33	s	3	(5/2)(+ [#])	94	96Ge12 T $\beta^+=100; \beta^+p=?$	
¹³¹ Nd ^m	-67412	28	357	3	50	ns		(7/2-)	94	96Ge12 J IT=100	
¹³¹ Pm	-59740#	200#			6.3	s	0.8	5/2+ [#]	94	99Ga41 T $\beta^+=100; \beta^+p?$	
¹³¹ Sm	-50200#	300#			1.2	s	0.2	5/2+ [#]	94	$\beta^+=100; \beta^+p=?$	
¹³¹ Eu	-39350#	400#			17.8	ms	1.9	3/2+	02	$p=?; \beta^+=12\#$	
* ¹³¹ In ^m	D : ... ; $\beta^-n\leq 2.0$ 4; IT ≤ 0.018										
* ¹³¹ In ⁿ	D : ... ; $\beta^-n=0.028$ 5; IT<1										
* ¹³¹ Sn ^m	E : ENSDF'94=241.8(0.8) questioned from theoretical and exp. considerations										
* ¹³¹ Pr	T : average 96Gi08=1.57(0.07) 93Al03=1.48(0.02) and 83Ga.A=1.58(0.05)										

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life	J^π	Ens Reference	Decay modes and intensities (%)
^{132}Cd	-50720#	500#			97 ms	10	0 ⁺	00Ha55 TD β^- =100; β^- n=60 15
^{132}In	-62420	60			206 ms	4	(7 ⁻)	02 β^- =100; β^- n=6.2 11
^{132}Sn	-76554	14			39.7 s	0.5	0 ⁺	92 β^- =100
^{132}Sb	-79674	14			2.79 m	0.05	(4 ⁺)	92 β^- =100
$^{132}\text{Sb}^m$	-79470	30	200	30	4.15 m	0.05	(8 ⁻)	92 β^- =100
^{132}Te	-85182	7			3.204 d	0.013	0 ⁺	92 β^- =100
^{132}I	-85700	6			2.295 h	0.013	4 ⁺	92 β^- =100
$^{132}\text{I}^m$	-85595	10	104	12	1.387 h	0.015	(8 ⁻)	92 IT=86 2; β^- =14 2
^{132}Xe	-89280.5	1.0			STABLE		0 ⁺	92 IS=26.89 6
$^{132}\text{Xe}^m$	-86528.2	1.0	2752.27	0.17	8.39 ms	0.11	(10 ⁺)	92 IT=100
^{132}Cs	-87155.9	1.9			6.479 d	0.007	2 ⁺	92 β^+ =98.13 9; β^+ n=1.87 9
^{132}Ba	-88434.8	1.1			STABLE	(>300 Ey)	0 ⁺	94 96Ba24 T IS=0.101 1; $2\beta^+$?
^{132}La	-83740	40			4.8 h	0.2	2 ⁻	94 β^+ =100
$^{132}\text{La}^m$	-83550	40	188.18	0.11	24.3 m	0.5	6 ⁻	94 IT=76; β^+ =24
^{132}Ce	-82474	21			3.51 h	0.11	0 ⁺	99 β^+ =100
$^{132}\text{Ce}^m$	-80133	21	2340.8	0.5	9.4 ms	0.3	(8 ⁻)	99 01Mo05 TJ IT=100
^{132}Pr	-75210	60			1.49 m	0.11	(2 ⁺)	01 94Bu18 TJ β^+ =100
$^{132}\text{Pr}^m$	-75210#	120#	0#	100#	20#	s	(5 ⁺)	90Ko25 J β^+ ?
^{132}Nd	-71426	24			1.56 m	0.10	0 ⁺	97 95Bu11 T β^+ =100
^{132}Pm	-61710#	200#			6.3 s	0.7	(3 ⁺)	92 β^+ =100; β^+ p \approx 5e-5
^{132}Sm	-55250#	300#			4.0 s	0.3	0 ⁺	92 β^+ =100; β^+ p ?
^{132}Eu	-42500#	400#			100#	ms		93Li40 D β^+ ?; p=0
* ^{132}Pr	T : average 94Bu18=1.47(0.12) 74Ar27=1.6(0.3) **							
* ^{132}Nd	T : average 95Bu11=1.47(0.12) 77Bo02=1.75(0.17) **							
^{133}In	-57930#	300#			165 ms	3	(9/2 ⁺)	02 96Ho16 J β^- =100; β^- n=85 10
$^{133}\text{In}^m$	-57600#	300#	330#	40#	180#	ms	(1/2 ⁻)	96Ho16 J IT ?
^{133}Sn	-70950	40			1.45 s	0.03	7/2 ⁻ #	98 93Ru01 D β^- =100; β^- n=0.0294 24
^{133}Sb	-78943	25			2.5 m	0.1	(7/2 ⁺)	95 β^- =100
^{133}Te	-82945	24			12.5 m	0.3	(3/2 ⁺)	95 β^- =100
$^{133}\text{Te}^m$	-82611	24	334.26	0.04	55.4 m	0.4	(11/2 ⁻)	95 β^- =82.5 30; IT=17.5 30
^{133}I	-85887	5			20.8 h	0.1	7/2 ⁺	95 β^- =100
$^{133}\text{I}^m$	-84253	5	1634.174	0.017	9 s	2	(19/2 ⁻)	95 IT=100
^{133}Xe	-87643.6	2.4			5.2475 d	0.0005	3/2 ⁺	95 02Un02 T β^- =100
$^{133}\text{Xe}^m$	-87410.4	2.4	233.221	0.018	2.19 d	0.01	11/2 ⁻	95 IT=100
^{133}Cs	-88070.958	0.022			STABLE		7/2 ⁺	95 IS=100.
^{133}Ba	-87553.5	1.0			10.51 y	0.05	1/2 ⁺	95 ϵ =100
$^{133}\text{Ba}^m$	-87265.3	1.0	288.247	0.009	38.9 h	0.1	11/2 ⁻	95 IT \approx 100; ϵ =0.0096 11
^{133}La	-85494	28			3.912 h	0.008	5/2 ⁺	95 β^+ =100
$^{133}\text{La}^m$	-84958	28	535.60	0.02	62 ns	3	11/2 ⁻	
^{133}Ce	-82423	16			97 m	4	1/2 ⁺	97 β^+ =100
$^{133}\text{Ce}^m$	-82386	16	37.1	0.8	4.9 h	0.4	9/2 ⁻	97 β^+ =100
^{133}Pr	-77938	12			6.5 m	0.3	(3/2 ⁺)	97 β^+ =100
$^{133}\text{Pr}^m$	-77746	12	192.05	0.14	1.1 μ s	0.2	(11/2 ⁻)	97 01Xu04 T IT=100
^{133}Nd	-72330	50			70 s	10	(7/2 ⁺)	97 β^+ =100
$^{133}\text{Nd}^m$	-72200	50	127.97	0.11	70 s		(1/2 ⁺)	97 95Br24 D β^+ \approx 100; IT=?
$^{133}\text{Nd}^n$	-72150	50	176.10	0.10	300 ns		(9/2 ⁻)	97 IT=100
^{133}Pm	-65410	50			& 15 s	3	(3/2 ⁺)	95 96Ga17 J β^+ =100
$^{133}\text{Pm}^m$	-65280	50	130.4	1.0	& 10# s		(11/2 ⁻)	96Ga17 EJ β^+ ?; IT ?
^{133}Sm	-57130#	200#			2.90 s	0.17	(5/2 ⁺)	01 01Xu04 T β^+ =100; β^+ p=?
^{133}Eu	-47280#	300#			200#	ms	11/2 ⁻ #	β^+ ?
* ^{133}In	D : β^- n intensity is from 93Ru01 **							
* $^{133}\text{Pm}^m$	E : combining γ s from Table 1: 214.7 + 357.7 + 453.8 - 252.8 - 643(1) **							
* ^{133}Sm	T : average 01Xu04=3.1(0.5) 85Wi07=2.8(0.2) 77Bo02=3.2(0.4) **							

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens Reference	Decay modes and intensities (%)
^{134}In	-52020#	400#			140 ms	4	high	02 96Ho16 J $\beta^- = 100; \beta^- n = 65; \dots$ *
^{134}Sn	-66800	100			1.12 s	0.08	0 ⁺	94 $\beta^- = 100; \beta^- n = 17$ 13
^{134}Sb	-74170	40			* 780 ms	60	(0 ⁻)	95 $\beta^- = 100$
$^{134}\text{Sb}^m$	-74090	100	80	110	BD*	10.22 s	0.09	(7 ⁻) 95 $\beta^- = 100; \beta^- n = 0.091$ 8
^{134}Te	-82559	11			41.8 m	0.8	0 ⁺	98 $\beta^- = 100$
$^{134}\text{Te}^m$	-80868	11	1691.24	0.17	164 ns	1	6 ⁺	98 IT=100
^{134}I	-84072	8			52.5 m	0.2	(4 ⁺)	94 $\beta^- = 100$
$^{134}\text{I}^m$	-83756	8	316.49	0.22	3.60 m	0.10	(8 ⁻)	94 IT=97.7 10; $\beta^- = 2.3$ 10
^{134}Xe	-88124.5	0.8			STABLE	(>11 Py)	0 ⁺	94 89Ba22 T IS=10.44 10; $2\beta^-$?
$^{134}\text{Xe}^m$	-86159.0	0.9	1965.5	0.5	290 ms	17	7 ⁻	94 IT=100
^{134}Cs	-86891.181	0.026			2.0648 y	0.0010	4 ⁺	94 $\beta^- = 100; \epsilon = 0.0003$ 1
$^{134}\text{Cs}^m$	-86752.437	0.026	138.7441	0.0026	2.903 h	0.008	8 ⁻	94 IT=100
^{134}Ba	-88949.9	0.4			STABLE		0 ⁺	95 IS=2.417 18
^{134}La	-85219	20			6.45 m	0.16	1 ⁺	94 $\beta^+ = 100$
^{134}Ce	-84836	20			3.16 d	0.04	0 ⁺	94 $\epsilon = 100$
^{134}Pr	-78510	40			& 11 m		(5 ⁻)	94 $\beta^+ = 100$
$^{134}\text{Pr}^m$	-78510#	110#	0#	100#	& 17 m	2	2 ⁻	94 $\beta^+ = 100$
^{134}Nd	-75646	12			8.5 m	1.5	0 ⁺	99 $\beta^+ = 100$
$^{134}\text{Nd}^m$	-73353	12	2293.1	0.4	410 μs	30	(8 ⁻)	99 IT=100
^{134}Pm	-66740	60			* 22 s	1	(5 ⁺)	94 $\beta^+ = 100$
$^{134}\text{Pm}^m$	-66740#	120#	0#	100#	* 5 s		(2 ⁺)	94 $\beta^+ = 100$
^{134}Sm	-61510#	200#			10 s	1	0 ⁺	94 $\beta^+ = 100$
^{134}Eu	-49830#	200#			500 ms	200		94 $\beta^+ = 100; \beta^+ p = ?$
^{134}Gd	-41570#	400#			400# ms		0 ⁺	$\beta^+ ?$
* ^{134}In	D : ... ; $\beta^- 2n < 4$							**
* ^{134}In	D : $\beta^- 2n$ intensity limits is from 95Jo.A							**
^{135}In	-47200#	500#			92 ms	10	9/2 ⁺ #	02 $\beta^- ?; \beta^- n ?$
^{135}Sn	-60800#	400#			530 ms	20	(7/2 ⁻)	02 $\beta^- = 100; \beta^- n = 21$ 3
^{135}Sb	-69710	100			1.68 s	0.02	(7/2 ⁺)	02 02Sh08 J $\beta^- = 100; \beta^- n = 22$ 3
^{135}Te	-77830	90			19.0 s	0.2	(7/2 ⁻)	98 $\beta^- = 100$
$^{135}\text{Te}^m$	-76280	90	1554.88	0.17	510 ns	20	(19/2 ⁻)	98 IT=100
^{135}I	-83790	7			6.57 h	0.02	7/2 ⁺	98 $\beta^- = 100$
^{135}Xe	-86417	5			9.14 h	0.02	3/2 ⁺	98 $\beta^- = 100$
$^{135}\text{Xe}^m$	-85890	5	526.551	0.013	15.29 m	0.05	11/2 ⁻	98 IT \approx 100; $\beta^- = 0.30$ 17 *
^{135}Cs	-87581.9	1.0			2.3 My	0.3	7/2 ⁺	98 $\beta^- = 100$
$^{135}\text{Cs}^m$	-85949.0	1.8	1632.9	1.5	53 m	2	19/2 ⁻	98 IT=100
^{135}Ba	-87850.5	0.4			STABLE		3/2 ⁺	98 IS=6.592 12
$^{135}\text{Ba}^m$	-87582.3	0.4	268.22	0.02	28.7 h	0.2	11/2 ⁻	98 IT=100
^{135}La	-86651	10			19.5 h	0.2	5/2 ⁺	98 $\beta^+ = 100$
^{135}Ce	-84625	11			17.7 h	0.3	1/2 ⁽⁺⁾	98 $\beta^+ = 100$
$^{135}\text{Ce}^m$	-84179	11	445.8	0.2	20 s	1	(11/2 ⁻)	98 IT=100
^{135}Pr	-80936	12			24 m	2	3/2 ⁽⁺⁾	98 $\beta^+ = 100$
$^{135}\text{Pr}^m$	-80578	12	358.06	0.06	105 μs	10	(11/2 ⁻)	98 IT=100
^{135}Nd	-76214	19			12.4 m	0.6	9/2 ⁽⁻⁾	98 $\beta^+ = 100$
$^{135}\text{Nd}^m$	-76149	19	65.0	0.2	5.5 m	0.5	(1/2 ⁺)	98 $\beta^+ > 99.97; IT < 0.03$
^{135}Pm	-69980	60			* & 49 s	3	(5/2 ⁺ , 3/2 ⁺)	98 $\beta^+ = 100$
$^{135}\text{Pm}^m$	-69930#	120#	50#	100#	* & 40 s	3	(11/2 ⁻)	98 89Ko07 TJ $\beta^+ = 100$
^{135}Sm	-62860	150			* 10.3 s	0.5	(7/2 ⁺)	98 77Bo02 J $\beta^+ = 100; \beta^+ p = 0.02$ 1
$^{135}\text{Sm}^m$	-62860#	340#	0#	300#	* 2.4 s	0.9	(3/2 ⁺ , 5/2 ⁺)	98 89Vi04 TJD $\beta^+ = 100$ *
^{135}Eu	-54190#	300#			1.5 s	0.2	11/2 ⁻ #	98 $\beta^+ = 100; \beta^+ p ?$
^{135}Gd	-44180#	500#			1.1 s	0.2	3/2 ⁻	98 98St28 J $\beta^+ = 100; \beta^+ p \approx 2$
* $^{135}\text{Xe}^m$	D : β^- ranging 0.004 to 0.6%							**
* $^{135}\text{Sm}^m$	I : existence of $^{135}\text{Sm}^m$ and spins of both states are discussed in ENSDF							**

Nuclide	Mass excess (keV)	Excitation energy(keV)				Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{136}Sn	-56500# 500#					250 ms	30	0^+	02		$\beta^- = 100; \beta^- n = 30.5$
^{136}Sb	-64880# 300#					923 ms	14	$1^- \#$	02		$\beta^- = 100; \beta^- n = 16.3, 32, \dots$ *
$^{136}\text{Sb}^m$	-64710# 300#	173	3			570 ns	50	$6^- \#$	02	01Mi22 E	IT=100
^{136}Te	-74430 50					17.63 s	0.08	0^+	02		$\beta^- = 100; \beta^- n = 1.31, 5$
^{136}I	-79500 50					83.4 s	1.0	(1^-)	02		$\beta^- = 100$
$^{136}\text{I}^m$	-78850 110	650	120	BD		46.9 s	1.0	(6^-)	02		$\beta^- = 100; IT=0$
^{136}Xe	-86425 7					STABLE	(>10 Zy)	0^+	02	02Be74 T	IS=8.87 16; $2\beta^- ?$
$^{136}\text{Xe}^m$	-84533 7	1891.703	0.014			2.95 μs	0.09	6^+	02		IT=100
^{136}Cs	-86338.7 1.9				*	13.16 d	0.03	5^+	02		$\beta^- = 100$
$^{136}\text{Cs}^m$	-85821 5	518	5	*		19 s	2	8^-	02	83We07 E	IT=?; $\beta^- ?$
^{136}Ba	-88886.9 0.4					STABLE		0^+	02		IS=7.854 24
$^{136}\text{Ba}^m$	-86856.4 0.4	2030.466	0.018			308.4 ms	1.9	7^-	02		IT=100
^{136}La	-86040 50					9.87 m	0.03	1^+	02		$\beta^+ = 100$
$^{136}\text{La}^m$	-85790 50	255	9			114 ms	3	$(8)^{-\#}$	02	ABBW E	IT=100
^{136}Ce	-86468 13					STABLE	(>38 Py)	0^+	02	01Da22 T	IS=0.185 2; $2\beta^+ ?$
$^{136}\text{Ce}^m$	-83373 13	3095.5	0.4			2.2 μs	0.2	10^+	02		IT=100
^{136}Pr	-81327 12					13.1 m	0.1	2^+	02		$\beta^+ = 100$
$^{136}\text{Pr}^m$	-80732 12	594.62	0.22			91.7 ns	0.9	$(6)^+$	02		IT=100
^{136}Nd	-79199 12					50.7 m	0.3	0^+	02		$\beta^+ = 100$
^{136}Pm	-71200 80				* &	107 s	6	(5^-)	02		$\beta^+ = 100$
$^{136}\text{Pm}^m$	-71070 90	130	120	BD * &		47 s	2	(2^+)	02		$\beta^+ = 100$
^{136}Sm	-66811 12					47 s	2	0^+	02		$\beta^+ = 100$
$^{136}\text{Sm}^m$	-64546 12	2264.7	1.1			15 μs	1	(8^-)	02		IT=100
^{136}Eu	-56260# 200#				*	3.3 s	0.3	(7^+)	02	89Vi04 D	$\beta^+ = 100; \beta^+ p = 0.09, 3$
$^{136}\text{Eu}^m$	-56260# 540#	0#	500#	*		3.8 s	0.3	(3^+)	02	89Vi04 D	$\beta^+ = 100; \beta^+ p = 0.09, 3$
^{136}Gd	-49050# 400#					1# s	(>200 ns)	0^+	02	00So11 I	$\beta^+ ?$
^{136}Tb	-35970# 600#					200# ms			02		$\beta^+ ?$
* ^{136}Sb	D : . . . ; $\beta^- 2n = 0.28\#$										**
* $^{136}\text{La}^m$	E : approx. 10-40 keV above 230.1 level, from ENSDF'02, thus 230.1 + 25(9)										**
^{137}Sn	-50310# 600#					190 ms	60	$5/2^- \#$	02		$\beta^- = 100; \beta^- n = 58, 15$
^{137}Sb	-60260# 400#					450 ms	50	$7/2^+ \#$	94	02Sh08 TD	$\beta^- = 100; \beta^- n = 49, 10$
^{137}Te	-69560 120					2.49 s	0.05	$3/2^- \#$	94	93Ru01 D	$\beta^- = 100; \beta^- n = 2.99, 16$
^{137}I	-76503 28					24.13 s	0.12	$(7/2^+)$	94	93Ru01 TD	$\beta^- = 100; \beta^- n = 7.14, 23$ *
^{137}Xe	-82379 7					3.818 m	0.013	$7/2^-$	94		$\beta^- = 100$
^{137}Cs	-86545.6 0.5					30.1671 y	0.0013	$7/2^+$	01	02Un02 T	$\beta^- = 100$
^{137}Ba	-87721.2 0.4					STABLE		$3/2^+$	97		IS=11.232 24
$^{137}\text{Ba}^m$	-87059.5 0.4	661.659	0.003			2.552 m	0.001	$11/2^-$	97		IT=100
^{137}La	-87101 13					60 ky	20	$7/2^+$	94		$\epsilon = 100$
^{137}Ce	-85879 13					9.0 h	0.3	$3/2^+$	94		$\beta^+ = 100$
$^{137}\text{Ce}^m$	-85625 13	254.29	0.05			34.4 h	0.3	$11/2^-$	94		IT=99.22 3; $\beta^+ = 0.78, 3$
^{137}Pr	-83177 12					1.28 h	0.03	$5/2^+$	94		$\beta^+ = 100$
$^{137}\text{Pr}^m$	-82616 12	561.22	0.23			2.66 μs		$11/2^-$			
^{137}Nd	-79580 11					38.5 m	1.5	$1/2^+$	01		$\beta^+ = 100$
$^{137}\text{Nd}^m$	-79061 11	519.43	0.17			1.60 s	0.15	$(11/2^-)$	01		IT=100
^{137}Pm	-74073 13				&	2# m		$5/2^+ \#$			$\beta^+ ?$
$^{137}\text{Pm}^m$	-73920 50	150	50	BD &		2.4 m	0.1	$11/2^-$	94		$\beta^+ = 100$
^{137}Sm	-68030 40					45 s	1	$(9/2^-)$	94		$\beta^+ = 100$
$^{137}\text{Sm}^m$	-67850# 60#	180#	50#			20# s		$1/2^+ \#$			$\beta^+ ?$
^{137}Eu	-60020# 200#					8.4 s	0.5	$11/2^- \#$	94	88Be.A T	$\beta^+ = 100$
^{137}Gd	-51210# 400#					2.2 s	0.2	$7/2^+ \#$	94	99Xu05 T	$\beta^+ = 100; \beta^+ p = ?$
^{137}Tb	-41000# 600#					600# ms		$11/2^- \#$	96		$p ?; \beta^+ ?$
* ^{137}I	T : supersedes 74Ru08=24.5(0.2) from same group										**

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
¹³⁸ Sb	-55150#	300#		500#	ms (>300 ns)	2 ⁻ #	03	94Be24 I	β^- ?; β^-_n ?		
¹³⁸ Te	-65930#	210#		1.4	s	0 ⁺	03		β^- =100; β^-_n =6.3 21		
¹³⁸ I	-72330	80		6.23	s	0.03	(2 ⁻)	03	93Ru01 D	β^- =100; β^-_n =5.46 18	
¹³⁸ Xe	-80150	40		14.08	m	0.08	0 ⁺	03		β^- =100	
¹³⁸ Cs	-82887	9		33.41	m	0.18	3 ⁻	03		β^- =100	
¹³⁸ Cs ^m	-82807	9	79.9	0.3	2.91	m	0.08	6 ⁻	03	IT=81 2; β^- =19 2	
¹³⁸ Cs ^z	-82847	25	40	23	R=?		fsmix				
¹³⁸ Ba	-88261.6	0.4			STABLE		0 ⁺	03		IS=71.698 42	
¹³⁸ Ba ^m	-86171.1	0.4	2090.54	0.06	800	ns	100	6 ⁺	03	IT=100	
¹³⁸ La	-86525	4			102	Gy	1	5 ⁺	03	IS=0.090 1; ...	
¹³⁸ La ^m	-86452	4	72.57	0.03	116	ns	5	(3 ⁺)	03	IT=100	
¹³⁸ Ce	-87569	10			STABLE		(>150 Ty)	0 ⁺	03	01Da22 T	IS=0.251 2; 2 β^+ ?
¹³⁸ Ce ^m	-85440	10	2129.17	0.12	8.65	ms	0.20	7 ⁻	03	IT=100	
¹³⁸ Pr	-83132	14			1.45	m	0.05	1 ⁺	03	β^+ =100	
¹³⁸ Pr ^m	-82783	17	348	23	BD	2.12	h	0.04	7 ⁻	03	β^+ =100
¹³⁸ Nd	-82018	12			5.04	h	0.09	0 ⁺	03	β^+ =100	
¹³⁸ Nd ^m	-78843	12	3174.9	0.4	410	ns	50	(10 ⁺)	03	IT=100	
¹³⁸ Pm	-74940	27			10	s	2	1 ⁺ #	03	β^+ =100	
¹³⁸ Pm ^m	-74911	13	30	30	BD *	3.24	m	0.05	5 ⁻ #	03	β^+ =100
¹³⁸ Pm ⁿ			non existent		EU	3.24	m	0.05	(3 ⁺)	03	β^+ =100
¹³⁸ Sm	-71498	12			3.1	m	0.2	0 ⁺	03	81De38 I	β^+ =100
¹³⁸ Eu	-61750	28			12.1	s	0.6	(6 ⁻)	03	β^+ =100	
¹³⁸ Gd	-55780#	200#			4.7	s	0.9	0 ⁺	03	β^+ =100	
¹³⁸ Gd ^m	-53550#	200#	2232.7	1.1	6	μ s	1	(8 ⁻)	03		
¹³⁸ Tb	-43630#	400#			800#	ms	(>200 ns)	0 ⁺	03	00So11 I	β^+ ?; p=0
¹³⁸ Dy	-34940#	600#			200#	ms		0 ⁺		β^+ ?	
* ¹³⁸ La	D : . . . ; β^+ =65.6 5; β^- =34.4 5									**	
* ¹³⁸ Pm ⁿ	D : arguments for a second isomer, of intermediate spin, are not convincing									**	
* ¹³⁸ Tb	D : from 93Li40									**	
¹³⁹ Sb	-50320#	500#			300#	ms (>300 ns)	7/2 ⁺ #	01	94Be24 I	β^- ?	
¹³⁹ Te	-60800#	400#			500#	ms (>300 ns)	5/2 ⁻ #	01	94Be24 I	β^- ?; β^-_n ?	
¹³⁹ I	-68840	30			2.282	s	0.010	7/2 ⁺ #	01	93Ru01 T	β^- =100; β^-_n =10.0 3
¹³⁹ Xe	-75644	21			39.68	s	0.14	3/2 ⁻	01		β^- =100
¹³⁹ Cs	-80701	3			9.27	m	0.05	7/2 ⁺	01		β^- =100
¹³⁹ Ba	-84913.7	0.4			83.1	m	0.3	(7/2 ⁻)	01		β^- =100
¹³⁹ La	-87231.4	2.4			STABLE			7/2 ⁺	01	IS=99.910 1	
¹³⁹ Ce	-86952	7			137.641	d	0.020	3/2 ⁺	01	ϵ =100	
¹³⁹ Ce ^m	-86198	7	754.24	0.08	56.54	s	0.13	11/2 ⁻	01	94ItA T	IT=100
¹³⁹ Pr	-84823	8			4.41	h	0.04	5/2 ⁺	01		β^+ =100
¹³⁹ Nd	-81992	26			29.7	m	0.5	3/2 ⁺	01		β^+ =100
¹³⁹ Nd ^m	-81761	26	231.15	0.05	5.50	h	0.20	11/2 ⁻	01		β^+ =88.2 4; IT=11.8 4
¹³⁹ Pm	-77496	13			4.15	m	0.05	(5/2 ⁺)	01		β^+ =100
¹³⁹ Pm ^m	-77307	13	188.7	0.3	180	ms	20	(11/2 ⁻)	01		IT \approx 100; β^+ =0.16#
¹³⁹ Sm	-72380	11			2.57	m	0.10	1/2 ⁺	01		β^+ =100
¹³⁹ Sm ^m	-71923	11	457.40	0.22	10.7	s	0.6	11/2 ⁻	01		IT=93.7 5; β^+ =6.3 5
¹³⁹ Eu	-65398	13			17.9	s	0.6	(11/2 ⁻)	01		β^+ =100
¹³⁹ Gd	-57530#	200#			5.7	s	0.3	9/2 ⁻ #	01	99Xi04 T	β^+ =100; β^+_p ?
¹³⁹ Gd ^m	-57280#	250#	250#	150#	*	4.8	s	0.9	1/2 ⁺ #	01	β^+ =100; β^+_p ?
¹³⁹ Tb	-48170#	300#			1.6	s	0.2	11/2 ⁻ #	01		β^+ =100; β^+_p ?
¹³⁹ Dy	-37690#	500#			600	ms	200	7/2 ⁺ #	01		β^+ =100; β^+_p ?
* ¹³⁹ I	T : average 93Ru01=2.280(0.011) 80Al15=2.29(0.02)									**	
* ¹³⁹ Gd	T : average 99Xi04=5.8(0.9) 88Be.A=5.8(0.4); other 83Ni05=4.9(1.0) not used									**	
* ¹³⁹ Gd	T : since it corresponds to a mixture of ground-state and isomer									**	
* ¹³⁹ Gd ^m	D : assuming that the delayed protons reported by 83Ni05 are from both states									**	

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁴⁰ Te	-56960#	300#		300# ms (>300 ns)	0 ⁺	98	94Be24 I	β^- ?; β^-_n ?
¹⁴⁰ I	-64270#	200#		860 ms	40	(3) ^(-#)	95	β^- =100; β^-_n =9.3 10
¹⁴⁰ Xe	-72990	60		13.60 s	0.10	0 ⁺	02	β^- =100
¹⁴⁰ Cs	-77051	8		63.7 s	0.3	1 ⁻	95	β^- =100
¹⁴⁰ Ba	-83271	8		12.752 d	0.003	0 ⁺	98	β^- =100
¹⁴⁰ La	-84321.0	2.4		1.6781 d	0.0003	3 ⁻	95	β^- =100
¹⁴⁰ Ce	-88083.3	2.5		STABLE		0 ⁺	95	IS=88.450 51
¹⁴⁰ Ce ^m	-85975.5	2.5	2107.85	0.03	7.3 μ s	1.5	6 ⁺	
¹⁴⁰ Pr	-84695	6		3.39 m	0.01	1 ⁺	95	β^+ =100
¹⁴⁰ Pr ^m	-83932	6	763.3	0.7	3.05 μ s	0.20	(8) ⁻	
¹⁴⁰ Nd	-84252	28		3.37 d	0.02	0 ⁺	95	ϵ =100
¹⁴⁰ Nd ^m	-82031	28	2221.4	0.1	600 μ s	50	7 ⁻	IT=100
¹⁴⁰ Pm	-78210	40		9.2 s	0.2	1 ⁺	95	β^+ =100
¹⁴⁰ Pm ^m	-77783	13	420	40	5.95 m	0.05	8 ⁻	β^+ =100
¹⁴⁰ Sm	-75456	12		14.82 m	0.12	0 ⁺	95	β^+ =100
¹⁴⁰ Eu	-66990	50		1.51 s	0.02	1 ⁺	95	β^+ =100
¹⁴⁰ Eu ^m	-66780	50	210	15	125 ms	2	5 ^{-#}	IT \approx 100; β^+ <1 *
¹⁴⁰ Gd	-61782	28		15.8 s	0.4	0 ⁺	95	β^+ =100
¹⁴⁰ Tb	-50480	800		2.4 s	0.2	5	97	β^+ =100; β^+_p =0.26 13
¹⁴⁰ Dy	-42840#	500#		700# ms		0 ⁺	02	β^+ ?
¹⁴⁰ Dy ^m	-40670#	500#	2166.1	0.5	7.0 μ s	0.5	(8) ⁻	β^+ ?
¹⁴⁰ Ho	-29310#	500#		6 ms	3	8 [#]	02	p=?; β^+ =1#
* ¹⁴⁰ Eu ^m	E : less than 50 keV above 185.3 level, from ENSDF, thus 185.3 + 25(15) **							
¹⁴¹ Te	-51560#	400#		100# ms (>300 ns)	5/2 ^{-#}	01	94Be24 I	β^- ?; β^-_n ?
¹⁴¹ I	-60520#	200#		430 ms	20	7/2 ^{+#}	01	β^- =100; β^-_n =21 3
¹⁴¹ Xe	-68330	90		1.73 s	0.01	5/2 ^(-#)	01	β^- =100; β^-_n =0.044 5
¹⁴¹ Cs	-74477	11		24.84 s	0.16	7/2 ⁺	01	β^- =100; β^-_n =0.035 3
¹⁴¹ Ba	-79726	8		18.27 m	0.07	3/2 ⁻	01	β^- =100
¹⁴¹ La	-82938	5		3.92 h	0.03	(7/2 ⁺)	01	β^- =100
¹⁴¹ Ce	-85440.1	2.5		32.508 d	0.013	7/2 ⁻	01	β^- =100
¹⁴¹ Pr	-86020.9	2.5		STABLE		5/2 ⁺	01	IS=100.
¹⁴¹ Nd	-84198	4		2.49 h	0.03	3/2 ⁺	01	β^+ =100
¹⁴¹ Nd ^m	-83441	4	756.51	0.05	62.0 s	0.8	11/2 ⁻	70Ab05 D
¹⁴¹ Pm	-80523	14		20.90 m	0.05	5/2 ⁺	01	β^+ =100
¹⁴¹ Pm ^m	-79895	14	628.40	0.10	630 ns	20	11/2 ⁻	IT=100
¹⁴¹ Sm	-75939	9		10.2 m	0.2	1/2 ⁺	01	β^+ =100
¹⁴¹ Sm ^m	-75763	9	176.0	0.3	22.6 m	0.2	11/2 ⁻	β^+ \approx 100; IT=0.31 3
¹⁴¹ Eu	-69927	13		40.7 s	0.7	5/2 ⁺	01	β^+ =100
¹⁴¹ Eu ^m	-69831	13	96.45	0.07	2.7 s	0.3	11/2 ⁻	IT=86 3; β^+ =14 3
¹⁴¹ Gd	-63224	20		14 s	4	(1/2 ⁺)	01	β^+ =100; β^+_p =0.03 1
¹⁴¹ Gd ^m	-62846	20	377.8	0.2	24.5 s	0.5	(11/2 ⁻)	β^+ =89 2; IT=11 2
¹⁴¹ Tb	-54540	110		3.5 s	0.2	(5/2 ⁻)	01	β^+ =100
¹⁴¹ Tb ^m	-54540#	230#	0#	200#	7.9 s	0.6	11/2 ^{-#}	88Be.A I
¹⁴¹ Dy	-45320#	300#		900 ms	200	(9/2 ⁻)	01	β^+ =100; β^+_p =?
¹⁴¹ Ho	-34370#	500#		4.1 ms	0.3	(7/2 ⁻)	02	p=?; β^+ =1#
¹⁴¹ Ho ^m	-34300#	500#	66	2	6.4 μ s	0.8	(1/2 ⁺)	02
* ¹⁴¹ Tb ^m	I : existence discussed in 88Be.A. Provisionally accepted **							
* ¹⁴¹ Ho ^m	T : from 01Se03=6.5(+0.7-0.9) **							

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁴² Te	-47430# 600#		50# ms (>300 ns)	0 ⁺	00	94Be24 I	β^- ?	
¹⁴² I	-55720# 400#		200 ms	2 ⁻ #	00		β^- =100; β^- n=25#	
¹⁴² Xe	-65480 100		1.22 s 0.02	0 ⁺	00	03Be05 TD	β^- =100; β^- n=0.36 3	
¹⁴² Cs	-70515 11		1.689 s 0.011	0 ⁻	00	93Ru01 T	β^- =100; β^- n=0.090 4 *	
¹⁴² Ba	-77823 6		10.6 m 0.2	0 ⁺	00		β^- =100 *	
¹⁴² La	-80035 6		91.1 m 0.5	2 ⁻	00		β^- =100	
¹⁴² Ce	-84538.5 3.0		STABLE (>50 Py)	0 ⁺	00		IS=11.114 51; α ?; $2\beta^-$? *	
¹⁴² Pr	-83792.7 2.5		19.12 h 0.04	2 ⁻	00		β^- \approx 100; ϵ =0.0164 8	
¹⁴² Pr ^m	-83789.0 2.5	3.694 0.003	14.6 m 0.5	5 ⁻	00		IT=100	
¹⁴² Nd	-85955.2 2.3		STABLE	0 ⁺	00		IS=27.2 5	
¹⁴² Pm	-81157 25		40.5 s 0.5	1 ⁺	00		β^+ =100	
¹⁴² Pm ^m	-80274 25	883.17 0.16	2.0 ms 0.2	(8) ⁻	00		IT=100	
¹⁴² Sm	-78993 6		72.49 m 0.05	0 ⁺	00		β^+ =100	
¹⁴² Eu	-71320 30		2.36 s 0.10	1 ⁺	00	91Fi03 T	β^+ =100 *	
¹⁴² Eu ^m	-70856 12	460 30 BD	1.223 m 0.008	8 ⁻	00		β^+ =100	
¹⁴² Gd	-66960 28		70.2 s 0.6	0 ⁺	00		β^+ =100	
¹⁴² Tb	-57060# 300#		597 ms 17	1 ⁺	00		β^+ =100; β^+ p=0.0022 11	
¹⁴² Tb ^m	-56780# 300#	280.2 1.0	303 ms 17	(5 ⁻)	00		IT \approx 100; β^+ <0.5	
¹⁴² Dy	-49960# 360#		2.3 s 0.3	0 ⁺	00		β^+ =100; β^+ p=0.06 3	
¹⁴² Ho	-37470# 500#		400 ms 100	(6 ν 0)	02		β^+ \approx 100; β^+ p=?; p \approx 0	
* ¹⁴² Cs	T : average 93Ru01=1.684(0.014) 77Re05=1.70(0.02)							**
* ¹⁴² Ba	D : β^- n=0.091(0.003)% in ENSDF'00 contradicts $Q(\beta^-)$ =-2955(7) keV							**
* ¹⁴² Ce	T : lower limit is for α decay; for $\beta\beta$ decay 01Da22>260 Py							**
* ¹⁴² Eu	T : average 91Fi03=2.34(0.12) 75Ke08=2.4(0.2)							**
¹⁴³ I	-51640# 400#		100# ms (>300 ns)	7/2 ⁺ #	02	94Be24 I	β^- ?; β^- n=40#	
¹⁴³ Xe	-60450# 200#		511 ms 6	5/2 ⁻	02	03Be05 TD	β^- =100; β^- n=1.00 15	
¹⁴³ Cs	-67671 24		1.791 s 0.007	3/2 ⁺	02		β^- =100; β^- n=1.64 7	
¹⁴³ Ba	-73936 13		14.5 s 0.3	5/2 ⁻	02		β^- =100	
¹⁴³ La	-78187 15		14.2 m 0.1	(7/2) ⁺	02		β^- =100	
¹⁴³ Ce	-81612.0 3.0		33.039 h 0.006	3/2 ⁻	02		β^- =100	
¹⁴³ Pr	-83073.5 2.6		13.57 d 0.02	7/2 ⁺	02		β^- =100	
¹⁴³ Nd	-84007.4 2.3		STABLE	7/2 ⁻	02		IS=12.2 2	
¹⁴³ Pm	-82966 3		265 d 7	5/2 ⁺	02		ϵ =100; e^+ <5.7e-6	
¹⁴³ Pm ^m	-82006 3	959.73 0.13	24.0 ns 0.7	11/2 ⁻	02		IT=100	
¹⁴³ Sm	-79523 4		8.75 m 0.08	3/2 ⁺	02		β^+ =100	
¹⁴³ Sm ^m	-78769 4	753.99 0.16	66 s 2	11/2 ⁻	02		IT \approx 100; β^+ =0.24 6	
¹⁴³ Sm ⁿ	-76729 4	2793.8 0.13	30 ms 3	23/2 ⁽⁻⁾	02		IT=100	
¹⁴³ Eu	-74242 11		2.59 m 0.02	5/2 ⁺	02		β^+ =100	
¹⁴³ Eu ^m	-73852 11	389.51 0.04	50.0 μ s 0.5	11/2 ⁻	02		IT=100	
¹⁴³ Gd	-68230 200		39 s 2	(1/2) ⁺	02	78Fi02 D	β^+ =100; β^+ p=?; β^+ α =? *	
¹⁴³ Gd ^m	-68080 200	152.6 0.5	110.0 s 1.4	(11/2 ⁻)	02	78Fi02 D	β^+ =100; β^+ p=?; β^+ α =? *	
¹⁴³ Tb	-60430 60		12 s 1	(11/2 ⁻)	01		β^+ =100	
¹⁴³ Tb ^m	-60430# 120#	0# 100#	* < 21 s	5/2 ⁺ #	01		β^+ ?	
¹⁴³ Dy	-52320# 200#		5.6 s 1.0	(1/2 ⁺)	01	03Xu04 TJ	β^+ =100; β^+ p=? *	
¹⁴³ Dy ^m	-52010# 200#	310.7 0.6	3.0 s 0.3	(11/2 ⁻)	01	03Xu04 JTD	β^+ =100; β^+ p=? *	
¹⁴³ Ho	-42280# 400#		300# ms (>200 ns)	11/2 ⁻ #	01	00So11 I	β^+ ?	
¹⁴³ Er	-31350# 600#		200# ms	9/2 ⁻ #			β^+ ?	
* ¹⁴³ Gd	D : 78Fi02: β^+ p and/or β^+ α for ¹⁴³ Gd+ ¹⁴³ Gd ^m =0.001%, 39 particles detected							**
* ¹⁴³ Dy	T : others: 84Ni03=3.2(0.6) 83Ni05=4.1(0.3) in two different experiments							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁴⁴ I	-46580# 500#		50# ms (>300 ns)	1 ⁻ #	01	94Be24 I	β^- ?; β^- n=40#	
¹⁴⁴ Xe	-57280# 300#		388 ms	0 ⁺	01	03Be05 TD	β^- =100; β^- n=3.0 3	
¹⁴⁴ Cs	-63270 26		994 ms	4	1 ^(-#)	01	β^- =100; β^- n=3.20 21	
¹⁴⁴ Cs ^m	-62970# 200#	300# 200#	< 1 s	(> 3)	01		β^- =?; IT ?	
¹⁴⁴ Ba	-71769 13		11.5 s	0.2	0 ⁺	01	β^- =100 *	
¹⁴⁴ La	-74890 50		40.8 s	0.4	(3 ⁻)	01	β^- =100	
¹⁴⁴ Ce	-80437 3		284.91 d	0.05	0 ⁺	01	β^- =100	
¹⁴⁴ Pr	-80756 3		17.28 m	0.05	0 ⁻	01	β^- =100	
¹⁴⁴ Pr ^m	-80697 3	59.03 0.03	7.2 m	0.3	3 ⁻	01	IT≈100; β^- =0.07	
¹⁴⁴ Nd	-83753.2 2.3		2.29 Py	0.16	0 ⁺	01	IS=23.8 3; α =100	
¹⁴⁴ Pm	-81421 3		363 d	14	5 ⁻	01	ϵ =100; e ⁺ <8e-5	
¹⁴⁴ Pm ^m	-80580 3	840.90 0.05	780 ns	200	(9 ⁺)	01	IT=100	
¹⁴⁴ Pm ⁿ	-72825 4	8595.8 2.2	2.7 μ s		(27 ⁺)	01	IT=100	
¹⁴⁴ Sm	-81972.0 2.8		STABLE		0 ⁺	01	IS=3.07 7; 2 β^+ ?; α ?	
¹⁴⁴ Sm ^m	-79648.4 2.8	2323.60 0.08	880 ns	25	6 ⁺	01	IT=100	
¹⁴⁴ Eu	-75622 11		10.2 s	0.1	1 ⁺	01	β^+ =100	
¹⁴⁴ Eu ^m	-74494 11	1127.6 0.6	1.0 μ s	0.1	(8 ⁻)	01	IT=100	
¹⁴⁴ Gd	-71760 28		4.47 m	0.06	0 ⁺	01	β^+ =100	
¹⁴⁴ Tb	-62368 28		1 s		1 ⁺	01	β^+ =100; β^+ p ?	
¹⁴⁴ Tb ^m	-61971 28	396.9 0.5	4.25 s	0.15	(6 ⁻)	01	IT=66; β^+ =34; β^+ p ?	
¹⁴⁴ Tb ⁿ	-61892 28	476.2 0.5	2.8 μ s	0.3	(8 ⁻)	01	IT=100	
¹⁴⁴ Tb ^p	-61851 28	517.1 0.5	670 ns	60	(9 ⁺)	01	IT=100	
¹⁴⁴ Dy	-56580 30		9.1 s	0.4	0 ⁺	01	β^+ =100; β^+ p=?	
¹⁴⁴ Ho	-45200# 300#		700 ms	100		01	β^+ =100; β^+ p=?	
¹⁴⁴ Er	-36910# 400#		400# ms (>200 ns)	0 ⁺	01	00So11 I	β^+ ?	
* ¹⁴⁴ Ba	D : β^- n=3.6 7 in ENSDF'01 belongs in fact to ¹⁴⁴ Cs							**
¹⁴⁵ Xe	-52100# 300#		188 ms	4	3/2 ⁻ #	97	β^- =100; β^- n=5.0 6	
¹⁴⁵ Cs	-60057 11		582 ms	6	3/2 ⁺	93	β^- =100; β^- n=14.3 8 *	
¹⁴⁵ Ba	-67410 70		4.31 s	0.16	5/2 ⁻	98	β^- =100	
¹⁴⁵ La	-72990 90		24.8 s	2.0	(5/2 ⁺)	98	β^- =100	
¹⁴⁵ Ce	-77100 40		3.01 m	0.06	(3/2 ⁻)	93	β^- =100	
¹⁴⁵ Pr	-79632 7		5.984 h	0.010	7/2 ⁺	93	β^- =100	
¹⁴⁵ Nd	-81437.1 2.3		STABLE		7/2 ⁻	93	IS=8.3 1	
¹⁴⁵ Pm	-81274 3		17.7 y	0.4	5/2 ⁺	93	ϵ =100; α =2.8e-7	
¹⁴⁵ Sm	-80657.7 2.8		340 d	3	7/2 ⁻	02	ϵ =100	
¹⁴⁵ Sm ^m	-71871.5 2.9	8786.2 0.7	990 ns	170	(49/2 ⁺)	02	IT=100	
¹⁴⁵ Eu	-77998 4		5.93 d	0.04	5/2 ⁺	93	β^+ =100	
¹⁴⁵ Eu ^m	-77282 4	716.0 0.3	490 ns		11/2 ⁻	93	IT=100	
¹⁴⁵ Gd	-72927 19		23.0 m	0.4	1/2 ⁺	01	β^+ =100	
¹⁴⁵ Gd ^m	-72178 19	749.1 0.2	85 s	3	11/2 ⁻	01	IT=94.3 5; β^+ =5.7 5	
¹⁴⁵ Tb	-65880 60		20# m		(3/2 ⁺)	96	β^+ ?	
¹⁴⁵ Tb ^m	-65880# 120#	0# 100#	30.9 s	0.7	(11/2 ⁻)	96	β^+ =100 *	
¹⁴⁵ Dy	-58290 50		9.5 s	1.0	(1/2 ⁺)	93	β^+ =100; β^+ p=? *	
¹⁴⁵ Dy ^m	-58170 50	118.2 0.2	14.1 s	0.7	(11/2 ⁻)	93	β^+ =100 *	
¹⁴⁵ Ho	-49180# 300#		2.4 s	0.1	(11/2 ⁻)	93	β^+ =100	
¹⁴⁵ Ho ^m	-49080# 320#	100# 100#	100# ms		5/2 ⁺ #		β^+ ?; IT ?	
¹⁴⁵ Er	-39690# 400#		900 ms	300	1/2 ⁺ #	98	β^+ =100; β^+ p=?	
¹⁴⁵ Tm	-27880# 400#		3.1 μ s	0.3	(11/2 ⁻)	02	p=100 *	
* ¹⁴⁵ Cs	T : average 93Ru01=579(6) 82Ra13=594(13)							**
* ¹⁴⁵ Tb ^m	T : average 93Al03=31.6(0.6) 82No08=29.5(1.0) and 82Al07=29.5(1.5)							**
* ¹⁴⁵ Dy	T : average 93Al03=10.5(1.5) 93To04=6(2) and 84Sc.C=10(1)							**
* ¹⁴⁵ Dy ^m	T : average 93To04=14.5(1.0) 82No08=13.6(1.0)							**
* ¹⁴⁵ Tm	T : average 03Ka04=3.1(0.3) 98Ba13=3.5(1.0) J : not adopted by ENSDF'02							**

