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Design and Development of GRAT (Giant Resonances Active Target), a dedicated target for studying resonances in nuclei.

Energies of the Giant Monopole Resonance (GMR) modes and the Giant Quadrupole Resonance (GQR) modes are directly related to the incompressibility of finite nuclear matter (KA) from which the incompressibility of infinite nuclear matter(K_∞) can be deduced by comparing the experimental data with the theoretical predictions such as fully consistent Random Phase Approximations (RPA).The 20% uncertainty of the currently accepted value (K_∞ = 230±40 MeV) [1] is largely driven by the poor determination of the asymmetry term (K=-500±50 MeV) [2]. To improve upon the precision of this term, experimental measurements are being carried out on isotopic chains extending from the nuclei on the valley of stability towards exotic nuclei with larger proton-neutron asymmetry.

Previous measurements of isoscalar resonance modes for ^{56}Ni [3] [4] and ^{68}Ni [5] [6] with MAYA active target [7] at GANIL were made using inelastic scattering of alpha and deuteron particles in inverse kinematics. The excitation energies were derived with precisions around 10%, which has a direct impact on the uncertainty of K_∞. This large uncertainty was due to the experimental limitations of the MAYA active target that can reconstruct the recoil particles in the center of mass angles between 3 and 8 degrees. Since the cross section for these type of reactions is concentrated at very small center of mass angles (very high between 0 and 3 degrees) corresponding to very low energies, a dedicated target which can maximize the coverage as low as 0.2 degrees is being developed to improve upon the detection efficiency. This thin target is designed to be roughly four times the length of MAYA in order to increase the cross section and operates at a very low pressure to maximize the reconstruction efficiency for the lowest center of mass angles. The long target is wrapped with 10∗10 cm and 1mm thick double-sided stripped silicon detectors, which will increase the energy resolution by an order of magnitude, compared to MAYA. The track reconstruction will be done using 2∗2 mm square pads and a CERN MICROMEGAS amplifier. The design, optimization and construction of this project will be discussed during the talk.

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