Contribution ID: **209** Contribution code: **TUPB076** Type: **Poster Presentation**

Beam transient studies for the JAEA-ADS LEBT

Tuesday 27 August 2024 16:00 (2 hours)

The Japan Atomic Energy Agency (JAEA) is designing a 30-MW CW proton linear accelerator (linac) for nuclear waste transmutation. Space-charge is the primary challenge in achieving low losses and high beam quality for high-power accelerators, especially at low energy levels where space-charge forces are greater. To counteract the space-charge effects, the low-energy beam transport (LEBT) uses a magnetostatic design to enable the neutralization of the beam charge, the so-called space charge compensation. The neutralization is an accumulation process that reaches a charge balance between the main beam and the opposite ionized particles. However, this equilibrium is destroyed by the chopper system used during beam ramping. During those transient regimes, the beam optics conditions are not optimal for the beam, producing considerable degradation that can end in serious damage to the accelerator. Thus, analysis of beam behavior at these periods is essential to develop a robust design and an efficient operation of the JAEA-ADS linac. This study presents the beam dynamics of neutralization build-up and chopper operation for the JAEA-ADS LEBT.

Footnotes

Funding Agency

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Session Classification: Tuesday Poster Session

Track Classification: MC1: Beam Dynamics, Extreme Beams, Sources and Beam-Related Technologies: MC1.1 Beam Dynamics, beam simulations, beam transport