



SSERVI Monthly Report

NESS/PI Burns - April, 2021

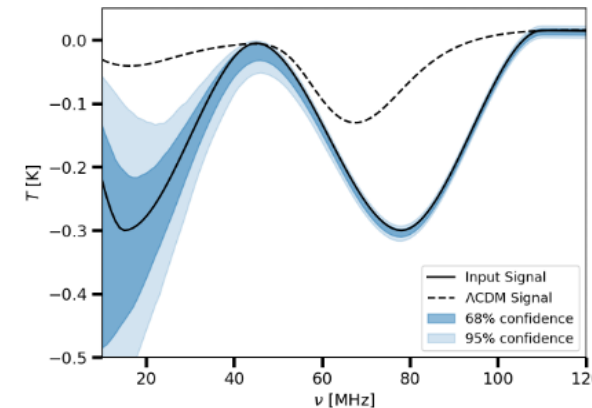


Progress Report:

- Papers:** (1) “Global 21-cm signal extraction from foreground and instrumental effects IV: Accounting for realistic instrument uncertainties and their overlap with foreground and signal models”, **Tauscher, Rapetti, Nhan, Burns, Handy, Bassett, Hibbard, Bordenave, Bradley, Burns**, submitted to ApJ; (2) “Validation of EDGES Low-Band Antenna Beam Model”, **Mahesh, Bowman, Mozdzen, Rogers, Monsalve, Murray, Lewis**, accepted to ApJ, arXiv:2103.00423; (3) “A Lunar Farside Low Radio Frequency Array for Dark Ages 21-cm Cosmology”, **Burns, Hallinan, Chang, Anderson, Bowman, Bradley, Furlanetto, Hegedus, Kasper, Kocz, Lazio, Lux, MacDowall, Mirocha, Nesnas, Pober, Polidan, Rapetti, Romero-Wolf, Slosar, Stebbins, Teitelbaum**, arXiv:2103.08623, response to a [joint DOE/NASA request for information \(RFI\)](#) ; (4) “Global 21-cm Cosmology from the Farside of the Moon”, **Burns, Bale, Bradley, Ahmed, Allen, Bowman, Furlanetto, MacDowall, Mirocha, Nhan, Pivovarov, Pulupa, Rapetti, Slosar, Tauscher**, arXiv:2103.05085, response to a [joint DOE/NASA RFI](#); (5) “Low Radio Frequency Observations from the Moon Enabled by NASA Landed Payload Missions”, **Burns, MacDowall, Bale, Hallinan, Bassett, Hegedus**, 2021, Planetary Science Journal, 2:44.
- News:** (1) [NASA-funded project to explore one-of-a-kind lunar observatory](#), CU Boulder Today article with quotes from **Burns**; (2) [CU Boulder team funded for lunar radio observatory](#), Daily Camera article with quotes from **Burns**; (3) [The Lunar FARSIDE Telescope](#), video of Fraser Cain speaking with **Burns**; (4) [FarView: One-Of-A-Kind Lunar Observatory](#), The Tundra interviewed **Burns**; (5) [NASA's next lunar rover will run open-source software](#), MIT Technology Review article with quotes from **Fong**; (6) [Exploring the far side of the Moon and beyond with NESS](#), Innovation News Network article with quotes from **Burns**.
- Funding:** The NASA Institute for Advanced Concepts (NIAC) program recently awarded a \$125,000 grant for a nine-month study on the Lunar Farside Radio Observatory or FarView.
- Meeting organization:** 4th Global 21-cm Workshop to be hosted by NESS at CU Boulder virtually, in October 2021.
- Presentations:** (1) American Physical Society meeting, PhysPAG Town Hall, invited talk on “A Lunar Farside Low Radio Frequency Array for Dark Ages 21-cm Cosmology” by **Burns**.
- Abstracts submitted to:** (1) 238th American Astronomical Society (AAS) Meeting; (2) XXXIV General Assembly and Scientific Symposium (GASS) of the International Union of Radio Science; (3) NASA Exploration Science Forum and European Lunar Symposium, 2021.
- Outreach:** Public talk by NESS graduate student **Mahesh** on March 19, 2021 about FARSIDE, “A Farside Array for Radio Science Investigations of the Dark Ages and Exoplanets”, for the East Valley Astronomy Club, as it can be watched in [this video](#).

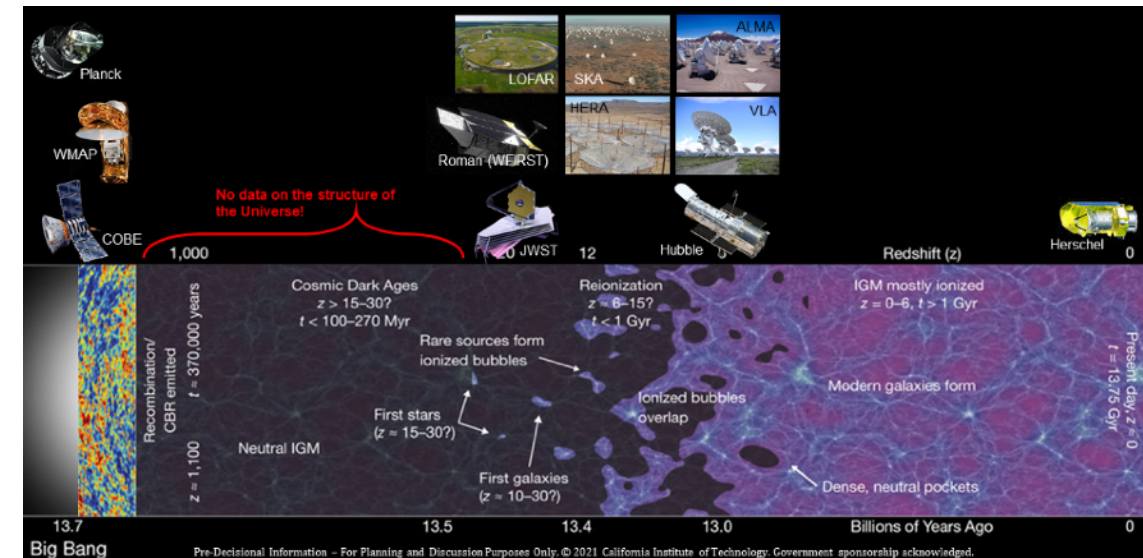
Moment of Science:

White paper related DAPPER submitted to a joint DOE/NASA request for information



This end-to-end Global 21-cm cosmology telescope simulation, including thermal noise along with instrument and foreground systematics, illustrates a clean $>5\sigma$ separation between the standard cosmological model (dashed black line) and an added cooling model possibly produced by dark matter scattering (blue). From the shape, depth, and frequencies of the troughs, the cooling rate and the redshift at which cooling commences is calculated. 240 hours of integration during the lunar day was assumed; further integration during the lunar night will shrink the uncertainty bands.

White paper related with FARSIDE & FarView submitted to the joint DOE/NASA RFI



The pre-stellar (Dark Ages), first stars (Cosmic Dawn), and Reionization epochs of the Universe can be uniquely probed using the redshifted 21-cm signal. Credit: JPL/Caltech (Bandyopadhyay et al. 2021).