Atomic Data and Nuclear Data Tables 133–134 (2020) 101336

Contents lists available at ScienceDirect

Atomic Data and Nuclear Data Tables

journal homepage: www.elsevier.com/locate/adt

Compilation of recent atomic mass measurements and deduced quantities

Liam Kroll *, Balraj Singh *, Alan A. Chen

Department of Physics and Astronomy, McMaster University, Hamilton, Ontario, Canada L8S 4L8

ARTICLE INFO

Article history:
Received 23 November 2019
Accepted 28 February 2020
Available online 24 March 2020

ABSTRACT

Measured atomic masses published from 2016 onwards have been compiled and are presented here. The measurements are compared to the values from the Atomic Mass Evaluation 2016 (Wang et al., 2017). β-, and α-decay Q-values as well as one- and two-nucleon separation energies are deduced using the newly measured mass excesses.

* Corresponding authors.
E-mail addresses: krolll@mcmaster.ca (L. Kroll), balraj@mcmaster.ca (B. Singh).

https://doi.org/10.1016/j.adt.2020.101336
0092-640X/

Contents

1. Introduction

Atomic masses, being one of the basic quantities in atomic and nuclear physics, are of vital importance in many scientific fields. Given the fixed rest mass of their constituent protons, neutrons, and electrons, atomic masses give direct insight into the forces binding nuclei together, as well as an indirect indication of the structure and stability of the nucleus [1,2], in addition to providing an important free parameter in nuclear astrophysics calculations [3]. When the masses of a particle and its antiparticle are measured, they can also provide a test of symmetry violation [4]. Given the utility of high-precision atomic mass measurements, there has been a continued interest in achieving high-level precision in atomic masses across the chart of nuclides. Currently, Penning trap and storage ring facilities are proving to be indispensable tools, which are able to achieve relative precision of the order of 10^{-12} [1]. In addition, advances in radioactive beamlines have enabled direct atomic mass measurements of nuclei far from stability, which can provide constraints on nuclear structure models, such as the location of proton and neutron drip lines, and allow improved accuracy when predicting nucleosynthesis in extreme astrophysical environments [3]. The results of recent experimental efforts can be seen in Fig. 1, where the current measurements are edging ever closer to the proton and neutron drip lines.

The present pace of experimental efforts focused on atomic mass measurements requires the accepted values be updated, and any discrepancies addressed. The Atomic Mass Evaluation (AME), started by A.H. Wapstra, uses a least-squares method coupled with a transparent evaluation technique that has established itself as a more accurate means of determining atomic masses across the whole chart of nuclides when compared to a simple mean of compiled measurements [1]. The AME and its precursors have provided an evaluated set of atomic masses to the community since the 1950's [2]. The AME publishes updated sets of evaluated atomic mass data periodically, the most recent of which – AME-2016 –, includes evaluated data from essentially the beginning of nuclear physics as a field until October 2016 [1]. However, given the volume of mass measurements currently produced by the experimental community, there is a large number of atomic mass measurements that have been made in the years intervening AME publications. The website nuclearmasses.org has been providing our compiled atomic mass measurements since 2008 to "improve the dissemination of nuclear mass information to the nuclear science community" with contributions from McMaster University data program [6]. This work is important as it provides a centralized location for researchers to find the most recent mass measurements that have not yet had the chance to be evaluated by the AME. With this same motivation in mind, the present work aims to provide researchers with recent published atomic mass measurements, deduced values such as Q-values and separation energies, and the references where the measurements were reported. The data compiled in this work cover atomic mass measurements from the beginning of 2016 until March 15, 2020. Given that many of the values compiled in the present work are not evaluated, they serve only as an update for the field, and readers should exercise caution before including the values in any calculation, especially if an evaluated value exists.

2. Calculation details

This section presents the detail of how the deduced quantities in Tables 1–3 were calculated.

The Q-values and separation energies calculated in this work are obtained using the same formulas used in Ref. [5], p98. In Ref. [5] the formulas are shown in terms of the total masses of the parent and daughter nuclides, however, it is equally valid to use the mass excesses of the parent and daughter nuclides. This common practice is adopted in the present work. Here $ME(A,Z)$ denotes the measured mass excess of the parent atom, where A is the mass number and Z is the charge number. The subscript $AME-2016$ denotes an atomic mass from Ref. [5]. All the quantities are in units of keV. The equations used in the present work are:

$$\Delta ME = ME(A,Z) - ME(A,Z)_{AME-2016} \quad (1)$$

$$Q_{\beta^-/\epsilon} = ME(A,Z) - ME(A,Z\pm 1)_{AME-2016} \quad (2)$$

$$S_n = -ME(A,Z) + ME(A-1,Z)_{AME-2016} + ME(n)_{AME-2016} \quad (3)$$

$$S_p = -ME(A,Z) + ME(A-1,Z-1)_{AME-2016} + ME(^1H)_{AME-2016} \quad (4)$$

$$Q_\alpha = ME(A,Z) - ME(A-4,Z-2)_{AME-2016} - ME(^4He)_{AME-2016} \quad (5)$$

$$S_{2n} = -ME(A,Z) + ME(A-2,Z)_{AME-2016} + 2ME(n)_{AME-2016} \quad (6)$$

$$S_{2p} = -ME(A,Z) + ME(A-2,Z-2)_{AME-2016} + 2ME(^1H)_{AME-2016} \quad (7)$$

It should be noted that in some cases the authors of publications that are compiled in this paper calculated the quantities from Eqs. (2)–(7). In these cases the relevant quantity in Tables 2–4 has been noted. Readers should be cautious using these marked quantities; if the authors did not use Eqs. (2)–(7) in their calculations, the present values may differ from those in the corresponding publication.

3. Summary

Evaluations of atomic mass measurements, such as the Atomic Mass Evaluation (AME), are vital to many fields within physics. Given the rapidity with which new measurements are made,

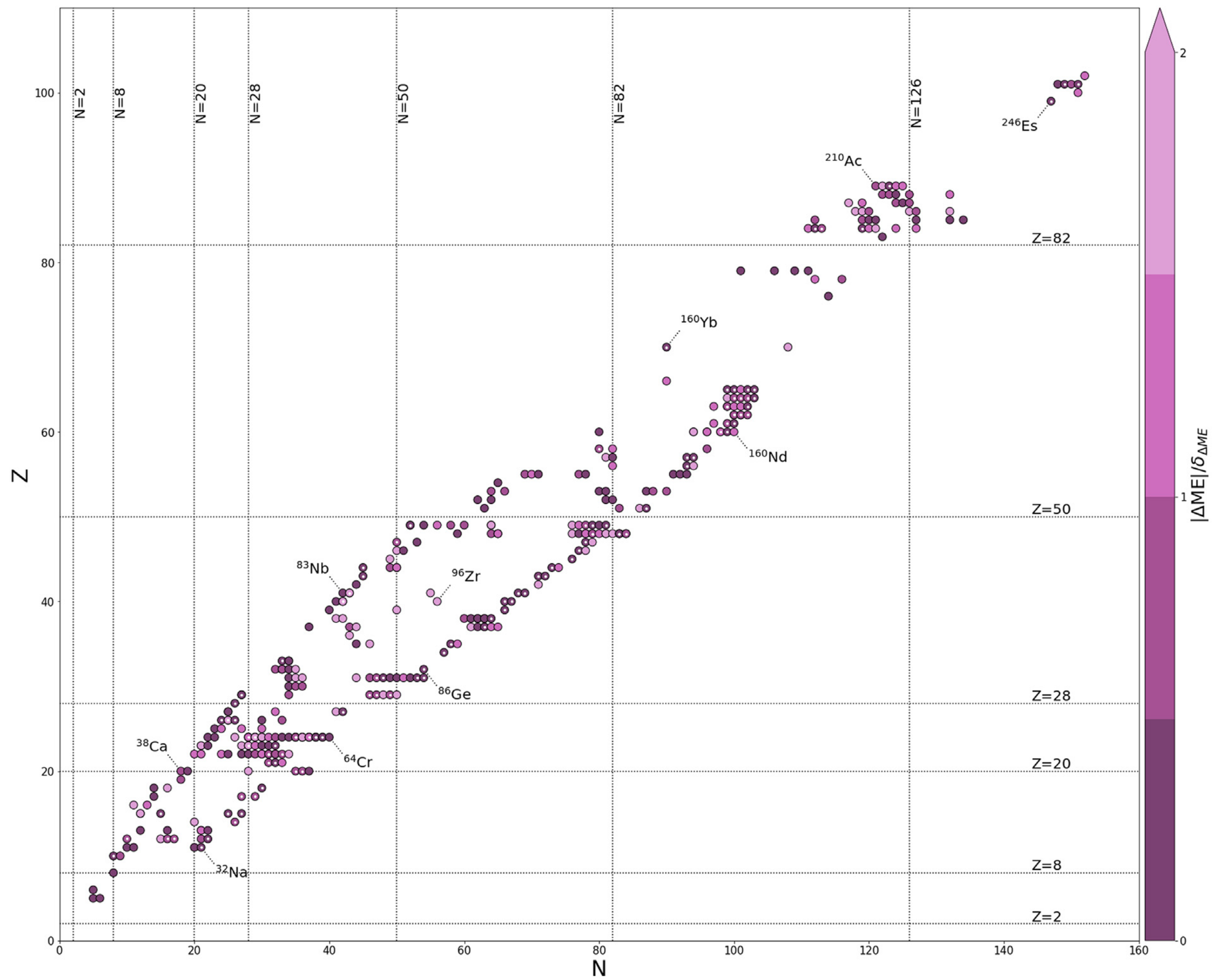

Fig. 1. A chart of nuclides showing the nuclei included in the present compilation. The magnitude of difference between the measured and AME-2016 [5] ground state mass excesses (|ΔME|) relative to the uncertainty ($\delta_{\Delta ME}$) is shown by the shade of each point. The compiled mass excesses that are in good agreement with AME-2016, and show an improved precision over AME-2016 are highlighted with small white points. Nucleon magic numbers (dotted lines), and isotope labels have been added at various points to guide the eye.

many new values arise between the most recent AME publications. It is therefore important to update the nuclear physics community on these new measurements while the next AME is being developed. In the present work measured atomic mass excesses published from 2016 on-wards were compiled into a concise form to update the nuclear physics community of the recent efforts in atomic mass determinations. In addition to atomic mass excesses, the Q-values of β, and α decays and one and two nucleon separation energies have been deduced using these reported mass excesses. Mass excesses of reported nuclear isomers have also been compiled.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We thank Dr. Vladimir Manea (CERN), Dr. Marcus Vilen (CERN), and Mr. Daniel Puentes (NSCL, MSU) for communicating results of their recent experiments.

References

[1] W.J. Huang, G. Audi, M. Wang, et al., Chin. Phys. C 41 (2017) 030002.
[2] G. Audi, Int. J. Mass Spectrom. 251 (2006) 85.
[3] H. Schatz, Int. J. Mass Spectrom. 349 (2013) 181.
[4] K. Blaum, Y. Litvinov, Int. J. Mass Spectrom. 349–350 (2013) 1.
[5] M. Wang, G. Audi, F.G. Kondev, et al., Chin. Phys. C 41 (2017) 030003.
[6] Nuclearmasses.org, 2019, http://www.nuclearmasses.org. (Accessed 21 November 2019).
[7] B. Pritychenko, E. Běták, M.A. Kellett, et al., Nucl. Instrum. Methods Phys. Res. A 640 (2011) 213.
[8] G. Audi, F.G. Kondev, M. Wang, et al., Chin. Phys. C 41 (2017) 030001.

Explanation of Tables

The compiled experimental mass excesses of nuclei in their ground state, as well as the comparison with AME-2016 are presented in Table 1. All calculated quantities have been calculated using the formulas of Section 2. All tables include the Nuclear Science References [7] (NSR) Keynumber corresponding to the publication from which the experimental mass excess was obtained. A shorthand notation is adopted for all quantities such that the uncertainty is given in the last digit(s) of the number itself (e.g. $-227.7(73) = -227.7 \pm 7.3$).

Table 1. Compiled ground state mass excesses

Tabulated ground state mass excesses compiled in the present work and their comparison with the values from AME-2016.

El	The elemental symbol of the measured nucleus
A	The mass number of the measured nucleus
ME	The measured mass excess in units of keV
ΔME	Difference between the measured and literature mass excesses (ME-$ME_{AME-2016}$)
In AME-2016	Specifies if the mass excess measurement was included in the AME-2016 evaluation.
NSR Keyno.	The NSR Keynumber identifying the publication where the ME was obtained.

Table 2. β-decay Q-values and one-nucleon separation energies

Calculated Q_β, S_n, and S_p using the values in Table 1 for the ground state nuclei compiled in the present work. β-decay modes are taken from Ref. [5].

El	The elemental symbol of the parent nucleus
A	The mass number of the parent nucleus
β-decay mode	The assumed β-decay mode, taken from Ref. [5]. Note that in general ϵ-decay is used to denote both electron capture and β^+ decay.
$Q_{\beta^-/\epsilon}$	The β^-/ϵ-decay Q-value of the given parent nucleus in keV.
S_n	The one-neutron separation energy of the parent nucleus in keV
S_p	The one-proton separation energy of the parent nucleus in keV
NSR Keyno.	The NSR Keynumber identifying the publication where the ME was obtained.

Table 3. α-decay Q-values and two-nucleon separation energies

Calculated Q_α, S_{2n}, and S_{2p} using the values in Table 1 for the ground state nuclei compiled in the present work. It should be noted that the α particle separation energy, S_α, is equivalent to the negative α-decay Q-value, Q_α.

El	The elemental symbol of the parent nucleus
A	The mass number of the parent nucleus
Q_α	The α-decay Q-value of the given parent nucleus in keV
S_{2n}	The two-neutron separation energy of the parent nucleus in keV
S_{2p}	The two-proton separation energy of the parent nucleus in keV
NSR Keyno.	The NSR Keynumber identifying the publication where the ME was obtained.

Table 4. Isomer and charged atom mass excesses

Tabulated isomer and charged atom mass excesses compiled in the present work. The excitation energies for the isomers were obtained from Ref. [8] unless stated otherwise.

El	The elemental symbol of the measured isomer/ion
A	The mass number of the measured isomer/ion
E*	Literature excitation energies of the measured isomers
Charge	Charge state of the measured ions
ME	The measured mass excess in units of keV
NSR Keyno.	The NSR Keynumber identifying the publication where the ME was obtained.

Table 1
Compiled ground state mass excesses.

