SPIDER: setup for low-energy Coulomb excitation measurements at LNL

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Recent advances in radioactive ion beam (RIB) technology, in particular the increasing range of species and post-acceleration energies available from ISOL facilities, has led to a resurgence of the use of low-energy Coulomb excitation technique [1].

This is a unique method to study electromagnetic properties of nuclei by providing information on the transitions strengths as well as spectroscopic quadrupole moments. The commonly used Coulomb excitation experimental setup consists of germanium detectors to register de-excitation gamma-rays, and a segmented particle detector mounted a few centimeters from the target to detect the scattered beam and/or recoiling target nuclei. As the kinematics of the reaction can be reconstructed from the measured scattering angles, a precise Doppler correction of the registered gamma rays can be performed.

A new ISOL (Isotope Separation On Line) facility for radioactive beams production is under construction at Laboratori Nazionali di Legnaro (LNL). The SPES (Selective Production of Exotic Species) facility will produce neutron-rich beams [2], which may be studied via Coulomb Excitation. For this purpose the development of this technique at LNL is required. The SPIDER array for particle detection is developed as ancillary detector for the modern 4π HPGe arrays that will be used at LNL: GALILEO [3] (permanently located at LNL) and AGATA [4], an innovative array based on gamma ray tracking. The latter is an itinerant array to European laboratories (at present it is at GANIL) that will be at LNL when the first SPES beams are expected.

SPIDER coupled with GALILEO will be used also with stable beams already provided by Tandem-PIAVE-ALPI accelerators at LNL in a dedicated measurements campaign. The first commissioning experiment with a 66Zn beam will yield new physics output because there are still questions about the structure of first 4+ state and, in addition, the structure of excited 0+ and 2+ states in 66Zn will be studied for the first time [5-6].

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