



Contribution ID: 66

Type: **Poster and Speed Talk**

Effect of surface roughness on optical transition radiation characteristics of a 10 keV electron beam

Thursday 4 July 2024 16:28 (3 minutes)

This study investigates the effects of surface roughness on the optical transition radiation (OTR) characteristics of a 10 keV electron beam incident on carbon steel targets. While OTR is well-established as a profile monitoring tool for relativistic charged beams, its viability for low-energy beams is still under scrutiny, primarily due to issues such as low yield and a wide angle of the radiation cone. This study explores the potential of exploiting the anomalously high intensity of OTR observed on rough surfaces for precise profile measurements of low-energy charged beams.

We present a systematic examination of the dependence of OTR yield and polarization on surface roughness characteristics, beam current, and the incidence angle of the beam. The observations are discussed qualitatively, shedding light on the nuanced interactions between these parameters and OTR characteristics. This research contributes insights to the ongoing discourse on utilizing OTR for low-energy charged beam diagnostics.

Summary

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Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics