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Experiments: Galactic Dark Matter from General Relativity

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General relativistic models of disc galaxies can provide non negligible corrections with respect the Newtonian description, for the rotation speeds and their relationship to the required gravitational mass. This result can be counterintuitive, for an object with sub-relativistic speeds such as a galaxy; but General Relativity (GR) does not only provide higher order, post-Newtonian corrections to gravitational dynamics. Indeed, GR is a richer theory, which also includes totally non-Newtonian phenomena.
In particular, in the stationary and axisymmetric case, solitonic solutions are admitted for the dragging speed, i.e. the off diagonal term of the metric. The dragging may therefore be a quantity of order v/c, unlike the dragging effect generated by the well-known gravitomagnetism, which is much weaker. Such a "strong dragging" would sustain a flat rotation curve in the halo of a galaxy, in front of a smaller galaxy mass.
We propose different techniques to empirically observe the possible presence of the strong dragging, in our Galaxy or in some distant ones. The strong dragging is mathematically allowed and, if present in real galaxies, may provide a partial explanation for some fraction of the galactic dark matter (DM). Such a discover would lead to re-evaluation of the quantity and characteristics of the DM, improving the future experiments to find it.

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