Search for Pygmy Dipole Resonances with gamma-ray detectors

A. Bracco, G. Benzoni, N. Blasi, F. Camera, F.Crespi, S. Leoni, P. Mason, B. Million,
M. Pignanelli, O. Wieland, INFN and University of Milano, Italia
A. Maj, M. Kmiecik, W. Meczynski, J. Styczen, J.Grebosz, IFJ PAN Cracow
T. Aumann, H. Emling, J. Gerl, M.Gorska, P.Reiter, T.Saito, H.Wollersheim et al., GSI
G. de Angelis, A. Gadea, D. Napoli, LNL
S. Lenzi, F. Della Vedova, E. Farnea, S. Lunardi, Padova
C. Petrache and G. Lo Bianco, Camerino
M. Castoldi and A. Zucchiatti, Genova
G. La Rana, Napoli
F. Azaiez, Orsay

The isovector giant dipole resonance (GDR) is one of the most important and easily accessible nuclear collective modes. A large amount of experimental data exists for nuclei in the proximity of the stability line, these data have contributed to the studies on the effective nucleon-nucleon interaction in the medium and, in general, to the understanding of the structure of the nuclei.
At the moment there are very few experimental data in nuclei far from the stability line. In particular, the question on how the Giant Dipole Resonance strength evolves when going from stable to exotic, weakly bound nuclei with extreme neutron to proton ratio is presently under discussion both theoretically and experimentally in connection with the existence of the so called pygmy resonances or soft mode [1-6].
A neutron rich nucleus in the medium mass region which is very interesting for the study of the GDR is ^{68}Ni. Recent theoretical calculations have predicted that the contribution of the low-energy region to the dipole strength distribution increases with the neutron excess.
The gamma emission from coulomb excited ^{68}Ni has been measured using the RISING array. The standard FRS-Rising setup [7] has been used. The particle identification setup after the target is performed by the CATE calorimeter which, in the present experiment, consisted of nine position sensitive Si detectors coupled to four 6 cm thick CsI. High and low energy gamma rays have been measured using 15 HPGe clusters of the Euroball array, 7 HPGe segmented clusters from the Miniball array and 8 BaF_2 from the Hector array. The preliminary data will be presented and the results discussed.

References

[1] H. Sagawa, T. Suzuki, Phys. Rev. C59(1999)3116
[2] D.Sarchi et al Phys. Lett. B601 (2004)27
[3] D.Vretnar et al - Nucl. Phys. A692(2001)496
[4] P. Adrich et al Phys. Rev. Lett. (2005)132501
[5] A. Leistenschneider et al Phys. Rev. Lett. (2001)5442
[6] E.Tryggestad et al Phys. Lett. B541 (2002)52
[7] H.J.Wollersheim et al NIM A537(2005)637