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Developing a sorting code for Coulomb-excitation studies at iThemba LABS

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Abstract content
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This work aims at developing a sorting code for Coulomb excitation studies at iThemba LABS. In Coulomb excitation reactions, the inelastic scattering of the projectile transfers energy to the partner nucleus (and vice-versa) through a time-dependent electromagnetic field. At energies well below the Coulomb barrier, the particles interact solely through the well known electromagnetic interaction, thereby excluding nuclear excitations from the process [1,2]. The data can therefore be analysed using a semiclassical approximation [3].

The sorting code was used to process and analise data acquired from the Coulomb excitation of 20Ne beams at 73 MeV and 96 MeV, onto a 3mg/cm2 194Pt target.
The detection of gamma rays was done using the AFRODITE HPGe clover detector array, which consists of 9 clover detectors, in coincidence with the 20Ne particles
detected with an S3 double-sided silicon detector. The new sorting code includes Doppler-correction effects, charge-sharing, energy and time conditions, GEANT simulations, kinematics and stopping powers, among others, and can be used for any particle-gamma coincidence measurements at iThemba LABS. Other Coulomb excitation measurements at iThemba LABS will also be presented.

[1] R.H. Spear, Phys. Rep. 73, 369 (1981).
[2] J.N. Orce, Phys. Rev. C 86, 041303(R) (2012).
[3] T. Czosnyka, D. Cline, and C. Y. Wu, Bull. Am. Phys. Soc. 28, 745 (1983).

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