

Query Tool exercises with solution

www-nds.iaea.org/queryensdf

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z range	N range

☐ More fields : Q-values, separation energies, atomic masses

LEVELS

☐ Energy ≤ keV ≤

☒ Decays B.R. ≤ % ≤ ☒ Only Ground State

☒ β^- ☐ $\beta^- n$ ☐ $\beta^- 2n$ ☐ $2\beta^-$ ☐ $\beta^- 3n$ ☐ $\beta^- 4n$ ☐ $\beta^- \alpha$ ☐ $\beta^- F$ ☐ $\beta^- p$

Order by : $T_{1/2}$

☐ Z ☐ A ☐ N ☐ Q(β) ☐ Q(α) ☐ Q(EC) ☐ Q($\beta^- n$) ☐ Sn ☐ Sp ☐ R ☐ AM ☐ E ☒ $T_{1/2}$ ☐ BR ☐ μ ☐ Q ☐ E_{rad} ☐ I_{rad}

☐ Log ft ☐ HF ☐ E_γ ☐ α ☐ B(E) ☐ B(M) ☐ δ

PLOTTING

X axis: Y axis:

List nuclides having an evaluated β^- decay, order by half-life, and display on nuclear chart

List nuclides that can theoretically β decay. Compare with the results before

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z n

☒ More fields : Q-values, separation energies, atom

☒ $Q(\beta)$ $\leq \text{keV} \leq$

☐ $Q(\beta - n)$ $\leq \text{keV} \leq$

Plot Q_{β} against $Q_{\beta-n}$ for those nuclides with evaluated β - and β -n decay

NUCLIDE ground state

Nuclide	Symbol	Z	N	A

☐ More fields : Q-values, separation energies

LEVELS

☐ Energy ≤ keV ≤

☒ Decays B.R. ≤ % ≤

☒ β - β -n β -2n 2β - β -3n β -4n β - α

β + 2β + β +2p β + α β +p β fission

ec $2ec$ $ec\beta$ ecp $ec2p$ $ec3p$ $ec\alpha$

α α ? IT IT? SF SF β -

^3H ^3He ^8Be ^{12}C ^{14}C ^{20}O ^{20}Ne

p n D G 2p Mg Ne

☐ Half Life 3.68E-8 fs ≤ $T_{1/2}$ ≤ 7.71

☐ More fields : nuclear moments

GAMMA transitions

☐ Energy ≤ keV ≤

☐ Final level ≤ keV ≤ J

☐ More fields : conversion coefficients, multi

Order by : Z, A

☒ Z ☒ A ☐ N ☐ $Q(\beta)$ ☐ $Q(\alpha)$ ☐ $Q(\beta-n)$

☐ Log ft ☐ HF ☐ Ev ☐ α ☐ B(E) ☐ B

PLOTTING

X axis: $Q(\beta)$ Y axis: $Q(\beta-n)$

Relational ENSDF
December 2015 snapshot of

Drag here to move the panel - right click on the image to save

Draw

Title

Labels: x

y

Title

Type

☐ line ☒ scatter

Size

w: h:

