^{1}H(^{76}Kr,^{76}Kr′γ) 2023Sp02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Jun Chen and Ameenah R. Farhan	NDS 194,3 (2024)	8-Jan-2024

2023Sp02,2022Sp04: ^{76}Kr secondary beam of 79% purity and E(c.m.)=100 MeV was produced from the fragmentation of 150 MeV/nucleon ^{78}Kr beam incident on ^{9}Be target, followed by separation of fragments by A1900 separator at the NSCL-MSU facility. Target was NSCL/Ursinus liquid hydrogen (LH_2) located at the target position of the S800 spectrograph. The secondary beams were identified from other fragments in the cocktail beam via the time-of-flight (tof) difference measured between two plastic scintillators located at the exit of the A1900 magnetic separator. Projectile-like reaction residues were analyzed event-by-event based on energy loss (ΔE) and time of flight (tof). Measured Eγ, Iγ, lifetimes by recoil-distance Doppler shift (RDDS) using the S800 spectrograph. The γ rays emitted by the reaction residues in flight were detected using the GRETINA γ-ray array, with eight GRETINA modules, each containing four, 36-fold segmented HPGe detectors. Measured Doppler-corrected Eγ, Iγ, (particle)γ-coin, angular distribution of γ rays at 58°, 90° and 122°. Deduced γ-ray yields, inelastic scattering cross sections, β_2 and β_4 deformation parameters, and B(E4). Reaction calculations were performed with the coupled-channels code CHUCK3. For β_4, theoretical nuclear density functional theory (Δ(log ft)) calculations were performed using the Skyrme SkM*, UNEDF1, covariant NL3*, and DD-PC1 energy density functionals.

^{76}Kr Levels

E(level)†	J$^{\pi}$†	Comments
0.0	0$^+$	
424.1	2$^+$	Deduced β_2=+0.40 *2*(stat) *3*(syst) (2023Sp02).
1034.8	4$^+$	Measured scattering σ=5.1 mb *5* (2023Sp02) for one step process. Estimated ≈0.8 mb for the two-step process. Deduced β_4=+0.201 *9*(stat) *16*(syst) (2023Sp02) for constructive interference, and β_4=−0.127 *9*(stat) *22*(syst) for destructive interference between the one-step and the two-step processes. Authors preferred positive deformation parameter, based on a geometric idea of the polar-gap model of β_4 deformations, where positive deformations are expected at the beginning of a shell and negative hexadecapole deformations are expected at the end of a shell. B(E4)(W.u.)(4$^+$ to 0$^+$)=22.7 *10*(stat) *18*(syst) (2023Sp02) for positive β_4; 9.1 *6* for negative β_4, the latter numerical value from e-mail reply of May 05, 2023 from M. Spieker.
1221.7	2$^+$	
1957.4	4$^+$	Deduced β_4=+0.151 *11*(stat) *12*(syst) (2023Sp02) for assumed single-step mechanism. B(E4)(4$^+$ to 0$^+$)=12.9 *9*(stat) *20*(syst) (2023Sp02). B(E4)(W.u.)(4$^+$ to 0$^+$)=36 *2*(stat) *4*(syst) (2023Sp02).
2257.6	3$^-$	

† From Adopted Levels. Energies are rounded values.

γ(^{76}Kr)

E$_\gamma$†	E$_i$(level)	J$^{\pi}_i$	E$_f$	J$^{\pi}_f$
424.0	424.1	2$^+$	0.0	0$^+$
610.6	1034.8	4$^+$	424.1	2$^+$
736.0	1957.4	4$^+$	1221.7	2$^+$
922.6	1957.4	4$^+$	1034.8	4$^+$
1833.6	2257.6	3$^-$	424.1	2$^+$

† Rounded values from Adopted Gammas.

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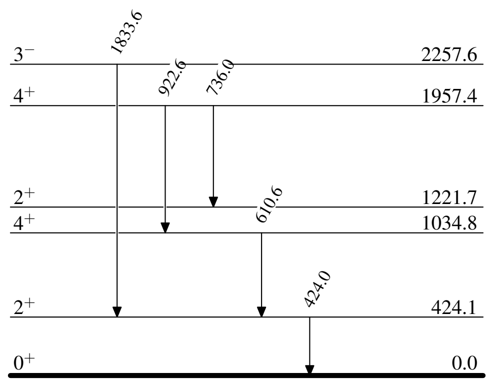
Level Scheme



$^{76}_{36}Kr_{40}$