Fundamental Constants as Monitors of Particle Physics and Dark Energy

RODGER THOMPSON, Steward Observatory and Department of Astronomy, University of Arizona — This contribution considers the constraints on particle physics and dark energy parameter space imposed by the astronomical observational constraints on the variation of the proton to electron mass ratio $\mu$ and the fine structure constant $\alpha$. These constraints impose limits on the temporal variation of these parameters on a time scale greater than half the age of the universe, a time scale inaccessible by laboratory facilities such as the Large Hadron Collider. The limits on the variance of $\mu$ and $\alpha$ constrain combinations of the QCD Scale, the Higgs VEV and the Yukawa coupling on the particle physics side and a combination of the temporal variation of rolling scalar field and its coupling to the constants on the dark energy side.