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Relativistic ionization fronts in gas jets NUNO LEMOS, J.M. DIAS, GoLP/CFP, Instituto Superior Tecnico, Portugal, J.G. GALLACHER, R.C. ISSAC, D.P., University of Strathclyde, UK, R.A. FONSECA, DCTI, Instituto Superior de Ciências do Trabalho e da Empresa, Portugal, N.C. LOPES, L.O. SILVA, J.T. MENDONÇA, GoLP/CFP, Instituto Superior Técnico, Portugal, D.A. JAROSZYNSKI, D.P. , University of Strathclyde, UK — A high-power ultra-short laser pulse propagating through a gas jet, ionizes the gas by tunnelling ionization, creating a relativistic plasma-gas interface. The relativistic ionization front that is created can be used to frequency up-shift electromagnetic radiation either in co-propagation or in counter-propagation configurations. In the counter-propagation configuration, ionization fronts can act as relativistic mirrors for terahertz radiation, leading to relativistic double Doppler frequency up-shift to the visible range. In this work, we identified and explored, the parameters that optimize the key features of relativistic ionization fronts for terahertz radiation reflection. The relativistic ionization front generated by a high power laser (TOPS) propagating in a supersonic gas jet generated by a Laval nozzle has been fully characterized. We have also performed detailed two-dimensional relativistic particle-in-cell simulations with Osiris 2.0 to analyze the generation and propagation of the ionization fronts.

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