



Contribution ID: 291

Type: Oral

## Description Of Low-Lying Collective States in Osmium Isotopes in the Boson Expansion Theory

Thursday, 30 November 2023 17:30 (15 minutes)

Neutron-rich nuclei with  $A \sim 190$  provide a characteristic testing ground for microscopic theories of nuclear structures. There are quite a few indications that a prolate-oblate shape transition takes place at around  $N = 116$  in this region [1, 2].

The microscopic description of anharmonicities in nuclear quadrupole collective motions, in terms of the fermion degrees of freedom, is a long-standing and fundamental subject in the study of nuclear many-body systems. The boson expansion theory (BET) is a promising method for the subject if the coupling to non-collective states is faithfully included in the calculation [3]. It allows us to take into account higher-order terms neglected in the RPA, and the adiabatic condition for particle motions can be avoided.

In this work, the low-lying collective states in osmium isotopes are investigated microscopically by means of the BET with the self-consistent effective interactions [4]. The fermion Hamiltonian is comprised of the QQ interaction with its self-consistent higher-order (many-body) terms [5], monopole- and quadrupole-pairing interactions in addition to the spherical limit of the Nilsson Hamiltonian. The Kishimoto-Tamura method of normal-ordered linked-cluster expansion of the modified Marumori boson mapping [6] is applied to construct the microscopic boson image of the Hamiltonian and that of the E2 operator. The potential energy surfaces and the structures of boson wave functions for some relevant low-lying collective states are illustrated [7]. Calculated level structures and electromagnetic properties are compared with the available experimental data.

[1] P. Sarriguren, R. R.-Guzmán and L. M. Robledo, Phys. Rev. C 77 (2008) 064322.

[2] N. Al-Dahan et al., Phys. Rev. C 85 (2012) 34301.

[3] A. Klein and E. R. Marshalek, Rev. Mod. Phys. 63 (1991) 375.

[4] H. Sakamoto and T. Kishimoto, Nucl. Phys. A501 (1989) 205; *ibid.* 242.

[5] H. Sakamoto, J. Phys.: Conf. Ser. 1023 (2018) 012003.

[6] T. Kishimoto and T. Tamura, Phys. Rev. C 27 (1983) 341.

[7] H. Sakamoto, Phys. Rev. C 104 (2021) 034304; J. Phys.: Conf. Ser. 1555 (2020) 012023.

### Attendance Type

In-person

**Primary author:** SAKAMOTO, Hideo (Gifu University)

**Presenter:** SAKAMOTO, Hideo (Gifu University)

**Session Classification:** Session 5

**Track Classification:** Nuclear Structure, Reactions and Dynamics