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
¹⁴⁶ Xe	-48670#	400#			146	ms	6	0 ⁺	97	03Be05 TD	β^- =100; β^- n=6.9 15	
¹⁴⁶ Cs	-55620	70			323	ms	6	1 ⁻	97	93Ru01 T	β^- =100; β^- n=14.2 5 *	
¹⁴⁶ Ba	-65000	70			2.22	s	0.07	0 ⁺	97	93Ru01 D	β^- =100 *	
¹⁴⁶ La	-69120	70			6.27	s	0.10	2 ⁻	97	93Ru01 D	β^- =100 *	
¹⁴⁶ La ^m	-68990	150	130	130	*	10.0	s	0.1	(6 ⁻)	97	79Ke02 E	β^- =100 *
¹⁴⁶ Ce	-75680	70			13.52	m	0.13	0 ⁺	97		β^- =100	
¹⁴⁶ Pr	-76710	60			24.15	m	0.18	(2) ⁻	97		β^- =100	
¹⁴⁶ Nd	-80931.1	2.3			STABLE			0 ⁺	97		IS=17.2 3; 2 β^- ?; α ?	
¹⁴⁶ Pm	-79460	5			5.53	y	0.05	3 ⁻	99		ϵ =66.0 13; β^- =34.0 13	
¹⁴⁶ Sm	-81002	4			103	My	5	0 ⁺	97		α =100	
¹⁴⁶ Eu	-77122	6			4.61	d	0.03	4 ⁻	97		β^+ =100	
¹⁴⁶ Eu ^m	-76456	6	666.37	0.16	235	μ s	3	9 ⁺	97		IT=100	
¹⁴⁶ Gd	-76093	5			48.27	d	0.10	0 ⁺	01		ϵ =100	
¹⁴⁶ Tb	-67770	50			8	s	4	1 ⁺	97		β^+ =100	
¹⁴⁶ Tb ^m	-67620#	110#	150#	100#	*	24.1	s	0.5	5 ⁻	93Al03 T	β^+ =100	
¹⁴⁶ Tb ⁿ	-66840#	110#	930#	100#		1.18	ms	0.02	(10 ⁺)	97	IT=100 *	
¹⁴⁶ Dy	-62554	27			33.2	s	0.7	0 ⁺	97	93Al03 T	β^+ =100	
¹⁴⁶ Dy ^m	-59618	27	2935.7	0.6	150	ms	20	10 ⁺ #	97		IT=100	
¹⁴⁶ Ho	-51570#	200#			3.6	s	0.3	(10 ⁺)	97		β^+ =100; β^+ p=?	
¹⁴⁶ Er	-44710#	300#			1.7	s	0.6	0 ⁺	97	93To05 D	β^+ =100; β^+ p=?	
¹⁴⁶ Tm	-31280#	400#			240	ms	30	(6 ⁻)	02		p \approx 100; β^+ ?	
¹⁴⁶ Tm ^m	-31200#	400#	71	6	p	72	ms	23	(10 ⁺)	02	p=?; β^+ =16#	
* ¹⁴⁶ Cs	T : average 93Ru01=321(2) 76Lu02=343(7)										**	
* ¹⁴⁶ Ba	D : 93Ru01 β^- n<0.02% is not relevant since $Q(\beta^-$ n) is negative: =-190(100)										**	
* ¹⁴⁶ La	D : 93Ru01 β^- n<0.007% is not relevant since $Q(\beta^-$ n) is negative: =-180(80)										**	
* ¹⁴⁶ La ^m	E : derived from $Q(^{146}\text{La}^m)$ =6660(120) in 79Ke02										**	
* ¹⁴⁶ Tb ⁿ	E : 779.6 keV above ¹⁴⁶ Tb ^m , from ENSDF										**	
¹⁴⁷ Xe	-43260#	400#			130	ms	80	3/2 ⁻ #	98	03Be05 TD	β^- =100; β^- n=4.0 23 *	
¹⁴⁷ Cs	-52020	50			225	ms	5	(3/2 ⁺)	92	93Ru01 D	β^- =100; β^- n=28.5 17	
¹⁴⁷ Ba	-60600#	210#			893	ms	1	(3/2 ⁺)	98	93Ru01 D	β^- =100 *	
¹⁴⁷ La	-66850	50			4.015	s	0.008	(5/2 ⁺)	98	93Ru01 D	β^- =100; β^- n=0.040 3 *	
¹⁴⁷ Ce	-72030	30			56.4	s	1.0	(5/2 ⁻)	92		β^- =100	
¹⁴⁷ Pr	-75455	23			13.4	m	0.4	(3/2 ⁺)	92		β^- =100	
¹⁴⁷ Nd	-78151.9	2.3			10.98	d	0.01	5/2 ⁻	92		β^- =100	
¹⁴⁷ Pm	-79047.9	2.4			2.6234	y	0.0002	7/2 ⁺	96		β^- =100	
¹⁴⁷ Sm	-79272.1	2.4			106.0	Gy	1.1	7/2 ⁻	92	70Gu14 T	IS=14.99 18; α =100 *	
¹⁴⁷ Eu	-77550	3			24.1	d	0.6	5/2 ⁺	99		β^+ \approx 100; α =0.0022 6	
¹⁴⁷ Gd	-75363	3			38.06	h	0.12	7/2 ⁻	99		β^+ =100	
¹⁴⁷ Gd ^m	-66775	3	8587.8	0.4	510	ns	20	(49/2 ⁺)	99		IT=100	
¹⁴⁷ Tb	-70752	12			1.64	h	0.03	1/2 ⁺ #	99	97Wa04 T	β^+ =100	
¹⁴⁷ Tb ^m	-70701	12	50.6	0.9	1.87	m	0.05	(11/2) ⁻	99	93Al03 T	β^+ =100 *	
¹⁴⁷ Dy	-64188	20			40	s	10	1/2 ⁺	92	84To07 D	β^+ =100; β^+ p \approx 0.05	
¹⁴⁷ Dy ^m	-63438	20	750.5	0.4	55	s	1	11/2 ⁻	92		β^+ =65 4; IT=35 4	
¹⁴⁷ Ho	-55837	28			5.8	s	0.4	(11/2 ⁻)	92		β^+ =100; β^+ p ?	
¹⁴⁷ Er	-47050#	300#			* &	2.5	s	(1/2 ⁺)	92		β^+ =100; β^+ p=?	
¹⁴⁷ Er ^m	-46950#	300#	100#	50#	* &	2.5	s	(11/2 ⁻)	92		β^+ =100 *	
¹⁴⁷ Tm	-36370#	300#			580	ms	30	11/2 ⁻	02		β^+ =85 5; p=15 5	
¹⁴⁷ Tm ^m	-36300#	300#	60	5	p	360	μ s	40	3/2 ⁺	02	p=100	
* ¹⁴⁷ Xe	D : from β^- n<8%										**	
* ¹⁴⁷ Ba	D : 93Ru01 β^- n=0.06(3)% contradicts $Q(\beta^-$ n)=-340(120)										**	
* ¹⁴⁷ La	J : from 96Ur02										**	
* ¹⁴⁷ Sm	T : average 70Gu14=106(2) 65Va16=108(2) 64Do01=104(3) 61Wr02=105(2)										**	
* ¹⁴⁷ Tb ^m	T : average 93Al03=1.92(0.07) 73Bo13=1.83(0.06) E : from 87Li09										**	
* ¹⁴⁷ Er ^m	E : estimated from 11/2 ⁻ level in isotones ¹⁴¹ Sm=175 ¹⁴³ Gd=152 ¹⁴⁵ Dy=118										**	

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{148}Cs	-47300	580			146 ms	6		00		$\beta^- = 100; \beta^-_n = 25.1\ 25$
^{148}Ba	-58010	80			612 ms	17	0^+	00		$\beta^- = 100; \beta^-_n = 0.4\ 3$
^{148}La	-63130	60			1.26 s	0.08	(2^-)	00		$\beta^- = 100; \beta^-_n = 0.15\ 3$
^{148}Ce	-70391	29			56 s	1	0^+	00		$\beta^- = 100$
^{148}Pr	-72531	26			2.29 m	0.02	1^-	00		$\beta^- = 100$
$^{148}\text{Pr}^m$	-72480#	40#	50#	30#	* 2.01 m	0.07	(4)	00	ABBW E	$\beta^- = 100$ *
^{148}Nd	-77413.4	2.8			STABLE	(>3.0 Ey)	0^+	00	82Be20 T	IS=5.7 1; $2\beta^-$?; α ?
^{148}Pm	-76872	6			5.368 d	0.002	1^-	00		$\beta^- = 100$
$^{148}\text{Pm}^m$	-76734	6	137.9	0.3	41.29 d	0.11	$5^-, 6^-$	00		$\beta^- = 95.8\ 6; IT = 4.2\ 6$
^{148}Sm	-79342.2	2.4			7 Py	3	0^+	00		IS=11.24 10; $\alpha = 100$
^{148}Eu	-76302	10			54.5 d	0.5	5^-	00		$\beta^+ = 100; \alpha = 9.4e-7\ 28$
^{148}Gd	-76275.8	2.8			74.6 y	3.0	0^+	00		$\alpha = 100; 2\beta^+$?
^{148}Tb	-70540	14			60 m	1	2^-	00		$\beta^+ = 100$
$^{148}\text{Tb}^m$	-70450	14	90.1	0.3	2.20 m	0.05	$(9)^+$	00		$\beta^+ = 100$
$^{148}\text{Tb}^n$	-61921	14	8618.6	1.0	1.310 μs	0.007	(27^+)	00		IT=100
^{148}Dy	-67859	11			3.3 m	0.2	0^+	00		$\beta^+ = 100$
^{148}Ho	-58020	130			2.2 s	1.1	(1^+)	00		$\beta^+ = 100$
$^{148}\text{Ho}^m$	-57620#	160#	400#	100#	9.49 s	0.12	$(6)^-$	00	93A103 T	$\beta^+ = 100; \beta^+_p = 0.08\ 1$ *
$^{148}\text{Ho}^n$	-57330#	160#	690#	100#	2.35 ms	0.04	(10^+)	00		IT=100 *
^{148}Er	-51650#	200#			4.6 s	0.2	0^+	00		$\beta^+ = 100; \beta^+_p \approx 0.15$
^{148}Tm	-39270#	400#			700 ms	200	(10^+)	00		$\beta^+ = 100$
^{148}Yb	-30350#	600#			250# ms		0^+			$\beta^+ ?$
* $^{148}\text{Pr}^m$	E : derived from ENSDF estimate $E < 90$ keV **									
* $^{148}\text{Ho}^m$	T : average 93A103=9.30(0.20) 89Ta11=9.59(0.15) **									
* $^{148}\text{Ho}^n$	E : 694.4 keV above $^{148}\text{Ho}^m$, from ENSDF **									
^{149}Cs	-43850#	200#			150# ms	(>50 ms)	$3/2^+\#$	95	87Ra12 I	$\beta^- ?; \beta^-_n ?$
^{149}Ba	-53490#	200#			344 ms	7	$3/2^-\#$	95		$\beta^- = 100; \beta^-_n = 0.43\ 12$
^{149}La	-60800#	320#			1.05 s	0.03	$5/2^+\#$	95	93Ru01 D	$\beta^- = 100; \beta^-_n = 1.4\ 3$
^{149}Ce	-66700	100			5.3 s	0.2	$3/2^-\#$	98		$\beta^- = 100$
^{149}Pr	-71060	80			2.26 m	0.07	$(5/2^+)$	95		$\beta^- = 100$
^{149}Nd	-74380.9	2.8			1.728 h	0.001	$5/2^-$	95		$\beta^- = 100$
^{149}Pm	-76071	4			53.08 h	0.05	$7/2^+$	95		$\beta^- = 100$
$^{149}\text{Pm}^m$	-75831	4	240.214	0.007	35 μs	3	$11/2^-$			
^{149}Sm	-77141.9	2.4			STABLE	(>2 Py)	$7/2^-$	95		IS=13.82 7; $\alpha ?$
^{149}Eu	-76447	4			93.1 d	0.4	$5/2^+$	95		$\epsilon = 100$
^{149}Gd	-75133	4			9.28 d	0.10	$7/2^-$	01		$\beta^+ = 100; \alpha = 4.3e-4\ 10$
^{149}Tb	-71496	4			4.118 h	0.025	$1/2^+$	99		$\beta^+ = 83.3\ 17; \alpha = 16.7\ 17$
$^{149}\text{Tb}^m$	-71460	4	35.78	0.13	4.16 m	0.04	$11/2^-$	99		$\beta^+ \approx 100; \alpha = 0.022\ 3$
^{149}Dy	-67715	9			4.20 m	0.14	$7/2^{(-)}$	95	88Ah02 J	$\beta^+ = 100$
$^{149}\text{Dy}^m$	-65054	9	2661.1	0.4	490 ms	15	$(27/2^-)$	95		IT=99.3 3; $\beta^+ = 0.7\ 3$
$^{149}\text{Dy}^n$	-60230	30	7490	30	28 ns	2	$(47/2^+)$	95		IT=100 *
^{149}Ho	-61688	18			21.1 s	0.2	$(11/2^-)$	95		$\beta^+ = 100$
$^{149}\text{Ho}^m$	-61639	18	48.80	0.20	56 s	3	$(1/2^+)$	95		$\beta^+ = 100$
^{149}Er	-53742	28			4 s	2	$(1/2^+)$	95		$\beta^+ = 100; \beta^+_p = 7\ 2$
$^{149}\text{Er}^m$	-53000	28	741.8	0.2	8.9 s	0.2	$(11/2^-)$	95		$\beta^+ = 96.5\ 7; IT = 3.5\ 7; \dots$ *
^{149}Tm	-44040#	300#			900 ms	200	$(11/2^-)$	95		$\beta^+ = 100; \beta^+_p = 0.26\ 15$
^{149}Yb	-33500#	500#			700 ms	200	$(1/2^+, 3/2^+)$	95	01Xu06 TD	$\beta^+ = 100; \beta^+_p = ?$
* $^{149}\text{Dy}^n$	E : 7409.9 above level at ≈ 80 keV **									
* $^{149}\text{Er}^m$	D : ... ; $\beta^+_p = 0.18\ 7$ **									
^{150}Cs	-38960#	300#			100# ms	(>50 ms)		97	87Ra12 I	$\beta^- ?; \beta^-_n ?$
^{150}Ba	-50600#	400#			300 ms		0^+	95		$\beta^- = 100; \beta^-_n ?$
^{150}La	-57040#	400#			510 ms	30	(3^+)	97	95Ok02 TJ	$\beta^- = 100; \beta^-_n = 2.7\ 3$
^{150}Ce	-64820	50			4.0 s	0.6	0^+	95		$\beta^- = 100$
^{150}Pr	-68304	26			6.19 s	0.16	$(1)^-$	96		$\beta^- = 100$
^{150}Nd	-73690	3			6.7 Ey	0.7	0^+	96	97De40 TD	IS=5.6 2; $2\beta^- = 100$ *
^{150}Pm	-73603	20			2.68 h	0.02	(1^-)	95		$\beta^- = 100$

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
¹⁵⁰ Sm	-77057.3	2.4	STABLE	0 ⁺	96		IS=7.38 1	
¹⁵⁰ Eu	-74797	6	36.9 y	0.9	5 ⁽⁻⁾	95	$\beta^+=100$	
¹⁵⁰ Eu ^m	-74755	6	42.1 0.5	12.8 h	0.1	0 ⁻	$\beta^-=89.2; \beta^+=11.2; \dots$ *	
¹⁵⁰ Gd	-75769	6	1.79 My	0.08	0 ⁺	96	$\alpha=100; 2\beta^+?$	
¹⁵⁰ Tb	-71111	8	3.48 h	0.16	(2 ⁻)	96	$\beta^+\approx 100; \alpha < 0.05$	
¹⁵⁰ Tb ^m	-70654	28	457 29 MD	5.8 m	0.2	9 ⁺	$\beta^+\approx 100; IT?$	
¹⁵⁰ Dy	-69317	5	7.17 m	0.05	0 ⁺	96	$\beta^+=64.5; \alpha=36.5$	
¹⁵⁰ Ho	-61948	14	*	76.8 s	1.8	2 ⁻	95 93Al03 T $\beta^+=100$ *	
¹⁵⁰ Ho ^m	-61960	50	-10 50 BD *	23.3 s	0.3	(9 ⁺)	95 $\beta^+=100$	
¹⁵⁰ Ho ⁿ	-61960	50	8000	751 ns				
¹⁵⁰ Er	-57833	17		18.5 s	0.7	0 ⁺	95 $\beta^+=100$	
¹⁵⁰ Tm	-46610#	200#		* & 3#	s	(1 ⁺)	88Ni02 J $\beta^+=100$	
¹⁵⁰ Tm ^m	-46470#	240#	140# 140#	* & 2.20	s	0.06	(6 ⁻) 95 96Ga24 T $\beta^+=100; \beta^+p=1.2.3$ *	
¹⁵⁰ Tm ⁿ	-45800#	240#	810# 140#	5.2	ms	0.3	(10 ⁺) 95 IT=100 *	
¹⁵⁰ Yb	-38730#	400#		700#	ms (>200 ns)	0 ⁺	97 00So11 I $\beta^+?$	
¹⁵⁰ Lu	-24940#	500#		46	ms	6	(5 ⁻ , 6 ⁻) 02 00Gi01 J $p=?; \beta^+=30\#$	
¹⁵⁰ Lu ^m	-24900#	500#	34 15 p	80	μ s	60	(1 ⁺ , 2 ⁺) 02 00Gi01 J $p\approx 100; \beta^+?$	
* ¹⁵⁰ Nd	T : from 6.75(+0.37-0.68 statistics + 0.68 systematics)							**
* ¹⁵⁰ Eu ^m	D : ... ; IT \leq 5e-8							**
* ¹⁵⁰ Ho	T : average 93Al03=78(2) 82No08=72(4)							**
* ¹⁵⁰ Tm ^m	T : average 96Ga24=2.22(0.07) 88Ni02=2.15(0.10) and 87To05=2.2(0.2)							**
* ¹⁵⁰ Tm ⁿ	T : 82No08=3.5(0.6) at variance, not used D : from 88Ni02							**
* ¹⁵⁰ Tm ⁿ	E : 671.6 keV above ¹⁵⁰ Tm ^m , from ENSDF							**
¹⁵¹ Cs	-35220#	500#		60#	ms (>50 ms)	3/2 ⁺ #	97 87Ra12 I $\beta^-?; \beta^-n?$	
¹⁵¹ Ba	-45820#	400#		200#	ms (>300 ns)	3/2 ⁻ #	97 94Be24 I $\beta^-?$	
¹⁵¹ La	-54290#	400#		300#	ms (>300 ns)	5/2 ⁺ #	97 94Be24 I $\beta^-?$	
¹⁵¹ Ce	-61500	100		1.02	s	0.06	3/2 ⁻ # 97 $\beta^-=100$	
¹⁵¹ Pr	-66771	23		18.90	s	0.07	(3/2) ^(-#) 97 $\beta^-=100$	
¹⁵¹ Nd	-70953	3		12.44	m	0.07	3/2 ⁺ 97 $\beta^-=100$	
¹⁵¹ Pm	-73395	5		28.40	h	0.04	5/2 ⁺ 97 $\beta^-=100$	
¹⁵¹ Sm	-74582.5	2.4		90	y	8	5/2 ⁻ 97 $\beta^-=100$	
¹⁵¹ Sm ^m	-74321.4	2.4	261.13 0.04	1.4	μ s	0.1	(11/2) ⁻ 97 IT=100	
¹⁵¹ Eu	-74659.1	2.5		STABLE		5/2 ⁺	97 IS=47.81 3	
¹⁵¹ Eu ^m	-74462.9	2.5	196.245 0.010	58.9	μ s	0.5	11/2 ⁻ 97	
¹⁵¹ Gd	-74195	4		124	d	1	7/2 ⁻ 97 $\epsilon=100; \alpha=1.0e-6.6$	
¹⁵¹ Tb	-71630	5		17.609	h	0.001	1/2 ⁽⁺⁾ 99 $\beta^+\approx 100; \alpha=0.0095.15$	
¹⁵¹ Tb ^m	-71530	5	99.54 0.06	25	s	3	(11/2 ⁻) 99 IT=93.8 4; $\beta^+=6.2.4$	
¹⁵¹ Dy	-68759	4		17.9	m	0.3	7/2 ⁽⁻⁾ 99 $\beta^+=?; \alpha=5.6.4$	
¹⁵¹ Ho	-63632	12		35.2	s	0.1	11/2 ⁽⁻⁾ 97 87Ne.A J $\beta^+=?; \alpha=22.3$	
¹⁵¹ Ho ^m	-63591	12	41.0 0.2	47.2	s	1.0	1/2 ⁽⁺⁾ 97 87Ne.A J $\alpha=77.18; \beta^+?$	
¹⁵¹ Er	-58266	16		23.5	s	1.3	(7/2 ⁻) 97 $\beta^+=100$	
¹⁵¹ Er ^m	-55681	16	2585.5 0.6	580	ms	20	(27/2 ⁻) 97 IT=95.3 3; $\beta^+=4.7.3$	
¹⁵¹ Tm	-50782	20		& 4.17	s	0.10	(11/2 ⁻) 97 $\beta^+=100$	
¹⁵¹ Tm ^m	-50690	21	92 7 AD &	6.6	s	1.4	(1/2 ⁺) 97 $\beta^+=100$	
¹⁵¹ Tm ⁿ	-48126	20	2655.67 0.22	451	ns	24	(27/2 ⁻) 97 IT=100	
¹⁵¹ Yb	-41540	300		1.6	s	0.5	(1/2 ⁺) 97 86To12 T $\beta^+=100; \beta^+p=?$ *	
¹⁵¹ Yb ^m	-40790#	320#	750# 100#	1.6	s	0.5	(11/2 ⁻) 97 86To12 TD $\beta^+\approx 100; \beta^+p=?; IT=0.4\#$ *	
¹⁵¹ Yb ⁿ	-39750#	580#	1790# 500#	2.6	μ s	0.7	19/2 ⁻ # 97 IT=100 *	
¹⁵¹ Yb ^p	-39090#	580#	2450# 500#	20	μ s	1	27/2 ⁻ # 97 IT=100 *	
¹⁵¹ Lu	-30200#	400#		80.6	ms	1.9	(11/2 ⁻) 02 93Se04 D $p=?; \beta^+=37\#$ *	
¹⁵¹ Lu ^m	-30130#	400#	77 5 p	16	μ s	1	(3/2 ⁺) 02 $p=?; \beta^+?$	
* ¹⁵¹ Yb	T : derived from 1.6(0.1), for mixture of ground-state and isomer with almost same half-life							**
* ¹⁵¹ Yb ^m	E : 740# estimated by 90Ak01 (see ENSDF'97)							**
* ¹⁵¹ Yb ⁿ	E : 1791.2 keV above ¹⁵¹ Yb ^m (see ENSDF'97)							**
* ¹⁵¹ Yb ^p	E : 2448 keV above ¹⁵¹ Yb ^m (see ENSDF'97)							**
* ¹⁵¹ Lu	D : p=63.4(0.9)% in ENSDF'02, based on predicted beta-decay half-life \approx 220 ms							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)			
¹⁵² Ba	-42600#	500#	100# ms	0 ⁺	97		β^- ?			
¹⁵² La	-50070#	400#	200# ms (>300 ns)		97	94Be24 I	β^- ?			
¹⁵² Ce	-59110#	200#	1.1 s	0 ⁺	97	90Ta07 T	β^- =100 *			
¹⁵² Pr	-63810	120	3.63 s	0.12	4 ⁺	97	99To04 J	β^- =100		
¹⁵² Nd	-70158	25	11.4 m	0.2	0 ⁺	97	β^- =100			
¹⁵² Pm	-71262	26	* 4.12 m	0.08	1 ⁺	97	β^- =100			
¹⁵² Pm ^m	-71120	80	140 90	BD *	7.52 m	0.08	4 ⁻	β^- =100		
¹⁵² Pm ⁿ	-71010#	150#	250# 150#	*	13.8 m	0.2	(8)	97	β^- ≈100; IT=? *	
¹⁵² Sm	-74768.8	2.5		STABLE			0 ⁺	97	IS=26.75 16	
¹⁵² Eu	-72894.5	2.5		13.537 y	0.006	3 ⁻	97	β^+ =72.1 3; β^- =27.9 3		
¹⁵² Eu ^m	-72848.9	2.5	45.5998	0.0004	9.3116 h	0.0013	0 ⁻	97	β^- =72 4; β^+ =28 4	
¹⁵² Eu ⁿ	-72746.6	2.5	147.86	0.10	96 m	1	8 ⁻	97	IT=100	
¹⁵² Gd	-74714.2	2.5		108 Ty	8	0 ⁺	97	IS=0.20 1; α =100; 2 β^+ ?		
¹⁵² Tb	-70720	40		17.5 h	0.1	2 ⁻	98	β^+ =100; α <7e-7		
¹⁵² Tb ^m	-70220	40	501.74	0.19	4.2 m	0.1	8 ⁺	98	IT=78.8 8; β^+ =21.2 8	
¹⁵² Dy	-70124	5		2.38 h	0.02	0 ⁺	99	ϵ ≈100; α =0.100 7		
¹⁵² Ho	-63608	14		161.8 s	0.3	2 ⁻	97	β^+ =88 3; α =12 3		
¹⁵² Ho ^m	-63448	14	160	1	50.0 s	0.4	9 ⁺	97	β^+ =89.2 17; α =10.8 17	
¹⁵² Ho ⁿ	-60588	14	3019.59	0.19	8.4 μ s	0.3	19 ⁻	97	IT=100	
¹⁵² Er	-60500	11		10.3 s	0.1	0 ⁺	97	α =90 4; β^+ =10 4		
¹⁵² Tm	-51770	70		* 8.0 s	1.0	(2#) ⁻	97	β^+ =100		
¹⁵² Tm ^m	-51670#	110#	100#	80#	* 5.2 s	0.6	(9) ⁺	97	β^+ =100	
¹⁵² Yb	-46310	210		3.04 s	0.06	0 ⁺	97	β^+ =100; β^+ p ?		
¹⁵² Lu	-33420#	200#		650 ms	70	(5 ⁻ , 6 ⁻)	97	88Ni02 T	β^+ =100; β^+ p=15 7 *	
* ¹⁵² Ce	T : average 90Ta07=1.4(0.2) 91Ay.A=0.8(0.3)							**		
* ¹⁵² Pm ⁿ	E : ENSDF: "Probably feeds 7.52 m level" at 140 keV							**		
* ¹⁵² Lu	T : average 88Ni02=600(100) 87To02=700(100)							**		
¹⁵³ Ba	-37620#	800#	80# ms		5/2 ⁻ #			β^- ?		
¹⁵³ La	-46930#	600#	150# ms (>300 ns)		5/2 ⁺ #	98	94Be24 I	β^- ?		
¹⁵³ Ce	-55350#	400#	500# ms (>300 ns)		3/2 ⁻ #	98	94Be24 I	β^- ?		
¹⁵³ Pr	-61630	100	4.28 s	0.11	5/2 ⁻ #	98		β^- =100		
¹⁵³ Nd	-67349	27	31.6 s	1.0	(3/2) ⁻	98		β^- =100		
¹⁵³ Pm	-70685	11	5.25 m	0.02	5/2 ⁻	98		β^- =100		
¹⁵³ Sm	-72565.8	2.5		46.284 h	0.004	3/2 ⁺	98	β^- =100 *		
¹⁵³ Sm ^m	-72467.4	2.5	98.37	0.10	10.6 ms	0.3	11/2 ⁻	98	IT=100	
¹⁵³ Eu	-73373.5	2.5		STABLE			5/2 ⁺	98	IS=52.19 3	
¹⁵³ Gd	-72889.8	2.5		240.4 d	1.0	3/2 ⁻	98	ϵ =100		
¹⁵³ Gd ^m	-72794.6	2.5	95.1737	0.0012	3.5 μ s	0.4	(9/2 ⁺)	98	IT=100	
¹⁵³ Gd ⁿ	-72718.6	2.5	171.189	0.005	76.0 μ s	1.4	(11/2 ⁻)	98	IT=100	
¹⁵³ Tb	-71320	4		2.34 d	0.01	5/2 ⁺	98	β^+ =100		
¹⁵³ Tb ^m	-71157	4	163.175	0.005	186 μ s	4	11/2 ⁻	98	IT=100	
¹⁵³ Dy	-69150	5		6.4 h	0.1	7/2 ⁽⁻⁾	99	β^+ ≈100; α =0.0094 14		
¹⁵³ Ho	-65019	6		2.01 m	0.03	11/2 ⁻	98	β^+ ≈100; α =0.051 25		
¹⁵³ Ho ^m	-64950	6	68.7	0.3	9.3 m	0.5	1/2 ⁺	98	β^+ ≈100; α =0.18 8	
¹⁵³ Er	-60488	9		37.1 s	0.2	7/2 ⁽⁻⁾	98	85Ah.1 J	α =53 3; β^+ =47 3 *	
¹⁵³ Tm	-54015	18		1.48 s	0.01	(11/2 ⁻)	98	α =91 3; β^+ =9 3		
¹⁵³ Tm ^m	-53972	18	43.2	0.2	2.5 s	0.2	(1/2 ⁺)	98	α =92 3; β^+ =?	
¹⁵³ Yb	-47060#	200#		4.2 s	0.2	7/2 ⁻ #	98	88Wi05 D	β^+ =?; α =50#; ... *	
¹⁵³ Yb ^m	-44360#	220#	2700	100	15 μ s	1	(27/2 ⁻)	98	*	
¹⁵³ Lu	-38410	210		900 ms	200	11/2 ⁻	98	97Ir01 D	α =70#; β^+ =?; p=0 *	
¹⁵³ Lu ^m	-38330	210	80	5	1# s		1/2 ⁺	98	97Ir01 ED	β^+ ?; α ?; p=0
¹⁵³ Lu ⁿ	-35780	210	2632.9	0.5	15 μ s	3	27/2 ⁻	98		
¹⁵³ Hf	-27300#	500#		400# ms (>200 ns)		1/2 ⁺ #		00So11 I	β^+ ?	
¹⁵³ Hf ^m	-26550#	510#	750#	100#	500# ms		11/2 ⁻ #		β^+ ?; IT ?	
* ¹⁵³ Sm	T : see also 99Sc12=46.274(7)							**		
* ¹⁵³ Er	J : and 89Ot.A							**		
* ¹⁵³ Yb	D : ... ; β^+ p=0.008 2							**		
* ¹⁵³ Yb ^m	E : in ENSDF 2578.2 + x							**		
* ¹⁵³ Lu	D : p decay is from 97Ir01							**		

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁵⁴ La	-42380# 600#			100# ms				β^- ?
¹⁵⁴ Ce	-52700# 500#			300# ms (>300 ns)	0 ⁺	98	94Be24 I	β^- ?
¹⁵⁴ Pr	-58200 150			2.3 s 0.1	(3 ⁺ , 2 ⁺)	98		β^- =100
¹⁵⁴ Nd	-65690 110			25.9 s 0.2	0 ⁺	98		β^- =100
¹⁵⁴ Nd ^m	-65210# 190#	480#	150#	1.3 μ s				98
¹⁵⁴ Nd ⁿ	-64340 110	1349	10	> 1 μ s	(5 ⁻)	98		
¹⁵⁴ Pm	-68500 40			* & 1.73 m 0.10	(0, 1)	98		β^- =100
¹⁵⁴ Pm ^m	-68380 110	120	120	BD * & 2.68 m 0.07	(3, 4)	98		β^- =100
¹⁵⁴ Sm	-72461.6 2.5			STABLE (>2.3 Ey)	0 ⁺	98		IS=22.75 29; 2 β^- ?
¹⁵⁴ Eu	-71744.4 2.5			8.593 y 0.004	3 ⁻	98		β^- \approx 100; ϵ =0.02 1
¹⁵⁴ Eu ^m	-71599.1 2.5	145.3	0.3	46.3 m 0.4	(8 ⁻)	98		IT=100
¹⁵⁴ Gd	-73713.2 2.5			STABLE	0 ⁺	98		IS=2.18 3
¹⁵⁴ Tb	-70160 50			* 21.5 h 0.4	0 ⁽⁺⁾ #	98		β^- \approx 100; β^- < 0.1
¹⁵⁴ Tb ^m	-70150 50	12	7	* 9.4 h 0.4	3 ⁻	98	ABBW E	β^+ =78.2 7; IT=21.8 7;... *
¹⁵⁴ Tb ⁿ	-69960# 160#	200#	150#	* 22.7 h 0.5	7 ⁻	98		β^+ =98.2 6; IT=1.8 6
¹⁵⁴ Dy	-70398 8			3.0 My 1.5	0 ⁺	99		α =100; 2 β^+ ?
¹⁵⁴ Ho	-64644 8			11.76 m 0.19	2 ⁻	98		β^+ \approx 100; α =0.019 5
¹⁵⁴ Ho ^m	-64406 28	238	30	AD 3.10 m 0.14	8 ⁺	98		β^+ =100; α <0.001; IT \approx 0
¹⁵⁴ Er	-62612 5			3.73 m 0.09	0 ⁺	01		β^+ \approx 100; α =0.47 13
¹⁵⁴ Tm	-54429 14			* 8.1 s 0.3	(2 ⁻)	98		α =54 5; β^+ =46 5
¹⁵⁴ Tm ^m	-54360 50	70	50	BD * 3.30 s 0.07	(9 ⁺)	98		α =58 5; β^+ =42 5 *
¹⁵⁴ Yb	-49934 17			409 ms 2	0 ⁺	98		α =92.6 12; β^+ =7.4 12
¹⁵⁴ Lu	-39570# 200#			1# s	(2 ⁻)	98		β^+ ?
¹⁵⁴ Lu ^m	-39510# 200#	58	13	AD 1.12 s 0.08	(9 ⁺)	98	88Vi02 D	β^+ \approx 100; β^+ p=?; ... *
¹⁵⁴ Lu ⁿ	-37300# 600#	> 2562		35 μ s 3	(17 ⁺)	98		IT=100
¹⁵⁴ Hf	-32730# 500#			2 s 1	0 ⁺	98		β^+ \approx 100; α \approx 0
* ¹⁵⁴ Tb ^m	D : ... ; β^- < 0.1 **							
* ¹⁵⁴ Tb ⁿ	E : less than 25 keV, from ENSDF **							
* ¹⁵⁴ Tm ^m	D : IT decay has not been observed **							
* ¹⁵⁴ Lu ^m	D : ... ; β^+ α =?; α =0.002# **							
* ¹⁵⁴ Lu ⁿ	D : β^+ p and β^+ α modes observed by 88Vi02; β^+ p confirmed by 90Sh.A **							
¹⁵⁵ La	-38800# 800#			60# ms	5/2 ⁺ #			β^- ?
¹⁵⁵ Ce	-48400# 600#			200# ms (>300 ns)	5/2 ⁻ #	97	94Be24 I	β^- ?
¹⁵⁵ Pr	-55780# 300#			1# s (>300 ns)	5/2 ⁻ #	97	95Cz.A I	β^- ?
¹⁵⁵ Nd	-62470# 150#			8.9 s 0.2	3/2 ⁻ #	94		β^- =100
¹⁵⁵ Pm	-66970 30			41.5 s 0.2	(5/2 ⁻)	94		β^- =100
¹⁵⁵ Sm	-70197.2 2.6			22.3 m 0.2	3/2 ⁻	94		β^- =100
¹⁵⁵ Eu	-71824.5 2.5			4.7611 y 0.0013	5/2 ⁺	94		β^- =100
¹⁵⁵ Gd	-72077.1 2.5			STABLE	3/2 ⁻	97		IS=14.80 12
¹⁵⁵ Gd ^m	-71956.1 2.5	121.05	0.19	32.0 ms 0.3	11/2 ⁻	97		IT=100
¹⁵⁵ Tb	-71254 12			5.32 d 0.06	3/2 ⁺	94		ϵ =100
¹⁵⁵ Dy	-69160 12			9.9 h 0.2	3/2 ⁻	99		β^+ =100
¹⁵⁵ Dy ^m	-68926 12	234.33	0.03	6 μ s	11/2 ⁻	99		IT=100
¹⁵⁵ Ho	-66040 18			48 m 1	5/2 ⁺	94		β^+ =100
¹⁵⁵ Ho ^m	-65898 18	141.97	0.11	880 μ s 80	11/2 ⁻	94		IT=100
¹⁵⁵ Er	-62215 7			5.3 m 0.3	7/2 ⁻	94		β^+ \approx 100; α =0.022 7
¹⁵⁵ Tm	-56635 13			21.6 s 0.2	(11/2 ⁻)	95		β^+ =98.1 3; α =1.9 3
¹⁵⁵ Tm ^m	-56594 14	41	6	45 s 3	(1/2 ⁺)	95		β^+ >92; α <8
¹⁵⁵ Yb	-50503 17			1.793 s 0.019	(7/2 ⁻)	94	96Pa01 T	α =89 4; β^+ =11 4 *
¹⁵⁵ Lu	-42554 20			& 68.6 ms 1.6	(11/2 ⁻)	94	97Da07 TD	α =88 4; β^+ ? *
¹⁵⁵ Lu ^m	-42534 21	20	6	AD & 138 ms 8	(1/2 ⁺)	94	97Da07 TJD	α =76 16; β^+ ? *
¹⁵⁵ Lu ⁿ	-40773 20	1781.0	2.0	AD 2.70 ms 0.03	(25/2 ⁻)	94	96Pa01 T	α \approx 100; IT ? *
¹⁵⁵ Hf	-34100# 400#			890 ms 120	7/2 ⁻ #	94		β^+ \approx 100; α ?
¹⁵⁵ Ta	-23670# 500#			13 μ s 4	(11/2 ⁻)	02		p=100
* ¹⁵⁵ Yb	T : average 96Pa01=1.80(0.02) 91To08=1.75(0.05) **							
* ¹⁵⁵ Lu	T : average 96Pa01=70(1) 97Da07=63(2) 91To09=66(7) 79Ho10=70(6) **							
* ¹⁵⁵ Lu	D : α : average 97Da07=90(2)% 79Ho10=79(4)% with Birge ratio B=4.4 **							
* ¹⁵⁵ Lu ^m	T : average 97Da07=150(24) 96Pa01=136(9) 91To09=140(20) **							
* ¹⁵⁵ Lu ⁿ	T : average 96Pa01=2.71(0.03) 81Ho.A=2.62(0.07) **							

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)			
¹⁵⁶ Ce	-45400#	600#		150#	ms	0 ⁺			β^- ?			
¹⁵⁶ Pr	-51910#	400#		500#	ms (>300 ns)			95Cz.A I	β^- ?			
¹⁵⁶ Nd	-60530	200		5.49	s	0.07	0 ⁺	03	β^- =100			
¹⁵⁶ Nd ^m	-59100	200	1432	5	135	ns	5 ⁻	03	IT=100			
¹⁵⁶ Pm	-64220	30		26.70	s	0.10	4 ⁻	03	β^- =100			
¹⁵⁶ Sm	-69370	10		9.4	h	0.2	0 ⁺	03	β^- =100			
¹⁵⁶ Sm ^m	-67972	10	1397.55	0.09	185	ns	7	5 ⁻	03	IT=100		
¹⁵⁶ Eu	-70093	6		15.19	d	0.08	0 ⁺	03	β^- =100			
¹⁵⁶ Gd	-72542.2	2.5		STABLE			0 ⁺	03	IS=20.47 9			
¹⁵⁶ Gd ^m	-70404.6	2.5	2137.60	0.05	1.3	μ s	0.1	7 ⁻	03	IT=100		
¹⁵⁶ Tb	-70098	4		5.35	d	0.10	3 ⁻	03	β^+ \approx 100; β^- ?			
¹⁵⁶ Tb ^m	-70044	5	54	3	24.4	h	1.0	(7 ⁻)	03	IT=100		
¹⁵⁶ Tb ⁿ	-70010	4	88.4	0.2	5.3	h	0.2	(0 ⁺)	03	IT=?; β^+ =?		
¹⁵⁶ Dy	-70530	7		STABLE		(>1 Ey)	0 ⁺	03	58Ri23 T	IS=0.06 1; α ?; $2\beta^+$?		
¹⁵⁶ Ho	-65350	40		56	m	1	4 ⁻	03		β^+ =100		
¹⁵⁶ Ho ^m	-65300	40	52.4	0.5	9.5	s	1.5	1 ⁻	03	IT=?; β^+ ?		
¹⁵⁶ Ho ⁿ	-65250#	60#	100#	50#	7.8	m	0.3	(9 ⁺)	03	β^+ =75; IT ?		
¹⁵⁶ Er	-64213	24		19.5	m	1.0	0 ⁺	03		β^+ =100; $\alpha=17e-6$ 4		
¹⁵⁶ Tm	-56840	16		83.8	s	1.8	2 ⁻	03		β^+ \approx 100; $\alpha=0.064$ 10		
¹⁵⁶ Tm ^m	-56636	16	203.6	0.5	400	ns		(11 ⁻)	03	IT=100		
¹⁵⁶ Tm ⁿ			non existent	RN	19	s	3	9 ⁺	03	91To08 I		
¹⁵⁶ Yb	-53264	11		26.1	s	0.7	0 ⁺	03		β^+ =90 2; $\alpha=10$ 2		
¹⁵⁶ Lu	-43750	70		494	ms	12	(2 ⁻)	03		α =?; β^+ =5#		
¹⁵⁶ Lu ^m	-43530#	110#	220#	80#	198	ms	2	(9 ⁺)	03	96Pa01 D	$\alpha=94$ 6; β^+ ?	
¹⁵⁶ Hf	-37850	210		23	ms	1	0 ⁺	03	96Pa01 D	$\alpha=97$ 3; β^+ ?		
¹⁵⁶ Hf ^m	-35890	210	1959.0	1.0	AD	480	μ s	40	8 ⁺	03	96Pa01 T	$\alpha=100$
¹⁵⁶ Ta	-25800#	400#		144	ms	24	(2 ⁻)	03		p \approx 100; β^+ ?		
¹⁵⁶ Ta ^m	-25700#	400#	100	8	AD	360	ms	40	(9 ⁺)	03	β^+ =95.8 9; p=4.2 9	
* ¹⁵⁶ Tb ^m	E : derived from E3 24h to 4 ⁺ 49.630 level and $E(IT)< B(L)=9$ keV									**		
* ¹⁵⁶ Dy	T : lower limit is for α decay									**		
* ¹⁵⁶ Tm ⁿ	I : see also the discussion in ENSDF'03									**		
* ¹⁵⁶ Lu ^m	D : derived from original $\alpha=98(9)\%$									**		
* ¹⁵⁶ Hf	D : derived from original $\alpha=100(6)\%$									**		
* ¹⁵⁶ Hf ^m	T : average 96Pa01=520(10) 81Ho.A=444(17)									**		
* ¹⁵⁶ Ta ^m	T : 96Pa01=375(54) 93Li34=320(80)									**		
¹⁵⁷ Ce	-40670#	700#		50#	ms		7/2 ⁺ #			β^- ?		
¹⁵⁷ Pr	-48970#	400#		300#	ms		5/2 ⁻ #			β^- ?		
¹⁵⁷ Nd	-56790#	200#		2#	s	(>300 ns)	5/2 ⁻ #	97	95Cz.A I	β^- ?		
¹⁵⁷ Pm	-62370	110		10.56	s	0.10	(5/2 ⁻)	96		β^- =100		
¹⁵⁷ Sm	-66730	50		8.03	m	0.07	(3/2 ⁻)	96		β^- =100		
¹⁵⁷ Eu	-69467	5		15.18	h	0.03	5/2 ⁺	96		β^- =100		
¹⁵⁷ Gd	-70830.7	2.5		STABLE			3/2 ⁻	96		IS=15.65 2		
¹⁵⁷ Tb	-70770.6	2.5		71	y	7	3/2 ⁺	96		$\epsilon=100$		
¹⁵⁷ Dy	-69428	7		8.14	h	0.04	3/2 ⁻	97		β^+ =100		
¹⁵⁷ Dy ^m	-69229	7	199.38	0.07	21.6	ms	1.6	11/2 ⁻	97	IT=100		
¹⁵⁷ Ho	-66829	24		12.6	m	0.2	7/2 ⁻	96		β^+ =100		
¹⁵⁷ Er	-63420	28		18.65	m	0.10	3/2 ⁻	96		β^+ =100		
¹⁵⁷ Er ^m	-63265	28	155.4	0.3	76	ms	6	(9/2 ⁺)	96	IT=100		
¹⁵⁷ Tm	-58709	28		3.63	m	0.09	1/2 ⁺	97		β^+ =100		
¹⁵⁷ Yb	-53442	10		38.6	s	1.0	7/2 ⁻	96		β^+ =99.5; $\alpha=0.5$		
¹⁵⁷ Lu	-46483	19		6.8	s	1.8	(1/2 ⁺ , 3/2 ⁺)	96		β^+ ?; α =?		
¹⁵⁷ Lu ^m	-46462	19	21.0	2.0	AD	4.79	s	0.12	(11/2 ⁻)	96	β^+ =?; $\alpha=6$ 2	
¹⁵⁷ Hf	-38750#	200#		115	ms	1	7/2 ⁻	96	96Pa01 T	$\alpha=86$ 9; β^+ =14 9		
¹⁵⁷ Ta	-29630	210		10.1	ms	0.4	1/2 ⁺	02		α =?; p=3.4 12; ...		
¹⁵⁷ Ta ^m	-29610	210	22	5	4.3	ms	0.1	11/2 ⁻	02	α =?; β^+ =1#; p=0		
¹⁵⁷ Ta ⁿ	-28040	210	1593	9	AD	1.7	ms	0.1	(25/2 ⁻)	02	$\alpha=100$	
* ¹⁵⁷ Dy ^m	T : as adopted by ENSDF evaluator from 3 inconsistent results									**		
* ¹⁵⁷ Lu	T : ENSDF'96 average of very discrepant 91To09=5.7(0.5) 91Le15,92Po14=9.6(8)									**		
* ¹⁵⁷ Ta	D : ...; β^+ =1#									**		

