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Intermediate-Energy Coulomb Excitation of 79Ga

This thesis focuses on examining the Coulomb excitation of the odd-even nucleus ^{79}Ga to explore its collective behavior. Located near ^{78}Ni in the mass region, studying ^{79}Ga provides valuable insights into deviations from traditional shell structure within this mass range. The experimental study took place in 2015 at the Radioactive Ion Beam Factory (RIBF) situated at the RIKEN Nishina Center in Japan. Exotic nuclei in the ^{78}Ni mass region were created through in-flight fission induced by a 345 MeV ^{238}U beam directed at a 3 mm thick ^{9}Be primary target. These nuclei were then separated and identified using the BigRIPS fragment separator before being directed to the secondary ^{197}Au target (948 mg/cm^2) for Coulomb excitation. The resulting γ-rays from the de-excitation of the Coulomb-excited ions were detected by the DALI2 γ-ray spectrometer, comprising 186 NaI(Tl) detectors. The de-excited ions underwent further separation and identification using the ZeroDegree spectrometer. Additionally, a complementary dataset was collected by substituting the Au target with a 903 mg/cm^2 thick ^{12}C target to evaluate the influence of nuclear interactions on the observed γ-yield for the ions.

So far in this work, the Doppler-corrected γ-ray spectrum was obtained for the setup with the Au target. Transitions at energies of 707 keV, 871 keV, and 960 keV have been detected, and have already been observed. The observed transitions were fitted with the DALI2 response functions obtained from GEANT4 simulations to calculate the γ-ray intensity of each peak. Having the intensities, it will be possible to calculate the cross section of the Coulomb excitation, which can then be converted to B(E2) values using a reaction code such as FRESCO

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