Contribution ID: **36** Type: **Oral contribution**

Pairing collectivity in the ground state of Borromean nuclei and unbound 2n-systems: 22C and 26O

Thursday, 7 June 2018 09:54 (18 minutes)

In recent years, there has been rapidly increasing interest in the study of the Borromean nuclei sitting right on the top of neutron driplines and two-neutron decays of unbound systems beyond the neutron dripline. These systems demands a three-body description with proper treatment of continuum, the conventional shell-model assumptions being insufficient. Very recently a high
precision measurement of interaction cross-section for 22C was made on a carbon target at 235 MeV/nucleon [1] and also the unbound nucleus 26O has been investigated, using invariant-mass spectroscopy [2] at RIKEN Radioactive Isotope Beam Factory. These high precision measurements, are the motivation for selecting these systems for the present study. We have studied the pairing
collectivity in the ground state of Borromean nuclei 22C and in the 2n- unbound system 26O. For this study we have used our recently implemented 3 - body (core+n+n) structure model for ground and continuum states of the Borromean nuclei [3, 4].

We will present the ground state properties of 22C and 26O systems and transitions to the continuum that might be of help in disentangling the still poorly known low-energy resonances and predicting new resonances of these nuclei. We compare our findings with the more recent experimental works and the scarce theoretical work that has been done in the recent past on these
systems.

The neutron single-particle unbound spdf- continuum states of the 21C and 25O system are calculated in a simple shell model picture for different continuum energy cut-off's of 5, 10 and 15 MeV by using a Dirac delta normalization and are checked with a more refined phase-shift analysis. The sensitivity of the (core+n) potential has been explored for the emergence of different dominant configurations in the ground state of 22C and 26O. After fixing convergence with the continuum energy cuts and bining size, a reasonable energy cut of 5 MeV and bin size of 0.1 MeV is used for present study. These (core+n) continuum wavefunctions are used to construct the two-particle 22C and 26O states by proper angular momentum couplings and taking contribution
from different configurations. We have explored the role of different pairing interactions such as density independent (DI) contact-delta pairing interaction and density dependent (DD) contact-delta pairing interaction in the structure of these systems. We have shown how the ground state
displays a collective nature, taking contribution from many different oscillating continuum states that coherently sum up to give an exponentially decaying bound wavefunction in 22C and an oscillating unbound wavefunction in case of 26O.

[1] Y. Togano et al., Phys. Lett. B761, 412-418 (2016).
[2] Y. Kondo et al., Phys. Rev. Lett. 116, 102503 (2016).
[3] L.Fortunato, R.Chatterjee, Jagjit Singh and A.Vitturi, Phys. Rev. 90, 064301 (2014).
[4] Jagjit Singh, L.Fortunato, A.Vitturi and R.Chatterjee, Eur. Phys. J. A 52 209 (2016).

Primary author: Dr SINGH, JAGJIT (Nuclear Reaction Data Center, Faculty of Science, Hokkaido University, Sapporo 060-0810, Japan)

Co-authors: Prof. VITTURI, Andrea (Dipartimento di Fisica e Astronomia "G.Galilei", and INFN-Sezione di Padova, via Marzolo 8, I-35131 Padova, Italy); Dr FORTUNATO, Lorenzo (Dipartimento di Fisica e Astronomia "G.Galilei", and INFN-Sezione di Padova, via Marzolo 8, I-35131 Padova, Italy); Dr HORIUCHI, Wataru (Department of Physics, Hokkaido University, Sapporo 060-0810, Japan)

Presenter: Dr SINGH, JAGJIT (Nuclear Reaction Data Center, Faculty of Science, Hokkaido University, Sapporo 060-0810, Japan)

Session Classification: Session 11