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# Probing Nuclear Structure of the Edge of the N=20 Region of Deformation through the β-decay of Exotic Ne and Na Isotopes

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Neutron-rich nuclei in the N=20 region of deformation have played a key role in our understanding of nuclear structure. In this mass region, so-called intruder states from nucleon occupations in the pf-shell are observed to energetically compete with the expected configurations in the sd-shell. Although nuclei in this mass region can be experimentally challenging to access, β-decay can clearly populate such intruder configurations, which play a critical role in our understanding of nuclear structure by providing clear benchmarks for nuclear theory.

The current presentation will highlight the β-decay of neutron-rich Ne and Na isotopes approaching the dripline. The discussion will focus on data collected from one of the last experiments to run at the NSCL, where neutron-rich isotopes centered on 31Ne were created through the fragmentation of a 48Ca beam and implanted into the β Counting System. Here, β- delayed γ-ray spectroscopy data were collected. Details of the nuclear structure obtained from the implanted 31,30Ne, and 33, 32Na isotopes will be discussed, with a focus on their half-lives and β- branchings. Spin-parity assignments are made from logft and β-branching arguments for observed levels in 31,32,33Mg, and 30,31Na following the β or β-n decay branches.

Notably, the data suggests a novel Jπ = 3/2+ assignment for the ground state of 31Ne—an unnatural parity assignment, which illustrates the presence of significant odd particle-hole configurations in its ground state, rather than the primarily even particle-hole configurations that have been suggested so far. Moreover, this marks the first identification of ground states with odd-particle- odd-hole configurations from a beta-decay measurement in the N=20 region of deformation. A discussion of the confirmation of these states compared to various theoretically predicted states from modern shell-model calculations will be presented. The dominance of these odd particle-hole configurations in the ground-state configuration of 31Ne is a prime example of how this mass region continues to challenge our understanding of nuclear structure.

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