

BERkeley Alpha and proton Radiation (BEAR) database: an On-line Heavy Charged-Particle Decay Database

J. C. Batchelder¹, A. M. Hurst¹, Y. -H. Lee¹, and S. Goyal¹
¹*Dept. of Nuclear Engineering, University of California, Berkeley, USA*

The Berkeley data group have launched an online database BERkeley Alpha and proton Radiation (BEAR) detailing all known information on beta-delayed and direct heavy particle emitters (p, α , fission). This includes branching ratios, $T_{1/2}$, and all relevant Q and particle separation values. These are listed for all nuclei where these decays are energetically possible. In addition, for nuclei with known discrete proton and alpha transitions, the particle energies, intensities, initial and final states are compiled. A figure showing the major decays and a list of experimental references is also given for each dataset. Nuclei are organized by their isospin projection (Tz) and alpha-chain in this database, and split into even and odd Z. Information for this database is primarily obtained through a combination of NSR, google scholar, and IAEA.

At the time that this abstract was submitted, complete evaluations/compilations from Tz=-4 to Tz=+11 are included (61 datasets detailing 1544 transitions from 510 nuclei from 1355 references). This includes all of the delayed and ground-state proton emitters and alpha chains up to ¹⁹⁴Rn and ¹⁹²At. Additional Tz groups will be added at a rate of ≈ 1 /week up to the very heaviest nuclei known (Tz=+30), and will be updated as new papers are published. The tables in this database can be currently downloaded as a pdf document, and we will soon be offering them in a JavaScript Object Notation (JSON) format.

This database is now live and can be accessed at:

<https://nucleardata.berkeley.edu/research/betap.html>

or from following links from our group website. An example (for even-Z, Tz=-3/2) is given below (cut off after a few nuclei; the actual database contains all relevant nuclei).

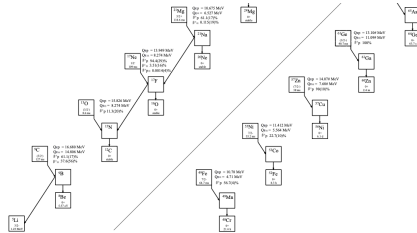


Table 1
Observed and predicted β -delayed proton emission from the even-Z, $T_z = -3/2$ nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein.

| Nuclide | J^π | $T_{1/2}$ | Q_ϵ | $Q_{\epsilon p}$ | $BR_{\beta p}$ | $Q_{\epsilon 2p}$ | $Q_{\epsilon 3p}$ | $Q_{\epsilon \alpha}$ | $BR_{\beta \alpha}$ | Experimental |
|------------------|---------------------|-------------|--------------|------------------|----------------|-------------------|-------------------|-----------------------|---------------------|--|
| ⁹ C | (3/2 ⁻) | 126.5(9) ms | 16.495(23) | 16.680(2) | 61.1(1.7)%* | -0.574(2) | -10.548(2) | 14.806(50) | 37.6(56)% | [2001Be51, 2001Bu05, 1972Es05, 2000Ge09, 2005Kn02, 1990As01, 1971EsZR, 1970Es03, 1965Mc09] |
| ¹³ O | (3/2 ⁻) | 8.58(5) ms | 17.770(10) | 15.826(10) | 11.3(20)% | -0.131(10) | -11.360(10) | 8.274(10) | | |
| ¹⁷ Ne | 1/2 ⁻ | 109.3(6) ms | 14.5488(4) | 13.9485(4) | 94.4(29)% | 1.8211(4) | -8.3865(4) | 8.7300(5) | 3.51(16)% | [2002Mo19, 1988Bo39] |

Table 2
Particle separation from the even-Z, $T_z = -3/2$ nuclei. Unless otherwise stated, all Q-values and separation energies are taken from [2021Wa16] or deduced from values therein.

| Nuclide | S_p | S_{2p} | Q_α | Experimental |
|------------------|------------|-----------|--------------|--|
| ⁹ C | 1.2996(24) | 1.436(2) | -10.65(200)# | [2000Ge09, 2001Bu05, 2001Be51, 1988Mi03] |
| ¹³ O | 1.512(10) | 2.112(10) | -8.220(10) | |
| ¹⁷ Ne | 1.464(5) | 0.933(1) | -9.040(10) | 2002Mo19, 2002Ch61, 1988Bo39] |