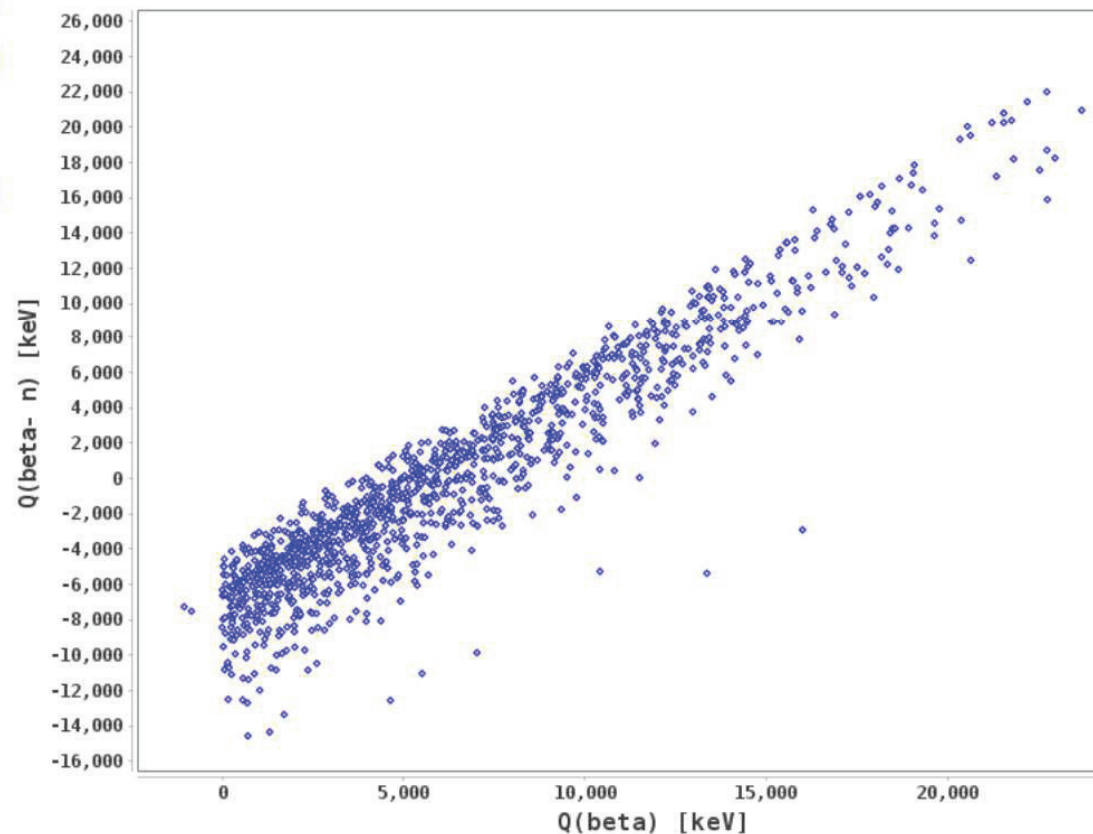
Log Scale

☐ x ☐ y

Grids

☐ x ☐ y

• Show data



Find β^- -decaying nuclides which have β transitions with $9 \leq \log ft \leq 10$. Check ΔJ and $\Delta \pi$ values.

d Metastables

able

☐ Isospin ☐ P
☒ J^π ☐ weak order ☐ π

☒ **DECAY radiation** emitted by the daughter
☒ Type ☐ any ☐ α ☒ β^- ☐ β^+ ☐ γ ☐ e
 delayed ☐ n ☐ p ☐ α
 Energy $\leq$ keV $\leq$ ☐ only most intense lines
 Intensity $\leq$ % $\leq$
 Max En. $\leq$ keV $\leq$ $\leq$ log FT $\leq$

You requested: Radiation type β^- $9 \leq \log FT \leq 10$

Ground State Levels Gammas Decay Radiation

510 rows retrieved

Comments



Click on a column header to open the guide

Uncertainty for numeric values refers to the last digits of the value: 12.123 means 12.1 ± 2.3

Data from: ENSDF apart Q from AME2012

[Definitions and Sources](#) ?

Click on a nuclide symbol to show the decay schema

Beta -



$\langle E_\beta \rangle$ [keV]	$I_\beta(\text{abs})$ [%]	Daughter level [keV]	J^π	$E_{\beta-, \text{max}}$ [keV]	$\log ft$	Transition type	Comments	Parent	$T_{1/2}$	E_x [keV]	J^π order	Decay
49.47	100	0	1+	156.475 4	9.040 3			$^{14}_6\text{C}_{8-}$	5700 y 30	0.0	0+	β^- 100 %
1000 0.12	0.012 4	6010 4.10	0+	4270 2	0.06 15	1st forbidden		16	7.12 e 2	0.0	2	β^- 100 %

In the “Decay Radiation” tab check J^π of parent and daughter, or download the CSV for further analysis

