Contribution ID: **31** Type: **Poster/Demo**

Optimization design of photocathode injector assisted by deep Gaussian process

Thursday, March 7, 2024 3:25 PM (1 minute)

To meet the requirement of electron beam characteristics at linac entrance of CEPC and PWFA. A method of searching in a high-dimensional parameter space was performed using a multi-objective genetic algorithm. A deep Gaussian process was adopted as an surrogate model to solve high-dimensional parameter optimization problem. geometric parameters of radio frequency gun and beam element parameters have been determined to minimize rms transverse beam emittance and rms bunch length. In conclusion, we conducted a study on bunch injectors with three distinct charge levels. We provided optimization results for initial charge levels of 1nC, 5nC, and 10nC, corresponding to flat-top beam distributions and Gaussian beam distributions. These injectors were composed of an L-band RF gun, a pair of solenoids, and an accelerator tube. Our findings demonstrate that the optimization algorithm enables us to efficiently identify multiple sets of optimal solutions. Furthermore, for high-dimensional parameter optimization, the utilization of a deep Gaussian process has proven to be a favorable method.

Primary Keyword

ML-based optimization

Secondary Keyword

surrogate model architecture

Tertiary Keyword

bayesian optimization

Primary authors: SUN, Zheng (Institution of high energy physics,IHEP); Mr TIANMU, Xin (IHEP)

Presenter: SUN, Zheng (Institution of high energy physics,IHEP)

Session Classification: Poster/Demos

Track Classification: Optimization & Control