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Abstract for an Invited Paper
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James Clerk Maxwell Prize Address: High Intensity Laser Propagation and Interactions[1]

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High intensity laser radiation sources cover a wide range of parameters, e.g., peak powers from tera to peta watts, pulse lengths from pico to femto seconds, repetition rates ranging from kilo to mega hertz and average powers of many tens of watts. This talk will cover, among other things, some of the unique physical processes which result when high intensity laser radiation interacts with gases and plasmas. One of the interesting topics to be discussed is the propagation of these laser pulses in a turbulent atmosphere which results in a multitude of coupled linear and nonlinear processes including filamentation and scintillation. Phase conjugation techniques to reduce the effects of atmospheric turbulence (scintillation) will be described. This talk will also discuss a range of potential applications of these high intensity lasers, including: electron acceleration in spatially periodic and tapered plasma channels, detection of radioactive material using electromagnetic signatures, atmospheric lasing of N_2 molecules, as well as incoherent and coherent x-ray generation mechanisms.

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