

## