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A phase coherent dual-comb source in the VUV based on intracavity high harmonic generation DAVID CARLSON, TSUNG-HAN WU, R. JASON JONES, University of Arizona, College of Optical Science — Intracavity high harmonic generation (iHHG) utilizing femtosecond enhancement cavities (fsEC's) has been established as an efficient route for generation of femtosecond frequency combs in the vacuum and extreme ultraviolet spectral regions. To enable more robust direct frequency comb spectroscopy of complex atomic and molecular structure in the VUV, we have developed a novel dual-comb system. Two phase-coherent fiber based frequency combs are up converted to the VUV using iHHG. Dual-comb spectroscopy has already been established in the IR as a powerful spectroscopic method that does not require high-resolving power components to isolate individual fs comb modes. In such systems, the second phase coherent frequency comb acts as a local oscillator, enabling one to directly measure individual comb components through the unique heterodyne beat frequency of each comb mode. By allowing the detection of individual comb components in the VUV and XUV for the first time, our system will also enable a systematic study of its noise properties, offering insight to the underlying physics of iHHG that affects the XUV comb coherence. We demonstrate the current dual-comb VUV source as a first step towards precision dual-comb spectroscopy of atomic and molecular systems in the VUV.

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