Contribution ID: **1027** Contribution code: **TUE-PO1-104-13** Type: **Poster**

Truncated-Cosine-Theta Design for High Field Septum Magnets

Tuesday, November 16, 2021 1:15 PM (20 minutes)

Conventional design of a septum magnet is based on combination of C-shape iron, which forms decent dipole magnetic field, and a coil. Due to saturation of magnetic induction of the iron yoke, the maximum magnetic field of such a kind of septum magnets is limited about 2 T. However, a higher magnetic field of septum magnets is required for next generation high energy accelerators. Truncated-cosine-theta (TCT) design enables to overcome the 2 T limitation and reach a higher magnetic field strength.

For Future Circular Collider (FCC) at CERN and a future heavy ion synchrotron at FAIR/GSI, design studies of superconducting septum magnets with TCT aimed at a field strength about 4 T is ongoing. Due to high rigidity of the beam of FCC, high field septum magnet is required to minimise the extraction beam line length. A future heavy ion synchrotron will be assembled above the other synchrotron SIS100 currently being constructed for FAIR. Due to limitation on space for the beam extraction, which is commonly used with SIS100, a high field septum magnet is considered.

In this presentation, the design principle of a TCT magnet will be described and status of the design studies will be presented.

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Session Classification: TUE-PO1-104 Accelerator Magnets II: fast cycling, injection, extraction