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Study of the radiation field from multiple out-coupling holes in an infrared free electron laser oscillator

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A new infrared Free-Electron Laser (FEL) facility FELiChEM has been established as an experimental facility at the University of Science and Technology of China. It consists of two free electron laser oscillators which produce mid-infrared and far-infrared lasers covering the spectral range of 2-200 μm at the present stage. Both oscillators are driven by a normal conducting S-band linac and this coverage is achieved by adjusting the electron beam energy from 12 to 65 MeV. The facility is dedicated to energy chemistry research, and output power is one of the most crucial parameters concerned by users. The output power is typically achieved by an out-coupling hole located in the center of a cavity mirror. Nevertheless, the spectral gap phenomenon has been observed in FEL oscillators with partial waveguides, which means that output powers are drastically reduced at certain wavelengths. Such power gaps have an adverse effect on experimental results since numerous experiments require continuous spectral scanning. In this paper, we propose the utilization of multiple out-coupling holes on the cavity mirror, instead of relying solely on a central out-coupling hole, to reduce the adverse impact of the spectral gap phenomenon.

Footnotes

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