

Dissemination and visualisation of reference decay data



Link to LNHB posters

Christophe DULIEU, Mark A. KELLETT, Xavier MOUGEOT

CEA, List, Laboratoire National Henri Becquerel (LNE-LNHB), F-91191 Gif-sur-Yvette Cedex, France

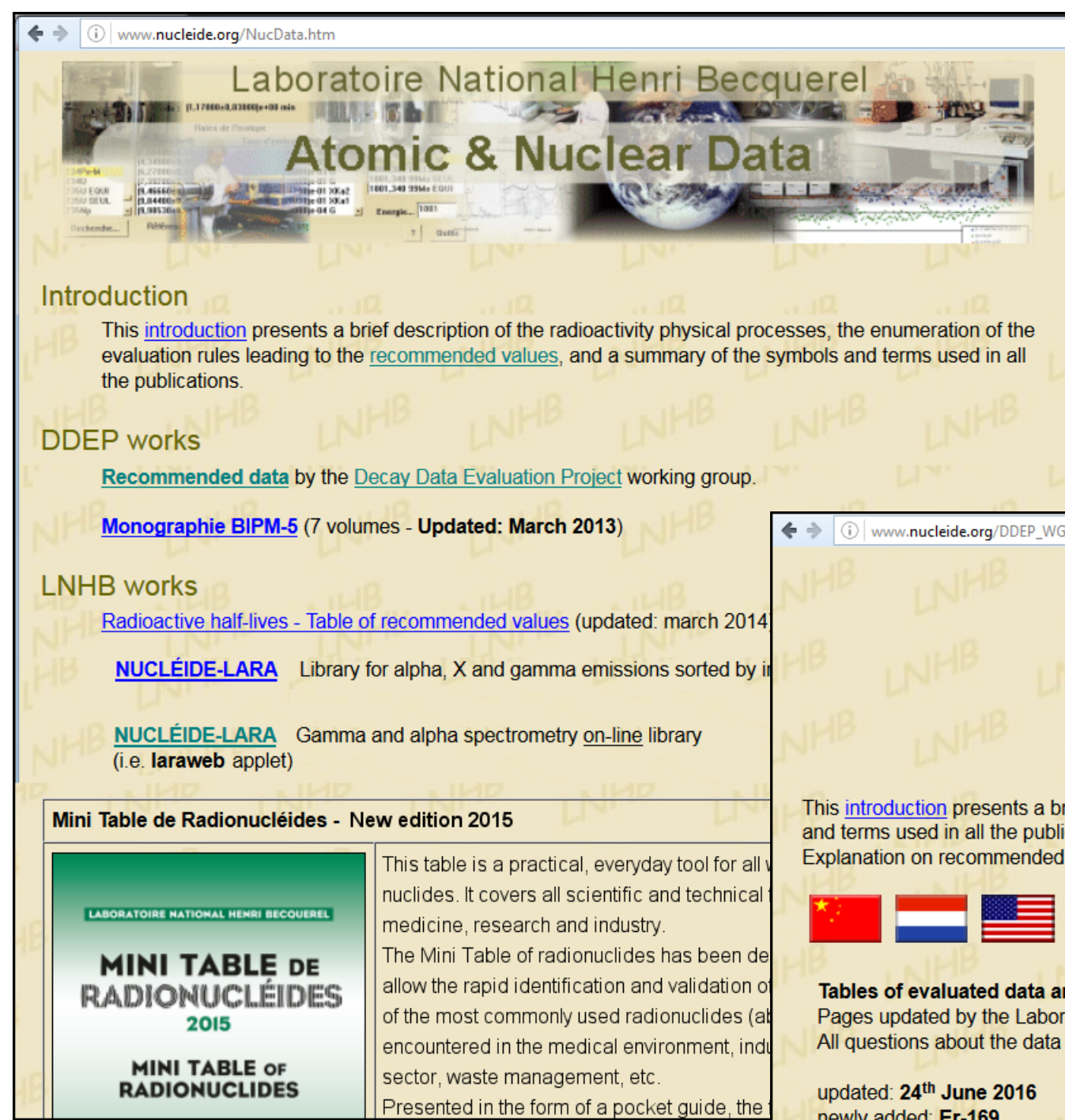
Introduction

LNHB, through its participation to the DDEP, is deeply involved in decay data evaluation and publication. Our laboratory is in charge of the dissemination of the recommended decay data to the users, once the evaluation process is completed. Multiple media may be used for this purpose: tabulated data files on our website, regular or special paper publications, and online access thanks to a specially developed web application, LARAWEB. We present you hereafter some of these media.

LNHB website

This is the entry point to find all necessary information on recommended decay data.

- New recommended radionuclide decay data are regularly uploaded
- Links to the already published dataset collection (e.g. Monographie BIPM-5 volumes, Mini Table)
- Links to other useful publications (table of half-lives, table of α , X and γ emissions, etc.)

