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BAGEL: the HPGe clovers array at K600 spectrometer

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Abstract content
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The 8 HPGe clover detectors of the AFRODITE array will be coupled to the K600 spectrometer at iThemba LABs to allow coincident measurements of the γ -decay of nuclei excited in inelastic hadron scattering at 50–200 MeV incident energies. Compared to previous experiments, where NaI detectors have been used, the energy resolution of the γ -detection will be improved by more than one order of magnitude in the energy region of interest. The coincident measurement of the γ -decay in inelastic hadron scattering experiments is very useful for the separation of nearby excitations, the assignment of multipolarities, the determination of branching ratios and to study the isospin character of excitations.

Preparations for such particle- γ coincidence measurements started as far back as 2012. In December 2012 a successful test measurement of the $(\alpha, \alpha' \gamma)$ reaction on ^{24}Mg at 160 MeV was performed using two HPGe Clover detectors from the AFRODITE array. The results demonstrated that HPGe detectors can be used nearby the target chamber in coincidence with the K600 spectrometer to separate the excitations of interest and to determine branching ratios.

A particular physics case that can be study with this experimental set-up is the Pygmy Dipole Resonance (PDR). This resonance can be interpreted as the vibration of the excess neutrons against the core. Studies of the PDR are currently almost exclusively focused on spherical nuclei. Only a few measurements on the PDR have been performed in deformed nuclei so far. These measurements showed the presence of a double-hump structure of the PDR in these deformed nuclei similar to the one observed in the GDR. To investigate in more detail what is the contribution of the deformation to this excitation mode, an $(\alpha, \alpha' \gamma)$ experiment aimed at the study of the PDR character in the deformed ^{154}Sm nucleus via inelastic scattering of 120-MeV α particles.

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Level for award (Hons, MSc, PhD, N/A)?

N/A

Main supervisor (name and email) and his / her institution

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