Reconstructing the dark energy equation of state with varying alpha

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abstract The possibility of reconstructing the dark energy equation of state from variations in the fine structure constant is investigated for a class of models where the quintessence field is non-minimally coupled to the electromagnetic field. For given classes of couplings and quintessence interaction potentials, it is typically found that variations in alpha would need to be measured to within an accuracy of at least $5 \times 10^{-7}$ to obtain a reconstructed equation of state with less than a twenty per cent deviation from the true equation of state between redshifts 0 and 3.5. In this case, it is argued that the sign of the first derivative of the equation of state can be uncovered from the reconstruction, thus providing unique information on how the universe developed into its present dark energy dominated phase independent of high redshift surveys. Such information would complement future observations anticipated from the Supernova Acceleration Probe.