List nuclides with evaluated α decay and display on nuclear chart

NUCLIDE ground state

Nuclide	Symbol	Z	N	A

☐ More fields : Q-values, separation energies,

LEVELS

☐ Energy ≤ keV ≤

☒ Decays B.R. ≤ % ≤ ☒ On

β^-	$\beta^- n$	$\beta^- 2n$	$2\beta^-$	$\beta^- 3n$	$\beta^- 4n$	$\beta^- \alpha$
β^+	$2\beta^+$	$\beta^+ 2p$	$\beta^+ \alpha$	$\beta^+ p$	β fission	
ec	2ec	ec β^+	ec p	ec 2p	ec 3p	ec α
α	$\alpha?$	IT	IT?	SF	SF β^-	
^3H	^3He	^8Be	^{12}C	^{14}C	^{20}O	^{20}Ne
p	n	D	G	2p	Mg	Ne

List nuclides that can theoretically α decay and compare with the retrieval before

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z range	N range	A range	Z	N	A	Z	N	A
					☐						even	☐	☐
											odd	☐	☐

☒ More fields : Q-values, separation energies, atomic masses, radius

☐ Q(β)		$\leq$ keV $\leq$		☐ Q(EC)		$\leq$ keV $\leq$		☒ Q(α)	0	$\leq$ keV $\leq$	
☐ Q(β^- n)		$\leq$ keV $\leq$		☐ S(n)		$\leq$ keV $\leq$		☐ S(p)		$\leq$ keV $\leq$	

Plot Q_α vs A for even-even,

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z range	N range	A range	Z	N	A	Z	N	A
								even	☒	☒	odd	☐	☐

☒ More fields : Q-values, separation energies, atomic masses, radius

☐ $Q(\beta)$ ≤ keV ≤
☐ $Q(\text{EC})$ ≤ keV ≤
☒ $Q(\alpha)$ ≤ keV ≤

☐ $Q(\beta-n)$ ≤ keV ≤
☐ $S(n)$ ≤ keV ≤
☐ $S(p)$ ≤ keV ≤

☐ R ≤ fm ≤
☐ Atomic mass AM ≤ μ AMU ≤

LEVELS

☐ Energy ≤ keV ≤
☐ Decays B.R. ≤ % ≤
☒ Only Ground State and Metastables

☐ Half Life fs ≤ $T_{1/2}$ ≤ y ☐ Stable

☐ J^π ☐ weak order π any

☐ More fields : nuclear moments

GAMMA transitions

☐ Energy ≤ keV ≤
☐ Final level ≤ keV ≤ J order π any

☐ More fields : conversion coefficients, multipolarity, mixing ratio

DECAY radiation emitted by the daughter

☐ Type ☒ any ☐ α ☐ β^- ☐ β^+ ☐ γ ☐ e

☐ delayed ☐ n ☐ p ☐ α

Energy ≤ keV ≤ ☐ only most Intense lines

Intensity ≤ % ≤

Max En. ≤ keV ≤ ≤ log FT ≤

Order by : Z, A

☒ Z ☒ A ☐ N ☐ $Q(\beta)$ ☐ $Q(\alpha)$ ☐ $Q(\text{EC})$ ☐ $Q(\beta-n)$ ☐ Sn ☐ Sp ☐ R ☐ AM ☐ E ☐ $T_{1/2}$ ☐ BR ☐ μ ☐ Q ☐ Erad

☐ Log ft ☐ HF ☐ E_γ ☐ α ☐ B(E) ☐ B(M) ☐ δ

PLOTTING

X axis: A Y axis: $Q(\alpha)$

- Find α decaying nuclides with Hindrance Factor $HF=1$. Plot Q_α vs A .

