



Contribution ID: 37

Type: **not specified**

Plasma-based acceleration experiments at SPARC LAB

The current goal of the world wide R&D programs is to demonstrate the stable and repeatable production of high brightness beams (HBEBs), as those required for example by Free Electron Lasers which is one of the most demanding application of electron particle accelerators.

The scheme proposed at the SPARC_LAB test facility is based on the external injection of the electrons inside the plasma in order to achieve low beam emittance and low energy spread. Two different mechanisms are proposed for generating the conditions suitable to achieve acceleration of the electron beam inside the plasma: an external injection laser wakefield acceleration (LWFA), by combining the multi-hundreds power laser (Flame) and the HBEB from the SPARC photo-injector, and a resonant plasma wakefield acceleration (PWFA), by using a train of high brightness electron bunches, the so-called comb beam.

The experience gained at SPARC_LAB on the generation, manipulation, acceleration and application of high brightness electron beams enable us to face with this challenging task.

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