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{158}Pr	-44730# 600#				200# ms				β^- ?
^{158}Nd	-54400# 400#				700# ms (>300 ns)	0^+	97	95Cz.A I	β^- ?
^{158}Pm	-59090 130				4.8 s	0.5			β^- =100
^{158}Sm	-65210 80				5.30 m	0.03			β^- =100
^{158}Eu	-67210 80				45.9 m	0.2			β^- =100
^{158}Gd	-70696.8 2.5				STABLE				IS=24.84 7
^{158}Tb	-69477.2 2.6				180 y	11			β^+ =83.4 7; β^- =16.6 7
$^{158}\text{Tb}^m$	-69366.9 2.9	110.3	1.2		10.70 s	0.17			IT \approx 100; β^- <0.6; ... *
$^{158}\text{Tb}^n$	-69088.8 2.6	388.37	0.15		395 μ s				7^-
^{158}Dy	-70412 3				STABLE				IS=0.10 1; α ?; $2\beta^+$?
^{158}Ho	-66191 27				11.3 m	0.4			β^+ \approx 100; α ?
$^{158}\text{Ho}^m$	-66124 27	67.200	0.010		28 m	2			IT>81; β^+ <19
$^{158}\text{Ho}^n$	-66010# 80#	180#	70#		21.3 m	2.3			β^+ >93; IT<7#
^{158}Er	-65304 25				2.29 h	0.06			ε =100
^{158}Tm	-58703 25				3.98 m	0.06			β^+ =100
$^{158}\text{Tm}^m$	-58650# 100#	50#	100#	*	20 ns				IT ? *
^{158}Yb	-56015 8				1.49 m	0.13			β^+ \approx 100; $\alpha\approx$ 0.0021 12
^{158}Lu	-47214 15				10.6 s	0.3			β^+ =99.09 20; ... *
^{158}Hf	-42104 18				2.84 s	0.07			β^+ =55 3; α =45 3 *
^{158}Ta	-31020# 200#				& 49 ms	8			α =96 4; β^+ ? *
$^{158}\text{Ta}^m$	-30880# 200#	140	12	AD	& 36.0 ms	0.8			α =93 6; β^+ ?; IT ? *
^{158}W	-23700# 500#				1.37 ms	0.17			α =100 *
$^{158}\text{W}^m$	-21810# 500#	1889	8	AD	143 μ s	19			α =100 *
* $^{158}\text{Tb}^m$	D : ... ; β^+ <0.01 **								
* $^{158}\text{Tm}^m$	I : T \approx 20 s in 81Dr07 was a typo. Value in Fig. 2 was correct. See 96Dr.A **								
* ^{158}Lu	D : ... ; α =0.91 20 **								
* ^{158}Hf	T : average 96Pa01=2.85(0.07) 73To02=2.8(0.2) **								
* ^{158}Ta	T : average 97Da07=72(12) 96Pa01=46(4) with Birge ratio B=2 **								
* ^{158}Ta	D : derived from original $\alpha\approx$ 100(8)% **								
* $^{158}\text{Ta}^m$	T : average 97Da07=37.7(1.5) 96Pa01=35(1) 79Ho10=36.8(1.6) **								
* ^{158}W	T : average 00Ma95=1.5(0.2) 96Pa01=0.9(+0.4-0.3) **								
* $^{158}\text{W}^m$	T : average 00Ma95=140(20) 96Pa01=160(50) **								
^{159}Pr	-41450# 700#				100# ms				β^- ?
^{159}Nd	-50220# 500#				500# ms				β^- ?
^{159}Pm	-56850# 200#				1.47 s	0.15			β^- =100
^{159}Sm	-62210 100				11.37 s	0.15			β^- =100
^{159}Eu	-66053 7				18.1 m	0.1			β^- =100
^{159}Gd	-68568.5 2.5				18.479 h	0.004			β^- =100
^{159}Tb	-69539.0 2.6				STABLE				IS=100.
^{159}Dy	-69173.5 2.7				144.4 d	0.2			ε =100
$^{159}\text{Dy}^m$	-68820.7 2.7	352.77	0.14		122 μ s	3			IT=100
^{159}Ho	-67336 4				33.05 m	0.11			β^+ =100
$^{159}\text{Ho}^m$	-67130 4	205.91	0.05		8.30 s	0.08			IT=100
^{159}Er	-64567 4				36 m	1			β^+ =100
$^{159}\text{Er}^m$	-64384 4	182.602	0.024		337 ns	14			IT=100
$^{159}\text{Er}^n$	-64138 4	429.05	0.03		590 ns	60			IT=100
^{159}Tm	-60570 28				9.13 m	0.16			β^+ =100
^{159}Yb	-55843 18				1.72 m	0.10			β^+ =100 *
^{159}Lu	-49710 40				12.1 s	1.0			β^+ \approx 100; α =0.1#
$^{159}\text{Lu}^m$	-49610# 90#	100#	80#	*	10# s				β^+ ?; IT ?; α ?
^{159}Hf	-42854 17				5.20 s	0.10			β^+ =65 7; α =35 7 *
^{159}Ta	-34448 21				1.04 s	0.09			β^+ ?; α =34 5 *
$^{159}\text{Ta}^m$	-34385 20	64	5	AD	514 ms	9			α =55 1; β^+ ? *
^{159}W	-25230# 400#				8.2 ms	0.7			α =82 16; β^+ ? *
* ^{159}Yb	T : supersedes 80A114=1.40(0.20) from same group **								
* ^{159}Hf	J : $7/2^-$ is not measured in 00D118, p.7: "a $7/2^-$ assignment is assumed" **								
* ^{159}Ta	T : average 97Da07=0.83(0.18) 96Pa01=1.10(0.10) **								
* $^{159}\text{Ta}^m$	T : average 97Da07=500(11) 96Pa01=544(16); other 02Ro17=620(50) **								
* ^{159}W	D : derived from original α =92(23)% **								

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)				
¹⁶⁰ Nd	-47420#	600#	300# ms	0 ⁺		85Si25 I	β^- ? *				
¹⁶⁰ Pm	-53100#	300#	2# s				β^- ?				
¹⁶⁰ Sm	-60420#	200#	9.6 s	0.3	0 ⁺	97	β^- =100				
¹⁶⁰ Eu	-63370#	200#	38 s	4	1 ⁽⁻⁾	97	β^- =100				
¹⁶⁰ Gd	-67948.6	2.6	STABLE	(>31 Ey)	0 ⁺	97	IS=21.86 19; 2 β^- ?				
¹⁶⁰ Tb	-67842.9	2.6	72.3 d	0.2	3 ⁻	97	β^- =100				
¹⁶⁰ Dy	-69678.1	2.5	STABLE		0 ⁺	97	IS=2.34 8				
¹⁶⁰ Ho	-66388	15	25.6 m	0.3	5 ⁺	97	β^+ =100				
¹⁶⁰ Ho ^m	-66328	15	59.98	0.03	5.02	h	0.05	2 ⁻	97	IT=65 3; β^+ =35 3	
¹⁶⁰ Ho ⁿ	-66191	22	197	16	3	s	(9 ⁺)	97	ABBW E	IT=100 *	
¹⁶⁰ Er	-66058	24			28.58	h	0.09	0 ⁺	97	ϵ =100	
¹⁶⁰ Tm	-60300	30			9.4	m	0.3	1 ⁻	97	β^+ =100	
¹⁶⁰ Tm ^m	-60230	40	70	20	74.5	s	1.5	5 ⁽⁺⁾	97	IT=85 5; β^+ =15 5	
¹⁶⁰ Yb	-58170	17			4.8	m	0.2	0 ⁺	97	β^+ =100	
¹⁶⁰ Lu	-50270	60		*	36.1	s	0.3	2 ⁻ #	97	β^+ =100; $\alpha < 1e-4$	
¹⁶⁰ Lu ^m	-50270#	120#	0#	100#	40	s	1		97	$\beta^+ \approx 100$; α ?	
¹⁶⁰ Hf	-45937	12			13.6	s	0.2	0 ⁺	97	$\beta^+ = 99.3$ 2; $\alpha = 0.7$ 2	
¹⁶⁰ Ta	-35880	90			1.70	s	0.20	(2#) ⁻	96Pa01	TJD	β^+ ?; $\alpha = ?$ *
¹⁶⁰ Ta ^m	-35560#	110#	310#	90#	1.55	s	0.04	(9) ⁺	97	96Pa01 TJ	$\beta^+ = 66$ #; $\alpha = ?$ *
¹⁶⁰ W	-29360	210			90	ms	5	0 ⁺	97	96Pa01 TD	$\alpha = 87$ 8; β^+ ? *
¹⁶⁰ Re	-16660#	400#			860	μ s	120	(2 ⁻)	02	92Pa05 J	p=91 5; $\alpha = 9$ 5 *
* ¹⁶⁰ Nd	I : seen in the thermal fission of ²⁵² Cf							**			
* ¹⁶⁰ Ho ⁿ	E : less than 55 keV above 169.55 level, from ENSDF							**			
* ¹⁶⁰ Ta	J : from α correlation with ¹⁵⁶ Lu line							**			
* ¹⁶⁰ Ta ^m	J : from α correlation with ¹⁵⁶ Lu ^m line							**			
* ¹⁶⁰ W	T : average 96Pa01=91(5) 81Ho10=81(15)							**			
* ¹⁶⁰ Re	J : protons from d _{3/2} orbital							**			
¹⁶¹ Nd	-42960#	700#	200# ms		1/2 ⁻ #					β^- ?	
¹⁶¹ Pm	-50430#	500#	700# ms		5/2 ⁻ #					β^- ?	
¹⁶¹ Sm	-56980#	300#	4.8 s	0.8	7/2 ⁺ #	00				β^- =100	
¹⁶¹ Eu	-61780#	300#	26 s	3	5/2 ⁺ #	00				β^- =100	
¹⁶¹ Gd	-65512.7	2.7	3.646 m	0.003	5/2 ⁻	00	94It.A	T		β^- =100	
¹⁶¹ Tb	-67468.2	2.6	6.906 d	0.019	3/2 ⁺	00				β^- =100	
¹⁶¹ Dy	-68061.1	2.5	STABLE		5/2 ⁺	00				IS=18.91 24	
¹⁶¹ Ho	-67203	3	2.48 h	0.05	7/2 ⁻	00				ϵ =100	
¹⁶¹ Ho ^m	-66992	3	211.16	0.03	6.76	s	0.07	1/2 ⁺	00	IT=100	
¹⁶¹ Er	-65209	9			3.21	h	0.03	3/2 ⁻	00	β^+ =100	
¹⁶¹ Er ^m	-64813	9	396.44	0.04	7.5	μ s	0.7	11/2 ⁻	00	IT=100	
¹⁶¹ Tm	-61899	28			30.2	m	0.8	7/2 ⁺	00	β^+ =100	
¹⁶¹ Tm ^m	-61892	28	7.4	0.2	5#	m		1/2 ⁺	00	β^+ ?; IT ?	
¹⁶¹ Yb	-57844	16			4.2	m	0.2	3/2 ⁻	00	β^+ =100	
¹⁶¹ Lu	-52562	28			77	s	2	1/2 ⁺	00	β^+ =100	
¹⁶¹ Lu ^m	-52400	30	166	18	7.3	ms	0.4	(9/2 ⁻)	00	ABBW E	IT=100 *
¹⁶¹ Hf	-46319	23			18.2	s	0.5	3/2 ⁻ #	00	$\beta^+ \approx 100$; $\alpha < 0.13$	
¹⁶¹ Ta	-38730#	60#		*	3#	s		1/2 ⁺ #		β^+ ?; α ?	
¹⁶¹ Ta ^m	-38684	23	50#	50#	2.89	s	0.12	11/2 ⁻ #	00	$\beta^+ = 95$ #; $\alpha = ?$	
¹⁶¹ W	-30410#	200#			409	ms	16	7/2 ⁻ #	00	96Pa01 T	$\alpha = 73$ 3; $\beta^+ = 27$ 3 *
¹⁶¹ Re	-20880	210			370	μ s	40	1/2 ⁺	02	97Ir01 D	p=97 2; α ? *
¹⁶¹ Re ^m	-20750	210	123.8	1.3	15.6	ms	0.9	11/2 ⁻	02		$\alpha = ?$; p=4.8 6 *
* ¹⁶¹ Lu ^m	E : less than K binding energy (61 keV) above 135.6 level, from ENSDF							**			
* ¹⁶¹ W	T : average 96Pa01=409(18) 79Ho10=410(40)							**			
* ¹⁶¹ Re	D : derived from original p=100(7)%							**			

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{162}Pm	-46310#	700#	500# ms				β^- ?	
^{162}Sm	-54750#	500#	2.4 s	0.5	0 ⁺	00As.A TD	β^- =100	
^{162}Eu	-58650#	300#	10.6 s	1.0		99	β^- =100	
^{162}Gd	-64287	5	8.4 m	0.2	0 ⁺	99	β^- =100	
^{162}Tb	-65680	40	7.60 m	0.15	1 ⁻	99	β^- =100	
^{162}Dy	-68186.8	2.5	STABLE		0 ⁺	99	IS=25.51 26	
^{162}Ho	-66047	4	15.0 m	1.0	1 ⁺	99	β^+ =100	
$^{162}\text{Ho}^m$	-65941	8	106 7 67.0 m	0.7	6 ⁻	99	IT=62; β^+ =38	
^{162}Er	-66343	3	STABLE	(>140 Ty)	0 ⁺	99	IS=0.14 1; α ?; $2\beta^+$?	
^{162}Tm	-61484	26	21.70 m	0.19	1 ⁻	99	β^+ =100	
$^{162}\text{Tm}^m$	-61350	50	130 40 24.3 s	1.7	5 ⁺	99	IT ?; β^+ =18 4	
^{162}Yb	-59832	16	18.87 m	0.19	0 ⁺	99	β^+ =100	
^{162}Lu	-52840	80	* 1.37 m	0.02	1 ⁽⁻⁾	99	β^+ =100	
$^{162}\text{Lu}^m$	-52720#	220#	120# 200# * 1.5 m		4 ⁻	99	β^+ ≈100; IT ?	
$^{162}\text{Lu}^m$	-52540#	220#	300# 200# * 1.9 m			99	β^+ ≈100; IT ?	
^{162}Hf	-49173	10	39.4 s	0.9	0 ⁺	99	β^+ ≈100; α =0.008 1	
^{162}Ta	-39780	50	3.57 s	0.12	3 ⁺	99	β^+ ≈100; α =0.074 10	
^{162}W	-34002	18	1.36 s	0.07	0 ⁺	99	β^+ ?; α =45.2 16	
^{162}Re	-22350#	200#	107 ms	13	(2 ⁻)	99	α =94 6; β^+ ?	
$^{162}\text{Re}^m$	-22180#	200#	173 10 AD 77 ms	9	(9 ⁺)	99	α =91 5; β^+ ?	
^{162}Os	-14500#	500#	1.87 ms	0.18	0 ⁺	99	00Ma95 T α =100	
* $^{162}\text{Ho}^m$	E : about 10 keV above level at 96.1(0.1), from ENSDF; error from NUBASE							**
* ^{162}Er	T : lower limit is for α decay							**
* $^{162}\text{Tm}^m$	E : above 66.90 level and less than 192 keV, from ENSDF							**
* ^{162}Os	T : average 00Ma95=1.9(0.2) 96Bi07=1.5(+0.7-0.5) 89Ho12=1.9(0.7)							**
^{163}Pm	-43150#	800#	200# ms		5/2 ⁻ #		β^- ?	
^{163}Sm	-50900#	700#	1# s		1/2 ⁻ #		β^- ?	
^{163}Eu	-56630#	500#	6# s		5/2 ⁺ #		β^- ?	
^{163}Gd	-61490#	300#	68 s	3	7/2 ⁺ #	00	β^- =100	
^{163}Tb	-64601	5	19.5 m	0.3	3/2 ⁺	00	β^- =100	
^{163}Dy	-66386.5	2.5	STABLE		5/2 ⁻	00	IS=24.90 16	
^{163}Ho	-66383.9	2.5	4.570 ky	0.025	7/2 ⁻	00	ϵ =100	
$^{163}\text{Ho}^m$	-66086.0	2.5	297.88 0.07 1.09 s	0.03	1/2 ⁺	00	IT=100	
^{163}Er	-65174	5	75.0 m	0.4	5/2 ⁻	00	β^+ =100	
$^{163}\text{Er}^m$	-64729	5	445.5 0.6 580 ns	100	(11/2 ⁻)	00	IT=100	
^{163}Tm	-62735	6	1.810 h	0.005	1/2 ⁺	00	β^+ =100	
^{163}Yb	-59304	16	11.05 m	0.25	3/2 ⁻	00	β^+ =100	
^{163}Lu	-54791	28	3.97 m	0.13	1/2 ⁽⁺⁾	01	β^+ =100	
^{163}Hf	-49286	28	40.0 s	0.6	3/2 ⁻ #	00	β^+ =100; α <0.0001	
^{163}Ta	-42540	40	10.6 s	1.8	1/2 ⁺ #	00	β^+ ≈100; α ≈0.2	
^{163}W	-34910	50	2.8 s	0.2	3/2 ⁻ #	00	β^+ ?; α =13 2	
^{163}Re	-26007	20	390 ms	70	(1/2 ⁺)	00	β^+ ?; α =32 3	
$^{163}\text{Re}^m$	-25892	20	115 4 AD 214 ms	5	(11/2 ⁻)	00	α =66 4; β^+ ?	
^{163}Os	-16120#	400#	5.5 ms	0.6	7/2 ⁻ #	00	α ≈100; β^+ ?; β^+ p ?	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁶⁴ Sm	-48180# 800#		500# ms	0 ⁺			β^- ?	
¹⁶⁴ Eu	-53100# 600#		2# s				β^- ?	
¹⁶⁴ Gd	-59750# 400#		45 s	3	0 ⁺	01	β^- =100	
¹⁶⁴ Tb	-62080 100		3.0 m	0.1	(5 ⁺)	01	β^- =100	
¹⁶⁴ Dy	-65973.3 2.5		STABLE		0 ⁺	01	IS=28.18 37	
¹⁶⁴ Ho	-64987.1 2.8		29 m	1	1 ⁺	01	ϵ =60 5; β^- =40 5	
¹⁶⁴ Ho ^m	-64847.3 2.8	139.77 0.08	38.0 m	1.0	6 ⁻	01	IT=100	
¹⁶⁴ Er	-65950 3		STABLE		0 ⁺	01	IS=1.61 3; α ?; 2 β^+ ?	
¹⁶⁴ Tm	-61888 28		* 2.0 m	0.1	1 ⁺	01	ϵ =61 1; e^+ =39 1	
¹⁶⁴ Tm ^m	-61878 29	10 6	* 5.1 m	0.1	6 ⁻	01	IT \approx 80; β^+ \approx 20	
¹⁶⁴ Yb	-61023 16		75.8 m	1.7	0 ⁺	01	ϵ =100	
¹⁶⁴ Lu	-54642 28		3.14 m	0.03	1 ⁽⁻⁾	01	β^+ =100	
¹⁶⁴ Hf	-51822 20		111 s	8	0 ⁺	01	β^+ =100	
¹⁶⁴ Ta	-43283 28		14.2 s	0.3	(3 ⁺)	01	β^+ =100	
¹⁶⁴ W	-38234 12		6.3 s	0.2	0 ⁺	01	β^+ =96.2 12; α =3.8 12	
¹⁶⁴ Re	-27640# 160#		* &		high	95Pa.A J	α ?	
¹⁶⁴ Re ^m	-27520 100	120# 120#	* & 530 ms	230	(2#) ⁻	01	α ?; β^+ =42#	
¹⁶⁴ Os	-20460 210		21 ms	1	0 ⁺	01	α ?; β^+ =2#	
¹⁶⁴ Ir	-7270# 410#		& 1# ms		2 ⁻ #		p ?; α ?; β^+ ?	
¹⁶⁴ Ir ^m	-7000# 400#	270# 110#	& 94 μ s	27	9 ⁺ #	02	p=?; α ?; β^+ ?	
* ¹⁶⁴ Tm ^m	E : less than 20 keV, from ENSDF							**
* ¹⁶⁴ Lu	J : negative parity proposed by 98Ge13; odd-odd ¹⁶⁰ Tm ¹⁶² Tm ¹⁶² Lu have 1 ⁻ ground-state							**
* ¹⁶⁴ Ta	D : was erroneously considered as alpha emitter, instead of ¹⁶³ Ta by 83Sc18							**
* ¹⁶⁴ Re ^m	J : from α correlation with ¹⁶⁰ Ta line							**
* ¹⁶⁴ Ir ^m	T : average 02Ma61=58(+46-18) 01Ke05=110(+60-30)							**
¹⁶⁵ Sm	-43800# 900#		200# ms		5/2 ⁻ #		β^- ?	
¹⁶⁵ Eu	-50560# 700#		1# s		5/2 ⁺ #		β^- ?	
¹⁶⁵ Gd	-56470# 500#		10.3 s	1.6	1/2 ⁻ #	99	β^- =100	
¹⁶⁵ Tb	-60660# 200#		2.11 m	0.10	3/2 ⁺ #	92	β^- =100	
¹⁶⁵ Dy	-63617.9 2.5		2.334 h	0.001	7/2 ⁺	92	β^- =100	
¹⁶⁵ Dy ^m	-63509.7 2.5	108.160 0.003	1.257 m	0.006	1/2 ⁻	92	IT=97.76 11; β^- =2.24 11	
¹⁶⁵ Ho	-64904.6 2.5		STABLE		7/2 ⁻	92	IS=100.	
¹⁶⁵ Er	-64528 3		10.36 h	0.04	5/2 ⁻	92	ϵ =100	
¹⁶⁵ Tm	-62936 3		30.06 h	0.03	1/2 ⁺	92	β^+ =100	
¹⁶⁵ Yb	-60287 28		9.9 m	0.3	5/2 ⁻	92	β^+ =100	
¹⁶⁵ Lu	-56442 27		* 10.74 m	0.10	1/2 ⁺	99	β^+ =100	
¹⁶⁵ Hf	-51636 28		76 s	4	(5/2 ⁻)	92	β^+ =100	
¹⁶⁵ Ta	-45855 17		31.0 s	1.5	5/2 ⁻ #	92	β^+ =100	
¹⁶⁵ Ta ^p	-45800 30	60 30	AD		9/2 ⁻ #			
¹⁶⁵ W	-38862 25		5.1 s	0.5	3/2 ⁻ #	99	β^+ \approx 100; α <0.2	
¹⁶⁵ Re	-30657 28		* & 1# s		1/2 ⁺ #	99	β^+ ?; α ?	
¹⁶⁵ Re ^m	-30610 23	47 26	AD * & 2.1 s	0.3	11/2 ⁻ #	99	β^+ =87 3; α =13 3	
¹⁶⁵ Os	-21650# 200#		71 ms	3	(7/2 ⁻)	99	α >60; β^+ <40	
¹⁶⁵ Ir	-11630# 220#		< 1# μ s		1/2 ⁺ #	02	p ?; α ?	
¹⁶⁵ Ir ^m	-11440 210	180# 50#	300 μ s	60	11/2 ⁻	02	p=87 4; α =13 4	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{166}Eu	-46600#	800#	400# ms				β^- ?
^{166}Gd	-54400#	600#	4.8 s	1.0	0 ⁺	00As.A TD	β^- =100
^{166}Tb	-57760	100	25.6 s	2.2		97 00As.A T	β^- =100 *
^{166}Dy	-62590.1	2.6	81.6 h	0.1	0 ⁺	92	β^- =100
^{166}Ho	-63076.9	2.5	26.83 h	0.02	0 ⁻	92	β^- =100
$^{166}\text{Ho}^m$	-63070.9	2.5	5.985 0.018	1.20	ky 0.18	(7) ⁻ 92	β^- =100
^{166}Er	-64931.6	2.5	STABLE			92	IS=33.61 35
^{166}Tm	-61894	12	7.70 h	0.03	2 ⁺	92	β^+ =100
$^{166}\text{Tm}^m$	-61772	14	122 8	340	ms 25	6 ⁻ 96Dr07 TJE	IT=100 *
^{166}Yb	-61588	8	56.7 h	0.1	0 ⁺	92	ϵ =100
^{166}Lu	-56021	30	2.65 m	0.10	6 ⁽⁻⁾	92 98Ge13 J	β^+ =100
$^{166}\text{Lu}^m$	-55990	30	34.37 0.05	1.41	m 0.10	3 ⁽⁻⁾ 92 98Ge13 J	β^+ =58 5; IT=42 5
$^{166}\text{Lu}^n$	-55980	30	42.9 0.5	2.12	m 0.10	0 ⁽⁻⁾ 92 98Ge13 J	β^+ >80; IT<20
^{166}Hf	-53859	28	6.77 m	0.30	0 ⁺	92	β^+ =100
^{166}Ta	-46098	28	34.4 s	0.5	(2) ⁺	92	β^+ =100
^{166}W	-41892	10	19.2 s	0.6	0 ⁺	00	β^+ ≈100; α =0.035 12
^{166}Re	-31850#	90#	& 2#	s	2 ⁻ #		β^+ ?; α ?
$^{166}\text{Re}^m$	-31700	70	150# 50#	& 2.5	s 0.2	9 ⁺ # 92 92Me10 T	β^+ ?; α =5 2 *
$^{166}\text{Re}^n$	-31700#	100#	150# 50#			low	
^{166}Os	-25438	18	216 ms	9	0 ⁺	92 96Pa01 T	α =72 13; β^+ =28 13 *
^{166}Ir	-13210#	200#	10.5 ms	2.2	(2) ⁻	02	α =93 3; p=7 3
$^{166}\text{Ir}^m$	-13030#	200#	172 6 p	15.1	ms 0.9	(9) ⁺ 02	α =98.2 6; p=1.8 6
^{166}Pt	-4790#	500#	300 μ s	100	0 ⁺	97 96Bi07 TD	α =100
* ^{166}Tb	T : supersedes 94Ts.A=21(6) same group **						
* $^{166}\text{Tm}^m$	E : less than 25 keV above 109.34 level **						
* $^{166}\text{Re}^m$	T : average 92Me10=2.3(0.2) 84Sc06=2.8(0.3) **						
* $^{166}\text{Re}^n$	D : α intensity is derived from 2% < α < 8% as discussed in ENSDF **						
* ^{166}Os	T : average 96Pa01=220(7) 91Se01=194(17) **						
^{167}Eu	-43590#	800#	200# ms		5/2 ⁺ #		β^- ?
^{167}Gd	-50700#	600#	3# s		5/2 ⁻ #		β^- ?
^{167}Tb	-55840#	400#	19 s	3	3/2 ⁺ #	00 99As03 T	β^- =100
^{167}Dy	-59940	60	6.20 m	0.08	(1/2) ⁻	00	β^- =100
^{167}Ho	-62287	6	3.1 h	0.1	7/2 ⁻	00	β^- =100
$^{167}\text{Ho}^m$	-62028	6	259.34 0.11	6.0	μ s 1.0	3/2 ⁺ 00	IT=100
^{167}Er	-63296.7	2.5	STABLE			7/2 ⁺ 00	IS=22.93 17
$^{167}\text{Er}^m$	-63088.9	2.5	207.801 0.005	2.269	s 0.006	1/2 ⁻ 00	IT=100
^{167}Tm	-62548.3	2.7	9.25 d	0.02	1/2 ⁺	00	ϵ =100
$^{167}\text{Tm}^m$	-62368.8	2.7	179.480 0.019	1.16	μ s 0.06	(7/2) ⁺ 00	IT=100
$^{167}\text{Tm}^n$	-62255.5	2.7	292.820 0.020	0.9	μ s 0.1	7/2 ⁻ 00	IT=100
^{167}Yb	-60594	5	17.5 m	0.2	5/2 ⁻	00	β^+ =100
^{167}Lu	-57500	30	51.5 m	1.0	7/2 ⁺	00	β^+ =100
$^{167}\text{Lu}^m$	-57500#	40#	0# 30# *	> 1	m	1/2 ^(-#) 00	IT ?; β^+ ?
^{167}Hf	-53468	28	2.05 m	0.05	(5/2) ⁻	00	β^+ =100
^{167}Ta	-48351	28	1.33 m	0.07	(3/2 ⁺)	00	β^+ =100
^{167}W	-42089	19	19.9 s	0.5	3/2 ⁻ #	00	β^+ =99.96 1; α =0.04 1 *
^{167}Re	-34840#	50#	& 3.4	s 0.4	9/2 ⁻ #	00	α ≈100; β^+ ?
$^{167}\text{Re}^m$	-34710	40	130# 40#	& 5.9	s 0.3	1/2 ⁺ #	00 β^+ ≈99; α ≈1
^{167}Os	-26500	70	810 ms	60	3/2 ⁻ #	00	α =57 8; β^+ =43 8
^{167}Ir	-17079	19	35.2 ms	2.0	1/2 ⁺	02	α =48 6; p=32 4; β^+ ?
$^{167}\text{Ir}^m$	-16903	19	175.3 2.2 p	30.0	ms 0.6	11/2 ⁻ 02	α =80 10; β^+ ?; ... *
^{167}Pt	-6540#	410#	700 μ s	200	7/2 ⁻ #	00	α =100
* ^{167}W	J : lowest observed state by 92Th06 is 13/2 ⁺ **						
* $^{167}\text{Ir}^m$	D : ... ; p=0.4 1 **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{168}Gd	-48100# 700#		300# ms	0^+		85Si25 I	$\beta^- ?$ *
^{168}Tb	-52500# 500#		8.2 s 1.3	$4^- \#$	99		$\beta^- = 100$
^{168}Dy	-58560 140		8.7 m 0.3	0^+	99		$\beta^- = 100$
^{168}Ho	-60070 30		2.99 m 0.07	3^+	94		$\beta^- = 100$
$^{168}\text{Ho}^m$	-60010 30	59 1	132 s 4	(6^+)	94	90Ch37 E	$\text{IT} \approx 100; \beta^- < 0.5$
^{168}Er	-62996.7 2.5		STABLE	0^+	94		$\text{IS} = 26.78 \text{ 26}$
^{168}Tm	-61317.7 2.9		93.1 d 0.2	3^+	94		$\beta^+ \approx 100; \beta^- = 0.010 \text{ 7}$
^{168}Yb	-61575 4		STABLE ($> 130 \text{ Ty}$)	0^+	94	56Po16 T	$\text{IS} = 0.13 \text{ 1}; \alpha ?; 2\beta^+ ?$ *
^{168}Lu	-57060 50		5.5 m 0.1	$6^{(-)}$	94	98Ge13 J	$\beta^+ = 100$
$^{168}\text{Lu}^m$	-56880 100	180 110	6.7 m 0.4	3^+	94		$\beta^+ > 95; \text{IT} < 5$
^{168}Hf	-55361 28		25.95 m 0.20	0^+	94		$\epsilon \approx 98; e^+ \approx 2$
^{168}Ta	-48394 28		2.0 m 0.1	$(2^-, 3^+)$	01		$\beta^+ = 100$
^{168}W	-44890 16		51 s 2	0^+	94		$\beta^+ \approx 100; \alpha = 0.0032 \text{ 10}$
^{168}Re	-35790 30		4.4 s 0.1	$(5^+, 6^+, 7^+)$	94		$\beta^+ \approx 100; \alpha \approx 0.005$
$^{168}\text{Re}^m$		non existent	6.6 s 1.5			92Me10 I	
^{168}Os	-29991 12		2.06 s 0.06	0^+	94	96Pa01 T	$\beta^+ = 51 \text{ 3}; \alpha = 49 \text{ 3}$ *
^{168}Ir	-18740# 150#		161 ms 21	high	94	96Pa01 TJD	$\alpha = 82 \text{ 14}$
$^{168}\text{Ir}^m$	-18690 110	50# 100#	125 ms 40	low	94	96Pa01 TJ	$\alpha = ?; \beta^+ ?$
^{168}Pt	-11040 210		2.00 ms 0.18	0^+	94	98Ki20 T	$\alpha \approx 100; \beta^+ = 0.7\#$ *
* ^{168}Gd	I : seen in the thermal fission of ^{252}Cf **						
* ^{168}Yb	T : lower limit is for α decay **						
* ^{168}Os	T : average 96Pa01=2.1(0.1) 84Sc06=2.0(0.2) 82En03=2.2(0.1) 78Ca11=1.9(0.1) **						
* ^{168}Os	T : 84Sc06 supersedes 78Sc26=2.4(0.2) from same group **						
* ^{168}Pt	T : average 98Ki20=2.0(0.2) 96Bi07=2.0(0.4) **						
^{169}Gd	-43900# 800#		1# s	$7/2^- \#$			$\beta^- ?$
^{169}Tb	-50100# 600#		2# s	$3/2^+ \#$			$\beta^- ?$
^{169}Dy	-55600 300		39 s 8	$(5/2^-)$	91		$\beta^- = 100$
^{169}Ho	-58803 20		4.7 m 0.1	$7/2^-$	91		$\beta^- = 100$
^{169}Er	-60928.7 2.5		9.40 d 0.02	$1/2^-$	91		$\beta^- = 100$
^{169}Tm	-61280.0 2.5		STABLE	$1/2^+$	91		$\text{IS} = 100.$
^{169}Yb	-60370 4		32.026 d 0.005	$7/2^+$	91		$\epsilon = 100$
$^{169}\text{Yb}^m$	-60346 4	24.199 0.003	46 s 2	$1/2^-$	91		$\text{IT} = 100$
^{169}Lu	-58077 5		34.06 h 0.05	$7/2^+$	91		$\beta^+ = 100$
$^{169}\text{Lu}^m$	-58048 5	29.0 0.5	160 s 10	$1/2^-$	91		$\text{IT} = 100$
^{169}Hf	-54717 28		3.24 m 0.04	$(5/2^-)$	91		$\beta^+ = 100$
^{169}Ta	-50290 28		4.9 m 0.4	$(5/2^+)$	91	98Zh03 J	$\beta^+ = 100$
^{169}W	-44918 15		76 s 6	$(5/2^-)$	91		$\beta^+ = 100$
^{169}Re	-38386 28		8.1 s 0.5	$9/2^- \#$	91	92Me10 TD	$\beta^+ = ?; \alpha = 0.005 \text{ 3}$ *
$^{169}\text{Re}^m$	-38241 17	145 29	15.1 s 1.6	$1/2^+ \#$	91	92Me10 TD	$\beta^+ ?; \alpha \approx 0.2$ *
^{169}Os	-30721 25		3.46 s 0.11	$3/2^- \#$	91	96Pa01 T	$\beta^+ = 89 \text{ 1}; \alpha = 11 \text{ 1}$ *
^{169}Ir	-22081 26		780 ms 360	$1/2^+ \#$		99Po09 TD	$\alpha = 50 \text{ 18}; \beta^+ ?$
$^{169}\text{Ir}^m$	-21927 22	154 24	308 ms 22	$11/2^- \#$	91	96Pa01 TD	$\alpha = 81 \text{ 7}; \beta^+ = 19 \text{ 7}$ *
^{169}Pt	-12380# 200#		3.7 ms 1.5	$3/2^- \#$	91	96Pa01 T	$\alpha = ?; \beta^+ = 1\#$ *
^{169}Au	-1790# 300#		150# μs	$1/2^+ \#$			$\alpha ?; \beta^+ ?$
* ^{169}Re	D : $\alpha = 0.005(3)\%$ derived from original $\alpha = 0.001\% - 0.01\%$ **						
* $^{169}\text{Re}^m$	T : average 92Me10=16.3(0.8) 84Sc06=12.9(1.1) **						
* ^{169}Os	T : average 96Pa01=3.6(0.2) 95Hi02=3.2(0.3) 84Sc06=3.5(0.2) 82En03=3.4(0.2) **						
* $^{169}\text{Ir}^m$	T : also 99Po09=323(+90-66) D : average 99Po09=84(8)% 96Pa01=72(13)% **						
* ^{169}Pt	T : average 96Pa01=5(3) 81Ho10=2.5(+2.5-1.0) **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁷⁰ Tb	-46340# 700#		3# s				$\beta^- ?$
¹⁷⁰ Dy	-53660# 200#		30# s		0+	02	$\beta^- ?$
¹⁷⁰ Ho	-56240 50		2.76 m	0.05	6 ⁺ #	02	$\beta^- =100$
¹⁷⁰ Ho ^m	-56140 60	100 80	43 s		2 (1 ⁺)	02	$\beta^- =100$
¹⁷⁰ Er	-60114.6 2.8		STABLE	(>320 Py)	0+	02	IS=14.93 27; ... *
¹⁷⁰ Tm	-59800.6 2.5		128.6 d	0.3	1 ⁻	02	$\beta^- \approx 100$; $\epsilon = 0.131$ 10 *
¹⁷⁰ Tm ^m	-59617.4 2.5	183.197 0.004	4.12 μ s	0.13	(3) ⁺	02	IT=100
¹⁷⁰ Yb	-60769.0 2.4		STABLE		0+	02	IS=3.04 15
¹⁷⁰ Yb ^m	-59510.5 2.4	1258.46 0.14	370 ns	15	4 ⁻	02	IT=100
¹⁷⁰ Lu	-57310 17		2.012 d	0.020	0+	02	$\beta^+ =100$
¹⁷⁰ Lu ^m	-57217 17	92.91 0.09	670 ms	100	(4) ⁻	02	IT=100
¹⁷⁰ Hf	-56254 28		16.01 h	0.13	0+	02	$\epsilon =100$
¹⁷⁰ Ta	-50138 28		6.76 m	0.06	(3) ⁽⁺⁾	02	$\beta^+ =100$
¹⁷⁰ W	-47293 15		2.42 m	0.04	0+	02	$\beta^+ \approx 100$; $\alpha < 1\%$
¹⁷⁰ Re	-38918 26		9.2 s	0.2	(5) ⁺	02	$\beta^+ \approx 100$; $\alpha < 0.01\%$
¹⁷⁰ Os	-33928 11		7.46 s	0.23	0+	02	$\beta^+ = ?$; $\alpha = 8.6$ 18
¹⁷⁰ Ir	-23320# 100#		910 ms	150	low#	02	$\beta^+ ?$; $\alpha = 5.2$ 17
¹⁷⁰ Ir ^m	-23050 70	270# 70#	440 ms	60	high#	02	$\alpha = 36$ 10; $\beta^+ ?$; IT ?
¹⁷⁰ Pt	-16306 19		13.8 ms	0.5	0+	02	$\alpha = ?$; $\beta^+ = 2\%$
¹⁷⁰ Au	-3610# 200#		310 μ s	50	(2) ⁻	02	p=85 10; $\alpha = 15$ 10
¹⁷⁰ Au ^m	-3340# 200#	274 16	630 μ s	60	(9) ⁺	02	p=75 15; $\alpha = ?$; $\beta^+ ?$ *
* ¹⁷⁰ Er	D : ... ; $2\beta^- ?$; $\alpha ?$ **						
* ¹⁷⁰ Au ^m	T : from 02Ke.C=620(+60-50); other 02Ma61=570(+310-150) **						
¹⁷¹ Tb	-43500# 800#		500# ms		3/2 ⁺ #		$\beta^- ?$
¹⁷¹ Dy	-50110# 300#		6# s		7/2 ⁻ #		$\beta^- ?$
¹⁷¹ Ho	-54520 600		53 s	2	7/2 ⁻ #	02	$\beta^- =100$
¹⁷¹ Er	-57724.9 2.8		7.516 h	0.002	5/2 ⁻	02	$\beta^- =100$
¹⁷¹ Er ^m	-57526.3 2.8	198.6 0.1	210 ns	10	1/2 ⁻	02	IT=100
¹⁷¹ Tm	-59215.6 2.6		1.92 y	0.01	1/2 ⁺	02	$\beta^- =100$
¹⁷¹ Tm ^m	-58790.6 2.6	424.9560 0.0015	2.60 μ s	0.02	7/2 ⁻	02	IT=100
¹⁷¹ Yb	-59312.1 2.4		STABLE		1/2 ⁻	02	IS=14.28 57
¹⁷¹ Yb ^m	-59216.8 2.4	95.282 0.002	5.25 ms	0.24	7/2 ⁺	02	IT=100
¹⁷¹ Yb ⁿ	-59189.7 2.4	122.416 0.002	265 ns	20	5/2 ⁻	02	IT=100
¹⁷¹ Lu	-57833.5 2.8		8.24 d	0.03	7/2 ⁺	02	$\beta^+ =100$
¹⁷¹ Lu ^m	-57762.4 2.8	71.13 0.08	79 s	2	1/2 ⁻	02	IT=100
¹⁷¹ Hf	-55431 29		12.1 h	0.4	7/2 ⁽⁺⁾	02	$\beta^+ =100$
¹⁷¹ Hf ^m	-55409 29	21.93 0.09	29.5 s	0.9	1/2 ⁽⁻⁾	02	IT \approx 100; $\beta^+ ?$
¹⁷¹ Ta	-51720 28		23.3 m	0.3	(5/2 ⁻)	02	$\beta^+ =100$
¹⁷¹ W	-47086 28		2.38 m	0.04	(5/2 ⁻)	02	$\beta^+ =100$
¹⁷¹ Re	-41250 28		15.2 s	0.4	(9/2 ⁻)	02	$\beta^+ =100$
¹⁷¹ Os	-34293 19		8.3 s	0.2	(5/2 ⁻)	02	$\beta^+ ?$; $\alpha = 1.80$ 21
¹⁷¹ Ir	-26430 40		3.6 s	1.0	1/2 ⁺ #	02	$\alpha \approx 100$; $\beta^+ ?$
¹⁷¹ Ir ^m	-26250# 50#	180# 30#	1.40 s	0.10	(11/2 ⁻)	02	99Ba84 J $\alpha = 58$ 11; $\beta^+ ?$; p ?
¹⁷¹ Pt	-17470 90		44 ms	7	3/2 ⁻ #	02	$\alpha = ?$; $\beta^+ = 2\%$
¹⁷¹ Au	-7565 26		30 μ s	5	(1/2 ⁺)	02	03Ba20 T p \approx 100; $\alpha ?$ *
¹⁷¹ Au ^m	-7315 20	250 16	1.014 ms	0.019	11/2 ⁻	02	03Ba20 TJ $\alpha = 54$ 4; p=46 4
¹⁷¹ Hg	3500# 300#		80 μ s	30	3/2 ⁻ #	02	$\alpha \approx 100$; $\beta^+ = 0.01\%$
* ¹⁷¹ Au	T : average 03Ba20=37(+7-5) 99Po09=17(+9-5); Birge ratio B=2.0 **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁷² Dy	-47730# 400#		3# s	0 ⁺			β^- ?
¹⁷² Ho	-51400# 400#		25 s	3	95		β^- =100
¹⁷² Er	-56489 5		49.3 h	0.3	95		β^- =100
¹⁷² Tm	-57380 6		63.6 h	0.2	95		β^- =100
¹⁷² Yb	-59260.3 2.4		STABLE		95		IS=21.83 67
¹⁷² Lu	-56741.3 3.0		6.70 d	0.03	95		β^+ =100
¹⁷² Lu ^m	-56699 3	41.86 0.04	3.7 m	0.5	95		IT=100
¹⁷² Lu ⁿ	-56632 3	109.41 0.10	440 μ s	12			(1) ⁺
¹⁷² Hf	-56404 24		1.87 y	0.03	95		ϵ =100
¹⁷² Hf ^m	-54398 24	2005.58 0.11	163 ns	3			(8 ⁻)
¹⁷² Ta	-51330 28		36.8 m	0.3	95		(3 ⁺)
¹⁷² W	-49097 28		6.6 m	0.9	95		0 ⁺
¹⁷² Re	-41520 50		15 s	3	95		(5)
¹⁷² Re ^m	-41520# 110#	0# 100#	55 s	5	95		(2)
¹⁷² Os	-37238 15		19.2 s	0.9	95	95Hi02 D	β^+ =?; α =1.1 2
¹⁷² Ir	-27520# 110#		4.4 s	0.3	95		(3 ⁺)
¹⁷² Ir ^m	-27240 30	280# 100#	2.0 s	0.1	95		(7 ⁺)
¹⁷² Pt	-21101 13		98.4 ms	2.4	95	02Ro17 T	α =77 21; β^+ ? *
¹⁷² Au	-9280# 160#		4.7 ms	1.1	95	96Pa01 TJ	α =?; p<2 *
¹⁷² Hg	-1090 210		420 μ s	240		99Se14 TD	α =100
* ¹⁷² Pt	T : average 02Ro17=104(7) 96Pa01=96(3) 82En03=90(10) 81De22=120(10) and **						
* ¹⁷² Pt	T : 75Ga25=100(10) D : derived from original α =94(32)% **						
* ¹⁷² Au	T : average 96Pa01=6.3(1.5) 93Se09=4(1) **						
* ¹⁷² Au	J : from α correlation with ¹⁶⁸ Ir line **						
¹⁷³ Dy	-43780# 500#		2# s	9/2 ⁺ #			β^- ?
¹⁷³ Ho	-49100# 400#		10# s	7/2 ⁻ #			β^- ?
¹⁷³ Er	-53650# 200#		1.434 m	0.017	95	94It.A T	β^- =100
¹⁷³ Tm	-56259 5		8.24 h	0.08	95		β^- =100
¹⁷³ Tm ^m	-55941 5	317.73 0.20	10 μ s				(7/2 ⁻)
¹⁷³ Yb	-57556.3 2.4		STABLE		95		IS=16.13 27
¹⁷³ Yb ^m	-57157.4 2.5	398.9 0.5	2.9 μ s	0.1			1/2 ⁻
¹⁷³ Lu	-56885.8 2.4		1.37 y	0.01	95		ϵ =100
¹⁷³ Lu ^m	-56762.1 2.4	123.672 0.013	74.2 μ s				5/2 ⁻
¹⁷³ Hf	-55412 28		23.6 h	0.1	95		β^+ =100
¹⁷³ Ta	-52397 28		3.14 h	0.13	95		β^+ =100
¹⁷³ W	-48727 28		7.6 m	0.2	95		β^+ =100
¹⁷³ Re	-43554 28		2.0 m	0.3	95		(5/2 ⁻)
¹⁷³ Os	-37438 15		22.4 s	0.9	95	95Hi02 TD	β^+ \approx 100; α =0.4 2
¹⁷³ Ir	-30272 14		9.0 s	0.8	95		(3/2 ⁺ , 5/2 ⁺)
¹⁷³ Ir ^m	-30019 28	253 27	2.20 s	0.05	95		(11/2 ⁻)
¹⁷³ Pt	-21940 60		365 ms	7	95	02Ro17 T	α =84 6; β^+ =16 6 *
¹⁷³ Au	-12820 26		25 ms	1	03		(1/2 ⁺)
¹⁷³ Au ^m	-12606 22	214 23	14.0 ms	0.9	03		α =86 13; β^+ =6# *
¹⁷³ Hg	-2570# 210#		1.1 ms	0.4	03		α =89 11; β^+ =4#
* ¹⁷³ Pt	T : average 02Ro17=370(13) 96Pa01=376(11) 82En03=360(20) and 81De22=325(20) **						
* ¹⁷³ Au	D : from 94(+6-19)%; and for isomer ¹⁷³ Au ^m 92(+8-13)% **						

