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Study on the Isoscalar Excitation of the Pygmy Dipole Resonance in ^{68}Ni

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Recently, much relevance has been given to the collective states in neutron-rich nuclei. The remarkable interest in these states is driven by the presence of an electric dipole response around the nucleon binding energy [1,2]. This mode, the so called Pygmy Dipole Resonance (PDR), although is carrying few per cent of the isovector Energy Weighted Sum Rule (EWSR) has a strong relation with the symmetry energy and it has been used as a further tool to constrain it. It is predicted to be present in almost all nuclei with neutron excess: in particular for nuclei far from the stability line. This mode can be populated by both isoscalar and isovector probes due to the properties of its transition densities [3]. Several experiments, with both the probes, have been performed on stable nuclei [1,2,4,5]. Whereas, the study of the PDR with unstable nuclei has been done in pioneering experiments carried out at the GSI, using relativistic Coulomb excitations on ^{132}Sn [6] and ^{68}Ni [7] isotopes.

We use, for the first time, an isoscalar probe to excite the PDR on an unstable isotope. The experiment with a ^{68}Ni beam at 33 MeV/nucleon on a ^{12}C target was performed at LNS-INFN of Catania. The unstable beam was produced by In Flight Fragmentation method in a dedicated In Flight Radioactive Ion Beams (FRIBs) transport line. The detector systems CHIMERA [8] and Farcos [9] were used to detect both gamma and charged products.

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