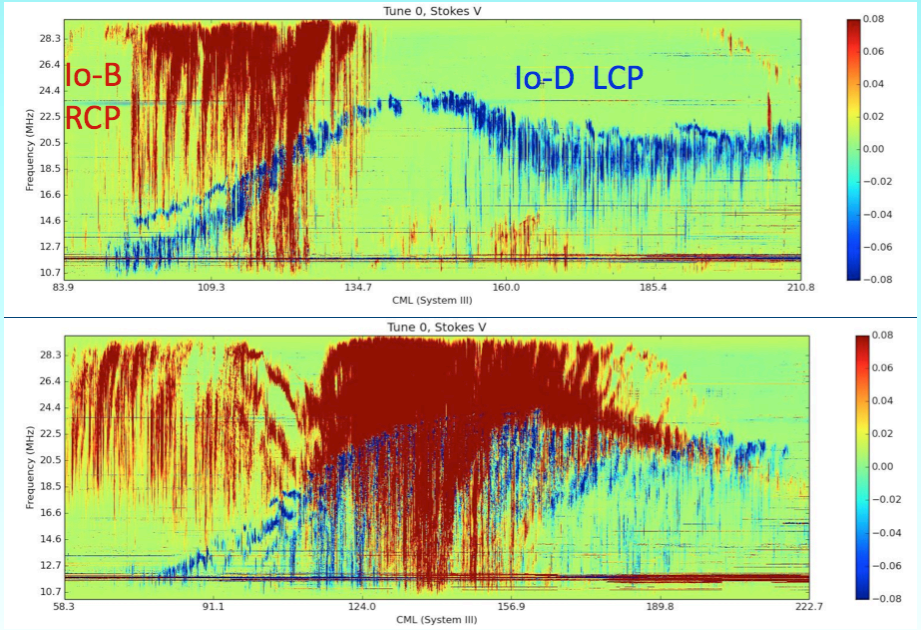
Jovian Decametric Emission



Clarke et al. 2014, JGR, 119, 9508

INSTITUTIONS OF THE LWA PROJECT

UNM VT LANL JPL NRL

Collaborators at: Caltech, UTB, UTAS, Stanford, MTSU, Berkeley, UCSD, Penn State, ASU, GMU, AFRL, UM, TTU, ERAU and NMT

NRAO hosts the LWA1 Station, Caltech operates the OVRO-LWA station.

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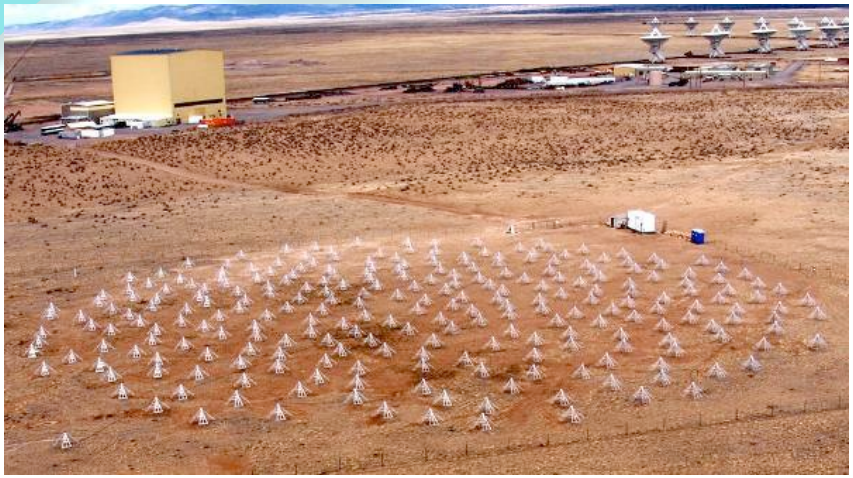
LWA Long Wavelength Array [updated 1/2/2019]

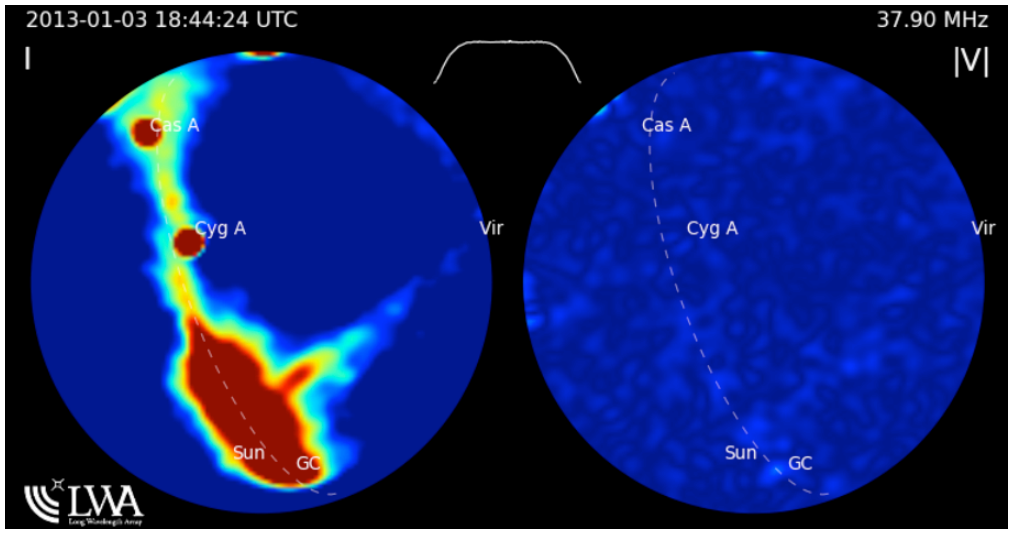
LWA – The greatest discoveries in Space Physics & Astrophysics have accompanied technological innovations that opened new windows of the electromagnetic spectrum. One of the last poorly explored regions lies between 100 MHz and the ionospheric cutoff at ~10 MHz. Ionospheric variations have limited ground-based observations in the past to small (<5 km) apertures with resultant relatively primitive angular resolution and sensitivity. Ever-increasing computing power combined with new wide field-of-view imaging algorithms and self-calibration techniques make it possible to overcome these restrictions. The 74 MHz observing system at the VLA has elegantly demonstrated that connected element interferometry at low frequencies can provide high-precision, synoptic views of the ionosphere and solar weather events, and of a panoply of astrophysical phenomena. The LWA will provide major advances in sensitivity and angular resolution, together with refinements in calibration and new strategies for mitigation of interference at radio frequencies.

