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The muonic hydrogen Lamb shift and proton radius from effective field theories

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We obtain a model independent expression for the muonic hydrogen Lamb shift. The hadronic effects are controlled by the chiral theory, which allows for their model independent determination. We give their complete expression including the pion and Delta particles. Out of this analysis and the experimental measurement of the muonic hydrogen Lamb shift we determine the electromagnetic
proton radius: $r_p = 0.8432(16)$ fm. This number is at 6.4σ variance with respect to the CODATA value. The parametric control of the
uncertainties allows us to obtain a model independent determination of the error, which is dominated by hadronic effects.

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