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Cosmology from the matter power spectrum peak

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The position of the peak of the matter power spectrum is a different kind of standard ruler, with a scale set by the horizon size at the epoch of matter-radiation equality. It can easily be predicted in terms of the physics of the Universe in the relativistic era, and so used as a standard ruler independently of other rulers, such BAO. However, it requires a very large effective volume to be measured accurately, and the precision will lag other standard rulers that use smaller-scale information. We present a model-independent method to extract the geometric information from the so-called 'turnover scale.'We present a tentative detection from the eBOSS quasar sample, and measure the physical matter density to be $\Omega_m h^2 = 0.1592^{+0.041}_{-0.037}$, a measurement that is independent from the CMB power spectrum. We make forecasts for the effectiveness of this standard ruler for future large-scale spectroscopic surveys, including DESI, MSE and MegaMapper.

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