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TABLES OF MAXIMUM ENERGIES OF CHARACTERISTIC β-DECAY.

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TABLES OF MAXIMUM ENERGIES OF CHARACTERISTIC β-DECAY

V. Loessner

ABSTRACT. The maximum energies characteristic of β-decays are given for 120 isotopes arranged by order of energy. The table can be used in identifying unknown beta-emitting isotopes if the maximum energy is measured.

The following table contains the maximum energy characteristics of β-decays /1* of about 120 common nuclides. The selected maximum β-energies are ordered according to energy. In addition, data are given regarding the decay frequency, half life, other β^- and β^+ decays of the corresponding nuclide, electron capture, γ-energies, end products and mother substances. The data contained in the table are taken from the "International Directory of Isotopes" (Ref. 1). The "Nuclear Data Sheets"(National Research Council, Washington 25, D.C.) up to June 1964 are contained in it. Data which are not shown (Ref. 1) are taken from the book Landolt-Börnstein, New Series (Ref. 2), in which the data shown in the "Nuclear Data Sheets" up to the fall of 1960 have been processed.

The analysis of the β-radiation is important in the identification of unknown nuclides or nuclide mixtures. In many cases, scintillation-γ-spectrometry with a NaJ(Tl) crystal, which has been developed through a standard method, is sufficient for the identification. However, often γ-radiation is either not present, cannot be readily measured, or is so complex that the resolution in terms of energy of the scintillation measurement device is too low to separate the large number of γ-energies. In this case the analysis of the β-radiation can give important information for identification purposes. The possibilities of β-analysis have recently been considerably extended by improved methods in scintillation-β-spectrometry [we would especially like to mention the fast method of Gleu, Hoyer and König (Ref.3)] and in semiconductor spectrometry. Even simple methods (Ref.4), such as range measurements, determination of the absorption coefficient, measurement of back scattering, etc., give useful results. However, there are no great possibilities for separating several β-components. /2

In order to associate the corresponding nuclide with the maximum energy determined from the β-analysis, it is very useful to have a table in which the β-decays are ordered according to their maximum energy. Since the size of such a table must be related to its usefulness, it is first necessary to make a selection of the nuclides to be tabulated and to then make a selection from their maximum β-energies.

In the present table, almost all nuclides mentioned in (Ref. 1) were included. The nuclides used in applications in the German Democratic Republic were given special consideration. Nuclides, which only show α-radiation

*Note: Numbers in the margin indicate pagination in the original foreign text.

or electron capture are not contained in the table. If the nuclide has several β-transitions, then the largest maximum energy is entered in the table, unless its intensity is too small. In addition, sometimes one or two additional maximum energies are selected if the energy is large. These one to three characteristic maximum β-energies are ordered according to energy. All the other important decay data are given after the tabulated maximum energy in complete form. The continuation of those data pertaining to a given β-energy on the next page is indicated by the sign +) in the column "Subsequent Products, Mother Products".

Explanation of the Individual Columns:

1. "Energy"

This column contains the selected maximum energies of β-radiating nuclides in the order of increasing energy. The entry is given MeV. The conversion electron energies are not given.

2. "Decay, Frequency"

The nature of the decay (β^- or β^+) and the frequency of the transition in percent are given (as related to the total decay rate of 100%) for the maximum energies shown in column 1.

3. "HLT"

In this column the half lifetime of the decaying nuclide is given. /3

4. "Nuclide"

The element symbol and the mass number of the decaying nucleus are shown here.

5. "Other β^- and β^+ Energies and EC, Frequency"

In addition to the energies tabulated in column 1, all other maximum energies of β^- - and β^+-decays are given with their percentile contribution (in brackets) to the total decay rate of 100%. In general, decays whose intensity is less than 1% are usually not entered.

Electron capture is specified by the symbol EC (Electron Capture), and its frequency is given by the following percent in brackets (related to the total decay rate of 100%).

6. "γ-Energies, Frequencies, Frequency of IC"

The most important energies of the accompanying γ-radiation are given here as well as their frequency (if the data are available) in percent (also referred to the total decay rate of 100%). In the case of γ-cascades, the total percentage of 100% can be exceeded. If instead of a quantum emission there is an "internal conversion" (IC), the frequency of it is given just after the corresponding γ-energy in a separate column. The addition of both percentage numbers (γ + IC) gives the total contribution of this transition. In the case of metastable states, the transitions to nuclear levels which have lower energies are called IT (isomeric transition).

7. "End Products, Mother Substance"

If the end products which are created in the nuclear decay are not stable, then they, as well as the radiations which occur during these decays, are shown in the following order: Element symbol with mass number, the half life of the end products in brackets, and then the accompanying radiations are shown. The latter are given in more detail in some cases. The frequency of "Inner Conversion" (IC) is given in / / - in brackets. /4

If the nuclide in question can be produced by the decay of another nuclide, the "mother substance" and its radiations are given in the same form as the end products. In general, only those mother substances are mentioned whose half lives are larger than, or have the same order of magnitude as, those of the tabulated nuclides.

8. "Number"

The region of application of this table can be considerably extended with only a small amount of additional effort. In the following, we give all the nuclides shown in the table in order of increasing mass number. After each nuclide there is a number in brackets, which is used as a running number in the table. It then becomes possible to find any data of interest that go with a certain nuclide.

The following nuclides are shown in the table:

^{3}H (1)	^{44}Sc (119)	^{64}Cu (52; 65)
^{10}Be (49)	^{45}Ca (18)	^{65}Ni (135)
^{14}C (9)	^{46}Sc (27)	^{65}Zn (24)
^{18}F (63)	^{47}Sc (33; 57)	^{66}Ga (154)
^{22}Na (48)	^{47}Ca (70; 134)	^{69}Zn (84)
^{24}Na (115)	^{48}V (73)	^{72}Ga (89; 150)
^{26}Al (103)	^{52}Mn (55)	^{72}As (146; 151)
^{28}Mg (36)	^{52}Fe (80)	^{74}As (76; 85; 112)
^{32}P (127)	^{56}Mn (147)	^{76}As (144; 148)
^{35}S (11)	^{56}Co (123)	^{77}As (69)
^{36}Cl (75)	^{58}Co (39)	^{82}Br (35)
^{40}K (111)	^{59}Fe (37)	^{84}Rb (126)
^{42}K (153)	^{60}Co (22)	^{85}Kr (68)
^{43}K (81)	^{63}Ni (4)	^{86}Rb (128)
		^{89}Sr (118)

