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**A compact X-ray to Gamma-ray FEL** FREDERICO FIUZA, LUIS SILVA, GoLP/Instituto de Plasmas e Fusao Nuclear, Instituto Superior Tecnico, Lisboa, Portugal — We study the possibility of using the magnetic mode driven by an intense radiation source impinging on a relativistic ionization front as a plasma undulator with periods that can be orders of magnitude smaller than those of conventional undulators, allowing for the generation of ultrashort-wavelength radiation with modest electron-beam energies, and therefore strongly decreasing the size of FEL systems. The effects of the plasma background on the resonance condition and on the growth rate of the generated radiation are investigated, as well as the role of the associated beam-plasma instabilities in the FEL mechanism. In order to check the validity of our theoretical predictions, we have performed simulations both with GENESIS 1.3, for an equivalent magnetic field structure, and with OSIRIS 2.0, in order to also include the plasma effects. The analysis reveals a good agreement between theory and simulation results, illustrating the possibility of using short-period plasma undulators to produce a compact X-ray to Gamma-ray FEL.

Frederico Fiuza  
GoLP/Instituto de Plasmas e Fusao Nuclear,  
Instituto Superior Tecnico, Lisboa, Portugal

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