

The VLA Low Band Ionospheric and Transient Experiment (VLITE): A New Commensal System on the NRAO VLA

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The VLA Low Band Ionospheric and Transient Experiment (VLITE) is a new commensal observing system on the National Radio Astronomy Observatory's Very Large Array (VLA). VLITE exploits the fact that the feeds for frequencies above 1 GHz are located in a ring around the Cassegrain focus of the VLA while the lower frequency feeds are at the prime focus. This separation of feeds provides the opportunity to engage both prime focus and Cassegrain receivers simultaneously, significantly expanding the capabilities of the VLA. NRL and NRAO are exploring the scientific potential of commensal observing through the limited VLITE program that taps into the low band receivers on a subset of 10 VLA antennas. VLITE does not have an impact on general NRAO observing resources as it has dedicated samplers, fibers, a custom-designed DiFX correlator, and post-processing/archiving system. VLITE provides real-time correlation (all four polarization products) across 64 MHz of bandwidth, centered on 352 MHz, with 2s temporal resolution and 100 kHz spectral resolution. It began the science phase of operations in November 2014 and operates continuously at nearly 70% wall time for all VLA observations.

VLITE data are used in real-time for ionospheric work and are brought to NRL daily for processing in the astrophysics and transient pipelines. These pipelines provide automated radio frequency interference excision, calibration, imaging, and self-calibration of data.

We present details of the VLITE system, astrophysics pipeline, data products, and initial astrophysical results. In addition to enhanced science for PI programs using the Cassegrain receivers, the large field of view of VLITE (FWHM~2.3 degrees) opens up important opportunities for leading-edge low frequency science programs. We will briefly discuss these programs as they highlight the broad and powerful nature of a commensal observing system. Finally, we will present a potential path forward from the narrow-band 10 antenna VLITE system to the full broad-band 27 antenna Low Band Observatory (LOBO) system.