Contribution ID: **2260** Contribution code: **SUPC036** Type: **Poster Presentation**

Characterization of FEL mirrors with long ROCs

Sunday, 19 May 2024 16:00 (2 hours)

FEL oscillators typically employ a two-mirror cavity with spherical mirrors. For storage ring FELs, a long, nearly concentric FEL cavity is utilized to achieve a reasonably small Rayleigh range, optimizing the FEL gain. A challenge for the Duke storage ring, with a 53.73 m long cavity, is the characterization of FEL mirrors with a long radius of curvature (ROC). The Duke FEL serves as the laser drive for the High Intensity Gamma-ray Source (HIGS). As we extend the energy coverage of the gamma-ray beam from 1 to 120 MeV, the FEL operation wavelength has expanded from infrared to VUV (1 micron to 170 nm). To optimize Compton gamma-ray production, the optimal value for the mirror's ROC needs to vary from 27.5 m to about 28.5 m. Measuring long mirror ROCs (> 10 m) with tight tolerances remains a challenge. We have developed two different techniques, one based on light diffraction and the other on geometric imaging, to measure the long ROCs. In this work, we present both techniques and compare their strengths and weaknesses when applied to measure mirror substrates with low reflectivity and FEL mirrors with high reflectivity.

Footnotes

Funding Agency

This work is partially supported by DOE Grant No. DE-FG02-97ER41033.

Paper preparation format

LaTeX

Region represented

North America

Primary author: DELOOZE, William (Duke University)

Co-authors: YAN, Jun (Duke University); LI, Wei (Duke University); WU, Ying (Duke University)

Presenter: DELOOZE, William (Duke University)

Session Classification: Student Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.A06 Free Electron Lasers