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The Moon Science Working Group of the Lunar Gravitational-Wave Antenna Project

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Lunar Gravitational-wave Antenna (LGWA) proposes to deploy an array of high-end seismometers on the surface of the Moon. The LGWA network will measure the lunar surface displacement excited by Gravitational waves (GWs) with a targeted observation band of 1mHz – few Hz. Seismic noise in that frequency band is very low due to the absence of atmosphere and oceans, representing the main inherent advantage that makes the Moon an ideal target for a GW detection experiment.

The scientific and technical challenges of LGWA are diverse. Since its initiation, LGWA has relied on experts from fundamental physics, astrophysics, geophysics, engineering, and planetary science.

The collaboration is currently organized in working groups (WGs) to cover five key themes: GW science, lunar science, payload, deployment, and operations.

At the beginning of 2022, we started the activities of WG2 to assess the current knowledge of the lunar environment. We aim to characterize and develop models of deployment scenarios suitable for LGWA sensors, via a multi-pronged approach of data analysis and on-field experiments probing terrestrial analogs of lunar terrains.

Besides characterizing the lunar seismic background noise, other goals of the group are related to modeling the lunar interior structure as well as Moon's normal modes. These will be further used to develop a model of the interaction between the Moon and GWs. The knowledge about the displacement level of this excitation and the background noise will be used to define novel techniques for background noise reduction.

For this purpose, WG2 is composed of physicists, engineers, geophysicists, and geologists. For our

activities, we chose an interdisciplinary approach that requires initial communication efforts to create a common ground that will evolve into a crucial baseline activity for the whole LGWA project.

Here we will report our progress in the first months of the activity of our collaboration.