HOT GDR IN ^{118}Sn

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Experiments have been run in the past to measure properties of the giant dipole resonance (GDR) in Sn isotopes [1, 2]. In these experiments the GDR was studied from the γ-decays of the full decay cascade. Consequently, the γ-ray spectra contain information on the daughter nuclei populated at different temperatures in addition to the nucleus of interest itself. Thus, to extract the parameters of the GDR it was necessary to average over many decay steps. This procedure introduces uncertainties, because it requires knowledge of uncertain key parameters. It is because of these uncertainties that a measurement of the GDR should be made in such a way as to eliminate averaging over many decay steps.

In December of 2000, an experiment was performed at Argonne National Laboratory to measure the GDR in ^{118}Sn. This experiment was designed to eliminate averaging over many decay steps, and thus allow for the first direct comparison of the hot GDR with the ground state measurement in the same nucleus. As a result, the width and energy of the GDR will be able to be determined more accurately than in the past. This measurement required measuring the γ-ray spectrum for the nucleus following one-neutron evaporation (i.e. ^{117}Sn) at the corresponding excitation energy. Subtracting the ^{117}Sn γ-ray spectrum from ^{118}Sn will yield the γ-ray spectrum from the initial compound nucleus only. This technique has previously been used to study ^{162}Yb [3].

The ^{118}Sn and ^{117}Sn compound nuclei were formed using the fusion evaporation reactions ^{18}O + ^{100}Mo and ^{17}O + ^{100}Mo. We excited the ^{118}Sn nucleus to 85 MeV and the ^{117}Sn nucleus to 71 MeV. This required beam energies of 95 MeV and 79 MeV respectively. The ^{100}Mo target was approximately 0.5 mg/cm^2 thick. Beam currents of approximately 15 pnA were used. The experiment ran for a total of five days.

The GDR of the compound nucleus will be extracted by studying the data collected from the expanded LEPPEX array of BaF_2 detectors from ORNL, MSU, and TAMU. This data will yield the GDR decay via γ rays. Coincidences with the FMA ensured the formation of the compound nucleus. In order for the difference technique to be well-defined, it is necessary to keep the range of angular momentum the same for the ^{118}Sn and ^{117}Sn γ-ray spectra. This will be accomplished by using the data collected from the BGO detectors and/or making mass cuts on the FMA data.

The analysis of the data from this experiment is currently underway.

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