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New SiC kicker power supply for J-PARC

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A new kicker power supply using SiC-MOSFETs is under development at J-PARC. SiC-MOSFETs enables the fabrication of compact high-speed pulse power supplies to replace thyratrons switch power supply. The base circuit uses an induction voltage superposition circuit of the LTD method, and the semiconductor module circuit consists of a radial symmetry type that achieves low noise. The three main parts of an existing kicker power supply, the thyratron, PFN circuit, and end clipper, can be configured in a single module circuit. The power supply consists of a 1.25kV/2kA main circuit module board that forms a trapezoidal pulse and a 0.1kV/2kA correction circuit module board that compensates for droop of the flat section. The thirty-two main circuit module boards and twenty correction circuit module boards are connected in series in a hierarchical manner to achieve the waveform specifications required for J-PARC RCS kicker power supplies: output voltage of 40kV, output current of 2kA, and pulse width of 1.2us. In addition, an insulating cylinder for conductors has been developed that suppresses corona discharge and withstands continuous operation for long periods of time.

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Footnotes

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Author: TAKAYANAGI, Tomohiro (Japan Atomic Energy Agency)

Co-authors: ONO, Ayato (Japan Atomic Energy Agency); HORINO, Koki (Japan Atomic Energy Agency); SUGITA, Moe (Ibaraki University); UENO, Tomoaki (Japan Atomic Energy Agency); YAMAMOTO, Kazami (Japan Proton Accelerator Research Complex (J-PARC)); OGURI, Hidetomo (Japan Proton Accelerator Research Complex (J-PARC)); KINSHO, Michikazu (Japan Atomic Energy Agency); ODA, Kodai (Ibaraki University); TOKUCHI, Akira (Pulsed Power Japan Laboratory Ltd.); IKOMA, Naoya (Nishina Center for Accelerator-Based Science)

Presenter: TAKAYANAGI, Tomohiro (Japan Atomic Energy Agency)

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