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁷⁴ Ho	-45500#	500#		8#	s				β^- ?	
¹⁷⁴ Er	-51950#	300#		3.2	m	0.2	0 ⁺	99	β^- =100	
¹⁷⁴ Tm	-53870	40		5.4	m	0.1	(4) ⁻	99	β^- =100	
¹⁷⁴ Yb	-56949.6	2.4		STABLE			0 ⁺	99	IS=31.83 92	
¹⁷⁴ Lu	-55575.3	2.4		3.31	y	0.05	1 ⁻	99	98Ge13 J β^+ =100	
¹⁷⁴ Lu ^m	-55404.5	2.4	170.83	0.05	142	d	2	6 ⁻	99	98Ge13 J IT=99.38 2; ϵ =0.62 2
¹⁷⁴ Hf	-55846.6	2.8		2.0	Py	0.4	0 ⁺	99	IS=0.16 1; α =100; 2 β^+ ?	
¹⁷⁴ Hf ^m	-54049	3	1797.5	2.0	2.39	μ s	0.04	(8) ⁻	99	IT=100
¹⁷⁴ Ta	-51741	28		1.14	h	0.08	3 ⁺	99	β^+ =100	
¹⁷⁴ W	-50227	28		33.2	m	2.1	0 ⁺	99	β^+ =100	
¹⁷⁴ Re	-43673	28		2.40	m	0.04		99	β^+ =100	
¹⁷⁴ Os	-39996	11		44	s	4	0 ⁺	99	β^+ \approx 100; α =0.024 7	
¹⁷⁴ Ir	-30869	28		7.9	s	0.6	(3) ⁺	99	β^+ =99.5 3; α =0.5 3	
¹⁷⁴ Ir ^m	-30676	26	193	11	4.9	s	0.3	(7) ⁺	99	β^+ =97.5 3; α =2.5 3
¹⁷⁴ Pt	-25319	12		889	ms	17	0 ⁺	99	α =76 8; β^+ ?	
¹⁷⁴ Au	-14200#	100#		139	ms	3	low	99	02Ro17 TD α =90 6; β^+ ?	
¹⁷⁴ Au ^m	-13840	70	360#	70#	171	ms	29	high	96Pa01 TJ α =?; β^+ ?	
¹⁷⁴ Hg	-6647	20		2.0	ms	0.4	0 ⁺	99	99Se14 T α \approx 100; β^+ =0.4#	
* ¹⁷⁴ Au	T : others 96Pa01=171(29) 83Sc24=120(20)									
¹⁷⁵ Ho	-42800#	600#		5#	s		7/2 ⁻ #		β^- ?	
¹⁷⁵ Er	-48650#	400#		1.2	m	0.3	(9/2 ⁺)	98	96Zh03 TD β^- =100	
¹⁷⁵ Tm	-52320	50		15.2	m	0.5	1/2 ⁺	98	β^- =100	
¹⁷⁵ Yb	-54700.6	2.4		4.185	d	0.001	7/2 ⁻	93	β^- =100	
¹⁷⁵ Yb ^m	-54185.7	2.4	514.869	0.007	68.2	ms	0.3	1/2 ⁻	93	IT=100
¹⁷⁵ Lu	-55170.7	2.2		STABLE			7/2 ⁺	93	IS=97.41 2	
¹⁷⁵ Lu ^m	-53780	4	1391	3	930	μ s	80	19/2 ⁺	98	98Wh02 ETJ IT=100
¹⁷⁵ Hf	-54483.8	2.8		70	d	2	5/2 ⁻	93	ϵ =100	
¹⁷⁵ Ta	-52409	28		10.5	h	0.2	7/2 ⁺	93	β^+ =100	
¹⁷⁵ W	-49633	28		35.2	m	0.6	(1/2 ⁻)	93	β^+ =100	
¹⁷⁵ Re	-45288	28		5.89	m	0.05	(5/2 ⁻)	93	β^+ =100	
¹⁷⁵ Os	-40105	14		1.4	m	0.1	(5/2 ⁻)	93	β^+ =100	
¹⁷⁵ Ir	-33429	20		9	s	2	(5/2 ⁻)	93	β^+ =99.15 28; α =0.85 28	
¹⁷⁵ Ir ^p	-33357	17	72	17	AD		am			
¹⁷⁵ Pt	-25690	19		2.52	s	0.08	5/2 ⁻ #	93	α =64 5; β^+ ?	
¹⁷⁵ Au	-17440	40		&	100#	ms	1/2 ⁺ #	02Ro17 D	α =?; β^+ ?	
¹⁷⁵ Au ^m	-17240#	50#	200#	30#	&	156	ms	3	11/2 ⁻ # 93	02Ro17 T α =82 17; β^+ ?
¹⁷⁵ Hg	-7990	100		10.8	ms	0.4	5/2 ⁻ #	93	02Ro17 T α =?; β^+ =1#	
* ¹⁷⁵ Au	D : from analysis of data in 02Ro17, we assign the 6412 line to ¹⁷⁵ Au									
* ¹⁷⁵ Au ^m	T : average 02Ro17=158(3) 01Ko44=143(8); others 96Pa01=185(30) 83Sc24=200(22)									
* ¹⁷⁵ Hg	T : others 97Uu01=13(+6-4) 96Pa01=8(8) outweighed, not used									
¹⁷⁶ Er	-46500#	400#		20#	s		0 ⁺		β^- ?	
¹⁷⁶ Tm	-49370	100		1.85	m	0.03	(4 ⁺)	98	94It.A T β^- =100	
¹⁷⁶ Yb	-53494.1	2.6		STABLE		(>160 Py)	0 ⁺	98	96De60 T IS=12.76 41; ...	
¹⁷⁶ Yb ^m	-52444.1	2.6	1050.0	0.3	11.4	s	0.3	(8) ⁻	98	IT=?; β^- <10#
¹⁷⁶ Lu	-53387.4	2.2		38.5	Gy	0.7	7 ⁻	98	03Gr02 T IS=2.59 2; β^- =100	
¹⁷⁶ Lu ^m	-53264.5	2.2	122.855	0.006	3.664	h	0.019	1 ⁻	98	β^- \approx 100; ϵ =0.095 16
¹⁷⁶ Hf	-54577.5	2.2		STABLE			0 ⁺	98	IS=5.26 7	
¹⁷⁶ Ta	-51370	30		8.09	h	0.05	(1) ⁻	98	β^+ =100	
¹⁷⁶ Ta ^m	-51270	30	103.0	1.0	1.1	ms	0.1	(+)	98	IT=100
¹⁷⁶ Ta ⁿ	-48550	60	2820	50	0.97	ms	0.07	(20) ⁻	98	IT=100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
¹⁷⁶ W	-50642	28	2.5 h	0.1	0 ⁺	98	$\epsilon=100$	
¹⁷⁶ Re	-45063	28	5.3 m	0.3	3 ⁺	98	$\beta^+=100$	
¹⁷⁶ Os	-42098	28	3.6 m	0.5	0 ⁺	98	$\beta^+=100$	
¹⁷⁶ Ir	-33861	20	8.3 s	0.6		98	$\beta^+=96.9$ 6; $\alpha=3.1$ 6	
¹⁷⁶ Pt	-28928	14	6.33 s	0.15	0 ⁺	98	$\beta^+ ?$; $\alpha=38$ 3	
¹⁷⁶ Au	-18540#	110#	1.08 s	0.17	(5 ⁻)	98	ABBW J $\alpha=?$; $\beta^+=40$ #	
¹⁷⁶ Au ^m	-18380	30	860 ms	160	(7 ⁺)	02Ro17 T	$\alpha=?$; $\beta^+=40$ #	
¹⁷⁶ Hg	-11779	14	20.4 ms	1.5	0 ⁺	98	02Ro17 T $\alpha=90$ 9; $\beta^+ ?$	
¹⁷⁶ Tl	550#	200#	10# ms				$\alpha ?$	
* ¹⁷⁶ Yb	D : ... ; 2 $\beta^- ?$; $\alpha ?$							**
* ¹⁷⁶ Lu	T : arithmetic average 03Gr02=40.8(0.3) 98Ni07=36.9(0.2) 92Da03=37.3(0.5)							**
* ¹⁷⁶ Lu	T : 90Ge05=40.5(0.9) 83Sa44=37.8(0.2) 82Sg01=35.9(0.5) 80No01=40.8(2.4)							**
* ¹⁷⁶ Lu	T : 72Ko50=37.9(0.3) (a weighed average would yield Birge ratio B=4.6)							**
* ¹⁷⁶ Ta ⁿ	E : 2774.8(1.5) + x, and x estimated 50(50) by NUBASE							**
* ¹⁷⁶ Au	J : from α decay to ¹⁷² Ir 168.4 level							**
* ¹⁷⁶ Au ^m	J : from α decay to ¹⁷² Ir ^m							**
* ¹⁷⁶ Hg	T : average 02Ro17=20(2) 99He25=21(3) 99Po09=21(4); others not used							**
* ¹⁷⁶ Hg	T : 96Pa01=18(10) and 83Sc24=34(+18-9)							**
¹⁷⁷ Er	-42800#	500#	3#	s	1/2 ⁻ #		$\beta^- ?$	
¹⁷⁷ Tm	-47470#	300#	90	s	6	(7/2 ⁻)	03 $\beta^-=100$	
¹⁷⁷ Yb	-50989.2	2.6	1.911 h	0.003		(9/2 ⁺)	03 $\beta^-=100$	
¹⁷⁷ Yb ^m	-50657.7	2.6	331.5	0.3	6.41 s	0.02	(1/2 ⁻)	03 IT=100
¹⁷⁷ Lu	-52389.0	2.2			6.647 d	0.004	7/2 ⁺	03 $\beta^-=100$
¹⁷⁷ Lu ^m	-51418.8	2.2	970.1750	0.0024	160.44 d	0.06	23/2 ⁻	03 $\beta^-=78.6$ 8; IT=21.4 8
¹⁷⁷ Lu ⁿ	-48489	10	3900	10	7 m	2	39/2 ⁻	03 03Al.1 ET $\beta^-=?$; IT ?
¹⁷⁷ Lu ^p	-52238.6	2.2	150.3967	0.0010	130 ns	3	9/2 ⁻	03 IT=100
¹⁷⁷ Lu ^q	-51819.3	2.2	569.7068	0.0016	155 μ s	7	1/2 ⁺	03 IT=100
¹⁷⁷ Hf	-52889.6	2.1			STABLE		7/2 ⁻	03 IS=18.60 9
¹⁷⁷ Hf ^m	-51574.1	2.1	1315.4504	0.0008	1.09 s	0.05	23/2 ⁺	03 IT=100
¹⁷⁷ Hf ⁿ	-50149.6	2.1	2740.02	0.15	51.4 m	0.5	37/2 ⁻	03 IT=100
¹⁷⁷ Hf ^p	-51547.2	2.1	1342.38	0.20	55.9 μ s	1.2	(19/2 ⁻)	03 IT=100
¹⁷⁷ Ta	-51724	4			56.56 h	0.06	7/2 ⁺	03 $\beta^+=100$
¹⁷⁷ Ta ^m	-51538	4	186.15	0.06	3.62 μ s	0.10	5/2 ⁻	03 IT=100
¹⁷⁷ Ta ⁿ	-50369	4	1355.01	0.19	5.31 μ s	0.25	21/2 ⁻	03 IT=100
¹⁷⁷ Ta ^p	-51651	4	73.36	0.15	410 ns	7	9/2 ⁻	03 IT=100
¹⁷⁷ Ta ^q	-47068	4	4656.3	0.5	133 μ s	4	49/2 ⁻	03 IT=100
¹⁷⁷ W	-49702	28			132 m	2	1/2 ⁻	03 $\beta^+=100$
¹⁷⁷ Re	-46269	28			14 m	1	5/2 ⁻	03 $\beta^+=100$
¹⁷⁷ Re ^m	-46184	28	84.71	0.10	50 μ s	10	5/2 ⁺	03 IT=100
¹⁷⁷ Os	-41950	16			3.0 m	0.2	1/2 ⁻	03 $\beta^+=100$
¹⁷⁷ Ir	-36047	20			30 s	2	5/2 ⁻	03 $\beta^+\approx 100$; $\alpha=0.06$ 1
¹⁷⁷ Pt	-29370	15			10.6 s	0.4	5/2 ⁻	03 $\beta^+=94.3$ 5; $\alpha=5.7$ 5
¹⁷⁷ Pt ^m	-29223	15	147.4	0.4	2.2 μ s	0.3	1/2 ⁻	03 IT=100
¹⁷⁷ Au	-21550	13			1.46 s	0.03	(1/2 ⁺ , 3/2 ⁺)	03 01Ko44 TJD $\alpha\approx 100$; $\beta^+ ?$
¹⁷⁷ Au ^m	-21334	28	216	26	1.180 s	0.012	11/2 ⁻	03 01Ko44 ETJ $\alpha\approx 100$; $\beta^+ ?$
¹⁷⁷ Au ⁿ	-21093	28	457	26	7 ns	4	(9/2 ⁻)	03 02Ro17 ETJ IT=100
¹⁷⁷ Hg	-12780	80			127.3 ms	1.8	5/2 ⁻ #	03 $\alpha=85$; $\beta^+=15$
¹⁷⁷ Tl	-3328	25			18 ms	5	(1/2 ⁺)	03 $\alpha=73$ 13; p=27 13
¹⁷⁷ Tl ^m	-2521	17	807	18	230 μ s	40	(11/2 ⁻)	03 p=51 8; $\alpha=49$ 8
* ¹⁷⁷ Au ^m	E : 157.9 keV above 5/2 ⁺ level at estimated 44(28) keV by NUBASE							**
* ¹⁷⁷ Au ⁿ	E : 240.8 keV above 11/2 ⁻ level T : < 15 ns							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁷⁸ Tm	-44120#	400#	30#	s			β^- ?
¹⁷⁸ Yb	-49698	10	74	m 3	0 ⁺	94	β^- =100
¹⁷⁸ Lu	-50343.0	2.9	28.4	m 0.2	1 ⁽⁺⁾	94	β^- =100
¹⁷⁸ Lu ^m	-50219	4	123.8	2.6	RQ	94	β^- =100
¹⁷⁸ Hf	-52444.3	2.1	23.1	m 0.3	9 ⁽⁻⁾	94	98Ge13 J
¹⁷⁸ Hf ^m	-51296.9	2.1	1147.423	0.005			IS=27.28 7
¹⁷⁸ Hf ^m	-51296.9	2.1	4.0	s 0.2	8 ⁻	94	IT=100
¹⁷⁸ Hf ⁿ	-49998.6	2.1	2445.69	0.11			IT=100
¹⁷⁸ Hf ^p	-49870.8	2.2	2573.5	0.5			IT=100
¹⁷⁸ Ta	-50507	15	68	μ s 2	(14 ⁻)	94	IT=100
¹⁷⁸ Ta ^m	-50410#	50#	9.31	m 0.03	1 ⁺	94	β^+ =100
¹⁷⁸ Ta ⁿ	-48940#	50#	2.36	h 0.08	(7) ⁻	94	β^+ =100
¹⁷⁸ Ta ^p	-47510#	50#	59	ms 3	(15 ⁻)	94	96Ko13 T
¹⁷⁸ W	-50416	15	290	ms 12	(21 ⁻)	94	96Ko13 TJE
¹⁷⁸ Re	-45653	28	21.6	d 0.3	0 ⁺	94	ϵ =100
¹⁷⁸ Os	-43546	16	13.2	m 0.2	(3 ⁺)	94	β^+ =100
¹⁷⁸ Ir	-36252	20	5.0	m 0.4	0 ⁺	94	β^+ =100
¹⁷⁸ Pt	-31998	11	12	s 2		95	β^+ =100
¹⁷⁸ Au	-22330	60	21.1	s 0.6	0 ⁺	94	β^+ =92.3 3; α =7.7 3
¹⁷⁸ Hg	-16317	13	2.6	s 0.5		94	β^+ ≤60; α >40
¹⁷⁸ Tl	-4750#	110#	269	ms 3	0 ⁺	94	02Ro17 T
¹⁷⁸ Pb	3568	24	255	ms 10			02Ro17 TD
¹⁷⁸ Ta ⁿ	E : 1470.6keV above ¹⁷⁸ Ta ^m , from ENSDF						
¹⁷⁸ Ta ⁿ	T : average 96Ko13=58(4) 79Du02=60(5)						
¹⁷⁸ Ta ^p	E : 2902 keV above the (7) ⁻ ¹⁷⁸ Ta ^m isomer						
¹⁷⁸ Hg	T : others 96Pa01=287(23) 91Se01=250(25) and 79Ha10=260(30)						
¹⁷⁸ Pb	T : two events at 202 and 147 μ s						
¹⁷⁹ Tm	-41600#	500#	20#	s	1/2 ⁺ #		β^- ?
¹⁷⁹ Yb	-46420#	300#	8.0	m 0.4	(1/2 ⁻)	94	β^- =100
¹⁷⁹ Lu	-49064	5	4.59	h 0.06	7/2 ⁽⁺⁾	94	β^- =100
¹⁷⁹ Lu ^m	-48472	5	592.4	0.4			IT=100
¹⁷⁹ Hf	-50471.9	2.1	3.1	ms 0.9	1/2 ⁽⁺⁾	94	IT=100
¹⁷⁹ Hf ^m	-50096.9	2.1	18.67	s 0.04	9/2 ⁺	94	IS=13.62 2
¹⁷⁹ Hf ⁿ	-49366.1	2.1	1105.84	0.19			IT=100
¹⁷⁹ Hf ^p	-49366.1	2.1	25.05	d 0.25	25/2 ⁻	94	IT=100
¹⁷⁹ Ta	-50366.3	2.2	1.82	y 0.03	7/2 ⁺	00	ϵ =100
¹⁷⁹ Ta ^m	-49049.0	2.2	9.0	ms 0.2	(25/2 ⁺)	00	IT=100
¹⁷⁹ Ta ⁿ	-47727.0	2.3	54.1	ms 1.7	(37/2 ⁺)	00	IT=100
¹⁷⁹ W	-49304	16	37.05	m 0.16	(7/2 ⁻)	94	β^+ =100
¹⁷⁹ W ^m	-49082	16	6.40	m 0.07	(1/2 ⁻)	94	IT≈100; β^+ =0.28 3
¹⁷⁹ Re	-46586	24	19.5	m 0.1	(5/2 ⁺)	95	β^+ =100
¹⁷⁹ Re ^m	-46521	24	95	μ s 25	(5/2 ⁻)		
¹⁷⁹ Os	-4320	18	6.5	m 0.3	(1/2 ⁻)	94	β^+ =100
¹⁷⁹ Ir	-38077	11	79	s 1	(5/2 ⁻)	98	β^+ =100
¹⁷⁹ Pt	-32264	9	21.2	s 0.4	1/2 ⁻	94	β^+ ≈100; α =0.24 3
¹⁷⁹ Au	-24952	17	7.1	s 0.3	5/2 ⁻ #	94	β^+ =78.0 9; α =22.0 9
¹⁷⁹ Au ^p	-24853	18			(11/2 ⁻)		
¹⁷⁹ Hg	-16922	27	1.09	s 0.04	5/2 ⁻ #	94	02Ro17 T
¹⁷⁹ Tl	-8300	40	270	ms 30	(1/2 ⁺)	01	ABBW J
¹⁷⁹ Tl ^m	-7440#	50#	1.60	ms 0.16	(9/2 ⁻)	01	02Ro17 T
¹⁷⁹ Pb	2000#	200#	3#	ms	5/2 ⁻ #		α ?
¹⁷⁹ Hg	T : average 02Ro17=1.08(0.09) 71Ha03=1.09(0.04)						
¹⁷⁹ Tl	T : average 02Ro17=415(55) 98To14=230(40) 83Sc24=160(+90-40)						
¹⁷⁹ Tl	J : from α decay to ¹⁷⁵ Au ^m						
¹⁷⁹ Tl ^m	T : average 02Ro17=1.7(0.2) 98To14=1.8(0.4) 96Pa01=0.7(+6-4) 83Sc24=1.4(0.5)						

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{180}Yb	-44400#	400#		2.4	m	0.5	0 ⁺	94	$\beta^- = 100$
^{180}Lu	-46690	70		5.7	m	0.1	5 ⁺	94	95Me03 J $\beta^- = 100$
$^{180}\text{Lu}^m$	-46680	70	13.9 0.3	1	s		3 ⁻	95Me03 EJT	$\beta^- ?$; IT ?
^{180}Hf	-49788.4	2.1		STABLE			0 ⁺	94	IS=35.08 16
$^{180}\text{Hf}^m$	-48646.9	2.1	1141.48 0.04	5.5	h	0.1	8 ⁻	94	IT \approx 100; $\beta^- = 0.3$ 1
^{180}Ta	-48936.2	2.2		8.152	h	0.006	1 ⁺	94	$\epsilon = 86$ 3; $\beta^- = 14$ 3
$^{180}\text{Ta}^m$	-48860.9	1.8	75.3 1.3 RQ	STABLE		(>1.2 Py)	9 ⁻	94	IS=0.012 2; $\beta^- ?$
$^{180}\text{Ta}^n$	-47485.2	2.4	1451.0 1.0	45	μs	2	15 ⁻	96Dr02 TE	
^{180}W	-49644	4		STABLE		(>700 Py)	0 ⁺	94	03Da05 T IS=0.12 1; $\alpha ?$; $2\beta^+ ?$ *
$^{180}\text{W}^m$	-48115	4	1529.04 0.03	5.47	ms	0.09	8 ⁻	94	IT=100
^{180}Re	-45840	21		2.44	m	0.06	(1) ⁻	94	$\beta^+ = 100$
^{180}Os	-44359	20		21.5	m	0.4	0 ⁺	94	$\beta^+ = 100$
^{180}Ir	-37978	22		1.5	m	0.1	(4,5) ⁽⁺⁾ #	94	$\beta^+ = 100$
^{180}Pt	-34436	11		52	s	3	0 ⁺	94	$\beta^+ \approx 100$; $\alpha \approx 0.3$
^{180}Au	-25596	21		8.1	s	0.3		94	$\beta^+ \leq 98.2$; $\alpha \geq 1.8$
^{180}Hg	-20245	14		2.56	s	0.02	0 ⁺	94	93Wa03 T $\beta^+ = 52$ 4; $\alpha = 48$ 4
^{180}Tl	-9400#	120#		1.5	s	0.2		94	98To14 TD $\beta^+ ?$; $\alpha = 7$ 3; ... *
^{180}Pb	-1939	21		5	ms	3	0 ⁺	00	96To08 TD $\alpha = 100$
* ^{180}W	T : lower limit is for α decay, also 03Ce01 > 270 Py 97Ge15 > 74 Py **								
* ^{180}W	T : indication in 03Da05 for 1.1(+0.8-0.4) Ey, but important background **								
* ^{180}W	T : 03Da09 > 80 Py for $2\beta^-$ decay **								
* ^{180}Tl	D : ... ; $\beta^+ \text{SF} \approx 1.0\text{e-}4$ **								
* ^{180}Tl	D : $\alpha = (2-12)\%$ from 02An.A **								
^{181}Yb	-40850#	400#		1#	m		3/2 ⁻ #		$\beta^- ?$
^{181}Lu	-44740#	300#		3.5	m	0.3	(7/2 ⁺)	91	$\beta^- = 100$
^{181}Hf	-47411.9	2.1		42.39	d	0.06	1/2 ⁻	91	$\beta^- = 100$
$^{181}\text{Hf}^m$	-46817	4	595 3	80	μs	5	(9/2 ⁺)	01Sh36 ETJ	IT=100
$^{181}\text{Hf}^n$	-46372	10	1040 10	100	μs		(17/2 ⁺)	01Sh36 ETJ	IT=100
$^{181}\text{Hf}^p$	-45674	10	1738 10	1.5	ms	0.5	(27/2 ⁻)	01Sh36 ETJ	IT=100
^{181}Ta	-48441.6	1.8		STABLE			7/2 ⁺	92	IS=99.988 2
$^{181}\text{Ta}^m$	-48435.4	1.8	6.238 0.020	6.05	μs	0.12	9/2 ⁻	92	IT=100
$^{181}\text{Ta}^n$	-46957	3	1485 3	25	μs	2	21/2 ⁻	98Wh02 ETJ	IT=100
$^{181}\text{Ta}^p$	-46212	3	2230 3	210	μs	20	29/2 ⁻	98Wh02 ETJ	IT=100
^{181}W	-48254	5		121.2	d	0.2	9/2 ⁺	91	$\epsilon = 100$
^{181}Re	-46511	13		19.9	h	0.7	5/2 ⁺	91	$\beta^+ = 100$
^{181}Os	-43550	30		105	m	3	1/2 ⁻	92	$\beta^+ = 100$
$^{181}\text{Os}^m$	-43500	30	48.9 0.2	2.7	m	0.1	(7/2) ⁻	92	95Ro09 E $\beta^+ = 100$
^{181}Ir	-39472	26		4.90	m	0.15	(5/2) ⁻	93	$\beta^+ = 100$
^{181}Pt	-34375	15		52.0	s	2.2	1/2 ⁻	99	95Bi01 D $\beta^+ \approx 100$; $\alpha = 0.074$ 10
^{181}Au	-27871	20		13.7	s	1.4	(3/2 ⁻)	99	$\beta^+ = ?$; $\alpha = 2.7$ 5
^{181}Hg	-20661	15		3.6	s	0.1	1/2 ⁽⁻⁾	99	$\beta^+ = 69$ 5; $\alpha = 31$ 5; ... *
$^{181}\text{Hg}^p$	-20460#	40#	210# 40#				13/2 ⁺		
^{181}Tl	-12801	9		3.2	s	0.3	1/2 ⁺ #	91	98To14 TD $\alpha = ?$; $\beta^+ ?$ *
$^{181}\text{Tl}^m$	-11944	29	857 29 AD	1.7	ms	0.4	9/2 ⁻ #	98To14 TD	$\beta^+ ?$; $\alpha = ?$; IT ? *
^{181}Pb	-3140	90		&	45	ms	5/2 ⁻ #	96To01 T	$\alpha = ?$; $\beta^+ = 2\#$ *
$^{181}\text{Pb}^m$	non existent RN & 13/2 ⁺ # 91 96To01 I *								
* ^{181}Hg	D : ... ; $\beta^+ p = 0.016$ 4; $\beta^+ \alpha = 11\text{e-}6$ 4 **								
* ^{181}Tl	T : average 98To14=3.2(0.3) 92Bo.D=3.4(0.6) **								
* $^{181}\text{Tl}^m$	T : average 98To14=1.4(0.5) 84Sc.A=2.7(1.0) **								
* ^{181}Pb	T : supersedes 89To01=50(+40-30) from same group **								
* $^{181}\text{Pb}^m$	I : proved by 96To01 not to exist **								

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁸² Lu	-41880#	200#		2.0	m	0.2		(0, 1, 2) 95	$\beta^- = 100$	
¹⁸² Hf	-46059	6		9	My	2		0 ⁺ 95	$\beta^- = 100$	
¹⁸² Hf ^m	-44886	6	1172.88	0.18	61.5	m	1.5	8 ⁻ 95	$\beta^- = 58.3$; IT=42.3	
¹⁸² Ta	-46433.3	1.8			114.43	d	0.03	3 ⁻ 95	$\beta^- = 100$	
¹⁸² Ta ^m	-46417.0	1.8	16.263	0.003	283	ms	3	5 ⁺ 95	IT=100	
¹⁸² Ta ⁿ	-45913.7	1.8	519.572	0.018	15.84	m	0.10	10 ⁻ 95	IT=100	
¹⁸² W	-48247.5	0.8			STABLE	(>170 Ey)		0 ⁺ 95	03Da05 T IS=26.50 16; α ?	
¹⁸² Re	-45450	100			64.0	h	0.5	7 ⁺ 95	$\beta^+ = 100$	
¹⁸² Re ^m	-45388	20	60	100	BD *	12.7	h	0.2	2 ⁺ 95	$\beta^+ = 100$
¹⁸² Os	-44609	22			22.10	h	0.25	0 ⁺ 95	$\epsilon = 100$	
¹⁸² Ir	-39052	21			15	m	1	(3 ⁺) 95	95Sa42 J $\beta^+ = 100$	
¹⁸² Pt	-36169	16			2.2	m	0.1	0 ⁺ 95	$\beta^+ \approx 100$; $\alpha = 0.038$ 2	
¹⁸² Au	-28301	20			15.5	s	0.4	(2 ⁺) 95	01Ib02 J $\beta^+ \approx 100$; $\alpha = 0.13$ 5	
¹⁸² Hg	-23576	10			10.83	s	0.06	0 ⁺ 95	97Ba21 D $\beta^+ \approx 86.2$ 9; $\alpha = 13.8$ 9; ...	
¹⁸² Tl	-13350	80			2.0	s	0.3	2 ⁻ # 95	92Bo.D T $\beta^+ > 96$; $\alpha < 4$	
¹⁸² Tl ^m	-13250#	130#	100#	100#	*	2.9	s	0.5	(7 ⁺) 91Bo22 TJ $\alpha \approx 100$; $\beta^+ ?$	
¹⁸² Tl ^p	-12750#	160#	600#	140#				10 ⁻		
¹⁸² Pb	-6826	14			60	ms	40	0 ⁺ 95	$\alpha = ?$; $\beta^+ = 2\#$	
* ¹⁸² W	T : also 03Ce01 > 25 Ey 97Ge15 > 8.3 Ey									
* ¹⁸² Au	T : average 95Bi01=14.5(1.3)(for β^+), 15.3(1.0)(for α) and 92Ro21=15.6(0.4)									
* ¹⁸² Hg	D : ... ; $\beta^+ p < 1e-5$									
* ¹⁸² Hg	D : α average 97Ba21=13.3(0.5) 80Sc09=15.2(0.8); $\beta^+ p$ is from 71Ho07									
* ¹⁸² Tl ^m	T : average 91Bo22=3.1(1.0) 92Bo.D=2.8(0.6)									
¹⁸³ Lu	-39520#	300#			58	s	4	(7/2 ⁺) 91	$\beta^- = 100$	
¹⁸³ Hf	-43290	30			1.067	h	0.017	(3/2 ⁻) 91	$\beta^- = 100$	
¹⁸³ Ta	-45296.1	1.8			5.1	d	0.1	7/2 ⁺ 91	$\beta^- = 100$	
¹⁸³ Ta ^m	-45222.9	1.8	73.174	0.012	107	ns	11	9/2 ⁻ 91	IT=100	
¹⁸³ W	-46367.0	0.8			STABLE	(>80 Ey)		1/2 ⁻ 01	03Da05 T IS=14.31 4; α ?	
¹⁸³ W ^m	-46057.5	0.8	309.493	0.003	5.2	s	0.3	11/2 ⁺ 01	IT=100	
¹⁸³ Re	-45811	8			70.0	d	1.4	5/2 ⁺ 99	$\epsilon = 100$	
¹⁸³ Re ^m	-43903	8	1907.6	0.3	1.04	ms	0.04	(25/2 ⁺) 99	IT=100	
¹⁸³ Os	-43660	50			13.0	h	0.5	9/2 ⁺ 91	$\beta^+ = 100$	
¹⁸³ Os ^m	-43490	50	170.71	0.05	9.9	h	0.3	1/2 ⁻ 91	$\beta^+ \approx 85$ 2; IT=15 2	
¹⁸³ Ir	-40197	25			58	m	5	5/2 ⁻ 91	61Di04 T $\beta^+ \approx 100$; $\alpha = 0.05\#$	
¹⁸³ Pt	-35772	16			6.5	m	1.0	1/2 ⁻ 93	95Bi01 D $\beta^+ \approx 100$; $\alpha = 0.0096$ 5	
¹⁸³ Pt ^m	-35738	16	34.50	0.08	43	s	5	(7/2 ⁻) 93	$\beta^+ \approx 100$; $\alpha < 4e-4$; IT ?	
¹⁸³ Au	-30187	10			42.8	s	1.0	5/2 ⁻ 99	94Pa37 J $\beta^+ \approx 100$; $\alpha = 0.55$ 25	
¹⁸³ Au ^m	-30114	10	73.3	0.4	> 1	μ s		(1/2 ⁺) 99	IT=100	
¹⁸³ Au ^p	-29956	10	230.6	0.6	< 1	μ s		(11/2 ⁻) 99	IT=100	
¹⁸³ Hg	-23800	8			9.4	s	0.7	1/2 ⁻ 01	$\beta^+ \approx 88.3$ 20; $\alpha = 11.7$ 20; ...	
¹⁸³ Hg ^m	-23560#	40#	240#	40#	EU	5#	s	13/2 ⁺ #	01Sc41 I $\beta^+ ?$	
¹⁸³ Hg ^p	-23602	13	198	14	AD			13/2 ⁺ #		
¹⁸³ Tl	-16587	10			6.9	s	0.7	1/2 ⁺ # 02	$\beta^+ = ?$; $\alpha = 2\#$	
¹⁸³ Tl ^m	-15944	16	643	14	AD	60	ms	15	9/2 ⁻ # 02	$\alpha \approx 1.5$; $\beta^+ ?$; IT ?
¹⁸³ Tl ⁿ	-15611	20	976.8	17	1.48	μ s	0.10	(13/2 ⁺) 02	01Mu26 EJ IT=100	
¹⁸³ Pb	-7569	28			535	ms	30	(3/2 ⁻) 03	$\alpha = ?$; $\beta^+ = 10\#$	
¹⁸³ Pb ^m	-7475	28	94	8	AD	415	ms	20	(13/2 ⁺) 03	$\alpha \approx 100$; $\beta^+ ?$
* ¹⁸³ W	T : also 03Ce01 > 13 Ey 97Ge15 > 1.9 Ey									
* ¹⁸³ Ir	T : average 61Di04=55(7) 61La05=60(6)									
* ¹⁸³ Hg	D : ... ; $\beta^+ p = 2.6e-4$ 8									
* ¹⁸³ Hg ^m	I : 2001Sc41= no isomer seen with same characteristics as ¹⁸⁵ Hg or ¹⁸⁷ Hg									
* ¹⁸³ Hg ^m	I : no isomer in same odd-N ¹⁸¹ Pt and ¹⁷⁹ Os									
* ¹⁸³ Tl ⁿ	E : 346.8(0.3) keV above ¹⁸³ Tl ^m									

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{184}Lu	-36410#	400#		20	s	3	(3 ⁺)	90 95Kr04 TJ	β^- =100
$^{184}\text{Lu}^m$			non existent	20	s		high	95Kr04 I	
^{184}Hf	-41500	40		4.12	h	0.05	0 ⁺	90	β^- =100
$^{184}\text{Hf}^m$	-40230	40	1272.4 0.4	48	s	10	8 ⁻	95Kr04 TE	β^- =100
^{184}Ta	-42841	26		8.7	h	0.1	(5 ⁻)	90	β^- =100
^{184}W	-45707.3	0.9		STABLE	(>180 Ey)		0 ⁺	90 03Da05 T	IS=30.64 2; α ? *
^{184}Re	-44227	4		38.0	d	0.5	3 ⁽⁻⁾	90	β^+ =100
$^{184}\text{Re}^m$	-44039	4	188.01 0.04	169	d	8	8 ⁽⁺⁾	90	IT=75.4 11; ϵ =24.6 11
^{184}Os	-44256.1	1.3		STABLE	(>56 Ty)		0 ⁺	90	IS=0.02 1; α ?; $2\beta^+$? *
^{184}Ir	-39611	28		3.09	h	0.03	5 ⁻	90	β^+ =100
$^{184}\text{Ir}^m$	-39385	28	225.65 0.11	470	μs		3 ⁺		
^{184}Pt	-37332	18		17.3	m	0.2	0 ⁺	90 95Bi01 D	β^+ \approx 100; α =0.0017 7
$^{184}\text{Pt}^m$	-35493	18	1839.4 1.6	1.01	ms	0.05	8 ⁻	90	IT=100
^{184}Au	-30319	22		20.6	s	0.9	5 ⁺	03	β^+ \approx 100; α <0.016
$^{184}\text{Au}^m$	-30251	22	68.46 0.01	47.6	s	1.4	2 ⁺	03 94Ib01 EJ	β^+ =?; IT=30 10; α <0.016
$^{184}\text{Au}^n$	-30091	22	228.40 0.06	69	ns	6	3 ⁻	03	IT=100
^{184}Hg	-26349	10		30.6	s	0.3	0 ⁺	90	β^+ =98.89 6; α =1.11 6
^{184}Tl	-16890	50		9.7	s	0.6	2 ⁻ #	90 92Bo.D T	β^+ =97.9 7; α =2.1 7
$^{184}\text{Tl}^m$	-16790#	110#	100# 100#	10#	s		7 ⁺ #		β^+ ?; IT ?
$^{184}\text{Tl}^n$	-16390#	150#	500# 140#	> 20	ns		(10 ⁻)	84Sc.A T	IT ? *
^{184}Pb	-11045	14		490	ms	25	0 ⁺	03 02An.A D	α =80 15; β^+ ?
^{184}Bi	1050#	130#		6.6	ms	1.5	3 ⁺ #	02An.A T	α =?
$^{184}\text{Bi}^m$	1200#	160#	150# 100#	13	ms	2	10 ⁻ #	02An.A T	α =?
* ^{184}W	T : also 03Ce01 > 29 Ey 97Ge15 > 4.0 Ey **								
* ^{184}Os	T : lower limit is for α decay **								
* $^{184}\text{Tl}^n$	T : alpha decay from $^{188}\text{Bi}^m$ not coincident with X(K) and γ **								
* $^{184}\text{Tl}^n$	I : identified by 02Sc.A **								
^{185}Hf	-38360#	200#		3.5	m	0.6	3/2 ⁻ #	95	β^- =100
^{185}Ta	-41396	14		49.4	m	1.5	7/2 ⁺ #	95	β^- =100
$^{185}\text{Ta}^m$	-40090	30	1308 29	> 1	ms		(21/2 ⁻)	99Wh03 TJD	IT=100 *
^{185}W	-43389.7	0.9		75.1	d	0.3	3/2 ⁻	95	β^- =100
$^{185}\text{W}^m$	-43192.3	0.9	197.43 0.05	1.597	m	0.004	11/2 ⁺	95 94It.A T	IT=100
^{185}Re	-43822.2	1.2		STABLE			5/2 ⁺	95	IS=37.40 2
$^{185}\text{Re}^m$	-41698.2	2.3	2124 2	123	ns	23	(21/2)	97Sh37 T	IT=100
^{185}Os	-42809.4	1.3		93.6	d	0.5	1/2 ⁻	95	ϵ =100
$^{185}\text{Os}^m$	-42707.1	1.5	102.3 0.7	3.0	μs	0.4	7/2 ⁻ #	95	IT ?
^{185}Ir	-40336	28		14.4	h	0.1	5/2 ⁻	95	β^+ =100
^{185}Pt	-36680	40		70.9	m	2.4	(9/2 ⁺)	95	β^+ \approx 100; α =0.0050 20 *
$^{185}\text{Pt}^m$	-36580	40	103.4 0.2	33.0	m	0.8	(1/2 ⁻)	95	β^+ =?; IT<2
^{185}Au	-31867	26		4.25	m	0.06	5/2 ⁻	95	β^+ \approx 100; α =0.26 6
$^{185}\text{Au}^m$	-31770#	100#	100# 100#	6.8	m	0.3	1/2 ⁺ #	95	β^+ <100; IT ?
^{185}Hg	-26176	16		49.1	s	1.0	1/2 ⁻	95	β^+ =94 1; α =6 1
$^{185}\text{Hg}^m$	-26072	16	103.8 1.0	21.6	s	1.5	13/2 ⁺	95 87Ki.A E	IT=54 10; β^+ =46 10; α \approx 0.03 *
^{185}Tl	-19760	50		19.5	s	0.5	1/2 ⁺ #	95	β^+ =?; α ?
$^{185}\text{Tl}^m$	-19300	50	452.8 2.0	1.83	s	0.12	9/2 ⁻ #	95 77Sc03 E	IT \approx 100; α =0.10 3; β^+ ?
$^{185}\text{Tl}^n$	-18760	50	1003.0 2.0	8.3	ns	1.4	(13/2 ⁺)	95La08 T	
^{185}Pb	-11541	16		6.3	s	0.4	3/2 ⁻	95 02An15 TJD	α =50 25; β^+ ? *
$^{185}\text{Pb}^m$	-11480#	40#	60# 40#	4.07	s	0.15	13/2 ⁺	02An15 TJD	α =50 25; β^+ ? *
^{185}Bi	-2210#	50#		&	2#	ms	9/2 ⁻ #	96Da06 J	p ?; α ? *
$^{185}\text{Bi}^m$	-2143	18	70# 50#	&	49	μs	7	01Po05 T	p=85 6; α =15 6 *
* $^{185}\text{Ta}^m$	E : from 99Wh03 : less than 100 keV above 1258 level J : assuming ground-state=7/2 ⁺ **								
* ^{185}Pt	D : if the 4444(10) keV α line is from ground-state; otherwise α =0.0010(4)% from isomer **								
* $^{185}\text{Hg}^m$	E : ENSDF gives 99.3(0.5) plus "8-keV uncertainty", but missed 87Ki.A work **								
* ^{185}Pb	T : average 02An15=6.3(0.4) 80Sc09=6.1(1.1) **								
* $^{185}\text{Pb}^m$	T : average 02An15=4.3(0.2) 80Sc09=3.73(0.24) (excluding the 6.1 s activity) **								
* ^{185}Bi	T : estimated from 9/2 ⁻ isomers in odd Bi and Tl isotopes **								
* $^{185}\text{Bi}^m$	T : average 01Po05=50(8) 96Da06=44(16) **								

