

A low-power X-band free electron laser by prebunching of the electrons

Abstract

We are developing a prototype free electron laser that is compact, low cost, and low power. The design, setup, and results of a novel X-band rectangular waveguide prebunched free electron laser (PFEL) are presented in this article. Our initial device operates at 10 GHz and uses two rectangular waveguide cavities (one for velocity modulation and the other for energy extraction). The electron beam used in this experiment is produced by thermionic electron gun, which operates at 3 kV and up to 50 μ A. The nominal beam diameter is 1 mm passing across the X-band cavity resonators. The resonant cavity consists of a thin gap section of height 1.5 mm, which reduces the beam energy required for beam wave interaction.