

# **3rd BIG&C Meeting**

## **Report of Contributions**

Contribution ID : 1

Type : **not specified**

## The seeds of the first supermassive black holes

*Friday, 17 May 2024 10:15 (55)*

Quasars powered by supermassive black holes of  $10^{10}$  solar masses already existed at  $z \sim 6-7$ , when the Universe was less than 1 Gyr old. Recently, the James Webb Space Telescope has started to detect supermassive black holes of  $10^7$  at even  $z \sim 10$ . To reach this mass in such a short time, supermassive black holes should have started as seed black holes of  $10^2-10^5$  solar masses at  $z > 15$ . Such seed black holes could result from the death of the first generation of Population III stars or form either via runaway mergers in dense stellar clusters or via direct collapse of pristine gas, among other possibilities. While those seed black holes that did not grow could be found as leftover intermediate-mass black holes in globular clusters and dwarf galaxies in the local Universe, the detection of the early seeds will have to await the next generation of observatories such as the Einstein Telescope.

**Presenter(s) :** Dr MEZCUA, Mar (Institute of Space Sciences )

Contribution ID : 2

Type : **not specified**

## **Inflationary gravitational wave background with LISA**

*Friday, 17 May 2024 11:40 (35)*

I will discuss the current LISA Cosmology Working Group effort to initiate the first template-based analysis for Stochastic Gravitational Wave Background (SGWB) signals.

After introducing a databank to describe well-motivated signals from inflation, prototype their template-based searches, and forecast the constraints on the model parameters, I will examine how the signal reconstructions shed light on fundamental physics models.

I will also briefly comment on two related analysis with LISA on early universe phase-transitions and cosmic strings scenarios.

**Presenter(s)** : Dr FUMAGALLI, Jacopo (Institute of Cosmos Sciences of the University of Barcelona (ICCUB))

Contribution ID : 3

Type : **not specified**

## Looking for ultra-light scalars with gravitational-wave observations

*Friday, 17 May 2024 12:15 (35)*

Ultra-light dark matter is an exciting alternative to the standard cold dark matter paradigm: it reproduces its large-scale (cosmological) predictions while solving most of its potential tension with small-scale (galactic) observations, like the “cusp-core” and “missing satellites” problems. If dark matter is made of some new ultra-light boson, dense structures are expected to form at the centre of galaxies (solitonic cores), or around compact objects (e.g., superradiant clouds, or DM spikes). These non-trivial environments may affect the sourcing and propagation of gravitational waves in compact binary coalescences, allowing near-future gravitational-wave observations to probe the nature of dark matter. In this talk, I will discuss some recent efforts on the modelling of black hole coalescences in ultralight dark matter environments: from numerical relativity simulations of mergers of equal-mass binaries to general-relativistic perturbative approaches to the evolution of extreme mass-ratio inspirals.

**Presenter(s)** : Dr VICENTE, Rodrigo (Institute of High Energy Physics (IFAE))

Contribution ID : 4

Type : **not specified**

## Search for continuous gravitational waves

*Friday, 17 May 2024 14:30 (55)*

Observing sources of, almost monochromatic, continuous gravitational waves (CWs) represents one of the next major goals in gravitational-wave astronomy. The primary source would be rapidly-rotating neutron stars (NSs) in our Galaxy, either isolated or in binary systems, which are characterized by a time-varying quadrupole deformation due to an asymmetry in their mass distribution. Due to the expected small degree of asymmetry of a NS, the search for this kind of signal is extremely challenging, and can be very computationally expensive when the source parameters are not known or not well constrained. CW detection from a spinning NS will allow us to characterize its structure and properties, making this source an unparalleled laboratory for studying several key issues in fundamental physics and relativistic astrophysics, in conditions that cannot be reproduced on Earth.

In this talk we will give the motivation for, and describe, some searches for continuous gravitational waves using LIGO and Virgo data from the third observing run.

**Presenter(s) :** Prof. SINTES, Alicia (University of the Balearic Islands (UIB))

Contribution ID : 5

Type : **not specified**

## **Waveform modelling for current and future gravitational wave detectors**

*Friday, 17 May 2024 15:25 (35)*

The talk reviews the goals and current status of the challenge to develop accurate models of gravitational wave signals, which can be used for matched-filter based data analysis in current and future gravitational wave detectors. I will highlight the main approaches to this problem, and discuss in some more detail the phenomenological waveforms program, which has produced waveforms that have been used by the LVK collaboration to analyse all gravitational wave events detected to date.

**Presenter(s) :** Dr HUSA, Sascha (Institute of Space Sciences (ICE) and University of the Balearic Islands (UIB))

Contribution ID : 6

Type : **not specified**

## **Debate about the BIG&C Meetings**

*Friday, 17 May 2024 16:30 (60)*

We would like to have an open discussion about the future of the BIG&C meetings and the role they can have in articulating the Barcelona community working on these subjects.