Project acronym:	**DYBHO**
Project:	The dynamics of black holes: testing the limits of Einstein's theory
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Host Institution (HI):	INSTITUTO SUPERIOR TECNICO
Call Details:	Starting Grant (StG), PE2, ERC-2010-StG_20091028

Summary

From astrophysics to high-energy physics and quantum gravity, black holes (BHs) have acquired an ever increasing role in fundamental physics, and are now part of the terminology of many important branches of theoretical and observational physics. It has been established that supermassive BHs lurk at the center of many galaxies and provide fertile ground for stellar growth and evolution. Millions of stellar-mass BHs populate the galaxies, and power violent processes such as gamma-ray bursts, etc. In high-energy physics, the gauge/gravity duality has created a powerful framework for the study of strongly coupled gauge theories and found applications in connection with the experimental program on heavy ion collisions at RHIC and LHC, among many others. As emphasized by Maldacena and Witten, BHs play a special role in the correspondence: confinement in QCD may be related via the Hawking-Page phase transition to BHs in anti-de Sitter (AdS). Given the central role that BHs have been claiming in physics, a major task for theoreticians is to understand processes in which they are involved. With the advent of techniques to evolve BH spacetimes numerically, the field is undergoing a phase transition from a promising branch of general relativity to one of the most exciting fields in 21st century research that will open up unprecedented opportunities to expand and test our understanding of fundamental physics and the universe. This project aims at evolving numerically BHs in generic backgrounds, in a fully non-linear framework. We intend to generalize all the machinery developed in the last 30 years for asymptotically flat, (3+1) dimensional spacetimes to other geometries and field equations. This allows a number of fundamental questions to be tackled, from tests of the cosmic censorship to an understanding of the stability and phase diagrams of these objects and how different field equations can impact on gravitational-wave emission

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