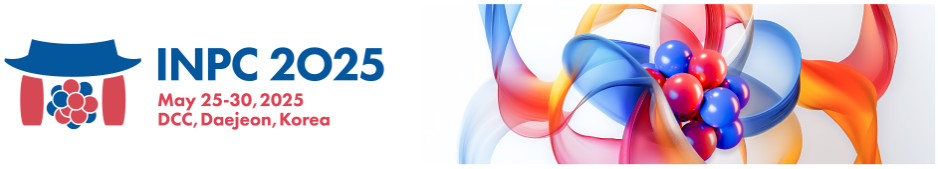

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Review of magnetic- and antimagnetic-rotational structures in nuclei

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This work is an update of the 2000 publication of magnetic-rotational bands by Amita et al. [1], followed by an unpublished update of 2006 [2], and reviews detailed experimental data extracted from original publications for 228 magnetic-rotational (MR or Shears) structures spread over 117 nuclides, and 38 antimagnetic-rotational (AMR) structures in 28 nuclei, with a brief commentary about each band. Many of these nuclei are located at or near the semi-magic nucleon numbers, mostly for protons. For example, 88 MR bands are currently known for the Pb (Z=82) nuclei, and 27 AMR band in Pd, Cd and In nuclei. It is interesting that the proton magic numbers appear to play a major role in the MR phenomenon, which seems less well understood. A brief discussion of the salient features of the MR and AMR bands and their theoretical interpretation has been presented in the present review. The tables contain gamma-ray energies, associated level energies with spins and parities, level lifetimes, B(M1), B(E2), and B(M1)/B(E2) ratios, the latter four when available, and probable spherical quasiparticle configurations. We find that many bands claimed in the literature as MR and AMR bands still have tentative assignments, as level lifetimes, thus B(M1) and B(E2) values, for a large number of MR and AMR bands, which can potentially provide critical criteria for firm identification of such structures, are lacking. Additionally, theoretical model calculations for many of these bands, which could provide insight for a better description of nuclear structure, are also lacking in literature. While this review is mainly based on original research articles, nuclear structure databases ENSDF [3], XUNDL [4], and NSR [5] databases have been consulted for completeness. The literature cut-off date is August 11, 2024.

References

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[3]T.W. Burrows, Nucl. Instrum. Meth. Phys. Res. A 286, 595 (1990), Evaluated Nuclear Structure Data File (ENSDF database), http://www.nndc.bnl.gov/ensdf/
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Primary author: KUMAR, Sushil (Akal University Talwandi Sabo)

Co-authors: Prof. JAIN, AK (Amity University Noida); Dr AMITA, Amita (RBS College Agra); Dr SINGH, Balraj (McMaster University Canada); Prof. SINGH, Sukhjeet (Akal University Talwandi Sabo)

Presenter: KUMAR, Sushil (Akal University Talwandi Sabo)

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