



Isomer API Widget

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Goals

- Create a restful API for users to easily access the LISE⁺⁺ Isomer database and perform filters for desired isomer information.
 - Useful for identifying isomers detected by gamma emissions, visualizing decay schemes, and granting user access to isomer data for research questions.
- Currently, the isomer database can be interfaced, but only one entry at a time.
- The API allows the user to view all isomer information available in the LISE⁺⁺ database at once.
 - Also allows the user to easily download specific filtered data.
 - » Criteria such as half-life, gamma energy, atomic mass and proton number, etc.

The screenshot shows the 'Isomer Database' web interface. At the top, there's a search bar with 'A' (31), 'Element' (Mg), and 'Z' (12). Below this, a button labeled 'β⁻ & β⁻ n decay' is visible. To the right, there's a 'Table of Nuclides' button and a 'Database Index' section with a search bar containing '31120049.9'. The main section is titled 'for this isotope' and contains a table with columns 'Value' and 'Error'. The table lists various properties: γ-energy (49.9 keV), Isomeric ratio (10%), T_{1/2} (1.20e-02 μs), Level energy (49.93 keV), J^π (3/2⁺), I_γ, M_γ (M1), M ratio, Conversion Coef., Data source (Atlas2), and User Name (DK). On the right side, there are buttons for 'Save', 'Quit', 'Help', 'NNDC', 'Add Record', 'Delete Record', 'Check fields', and 'Show Structure'. At the bottom right, there's a navigation bar with arrows and the number '25'.

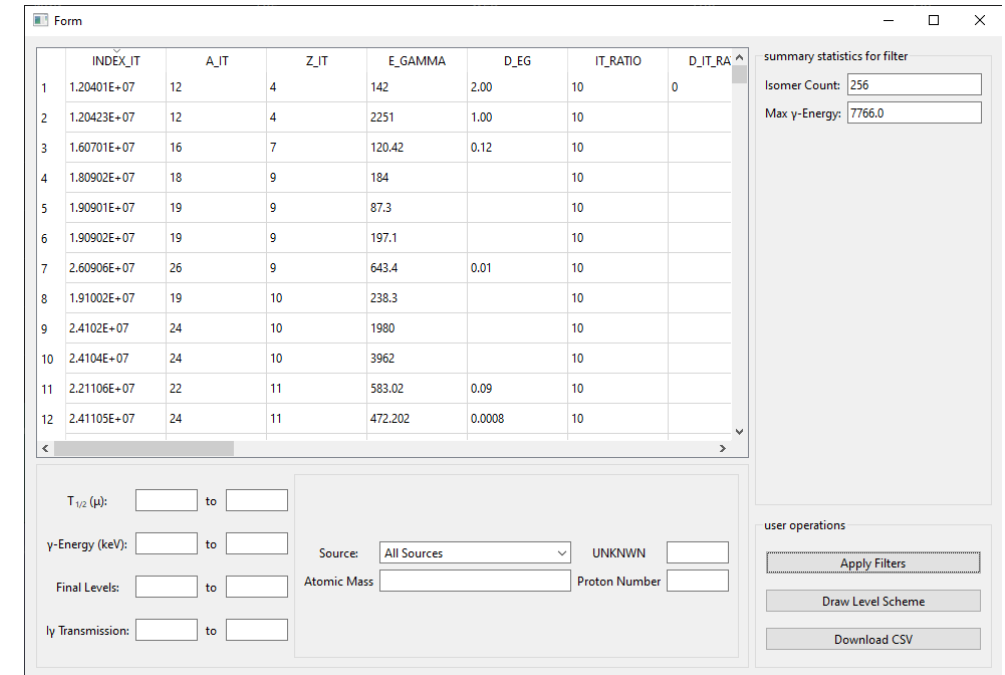
Figure 1: Current Isomer Database view

Methodology

- Use Qt Creator to create a python widget that connects to the LISE⁺⁺ isomer database and presents a view model to the user.
 - QSqlTableModel creates the connection for the widget's table view.
 - The API uses controlled queries with the model that are read-only for bounds on values, integer values, and source names.
- Summary statistics update on model-refresh and provide some context to the user's filters.
- Level scheme drawing utilities can currently be ran on the data when filtered for a particular isotope.
 - Pandas and Sqlite3 create connections to the database based on QSqlTableModel's applied filters.
 - Temporary tables are drawn from the applied filters and passed to a script which creates the drawing.
 - » Other utilities for the database may be implemented later such as source, downloading, etc.

