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## Simultaneous temporal resolved measurements of protons and fast electrons in TNSA experiments

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The interaction of ultra-intense high power lasers with solid state targets have been largely studying for twenty years as future compact proton and ion source. Indeed, the huge potential established on the target surface by the escaping electrons provides accelerating gradients of  $\sim$ TV/m. This process, called TNSA, involves a large number of phenomena and is very difficult to study because of the picosecond scale dynamics. At SPARC\_LAB Test Facility the high power laser FLAME is employed in experiments with solid targets aiming to study possible correlations between ballistic fast electrons and accelerated protons. In detail, we have installed in the interaction chamber two different diagnostics, each one devoted to characterize one beam. The first relies on Electro-Optic Sampling and has been used to perform temporally resolved electron charge measurements with a resolution of the order of 100fs. On the other hand, a Time-Of-Flight detector, based on a Chemical-Vapor-Deposited (CVD) diamond, has allowed to retrieve the proton energy spectrum.

In this work we report on simultaneous temporal resolved measurements of both escaping electrons and accelerated protons made for different laser energies to provide a more complete scenario of the interaction.

**Primary authors:** BISESTO, Fabrizio Giuseppe (LNF); GALLETTI, Mario (Istituto Superior Tecnico); ANANIA, Maria Pia (LNF); COSTA, Gemma (LNF); FERRARIO, Massimo (LNF); POMPILI, Riccardo (LNF); ZIGLER, Arie (LNF); CONSOLI, Fabrizio (ENEA - Centro Ricerche Frascati); SALVADORI, Martina (Roma1); ANDREOLI, pierluigi (ENEA - Centro Ricerche Frascati); VERONA, claudio (University of Rome "Tor Vergata", Industrial Engineering Department)

**Presenter:** BISESTO, Fabrizio Giuseppe (LNF)

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