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁸⁶ Hf	-36430#	300#	2.6 m	1.2	0 ⁺	03	β^- =100
¹⁸⁶ Ta	-38610	60	10.5 m	0.3	(2 ⁻ , 3 ⁻)	03	β^- =100
¹⁸⁶ W	-42509.5	1.7	STABLE	(>4.1 Ey)	0 ⁺	03 03Da09 T	IS=28.43 19; 2 β^- ?; α ? *
¹⁸⁶ W ^m	-40992.3	1.8	1517.2	0.6	18 μ s	1	(7 ⁻) 03 IT=100
¹⁸⁶ W ⁿ	-38966.7	2.7	3542.8	2.1	> 3 ms		(16 ⁺) 03 *
¹⁸⁶ Re	-41930.2	1.2	3.7183 d	0.0011	1 ⁻	03	β^- =92.53 10; ϵ =7.47 10
¹⁸⁶ Re ^m	-41781	7	149	7	200 ky	50	(8 ⁺) 03 IT=?; β^- <10 *
¹⁸⁶ Os	-42999.5	1.4	2.0 Py	1.1	0 ⁺	03	IS=1.59 3; α =100
¹⁸⁶ Ir	-39173	17	16.64 h	0.03	5 ⁺	03	β^+ =100
¹⁸⁶ Ir ^m	-39172	17	0.8	0.4	1.92 h	0.05	2 ⁻ 03 91Be25 ET β^+ \approx 75; IT \approx 25 *
¹⁸⁶ Pt	-37864	22	2.08 h	0.05	0 ⁺	03	β^+ =100; α \approx 1.4e-4
¹⁸⁶ Au	-31715	21	10.7 m	0.5	3 ⁻	03	β^+ =100; α =0.0008 2
¹⁸⁶ Au ^m	-31487	21	227.77	0.07	110 ns	10	2 ⁺ 03 IT=100
¹⁸⁶ Au ^p			non existent	RN	< 2 m		83Po10 I
¹⁸⁶ Hg	-28539	11	1.38 m	0.06	0 ⁺	03	β^+ \approx 100; α =0.016 5
¹⁸⁶ Hg ^m	-26322	11	2217.3	0.4	82 μ s	5	(8 ⁻) 03 IT=100
¹⁸⁶ Tl	-20190	180			40# s		(2 ⁻) 03 91Va04 I β^+ ? *
¹⁸⁶ Tl ^m	-19874	9	320	180	AD * & 27.5 s	1.0	(7 ⁺) 03 β^+ \approx 100; α \approx 0.006
¹⁸⁶ Tl ⁿ	-19501	9	690	180	AD	2.9 s	0.2 (10 ⁻) 03 IT=100 *
¹⁸⁶ Pb	-14681	11	4.82 s	0.03	0 ⁺	03	β^+ ?; α =40 8
¹⁸⁶ Bi	-3170	80			14.8 ms	0.7	(3 ⁺) 03 02An.A T α \approx 100; β^+ ? *
¹⁸⁶ Bi ^m	-2900#	160#	270#	140#	*	9.8 ms	0.4 (10 ⁻) 03 02An.A T α \approx 100; β^+ ? *
* ¹⁸⁶ W	T : limit is 2 β^- decay; 03Da05>170 Ey 03Ce01>27 Ey 97Ge15>6.5 Ey for α decay **						
* ¹⁸⁶ W ⁿ	T : lower limit is 3 ms; upper limit 30 s **						
* ¹⁸⁶ Re ^m	T : uncertainty estimated by ENSDF'89 evaluator **						
* ¹⁸⁶ Ir ^m	T : average 91Be25=1.90(0.05) 70Fi.A=2.0(0.1) **						
* ¹⁸⁶ Ir ^m	E : E is positive and below 1.5 keV **						
* ¹⁸⁶ Tl	I : identified as decay level from ¹⁹⁰ Bi in 91Va04 **						
* ¹⁸⁶ Tl ⁿ	E : 374.0(0.2) keV above ¹⁸⁶ Tl ^m **						
* ¹⁸⁶ Bi	T : average 02An.A=14.8(0.8) 97Ba21=15.0(1.7) **						
¹⁸⁷ Hf	-32980#	400#	30#	s	(>300 ns)	3/2 ⁻ #	99Be63 I β^- ?
¹⁸⁷ Ta	-36770#	200#	2#	m	(>300 ns)	7/2 ⁺ #	99Be63 I β^- ?
¹⁸⁷ W	-39904.8	1.7	23.72 h	0.06	3/2 ⁻	92	β^- =100
¹⁸⁷ Re	-41215.7	1.4	41.2 Gy	0.2	5/2 ⁺	91	01Ga01 T IS=62.60 2; β^- =100; ... *
¹⁸⁷ Os	-41218.2	1.4	STABLE		1/2 ⁻	92	IS=1.96 2
¹⁸⁷ Ir	-39716	6	10.5 h	0.3	3/2 ⁺	91	β^+ =100
¹⁸⁷ Ir ^m	-39530	6	186.15	0.04	30.3 ms	0.6	9/2 ⁻ 91 IT=100
¹⁸⁷ Pt	-36713	28	2.35 h	0.03	3/2 ⁻	91	β^+ =100
¹⁸⁷ Au	-33005	25	8.4 m	0.3	1/2 ⁺	91	β^+ \approx 100; α =0.003#
¹⁸⁷ Au ^m	-32884	25	120.51	0.16	2.3 s	0.1	9/2 ⁻ 91 IT=100
¹⁸⁷ Hg	-28118	14			& 1.9 m	0.3	3/2 ⁻ 91 β^+ =100; α >1.2e-4
¹⁸⁷ Hg ^m	-28059	20	59	16	MD & 2.4 m	0.3	13/2 ⁺ 91 β^+ =100; α >2.5e-4
¹⁸⁷ Tl	-22444	8			51 s		(1/2 ⁺) 99 β^+ <100; α ?
¹⁸⁷ Tl ^m	-22109	8	335	3	AD	15.60 s	0.12 (9/2 ⁻) 99 IT=?; β^+ ?; α =0.15 5
¹⁸⁷ Pb	-14980	8			*	15.2 s	0.3 (3/2 ⁻) 00 β^+ =93 2; α =7 2
¹⁸⁷ Pb ^m	-14969	11	11	11	AD *	18.3 s	0.3 (13/2 ⁺) 00 β^+ =88 2; α =12 2
¹⁸⁷ Bi	-6373	15			32 ms	3	9/2 ⁻ # 01 α >50; β^+ ?
¹⁸⁷ Bi ^m	-6272	18	101	20	AD	320 μ s	70 1/2 ⁺ # 01 α >50; β^+ ?
¹⁸⁷ Bi ⁿ	-6121	15	252	1	7 μ s	5	(13/2 ⁺) 02Hu14 ETJ IT=100
* ¹⁸⁷ Re	D : ... ; α <0.0001 **						
* ¹⁸⁷ Re	T : others: 89Li30=42.3(0.7) outweighed and, same group, 86Li11=43.5(1.3) **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁸⁸ Hf	-30880#	500#	20#	s (>300 ns)	0 ⁺	02 99Be63 I	β^- ?
¹⁸⁸ Ta	-33810#	200#	20#	s (>300 ns)	0 ⁺	02 99Be63 I	β^- ?
¹⁸⁸ W	-38667	3	69.78	d	0.05	0 ⁺ 02	β^- =100
¹⁸⁸ Re	-39016.1	1.4	17.0040	h	0.0022	1 ⁻ 02	β^- =100
¹⁸⁸ Re ^m	-38844.0	1.4	172.069	0.009	18.59	m 0.04	(6) ⁻ 02 IT=100
¹⁸⁸ Os	-41136.4	1.4	STABLE			0 ⁺ 02	IS=13.24 8
¹⁸⁸ Ir	-38328	7	41.5	h	0.5	1 ⁻ 02	β^+ =100
¹⁸⁸ Ir ^m	-37360	30	970	30	4.2	ms 0.2	7 ⁺ # 02 ABBW E IT≈100; β^+ ? *
¹⁸⁸ Pt	-37823	5	10.2	d	0.3	0 ⁺ 02	ϵ =100; α =2.6e-5 3
¹⁸⁸ Au	-32301	20	8.84	m	0.06	1 ⁽⁻⁾ 02	β^+ =100
¹⁸⁸ Hg	-30202	12	3.25	m	0.15	0 ⁺ 02	β^+ =100; α =3.7e-5 8
¹⁸⁸ Hg ^m	-27478	12	2724.3	0.4	134	ns 15	(12 ⁺) 02 IT=100
¹⁸⁸ Tl	-22350	30	*	71	s 2	(2 ⁻) 02	β^+ =100
¹⁸⁸ Tl ^m	-22307	10	40	30	MD *	71 s 1	(7 ⁺) 02 β^+ =100
¹⁸⁸ Tl ⁿ	-22038	10	310	30	MD *	41 ms 4	(9 ⁻) 02 IT≈100; β^+ ? *
¹⁸⁸ Pb	-17815	11	25.5	s	0.1	0 ⁺ 02	β^+ =?; α =9.3 8
¹⁸⁸ Pb ^m	-15237	11	2578.2	0.7	830	ns 210	(8 ⁻) 02 IT=100
¹⁸⁸ Pb ⁿ	-15102	11	2713.0	0.6	94	ns	(11 ⁻) 02 IT=100
¹⁸⁸ Pb ^p	-15020	50	2800	50	797	ns 21	02 IT=100 *
¹⁸⁸ Bi	-7200	50	*	&	44	ms 3	3 ⁺ # 02 97Wa05 T α =?; β^+ ? *
¹⁸⁸ Bi ^m	-7000#	150#	210#	140#	*	&	40 ms 40 (10 ⁻) 02 97Wa05 T α =?; β^+ ? *
¹⁸⁸ Po	-538	19	430	μ s	180	0 ⁺ 02	α =?; β^+ ?
* ¹⁸⁸ Ir ^m	E : less than 100 keV above 923.5 level, from ENSDF **						
* ¹⁸⁸ Tl ⁿ	E : 268.8(0.5) keV above ¹⁸⁸ Tl ^m , from 91Va04 **						
* ¹⁸⁸ Pb ^p	E : 2700.5 above unknown level, see ENSDF'02 **						
* ¹⁸⁸ Bi	T : average 97Wa05=46(7) 84Sc.A=44(3) **						
* ¹⁸⁸ Bi ^m	T : average 97Wa05=218(50) 84Sc.A=210(90) **						
¹⁸⁹ Ta	-31830#	300#	3#	s (>300 ns)	7/2 ⁺ #	99Be63 I	β^- ?
¹⁸⁹ W	-35480	200	11.6	m	0.3	(3/2 ⁻) 91	β^- =100 *
¹⁸⁹ Re	-37978	8	24.3	h	0.4	5/2 ⁺ 91	β^- =100
¹⁸⁹ Os	-38985.4	1.5	STABLE			3/2 ⁻ 91	IS=16.15 5
¹⁸⁹ Os ^m	-38954.6	1.5	30.814	0.018	5.8	h 0.1	9/2 ⁻ 91 IT=100
¹⁸⁹ Ir	-38453	13	13.2	d	0.1	3/2 ⁺ 91	ϵ =100
¹⁸⁹ Ir ^m	-38081	13	372.18	0.04	13.3	ms 0.3	11/2 ⁻ 91 IT=100
¹⁸⁹ Ir ⁿ	-36120	13	2333.3	0.4	3.7	ms 0.2	(25/2) ⁺ 91 IT=100
¹⁸⁹ Pt	-36483	11	10.87	h	0.12	3/2 ⁻ 92	β^+ =100
¹⁸⁹ Pt ^m	-36291	11	191.6	0.4	143	μ s	(13/2 ⁺)
¹⁸⁹ Au	-33582	20	28.7	m	0.3	1/2 ⁺ 92	β^+ =100; α <3e-5
¹⁸⁹ Au ^m	-33335	20	247.23	0.17	4.59	m 0.11	11/2 ⁻ 92 β^+ ≈100; IT=?
¹⁸⁹ Hg	-29630	30	7.6	m	0.1	3/2 ⁻ 96	β^+ =100; α <3e-5
¹⁸⁹ Hg ^m	-29549	18	80	30	MD	8.6 m 0.1	13/2 ⁺ 96 β^+ =100; α <3e-5
¹⁸⁹ Tl	-24602	11	2.3	m	0.2	(1/2 ⁺) 99	β^+ =100
¹⁸⁹ Tl ^m	-24319	10	283	6	AD	1.4 m 0.1	9/2 ⁽⁻⁾ 99 β^+ ≈100; IT<4
¹⁸⁹ Pb	-17880	30	*	51	s 3	(3/2 ⁻) 91 ABBW J β^+ >99; α ≈0.4 *	
¹⁸⁹ Pb ^m	-17840#	50#	40#	30#	*	1# m	(13/2 ⁺) ABBW J β^+ ?; IT ? *
¹⁸⁹ Bi	-10060	50	674	ms	11	(9/2 ⁻) 98 95Ba75 J α >50; β^+ <50 *	
¹⁸⁹ Bi ^m	-9880	50	181	6	AD	6.6 ms 0.6	(1/2 ⁺) 98 95Ba75 TJ α >50; β^+ <50 *
¹⁸⁹ Bi ⁿ	-9700	50	357	1	880	ns 50	(13/2 ⁺) 01An11 ETJ IT=100 *
¹⁸⁹ Po	-1415	22	5	ms	1	3/2 ⁻ # 99An52 TD α =?; β^+ ?	
* ¹⁸⁹ W	T : average 97Ya03=11.7(0.5) 65Ka07=11.5(0.3) **						
* ¹⁸⁹ Pb	J : from α decay to ¹⁸⁵ Hg **						
* ¹⁸⁹ Pb ^m	J : from α decay from ¹⁹³ Po ^m **						
* ¹⁸⁹ Bi	T : average 02Hu14=667(13) 97Wa05=728(40) 85Co06=680(30) **						
* ¹⁸⁹ Bi ^m	T : average 97An09=4.8(0.5) 97Wa05=5.2(0.6) 95Ba75=7.0(0.2) **						
* ¹⁸⁹ Bi ⁿ	T : from 02Hu14; also 01An11>360(120) **						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{190}Ta	-28660#	400#	300# ms				β^- ?
^{190}W	-34300	160	30.0 m	1.5		03	β^- =100
$^{190}\text{W}^m$	-31920	160	2381	5		(10 ⁻) 03	IT=100
^{190}Re	-35570	150				(2) ⁻ 03	β^- =100
$^{190}\text{Re}^m$	-35360	160	210	60		(6 ⁻) 03	β^- =54.4 20; IT ?
^{190}Os	-38706.3	1.5				03	IS=26.26 2
$^{190}\text{Os}^m$	-37000.9	1.5	1705.4	0.2		(10) ⁻ 03	IT=100
^{190}Ir	-36751.2	1.7				4 ⁻ 03	β^+ =100; e^+ <0.002
$^{190}\text{Ir}^m$	-36725.1	1.7	26.1	0.1		(1 ⁻) 03	IT=100
$^{190}\text{Ir}^n$	-36374.8	1.7	376.4	0.1		(11) ⁻ 03	β^+ =91.4 2; IT=8.6 2
$^{190}\text{Ir}^p$	-36715.0	1.7	36.154	0.025		(4) ⁺ 03	IT=100
$^{190}\text{Ir}^q$	-36433.6	1.7	317.56	0.04		(5 ⁻) 03	IT=100
^{190}Pt	-37323	6				03	IS=0.014 1; α =100;...
^{190}Au	-32881	16				1 ⁻ 03	β^+ =100; α <1e-6
$^{190}\text{Au}^m$	-32680#	150#	200#	150#		11 ⁻ # 03	IT≈100; β^+ ?
^{190}Hg	-31370	16				03	ϵ ≈100; e^+ <1; ...
^{190}Tl	-24330	50				2 ⁽⁻⁾ 03	β^+ =100
$^{190}\text{Tl}^m$	-24200#	70#	130#	90#		7 ⁽⁺⁾ # 03	β^+ =100
$^{190}\text{Tl}^n$	-24040#	90#	290#	70#		(8 ⁻) 03	IT=100
$^{190}\text{Tl}^p$	-23920#	90#	410#	70#		9 ⁻ 03	IT ?
^{190}Pb	-20417	12				03	β^+ ?; α =0.40 4
$^{190}\text{Pb}^m$	-17802	12	2614.8	0.8		(10) ⁺ 03	IT=100
$^{190}\text{Pb}^n$	-17799	23	2618	20		(12) ⁺ 03	IT ?
$^{190}\text{Pb}^p$	-17759	12	2658.2	0.8		(11) ⁻ 03	IT=100
^{190}Bi	-10900	180				03	α =77 21; β^+ =?
$^{190}\text{Bi}^m$	-10483	10	420	180	MD	(10 ⁻) 03	α =70 9; β^+ ?
$^{190}\text{Bi}^n$	-10210	10	690	180	MD	7 ⁺ # 03	IT=100
^{190}Po	-4563	13				03	α ≈100; β^+ =0.1#
$^{190}\text{Re}^m$	E : from lower limit 119.12 and calculated 173 and 220 (see ENSDF'90)						
$^{190}\text{Re}^m$	E : 210(290) from difference in beta-decay						
^{190}Pt	D : ... ; $2\beta^+$?						
^{190}Hg	D : ... ; α <3.4e-7						
$^{190}\text{Tl}^n$	E : 161.9 keV above $^{190}\text{Tl}^m$						
$^{190}\text{Tl}^p$	E : 236.2 keV above $^{190}\text{Tl}^m$						
$^{190}\text{Pb}^n$	E : above $^{190}\text{Pb}^m$, see ENSDF'03						
$^{190}\text{Bi}^n$	E : 273(1) keV above the (10 ⁻) isomer						
^{191}W	-31110#	200#				20# s (>300 ns)	β^- ?
^{191}Re	-34349	10				9.8 m	β^- =100
^{191}Os	-36393.7	1.5				15.4 d	β^- =100
$^{191}\text{Os}^m$	-36319.3	1.5	74.382	0.003		13.10 h	IT=100
^{191}Ir	-36706.4	1.7				STABLE	IS=37.3 2
$^{191}\text{Ir}^m$	-36535.2	1.7	171.24	0.05		4.94 s	IT=100
$^{191}\text{Ir}^n$	-34590	40	2120	40		5.5 s	IT=100
^{191}Pt	-35698	4				2.802 d	ϵ =100
$^{191}\text{Pt}^m$	-35549	4	149.04	0.02		95 μ s	
^{191}Au	-33810	40				3.18 h	β^+ =100
$^{191}\text{Au}^m$	-33540	40	266.2	0.5		920 ms	IT=100
^{191}Hg	-30593	23				49 m	β^+ =100; α <5e-6
$^{191}\text{Hg}^m$	-30470	30	128	22		50.8 m	β^+ =100; α <5e-6
^{191}Tl	-26281	8				20# m	β^+ ?
$^{191}\text{Tl}^m$	-25984	7	297	7	BD	5.22 m	β^+ =100
^{191}Pb	-20250	40				1.33 m	β^+ ≈100; α =0.013 5
$^{191}\text{Pb}^m$	-20231	28	20	50	MD	2.18 m	β^+ ≈100; α ≈0.02
^{191}Bi	-13240	7				12.3 s	α =60 20; β^+ =40 20
$^{191}\text{Bi}^m$	-13000	9	240	4	AD	124 ms	α =75 25; β^+ ≈25
^{191}Po	-5054	11				22 ms	α ≈100; β^+ ?
$^{191}\text{Po}^m$	-5020	10	34	12	AD	98 ms	α ≈100; β^+ ?
$^{191}\text{Ir}^n$	E : estimated less than 150 keV above 2047.1 level, from ENSDF						
$^{191}\text{Hg}^m$	E : original error (8 keV) increased by 20 for isomer+ground-state lines in trap						
^{191}Bi	T : average 03Ke04=12.4(0.4) 85Co06=12(1) 74Le02=13(1) 72Ga27=12.0(0.7)						
$^{191}\text{Bi}^m$	T : average 03Ke04=121(+8-5) 99An36=115(10) 81Le23=150(15)						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{192}W	-29650# 600#		10# s (>300 ns)	0^+		99Be63 I	$\beta^- ?$
^{192}Re	-31710# 200#		16 s 1		98		$\beta^- =100$
^{192}Os	-35880.5 2.6		STABLE (>9.8 Ty)	0^+	98		IS=40.78 19; $2\beta^- ?$; $\alpha ?$ *
$^{192}\text{Os}^m$	-33865.1 2.6	2015.40 0.11	5.9 s 0.1	(10^-)	98		IT>87; $\beta^- <13$
^{192}Ir	-34833.2 1.7		73.827 d 0.013	4^+	98		$\beta^- =95.13$ 14; $\epsilon =4.87$ 14
$^{192}\text{Ir}^m$	-34776.5 1.7	56.720 0.005	1.45 m 0.05	1^-	98		IT \approx 100; $\beta^- =0.0175$
$^{192}\text{Ir}^n$	-34665.1 1.7	168.14 0.12	241 y 9	(11^-)	98		IT=100
^{192}Pt	-36292.9 2.5		STABLE	0^+	98		IS=0.782 7
^{192}Au	-32777 16		4.94 h 0.09	1^-	98		$\beta^+ =100$
$^{192}\text{Au}^m$	-32642 16	135.41 0.25	29 ms	$5^{\#+}$	98		IT=100
$^{192}\text{Au}^n$	-32345 16	431.6 0.5	160 ms 20	(11^-)	98		IT=100
^{192}Hg	-32011 16		4.85 h 0.20	0^+	00		$\epsilon =100$; $\alpha <4e-6$
^{192}Tl	-25870 30		9.6 m 0.4	(2^-)	99		$\beta^+ =100$
$^{192}\text{Tl}^m$	-25710 60	160 50	10.8 m 0.2	(7^+)	99	91Va04 E	$\beta^+ =100$
$^{192}\text{Tl}^p$	-25694 25	180 40	AD	(3^+)		91Va04 E	
^{192}Pb	-22556 13		3.5 m 0.1	0^+	98		$\beta^+ \approx 100$; $\alpha =0.0059$ 7
$^{192}\text{Pb}^m$	-19975 13	2581.1 0.1	164 ns 7	$(10)^+$	98		IT=100
$^{192}\text{Pb}^n$	-19931 13	2625.1 1.1	1.1 μs 0.5	(12^+)	98		IT=100
$^{192}\text{Pb}^p$	-19813 13	2743.5 0.4	756 ns 21	$(11)^-$	98		IT=100
^{192}Bi	-13550 30		34.6 s 0.9	(3^+)	98		$\beta^+ =88$ 5; $\alpha =12$ 5
$^{192}\text{Bi}^m$	-13399 9	150 30	MD	(10^-)	98		$\beta^+ =90$ 3; $\alpha =10$ 3
^{192}Po	-8071 12		32.2 ms 0.3	0^+	98	99He32 T	$\alpha =?$; $\beta^+ =0.5\#$ *
$^{192}\text{Po}^m$	-5470# 500# 2600# 500#		1 μs	$12^{\#+}$		99He32 T	IT=100 **
* ^{192}Os	T : lower limit is for $0\nu-2\beta^-$ decay **						
* ^{192}Po	T : others 98A127=31(4) 96Bi17=33.2(1.4) 81Le23=34(3) outweighed, not used **						
^{193}Re	-30300# 200#		30# s (>300 ns)	$5/2^{\#+}$		99Be63 I	$\beta^- ?$
^{193}Os	-33392.6 2.6		30.11 h 0.01	$3/2^-$	98		$\beta^- =100$
^{193}Ir	-34533.8 1.7		STABLE	$3/2^+$	98		IS=62.7 2
$^{193}\text{Ir}^m$	-34453.6 1.7	80.240 0.006	10.53 d 0.04	$11/2^-$	98		IT=100
^{193}Pt	-34477.0 1.7		50 y 6	$1/2^-$	98		$\epsilon =100$
$^{193}\text{Pt}^m$	-34327.2 1.7	149.78 0.04	4.33 d 0.03	$13/2^+$	98		IT=100
^{193}Au	-33394 11		17.65 h 0.15	$3/2^+$	98		$\beta^+ =100$; $\alpha <1e-5$
$^{193}\text{Au}^m$	-33104 11	290.19 0.03	3.9 s 0.3	$11/2^-$	98		IT \approx 100; $\beta^+ \approx 0.03$
^{193}Hg	-31051 15		3.80 h 0.15	$3/2^-$	99		$\beta^+ =100$
$^{193}\text{Hg}^m$	-30910 15	140.76 0.05	11.8 h 0.2	$13/2^+$	99		$\beta^+ =92.8$ 5; IT=7.2 5
^{193}Tl	-27320 110		21.6 m 0.8	$1/2^{(\#)}$	99		$\beta^+ =100$
$^{193}\text{Tl}^m$	-26950 110	369 4	2.11 m 0.15	$9/2^-$	99		IT=75; $\beta^+ =25$ *
^{193}Pb	-22190 50		* 5# m	$(3/2^-)$	99	ABBW J	$\beta^+ ?$ *
$^{193}\text{Pb}^m$	-22060# 90# 130# 80#		* 5.8 m 0.2	$13/2^{(+)}$	99	88Me.A J	$\beta^+ =100$
^{193}Bi	-15873 10		67 s 3	$(9/2^-)$	98		$\beta^+ ?$; $\alpha =3.5$ 15
$^{193}\text{Bi}^m$	-15564 12	308 7	AD	$(1/2^+)$	98		$\alpha =90$ 20; $\beta^+ ?$
^{193}Po	-8360 30		420 ms 40	$3/2^- \#$	98		$\alpha =?$; $\beta^+ =5\#$
$^{193}\text{Po}^m$	-8260# 50# 100# 30#		240 ms 10	$(13/2^+)$	98	ABBW J	$\alpha =?$; $\beta^+ =3\#$
^{193}At	-150 50		40 ms	$9/2^- \#$	98		$\alpha =100$
* $^{193}\text{Tl}^m$	E : less than 13 keV above 362.5 level, from ENSDF **						
* ^{193}Pb	J : from α decay from ^{197}Po **						
* ^{193}Pb	T : T=4.0 m reported in Karlsruhe charts 1981 and 1995. Not traceable **						
^{194}Re	-27550# 300#		2# s (>300 ns)			99Be63 I	$\beta^- ?$
^{194}Os	-32432.7 2.6		6.0 y 0.2	0^+	96		$\beta^- =100$
^{194}Ir	-32529.3 1.7		19.28 h 0.13	1^-	96		$\beta^- =100$
$^{194}\text{Ir}^m$	-32382.2 1.7	147.078 0.005	31.85 ms 0.24	(4^+)	96		IT=100
$^{194}\text{Ir}^n$	-32160 70	370 70	BD	$(10, 11)^{(-\#)}$	96		$\beta^- =100$
^{194}Pt	-34763.1 0.9		STABLE	0^+	96		IS=32.967 99
^{194}Au	-32262 10		38.02 h 0.10	1^-	96		$\beta^+ =100$
$^{194}\text{Au}^m$	-32155 10	107.4 0.5	600 ms 8	(5^+)	96		IT=100
$^{194}\text{Au}^n$	-31786 10	475.8 0.6	420 ms 10	(11^-)	96		IT=100
^{194}Hg	-32193 13		440 y 80	0^+	01		$\epsilon =100$

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
¹⁹⁴ Tl	-26830	140			*	33.0 m	0.5 2 ⁻ 99 $\beta^+=100; \alpha < 1e-7$	
¹⁹⁴ Tl ^m	-26530#	240#	300#	200#	*	32.8 m	0.2 (7 ⁺) 99 $\beta^+=100$	
¹⁹⁴ Pb	-24208	17				12.0 m	0.5 0 ⁺ 99 $\beta^+=100; \alpha=7.3e-6$ 29	
¹⁹⁴ Bi	-15990	50			*	95 s	3 (3 ⁺) 96 $\beta^+\approx 100; \alpha=0.46$ 25	
¹⁹⁴ Bi ^m	-15880	50	110	70	MD *	125 s	2 (6 ⁺ , 7 ⁺) 96 $\beta^+\approx 100; \alpha ?$	
¹⁹⁴ Bi ⁿ	-15760#	70#	230#	90#		115 s	4 (10 ⁻) 96 $\beta^+\approx 100; \alpha=0.20$ 7	
¹⁹⁴ Po	-11005	13				392 ms	4 0 ⁺ 96 $\alpha\approx 100; \beta^+ ?$	
¹⁹⁴ Po ^m	-8480	13	2525	2		15 μ s	2 (11 ⁻) 99He32 TJD IT=100	
¹⁹⁴ At	-1190	190				40 ms	3 ⁺ # 96 $\alpha\approx 100; \beta^+ ?$	
¹⁹⁴ At ^m	-711	17	480	190	AD	250 ms	10 ⁻ # 96 $\alpha\approx 100; IT ?$	
¹⁹⁵ Os	-29690	500				6.5 m	3/2 ⁻ # 99 $\beta^-=100$ *	
¹⁹⁵ Ir	-31689.8	1.7				2.5 h	0.2 3/2 ⁺ 99 $\beta^-=100$	
¹⁹⁵ Ir ^m	-31590	5	100	5		3.8 h	0.2 11/2 ⁻ 99 $\beta^-=95$ 5; IT=5 5	
¹⁹⁵ Pt	-32796.8	0.9				STABLE	1/2 ⁻ 99 IS=33.832 10	
¹⁹⁵ Pt ^m	-32537.5	0.9	259.30	0.08		4.02 d	0.01 13/2 ⁺ 99 IT=100	
¹⁹⁵ Au	-32570.0	1.3				186.10 d	0.05 3/2 ⁺ 99 $\epsilon=100$	
¹⁹⁵ Au ^m	-32251.4	1.3	318.58	0.04		30.5 s	0.2 11/2 ⁻ 99 IT=100	
¹⁹⁵ Hg	-31000	23				10.53 h	0.03 1/2 ⁻ 99 01Li17 T $\beta^+=100$	
¹⁹⁵ Hg ^m	-30824	23	176.07	0.04		41.6 h	0.8 13/2 ⁺ 99 IT=54.2 20; $\beta^+=45.8$ 20	
¹⁹⁵ Tl	-28155	14				1.16 h	0.05 1/2 ⁺ 99 $\beta^+=100$	
¹⁹⁵ Tl ^m	-27672	14	482.63	0.17		3.6 s	0.4 9/2 ⁻ 99 IT=100	
¹⁹⁵ Pb	-23714	23				15 m	3/2 [#] 99 $\beta^+=100$	
¹⁹⁵ Pb ^m	-23511	23	202.9	0.7		15.0 m	1.2 13/2 ⁺ 99 $\beta^+=100$	
¹⁹⁵ Bi	-18024	6				183 s	4 (9/2 ⁻) 99 ABBW J $\beta^+\approx 100; \alpha=0.03$ 2	
¹⁹⁵ Bi ^m	-17624	8	399	6	AD	87 s	1 (1/2 ⁺) 99 ABBW J $\beta^+=67$ 17; $\alpha=33$ 17 *	
¹⁹⁵ Po	-11070	40				4.64 s	0.09 3/2 ⁻ # 99 $\alpha=75$ 15; $\beta^+=25$ 15	
¹⁹⁵ Po ^m	-10964	28	110	50	AD	1.92 s	0.02 13/2 ⁺ # 99 $\alpha\approx 90; \beta^+\approx 10; IT < 0.01$	
¹⁹⁵ At	-3476	9				& 328 ms	20 (1/2 ⁺) 00 03Ke04 T $\alpha\approx 100; \beta^+ ?$	
¹⁹⁵ At ^m	-3443	8	34	7	AD &	& 147 ms	5 9/2 ⁻ # 00 03Ke04 T $\alpha=?; \beta^+ < 25\%$	
¹⁹⁵ Rn	5070	50			*	6 ms	3/2 ⁻ # 01Ke06 TD $\alpha=?$	
¹⁹⁵ Rn ^m	5118	15	50	50	*	6 ms	13/2 ⁺ # 01Ke06 TD $\alpha=?$	
* ¹⁹⁵ Os	I : identification of this nuclide has been questioned, see ENSDF'99							**
* ¹⁹⁵ Bi ^m	J : spins of ground-state and of isomer derived from alpha decay							**
¹⁹⁶ Os	-28280	40				34.9 m	0.2 0 ⁺ 98 $\beta^-=100$	
¹⁹⁶ Ir	-29440	40				52 s	1 (0 ⁻) 98 $\beta^-=100$	
¹⁹⁶ Ir ^m	-29229	20	210	40	BD	1.40 h	0.02 (10, 11 ⁻) 98 $\beta^-\approx 100; IT < 0.3$	
¹⁹⁶ Pt	-32647.4	0.9				STABLE	0 ⁺ 98 IS=25.242 41	
¹⁹⁶ Au	-31140.0	3.0				6.1669 d	0.0006 2 ⁻ 98 01Li17 T $\beta^+=92.8$ 8; $\beta^-=7.2$ 8	
¹⁹⁶ Au ^m	-31055	3	84.660	0.020		8.1 s	0.2 5 ⁺ 98 IT=100	
¹⁹⁶ Au ⁿ	-30544	3	595.66	0.04		9.6 h	0.1 12 ⁻ 98 IT=100	
¹⁹⁶ Hg	-31826.7	2.9				STABLE (>2.5 Ey)	0 ⁺ 98 90Bu28 T IS=0.15 1; 2 $\beta^+ ?$	
¹⁹⁶ Tl	-27497	12				1.84 h	0.03 2 ⁻ 98 $\beta^+=100$	
¹⁹⁶ Tl ^m	-27103	12	394.2	0.5		1.41 h	0.02 (7 ⁺) 98 $\beta^+=95.5; IT=4.5$	
¹⁹⁶ Pb	-25361	14				37 m	3 0 ⁺ 01 $\beta^+=100; \alpha \leq 3e-5$	
¹⁹⁶ Pb ^m	-23623	14	1738.27	0.12		< 1 μ s	4 ⁺ 01 IT=100	
¹⁹⁶ Bi	-18009	24				5.1 m	0.2 (3 ⁺) 99 $\beta^+\approx 100; \alpha=0.00115$ 34	
¹⁹⁶ Bi ^m	-17842	25	166.6	3.0	AD	0.6 s	0.5 (7 ⁺) 99 IT=?; $\beta^+ ?$	
¹⁹⁶ Bi ⁿ	-17739	25	270	3	AD	4.00 m	0.05 (10 ⁻) 99 $\beta^+=74.2$ 25; IT=25.8 25;... *	
¹⁹⁶ Po	-13474	13				5.56 s	0.12 0 ⁺ 98 93Wa04 TD $\alpha=94$ 5; $\beta^+=6$ 5 *	
¹⁹⁶ Po ^m	-10984	13	2490.5	1.7		850 ns	90 (11 ⁻) 98 IT=100	
¹⁹⁶ At	-3920	60			*	253 ms	9 3 ⁺ # 98 97Pu01 T $\alpha=?; \beta^+=4\%$	
¹⁹⁶ At ^m	-3950	50	-30	80	AD *	20# ms	10 ⁻ # 96En01 D IT ?	
¹⁹⁶ At ⁿ	-3760	60	157.9	0.1		11 μ s	5 ⁺ # 00Sm06 ET IT ?	
¹⁹⁶ Rn	1970	15				4.7 ms	1.1 0 ⁺ 98 01Ke06 T $\alpha\approx 100; \beta^+=0.2\%$	
* ¹⁹⁶ Bi ⁿ	D : ... ; $\alpha=0.00038$ 10							**
* ¹⁹⁶ Po	T : average 97Pu01=5.5(0.1) 93Wa04=5.8(0.2)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
^{197}Ir	-28268	20	5.8 m	0.5	3/2 ⁺	96	β^- =100		
$^{197}\text{Ir}^m$	-28153	21	115	5	8.9 m	0.3	11/2 ⁻ 96	β^- ≈100; IT=0.25 10	
^{197}Pt	-30422.4	0.8	19.8915 h	0.0019	1/2 ⁻	96	β^- =100		
$^{197}\text{Pt}^m$	-30022.8	0.8	399.59	0.20	95.41 m	0.18	13/2 ⁺ 96	IT=96.7 4; β^- =3.3 4	
^{197}Au	-31141.1	0.6			STABLE		3/2 ⁺ 96	IS=100.	
$^{197}\text{Au}^m$	-30732.0	0.6	409.15	0.08	7.73 s	0.06	11/2 ⁻ 96	IT=100	
^{197}Hg	-30541	3			64.94 h	0.07	1/2 ⁻ 96	01Li17 T ϵ =100	
$^{197}\text{Hg}^m$	-30242	3	298.93	0.08	23.8 h	0.1	13/2 ⁺ 96	IT=91.4 7; ϵ =8.6 7	
^{197}Tl	-28341	16			2.84 h	0.04	1/2 ⁺ 96	β^+ =100	
$^{197}\text{Tl}^m$	-27733	16	608.22	0.08	540 ms	10	9/2 ⁻ 96	IT=100	
^{197}Pb	-24749	6			8 m	2	3/2 ⁻ 01	β^+ =100	
$^{197}\text{Pb}^m$	-24429	6	319.31	0.11	43 m	1	13/2 ⁺ 01	β^+ =81 2; IT=19 2; ...	
$^{197}\text{Pb}^n$	-22835	6	1914.10	0.25	1.15 μs	0.20	21/2 ⁻ 01	IT=100	
^{197}Bi	-19688	8			9.3 m	0.5	(9/2 ⁻) 99	β^+ =100; α =1e-4#	
$^{197}\text{Bi}^m$	-19000	110	690	110	AD	5.04 m	0.16	(1/2 ⁺) 99	α =55 40; β^+ =45 40; ...
^{197}Po	-13360	50			53.6 s	1.0	(3/2 ⁻) 96	β^+ ?; α =44 7	
$^{197}\text{Po}^m$	-13120#	90#	230#	80#		25.8 s	0.1	(13/2 ⁺) 96	α =84 9; β^+ ?; IT=0.01#
^{197}At	-6340	50			* 350 ms	40	(9/2 ⁻) 96	α =96 4; β^+ =4 4	
$^{197}\text{Au}^m$	-6293	13	50	50	AD *	3.7 s	2.5	(1/2 ⁺) 96	α ≈100; β^+ ?; IT<0.004
^{197}Rn	1480	60			66 ms	16	3/2 ⁻ # 98	96En02 T α ≈100; β^+ ?	
$^{197}\text{Rn}^m$	1670#	50#	200#	60#		21 ms	5	(13/2 ⁺) 98	96En02 T α ≈100; β^+ ?
* ^{197}Hg	T : other 66El09=64.14(0.05) at strong variance: Birge ratio would be B=9.3							**	
* $^{197}\text{Pb}^m$	D : ... ; α <3e-4							**	
* $^{197}\text{Bi}^m$	D : ... ; IT<0.3							**	
* ^{197}Rn	T : average 96En02=65(+25-14) 95Mo14=51(+35-15)							**	
* $^{197}\text{Rn}^m$	T : average 96En02=19(+8-4) 95Mo14=18(+9-5) J : from α decay to $^{193}\text{Po}^m$							**	
^{198}Ir	-25820#	200#			8 s	1	02	β^- =100	
^{198}Pt	-29908	3			STABLE	(>320 Ty)	0 ⁺ 02	52Fr23 T IS=7.163 55; 2 β^- ?; α ?	
^{198}Au	-29582.1	0.6			2.69517 d	0.00021	2 ⁻ 02	β^- =100	
$^{198}\text{Au}^m$	-29269.9	0.6	312.2200	0.0020	124 ns	4	5 ⁺ 02	IT=100	
$^{198}\text{Au}^n$	-28770.4	1.6	811.7	1.5	2.27 d	0.02	(12 ⁻) 02	IT=100	
^{198}Hg	-30954.4	0.3			STABLE		0 ⁺ 02	IS=9.97 20	
^{198}Tl	-27490	80			5.3 h	0.5	2 ⁻ 02	β^+ =100	
$^{198}\text{Tl}^m$	-26950	80	543.5	0.4	1.87 h	0.03	7 ⁺ 02	β^+ =54 2; IT=46 2	
$^{198}\text{Tl}^n$	-26750	80	742.3	0.4	32.1 ms	1.0	10 ⁻ # 02	IT=100	
^{198}Pb	-26050	15			2.4 h	0.1	0 ⁺ 02	β^+ =100	
$^{198}\text{Pb}^m$	-23909	15	2141.4	0.4	4.19 μs	0.10	(7 ⁻) 02	IT=100	
^{198}Bi	-19369	28			10.3 m	0.3	(2 ⁺ , 3 ⁺) 02	β^+ =100	
$^{198}\text{Bi}^m$	-19085	28	280	40	MD	11.6 m	0.3	(7 ⁺) 02	β^+ =100
$^{198}\text{Bi}^n$	-18837	28	530	40	MD	7.7 s	0.5	10 ⁻ 02	IT=100
^{198}Po	-15473	17			1.77 m	0.03	0 ⁺ 02	α =57 2; β^+ =43 2	
$^{198}\text{Po}^m$	-13619	17	1853.63	0.18	29 ns	2	8 ⁺ 02	IT=100	
$^{198}\text{Po}^n$	-12907	17	2565.92	0.20	200 ns	20	11 ⁻ 02	IT=100	
$^{198}\text{Po}^p$	-12781	17	2691.86	0.20	750 ns	50	12 ⁺ 02	IT ?	
^{198}At	-6670	50			4.2 s	0.3	(3 ⁺) 02	95Bi.A D α >94; β^+ ?	
$^{198}\text{At}^m$	-6340#	70#	330#	90#	1.0 s	0.2	(10 ⁻) 02	95Bi.A D α >86; β^+ ?	
^{198}Rn	-1231	13			65 ms	3	0 ⁺ 02	α =?; β^+ =1#	
$^{198}\text{Rn}^m$			non existent	EU	50 ms	9		α =?; β^+ =?; IT=?	
* ^{198}Pt	T : lower limit is for 0v-2 β^- decay							**	
* $^{198}\text{Bi}^n$	E : 248.5(0.5) keV above $^{198}\text{Bi}^m$, from 92Hu04							**	
* $^{198}\text{Rn}^m$	I : α decay assigned to isomer by ENSDF'95, not accepted by NUBASE							**	
^{199}Ir	-24400	40			20# s		3/2 ⁺ # 01	β^- ?	
^{199}Pt	-27392	3			30.80 m	0.21	5/2 ⁻ 94	β^- =100	
$^{199}\text{Pt}^m$	-26968	4	424	2	13.6 s	0.4	(13/2 ⁺) 94	IT=100	
^{199}Au	-29095.0	0.6			3.139 d	0.007	3/2 ⁺ 94	β^- =100	
$^{199}\text{Au}^m$	-28546.1	0.6	548.9368	0.0021	440 μs	30	(11/2 ⁻) 94	IT=100	
^{199}Hg	-29547.1	0.4			STABLE		1/2 ⁻ 94	IS=16.87 22	
$^{199}\text{Hg}^m$	-29014.6	0.4	532.48	0.10	42.66 m	0.08	13/2 ⁺ 94	01Li17 T IT=100	

