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Design of Beam Diagnostic System based on Secondary Electron Emission for Neutral Beam Injector at CRAFT

Neutral beam injection is one of the main auxiliary heating methods in Tokamak nuclear fusion device. At present, the calorimeter with thermocouples is used for beam diagnostics, but it can not meet the requirement of high-precision real-time measurement of NBI system at Comprehensive Research Facility for Fusion Technology (CRAFT) under long pulse operation in the future. In order to meet the requirement of beam diagnostic, a set of beam diagnostic system based on secondary electron produced by beam bombardment on the metal calorimeter is put forward. To achieve this goal, the principle of secondary electron emission and the influence of beam energy, calorimeter surface temperature, and the incidence angle of beam on secondary electron emission coefficient is analyzed. The flow chart of the beam diagnosis system is given, and the data acquisition and processing system has been built. The relevant test will be carried out in RF ion source test bench to verify the reasonability of design in the last few months.

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