**IMAGING MAGNETOSPHERIC TRANSIENT EMISSIONS WITH A LUNAR NEARSIDE RADIO ARRAY**

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**Introduction:** FARSIDE (Farside Array for Radio Science Investigations of the Dark ages and Exoplanets) is a concept low frequency radio interferometric array that would go to the radio quiet zone on the lunar farside. A recently completed NASA funded design study outlined the specifics of the instrument, the deployment rover, the lander and base station. Originally intended as a farside array covering 0.1 – 40 MHz, this work explores the possibility of a sister array on the near side covering 0.1 – 10 MHz that would conduct novel measurements of transient emission from Earth's magnetosphere. A static array that could constantly view most of Earth's magnetosphere could give us an unprecedented real time picture of space weather and energetic electron events that produce these transient emissions. Many of these transients are very bright, and a smaller array like FARSIDE may be able to do a good job mapping them. In this work we test the response of a nearside array to different types of low frequency magnetospheric emissions. Some like Auroral Kilometric Radiation (AKR) may be treated like near point sources, and others like Terrestrial Continuum Emission are more broadly beamed.

**Methodology:** The notional architecture consists of 128 dipole antennas deployed across a 10 km area by a rover, and tethered to a base station for central processing, power and data transmission. Using Digital Elevation Models from Lunar Reconnaissance Orbiter (LRO) Lunar Orbiter Laser Altimeter (LOLA) data, we select a set of locations near the Lunar sub-Earth point with minimum elevation variation and recreate the structure and sensitivity of the FARSIDE array to simulate its response to common low frequency magnetospheric emissions. We use SPICE to align the Moon ME frame to the celestial sky in order to track its relative position with the Sun and Earth. We then use a custom CASA code to image and process the data from the simulated nearside array.

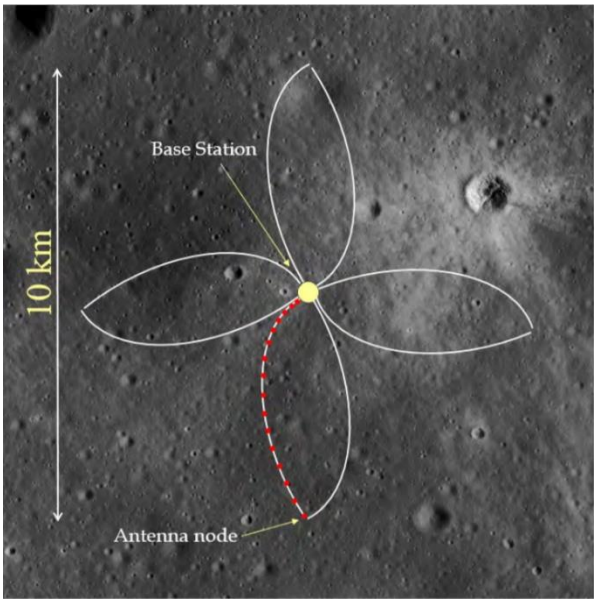


*Figure 1: Proposed layout of the FARSIDE array that will be copied to the near side for imaging various magnetospheric emissions. Taken from the FARSIDE Probe Study Report [1].*

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[1] Burns, Jack O, G Hallinan, L Teitelbaum, T-C Chang, J Kocz, J Bowman, R MacDowall, J Kasper, R Bradley, M Anderson, D Rapetti, Z Zhen, W. Wu, J Pober, S Furlanetto, J. Mirocha, A Austin, 2019 Probe Study Report: FARSIDE (Farside Array for Radio Science Investigations of the Dark ages and Exoplanets), NASA, https://arxiv.org/abs/1911.08649.