Experimental Study of a 33.3 GHz Free Electron Laser Amplifier 
with a Reversed Axial Guide Magnetic Field

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ABSTRACT

We report on a new regime of free electron laser operation with reversed axial guide magnetic field, in which the cyclotron rotation of the electrons in the uniform axial field opposes the rotation in the helical wiggler field. The 33.3 GHz free electron laser amplifier is driven by a mildly relativistic electron beam (750 kV, 300 A, 30 ns) and generates 61 MW of radiation with a 27% conversion efficiency. The results are compared with those obtained when the axial guide field is in its conventional orientation where considerable loss of power and efficiency is observed.

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