Contribution ID: **1376** Contribution code: **THPS117** Type: **Poster Presentation**

Genetic algorithm code for real-time optimization in the STAR thomson back-scattering source

Thursday 5 June 2025 15:30 (2 hours)

The STAR facility represents an advanced high-energy photon source located at the University of Calabria (Italy). It was conceived to generate high-energy photons through the inverse Thomson scattering process. Following a recent upgrade, the facility features an additional beamline driving the source from 65 MeV electron beam energy up to 140 MeV, leading to a maximum photon energy of 350 keV. The control system based on the EPICS framework is central to STAR's operation. Optimizing the machine's performance requires advanced methodologies capable of managing its non-linear dynamics. Artificial intelligence, particularly Genetic Algorithms, has emerged as a powerful tool for achieving real-time optimization. The software GIOTTO, a GA-based optimization framework, will be set to redefine STAR's beamline operations by dynamically tuning machine parameters to enhance radiation production and beam quality. By driving the ASTRA simulation code as a stand-in for the real machine, we are actively testing GIOTTO's capabilities in a controlled environment. The full integration of GIOTTO into STAR's control system promises to improve the machine and beam dynamics optimization processes.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

Author: OLIVIERI, Antonietta (La Sapienza University of Rome)

Co-authors: BACCI, Alberto (Istituto Nazionale di Fisica Nucleare); TASSI, Enrico (Università della Calabria); PRELZ, Francesco (Universita' degli Studi di Milano & INFN); SERAFINI, Luca (Istituto Nazionale di Fisica Nucleare); FAILLACE, Luigi (Istituto Nazionale di Fisica Nucleare); ROSSETTI CONTI, Marcello (Istituto Nazionale di Fisica Nucleare); PATROLEA, Razvan (Universita' degli Studi di Milano)

Presenter: OLIVIERI, Antonietta (La Sapienza University of Rome)

Session Classification: Thursday Poster Session

Track Classification: MC6: Beam Instrumentation and Controls,Feedback and Operational Aspects: MC6.T04 Accelerator/Storage Ring Control Systems