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Proton radius puzzle: theory vs experiment

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Brief review of the proton radius problem is given. In the framework of the quasipotential method in quantum electrodynamics we calculate the contribution of light pseudoscalar (PS) and axial-vector (AV) mesons to the interaction operator of a muon and a proton in muonic hydrogen atom. The coupling of mesons with the muon is via two-photon intermediate state. The parametrization of the transition form factor of two photons into PS and AV mesons, based on the experimental data on the transition form factors and QCD asymptotics, is used. Numerical estimates of the contributions to the hyperfine structure of the spectrum of the S and P levels are presented. It is shown that such contribution to the hyperfine splitting in muonic hydrogen is rather important for a comparison with precise experimental data.

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