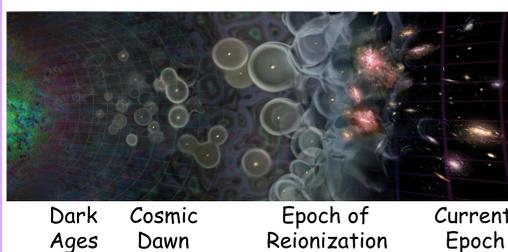


Low Frequency Deployable Antennas for Space

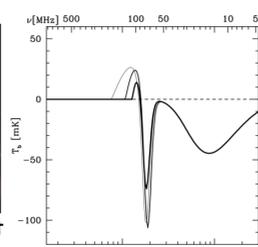
Astrophysics from the Cis-Lunar Environment and the Lunar Surface

Dayton L. Jones, Joseph Lazio, Deborah Sigel, Louis Giersch, Issa Nesnas, and Luis Amaro
(Jet Propulsion Laboratory, California Institute of Technology)

Introduction



Dark Ages Cosmic Dawn Epoch of Reionization Current Epoch



Predicted all-sky signal from highly redshifted neutral hydrogen

➤ Science goals:

- Large-scale structure formation during cosmic Dark Ages and Cosmic Dawn epochs
- Track solar radio bursts from the Sun to the vicinity of Earth
- Exoplanet radio emission
- Lunar ionosphere monitoring

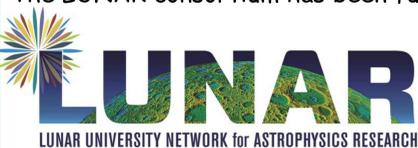
➤ Antenna requirements:

- Usable frequency response below ~ 50 MHz
- Extremely low mass
- Deployable from spacecraft or on lunar surface

Summary

- Current development at JPL is focusing on low frequency receivers, calibration techniques, bi-conical dipole antennas for small spacecraft, and polyimide film antennas for the lunar surface
- Antenna deployment and RF performance testing underway
- No fundamental show-stoppers found yet, but calibration accuracy remains a challenge

This work was carried out at the Jet Propulsion Laboratory, California Institute of Technology, with partial support from the Lunar University Network for Astrophysical Research (LUNAR). The LUNAR consortium has been funded by the NASA Lunar



Science Institute to investigate concepts for astrophysical observatories on the Moon via cooperative agreement NNA09DB30A.

Spacecraft Antenna Concepts

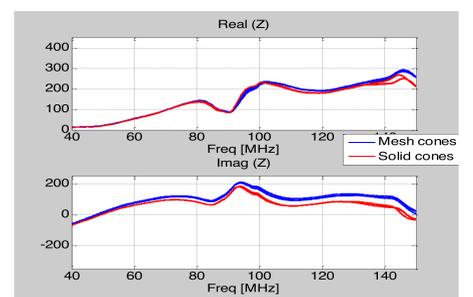
Deployable antenna concept for spacecraft HI observations



Deployable bi-conical dipole antenna



Fixed, solid conductor reference antenna



Measured impedances of the deployable and reference antennas agree very well

Lunar Surface Antenna Concepts



JPL Axel rover starting to deploy a polyimide film dipole antenna



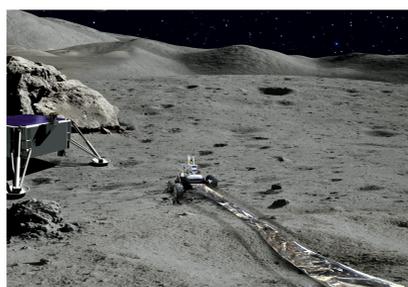
Example of an inflation-driven antenna deployment test over similar size rocks



Deployed polyimide film dipole antenna in JPL's Mars Yard. White cabinet contains electronics.



Dipole antenna deployed from lander mockup



Artist concept of rover-based deployment



Artist concept of inflation-based deployment