ID de Contribution: **46** Type: **Non spécifié**

Lifetime measurements of excited states in neutron-rich C and O isotopes as a test of the three-body forces

mardi 15 octobre 2019 18:30 (5 minutes)

This contribution reports on an experiment performed in GANIL in July 2017 with the AGATA tracking array coupled to the PARIS scintillator array and the VAMOS magnetic spectrometer. Aim of the measurement was the determination of the lifetimes of excited states in neutron rich C and O isotopes, in particular in 16C and 20O. For these nuclei, ab-initio calculations predict a strong sensitivity of selected electromagnetic transition probabilities to the details of the nucleon-nucleon interactions, especially to the three-body term (NNN). Strong sensitivity is expected, in particular, in the case of the lifetime of the second excited 2+ state, in each nucleus of interest.

The poster will present results of analysis of the data collected with the AGATA, VAMOS and PARIS detectors, for the reaction employing the 18O beam (Ebeam = 7.0 MeV/A) on a thick (6.7 mg/cm2) 181Ta target. Determination of nuclear state lifetimes in the range of few hundreds femtoseconds is based on the analysis of line shape and line centroid shift angular dependence observed in AGATA Doppler corrected gamma-ray energy spectra, in comparison with simulation calculations. Sensitivity and correctness of this method was validated by (re)-measured known lifetimes in 17O and 19O nuclei. Comparison of experimental lifetime of the second 2+ state in 20O with calculated values (with NN and NN+NNN interactions) will be presented, as well as results obtained for the case of 16C will be discussed.

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Classification de Session: Poster session