GdR Gravitational Waves, Cosmology

Rapport sur les contributions

Ilia Musco (Geneva University): Pr...

ID de Contribution: 1

Type: Non spécifié

Ilia Musco (Geneva University): Primordial Black Holes: formation and cosmological impact

jeudi 28 janvier 2021 09:50 (30 minutes)

Type: Non spécifié

Michele Mancarella (Geneva University): Constraining modified GW propagation with LIGO/Virgo dark sirens

jeudi 28 janvier 2021 10:20 (30 minutes)

Modified GW propagation is a generic prediction of modified gravity models at cosmological scales and allows new tests of GR, based on the fact that GW signals are standard sirens.

The recent detections and data releases from LIGO/Virgo allow the first concrete applications of such tests.

I will present the hierarchical bayesian framework for constraining modified GW propagation (as well as the Hubble parameter) with dark sirens and galaxy catalogues, focussing in particular on relevant improvements to the treatment of the latter, such as their completeness, and on the treatment of selection bias. I will then show results that make use of the recent O3a data release, presenting the most accurate measurement of H0 from dark sirens alone, bounds on modified GW propagation, and commenting on the role of EM counterparts. I will also present the python code used to produce these results, that will be shortly publicly available, making it the first open source tool to date to constrain H0 and modified GW propagation.

Type: Non spécifié

Siyuan Chen (Orléans University): 25 years of European Pulsar Timing Array

jeudi 28 janvier 2021 11:10 (30 minutes)

Pulsar Timing Array (PTA) experiments aim to detect nHz gravitational waves from supermassive black hole binaries. This is done by looking for correlated variations of the times of Arrival across an array of ultra-stable millisecond pulsars. Regular observations have been taken and collected over the last 2 and more decades. Three established PTA collaborations: the North American Nanohertz Gravitational Wave Observatory (NANOGrav), the Australian Parkes PTA (PPTA) and the European PTA (EPTA), as well as emerging PTA collaborations from India, China and South Africa all work together in the International PTA consortium towards the common goal of detecting low frequency gravitational waves.

The EPTA can build on the history of European pulsar observations and has therefore a long timespan of PTA observations of up to 25 years. There are 5 major European telescopes: Effelsberg in Germany, Lovell in the UK, Westerbork in the Netherlands, Sardinia in Italy and the Nancay Radio Telescope (NRT) in France. The NRT is a vital part of the EPTA providing a large fraction of the European data. In this talk, I will present some of the most recent results of the searches from PTA collaborations with a focus on the results from the 25 years of EPTA data and the astrophysical interpretation.

Ryusuke Jinno (DESY): Gravitatio...

ID de Contribution: 4

Type: Non spécifié

Ryusuke Jinno (DESY): Gravitational waves from first-order phase transitions

jeudi 28 janvier 2021 11:40 (30 minutes)

Type: Non spécifié

Alberto Roper Pol (APC Paris): Gravitational radiation from MHD turbulence in the early universe

jeudi 28 janvier 2021 12:10 (20 minutes)

The generation of primordial magnetic fields and its interaction with the primordial plasma during cosmological phase transitions is turbulent in nature. I will describe and discuss results of direct numerical simulations of magnetohydrodynamic (MHD) turbulence in the early universe and the resulting stochastic gravitational wave background (SGWB). In addition to the SGWB, the primordial magnetic field will evolve up to our present time and its relics can explain indirect observations of weak magnetic fields coherent on very large scales. I will apply the numerical results to magnetic fields produced at the electroweak and the QCD phase transitions and show that these signals may be detectable by the planned Laser Interferometer Space Antenna and by Pulsar Timing Array. The detection of these signals would lead to the understanding of cosmological phase transition physics, which can have consequences on the baryon asymmetry problem and on the origin seed of observed magnetic fields coherent over very large scales at the present time.

Type: Non spécifié

Angelo Ricciardone (INFN Padua): Probing anisotropies of the stochastic gravitational waves backgrounds with LISA

jeudi 28 janvier 2021 14:20 (30 minutes)

Gravitational Waves (GWs) represent a unique tool to explore astrophysics, cosmology and fundamental physics of our universe. After the GW detections by the LIGO/Virgo collaboration the next target of future ground and space-based interferometers is the detection of the stochastic background of GW (SGWB), both astrophysical and hopefully cosmological. Beside their isotropic contribution, such SGWBs are characterized by anisotropies, in the same fashion of the Cosmic Microwave Background.

In this talk I will present the formalism and prospect for detection of the anisotropies of the SGWB, which represent a powerful tool to characterise and disentangle it. I will mainly discuss the cosmological background case and I will present some recent studies to probe the anisotropies using the future space-based interferometer LISA.

Otto Hannuksela (Nikhef Amsterd ...

ID de Contribution: 7

Type: Non spécifié

Otto Hannuksela (Nikhef Amsterdam): Gravitational-wave lensing with ground-based gravitational-wave detectors

jeudi 28 janvier 2021 14:50 (30 minutes)

Gravitational waves, like light, could be gravitationally lensed. Recent studies suggest that we might see gravitational wave lensing already within the coming years as the current ground based gravitational-wave detectors reach their design sensitivities. However, the methods to detect and utilize gravitational-wave lensing are entirely different from that of light. I will discuss some of the latest gravitational-wave lensing advances and present our search results for gravitational-wave lensing.

Type: Non spécifié

Felix Mirabel (CEA): Is there a cosmic gravitational background from cosmic dawn?

Type: Non spécifié

Sebastien Renaux-Petel (IAP): Probing primordial features with the Stochastic Gravitational Wave Background

jeudi 28 janvier 2021 15:40 (20 minutes)

Features of the primordial density fluctuations power spectrum are theoretically extremely motivated and detecting them would provide a unique insight into the physics of the early universe. In this talk, I will show how the stochastic gravitational wave background (SGWB) offers a new way to probe primordial features, on scales complementary to the ones probed by the CMB and LSS. These features give rise to specific oscillatory patterns in the frequency profile of the SGWB, which can be detected in future GW observatories like LISA. The talk will be based on arXiv:2012.02761