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Quantum Anomalous Energy Effects on the Nucleon Mass YIZHUANG LIU, University of Regensburg — We use the Hamiltonian approach to examine the content of the nucleon mass in quantum chromodynamics, which receives contributions from both scalar and tensor densities of the energy-momentum tensor. Apart from the quark masses, the scalar density contains a composite-gluon field F^2 originated from anomalous breaking of the scale symmetry due to ultraviolet quantum fluctuations. The response of this scalar field in the presence of the nucleon generates a non-perturbative contribution to the nucleon mass, in much the same way the Higgs fields endow mass for fundamental matter particles. We illustrate the physics of this anomalous energy contribution as a dynamical Higgs mechanism through a 1+1 dimensional non-linear sigma model. Finally, the anomalous energy sets the scale for quark and gluon kinetic and potential energy contributions to the remainder of the nucleon mass through a relativistic virial theorem.

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