

NNDC Mobile Applications

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November 2024

Background

Nuclear Wallet Cards: a reference for ground- and isomer-states

- Originally printed in 2011



Nuclear Wallet Cards Search

Nuclide OR Protons (Z): Min to Max OR Element

Neutrons (N): Min to Max

Atomic Mass (A): Min to Max

Search Conditions: None Filters: None

Page Size: 25

A...	E...	E(level)	J π	T _{1/2}	Decay Width	Abundance	Mass Excess	Decay Modes
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Background (contd.)

Two versions of Wallet Cards exist - “standard” and “radioactive”



Background (contd.)

CapGam: A collection of thermal neutron capture datasets

The screenshot displays the National Nuclear Data Center (NNDC) website interface. The top navigation bar includes the NNDC logo, the text "National Nuclear Data Center", and several menu items: "Databases", "Structure & Decay", "Reactions", "Resources", and the Brookhaven National Laboratory logo. A left sidebar menu is titled "NNDC Site Index" and contains a "CapGam" section with sub-links for "About CapGam", "CapGam by Energy", and "CapGam by Target". Below this are "Resources" (ENSDF, Nuclear Data Sheets) and "Networks" (USNDP, NSDD). The main content area features a periodic table of elements, with each element cell containing its atomic number and symbol. The table is color-coded: elements 1-10 are light blue, 11-18 are light blue, 19-36 are light blue, 37-54 are light blue, 55-86 are light blue, 87-118 are light blue, 58-71 are light green, and 90-103 are light yellow.

Why Mobile Apps?

Both of these data collections:

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- are updated infrequently

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Why Mobile Apps?

Both of these data collections:

- are updated infrequently
 - i.e. do not require a persistent connection
- require some kind of search function
 - i.e. simple data dumps may not be convenient
- may be needed in locations without Internet

Nuclear Wallet Cards

Developed in parallel with **walletcards-pipeline**

- Set of programs used to print the 2023 PDF

Nuclear Wallet Cards

Developed in parallel with **walletcards-pipeline**

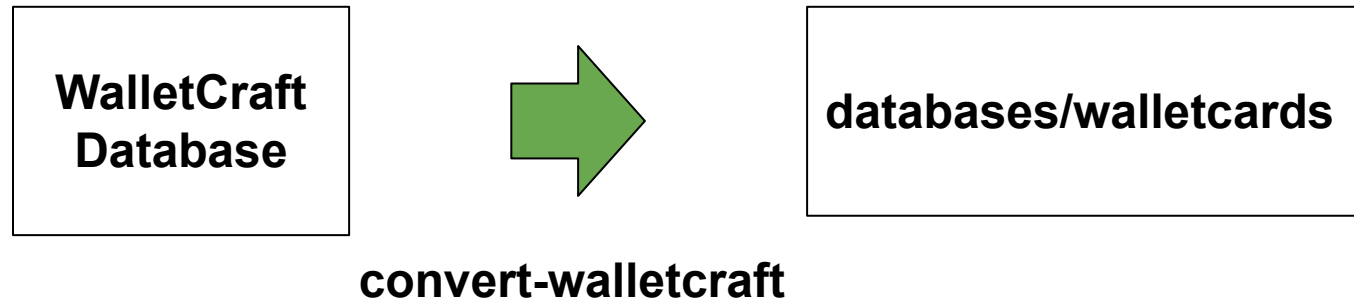
- Set of programs used to print the 2023 PDF

**WalletCraft
Database**

Nuclear Wallet Cards

Developed in parallel with **walletcards-pipeline**

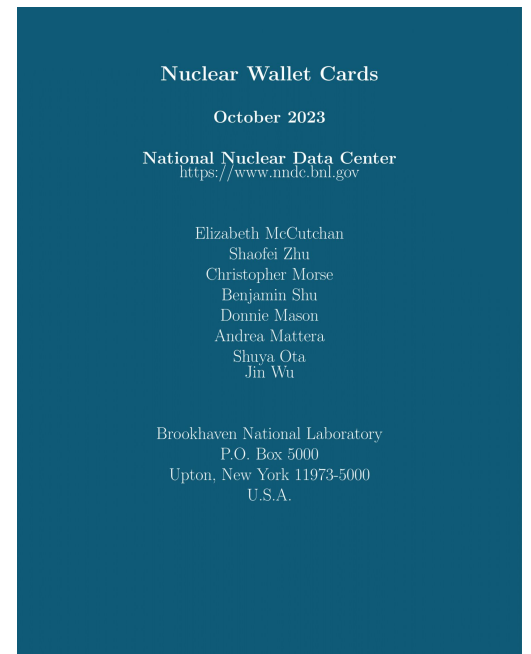
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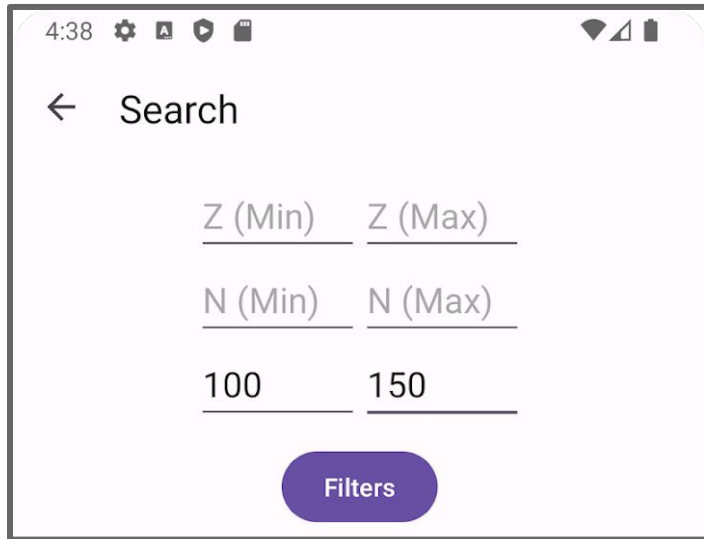


