Search for time variation of the fine-structure constant using [O_{III}] emission lines

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Abstract: A possible spatial and temporal dependence of the fine-structure constant ?=e^2/(4 ???$_0$?c) was investigated. For this purpose, a statistical analysis of fine splitting of [O_{III}] doublet emission lines in SDSS (Sloan Digital Sky Survey) quasar spectra is carried out in order to estimate a possible time variation of the fine-structure constant (?) 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 ? based on the analysis of 42 [O_{III}] doublets selected from SDSS quasar sample. We find ???/?=(-0.52?0.77)??10^{-5} over a redshift range 0.16??z??0.80. This result represents a factor of ?14 improvements on the constraint on ???/? based on [O_{III}] doublets compared to the published results in the literature. ?? 2010 Springer Science+Business Media B.V.

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