## Progress Report

- **Papers:** (1) "Global 21-cm signal extraction from foreground and instrumental effects III: Utilizing drift-scan time dependence and full Stokes measurements", **Tauscher**, **Rapetti**, **Burns**, submitted to ApJ.
- **News:** (1) **Burns** and **Hallinan** visited Blue Origin on Jan. 28-29 at their invitation to discuss the company's Blue Moon lunar lander and its potential delivery of the FARSIDE lunar array and rover to the lunar farside surface. (2) **Burns** met with Steve Clarke (NASA HQ) and Eugene Tu on Feb. 19 for a briefing on the status of instrument development for DAPPER. (3) Video posted in youtube on the FARSIDE array concept, titled "The Far Side Of The Moon Is The Perfect Place For a Radio Telescope". (4) As described in "First Commercial Moon Delivery Assignments to Advance Artemis", NASA has finalized the first 16 science experiments and technology demonstrations to be delivered to the surface of the Moon under the Artemis program, which include LuSEE (PI: **Bale**) and ROLSES (PI: **MacDowall**).
- **Meetings:** (i) A DAPPER Technical Interchange Meeting (TIM) took place at the Space Sciences Laboratory (SSL) of UC Berkeley on Feb. 12-13 and at NASA Ames on Feb. 14, with the participation of DAPPER team members from CU Boulder, NASA Ames, SSL Berkeley, and NRAO Virginia, and NESS talks from (1) **Burns** & Bauman on 'Science Overview and SOW review'; (2) **Bradley** & **Bordenave** on 'WP3: Receiver design & development @ NRAO'; (3) **Rapetti** on 'WP2: Data pipeline overview'; (4) **Rapetti** & Goetz on 'WP4: RFI - controlling interference from instrument & spacecraft'; (5) **Burns** on 'Review of action items'. (ii) In the American Astronomical Society meeting in Honolulu, on Jan. 4-8, **Burns** talked on "FARSIDE: Farside Array for Radio Science Investigations of the Dark ages and Exoplanets", **Mahesh** on "Beam Chromaticity of the EDGES Low-Band Blade Dipole", and **Bordenave** presented a poster on "A Study of the Dynamic Polarization Induced by the Galactic Foreground with the Cosmic Twilight Polarimeter". (iii) Science at Low Frequencies conference, Tempe, Dec. 9-11: talks from **Burns, Tauscher, Mahesh, Anderson, Pober, Hallinan**, and posters/lightning talks from **Rapetti**, **Bassett**.
- **Outreach:** The NESS production of a new planetarium show on Space Exploration, with emphasis on Artemis and CLPS, is progressing well. This show is funded by outreach funds from SSERVI and cost-shared by Lockheed Martin. We will be doing a Fiske night and reception at the Exploration Science Forum in July in which clips from this new program will be shown.
- **Upcoming Meetings:** (i) Lunar Surface Science Workshop, Denver, Apr. 28-30, with talks

(contd.) from: **Burns** on "FARSIDE: A Low Frequency Radio Array for the Lunar Farside", **Rapetti** on "Data Analysis Pipeline for Global Neutral Hydrogen Observations with the Lunar-Based FARSIDE Array", **Bassett** on "FARSIDE: A Low Frequency Radio Array for the Lunar Farside", **Bale** on "The Lunar Surface Electromagnetics Experiment (LuSEE)", **Menon** on "Virtual Reality Simulator for Telerobotics Research to Enable Artemis and the FARSIDE Low Frequency Radio Telescope", **Walker** on "Mixed Reality Interfaces for the Moon and Beyond: Advancing Surface Telerobotic Interfaces in the NASA Artemis Program", and **Kumar** on "Telerobotic Assembly Research and Artemis Infrastructure to Enable the FARSIDE Mission". (ii) Astronomy from the Moon: The Next Decades, London, March 18-19: **Burns** will talk on "Transformative science from the lunar farside: observations of the dark ages and exoplanetary systems at low radio frequencies".

Moment of Science:
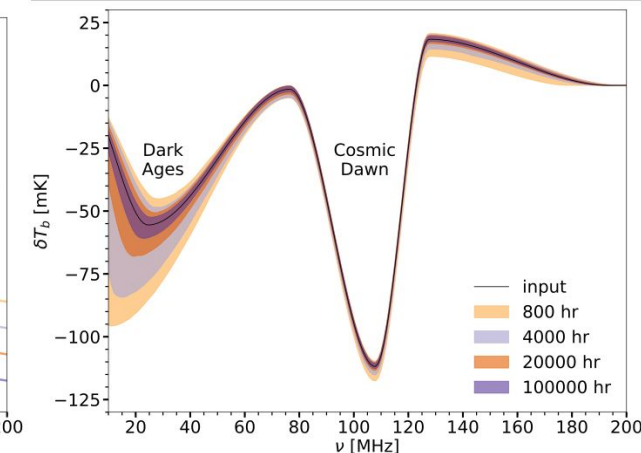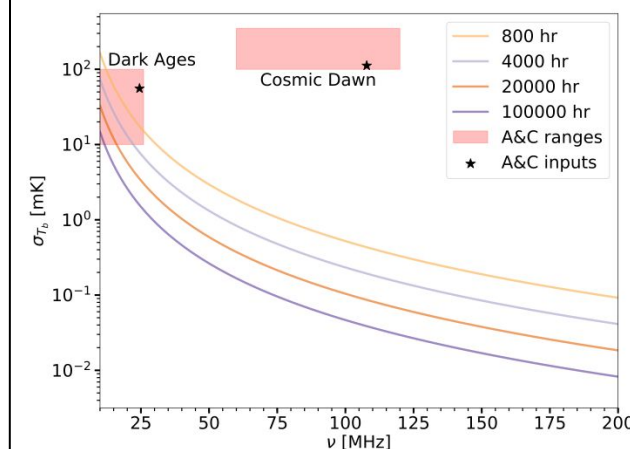
Plots from Paper II of our pipeline series (Rapetti, Tauscher, Mirocha & Burns, arXiv:1912.02205). Left: 1σ noise levels for four evenly increasing integration times up from the reference value of 800 hours, with the same random seed for noise generation to ensure comparability. The red rectangles encompass the allowed ranges of frequencies and absolute values of temperatures for turning points A and C, representing the Dark Ages and Cosmic Dawn troughs respectively. The black stars indicate the input values for the given studied case for this model. The uncertainties given by the curves correspond only to the noise levels and do not account for uncertainties deriving from the overlap between foreground and signal. Right: Full (statistical plus systematic) uncertainties for this case in frequency space.