Nuclear Wallet Cards (Android)

Originally programmed by Melissa Wissman

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Search for nuclei by Z, N, A

Nuclear Wallet Cards (Android)

Originally programmed by Melissa Wissman

4:38

← Search

Z (Min) Z (Max)

N (Min) N (Max)

100 150

Filters

Search for nuclei by Z, N, A

A	El	Level Energy	Spin-Parity	H
101	Br	0 keV		
100	Kr	0 keV	0 ⁺	7 r
101	Kr	0 keV		

Display results in a table

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A	El	Level Energy	Spin-Parity	H
101	Br	0 keV		
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Display results in a table

Filters

Close

Decay Mode

+ Add

Half-Life (Min) (Max)

Mass Excess (Min) keV (Max) keV

Decay Mode Any (Min) % (Max) %

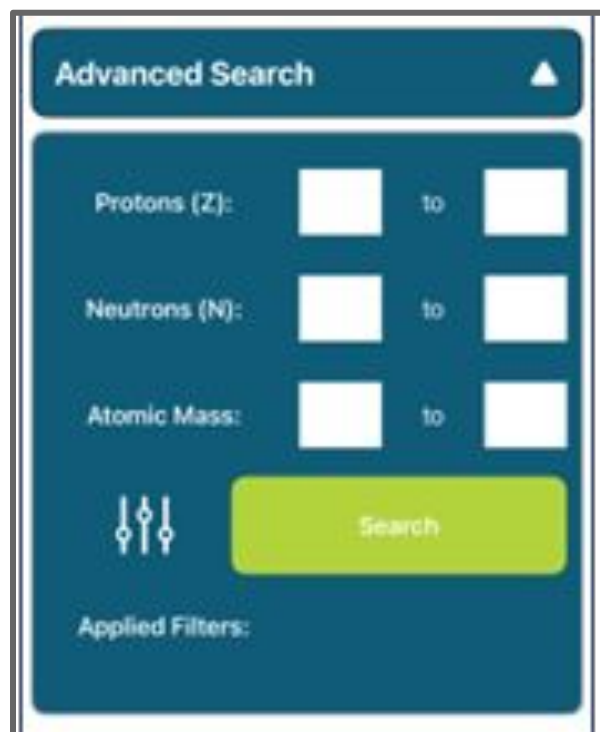
Filter by observable properties

Nuclear Wallet Cards (iOS)

Developed by Hamnah Irfan

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Advanced Search

Protons (Z): to

Neutrons (N): to

Atomic Mass: to



Applied Filters:

