Contribution ID: **67** Type: **poster**

High energy electrons from interaction with a structured gas-jet at FLAME

Monday, 3 June 2013 19:30 (30 minutes)

In this poster we discuss the spectra of the electrons produced in the laser-plasma acceleration experiment at FLAME.
In the experiment the laser is set to propagate along the longitudinal axis of a 10mm gasjet to study the role of density gradients.
Thomson scattering optical imaging shows that a significant laser depletion takes place typically in the first 4mm.
Angular and spectral properties of accelerated electrons are then studied to infer the regime of acceleration occurring in the plasma. Our LANEX data show highly collimated bunches (<1mrad) with a relatively stable pointing direction (<10mrad). Typical bunch electron energy ranges between 50MeV and 200MeV with occasional events of higher energy up to 1GeV. Spectra are characterized by large energy spread with evidence of spectral modulations.
Fully 3DPIC numerical simulations confirm that laser intensity and plasma density are in the range where electron acceleration takes place by self-injection in the bubble-like structure. This phase characterizes the first few mm of the laser propagation. In the second phase a new regime comes in, where the propagation of the relativistic electron bunch in the undisturbed gas jet possibly drives a new wakefield acting to remodulate the spectral shape of accelerated electrons.

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Session Classification: Wine and Poster Session

Track Classification: Wine and Poster Session