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Understanding the Giant Dipole Resonance in Heavy Deformed Nuclei

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The IsoVector Giant Dipole Resonance (IVGDR) has far-reaching implications in nuclear physics. Experimental GDR data have been obtained using various techniques including photo-nuclear measurements with photons from Bremsstrahlung and quasi-monoenergetic photons from positron annihilation in flight and Laser Compton Scattering, but also using proton inelastic scattering. While good agreement of (p,p′) data with (γ,abs) has been seen for the closed-shell nuclei 120Sn and 208Pb, unexpected differences are seen for deformed nuclei. A study on selected Nd and Sm isotopes using the K600 magnetic spectrometer at iThemba LABS found significant differences with respect to the distribution of the IVGDR strength between the extracted photo-absorption data from iThemba LABS and pre-existing (γ,xn) data from Saclay. Furthermore, discrepancies exist for several nuclei between photo-absorption data taken at the Saclay and Livermore laboratories. It is important for these discrepancies, as well as the IVGDR in heavy deformed nuclei in general, to be understood. To this end, a wide-ranging study of various aspects of the IVGDR will be discussed, which will include an investigation into the above-mentioned discrepancies, working as part of a larger collaboration to attempt to construct calibration standards, and investigating the effects of triaxiality and shape coexistence.

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