

²⁵⁸Lr α decay (3.92 s) 1971Es01

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 156, 1 (2019)	31-Jan-2019

Parent: ²⁵⁸Lr: E=0.0; T_{1/2}=3.92 s 33; Q(α)=8904 19; % α decay=97.4 18

²⁵⁸Lr-T_{1/2}: From ²⁵⁸Lr Adopted Levels in the ENSDF database (August 2017 update).

²⁵⁸Lr-Q(α): From 2017Wa10.

²⁵⁸Lr-% α decay: % α =97.4 18 (from ²⁵⁸Lr Adopted Levels).

1971Es01: ²⁵⁸Lr source was produced in ¹⁵N bombardments of ²⁴⁹Cf and ²⁴⁸Cm targets, and ¹²C, ¹³C bombardments of ²⁴⁹Cf target; the authors used ¹¹B and ¹⁰B beams on ²⁴⁹Cf target.

1976BeZY: ²⁵⁸Lr produced in ²⁴⁹Cf(¹⁵N, α 2n). Measured E α , I α , half-life at ORNL accelerator facility.

2014Ha04: ²⁵⁸Lr produced as daughter from α decay of ²⁶²Db, which was produced via the reaction ²⁴⁸Cm(¹⁹F,5n) at beam energies of 97.4 and 103.1 MeV from the RIKEN Linear Accelerator (RILAC). The evaporation residues (EVR) were separated in flight from beam particles and majority of nuclear transfer products by the gas-filled recoil ion separator (GARIS) and transported to the rotating wheel apparatus MANON (measurement system for Alpha- particle and spontaneous fission events On-line). They were deposited on mylar foils and set on the wheel between 15 pairs of Si PIN photodiodes with separated signals for α -particles (1-20 MeV) and spontaneous fission (SF) fragments (5-150 MeV). FWHM for α detection was 50 keV in the top detectors and about 100 keV in the bottom ones. Measured time-correlated $\alpha\alpha$ and α (SF) events in the α energy range of 8.0 MeV $\leq$ E α $\leq$ 9.0 MeV and SF fragment energy range E_{SF} $\geq$ 30 MeV.

The deduced α hindrance factors for both sets of E α and I α data, measured by two different groups, as well as the level spacings indicate some abnormalities, perhaps, the possible existence of some impurities in their sources.

²⁵⁴Md Levels

E(level)	Comments
83 30	If E α =8648 10 (1976BeZY), then E(level)=120 23.
114 30	If E α =8614 10 (1976BeZY), then E(level)=154 23.
144 30	If E α =8589 10 (1976BeZY), then E(level)=180 23.
175 30	If E α =8540 20 (1976BeZY), then E(level)=230 30.

α radiations

E α ^{†‡}	E(level)	I α ^{#&}	HF [@]	Comments
8590 20	175	30 4	$\approx$ 0.6	E α =8540 20 and I α =10 5 were measured by 1976BeZY. When these measurements are used, HF $\approx$ 1.2.
8620 20	144	47 3	$\approx$ 0.5	E α =8589 10 and I α =45 7 were measured by 1976BeZY. When these measurements are used, HF $\approx$ 0.4.
8650 20	114	16 3	$\approx$ 1.7	E α =8614 10 and I α =35 5 were measured by 1976BeZY. When these measurements are used, HF $\approx$ 0.6.
8680 20	83	7 2	$\approx$ 4.7	E α =8648 10 and I α =10 2 were measured by 1976BeZY. When these measurements are used, HF $\approx$ 2.6.

[†] α energies measured by 1971Es01 and 1976BeZY differ by 30-50 keV. The published data of 1971Es01 are listed here, and those of 1976BeZY are quoted for comparison.

[‡] The original energies have not been adjusted for changes in calibration energies, as the changes would be well within the uncertainties for E α values: E α (²¹³Fr)=6773, E α (²¹¹Po)=7443 and E α (²⁵³Es)=6640 were used by 1971Es01, and E α (²⁴⁴Cm)=5804.9, E α (²⁴³Am)=5274.8 and E α (²⁴⁹Cf)=5813.5 were used by 1976BeZY for energy calibration. 1991Ry01 recommends E α (²⁴⁴Cm)=5804.77 5, E α (²⁴³Am)=5275.3 10, E α (²⁴⁹Cf)=5812.8 16; E α (²¹³Fr)=6775 2, E α (²¹¹Po)=7449.3 13, E α (²⁵³Es)=6632.51 5 have been adopted in the ENSDF database. In 2014Ha04, a broad α group is reported at 8.61 MeV, which probably corresponds to the known α lines as listed in the table here.

[#] α intensity per 100 α decays. I α values of 1971Es01 and 1976BeZY are not in perfect agreement. I α measured by 1971Es01 are listed; I α measured by 1976BeZY are also quoted.

 ^{258}Lr α decay (3.92 s) [1971Es01](#) (continued)

 α radiations (continued)

@ $r_0(^{254}\text{Md})=1.48$ *f*, deduced from r_0 systematics given in [1998Ak04](#), is used in calculations. The calculated HF's and the level spacings are quite different from that for the normal behavior in this region. They may indicate perhaps some impurity in the source, or that the deduced partial α -decay half-lives are not correct.

& For absolute intensity per 100 decays, multiply by 0.974 *f*.