



ID de Contribution: 37

Type: **Non spécifié**

Multi-messenger avenues towards primordial black hole detection

jeudi 6 octobre 2022 11:30 (25 minutes)

Black holes formed in the early Universe (PBHs) could constitute (a component of) the dark matter. In this talk I will consider primordial black holes (PBHs) of $O(1)$ - $O(100)$ solar masses. First, I will discuss the possibility of detecting PBHs in the Milky Way through the process of gas accretion, presenting a comprehensive study of the uncertainties associated to this observation channel. Moving on to cosmological distances, merging black holes in the same mass range can be detected through gravitational waves. I will discuss the potential of the Einstein Telescope, a planned third-generation GW observatory, to identify and measure the abundance of a subdominant population of PBHs, based exclusively on redshift evolution of the observed merger rate. The analysis I will present is based on the generation of realistic mock catalogues of binary black hole merger events, consisting of the inferred luminosity distances and corresponding errors.

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