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The gravitational polarization of the quantum vacuum as a possible solution to the dark energy problem

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Our study is based on the working hypothesis that by their nature quantum vacuum fluctuations are virtual gravitational dipoles. This hypothesis is the simplest solution to the cosmological constant problem and opens the possibility to consider the known Standard Model matter (i.e. matter made from quarks and leptons interacting through the exchange of gauge bosons) as the only content of the Universe. If this hypothesis is correct, each galactic halo of hypothetical dark matter must be replaced by the halo of the quantum vacuum polarized by the immersed baryonic matter. Totality of all these halos is a cosmological fluid which during expansion of the Universe converts from a fluid with negative pressure (allowing an accelerated expansion of the Universe) to a fluid with zero pressure (physically it means the end of the accelerated expansion). This for the first time suggests, at least mathematically, quantum vacuum may explain both phenomena; phenomena usually attributed to dark matter and phenomena usually attributed to dark energy.

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