**Angular-resolved Thomson Parabola Spectrometer for Laser-Plasma Ion Accelerators**

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Since the experimental demonstration of laser-plasma based ion acceleration [1,2], several diagnostics have been applied to measure simultaneously both angular and spectral properties of the beams and their correlation. Thomson parabolas (TP) spectrometers, radiochromic film stacks and nuclear track detector are commonly used, but somehow all are limited in angular or spectral resolution and/or in ion specie discrimination [3].

We report on the design and construction of a high-repetition rate compatible, angle-resolved TP spectrometer for laser-accelerated mutli-MeV ion beams, fully developed at CLPU [4]. Thanks to an entrance array of pinholes, which chops the ion beam into beamlets with different emission angles and an analysis procedure capable of accounting for crossing particle traces, this detector combines the spectral and ion charge-to-mass ratio resolution for each beamlet detected, with very few restrictions for all parameters. We describe as well the first test of the device at the 1 PW VEGA 3 laser facility at CLPU.

Furthermore, employing the same device, we present a technique for fully energy-resolved emittance measurement for laser-generated proton beams. By means of a combined methodology between magnetic spectrometer and pepper-pot diagnostic [5] we performed a discretized and spectrally resolved study of the trace-space of the proton beam driven by VEGA 3.

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