

Abstract Submitted  
for the OSF11 Meeting of  
The American Physical Society

**Petawatt-Class Ultra-High-Peak-Power Laser Design for the SCARLET Laser Facility**<sup>1</sup> PATRICK POOLE, CHRIS WILLIS, ENAM CHOWDHURY, REBECCA DASKALOVA, LINN VAN WOERKOM, RICK FREEMAN, The Ohio State University — The OSU High Energy Density Physics (HEDP) group focuses on high-intensity ultra-fast laser experiments, especially those pertaining to fast-ignition fusion. A petawatt-scale upgrade designed to significantly increase the intensity of OSU's SCARLET laser. The beam will have 400 TW peak power at 800 nm wavelength with a 5  $\mu\text{m}$  focal spot, delivering  $10^{22}$  W/cm<sup>2</sup> with a  $< 40$  fs pulse at a repetition rate of once per minute. To achieve this, SCARLET uses a 3-pass amplifier (Ti:Sapphire crystal) irradiated by two 25 J, ND:glass 527 nm pump lasers as well as Dual Chirped Pulsed Amplification (DCPA) by way of a new stretcher with a compact mirror-stripped grating design to stretch the initial pulse from 25 fs to 800 ps. Several air-spaced achromatic doublets were designed in-house to serve as image-relay telescopes to and from the new amplifier; these have been optimized to minimize chromatic and spherical aberration within the 100 nm bandwidth pulse. Also presented are results from gain modeling performed to predict effects like red-shift and gain narrowing in amplification.

<sup>1</sup>This work was supported by the US DOE under contract DE-FC52-06NA26262 (NNSA) and the Fusion Science Center (PO#415026-G/UR).

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Date submitted: 12 Sep 2011

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