

Abstract Submitted
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Femtosecond laser frequency comb for precision astrophysical spectroscopy CHIH-HAO LI, Harvard-Smithsonian CfA, ANDREW J. BENEDICK, PETER FENDEL, MIT, ALEX GLENDAY, Harvard-Smithsonian CfA, FRANZ X. KAERTNER, MIT, DAVID F. PHILLIPS, DIMITAR SASSELOV, ANDREW SZENTGYORGYI, RONALD L. WALSWORTH, Harvard-Smithsonian CfA — Spectroscopy is a crucial tool for cosmology and the search for extrasolar planets. Broadband frequency combs have revolutionized precision spectroscopy in the laboratory with absolute frequencies determined to better than one part in 10^{15} . Good long-term stability and reproducibility are also major advantages of the frequency comb. However, their application to any astrophysical spectrograph requires increasing the comb-line spacing by at least 10-fold from today's high repetition rate sources operating at about 1 GHz. We report the successful test of a 40-GHz comb generated from a 1-GHz source, without compromise on long-term stability, reproducibility and resolution. The application of this novel technique to astrophysics should allow more than a 10-fold improvement in Doppler-shift sensitivity, with significant impact to many fields, including the search for extrasolar Earths, the direct measurement of the universe expansion and the detection of the temporal variation of physical constants.

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