In Search for the Tetrahedral Symmetry in the Actinides: *a possible experimental proof through the ELMA Project*

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During the last few years the TetraNuc collaboration has launched a series of experiments to possibly demonstrate the existence of high-rank symmetries in subatomic physics: in particular the tetrahedral symmetry. The search criteria were based on the expectation that the E2 transitions in rotational bands of tetrahedral-symmetric nuclei should be 'weak' and as a consequence in the experiments proposed so far the rotational bands with vanishing E2's were aimed at. TetraNuc-collaboration experiments have been performed worldwide focussing on the Rare-Earth region nuclei. The first experimental results are just appearing suggesting that the rotational bands selected at first as possible candidate-structures may not be the structures that we are looking for. More results are expected soon from direct coincidence measurements. Meanwhile an important progress has been made on the theory side. Some suggestions strongly indicate that the Actinide region may be of particular interest because of the role of the octahedral symmetry. An extended compilation of the currently available experimental data has been compared to the predictions of the Mean-Field calculations. This analysis clearly points out that some uranium isotopes are among the most interesting experimental candidates.

The studies of high-rank symmetries will focus in the future on the measurement of the branching ratio but also on the B(E2) and B(E1) transition probabilities. One has to remind that in the exact static limit of the tetrahedral symmetry, both the static quadrupole moment and the dipole moment must vanish and hence both transition probabilities are expected to be small. In the uranium isotopes a strong experimental hint comes from the excited negative parity bands that are so far reported in the literature with no E2 in-band transitions; this fact might sign weak B(E2) but also large B(E1). To go further experimentally, we need to measure the candidate states-lifetimes. Unfortunately, it is far from being an easy task for these nuclei because of the limited existing production possibilities: most of them preclude the lifetime measurements to be performed based on the available Doppler methods. This motivates us to develop the ELMA project *(Electron for Lifetime Measurements in the Actinides)*.

In this talk we will present an overview of the current experimental knowledge and develop the ideas on how to search for the symmetries in the Actinide region as well.