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Optical cavity status for SSMB at Tsinghua

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A novel mechanism, known as steady-state microbunching (SSMB), is anticipated to produce light with high peak brilliance and a high repetition rate by integrating the characteristics of free electron lasers and synchrotron radiation facilities. This paper presents the status of a high-finesse prototype optical enhancement cavity designed for SSMB, achieving an average power of 55 kW. The cavity finesse, measured through both the decay-time method and the EOM-based frequency modulation method, is approximately 16,000. The phenomenon of thermal-induced modal degeneracy is observed, and the mitigation of modal instability is successfully achieved through the implementation of a pair of D-shaped mirrors. The average absorption coefficient of the cavity mirrors is estimated to be 12 ppm by fitting the size of the thermal-induced evolution of the cavity fundamental mode in experiments. The intra-cavity average power reaches 55 kW, limited by the high absorption coefficient.

Footnotes

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Paper preparation format

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Asia

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