

Coherent and incoherent π^0 photoproduction at MAMI

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The Crystal Ball and TAPS detectors at MAMI offer close to complete and uniform angular acceptance for the detection of photons from neutral meson decays. The use of these detectors with the intense MAMI photon beam ($E_\gamma = 0.1 - 1.4$ GeV) enables neutral pion photoproduction processes to be studied with a new level of accuracy. New results on coherent neutral pion production from an isotopically pure ^{208}Pb target will be presented along with a preliminary assessment of the sensitivity of the data to the neutron skin thickness of ^{208}Pb . The implications of the ^{208}Pb neutron skin for nuclear theories and neutron star physics will be discussed.

Coincident detection of the π^0 and low energy nuclear decay photons in the Crystal Ball detector has enabled [1] the first detailed study of incoherent neutral pion production to a discrete nuclear state. The results provides a sensitive test of the Δ -N interaction and give the first access to matter transition form factors with an electromagnetic probe. Some of the possibilities for future measurements using the technique will be outlined.

[1] C M Tarbert, D P Watts et. al., Phys Rev. Let. 100 132301 (2008)

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