Constraining the cosmological time variation of the fine - structure constant

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Abstract: The variation of the fine-structure constant ? = e^2 th{stroke}c can be probed by comparing the wavelength of atomic transitions from the redshift of quasars in the Universe and laboratory over cosmological time scales t ~ 10^{10} yr. After a careful selection of pairs of lines, the Thong method with a derived analytical expression for the error analysis was applied to compute the ? variation. We report a new constraint on the variation of the fine-structure constant based on the analysis of the C_{IV}, N_V, Mg_{II}, Al_{III}, and Si_{IV} doublet absorption lines. The weighted mean value of the variation in ? derived from our analysis over the redshift range 0.4939 ?? z ?? 3.7 is = (0.09 ? 0.07)??10^{-5}. This result is three orders of magnitude better than the results obtained by earlier analysis of the same data on the constraint on ???/?. ?? 2010 Springer Science+Business Media, Inc.

Author Keywords: absorption lines; Cosmology; observations - line; profiles - quasars

Year: 2010
Source title: Astrophysics
Volume: 53
Issue: 3
Page : 446-452
Link: Scorpus Link
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ISSN: 5717256
DOI: 10.1007/s10511-010-9135-8
Language of Original Document: English
Abbreviated Source Title: Astrophysics
Document Type: Article
Source: Scopus
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