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Investigation and mitigation of magnetic field emissions in the SMH16 septum system's high-current cable connections

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The SMH16 system at CERN is a pulsed septum magnet driven by a single period of a flattened sine wave current with a fundamental frequency of approximately 2.5 kHz and a peak current of 28 kA. The magnet connects to its pulse generator via ten high-voltage, high-power cables, each containing go, return, and ground conductors and coarse shielding. Due to the high currents, magnetic field emissions could interfere with nearby equipment and affect electromagnetic compatibility.
This work investigates these magnetic field emissions and evaluates potential shielding measures. 2D field simulations of the cable connections to model the emissions and assess the effectiveness of additional shielding configurations have been conducted. To validate the simulations, time-dependent magnetic field measurements using a magnetic near-field probe, and a custom Hall probe were performed on a section of the cable connection in a full-scale test setup of the SMH16 system, both with and without extra shielding around the cable bundle.
The results showed good agreement between simulations and measurements. Additional shielding can significantly reduce magnetic field emissions.

Footnotes

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Region represented

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