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z range	N range	A range	Z	N	A	Z

☐ More fields : Q-values, separation energies, atomic masses, radius

LEVELS

☐ Energy ≤ keV ≤
☐ Decays B.R. ≤ % ≤ ☒ Only Ground State and Metastables
☐ Half Life **3.68E-8** fs ≤ $T_{1/2}$ ≤ **7.7E24** y ☐ Stable ☐ J π ☐ weak ☐ ord

☐ More fields : nuclear moments

GAMMA transitions

☐ Energy ≤ keV ≤
☐ Final level ≤ keV ≤ J order π any
☐ More fields : conversion coefficients, multipolarity, mixing ratio

DECAY radiation emission

☒ Type ☐ any ☒ α ☐ β^- ☐ β^+
☐ delayed ☐ n ☐ p ☐ c

Energy ≤ keV ≤
 Intensity ≤ % ≤
 Hindrance **1** ≤ HF ≤ **1**

Order by : Z , A

☒ Z ☒ A ☐ N ☐ Q(β) ☐ Q(α) ☐ Q(EC) ☐ Q(β^- -n) ☐ Sn ☐ Sp ☐ R ☐ AM ☐ E ☐ $T_{1/2}$ ☐ BR
☐ Log ft ☐ HF ☐ E_γ ☐ α ☐ B(E) ☐ B(M) ☐ δ

PLOTTING

X axis: A Y axis: Q(α)

Plot $B(E_2)$ strengths of transitions from first excited 2^{++} states to the ground state vs A

☐ More fields : Q-values, separation energies, atomic masses, radius

LEVELS

☐ Energy ≤ keV ≤
☐ Decays B.R. ≤ % ≤ ☒ Only Ground State and Metastables
☐ Half Life 3.68E-8 fs ≤ $T_{1/2}$ ≤ 7.7E24 y ☐ Stable
☐ More fields : nuclear moments

☐ Isospin
☒ J^π 2 ☐ weak order 2 π +

☒ GAMMA transitions

☐ Energy ≤ keV ≤
 Final ≤ keV 0 J order π any
☒ level 0 ≤

☒ More fields : conversion coefficients, multipolarity, mixing ratio

☐ Conv. Coef. ≤ α ≤ Total

☒ Multipolarity E2 ☐ weak No mix
☐ w.u. $B(E_2)$

☐ Mixing ≤ δ ≤

☐ DECAY radiation emitted by the daughter

☐ Type ☒ any α β^- β^+ γ e
 delayed ☐ n ☐ p ☐ α
 Energy ≤ keV ≤ ☐ only 2 most intense lines
 Intensity ≤ % ≤

Order by : Z , A

☒ Z ☒ A ☐ N ☐ Q(β) ☐ Q(α) ☐ Q(EC) ☐ Q(β -n) ☐ Sn ☐ Sp ☐ R ☐ AM ☐ E ☐ $T_{1/2}$ ☐ BR ☐ μ ☐ Q ☐ E_{rad}
☐ Log ft ☐ HF ☐ E_y ☐ α ☐ B(E) ☐ B(M) ☐ δ

PLOTTING

X axis: A Y axis: $B(E)$

Find nuclides which emit γ rays of energy 197.2 keV through internal transitions and induced reactions.

