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Development of a modular corrector magnet power supply with N+1 redundancy for TPS facilities

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This paper delves into implementing multi-module parallel current output using the existing TPS storage ring correction magnet power supply. We have devised a control interface card with N+1 redundancy to facilitate bipolar high-current parallel module output. To achieve this, we have employed various current feedback methods, including external DC Current Transducer (DCCT) and internal module current feedback signals. Following PI compensation, these feedback signals are amalgamated with reference current signals to compute compensation values for each module, which are subsequently disseminated to each Corrector Magnet Power Supply (CMPS) for modulation, thereby enabling closed-loop current control. A single CMPS module can deliver ±48 V/±10 A output, while up to eight CMPS modules can be interconnected, yielding a maximum output of ±80 A. Through numerous experimental measurements, the long-term output current stability remains within 0.6 mA, or 7.5 ppm, with the output current spectrum predominantly maintained within 500 μA. Furthermore, the system boasts N+1 redundancy functionality and bipolar output current characteristics.

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