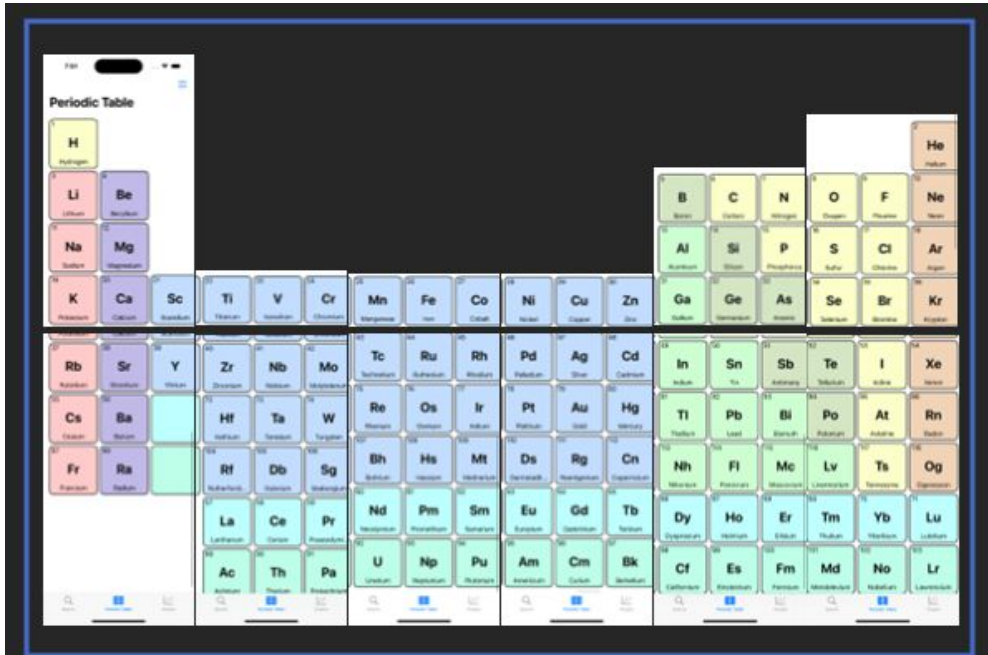
Nucleus	E (level) (keV)	J π	Mass Excess	Halflife and Abundance	Decay Modes
${}^1_0\text{nn}$	0.0	$\frac{1}{2}^+$	8071.3181 keV 4	608.9 ± 3	$\beta^- = 100\%$
${}^1_1\text{H}$	0.0	$\frac{1}{2}^+$	7288.971064 keV 13	STABLE 99.972-99.999 %	
${}^2_1\text{H}$	0.0	1^+	13135.722895 keV 15	STABLE 0.001-0.028 %	
${}^3_1\text{H}$	0.0	$\frac{1}{2}^+$	14949.81090 keV 8	12.322 y 11	$\beta^- = 100\%$
${}^4_1\text{H}$	0.0	2^-	$2.462\text{E}+4$ keV 10		$\text{N} = 100\%$
${}^5_1\text{H}$	0.0	$(\frac{1}{2}^+)$	$3.289\text{E}+4$ keV 9		$2\text{N} = 100\%$
${}^6_1\text{H}$	0.0		$4.19\text{E}+4$ keV 3		
${}^7_1\text{H}$	0.0	$\frac{1}{2}^+$	$4.91\text{E}+4$ keV 10		$2\text{N} 7$
${}^3_2\text{He}$	0.0	$\frac{1}{2}^+$	14931.21888 keV 6	STABLE 0.0002 % 2	
${}^4_2\text{He}$	0.0	0^+	2424.91587 keV 15	STABLE 99.9998 % 2	

Nuclear Wallet Cards (iOS)

Developed by Hamnah Irfan

Nuclear Wallet Cards (iOS)

