Int. Workshop “Shapes and Dynamics of Atomic Nuclei: Contemporary Aspects”
ed. Nikolay Minkov, Heron Press, Sofia 2023

The Nature of 0^+ states – Current Status

S.R. Lesher[1,2]

[1]University of Wisconsin, La Crosse, La Crosse, Wisconsin, 54601, USA
[2]University of Notre Dame, South Bend, Indiana 46637, USA

Abstract

As basic building blocks of matter, nuclei show some emergent collective behavior across isotopic and isobaric chains and are known to be deformed in shape in regions of the chart of nuclides away from closed shell. One mode of collective behavior is the existence of vibrational degrees of freedom superimposed on rotational and is one of the open questions in nuclear structure physics today. Varying models and theories address the existence or absence of different vibrational degrees of freedom. Of great interest is the nature of $0+$ states, particularly in the rare-earth region of the chart of nuclide where the $4^+/2^+$ ratio ground state energy ratio approaches 3.3 indicating a well-deformed nucleus. In the past decade, multiple experiments have added to this discussion by observing multiple 0^+ states below 2 MeV in a number of deformed nuclei. This talk will discuss the information known about this region, how 0^+ states are identified and characterized, and what experimental information is still required to address this issue.