SL_COMB2FEL

(Resp. Naz.: E. Chiadroni, LNF)

Sezioni coinvolte:

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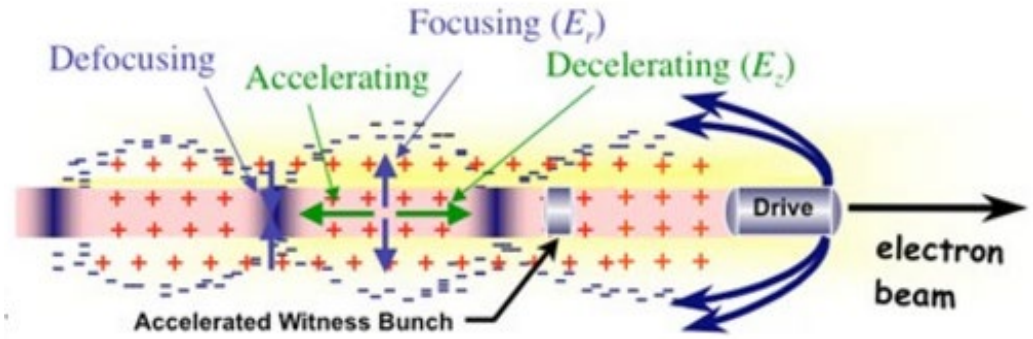
Why SL_COMB2FEL

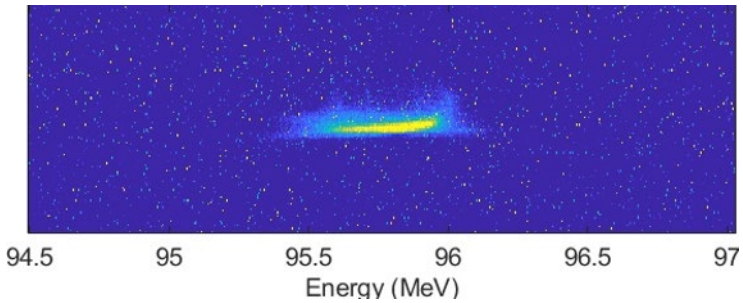


In this scheme a driver beam creates a plasma wake, while a witness bunch is accelerated in the back of the plasma bubble. The aim of the experiment is:

- Demonstration of high-quality plasma accelerated electrons beam through the final measurement of the FEL gain curve
- Miniaturization of ancillary components to move towards a compact facility (accelerating modules, diagnostics, measurement stations, beam position monitors)
- **R&D on diagnostics**
- Path towards EuPRAXIA@SPARC_LAB test user facility (recently founded with 110 Meuro)

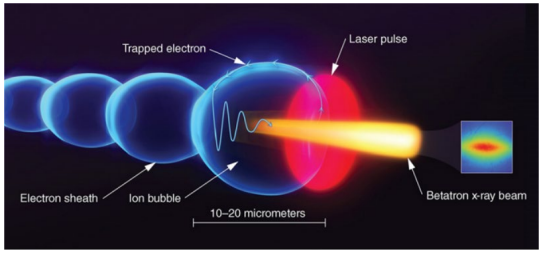
Big achievement in 2020

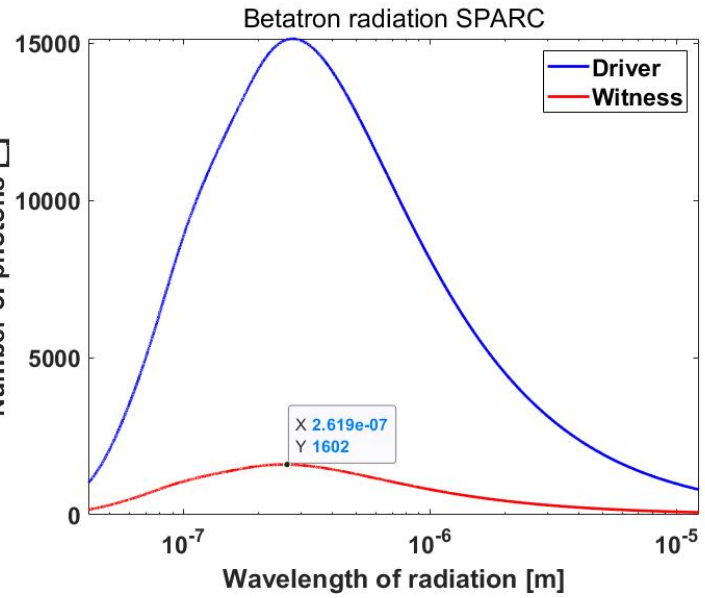
- One of the main issue in plasma acceleration is the large energy spread > % level.
- We have obtained the first Plasma accelerated beam with energy spread of 0.1% (former best result in the world was 0.7%)
- We discovered a mechanism to accelerate and compensate the energy spread (paper submitted to Nature Physics)
- Gradient still to be optimized, 200 MeV/m.



Description of the activities TOV

- In 2021 we want to characterize the driver beam at the exit of the plasma, via betatron radiation emission.
- Betatron radiation is emitted by electrons undulating in the plasma
- The radiation is completely dominated by the driver, so it is a great diagnostics for driver beam after the interaction
- It is important to study effect of the plasma on the driver because it reflects in how the wake is generated in the bubble.
- We want to image the betatron radiation downstream of the interaction with a mirror in the vacuum and a UV camera. The mirror will be after a dipole to remove the electrons
- The contribution of Synchrotron radiation has been estimated and it is negligible.





TOV Request 2021

- 5.5 kEuro inventario per camera UV
- 3 kEuro missioni a LNF
- 1 keuro consumo (UV mirrors+UHV A.R. UV window)