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Can massive primordial black holes be the dark matter?

The recent detection by Advanced-LIGO/VIRGO of gravitational waves (GW) from the merging of binary black hole systems sets new limits on the merging rates of massive primordial black holes (PBH) that could be identified to the dark matter in the Universe. If PBH are regrouped in clusters with a similar density to the one observed in ultra-faint dwarf galaxies, merging rates are comparable to aLIGO expectations. Massive PBH dark matter predicts the existence of thousands of those dwarf galaxies where star formation is unlikely, which would possibly provide a solution to the missing satellite and too-big-to-fail problems. Such PBH could be produced in the early Universe, e.g. due to the collapse of large density fluctuations generated during a phase of hybrid inflation, a model easily embedded in high-energy frameworks such as supersymmetry and GUT. aLIGO and future GW antennas could be able measure the abundance and mass distribution of PBH in the range 5 - 200 solar masses to 10% accuracy, which could help to reveal their nature, with profound implications for cosmology and high energy physics. Moreover, the future LISA space interferometer will be able to detect the stochastic background of gravitational waves induced by PBHs, that could be distinguished from the GW background from stellar BH binaries due to a specific frequency dependance.

Author: M. CLESSE, Sébastien (RWTH Aachen University)

Orateur: M. CLESSE, Sébastien (RWTH Aachen University)