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Harnessing the plasma magnetic mode for the generation of brilliant synchrotron radiation LUIS SILVA, FREDERICO FIUZA, SAMUEL MARTINS, RICARDO FONSECA, GoLP/IPFN - Instituto Superior Tecnico, CHAN JOSHI, University of California Los Angeles, Los Angeles, USA — The existence of a plasma magnetic mode (PMM), or picket-fence mode, excited in the collision of a light pulse with a relativistic ionization front, has been predicted theoretically, but a clear experimental evidence of this fundamental plasma mode is still missing. We study the possibility to generate ultrashort-wavelength, high-brilliance radiation by using the PMM as a short-wavelength plasma undulator. The synchrotron radiation, generated when a relativistic energy beam traverses this magnetic structure, allows for a clear signature of the PMM. In order to check the validity of our scheme, we have performed simulations both with OSIRIS 2.0, including tunneling ionization, and with GENESIS 1.3, for an equivalent magnetic field structure. Our results demonstrate the possibility for controlled generation of radiation in the PMM, with high brilliance, equivalent to a compact gamma-ray synchrotron source, providing a clear experimental evidence of this plasma mode and opening the way towards the use of short-wavelength magnetostatic structures in plasmas.

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