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Time-Resolved Measurements of Fast Electrons and Protons Emitted in Ultra-Intense Laser-Solid Matter Interactions at SPARC_LAB

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The interaction between solid state matter and very intense lasers in the relativistic regime (IL>1018 W/cm2) has been widely investigated in the last two decades, mainly aiming to probe the feasibility of completely new, extremely compact proton accelerators thanks to the high electric fields generated (>TV/m). Nevertheless, the physical mechanism is still not completely clear, also due to the fast temporal evolution of this phenomenon, in the picosecond time scale. Therefore, time-resolved diagnostics tools are mandatory to probe this kind of interaction.

At SPARC_LAB, the high power laser FLAME (25fs, 4J, 10Hz) is currently employed in pump-and-probe experiments, making it interact with solid state target. The main purpose concerns the temporal characterization of the charged particles emitted during the interaction. For this reason two main diagnostics have been set-up in our experimental chamber: an Electro Optic Sampling (EOS) line to measure, with sub-picosecond resolution, the temporal distribution of fast electrons leaving the target, and a time of flight (TOF) detector to measure the longitudinal profile of the emitted protons/ions.
In this work, last results obtained with these two online temporal diagnostics will be presented.

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