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Measurement of beam energy characteristics at the LHe-free Nb₃Sn demo SRF e-linac

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The demonstration of a 100mA, 4.6MeV superconducting radio frequency linear electron accelerator, based on conduction cooling and developed by the Institute of Modern Physics (IMP), aims to validate the feasibility of stable beam commissioning in a liquid helium-free 5-cell- $\beta_{opt}=0.82$ Nb₃Sn elliptical cavity, and to offer guidance for subsequent industrial applications. The beam energy characteristics, considered one of the critical parameters, need to be precisely measured. Due to the high energy of the beam and the compact, simple layout requirement of this accelerator, only one dipole magnet is used for energy measurement. This paper compares errors from three different experimental processes, presenting simulation and online measurement results of energy measurement under various cavity voltage. It analyzes the impact of various errors during online energy measurement and examines the effects of the slit after the dipole and its shape on energy measurement.

Footnotes

Funding Agency

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Yes

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