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Characterization of a Pulse Charge Mode Multigap Pseudo-spark Device as an Enhanced Electron Beam Source

권영건, 이준석, 이의완, 남상훈*, 박성수*, 김상희*, 허훈*, 한영진*
경북대학교 물리학과, *포항가속기연구소

Multigap pseudospark devices can be used to produce intense pulsed electron beams. Pseudospark discharge is generally initiated by a self-breakdown or an external trigger in which mode DC high voltage is used. In this work, we investigated a pulse charge mode to generate enhanced pulsed electron beam from a 10-gap pseudospark device. In the pulse charge mode, pulsed high voltage is applied to the device. With the pulse charge mode, we could obtain enhanced electron beams in wider ranges of voltage and pressure than the self-discharge or the trigger mode. We had maximum efficiency of enhanced electron beams at 3×10^{-1} mbar of Ar gas. At this best pressure condition, we also observed well focused electron beams with diameter of down to 0.1 mm, peak current of up to 130 A, and full width at half maximum (FWHM) of 10 ns. The peak power density was 1010 W/cm².