Contribution ID: **1656** Contribution code: **WEPB064** Type: **Poster Presentation**

Development of a 13 kV SiC-MOSFET-Based pulsed power supply for evaluating metallic materials under high electric fields

Wednesday 4 June 2025 16:00 (2 hours)

To perform high electric field experiments for evaluating the vacuum breakdown characteristics of accelerator materials, we have developed a high-voltage pulsed power supply capable of providing a 10 kV peak voltage, 1 μs pulse width, and 1 kHz repetition rate. This system is designed to reliably apply intense fields to metallic electrodes with load capacitances up to 650 pF. To ensure operational reliability and prevent potential equipment damage, it incorporates an interlock system that halts operation when load short-circuits or external interlock signals are detected. By employing a 13 kV SiC-MOSFET developed under the Tsukuba Power Electronics Constellation (TPEC), we reduced the number of components and improved overall reliability. This report presents the technical features and performance of the power supply, demonstrating that it meets the operational specifications necessary for evaluating candidate materials under high electric field conditions.

Footnotes

Paper preparation format

LaTeX

Region represented

Asia

Funding Agency

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Session Classification: Wednesday Poster Session

Track Classification: MC7: Accelerator Technology and Sustainability: MC7.T16 Pulsed Power Technology