^{A}El	ME (keV)	ΔME (keV)	In AME-2016	NSR Keyno.
^{10}B	12050.611(15)	0.002(21)	Yes	2016Gu02
^{11}B	8667.707(12)	0.000(17)	Yes	2016Gu02
^{11}C	10649.397(60)	−0.003(85)	Yes	2016Gu02
^{16}O	−4737.00(3)	0.001(30)	No	2017He14
^{18}Ne	5317.63(36)	0.03(54)	No	2017Se09
^{19}Ne	1751.83(31)	−0.22(35)	No	2017Se09
^{21}Na	−2184.71(21)	−0.08(23)	No	2017Se09
^{22}Na	−5181.49(22)	0.02(28)	No	2017Re10
^{22}Mg	−400.10(22)	−0.20(37)	No	2017Re10
^{25}Al	−8916.2(5)	−0.23(50)	Yes	2016Ca22
^{27}Mg	−14586.38(14)	0.23(15)	No	2017Br14
^{27}P	−685(42)	37(49)	No	2018Fu11
^{27}P[a]	−659(9)	63(28)	No	2019Su14
^{27}S[a]	17678(77)	648(407)	No	2019Su14
^{28}Mg	−15019.95(26)	−1.2(20)	No	2017Br14
^{29}Mg	−10612.38(34)	−9(11)	No	2017Br14
^{29}Al	−18207.77(37)	0.03(48)	Yes	2017Ga20
^{29}S	−3094(13)	66(52)	No	2018Fu11
^{30}P	−20200.854(64)	−0.004(95)	Yes	2016Ca22
^{31}Na	12246(14)	0(20)	Yes	2017Ga20
^{31}Cl	−7034.7(34)	0.3(45)	Yes	2016Ka15
^{32}Na	18638(37)	−2(54)	Yes	2017Ga20
^{32}Ar	−2200.2(18)	0.2(25)	No	2017Se09
^{33}Mg	4966.2(68)	3.9(74)	No	2019As04
^{34}Mg	8323.2(69)	0(30)	No	2019As04
^{34}Al	−3000.5(29)	−0.5(42)	Yes	2017Ga20
^{34}Al	−2995.4(29)	4.6(42)	No	2019As04
^{34}Si	−19991.7(8)	−35(14)	No	2019As04
^{34}Ar	−18377.10(41)	1.19(42)	No	2017Se09
^{35}Al	−223.7(73)	0(10)	Yes	2017Ga20
^{37}K	−24800.45(35)	−0.25(36)	No	2017Se09
^{38}Ca	−22058.01(65)	0.49(68)	No	2017Se09
^{39}Ca	−27282.57(60)	0.13(85)	No	2017Se09
^{40}Si	5700(130)	270(373)	No	2018Mi08
^{40}P	−8150(100)	−40(180)	No	2018Mi08
^{42}P	1100(100)	90(326)	No	2018Mi08
^{42}Ti	−25125(19)	−20(19)	Yes	2017Zh12
^{43}Ti[b]	−29306(9)	15(11)	No	2018Zh29
^{44}Cl	−20540(110)	−160(178)	No	2018Mi08
^{44}V	−23827(20)	293(181)	No	2018Zh29
^{44}V	−23804.9(80)	315(180)	No	2020PuAA
^{45}V	−31885(10)	1(10)	No	2018Zh29
^{46}Cl	−13700(110)	160(237)	No	2018Mi08
^{46}Ti	−44128.06(12)	−0.26(20)	No	2017Ka53
^{46}Cr[c]	−29471(11)	1(16)	No	2018Zh29
^{47}Ti	−44937.35(12)	0.01(17)	No	2017Ka53
^{47}Cr	−34565(10)	−2(12)	No	2018Zh29
^{48}Ar	−22330(120)	−50(332)	No	2018Mi08
^{48}Ca	−44224.869(3)	−0.24(10)	No	2016Ko45
^{48}Mn[c]	−29299(7)	−3.0(99)	No	2018Zh29
^{49}Ti	−48563.76(12)	0.03(16)	No	2017Ka53
^{49}Mn	−37607(14)	14(14)	No	2018Zh29
^{50}Ti	−51431.58(12)	0.08(17)	No	2017Ka53
^{50}V	−49222.88(15)	1.12(43)	No	2017Ka53
^{50}Cr	−50261.16(13)	0.94(42)	No	2017Ka53
^{50}Fe[c]	−34477(6)	−1(10)	No	2018Zh29
^{51}Ti[d]	−49731.5(21)	1.3(22)	No	2018Re11
^{51}V[d]	−52203.5(18)	0.3(18)	No	2018Re11
^{51}V	−52202.87(13)	0.93(42)	No	2017Ka53
^{51}Fe	−40198(14)	5(17)	No	2018Zh29
^{51}Fe	−40189.2(16)	13.8(91)	No	2018On01
^{52}Sc	−40525(65)	−85(103)	Yes	2019Xu09
^{52}Ti	−49466(16)	4(17)	No	2018Le03
^{52}Ti	−49479.1(30)	−9.1(76)	No	2018Re11
^{52}V	−51417(26)	27(26)	No	2018Re11
^{52}Cr	−55419.13(14)	0.07(33)	No	2017Ka53
^{52}Cr[d]	−55421.3(20)	−2.1(20)	No	2018Re11
^{52}Cr	−55419.7(4)	−0.50(50)	Yes	2019Hu15
^{52}Mn	−50709.97(59)	−2.7(19)	No	2017Ne05
^{52}Fe	−48330.67(60)	−0.7(50)	No	2017Ne05
^{52}Co	−34331.6(66)	29(10)	No	2017Ne05
^{52}Co[e]	−34361(8)	0(11)	Yes	2018Zh29
^{53}Sc	−38910(80)	0(120)	Yes	2019Xu09

(continued on next page)

Table 1 (*continued*)

^{A}El	ME (keV)	ΔME (keV)	In AME-2016	NSR Keyno.
^{53}Ti	−46881.4(29)	−51(100)	No	2018Re11
^{53}Ti	−46881.3(29)	−51(100)	No	2018Le03
^{53}V	−51851(19)	0(19)	No	2018Re11
^{53}Cr[d]	−55288.4(19)	−1.4(19)	No	2018Re11
^{53}Cr	−55287.58(15)	−0.58(34)	No	2017Ka53
^{53}Cr	−55288.8(5)	−1.80(58)	No	2019Hu15
^{54}Sc	−34485(360)	−595(450)	Yes	2019Xu09
^{54}Ti	−45744(16)	−124(82)	No	2018Le03
^{54}Ti	−45690(100)	−70(128)	Yes	2019Xu09
^{54}V	−49904(17)	−11(23)	No	2018Re11
^{54}Cr[d]	−56929.3(46)	5.5(46)	No	2018Re11
^{54}Cr	−56935.17(18)	−0.37(44)	No	2017Ka53
^{54}Cr	−56936.4(6)	−1.60(72)	No	2019Hu15
^{54}Ni[c]	−39278(4)	0.0(64)	Yes	2018Zh29
^{55}Ca	−18650(160)	−300(340)	No	2018Mi08
^{55}Ti	−41832(29)	−162(163)	No	2018Le03
^{55}V	−49125(27)	15(104)	No	2018Re11
^{55}Cr	−55112.3(18)	−2.6(18)	Yes	2019Hu15
^{55}Mn	−57711.5(7)	0.90(76)	Yes	2019Hu15
^{56}Ca	−13510(250)	390(472)	No	2018Mi08
^{56}Ti	−39810(190)	−490(225)	Yes	2019Xu09
^{56}Cr	−55284.4(7)	0.60(92)	Yes	2019Hu15
^{56}Fe	−60606.9(6)	0.20(67)	Yes	2019Hu15
^{56}Cu	−38626.7(71)	16(17)	No	2018Va01
^{56}Cu	−38643(15)	0(21)	Yes	2018Zh29
^{57}Ca	−7370(990)	−500(1068)	No	2018Mi08
^{57}Cr	−52525.0(18)	−0.3(21)	Yes	2019Hu15
^{58}Cr	−51991.8(30)	0.0(34)	Yes	2018Mo14
^{59}Cr	−48115.9(7)	−26(220)	No	2018Mo14
^{59}Cr	−48132(20)	−42(221)	No	2018Mo14
^{59}Cr	−48540(440)	−450(492)	Yes	2016Me07
^{59}Fe	−60664.1(10)	0.7(11)	Yes	2019Hu15
^{59}Co	−62227.8(14)	1.9(15)	No	2019Hu15
^{60}Cr	−46908.5(11)	−238(190)	No	2018Mo14
^{60}Cr	−46917(19)	−247(191)	No	2018Mo14
^{60}Cr	−47440(460)	−770(498)	Yes	2016Me07
^{61}Cr	−42496.5(18)	−16(100)	No	2018Mo14
^{61}Cr	−42503(20)	−23(102)	No	2018Mo14
^{61}Cr	−43080(510)	−600(520)	Yes	2016Me07
^{62}Cr	−40852.6(35)	37(150)	No	2018Mo14
^{62}Cr	−40841(18)	49(151)	No	2018Mo14
^{62}Cr	−40890(490)	0(512)	Yes	2016Me07
^{63}Cr	−36178(73)	−168(367)	No	2018Mo14
^{63}Cr	−35940(430)	70(561)	Yes	2016Me07
^{63}Cu[f]	−65569(13)	11(13)	No	2018Ki21
^{64}Cr	−33480(440)	0(622)	Yes	2016Me07
^{64}Zn[f]	−66010(15)	−6(15)	No	2018Ki21
^{64}Ge	−54354(40)	−39(40)	No	2019Sc11
^{65}Zn	−65905(12)	7(12)	No	2018Ki21
^{65}Ga	−62657.1(21)	0.4(22)	No	2018Ki21
^{65}Ge	−56472.2(4.0)	6.0(46)	Yes	2019Sc11
^{65}Ge	−56465(20)	13(20)	No	2018Ki21
^{65}Ge[f]	−56457(23)	21(23)	No	2018Ki21
^{66}Zn[f]	−68891(14)	8(14)	No	2018Ki21
^{66}Ga[g]	−63749.8(97)	−26.1(98)	No	2018Ki21
^{66}Ge	−61611(13)	−4(13)	No	2018Ki21
^{66}As	−52025.0(5.7)	0.0(83)	Yes	2019Sc11
^{67}Ga[g]	−66845(10)	34(10)	No	2018Ki21
^{67}Ge	−62675.2(46)	−17.2(68)	No	2018Ki21
^{67}As	−56587.26(55)	−0.06(68)	Yes	2019Sc11
^{67}As	−56589(26)	−2(26)	No	2018Ki21
^{68}Co	−51642.8(44)	287(190)	No	2018Iz01
^{69}Co	−50214(14)	66(141)	No	2018Iz01
^{74}Rb	−51915.2(40)	0.8(50)	No	2017Se09
^{75}Cu	−54470.04(76)	1.3(24)	No	2017We16
^{75}Ga	−68460.6(7)	4.0(25)	No	2019Hu15
^{76}Cu	−50981.55(89)	−5.6(71)	No	2017We16
^{77}Cu	−48862.8(12)	−243(150)	No	2017We16
^{77}Ga	−65995.0(42)	−2.7(48)	No	2019Hu15
^{78}Cu	−44772(17)	−272(500)	No	2017We16
^{78}Ga	−63704.0(11)	2.0(22)	No	2019Hu15
^{79}Cu	−42408(105)	−668(318)	No	2017We16
^{79}Ga	−62548.8(16)	−1.1(25)	No	2019Hu15

(*continued on next page*)

Table 1 (*continued*)

^{A}El	ME (keV)	ΔME (keV)	In AME-2016	NSR Keyno.
^{79}Br	−76068.4(51)	−0.4(52)	No	2018Ki21
^{79}Kr[b]	−74342.7(93)	99.3(98)	No	2018Ki21
^{79}Sr	−65490(16)	−13.0(82)	No	2018Ki21
^{79}Y	−57803(80)	17(113)	Yes	2018Xi04
^{80}Ga[b]	−59212(48)	12(48)	No	2020Re04
^{80}Rb	−72185(11)	−10(11)	No	2018Ki21
^{80}Sr[g]	−70339(15)	−28.0(34)	No	2018Ki21
^{81}Ga	−57616(31)	12(31)	No	2020Re04
^{81}Br	−77955.4(53)	21.6(54)	No	2018Ki21
^{81}Rb[b]	−75391.5(29)	65.5(58)	No	2018Ki21
^{81}Zr	−57524(92)	−64(129)	Yes	2018Xi04
^{82}Ga[b]	−52974(31)	−43(31)	No	2020Re04
^{82}Zr	−63632(10)	−1(15)	Yes	2018Xi04
^{82}Zr	−63613(2)	18(11)	No	2019Vi05
^{83}Ga	−49258(25)	−1(25)	No	2020Re04
^{83}Nb	−57613(162)	−53(221)	Yes	2018Xi04
^{84}Ga	−44094(30)	−4(202)	No	2020Re04
^{84}Nb	−61219(12)	0(18)	Yes	2018Xi04
^{84}Nb	−61193.8(4)	25(13)	No	2019Vi05
^{85}Ga	−39744(37)	106(302)	No	2020Re04
^{86}Ge	−49400(175)	0(474)	Yes	2016Kn03
^{86}Mo	−64112(5)	−2.0(64)	No	2019Vi05
^{88}Tc	−61670(4)	10(150)	No	2019Vi05
^{89}Y	−87711.21(34)	−2.8(16)	No	2019Sa39
^{89}Ru	−58372(21)	−112(301)	No	2019Vi05
^{91}Se	−50580(173)	0(463)	Yes	2016Kn03
^{93}Br	−52890(172)	0(463)	Yes	2016Kn03
^{93}Ru	−77177(44)	40(44)	No	2019An10
^{94}Br	−46800(400)	600(500)	Yes	2016Kn03
^{94}Ru	−82531(72)	53(72)	No	2017Ze02
^{94}Ru	−82547(26)	37(26)	No	2019An10
^{94}Rh[b]	−72848(24)	60(24)	No	2019An10
^{96}Zr	−85437.50(41)	1.35(42)	Yes	2016Al03
^{96}Nb	−85601.46(43)	1.36(46)	Yes	2016Al03
^{96}Pd	−76246(38)	−63(38)	No	2019An10
^{97}Pd	−77790(37)	16(37)	No	2019An10
^{97}Ag	−70904(12)	−74(111)	No	2020Ho03
^{98}Rb	−54319.6(55)	49(17)	Yes	2016Kl04
^{98}Sr	−66416.6(67)	6.4(73)	Yes	2016Kl04
^{99}Rb	−51124.6(93)	−4(10)	Yes	2016Kl04
^{99}Sr	−62522.4(65)	−1.4(82)	Yes	2016Kl04
^{100}Rb	−46290(19)	−43(28)	No	2017De18
^{100}Rb	−46190(140)	57(141)	Yes	2016Kl04
^{100}Sr	−59821(27)	0(28)	No	2017De18
^{100}Sr	−59816(11)	5(13)	Yes	2016Kl04
^{100}Ag[b]	−78146(41)	−8(41)	No	2019An10
^{101}Rb	−42558(28)	292(202)	No	2017De18
^{101}Sr	−55315(21)	10(22)	No	2017De18
^{101}Sr	−55327.6(98)	−3(13)	Yes	2016Kl04
^{101}In	−68550(14)	60(200)	No	2019Xu13
^{101}In	−68535(20)	75(201)	No	2020Ho03
^{102}Rb	−37253(83)	457(311)	No	2017De18
^{102}Sr	−52160(67)	0(97)	No	2017De18
^{103}In	−74631(25)	2(27)	No	2020Ho03
^{105}Y	−51270(535)	0(1443)	Yes	2016Kn03
^{105}In	−79677(31)	−36(33)	No	2020Ho03
^{106}Zr	−58550(173)	0(463)	Yes	2016Kn03
^{107}Zr	−54380(449)	0(1207)	Yes	2016Kn03
^{107}Cd	−86963(90)	27(90)	No	2019An10
^{107}In	−83583(27)	−19(29)	No	2020Ho03
^{109}Nb	−56690(172)	0(312)	Yes	2016Kn03
^{109}In	−86522(34)	−32(34)	No	2020Ho03
^{110}Nb	−52310(335)	0(904)	Yes	2016Kn03
^{112}Cd	−90574.51(27)	0.35(37)	No	2016Ga33
^{113}Mo	−53390(314)	−900(434)	Yes	2016Kn03
^{113}Cd	−89043.31(32)	−0.03(40)	No	2016Ga33
^{113}Cd	−89044.23(62)	−0.95(66)	No	2016Ga33
^{113}In	−89366.84(22)	0.28(29)	No	2016Ga33
^{113}In	−89368.47(63)	−1.35(66)	No	2016Ga33
^{114}Tc	−58600(173)	0(463)	Yes	2016Kn03
^{114}Sb	−84497(47)	0(52)	No	2019An10
^{114}Te	−81893(50)	−4(57)	No	2019An10
^{115}Tc	−56320(316)	0(851)	Yes	2016Kn03

