Dark matter as a QCD effect in an Anti de Sitter background (Cosmogonic implications of de Sitter, Anti de Sitter and Poincaré symmetries)

Jean-Pierre Gazeau

U. Paris Cité

Joint work with: Gilles Cohen-Tannoudji, CEA Saclay

The ΛCDM standard model of cosmology involves two dark components of the universe, dark energy and dark matter. Whereas dark energy is usually associated with the (positive) cosmological constant associated with a de Sitter geometry, we propose [1] to explain dark matter as a pure QCD effect, namely a gluonic Bose Einstein condensate. This effect is due to the trace anomaly viewed as a Anti de Sitter positive curvature (negative cosmological constant) accompanying baryonic matter at the hadronization transition from the quark gluon plasma phase to the colorless hadronic phase. Our approach not only allows us to assume a ratio Dark/Visible equal to 11/2 but also provides gluons (and di-gluons, viewed as quasi-particles) with an extra mass of vibrational nature. Such an interpretation would comfort the idea that, apart from the violation of the matter/antimatter symmetry satisfying the Sakharovs conditions, the reconciliation of particle physics and cosmology needs not the recourse to any ad hoc fields, particles or hidden variables.

1. Gilles Cohen-Tannoudji and Jean-Pierre Gazeau https://www.mdpi.com/2218-1997/7/11/402 (ArXiv https://arxiv.org/abs/2111.01130v2) and references therein