^{90}Sr (47)	^{127}Sb (122)	^{159}Gd (87)
^{90}Y (142)	^{129}J (8)	^{160}Tb (51; 82)
^{91}Y (124)	^{130}J (92)	^{161}Tb (43)
^{95}Zr (28)	^{131}J (59)	^{165}Dy (109)
^{95}Nb (10)	^{132}J (137)	^{166}Ho (129)
^{99}Mo (107)	^{132}Te (15)	^{169}Er (26)
^{99}Tc (19)	^{132}Cs (58)	^{170}Tm (90)

^{102}Rh (101)
^{103}Ru (14)
^{105}Rh (50)
^{105}Ru (104)
^{106}Ru (2)
^{106}Rh (152)
^{109}Pd (93)
$^{110m}Ag/^{110}Ag$ (46)
^{111}Ag (94)
$^{114m}In/^{114}In$ (133)
$^{115m}In/^{115}In$ (41)
^{115m}Cd (125)
^{115}Cd (56; 99)
^{121}Sn (29)
^{122}Sb (116; 132)
^{123}Sn (117)
^{124}Sb (61; 143)
^{124}J (139)
^{125}Sb (5; 21; 60)
^{126}J (83; 108)
$^{127m}Te/^{127}Te$ (71)

^{133}Xe (25)
^{133}J (106)
^{134}Cs (64)
^{137}Cs (44; 105)
^{140}Ba (42; 91)
^{140}La (113; 140)
^{141}Ce (32; 54)
^{142}Pr (138)
^{143}Pr (86)
^{143}Ce (98; 114)
^{144}Ce (12; 23)
^{144}Pr (149)
^{147}Pm (16)
^{147}Nd (79)
^{149}Pm (96)
^{152m}Eu(131)
^{152}Eu (74; 120)
^{153}Sm (72; 78)
^{154}Eu (53; 130)
^{155}Eu (7; 17)
^{156}Eu (145)

^{171}Er (95; 121)
^{175}Yb (38)
^{177}Lu (40)
^{181}Hf (30)
^{182}Ta (34; 45)
^{185}W (31)
^{186}Re (97)
^{187}W (62; 110)
^{188}Re (136)
$^{191m}Os/^{191}Os$ (6)
^{192}Ir (67)
^{193}Os (100)
^{194}Ir (141)
^{197}Pt (66)
^{198}Au (88)
^{199}Au (20)
^{203}Hg (13)
^{204}Tl (77)
^{210}Bi (102)
^{227}Ac (3)

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Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,018	β^- (100)	12,26 a	^{3}H					1
0,039	β^- (100)	1,0 a	^{106}Ru				F: ^{106}Rh(30 sec.) β^-, γ β^-: 2,0 (2); 2,4 (11); 3,0 (8); 3,54 (78); γ : 0,513 (21); 0,612 (1); 0,624 (10); 1,045 (2); u. a.	2
0,046	β^- (99)	22 a	^{227}Ac	also: α	some very soft		F: some (short lifetime) α, β^-, γ	3
0,067	β^- (100)	120 a	^{63}Ni					4
0,12	β^- (37)	2,7 a	^{125}Sb	β^-: 0,09 (2) 0,23 (1) 0,30 (40) 0,44 (6) 0,61 (13)	0,18 (7) 0,43 (31) 0,46 (10) 0,60 (24) 0,63 (11) others		M: ^{125m}Sn/^{125}Sn(9,7 min / 9,4 d) β^-,γ F: ^{125m}Te (58 d) γ γ (IT): 0,035 (76) 0,11 (21)	5
0,139	β^- (100)	14h d/ 15 d	^{191m}Os/ ^{191}Os		IT: 0,074 (0)	100	F: ^{191m}Ir (4,9 sec.) γ γ (IT): 0,042 (~ o) /~100 / 0,129 (2o) / 80 /	6
0,140	β^- (43)	1,8 a	^{155}Eu	β^-: 0,158 (32) 0,185 (10) 0,247 (15)	0,019 (0) 0,027 (4) 0,045 (1) 0,060 (2) 0,087 (32) 0,105 (19)	18 13 13 6		7

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
150	β^- (100)	$1{,}6 \cdot 10^7$ a	^{129}J		0,038 (4)	96		8
155	β^- (100)	5570 a	^{14}C					9
16	β^- (99)	35 d	^{95}Nb	β^-: 0,93 (1)	0,768 (99)		M: ^{95}Zr(65 d) β^-, γ β^-: 0,360 (43); 0,396 (55) 0,885 (2); 1,13 (0,4) γ : 0,726 (55); 0,76 (43)	10
167	β^- (100)	87 d	^{35}S				over ^{95m}Nb (90h)γ γ (IT): 0,235 (0) / 2 /	11
186	β^- (20)	284 d	^{144}Ce	β^-: 0,240 (8) 0,320 (72)	0,034 (~0) 0,042 0,054 (~0,) 0,081 (~2) 0,100 (~0,2) 0,134 (~10)	~ 1 ~ 1 ~ 4 8	F: ^{144}Pr(17 min) β^-, γ especially: β^-: 0,803 (1) 2,29 (1) 2,98 (98) γ : 0,691 (1,6) 1,49 (0,3) 2,18 (0,8)	12
,21	β^- (100)	47 d	^{203}Hg		0,279 (81)	19		13
,21	β^- (89)	40 d	^{103}Ru	β^-: 0,10 (7) 0,71 (3)	0,053 (0,5) 0,498 (89) 0,610 (7)	1	F: ^{103m}Rh(57 min) IC, γ : 0,04 (0) /100/	14