(*continued on next page*)

Table 1 (*continued*)

^{A}El	ME (keV)	ΔME (keV)	In AME-2016	NSR Keyno.
^{116}Te	−85268(51)	1(58)	No	2019An10
^{117}Ru	−59490(173)	0(463)	Yes	2016Kn03
^{117}I	−80488(47)	−52(54)	No	2019An10
^{118}Ru	−57640(183)	−380(271)	Yes	2016Kn03
^{119}I	−83796(34)	−30(44)	No	2019An10
^{119}Xe	−78816(57)	−22(58)	No	2019An10
^{121}Rh	−56250(248)	0(668)	Yes	2016Kn03
^{123}Pd	−60430(316)	0(851)	Yes	2016Kn03
^{124}Pd	−60190(372)	−1800(478)	Yes	2016Kn03
^{124}Cd	−76692.4(54)	9.3(62)	No	2020Ma09
^{124}Cs	−81700(39)	31(40)	No	2019An10
^{125}Ag	−64520(173)	0(463)	Yes	2016Kn03
^{125}Cd	−73348.1(29)	0.0(41)	Yes	2017La16
^{125}In	−80412.4(15)	65(27)	No	2018Ba08
^{125}Cs	−84040(42)	48(43)	No	2019An10
^{126}Ag	−61410(306)	−730(366)	Yes	2016Kn03
^{126}Cd	−72260.7(70)	−3.9(74)	Yes	2017La16
^{126}Cd	−72249.8(62)	7.0(67)	No	2020Ma09
^{126}In	−77809.5(41)	−36(27)	No	2018Ba08
^{126}Cs	−84340(46)	11(47)	No	2019An10
^{127}Cd	−68743.4(56)	4(13)	Yes	2017La16
^{127}Cd	−68737(11)	10(16)	No	2020Ma09
^{127}In	−76876(11)	20(24)	No	2018Ba08
^{128}Cd	−67225(14)	17(16)	No	2020Ma09
^{128}In	−74170.5(97)	−20(150)	No	2018Ba08
^{129}Cd	−63145(173)	−87(174)	Yes	2016Kn02
^{129}Cd	−62779.1(56)	279(18)	No	2020Ma09
^{129}In	−72836.4(61)	1.3(67)	No	2018Ba08
^{130}Cd	−62131(411)	−1013(412)	Yes	2016Kn02
^{130}In	−69862(20)	18(45)	No	2018Ba08
^{131}Cd	−55583(953)	−363(958)	Yes	2016Kn02
^{131}Cd	−55167(31)	53(105)	No	2020Ma09
^{131}Cd	−55238(24)	−18(103)	No	2020Ma09
^{132}Cd	−50499(72)	−239(213)	No	2020Ma09
^{132}Cd	−50386(110)	−126(228)	No	2020Ma09
^{132}Cs	−87151.4(12)	1.3(16)	No	2017At01
^{133}Te	−82932(40)	5(40)	No	2019An10
^{133}I	−85852(15)	6(16)	No	2019An10
^{133}Cs	−88072.1(30)	−1.2(30)	Yes	2017La16
^{134}Sb	−73915(122)	106(122)	No	2019An10
^{134}Te	−82543(41)	−9(41)	No	2019An10
^{134}I	−84062(54)	−19(54)	No	2019An10
^{137}Sb	−60610(173)	−550(180)	Yes	2016Kn03
^{138}Sb	−54220(426)	0(1142)	Yes	2016Kn03
^{138}Ba	−88262.13(44)	−0.53(53)	No	2019Sa36
^{138}La	−86513.44(57)	5.6(31)	No	2019Sa36
^{138}Ce	−87566.21(52)	4.8(50)	No	2019Sa36
^{139}La	−87226.2(20)	0.0(28)	No	2019Sa39
^{140}I	−63530(173)	76(173)	Yes	2016Kn03
^{140}Ce	−88072.0(23)	4.1(28)	Yes	2019Hu15
^{140}Nd	−84257.3(32)	1.7(44)	Yes	2019Hu15
^{141}I	−60030(173)	−103(174)	Yes	2016Kn03
^{143}I	−50160(461)	470(503)	Yes	2016Kn03
^{146}Cs	−55309(3)	1.4(42)	No	2017At01
^{147}Cs	−51920(8)	0(11)	No	2017At01
^{148}Cs	−46911(13)	0(18)	No	2017At01
^{149}Ba	−53120(175)	0(474)	Yes	2016Kn03
^{150}Ba	−51520(346)	−1620(458)	Yes	2016Kn03
^{150}La	−56130(174)	0(473)	Yes	2016Kn03
^{151}La	−53310(174)	0(473)	Yes	2016Kn03
^{154}Ce	−52540(577)	−320(611)	Yes	2016Kn03
^{154}Nd	−65579.6(10)	240(50)	No	2018Or02
^{154}Nd	−65601.2(251)	219(56)	No	2020ViAA
^{156}Nd	−60202.1(13)	268(200)	No	2018Or02
^{156}Nd	−60210(2)	260(200)	No	2018Vi02
^{156}Dy	−70523.1(42)	5.9(44)	Yes	2019Hu15
^{158}Nd	−53897(37)	163(203)	No	2018Vi02
^{158}Nd	−53835.1(13)	225(200)	No	2018Or02
^{158}Pm	−59104(2)	−15(13)	No	2018Vi02
^{159}Nd	−49724(30)	86(301)	No	2018Or02
^{160}Nd	−46725(47)	405(304)	No	2018Or02
^{160}Pm	−52851(16)	149(201)	No	2018Vi02
^{160}Eu	−63493.4(9)	−13(10)	No	2018Ha19

(*continued on next page*)

Table 1 (*continued*)

^{A}El	ME (keV)	ΔME (keV)	In AME-2016	NSR Keyno.
^{160}Yb	−58163.2(55)	−0.2(89)	Yes	2019Hu15
^{161}Pm	−50107.6(593)	132(306)	No	2020ViAA
^{162}Sm	−54377.0(50)	153(200)	No	2018Or02
^{162}Sm	−54381(5)	149(200)	No	2018Vi02
^{162}Eu	−58723.9(15)	−24(40)	No	2018Ha19
^{162}Eu[h]	−58720.4(31)	−20(40)	No	2020ViAA
^{163}Sm	−50599.6(73)	120(300)	No	2018Or02
^{163}Sm	−50552.3(362)	168(302)	No	2020ViAA
^{163}Eu[h]	−56575.7(38)	−96(70)	No	2020ViAA
^{163}Gd[h]	−61382.4(102)	−68(13)	No	2020ViAA
^{164}Sm	−47925.3(40)	175(300)	No	2018Or02
^{164}Eu	−53231.1(37)	149(110)	No	2020ViAA
^{164}Gd	−59694(3)	76(100)	No	2018Vi02
^{164}Tb	−62090(4)	−10(100)	No	2018Vi02
^{165}Eu	−50726.9(60)	−7(140)	No	2020ViAA
^{165}Gd	−56522(4)	−72(120)	No	2018Vi02
^{165}Tb	−60595.1(39)	−25(100)	No	2020ViAA
^{166}Gd	−54387(4)	143(200)	No	2018Vi02
^{166}Tb	−57807.6(37)	72(70)	No	2020ViAA
^{167}Gd	−50783.4(123)	27(300)	No	2020ViAA
^{167}Tb	−55883.7(38)	46(200)	No	2020ViAA
^{168}Tb	−52781.2(41)	−61(300)	No	2020ViAA
^{178}Yb	−49663.1(87)	32(13)	No	2019Hu15
^{180}Au	−25627.3(50)	−1.3(71)	Yes	2017Ma29
^{185}Au	−31858.2(26)	−0.1(37)	Yes	2017Ma29
^{188}Au	−32371.3(27)	0.0(38)	Yes	2017Ma29
^{190}Os	−38707.81(88)	−0.0(11)	Yes	2016Ei01
^{190}Pt	−37305.46(68)	1.04(98)	Yes	2016Ei01
^{190}Au	−32833.5(35)	0.5(46)	Yes	2017Ma29
^{194}Pt	−34759.38(62)	0.72(80)	Yes	2016Ei01
^{195}Po	−11117.9(61)	−58(40)	No	2017Al34
^{196}Po	−13467.9(59)	5(15)	No	2017Al34
^{197}Po	−13396(10)	−36(51)	No	2017Al34
^{197}At	−6371(18)	−16(20)	Yes	2017Ma29
^{203}Po	−17310.3(56)	1(11)	No	2017Al34
^{204}Po	−18095(185)	246(185)	No	2017Sc02
^{204}At	−11908(57)	−33(61)	No	2017Sc02
^{204}Rn	−8067(28)	−97(29)	No	2017Sc02
^{204}Fr[b]	679(24)	72(35)	No	2017Sc02
^{205}Bi	−20826(569)	239(569)	No	2017Sc02
^{205}Po	−16791(257)	730(257)	No	2017Sc02
^{205}At	−12983(71)	−11(73)	No	2017Sc02
^{205}Rn	−7584(32)	126(32)	No	2017Sc02
^{206}At	−12497(2150)	−67(2150)	No	2017Sc02
^{206}Rn	−8565(600)	568(600)	No	2017Sc02
^{206}Fr[b]	−1104(107)	138(111)	No	2017Sc02
^{208}Po	−17463.5(55)	6.1(58)	No	2017Al34
^{210}Ra	411(33)	−32(34)	No	2018Ro14
^{210}Ac	8626(157)	−164(168)	No	2018Ro14
^{211}Po	−12593(137)	−160(137)	No	2019An10
^{211}Fr	−4108(40)	32(42)	No	2019An10
^{211}Ra	819(25)	−13(26)	No	2018Ro14
^{211}Ac	7007(99)	−193(111)	No	2018Ro14
^{212}At[b]	−8601(86)	27(86)	No	2019An10
^{212}Rn	−8609(30)	51(30)	No	2019An10
^{212}Fr	−3530(28)	−14(29)	No	2019An10
^{212}Ra	−198(25)	1(27)	No	2018Ro14
^{212}Ac	7304(24)	24(55)	No	2018Ro14
^{213}Rn	−5737(63)	−41(63)	No	2019An10
^{213}Fr	−3561.9(123)	−9(13)	No	2019An10
^{213}Ac	6122(18)	−33(23)	No	2018Ro14
^{214}Ra	59(35)	−34(35)	No	2018Ro14
^{214}Ac	6396(29)	−48(33)	No	2018Ro14
^{217}At	4433(135)	38(135)	No	2019An10
^{218}Rn	5089(54)	−128(54)	No	2019An10
^{219}At	10394.4(77)	−1.6(83)	Yes	2017Ma29
^{220}Ra	10609(320)	339(320)	No	2019An10
^{246}Es	67812(109)	−88(246)	No	2018It04
^{249}Md	77259(221)	29(298)	No	2018It04
^{250}Md	78472(138)	−158(330)	No	2018It04
^{251}Fm	75996(34)	42(37)	No	2018It04
^{251}Md	79025(60)	58(63)	No	2018It04
^{252}Md	80467(89)	−43(158)	No	2018It04

(*continued on next page*)

Table 1 (*continued*)

^{A}El	ME (keV)	ΔME (keV)	In AME-2016	NSR Keyno.
^{254}No	84675(42)	−48(43)	No	2018It04

[a]Mass excess also reported in 2020Su05.
[b]Possible mixing of ground state and isomer.
[c]Mass excess also reported in 2017Zh12.
[d]Mass excess also reported in 2018Le03.
[e]Mass excess also reported in 2016Xu10.
[f]Mass excess given by the authors for a compound. Compilers have deduced the value for the atom.
[g]Mass excess given by the authors is treated as tentative as it is influenced by neighboring peaks.
[h]Mass excess reported in 2018Vi02 has been corrected in 2020ViAA, and also in an Erratum for 2018Vi02 to be published in PRL.

Table 2
β-decay Q-values and one-nucleon separation energies.

^{A}El	β-decay mode	Q_β (keV)	S_n (keV)	S_p (keV)	NSR Keyno.
^{10}B		[a,b]	8437.21(90)	6586.810(81)	2016Gu02
^{11}B		[a,b]	11454.219(19)	11228.754(81)	2016Gu02
^{11}C	ϵ	1981.690(61)[b]	13120.590(92)	8690.183(62)	2016Gu02
^{16}O		[a]	15663.92(50)	12127.409(30)	2017He14
^{18}Ne	ϵ	4444.53(62)[b]	19254.09(54)	3923.04(44)	2017Se09
^{19}Ne	ϵ	3239.27(31)[b]	11637.09(51)	6410.24(59)	2017Se09
^{21}Na	ϵ	3547.07(21)[b]	17106.6(11)	2431.75(21)	2017Se09
^{21}Na	ϵ	3546.902(18)[c]	N/A	N/A	2019Ka30
^{22}Na	ϵ	2843.23(22)	11068.18(24)	6738.68(22)	2017Re10
^{22}Mg	ϵ	4781.41(28)[b]	19375.22(83)	5504.44(24)	2017Re10
^{23}Mg	ϵ	4056.182(32)[c]	N/A	N/A	2019Ka30
^{25}Al	ϵ	4276.58(50)	16938.66(55)	2271.60(50)	2016Ca22
^{27}Mg	β^-	2610.48(15)	6443.16(14)	15014.4(40)	2017Br14
^{27}P	ϵ	11700(42)	19726(204)	833(42)	2018Fu11
^{27}P	ϵ	11725.5(90)	19700(200)	807.0(90)[b]	2019Su14
^{27}S	ϵ	18400(81)[b]	17473(605)	581(214)	2019Su14
^{28}Mg	β^-	1830.69(27)	8504.66(26)	16790.9(40)	2017Br14
^{29}Mg	β^-	7595.42(45)	3664.9(20)	16913(10)	2017Br14
^{29}Al	β^-	3687.31(37)	9428.45(38)	10477.9(20)	2017Ga20
^{29}S	ϵ	13859(13)	15235(161)	3235(13)	2018Fu11
^{30}P	ϵ	4232.106(68)	11319.37(41)	5594.746(64)	2016Ca22
^{31}Na	β^-	15368(14)	4300(15)	18323(250)	2017Ga20
^{31}Cl	ϵ	12007.8(34)	19546(200)	264.4(34)[b]	2016Ka15
^{32}Na	β^-	19467(37)	1679(40)	19831(273)	2017Ga20
^{32}Ar	ϵ	11134.5(19)[b]	21602(200)	2454.2(35)	2017Se09
^{33}Mg	β^-	13463.2(98)	2276.1(74)	20963(41)	2019As04
^{34}Mg	β^-	11323.2(75)	4710.4(75)	22746(450)	2019As04
^{34}Al	β^-	16956(14)	2574.8(76)	15251.8(41)	2017Ga20
^{34}Al	β^-	16962(14)	2569.7(76)	15246.7(41)	2019As04
^{34}Si	β^-	4557.0(11)	7548.7(11)	18783.7(70)	2019As04
^{34}Ar	ϵ	6062.98(41)[b]	17064.12(57)	4662.77(57)	2017Se09
^{35}Al	β^-	14166(41)	5295.0(79)	15836(30)	2017Ga20
^{37}K	ϵ	6147.21(41)[b]	15454.67(46)	1857.88(35)	2017Se09
^{38}Ca	ϵ	6742.74(68)[b]	16993.23(88)	4546.78(66)	2017Se09
^{39}Ca	ϵ	6524.62(60)[b]	13295.39(63)	5770.79(63)	2017Se09
^{40}Si	β^-	13810(198)	4691(191)	22239(421)	2018Mi08
^{40}P	β^-	14688(100)	3451(149)	17759(172)	2018Mi08
^{42}P	β^-	18738(100)	1991(156)	18309(559)	2018Mi08
^{42}Sc	ϵ	6426.350(53)[c]	N/A	N/A	2017Er01
^{42}Ti	ϵ	6996(19)	17498(34)	3772(19)	2017Zh12
^{43}Ti[d]	ϵ	6882.1(92)	12272.6(90)	4473.8(90)	2018Zh29
^{44}Cl	β^-	12133(110)	4451(125)	15634(110)	2018Mi08
^{44}V	ϵ	13722(20)	13978(45)	1795(21)	2018Zh29
^{44}V	ϵ	13743.7(80)	13956(41)	1773(11)	2020PuAA
^{45}V	ϵ	7125(10)	15836(180)	1625(10)	2018Zh29
^{46}Cl	β^-	16073(110)	3511(178)	16999(1046)	2018Mi08
^{46}Ti		[a]	13189.58(81)	10345.13(71)	2017Ka53
^{46}Cr	ϵ	7604(11)	18032(41)	4874(11)	2018Zh29
^{47}Ti		[a]	8880.87(20)	10465.12(71)	2017Ka53
^{47}Cr	ϵ	7442(10)	13164(15)	4779(10)	2018Zh29
^{48}Ar	β^-	9954(120)	5035(120)	19839(418)	2018Mi08
^{48}Ca	β^-	279.1(50)	9951.8(22)	15801.8(14)	2016Ko45
^{48}Mn	ϵ	13523.0(99)	14800(31)	2025.0(92)	2018Zh29
^{49}Ti		[a]	8142.37(16)[b]	11348.7(50)	2017Ka53
^{49}Mn	ϵ	7726(14)	16382(16)	2074(16)	2018Zh29
^{50}Ti	β^-	−2207.58(42)	10939.11(16)[b]	12159.3(27)	2017Ka53
^{50}V	β^-	1039.22(43)[b]	9332.30(81)	7948.06(19)	2017Ka53
^{50}Cr		[a,b]	12999.4(22)	9588.23(81)	2017Ka53
^{50}Fe	ϵ	8150.6(60)	17797(25)	4145.4(64)	2018Zh29
^{51}Ti	β^-	2472.3(21)	6371.2(21)	12473(15)	2018Re11
^{51}V		[a]	11050.8(18)	8060.8(18)	2018Re11
^{51}V		[a]	11050.19(42)	8060.18(18)	2017Ka53
^{51}Fe	ϵ	8046(14)	13793(16)	4859(14)	2018Zh29
^{51}Fe	ϵ	8054.7(17)	13784.5(82)	4850.6(16)	2018On01
^{52}Sc	β^-	8945(65)	5367(68)	11482(65)	2019Xu09
^{52}Ti	β^-	1978(16)	7805(16)	13526(26)	2018Le03
^{52}Ti	β^-	1964.7(30)	7817.6(30)	13539(20)	2018Re11
^{52}V	β^-	4002(26)	7285(26)	8973(26)	2018Re11
^{52}Cr		[a]	12039.05(42)	10504.30(42)	2017Ka53
^{52}Cr		[a]	12041.2(20)	10506.5(20)	2018Re11
^{52}Cr		[a]	12039.62(57)	10504.87(57)	2019Hu15
^{52}Mn	ϵ	4709.23(66)	10537.39(77)	6547.54(71)	2017Ne05
^{52}Fe	ϵ	2376.6(19)	16199.0(90)	7375.74(78)	2017Ne05

