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Invited Talk: Fine structure of the IVGDR in open-shell calcium isotopes

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This study aims to investigate fine structure of the isovector giant dipole resonance (IVGDR) in open-shell calcium isotopes and the effect of neutron excess in the sd-shell configurations. This will allow for disentangling the origin of damping mechanisms with considerations of different theoretical model calculations beyond Random Phase Approximation (RPA). The IVGDR was excited in 42,44Ca isotopes using proton-particle inelastic scattering measurements acquired with Ep = 200 MeV beam at zero-degree scattering angle. The K600 magnetic spectrometer at iThemba LABS was used to detect and momentum analyze the inelastically scattered proton particles. An experimental energy resolution of ~35 keV (FWHM) was attained, revealing fine structure in the excitation-energy region of the IVGDR. The isovector strength distributions in these nuclei studied were obtained with equivalent photo-absorption method by considering Eikonal approximations. The theoretical comparison is based on the Relativistic Quasiparticle Time Blocking Approximation (R(Q)TBA, Relativistic Quasiparticle Random Phase Approximation (R(Q)RPA, Quasiparticle Random-Phase Approximation (QRPA) and Phonon-Phonon Couplings (PPC). Experimental cross sections as well as theoretical strength functions for 42,44Ca isotopes were extracted and compared using wavelet analysis technique. The obtained power spectra and the characteristic energy scales were found to give good agreement with the results of PPC in both nuclei, where higher contributions including 3p-3h couplings were considered.

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