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Simulation of Thomson Parabola spectrometer for charged particle diagnostics in the PETAL+ project

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The PETAL (PETawatt Aquitaine Laser) laser facility is a high energy multi-petawatt laser, which is able to generate pulses of up to 3.5 kJ energy with a duration of 0.5 to 5 ps. This petawatt laser will be coupled with the ns pulsed beams of the LMJ (Laser MégaJoule). Such facility will provide unique tools for inertial confinement fusion (ICF) physics. PETAL is located in the site of the CEA/CESTA in the Barp, close to Bordeaux. The Petal+ project is aiming at designing and constructing the first diagnostics of the PETAL laser for the characterization of the Target Normal Sheath Acceleration (TNSA) particle source. Among them, SEPAGE (Spectometre Electrons Protons A Grande Energie) is a two Thomson Parabola (TP) diagnostic and will measure the electron, proton & ion energy spectra in the direction perpendicular to the PETAL target. This paper presents the simulation by Finite Element Method of these two Thomson Parabolas: High Energy (HE) and Low Energy (LE) which work simultaneously. Each TP involves the use of a magnetic field generated by a pair of permanent magnets and an electric field generated by a potential difference across a pair of electrodes.

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