

# Decay Data Evaluation Project (DDEP): Updated Evaluation of the $^{133}\text{Ba}$ , $^{140}\text{Ba}$ , $^{140}\text{La}$ and $^{141}\text{Ce}$ Decay Characteristics

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- DDEP evaluations published in 2004 have been updated for 4 average mass region isotopes of  $^{133}\text{Ba}$ ,  $^{140}\text{Ba}$ ,  $^{140}\text{La}$ , and  $^{141}\text{Ce}$ .
- Experimental and other information (compilations, analyses, corrections) published up to 2016 was used.
- New recommended values of half-lives and a number of other key decay characteristics are presented.
- Our evaluated total average emission energies  $\langle E \rangle$ , for one disintegration, are compared to Q-values from mass tables of Wang et al. (2012).

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Topic track: [Evaluation](#)

## Main update features

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- **The updated evaluated decay data** were obtained using the approaches and methodology adopted by the working group of the DDEP cooperation.
- **For half-lives**, in relation to the problem discovered in the NIST ionization chamber calibration method, the 2014 corrected NIST half-life values (Unterweger and Fitzgerald, 2014) were introduced into the available experimental data sets.
- **Two important compilations** were taken into account in the current evaluations: the AME2012 atomic mass tables by Wang *et al.* (2012) and the evaluation of theoretical conversion coefficients using Brlcc by Kibédi *et al.* (2008). The first of them leads to updating Q-values and relevant corrections in nuclear transition energy values, and the latter allows improving the theoretical internal conversion coefficients (ICCs) used in the evaluations.

## Details

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Our detailed evaluation results and comments have been placed on the DDEP web site: ([http://www.nucleide.org/DDEP\\_WG/DDEPdata.htm](http://www.nucleide.org/DDEP_WG/DDEPdata.htm)) maintained by CEA-LNE/LNHB.

The **total list of the evaluated decay characteristics** includes:

- ✓ half-life,
- ✓ decay energy,
- ✓ energies and probabilities of beta or electron capture nuclear transitions,
- ✓ energies and probabilities of gamma-ray transitions,
- ✓ internal conversion coefficients,
- ✓ energies and emission probabilities of gamma-rays,
- ✓ energies and emission probabilities of X-rays,
- ✓ energies and emission probabilities of electrons.

# Energy conservation

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The reliability of the obtained evaluated data has been checked for each nuclide by **comparison of the total average emission energies  $\langle E \rangle$ , for one disintegration**, calculated from the current evaluated data **with Q-values from mass tables** by Wang *et al.* (2012).

Comparison  $\langle E \rangle$  calculated from the evaluated data  
with Q-values

Nuclide	$\langle E \rangle$ , keV	Q, keV
$^{133}\text{Ba}$	516.8 (36)	517.3 (10)
$^{140}\text{Ba}$	1040 (60)	1048 (8)
$^{140}\text{La}$	3763 (10)	3760.9 (18)
$^{141}\text{Ce}$	580.5 (33)	580.4 (11)