Contribution ID: **108** Type: **Poster Presentation**

Thermal and Efficiency Study of a solid-state dual Marx generator combined a pulse transformer

Thursday, 7 July 2016 14:40 (20 minutes)

A solid-state dual Marx generator combined a pulse transformer is proposed in this paper, which can obtain a bipolar pulse and increase the output voltage. While, its input current will many times of the ratio of the pulse transformer, which will increase the difficult of the system thermal stress for its compact footprint. The power loss, power efficiency and thermal stress will be studied for a 40kV, 10kHz and 150A system. Its circuit action will be analyzed under different damping conditions with resonance characteristic build by the pulse transformer and load. And its every stages power loss and power efficiency will be quantitative. The thermal model of the Marx generator is also established to the heat sink design. Studies have shown that it can be applied to DBD load with under-damping and the leak inductance of the pulse transformer can make solid-state dual Marx generator worked at soft switching, which can improve its power efficiency and decrease thermal stress. Some practical measurements with a thermal imaging instrument have conducted for experimental demonstration. Through the above equivalent circuit model theory analysis and the experimental measurement, a feasible method for loss analysis, efficiency analysis and thermal design is proposed in this paper.
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Session Classification: Poster 2-A

Track Classification: Power Electronics, Power Supplies, Prime Power, Rotating Machines, and Energy Converters