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Generating radiation in terahertz frequency range by means of two-stream instability NIKOLAI YAMPOLSKY, KIP BISHOFBERGER, BRUCE CARLSTEN, RICKEY FAEHL, TENGIZ SVIMONISHVILI, Los Alamos National Laboratory — Generating radiation in the terahertz frequency range using methods developed in electronics is complicated. These methods imply the use of a slow-wave structure which is designed to match the dispersion curves of the electro-magnetic mode and the electron beam traveling slower than the speed of light. Such a slow-wave structure should have the scale on the order of the radiation wavelength, which is 100 μm for 3 THz radiation. Moreover, metal-based structures become ineffective in this frequency range due to high losses. Alternatively, two electron beams having close energies develop the two-stream instability resulting in the beam bunching. The resulting bunched beam can be utilized for generating radiation either by means of transition radiation or through the coupling of the output radiation with the second harmonic of the beam density modulations. The frequency of the output radiation can be easily controlled by adjusting the voltage, current, and spot size of the electron beams coupled by the two-stream instability. Therefore, the proposed scheme can be used for generating high-power radiation in a broad frequency range.

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