

**Lunar Gravitational-wave
Antenna - white paper
kick-off**

Report of Contributions

Contribution ID: 1

Type: **not specified**

Goals of the white paper

Thursday, 9 February 2023 14:00 (30 minutes)

Presenter: HARMS, Jan (Gran Sasso Science Institute)

Contribution ID: 2

Type: **not specified**

LGWA payload and sensitivity model

Thursday, 9 February 2023 14:30 (30 minutes)

Presenter: ZEOLI, Morgane (UCLouvain)

Contribution ID: 3

Type: **not specified**

Planning of the white paper

Friday, 10 February 2023 11:45 (1 hour)

Presenter: HARMS, Jan (Gran Sasso Science Institute)

Contribution ID: 4

Type: **not specified**

Lunar geology

Thursday, 9 February 2023 15:30 (30 minutes)

Presenter: FRIGERI, Alessandro (Istituto Nazionale di Astrofisica (INAF) - Istituto di Astrofisica e Planetologia Spaziali (IAPS), Roma)

Session Classification: Lunar science

Contribution ID: 5

Type: **not specified**

Introduction to lunar seismology

Thursday, 9 February 2023 16:00 (15 minutes)

Presenter: OLIVIERI, Marco (INGV)

Session Classification: Lunar science

Contribution ID: 6

Type: **not specified**

Lunar GW response

Thursday, 9 February 2023 16:15 (15 minutes)

Presenter: HARMS, Jan (Gran Sasso Science Institute)

Session Classification: Lunar science

Contribution ID: 7

Type: **not specified**

Synthetic models of the lunar seismic field

Thursday, 9 February 2023 16:45 (15 minutes)

Presenter: CASAROTTI, Emanuele (INGV)

Session Classification: Lunar science

Contribution ID: 8

Type: **not specified**

Lunar magnetism

Thursday, 9 February 2023 17:00 (15 minutes)

Presenter: CHIAPPINI, Massimo (INGV)

Session Classification: Lunar science

Contribution ID: 9

Type: **not specified**

Discussion

Thursday, 9 February 2023 17:15 (30 minutes)

Session Classification: Lunar science

Contribution ID: **10**

Type: **not specified**

Seismic background reduction

Thursday, 9 February 2023 15:00 (15 minutes)

Presenter: BADARACCO, Francesca (INFN Genova)

Contribution ID: **11**

Type: **not specified**

Discussion

Thursday, 9 February 2023 15:15 (15 minutes)

Presenter: VAN HEIJNINGEN, Joris (UCLouvain)

Contribution ID: 12

Type: **not specified**

Tidal disruption events

Thursday, 9 February 2023 17:45 (30 minutes)

Presenter: BORTOLAS, Elisa (Università di Milano Bicocca)

Session Classification: GW science and multi-messenger astronomy

Contribution ID: 13

Type: **not specified**

Can deci-Hz detectors shed light on the true nature of intermediate-mass black holes?

Thursday, 9 February 2023 18:15 (30 minutes)

Intermediate-mass black holes (IMBHs) constitute an elusive class of compact objects populating the 10^2 - 10^4 solar mass range. Aside from the revolutionising discovery of an IMBH weighing 150 solar mass via emission of gravitational waves (GWs) by two stellar-size BHs conducted by the LIGO-Virgo Kagra collaboration, and the observations of a few IMBH candidates with masses $> 50,000$ solar mass, the IMBH mass range is vastly unconstrained. The very existence of IMBHs is still questionable. Over the next decades, the Einstein Telescope (ET) and LISA could provide us with observations of relatively closeby (redshift < 1) IMBHs in the 10^3 - 10^4 solar mass range. A detector capable of scanning the unexplored deci-Hz frequency band, thus sitting between ET and LISA, will increase our chance to understand what IMBHs are, enabling us to exquisitely observe IMBHs orbited by a close stellar-size compact companion, a class of GW sources called intermediate-mass ratio inspirals (IMRIs). In this review, I will discuss how future Decihertz Observatories could help us make the next leap in our understanding of the nature of BHs, solving the mystery behind the true nature of IMBHs.

Presenter: ARCA SEDDA, Manuel (University of Padova)

Session Classification: GW science and multi-messenger astronomy

Contribution ID: 14

Type: **not specified**

LGWA Sources in Our Galactic Backyard

Friday, 10 February 2023 10:00 (30 minutes)

Compact binary systems composed of white dwarfs (WDs), neutron stars (NSs) and black holes populating our local Universe are ideal targets for space-based GW missions. About a million years prior to the merger, they enter the mHz frequency band, where missions like LISA are expected to operate in the 2030s. Lunar-based projects like LGWA have the potential to further extend the science case of these compact binaries by catching white dwarf and white dwarf-neutron star mergers at higher frequencies. In my talk I will focus on binaries composed of WDs and NSs as gravitational wave sources. I will also discuss their connection to (optical) transient astronomy highlighting multi-messenger opportunities.

Presenter: KOROL, Valeriya (MPA Garching)

Session Classification: GW science and multi-messenger astronomy

Contribution ID: 15

Type: **not specified**

Decihertz Dark Matter: Gravitational Waves from Dark Matter Spikes and Primordial Black Holes

Friday, 10 February 2023 10:45 (30 minutes)

There is overwhelming evidence for the gravitational interactions of Dark Matter (DM), from cosmological observations to the structures of galaxies. Though the nature of DM is still unknown, the direct observation of gravitational waves (GWs) has opened up new avenues to search for and perhaps identify Dark Matter. For example, dense ‘spikes’ of wave-like or particle Dark Matter may form around intermediate and supermassive black holes. The observation of intermediate and extreme mass ratio inspirals (IMRIs/EMRIs) over long time periods may allow us to tease out the dynamical effects of these DM ‘spikes’ on lighter inspiraling compact objects. It is also possible that DM may itself be in the form of black holes. These primordial black holes (PBHs) would form from large density fluctuations in the early Universe, long before the formation of the first stars. These may also be probed either directly through their mergers, or through the stochastic background of GWs produced during their formation. I will discuss how GWs can help us to probe these very different types of DM, focusing on what we can learn from the decihertz band.

Presenter: KAVANAGH, Bradley (IFCA in Santander)

Session Classification: GW science and multi-messenger astronomy

Contribution ID: 16

Type: **not specified**

Discussion

Friday, 10 February 2023 11:15 (30 minutes)

Session Classification: GW science and multi-messenger astronomy

Contribution ID: 17

Type: **not specified**

Introduction to simulation tools

Friday, 10 February 2023 09:00 (1 hour)

In this session, the GW network simulation tool GWFish, and the seismic simulation tool SPECFEM3D will be presented.

Presenters: TISSINO, Jacopo (GSSI); KOLEY, Soumen (Gran Sasso Science Institute)

Contribution ID: **18**

Type: **not specified**

Dinner at L'Unico Posto

Thursday, 9 February 2023 20:00 (3 hours)