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
,22	β^- (100)	78 h	^{132}Te		0,052 (~16) 0,23 (92)	~ 84 8	F: ^{132}J(2,3 h) β^-, γ espe- β^-: 0,60 (21) 1,49 (12) cially: 1,04 (15) 1,61 (21) 1,22 (12) 2,14 (18)	15
,225	β^- (~100)	2,6 a	^{147}Pm				F: ^{147}Sm($1,2 \cdot 10^{11}$ a) α M: ^{147}Nd(11 d) β^-,γ	16
,247	β^- (15)	1,8 a	^{155}Eu	β^-: 0,140 (43) 0,158 (32) 0,185 (10)	0,019 (0) 0,027 (4) 0,045 (1) 0,060 (2) 0,087 (32) 0,105 (19) others	18 13 13 6		17
),254	β^- (100)	165 d	^{45}Ca					18
),292	β^- (100)	$2,1 \cdot 10^5$ a	^{99}Tc				M: ^{99}Mo(67 h) β^-, γ especially: β^-: 1,23 (85) γ : 0,041 (1) /5/; 0,741 (10) 0,181 (2) /2/; 0,780 (4) via: ^{99m}Tc (6h) γ γ (IT): 0,140 (84) /10/	19
),30	β^- (70)	3,15 d	^{199}Au	β^-: 0,25 (23) 0,46 (7)	0,050 (0,3) 0,158 (41) 0,208 (9)	4 39 8		20

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,30	β^- (40)	2,7 a	^{125}Sb	β^-: 0,09 (2) 0,12 (37) 0,23 (1) 0,44 (6) 0,61 (13)	0,18 (7) 0,43 (31) 0,46 (10) 0,60 (24) 0,63 (11) Others		M: $^{125m}Sn/^{125}Sn$(9,7 min / 9,4 d) β^-,γ F: ^{125m}Te (58 d) γ γ (IT): 0,035 (76) 0,11 (21)	21
0,313	β^- (~100)	5,27 a	^{60}Co	β^-: 1,48 (~ 0,01)	1,173 (100) 1,332 (100)			22
0,320	β^- (72)	284 d	^{144}Ce	β^-: 0,186 (20) 0,240 (8)	0,034 (~ 0) 0,042 0,054 (~ 0) 0,081 (~ 2) 0,100 (~ 0,2) 0,134 (~10)	~ 1 ~ 1 ~ 4 8	F: ^{144}Pr(17 min) β^-,γ especially: β^-: 0,803 (1) 2,29 (1) 2,98 (98) γ : 0,691 (1,6) 1,49 (0,3) 2,18 (0,8)	23
0,326	β^+ (1,7)	245 d	^{65}Zn	EC (98)	0,51 (from β^+) 1,14 (49)			24
0,34	β^- (100)	5,3 d	^{133}Xe		0,081 (35)	65	M: ^{133}J(20,9 h) β^-,γ	25
0,340	β^- (58)	9,5 d	^{169}Er	β^-: 0,332 (42)	0,0084 (~ 0)	42		26
0,357	β^- (~100)	84 d	^{46}Sc	β^-: 1,48 (0,004)	0,887 (100) 1,119 (100)			27

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,396	β^- (55)	65 d	^{95}Zr	β^-: 0,360 (43) 0,885 (2) 1,13 (0,4)	0,726 (55) 0,76 (43)		F: ^{95m}Nb(90 h) γ γ (IT): 0,235 (0) / 2 / ^{95}Nb(35 d) β^-, γ especially: β^-: 0,160 (99) γ : 0,768 (99)	28
0,4	β^- (100)	28 h	^{121}Sn				Note: ^{121m}Sn(> 5 a) approx. same β^--energy	29
0,41	β^- (~96)	45,5 d	^{181}Hf	β^-: ~0,34 (~1) 0,55 (~2)	0,133 (37) 0,136 (6) 0,137 (2) 0,346 (13) 0,482 (80)	49 9 2 1 2		30
0,432	β^- (100)	74 d	^{185}W					31
0,435	β^- (70)	32,5 d	^{141}Ce	β^-: 0,580 (30)	0,145 (49)	21	M: ^{141}La(3,8 h) β^-, γ	32
0,440	β^- (~70)	3,45 d	^{47}Sc	β^-: 0,600 (~30)	0,160 (~70)		M: ^{47}Ca(4,7 d) β^-, γ β^-: 0,69 (82) 2,00 (18) γ : 0,50 (6) 0,81 (6) 1,30 (76)	33

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
.443	β^- (23)	115 d	^{182}Ta	β^-: 0,18 (38) 0,25 (~ 5) 0,33 (~ 2) 0,363 (20) 0,48 (~ 4) 0,514 (~ 8)	0,066 (2) 0,068 (28) 0,085 (2) 0,100 (13) 0,152 (12) 0,222 (12) 1,122 (33) 1,189 (15) 1,222 (28) 1,231 (11) others	8 6 12 43 8 1		34
.444	β^- (100)	36 h	^{82}Br		0,554 (74) 0,618 (44) 0,698 (28) 0,777 (84) 0,827 (26) 1,044 (26) 1,319 (30) 1,477 (16)			35
.459	β^- (100)	21,4 h	^{28}Mg		0,032 (96) 0,40 (30) 0,95 (30) 1,35 (70)	4	F: ^{28}Al(2,3 min) β^-,γ β^-: 2,868 (100) γ : 1,78 (100)	36
.46	β^- (54)	45 d	^{59}Fe	β^-: 0,27 (46) 1,56 (0,3)	0,19 (3) 1,10 (57) 1,29 (44) others			37

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,467	β^- (87)	4,1 d	^{175}Yb	β^-: 0,07 (10) 0,357 (3)	0,114 (~2) 0,137) 0,145) weak 0,25) 0,283 (~4) 0,396 (~7)	~4		38
0,49	β^+ (15)	71 d	^{58}Co	EC: (85)	0,51 (from β^+) 0,81 (99,5) 1,6 (0,5)			39
0,497	β^- (90)	6,75 d	^{177}Lu	β^-: 0,176 (7) 0,384 (3)	0,071 (0,1) 0,112 (3,2) 0,208 (6,7) 0,250 (0,1) 0,321 (0,1)	6,8 0,3	M: ^{177}Yb(1,9 h) β^-, γ	40
0,5	β^- (100)	4,5 h/ $6 \cdot 10^{14}$ a	^{115m}In/ ^{115}In	β^-: 0,84 (5,5) instead IT	IT: 0,335 (94,5)		M: ^{115m}Cd(43 d) β^-, γ ^{115}Cd (2,3 d) β^-, γ	41
0,5	β^- (25)	12,8 d	^{140}Ba	β^-: 0,6 (10) 0,9 (5) 1,0 (60)	0,030 0,132 0,160 0,305 0,43 0,54 others		F: ^{140}La(40 h) β^-, γ	42
0,509	β^- (64)	6,9 d	^{161}Tb	β^-: 0,45 (26) 0,584 (10)	0,0256 (26) 0,0489 (22) 0,0572 (13) 0,0745 (11) others	47 51 13 5		43