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...											
¹⁹⁹ Tl	-28059	28			7.42	h	0.08	1/2 ⁺	94	$\beta^+=100$	
¹⁹⁹ Tl ^m	-27309	28	749.7	0.3	28.4	ms	0.2	9/2 ⁻	94	IT=100	
¹⁹⁹ Pb	-25228	26			90	m	10	3/2 ⁻	01	$\beta^+=100$	
¹⁹⁹ Pb ^m	-24799	26	429.5	2.7	12.2	m	0.3	(13/2 ⁺)	01	IT=93; $\beta^+=7$	
¹⁹⁹ Pb ⁿ	-22664	26	2563.8	2.7	10.1	μ s	0.2	(29/2 ⁻)	01	IT=100	
¹⁹⁹ Bi	-20798	12			27	m	1	9/2 ⁻	94	$\beta^+=100$	
¹⁹⁹ Bi ^m	-20131	12	667	4	24.70	m	0.15	(1/2 ⁺)	94	$\beta^+=?$; IT<2; $\alpha\approx 0.01$	
¹⁹⁹ Po	-15215	23			5.48	m	0.16	(3/2 ⁻)	94	$\beta^+=92.5$ 3; $\alpha=7.5$ 3	
¹⁹⁹ Po ^m	-14903	23	312.0	2.8	AD	4.17	m	0.04	13/2 ⁺	94	$\beta^+=73.5$ 10; $\alpha=24$ 1; IT=2.5
¹⁹⁹ At	-8820	50			7.2	s	0.5	(9/2 ⁻)	94	$\alpha=89$ 6; $\beta^+?$	
¹⁹⁹ Rn	-1520	60			620	ms	30	3/2 ⁻ #	98	$\alpha=?$; $\beta^+=6\#$	
¹⁹⁹ Rn ^m	-1334	29	180	70	AD	320	ms	20	13/2 ⁺ #	98	$\alpha=?$; $\beta^+=3\#$
¹⁹⁹ Fr	6760	40			16	ms	7	1/2 ⁺ #	01	99Ta20 T $\alpha\approx 100$; $\beta^+?$	
* ¹⁹⁹ Hg ^m	T : average 01Li17=42.67(0.09) 69KI06=42.6(0.2)										
* ¹⁹⁹ Pb ^m	E : 424.8 γ to level lower than 9.3 keV, from ENSDF D : from 78Le.A										
* ¹⁹⁹ Pb ⁿ	E : 2559.1 to level lower than 9.3 keV, from ENSDF										
²⁰⁰ Pt	-26603	20			12.5	h	0.3	0 ⁺	95	$\beta^-=100$	
²⁰⁰ Au	-27270	50			48.4	m	0.3	1 ⁽⁻⁾	95	$\beta^-=100$	
²⁰⁰ Au ^m	-26300	50	970	70	BD	18.7	h	0.5	12 ⁻	95	$\beta^-=82$ 2; IT=18 2
²⁰⁰ Hg	-29504.1	0.4			STABLE			0 ⁺	95	IS=23.10 19	
²⁰⁰ Tl	-27048	6			26.1	h	0.1	2 ⁻	95	$\beta^+=100$	
²⁰⁰ Tl ^m	-26294	6	753.6	0.2	34.3	ms	1.0	7 ⁺	95	IT=100	
²⁰⁰ Pb	-26243	11			21.5	h	0.4	0 ⁺	95	$\epsilon=100$	
²⁰⁰ Bi	-20370	24			*	36.4	m	0.5	7 ⁺	95	$\beta^+=100$
²⁰⁰ Bi ^m	-20270#	70#	100#	70#	*	31	m	2	(2 ⁺)	95	$\beta^+>90$; IT<10
²⁰⁰ Bi ⁿ	-19942	24	428.20	0.10	400	ms	50	(10 ⁻)	95	IT=100	
²⁰⁰ Po	-16954	14			11.5	m	0.1	0 ⁺	95	$\beta^+=88.9$ 3; $\alpha=11.1$ 3	
²⁰⁰ At	-8988	24			43.2	s	0.9	(3 ⁺)	95	96Ta18 T $\alpha=57$ 6; $\beta^+=43$ 6	
²⁰⁰ At ^m	-8875	25	112.7	3.0	AD	47	s	1	(7 ⁺)	95	$\alpha=43$ 7; $\beta^+=?$; IT?
²⁰⁰ At ⁿ	-8644	24	344	3	AD	3.5	s	0.2	(10 ⁻)	95	IT ≈ 84 ; $\alpha\approx 10.5$; $\beta^+\approx 4.5$
²⁰⁰ Rn	-4006	13			1.03	s	0.05	0 ⁺	98	96Ta18 T $\alpha=?$; $\beta^+=2\#$	
²⁰⁰ Fr	6120	80			*	24	ms	10	3 ⁺ #	97	96En01 TD $\alpha=100$
²⁰⁰ Fr ^m	6180	70	60	110	AD *	650	ms	210	10 ⁻ #	97	95Mo14 TD $\alpha\approx 100$; IT?
* ²⁰⁰ At	T : average 96Ta18=44(2) 92Hu04=43(1)										
* ²⁰⁰ At ⁿ	E : 230.9(0.2) keV above ²⁰⁰ At ^m , from ENSDF										
* ²⁰⁰ Rn	T : average 96Ta18=0.96(0.03) 84Ca32=1.06(0.02)										
²⁰¹ Pt	-23740	50			2.5	m	0.1	(5/2 ⁻)	94	$\beta^-=100$	
²⁰¹ Au	-26401	3			26	m	1	3/2 ⁺	94	$\beta^-=100$	
²⁰¹ Hg	-27663.3	0.6			STABLE			3/2 ⁻	94	IS=13.18 9	
²⁰¹ Hg ^m	-26897.1	0.6	766.23	0.15	94	μ s		13/2 ⁺			
²⁰¹ Tl	-27182	15			72.912	h	0.017	1/2 ⁺	94	$\epsilon=100$	
²⁰¹ Tl ^m	-26263	15	919.50	0.09	2.035	ms	0.007	(9/2 ⁻)	94	IT=100	
²⁰¹ Pb	-25258	22			9.33	h	0.03	5/2 ⁻	94	$\beta^+=100$	
²⁰¹ Pb ^m	-24629	22	629.14	0.17	61	s	2	13/2 ⁺	94	IT>99; $\beta^+<1$	
²⁰¹ Bi	-21416	15			108	m	3	9/2 ⁻	94	$\beta^+=100$; $\alpha<1e-4$	
²⁰¹ Bi ^m	-20570	15	846.34	0.21	59.1	m	0.6	1/2 ⁺	94	$\beta^+=92.9\#$; IT<6.8; $\alpha=?$	
²⁰¹ Po	-16525	6			15.3	m	0.2	3/2 ⁻	94	$\beta^+=98.4$ 3; $\alpha=1.6$ 3	
²⁰¹ Po ^m	-16101	6	424.1	2.4	AD	8.9	m	0.2	13/2 ⁺	94	IT=56 14; $\beta^+=41$ 10; $\alpha\approx 2.9$
²⁰¹ At	-10789	8			85	s	3	(9/2 ⁻)	94	96Ta18 T $\alpha=71$ 7; $\beta^+=29$ 7	
²⁰¹ Rn	-4070	70			7.0	s	0.4	(3/2 ⁻)	94	96Ta18 T $\alpha=?$; $\beta^+=20\#$	
²⁰¹ Rn ^m	-3790#	90#	280#	90#	3.8	s	0.1	(13/2 ⁺)	94	96Ta18 T $\alpha=?$; $\beta^+=10\#$; IT=0.01#	
²⁰¹ Fr	3600	70			61	ms	12	(9/2 ⁻)	94	96En01 T $\alpha\approx 100$; $\beta^+<1$	
* ²⁰¹ Bi ^m	D : α decay is observed. Its branching ratio is estimated 0.3%# in ENSDF										
* ²⁰¹ At	T : average 96Ta18=83(2) and two results in ENSDF=89(3)										
* ²⁰¹ Rn	T : average 96Ta18=7.1(0.8) 71Ho01=7.0(0.4)										
* ²⁰¹ Fr	T : average 96En01=69(+16-11) 80Ew03=48(15)										

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
²⁰² Pt	-22600#	300#		44	h	15	0 ⁺	97	β^- =100
²⁰² Au	-24400	170		28.8	s	1.9	(1 ⁻)	97	β^- =100
²⁰² Hg	-27345.9	0.6		STABLE			0 ⁺	97	IS=29.86 26
²⁰² Tl	-25983	15		12.23	d	0.02	2 ⁻	97	β^+ =100
²⁰² Tl ^m	-25033	15	950.19	0.10	572	μ s	7	97	
²⁰² Pb	-25934	8		52.5	ky	2.8	0 ⁺	97	ϵ ≈100; α <1#
²⁰² Pb ^m	-23764	8	2169.83	0.07	3.53	h	0.01	9 ⁻	IT=90.5 5; β^+ =9.5 5
²⁰² Bi	-20733	20		1.72	h	0.05	5 ⁽⁺⁾	97	β^+ =100; α <1e-5
²⁰² Bi ^m	-20118	21	615	7	3.04	μ s	0.06	(10#) ⁻	97
²⁰² Po	-17924	15		44.7	m	0.5	0 ⁺	97	β^+ =?; α =1.92 7
²⁰² Po ^m	-15297	15	2626.7	0.7	> 200	ns		11 ⁻	97
²⁰² At	-10591	28		184	s	1	(2,3) ⁺	97	β^+ =?; α =18 3
²⁰² At ^m	-10401	28	190	40	MD	182	s	2	(7 ⁺)
²⁰² At ⁿ	-10010	28	580	40	MD	460	ms	50	(10 ⁻)
²⁰² Rn	-6275	18		9.94	s	0.18	0 ⁺	97	92Hu04 E
²⁰² Fr	3140	50		290	ms	30	(3 ⁺)	97	96Ta18 T
²⁰² Fr ^m	3470#	70#	330#	90#	340	ms	40	(10 ⁻)	97
²⁰² Ra	9210	60		2.6	ms	2.1	0 ⁺	98	96Le09 TD
* ²⁰² Hg	D : lower half-life limit for ²⁴ Ne decay $T > 3.7$ Zy, from 90Bu28								
* ²⁰² Bi	J : re-evaluation to a possible 6 ⁺ is discussed in 96Ca02								
* ²⁰² At ⁿ	D : . . . ; α =0.096 11								
* ²⁰² At ⁿ	E : 391.7(0.5) keV above ²⁰² At ^m								
* ²⁰² Rn	T : average 96Ta18=10.3(0.4) 71Ho01=9.85(0.20)								
* ²⁰² Fr	T : average 96En01=230(+80-40) 95Bi.A=300(40)								
²⁰³ Au	-23143	3		53	s	2	3/2 ⁺	93	β^- =100
²⁰³ Hg	-25269.1	1.7		46.612	d	0.018	5/2 ⁻	93	β^- =100
²⁰³ Hg ^m	-24336.0	2.0	933.1	1.0	24	μ s	(13/2 ⁺)		
²⁰³ Tl	-25761.2	1.3		STABLE			1/2 ⁺	93	IS=29.524 14
²⁰³ Tl ^m	-22360	300	3400	300	7.7	μ s	0.5	(25/2 ⁺)	98Pf02 TJ
²⁰³ Pb	-24787	7		51.873	h	0.009	5/2 ⁻	93	ϵ =100
²⁰³ Pb ^m	-23962	7	825.20	0.09	6.3	s	0.2	13/2 ⁺	93
²⁰³ Pb ⁿ	-21838	7	2949.47	0.22	480	ms	20	29/2 ⁻	93
²⁰³ Bi	-21540	22		11.76	h	0.05	9/2 ⁻	93	β^+ =100; α ≈1e-5
²⁰³ Bi ^m	-20442	22	1098.14	0.07	303	ms	5	1/2 ⁺	93
²⁰³ Po	-17307	26		36.7	m	0.5	5/2 ⁻	93	β^+ ≈100; α =0.11 2
²⁰³ Po ^m	-16666	26	641.49	0.17	45	s	2	13/2 ⁺	93
²⁰³ At	-12163	12		7.4	m	0.2	9/2 ⁻	93	β^+ =69 3; α =31 3
²⁰³ Rn	-6160	24		43.5	s	2.1	(3/2,5/2) ⁻	93	96Ta18 T
²⁰³ Rn ^m	-5798	24	363	4	AD	26.7	s	0.5	13/2 ⁽⁺⁾
²⁰³ Fr	861	16		550	ms	20	9/2 ⁻	#	98
²⁰³ Ra	8640	80		4	ms	3	(3/2 ⁻)	98	96Le09 TJD
²⁰³ Ra ^m	8860	40	220	90	AD	41	ms	17	(13/2 ⁺)
* ²⁰³ Rn	T : average 96Ta18=42(3) 71Ho01=45(3)								
* ²⁰³ Rn ^m	T : from 96Ta18								
²⁰⁴ Au	-20750#	200#		39.8	s	0.9	(2 ⁻)	94	β^- =100
²⁰⁴ Hg	-24690.2	0.3		STABLE			0 ⁺	94	IS=6.87 15; 2 β^- ?
²⁰⁴ Tl	-24346.0	1.3		3.78	y	0.02	2 ⁻	94	β^- =97.10 12; ϵ =2.90 12
²⁰⁴ Tl ^m	-23242.0	1.4	1104.0	0.4	63	μ s	2	(7 ⁺)	94
²⁰⁴ Tl ⁿ	-21850	500	2500	500	2.6	μ s	0.2	(12 ⁻)	98Pf02 TJ
²⁰⁴ Tl ^p	-20850	500	3500	500	1.6	μ s	0.2	(20 ⁺)	98Pf02 TJ
²⁰⁴ Pb	-25109.7	1.2		STABLE		(>140 Py)	0 ⁺	94	IS=1.4 1; α ?
²⁰⁴ Pb ^m	-22923.9	1.2	2185.79	0.05	67.2	m	0.3	9 ⁻	94
²⁰⁴ Bi	-20667	26		11.22	h	0.10	6 ⁺	94	β^+ =100
²⁰⁴ Bi ^m	-19862	26	805.5	0.3	13.0	ms	0.1	10 ⁻	94
²⁰⁴ Bi ⁿ	-17834	26	2833.4	1.1	1.07	ms	0.03	(17 ⁺)	94
²⁰⁴ Po	-18334	11		3.53	h	0.02	0 ⁺	94	β^+ =99.34 1; α =0.66 1

. . . A-group is continued on next page . . .

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...									
²⁰⁴ At	-11875	24		9.2 m	0.2	7 ⁺	94	$\beta^+=96.2$ 2; $\alpha=3.8$ 2	
²⁰⁴ At ^m	-11288	24	587.30	0.20	108 ms	10	(10 ⁻)	94 IT=100	
²⁰⁴ Rn	-7984	15			1.24 m	0.03	0 ⁺	95 $\alpha=73$ 1; β^+ ?	
²⁰⁴ Fr	608	25			1.7 s	0.3	(3 ⁺)	94 95Bi.A D $\alpha=96$ 2; β^+ ?	
²⁰⁴ Fr ^m	658	25	50	4 AD	2.6 s	0.3	(7 ⁺)	94 95Bi.A D $\alpha=90$ 2; β^+ ?	
²⁰⁴ Fr ⁿ	934	25	326	4 AD	1.7 s	0.6	(10 ⁻)	94 94Le05 T $\alpha=74$ 8; IT=26 8	
²⁰⁴ Ra	6054	15			60 ms	11	0 ⁺	98 95Le04 T $\alpha\approx 100$; $\beta^+=0.3$ #	
* ²⁰⁴ Fr ⁿ	E : 276.1 keV above ²⁰⁴ Fr ^m , from 95Bi.A				D : α intensity is from 95Bi.A			**	
* ²⁰⁴ Ra	T : average 95Le04=45(+55-21) 96Le09=59(+12-9)							**	
²⁰⁵ Au	-18750#	300#			31 s	2	3/2 ⁺	97 94We02 T β^- =100	
²⁰⁵ Hg	-22287	4			5.2 m	0.1	1/2 ⁻	98 β^- =100	
²⁰⁵ Hg ^m	-20730	4	1556.53	0.24	1.10 ms	0.04	(13/2 ⁺)	98 IT=100	
²⁰⁵ Tl	-23820.6	1.3			STABLE		1/2 ⁺	93 IS=70.476 14	
²⁰⁵ Tl ^m	-20530.0	1.3	3290.63	0.17	2.6 μ s	0.2	25/2 ⁺	93 IT=100	
²⁰⁵ Pb	-23770.1	1.2			15.3 My	0.7	5/2 ⁻	93 $\epsilon=100$	
²⁰⁵ Pb ^m	-22756.3	1.2	1013.839	0.013	5.54 ms	0.10	13/2 ⁺	93 IT=100	
²⁰⁵ Pb ⁿ	-20574.5	1.4	3195.6	0.8	217 ns	5	25/2 ⁻	93 IT=100	
²⁰⁵ Bi	-21062	7			15.31 d	0.04	9/2 ⁻	93 $\beta^+=100$	
²⁰⁵ Po	-17509	20			1.66 h	0.02	5/2 ⁻	93 $\beta^+\approx 100$; $\alpha=0.04$ 1	
²⁰⁵ Po ^m	-16048	20	1461.20	0.21	58 ms	1	19/2 ⁻	93 IT=100	
²⁰⁵ Po ⁿ	-16629	20	880.30	0.04	645 μ s		13/2 ⁺		
²⁰⁵ At	-12972	15			26.2 m	0.5	9/2 ⁻	93 $\beta^+=90$ 2; $\alpha=10$ 2	
²⁰⁵ At ^m	-10909	15	2062.57	0.25	67.9 ns		25/2 ⁺		
²⁰⁵ At ⁿ	-10632	15	2339.60	0.25	7.8 μ s		29/2 ⁺		
²⁰⁵ Rn	-7710	50			2.8 m	0.1	5/2 ⁻	93 $\beta^+=77$ 4; $\alpha=23$ 4	
²⁰⁵ Fr	-1310	8			3.85 s	0.10	(9/2 ⁻)	93 $\alpha\approx 100$; $\beta^+ < 1$	
²⁰⁵ Ra	5840	90			220 ms	40	(3/2 ⁻)	93 96Le09 TJ $\alpha=?$; β^+ ?	
²⁰⁵ Ra ^m	6150#	100#	310#	110#	180 ms	50	(13/2 ⁺)	96Le09 TJD $\alpha=?$; IT ?	
* ²⁰⁵ Ra	T : average 96Le09=210(+60-40) 87He10=220(60)							**	
²⁰⁶ Hg	-20946	20			8.15 m	0.10	0 ⁺	99 β^- =100	
²⁰⁶ Tl	-22253.1	1.4			4.200 m	0.017	0 ⁻	99 β^- =100	
²⁰⁶ Tl ^m	-19610.0	1.4	2643.11	0.19	3.74 m	0.03	(12 ⁻)	99 IT=100	
²⁰⁶ Pb	-23785.4	1.2			STABLE		0 ⁺	99 IS=24.1 1	
²⁰⁶ Pb ^m	-21585.3	1.2	2200.14	0.04	125 μ s	2	7 ⁻	99 IT=100	
²⁰⁶ Pb ⁿ	-19758.1	1.4	4027.3	0.7	202 ns	3	12 ⁺	99 IT=100	
²⁰⁶ Bi	-20028	8			6.243 d	0.003	6 ⁽⁺⁾	99 $\beta^+=100$	
²⁰⁶ Bi ^m	-19968	8	59.897	0.017	7.7 μ s	0.2	(4 ⁺)	99 IT=100	
²⁰⁶ Bi ⁿ	-18983	8	1044.8	0.5	890 μ s	10	(10 ⁻)	99 IT=100	
²⁰⁶ Po	-18182	8			8.8 d	0.1	0 ⁺	99 $\beta^+=94.55$ 5; $\alpha=5.45$ 5	
²⁰⁶ Po ^m	-16596	8	1585.85	0.11	222 ns	10	8 ⁺ #	99 IT=100	
²⁰⁶ Po ⁿ	-15920	8	2262.22	0.14	1.05 μ s	0.06	9 ⁻ #	99 IT=100	
²⁰⁶ At	-12420	20			30.6 m	1.3	(5 ⁺)	99 $\beta^+=99.11$ 8; $\alpha=0.89$ 8	
²⁰⁶ At ^m	-11613	20	807	3	410 ns	80	(10 ⁻)	99 99Fe10 ETJ IT=100	
²⁰⁶ Rn	-9116	15			5.67 m	0.17	0 ⁺	99 $\alpha=62$ 3; $\beta^+=38$ 3	
²⁰⁶ Fr	-1243	28			16 s		(2 ⁺ , 3 ⁺)	99 92Hu04 D $\beta^+=?$; $\alpha=42$ 24	
²⁰⁶ Fr ^m	-1048	28	190	40 MD	15.9 s	0.1	(7 ⁺)	99 92Hu04 D $\alpha=42$ 24; β^+ ?; IT ?	
²⁰⁶ Fr ⁿ	-517	28	730	40 MD	700 ms	100	(10 ⁻)	99 IT=?; $\alpha\approx 12$ #	
²⁰⁶ Ra	3565	18			240 ms	20	0 ⁺	99 $\alpha=100$	
²⁰⁶ Ac	13510	70			* & 25 ms	7	(3 ⁺)	99 $\alpha\approx 100$; $\beta^+=0.2$ #	
²⁰⁶ Ac ^m	13590	90	80	50	* & 15 ms	6		99 $\alpha\approx 100$	
²⁰⁶ Ac ⁿ	13800#	80#	290#	110#	& 41 ms	16	(10 ⁻)	99 $\alpha\approx 100$	
* ²⁰⁶ Po ^m	E : less than 40 keV above 1573.4 level, from ENSDF							**	
* ²⁰⁶ Fr	D : $\alpha=84(2)$ % for mixture of ²⁰⁶ Fr and ²⁰⁶ Fr ^m , in 92Hu04. Value replaced by							**	
* ²⁰⁶ Fr	D : uniform distribution 0%-84% for each isomer							**	
* ²⁰⁶ Fr ⁿ	E : 531 keV above ²⁰⁶ Fr ^m , from ENSDF							**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)					
²⁰⁷ Hg	-16220	150	2.9 m	0.2	(9/2 ⁺)	94	β^- =100					
²⁰⁷ Tl	-21034	5	4.77 m	0.02	1/2 ⁺	94	β^- =100					
²⁰⁷ Tl ^m	-19686	5	1348.1	0.3	1.33 s	0.11	11/2 ⁻	94	IT≈100; β^- <0.1#			
²⁰⁷ Pb	-22451.9	1.2	STABLE		1/2 ⁻	94	IS=22.1 1					
²⁰⁷ Pb ^m	-20818.5	1.2	1633.368	0.005	806 ms	6	13/2 ⁺	94	IT=100			
²⁰⁷ Bi	-20054.4	2.4	32.9 y	1.4	9/2 ⁻	94	β^+ =100					
²⁰⁷ Bi ^m	-17952.9	2.4	2101.49	0.16	182 μ s	6	21/2 ⁺	94	IT=100			
²⁰⁷ Po	-17146	7	5.80 h	0.02	5/2 ⁻	94	β^+ ≈100; α =0.021 2					
²⁰⁷ Po ^m	-15763	7	1383.15	0.06	2.79 s	0.08	19/2 ⁻	94	IT=100			
²⁰⁷ Po ⁿ	-16031	7	1115.073	0.016	49 μ s		13/2 ⁺					
²⁰⁷ At	-13243	21	1.80 h	0.04	9/2 ⁻	94	β^+ =91.4 10; α =8.6 10					
²⁰⁷ Rn	-8631	26	9.25 m	0.17	5/2 ⁻	94	β^+ =79 3; α =21 3					
²⁰⁷ Rn ^m	-7732	26	899.0	1.0	181 μ s	18	(13/2 ⁺)	94	IT=100			
²⁰⁷ Fr	-2840	50	14.8 s	0.1	9/2 ⁻	94	α =95 2; β^+ =5 2					
²⁰⁷ Ra	3540	60	1.3 s	0.2	(5/2 ⁻ , 3/2 ⁻)	94	α ≈90; β^+ ≈10					
²⁰⁷ Ra ^m	4095	25	560	50	AD	57 ms	8	(13/2 ⁺)	94	96Le09 T	IT=85#; α =?; ...	*
²⁰⁷ Ac	11130	50			31 ms	8	9/2 ⁻ #	98	94Le05 TD	α =100	*	
* ²⁰⁷ Ra ^m	D : ... ; β^+ =0.55#							**				
* ²⁰⁷ Ra ^m	T : average 96Le09=63(16) 87He10=55(10)							**				
* ²⁰⁷ Ac	T : average 98Es02=27(+11-6) 94Le05=22(+40-9)							**				
²⁰⁸ Hg	-13100#	300#	42 m	5	0 ⁺	98	98Zh22 T	β^- =100	*			
²⁰⁸ Tl	-16749.5	2.0	3.053 m	0.004	5(+)	98		β^- =100				
²⁰⁸ Pb	-21748.5	1.2	STABLE		0 ⁺	96		IS=52.4 1				
²⁰⁸ Pb ^m	-16853.5	2.3	4895	2	500 ns	10	10 ⁺	86	98Pf02 T	IT=100		
²⁰⁸ Bi	-18870.0	2.4	368 ky	4	(5) ⁺	86		β^+ =100				
²⁰⁸ Bi ^m	-17298.9	2.4	1571.1	0.4	2.58 ms	0.04	(10) ⁻	86		IT=100		
²⁰⁸ Po	-17469.5	1.8	2.898 y	0.002	0 ⁺	86		α ≈100; β^+ =0.00223 23				
²⁰⁸ At	-12491	26	1.63 h	0.03	6 ⁺	86		β^+ =99.45 6; α =0.55 6				
²⁰⁸ Rn	-9648	11	24.35 m	0.14	0 ⁺	86		α =62 7; β^+ =38 7				
²⁰⁸ Fr	-2670	50	59.1 s	0.3	7 ⁺	86		α =90 4; β^+ =10 4				
²⁰⁸ Ra	1714	15	1.3 s	0.2	0 ⁺	86		α =?; β^+ =5#				
²⁰⁸ Ra ^m	3510	200	1800	200	270 ns		(8 ⁺)	98Le.A	ETJ			
²⁰⁸ Ac	10760	60	97 ms	16	(3 ⁺)	96	96Ik01 T	α =?; β^+ =1#	*			
²⁰⁸ Ac ^m	11258	28	500	50	AD	28 ms	7	(10 ⁻)	96	96Ik01 T	α =?; IT<10#; β^+ =1#	*
* ²⁰⁸ Hg	T : 98Zh22=41(+5-4) supersedes 94Zh02=42(+23-12) of same group							**				
* ²⁰⁸ Ac	T : average 96Ik01=83(+34-19) 94Le05=95(+24-16)							**				
* ²⁰⁸ Ac ^m	E : if α decay goes to (7 ⁺) ²⁰⁴ Fr ^m , instead of (10 ⁻) as assumed in AME, then							**				
* ²⁰⁸ Ac ^m	E : E will become 234(22) keV							**				
* ²⁰⁸ Ac ^m	T : average 96Ik01=21(+28-8) 94Le05=25(+9-5)							**				
²⁰⁹ Hg	-8350#	200#	37 s	8	9/2 ⁺ #		98Zh22 T	β^- =100				
²⁰⁹ Tl	-13638	8	2.161 m	0.007	(1/2 ⁺)	91	94Ar23 T	β^- =100				
²⁰⁹ Pb	-17614.4	1.8	3.253 h	0.014	9/2 ⁺	91		β^- =100				
²⁰⁹ Bi	-18258.5	1.4	19 Ey	2	9/2 ⁻	91	03De11 TD	IS=100.; α =100				
²⁰⁹ Po	-16365.9	1.8	102 y	5	1/2 ⁻	91		α ≈100; β^+ =0.48 4				
²⁰⁹ At	-12880	7	5.41 h	0.05	9/2 ⁻	91		β^+ =95.9 5; α =4.1 5				
²⁰⁹ Rn	-8929	20	28.5 m	1.0	5/2 ⁻	91		β^+ =83 2; α =17 2				
²⁰⁹ Rn ^m	-7755	20	1173.98	0.13	13.4 μ s		13/2 ⁺					
²⁰⁹ Fr	-3769	15	50.0 s	0.3	9/2 ⁻	91		α =89 3; β^+ =11 3				
²⁰⁹ Ra	1850	50	4.6 s	0.2	5/2 ⁻	91		α ≈90; β^+ ≈10				
²⁰⁹ Ac	8840	50	92 ms	11	(9/2 ⁻)	91	00He17 T	α =?; β^+ =1#	*			
²⁰⁹ Th	16500	100	7 ms	5	5/2 ⁻ #	97	96Ik01 TD	α =?; β^+ ?	*			
* ²⁰⁹ Ac	T : average 00He17=98(+59-27) 96Ik01=82(+18-13) 94Le05=91(+21-14)							**				
* ²⁰⁹ Ac	and 68Va04=100(50)							**				

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²¹⁰ Hg	-5110#	300#	10#	m (>300 ns)	0 ⁺	03 98Pf02 I	β^- ?
²¹⁰ Tl	-9246	12	1.30	m	0.03	5 ⁺ #	03 β^- =100; β^- n=0.009 6
²¹⁰ Pb	-14728.3	1.5	22.20	y	0.22	0 ⁺	03 β^- =100; α =1.9e-6 4
²¹⁰ Pb ^m	-13450	5	1278	5	201	ns	17 8 ⁺ 03 IT=100
²¹⁰ Bi	-14791.8	1.4	5.012	d	0.005	1 ⁻	03 β^- =100; α =13.2e-5 10
²¹⁰ Bi ^m	-14520.5	1.4	271.31	0.11	3.04	My	0.06 9 ⁻ 03 α =100
²¹⁰ Bi ⁿ	-14358.3	1.4	433.49	0.10	57.5	ns	10 7 ⁻ 03 IT=100
²¹⁰ Po	-15953.1	1.2	138.376	d	0.002	0 ⁺	03 α =100
²¹⁰ Po ^m	-14396.1	1.2	1556.96	0.03	98.9	ns	2.5 8 ⁺ 03 IT=100
²¹⁰ At	-11972	8	8.1	h	0.4	(5) ⁺	03 β^+ ≈100; α =0.175 20
²¹⁰ At ^m	-9422	8	2549.6	0.2	482	μs	6 (15) ⁻ 03 IT=100
²¹⁰ At ⁿ	-7944	8	4027.7	0.2	5.66	μs	0.07 (19) ⁺ 03 IT=100
²¹⁰ At ^p	-5013	8	6959.3	0.6	98	ns	2 (26 ⁻) 03 IT=100
²¹⁰ Rn	-9598	9	2.4	h	0.1	0 ⁺	03 α =96 1; β^+ ?
²¹⁰ Rn ^m	-7908	17	1690	15	644	ns	40 8 ⁺ # 03 IT ?
²¹⁰ Rn ⁿ	-5761	17	3837	15	1.06	μs	0.05 (17) ⁻ 03 IT=100
²¹⁰ Rn ^p	-3105	17	6493	15	1.04	μs	0.07 (22) ⁺ 03 IT=100
²¹⁰ Fr	-3346	22	3.18	m	0.06	6 ⁺	03 α =60 30; β^+ =40 30
²¹⁰ Ra	461	15	3.7	s	0.2	0 ⁺	03 α ?; β^+ =4#
²¹⁰ Ra ^m	2260	200	1800	200	2.24	μs	(8 ⁺) 03 98Le.A EJ α ?; β^+ =9#
²¹⁰ Ac	8790	60	350	ms	40	7 ⁺ #	03 00He17 T α ?; β^+ =1#
²¹⁰ Th	14043	25	17	ms	11	0 ⁺	03 α ?; β^+ =1#
* ²¹⁰ Rn ^m	E : ENSDF2003: less than 50 keV above 1664.6 level						
* ²¹⁰ Ac	T : average 00He17=335(+64-46) 68Va04=350(50)						
²¹¹ Tl	-6080#	200#	1#	m (>300 ns)	1/2 ⁺ #	98Pf02 I	β^- ?
²¹¹ Pb	-10491.4	2.7	36.1	m	0.2	9/2 ⁺	91 β^- =100
²¹¹ Bi	-11858	6	2.14	m	0.02	9/2 ⁻	91 α ≈100; β^- =0.276 4
²¹¹ Bi ^m	-10631	6	1227.2	0.3	70	ns	5 (21/2 ⁻) 91 IT=100
²¹¹ Bi ⁿ	-10601	12	1257	10	1.4	μs	0.3 (25/2 ⁻) 91 98Pf02 T IT=100
²¹¹ Po	-12432.5	1.3	516	ms	3	9/2 ⁺	91 α =100
²¹¹ Po ^m	-10970	5	1462	5	AD 25.2	s	0.6 (25/2 ⁺) 91 α ≈100; IT=0.016 4
²¹¹ Po ⁿ	-10298	5	2135	5	0.25	μs	0.07 (31/2 ⁻) 98Fo04 ETJ IT≈100; α ?
²¹¹ Po ^p	-7559	5	4874	5	2	μs	1 (43/2 ⁺) 98Fo04 ETJ IT≈100; α ?
²¹¹ At	-11647.1	2.8	7.214	h	0.007	9/2 ⁻	96 ϵ =58.20 8; α =41.80 8
²¹¹ Rn	-8756	7	14.6	h	0.2	1/2 ⁻	96 β^+ =72.6 17; α =27.4 17
²¹¹ Fr	-4158	21	3.10	m	0.02	9/2 ⁻	91 α >80; β^+ <20
²¹¹ Ra	836	26	13	s	2	5/2 ⁽⁻⁾	91 α >93; β^+ <7
²¹¹ Ac	7200	70	213	ms	25	9/2 ⁻ #	91 00He17 T α ≈100; β^+ <0.2
²¹¹ Th	13910	70	48	ms	20	5/2 ⁻ #	96 95Uu01 T α ?; β^+ =0.5#
* ²¹¹ Ac	T : average 00He17=200(29) 68Va04=250(50)						
²¹² Tl	-1650#	300#	30#	s (>300 ns)	5 ⁺ #	98Pf02 I	β^- ?
²¹² Pb	-7547.4	2.2	10.64	h	0.01	0 ⁺	92 β^- =100
²¹² Pb ^m	-6212	10	1335	10	5	μs	1 (8 ⁺) 92 98Pf02 T IT=100
²¹² Bi	-8117.3	2.0	60.55	m	0.06	1 ⁽⁻⁾	92 89Ha.A D β^- =64.06 6; α =35.94 6; ... *
²¹² Bi ^m	-7870	30	250	30	AD 25.0	m	0.2 (9 ⁻) 92 α =67 1; β^- =33 1; β^- α =30 1
²¹² Bi ⁿ	-5920#	200#	2200#	200#	7.0	m	0.3 > 15 92 β^- ≈100; IT ?
²¹² Po	-10369.4	1.2	299	ns	2	0 ⁺	92 α =100
²¹² Po ^m	-7459	12	2911	12	AD 45.1	s	0.6 (18 ⁺) 92 α ≈100; IT=0.07 2
²¹² At	-8621	7	314	ms	2	(1 ⁻)	92 α ≈100; β^+ <0.03; β^- <2e-6
²¹² At ^m	-8395	6	226	9	AD 119	ms	3 (9 ⁻) 92 α >99; IT<1
²¹² At ⁿ	-3849	8	4772	3	152	μs	5 (25 ⁻) 98By01 ETJ IT=100
²¹² Rn	-8660	3	23.9	m	1.2	0 ⁺	92 α =100; 2 β^+ ?
²¹² Fr	-3538	26	20.0	m	0.6	5 ⁺	92 β^+ =57 2; α =43 2
²¹² Ra	-191	11	13.0	s	0.2	0 ⁺	92 α ?; β^+ =15#
²¹² Ra ^m	1767	11	1958.4	0.5	10.9	μs	0.4 (8 ⁺) 92 IT=100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
... A-group continued ...									
²¹² Ac	7280	70	920 ms	50	6 ⁺ #	92 00He17 T	$\alpha=?; \beta^+=3\#$	*	
²¹² Th	12091	18	36 ms	15	0 ⁺	92	$\alpha\approx 100; \beta^+=0.3\#$		
²¹² Pa	21610	70	8 ms	5	7 ⁺ #	97Mi03 TD	$\alpha=100$		
* ²¹² Bi	D: ...; $\beta^- \alpha=0.014$							**	
* ²¹² Bi ⁿ	E: 1910 keV, if 100% β^- decay goes to 2922 level in ²¹² Po, and if $\log ft$ for							**	
* ²¹² Bi ⁿ	E: this transition is 5.1 (see ENSDF), or higher							**	
* ²¹² Ac	T: average 00He17=880(110) 68Va04=930(50)							**	
* ²¹² Ac	J: ENSDF proposes to assign 7 ⁺ , if the observed α feeds the ²⁰⁸ Fr 7 ⁺ ground-state							**	
²¹³ Pb	-3184	8	10.2 m	0.3	(9/2 ⁺)	92	$\beta^-=100$		
²¹³ Bi	-5231	5	45.59 m	0.06	9/2 ⁻	92	$\beta^-=97.91\ 3; \alpha=2.09\ 3$		
²¹³ Po	-6653	3	4.2 μ s	0.8	9/2 ⁺	92	$\alpha=100$		
²¹³ At	-6579	5	125 ns	6	9/2 ⁻	92	$\alpha=100$		
²¹³ Rn	-5698	6	19.5 ms	0.1	(9/2 ⁺)	92 00He17 T	$\alpha=100$	*	
²¹³ Fr	-3550	8	34.6 s	0.3	9/2 ⁻	92	$\alpha=99.45\ 3; \beta^+=0.55\ 3$		
²¹³ Ra	358	20	2.74 m	0.06	1/2 ⁻	92	$\alpha=80\ 5; \beta^+?$		
²¹³ Ra ^m	2127	21	1769	6	AD	2.1 ms	0.1 17/2 ⁻ # 92 76Ra37 J	$\Gamma\approx 99; \alpha\approx 1$	*
²¹³ Ac	6150	50	731 ms	17	9/2 ⁻ #	92 00He17 T	$\alpha=?; \beta^+?$		
²¹³ Th	12120	70	140 ms	25	5/2 ⁻ #	92	$\alpha=?; \beta^+?$		
²¹³ Pa	19660	70	7 ms	3	9/2 ⁻ #	97 95Ni05 TD	$\alpha=100$		
* ²¹³ Rn	T: in same paper 18.0(0.4) 19.0(0.5), not used. Other 70Va13=25.0(0.2) at							**	
* ²¹³ Rn	T: variance, not used							**	
* ²¹³ Ra ^m	E: derived from difference in α decay energy in the AME evaluation.							**	
* ²¹³ Ra ^m	E: ENSDF evaluation: less than 10 keV above 1769.7 level, thus 1775(3) keV							**	
* ²¹³ Ra ^m	J: 17/2 ⁻ or 13/2 ⁺ as proposed by 76Ra37							**	
²¹⁴ Pb	-181.3	2.4	26.8 m	0.9	0 ⁺	95	$\beta^-=100$		
²¹⁴ Bi	-1200	11	19.9 m	0.4	1 ⁻	95 89Ha.A D	$\beta^-\approx 100; \alpha=0.021\ 1; \beta^-\alpha=0.003$		
²¹⁴ Po	-4469.9	1.5	164.3 μ s	2.0	0 ⁺	95	$\alpha=100$		
²¹⁴ At	-3380	4	558 ns	10	1 ⁻	95	$\alpha=100$		
²¹⁴ At ^m	-3320	8	59	9	AD	268 ns			
²¹⁴ At ⁿ	-3146	5	234	6	AD	760 ns	9 ⁻		
²¹⁴ Rn	-4320	9	270 ns	20	0 ⁺	95	$\alpha=100; 2\beta^+?$		
²¹⁴ Rn ^m	-2695	9	1625.1	0.5		6.5 ns	3.0 8 ⁺		
²¹⁴ Fr	-958	9	5.0 ms	0.2	(1 ⁻)	95	$\alpha=100$		
²¹⁴ Fr ^m	-835	9	123	6	AD	3.35 ms	0.05 (8 ⁻) 95	$\alpha=100$	
²¹⁴ Ra	101	9	2.46 s	0.03	0 ⁺	95	$\alpha\approx 100; \beta^+=0.059\ 4$		
²¹⁴ Ac	6429	22	8.2 s	0.2	5 ⁺ #	95	$\alpha\geq 89\ 3; \beta^+\leq 11\ 3$		
²¹⁴ Th	10712	17	100 ms	25	0 ⁺	95	$\alpha\approx 100; \beta^+=0.1\ \#$		
²¹⁴ Pa	19490	80	17 ms	3		95 95Ni05 D	$\alpha=100$		
²¹⁵ Pb	4480#	410#	36 s	1	5/2 ⁺ #	96Ry.B T	$\beta^-=100$	*	
²¹⁵ Bi	1649	15	7.6 m	0.2	(9/2 ⁻)	01	$\beta^-=100$		
²¹⁵ Bi ^m	2997	15	1347.5	2.5		36.4 m	2.5 (25/2 ⁻) 01 02Fr.B D	$\Gamma=?; \beta^-=?$	*
²¹⁵ Po	-540.3	2.5	1.781 ms	0.004	9/2 ⁺	01	$\alpha=100; \beta^-=2.3e-4\ 2$		
²¹⁵ At	-1255	7	100 μ s	20	9/2 ⁻	01	$\alpha=100$		
²¹⁵ Rn	-1169	8	2.30 μ s	0.10	9/2 ⁺	01	$\alpha=100$		
²¹⁵ Fr	318	7	86 ns	5	9/2 ⁻	01	$\alpha=100$		
²¹⁵ Ra	2534	8	1.55 ms	0.07	9/2 ⁺ #	01	$\alpha=100$		
²¹⁵ Ra ^m	4412	8	1877.8	0.5		7.1 μ s	0.2 (25/2 ⁺) 01	$\Gamma=100$	
²¹⁵ Ra ⁿ	4781	8	2246.9	0.5		1.39 μ s	0.07 (29/2 ⁻) 01	$\Gamma=100$	
²¹⁵ Ac	6012	21	170 ms	10	9/2 ⁻	01	$\alpha\approx 100; \beta^+=0.09\ 2$		
²¹⁵ Th	10927	27	1.2 s	0.2	(1/2 ⁻)	01	$\alpha=100$		
²¹⁵ Pa	17870	90	14 ms	2	9/2 ⁻ #	01	$\alpha=100$		
* ²¹⁵ Pb	T: other preliminary result 02Fr.B=147(12) s							**	
* ²¹⁵ Bi ^m	T: other preliminary result 02Fr.B=36.9(0.6) s							**	

