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## What it takes to solve the Hubble tension through modifications of cosmological recombination

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We develop a formalism exploring the existence of a data-driven solution to the Hubble tension, considering perturbative modifications around a fiducial  $\Lambda$ CDM cosmology. Taking as proof-of-principle the case of a time-varying electron mass and fine structure constant, we demonstrate that a modified recombination can solve the Hubble tension and lower  $S_8$  to match weak lensing measurements. Once baryonic acoustic oscillation and uncalibrated supernovae data are included, however, it is not possible to fully solve the tension with perturbative modifications to recombination.

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