Observation of Strong Isospin Mixing in ^{26}Si via β decay of ^{26}P

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The concept of isospin was proposed by W. Heisenberg to interpret the symmetry in atomic nuclei based on similiar properties between protons and neutrons with respect to the strong interaction [1]. However, isospin symmetic is not strictly conserved due to proton-neutron mass difference, Coulomb interaction, and charge-dependent parts of nuclear force. Such asymmetry leads to Fermi tranisition strength shared between isobaric analog state (IAS) and its neighboring states via strong isospin mixing, instead of being contributed into only one state. Probing isospin mixing has gained considerable traction in β-decay studies.

We have conducted the β-decay experiment of ^{26}P [2] at the Heavy Ion Research Facility in Lanzhou (HIRFL), using a complex detection array consisted of double-sided silicon strip detectors operating in conjunction with high-purity germanium detectors [2-5]. The IAS at 13055 keV and two new high-lying states at 13380 and 11912 keV in ^{26}Si determined via β-delayed two-proton emission of ^{26}P. The abnormal log ft values of IAS and 13380-keV state indicates a strong isospin mixing between these two states. The isospin mixing matrix element is determined to be 130(21) keV, representing the strongest mixing ever observed in β-decay experiments [6].

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