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z range	N range

☐ More fields : Q-values, separation energies, atomic masses, radius

LEVELS

☐ Energy ≤ keV ≤

☐ Decays B.R. ≤ % ≤ ☒ Only Ground State and Met

☐ Half Life ≤ T_{1/2} ≤ y ☐ Stable

☐ More fields : nuclear moments

☒ **GAMMA transitions**

☒ Energy 197.1 ≤ keV ≤ 197.3

Final ≤ keV J order π any

☐ level ≤ J order π any

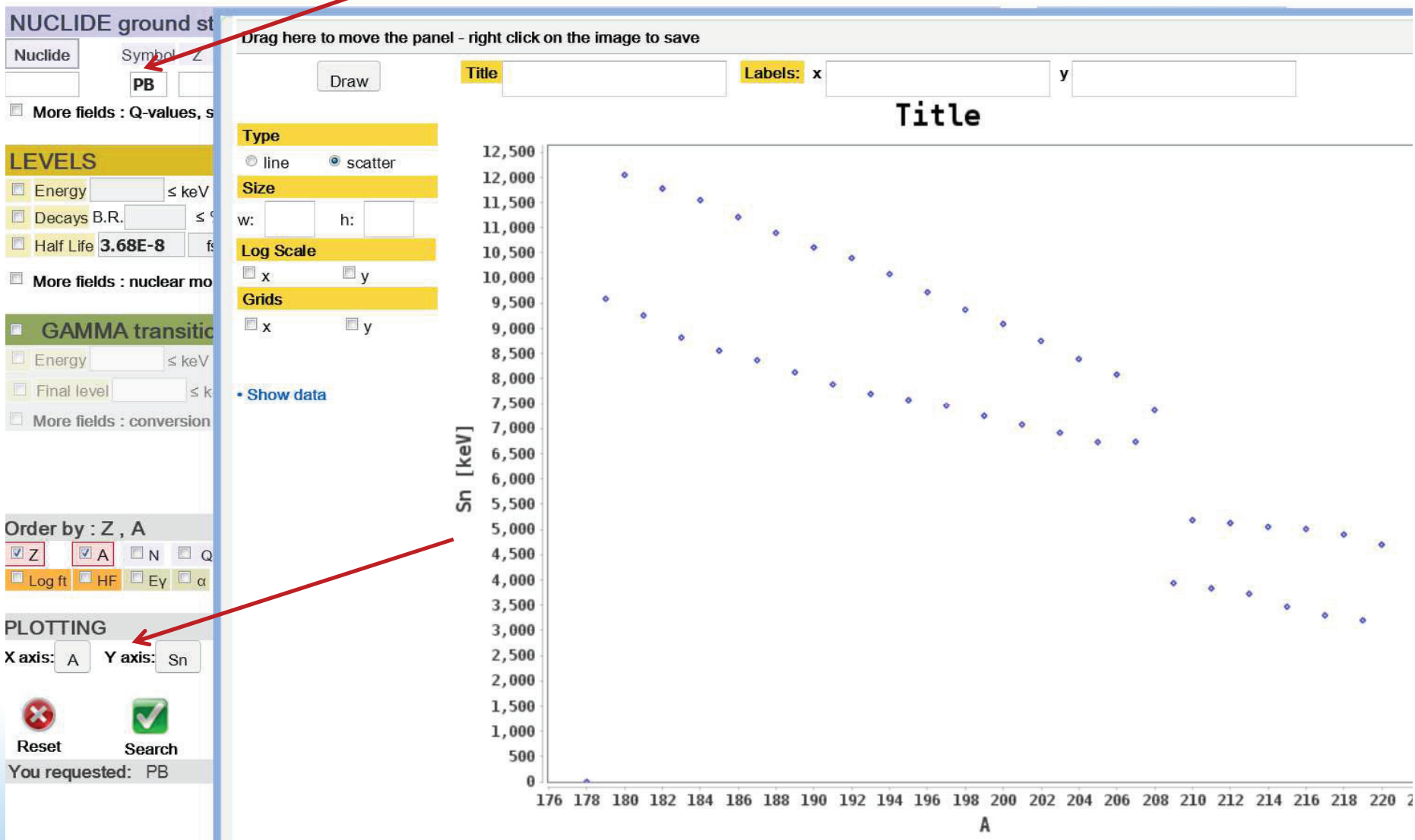
☐ More fields : conversion coefficients, multipolarity, mixing ratio

