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A Compact Accelerator-based Light Source for High-power, Full-bandwidth Tunable Coherent THz Generation

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Terahertz (THz) radiation sources are increasingly significant for many scientific frontiers, while the generation of THz radiation with high-power at wide-tunable frequencies is still a limitation for most existing methods. In this paper, a compact accelerator-based light source is proposed to produce coherent THz radiation with high pulse energy and tunable frequency from 0.1 THz to 60 THz. By using a frequency beating laser modulated electron beam and undulator taper, intense coherent THz radiation can be generated through undulators. Theoretical analysis and numerical simulations demonstrate that the proposed technique can generate narrow-bandwidth THz radiation with a pulse energy up to 6.3 millijoule (mJ) and the three-dimensional effects of beam has limited influence on its performance. The proposed technique will open up new opportunities for THz spectroscopic and time-resolved experiments.

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Footnotes

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