Contribution ID: **4** Type: **Flash Talk**

Optimizing Free-Electron Laser Operation with Neural Network-Based Beam Pointing Predictions

Friday 22 November 2024 15:02 (6 minutes)

Virtual diagnostic tools leveraging readily available input data offer a non-invasive way to optimize Free-Electron Lasers (FEL) operation and delivery, especially when limitations with conventional diagnostics arise. This work presents a novel approach using an artificial neural network to online predict photon pulse pointing at MHz level for both soft and hard x-rays. The model input is based purely on parasitically available diagnostic of both the electron and the photon beam. The model is validated by diamond sensor measurements at 11~keV, achieving a correlation coefficient greater than 0.95. This virtual diagnostic not only streamlines beam alignment and optimization, but is also the funding stone of a MHz-capable beam pointing stabilization. Furthermore, it further improves the online characterization of each photon pulse at MHz level.

Primary author: JAFARINIA, Farzad (MXL (XFEL))

Co-authors: GRECH, Christian (MXL (XFEL)); GELONI, Gianluca Aldo (Eur.XFEL (European XFEL)); GUETG, Marc (MXL (XFEL))

Presenter: JAFARINIA, Farzad (MXL (XFEL))

Session Classification: Flash Talks 3