ID contributo: **2** Tipo: **Oral**

On the Elusive Links Between High-K and Low-K States in 176Lu and 180Ta

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Nature's heaviest naturally occurring odd-odd isotopes, 176Lu and 180Ta have a pair of high and low-K levels at low energies formed by parallel or anti-parallel coupling of the unpaired proton and neutron to give a total projection, K = | Omega p ± Omega n |.
One consequence of this is the formation of a long-lived 9- state in 180Ta, the only naturally occurring nuclear isomer, with a lifetime of tm > 1 x 10^16 years, 77 keV above the Kpi = 1+ short-lived ground state. The opposite situation occurs in 176Lu: it exhibits a long-lived Kpi = 7- ground state and a 1- short-lived isomer at 123 keV. Both nuclei present issues for nucleosynthesis; 180mTa in terms of its abundance, creation, and survival in stellar environments; 176Lu because, while definitely s-process (a possible s-process chronometer or thermometer), it could be destroyed through neutron capture to the short-lived beta-decaying state. Furthermore, photon excitation via intermediate-K states, passing from the 1- isomeric level to the ground state, or the equivalent transition in the opposite direction, could either increase or decrease its abundance, and that of 176Hf. (See Refs. [1,2], for example.)
The presentation will cover some recent results [3,4] from gamma-ray spectroscopy that bear on these issues, partly in the context of the relationship between the strong resonances observed in laboratory photoactivation (see, for example, Ref. [5]) and the nuclear structure problem of associating these resonances and their properties with specific excited states.

1. P. Mohr, F. Kappeler, R. Gallino, Phys. Rev. C 75, 012802(R) (2007).
2. P. Mohr et al., Phys. Rev. C 79, 045804 (2009)
3. G. D. Dracoulis et al. Phys. Rev. C, 81, 011301(R) (2010)
4. G. D. Dracoulis and G.J. Lane, to be published
5. D. Belic et al. Phys. Rev. C 65, 035801 (2002).

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