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Setup for Coulomb Excitation Measurements at SPES

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Low-energy Coulomb excitation provides a well-understood means of exciting atomic nuclei, allowing the study of the e.m. properties (such as transition probabilities and quadrupole moments) of low-lying excited levels. In particular, for collective excitations, these properties are very sensitive to the underlying nuclear shape and their experimental study contributes significantly to the understanding of the nuclear many-body problem.

The basic assumption of Coulomb excitation is that the excitation of nuclear states is caused solely by the electromagnetic field acting between the colliding nuclei, without the contribution of short range nuclear forces. The process can be thus described by the well-established theory of the electromagnetic interaction allowing the nuclear structure to be studied in a model-independent way.

The set-ups used for Coulomb excitation experiments, at the different ISOL facilities, are rather similar: germanium detectors are utilized to detect gamma rays while an annular strip silicon detector is used a few centimeters downstream from the target to detect the scattered projectiles and/or recoiling target nuclei. If the projectile and target nuclei have different mass, they can be identified by the energy deposited in the silicon detector, and the kinematics of the scattering process can be fully reconstructed.

To this aim we have developed and assembled an apparatus to be used at the SPES facility which consists of 8 sector shaped silicon detectors (aperture angle about 45 degrees) arranged in a pie shape. Each sector is segmented into eight independent annular strips on the front surface. This Silicon PIe DEtectoR (SPIDER) will provide a clean trigger to an array of germanium detectors (like GALILEO or AGATA).

We will report on the status of the project and we will show the results of the preliminary tests we performed on SPIDER elements.

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