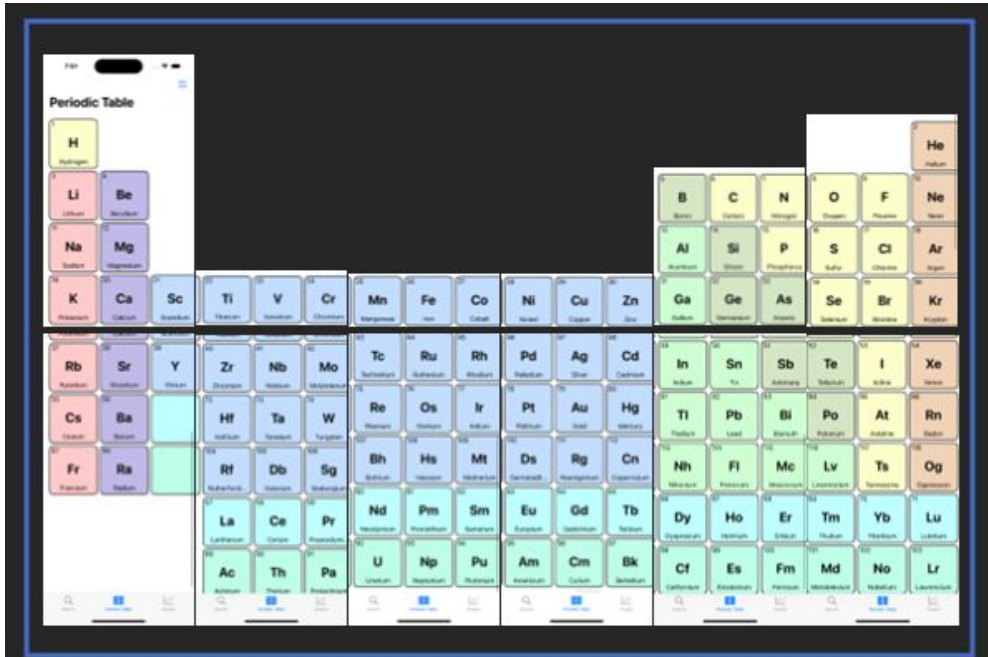
Developed by Hamnah Irfan



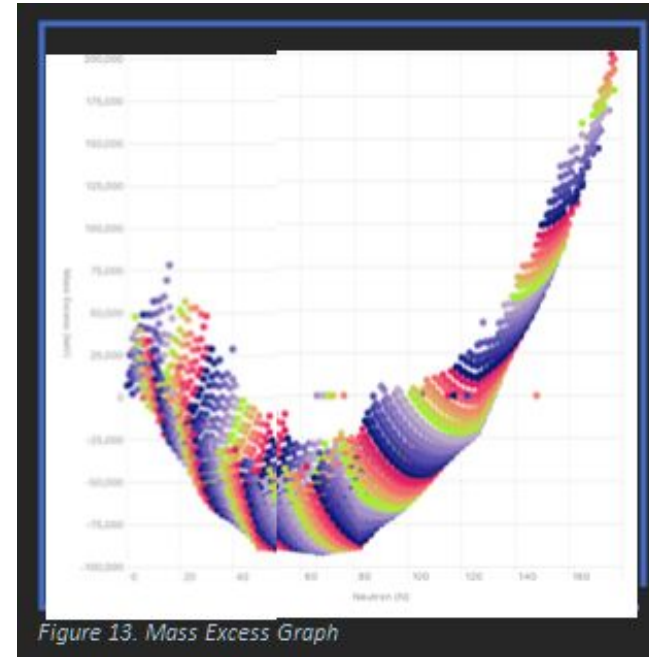
Periodic table interface for browsing nuclei

Nuclear Wallet Cards (iOS)

Developed by Hamnah Irfan



Periodic table interface for browsing nuclei



Scatter plots of observable properties

CapGam

Borrows code used for ENSDF modernization project

- ENSDF JSON files converted into “CapGam datasets”

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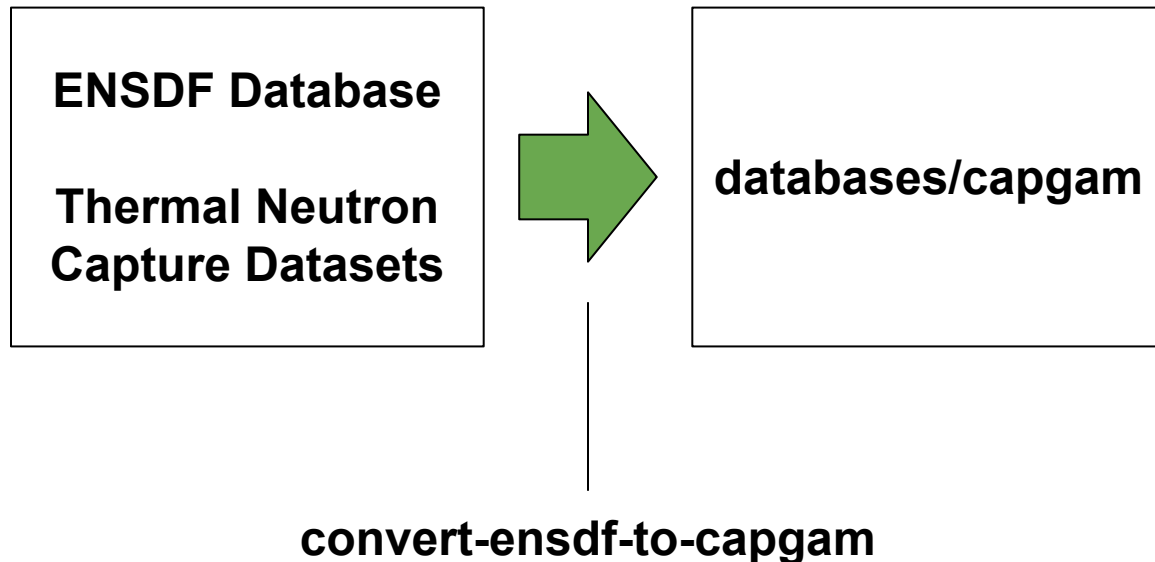
ENSDF Database

**Thermal Neutron
Capture Datasets**

CapGam

Borrows code used for ENSDF modernization project

- ENSDF JSON files converted into “CapGam datasets”

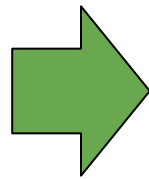


CapGam

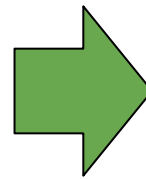
Borrows code used for ENSDF modernization project

- ENSDF JSON files converted into “CapGam datasets”

ENSDF Database
Thermal Neutron
Capture Datasets



databases/capgam



The screenshot shows the National Nuclear Data Center website with a periodic table. The table is color-coded: blue for stable elements, yellow for radioactive elements, and red for synthetic elements. The website header includes 'National Nuclear Data Center', 'Databases', 'Structure & Decay', 'Reactions', 'Resources', and 'Brookhaven National Laboratory'.

