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A way to acquire some current quark mass from a general relativistic effect

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We calculate a way to acquire some current quark mass from a general relativistic effect. For a bare quark, we model that boundary conditions on the spacetime metric can plausibly couple the value of current quark mass to the charge, via external pressure (e.g., as supplied by a background field) at sub-fm length scales. This mechanism acquires some (up to $\sim 40\%$) current quark mass “from” the charge. To construct an approximate metric, we model a bare quark as a spherically symmetric static perfect fluid with charge, using a recent exact Maxwell-Einstein metric for the interior, out to a radius r at which the boundary condition is to match to the Reissner-Nordström metric (for spacetime external to a charged mass). At r , the model produces internal pressure, which should be matched to external pressure. For reported values of quark charges q and bare masses m_q , this construction produces sub-fm radii. Although the metric at this radius differs only perturbatively from a flat spacetime, the matching condition is more significant and couples the current quark mass to the charge.

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