



Contribution ID: 336

Type: poster

Plasma afterglow metrology at CLARA

Wednesday, September 18, 2019 7:00 PM (1 hour)

The field of plasma acceleration has undergone rapid advancement in recent years, with significant progress being made towards the production of stable high quality electron beams. With this progression comes new avenues of research into potential applications, facilitating the need for precise understanding and control of the femtosecond-micrometer scale interaction process. Experimental results from the Stanford linear accelerator FACET I facility have demonstrated the potential for plasma afterglow as a novel diagnostic for the spatiotemporal synchronisation of laser and electron beam. Recent work at the Daresbury laboratory CLARA facility continues this investigation into plasma afterglow, utilising a low energy relativistic electron beam interacting with a partially ionised Argon plasma. Analysis of features within the plasma afterglow and electron-beam spectrometer data is presented, along with discussion of potential sources such as gas dynamics and partial plasma lensing. Further discussion will address upcoming experiments at the FACET II facility (E315 & E316) and at Helmholtz-Zentrum Dresden-Rossendorf, which seek to examine this diagnostic for application in both PWFA and hybrid acceleration schemes.

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Session Classification: Cheese and Wine Poster Session 2

Track Classification: WG5 - Plasma devices, plasma and beam diagnostics