convert-ensdf-to-capgam

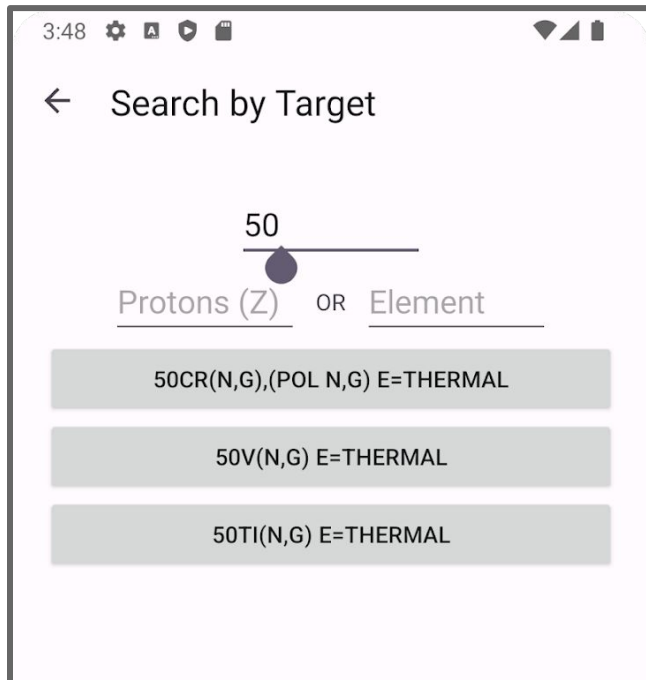
build-capgam-pages

CapGam (Android)

Also originally programmed by Melissa Wissman

CapGam (Android)

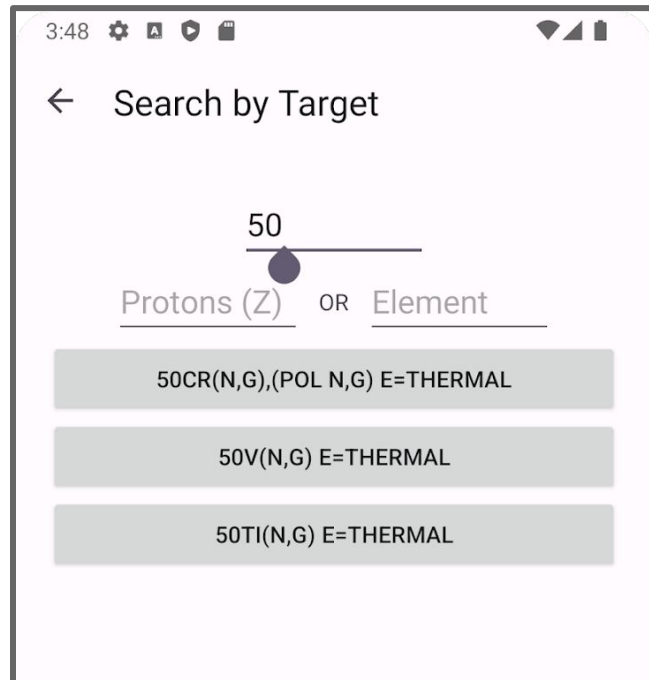
Also originally programmed by Melissa Wissman



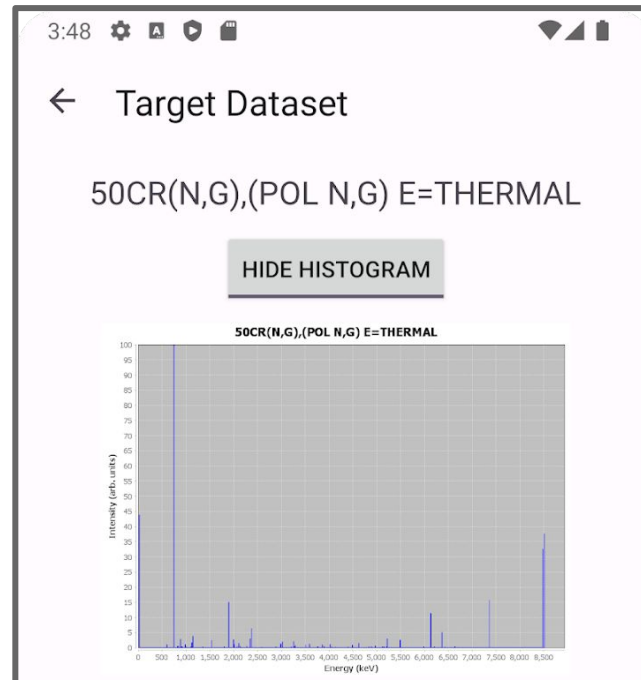
Search for targets by Z, A

CapGam (Android)

