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A compact high resolution Thomson Parabola Spectrometer

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Thomson parabola spectrometer is a diagnostic tool for a multi-ion beam sources widely employed in the field of laser-matter/plasma interaction to separate ionic species according to their energy and charge-to-mass ratio, based on effect of electric and magnetic fields on particle trajectories. To develop a novel Thomson parabola spectrometer for laser-generated proton and ion beams, a Monte Carlo based simulation toolkit called Topas has been used to realistically model the physical processes that occur during the transport of the particles in the medium, such as secondary radiation, collisions, etc. The new prototype has been designed and optimized to be suitable for low and high energy proton beams up to 100 MeV with an energy resolution $\Delta E/E < 2\,\%$. Moreover, with a length of 30 cm, the spectrometer can be placed directly in the target chamber, which improves its practical usability.