OBSERVING SOLAR RADIO BURSTS FROM THE LUNAR SURFACE

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Locating low frequency radio observatories on the lunar surface has a number of advantages. Here, we describe the Radio Observatory for Lunar Sortie Science (ROLSS), a concept for a low frequency, radio imaging interferometric array designed to study particle acceleration in the corona and inner heliosphere. ROLSS would be deployed during an early lunar sortie or by a robotic rover as part of an unmanned landing. The prime science mission is to image type II and type III solar radio bursts with the aim of determining the sites at and mechanisms by which the radiating particles are accelerated. Secondary science goals include constraining the density of the lunar ionosphere by searching for a low radio frequency cutoff of the solar radio emissions and constraining the low energy electron population in astrophysical sources. Furthermore, ROLSS serves a pathfinder function for larger lunar radio arrays.

Key design requirements on ROLSS include the operational frequency and angular resolution. The electron densities in the solar corona and inner heliosphere are such that the relevant emission occurs below 10 MHz, essentially unobservable from Earth's surface due to the terrestrial ionospheric cutoff. Resolving the potential sites of particle acceleration requires an instrument with an angular resolution of at least 2 deg, equivalent to a linear array size of approximately 500 meters. Operations would consist of data acquisition during the lunar day, with regular data downlinks. The major components of the ROLSS array are 3 antenna arms arranged in a Y shape, with a central electronics package (CEP). Each antenna arm is a linear strip of polyimide film (e.g., Kapton (TM)) on which 16 single polarization dipole antennas are located by depositing a conductor (e.g., silver). The arms also contain transmission lines for carrying the radio signals from the science antennas to the CEP.

We will describe testing already completed for ROLSS and planned future testing.