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New, precise and reliable quasar absorption limits on alpha-variation

Thursday 15 September 2016 10:00 (1 hour)

Previous evidence for time and space variations in the fine-structure constant (alpha) emerged from large samples of quasar spectra observed with the Very Large Telescope and Keck telescope. I will first review this evidence in light of our work that identified systematic wavelength calibration errors in these telescopes. These errors are subtle, complex and still not fully understood; they clearly change with time, making it difficult to estimate the detailed effect they had on the quasar spectra. Nevertheless, I will argue that they are likely to explain the previous evidence for variations in alpha, and at least substantially weaken that evidence.

Secondly, I will describe new observations and measurements which are corrected for, or are insensitive to, these calibration errors. In particular, I will report 11 new such measurements which, combined, constrain the relative deviation in alpha to be $\Delta\alpha/\alpha = 0.4 \pm 1.7$ parts-per-million from the current laboratory value at redshifts 1.0–2.4 (look-back times of 7.8–11 billion years). This is consistent with no variation in alpha at a precision level comparable to that of the two large quasar samples. However, the particular distribution of these quasars on the sky precludes a strong test of possible evidence variation in alpha across the sky in those large samples (ignoring the calibration errors above). I will report on progress towards several new measurements that, combined with those reported here, should enable such a test.

Summary

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