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,514	β^- (95)	30 a	^{137}Cs	β^-: 1,18 (5)	0.662 (85) from Ba-137m	10		44
0,514	β^- (~8)	115 d	^{182}Ta	β^-: 0,18 (38) 0,25 (~5) 0,33 (~2) 0,363 (20) 0,443 (23) 0,48 (~4)	0,066 (2) 0,068 (28) 0,085 (2) 0,100 (13) 0,152 (12) 0,222 (12) 1,122 (33) 1,189 (15) 1,222 (28) 1.231 (11) others	8 6 12 43 8 1		45
0,530	β^- (33)	253 d/ 24 sec	^{110m}Ag/ ^{110}Ag	via ^{110m}Ag : β^-: 0,085 (65) via ^{110}Ag : β^-: 2,87 (2)	IT: 0,116 (~0) über β^-: 0,656 (93) 0,706 (19) 0,764 (23) 0,885 (72) 0,937 (34) 1,384 (24) 1,504 (12) others	~ 2		46
0,544	β^- (100)	28 a	^{90}Sr				F: ^{90}Y(64,4 h) β^- β^-: 2,27 (~100)	47
0,544	β^+ (90)	2,58 a	^{22}Na	β^+: 1,83 (0,06) EC: (10)	0,51 (from β^+) 1,274 (100)			48

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,555	β^- (100)	$2{,}5 \cdot 10^6$ a	^{10}Be					49
0,56	β^- (~90)	35 h	^{105}Rh	β^-: 0,25 (~10)	0,319		M: ^{105}Ru(4,4 h) β^-, γ β^-: 1,180 (~50) 1,115 (~35) γ : 0,129 0,477 0,263 0,668 0,317 0,723 0,400	50
0,56	β^- (38)	73 d	^{160}Tb	β^-: 0,3 (12) 0,46 (19) 0,76 (11) 0,86 (20) 1,71 (0,4)	0,087 0,298 0,88 0,97 1,18 1,27 others			51
0,57	β^- (38)	12,8 h	^{64}Cu	β^+: 0,66 (19) EC: (43)	0,51 (from β^+) 1,34 (0,6)			52
0,57	β^- (35)	16 a	^{154}Eu	β^-: 0,25 (29) 0,83 (~20) 0,97 (~ 3) 1,60 (~ 3) 1,85 (~10)	0,12x 0,25 0,59 0,69 0,72 0,76 0,87 1,00x 1,28x x) others intensive line			53

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,580	β^- (30)	32,5 d	^{141}Ce	β^-: 0,435 (70)	0,145 (49)	21	M: ^{141}La(3,8 h) β^-, γ	54
0,58	β^+ (29)	5,7 d	^{52}Mn	EC: (71)	0,51 (from β^+) 0,744 (82) 0,935 (84) 1,24 (6) 1,33 (6) 1,43((100) others		M: ^{52}Fe(8,2 h) β^+, EC, γ	55
0,59	β^- (24)	2,3 d	^{115}Cd	β^-: 0,63 (13) 0,85 (1) 1,11 (62)	0,49 (12) 0,52 (24) others		F: ^{115m}In/^{115}In(4,5 h/$6\cdot10^{14}$a) β^-,γ espe- cially: β^-: 0,84 (5) via ^{115m}In γ: 0,34 (48) / 44 / via ^{115m}In (IT)	56
0,600	β^- (30)	3,45 d	^{47}Sc	β^-: 0,440 (70)	0,160 (70)		M: ^{47}Ca(4,7 d) β^-, γ β^-: 0,69 (82) 2,00 (18) γ: 0,50 (6) 0,81 (6) 1,30 (76)	57
0,6	β^+ (1)	6,5 d	^{132}Cs	EC: (99)	0,51 (from β^+) 0,673 (99)			58

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,61	β^- (87)	8,06 d	^{131}J	β^-: 0,25 (3) 0,33 (9) 0,81 (1)	0,08 (2) 0,28 (5) 0,36 (80) 0,64 (9) 0,72 (3)	4 0,3 1	F: stable (^{131}Xe) ^{131m}Xe(12 d) IT IT: 0,164 (0) / 0,7 / M: $^{131m}Te/^{131}Te$(1,2 d/25 min) β^-, γ	59
0,61	β^- (13)	2,7 a	^{125}Sb	β^-: 0,09 (2) 0,12 (37) 0,23 (1) 0,30 (40) 0,44 (6)	0,18 (7) 0,43 (31) 0,46 (10) 0,60 (24) 0,63 (11) others		M: $^{125m}Sn/^{125}Sn$(9,7 min/9,4 d) β^-, γ F: ^{125m}Te (58 d) γ γ (IT): 0,035 (76) 0,11 (21)	60
0,62	β^- (51)	60 d	^{124}Sb	β^-: 0,051 (2) 0,22 (11) 0,95 (5) 1,02 (2) 1,59 (5) 2,31 (23)	0,60 (98) 0,65 (7) 0,72 (11) 1,69 (48) others			61
0,63	β^- (70)	24,0 h	^{187}W	β^-: 0,34 (10) 1,315 (20)	0,072 0,136 0,482 x 0,552 0,621 0,686 x 0,775 others x) intensive lines		F: ^{187}Re($6 \cdot 10^{10}$a) β^- β^-: <0,008 (100)	62

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,644	β^+ (~97)	112 min	^{18}F	EC: (~3)				63
0,65	β^- (75)	2,2 a	^{134}Cs	β^-: 0,086 (20) 0,28 (3) 0,89 (~1,5) 1,45 (~0,2)	0,20 0,97 0,605 0,80 1,17 1,37 others			64
0,66	β^+ (19)	12,8 h	^{64}Cu	β^-: 0,57 (38) EC: (43)	0,51 (from β^+) 1,34 (0,6)			65
0,67	β^- (90)	20 h	^{197}Pt	β^-: 0,47 (1) 0,48 (9)	0,077 (21) 0,191 (2) 0,279 (1)	78 7		66
0,67	β^- (46)	74 d	^{192}Ir	β^-: 0,24 (8) 0,54 (42) EC: (4)	0,206 (3) 0,296 (26) 0,308 (28) 0,317 (72) 0,468 (47) 0,485 (3) 0,589 (5) 0,604 (9) 0,612 (6) others	1 3 3 8 1	F: stable (^{192}Os); ^{192}Pt (~10^{15} a) α Note: ^{192m}Ir(>5a) IT IT: 0,161	67
0,672	β^- (<99,3)	10,6 a	^{85}Kr	β^-: 0,15 (> 0,7)	0,514 (~0,7)			68

