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Measurement and analysis of the intensity-dependent effects on the CSNS medium energy beam transport line

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The China Spallation Neutron Source (CSNS) has been operated with 100kW beam power on target since 2020. The Linac consists of an H⁻ ion source, a low-energy beam transport line (LEBT), a 3 MeV Radio Frequency Quadrupole (RFQ), a Medium Energy Beam Transport line (MEBT) and a Drift Tube Linear (DTL) accelerator to boost the beam energy to 80 MeV with a beam intensity of 10 mA. A power upgrade project (CSNS-II) has been approved in 2021 to increase the beam power to 500 kW, for which the Linac energy will reach 300 MeV and the beam intensity is expected to be 50 mA. Now we are gradually increasing the beam intensity of the CSNS Linac to fully explore its capability and furtherly deepen our understanding of the properties of high intensity beam. In this study, we show the beam measurement results given by the wire scanners and the emittance monitor at various current intensities, and the numerical modeling and fitting methods to obtain the evolution of the beam envelope and emittance along the CSNS MEBT.

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Footnotes

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Yes

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