Tracking Solar Type II Bursts to .5 AU with Radio Interferometers on the Lunar Surface. A. M. Hegedus[1], J. C. Kasper[1], and W. B. Manchester[1], [1]University of Michigan – Climate and Space Sciences and Engineering

Introduction: The Earth's Ionosphere limits radio measurements on its surface, blocking out any radiation below 10 MHz. Valuable insight into various astrophysical processes could be gained by having a radio interferometer in space to image this frequency window for the first time. One proposed incarnation of this is the pathfinder mission SunRISE, an interferometer to orbit around the Earth in the form of multiple smallsats working to observe Type II bursts tracking solar energetic particle (SEP) acceleration in Coronal Mass Ejections (CMEs). An interferometer on the lunar surface would be a stable alternative that avoids both the positional uncertainty and 10s-100s kHz noise that would affect orbiting arrays. Arrays could also be larger, having better resolution at lower frequencies, allowing us to image Type II bursts and track gradual SEP events out to .5 AU, far further out than a smaller orbiting array.

Using Digital Elevation Models partially from Lunar Reconnaissance Orbiter's Lunar Orbiter Laser Altimeter (LOLA) instrument, we test different sets of locations on the lunar surface to find near optimal configurations for planar arrays for tracking Solar Radio Bursts far from the sun. Custom software is used to model the response of different array configurations over the lunar year, combining ephemerides of the sun and moon with LOLA data to correctly correlate the virtual data. Traditional radio astronomy software is hard coded to assume an Earth based array. To circumvent this, we manually calculate the antenna separations and insert them along with the simulated visibilities into a CASA MS file for analysis. To create the realest possible virtual input data, we take a 2-temperature MHD simulation of a CME event, and superimpose realistic radio emission models on top of it, and propagate the signal through the various simulated lunar interferometers. We consider both probabilistic emission models derived from data cuts of various Type II burst correlated variables, and analytical emission models using plasma emission wave interaction theory. We conclude by offering recommendations for the location and geometry of a future lunar radio interferometer for tracking solar radio bursts out to 0.5 AU.