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,684	β^- (94,4)	38,7 h	^{77}As	β^-: 0,16 (2,8) 0,438 (2,8)	0,245 (~8,5) 0,525 (~2,7) others		M: ^{77}Ge(11 h) β^-, γ especially β^-: 1,56 (24) 2,12 (29) 2,27 (14)	69
0,69	β^- (82)	4,7 d	^{47}Ca	β^-: 2,00 (18)	0,50 (6) 0,81 (6) 1,30 (76)		F: ^{47}Sc(3,45 d) β^-, γ β^-: 0,440 (~70) 0,600 (~30) γ : 0,160 (~70)	70
0,695	β^- (99)	105 d/ 9,3 h	^{127m}Te/ ^{127}Te	β^-: from ^{127}Te: 0,27 (1) from ^{127m}Te: 0,73 (1,5) (instead of IT)	IT: 0,0887 (98,5) via β^-: 0,059 0,36 0,145 0,42 0,170 0,203 others 0,215		M: ^{127}Sb(3,7 d) β^-, γ	71
0,696	β^- (46)	47 h	^{153}Sm	β^-: 0,641 (~33) 0,71 (1) 0,804 (20)	0,070 (5) 0,103 (28) others	23 43		72
0,698	β^+ (56)	16,1 d	^{48}V	EC: (44)	0,51 (from β^+) 0,986 (100) 1,314 (98) 2,25 (2)		M: ^{48}Cr(23 h), EC	73

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
),71	β^- (12)	13 a	^{152}Eu	β^-: 0,22 (2) 0,36 (3) 1,04 (2) 1,47 (7) EC: (74)	via β^-: 0,344 (26) 0,411 (2) 0,778 (12) 1,10 (2,5) 1,24 (2) via EC: 0,122 (32) 0,245 (4) 0,44 (5) 0,87 (4) 0,96 (15) 1,09 (12) 1,11 (13) 1,21 (2) 1,41 (25)	30 4	F: via EC stable (^{152}Sm) via β^-: ^{152}Gd(~ 10^{13}a) α	74
),714	β^- (98,3)	$3,1 \cdot 10^5$ a	^{36}Cl	EC: (1,7)				75
),72	β^- (14,5)	18 d	^{74}As	β^-: 1,36 (17,7) β^+: 0,91 (26,1) 1,5 (3,6) EC: (38,1)	0,51(from β^+) 0,596 (61) 0,635 (14,5			76
),77	β^- (98)	3,76 a	^{204}Tl	EC: (2)			F: via EC stable (^{204}Hg) via β^-: ^{204}Pb($1,4 \cdot 10^{17}$a) α	77

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,804	β^- (20)	47 h	^{153}Sm	β^-: 0,641 (~33) 0,696 (46) 0,71 (1)	0,070 (5) 0,103 (28) others	23 43		78
0,810	β^- (~77)	11,1 d	^{147}Nd	β^-: 0,212 (~ 3) 0 ,368 (~20)	0,091 (29) 0,275 (1) 0,32 (3) 0,40 (2) 0,440 (2) 0,532 (18) 0,688 (1)	52	F: ^{147}Pm(2,7 a) β^-, $\gamma \rightarrow {}^{147}Sm$(1,2.10^{11}a)$\alpha$ especially β^-: 0,225 (100)	79
0,81	β^+ (57)	8,3 h	^{52}Fe	EC: (43)	0,165 (100) 0,51 (from β^+)		F: $^{52m}Mn/^{52}Mn$(21 min/5,7 d) β^+, EC, γ especially: via ^{52m}Mn β^+: 2,63 (90) γ : 0,51 (β^+) 1,43 (100)	80
0,83	β^- (87)	22 h	^{43}K	β^-: 0,47 (8) 1,24 (3,5) 1,81 (1,5)	0,22 (3) 0,37 (85) 0,39 (18) 0,59 (13) 0,61 (81) 1,01 (2)			81
0,86	β^- (20)	73 d	^{160}Tb	β^-: 0,3 (12) 0,46 (19) 0,56 (38) 0,76 (11) 1,71 (0,4)	0,087 0,298 0,88 0,97 1,18 1,27 others			82

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,87	β^- (29)	13 d	^{126}J	β^-: 0,39 (6) 1,25 (9) β^+: 1,11 (1) EC: (55)	0,39 (34) 0,48 (5) 0,51 (from β^+) 0,65 (33) 0,75 (4) u. a.			83
0,90	β^- (100)	55 min	^{69}Zn				M: ^{69m}Zn(14 h) γ(IT) γ : 0,435 (95) / 5 /	84
0,91	β^+ (26,1)	18 d	^{74}As	β^+: 1,5 (3,6) β^-: 0,72 (14,5) 1,36 (17,7) EC: (38,1)	0,51 (from β^+) 0,596 (61) 0,635 (14,5)			85
0,93	β^- (100)	13,8 d	^{143}Pr				M: ^{143}Ce(33 h) β^-, γ	86
0,95	β^- (63)	18 h	^{159}Gd	β^-: 0,59 (13) 0,89 (24)	0,058 (3) 0,36 (12)	21		87
0,96	β^- (99)	2,70 d	^{198}Au	β^-: 0,29 (1) 1,37 (0,025)	0,412 (96) 0,68 (1,1) 1,09 (0,26)	3,6		88

