SEMPARIS – Séminaires en région parisienne

http ://string.lpthe.jussieu.fr/semparis/

Seminar of the theory group of APC

Mardi 26 Octobre 2021, 14 :00
APC, seminar room 483A, contact roperpol@apc.in2p3.fr for Zoom meeting details
Domaines : gr-qc

Titre : *Two recent topics in gravitational-wave cosmology : Binary resonance searches and nonlinear memory from cosmic strings*

Orateur : **Alexander Jenkins (King's College London)**

Résumé : *In the first half of this talk, I will discuss how binary systems can be used as dynamical detectors of gravitational waves (GWs). Since the passage of GWs through a binary perturbs the trajectories of the two bodies, we can infer the presence of a GW signal by searching for changes in the binary's orbital parameters. In the presence of a stochastic GW background (SGWB) these changes accumulate over time, causing the binary orbit to execute a random walk through parameter space. I will present a powerful new formalism for calculating the full statistical evolution of a generic binary system in the presence of a SGWB, capturing all six of the binary's orbital parameters, and will show how this formalism can be applied to timing of binary pulsars and lunar laser ranging to set powerful upper limits on the SGWB spectrum in the microHz band between LISA and PTAs. In the second half of this talk, I will discuss the nonlinear GW memory effect—a fascinating prediction of general relativity, in which oscillatory GW signals are generically accompanied by a monotonically-increasing strain which persists in the detector long after the signal has passed. I will present the first-ever calculations of the nonlinear memory signal associated with GW bursts from cusps and kinks on cosmic string loops, which are an important target for current and future GW observatories. Surprisingly, the cusp GW signal diverges for sufficiently large loops when all memory contributions are included, which I argue is due to a breakdown in the weak-field treatment of GW emission from the cusp. This implies that previously-neglected strong gravity effects play an important role near cusps, although the exact mechanism by which they cure the divergence is not currently understood. I will argue that one*

possible resolution is for these cusps to collapse to form primordial black holes.