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Searching for evidences of Exotic Compact Objects from the spin distribution of compact binary coalescences

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Black holes (BHs) are among the most fascinating objects in the Universe. However, their description presents several theoretical difficulties such as the presence of a horizon at radius r_+. A class of horizonless objects, known as exotic compact objects (ECOs), have been formulated, in order to remove these difficulties. ECO's models generally predict the presence of a physical surface at a radius $r = r_+(1 + \epsilon)$, where ϵ quantifies the scale at which General Relativity should be corrected. A quantum scale would correspond to $\epsilon < 10^{-30}$.
Differently from BHs, ECOs are subject to *ergoregion instability*, i.e. a process that prevents the formation of ECOs spinning above a certain critical limit $\chi_{\rm crit}$ that depends on the compactness of the object and its reflectivity. As a result, the spin distribution of a population of ECOs will display local overdensities in correspondence of $\chi_{\rm crit}$.
Gravitational waves (GWs) from Compact Binary Coalescences (CBCs) offer a powerful tool probe for the existence of ECOs. By studying the spin distribution of CBCs, it is possible to probe the existence of ECOs.
In this talk, we propose to study the spin distribution of 90 CBCs with a population model that includes the possible presence of ECOs. When assuming that the population of CBCs is entirely composed by ECOs, we are able to set a lower limit on $\epsilon \geq 10^{-5}$ thus excluding the possibility of a population of ultra-compact objects ($\epsilon < 10^{-30}$). Instead, if we assume a population of mixed BHs and ECOs, we obtain that no more than 60 % of the CBCs observed can be composed of ultra-compact objects.

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