<http://www.nucleide.org/NucData.htm>

Recommended decay data files:

- data tables and decay scheme (PDF)
- comments on the evaluation process (PDF)
- various export formats (ENSDF, PenNuc, text file)



LARAWEB: online application for alpha, X & gamma spectrometry

Main features of LARAWEB are:

- Direct consultation of decay data, emissions and decay scheme for a selected nuclide (intensity and energy thresholds may be set)
- Advanced search engine with multiple criteria: decay mode (β^+ / ε , β^- , IT, α), emission type (α , X or γ), intensity, energy, atomic mass, half-life. Relevant results are highlighted.
- Simple calculation tools: mass to activity conversion, decay calculation

Simple consultation of decay data and scheme

Nucléide - Lara
Library for gamma and alpha emissions

Nuclide list:
59Fe
59Ni
60Co
60Co-M
61Cu
63Ni
63Zn
64Cu

Nuclide search:
(e.g.: 99Xx or Xx-99)

Energy threshold (keV):

Intensity threshold (%):

Coincidence threshold (%):

Show γ - γ coincidences:
☐

Sort by decreasing intensity:
☐

Show simple decay tools:
☐

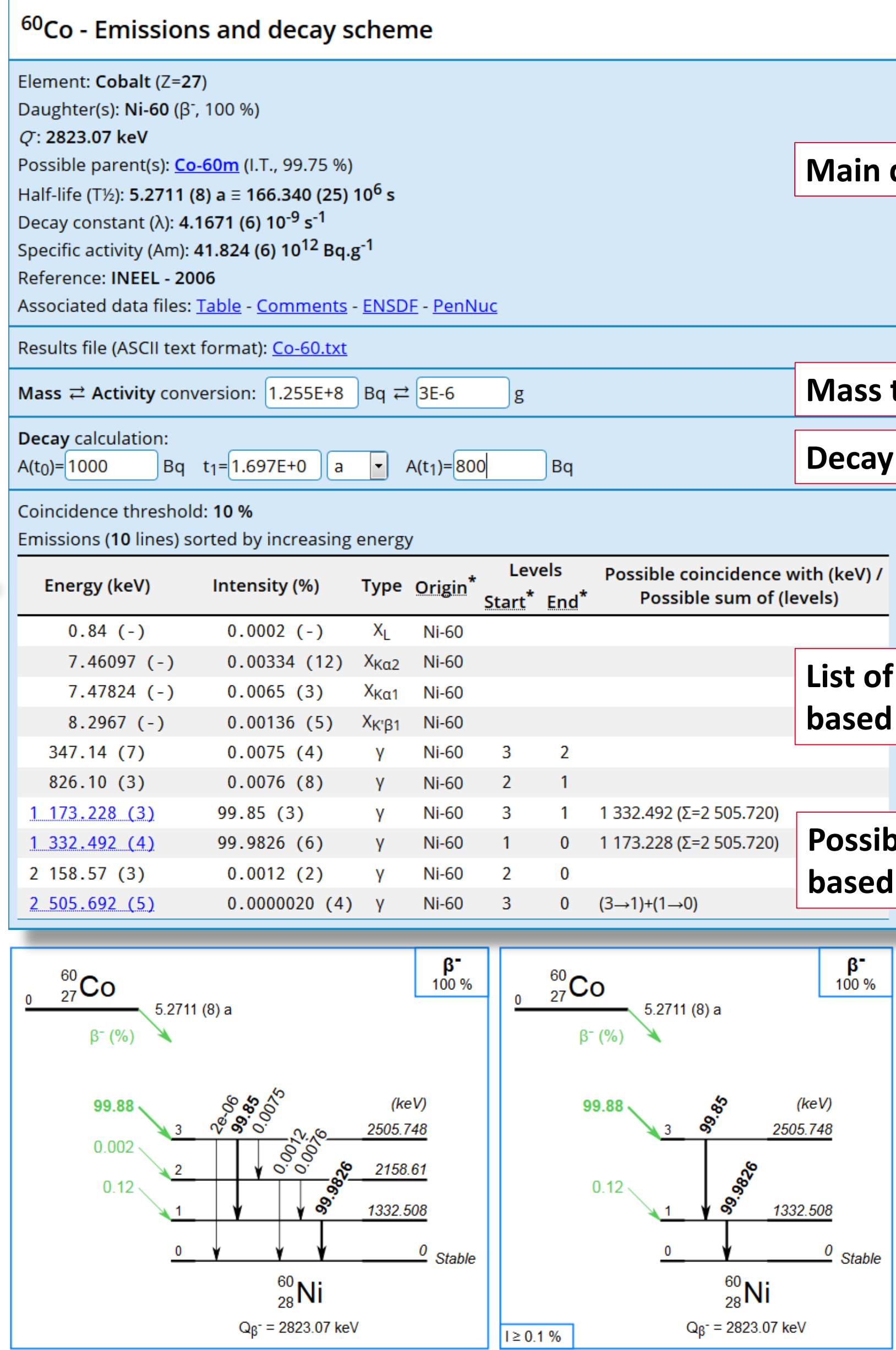
Display: ☒ Data ☒ Emissions ☒ Scheme

Emission type: ☒ X ☒ gamma ☒ alpha

Language: ☒ EN ☐ EO ☐ FR

Show data

Nuclide(s) selection, display parameters and threshold settings



Main data

Mass to activity conversion

Decay calculation tool

List of X, γ and α emissions, based on selected thresholdsPossible γ - γ coincidences based on selected threshold

