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Current progress on a fast semiconductor-based Marx generator for a pulsed electron beam device

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A fast semiconductor-based Marx-generator is currently under development at the Institute for Pulsed Power and Microwave Technology (IHM) as driving pulse power source for a pulsed electron beam device (GESA). Its design addresses the challenging requirements of multipoint explosive emission cathodes such as fast voltage rise times below 100 ns together with flat top pulse amplitudes of 120 kV ± 1% at currents ranging from 200 A to 600 A for pulse length of up to 100 µs. Guided by economic considerations, 6 parallel 1.2 kV IGBTs are employed as switching elements. Fast current rise time is achieved using an effective gate-boosting circuit and a quasi-coaxial design of the generator. To guarantee a flat top voltage pulse at varying load conditions due to the dynamic impedance of the device at moderate stage capacitance, approximately 150 stages are required. As result challenges arise considering the distribution of supply and charging voltage as well as synchronous triggering. This contribution presents selected aspects of the generator design and first measurements on a small-scale setup.

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