Characterization of electrons in intense laser-plasma interactions, both utilizing solid and gas targets

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Intense lasers can be used to irradiate either solid or gas targets to accelerate electrons. In the case of gas targets this is done to generate a relativistic electron bunch to be used in radiography, radioisotope production, or VHEE therapy. In the case of solid targets the acceleration of a fast electron beam drives secondary physics, such as X-ray generation and ion acceleration via TNSA. In both cases, characterising the properties of the accelerated electrons are of interest in terms of assessing the efficiency of the interaction or retrieving information on the fast electron transport through the solid target.

A *pepper-pot diagnostic* can be implemented to obtain an estimate of the emittance of the electron beam. The emittance is defined as the measure of the area of position-momentum space occupied by the electron population and encompasses information on the divergence of the electrons, the electron Lorentz factor related to its momentum, and the source size.

In this talk we speak on the use of a pepper-pot diagnostic in two separate campaigns at the ILIL facility in Pisa, Italy. Firstly, we report on an experiment in which a pepper-pot diagnostic was used to study the emittance of a relativistic electron bunch accelerated via Laser WakeField Acceleration. Details on both the experimental setup and the data analysis procedure will be given and the main outcomes, related to the observation of an asymmetry of the transverse emittance, will be briefly discussed.
Secondly, we report on emittance measurements from solid planar and nanowire targets to assess the impact of the front surface structures on the fast electron transport and heating.