Thesis Proposal for the Master's Degree in Physics

Title: Dark Matter Dynamics in the Vicinity of Black Holes

Abstract: Dark matter constitutes a hypothetical component which, unlike known matter, does not emit electromagnetic radiation and is currently detectable exclusively indirectly through its gravitational effects. The present thesis is designed to offer an introduction to the modified theory of gravity, which incorporates the existence of dark matter. The research will be dedicated to both theoretical and modeling aspects of Einstein's equations, supplemented by a scalar field model that emulates dark matter. Following the theoretical overview, we will advance to modeling the behavior of dark matter in proximity to supermassive black holes, utilizing sophisticated numerical codes such as the *Einstein Toolkit*. The research will pave the way for a deeper understanding of unresolved challenges in the field of cosmology.

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Laboratory where the thesis is carried out: Numerical Lab of the Astrophysics Group

Any participating external structures: None

Type of thesis: Theoretical research