Spectroscopic study of ^{114}Sn following the β^+ decay of ^{114}Sb using Gamma-Ray Infrastructure For Fundamental Investigations of Nuclei (GRIFFIN)

March 13, 2025

The experimental studies of semi-magic Sn ($Z = 50$) isotopes continue to be of significant interest as they provide valuable insights into the fundamental nucleon-nucleon interactions and offer suggestions for improvements in theoretical models. The mid-shell Sn isotopes (A = 112-122) exhibit shape coexistence, which is characterized by the presence of intruder proton 2p-2h deformed bands built on the excited 0^+ states in the vicinity of the ground-state bands. Recent spectroscopic studies of these mid-shell nuclei have reported different bandheads (viz., the 0_2^+ state in ^{118}Sn and the 0_3^+ state in ^{116}Sn) for the deformed 2p-2h band in these isotopes. In order to investigate how the properties of these shape-coexisting structures evolve along the Sn chain, a comprehensive study of neighboring ^{114}Sn nucleus was performed, incorporating gamma-ray spectroscopy, conversion electron measurements, and lifetime measurements.

The excited states in ^{114}Sn were populated via the β^+ decay of ^{114}Sb, which was produced at the TRIUMF-ISAC facility. The gamma rays emitted following the β decay were detected using the GRIFFIN spectrometer, consisting of 15 Compton-suppressed HPGe clover detectors. Additionally, a fast scintillator and an array of five Si(Li) detectors were used for β-particle and conversion-electron spectroscopy, respectively, while eight $LaBr_3$(Ce) scintillators were employed for fast timing measurements. Preliminary analysis reveals evidence of several new transitions in ^{114}Sn. Specific spectroscopic results pertaining to the level scheme, angular correlations and lifetime measurements will be presented.