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
0,96	β^- (35)	14 h	^{72}Ga	β^-: 0,66 (17) 0,68 (24) 1,51 (7) 1,94 (7) 2,53 (5) 3,17 (5)	0,601 (~ 6) 0,630 (~20) 0,835 (~85) 0,894 (~10) 1,050 (4) 1,465 (4) 1,598 (5) 1,860 (5) 2,201 (29) 2,49 (9) 2,50 (17) others		M: ^{72}Zn(49 h) β^-, γ	89
0,967	β^- (78)	127 d	^{170}Tm	β^-: 0,883 (22) EC: (0,15)	0,084 (3)	9		90
1,0	β^- (60)	12,8 d	^{140}Ba	β^-: 0,5 (25) 0,6 (10) 0,9 (5)	0,030 0,132 0,160 0,305 0,43 0,54 others		F: ^{140}La(40,2 h) β^-, γ	91
1,02	β^- (53)	12,5 h	^{130}J	β^-: 0,60 (47)	0,41 (35) 0,47 (88) 0,53 (100) 0,66 (100) 1,15 (13)			92

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,025	β^- (~100)	13,5 h	^{109}Pd		some weak ones		F: ^{109m}Ag(41 sec) IT:0,088 (4) / 96 /	93
1,05	β^- (93)	7,5 d	^{111}Ag	β^-: 0,69 (6) 0,79 (1)	0,247 (1) 0,342 (6)		M: ^{111m}Pd ^{111}Pd (5,5 h / 22 min) β^-, γ especi- β^-: 2,13 (100) ally γ (IT) : 0,17 (68)	94
1,05	β^- (93)	7,5 h	^{171}Er	β^-: 0,47 (0,6) 0,55 (2,6) 1,36 (1,5) 1,48 (2,1)	0,112 (22) 0,117 (2) 0,124 (9) 0,296 (23) 0,308 (69) others	49 3 12 1 1	F: ^{171}Tm(1,9 a) β^-, γ	95
1,07	β^- (97)	53 h	^{149}Pm	β^-: 0,78 (3)	0,286 (3)		M: ^{149}Nd(1,8 h) β^-, γ	96
1,071	β^- (73)	90 h	^{186}Re	β^-: 0,934 (23) EC: (4)	0,137 (11) 0,631 (weak) 0.768 (weak) via EC 0,123 (~ 2)	12		97
1,09	β^- (40)	33,4 h	^{143}Ce	β^-: 0,22 (6) 0,52 (12) 0,72 (5) 1,38 (37)	0,057 0,23 0,29 x 0,35 0,49 0,57 0,67 x) most intensive line		F: ^{143}Pr(13,8 d) β^- +) β^-: 0,933 (100)	98

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,09					0,72 0,86 1,10		+)	98
1,11	β^- (62)	2,3 d	^{115}Cd	β^-: 0,59 (24) 0,63 (13) 0,85 (1)	0,49 (12) 0,52 (24) others		F: $^{115m}In/^{115}In$(4,5 h/ $6\cdot10^{14}$a) β^-,γ especially β^-: 0,84 (5) via ^{115m}In γ : 0,34 (48) / 44 / via ^{115m}In (IT)	99
1,13	β^- (70)	31,5 h	^{193}Os	β^-: 0,52 (1) 0,57 (3) 0,67 (7) 0,9 (2) 0,99 (8) 1,06 (6)	0,139 (~5) 0,281 (2) 0,322 (2) 0,388 (2) 0,460 (4) 0,559 (2)	9 ~ 7		100
1,15	β^- (19)	206 d	^{102}Rh	β^+: 0,81 (4) 1,28 (11) EC: (66)	0,475 (53) 0,51 (from 0,63 (11) 0,765 (5) 1,05 (6)	β^+)[2]		101
1,16	β^- (100)	5,0 d	^{210}Bi (RaE)	α : 5,06 ($1,3\cdot10^{-4}$)	via α: 0,260) 0,300) weak		F: via α: ^{206}Tl(4,2 min) β^- β^-: 1,51 (100) via β^-: ^{210}Po(138 d)α , γ α : 5,305 (~ 100) 4,525 (~ 0,001) γ : 0,802 (~ 0,001)	102

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,16	β^+ (84,6)	$7,4 \cdot 10^5$ a	^{26}Al	EC: (15,4)	1,12 (3,7) 1,83 (99,7) 2,96 (0,3) 0,51 (from β^+)			103
1,180	β^- (~50)	4,4 h	^{105}Ru	β^-: 1,115 (~35)	0,129 0,263 0,317 0,400 0,477 0,668 0,723		F: ^{105}Rh(35 h) β^-, γ β^-: 0,25 (~10) 0,56 (~90) γ : 0,319	104
1,18	β^- (5)	30 a	^{137}Cs	β^-: 0,514 (95)	0,662 (85) from: ^{137m}Ba	10	F: stable (^{137}Ba)	105
1,22	β^- (strong)	20,9 h	^{133}J	β^-: 0,89 1,54 (weak)	0,23 (weak) 0,53 (strong) 0,87		F: $^{133m}Xe/^{133}Xe$(2,3 d/ 5,3 d) β^-, γ	106
1,23	β^- (85)	67 h	^{99}Mo	β^-: 0,45 (14) 0,87 (~1)	0,041 (1) 0,181 (2) 0,741 (10) 0,780 (4)	5 2	F: $^{99m}Tc/^{99}Tc$(6 h/ $2,1 \cdot 10^5$a) β^-, IT, γ especially IT: 0,140 (84) / 10 /	107
1,25	β^- (9)	13 d	^{126}J	β^-: 0,39 (6) 0,87 (29) β^+: 1,11 (1) EC: (55)	0,51 (from β^+) 0,39 (34) 0,48 (5) 0,65 (33) 0,75 (4) others			108

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,28	β^- (85)	2,35 h	^{165}Dy	β^-: 0,21 (0,6) 0,29 (1,4) 1,19 (13)	0,04 - 1,07			109
1,315	β^- (20)	24,0 h	^{187}W	β^-: 0,34 (10) 0,63 (70)	0,072 0,136 0,482x 0,552 0,621 0,686x 0,775 others x most intensive lines		F: ^{187}Re(6.10^{10}a) β^- β^-: <0,008 (100)	110
1,321	β^- (89)	$1,27 \cdot 10^9$ a	^{40}K	EC: (11)	1,46 (11) via EC		natural emitter	111
1,36	β^- (17,7)	18 d	^{74}As	β^-: 0,72 (14,5) β^+: 0,91 (26,1) 1,5 (3,6) EC: (38,1)	0,51 (from β^+) 0,596 (61) 0,635 (14,5)			112
1,38	β^- (~45)	40,2 h	^{140}La	β^-: 0,83 (~12) 1,10 (~26) 1,71 (~10) 2,20 (~ 7)	0,32 (19) 0,491 (40) 0,75 (3) 0,815 (19) 0,923 (10) 1,60 2,52 (4) others	1	M: ^{140}Ba(13 d) β^-, γ	113

