

Free electron lasers driven by plasma accelerators: status and near-term perspectives

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In an echo of the cluster of breakthrough laser wakefield acceleration experiments in the mid-2000's, there have been multiple milestone experiments in the past few years demonstrating free electron lasers (FELs) powered by plasma-based accelerators. The smallest lasing wavelength was observed by the SIOM group, 27 nanometers, but more than an order of magnitude in photon energy still remains to close the gap between plasma-powered FELs and conventional X-ray FEL facilities. Two of the greatest remaining challenges to achieve application readiness are the reduction of the electron beam energy spread, and operational stability. In this talk, the state-of-the-art in plasma-powered FELs will be described along with ongoing efforts to address these remaining challenges. In addition, new theoretical progress will be presented related to the ion channel laser: a plasma-based alternative to the free electron laser.

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