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Constraining a simple parametrisation for varying alpha

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One of the main science drivers of the high-resolution spectrograph ESPRESSO concerns the stability of physical constants, in particular the fine-structure constant on which strong bounds are provided by local experiments in short time-scales. Thanks to the more precise measurements of distant spectra quasars, ESPRESSO strengthens the limits on the variation of α in astrophysical time-scales. Even null results with increased accuracy would be beneficial to test cosmological models that predict a varying α. The model we test assumes that the electromagnetic sector is coupled to the scalar field responsible for the dark energy accelerating the Universe. We parametrise the resulting variation of the fine-structure constant by introducing two extra degrees of freedom beyond the concordance model. The first parameter drives the cosmological evolution of the quintessence component while the second one represents its coupling with the electromagnetic field. We perform a Bayesian analysis to constrain our parametrisation by comparing its predictions with observations. The datasets are composed of astrophysical measurements of QSO spectra, including the latest ESPRESSO data point, as well as Planck data on the cosmic microwave background. We combine them with local results from atomic clocks and the MICROSCOPE experiment. The constraints obtained on the parameter driving the quintessence evolution are consistent with a null variation of the field, i.e. compatible with a ΛCDM cosmology, while those on the coupling to the electromagnetic sector are dominated by the Eötvös parameter local bound.

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