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标题: Photonic Free-Electron Lasers
作者: van der Slot, PJM (van der Slot, P. J. M.); Denis, T (Denis, T.); Lee, JHH (Lee, J. H. H.); van Dijk, MW (van Dijk, M. W.); Boller, KJ (Boller, K. J.)
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摘要: A photonic free-electron laser (pFEL) produces coherent Cerenkov radiation from a set of parallel electron beams streaming through a photonic crystal. The function of the crystal is to slow down the phase velocity of a copropagating electromagnetic wave, such that also mildly relativistic electrons (of about 10-keV energy) can emit coherent Cerenkov radiation. Starting from spontaneous emission, the feedback of the radiation on the electrons results in bunching of the electrons on the scale of the radiation wavelength, and consequently, coherent radiation can build up. The frequency of the coherent mode is set by the electron velocity and wave dispersion of the photonic crystal and can, a priori, be continuously varied by varying the electron energy. The scale invariance of Maxwell's equation allows operation from Gigahertz to Terahertz and possible infrared (IR) frequencies without the need to increase the electron beam energy. Therefore, the pFEL is a very attractive, compact, and coherent radiation source that has the potential to significantly enhance the power available in the THz domain.
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地址: [van der Slot, P. J. M.; Denis, T.; Lee, J. H. H.; van Dijk, M. W.; Boller, K. J.] Univ Twente, Dept Sci & Technol, Mesa Inst Nanotechnol, NL-7500 Enschede, Netherlands
通讯作者地址: van der Slot, PJM (通讯作者),Univ Twente, Dept Sci & Technol, Mesa Inst Nanotechnol, NL-7500 Enschede, Netherlands
电子邮件地址: p.j.m.vanderslot@utwente.nl
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