(*continued on next page*)

Table 2 (*continued*)

^{A}El	β-decay mode	Q_β (keV)	S_n (keV)	S_p (keV)	NSR Keyno.
^{52}Co	ϵ	13998.4(83)	15063(50)	1418(11)[b]	2017Ne05
^{52}Co	ϵ	13969.0(94)	15092(51)	1447(12)	2018Zh29
^{53}Sc	β^-	7920(128)	6541(113)	11933(80)	2019Xu09
^{53}Ti	β^-	4969.6(42)	5482.7(76)	13730(80)	2018Re11
^{53}Ti	β^-	4969.7(42)	5482.6(76)	13730(80)	2018Le03
^{53}V	β^-	3436(19)	8479(19)	9670(20)	2018Re11
^{53}Cr		[a]	7940.5(19)	11133.6(19)	2018Re11
^{53}Cr		[a]	7939.70(34)	11132.75(43)	2017Ka53
^{53}Cr		[a]	7940.92(58)	11133.97(64)	2019Hu15
^{54}Sc	β^-	11135(369)	3646(371)	12384(362)	2019Xu09
^{54}Ti	β^-	4149(22)	6985(101)	14123(91)	2018Le03
^{54}Ti	β^-	4203(101)	6931(141)	14069(135)	2019Xu09
^{54}V	β^-	7031(17)	6124(17)	10363(101)	2018Re11
^{54}Cr	β^-	−1371.7(47)	9713.6(46)	12367.3(55)	2018Re11
^{54}Cr	β^-	−1377.6(11)	9719.49(35)	12373.1(30)	2017Ka53
^{54}Cr	β^-	−1378.8(13)	9720.72(67)	12374.4(31)	2019Hu15
^{54}Ni	ϵ	8732.0(40)	17718(25)	3907.6(43)	2018Zh29
^{55}Ca	β^-	11510(478)	1561(168)	20939(621)	2018Mi08
^{55}Ti	β^-	7308(104)	4283(85)	15231(272)	2018Le03
^{55}V	β^-	5985(27)	7303(31)	10794(84)	2018Re11
^{55}Cr	β^-	2600.1(18)	6248.8(18)	12508(15)	2019Hu15
^{55}Mn		[a]	10225.2(13)	8065.67(81)	2019Hu15
^{56}Ca	β^-	11340(641)	3231(391)	21509(743)	2018Mi08
^{56}Ti	β^-	6340(262)	6211(248)	16939(488)	2019Xu09
^{56}Cr	β^-	1627.10(76)	8246.02(81)	13433(100)	2019Hu15
^{56}Fe		[a]	11196.92(67)	10183.47(67)	2019Hu15
^{56}Cu	ϵ	15280.8(71)	15058(160)	579.9(71)	2018Va01
^{56}Cu	ϵ	15264(15)	15074(161)	596(15)	2018Zh29
^{57}Ca	β^-	13630(1634)	1541(1068)	22589(1273)	2018Mi08
^{57}Cr	β^-	4961.3(23)	5311.3(19)	13664(180)	2019Hu15
^{58}Cr	β^-	3835.8(40)	7538.4(32)	14871(80)	2018Mo14
^{59}Cr	β^-	7409.4(24)	4195.4(17)	15005(90)	2018Mo14
^{59}Cr	β^-	7393(20)	4212(20)	15021(92)	2018Mo14
^{59}Cr	β^-	6985(440)	4620(440)	15429(449)	2016Me07
^{59}Fe	β^-	1565.6(11)	6580.3(10)	12125.5(29)	2019Hu15
^{59}Co		[a]	10451.9(18)	7361.7(14)	2019Hu15
^{60}Cr	β^-	6059.4(25)	6890(220)	16367(160)	2018Mo14
^{60}Cr	β^-	6051(19)	6898(221)	16376(161)	2018Mo14
^{60}Cr	β^-	5528(460)	7421(510)	16899(487)	2016Me07
^{61}Cr	β^-	9245.6(29)	3898(190)	16545(220)	2018Mo14
^{61}Cr	β^-	9239(20)	3904(191)	16552(221)	2018Mo14
^{61}Cr	β^-	8662(510)	4481(544)	17129(555)	2016Me07
^{62}Cr	β^-	7671.4(78)	6444(100)	17632(890)	2018Mo14
^{62}Cr	β^-	7683(19)	6432(102)	17620(890)	2018Mo14
^{62}Cr	β^-	7634(490)	6481(500)	17669(1016)	2016Me07
^{63}Cr	β^-	10709(73)	3359(167)	17987(309)	2018Mo14
^{63}Cr	β^-	10947(430)	3121(455)	17749(524)	2016Me07
^{63}Cu		[a]	10853(13)	6112(13)	2018Ki21
^{64}Cr	β^-	9509(440)	5541(569)	18879(595)	2016Me07
^{64}Zn		[a]	11868(15)	7719(15)	2018Ki21
^{64}Ge	ϵ	4479(40)	15505(57)	5096(40)	2019Sc11
^{65}Zn	ϵ	1359(12)	7972(12)	7769(12)	2018Ki21
^{65}Ga	ϵ	3254.9(22)	11895.6(25)	3942.1(22)	2018Ki21
^{65}Ge	ϵ	6185.3(41)	10228.5(57)	4928.4(42)	2019Sc11
^{65}Ge	ϵ	6192(20)	10221(20)	4921(20)	2018Ki21
^{65}Ge	ϵ	6200(23)	10213(23)	4913(23)	2018Ki21
^{66}Zn		[a]	11050(14)	8916(14)	2018Ki21
^{66}Ga	ϵ	5149.4(97)	9163.6(97)	5126.8(97)	2018Ki21
^{66}Ge	ϵ	2113(13)	13204(13)	6242(13)	2018Ki21
^{66}As	ϵ	9582.0(62)	13156(80)	2835.8(61)	2019Sc11
^{67}Ga	ϵ	1035(10)	11193(10)	5235(10)	2018Ki21
^{67}Ge	ϵ	4203.8(48)	9139.5(52)	6240.5(47)	2018Ki21
^{67}As	ϵ	6070.7(50)	12633.6(60)	2269.2(25)	2019Sc11
^{67}As	ϵ	6069(26)	12635(27)	2271(26)	2018Ki21
^{68}Co	β^-	11821.0(53)	4392.1(74)	13322(270)	2018Iz01
^{69}Co	β^-	9765(15)	6355(191)	14013(370)	2018Iz01
^{71}Ga	β^-	232.443(93)[c]	N/A	N/A	2016Al30
^{74}Rb	ϵ	10416.6(45)[b]	13907(200)	2652.2(81)	2017Se09
^{75}Cu	β^-	8088.9(21)	6535.4(60)	13299(200)	2017We16
^{75}Ga	β^-	3396.36(70)	8482.3(31)	9992.9(26)	2019Hu15
^{76}Cu	β^-	11321.4(17)	4581.6(25)	14241(300)	2017We16
^{77}Cu	β^-	9926.4(23)	5958.1(71)	14522(400)	2017We16
^{77}Ga	β^-	5217.9(42)	7769.7(47)	10981.0(45)	2019Hu15

(*continued on next page*)

Table 2 (*continued*)

^{A}El	β-decay mode	Q_{β} (keV)	S_n (keV)	S_p (keV)	NSR Keyno.
^{78}Cu	β^-	12711(17)	4223(151)	15261(500)	2017We16
^{78}Ga	β^-	8158.0(41)	5783.0(26)	12203.8(23)	2019Hu15
^{79}Cu	β^-	11024(105)	5979(511)	15807(609)	2017We16
^{79}Ga	β^-	6981(40)	6914.1(25)	12354.6(25)	2019Hu15
^{79}Br		[a]	10687.7(65)	6331.4(51)	2018Ki21
^{79}Kr[d]	ϵ	1725.3(94)	8235.7(93)	8180(10)	2018Ki21
^{79}Sr	ϵ	5313.0(26)	10387.3(72)	5844.0(34)	2018Ki21
^{79}Y	ϵ	7674(80)	13704(310)	1918(80)[b]	2018Xi04
^{80}Ga[d]	β^-	10323(48)	4736(48)	13069(48)	2020Re04
^{80}Rb	ϵ	5708(11)	9453(11)	5032(11)	2018Ki21
^{80}Sr	ϵ	1836.5(24)	12933.3(81)	6825.0(26)	2018Ki21
^{81}Ga	β^-	8676(31)	6464(31)	13256(31)	2020Re04
^{81}Br		[a]	10137.7(54)	7484.9(54)	2018Ki21
^{81}Rb[d]	ϵ	2304.7(31)	11287.3(35)	4787.2(30)	2018Ki21
^{81}Zr	ϵ	8189(92)	11235(314)	3665(92)[b]	2018Xi04
^{82}Ga[d]	β^-	12441(31)	3417(31)	14063(31)	2020Re04
^{82}Zr	ϵ	4432(11)	14243(91)	5208(11)[b]	2018Xi04
^{82}Zr	ϵ	4451.0(54)	14224(90)	5189.0(54)	2019Vi05
^{83}Ga	β^-	11718(25)	4399(25)	14233(25)	2020Re04
^{83}Nb	ϵ	8299(162)	13594(341)	1271(162)[b]	2018Xi04
^{84}Ga	β^-	14054(30)	2908(30)	15093(301)	2020Re04
^{84}Nb	ϵ	10203(13)	11730(150)	2596(13)[b]	2018Xi04
^{84}Nb	ϵ	10228.2(50)	11705(150)	2570.8(60)	2019Vi05
^{85}Ga	β^-	13379(37)	3725(203)	15103(402)	2020Re04
^{86}Ge	β^-	9562(175)	4348(175)	16839(347)	2016Kn03
^{86}Mo	ϵ	5022.0(71)	14673(17)	5121.0(64)	2019Vi05
^{88}Tc	ϵ	11017.0(57)	12051.3(57)	2074.2(49)	2019Vi05
^{89}Y		[a]	11483.5(15)	7078.56(34)	2019Sa39
^{89}Ru	ϵ	9023(21)	12103(301)	3981(151)	2019Vi05
^{91}Se	β^-	10527(173)	2851(373)	16539(436)	2016Kn03
^{93}Br	β^-	11246(172)	4728(172)	13459(435)	2016Kn03
^{93}Ru	ϵ	6429(44)	10947(44)	5540(44)	2019An10
^{94}Br	β^-	14548(400)	1981(587)	13369(566)	2016Kn03
^{94}Ru	ϵ	1627(72)	13386(72)	6214(72)	2017Ze02
^{94}Ru	ϵ	1611(26)	13402(26)	6230(26)	2019An10
^{94}Rh[d]	ϵ	9736(24)	11908(24)	2920(24)	2019An10
^{96}Zr	β^-	165.32(44)	7848.92(99)	11517.5(70)	2016Al03
^{96}Nb	β^-	3193.42(45)[b]	6886.48(66)	7230.5(10)	2016Al03
^{96}Pd	ϵ	3442(39)	14351(38)	5194(38)	2019An10
^{97}Pd	ϵ	4810(54)	9678(37)	5391(38)	2019An10
^{97}Ag	ϵ	6902(13)	14465(91)	2010(13)	2020Ho03
^{98}Rb	β^-	12103.4(63)	3871.8(58)	14189(130)	2016Kl04
^{98}Sr	β^-	5878(10)	5906.9(73)	15186.5(70)	2016Kl04
^{99}Rb	β^-	11396(11)	4827(19)	14104(300)	2016Kl04
^{99}Sr	β^-	8127.6(96)	4170.7(72)	15442(17)	2016Kl04
^{100}Rb	β^-	13531(20)	3240(19)	14819(400)	2017De18
^{100}Rb	β^-	13631(140)	3140(140)	14719(424)	2016Kl04
^{100}Sr	β^-	7506(29)	5371(27)	15989(27)	2017De18
^{100}Sr	β^-	7511(16)	5366(12)	15984(12)	2016Kl04
^{100}Ag[d]	ϵ	7067(45)	9505(41)	3252(41)	2019An10
^{101}Rb	β^-	12767(29)	4382(34)	14797(401)	2017De18
^{101}Sr	β^-	9746(22)	3565(22)	16357(29)	2017De18
^{101}Sr	β^-	9733(12)	3578(12)	16370(22)	2016Kl04
^{101}In	ϵ	7286(14)	12311(181)	1644(14)	2019Xu13
^{101}In	ϵ	7302(20)	12296(181)	1629(20)	2020Ho03
^{102}Rb	β^-	14907(109)	2474(217)	15412(507)	2017De18
^{102}Sr	β^-	9013(67)	4906(67)	16599(211)	2017De18
^{103}In	ϵ	6021(25)	12007(25)	2260(25)	2020Ho03
^{105}Y	β^-	10195(535)	5281(668)	14449(613)	2016Kn03
^{105}In	ϵ	4657(31)	11565(32)	2998(31)	2020Ho03
^{106}Zr	β^-	7653(173)	5156(173)	14569(1351)	2016Kn03
^{107}Zr	β^-	9344(449)	3901(622)	15619(672)	2016Kn03
^{107}Cd	ϵ	1444(90)	7902(90)	7310(90)	2019An10
^{107}In	ϵ	3407(27)	11046(30)	3740(27)	2020Ho03
^{109}Nb	β^-	9976(172)	5215(172)	12629(435)	2016Kn03
^{109}In	ϵ	1982(34)	10473(35)	4559(34)	2020Ho03
^{110}Nb	β^-	12233(336)	3691(424)	13409(602)	2016Kn03
^{112}Cd	β^-	−2584.5(40)	9393.63(48)	9648.1(15)	2016Ga33
^{113}Mo	β^-	9422(314)	4001(372)	16409(434)	2016Kn03
^{113}Cd	β^-	323.81(37)[b]	6539.77(41)	9748.6(24)	2016Ga33
^{113}Cd	β^-	322.89(65)[b]	6540.69(67)	9749.5(25)	2016Ga33
^{113}In		[a]	9448.2(40)	6080.95(33)	2016Ga33
^{113}In		[a]	9449.8(40)	6082.58(68)	2016Ga33

