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Modern electron beam diagnostic techniques based on LOCO and feed forward artificial neural networks.

Tuesday, 21 May 2024 16:00 (2 hours)

National Synchrotron Radiation Center SOLARIS operates a third-generation synchrotron light source located in Krakow, Poland. It is the only operator of synchrotron light source in Poland. SOLARIS accelerator complex consists of a linear accelerator, 1.5 GeV storage ring with 96 m circumference, six operating beamlines and three more under construction. The storage ring accelerates the electron beam from injection (approx. 550 MeV) to its final 1.5 GeV energy and stores the circulating electron beam for approximately 13 hours on a stable orbit providing beamlines access to the synchrotron radiation used for research around the world for low to tender gamma energy range.

The beam stability and reproducibility are of great interest for the light source facilities. Beam stability is characterized in 6-D phase space: (x, x', y, y', E, t), where x, x', y, y' are the transverse position and divergence of the beam whereas the E, t is related with the longitudinal coordinates beam energy and time. In the first part of this presentation results of diagnostic measurement methods based on loco runs for various beam conditions will be discussed. In the second part concepts and implementations of anomaly detection techniques, neural network forecasting based on Long short-term memory (LSTM) and Bayesian integrated in Tango will be presented with emphasis on the usage of GPU for computation speed up.

Footnotes

Funding Agency

Paper preparation format

Region represented

Europe

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