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Status of the Spallation Neutron Source beam test facility and progress of beam dynamics studies

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The Spallation Neutron Source (SNS) Beam Test Facility (BTF) supports the study of beam dynamics in the front end of a high power LINAC. The BTF combines a replica of the SNS front end, including nearly-identical ion source, RFQ and MEBT, with extensive phase space diagnostics and a FODO transport line. Diagnostic capabilities include direct measurement of 6D phase space distribution and detection of halo distributions to a sensitivity of greater than one part-per-million. The goal of on-going BTF studies is to demonstrate accurate particle-in-cell modeling of halo growth and evolution by leveraging unprecedented accuracy in the description of the initial beam distribution. This work is motivated by operational experience at the SNS, which currently operates with beam loss that cannot be described by any model. This paper summarizes progress in the BTF beam study program as well as diagnostics development and recent upgrades to the beamline configuration.

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