

Static Performance Prediction of Long-pulse Negative Ion based Neutral Beam Injection Experiment

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Neutral beam injection is now focused on thousands of seconds for the long-pulse experiment. It is of great significance to establish a simple physical calculation model for evaluating the current parameters of the long-pulse Negative Ion based Neutral Beam Injection (NNBI) facility before the experiment for adjusting and setting the experimental parameters of long-pulse negative ion source experiment. Based on the physical characteristics of each key parameter of the ion source, this paper analyzes the experimental data and predicts the static performance of the current NNBI facility through the analyzed data. All NNBI static performance prediction, including data acquisition, data preprocessing, prediction model and delivery of results. Data acquisition is carried out by the historical data before 2022 read locally. The data preprocessing part firstly selects the experimental data according to the corresponding rules, and then uses the maximum and minimum value method to standardize the data. The data set is divided into training set, verification set and test set. The static performance prediction model is established based on back propagation (BP) neural network. The state of the network is determined according to the error convergence curve. Finally, the results are mapped to the normal interval using a disnormalized method. The static performance prediction model can avoid the ineffective shot more effectively and improve the performance of the long-pulse NNBI experiment, and provide a good encouragement for the NNBI dynamic performance preview in the next step.

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