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,38	β^- (37)	33,4 h	^{143}Ce	β^-: 0,22 (6) 0,52 (12) 0,72 (5) 1,09 (40)	0,057 0,23 0,29 x 0,35 0,49 0,57 0,67 0,72 0,86 1,10 x most intensive line		F: ^{143}Pr (13,8 d) β^- β^-: 0,933 (100)	114
1,39	β^- (100)	15,0 h	^{24}Na		1,37 (100) 2,75 (100) others			115
1,40	β^- (63)	2,74 d	^{122}Sb	β^-: 0,74 (4) 1,97 (30) EC: (3)	0,57 (66) 0,69 (3) 1,26 (1) 1,14 (1)		Note: Existence of ^{123}Sn (41 min) β^-,γ β^-: 1,26 (100) γ : 0,16	116
1,42	β^- (98)	125 d	^{123}Sn	β^-: 0,34 (2)	0,16 0,38 1,08			117
1,46	β^- (100)	50,4 d	^{89}Sr					118

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,47	β^+ (92)	3,9 h	^{44}Sc	β^+: 0,99 (1) 1,37 (3) EC: (5)	0,51 (from β^+) 1,14 (3) 1,16 (100) 1,50 (1)		M: ^{44}Ti (~10^3a) EC	119
1,47	β^- (7)	13 a	^{152}Eu	β^-: 0,22 (2) 0,36 (3) 0,71 (12) 1,04 (2) EC: (74)	via β^-: 0,344 (26) 0,411 (2) 0,778 (12) 1,10 (2,5) 1,24 (2) via EC: 0,122 (32) 0,245 (4) 0,44 (5) 0,87 (4) 0,96 (15) 1,09 (12) 1,11 (13) 1,21 (2) 1,41 (25)	 30 4	F: via EC: stable (^{152}Sm) via β^-: ^{152}Gd (~10^{15}a) α	120
1,48	β^- (2,1)	7,5 h	^{171}Er	β^-: 0,47 (0,6) 0,55 (2,6) 1,05 (93) 1,36 (1,5)	0,112 (22) 0,117 (2) 0,124 (9) 0,296 (23) 0,308 (69) others	49 3 12 1 1	F: ^{171}Tm(1,9 a) β^-,γ	121

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,50	β^- (~20)	3,7 d	^{127}Sb	β^-: 0,80 (~40) 0,86 (~5) 1,11 (~35)	0,060 (~10) 0,25 (14) 0,31 (6) 0,46 (54) 0,77 (24)		F: ^{127m}Te(105 d) IT: 0,0887 (98,5) β^-: 0,73 (1,5) ^{127}Te(9,3 h) β^-, γ especially: β^-:0.695 (99) 0.27 (1)	122
1,50	β^+ (18)	77,3 d	^{56}Co	EC: (82)	0,51 (from β^+) 0,845 (100) 1,03 (16) 1,24 (71) 1,36 (5) 1,75 (18) 2,02 (11) 2,60 (16) 2,99 (1) 3,25 (12) 3,47 (1)		M: ^{56}Ni(6 d) EC, γ	123
1,54	β^- (99,7)	59 d	^{91}Y	β^-: 0,33 (0,3)	1,21 (0,3)		M: ^{91}Sr(9,7h) β^-, γ	124
1,63	β^- (96,7)	43 d	^{115m}Cd	β^-: 0,2 (0,3) 0,335 (1) 0,687 (2)	0,485 (0,3) 0,935 (2,3) 1,30 (1)		F: ^{115m}In/^{115}In(4,5 h/ $6\cdot10^{14}$a) β^-, γ especially: β^-: 0,84 (5)via ^{115m}In : 0,50 (100)via ^{115}In γ (IT) : 0,34 (48) / 44 /	125
1,65	β^+ (10)	33 d	^{84}Rb	β^+: 0,80 (11) β^-: 0,90 (3) EC: (76)	0,51 (from β^+) 0,88 (74) 1,01, very 1,90 weak			126

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,71	β^- (100)	14,45 d	^{32}P				M: ^{32}Si (~700 a) β^-: ~0,10 (100)	127
1,777	β^- (91)	18,7 d	^{86}Rb	β^-: 0,696 (9)	1,084 (9)			128
1,84	β^- (47)	27 h	^{166}Ho	β^-: 0,23 (2) 0,41 (5) 0,87 (9) 1,76 (37) 1,84 (47)	0,080 (6) 0,970 1,38 (~1) 1,54) weak 1,62) weak	49	M: ^{166}Dy (80 h) β^-, γ Note: ^{166m}Ho (> 30 a) β^-, γ	129
1,85	β^- (~10)	16 a	^{154}Eu	β^-: 0,25 (29) 0,57 (35) 0,83 (~20) 0,97 (~ 3) 1,60 (~ 3)	0,12x 0,25 0,59 0,69 0,72 0,76 0,87 1,00x 1,28x others x most intensive lines			130
1,87	β^- (74)	9,35 h	^{152m}Eu	β^-: 0,56 (1,6) 1,55 (2) EC: (22)	via β^-: 0,344 (3) 0,975 (1) 1,32 (1) via EC: 0,122 (7) 0,841 (11) 0,963 (9) 1,39 (1)	6	F: via EC: stable (^{152}Sm) via β^-: ^{152}Gd (~10^5 a) α	131