In the results, take ¹⁹F and plot its level schema

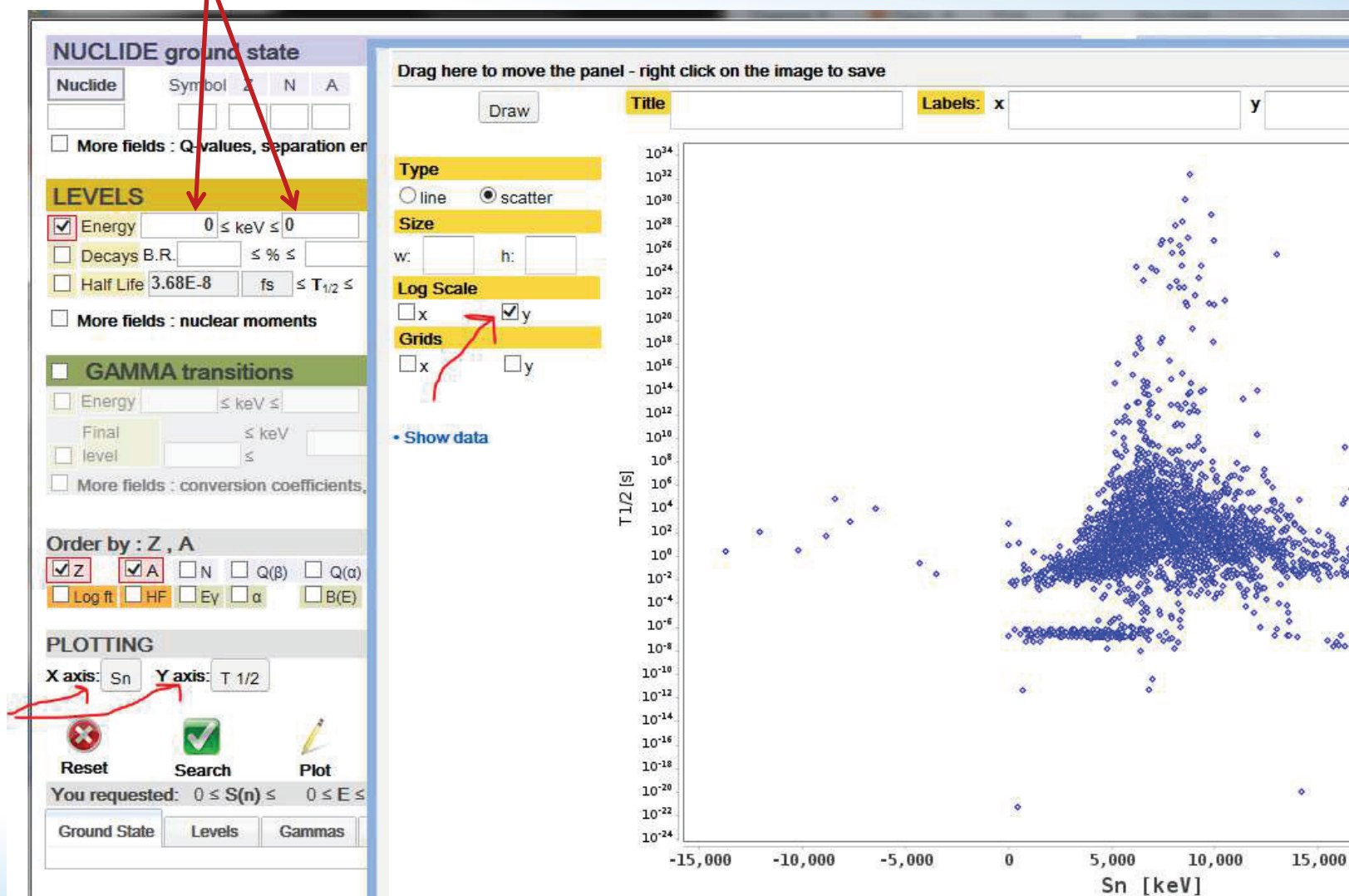


Nuclide	Energy [keV]	J ^{π}	T _{1/2} Abund. [mole fract.]
¹⁹ ₉ F	0.0	1/2+	STABLE 100 %
³⁶ ₁₈ Ar	0.0	0+	STABLE 0.3336 % 21
⁸¹ ₃₅ Br	0	3/2-	22.26 h

Plot S_n vs A for Led



Plot ground states S_n vs $T_{1/2}$



Plot A vs $T_{1/2}$ for $Z \leq 100$ levels decaying via β^- n for which there is an evaluated n emission

