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Modified gravity theories and dark matter models tested by galactic rotation curves

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The rotation curves of galaxies provide a tool for studying the distribution and fundamental properties of gravitating matter. Rotation curve data shows that either gravity should be modified on the galactic scale or baryonic matter should be supplemented by a dark matter halo. As a first possibility we investigated higher-dimensional modifications of general relativity. In the brane-world scenario the four dimensional effective Einstein equation has an additional source term originating in the higher dimensional curvature, behaving as a fluid. We have shown that a linear equation of state of this Weyl fluid is compatible with the rotation curves. As a second attempt, we assumed a cold dark matter distribution in the form of a Bose-Einstein condensate, and tested this assumption on a selected sample of different type of galaxies. This second model is suitable to explain the rotation curves of the high surface brightness and dwarf galaxies, and a subset of the low surface brightness galaxies.