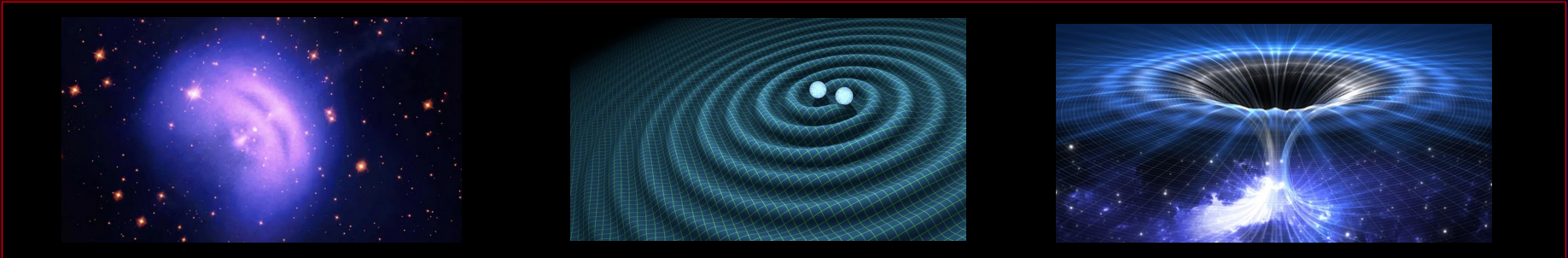




Compact objects

José Luis Blázquez-Salcedo



IPARCOS SAB WORKSHOP

**6 March 2024
Madrid, Spain**

Members of the group

José Luis Blázquez Salcedo

Luis Manuel González Romero

Francisco Navarro Lérica

@ Theoretical Physics Departments, UCM

External collaborators:

Oldenburg University: Jutta Kunz, Burkhard Kleihaus, Fech Scen Khoo

Aveiro University: Eugen Radu, Carlos Herdeiro

Tübingen University: Daniela Doneva

Sofia University: Stoytcho Yazadjev

Dublin DIAS: Tigran Tchrakian

Jiangsu UST: Xiao Yan Chew

Funding

- ✓ PID2021-125617NB-I00. MCINN, Spain.
10/2022 – 10/2026
 - *Quasimode: from Gravitational Waves to Black Holes and Neutron Stars*
 - PIs: José Luis Blázquez-Salcedo and Francisco Navarro-Lérida
 - 35.695 €

- ✓ CNS2023-144089. Consolidación Investigadora 2023. MCINN, Spain.
2024 – 2026
Quasinormal modes of rotating black holes, neutron stars and other compact objects: probing General Relativity with gravitational waves
PI: José Luis Blázquez-Salcedo
49.460 €

As a member

- ✓ PTDC/FIS-AST/3041/2020. IST-ID, Portugal. Led by Aveiro University group.
03/2021-02/2024
Testing the Kerr hypothesis with gravitational waves and lensing.
PI: Carlos Herdeiro.
248.057 €

Recently expired:

- ◆ PR44/21, Ref: 21-29910. Banco Santander-UCM, Madrid, Spain.
09/2022 – 09/2023
Quasinormal Modes
PI: José Luis Blázquez-Salcedo
12.000 €

Research Activity

Black holes:



Construction of solutions in alternative theories or matter content beyond the standard model.

Hairy black holes: scalar hair ...

Ringdown phase and gravitational wave emission.

Stability analysis.

New development of analytical and numerical techniques: Quasinormal modes of rotating configurations via perturbative methods, spectral methods...

Wormholes:



Discovery of new models with Dirac fields

Stability analysis: evidence for the stabilization of the throat because of rotation

First calculation of the ringdown spectrum for fully rotating solutions

Comparison with black holes: (non-)isospectrality, ...

Neutron stars:



Neutron stars beyond GR:
– $f(R)$, STT, ...

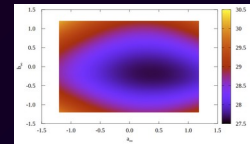
Universal relations in alternative theories of gravity.

Gravitational waves: long-lived quasinormal modes, scalar radiation ...

Inverse problem: reconstruction of the equation of state from potential ringdown measurements.

Stability and maximum mass.

Other exotic objects:



Higher dimensional black holes:

– Chern-Simons theory, supergravity, ...

Solitonic solutions: vortices, Skyrmions, ...

Stability

Publications, dissemination and outreach

13 publications in the past 2 years:

2 Physics Letters B,
6 Physical Review D,
Journal of Physics A,
Universe,
Frontiers (invited contribution),
+ 2 preprints under consideration

Research stays:

FNL – 6 / 2022 – Ireland

JLBS – 11 / 2022 – Oldenburg

Talk at *Annual Meeting of the Astronomische Gesellschaft 2022, Bremen*

JLBS – 12 / 2022 – Aveiro:

Invited seminar at *1 day strong gravity mini-workshop*

JLBS – 11 / 2023 – Oldenburg

Talk at *From Nuclear Physics to Black holes and back; in Honour of Jutta Kunz*

Outreach activities:

JLBS: Interview at [Órbita Laika](#), RTVE, 12/12/2023

JLBS: Interview at [Epsilon n°33](#), “Trou de ver, la nouvelle star de la physique”, 12/2/2024



Thank you very much for your attention!