The **LWA** will have a very large aperture (>1000 km) and operate between 10 and 88 MHz. Currently the LWA consists of two stations in New Mexico and one in California. New stations are in the planning stages.



Aerial view of the First LWA1 station whose construction began in the summer 2009, was completed in December, and dedicated in April 2010. Routine operations began in 2011.

The sky as seen by LWA1 at 37.9 MHz



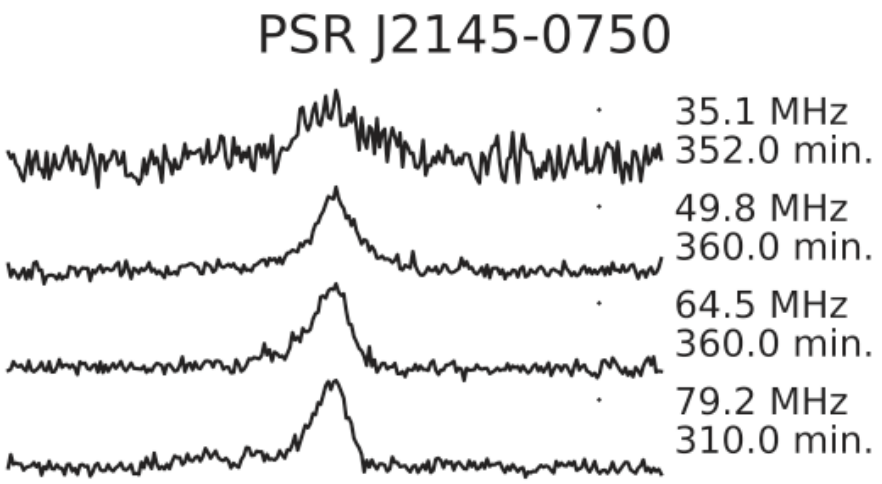
LWA1 is a compact array radio telescope operating in the 10-88 MHz band, colocated with the VLA in central New Mexico. LWA1 currently consists of 257 dual-polarization active dipole antennas in a 100 m x 110 m elliptical footprint with an outlier dipole antenna located approximately 300-m east of the main array. Each dipole is individually digitized and then formed into 4 beams using a delay- and-sum technique. The beams can be pointed independently; thus LWA1 can be used similarly to 4 separate radio telescopes. The individual dipole signals can also be recorded. A subset of LWA1 science targets includes pulsars, astrophysical transients, the Sun, Jupiter, and the ionosphere, but innovative, technically feasible investigations of all kinds are welcomed. Support for operations and continuing development of the LWA1 is provided by the Air Force Research Laboratory and the National Science Foundation under grants AST-1835400 and AGS- 1708855. We invite proposals from all individuals wishing to use this new instrument. For more information visit lwa.unm.edu.

Long wavelength astronomy in the southwestern United States offers many collectively unmatched advantages:

- **Co-location with a premier radio astronomy facility, the VLA, thus permitting cooperative and complementary radio observations from 10 MHz to 50 GHz,**
- **Access to the Galactic Center, and access to important northern regions of the sky such as Virgo, Coma, and Andromeda,**
- **Supporting university institutions interested in re-invigorating university based radio science in the US, and**
- **Superior existing infrastructure resources, particularly land, access, and fiber-optic cable.**

LWA KEY SCIENCE DRIVERS

Ionospheric, Solar, & Space Weather Science	High-precision measurements of ionospheric waves & turbulence Radioheliography of solar bursts & Coronal Mass Ejections Solar radar
Solar & Exosolar Planets	Bursts and nonthermal emission in the Solar system Searches of magnetized exosolar planets
Transient Phenomena	Pulsars and magnetars Prompt, coherent emission High energy cosmic ray air showers
Acceleration, Turbulence, & Propagation in the ISM	Origin, spectrum, & distribution of Galactic cosmic rays Scattering & thermal absorption in the ISM Supernova remnants & Galactic evolution
Cosmic Evolution	High redshift radio galaxies including the earliest black Holes, Large-scale structure including Dark Matter & Dark Energy Epochs of reionization and reheating Interstellar matter in nearby galaxies



Millisecond Pulsar J2145-0750 with LWA1
Stovall et al. 2014, ApJ, 808, 156; Dowell et al. 2013; ApJL 775, L28