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## Investigation of fine structure of the Isovector Giant Dipole Resonance in nuclei across the periodic table using proton inelastic scattering at zero degrees

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### Abstract content <br> &nbsp; (Max 300 words)

A survey of the fine structure phenomenon of the Isovector Giant Dipole Resonance (IVGDR) was carried out at the K600 Magnetic Spectrometer of iThemba LABS using proton inelastic scattering at an incident energy of 200 MeV for a wide target-mass range including closed and near-closed shell nuclei:  $^{27}\text{Al}$ ,  $^{40}\text{Ca}$ ,  $^{56}\text{Fe}$ ,  $^{58}\text{Ni}$  and  $^{208}\text{Pb}$ . The data obtained provide a unique insight into the role of different damping mechanisms contributing to the decay of the IVGDR. Absolute cross-sections together with systematic predictions on the position and width ( $\Gamma$ ) in the nuclei studied will be presented. The presence of other multipole admixtures such as the Isoscalar Giant Quadrupole Resonance (ISGQR) and Isovector Giant Quadrupole Resonance (IVGQR), were found in the measured spectra for some of the target nuclei investigated. Such observations allow for the confirmation of their respective resonance widths, centroids and strengths for each identified giant resonance. Experimental results using other probes (e.g.  $\gamma$ -capture) exciting the IVGDR will also be compared to the present data. Characteristic energy scales from experimental data are extracted using the wavelet analysis technique, and provide insight into the long-standing search for experimental signatures of scales associated with the coupling between collective states and internal degrees of freedom. Another vital aspect of the fine structure is its connection to nuclear level densities in the excitation region of giant resonances. Finally, the state-of-art microscopic models like the Quasi-particle Phonon Model (QPM) for medium-heavy nuclei and Second Random Phase Approximation (SRPA) for light nuclei will also be compared to the experimental data.

### Apply to be<br> consider for a student <br> &nbsp; award (Yes / No)?

Yes

### Level for award<br>&nbsp;(Hons, MSc, <br> &nbsp; PhD)?

PhD

### Main supervisor (name and email)<br>and his / her institution

Prof John Carter (john.carter@wits.ac.za) and Prof Elias Sideras-Haddad, University of the Witwatersrand, Johannesburg

### Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?

Yes

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