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An Investigation of the Pygmy Dipole Resonance in 92Sr Exploiting the Beta Decay of 92Rb

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A number of recent β-decay studies of neutron-rich rubidium isotopes which utilised Total Absorption Spectroscopy (TAS) revealed significant discrepancies in β-feeding probabilities from High Resolution Spectroscopy (HRS) studies performed over 40 years ago. These discrepancies can be attributed to the *pandemonium* effect which was a significant challenge in spectroscopy studies performed with early generation Ge(Li) detectors. Given their large cumulative yields from nuclear fission and the large Q_β values, incorrect β-feeding patterns of these isotopes have a significant impact for reactor physics.
While TAS studies are free of and the measured β-feeding probabilities are confidently considered robust, the method is a largely insensitive probe into the nature of these levels and much key spectroscopic information is missed.
We report results of a new β-decay study of ^{92}Rb with the GRIFFIN spectrometer at TRIUMF providing complementary data to recent TAS studies. These results significantly expand the known level scheme of ^{92}Sr with over 180 levels and 850 γ-ray transitions identified providing one of the most complex decay schemes across the nuclear chart. As ^{92}Rb has a 0^- ground state and large Q_β value, the decay populates numerous high-lying 1^- levels associated with the Pygmy Dipole Resonance (PDR) which is responsible for an enhancement of $E1$ strength below the neutron separation energy at the low-energy tail of the Giant Dipole Resonance. The PDR is interpreted as an out-of-phase oscillation between the neutron-skin and an isospin saturated core. From this, the PDR can be connected to the symmetry term of the nuclear binding energy and the nuclear equation of state. This interpretation however, is a matter of debate.
As the underlying nature of the PDR remains uncertain, β-decay offers an alternative probe compared to often employed Nuclear Resonance Fluorescence method and provide further complementary data.

Keyword-1

Nuclear structure

Keyword-2

Beta decay

Keyword-3

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