



Contribution ID: 88

Type: **Invited Presentation**

Structure of Unbound Nuclei 10-N and 9-He

Thursday, 1 June 2017 16:20 (15 minutes)

Evolution of nuclear structure of Nitrogen isotopes ($Z=7$) and $N=7$ isotones with increasing imbalance between protons and neutrons has been a focus of intense scrutiny since the discovery of parity inversion in 11-Be . Yet, the level structure of the most exotic nuclear systems with 7 neutrons or protons (such as 9-He , 10-Li , 10-N) remain uncertain and presents a major challenge both theoretically and experimentally. Recent experimental results that shed light on the structure of 9-He and 10-N will be discussed.

The low-lying levels in 10-N (mirror of 10-Li) have been populated in $9\text{-C}+p$ resonance scattering [1]. The location of the $2s_{1/2}$ shell in this most neutron deficient isotope of Nitrogen is now firmly established. Properties of the ground and first excited states of 10-N will be discussed.

The level structure of 9-He was studied through the $T=5/2$ isobaric analog states in 9-Li , populated via $8\text{-He}+p$ resonance scattering [2]. No narrow $T=5/2$ structures were observed in the proton spectrum, providing strong evidence that there are no narrow, near neutron threshold states in 9-He , suggested previously in several other experiments (see [3] and references therein).

The new experimental results provide a good basis for better understanding of shell evolution in $Z/N=7$ nuclear systems and for making reliable extrapolations on the structure of 10-Li and 9-N (never observed) isotopes.

References:

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- [3] T. Al Kalanee, et al., Phys.Rev. C 88, 034301 (2013).

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Session Classification: Breakout 2