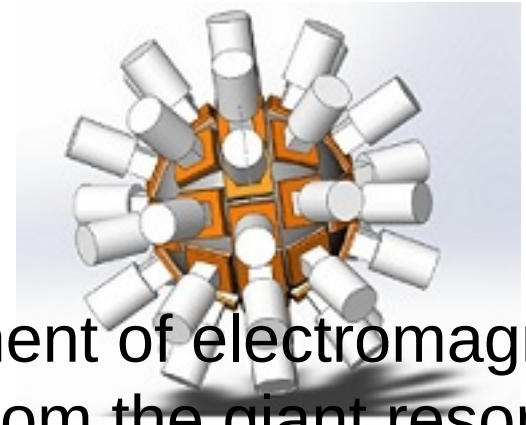
Frontiers in Gamma Ray Spectroscopy FIG18



Contribution ID : 57

Measurement of electromagnetic direct decays from the giant resonances of 12C and 16O.

Content :

We carried out an experiment(E398) to measure the energy and emission probabilities of gamma-rays from the giant resonances16O and 12C at Research Center for Nuclear Physics in Osaka University, using 392-MeV proton beam, high-resolution magnetic spectrometer "Grand Raiden" and an array of NaI(Tl) scintillators.

The nucleus excited to the giant resonances(GR) may decay via hadronic mode by emitting a particle or with electromagnetic mode by emission of high energy gamma rays. In this presentation, we stress on the electromagnetic decay mode and its measurements. Electromagnetic decay of GR is extremely sensitive to its multipolarity. As the strength of E1 transition is much larger than other multipole transitions, direct electromagnetic decays to the ground state of 12C(0+) are dominated by GDR(1-)and contribution from the GR with higher multipolarities is suppressed.

The direct gamma ray branching ratio was measured as a function of excitation energy(Ex). For the region(16MeV<Ex<22MeV) populated by resonances with higher multipolarities(Jπ = 2-,3-,4-), we measured branching ratio to be 0.14 ±0.06%, which is small and insignificant (2σ level). The significant branching ratio of 0.28 ±0.04% has been observed for the region(22MeV<Ex<26 MeV) which is dominated by GDR.

We also measure the direct gamma cross section by combining E398 cross section for 12C(p,p') reaction. The measured direct gamma cross section also clearly shows the dominance of GDR.

We present the measurement of direct decays and theoretical implications of the result.

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Session classification : --not yet classified--

Track classification : --not yet classified--

Type : Poster