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Study of electron flow in a pyroelectric accelerator

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By periodically varying the temperature of a pyroelectric single crystal under vacuum conditions, a compact charged particle accelerator can be created [1]. In addition to the single crystal, this also requires a grounded target, which acts as the second electrode in the acceleration scheme. This type of accelerator can be described as quasi-electrostatic. In various modes, this compact device can serve as a monoenergetic source of non-relativistic electrons, ions, X-rays, and even neutrons [2-4].

This paper discusses the phase characteristics, emittance, and focusing of such an accelerator. The study was conducted both experimentally and through numerical simulation. Issues related to avalanche breakdown, which are significant for practical applications, and stability and reproducibility of electron beams are also discussed.

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