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OR21 - Online reinforcement learning control of beam collision at IP for BEPCII

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For BEPCII, operators need to tune the transverse offset in displacement and angular deviation (x , x' , y , y') of the two beams at the interaction point (IP) to maintain a high luminosity as the beam current decays in a normal run. Since the optimal offset change with current nonlinearly in a run and varies in each run. It is laborious to keep the best beam offset at IP for high luminosity at any time, thus operators usually use a linear model to tune the offset automatically. In this research, a Deep-Q-Network (DQN) agent is trained by the history data to adjust the beam offset at IP. The kernel of DQN agent is a neural network (NN) with 18 input parameters (IP offset, bpm, current) and 8 output parameters (Q-value, used to choose action). The DQN agent has been put into daily offset tune successful, basically replacing the linear model and manual operation of the operators, and also gains an increase in integrated luminosity than before.

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Session Classification: How Does the Machine Learning Integrate with Operation?