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Title:Superimposed coherent terahertz wave radiation from mono-energetically bunched multi-beam

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Abstract:Intense coherent radiation is obtained from multiple electron beams monochromatically bunched over the wide higher-order-mode (HOM) spectral band in the THz regime. The overmoded waveguide corrugated by dielectric-implanted staggered gratings superimposes evanescent waves emitted from the low energy electron beams. The dispersion and transmission simulations of the three-beam slow wave structure show that the first two fundamental modes (TEinf10/inf and TEinf20/inf) are considerably suppressed ( $\sim -50$  dB) below the multi-beam resonating mode (TEinf30/inf) at the THz regime (0.8-1.24 THz). The theoretical calculations and particle-in-cell simulations show that with significantly higher interaction impedance and power growth rate radiation of the TEinf30/inf mode is  $\sim 23$  dBm and  $\sim 50$  dBm stronger than the TEinf10/inf and TEinf20/inf modes around 1 THz, respectively. This highly selective HOM multi-beam interaction has potential applications for power THz sources and high intensity accelerators. © 2012 American Institute of Physics.

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Main heading:Terahertz waves

Controlled terms:Electron beams - Fiber optics - Slow wave structures

Uncontrolled terms:Coherent radiation - Coherent terahertz waves - Evanescent wave - Fundamental modes - High intensity accelerator - Higher-order-mode - Interaction impedance - Low energy electron beams - Multi-beam - Overmoded - Particle-in-cell simulations - Potential applications - Spectral band - Theoretical calculations - THz sources

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