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Thu-Mo-Po4.01-04 [3]: The Design of the 30kA DCCT using in the FTPMF system

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The Direct-Current Current Transformers (DCCTs), which is based on the magnetic flux compensation, are the most sophisticated instruments to measure currents. In order to achieve the precision measurement of the magnet current in the flat-top pulsed high magnetic field (FTPMF) facility, the DCCT based on magnetic modulator with the range of 30kA is developed. In the conventional high precision (<100ppm) DCCT, the architecture of power amplifiers (PA) is usually based on a class AB output stage, which is characterized by features such as low total harmonic distortion (THD) and low energy efficiency. The class D amplifiers, also called "switching amplifiers", are very high efficiency. In order to reduce the power consumption, the PREMO Group used the class D amplifier as the PA of the DCCTs, which significantly improve the energy consumption by almost 40%. However, the measurement accuracy is only 0.2%, which can not meet the requirement of FTPMF system, due to the inherent ripple of the class D amplifiers. In this paper, we proposed using resonant circuits to filter the current ripples caused by the class D amplifiers making it possible to reduce significantly the power consumption of the current transducers without affecting their performance. Base on this scheme the DCCT using in the FTPMF system is fulfillment at the Wuhan National High Magnetic Field Center in China.

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