



Gravitational waves: theory, astrophysics and cosmology

Antonio L. Maroto

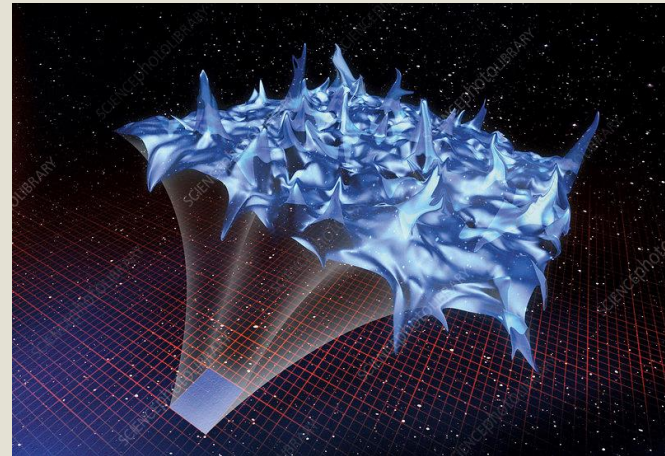
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Luis J. Garay
Mercedes Martín Benito

Gravitational waves as a window to explore the quantum nature of gravity

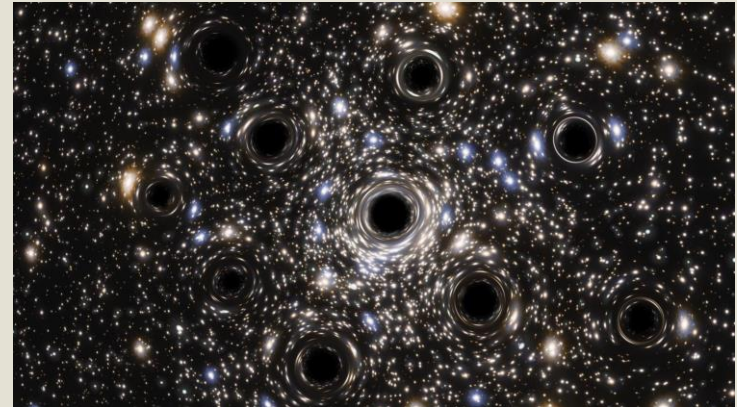
- Study of phenomena affected by quantum gravity effects that potentially could leave an imprint in gravitational wave signals:
- Black hole mimickers [Gravitational wave echoes from macroscopic quantum gravity effects, C Barceló, R Carballo-Rubio, LJ Garay **JHEP 2017, 54 (2017)**].
- Primordial Universe [States of Low Energy in bouncing inflationary scenarios in Loop Quantum Cosmology, M Martín-Benito, RB Neve, J Olmedo, **Phys. Rev. D 103, 123524 (2021)**].



José Luis Blázquez Salcedo
Diego Rubiera

Testing gravity with gravitational waves

- Quasinormal modes in black holes and neutron stars: effects on ringdown in modified theories [Perturbed black holes in Einstein – dilaton – Gauss -Bonnet gravity: Stability, ringdown, and gravitational wave emission”, Blázquez Salcedo et al. **Phys. Rev. D** 94 (2016) 10, 104024]
- Searching for exotic objects with GW: boson stars, gravastars, wormholes... [Nonsingular black holes, wormholes, and de Sitter cores from anisotropic fluids, D. Rubiera et al. **Phys. Rev. D** 96, 104028 (2017)]



José Alberto Ruiz Cembranos
Prado Martín Moruno
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Testing the dark sector with gravitational waves

- Dark energy and modified gravity theories: massive gravity, Hordenski, F(R), non-local...
- Ultralight dark matter and GW propagation

[*Prospects for Fundamental Physics with LISA*, Baruse et al, **Gen.Rel.Grav.** **52 (2020) 8, 81**]

[*Modified gravity as a diagravitational medium*, J.A.R. Cembranos, M. Coma Diaz, P. Martin-Moruno, **Phys.Lett.B** **788 (2019) 336-340**]

[*Imprint of ultralight vector fields on gravitational wave propagation*, A. Delgado, A.L. Maroto, **Phys. Rev.D** **103 (2021) 12, 123546**]



Felipe J. Llanes-Estrada
Antonio Dobado

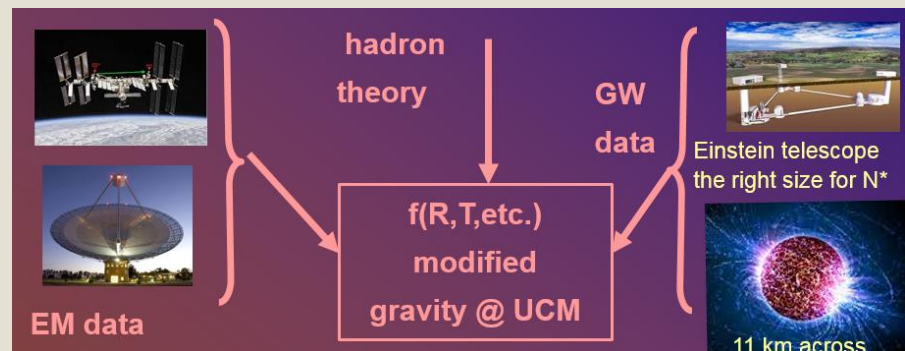
Hadron physics and GW sources

- Hadronic equation of state without input from astrophysics nor general relativity, (particle physics alone)
nEoS @ Complutense

- Einstein's equations well tested in vacuum (solar system, pulsars, grav. Waves...)

$$G^{\mu\nu} = 8\pi T^{\mu\nu}$$

- Matter part of equation less well tested
<http://teorica.fis.ucm.es/nEoS>



Africa Castillo
Armando Gil de Paz
Jesús Gallego
(co PI of MOSAIC-ELT)
José Luis Contreras (CTA)

Multimessenger astrophysics

- IPARCOS-UCM currently involved in two electromagnetic telescopes that will operate with ET (alert follow-up)

