Progress Report

- Research highlights: Mahesh and Bowman have explored the possibility of using planar dipoles on the lunar regolith using simulations in FEKO. Placing the blade dipole on the soil without a ground plane, causes the antenna to look essentially into the lunar surface (i.e., the response towards zenith is <1; absolute gain). But on scaling the blade dimensions to an appropriate size (2.5 m x 1.92 m) and placing it 10 cm above the soil gives a reasonable response and bandwidth. The next steps are: 1) looking into Patch antennas as alternatives since this reduces the size considerably and has better gain because of the ground plane; and 2) using model sky temperatures and realized gain of the antenna response, calculating the overall efficiency of the system to sky observations in the desired frequency range.


- News: (1) NESS corporate partner Lockheed Martin selected by NASA as a provider for the Commercial Lunar Payload Services (CLPS) program; (2) NASA’s Chief Scientist Dr. J. Green visited CU Boulder (11/28/2018) to lecture in Burns’ Space Policy class, interacted with the local NESS team, and presented a seminar at LASP: “Space weather at Earth and Mars: How Bad Can it Get?”, (3) NASA ARC Director Dr. Eugene Tu visited CU (12/12/2018) to lecture in Burns’ Space Policy class.


- Talks: Mirocha gave 1) a KIPAC Cosmology Seminar at Stanford and 2) a SCIPP Seminar at UC Santa Cruz on “New Directions in Galaxy Formation and Cosmology Following the First High-z 21-cm Detection”.

- Meeting: Mirocha participated in the workshop “Near/Far Workshop: The Faint End of the High-z UV Luminosity Function” on December 5-7 in Napa, CA.

Moment of Science:

Bradley, Tauscher, Rapetti & Burns (2018) reported a possible systematic artifact within ground screens, which moderate Earth effects in 21-cm experiments, that may produce broad absorption features in the observed spectra. The publicly released EDGES dataset, from which a 78 MHz absorption feature was suggested, is used to probe for the presence of ground plane resonances. **Top left:** The sum of three fit resonances at 73.8, 84.2, and 111.8 MHz, only 2 foreground terms of a polynomial in logarithmic space are employed in this fit. **Top right:** Residuals (RMS = 20.8 mK) to the fit which resulted in the left panel. **Bottom left:** Similar except the foreground is given by a slightly different, 5-term polynomial model and a flattened Gaussian model, used in the fit which produced Fig. 1 of Bowman et al. (2018), is used in place of the resonances. **Bottom right:** The residuals of this fit have an RMS of 24.5 mK.