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
²¹⁶ Bi	5874	11		2.17 m	0.05	1 ⁻ #	97	96Ry.B T	β^- =100	*
²¹⁶ Po	1783.8	2.2		145 ms	2	0 ⁺	97		α =100; $2\beta^-$?	
²¹⁶ At	2257	4		300 μ s	30	1 ⁽⁻⁾	97		α \approx 100; β^- <0.006; ϵ <3e-7	
²¹⁶ At ^m	2670	6	413	100# μ s		(9 ⁻)	97		α =100	
²¹⁶ Rn	256	7		45 μ s	5	0 ⁺	97		α =100	
²¹⁶ Fr	2979	14		700 ns	20	(1 ⁻)	97		α =100; β^+ <2e-7#	
²¹⁶ Ra	3291	9		182 ns	10	0 ⁺	97		α =100; ϵ <1e-8	
²¹⁶ Ac	8123	27		440 μ s	16	(1 ⁻)	97	00He17 T	α =100; β^+ =7e-5#	
²¹⁶ Ac ^m	8166	26	44	7	AD	443 μ s	7	(9 ⁻) 97	00He17 T	α =100; β^+ =7e-5#
²¹⁶ Th	10304	13		26.8 ms	0.3	0 ⁺	97	01Ha46 T	α \approx 100; β^+ =0.006#	*
²¹⁶ Th ^m	12346	16	2042	13	AD	137 μ s	4	(8 ⁺) 97	01Ha46 TJD	IT=94 4; α =?
²¹⁶ Th ⁿ	12941	24	2637	20		615 ns	55	(11 ⁻) 97	01Ha46 TJ	IT=100
²¹⁶ Pa	17800	70		105 ms	12		97	96An21 T	α =?; β^+ =2#	*
* ²¹⁶ Bi	T: also 90Ru02=3.6(0.4) outweighed, not used									**
* ²¹⁶ Th	T: average 01Ha46=25.4(0.8) 00He17=27.0(0.3); other 68Va18=28(2) outweighed									**
* ²¹⁶ Th ^m	T: average 01Ha46=128(8) 00He17=140(5)									**
* ²¹⁶ Pa	T: not updated in 00He17: "could not be determined satisfactorily"									**
²¹⁷ Bi	8820#	200#		97 s	3	9/2 ⁻ #		96Ry.B T	β^- =100	
²¹⁷ Po	5901	7		1.47 s	0.05	5/2 ⁺ #	91	96Ry.B T	α >95; β^- <5	
²¹⁷ At	4396	5		32.3 ms	0.4	9/2 ⁻	91	97Ch53 D	α \approx 100; β^- =0.008 2	*
²¹⁷ Rn	3659	4		540 μ s	50	9/2 ⁺	91		α =100	
²¹⁷ Fr	4315	7		16.8 μ s	1.9	9/2 ⁻	94	90An19 T	α =100	*
²¹⁷ Ra	5887	9		1.63 μ s	0.17	(9/2 ⁺)	91	90An19 T	α =100	*
²¹⁷ Ac	8707	13		69 ns	4	9/2 ⁻	91		α =?; β^+ <2	
²¹⁷ Ac ^m	10719	19	2012	20	AD	740 ns	40	(29/2 ⁺) ⁺ 91	IT=95.7 10; α =4.3 10	
²¹⁷ Th	12216	21		240 μ s	5	(9/2 ⁺)	91	02He29 T	α =100	*
²¹⁷ Pa	17070	50		3.48 ms	0.09	9/2 ⁻ #	91	02He29 T	α =100	*
²¹⁷ Pa ^m	18930	50	1860	7	AD	1.08 ms	0.03	29/2 ⁺ # 91	02He29 TD	α =73 4; IT ?
²¹⁷ U	22700	90		26 ms	14	1/2 ⁻ #		00Ma65 TD	α =?	
* ²¹⁷ At	D: average β^- 97Ch53=0.0067(24) 69Le.A=0.012(4)									**
* ²¹⁷ Fr	T: average 90An19=16(2) 70Bo13=22(5)									**
* ²¹⁷ Ra	T: average 90An19=1.7(0.3) 70Bo13=1.6(0.2)									**
* ²¹⁷ Th	T: average 02He29=237(2) 00He17=247(3) with Birge ratio B=2.8									**
* ²¹⁷ Pa	T: average 02He29=3.8(0.2) 00He17=3.4(0.1)									**
²¹⁸ Bi	13340#	360#		33 s	1	1 ⁻ #		02Fr.B TD	β^- =100	
²¹⁸ Po	8358.3	2.4		3.10 m	0.01	0 ⁺	96		α \approx 100; β^- =0.020 2	
²¹⁸ At	8099	12		1.5 s	0.3	1 ⁻ #	96		α \approx 100; β^- =0.1	
²¹⁸ Rn	5217.5	2.4		35 ms	5	0 ⁺	96		α =100	
²¹⁸ Fr	7059	5		1.0 ms	0.6	1 ⁻	96		α =100	
²¹⁸ Fr ^m	7146	6	86	4	AD	22.0 ms	0.5		α \approx 100; IT ?	
²¹⁸ Fr ^p	7260#	150#	200#	150#						
²¹⁸ Ra	6651	11		25.6 μ s	1.1	0 ⁺	96		α =100; $2\beta^+$?	
²¹⁸ Ac	10840	50		1.08 μ s	0.09	1 ⁻ #	96		α =100	
²¹⁸ Ac ^m	10990#	70#	150#	50#		32 ns	9	(9 ⁻) 96	94De04 ET	*
²¹⁸ Ac ⁿ	11420#	70#	584#	50#		103 ns	11	(11 ⁺) 96		*
²¹⁸ Th	12374	13		109 ns	13	0 ⁺	96		α =100	
²¹⁸ Pa	18669	25		113 μ s	10		96	00He17 T	α =100	*
²¹⁸ U	21920	30		6 ms	5	0 ⁺	96		α =100	
* ²¹⁸ Ac ^m	E: at least 122.5 in 94De04									**
* ²¹⁸ Ac ⁿ	E: 384.5(0.2) keV above ²¹⁸ Ac ^m , from ENSDF									**
* ²¹⁸ Pa	T: supersedes 96An21=110(20)									**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²¹⁹ Po	12800# 360#		2# m (>300 ns)	7/2 ⁺ #		98Pf02 I	$\beta^- ?; \alpha ?$	
²¹⁹ At	10397 4		56 s 3	5/2 ⁻ #	01		$\alpha \approx 97; \beta^- \approx 3$	
²¹⁹ Rn	8830.8 2.5		3.96 s 0.01	5/2 ⁺	01		$\alpha=100$	
²¹⁹ Fr	8618 7		20 ms 2	9/2 ⁻	01		$\alpha=100$	
²¹⁹ Ra	9394 8		10 ms 3	(7/2) ⁺	01		$\alpha=100$	
²¹⁹ Ac	11570 50		11.8 μ s 1.5	9/2 ⁻	01		$\alpha=100; \beta^+=1e-6\#$	
²¹⁹ Th	14470 50		1.05 μ s 0.03	9/2 ⁺ #	01		$\alpha=100; \beta^+=1e-7\#$	
²¹⁹ Pa	18520 50		53 ns 10	9/2 ⁻	01		$\alpha=100; \beta^+=5e-9\#$	
²¹⁹ U	23210 60		55 μ s 25	9/2 ⁺ #	01		$\alpha=100; \beta^+=1.4e-5\#$	
²²⁰ Po	15470# 360#		40# s (>300 ns)	0 ⁺		98Pf02 I	$\beta^- ?$	
²²⁰ At	14350 50		3.71 m 0.04	3 ^(-#)	97		$\beta^- =92.2; \alpha=8.2$	
²²⁰ Rn	10613.4 2.2		55.6 s 0.1	0 ⁺	97		$\alpha=100; 2\beta^- ?$	
²²⁰ Fr	11483 4		27.4 s 0.3	1 ⁺	97		$\alpha \approx 100; \beta^- =0.35.5$	
²²⁰ Ra	10273 9		17.9 ms 1.4	0 ⁺	97	00He17 T	$\alpha=100$ *	
²²⁰ Ac	13752 15		26.36 ms 0.19	(3 ⁻)	97	90An19 T	$\alpha=100; \beta^+=5e-4\#$ *	
²²⁰ Th	14669 22		9.7 μ s 0.6	0 ⁺	97		$\alpha=100; \epsilon=2e-7\#$	
²²⁰ Pa	20380 60		780 ns 160	1 ⁻ #	97		$\alpha=100; \beta^+=3e-7\#$	
²²⁰ U	23030# 200#		60# ns	0 ⁺			$\alpha ?; \beta^+ ?$	
* ²²⁰ Ra	T : average 00He17=18(2) 90An19=17(2) 61Ru06=23(5)							**
* ²²⁰ Ac	T : average 90An19=26.4(0.2) 70Bo13=26.1(0.5)							**
²²¹ At	16810# 200#		2.3 m 0.2	3/2 ⁻ #	90		$\beta^- =100$	
²²¹ Rn	14472 6		25 m 2	7/2 ⁽⁺⁾	90		$\beta^- =78.1; \alpha=22.1$	
²²¹ Fr	13278 5		4.9 m 0.2	5/2 ⁻	90	97Ch53 D	$\alpha \approx 100; \beta^- =0.0048.15; \dots$ *	
²²¹ Ra	12964 5		28 s 2	5/2 ⁺	90	94Bo28 D	$\alpha=100; {}^{14}\text{C}=1.2e-10.9$	
²²¹ Ac	14520 50		52 ms 2	9/2 ⁻ #	90		$\alpha=100$	
²²¹ Th	16938 9		1.68 ms 0.06	(7/2 ⁺)	90		$\alpha=100$ *	
²²¹ Pa	20380 50		5.9 μ s 1.7	9/2 ⁻	90		$\alpha=100$	
²²¹ U	24590# 100#		700# ns	9/2 ⁺ #			$\alpha ?; \beta^+ ?$	
* ²²¹ Fr	D : ... ; ${}^{14}\text{C}=8.8e-11.11$							**
* ²²¹ Fr	D : β^- intensity is from 97Ch53; ${}^{14}\text{C}$ intensity is from 94Bo28							**
* ²²¹ Th	T : also 00He17=2.0(+0.3-0.2)							**
²²² At	20800# 300#		54 s 10		96		$\beta^- =100$	
²²² Rn	16373.6 2.4		3.8235 d 0.0003	0 ⁺	96		$\alpha=100$	
²²² Fr	16349 21		14.2 m 0.3	2 ⁻	96		$\beta^- =100$	
²²² Ra	14321 5		38.0 s 0.5	0 ⁺	96		$\alpha=100; {}^{14}\text{C}=3.0e-8.10$	
²²² Ac	16621 5		5.0 s 0.5	1 ⁻	96		$\alpha=99.1; \beta^+=1.1$	
²²² Ac ^m	16820# 150# 200# 150# *		1.05 m 0.07	high	96		$\alpha=?; IT \leq 10; \beta^+=1.4.4$ *	
²²² Th	17203 12		2.05 ms 0.07	0 ⁺	96	00He17 T	$\alpha=100; \epsilon < 1.3e-8\#$ *	
²²² Pa	22120# 70#		3.2 ms 0.3		96	95Ni.A T	$\alpha=100$ *	
²²² U	24300# 100#		1.4 μ s 0.7	0 ⁺	96		$\alpha=100; \beta^+ < 1e-6\#$	
* ²²² Ac ^m	D : derived from $0.7\% < \beta^+ < 2\%$, in ENSDF							**
* ²²² Th	T : average 00He17=2.0(0.1) 99Gr28=2.1(0.1)							**
* ²²² Pa	T : average 95Ni.A=3.3(0.3) 79Sc09=2.9(+0.6-0.4)							**
* ²²² Pa	T : 70Bo13=5.7(0.5) at variance, not used							**
²²³ At	23460# 400#		50 s 7	3/2 ⁻ #	01		$\beta^- \approx 100; \alpha=0.008\#$	
²²³ Rn	20300# 300#		24.3 m 0.4	7/2	01		$\beta^- =100; \alpha=0.0004\#$	
²²³ Fr	18383.8 2.4		22.00 m 0.07	3/2 ⁽⁻⁾	01		$\beta^- \approx 100; \alpha=0.006$	
²²³ Ra	17234.7 2.5		11.43 d 0.05	3/2 ⁺	01		$\alpha=100; {}^{14}\text{C}=8.9e-8.4$	
²²³ Ac	17826 7		2.10 m 0.05	(5/2 ⁻)	01		$\alpha=99; \epsilon=1$	
²²³ Th	19386 9		600 ms 20	(5/2) ⁺	01		$\alpha=100$	
²²³ Pa	22320 70		5.1 ms 0.3	9/2 ⁻ #	01	99Ho28 T	$\alpha=100; \beta^+ < 0.001\#$ *	
²²³ U	25840 70		21 μ s 8	7/2 ⁺ #	01		$\alpha \approx 100; \beta^+ =0.2\#$	
* ²²³ Pa	T : average 99Ho28=4.9(0.4) 95Ni.A=5.0(1.0) 70Bo13=6.5(1.0)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²²⁴ Rn	22440# 300#		107 m 3	0 ⁺	97		$\beta^- = 100$
²²⁴ Fr	21660 50		3.33 m 0.10	1 ⁻	97		$\beta^- = 100$
²²⁴ Ra	18827.2 2.2		3.66 d 0.04	0 ⁺	97		$\alpha = 100$; $^{14}\text{C} = 4.0\text{e-}9$ 12
²²⁴ Ac	20235 4		2.78 h 0.17	0 ⁻	97		$\beta^+ = 90.6$ 17; $\alpha = 9.4$ 17; $\beta^- < 1.6\#$
²²⁴ Th	19996 11		1.05 s 0.02	0 ⁺	97		$\alpha = 100$; $2\beta^+ ?$
²²⁴ Pa	23870 16		844 ms 19	5 ⁻ #	97	96Li05 T	$\alpha \approx 100$; $\beta^+ = 0.1\#$ *
²²⁴ U	25714 25		940 μs 270	0 ⁺	97	92To02 T	$\alpha = 100$; $\beta^+ < 1.2\text{e-}4\#$ *
* ²²⁴ Pa	T : average 96Li05=790(60) 96Wi.A=850(20)						**
* ²²⁴ U	T : average 92To02=1000(400) 91An10=700(+500-200)						**
²²⁵ Rn	26490# 300#		4.66 m 0.04	7/2 ⁻	90	97Bu03 T	$\beta^- = 100$
²²⁵ Fr	23810 30		4.0 m 0.2	3/2 ⁻	90		$\beta^- = 100$
²²⁵ Ra	21994.0 3.0		14.9 d 0.2	1/2 ⁺	90		$\beta^- = 100$
²²⁵ Ac	21638 5		10.0 d 0.1	(3/2 ⁻)	90	93Bo26 D	$\alpha = 100$; $^{14}\text{C} = 6.0\text{e-}10$ 13
²²⁵ Th	22310 5		8.72 m 0.04	(3/2 ⁺)	90		$\alpha \approx 90$; $\epsilon \approx 10$
²²⁵ Pa	24340 70		1.7 s 0.2	5/2 ⁻ #	90		$\alpha = 100$
²²⁵ U	27377 12		61 ms 4	5/2 ⁺ #	90	00He17 T	$\alpha = 100$ *
²²⁵ Np	31590 70		3# ms (>2 μs)	9/2 ⁻ #	97	94Ye08 ID	$\alpha = 100$
* ²²⁵ U	T : 00He17=59(+5-2); others 94An02=68(+45-20) 92To02=95(15) and						**
* ²²⁵ U	T : 89He13=80(+40-10) outweighed, not used						**
²²⁶ Rn	28770# 400#		7.4 m 0.1	0 ⁺	96		$\beta^- = 100$
²²⁶ Fr	27370 100		49 s 1	1 ⁻	96		$\beta^- = 100$
²²⁶ Ra	23669.1 2.3		1.600 ky 0.007	0 ⁺	96	90We01 D	$\alpha = 100$; $^{14}\text{C} = 2.6\text{e-}9$ 6; $2\beta^- ?$ *
²²⁶ Ac	24310 3		29.37 h 0.12	(1) ^(-#)	96		$\beta^- = 83$ 3; $\epsilon = 17$ 3; $\alpha = 0.006$ 2
²²⁶ Th	23197 5		30.57 m 0.10	0 ⁺	96	01Bo11 D	$\alpha = 100$; $^{18}\text{O} < 3.2\text{e-}12$
²²⁶ Pa	26033 11		1.8 m 0.2		96		$\alpha = 74$ 5; $\beta^+ = 26$ 5
²²⁶ U	27329 13		269 ms 6	0 ⁺	96	01Ca.B T	$\alpha = 100$ *
²²⁶ Np	32740# 90#		35 ms 10		96		$\alpha = 100$; $\beta^+ = 0.003\#$
* ²²⁶ Ra	D : ^{14}C : average 90We01=2.3(0.8) 86Ba26=2.9(1.0) 85Ho21=3.2(1.6)						**
* ²²⁶ U	T : average 01Ca.B=258(13) 00He17=281(9) 99Gr28=260(10)						**
²²⁷ Rn	32980# 420#		20.8 s 0.7	5/2 ^(+#)	01	97Ku20 J	$\beta^- = 100$
²²⁷ Fr	29650 100		2.47 m 0.03	1/2 ⁺	01		$\beta^- = 100$
²²⁷ Ra	27179.0 2.4		42.2 m 0.5	3/2 ⁺	01		$\beta^- = 100$
²²⁷ Ac	25850.9 2.4		21.772 y 0.003	3/2 ⁻	01		$\beta^- = 98.62$ 36; $\alpha = 1.38$ 36
²²⁷ Th	25806.2 2.5		18.68 d 0.09	1/2 ⁺	01		$\alpha = 100$
²²⁷ Pa	26832 7		38.3 m 0.3	(5/2 ⁻)	01		$\alpha = 85$ 2; $\epsilon = 15$ 2
²²⁷ U	29022 17		1.1 m 0.1	(3/2 ⁺)	01		$\alpha = 100$; $\beta^+ < 0.001\#$
²²⁷ Np	32560 70		510 ms 60	5/2 ⁻ #	01		$\alpha \approx 100$; $\beta^+ = 0.05\#$
²²⁸ Rn	35380# 410#		65 s 2	0 ⁺	97		$\beta^- = 100$
²²⁸ Fr	33280# 200#		38 s 1	2 ⁻	97		$\beta^- = 100$
²²⁸ Ra	28941.8 2.4		5.75 y 0.03	0 ⁺	97		$\beta^- = 100$
²²⁸ Ac	28896.0 2.5		6.15 h 0.02	3 ⁺	97		$\beta^- = 100$
²²⁸ Th	26772.2 2.2		1.9116 y 0.0016	0 ⁺	97		$\alpha = 100$; $^{20}\text{O} = 1.13\text{e-}11$ 22
²²⁸ Pa	28924 4		22 h 1	3 ⁺	97		$\beta^+ = 98.0$ 2; $\alpha = 2.0$ 2
²²⁸ U	29225 15		9.1 m 0.2	0 ⁺	97		$\alpha > 95$; $\epsilon < 5$
²²⁸ Np	33700# 200#		61.4 s 1.4		97	94Kr13 D	$\epsilon = 60$ 7; $\alpha = 40$ 7; $\beta^+ \text{SF} = 0.012$ 6 *
²²⁸ Pu	36090 30		10# ms (>2 μs)	0 ⁺	97	94An02 ID	$\alpha \approx 100$; $\beta^+ = 0.1\#$
* ²²⁸ Np	D : $\beta^+ \text{SF} = 0.020(9)\%$ defined by 94Kr13 relative to ϵ , thus 0.012(6)% of total						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²²⁹ Fr	35820	40	50.2 s	0.4	1/2 ⁺ #	90 92Bo05 T	$\beta^- = 100$
²²⁹ Ra	32563	19	4.0 m	0.2	5/2 ⁽⁺⁾	90	$\beta^- = 100$
²²⁹ Ac	30750	30	62.7 m	0.5	(3/2 ⁺)	90	$\beta^- = 100$
²²⁹ Th	29586.5	2.8	7.34 ky	0.16	5/2 ⁺	90	$\alpha = 100$
²²⁹ Th ^m	29586.5	2.8	0.0035	0.0010	70 h	50 3/2 ⁺	94He08 TEJ IT ?
²²⁹ Pa	29898.0	2.7	1.50 d	0.05	(5/2 ⁺)	90	$\epsilon \approx 100$; $\alpha = 0.48$ 5
²²⁹ Pa ^m	29909.6	2.7	11.6	0.3	420 ns	30 3/2 ⁻	98Le15 EJD IT=100
²²⁹ U	31211	6	58 m	3	(3/2 ⁺)	90	$\beta^+ \approx 80$; $\alpha \approx 20$
²²⁹ Np	33780	90	4.0 m	0.2	5/2 ⁺ #	90	$\alpha > 50$; $\beta^+ < 50$
²²⁹ Np ^p	33850#	100#	70#	50#	5/2 ⁻ #		
²²⁹ Pu	37400	50	120 s	50	3/2 ⁺ #	97 01Ca.B TD	$\alpha = 100$
* ²²⁹ Th ^m	D : ultraviolet γ -ray emission assigned by 97Ir02 and 98Ri03 to IT decay is						
* ²²⁹ Th ^m	D : proved by 99Sh12 to be due to N ₂ discharge emission. 99Ut01 sees						
* ²²⁹ Th ^m	D : no UV in vacuo.						
²³⁰ Fr	39600#	450#	19.1 s	0.5		93	$\beta^- = 100$
²³⁰ Ra	34518	12	93 m	2	0 ⁺	93	$\beta^- = 100$
²³⁰ Ac	33810	300	122 s	3	(1 ⁺)	94 01Yu03 D	$\beta^- = 100$; β^- SF=1.19e-6 40
²³⁰ Th	30864.0	1.8	75.38 ky	0.30	0 ⁺	93	$\alpha = 100$; SF<5e-11; ...
²³⁰ Pa	32175	3	17.4 d	0.5	(2 ⁻)	93	$\beta^+ \approx 91.6$ 13; $\beta^- \approx 8.4$ 13; ...
²³⁰ U	31615	5	20.8 d		0 ⁺	93 01Bo11 D	$\alpha = 100$; 22Ne=4.8e-12 20; ...
²³⁰ Np	35240	50	4.6 m	0.3		93	$\beta^+ < 97$; $\alpha \geq 3$
²³⁰ Np ^p	35540#	210#	300#	200#			
²³⁰ Pu	36934	15	1.70 m	0.17	0 ⁺	93 01Ca.B T	$\alpha = ?$; $\beta^+ ?$
* ²³⁰ Th	D : ...; ²⁴ Ne=5.6e-11 10						
* ²³⁰ Pa	D : ...; $\alpha = 0.0032$ 1						
* ²³⁰ U	D : ...; SF<1.4e-10#; 2 $\beta^+ ?$						
* ²³⁰ Pu	T : also 90An22=154(66)s outweighed, not used						
²³¹ Fr	42330#	470#	17.6 s	0.6	1/2 ⁺ #	01	$\beta^- = 100$
²³¹ Ra	38400#	300#	103 s	3	(5/2 ⁺)	01	$\beta^- = 100$
²³¹ Ra ^m	38470#	300#	66.21	0.09	53 μ s	(1/2 ⁺)	01 IT=100
²³¹ Ac	35920	100	7.5 m	0.1	(1/2 ⁺)	01	$\beta^- = 100$
²³¹ Th	33817.3	1.8	25.52 h	0.01	5/2 ⁺	01	$\beta^- = 100$; $\alpha = 4e-11$ #
²³¹ Pa	33425.7	2.3	32.76 ky	0.11	3/2 ⁻	01	$\alpha = 100$; SF<3e-10; ...
²³¹ U	33807	3	4.2 d	0.1	(5/2 ⁽⁺⁾)	01	$\epsilon \approx 100$; $\alpha = 0.004$ 1
²³¹ Np	35630	50	48.8 m	0.2	(5/2 ⁽⁺⁾)	01	$\beta^+ = 98$ 1; $\alpha = 2$ 1
²³¹ Np ^p	35690#	60#	60#	40#	5/2 ⁻ #		
²³¹ Pu	38285	26	8.6 m	0.5	3/2 ⁺ #	01 99La14 D	$\beta^+ = 87$ 5; $\alpha = 13$ 5
²³¹ Am	42440#	300#	30#	s			$\beta^+ ?$; $\alpha ?$
* ²³¹ Pa	D : ...; ²⁴ Ne=13.4e-10 17; ²³ F=9.9e-13						
²³² Fr	46360#	640#	5 s	1		97 90Me13 T	$\beta^- = 100$
²³² Ra	40650#	280#	250 s	50	0 ⁺	91	$\beta^- = 100$
²³² Ac	39150	100	119 s	5	(1 ⁺)	91	$\beta^- = 100$
²³² Th	35448.3	2.0	14.05 Gy	0.06	0 ⁺	91 95Bo18 D	IS=100.; $\alpha = 100$; SF=11e-10 3; ...
²³² Pa	35948	8	1.31 d	0.02	(2 ⁻)	91	$\beta^- \approx 100$; $\epsilon = 0.003$ 1
²³² U	34610.7	2.2	68.9 y	0.4	0 ⁺	91 90Bo16 D	$\alpha = 100$; ²⁴ Ne=8.9e-10 7; ...
²³² Np	37360#	100#	14.7 m	0.3	(4 ⁺)	91	$\beta^+ \approx 100$; $\alpha \approx 0.003$
²³² Pu	38366	18	33.7 m	0.5	0 ⁺	91 ABBW D	$\epsilon = ?$; $\alpha = 11$ #
²³² Am	43400#	300#	1.31 m	0.04		91	$\beta^+ = ?$; $\alpha = 2$ #; β^+ SF=0.069 10
* ²³² Th	D : ...; ²⁴ Ne+ ²⁶ Ne<2.78e-10; 2 $\beta^- ?$						
* ²³² U	D : ...; ²⁸ Mg<5e-12; SF<1e-12						
* ²³² U	D : ²⁴ Ne: average, as adopted by 91Bo20, of 2 results from their group						
* ²³² Pu	T : average 00La25=33.1(0.8) 73Ja06=34.1(0.7)						
* ²³² Pu	D : derived from 1.6%# < α < 20%#, in ENSDF						

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²³³ Ra	44770# 470#		30 s	5	1/2 ⁺ #	97	β^- =100
²³³ Ac	41500# 300#		145 s	10	(1/2 ⁺)	90	β^- =100
²³³ Th	38733.2 2.0		22.3 m	0.1	1/2 ⁺	90	β^- =100
²³³ Pa	37490.1 2.2		26.967 d	0.002	3/2 ⁻	90	β^- =100
²³³ U	36920.0 2.7		159.2 ky	0.2	5/2 ⁺	96	α =100; SF<6e-9; ...
²³³ Np	37950 50		36.2 m	0.1	(5/2 ⁺)	90	β^+ ≈100; α <0.001
²³³ Np ^p	38000# 60# 50# 30#				(5/2 ⁻)	90	
²³³ Pu	40050 50		20.9 m	0.4	5/2 ⁺ #	90	β^+ ≈100; α =0.12 5
²³³ Am	43170# 100#		3.2 m	0.8		00Sa52	TD β^+ ?; α >3
²³³ Cm	47290 70		1# m		3/2 ⁺ #	01Ca.B	D α =?; β^+ ?
* ²³³ U	D : ... ; ²⁴ Ne=7.2e-11 9; ²⁸ Mg<1.3e-13						**
²³⁴ Ra	47230# 490#		30 s	10	0 ⁺	94	β^- =100
²³⁴ Ac	45100# 400#		44 s	7		94	β^- =100
²³⁴ Th	40614 3		24.10 d	0.03	0 ⁺	94	β^- =100
²³⁴ Pa	40341 5		6.70 h	0.05	4 ⁺	94	78Ga07 D β^- =100; SF<3e-10
²³⁴ Pa ^m	40419 4 78 3		1.17 m	0.03	(0 ⁻)	94	78Ga07 D β^- ≈100; IT=0.16 4; SF<1e-10
²³⁴ U	38146.6 1.8		245.5 ky	0.6	0 ⁺	94	IS=0.0055 2; α =100; ...
²³⁴ U ^m	39567.9 1.8 1421.32 0.10		33.5 μ s	2.0	6 ⁻		*
²³⁴ Np	39956 9		4.4 d	0.1	(0 ⁺)	94	β^+ =100
²³⁴ Pu	40350 7		8.8 h	0.1	0 ⁺	94	ϵ ≈94; α ≈6
²³⁴ Am	44530# 210#		2.32 m	0.08		94	90Ha02 D β^+ ≈100; α =0.039 12; ...
²³⁴ Cm	46724 18		51 s	12	0 ⁺	01Ca.B	TD α =?; β^+ =47#; SF=3
* ²³⁴ U	D : ... ; SF=1.73e-9 10; ²⁸ Mg=1.4e-11 3; ²⁴ Ne+ ²⁶ Ne=9e-12 7						**
* ²³⁴ Am	D : ... ; β^+ SF=0.0066 18						**
²³⁵ Ac	47720# 360#		40# s		1/2 ⁺ #		β^- ?
²³⁵ Th	44260 50		7.2 m	0.1	1/2 ⁺ #	03	β^- =100
²³⁵ Pa	42330 50		24.44 m	0.11	(3/2 ⁻)	03	β^- =100
²³⁵ U	40920.5 1.8		704 My	1	7/2 ⁻	03	IS=0.7200 51; α =100; ...
²³⁵ U ^m	40920.6 1.8 0.0765 0.0004		26 m		1/2 ⁺	03	IT=100
²³⁵ Np	41044.7 2.0		396.1 d	1.2	5/2 ⁺	03	ϵ ≈100; α =0.00260 13
²³⁵ Pu	42184 21		25.3 m	0.5	(5/2 ⁺)	03	β^+ ≈100; α =0.0028 7
²³⁵ Am	44660# 120#		9.9 m	0.5	5/2 ⁻ #	03	β^+ ≈100; α =0.40 5
²³⁵ Cm	47910# 200#		5# m		5/2 ⁺ #	03	β^+ ?; α ?
²³⁵ Cm ^p	47960# 210# 50# 50#				am		
²³⁵ Bk	52700# 400#		20# s				β^+ ?; α ?
* ²³⁵ U	D : ... ; SF=7e-9 2; ²⁰ Ne=8e-10 4; ²⁵ Ne≈8e-10; ²⁸ Mg=8e-10						**
²³⁶ Ac	51510# 500#		2# m				β^- ?
²³⁶ Th	46450# 200#		37.5 m	0.2	0 ⁺	91	β^- =100
²³⁶ Pa	45350 200		9.1 m	0.1	1 ⁽⁻⁾	91	β^- =100; β^- SF=6e-8 4
²³⁶ U	42446.3 1.8		23.42 My	0.03	0 ⁺	91	α =100; SF=9.6e-8 6
²³⁶ U ^m	45196 10 2750 10		115 ns		0 ⁺		*
²³⁶ Np	43380 50		154 ky	6	(6 ⁻)	91	ϵ =87.3 5; β^- =12.5 5; α =0.16 4
²³⁶ Np ^m	43439 7 60 50		22.5 h	0.4	1	91	ϵ =52 1; β^- =48 1
²³⁶ Np ^p	43618 14 240 50 AD				3 ⁻		
²³⁶ Pu	42902.7 2.2		2.858 y	0.008	0 ⁺	91	90Og01 D α =100; SF=1.36e-7 4; ...
²³⁶ Am	46180# 100#		30# m			91	β^+ ?; α ?
²³⁶ Cm	47890# 200#		10# m		0 ⁺	91	β^+ ?; α ?
²³⁶ Bk	53400# 400#		1# m				β^+ ?; α ?
* ²³⁶ Pa	D : β^- SF decay questioned by 90Ha02						**
* ²³⁶ U	D : and Ne+Mg < 4e-10%, from 89Mi.A						**
* ²³⁶ Pu	D : ... ; ²⁸ Mg=2e-12; 2 β^+ ?						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²³⁷ Th	50200# 360#		4.8 m	0.5	5/2 ⁺ #	97 00Xu02 T	$\beta^- = 100$	*
²³⁷ Pa	47640 100		8.7 m	0.2	(1/2 ⁺)	95	$\beta^- = 100$	
²³⁷ U	45391.9 1.9		6.75 d	0.01	1/2 ⁺	95	$\beta^- = 100$	
²³⁷ Np	44873.3 1.8		2.144 My	0.007	5/2 ⁺	95 89Pr.A D	$\alpha = 100$; SF $\leq 2e-10$; ³⁰ Mg $< 4e-12$	*
²³⁷ Pu	45093.3 2.2		45.2 d	0.1	7/2 ⁻	95	$\epsilon \approx 100$; $\alpha = 0.0042$	
²³⁷ Pu ^m	45238.8 2.2	145.544 0.010	180 ms	20	1/2 ⁺	95	IT=100	
²³⁷ Am	46570# 60#		73.0 m	1.0	5/2 ⁽⁻⁾	95	$\beta^+ \approx 100$; $\alpha = 0.025$	3
²³⁷ Cm	49280# 210#		20# m		5/2 ⁺ #	95	$\beta^+ ?$; $\alpha ?$	
²³⁷ Cm ^p	49480# 260#	200# 150#			7/2 ⁻			
²³⁷ Bk	53100# 220#		1# m		7/2 ⁺ #		$\beta^+ ?$; $\alpha ?$	
²³⁷ Bk ^p	53170# 230#	70# 30#			(3/2 ⁻)			
²³⁷ Cf	57820# 500#		2.1 s	0.3	5/2 ⁺ #	98 95La09 TD	$\alpha ?$; SF ≈ 10 ; $\beta^+ ?$	
* ²³⁷ Th	T : average 00Xu02=4.69(0.60) 93Yu03=5.0(0.9)							**
* ²³⁷ Np	D : and cluster (Z=10-14) < 1.8e-12%, from 92Mo03							**
²³⁸ Th	52630# 280#		9.4 m	2.0	0 ⁺	02	$\beta^- = 100$	
²³⁸ Pa	50770 60		2.27 m	0.09	3 ⁻ #	02 85Ba57 D	$\beta^- = 100$; β^- SF $< 2.6e-6$	
²³⁸ U	47308.9 1.9		4.468 Gy	0.003	0 ⁺	02 91Tu02 D	IS=99.2745 106; $\alpha = 100$; ...	*
²³⁸ U ^m	49866.8 2.0	2557.9 0.5	280 ns	6	0 ⁺	02	IT=?; SF=2.6 4; $\alpha < 0.5$	
²³⁸ Np	47456.3 1.8		2.117 d	0.002	2 ⁺	02	$\beta^- = 100$	
²³⁸ Np ^m	49760# 200#	2300# 200#	112 ns	39		02	SF ≈ 100 ; IT ?	
²³⁸ Pu	46164.7 1.8		87.7 y	0.1	0 ⁺	02 89Wa10 D	$\alpha = 100$; SF=1.9e-7 1; ...	*
²³⁸ Am	48420 50		98 m	2	1 ⁺	02	$\beta^+ = 100$; $\alpha = 1.0e-4$	4
²³⁸ Am ^m	50920# 210#	2500# 200#	35 μ s	10		02	SF ≈ 100 ; IT ?	
²³⁸ Cm	49400 40		2.4 h	0.1	0 ⁺	02	$\epsilon ?$; $\alpha \leq 10$	
²³⁸ Bk	54290# 290#		2.40 m	0.08		02 94Kr03 D	$\beta^+ \approx 100$; $\alpha ?$; β^+ SF=0.048 2	
²³⁸ Bk ^p	54490# 330#	200# 150#			am			
²³⁸ Cf	57200# 400#		21.1 ms	1.3	0 ⁺	02 01Og08 TD	SF ≈ 100 ; $\alpha \approx 0.2$; $\beta^+ ?$	*
* ²³⁸ U	D : ... ; SF=5.45e-5 7; $2\beta^- = 2.2e-10$ 7							**
* ²³⁸ U	D : $2\beta^- = 2.2(7)e-10\%$ derived from $2\beta^-$ half-life $T = 2.0(0.6)$ Zy, in 91Tu02							**
* ²³⁸ Pu	D : ... ; ³² Si $\approx 1.4e-14$; ²⁸ Mg+ ³⁰ Mg $\approx 6e-15$							**
* ²³⁸ Cf	T : average 01Og08=21.1(+1.9-1.7) 95La09=21(2)							**
²³⁹ Pa	53340# 200#		1.8 h	0.5	(3/2) ^(-#)	03	$\beta^- = 100$	
²³⁹ U	50573.9 1.9		23.45 m	0.02	5/2 ⁺	03	$\beta^- = 100$	
²³⁹ U ^m	50594# 20#	20# 20#	> 250 ns		(5/2 ⁺)	03	$\beta^- = 100$	
²³⁹ U ⁿ	50707.7 1.9	133.7990 0.0010	780 ns	40	1/2 ⁺	03	IT=100	
²³⁹ Np	49312.4 2.1		2.356 d	0.003	5/2 ⁺	03	$\beta^- = 100$; $\alpha = 5e-10\%$	
²³⁹ Pu	48589.9 1.8		24.11 ky	0.03	1/2 ⁺	03	$\alpha = 100$; SF=3.1e-10 6	
²³⁹ Pu ^m	48981.5 1.8	391.584 0.003	193 ns	4	7/2 ⁻	03	IT=100	
²³⁹ Am	49392.0 2.4		11.9 h	0.1	(5/2) ⁻	03	$\epsilon \approx 100$; $\alpha = 0.010$	1
²³⁹ Am ^m	51890 200	2500 200	163 ns	12	(7/2 ⁺)	03	SF ≈ 100 ; IT ?	
²³⁹ Cm	51190# 100#		2.9 h		(7/2 ⁻)	03	$\beta^+ \approx 100$; $\alpha < 0.1$	
²³⁹ Cm ^p	51340# 140#	150# 100#			1/2 ⁺			
²³⁹ Bk	54290# 230#		3# m		7/2 ⁺ #	03	$\beta^+ ?$; $\alpha ?$	
²³⁹ Bk ^p	54330# 230#	41 11			(3/2 ⁻)			
²³⁹ Cf	58150# 210#		60 s	30	5/2 ⁺ #	03	$\alpha = ?$; $\beta^+ ?$	
²⁴⁰ Pa	56800# 300#		2# m				$\beta^- ?$	
²⁴⁰ U	52715 5		14.1 h	0.1	0 ⁺	96	$\beta^- = 100$; $\alpha < 1e-10$	
²⁴⁰ Np	52315 15		* 61.9 m	0.2	(5 ⁺)	96	$\beta^- = 100$	
²⁴⁰ Np ^m	52335 21	20 15	* 7.22 m	0.02	1 ⁽⁺⁾	96 81Hs02 E	$\beta^- \approx 100$; IT=0.11 3	
²⁴⁰ Pu	50127.0 1.8		6.564 ky	0.011	0 ⁺	01 89Pr.A D	$\alpha = 100$; SF=5.7e-6 2; ³⁴ Si $< 1.3e-13$	
²⁴⁰ Am	51512 14		50.8 h	0.3	(3 ⁻)	96	$\beta^+ = 100$; $\alpha \approx 1.9e-4$	
²⁴⁰ Cm	51725.4 2.3		27 d	1	0 ⁺	96	$\alpha \approx 100$; $\epsilon < 0.5$; SF=3.9e-6 8	
²⁴⁰ Bk	55670# 150#		4.8 m	0.8		96	$\beta^+ ?$; $\alpha = 10\%$; β^+ SF=0.0020 13	
²⁴⁰ Bk ^p	55910# 180#	240# 100#			am			
²⁴⁰ Cf	58030# 200#		1.06 m	0.15	0 ⁺	96 95La09 D	$\alpha \approx 98$; SF ≈ 2 ; $\beta^+ ?$	
²⁴⁰ Es	64200# 400#		1# s				$\alpha ?$; $\beta^+ ?$	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁴¹ U	56200#	300#	5#	m		7/2 ⁺ #	β^- ?	
²⁴¹ Np	54260	70	13.9	m	0.2	(5/2 ⁺) 94	β^- =100	
²⁴¹ Pu	52956.8	1.8	14.35	y	0.10	5/2 ⁺ 96	$\beta^- \approx 100$; $\alpha=0.00245$ 2; ... *	
²⁴¹ Pu ^m	53118.4	1.8	880	ns		1/2 ⁺		
²⁴¹ Pu ⁿ	55160	200	21	μ s	3			
²⁴¹ Am	52936.0	1.8	432.2	y	0.7	5/2 ⁻ 94	$\alpha=100$; SF=4.3e-10 18; ... *	
²⁴¹ Am ^m	55140	100	1.5	μ s				
²⁴¹ Cm	53703.4	2.2	32.8	d	0.2	1/2 ⁺ 94	$\epsilon=99.0$ 1; $\alpha=1.0$ 1	
²⁴¹ Bk	56100#	200#	4.6	m	0.4	(7/2 ⁺) 94	03As01 T α ?; β^+ ?	
²⁴¹ Bk ^p	56150#	200#				3/2 ⁻		
²⁴¹ Cf	59360#	260#	3.8	m	0.7	7/2 ⁻ # 94	$\beta^+ \approx 75$; $\alpha \approx 25$	
²⁴¹ Cf ^p	59510#	270#				(1/2 ⁺)		
²⁴¹ Es	63840#	230#	10	s	5	(3/2 ⁻) 97	96Ni09 TJD α =?; β^+ ?	
²⁴¹ Es ^p	64240#	300#				(7/2 ⁺)		
* ²⁴¹ Pu	D : ... ; SF<2.4e-14							**
* ²⁴¹ Am	D : ... ; ³⁴ Si<7.4e-14							**
²⁴² U	58620#	200#	16.8	m	0.5	0 ⁺ 02	β^- =100	
²⁴² Np	57420	200	2.2	m	0.2	(1 ⁺) 02	β^- =100	
²⁴² Np ^m	57420#	210#	5.5	m	0.1	6 ⁺ # 02	β^- =100	
²⁴² Pu	54718.4	1.9	375	ky	2	0 ⁺ 02	$\alpha=100$; SF=5.50e-4 6	
²⁴² Am	55469.7	1.8	16.02	h	0.02	1 ⁻ 02	β^- =82.7 3; $\epsilon=17.3$ 3	
²⁴² Am ^m	55518.3	1.8	141	y	2	5 ⁻ 02	IT \approx 100; $\alpha=0.45$ 2; SF<4.7e-9	
²⁴² Am ⁿ	57670	80	14.0	ms	1.0	(2 ⁺ , 3 ⁻) 02	SF \approx 100; IT=?; α ?	
²⁴² Cm	54805.2	1.8	162.8	d	0.2	0 ⁺ 02	$\alpha=100$; SF=6.2e-6 3; ... *	
²⁴² Bk	57740#	200#	7.0	m	1.3	2 ⁻ # 02	80Ga07 D $\beta^+ \approx 100$; β^+ SF<3e-5; α ?	
²⁴² Bk ^m	57940#	280#	600	ns	100		SF \approx 100; IT ?	
²⁴² Bk ^p	57990#	220#				4 ⁻		
²⁴² Cf	59340	40	3.49	m	0.15	0 ⁺ 02	70Si19 T $\alpha=80$ 20; β^+ ?; SF<0.014	
²⁴² Es	64970#	330#	13.5	s	2.5	02	94Ke.B D α =?; β^+ =?; β^+ SF=0.6	
²⁴² Fm	68400#	400#	800	μ s	200	0 ⁺ 02	SF=?; α ?	
* ²⁴² Cm	D : ... ; ³⁴ Si=1.1e-14 4; 2 β^+ ?							**
* ²⁴² Cf	T : average 70Si19=3.68(0.44) 67Si07=3.4(0.2) 67Fi04=3.2(0.5) 67H01=3.7(0.3)							**
* ²⁴² Es	D : β^+ SF=0.6% assuming α and β^+ are equal							**
²⁴³ Np	59880#	30#	1.85	m	0.15	(5/2 ⁻) 93	β^- =100	
²⁴³ Np ^p	59925	11				(5/2 ⁻)		
²⁴³ Pu	57756	3	4.956	h	0.003	7/2 ⁺ 93	β^- =100	
²⁴³ Pu ^m	58140	3	330	ns	30	(1/2 ⁺) 93	IT=100	
²⁴³ Am	57176.1	2.3	7.37	ky	0.04	5/2 ⁻ 93	$\alpha=100$; SF=3.7e-9 2	
²⁴³ Cm	57183.6	2.1	29.1	y	0.1	5/2 ⁺ 93	$\alpha \approx 100$; $\epsilon=0.29$ 3; SF=5.3e-9 9	
²⁴³ Cm ^p	57312	10				7/2 ⁺		
²⁴³ Bk	58691	5	4.5	h	0.2	(3/2 ⁻) 93	$\beta^+ \approx 100$; $\alpha \approx 0.15$	
²⁴³ Bk ^p	58740#	30#				(7/2 ⁻)		
²⁴³ Cf	60950#	140#	10.7	m	0.5	(1/2 ⁺) 93	$\beta^+ \approx 86$; $\alpha \approx 14$	
²⁴³ Es	64780#	230#	21	s	2	3/2 ⁻ # 93	$\beta^+ \leq 70$; $\alpha \geq 30$	
²⁴³ Es ^p	65180#	310#				am		
²⁴³ Fm	69260#	220#	210	ms	60	7/2 ⁻ # 93	ABBW D $\alpha=60$ 40; β^+ ?; SF=0.57#	
* ²⁴³ Fm	D : $\alpha=40(20)$ % if α branching of ²³⁹ Cf is 100%, see ENSDF							**
²⁴⁴ Np	63200#	300#	2.29	m	0.16	(7 ⁻) 03	β^- =100	
²⁴⁴ Pu	59806	5	80.0	My	0.9	0 ⁺ 03	92Mo25 D $\alpha \approx 100$; SF=0.121 4; ... *	
²⁴⁴ Am	59881.0	2.1	10.1	h	0.1	6 ⁻ # 03	β^- =100	
²⁴⁴ Am ^m	59969.5	2.3	26	m	1	1 ⁺ 03	$\beta^- \approx 100$; $\epsilon=0.0361$ 13	
²⁴⁴ Cm	58453.7	1.8	18.10	y	0.02	0 ⁺ 03	$\alpha=100$; SF=1.37e-4 3	
²⁴⁴ Cm ^m	59493.9	1.8	34	ms	2	6 ⁺ 03	IT=100	

