

Abstract Submitted  
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**Diffraction Grating Interferometer for Single-shot Soft-x-ray Laser Linewidth Measurement**<sup>1</sup> LIANG YIN, YONG WANG, SHOUJUN WANG, Colorado State University, MARK BERRILL, Oak Ridge National Laboratory, MARIO MARCONI, Colorado State University, OSCAR MARTINEZ, Universidad de Buenos Aires, Argentina, JAMES DUNN, Lawrence Livermore National Laboratory, JORGE ROCCA, Colorado State University — The linewidth of soft x-ray laser beams generated from highly charged ions in dense plasma amplifiers is an important parameter that ultimately limits their minimum pulsewidth. An innovative interferometer design was used to measure the linewidth of a plasma-based table-top soft x-ray laser operating in the  $\lambda = 14.7$  nm  $4d^1S_0-4p^1P_1$  line of Ni-like Pd in a single shot. The technique uses diffraction gratings as beam splitter in a Mach-Zehnder configuration that introduces a time delay across the detector plane. Measurement of the temporal coherence length, and hence the linewidth, were obtained for different grazing incidence angles of the optical pump laser that heats the plasma. The temporal coherence length for plasmas generated by irradiation at grazing incident angle of  $23^\circ$ ,  $30^\circ$ ,  $37^\circ$  was measured, yielding values that vary from  $221 \pm 10 \mu\text{m}$  for the smaller angle to  $191 \pm 8 \mu\text{m}$ , corresponding to FWHM spectral linewidths of  $\Delta\lambda/\lambda = 2.94 \times 10^{-5}$  and  $3.42 \times 10^{-5}$  respectively. Results were also obtained for an injection-seeded configuration in which a high harmonic pulse is used to seed the amplifier.

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