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Drift Tube Linac (DTL) steering magnets replacement design at SNS

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The SNS Drift Tube Linac (DTL) operates at 402.5 MHz and consists of 6 RF tanks, DTL1 to DTL6, which can accelerate the H- beam from 2.5 MeV to 87 MeV before entering the Coupled Cavity Linac (CCL). Each DTL tank assembly has 2 sets of horizontal and vertical electromagnetic steering magnets (24 in total) required for transverse beam steering. The coils of these steering magnets were routed to specific shapes with water-cooled copper tubing to fit the limited space inside the drift tube bodies. After operating over 20 years, some steering coils start having water leaks. Spare drift tubes including the steering ones are under development at SNS. To simplify the steering coil routing and avoid water leaking issues, a non-water-cooled steering magnet design has been developed for the replacement of existing magnets. With the existing yoke, the new coils are designed to produce the same magnetic field with a low electric power. According to the CST simulations, the maximum temperature of the coils is below 50 C with no water cooling. A prototype development is in progress and will be used for thermal test and magnetic field verification. Details of the steering magnet design and calculation results are presented in this paper.

Footnotes

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