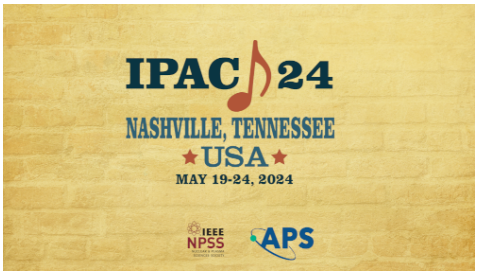

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A seeded THz free electron laser with an overmoded waveguide to reduce diffraction

Monday, 20 May 2024 16:00 (2 hours)

THz (1e+12 Hz) radiation is very attractive for its non-ionizing penetrative nature and unique absorption in water, metals, and other chemicals. While THz has great potential for imaging and for diagnosing chemical traces, it has not been utilized extensively due to scarcity of high-power THz sources. Currently, compact THz sources deliver power in the range of 50 μW —0.5 W, insufficient for most imaging and sensing applications. A compact THz sources is proposed to mitigate this gap of technology. FELs have been used for THz generation but have not been compact enough for most applications. The recent demonstration of waveguide THz FELs [1] has opened the door to more compact THz FELs. We propose a design of a seeded THz FEL with an overmoded waveguide. In addition, an efficient use of compact photoinjector to drive particles in energy of 2-4 MeV greatly reduces the overall footprint by 20%. We plan to use high-power GUNN diodes provides to efficiently seed THz power to the electron bunches, reducing the overall length of the device by 200%. An overmoded waveguide will allow for a larger waveguide to be used. The design has the potential to unleash full potential of THz spectrum.

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