Study of the soft dipole modes in ^{140}Ce *via* inelastic scattering of ^{17}O

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Giant Resonances are collective modes of excitation of atomic nuclei, which provide useful information on nuclear structure and on the effective nucleon-nucleon interaction [1]. Such resonances can be excited with different probes as for example: photons, charged particles or heavy ions, followed by subsequent decays by emission of particles and γ's [2]. Below particle threshold, a large fraction of highly excited states has been found to be of a dipole nature and it has been associated to the Pygmy Dipole Resonance, which is considered to be caused by the oscillation of the neutron skin against the inert proton-neutron core.

Main aim of this study is a deeper understanding of the nuclear structure properties of the soft dipole modes in ^{140}Ce, excited *via* inelastic scattering of a weakly bound ^{17}O projectiles. Comparison with previous results for this nucleus, investigated in (γ,γ') and (α,α') experiments [3], will be helpful for drawing final conclusions.

The experiment was performed at Laboratori Nazionali di Legnaro, Italy. Inelastic scattering of ^{17}O ion beam at 20 MeV/A was used to excite the resonance modes in the ^{140}Ce target (2.5 mg/cm^2 thick). Gamma rays were registered by 5 AGATA triple clusters and 8 large volume scintillators ($LaBr_3$), useful for high γ-energy. The detectors were mounted at a distance of about 20 cm from the target position, resulting in a full absorption efficiency of about 0.8% at 10 MeV. The scattered ^{17}O ions were identified by two ΔE-E Si telescopes of the TRACE array mounted inside the scattering chamber at 9° (which is the grazing angle for the reaction) with respect to the beam axis. The telescopes consisted of 2 segmented Si-pad detectors, each made of 60 pixels (with a pixel size of 4x4 mm^2) covering an active area of 20x50 mm^2. The resulting solid angle for the Si telescope was about 100 msr.

During the presentation, progress in complex data analysis will be discussed and preliminary results of the experiment will be presented.

[1] P. F. Bortignon, A. Bracco and R. A. Broglia, Giant Resonances, nuclear structure at finite temperature, Contemporary Concepts in Physics, Harwood Academic Publishers (1998).
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[3] J. Endres et al., Phys. Rev. C80, 034302 (2009).