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Investigating the Nuclear Shell Evolution in Neutron-Rich Calcium

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Nuclei away from the line of stability have been found to demonstrate behavior that is inconsistent with the traditional magic numbers of the spherical shell model. This has led to the concept of the evolution of nuclear shell structure in exotic nuclei, and the neutron-rich Ca isotopes are a key testing ground of these theories; there have been conflicting results from various experiments as to the true nature of a sub-shell closure for neutron-rich nuclei around ^{52}Ca . In November of 2019, an experiment was performed at the ISAC facility of TRIUMF; ^{52}K , ^{53}K , and ^{54}K were delivered to the GRIFFIN gamma-ray spectrometer paired with the SCEPTAR and the ZDS ancillary detectors for beta-tagging, as well as DESCANT for neutron-tagging. Using this powerful combination of detectors we combine the results to construct level schemes for the isotopes populated in the beta-decay. Preliminary results from the analysis of the gamma, beta, and neutron spectra will be presented and discussed in the context of an $N=32$ shell closure in neutron-rich nuclei.

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