**Energy-resolved Thomson parabola spectrometer for laser-driven low energy multi-ion measurement**

Alma Kurmanova1,2, Giada Petringa2, Roberto Catalano2, Pablo Cirrone2

*1 Università degli Studio di Catania, INFN Laboratori Nazionali del Sud, Catania, Italy*

*2 INFN Laboratori Nazionali del Sud, Catania, Italy*

Laser-driven tabletop accelerators have paved the way for multi-ion sources with ultra-high energies and well-defined beam divergence. Real-world applications need to be preceded by robust beam diagnostics, which are challenging due to the operating conditions and beam complexity. One possible dosimetric solution is the Thomson parabola spectrometer (TPS), which scatters ions according to their kinetic energy and charge-to-mass ratio (q/m) thanks to the combination of electric and magnetic fields. A new compact TPS has been designed and is under development at INFN Laboratori Nazionali del Sud based on realistic beam simulations performed using the Monte Carlo based toolkit TOPAS. The spectrometer is specially designed for low energy ion beams composed of 0.5-5 MeV protons and 1-10 MeV alpha particles, to distinguish then with high energy resolution ΔE/E <1%. Overlapping ion traces in a certain energy range are consequently avoided, through careful choice of pinhole diameter, field parameters, and drift lengths. The proposed TPS has been designed to be merely 30 cm in size while retaining full functionality, to allow for direct placement in the target-laser interaction chamber. The compact design can be readily deployed in proton-boron fusion experiments with low reaction rates where particle flux is expected to be small.