

Abstract Submitted  
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**Zettawatt-Equivalent Ultrashort Pulse Laser System (ZEUS) at the University of Michigan**<sup>1</sup> A. MAKSIMCHUK, I. JOVANOVIĆ, G. KALINCHENKO, C. KURANZ, J. NEES, A.G.R. THOMAS, L. WILLINGALE, K. KRUSHELNICK, University of Michigan — The past two decades have witnessed the development of revolutionary light sources having the unprecedented ability to probe and control matter with atomic scale precision. The University of Michigan has been at the forefront in the development of this high-power laser technology, with the HERCULES laser presently operational at peak powers up to 500 TW. The ZEUS facility to be constructed will include a dual-beamline 3 PW laser system that will provide unique new capabilities. The name ZEUS (Zettawatt-Equivalent Ultrashort pulse laser System) refers to the interaction of a PW laser pulse colliding with a GeV energy electron beam generated by one of its two beamlines. This geometry provides the equivalent of a "Zettawatt" power laser interaction ( $10^{21}$  Watts) in the rest frame of the electron beam. It will consequently allow exploration of fundamental questions regarding non-linear quantum electrodynamics in relativistic plasmas and electron-positron pair production mechanisms. Further experiments enabled by this facility will include pump-probe experiments using femtosecond x-rays to probe material dynamics, the production of GeV ion beams, the exploration of vacuum polarization effects and relativistic astrophysical shocks. Once completed, the ZEUS laser system will be the highest-power laser system in the US and will be a user facility for US scientists and wider international research community.

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