An updated constraints on the variations of the fine-structure constant from an analysis of white-dwarf spectra

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Abstract: We use the observed spectra from the white dwarf star G191-B2B to constrain the space-time variation of the fine-structure constant, $\alpha = \frac{e^2}{4\pi\varepsilon_0 \hbar c}$. The analysis was combined with laboratory and astronomical lines in [Ni V] to find $\Delta\alpha/\alpha = (-0.003 \pm 0.072) \times 10^{-6}$. The obtained result suggests a comparison with previous studies looking at cosmological variations of α using QSO spectra. In this way, we can expect higher sensitivity from the white-dwarf spectra than the QSO spectra. Therefore, this study should have more orders of magnitude higher sensitivity per system than the previous quasar studies and we should be reaching the statistical and systematic errors in high accuracies. This result represents the most stringent limit on $\Delta\alpha/\alpha$ compared with the results using the same data published in the literature.