Also originally programmed by Melissa Wissman



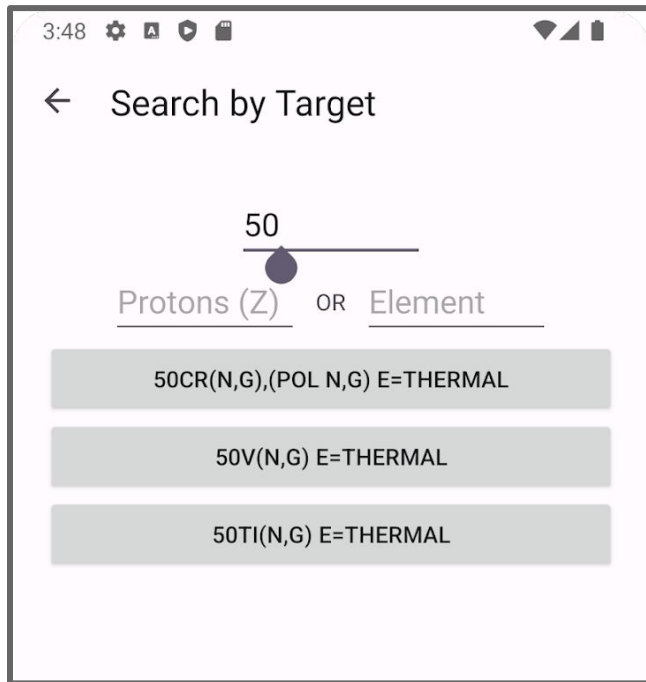
Search for targets by Z, A



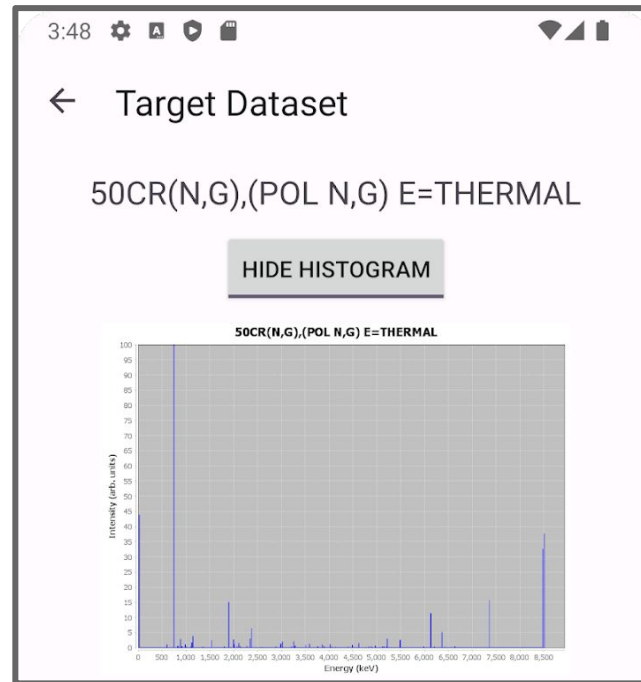
Draw histogram of $E(\gamma)$

CapGam (Android)

Also originally programmed by Melissa Wissman



Search for targets by Z, A



Draw histogram of E(γ)

The screenshot shows a table of data for the target '50CR(N,G),(POL N,G) E=THERMAL'. The table has three columns: Type, E(γ), and I(γ)/Max. The data is as follows:

Type	E(γ)	I(γ)/Max
Secondary	28 ± N/A	43.7500 ± 5.7618
Secondary	603.3 ± 0.4	0.9500 ± 0.2102
Secondary	749.00 ± 0.12	100.0000 ± 14.1421
Secondary	826.9 ± 0.8	0.3500 ± 0.0942
Secondary	834.1 ± 0.8	0.3875 ± 0.0957
Secondary	845.2	0.4500

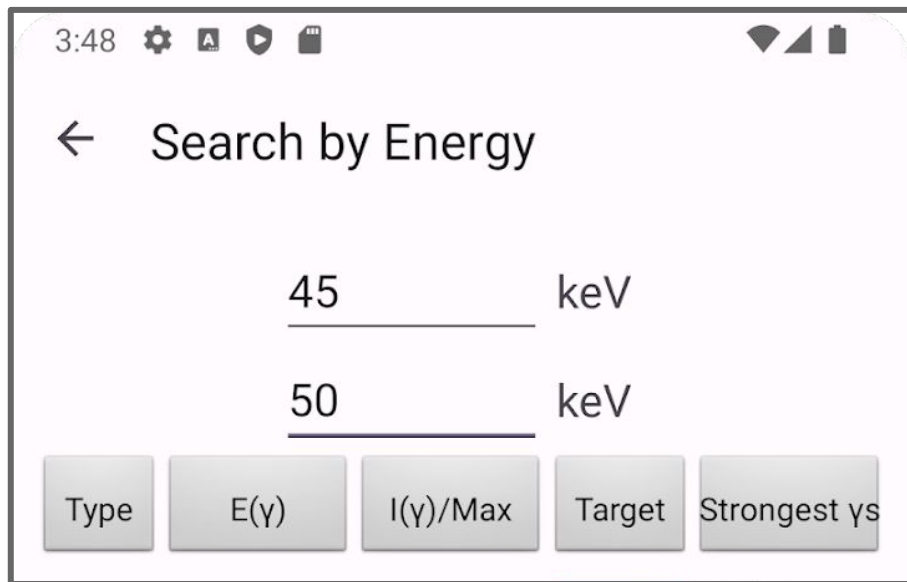
Display E(γ), I(γ) in tables

CapGam (Android)

