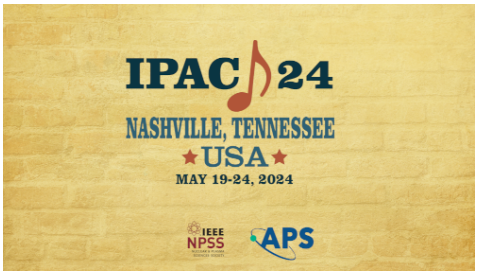

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Development of high-current correction magnet power supply for TPS facilities

Thursday, 23 May 2024 16:00 (2 hours)

In this paper, the focus is on the development of a bipolar high-current correction magnet power supply for the future TPS-II permanent magnet corrector coil. The maximum output current of the prototype is specified as 20 A, operating at a voltage of 48 V. This con-figuration enhances the amplitude of the trim magnetic core correction magnetic field, thereby providing greater flexibility in manufacturing the permanent magnet corrector coil. The Danisense DP50-IP-B DCCT is the current feedback component to design a power supply with high current and stability. MOSFETs are configured in a full bridge setup serving as power switches. The driving frequency is set at 40 kHz. Analogue modulation control circuitry and pro-tection circuits ensure precise current control loop modulation. Finally, a hardware prototype circuit is constructed in the power supply laboratory with an input voltage of 48 V, an output current of 20 A, a maximum power of 960 W, and the current ripple com-ponent maintained within 400 μA. This validates the control loop design of the prototype, demonstrating the capability to achieve rapid and stable output cur-rent performance. The small-signal bandwidth tested using a 1V input reference signal shows a -3 dB band-width of 8.51 kHz. Long-term current stability is with-in ±10 ppm, and the interface is compatible with exist-ing TPS correction magnet power supply interfaces, allowing for direct operation within the current sys-tem.

Footnotes

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