Contribution ID: **13** Type: **not specified**

Isomers and the evolution of structure in Hg, Tl and Pb isotopes

Monday 4 February 2019 15:15 (25 minutes)

The structure of nuclei around the line of stability with A˜200 exhibits diverse excitation modes ranging from collective rotation, including decoupled and semi-decoupled bands, and isomeric states whose decay rates span a large range from enhanced to hindered in comparison with single-particle estimates. The evolution of collectivity and the gradual predominance of intrinsic excitations with increasing Z from Hg (Z=80) to Pb (Z=82), as well as along an isotopic chain approaching the neutron shell closure at N=126, is evident. Isotopes of Hg, Tl and Pb which lie in this transitional region offer insight into the complex underlying nuclear interactions.

The excited level structure of a number of isotopes, $viz.$ $^{197-202}$Hg, $^{199-203}$Tl and $^{202-204}$Pb, have been studied using fusion-evaporation and multi-nucleon transfer reactions. The experiments have been performed at the Inter-University Accelerator Centre and the Argonne National Laboratory with γ-ray coincidence data being recorded using the Indian National Gamma Array (INGA) and Gammasphere spectrometers. An extensive analysis of the data obtained in these experiments has been performed [1] resulting in considerable extension of the known level structure and identification of new isomeric states.

While the data have revealed a number of facets of the structure of these nuclei, a common theme is the observation of isomers with half-lives ranging from a few nanoseconds to hundreds of microseconds. The gamut of responsible excitation mechanisms is exemplified by the disparate configurations and decay modes of the isomers. A total of 12 isomers have been newly identified in Hg, Tl and Pb isotopes [2,3,4] and several previously established ones have been confirmed. These results allow for a systematic and thorough examination of nuclear structure in this region. An understanding of these results, particularly those for isomers, has been obtained in the context of empirical calculations using single-particle and pair-gap energies, and residual interactions obtained from experimental data and shell model calculations performed with the Oxbash code using the KHH7B interaction. The detailed results will be presented at the conference.

[1] S.K. Tandel $et\ al.$, Physics Letters B 750 (2015) 225.
[2] S.G. Wahid, S.K. Tandel $et\ al.$, Proceedings of the DAE Symposium on Nuclear Physics 63 (2018) 228.
[3] Poulomi Roy, S.K. Tandel $et\ al.$, Proceedings of the DAE Symposium on Nuclear Physics 63 (2018) 238.
[4] Saket Suman, S.K. Tandel $et\ al.$, Proceedings of the DAE Symposium on Nuclear Physics 63 (2018) 176.

Primary author: Prof. TANDEL, S.K. (UM-DAE Centre for Excellence in Basic Sciences)

Presenter: Prof. TANDEL, S.K. (UM-DAE Centre for Excellence in Basic Sciences)

Session Classification: Parallel Session Nuclear Physics