



Contribution ID: 2049 Contribution code: MOPC32

Type: **Poster Presentation**

Beam loss mitigation in H- linac

Monday, 20 May 2024 16:00 (2 hours)

Charge-exchange injection is a key to overcome the Liouville's theorem and to get over the intensity barrier. Specifically negative hydrogen linac injector for a ring is mostly used to obtain high intensity pulsed proton beam for high-energy physics or neutron application. However, different from proton linac, beam loss due to stripping can be a significant issue. For instance, the intra-beam stripping (IBSt) can be the dominant source of residue radiation in a high-intensity H- linac. IBSt rate can be only affected by focusing structure. It is of interests in J-PARC linac, which has an original equi-partition design and flexibility to manipulate a considerable range. The H₀ resulting from stripping generates a broad loss pattern, which is sensitive to the aperture. We studied the dependencies and achieved consistency between simulation and measurements from beam loss monitors and residue radiation, and found a systematic way for beam loss mitigation for operation. We successfully removed abnormal hot spots and mitigate the total residue radiation by half. These results provide insights into optimizing existing H- linac performance as well as design strategies of future H- linacs.

Footnotes

Funding Agency

Paper preparation format

Word

Region represented

Asia

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Session Classification: Monday Poster Session

Track Classification: MC1: Colliders and other Particle and Nuclear and Physics Accelerators:
MC1.A08 Linear Accelerators