Nuclear Seminar

Exotic Modes of Collective Nuclear Excitations-Nuclear Tidal Waves and the Phenomenon of Multiple Chiral Bands

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Many aspects of low energy nuclear structure are characterized by the collective degrees of freedom, namely vibration and rotation. For the group of nuclei in the transitional region between spherical and well deformed nuclear shapes, the low-lying structure may be described semi-classically as quadrupole running waves (tidal waves) and the observed vibrational-rotational behavior can be thought of as resulting from a rotating condensate of interacting d-bosons. In the first part of my talk, I will discuss our recent lifetime measurements that led to the first experimental identification of a seven-phonon yrast state in ^{102}Pd. I will then describe the structural composition of these states in terms of a rotating condensate of d-bosons.

The second part of my talk will be based on the new concept of multiple chiral doublets ($M_\chi D$): the existence of more than one pair of chiral doublet bands in a single nucleus, a phenomenon previously predicted in the framework of the relativistic mean eld (RMF) theory. Two distinct pairs of chiral partner bands have been identified in ^{133}Ce. The chiral nature of these bands will be discussed in the context of the established fingerprints of nuclear chirality along with theoretical calculations that support this interpretation.

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