Results

- The Isomer API contains a table view, filter selection, summary statistics, and user operations.
 - Due to batch loading, only 256 entries are loaded in the viewer, however the data contains all entries.
- As development continues, statistics and utilities will continue to grow.
 - A custom isotope filter widget will be included as well as image display formatting for style consistency with LISE⁺⁺.



The screenshot shows a web application window titled "Form". It contains a table with 12 rows of isomer data. To the right of the table is a sidebar with "summary statistics for filter" showing "Isomer Count: 256" and "Max y-Energy: 7766.0". Below the table are filter controls for $T_{1/2}$ (μ), γ -Energy (keV), Final Levels, and γ Transmission, each with "to" and "from" input fields. There are also dropdowns for "Source" (set to "All Sources") and "Atomic Mass", and input fields for "UNKNOWN", "Proton Number", and "D_IT_RA". At the bottom right are buttons for "Apply Filters", "Draw Level Scheme", and "Download CSV".

	INDEX_IT	A_IT	Z_IT	E_GAMMA	D_EG	IT_RATIO	D_IT_RA
1	1.20401E+07	12	4	142	2.00	10	0
2	1.20423E+07	12	4	2251	1.00	10	
3	1.60701E+07	16	7	120.42	0.12	10	
4	1.80902E+07	18	9	184		10	
5	1.90901E+07	19	9	87.3		10	
6	1.90902E+07	19	9	197.1		10	
7	2.60906E+07	26	9	643.4	0.01	10	
8	1.91002E+07	19	10	238.3		10	
9	2.4102E+07	24	10	1980		10	
10	2.4104E+07	24	10	3962		10	
11	2.21106E+07	22	11	583.02	0.09	10	
12	2.41105E+07	24	11	472.202	0.0008	10	

Figure 2: Isomer API before filtering

Example Usage

- The database is filtered for ^{31}Mg isomers with half-lives below 1 micro-second and gamma emissions above 35 keV.
- A decay scheme is created based on the entries remaining after the applied filters.

The screenshot shows a web application window titled 'Form'. It contains a table with the following columns: INDEX_IT, A_IT, Z_IT, E_GAMMA, D_EG, IT_RATIO, and D_IT_RATIO. The table lists four entries for ^{31}Mg isomers. To the right of the table is a 'summary statistics for filter' section with input fields for 'Isomer Count' (4) and 'Max γ -Energy' (239.9). Below the table are filter controls: 'T_{1/2} (μ s):' with a range from an empty field to 1; ' γ -Energy (keV):' with a range from 35 to an empty field; 'Final Levels:' with a range from an empty field to an empty field; 'ly Transmission:' with a range from an empty field to an empty field; 'Source:' with a dropdown menu set to 'NNDCAtlas2'; 'Atomic Mass' set to 31; 'Proton Number' set to 12; and 'UNKNNWN' set to an empty field. On the right side, there are three buttons: 'Apply Filters', 'Draw Level Scheme', and 'Download CSV'.

	INDEX_IT	A_IT	Z_IT	E_GAMMA	D_EG	IT_RATIO	D_IT_RATIO
1	3.11201E+07	31	12	49.9	0.10	10	
2	3.11202E+07	31	12	170.5	0.8	10	
3	3.11202E+07	31	12	221	4	10	
4	3.11202E+07	31	12	239.9	0.50	10	

Figure 3: Isomer API before and after filtering on ^{31}Mg (Z=12).

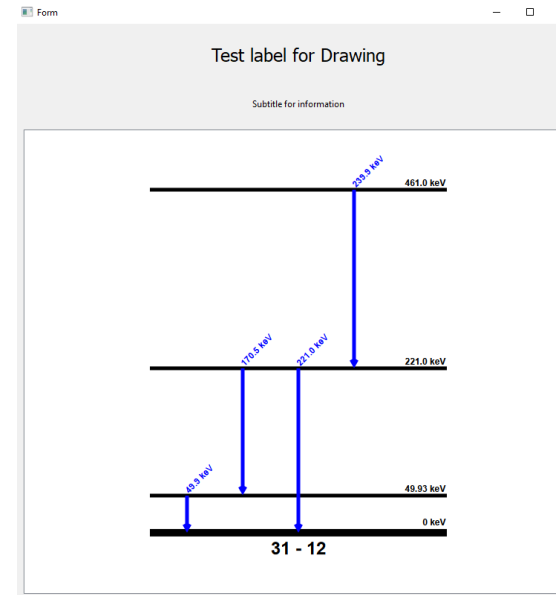


Figure 4: Drawn level-scheme from the filtered data.