HAW05-2005-000508
Abstract for an Invited Paper
for the HAW05 Meeting of
the American Physical Society

Experimental studies of giant resonances and nuclear incompressibility

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Isoscalar giant monopole resonances and isoscalar giant dipole resonances attract many nuclear physicists because they are related to the nuclear incompressibility and then to the equation of state(EOS) of nuclear matter, which plays an important role not only in nuclear physics but also in supernova explosion and neutron star formation. Due to the experimental difficulties to observe cleanly these giant resonances it is only recent years that we have obtained reliable data for peak positions of them and deduced a consistent value of nuclear incompressibility from them. The angular momentum transfers needed to excite them from the ordinary even-even nuclei are zero or one. Thus if we want to observe them by alpha particle scattering, we need to measure inelastic alpha particles at zero degrees and the extremely forward angles, where the angular distributions to excite them take their maximum values. In this talk we report recent data on isoscalar giant monopole and dipole resonances measured at RCNP ring cyclotron, which provides us a very clean and stable beam, the positions of which were monitored continuously during our measurements. We have measured inelastic alpha scattering of 400 MeV at extremely forward angles including zero degrees with the Grand Raiden magnetic spectrometer. In order to estimate and subtract the instrumental backgrounds we have utilized the double focusing property of the spectrometer and the ray-tracing type focal plane position detector. Angular distributions of 1 MeV energy bin above the excitation energy of 10 MeV have been multipole decomposed to give the excitation strength spectra separately for each giant resonance. From our giant resonance data of 208Pb we have deduced the nuclear incompressibility of 215 MeV by comparing with nonrelativistic RPA calculations. If time allows, we would like to mention our new results on the neutron skin thicknesses in 204,206,208Pb obtained by intermediate energy proton elastic scattering at RCNP.