Advanced search engine with multiple criteria

Nuclide search criteria

Decay mode: ☒ β^+ / ε ☒ β^- ☒ IT ☐ α
(☐ And ☒ Or ☐ XOR)

Emission type: ☐ X ☒ gamma ☐ alpha

Energy 1 (or range):
511 \pm 1 keV
And energy 2 (or range):
850 \pm 50 keV
And energy 3 (or range):
 \pm keV

Intensity range:
5 - %

Mass range:
 \pm u

Half-life range:
1 d - a

Find nuclides

Nuclide search window, e.g. looking for nuclides emitting γ -rays at 511 \pm 1 and 850 \pm 50 keV, with $I_\gamma > 5\%$ and $T_{1/2} > 1$ d

Selection results

3 nuclides disintegrating by β^+ , ε or β^- or I.T. giving 6 gamma emissions where
Energy 1: E = 511 \pm 1 keV
Energy 2: E = 850 \pm 50 keV
Intensity: I \geq 5 %
Half-life: $T_{1/2} \geq 1$ d

Energy / Intensity (nuclide):

Nuclide (half-life)	Energy (keV)	Intensity (%)
56Co (77.236 d)	511	5.14E+1 (84Rb)
58Co (70.85 d)	511	3.92E+1 (56Co)
84Rb (32.82 d)	511	2.99E+1 (58Co)
	810.7602	9.94E+1 (58Co)
	846.7638	9.99E+1 (56Co)
	881.61	6.90E+1 (84Rb)

Show emissions

Nuclide (half-life):
56Co (77.236 d)
58Co (70.85 d)
84Rb (32.82 d)

Energy threshold (keV):
Intensity threshold (%): 5

Show emissions

Nuclides meeting search criteria, ordered by emission energy & also by half-life

Related data and emissions: highlighted in yellow those meeting the search criteria, in blue other intense lines. Thresholds and emission type filters are also applied.

⁵⁶Co - Emissions

Element: Cobalt (Z=27)
Daughter(s): Fe-56 (β^+ , ε , 100 %)
 Q° : 4566 keV
Possible parent(s): **Ni-56** (β^+ , ε , 100 %)
Half-life ($T_{1/2}$): 77.236 (26) d \approx 6.6732 (22) 10^6 s
Decay constant (λ): 103.870 (35) 10^{-9} s $^{-1}$
Specific activity (Am): 1.11700 (38) 10^{15} Bq.g $^{-1}$
Reference: LBNL, NPL - 2005
Associated data files: [Table](#) - [Comments](#) - [ENSDF](#) - [PenNuc](#)

Results file (ASCII text format): [Co-56.txt](#)

Intensity threshold: 5 %
Gamma emissions (8 lines out of 47) sorted by increasing energy
Emissions meeting search criteria Other significantly intense emissions

Energy (keV)	Intensity (%)	Type	Origin*	Levels Start* End*
511 (-)	39.21 (22)	γ±	Fe-56	-1 -1
846.7638 (19)	99.9399 (23)	γ	Fe-56	1 0
1.037.8333 (24)	14.03 (5)	γ	Fe-56	5 2
1.238.2736 (22)	66.41 (16)	γ	Fe-56	2 1
1.771.327 (3)	15.45 (4)	γ	Fe-56	8 2
2.034.752 (5)	7.741 (13)	γ	Fe-56	11 2
2.598.438 (4)	16.96 (4)	γ	Fe-56	7 1
3.253.402 (5)	7.87 (3)	γ	Fe-56	10 1

⁵⁸Co - Emissions

Element: Cobalt (Z=27)
Daughter(s): Fe-58 (β^+ , ε , 100 %)
 Q° : 2307.9 keV
Possible parent(s): **Co-58m** (I.T., 100 %)
Half-life ($T_{1/2}$): 70.85 (3) d \approx 6.1214 (26) 10^6 s
Decay constant (λ): 113.233 (48) 10^{-9} s $^{-1}$
Specific activity (Am): 1.17570 (50) 10^{15} Bq.g $^{-1}$
Reference: CEA/LNE-LNHB - 2013
Associated data files: [Table](#) - [Comments](#) - [ENSDF](#) - [PenNuc](#)

Results file (ASCII text format): [Co-58.txt](#)

Intensity threshold: 5 %
Gamma emissions (2 lines out of 4) sorted by increasing energy
Emissions meeting search criteria Other significantly intense emissions

Energy (keV)	Intensity (%)	Type	Origin*	Levels Start* End*
511 (-)	29.88 (32)	γ±	Fe-58	-1 -1
810.7602 (20)	99.44 (2)	γ	Fe-58	1 0

Conclusion

Many new developments have been implemented in the online tool LARAWEB, including information on γ - γ coincidences and the ability to plot decay schemes. In particular, the use of intensity thresholds allows the main decay radiations to be displayed and a simplified decay scheme to be plotted, which is unique to LARAWEB.

We would like to express our sincere thanks to all members of the Decay Data Evaluation Project, past and present.