(*continued on next page*)

Table 2 (*continued*)

^{A}El	β-decay mode	Q_β (keV)	S_n (keV)	S_p (keV)	NSR Keyno.
^{114}Tc	β^-	11622(173)	3859(173)	13399(346)	2016Kn03
^{114}Sb	ϵ	6063(47)	8151(50)	3458(47)	2019An10
^{114}Te	ϵ	2604(55)	11617(57)	4765(53)	2019An10
^{115}Tc	β^-	9870(329)	5791(534)	13799(436)	2016Kn03
^{116}Te	ϵ	1554(51)	11276(58)	5554(53)	2019An10
^{117}Ru	β^-	9407(173)	3492(173)	15319(346)	2016Kn03
^{117}I	ϵ	4607(49)	11069(110)	2508(55)	2019An10
^{118}Ru	β^-	7247(185)	6221(467)	16549(440)	2016Kn03
^{119}I	ϵ	3385(35)	10896(39)	3388(38)	2019An10
^{119}Xe	ϵ	4950(64)	8808(58)	5134(60)	2019An10
^{121}Rh	β^-	9932(248)	5501(319)	13529(471)	2016Kn03
^{123}Pd	β^-	9120(317)	3885(317)	15639(436)	2016Kn03
^{124}Pd	β^-	6010(448)	7831(873)	18119(546)	2016Kn03
^{124}Cd	β^-	4178(30)	7349.5(60)	14431(30)	2020Ma09
^{124}Cs	ϵ	5961(39)	8727(41)	3740(40)	2019An10
^{125}Ag	β^-	8828(173)	6391(304)	13419(346)	2016Kn03
^{125}Cd	β^-	7129(27)	4717.7(42)	14437(250)	2017La16
^{125}In	β^-	5484.0(18)	7614(30)	10999.7(34)	2018Ba08
^{125}Cs	ϵ	3153(42)	10380(43)	3668(42)	2019An10
^{126}Ag	β^-	10847(306)	4961(528)	14579(504)	2016Kn03
^{126}Cd	β^-	5512(28)	6983.9(76)	15030(430)	2017La16
^{126}Cd	β^-	5523(28)	6973.0(68)	15019(430)	2020Ma09
^{126}In	β^-	8206(11)	5404(27)	11750.4(50)	2018Ba08
^{126}Cs	ϵ	4807(46)	8323(47)	4436(46)	2019An10
^{127}Cd	β^-	8153(22)	4557.9(61)	15352(200)	2017La16
^{127}Cd	β^-	8159(24)	4552(11)	15346(200)	2020Ma09
^{127}In	β^-	6595(15)	7174(29)	11908(11)	2018Ba08
^{128}Cd	β^-	6925(151)	6549(18)	16074(200)	2020Ma09
^{128}In	β^-	9192(20)	5346(23)	12712(15)	2018Ba08
^{129}Cd	β^-	9693(173)	3974(173)[b]	15814(346)	2016Kn02
^{129}Cd	β^-	10058.6(62)	3608.4(90)[b]	15448(300)	2020Ma09
^{129}In	β^-	7755(18)	6758(150)	12883.4(93)	2018Ba08
^{130}Cd	β^-	7749(413)	7144(411)[b]	17440(574)	2016Kn02
^{130}In	β^-	10270(20)	5096(20)	14093(26)	2018Ba08
^{131}Cd	β^-	12442(953)	2536(953)[b]	17172(1076)	2016Kn02
^{131}Cd	β^-	12858(31)	2120(38)[b]	16756(501)	2020Ma09
^{131}Cd	β^-	12787(24)	2191(33)[b]	16827(501)	2020Ma09
^{132}Cd	β^-	11911(94)	3350(123)	17408(505)	2020Ma09
^{132}Cd	β^-	12024(125)	3237(149)	17295(512)	2020Ma09
^{132}Cs	β^-	1283.6(16)	7163.7(51)	6026.8(12)	2017At01
^{133}Te	β^-	2926(40)	5815(40)	10586(40)	2019An10
^{133}I	β^-	1792(15)	8220(16)	7953(15)	2019An10
^{133}Cs		[a]	8990.7(32)	6082.1(30)	2017La16
^{134}Sb	β^-	8619(122)	3062(122)	10330(122)	2019An10
^{134}Te	β^-	1500(41)	7677(41)	10908(41)	2019An10
^{134}I	β^-	4064(54)	6275(54)	8414(54)	2019An10
^{137}Sb	β^-	8694(173)	4174(173)	11999(346)	2016Kn03
^{138}Sb	β^-	11476(426)	2231(429)	11719(584)	2016Kn03
^{138}Ba	β^-	−1743.1(30)[b]	8612.25(53)	9005.50(59)	2019Sa36
^{138}La	β^-	1057.6(50)[b]	7444.1(18)	6081.21(64)	2019Sa36
^{138}Ce		[a,b]	9718.93(66)	7714.5(18)	2019Sa36
^{139}La		[a]	8778.5(36)	6253.6(20)	2019Sa39
^{140}I	β^-	9456(173)	3130(173)	10614(173)	2016Kn03
^{140}Ce		[a]	9195.3(74)	8134.8(30)	2019Hu15
^{140}Nd	ϵ	430.7(68)	10315(28)	6727.3(86)	2019Hu15
^{141}I	β^-	8167(173)	4495(173)	10739(183)	2016Kn03
^{143}I	β^-	10043(461)	3461(591)	11079(680)	2016Kn03
^{146}Cs	β^-	9638(21)	3326.3(95)	11105(11)	2017At01
^{147}Cs	β^-	8344(22)	4680.9(85)	11254(25)	2017At01
^{148}Cs	β^-	10679(61)	3062(15)	11840(200)	2017At01
^{149}Ba	β^-	7100(266)	3601(185)	13498(175)	2016Kn03
^{150}Ba	β^-	4610(560)	6471(560)	15559(529)	2016Kn03
^{150}La	β^-	8717(174)	3981(265)	10299(473)	2016Kn03
^{151}La	β^-	7915(175)	5251(473)	10699(347)	2016Kn03
^{154}Ce	β^-	5560(587)	5701(611)	13769(650)	2016Kn03
^{154}Nd	β^-	2930(50)	6320.6(29)	11301(12)	2018Or02
^{154}Nd	β^-	2909(56)	6342(25)[b]	11322(28)	2020ViAA
^{156}Nd	β^-	3961.9(42)	5989.4(91)	12076(17)	2018Or02
^{156}Nd	β^-	3954.0(45)	5997.3(92)	12084(17)	2018Vi02
^{156}Dy		[a]	9438(11)	6562(11)	2019Hu15
^{158}Nd	β^-	5192(39)	5506(45)	12646(302)	2018Vi02
^{158}Nd	β^-	5254(13)	5444(25)	12584(300)	2018Or02
^{158}Pm	β^-	6146.0(54)	4878.3(73)	9931(25)	2018Vi02

(*continued on next page*)

Table 2 (*continued*)

^{A}El	β-decay mode	Q_β (keV)	S_n (keV)	S_p (keV)	NSR Keyno.
^{159}Nd	β^-	6830(32)	3735(202)	12683(301)	2018Or02
^{160}Nd	β^-	6275(205)	4986(304)	12924(403)	2018Or02
^{160}Pm	β^-	7384(17)	4368(19)	10330(300)	2018Vi02
^{160}Eu	β^-	4448.3(16)	5521.7(41)	8574.4(61)	2018Ha19
^{160}Yb	ϵ	2137(30)	10396(19)	4882(29)	2019Hu15
^{161}Pm	β^-	6564(60)	5179(209)[b]	10267(306)	2020ViAA
^{162}Sm	β^-	4323(40)	5776.3(86)	11426(300)	2018Or02
^{162}Sm	β^-	4319(40)	5780.3(86)	11430(300)	2018Vi02
^{162}Eu	β^-	5556.1(43)	5003(10)	9340.9(72)	2018Ha19
^{162}Eu[e]	β^-	5559.6(51)	5000(10)[b]	9337.4(77)	2020ViAA
^{163}Sm	β^-	5880(70)	4141(200)	11519(300)	2018Or02
^{163}Sm	β^-	5928(79)	4094(203)[b]	11471(302)	2020ViAA
^{163}Eu[e]	β^-	4738.3(89)	5947(40)[b]	9335(200)	2020ViAA
^{163}Gd[e]	β^-	3214(11)	5174(11)[b]	9971(41)	2020ViAA
^{164}Sm	β^-	5455(110)	5277(300)	11964(400)	2018Or02
^{164}Eu	β^-	6539(100)	4822(70)[b]	9800(300)	2020ViAA
^{164}Gd	β^-	2386(100)	6451.3(85)	10503(70)	2018Vi02
^{164}Tb	β^-	3878.0(41)	5565.3(57)	8065.0(89)	2018Vi02
^{165}Eu	β^-	5723(120)	5418(110)[b]	9916(300)	2020ViAA
^{165}Gd	β^-	4048(100)	4823(100)	10431(110)	2018Vi02
^{165}Tb	β^-	3017.5(40)	6586(100)[b]	8114(100)	2020ViAA
^{166}Gd	β^-	3493(70)	6008(120)	10956(140)	2018Vi02
^{166}Tb	β^-	4777.2(38)	5309(100)[b]	8647(120)	2020ViAA
^{167}Gd	β^-	5147(200)	4325(200)[b]	10862(360)	2020ViAA
^{167}Tb	β^-	4046(60)	6075(70)[b]	8643(200)	2020ViAA
^{168}Tb	β^-	5779(140)	4923(200)[b]	9260(300)	2020ViAA
^{178}Yb	β^-	674.7(90)	6748.0(87)	9482(300)	2019Hu15
^{180}Au	ϵ	8809(12)	8710(13)	648.3(94)	2017Ma29
^{185}Au	ϵ	4830(26)	9611(22)	1813(16)	2017Ma29
^{188}Au	ϵ	5449.7(57)	7415(22)	2975(24)	2017Ma29
^{190}Os	β^-	−1954.3(17)	7792.4(11)	8017.8(80)	2016Ei01
^{190}Pt		[a,b]	8908(10)	6144(13)	2016Ei01
^{190}Au	ϵ	4473.0(36)	7323(20)	3653(11)	2017Ma29
^{194}Pt		[a]	8351.1(15)	7512.2(14)	2016Ei01
^{195}Po	ϵ	6908.1(79)	8184(14)	2377.9(86)	2017Al34
^{196}Po	ϵ	4541(25)	10479(40)	2730.9(77)	2017Al34
^{197}Po	ϵ	6291(13)	7994(17)	2676(26)	2017Al34
^{197}At	ϵ	6989(53)	10532(35)	187(23)	2017Ma29
^{203}Po	ϵ	4215(14)	7440(11)	3858(16)	2017Al34
^{204}Po	ϵ	2551(185)	8855(185)	3859(185)	2017Sc02
^{204}At	ϵ	6433(58)	7816(58)	1886(58)	2017Sc02
^{204}Rn	ϵ	3808(36)	9984(33)	3193(30)	2017Sc02
^{204}Fr[d]	ϵ	8649(25)	8268(25)	456(30)	2017Sc02
^{205}Bi	ϵ	2944(569)	8251(569)	3005(569)	2017Sc02
^{205}Po	ϵ	4274(257)	6521(257)	3434(257)	2017Sc02
^{205}At	ϵ	4538(72)	9179(74)	1931(72)	2017Sc02
^{205}Rn	ϵ	5388(35)	7685(33)	2998(39)	2017Sc02
^{206}At	ϵ	5692(2150)	7596(2150)	2265(2150)	2017Sc02
^{206}Rn	ϵ	3865(600)	8926(600)	2882(600)	2017Sc02
^{206}Fr[d]	ϵ	8029(107)	7865(107)	683(107)	2017Sc02
^{208}Po	ϵ	1406.7(60)	8388.8(89)	4697.9(60)	2017Al34
^{210}Ra	ϵ	3744(36)	9518(34)	3108(36)	2018Ro14
^{210}Ac	ϵ	8183(157)	8285(165)	521(157)	2018Ro14
^{211}Po		[a]	4711(137)	5090(137)	2019An10
^{211}Fr	ϵ	4647(41)	8846(43)	1792(40)	2019An10
^{211}Ra	ϵ	4959(28)	7695(27)	3137(29)	2018Ro14
^{211}Ac	ϵ	6175(99)	9854(116)	725(99)	2018Ro14
^{212}At[d]	β^-	59(86)	5025(86)	3457(86)	2019An10
^{212}Rn		[a]	7925(31)	4251(30)	2019An10
^{212}Fr	ϵ	5130(28)	7461(30)	2064(29)	2019An10
^{212}Ra	ϵ	3318(27)	9101(26)	3347(28)	2018Ro14
^{212}Ac	ϵ	7503(26)	7967(55)	817(25)	2018Ro14
^{213}Rn	ϵ	843(63)	5148(63)	4398(63)	2019An10
^{213}Fr	ϵ	2134(13)	8117(15)	2191(13)	2019An10
^{213}Ac	ϵ	5776(21)	9229(53)	968(21)	2018Ro14
^{214}Ra	ϵ	1018(36)	8358(36)	3677(35)	2018Ro14
^{214}Ac	ϵ	6303(29)	7830(33)	1239(31)	2018Ro14
^{217}At	β^-	774(135)	5895(135)	4638(135)	2019An10
^{218}Rn	β^-	−1970(54)	6641(54)	6595(54)	2019An10
^{219}At	β^-	1565.0(80)	5775(14)	5251.5(80)	2017Ma29
^{220}Ra		[a]	6856(320)	5298(320)	2019An10
^{246}Es	ϵ	3722(109)	6629(228)	2862(109)	2018It04
^{249}Md	ϵ	3740(221)	7962(326)	1928(221)	2018It04

(*continued on next page*)

Table 2 (*continued*)

^{A}El	β-decay mode	Q_β (keV)	S_n (keV)	S_p (keV)	NSR Keyno.
^{250}Md	ϵ	4400(138)	6829(243)	2336(138)	2018It04
^{251}Fm	ϵ	1484(35)	6147(35)	4523(106)	2018It04
^{251}Md	ϵ	3071(62)	7676(306)	2336(61)	2018It04
^{252}Md	ϵ	3651(89)	6571(91)	2776(90)	2018It04
^{254}No	ϵ	1225(108)	7755(43)	3784(52)	2018It04

[a]Daughter mass excess or β-decay mode not in Ref. [5].
[b]Quantity deduced in referenced publication.
[c]Q-value given in referenced publication, but no mass excesses given.
[d]Possible mixing of ground state and isomer.
[e]Mass excess reported in 2018Vi02 has been corrected in 2020ViAA, and also in an Erratum for 2018Vi02 to be published in PRL

Table 3
α-decay Q-values and two-nucleon separation energies.

