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标题: Mechanism study of a THz source using field emission array
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摘要: The micro-vacuum electronic device is one of the most promising sources for the generation of high power THz-wave radiations. In this paper, the systematical theoretical analyses and computer simulations on the physical mechanism of a kind of micro-vacuum electronic THz radiation source based on the cathode of field-emission array (FEA) are carried out. The mode matching method is used to study the electromagnetic characteristics of the structure, and pi-mode is confirmed to be an optimal operation mode for its field distribution. Linear theory (small signal theory) is used to analyze the beam-wave interaction of this kind of source, and the starting condition of the pi-mode oscillation is derived. The premodulation of electron beam emitted from FEA and the electron transit time effect in the interaction gap are the physical cause of the electromagnetic oscillation. These results are well verified by the computer simulations.
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