NUCLIDE ground state

Nuclide	Symbol	Z	N	A	Z range	N
					☒ 100	

☐ More fields : Q-values, separation energies, atomic masses

LEVELS

☐ Energy ≤ keV ≤

☒ Decays B.R. ≤ % ≤ ☒ Only Ground State

☐ β^- ☒ $\beta^- n$ ☐ $\beta^- 2n$ ☐ $2\beta^-$ ☐ $\beta^- 3n$ ☐ $\beta^- 4n$ ☐ $\beta^- \alpha$ ☐ $\beta^- F$ ☐ $\beta^- p$
☐ β^+ ☐ $2\beta^+$ ☐ $\beta^+ 2p$ ☐ $\beta^+ \alpha$ ☐ $\beta^+ p$ ☐ β fission

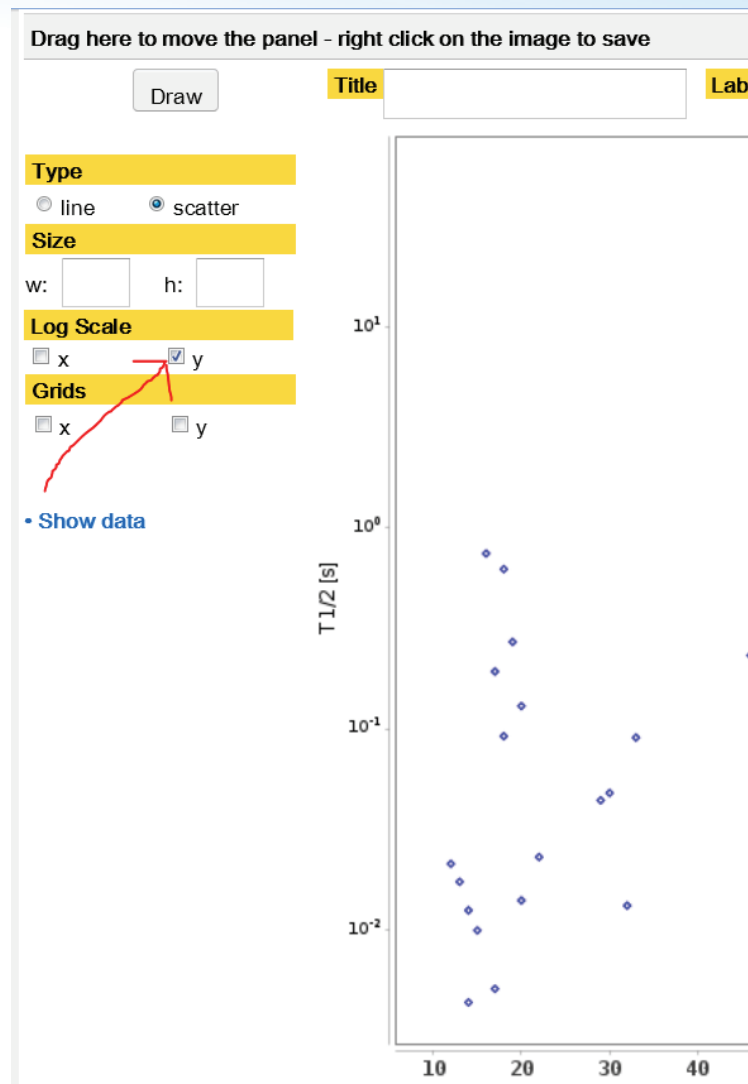
☒ **DECAY radiation** emitted by the daughter

☒ Type ☐ any ☐ α ☐ β^- ☐ β^+ ☐ γ ☐ e

delayed ☒ n ☐ p ☐ α

Energy ≤ keV ≤ ☐ only most intense lines

Intensity ≤ % ≤



- Plot A vs δ for E_2/M_1 transitions from J^π 2^- to 2^+ for even-even nuclides having $60 \leq A \leq 150$.

