The SelenITA Mission

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Goal: To understand the Moon's near surface plasma electrodynamics and space weather.

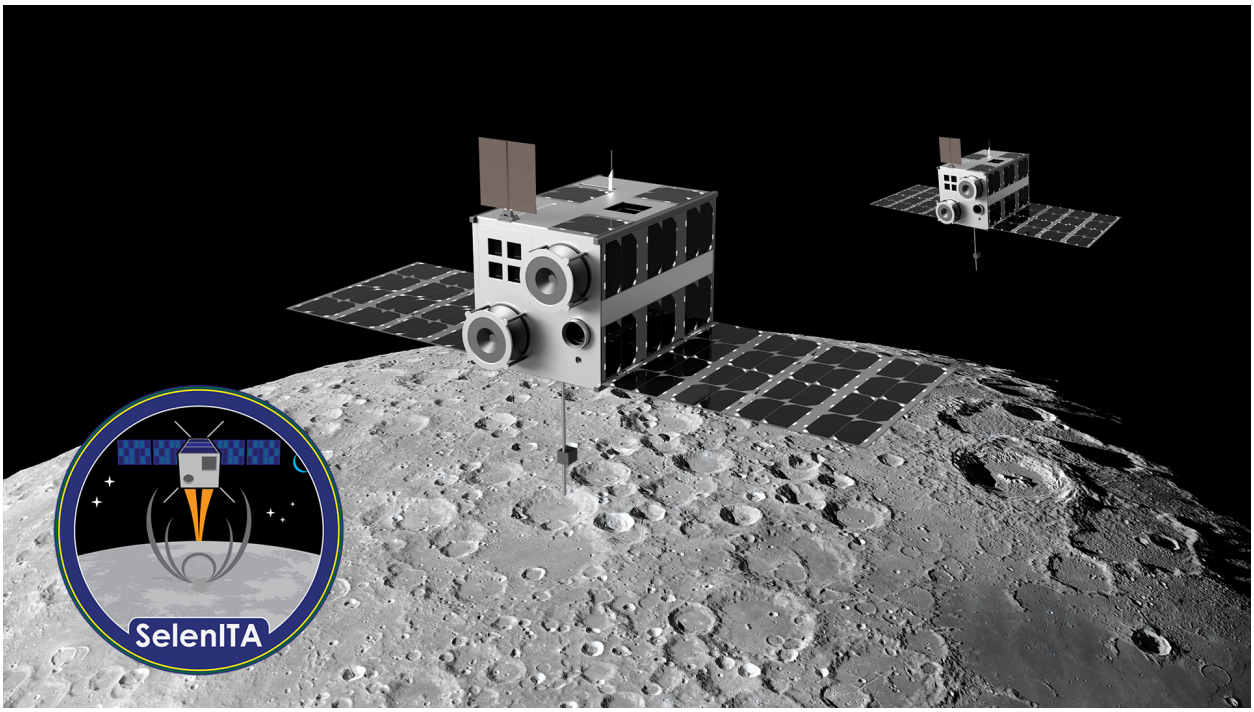

Figure 1. The SelenITA mission consists of two CubeSats flying in formation in low lunar orbit to investigate plasma interactions with the lunar surface including interactions with crustal magnetic fields and dust. We will also characterize space weather hazards for crew and sound the subsurface composition and structure. Image Credit: Tiago Matos (ITA).

Science Objectives:

- Further constrain the origins of crustal magnetic fields and their applications.
- Determine the nature of plasma interactions with crustal magnetic fields.
- Characterize plasma waves and turbulence at the Moon.
- Characterize the lunar surface potential in all plasma environments.
- Constrain the composition, thermal state, and structure of the lunar upper mantle and crust.
- Characterize the ionizing radiation in lunar orbit.
- Determine the density of the dust exosphere as a function of latitude, longitude, and altitude, including the lunar polar space environment.

Exploration objectives:

- Evaluate the space weather and dust hazards to crew living on the lunar surface.

Mission architecture: The SelenITA mission is consists of two CubeSats that will provide the first multi-point electromagnetic plasma measurements in a sustained low lunar orbit. This

mission will advance the understanding of spatiotemporal differentiation of the electromagnetic space environment at the Moon in support of Artemis crew and the geosciences. This mission concept is in development for future lunar CubeSat opportunities such PRISM or SIMPLEX.

SelenITA builds on a rich history of electromagnetic plasma observations of the near lunar surface space environment, and it answers important science questions with state-of-the-art instruments in a small package.

Expected measurements: 3-component vector magnetic field, plasma distribution (flux, energy, density, temperature), energetic particles (protons, electrons, gamma rays), and dust.

Environmental challenges: Unique lunar environmental conditions, including:

- Temperature variations
- Plasma / charging processes

Technology challenges:

- Miniaturized science instruments and spacecraft components optimized for CubeSats platform
- Formation flying of CubeSats at low lunar altitudes
- High delta V propulsion system capability in a small CubeSat optimized package
- Communication relay capability