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On the quantum origin of a dark universe

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It has been shown beyond reasonable doubt that about 95% of the total energy budget of the universe is given by the dark constituents, namely Dark Matter and Dark Energy. What constitutes Dark Matter and Dark Energy remains to be satisfactorily understood however, despite a number of promising candidates. An associated conundrum is that of coincidence, as to why the Dark Matter and Dark Energy densities are of the same order of magnitude at the present epoch. In an attempt to address these, we consider a quantum potential resulting from a quantum corrected Raychaudhuri/Friedmann Equation in presence of a Bose-Einstein condensate (BEC) of light bosons. For a suitable and physically motivated macroscopic ground state wavefunction of the BEC, we show that a unified picture of the cosmic dark sector can indeed emerge, which also resolves the issue of the coincidence. The effective density of the Dark energy component turns out to be a cosmological constant. Furthermore, comparison with observed data give an estimate of the mass of the constituent bosons in the BEC, which is well within the bounds predicted from other considerations.

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