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Progress of CNT multi-wire beam profile monitor for CSNS-II

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In the China Spallation Neutron Source II (CSNS-II), the H^- beam will be accelerated in the Linac to 300 MeV. Subsequently, the electrons are stripped from the H^- ions through a stripping foil during injection into the Accumulator Ring, converting them into a proton beam. Wire scanners are employed to measure the transverse beam profile and emittance in the injection area. This paper presents thermal analysis of the wire scanners in the Linac. To meet measurement requirements, the beam pulse length will be 575 μs , and the current will be approximately 30 mA. Given these parameters, carbon nanotube (CNT) or tungsten wires are considered as potential materials for measuring beam profiles throughout the facility. However, when the beam pulse length exceeds 200 μs , the temperature of a 33 μm tungsten wire surpasses its sublimation threshold (3000 K), approaching its melting temperature. This analysis compares the temperature of different wire materials. The results indicate that under the specified beam parameters, CNT wires exhibit a significantly lower temperature increase, making it the optimal choice.

Footnotes

Funding Agency

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Yes

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