Also originally programmed by Melissa Wissman

CapGam (Android)

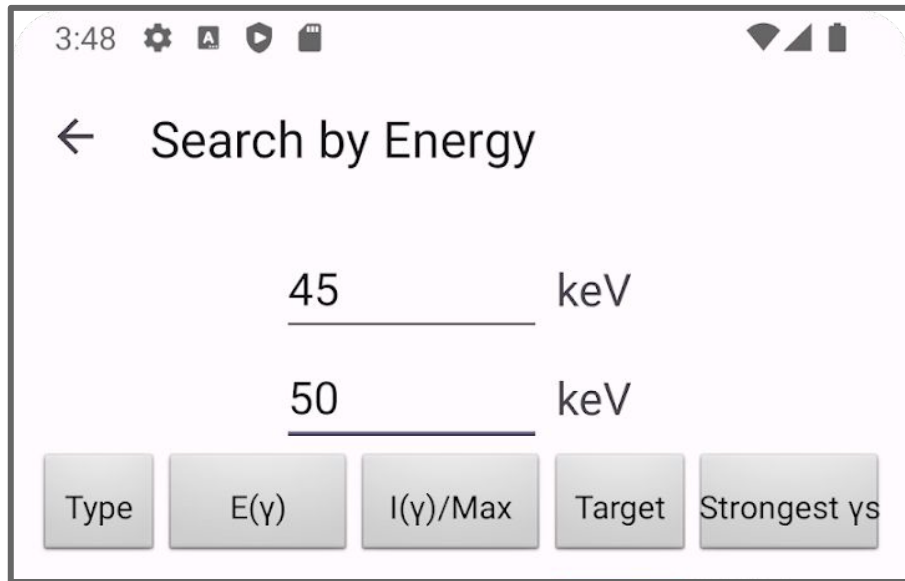
Also originally programmed by Melissa Wissman



Search all target datasets by E(γ)

CapGam (Android)

Also originally programmed by Melissa Wissman



Search all target datasets by E(γ)

S	45.00 ± 0.05	0.5392 ± 0.1494	115In	6470.4, 6559.3, 6656.3
S	45.0579 ± 0.0010	0.0382 ± 0.0062	151Eu	885.2, 1136.0, 1175.7
S	45.074 ± 0.010	0.1572 ± 0.0498	243Am	1407.04, 1408.32, 1409.94
S	45.197 ± 0.004	0.9353 ± 0.2412	237Np	633.56, 646.75, 648.27

Energy search results link to targets

CapGam (iOS)

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CapGam (iOS)

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0 NN Neutron <small>Unstable</small>	1 H Hydrogen <small>Nonmetal</small>	
	3 Li Lithium <small>Alkali metal</small>	4 Be Beryllium <small>Alkaline earth metal</small>
	11 Na Sodium <small>Alkali metal</small>	12 Mg Magnesium <small>Alkaline earth metal</small>
	19 K Potassium <small>Alkali metal</small>	20 Ca Calcium <small>Alkaline earth metal</small>
	37 Rb Rubidium	38 Sr Strontium

CapGam (iOS)

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	19 K Potassium <small>alkali metal</small>	20 Ca Calcium <small>alkaline earth metal</small>
	Rb Rubidium <small>alkali metal</small>	Sr Strontium <small>alkaline earth metal</small>

ZULFUNG-THERMAL
BULFUNG-THERMAL

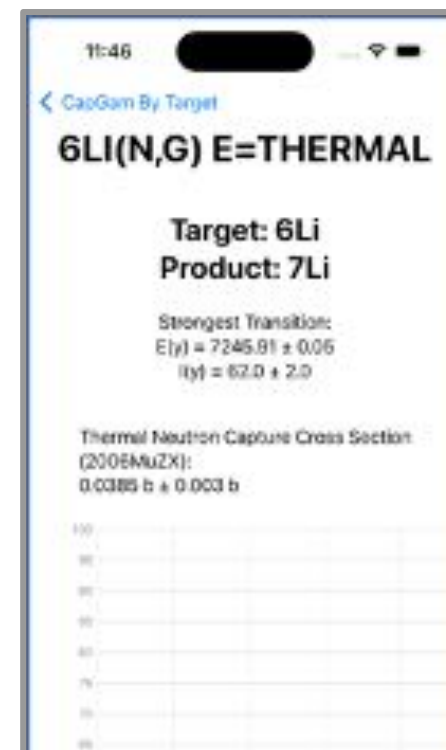
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	37 Rb Rubidium <small>alkali metal</small>	38 Sr Strontium <small>alkaline earth metal</small>

