

Abstract Submitted
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Laser frequency combs for precision astrophysical spectroscopy
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WALSWORTH, CLAIRE CRAMER, 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 sta-
bility 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 operation of a 40-GHz comb generated from
a 1-GHz source, without compromise on long-term stability, reproducibility and res-
olution at an astronomical observatory. The application of this novel technique to
astrophysics should allow more than a 10-fold improvement in Doppler-shift sen-
sitivity, 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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