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P2.084 The analysis and design on transient DC over-voltage protection of ITER PF AC/DC. converter

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The International Thermonuclear Experimental Reactor (ITER) Poloidal Field (PF) AC/DC. converter is composed by thyristor-based phase controlled converter modules. As the core component of ITER PF AC/DC. converter, the thyristor is very sensitive to over-voltage and could be broken down in microseconds, therefore, the transient over-voltage protection strategy is desperately essential to ensure the converter safety operation. In this paper, the transient DC over-voltage that caused by plasma disruption is studied, and a two-stage transient DC over-voltage protection strategy which combined by Metal Oxide Varistor (MOV) and external bypass is proposed based on the design principles. To ensure the reliability of the transient DC over-voltage protection strategy, a bidirectional BreakOver Diode (BOD) circuit board is designed to active external bypass when the transient DC over-voltage is positive or negative respectively, and the performance-testing platform is built to study its performance. The experiments on ITER PF AC/DC. converter test facility is also carried out, and the experiment results show that the external bypass triggered by BOD board effectively and the load current is transferred to external bypass in 2 us when BOD suffers an over-voltage. The effectiveness of the proposed transient DC over-voltage protection strategy is verified.

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