Constraining the cosmological time variation of the fine - structure constant

Duc Thong L., van Hung T., Thi Thu Huong N., Huy Bang H.

Ho Chi Minh City Institute of Physics, Ho Chi Minh, Viet Nam; Research and Development Center for Radiation Technology, Hanoi, Viet Nam; Laboratory for High Energy Physics and Cosmology, Faculty of Physics, Vietnam National University, Hanoi, Viet Nam

Abstract: The variation of the fine-structure constant ? = e^2 / h{combining short stroke overlay}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.

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Correspondence Address: Duc Thong, L.; Ho Chi Minh City Institute of Physics, Ho Chi Minh, Viet Nam; email: ducthong@gmail.com

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Authors with affiliations:

1. Duc Thong, L., Ho Chi Minh City Institute of Physics, Ho Chi Minh, Viet Nam
2. van Hung, T., Research and Development Center for Radiation Technology, Hanoi, Viet Nam
3. Thi Thu Huong, N., Laboratory for High Energy Physics and Cosmology, Faculty of Physics, Vietnam National University, Hanoi, Viet Nam
4. Huy Bang, H., Laboratory for High Energy Physics and Cosmology, Faculty of Physics, Vietnam National University, Hanoi, Viet Nam