The Moon is a unique platform for both cosmological and solar observations at low radio frequencies due to the very tenuous lunar ionosphere and diminished RFI, particularly on the far side. Science antennas constructed of metal dipoles deposited on thin dielectric film substrates would have the advantages of convenient packaging and easy deployment. Dielectric sheets, e.g., 25-μm thick polyimide, 1 to 2 m wide and up to several hundred meters long, deposited with an array of dozens of adjacent dipole antennas could be wound on a spool for transport and unrolled robotically on the lunar surface.

The prototype thin-film dipole antenna was constructed of a 5 μm thick Cu layer deposited on a 25 μm thick Kapton film. Each dipole arm was 8 m long and 30.5 cm wide. The inner 1 m of each arm tapered to a point at which a 1:1 wideband balun was attached. Coaxial cable connected the balun to an RFSpace SDR-14 software-defined receiver. The feedpoint impedance was measured with an AML4170 vector impedance analyzer. Fig. 1 shows the antenna deployed near the LWA1 site in New Mexico.

During this project we tested the antenna on moist grass-covered soil, dry sandy soil, and asphalt. For the results presented here, the antenna was deployed on very dry desert soil in an attempt to more closely approximate lunar conditions. We found good agreement between numerical simulations and measurements of the electromagnetic properties (gain, response pattern, and feedpoint impedance) of a 16 m long thin-film dipole that would be useful for solar radio studies at frequencies around 10 MHz.

The receiver recorded a spectrum from 1 – 30 MHz every 5 seconds for a period of 2.5 days. The spectral resolution was 1.017 kHz. Fig. 4 shows the received power as a function of frequency and local time (MDT). The daytime decrease in power below 15 MHz is due to absorption of terrestrial signals by the D layer of the ionosphere (Fig. 5). At the time of these measurements the maximum of the Galactic background emission occurred just before sunrise, making it difficult to separate this signal from the effects of the rapid diurnal variation, but ionospheric effects mask the expected Galactic background signal.

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