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
²⁴⁴ Bk	60716	14	4.35 h	0.15	4 ⁻ #	03	$\beta^+ ?; \alpha=0.006\ 3$	
²⁴⁴ Bk ^p	60860#	50#			am			
²⁴⁴ Cf	61479.2	2.9	19.4 m	0.6	0 ⁺	03	$\alpha \approx 100; \epsilon ?$	
²⁴⁴ Es	66030#	180#	37 s	4		03	$\beta^+ = ?; \alpha = 5\ 3; \beta^+ \text{SF} = 0.01$	
²⁴⁴ Es ^p	66230#	240#			am			
²⁴⁴ Fm	69010#	280#	3.3 ms	0.5	0 ⁺	03	SF $\approx 100; \alpha = 0.4\#$	
* ²⁴⁴ Pu	D : ... ; $2\beta^- < 7.3e-9$							**
* ²⁴⁴ Pu	T : and $T(2\beta^-) > 1.1\ \text{Ey}$, from ⁹² Mo25; thus $2\beta^- < 7.3\ e-9\%$							**
²⁴⁵ Pu	63106	14	10.5 h	0.1	(9/2 ⁻)	93	$\beta^- = 100$	
²⁴⁵ Am	61900	3	2.05 h	0.01	(5/2 ⁺)	93	$\beta^- = 100$	
²⁴⁵ Cm	61004.7	2.1	8.5 ky	0.1	7/2 ⁺	93	$\alpha = 100; \text{SF} = 6.1e-7\ 9$	
²⁴⁵ Cm ^m	61360.6	2.1	355.90	0.10	1/2 ⁺	93	IT=100	
²⁴⁵ Bk	61815.4	2.3	4.94 d	0.03	3/2 ⁻	93	$\epsilon \approx 100; \alpha = 0.12\ 1$	
²⁴⁵ Bk ^p	61870#	30#			(7/2 ⁻)			
²⁴⁵ Cf	63386.9	2.9	45.0 m	1.5	(5/2 ⁺)	93	$\beta^+ = 64\ 3; \alpha = 36\ 3$	
²⁴⁵ Cf ^p	63540#	100#			7/2 ⁺			
²⁴⁵ Es	66440#	200#	1.1 m	0.1	(3/2 ⁻)	93	$\beta^+ = 60\ 10; \alpha = 40\ 10$	
²⁴⁵ Es ^p	66740#	220#			am			
²⁴⁵ Es ^q	66790#	250#			am			
²⁴⁵ Fm	70220#	280#	4.2 s	1.3	1/2 ⁺ #	93	$\alpha = ?; \beta^+ = 4.2\#; \text{SF} = 0.13\#$	
²⁴⁵ Md	75290#	320#	* 900 μs	250	1/2 ⁻ #	97	96Ni09 TJD SF=?; $\alpha ?$	
²⁴⁵ Md ^m	75490#	310#	* 400 ms	200	(7/2 ⁺)	97	96Ni09 TJD $\alpha = ?; \beta^+ ?$	
²⁴⁶ Pu	65395	15	10.84 d	0.02	0 ⁺	98	$\beta^- = 100$	
²⁴⁶ Am	64995	18	39 m	3	(7 ⁻)	98	$\beta^- = 100$	
²⁴⁶ Am ^m	65025	15	30	10	2 ⁽⁻⁾	98	$\beta^- \approx 100; \text{IT} < 0.02$	
²⁴⁶ Cm	62618.4	2.1	4.76 ky	0.04	0 ⁺	98	$\alpha \approx 100; \text{SF} = 0.02615\ 7$	
²⁴⁶ Bk	63970	60	1.80 d	0.02	2 ⁽⁻⁾	98	$\beta^+ \approx 100; \alpha = 0.1\#$	
²⁴⁶ Cf	64091.7	2.1	35.7 h	0.5	0 ⁺	98	$\alpha = 100; \text{SF} = 2.5e-4\ 2; \epsilon < 4e-3$	
²⁴⁶ Es	67900#	220#	7.7 m	0.5	4 ⁻ #	98	$\beta^+ = 90.1\ 18; \alpha = 9.9\ 18; \dots$	
²⁴⁶ Es ^p	68250#	300#			am		*	
²⁴⁶ Fm	70140	40	1.1 s	0.2	0 ⁺	98	96Ni09 D $\alpha = ?; \beta^+ > 10; \text{SF} = 4.5\ 13; \dots$	
²⁴⁶ Md	76280#	330#	1.0 s	0.4		98	$\alpha = ?; \beta^+ ?; \text{SF} ?$	
²⁴⁶ Md ^m	76490#	340#	210	70	EU		96Ni09 TD $\alpha = ?; \beta^+ ?$	
* ²⁴⁶ Es	D : ... ; $\beta^+ \text{SF} \approx 0.003$							**
* ²⁴⁶ Fm	D : ... ; $\beta^+ \text{SF} = 10\ 5$							**
* ²⁴⁶ Md ^m	I : no longer considered to exist, see ENSDF'98							**
²⁴⁷ Pu	69000#	300#	2.27 d	0.23	1/2 ⁺ #	93	$\beta^- = 100$	
²⁴⁷ Am	67150#	100#	23.0 m	1.3	5/2#	93	$\beta^- = 100$	
²⁴⁷ Cm	65534	4	15.6 My	0.5	9/2 ⁻	93	$\alpha = 100$	
²⁴⁷ Bk	65491	6	1.38 ky	0.25	(3/2 ⁻)	93	$\alpha \approx 100; \text{SF} ?$	
²⁴⁷ Cf	66137	8	3.11 h	0.03	7/2 ⁺ #	93	$\epsilon \approx 100; \alpha = 0.035\ 5$	
²⁴⁷ Es	68610#	30#	4.6 m	0.3	7/2 ⁺ #	93	$\beta^+ \approx 93; \alpha \approx 7; \text{SF} \approx 9e-5\#$	
²⁴⁷ Es ^p	68930#	200#			am			
²⁴⁷ Fm	71580#	140#	35 s	4	5/2 ⁺ #	93	$\alpha \geq 50; \beta^+ \leq 50$	
²⁴⁷ Fm ^m		non existent	9.2 s	2.3		93	67F115 I $\alpha \approx 100; \text{IT} ?$	
²⁴⁷ Fm ^p	71730#	170#			(7/2 ⁺)		*	
²⁴⁷ Fm ^q	71980#	210#						
²⁴⁷ Md	76040#	320#	* 270 ms	160	1/2 ⁻ #	93	93Ho.A TD SF=?; $\alpha ?$	
²⁴⁷ Md ^m	76170#	310#	130#	100#	Nm * 1.12 s	0.22	(7/2 ⁺) 93Ho.A TD $\alpha = 100; \text{SF} = 0.0001\#$	
* ²⁴⁷ Fm ^m	I : existence of this isomer is discussed in ENSDF							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{248}Am	70560#	200#	3# m		99		β^- ?
^{248}Cm	67392	5	348 ky	6	0 ⁺	99	$\alpha=91.61$ 16; SF=8.39 16; ... *
^{248}Bk	68080#	70#	* > 9 y		6 ⁺ #	99	α ?
$^{248}\text{Bk}^m$	68110	21	* 23.7 h	0.2	1 ⁽⁻⁾	99	$\beta^-=70$ 5; $\epsilon=30$ 5; $\alpha=0.001$ #
$^{248}\text{Bk}^p$	68130	50			(5 ⁻)		
^{248}Cf	67240	5	334 d	3	0 ⁺	99	$\alpha\approx 100$; SF=0.0029 3
^{248}Es	70300#	50#	27 m	5	2 ⁻ , 0 ⁺ #	99	$\beta^+\approx 100$; $\alpha\approx 0.25$; β^+ SF=3e-5
$^{248}\text{Es}^m$		non existent	41 m			89Ha27 I	
^{248}Fm	71906	12	36 s	3	0 ⁺	99	$\alpha=93$ 7; $\beta^+=7$ 7; SF=0.10 5
^{248}Md	77150#	240#	7 s	3		99	$\beta^+=80$ 10; $\alpha=20$ 10; ... *
$^{248}\text{Md}^p$	77250#	250#				100# 70#	
^{248}No	80660#	300#	< 2 μ s		0 ⁺	03Be18 I	SF ?
* ^{248}Cm	D : ... ; 2 β^- ?						**
* ^{248}Md	D : ... ; β^+ SF<0.05						**
^{249}Am	73100#	300#	1# m				β^- ?
^{249}Cm	70750	5	64.15 m	0.03	1/2 ⁽⁺⁾	99	$\beta^-=100$
$^{249}\text{Cm}^m$	70799	5	23 μ s		(7/2 ⁺)	99	$\alpha=100$
^{249}Bk	69849.6	2.6	330 d	4	7/2 ⁺	99	$\beta^-\approx 100$; $\alpha=0.00145$ 8; ... *
$^{249}\text{Bk}^m$	69858.4	2.6	300 μ s		(3/2 ⁻)	99	IT=100
^{249}Cf	69725.6	2.2	351 y	2	9/2 ⁻	99	$\alpha=100$; SF=5.0e-7 4
$^{249}\text{Cf}^m$	69870.6	2.2	45 μ s	5	5/2 ⁺	99	IT=100
^{249}Es	71180#	30#	102.2 m	0.6	7/2 ⁺	99	$\beta^+\approx 100$; $\alpha=0.57$ 8
^{249}Fm	73620#	100#	2.6 m	0.7	7/2 ⁺ #	99	β^+ ?; $\alpha=33$ 9
^{249}Md	77330#	220#	24 s	4	(7/2 ⁻)	99	01He35 J $\alpha>60$; β^+ ?
$^{249}\text{Md}^m$	77430#	250#	1.9 s	0.9	(1/2 ⁻)	99	01He35 TJD $\alpha=100$
^{249}No	81820#	340#	57 μ s	12	5/2 ⁺ #	99	03Be18 T β^+ ?; α ?
* ^{249}Bk	D : ... ; SF=47e-9 2						**
^{250}Cm	72989	11	8300# y		0 ⁺	01	SF ≈ 74 ; $\alpha\approx 18$; $\beta^-\approx 8$
^{250}Bk	72951	4	3.212 h	0.005	2 ⁻	01	$\beta^-=100$
$^{250}\text{Bk}^m$	72987	4	29 μ s	1	(4 ⁺)	01	IT=100
$^{250}\text{Bk}^n$	73036	5	213 μ s	8	(7 ⁺)	01	IT ?
^{250}Cf	71171.8	2.1	13.08 y	0.09	0 ⁺	01	$\alpha\approx 100$; SF=0.077 3
^{250}Es	73230#	100#	* 8.6 h	0.1	(6 ⁺)	01	$\beta^+>97$; α ?
$^{250}\text{Es}^m$	73430#	180#	* 2.22 h	0.05	1 ⁽⁻⁾	01	$\beta^+\approx 100$; α ?
^{250}Fm	74074	12	30 m	3	0 ⁺	01	$\alpha>90$; $\epsilon<10$; SF=0.0069 10
$^{250}\text{Fm}^m$	75570#	300#	1.8 s	0.1	7, 8#	01	IT>80; $\alpha<20$; β^+ ?; ... *
^{250}Md	78640#	300#	52 s	6		01	$\beta^+=93$ 3; $\alpha=7$ 3; β^+ SF=0.02
$^{250}\text{Md}^p$	78830#	340#			am		
^{250}No	81520#	200#	5.7 μ s	0.8	0 ⁺	01	03Be18 T SF ≈ 100 ; $\alpha=0.1$ #; ... *
* $^{250}\text{Fm}^m$	D : ... ; SF<8.2E-5						**
* ^{250}No	D : ... ; $\beta^+=0.00025$ #						**
* ^{250}No	T : also 01Og08=36(+11-6)						**
^{251}Cm	76648	23	16.8 m	0.2	(1/2 ⁺)	99	$\beta^-=100$
^{251}Bk	75228	11	55.6 m	1.1	3/2 ⁻ #	99	$\beta^-=100$
$^{251}\text{Bk}^m$	75264	11	58 μ s	4	7/2 ⁺ #	99	IT=100
^{251}Cf	74135	4	900 y	40	1/2 ⁺	99	$\alpha\approx 100$; SF ?
^{251}Es	74512	6	33 h	1	(3/2 ⁻)	99	ϵ ?; $\alpha=0.5$ 2
^{251}Fm	75987	8	5.30 h	0.08	(9/2 ⁻)	99	$\beta^+=98.20$ 13; $\alpha=1.80$ 13
$^{251}\text{Fm}^m$	76178	8	15.2 μ s	2.3	(5/2 ⁺)	99	IT=100
^{251}Md	79030#	200#	4.0 m	0.5	7/2 ⁻ #	99	$\beta^+=95$ #; α ?
$^{251}\text{Md}^p$	79080#	210#			am		
^{251}No	82910#	180#	* 760 ms	30	7/2 ⁺ #	99	01He35 TD $\alpha=83$ 16; β^+ ?; SF<0.3
$^{251}\text{No}^m$	83030#	210#	* 1.7 s	1.0	9/2 ⁻ #	99	97He29 ETD $\alpha=100$
^{251}Lr	87900#	300#	150# μ s				β^+ ?; α ? *
* $^{251}\text{No}^m$	I : tentative assignment in 97He29, could not be confirmed in 01He35						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
²⁵² Cm	79060#	300#	< 1 d	0 ⁺	99		β^- ?		
²⁵² Bk	78530#	200#	1.8 m	0.5	99	92Kr.A TD	β^- ?; α ?		
²⁵² Cf	76034	5	2.645 y	0.008	0 ⁺	99	α =96,908 8; SF=3.092 8		
²⁵² Es	77290	50	471.7 d	1.9	(5 ⁻)	99	α =78 2; ϵ =22 2		
²⁵² Fm	76817	6	25.39 h	0.04	0 ⁺	99	α ≈100; SF=0.0023 2; $2\beta^+$?		
²⁵² Md	80630#	200#	2.3 m	0.8		99	β^+ >50; α <50		
²⁵² Md ^p	80670#	220#	40#	100#					
²⁵² No	82881	13	2.44 s	0.04	0 ⁺	99	01Og08 TD α ≈67; SF=32.2 5; β^+ ?	*	
²⁵² Lr	88840#	250#	390 ms	90		99	01He35 TD β^+ =71#; α ?; SF<1		
²⁵² Lr ^p	89140#	290#	300#	150#					
* ²⁵² No	T : other 03Be18=2.38(+0.26-0.22)		D : SF from 01Og08; α estimated by NUBASE					**	
²⁵³ Bk	80930#	360#	10#	m		91Kr.A I	β^- ?	*	
²⁵³ Cf	79301	6	17.81 d	0.08	(7/2 ⁺)	99	β^- ≈100; α =0.31 4		
²⁵³ Es	79013.7	2.6	20.47 d	0.03	7/2 ⁺	99	α =100; SF=8.7e-6 3		
²⁵³ Fm	79350	4	3.00 d	0.12	(1/2 ⁺)	99	ϵ =88 1; α =12 1		
²⁵³ Md	81300#	210#	12 m	8	7/2 ⁻ #	99	β^+ ≈100; α =0.6#		
²⁵³ Md ^p	81300#	210#	0#	30#					
²⁵³ No	84470#	100#	1.62 m	0.15	9/2 ⁻ #	99	α ?; β^+ =20#; SF=0.001#		
²⁵³ No ^m	84590#	100#	129	19	AD		α ?;		
²⁵³ Lr	88690#	220#	* &	580 ms	70	(7/2 ⁻)	99	01He35 TJD α =90 10; SF=2.6 21; β^+ =1#	
²⁵³ Lr ^m	88710#	250#	* &	1.5 s	0.3	(1/2 ⁻)	99	01He35 TJD α =90 10; SF=8 5; β^+ =1#	
²⁵³ Rf	93790#	450#	*	13 ms	5	(7/2 ⁺) ⁽⁺⁾	99	95Ho.B TJ SF≈50; α ≈50	
²⁵³ Rf ^m	93990#	470#	200#	150#	*	52 μ s	14	(1/2 ⁻) ⁽⁻⁾ 99	97He29 J SF=?; α =5#
* ²⁵³ Bk	I : possible identification, in 91Kr.A. Needs confirmation							**	
* ²⁵³ Rf	I : the state with ≈1.8 s reported in ENSDF is not confirmed							**	
²⁵⁴ Bk	84390#	300#	1#	m			β^- ?		
²⁵⁴ Cf	81341	12	60.5 d	0.2	0 ⁺	01	SF≈100; α =0.31 2; $2\beta^-$?		
²⁵⁴ Es	81992	4	275.7 d	0.5	(7 ⁺)	01	α ≈100; ϵ =0.03#; ...	*	
²⁵⁴ Es ^m	82076	3	84.2	2.5	AD		β^- =98 2; IT<3; α =0.32 1; ...	*	
²⁵⁴ Fm	80904.2	2.8	3.240 h	0.002	0 ⁺	01	α ≈100; SF=0.0592 3		
²⁵⁴ Md	83510#	100#	*	10 m	3	(0 ⁻)	01	β^+ ≈100; α ?	
²⁵⁴ Md ^m	83560#	140#	50#	100#	*	28 m	8	(3 ⁻) 01	β^+ ≈100; α ?
²⁵⁴ No	84724	18	51 s	10	0 ⁺	01	α =90 4; β^+ =10 4; SF=0.17 5		
²⁵⁴ No ^m	85220#	100#	500#	100#		280 ms	40	01	IT>80; α ?
²⁵⁴ Lr	89850#	340#	13 s	3		01	α =76 11; β^+ =24 11; SF ?	*	
²⁵⁴ Lr ^p	89880#	340#	30#	70#					
²⁵⁴ Rf	93320#	290#	23 μ s	3	0 ⁺	01	97He29 TD SF=?; α <1.5		
* ²⁵⁴ Es	D : ... ; β^- =1.74e-4 8; SF<3e-6							**	
* ²⁵⁴ Es ^m	D : ... ; ϵ =0.076 7; SF<0.045							**	
* ²⁵⁴ Lr	T : also 01Ga20=13.4(4.2)							**	
²⁵⁵ Cf	84810#	200#	85 m	18	(7/2 ⁺)	99	β^- =100; SF<0.001#; α =2e-7#		
²⁵⁵ Es	84089	11	39.8 d	1.2	(7/2 ⁺)	99	β^- =92.0 4; α =8.0 4; SF=0.0041 2		
²⁵⁵ Fm	83799	5	20.07 h	0.07	7/2 ⁺	99	α =100; SF=2.4e-5 10		
²⁵⁵ Fm ^p	84050#	100#	250#	100#	Nm		(9/2 ⁺)		
²⁵⁵ Md	84843	7	27 m	2	(7/2 ⁻)	99	β^+ =92 2; α =8 2; SF<0.15		
²⁵⁵ Md ^p	84850#	70#	10#	70#			am		
²⁵⁵ No	86854	10	3.1 m	0.2	(1/2 ⁺)	99	α =61 3; β^+ =39 3		
²⁵⁵ No ^p	86950#	70#	100#	70#	Nm		(7/2 ⁺)		
²⁵⁵ Lr	90060#	210#	22 s	4	7/2 ⁻ #	99	α ?; β^+ <30#; SF<1#	*	
²⁵⁵ Rf	94400#	180#	* 1.64 s	0.11	9/2 ⁻ #	99	01He35 TD α ?; SF=52 6		
²⁵⁵ Rf ^m	94320#	210#	* 1.0 s	0.4	5/2 ⁺ #	99	97He29 D α =100		
²⁵⁵ Db	100040#	420#	1.7 s	0.5		99	α ?; SF≈20		
* ²⁵⁵ Lr	T : also 01Ga20=21(8)							**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁵⁶ Cf	87040# 300#		12.3 m	1.2	0 ⁺	99	SF=100; $\alpha=6.2e-7\#; 2\beta^- ?$	
²⁵⁶ Es	87190# 100#		25.4 m	2.4	(1 ⁺ , 0 ⁻)	99	$\beta^- = 100$	
²⁵⁶ Es ^m	87190# 140#	0# 100#	7.6 h		(8 ⁺)	99	$\beta^- \approx 100; \beta^- SF=0.002$	
²⁵⁶ Fm	85486 7		157.6 m	1.3	0 ⁺	99	SF=91.9 3; $\alpha=8.1 3$	
²⁵⁶ Md	87620 50		77 m	2	(1 ⁻)	99	$\beta^+ = ?; \alpha=9.2 7; SF < 3$	
²⁵⁶ Md ^p	87700# 110#	80# 100#			am			
²⁵⁶ No	87824 8		2.91 s	0.05	0 ⁺	99	$\alpha \approx 100; SF=0.53 6; \epsilon < 0.01\#$	
²⁵⁶ Lr	91870# 220#		27 s	3		99	$\alpha=85 10; \beta^+ = 15 10; SF < 0.03$	
²⁵⁶ Lr ^p	91970# 230#	100 70 XL						
²⁵⁶ Rf	94236 24		6.45 ms	0.14	0 ⁺	99	97He29 TD SF=?; $\alpha=0.32 17$	
²⁵⁶ Db	100720# 290#		1.9 s	0.4		99	01He35 TD $\alpha=?; \beta^+ = 36 12; SF=?$	
* ²⁵⁶ Rf	T : average 97He29=6.2(0.2) 84Og02=6.7(0.2)							**
* ²⁵⁶ Db	T : average 01He35=1.6(+0.5-0.3) 83Og.A=2.6(+1.4-0.8)							**
²⁵⁷ Es	89400# 410#		7.7 d	0.2	7/2 ⁺ #	99	$\beta^- = 100; \alpha=4e-4\#$	
²⁵⁷ Fm	88589 6		100.5 d	0.2	(9/2 ⁺)	99	$\alpha \approx 100; SF=0.210 4$	
²⁵⁷ Md	88996.2 2.8		5.52 h	0.05	(7/2 ⁻)	99	$\epsilon=85 3; \alpha=15 3; SF < 4$	
²⁵⁷ No	90241 22		25 s	2	(7/2 ⁺)	99	02Ho11 D $\alpha=?; \beta^+ = 15 8$	
²⁵⁷ No ^p	90550# 110#	310# 100#			am			
²⁵⁷ Lr	92740# 210#		646 ms	25	9/2 ⁺ #	99	$\alpha \approx 100; \beta^+ = 0.01\#; SF=0.001\#$	
²⁵⁷ Lr ^p	92890# 230#	150# 100#			am			
²⁵⁷ Rf	95930# 100#		4.7 s	0.3	(1/2 ⁺)	99	97He29 JD $\alpha=?; \beta^+ = 11 1; SF < 1.4$	
²⁵⁷ Rf ^m	96050# 100#	114 17 AD	3.9 s	0.4	(11/2 ⁻)	99	97He29 EJ $\alpha \approx 100; SF=0.7\#; \beta^+ ?$	
²⁵⁷ Rf ^p	96030# 120#	100# 70#			(7/2 ⁺)		*	
²⁵⁷ Db	100340# 230#		1.53 s	0.17	(9/2 ⁺)	99	01He35 TJD $\alpha > 94; SF < 6; \beta^+ = 1\#$	
²⁵⁷ Db ^m	100450# 250#	100# 100#	790 ms	130	(1/2 ⁻)	99	01He35 TJD $\alpha > 87; SF < 13; \beta^+ = 1\#$	
* ²⁵⁷ Rf ^m	E : 97He29=118(4) keV form direct comparison of two alpha lines							**
²⁵⁸ Es	92700# 300#		3# m				$\beta^- ?; \alpha ?$	
²⁵⁸ Fm	90430# 200#		370 μ s	14	0 ⁺	01	86Hu05 T SF \approx 100; $\alpha ?$	
²⁵⁸ Md	91688 5		51.5 d	0.3	8 ⁻ #	01	93Mo18 D $\alpha \approx 100; \beta^+ < 0.0015; \beta^- < 0.0015$	
²⁵⁸ Md ^m	91690# 200#	0# 200#	57.0 m	0.9	1 ⁻ #	01	93Mo18 D $\epsilon=?; SF < 20; \beta^- < 10\#; \alpha < 1.2$	
²⁵⁸ No	91480# 200#		1.2 ms	0.2	0 ⁺	01	SF \approx 100; $\alpha=0.001\#; 2\beta^+ ?$	
²⁵⁸ Lr	94840# 100#		4.1 s	0.3		01	$\alpha > 95; \beta^+ < 5$	
²⁵⁸ Lr ^p	95040# 180#	200# 150#			am			
²⁵⁸ Rf	96400# 200#		12 ms	2	0 ⁺	01	SF=87 2; $\alpha=13 2$	
²⁵⁸ Db	101750# 340#		4.5 s	0.6		01	$\alpha=64 7; \beta^+ = 36 7; SF < 1\#$	
²⁵⁸ Db ^m	101810# 350#	60# 100#	20 s	10		01	$\beta^+ \approx 100; IT ?$	
²⁵⁸ Sg	105420# 410#		3.3 ms	1.0	0 ⁺	01	SF=?; $\alpha < 20$	
* ²⁵⁸ Fm	T : average 86Hu05=360(20) 71Hu03=380(20) (all 1 σ) ENSDF gives 3 σ							**
* ²⁵⁸ Md	D : derived from: "the sum of SF, ϵ and β^- decay branches < 0.003%" in							**
* ²⁵⁸ Md	D : 93Mo18 and T(SF)>150000 y, from 86Lo16, thus SF<1e-4#							**
* ²⁵⁸ Md ^m	D : SF<20% derived from 93Mo18 "the sum of SF and β^- decay branches < 30%"							**
²⁵⁹ Fm	93700# 280#		1.5 s	0.3	3/2 ⁺ #	99	SF=100	
²⁵⁹ Md	93620# 200#		1.60 h	0.06	7/2 ⁻ #	99	93Mo18 T SF=?; $\alpha < 1.3$	
²⁵⁹ No	94110# 100#		58 m	5	9/2 ⁺ #	99	$\alpha=75 4; \epsilon=25 4; SF < 10$	
²⁵⁹ No ^p	94390# 180#	280# 150#						
²⁵⁹ Lr	95850# 70#		6.2 s	0.3	9/2 ⁺ #	99	$\alpha=78 2; SF=22 2; \beta^+ = 0.6\#$	
²⁵⁹ Lr ^p	96200# 170#	350# 150#						
²⁵⁹ Rf	98400# 70#		2.8 s	0.4	7/2 ⁺ #	99	94Gr08 T $\alpha=92 2; SF=8 2; \beta^+ = 0.3\#$	
²⁵⁹ Rf ^p	98500# 100#	100# 70# Nm			(3/2 ⁺)		*	
²⁵⁹ Rf ^l	98610# 130#	210# 110# Nm			(9/2 ⁺)			
²⁵⁹ Db	102100# 210#		510 ms	160		99	01Ga20 TD $\alpha=100$	
²⁵⁹ Sg	106660# 180#		580 ms	210	1/2 ⁺ #	99	$\alpha=90 10; SF < 20$	
* ²⁵⁹ Rf	T : average 94Gr08=1.7(+0.8-0.5) 85So03=3.4(1.7) 81Be03=3.0(1.3)							**
* ²⁵⁹ Rf	T : 73Dr10=3.2(0.8) and 69Gh01=3.2(0.8)							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁶⁰ Fm	95640# 500#	EU	1# m	0 ⁺			SF ?	*
²⁶⁰ Md	96550# 320#		27.8 d	0.8	99	92Lo.B TD	SF=?; $\alpha < 5$; $\epsilon < 5$; $\beta^- < 3.5$	*
²⁶⁰ No	95610# 200#		106 ms	8	99		SF=100	
²⁶⁰ Lr	98280# 120#		3.0 m	0.5	99		$\alpha=80$ 20; $\beta^+=20$ 20	
²⁶⁰ Rf	99150# 200#		21 ms	1	99		SF=?; $\alpha=2\#$; $\epsilon=0.01\#$	
²⁶⁰ Db	103680# 230#		1.52 s	0.13	99		$\alpha \geq 90.4$ 6; SF ≤ 9.6 6; $\beta^+ < 2.5$	
²⁶⁰ Db ^p	103880# 280# 200# 150#							
²⁶⁰ Sg	106580 40		3.8 ms	0.8	99		SF=60 30; $\alpha=40$ 30	
²⁶⁰ Bh	113610# 580#		300# μ s		99		$\alpha=100$	
* ²⁶⁰ Fm	I: half-life ≈ 4 ms and SF=100 mode were reported in the 92Lo.B internal							**
* ²⁶⁰ Fm	I: report. Not confirmed in subsequent experiment by same group (97Lo.A)							**
* ²⁶⁰ Fm	I: Discovery of this nuclide is considered unproven							**
* ²⁶⁰ Md	T: supersedes 86Hu01=31.8(0.5) of same group							**
²⁶¹ Md	98480# 650#		40# m	7/2 ⁻ #			$\alpha ?$	
²⁶¹ No	98500# 300#		3# h	3/2 ⁺ #			$\alpha ?$	
²⁶¹ Lr	99560# 200#		39 m	12	99		SF=?; $\alpha ?$	
²⁶¹ Rf	101315 29		* & 5.5 s	2.5	99	02Ho11 T	$\alpha=?$; SF=40	
²⁶¹ Rf ^m	101390# 100# 70# 100#		* & 81 s	9	99	02Ho11 TD	$\alpha=?$; $\beta^+ < 15$; SF < 10	
²⁶¹ Rf ^p	101420 70 100 60 AD						3/2 ⁺ #	
²⁶¹ Db	104380# 230#		1.8 s	0.4	99		$\alpha > 82$; SF < 18	
²⁶¹ Sg	108160# 130#		230 ms	60	99		$\alpha \approx 100$; SF < 1	
²⁶¹ Sg ^p	108290# 140# 130 50 AD						(9/2 ⁺)	
²⁶¹ Sg ^q	108320# 140# 160 50 AD						(3/2 ⁺)	
²⁶¹ Bh	113330# 230#		13 ms	4	99		$\alpha=95$ 5; SF < 10	
²⁶² Md	101410# 580#		3# m				SF ?; $\alpha ?$	
²⁶² No	99950# 450#		5 ms	0 ⁺	01		SF ≈ 100 ; $\alpha ?$	
²⁶² Lr	102120# 200#		4 h		01		$\beta^+ = ?$; SF < 10; $\alpha ?$	
²⁶² Rf	102390# 280#		* 2.3 s	0.4	01		SF ≈ 100 ; $\alpha < 0.8$	
²⁶² Rf ^m	102990# 490# 600# 400#		* 47 ms	5	high	96La11 I	SF=100	*
²⁶² Db	106270# 180#		35 s	5	01		$\alpha \approx 67$; SF ≈ 30 ; $\beta^+ = 3\#$	
²⁶² Db ^p	106390# 200# 120# 70#						$\alpha ?$	
²⁶² Sg	108420# 280#		8 ms	3	01	01Ho06 TD	SF=?; $\alpha < 22$	
²⁶² Bh	114470# 350#		290 ms	160	01	97Ho14 T	$\alpha=?$; SF < 20	*
²⁶² Bh ^m	114780# 350# 300 60 AD		14 ms	4	01	97Ho14 T	$\alpha=?$; SF < 10	*
* ²⁶² Rf ^m	I: assigned by 96La11 to K-isomeric state							**
* ²⁶² Bh	T: 3 events at 225, 255 and 278 ms yielding 175(+240–64), see 84Sc13							**
* ²⁶² Bh ^m	T: 11 events yielding 12.2(+5.5–2.8)							**
²⁶³ No	102980# 490#		20# m				$\alpha ?$; SF ?	
²⁶³ Lr	103670# 360#		5# h				$\alpha ?$	
²⁶³ Rf	104840# 180#		11 m	3	99	93Gr.C TD	SF=?; $\alpha=30$	*
²⁶³ Db	107110# 170#		29 s	9	99	92Kr01 D	SF=56 14; $\alpha=?$; $\beta^+=6.9$ 16	*
²⁶³ Db ^p	107510# 260# 400# 200#							
²⁶³ Sg	110220# 120#		1.0 s	0.2	99		$\alpha > 70$; SF ?	
²⁶³ Sg ^m	110320# 100# 100# 70# Nm *		120 ms		99		$\alpha=?$; IT ?	
²⁶³ Bh	114610# 370#		200# ms		99		$\alpha ?$	
²⁶³ Hs	119750# 350#		1# ms		99		$\alpha=100$	
²⁶³ Hs ^p	120250# 360# 500# 100#				am		$\alpha ?$; SF ?	
* ²⁶³ Rf	T: average 03Kr.1=24(+19–7) m 93Gr.C=500(+300–200) s 92Cz.A=600(+300–200) s							**
* ²⁶³ Db	D: SF from 92Kr01=57(+13–15); β^+ average 03Kr.1=3(+4–1) 93Gr.C=8(2)							**
* ²⁶³ Db	T: Possibly a candidate for the 54(+98–21) s SF decay observed by 98Ik02							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁶⁴ No	104650# 640#		1# m	0 ⁺			α ?; SF ?	
²⁶⁴ Lr	106230# 440#		10# h				α ?; SF ?	
²⁶⁴ Rf	106180# 450#		1# h	0 ⁺			α ?	
²⁶⁴ Db	109360# 230#		3# m				α ?	
²⁶⁴ Sg	110780# 280#		400# ms	0 ⁺	99		α ?	
²⁶⁴ Bh	116070# 280#		1.3 s	0.5	99	02Ho11 T	α =?; β^+ ?	
²⁶⁴ Bh ^p	116370# 310#	300# 150#						
²⁶⁴ Hs	119600 40		540 μ s	300	0 ⁺	99 95Ho.B T	α ≈50; SF≈50	
* ²⁶⁴ Bh	T : mean lifetime of 6 events 1.5 s							**
* ²⁶⁴ Hs	T : 95Ho.B (2 events 76 μ s and 825 μ s) 87Mu15 (1 event 80 μ s). Average of							**
* ²⁶⁴ Hs	T : the 3 events: 327(+448–120) μ s, see 84Sc13							**
²⁶⁵ Lr	107900# 710#		10# h				α ?; SF ?	
²⁶⁵ Rf	108710# 420#		13 h	3/2 ⁺ #	00	99Og.A TD	α ?	
²⁶⁵ Db	110480# 280#		15# m				α ?	
²⁶⁵ Sg	112820 60		8 s	3	3/2 ⁺ #	99	α >50; SF ?	
²⁶⁵ Sg ^p	113120# 120#	300# 100#					11/2 ⁻ #	
²⁶⁵ Bh	116570# 380#		500# ms				α ?	
²⁶⁵ Hs	121170# 140#		2.1 ms	0.3	9/2 ⁺ #	99	α ≈100; SF<1	
²⁶⁵ Hs ^m	121480# 140#	300 70 AD	780 μ s	150	3/2 ⁺ #	99	α ≈100; IT ?	
²⁶⁵ Mt	126820# 460#		2# ms				α ?	
* ²⁶⁵ Rf	T : one case only after a 1.3 h measurement							**
²⁶⁶ Lr	111130# 660#		1# h				α ?; SF ?	
²⁶⁶ Rf	109880# 540#		10# h	0 ⁺			α ?; SF ?	
²⁶⁶ Db	112740# 360#		20# m				α ?; SF ?	
²⁶⁶ Sg	113700# 290#		21 s	6	0 ⁺	01 98Tu01 T	α =34 9; SF=66 9	
²⁶⁶ Bh	118250# 200#		5 s	3		01	α ≈100; β^+ ?; SF ?	
²⁶⁶ Hs	121190# 280#		2.7 ms	1.0	0 ⁺	01 01Ho06 TD	α =?; SF≈1.4#	
²⁶⁶ Mt	127890# 350#		1.2 ms	0.4		01 84Og03 D	α =?; SF<5.5	
²⁶⁶ Mt ^m	129120# 350#	1230 80 AD	6 ms	3		01 97Ho14 TD	α =100	
* ²⁶⁶ Sg	T : average 98Tu01=21(+20–12) 94La22=10–30 D : from 18%< α <50% 50%<SF<82%							**
* ²⁶⁶ Bh	T : from T=1–10; estimated 1# s from systematics							**
* ²⁶⁶ Mt	T : 10 events yielding 1.01(+0.47–0.24)							**
* ²⁶⁶ Mt ^m	T : 3 events at 7.8, 2.0 and 5.0 yield 3.4(+4.7–1.3)							**
²⁶⁷ Rf	113200# 580#		5# h				α ?; SF ?	
²⁶⁷ Db	113990# 470#		2# h				α ?; SF ?	
²⁶⁷ Sg	115900# 270#		19 ms			99Og.B T	α =100	
²⁶⁷ Bh	118910# 260#		22 s	10		00Wi15 TD	α =100	
²⁶⁷ Hs	122760# 100#		32 ms	15	3/2 ⁺ #	00	α =100	
²⁶⁷ Hs ^m		non existent EU	200 ms			95Ho.A TDI	α =?; IT ?	
²⁶⁷ Mt	127900# 540#		10# ms				α ?	
²⁶⁷ Ea	134450# 370#		10 μ s	8	9/2 ⁺ #	00 95Gh04 T	α =100	
* ²⁶⁷ Hs ^m	I : tentative only							**
* ²⁶⁷ Ea	T : one single event, lifetime 4 μ s, thus T=2.8(+13.0–1.3), see 84Sc13							**
²⁶⁸ Rf	115170# 710#		1# h	0 ⁺			α ?; SF ?	
²⁶⁸ Db	116850# 530#		6# h				α ?; SF ?	
²⁶⁸ Sg	117000# 540#		30# s	0 ⁺			α ?; SF ?	
²⁶⁸ Bh	120870# 380#		25# s				α ?; SF ?	
²⁶⁸ Hs	123110# 410#		2# s	0 ⁺			α ?	
²⁶⁸ Mt	129220# 320#		53 ms	21	5 ⁺ #, 6 ⁺ #	00 02Ho11 T	α =100	
²⁶⁸ Mt ^p	129470# 330#	250# 100#					α ?; SF ?	
²⁶⁸ Ea	133940# 500#		100# μ s	0 ⁺			α ?	
* ²⁶⁸ Mt	T : mean lifetime of 6 events 60 ms							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁶⁹ Db	118730# 770#		3# h				$\alpha ?$; SF ?	
²⁶⁹ Sg	119930# 660#		35 s	23	00		$\alpha < 100$; SF ?	
²⁶⁹ Bh	121740# 410#		25# s				$\alpha ?$	
²⁶⁹ Hs	124870# 120#		27 s	17	00	02Ho11 T	$\alpha = 100$ *	
²⁶⁹ Mt	129530# 550#		200# ms				$\alpha ?$	
²⁶⁹ Ea	135180# 140#		230 μ s	110	3/2 ⁺ #	00 95Ho03 T	$\alpha = 100$	
* ²⁶⁹ Hs	T : 2 events at 19.7 and 22.0 s yield 14(+26–6)							**
²⁷⁰ Db	121760# 720#		1# h				$\alpha ?$; SF ?	
²⁷⁰ Sg	121400# 620#		10# m	0 ⁺			$\alpha ?$; SF ?	
²⁷⁰ Bh	124460# 470#		30# s				$\alpha ?$; SF ?	
²⁷⁰ Hs	125430# 290#		30# s	0 ⁺		01Tu.B D	$\alpha = 100$	
²⁷⁰ Mt	131020# 540#		2# s				$\alpha ?$	
²⁷⁰ Ea	134810# 290#		160 μ s	100	0 ⁺	01Ho06 TD	$\alpha \approx 100$; SF ≈ 0.2	
²⁷⁰ Ea ^m	135940# 290#	1140 70	10 ms	6	(10) ^(-#)	01Ho06 ETJ	$\alpha = ?$; IT ?	
²⁷¹ Sg	124330# 650#		2# h				$\alpha ?$; SF ?	
²⁷¹ Bh	125920# 560#		40# s				$\alpha ?$; SF ?	
²⁷¹ Hs	128230# 340#		40# s				$\alpha ?$; SF ?	
²⁷¹ Mt	131470# 570#		5# s				$\alpha ?$	
²⁷¹ Ea	136060# 110#		210 ms	170	11/2 ⁻ #	00	$\alpha = 100$	
²⁷¹ Ea ^m	136090# 110#	29 29 AD *	1.3 ms	0.5	9/2 ⁺ #	00	$\alpha = 100$	
²⁷² Sg	125900# 770#		1# h	0 ⁺			$\alpha ?$; SF ?	
²⁷² Bh	128580# 610#		2# m				$\alpha ?$; SF ?	
²⁷² Hs	129530# 580#		40# s	0 ⁺			$\alpha ?$; SF ?	
²⁷² Mt	133890# 480#		10# s				$\alpha ?$; SF ?	
²⁷² Ea	136290# 650#		1# s	0 ⁺			SF ?	
²⁷² Eb	143090# 330#		2.0 ms	0.8	5 ⁺ #, 6 ⁺ #	00 02Ho11 T	$\alpha = 100$ *	
* ²⁷² Eb	T : mean lifetime of 6 events 2.3 ms							**
²⁷³ Sg	128750# 660#		1# m				SF ?	
²⁷³ Bh	130050# 830#		90# m				$\alpha ?$; SF ?	
²⁷³ Hs	132260# 830#	RN	50# s	3/2 ⁺ #	00	02Ni10 I	$\alpha ?$ *	
²⁷³ Mt	134990# 510#		20# s				$\alpha ?$; SF ?	
²⁷³ Ea	138670# 130#		360 μ s	280	13/2 ⁻ #	00	$\alpha = 100$	
²⁷³ Ea ^m	138870# 130#	198 20 EU	120 ms		3/2 ⁺ #	00	$\alpha = 100$	
²⁷³ Ea ^p	138950# 130#	290 40 AD					$\alpha ?$; SF ?	
²⁷³ Eb	143150# 610#		5# ms				$\alpha ?$	
* ²⁷³ Hs	T : 99Ni03=1.2(+1.7–0.6) alpha decay retracted by authors in 02Ni10							**
²⁷⁴ Bh	132680# 780#		90# m				$\alpha ?$; SF ?	
²⁷⁴ Hs	133330# 650#		1# m	0 ⁺			$\alpha ?$; SF ?	
²⁷⁴ Mt	137390# 560#		20# s				$\alpha ?$; SF ?	
²⁷⁴ Ea	139250# 490#		2# s	0 ⁺			$\alpha ?$; SF ?	
²⁷⁴ Eb	145050# 620#		5# ms				$\alpha ?$	
²⁷⁵ Bh	134370# 650#		40# m				SF ?	
²⁷⁵ Hs	135950# 710#		30# m				$\alpha ?$; SF ?	
²⁷⁵ Mt	138460# 590#		30# s				$\alpha ?$; SF ?	
²⁷⁵ Ea	141750# 450#		2# s				$\alpha ?$; SF ?	
²⁷⁵ Eb	145450# 690#		10# ms				$\alpha ?$	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁷⁶ Hs	137120#	820#	1# h	0 ⁺			α ?; SF ?	
²⁷⁶ Mt	140800#	680#	40# s				α ?; SF ?	
²⁷⁶ Ea	142550#	610#	5# s	0 ⁺			α ?; SF ?	
²⁷⁶ Eb	147640#	630#	100# ms				α ?; SF ?	
²⁷⁷ Hs	139580#	730#	40 m	30	3/2 ⁺ #	00 99Og10	TD SF=100	*
²⁷⁷ Mt	141980#	880#	1# m				α ?; SF ?	*
²⁷⁷ Ea	144980#	960#	5# s		11/2 ⁺ #	00 02Ni10	I α ?	*
²⁷⁷ Eb	148590#	620#	1# s				α ?; SF ?	*
²⁷⁷ Ec	152710#	130#	1.1 ms	0.7	3/2 ⁺ #	00 02Ho11	T α =100	*
* ²⁷⁷ Hs	T : one single event 16.5 m yields 11(+55–5)							**
* ²⁷⁷ Ea	T : 99Ni03=3.0(+4.7–1.5) alpha decay retracted by authors in 02Ni10							**
* ²⁷⁷ Ec	T : two events at 0.280 ms and 1.406 ms							**
²⁷⁸ Mt	144210#	840#	30# m				α ?; SF ?	*
²⁷⁸ Ea	145750#	680#	10# s		0 ⁺		α ?; SF ?	*
²⁷⁸ Eb	150530#	630#	1# s				α ?; SF ?	*
²⁷⁸ Ec	153060#	530#	10# ms		0 ⁺		α ?; SF ?	*
²⁷⁹ Mt	145490#	720#	6# m				α ?; SF ?	*
²⁷⁹ Ea	147980#	740#	10# s				α ?; SF ?	*
²⁷⁹ Eb	151340#	660#	3# s				α ?; SF ?	*
²⁷⁹ Ec	155140#	490#	100# ms				α ?; SF ?	*
²⁸⁰ Ea	148850#	850#	11 s	6	0 ⁺	01Og01	TD SF=100	*
²⁸⁰ Eb	153210#	740#	10# s				α ?; SF ?	*
²⁸⁰ Ec	155600#	640#	1# s		0 ⁺		α ?; SF ?	*
* ²⁸⁰ Ea	T : 3 events at 6.93, 14.3 and 7.4 yield 6.6(+9–2.4)							**
²⁸¹ Ea	150960#	730#	4 m	3	3/2 ⁺ #	00 99Og10	TD α =100	*
²⁸¹ Eb	154040#	930#	1# m				α ?; SF ?	*
²⁸¹ Ec	157690#	990#	10# s		3/2 ⁺ #	00 02Ni10	I α ?	*
* ²⁸¹ Ea	T : one single event 1.6 m yields 1.1(+5.3–0.5), see 84Sc13							**
* ²⁸¹ Ec	T : 99Ni03=0.89(+1.30–0.45) alpha decay retracted by authors in 02Ni10							**
²⁸² Eb	156010#	890#	4# m				α ?; SF ?	*
²⁸² Ec	158140#	710#	30# s		0 ⁺		α ?; SF ?	*
²⁸³ Eb	156880#	780#	10# m				α ?; SF ?	*
²⁸³ Ec	160020#	770#	4.2 m	2.1		99Og05	TD SF=100	*
²⁸³ Ed	164360#	730#	10# s				α ?; SF ?	*
* ²⁸³ Ec	T : 4 events at 99Og07=9.3 m, 3.8 m, 99Og05=3.0 m and 0.9 m yield 3(+3–1) m							**
²⁸⁴ Ec	160570#	850#	31 s	18	0 ⁺	01Og01	TD α =100	*
²⁸⁴ Ed	165880#	800#	1# m				α ?; SF ?	*
²⁸⁵ Ec	162180#	730#	40 m	30	5/2 ⁺ #	00 99Og10	TD α =100	*
²⁸⁵ Ed	166490#	980#	2# m				α ?; SF ?	*
²⁸⁵ Ee	171110#	1030#	5# s		3/2 ⁺ #	00 02Ni10	I α ?	*
* ²⁸⁵ Ec	T : one single event 15.4 s yields 11(+51–5), see 84Sc13							**
* ²⁸⁵ Ee	T : 99Ni03=580(+870–290) alpha decay retracted by authors in 02Ni10							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²⁸⁶ Ed	168120#	940#	5#	m			α ?; SF ?
²⁸⁶ Ee	171260#	770#	5#	s	0 ⁺		α ?; SF ?
²⁸⁷ Ed	168640#	830#	20#	m			α ?; SF ?
²⁸⁷ Ee	172880#	770#	10	s	7	99Og07 T	$\alpha=100$ *
²⁸⁷ Ef	178090#	790#	500#	ms			α ?; SF ?
* ²⁸⁷ Ee	T : 2 events at 1.32 s and 14.4 s yield 5.5(+10–2)						**
²⁸⁸ Ee	172970#	850#	2.8	s	1.4	0 ⁺	01Og01 TD $\alpha=100$
²⁸⁸ Ef	179310#	850#	1#	s			α ?; SF ?
²⁸⁹ Ee	174450#	730#	80	s	60	5/2 ⁺ #	00 99Og10 TD $\alpha=100$ *
²⁸⁹ Ef	179510#	1020#	10#	s			α ?; SF ?
²⁸⁹ Eg	185240#	1090#	10#	ms		5/2 ⁺ #	00 02Ni10 I α ? *
* ²⁸⁹ Ee	T : one single event at 30.4 s yields 21(+101–10)						**
* ²⁸⁹ Eg	T : 99Ni03=600(+860–300) alpha decay retracted by authors in 02Ni10						**
²⁹⁰ Ef	180840#	980#	10#	s			α ?; SF ?
²⁹⁰ Eg	184990#	840#	50#	ms	0 ⁺		α ?; SF ?
²⁹¹ Ef	181070#	890#	1#	m			α ?; SF ?
²⁹¹ Eg	186310#	850#	100#	ms			α ?; SF ?
²⁹¹ Eh	192410#	880#	10#	ms			α ?; SF ?
²⁹² Eg	186100#	850#	120	ms	100	0 ⁺	01Og01 TD $\alpha=100$ *
²⁹² Eh	193330#	940#	50#	ms			α ?; SF ?
* ²⁹² Eg	T : one single event at 46.9 ms yields 33(+155–15)						**
²⁹³ Ei	199960#	1200#	5#	ms		1/2 ⁺ #	00 02Ni10 I α ? *
* ²⁹³ Ei	T : 99Ni03=120(+180–60) alpha decay retracted by authors in 02Ni10						**