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Determination of E2/M1 mixing in the $J^{\pi} = 5/2^{+}$to the $J^{\pi} = 3/2^{+}$ transition in ^{21}Na and its relation to the ^{20}Ne(p, γ) stellar reaction

Tuesday, 5 July 2022 15:45 (15 minutes)

Measurements of nuclear reaction rates are crucial in determining isotopic abundances of elements produced within stellar interiors. This study focuses on the bottleneck reaction ^{20}Ne$(p, \gamma)^{21}$Na of the neon-sodium (NeNa) cycle, which is an important nuclear reaction cycle in stellar environments at temperatures greater than 0.05 GK. In particular, the ^{20}Ne(p, γ) reaction plays an important role in the hydrogen burning shells of red giants, cores of massive stars, AGB stars and nova explosions. This particular reaction rate is not well known, due to its cross section being very difficult to measure at astrophysically relevant energies. Recent experimental work showed that in order to have a better understanding of the reaction rate, one requires an accurate measurement of the electric quadrupole to magnetic dipole ($E2/M1$) mixing ratio for the γ-ray transition from the second $5/2^{+}$ state in ^{21}Na to the ground state. The only measurement of this mixing ratio ($\delta_{E2/M1}$) was performed nearly 60 years ago by C.Van der Leun and W.L Mouton at the Utrecht University, Netherlands. This presentation will highlight a recent ^{20}Ne(p, γ) study performed at the Center for Experimental Nuclear Physics and Astrophysics (CENPA) at the University of Washington in Seattle, to remeasure this mixing ratio with improved accuracy.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Primary author: GOPAL, Sumeera (Student)

Co-authors: TRIAMBAK, Smarajit (University of the Western Cape); SINGH, Bhivek (University of the Western Cape)

Presenter: GOPAL, Sumeera (Student)

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