In this section we consider the excited states as members of quasirotational bands. Figure 3 illustrates how the multiple-phonon levels may be decomposed into various intrinsic excitations

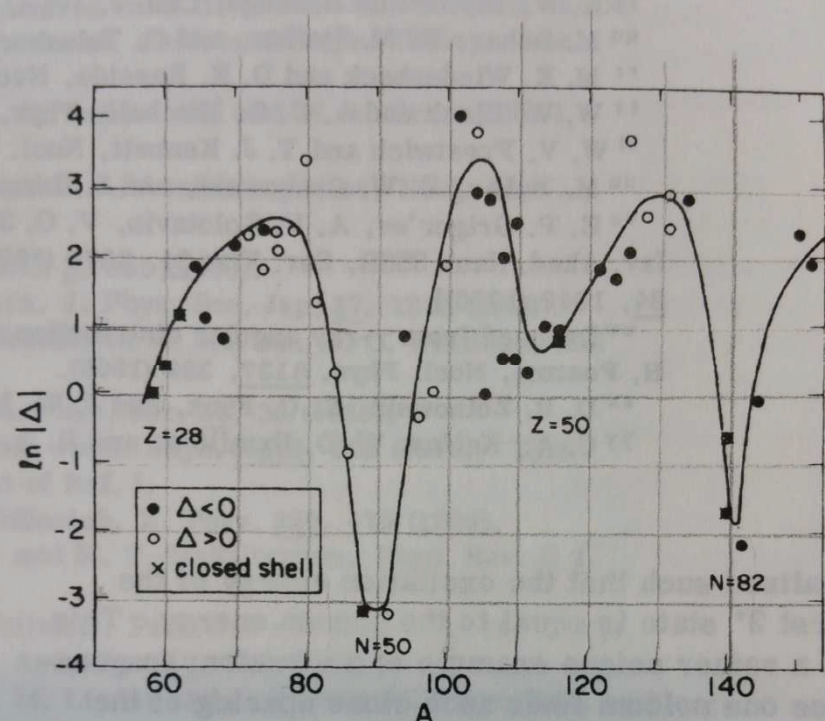


FIG. 2. E_2/M_1 mixing ratios of $2' \rightarrow 2$ transitions in even-even nuclei $60 \leq A \leq 150$. The solid curve indicates the trend of the measured values and shows pronounced minima in the vicinity of closed shells.

K.S. Krane, Phys.Rev. C 10 (1974) 1197
(Δ is a function of δ)

SEE NEXT PAGE

- Plot A vs δ for E_2/M_1 transitions from $J^\pi 2^+$ to 2^+ for e-e nuclides having $60 \leq A \leq 150$.

NUCLIDE ground state

Nuclide Symbol Z N A Z range N range A range Z N A Z N A

☒ More fields : Q-values, separation energies, atomic masses, radius

LEVELS

☐ Energy $\leq$ keV $\leq$

☐ Decays B.R. $\leq$ % $\leq$ ☒ Only Ground State and Metastables

☐ Half Life 3.68E-8 fs $\leq$ $T_{1/2} \leq$ 7.7E24 y ☐ Stable

☐ More fields : nuclear moments

☒ J^π 2 ☐ weak order 2 π + ☐ Isospin

GAMMA transitions

☐ Energy $\leq$ keV $\leq$

☒ Final level $\leq$ keV $\leq$ J 2 order 1 π +

☒ More fields : conversion coefficients, multipolarity, mixing ratio

☐ Conv. Coef. $\leq \alpha \leq$ Total

☒ Multipolarity E2 ☐ weak Yes mix

☐ w.u. B(E2)

☐ Mixing $\leq \delta \leq$

DECAY radiation emitted by the daughter

☐ Type ☒ any ☐ α ☐ β^- ☐ β^+ ☐ γ ☐ e

delayed ☐ n ☐ p ☐ α

Energy $\leq$ keV $\leq$ ☐ only 2 most intense

Intensity $\leq$ % $\leq$

Order by : Z, A

☒ Z ☒ A ☐ N ☐ Q(β) ☐ Q(α) ☐ Q(EC) ☐ Q(β -n) ☐ Sn ☐ Sp ☐ R ☐ AM ☐ E ☐ $T_{1/2}$ ☐ BR ☐ μ ☐ Q

☐ Log ft ☐ HF ☐ E γ ☐ α ☐ B(E) ☐ B(M) ☐ δ

PLOTTING

X axis: A Y axis: δ