Contribution ID: **25** Type: **not specified**

An Overview of MTE Measurement Techniques and Photocathode R&D at Daresbury Laboratory

Wednesday 18 September 2024 14:50 (25 minutes)

In this presentation, I will give a brief overview of some of the established and productive methods for measuring the transverse and longitudinal energy spreads from photocathode electron sources (Mean Longitudinal Energy and Mean Transverse Energy, or MLE and MTE respectively). These quantities represent the intrinsic emittance of the photocathode electron source. The generation of a high-brightness electron beam can be achieved through the operation of a photocathode with a low intrinsic emittance. Measurement of the intrinsic emittance can be challenging as the electron energies are frequently small, as are the MLE and MTE themselves. Over recent decades, several different systems have been developed which are capable of successfully measuring these performance characteristics, some of which go further to characterise spectral response too, for example.
The motivation for this aspect of accelerator science is frequently linked to the operation of an X-ray Free-Electron Laser (X-FEL), and this is the justification for the work being carried out in this field at the STFC Daresbury Laboratory.
In the second half of this presentation, I will review the work currently being undertaken by the Daresbury Photocathode R&D team and link this to various accelerator projects, focussing on the progress made since the last meeting.

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Session Classification: Photocathode theory and characterization

Track Classification: Paper submitted