^{A}El	Q_{α} (keV)	S_{2n} (keV)	S_{2p} (keV)	NSR Keyno.
^{10}B	−4461.184(15)	27013.6(10)	23473.130(52)	2016Gu02
^{11}B	−8664.314(13)	19891.43(90)	30865.13(19)	2016Gu02
^{11}C	−7544.519(92)	34404.2(21)	15276.99(10)	2016Gu02
^{16}O	−7161.916(30)	28887.415(39)	22334.834(30)	2017He14
^{18}Ne	−5115.07(36)	34812(20)	4523.31(36)	2017Se09
^{19}Ne	−3528.69(59)	30891.20(51)	12017.35(31)	2017Se09
^{21}Na	−6561.33(33)	31256(11)	15275.21(21)	2017Se09
^{22}Na	−8479.51(55)	28174.7(11)	19741.97(22)	2017Re10
^{22}Mg	−8142.62(46)	34020.4(19)	7936.11(22)	2017Re10
^{25}Al	−9156.49(51)	31806.93(58)	13964.29(50)	2016Ca22
^{27}Mg	−11857.25(17)	17536.23(15)	27128(29)	2017Br14
^{27}P	−9858(42)	36568(402)	6347(42)	2018Fu11
^{27}P	−9832.0(90)	36542(400)	6321.0(90)	2019Su14
^{27}S	−8447(506)	[a]	727(78)	2019Su14
^{28}Mg	−11493.27(56)	14948.04(26)	30079(18)	2017Br14
^{29}Mg	−11001(29)	12168.40(34)	32240(90)	2017Br14
^{29}Al	−11274.9(13)	17153.54(37)[b]	27267.7(40)	2017Ga20
^{29}S	−9346(16)	36267(400)	5287(13)	2018Fu11
^{30}P	−10415.620(95)	29195.8(12)	17928.16(10)	2016Ca22
^{31}Na	−15629(390)	6577(16)[b]	42482(530)	2017Ga20
^{31}Cl	−8738(26)	36337(190)	4659.8(34)	2016Ka15
^{32}Na	−17527(392)	5980(37)[b]	44050(601)	2017Ga20
^{32}Ar	−8695(160)	39273(210)	2718.9(18)	2017Se09
^{33}Mg	−15859(150)	8054.4(74)	40792(270)	2019As04
^{34}Mg	−17382(250)	6990.4(75)	43255(500)	2019As04
^{34}Al	−13900.4(58)	8044.1(76)[b]	36218(40)	2017Ga20
^{34}Al	−13895.3(58)	8039.0(76)	36213(40)	2019As04
^{34}Si	−13532.6(31)	12056.64(85)	33740.6(31)	2019As04
^{34}Ar	−6742.77(46)	32319.3(18)	6939.51(41)	2017Se09
^{35}Al	−14895(16)	7869(10)[b]	38582(450)	2017Ga20
^{37}K	−6222.07(53)	29770.18(61)	10364.86(35)	2017Se09
^{38}Ca	−6104.64(65)	31751(40)	6404.41(65)	2017Se09
^{39}Ca	−6660.19(92)	30289.10(85)	10912.85(64)	2017Se09
^{40}Si	−17105(702)	6273(164)	42948(517)	2018Mi08
^{40}P	−16525(180)	9673(122)	38938(383)	2018Mi08
^{42}P	−17535(383)	6933(180)	41068(412)	2018Mi08
^{42}Ti	−5491(19)	32418(161)	4857(19)	2017Zh12
^{43}Ti[c]	−4448.2(90)	29751(29)	8746.1(90)	2018Zh29
^{44}Cl	−14855(186)	11853(125)	36128(329)	2018Mi08
^{44}V	−5729(20)	32350(201)	6284(20)	2018Zh29
^{44}V	−5706.5(85)	32328(200)	6261.7(80)	2020PuAA
^{45}V	−5668(10)	30108(41)	10275(10)	2018Zh29
^{46}Cl	−17135(329)	9463(178)	38728(512)	2018Mi08
^{46}Ti	−8005.74(19)	22722.09(71)	17237.30(32)	2017Ka53
^{46}Cr	−6791(11)	32254(300)	6500(11)	2018Zh29
^{47}Ti	−8953.45(26)	22070.18(81)	18703.09(42)	2017Ka53
^{47}Cr	−7669(12)	31198(41)	10133(10)	2018Zh29
^{48}Ar	−15551(120)	8700(120)	37248(514)	2018Mi08
^{48}Ca	−13976.5(16)	17228.1(22)	29029.9(11)	2016Ko45
^{48}Mn	−7604(180)	32872(400)	6801.6(70)	2018Zh29
^{49}Ti	−10176.48(42)	19769.03(17)	20797.3(22)	2017Ka53
^{49}Mn	−8146(14)	31180(33)	10178(14)	2018Zh29
^{50}Ti	−10717.1(22)	19081.50(16)	21784.89(16)	2017Ka53
^{50}V	−9886.60(72)	20887.8(10)	19296.8(50)	2017Ka53
^{50}Cr	−8558.28(21)	23581.8(70)	16346.39(17)	2017Ka53
^{50}Fe	−7430(13)	32620(400)	6232.9(92)	2018Zh29
^{51}Ti	−9812.0(30)	17310.3(21)[b]	23009.7(21)	2018Re11
^{51}V	−10291.8(26)	20384.2(20)[b]	20220.1(32)	2018Re11
^{51}V	−10291.2(19)	20383.60(81)	20219.5(27)	2017Ka53
^{51}Fe	−8060(15)	31590(28)	9443(14)	2018Zh29
^{51}Fe	−8051.1(62)	31581(24)	9434.0(27)	2018On01
^{52}Sc	−10665(65)	12121(67)[b]	29375(65)	2019Xu09
^{52}Ti	−7666(16)	14177(16)[b]	24455(16)	2018Le03
^{52}Ti	−7679.4(30)	14190.1(30)[b]	24467.8(34)	2018Re11
^{52}V	−9338(26)	18336(26)[b]	21448(30)	2018Re11
^{52}Cr	−9351.34(18)	21299.66(42)	18565.41(18)	2017Ka53
^{52}Cr	−9353.5(20)	21301.8(20)[b]	18567.6(20)	2018Re11
^{52}Cr	−9351.91(41)	21300.23(57)	18565.98(42)	2019Hu15
^{52}Mn	−8657.2(12)	24225.00(71)	16063.91(71)	2017Ne05
^{52}Fe	−7933.6(70)	29997.3(80)	12646.51(72)	2017Ne05
^{52}Co	−7460.5(96)	32844(400)	6281.9(66)	2017Ne05
^{52}Co	−7490(11)	32874(400)	6311.3(80)	2018Zh29
^{53}Sc	−11723(80)	11824(82)[b]	30972(81)	2019Xu09

(continued on next page)

Table 3 (*continued*)

^{A}El	Q_{α} (keV)	S_{2n} (keV)	S_{2p} (keV)	NSR Keyno.
^{53}Ti	−8006.5(29)	13291.2(29)[b]	25127.0(29)	2018Re11
^{53}Ti	−8006.4(29)	13291.1(29)[b]	25126.9(29)	2018Le03
^{53}V	−7715(19)	15790(19)[b]	23200(28)	2018Re11
^{53}Cr	−9149.5(19)	19979.6(19)[b]	20133.5(20)	2018Re11
^{53}Cr	−9148.71(19)	19978.81(43)	20132.72(52)	2017Ka53
^{53}Cr	−9149.93(51)	19980.03(64)	20133.94(71)	2019Hu15
^{54}Sc	−11182(360)	10188(369)[b]	31923(361)	2019Xu09
^{54}Ti	−8580(16)	12417(17)[b]	26056(16)	2018Le03
^{54}Ti	−8526(100)	12363(100)[b]	26002(100)	2019Xu09
^{54}V	−7782(23)	14603(17)[b]	24042(82)	2018Re11
^{54}Cr	−7922.6(46)	17652.7(46)[b]	22037.2(84)	2018Re11
^{54}Cr	−7928.43(22)	17658.60(35)	22043.1(70)	2017Ka53
^{54}Cr	−7929.66(61)	17659.83(67)	22044.3(70)	2019Hu15
^{54}Ni	−7226.9(89)	33091(400)	5525.9(64)	2018Zh29
^{55}Ca	−14385(621)	5403(165)[b]	40018(718)	2018Mi08
^{55}Ti	−7925(29)	11145(104)[b]	27020(49)	2018Le03
^{55}V	−8321(34)	13417(27)[b]	24793(94)	2018Re11
^{55}Cr	−7804.4(19)	15967.9(18)	22860(100)	2019Hu15
^{55}Mn	−7932.62(81)	19164.03(86)	20438.4(31)	2019Hu15
^{56}Ca	−14655(650)	4493(255)[b]	[a]	2018Mi08
^{56}Ti	−7969(190)	10333(206)[b]	29228(196)	2019Xu09
^{56}Cr	−8239.3(70)	14492.23(81)	24242(80)	2019Hu15
^{56}Fe	−7612.62(67)	20495.03(72)	18250.04(72)	2019Hu15
^{56}Cu	−6691(11)	33359(400)	5194.6(71)	2018Va01
^{56}Cu	−6707(17)	33376(400)	5211(15)	2018Zh29
^{57}Ca	−16585(1212)	5163(1034)[b]	[a]	2018Mi08
^{57}Cr	−8120(100)	13557.9(18)	25433(160)	2019Hu15
^{58}Cr	−8797(80)	12849.4(31)[b]	27250(120)	2018Mo14
^{59}Cr	−8871(160)	11733.8(13)[b]	28774(260)	2018Mo14
^{59}Cr	−8887(161)	11750(20)	28790(261)	2018Mo14
^{59}Cr	−9295(468)	12158(440)[b]	29198(511)	2016Me07
^{59}Fe	−7979.3(11)	16624.9(10)	22717.3(15)	2019Hu15
^{59}Co	−6940.3(14)	19024.8(15)	19319.4(21)	2019Hu15
^{60}Cr	−10013(120)	11059.3(19)[b]	30376(200)	2018Mo14
^{60}Cr	−10022(121)	11068(19)	30385(201)	2018Mo14
^{60}Cr	−10545(475)	11591(460)[b]	30908(502)	2016Me07
^{61}Cr	−11001(260)	10549(220)[b]	31564(200)	2018Mo14
^{61}Cr	−11008(261)	10556(221)	31571(201)	2018Mo14
^{61}Cr	−11585(572)	11133(555)[b]	32148(548)	2016Me07
^{62}Cr	−12168(200)	10325(190)[b]	33101(300)	2018Mo14
^{62}Cr	−12156(201)	10314(191)	33089(301)	2018Mo14
^{62}Cr	−12205(529)	10363(526)[b]	33138(575)	2016Me07
^{63}Cr	−13093(213)	9841(124)[b]	34406(407)	2018Mo14
^{63}Cr	−12855(474)	9603(441)[b]	34168(587)	2016Me07
^{63}Cu	−5764(13)	19728(13)	17249(13)	2018Ki21
^{64}Cr	−13575(533)	8733(465)[b]	35558(595)	2016Me07
^{64}Zn	−3962(15)	20985(15)	13842(15)	2018Ki21
^{64}Ge	−2605(40)	28757(146)	7764(40)	2019Sc11
^{65}Zn	−4108(12)	19834(12)	14970(12)	2018Ki21
^{65}Ga	−3097.9(23)	22252.6(25)	11655.2(21)	2018Ki21
^{65}Ge	−2548(16)	25695(40)	8836.7(43)	2019Sc11
^{65}Ge	−2541(26)	25688(45)	8830(20)	2018Ki21
^{65}Ge	−2533(28)	25680(46)	8822(23)	2018Ki21
^{66}Zn	−4570(14)	19030(14)	16370(14)	2018Ki21
^{66}Ga	−3387.3(97)	21059.6(98)	12903.2(97)	2018Ki21
^{66}Ge	−2868(13)	23439(14)	10185(13)	2018Ki21
^{66}As	−2463.0(57)	28638(200)	7770.1(59)	2019Sc11
^{67}Ga	−3690(10)	20330(10)	14159(10)	2018Ki21
^{67}Ge	−2886.7(49)	22339.6(51)	11341.1(46)	2018Ki21
^{67}As	−2465.1(14)	25790(80)	8507.70(97)	2019Sc11
^{67}As	−2467(26)	25792(84)	8509(26)	2018Ki21
^{68}Co	−11078.7(59)	11376(15)[b]	29471(12)	2018Iz01
^{69}Co	−11672(15)	11035(15)[b]	31332(300)	2018Iz01
^{74}Rb	−2914(16)	29728(500)	7431.4(41)	2017Se09
^{75}Cu	−12525(470)	11625.3(20)[b]	31628(400)	2017We16
^{75}Ga	−8174.4(17)	14903.9(18)	24051.1(20)	2019Hu15
^{76}Cu	−13206(400)	11118.2(61)[b]	32739(500)	2017We16
^{77}Cu	−13868(400)	10534.1(26)[b]	33791(500)	2017We16
^{77}Ga	−9432.5(46)	13673.0(48)	26101.6(48)	2019Hu15
^{78}Cu	−14377(500)	9939(18)[b]	34840(600)	2017We16
^{78}Ga	−10122.9(61)	13550.0(23)	27305.9(71)	2019Hu15
^{79}Cu	−15183(511)	9931(183)[b]	35966(609)	2017We16
^{79}Ga	−10502.4(28)	12699.1(29)	28507(150)	2019Hu15

(*continued on next page*)

Table 3 (*continued*)

