

## Third Gravi-Gamma Workshop: The multimessenger view of the black hole life cycle



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Type: **Invited talk**

### Probing modified gravity theories and cosmology using gravitational-waves and associated electromagnetic counterparts

*Wednesday, 5 October 2022 10:30 (30 minutes)*

The standard cosmological model is one of the main predictions of General Relativity (GR). Although very successful, the standard cosmological model still suffers some theoretical and observational issues such as the nature of Dark Energy and the  $H_0$ -tension. Modifications of GR at cosmological scales are a possible avenue to solve these problems. In this talk, I will discuss how gravitational-wave bright standard sirens can be used to probe GR on cosmological scales. In particular, I will focus on theories that introduce an additional friction term and dispersion relation to GW propagation. I will show that combining 100 binary neutron stars detections associated with a short Gamma-ray burst and host galaxy identification, will suffice to measure the Hubble constant, the GW friction GW dispersion relation (graviton mass) with 2%, 15%, and 2% accuracy, respectively. Finally, I will apply the same study to GW170817, and demonstrate that for all of the GW dispersions relations we consider, including massive gravity, the GW must be emitted  $\sim 1.74$  s before the gamma-ray burst. Furthermore, at the GW merger peak frequency, we show that the fractional difference between the GW group velocity and  $c$  is  $\sim 10^{-17}$ .

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