Contribution ID: **97** Contribution code: **THPT51** Type: **Poster Presentation**

Reducing energy spread of low-energy slow extracted beam using longitudinal localized excitation method

Thursday, October 23, 2025 5:10 PM (20 minutes)

High-current or low-energy slow extraction from proton synchrotron suffers from strong space charge effect. Longitudinal localized excitation slow extraction method is proposed in this paper to reduce the spill energy spread while mitigating space charge effects. This method applies transverse excitation within a limited phase interval which locate at the edge of the longitudinal phase space.
By using SynTrack particles tracking code, we simulated low-energy slow extraction under strong space charge conditions for two cases: global excitation and localized excitation. The simulation results indicate that the momentum spread of the extracted beam in localized excitation mode can be significantly lower than that in the global excitation mode.
Due to the influence of longitudinal motion, excited particles may also move out of the excitation phase interval before being extracted, so it cannot be fully guaranteed that the extracted particles remain within the excitation phase interval. The mechanism of this leakage phenomenon and corresponding suppression methods are investigated.
Furthermore, the hardware design implementing the localized excitation function were presented.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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Session Classification: THPT poster session

Track Classification: WGA:Beam Dynamics in Rings