^{A}El	Q_α (keV)	S_{2n} (keV)	S_{2p} (keV)	NSR Keyno.
^{79}Br	−5459.1(52)	18976.2(58)	16730.0(54)	2018Ki21
^{79}Kr[c]	−4598.1(93)	20315.9(95)	14321.2(93)	2018Ki21
^{79}Sr	−3590.9(82)	23829.6(82)	9898.5(26)	2018Ki21
^{79}Y	−3009(80)	27506(215)[b]	7550(80)[b]	2018Xi04
^{80}Ga[c]	−10661(49)	11649(48)[b]	29290(502)	2020Re04
^{80}Rb	−4321(14)	21393(11)	13311(12)	2018Ki21
^{80}Sr	−3749.9(43)	23307.6(72)	10738.6(15)	2018Ki21
^{81}Ga	−11421(153)	11211(31)[b]	30454(302)	2020Re04
^{81}Br	−6464.0(56)	18030.0(54)	18897.3(73)	2018Ki21
^{81}Rb[c]	−4581.6(40)	20731.1(36)	13901.4(31)	2018Ki21
^{81}Zr	−2146(92)	26897(314)[b]	6625(92)[b]	2018Xi04
^{82}Ga[c]	−10899(501)	9893(31)[b]	31352(401)	2020Re04
^{82}Zr	−2883(12)	25415(300)[b]	7899(10)[b]	2018Xi04
^{82}Zr	−2863.9(73)	25396(300)[b]	7879.9(36)[b]	2019Vi05
^{83}Ga	−9943(301)	7773(25)[b]	32416(501)	2020Re04
^{83}Nb	−2218(181)	27396(432)[b]	6478(162)[b]	2018Xi04
^{84}Ga	−10319(401)	7306(30)[b]	33352(601)	2020Re04
^{84}Nb	−2496(13)	25272(300)[b]	7733(13)[b]	2018Xi04
^{84}Nb	−2470.7(60)	25246(300)[b]	7707.7(50)[b]	2019Vi05
^{85}Ga	−10749(501)	6630(37)[b]	[a]	2020Re04
^{86}Ge	−9511(175)	7395(175)	32048(437)	2016Kn03
^{86}Mo	−2906(12)	26085(300)[b]	7267.9(71)[b]	2019Vi05
^{88}Tc	−2876(14)	26243(300)[b]	7113.9(64)[b]	2019Vi05
^{89}Y	−7968.79(34)	20835.4(12)	17691.36(34)	2019Sa39
^{89}Ru	−3287(26)	28995(401)[b]	6065(21)[b]	2019Vi05
^{91}Se	−8925(346)	7731(173)	31428(436)	2016Kn03
^{93}Br	−8515(346)	7926(172)	30568(435)	2016Kn03
^{93}Ru	−4587(44)	25080(44)[b]	9546(44)	2019An10
^{94}Br	−7895(566)	6710(400)	30398(640)	2016Kn03
^{94}Ru	−4783(72)	24372(72)	10300(72)	2017Ze02
^{94}Ru	−4799(26)	24388(26)[b]	10316(26)	2019An10
^{94}Rh[c]	−4548(24)	25992(24)[b]	8500(24)	2019An10
^{96}Zr	−4995.4(30)	14310.81(44)	21169.7(17)	2016Al03
^{96}Nb	−3210.4(90)	15375.0(16)	17828.4(60)	2016Al03
^{96}Pd	−4370(38)	26287(38)[b]	8240(38)	2019An10
^{97}Pd	−2998(37)	23967(37)[b]	8910(38)	2019An10
^{97}Ag	−4317(12)	27447(300)	7141(13)	2020Ho03
^{98}Rb	−9345(300)	9108.2(63)[b]	30738(300)	2016Kl04
^{98}Sr	−7494(14)	9635(10)[b]	27915(21)	2016Kl04
^{99}Rb	−9780(300)	8748.1(95)[b]	31643(400)	2016Kl04
^{99}Sr	−8788(20)	10084.0(72)[b]	29680(130)	2016Kl04
^{100}Rb	−10555(301)	8064(25)[b]	32618(400)	2017De18
^{100}Rb	−10455(331)	7964(141)[b]	32518(424)	2016Kl04
^{100}Sr	−9166(34)	9541(27)[b]	30089(301)	2017De18
^{100}Sr	−9161(23)	9536(11)[b]	30084(300)	2016Kl04
^{100}Ag[c]	−883(42)	21219(51)[b]	9549(43)	2019An10
^{101}Rb	−10923(401)	7580(28)[b]	[a]	2017De18
^{101}Sr	−10320(132)	8937(22)[b]	31133(401)	2017De18
^{101}Sr	−10333(130)	8949(11)[b]	31146(400)	2016Kl04
^{101}In	−145(111)	23313(300)	6416(15)	2019Xu13
^{101}In	−130(112)	23298(301)	6401(21)	2020Ho03
^{102}Rb	−11428(409)	7149(85)[b]	[a]	2017De18
^{102}Sr	−10275(307)	8482(67)[b]	31688(406)	2017De18
^{103}In	−344(26)	22164(202)	7875(25)	2020Ho03
^{105}Y	−10845(571)	8955(535)	32238(668)	2016Kn03
^{105}In	−768(31)	21187(33)	9452(31)	2020Ho03
^{106}Zr	−8815(187)	8969(173)	29018(346)	2016Kn03
^{107}Zr	−9385(492)	9058(449)	30348(672)	2016Kn03
^{107}Cd	−1931(90)	18772(90)[b]	13123(90)	2019An10
^{107}In	−1205(27)	20085(29)	11090(27)	2020Ho03
^{109}Nb	−7845(1351)	9109(172)	28908(529)	2016Kn03
^{109}In	−1876(34)	19101(36)	12693(34)	2020Ho03
^{110}Nb	−8685(602)	8907(335)	29588(687)	2016Kn03
^{112}Cd	−3475.2(11)	16369.14(48)	16821.55(66)	2016Ga33
^{113}Mo	−9625(590)	9593(314)	30408(767)	2016Kn03
^{113}Cd	−3861.7(11)	15933.74(51)	17635.35(77)	2016Ga33
^{113}Cd	−3862.6(13)	15934.66(74)	17636.27(94)	2016Ga33
^{113}In	−3072.4(13)	17117.5(30)	15729.4(15)	2016Ga33
^{113}In	−3074.0(14)	17119.1(31)	15731.0(16)	2016Ga33
^{114}Tc	−8715(858)	9484(173)	28908(346)	2016Kn03
^{114}Sb	−452(49)	19041(50)[b]	11085(47)	2019An10
^{114}Te	1524(52)	20468(51)[b]	7816(50)	2019An10
^{115}Tc	−9865(436)	9651(316)	30388(510)	2016Kn03

(*continued on next page*)

Table 3 (*continued*)

^{A}El	Q_α (keV)	S_{2n} (keV)	S_{2p} (keV)	NSR Keyno.
^{116}Te	962(51)	19522(58)[b]	9286(51)	2019An10
^{117}Ru	−9425(346)	9443(195)	29318(436)	2016Kn03
^{117}I	1504(50)	20293(55)[b]	8063(50)	2019An10
^{118}Ru	−10255(351)	9714(183)	30718(532)	2016Kn03
^{119}I	782(38)	19503(43)[b]	9734(35)	2019An10
^{119}Xe	822(64)	20774(58)[b]	8299(58)	2019An10
^{121}Rh	−10295(471)	9570(248)	30458(558)	2016Kn03
^{123}Pd	−10295(436)	10391(316)	29958(510)	2016Kn03
^{124}Pd	−12605(546)	11717(373)	32618(623)	2016Kn03
^{124}Cd	−8837.2(59)	12222.6(59)	26654(21)	2020Ma09
^{124}Cs	−372(42)	19703(49)[b]	10198(39)	2019An10
^{125}Ag	−10695(644)	11113(176)	29738(436)	2016Kn03
^{125}Cd	−9591.0(42)	12076.5(40)[b]	27496(790)	2017La16
^{125}In	−8434(12)	13125(20)[b]	25440(30)	2018Ba08
^{125}Cs	−214(42)	19139(44)[b]	10674(42)	2019An10
^{126}Ag	−11755(429)	11353(395)	31098(504)	2016Kn03
^{126}Cd	−10070(21)	11701.6(76)[b]	28449(300)	2017La16
^{126}Cd	−10059(21)	11690.7(69)	28438(300)	2020Ma09
^{126}In	−9124(40)	13082(30)[b]	26187(250)	2018Ba08
^{126}Cs	−685(46)	18752(47)[b]	11552(46)	2019An10
^{127}Cd	−10738(790)	11537.9(63)[b]	29201(400)	2017La16
^{127}Cd	−10732(790)	11532(11)	29195(400)	2020Ma09
^{127}In	−9751(32)	12542(29)[b]	26934(430)	2018Ba08
^{128}Cd	−11260(300)	11111(14)	29943(400)	2020Ma09
^{128}In	−10395(250)	12540(29)[b]	28068(200)	2018Ba08
^{129}Cd	−11450(436)	10541(173)	30543(529)	2016Kn02
^{129}Cd	−11084(400)	10175(13)	30177(500)	2020Ma09
^{129}In	−10741(430)	12083(22)[b]	28974(200)	2018Ba08
^{130}Cd	−12696(574)	11032(411)	32219(647)	2016Kn02
^{130}In	−11607(201)	11855(151)[b]	29820(301)	2018Ba08
^{131}Cd	−10828(1076)	8668(953)	32551(1126)	2016Kn02
^{131}Cd	−10412(501)	8252(35)	32135(601)	2020Ma09
^{131}Cd	−10483(501)	8323(29)	32206(600)	2020Ma09
^{132}Cd	−8434(505)	5524(75)[b]	[a]	2020Ma09
^{132}Cd	−8321(512)	5411(112)[b]	[a]	2020Ma09
^{132}Cs	−1837.3(42)	16394.0(81)[b]	14793.3(32)	2017At01
^{133}Te	−4766(43)	13864(40)[b]	20245(40)	2019An10
^{133}I	−3648(26)	14552(15)[b]	18449(15)	2019An10
^{133}Cs	−1990.0(42)	16155.7(58)	15207.3(31)	2017La16
^{134}Sb	−6460(128)	10422(122)[b]	26083(136)	2019An10
^{134}Te	−4836(41)	13498(41)[b]	20574(41)	2019An10
^{134}I	−4201(56)	14502(54)[b]	19005(54)	2019An10
^{137}Sb	−5575(264)	7062(173)	28658(436)	2016Kn03
^{138}Sb	−4985(521)	5856(426)	28288(584)	2016Kn03
^{138}Ba	−2561.22(44)	15517.86(53)	16410.91(44)	2019Sa36
^{138}La	−2047.20(57)	16616(50)	14752.7(20)	2019Sa36
^{138}Ce	−1041.23(60)	17200.44(66)	13257.25(60)	2019Sa36
^{139}La	−2069.5(22)	16228.1(26)	15258.5(20)	2019Sa39
^{140}I	−1448(173)	7693(173)	23888(1074)	2016Kn03
^{140}Ce	−1610.0(23)	16643.6(55)	14388.3(23)	2019Hu15
^{140}Nd	−173.8(32)	18382(12)	11264.2(59)	2019Hu15
^{141}I	−2395(180)	7702(173)	24818(436)	2016Kn03
^{143}I	−2795(610)	6376(461)	25628(680)	2016Kn03
^{146}Cs	−2964(370)	8181(20)[b]	24607(400)	2017At01
^{147}Cs	−3715(200)	8009(12)[b]	25558(500)	2017At01
^{148}Cs	−4056(400)	7743(13)[b]	[a]	2017At01
^{149}Ba	−4052(175)	8999(176)	25338(266)	2016Kn03
^{150}Ba	−5990(347)	10073(351)	27498(458)	2016Kn03
^{150}La	−3245(174)	9564(175)	23797(174)	2016Kn03
^{151}La	−3815(174)	9233(265)	24638(436)	2016Kn03
^{154}Ce	−5065(650)	9703(611)	25408(702)	2016Kn03
^{154}Nd	−3158(12)	11573(24)	21178(200)	2018Or02
^{154}Nd	−3179(28)	11595(35)[b]	21199(202)	2020ViAA
^{156}Nd	−3647(200)	10525(50)	22560(200)	2018Or02
^{156}Nd	−3655(200)	10533(50)[b]	22568(200)	2018Vi02
^{156}Dy	1758.9(44)	16271.7(82)	11395.0(44)	2019Hu15
^{158}Nd	−4102(203)	9570(203)[b]	23655(302)	2018Vi02
^{158}Nd	−4040(200)	9508(200)	23593(300)	2018Or02
^{158}Pm	−3429(110)	11082.6(45)[b]	22112(200)	2018Vi02
^{159}Nd	−4369(301)	9405(39)	24372(401)	2018Or02
^{160}Nd	−4330(304)	8808(205)	24643(403)	2018Or02
^{160}Pm	−3706(201)	9905(21)[b]	23099(300)	2018Vi02
^{160}Eu	−1754.3(41)	12381(10)	18982(13)	2018Ha19

(*continued on next page*)

Table 3 (*continued*)

^{A}El	Q_α (keV)	S_{2n} (keV)	S_{2p} (keV)	NSR Keyno.
^{160}Yb	3624(26)	18295.8(97)	7437(26)	2019Hu15
^{161}Pm	−3993(306)	9696(60)[b]	23596(404)	2020ViAA
^{162}Sm	−2742(200)	10284.6(78)	21825(300)	2018Or02
^{162}Sm	−2746(200)	10288.6(78)[b]	21829(300)	2018Vi02
^{162}Eu	−2060(13)	11387(10)	20302(200)	2018Ha19
^{162}Eu[d]	−2056(13)	11383(10)[b]	20298(200)	2020ViAA
^{163}Sm	−3215(300)	10070(10)	22588(400)	2018Or02
^{163}Sm	−3167(302)	10023(37)[b]	22540(402)	2020ViAA
^{163}Eu[d]	−2447(11)	10926(11)[b]	20914(300)	2020ViAA
^{163}Gd[d]	−1599(12)	12019(10)[b]	19288(12)	2020ViAA
^{164}Sm	−3220(300)	9538(200)	22953(400)	2018Or02
^{164}Eu	−2656(200)	10674(40)[b]	21439(300)	2020ViAA
^{164}Gd	−1883.9(67)	11556.6(50)[b]	19742(200)	2018Vi02
^{164}Tb	−1035(11)	12553(40)[b]	17968(40)	2018Vi02
^{165}Eu	−2912(300)	10390(70)[b]	22055(400)	2020ViAA
^{165}Gd	−2274.9(81)	11350.6(89)[b]	20380(300)	2018Vi02
^{165}Tb	−1228(11)	12141.7(56)[b]	18693(70)	2020ViAA
^{166}Gd	−2282(200)	10760(100)[b]	20865(300)	2018Vi02
^{166}Tb	−1533(40)	11870(100)[b]	19006(110)	2020ViAA
^{167}Gd	−2488(300)	10476(121)[b]	21551(400)	2020ViAA
^{167}Tb	−1829(70)	11456(100)[b]	19742(140)	2020ViAA
^{168}Tb	−1826(110)	11044(70)[b]	20149(360)	2020ViAA
^{178}Yb	−138(300)	12314.4(87)	17611(400)	2019Hu15
^{180}Au	5826(18)	19466(11)[b]	3953(21)	2017Ma29
^{185}Au	5179.9(56)	17809.8(94)[b]	6233(24)	2017Ma29
^{188}Au	4815(28)	16799(21)[b]	7777(17)	2017Ma29
^{190}Os	1375.8(15)	13713.2(11)	14617.8(31)	2016Ei01
^{190}Pt	3269.5(10)	15627.1(50)	10746.20(98)	2016Ei01
^{190}Au	3914(17)	16604.8(44)[b]	9066.4(97)	2017Ma29
^{194}Pt	1523.50(86)	14613.5(27)	13455.1(24)	2016Ei01
^{195}Po	6687(40)	18936(16)	3506(50)	2017Al34
^{196}Po	6663(14)	18606(14)	3838(18)	2017Al34
^{197}Po	6369(51)	18479(41)	4266(21)	2017Al34
^{197}At	7089(20)	19044(21)	2923(19)	2017Ma29
^{203}Po	5497(11)	16931.9(75)	6617(15)	2017Al34
^{204}Po	5731(185)	16296(185)	6732(185)	2017Sc02
^{204}At	6038(61)	17460(64)	5745(59)	2017Sc02
^{204}Rn	6450(29)	17935(33)	4703(29)	2017Sc02
^{204}Fr[c]	7242(34)	18560(25)	3308(37)	2017Sc02
^{205}Bi	3930(569)	15444(569)	9643(569)	2017Sc02
^{205}Po	6055(257)	15623(257)	6582(257)	2017Sc02
^{205}At	6008(73)	16963(72)	6036(72)	2017Sc02
^{205}Rn	6512(32)	17573(37)	4851(33)	2017Sc02
^{206}At	5819(2150)	16765(2150)	6429(2150)	2017Sc02
^{206}Rn	6952(600)	16738(600)	4802(600)	2017Sc02
^{206}Fr[c]	7062(111)	17854(110)	3807(109)	2017Sc02
^{208}Po	5221.5(56)	15417.1(68)	8255.8(56)	2017Al34
^{210}Ra	7119(34)	17460(34)[b]	4511(35)	2018Ro14
^{210}Ac	7443(159)	18267(168)[b]	3286(157)	2018Ro14
^{211}Po	7434(137)	12370(137)[b]	9556(137)	2019An10
^{211}Fr	6694(42)	16481(43)[b]	5803(40)	2019An10
^{211}Ra	7029(26)	17182(26)[b]	4818(27)	2018Ro14
^{211}Ac	7426(101)	17976(111)[b]	3801(100)	2018Ro14
^{212}At[c]	7844(86)	12772(86)[b]	8387(86)	2019An10
^{212}Rn	6436(30)	15147(30)[b]	7234(30)	2019An10
^{212}Fr	6515(29)	16340(32)[b]	6136(29)	2019An10
^{212}Ra	7033(27)	16784(27)[b]	5171(25)	2018Ro14
^{212}Ac	7545(27)	17629(65)[b]	3941(28)	2018Ro14
^{213}Rn	8204(63)	13125(63)[b]	7882(63)	2019An10
^{213}Fr	6896(13)	15565(17)[b]	6493(13)	2019An10
^{213}Ac	7467(23)	17221(53)[b]	4316(22)	2018Ro14
^{214}Ra	7239(35)	15885(37)[b]	5859(35)	2018Ro14
^{214}Ac	7304(33)	17027(58)[b]	4666(30)	2018Ro14
^{217}At	7240(135)	10454(135)[b]	11774(135)	2019An10
^{218}Rn	7134(54)	11307(54)[b]	11271(54)	2019An10
^{219}At	6340.5(98)	10143.2(92)	12914(20)	2017Ma29
^{220}Ra	7931(320)	12185(320)[b]	9186(320)	2019An10
^{246}Es	7657(228)	14361(210)	7480(110)	2018It04
^{249}Md	8464(298)	14824(305)	5897(222)	2018It04
^{250}Md	8147(260)	14821(277)	6406(147)	2018It04
^{251}Fm	7467(37)	13666(35)	8305(34)	2018It04
^{251}Md	8022(63)	14348(209)	6733(67)	2018It04
^{252}Md	7742(102)	14306(313)	7341(134)	2018It04

