
Contribution ID: **43** Type: **parallel**

# Impact of long-range wavelength-scale distortion on fine-structure constant measurements.

*Thursday, 15 September 2016 14:00 (25 minutes)*

New ideas in unification theories suggest space-time variations of dimensionless physical constants may exist and that they might be within reach of current instrumental precision available from the world's best observatories. State-of-the-art observations already hint at such an effect. If confirmed, fundamental revisions in standard physics would be required.

Accurate calibrations are of course crucial in searches for space-time variations of dimensionless physical constants using spectroscopic observations from the world's best observatories. Several recent studies reveal wavelength distortions in optical echelle spectrographs. These are not yet understood and they have not yet been measured using the actual science data used to derive constraints on space-time variation of alpha (critical since they appear to vary with time). In this work we study the impact of such distortions on measurements of the fine structure constant, alpha, observed at high redshift using high-resolution quasar spectroscopy and show that whilst long-range wavelength-scale distortions do exist, and hence contribute an additional systematic error, these systematics (measured directly from the science exposures themselves) are small and unlikely to explain the spatial variations of alpha reported recently.

## Summary

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**Session Classification:** [VC-O] Varying constants –astronomical observations