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Title:Simulations of a two-stream backward-wave oscillator with a slot-hole structure

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Abstract:We study a two-stream backward-wave oscillator with a slot-hole structure at short millimeter waves with the help of a three-dimensional particle-in-cell simulation. In order to increase the interaction region of the electron beam, the efficiency and the output power, a slot-hole loaded rectangular waveguide structure used as the high-frequency system is proposed. Based on the mechanism of the backward-wave oscillator, a slow-wave oscillator with a frequency of 0.14 THz is designed. The simulations show that the output power and the efficiency of the oscillator can be enhanced due to the coupling between the two beams through the slot holes. The interaction efficiency is 5.18%, and the starting current density is below 5 A · cm⁻² for the two beams. These attractive results indicate that, based on the two-stream backward-wave oscillator, we can get short millimeter wave sources with high power and low current density.

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Inspec controlled terms:backward wave oscillators - current density - electron beams - millimetre wave oscillators - rectangular waveguides

Uncontrolled terms:two-stream backward-wave oscillator - three-dimensional particle-in-cell - interaction region - electron beam - slot-hole loaded structure - rectangular waveguide structure - current density - short millimeter wave sources - frequency 0.14 THz

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