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
1,97	β^- (30)	2,74 d	^{122}Sb	β^-: 0,74 (4) 1,40 (63) EC: (3)	0,57 (66) 0,69 (3) 1,26 (1) 1,14 (1)			132
1,984	β^- (99)	50 d/ 72 sec	^{114m}In/ ^{114}In	β^-: 0,67 (0,2) (from ^{114}In) EC: (3,5) from ^{114m}In (0,7) from ^{114}In	0,556 (3,5) 0,722 (3,5) 0,192 (18,5) 1,30 (0,2)	78		133
2,00	β^- (18)	4,7 d	^{47}Ca	β^-: 0,69 (82)	0,50 (6) 0,81 (6) 1,30 (76)		F: ^{47}Sc(3,4 d) β^-,γ β^-: 0,440 (~70) 0,600 (~30) γ : 0,160 (~70)	134
2,10	β^- (69)	2,56 h	^{65}Ni	β^-: 0,60 (23) 1,01 (8)	0,37 (~ 2) 1,11 (10) 1,49 (21)			135
2,12	β^- (78)	17 h	^{188}Re	β^-: 1,96 (20)	0,155 (10) & 13 others (2)	10	M: ^{188}W(65 d) β^- β^-: 0,8 (100)	136

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
?,14	β^- (18)	2,3 h	^{132}J	β^-: 0,80 (21) 1,04 (15) 1,22 (12) 1,49 (12) 1,61 (21) 2,22	0,52 (19) 0,62 (5) 0,65 (26) 0,67 (99) 0,72 (7) 0,78 (82) 0,95 (19) 1,14 (4) 1,40 (8) others		M: ^{132}Te(78 h) β^-, γ β^-: 0,22 (100) γ : 0,23	137
?,15	β^- (96)	19,2 h	^{142}Pr	β^-: 0,58 (4)	1,57 (4)			138
?,15	β^+ (11)	4,0 d	^{124}J	β^+: 1,55 (14) EC: (75)	0,51 from β^+) 0,603 (66) 0,645 (12) 0,72 (~12) 1,69 (14) others			139
?,20	β^- (~7)	40,2 h	^{140}La	β^-: 0,83 (~12) 1,10 (~26) 1,38 (~45) 1,71 (~10)	0,32 (19) 0,491 (40) 0,75 (3) 0,815 (19) 0,923 (10) 1,60 2,52 (4) others	1	M: ^{140}Ba(13 d) β^-, γ	140

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
2,24	β^- (66)	19,7 h	^{194}Ir	β^-: 0,44 (1) 0,73 (1) 0,76 (2) 0,97 (4) 1,3 (1) 1,6 (3) 1,91 (21)	0,293 (6) 0,328 (28) 0,620 (2) 0,643 (6) 0,937 (4) 1,149 (4) 1,180 (2) others			141
2,27	β^- (100)	64,4 h	^{90}Y				M: ^{90}Sr(28 a) β^- β^-: 0,544 (100)	142
2,31	β^- (23)	60 d	^{124}Sb	β^-: 0,051 (2) 0,22 (11) 0,62 (51) 0,95 (5) 1,02 (2) 1,59 (5)	0,60 (98) 0,65 (7) 0,72 (11) 1,69 (48) others			143
2,41	β^- (30,6)	26,5 h	^{76}As	β^-: 0,30 (0,6) 0,31 (1,3) 0,55 (0,9) 1,20 (6,6) 1,75 (3,6) 2,97 (56,4)	0,559 (44,6) 0,657 (6,3) 1,22 (4,3) 1,23 (1,0) & 15 others			144
2,455	β^- (50)	15 d	^{156}Eu	β^-: 0,50 1,22	0,089 0,868 1,065 1,154 2,098 2,187		M: ^{156}Sm(10 h) β^- β^-: 0,9 (100)	145

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
2,50	β^+ (56)	26 h	^{72}As	β^+: 1,84 (3) 3,34 (17) EC: (23)	0,51 (from β^+) 0,63 (~ 8) 0,835 (~80) others		M: ^{72}Se(8,4 d) EC, γ	146
2,86	β^- (60)	2,58 h	^{56}Mn	β^-: 0,33 (1) 0,75 (15) 1,05 (24)	0,845 (99) 1,81 (24) 2,12 (15) 2,52 (1) others			147
2,97	β^- (56,4)	26,5 h	^{76}As	β^-: 0,30 (0,6) 0,31 (1,3) 0,55 (0,9) 1,20 (6,6) 1,75 (3,6) 2,41 (30,6)	0,559 (44,6) 0,657 (6,3) 1,22 (4,3) 1,23 (1,0) & 15 others			148
2,98	β^- (98)	17 min	^{144}Pr	β^-: 0,803 (1) 2,29 (1)	0,691 (1,6) 1,49 (0,3) 2,18 (0,8)		F: ^{144}Nd(2,4·10^{15}a) α M: ^{144}Ce(284 d) β^-, γ especially: β^-: 0,320 (72) γ : 0,134 (~10) / 8 /	149
3,17	β^- (5)	14 · h	^{72}Ga	β^-: 0,66 (17) 0,68 (24) 0,96 (35) 1,51 (7) 1,94 (7) 2,53 (5)	0,601 (~ 6) 0,630 (~20) 0,835 (~85) 0,894 (~10) 1,050 (4) 1,465 (4) 1,598 (5) 1,860 (5)		M: ^{72}Zn(49 h) β^- , γ +)	150

Energy in MeV	Decay (frequency in %)	Half-life time	Nuclide	Other β^- and β^+ energies and EC (frequency in %)	γ - energies (frequency in %)	frequency of IC in %	End products (F) mother substance (M) and their radiation	Number
3,17					2,201 (29) 2,49 (9) 2,50 (17) others		+)	150
3,34	β^+ (7)	26 h	^{72}As	β^+: 1,84 (3) 2,50 (56) EC: (23)	0,51 (from β^+) 0,63 (~ 8) 0,835 (~80) others		M: ^{72}Se(8,4 d) EC, γ	151
3,54	β^- (78)	30 sec	^{106}Rh	β^-: 0,5-1,5 (1) 2,0 (2) 2,4 (11) 3,0 (8)	0,513 (21) 0,612 (1) 0,624 (10) 1,045 (2) others		M: ^{106}Ru(1,0 a) β^- β^-: 0,039 (100)	152
3,6	β^- (82)	12,5 h	^{42}K	β^-: 2,0 (18)	1,53 (18)			153
4,15	β^+ (44)	9,5 h	^{66}Ga	β^+:~0,4 (4) ~0,7 (3) ~0,9 (11) 1,07 (2) EC: (35)	0,51(from β^+) 0,828 (5) 1,037 (37) 2,183 (5) 2,748 (26) 4,30 (5) & 13 others		M: ^{66}Ge(2,4 h) β^+, γ, EC	154

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