Adopted Levels

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	15-Sep-2023

Q(β^-)=17710 *syst*; S(n)=2300 *syst*; S(p)=24130 *calc*; Q(α)=−17260 *calc* 2021Wa16,2019Mo01

Estimated uncertainties (2021Wa16): 890 for Q(β^-), 1060 for S(n).

Q(β^-) and S(n) from 2021Wa16. S(p) and Q(α) from 2019Mo01.

S(2n)=2200 *1000*, Q(β^-n)=16790 *810* (syst,2021Wa16). S(2p)=44950 (Theory, 2019Mo01). Q(β^-2n)=13560 *800*, Q(β^-3n)=10860 *800*, Q(β^-4n)=6000 *800*, Q(β^-5n)=1820 *800* (syst, deduced by evaluator from relevant mass excesses in 2021Wa16).

2018Ta17: ^{54}Ar formed by fragmentation of $^{70}Zn^{30+}$ beam at 345 MeV/nucleon from RIKEN-RIBF accelerator complex. Rotating target of ^{9}Be of 15 mm thickness were located at the BigRIPS two-stage ion separator. Particle identification (PID) was achieved by measuring time of flight (TOF), energy loss (ΔE), total kinetic energy (TKE), and magnetic rigidity (Bρ) through event by event analysis of reaction products. Particles of interest were stopped in a 76-mm thick CsI crystal after passing through six 1-mm thick silicon p-i-n diodes, while the magnetic rigidity (Bρ) of the fragments was reconstructed from position and angle measurements at foci using two sets of position-sensitive parallel plate avalanche counters (PPACs). Optimization was done using LISE^{++} simulation code. A total of 13 events were assigned to ^{54}Ar.

Theoretical calculations:

2022Bo09: calculated the charge radius within the framework of the Fayans density functional.

2022Kh01: calculated (M_n/M_p)/(N/Z) ratio with the parametrization of radii and diffuseness using the original Bernstein formula.

2019Sa58: calculated S(2n), charge and neutron radii, neutron density and skin thickness, deformation parameters, potential energy surface as a function of the deformation parameter, ground state properties using relativistic mean-field plus state-dependent BCS approach.

2014Eb02: calculated low-lying electric dipole (E1) strengths of pygmy dipole resonances (PDR), the PDR fraction as functions of the neutron number and neutron skin thickness, proton number dependence of the PDR fraction, shell structure, neutron skin thickness, neutron and proton pairing gaps and chemical potentials, quadrupole deformation parameters β_2 and γ using the canonical-basis time-dependent Hartree-Fock-Bogoliubov theory.

2013Wa05: calculated single-particle levels, J^π, occupational probabilities, proton density distributions using Skyrme-Hartree-Fock approach with different tensor forces.

2011Ka03: calculated energy of the first 2^+ state using shell model.

1998La02: calculated binding energy, radius, density, deformation using relativistic mean-field theory.

1997Pa38: calculated binding energy, deformations, radius using deformed relativistic mean field calculations.

Additional information 1.

^{54}Ar Levels

E(level)	J^π	Comments
0	0^+	%β^-=100; %β^-n=?; %β^-2n=?; %β^-3n=?; %β^-4n=? %β^-5n=? Only the β^- decay mode is expected, accompanied by delayed neutron decays, thus 100% β^- decay is assigned by inference. A total of 13 event were assigned to ^{54}Ar, two events each with tuned setting of spectrometer for ^{50}S and ^{53}Cl, one event for setting on ^{54}Ar, and four each for setting on ^{57}K and ^{60}Ca, according to data in Table I and text of 2018Ta07. Theoretical $T_{1/2}(\beta)$=7.1 ms, %β^-n=81, %β^-2n=5, %β^-3n=0, %β^-4n=0, %β^-5n=0 (2019Mo01). Theoretical $T_{1/2}(\beta)$=6.7 ms, %β^-n=68.2, 68.1; %β^-2n=3.7, 4.8; %β^-3n=1.8, 1.6; %β^-4n=0.007, 0.006; %β^-5n=0 (2021Mi17, two values for a decay mode refer to different fission barriers). $T_{1/2}$: half-life of the ^{54}Ar activity has not been measured. It is expected to be greater than the time-of-flight through the beam transport system, which may be about 500 ns. From systematics of half-lives of neighboring Sc isotopes, the half-life is expected to be <20 ms from 106 ms for ^{50}Ar, 236 ms for ^{49}Ar, 416 ms for ^{48}Ar and 1.23 s for ^{47}Ar, assuming a decreasing trend of half-life as neutron number increases in neutron-rich nuclei. From systematics, $T_{1/2}$=5 ms in 2021Ko07.