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Laser frequency comb for improved exoplanet detection and cosmology 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 —
Searches for extrasolar planets using the periodic Doppler shift of stellar lines are approaching Earth-like planet sensitivity. To find a 1-Earth-mass planet in an Earth-like orbit, an order of magnitude improvement in state-of-the-art radial velocity spectroscopy is necessary. An approach that combines a laser frequency comb with a Fabry-Perot cavity has been suggested as a promising avenue to improved wavelength calibration. Here we report the fabrication of such a laser comb with up to 40 GHz (≈ 1 $\mathring{A}$) line-spacing, without compromise of long-term stability, reproducibility or spectral resolution and that is well matched to the resolving power of high-resolution astrophysical spectrographs. The instrument will be deployed on the MMT in May 2008 to calibrate the Hectochelle spectrograph in a demonstration project to search for dark matter in globular clusters and in 2009/10 at the HARPS clone spectrograph on the William Herschel telescope to search for exoplanets.

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