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Generation of 15-TW single-cycle laser pulse using cross-phase modulation in a relativistic plasma SHOUYUAN CHEN, MATTHEW REVER, DONALD UMSTADTER, Department of Physics and Astronomy, University of Nebraska at Lincoln — The compression of amplified laser light is a topic of much current interest, and one in which plasmas can play an important role. We present the theory of high-power, ultra- short pulse generation using cross-phase modulation in a relativistic plasma [1]. The analysis shows that the spectrum of the modulated pulse has a bandwidth of 400 nm, which indicates a broadening by more than 10 times. The pulse duration will be only one or two laser cycles if a Fourier-transform limited pulse can be obtained after compression. The power of the compressed pulse is adjustable and can reach 15 TW since plasma has no damage threshold. That is orders of magnitude higher than the power of ultra-short pulses generated by self-phase modulation in noble gases. This work was supported by the Chemical Sciences, Geosciences, and Biosciences Divisions of the Office of Science, U.S. Department of Energy and the National Science Foundation.

References:
[1] S. Chen et al., "Observation of Relativistic Cross-Phase Modulation in High Intensity Laser- Plasma Interactions," CLEO (JThD6, oral presentation), Baltimore, May 22-27, 2005.

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