

The experimental results of a low power X- band free electron maser by electron prebunching

Abstract

We have developed a proof-of-concept low power free electron maser that is compact and low cost. The design, set-up and results of a novel (without wiggler) low power X-band rectangular waveguide pre-bunched free electron maser (PFEM) are presented in this paper. Our device operates at 10GHz, with 10mWatt seeding input power and employs two rectangular waveguide cavities (one for velocity modulation and the other for energy extraction). The electron beam used in this experiment is produced by Thoria coated Iridium filament which can operate at 3kV and up to 5mA beam current. The effect of the aperture on the power leaking out of the waveguide is also analyzed. The TE₁₀ mode propagation of the EM standing wave is used to pre-bunch the electron beams in the input cavity. The bunched electron beams are in the same phase as the TE₁₀ mode propagation of the EM wave in the output cavity. This free electron maser could be useful industrially, as it could be used with the commercially available accelerating voltage supplies.

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