

Synergies of future ground-based GW detectors with space assets for multi messenger Astrophysics

Dear Colleagues,

The discovery of GWs from cosmic sources by LIGO/Virgo has opened a new chapter in the textbook writing for Astronomy and Astrophysics. As recognized by the 2020 Astrophysics Decadal, Multi Messenger Astrophysics (MMA), combining signals from the traditional electromagnetic spectrum and non-photonic messengers, is ripe for groundbreaking science. The potential for this science, however, depends critically on the coordination of ground-based and space-based assets, and synergies between the two.

Recognizing this need, NASA organized in August 2022 a [Workshop](#) on the science of MMA. The event was spectacularly successful, and saw the enthusiastic participation of several hundreds of astronomers and physicists from all over the US and internationally. One of the outcomes of the August workshop was a white paper summarizing the main science thrusts and the necessary infrastructure. The paper is available at this [link](#). We invite you to send us your comments.

The ground and space-based astronomy and astrophysics communities are extremely eager to overcome boundaries and collaborate to the best possible extent. Looking to the future, we are optimistic as we can build on capabilities that overlap in time. The Fermi and Swift observatories, the two NASA workhorses for MMA, continue to work well and pave the way to newcomers, such as COSI, in development for a launch in 2026 (TBC). In Fall 2023, NASA will announce its down-select for a MIDEEX mission among two that have MMA as a core science goal, for launch in the late 2020s (STAR-X and UVEX). The Nancy Grace Roman Space Telescope is a flagship-class mission slated to launch in 2026 to provide wide-field time-domain surveys and much more in the optical and NIR. The Israeli-led UV mission ULTRASAT will launch in the late 2020s and will perform a wide-field survey of the sky at UV wavelengths. Finally, in the more distant future, the Habitable Worlds Observatory - a multipurpose world-class flagship - promises a rich trove of synergetic observations in the optical and UV, two key wavelengths for kilonovae and other GW mergers.

In conclusion, there is a tremendous potential in the upcoming decades for fruitful synergies between ground-based GW detectors and space-based NASA and international multiwavelength assets. We invite the community to engage promptly in a dialog aimed at maximizing opportunities for collaborations.

Regards,

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