(*continued on next page*)

Table 3 (*continued*)

^{A}El	Q_{α} (keV)	S_{2n} (keV)	S_{2p} (keV)	NSR Keyno.
^{254}No	8178(43)	14339(43)	6719(42)	2018It04

[a]Daughter mass excess not in Ref. [5].
[b]Quantity deduced in referenced publication.
[c]Possible mixing of ground state and isomer.
[d]Mass excess reported in 2018Vi02 has been corrected in 2020ViAA, and also in an Erratum for 2018Vi02 to be published in PRL.

Table 4
Isomer and charged atom mass excesses.

^{A}El	E* (keV)	Charge	ME (keV)	NSR Keyno.
^{1}H	0	1	−6777.985(2)	2017He14
p+d-^{3}He	0	3	5493.42(4)	2017Ha33
^{12}C	0	6	−3064.96357(3)	2017He14
^{26}Al	228.306(13)	0	−12210.20(6)	2017Se09
^{42}Sc[a]	616.751(82)	0	*N/A*	2017Er01
^{44}V[a]	286(28)	0	−23541(19)	2018Zh29
^{44}V[a]	268(10)	0	−23537(5)	2020PuAA
^{52}Fe	6958.0(4)	0	−41370.01(65)	2017Ne05
^{52}Co	387(13)	0	−33958(11)	2017Ne05
^{52}Co	387(13)	0	−33974(10)	2018Zh29
^{53}Co	4325.0(2.0)	0	−38333.6(27)	2016Su10
^{88}Tc[a]	70(7)	0	−61600(5)	2019Vi05
^{94}Ru	2644.1(4)	0	−79905(132)	2017Ze02
^{97}Ag[a]	618(38)	0		2020Ho03
^{101}In[a]	659(50)	0	−67891(48)	2019Xu13
^{101}In[a]	608(57)	0		2020Ho03
^{103}In[a]	689(77)	0		2020Ho03
^{105}In[a]	702(27)	0		2020Ho03
^{107}In[a]	663(22)	0		2020Ho03
^{109}In[a]	651(27)	0		2020Ho03
^{109}In[a]	2098(11)	0		2020Ho03
^{125}Cd	186(4)	0	−73157.9(90)	2017La16
^{125}In	360.12(9)	0	−80061(13)	2018Ba08
^{126}In[a]	90(7)	0	−77719.6(50)	2018Ba08
^{127}Cd[a]	283(8)	0	−68460.1(47)	2017La16
^{127}Cd[a]	283(12)	0	−68453.8(54)	2020Ma09
^{127}In	408.9(3)	0	−76487(15)	2018Ba08
^{127}In	1870(60)	0	−75179(48)	2018Ba08
^{128}In[a]	262(13)	0	−73908.8(91)	2018Ba08
^{129}Cd[a]	343(8)	0	−63122.1(54)	2020Ma09
^{129}In	458(4)	0	−72392(14)	2018Ba08
^{130}In[a]	359(34)	0	−69503(28)	2018Ba08
^{133}Te	334.26(4)	0	−82600(60)	2019An10
^{133}I	1634.148(10)	0	−84209(21)	2019An10
^{134}Sb	279(1)	0	−73703(210)	2019An10
^{134}I	316.49(22)	0	−83705(93)	2019An10
^{160}Eu[a]	93.0(12)	0	−63400.4(8)	2018Ha19
^{162}Eu[a]	160.2(24)	0	−58563.7(19)	2018Ha19
^{162}Eu[a]	155(8)	0	−58565.7(76)	2020ViAA
^{163}Gd	137.8(1.0)	0	−61200(4)	2018Vi02
^{163}Gd	137.8(1.0)	0	−61221.3(134)	2020ViAA
^{168}Lu	202.81(12)	0	−56908.2(58)	2019Hu15
^{195}Po[a]	150(9)	0	−10968.3(72)	2017Al34
^{197}Po[a]	199(12)	0	−13197.1(70)	2017Al34
^{197}At	45(8)	0	−6326(14)	2017Ma29
^{199}Po	311.9(2.7)	0	−14929.4(49)	2017Al34
^{204}Fr[b]	50(4)	0	679(24)	2017Sc02
^{206}Fr[b]	190(40)	0	−1104(107)	2017Sc02
^{211}Po	1462(5)	0	−11015(160)	2019An10

[a]Excitation energy obtained from mass measurements in the cited reference.
[b]Possible mixing of ground state and isomer.

References used in the Tables

[2016Al03]	M. Alanssari, D. Frekers, T. Eronen et al., Phys. Rev. Lett. **116** (2016) 072501
[2016Al30]	M.Alanssari, D. Frekers, T. Eronen et al., Int. J. Mass Spec. **406** (2016) 1–3
[2016Ca22]	L. Canete, A. Kankainen, T. Eronen et al., Eur. Phys. J. A **52** (2016) 124
[2016Ei01]	M. Eibach, G. Bollen, K. Gulyuz et al., Phys. Rev. C **94** (2016) 015502
[2016Ga33]	N. D. Gamage, G. Bollen, M. Eibach et al., Phys. Rev. C **94** (2016) 025505
[2016Gu02]	K. Gulyuz, G. Bollen, M. Brodeur et al., Phys. Rev. Lett. **116** (2016) 012501
[2016Ka15]	A. Kankainen, L. Canete, T. Eronen et al., Phys. Rev. C **93** (2016) 041304(R)
[2016Kl04]	R. Klawitter, A. Bader, M. Brodeur et al., Phys. Rev. C **93** (2016) 045807
[2016Kn02]	R. Knöbel, M. Diwisch, F. Bosch et al., Phys. Lett. B **754** (2016) 288
[2016Kn03]	R. Knöbel, M. Diwisch, H. Geissel et al., Eur. Phys. J. A **52** (2016) 138
[2016Ko45]	F. Köhler, K. Blaum, M. Block et at., Nature Comms**.** **7** (2016) 10246
[2016Me07]	Z. Meisel, S. George, S. Ahn et al., Phys. Rev. C **93** (2016) 035805
[2016Su10]	J. Su, W. P. Liu, N. T. Zhang et al., Phys. Lett. B **756** (2016) 323
[2016Xu10]	X. Xu, P. Zhang, P. Shuai et al., Phys. Rev. Lett. **117** (2016) 182503
[2017Al34]	N. A. Althubiti, D. Atanasov, K. Blaum et al., Phys. Rev. C **96** (2017) 044325
[2017At01]	D. Atanasov, D. Beck, K. Blaum et al., J. Phys. G **44** (2017) 044004
[2017Br14]	M. Brodeur, A. A. Kwiatkowski, O. M. Drozdowski et al., Phys. Rev. C **96** (2017) 034316
[2017De18]	A. de Roubin, D. Atanasov, K. Blaum et al., Phys. Rev. C **96** (2017) 014310
[2017Er01]	T. Eronen, J. C. Hardy, L. Canete et al., Phys. Rev. C **95** (2017) 025501
[2017Ga20]	A. T. Gallant, M. Alanssari, J. C. Bale et al., Phys. Rev. C **96** (2017) 024325
[2017Ha33]	S. Hamzeloui, J. A. Smith, D. J. Fink et al., Phys. Rev. A **96** (2017) 060501
[2017He14]	F. Heiße, F. Köhler-Langes, S. Rau et al., Phys. Rev. Lett. **119** (2017) 033001
[2017Ka53]	R. M. E. B. Kandegedara, G. Bollen, M. Eibach et al., Phys. Rev. C **96** (2017) 044321
[2017La16]	D. Lascar, R. Klawitter, C. Babcock et al., Phys. Rev. C **96** (2017) 044323
[2017Ma29]	V. Manea, P. Ascher, D. Atanasov et al., Phys. Rev. C **95** (2017) 054322
[2017Ne05]	D. A. Nesterenko, A. Kankainen, L. Canete et al., J. Phys. G **44** (2017) 065103
[2017Re10]	M. P. Reiter, K. G. Leach, O. M. Drozdowski et al., Phys. Rev. C **96** (2017) 052501
[2017Sc02]	P. Schury, M. Wada, Y. Ito et al., Phys. Rev. C **95** (2017) 011305(R)
[2017Se09]	N. Severijns, and B. Blank, J. Phys. G **44** (2017) 074002
[2017We16]	A. Welker, N. A. S. Althubiti, D. Atanasov et al., Phys. Rev. Lett. **119** (2017) 192502
[2017Ze02]	Q. Zeng, M. Wang, X. H. Zhou et al., Phys. Rev. C **96** (2017) 031303
[2017Zh12]	P. Zhang, X. Xu, P. Shuai et al., Phys. Lett. B **767** (2017) 20–24
[2018Ba08]	C. Babcock, R. Klawitter, E. Leistenschneider et al., Phys. Rev. C **97** (2018) 024312
[2018Fu11]	C. Y. Fu, Y. H. Zhang, X. H. Zhou et al., Phys. Rev. C **98** (2018) 014315
[2018Ha19]	D. J. Hartley, F. G. Kondev, R. Orford et al., Phys. Rev. Lett. **120** (2018) 182502
[2018It04]	Y. Ito, P. Schury, M. Wada et al., Phys. Rev. Lett. **120** (2018) 152501
[2018Iz01]	C. Izzo, G. Bollen, M. Brodeur et al., Phys. Rev. C **97** (2018) 014309
[2018Ki21]	S. Kimura, Y. Ito, D. Kaji et al., Int. J. Mass Spec. **430** (2018) 134-142
[2018Le03]	E. Leistenschneider, M. P. Reiter, S. Ayet San Andrés et al., Phys. Rev. Lett. **120** (2018) 062503
[2018Mi08]	S. Michimasa, M. Kobayashi, Y. Kiyokawa et al., Phys. Rev. Lett. **121** (2018) 022506
[2018Mo14]	M. Mougeot, D. Atanasov, K. Blaum et al., Phys. Rev. Lett. **120** (2018) 232501
[2018On01]	W. J. Ong, A. A. Valverde, M. Brodeur et al., Phys. Rev. C **98** (2018) 065803
[2018Or02]	R. Orford, N. Vassh, J. A. Clark et al., Phys. Rev. Lett. **120** (2018) 262702
[2018Re11]	M. P. Reiter, S. Ayet San Andrés, E. Dunling et al., Phys. Rev. C **98** (2018) 024310
[2018Ro14]	M. Rosenbusch, Y. Ito, P. Schury et al., Phys. Rev. C **97** (2018) 064306
[2018Va01]	A. A. Valverde, M. Brodeur, G. Bollen et al., Phys. Rev. Lett. **120** (2018) 032701
[2018Vi02]	M. Vilen, J. M. Kelly, A. Kankainen et al., Phys. Rev. Lett. **120** (2018) 262701 and Erratum to appear in PRL.
[2018Xi04]	Y. M. Xing, K. A. Li, Y. H. Zhang et al., Phys. Lett. B **781** (2018) 358–363
[2018Zh29]	Y. H. Zhang, P. Zhang, X. H. Zhou et al., Phys. Rev. C **98** (2018) 014319
[2019An10]	S. Ayet San Andrés, C. Hornung, J. Ebert et al., Phys. Rev. C **99** (2019) 064313
[2019As04]	P. Ascher, N. Althubiti, D. Atanasov et al., Phys. Rev. C **100** (2019) 014304
[2019Hu15]	W. J. Huang, D. Atanasov, G. Audi et al., Eur. Phys. J. A **55** (2019) 96
[2019Ka30]	J. Karthein, D. Atanasov, K. Blaum et al., Phys. Rev. C **100** (2019) 015502
[2019Sa36]	R. Sandler, G. Bollen, J. Dissanayake et al., Phys. Rev. C **100** (2019) 014308
[2019Sa39]	R. Sandler, G. Bollen, N. D. Gamage et al., Phys. Rev. C **100** (2019) 024309
[2019Sc11]	S. Schwarz, B. R. Barquest, G. Bollen et al., Nucl Phys A **989** (2019) 201–213
[2019Su14]	L. J. Sun, X. X. Xu, C. J. Lin et al., Phys. Rev. C **99** (2019) 064312
[2019Vi05]	M. Vilén, A. Kankainen, P. Baczyk et al., Phys. Rev. C **100** (2019) 054333
[2019Xu09]	X. Xu, M. Wang, K. Blaum et al., Phys. Rev. C **99** (2019) 064303
[2019Xu13]	X. Xu, J. H. Liu, C. X. Yuan et al., Phys. Rev. C **100** (2019) 051303
[2020Ho03]	C. Hornung, D. Amanbayev, I. Dedes et al., Phys. Lett. B **802** (2020) 135200
[2020Ma09]	V. Manea, J. Karthein, D. Atanasov et al., Phys. Rev. Lett. **124** (2020) 092502
[2020PuAA]	D. Puentes, G. Bollen, M. Brodeur et al., arXiv:2003.06039 (2020)
[2020Re04]	M. P. Reiter, S. Ayet San Andrés, S. Nikas et al., Phys. Rev. C **101** (2020) 025803
[2020Su05]	L. J. Sun, X. X. Xu, S. Q. Hou et al., Phys. Lett. B **802** (2020) 135213
[2020ViAA]	M. Vilen, J. M. Kelly, A. Kankainen et al., Phys. Rev. C (2020) accepted Jan 24, 2020. Pre-publication copy received from the authors.