7Li(N,G)-THERMAL
8Li(N,G)-THERMAL



CapGam (iOS)

Also developed by Hamnah Irfan

CapGam (iOS)

Also developed by Hamnah Irfan

Type	ΔE_{γ} (keV)	$I(\gamma)/I(\gamma)_{\max}$ x 100	$\Delta(I(\gamma)/I(\gamma)_{\max})$
Secondary	0.0005	100.0	11.5117
Secondary	0.3	0.0287	0.0031
Secondary	0.1	0.1372	0.0248
Secondary	0.16	0.014	0.0037
Secondary	NA	NA	NA
Secondary	0.04	0.1547	0.0139
Secondary	0.08	0.0721	0.011
Secondary	0.6	0.0105	0.0059
Secondary	0.08	0.0721	0.011
Secondary	0.007	0.3837	0.0468
Secondary	0.14	0.0465	0.0079
Secondary	0.12	0.0419	0.0078
Secondary	0.04	0.0616	0.0096
Secondary	0.01	0.2	0.0265

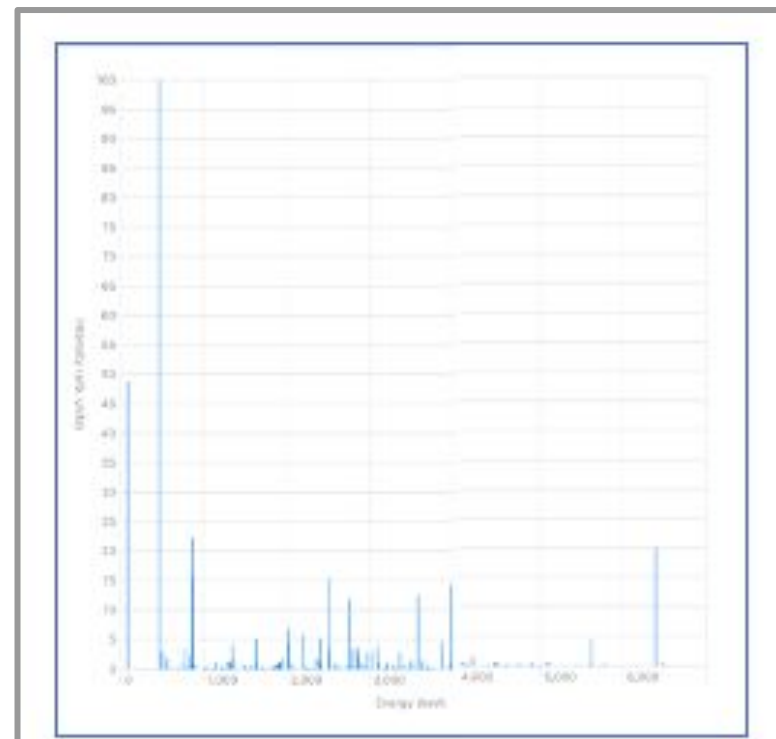
Figure 14: CapGam By Target Table

CapGam (iOS)

Also developed by Hamnah Irfan

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Secondary	0.08	0.0721	0.011
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Secondary	0.14	0.0465	0.0079
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Figure 14: CapGam By Target Table



CapGam (iOS)

Also developed by Hamnah Irfan

CapGam (iOS)

Also developed by Hamnah Irfan



CapGam (iOS)

Also developed by Hamnah Irfan



E(γ) (keV)	$\Delta E(\gamma)$	I(γ)	$\Delta I(\gamma)$	Capture Process	Strongest γ s
0.077	0.001	NA	NA	234U \rightarrow 235U	5245.9 5284.6 5297.6
0.91	NA	NA	NA	153Eu \rightarrow 154Eu	6359.1 6374.7 6441.85
2.328	0.007	NA	NA	204Pb \rightarrow 205Pb	5927.94 6468.86 6729.36
2.625	0.016	NA	NA	187Re \rightarrow 188Re	5715.5 5807.8 5871.6
2.636	0.003	NA	NA	187Re \rightarrow 188Re	5715.5 5807.8 5871.6
2.7	0.1	NA	NA	102Ru \rightarrow 103Ru	5885.5 6057.7 6096.6

Figure 15: CapGam By Energy Table

Current Status

- Nuclear Wallet Cards
 - <https://play.google.com/store/apps/details?id=gov.bnl.nndc.walletcards>
- CapGam:
 - <https://play.google.com/store/apps/details?id=gov.bnl.nndc.capgam>
- iOS versions awaiting approval from Apple Developer Program