EXCITATION OF THE PYGMY *E1* STATES IN INELATIC PROTON SCATTERING AND RCNP ACTIVITIES

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The low-lying electric dipole (*E1*) strength, often called the pygmy dipole resonance (PDR), is one of the hot topics in the nuclear structure physics. Several theoretical models predict a concentration of E1 strength at around the neutron separation energy that is characterized by a dipole oscillation of neutron excess against the isospin-saturated core. Experimental information is increasing employing various reactions *e.g.* (γ,γ'), (γ,n), (α,α'γ), (^{17}O,^{17}O'γ) as well as Coulomb excitation of unstable nuclei in inverse kinematics. We have measured Coulomb excitation by proton inelastic scattering at very forward angles for studying the PDR and the electric dipole response of nuclei. The advantages of the method are the high-resolution of ~20 keV, sensitivity to the total strength independent of the open decay channels, high and efficiency over the excitation energy range of 5-22 MeV, good sensitivity to the E1 and spin-M1 modes, decomposition of the E1 mode by the multipole-decomposition analysis as well as the polarization transfer observables, and determination of the absolute B(E1) with the Coulomb excitation calculations.

The methods have been applied to ^{208}Pb [1-3], ^{120}Sn [4,5], ^{90}Zr [6], ^{96}Mo, ^{154}Sm, and for the systematics of the Zn and Sn isotopes. We will report on the present status of the experiments as well as planned (*p*,*p*'γ) and (*α*,*α*'γ) experiments in near future.

Other activities on studying the spin-isospin modes employing the Grand Raiden spectrometer will also be introduced.

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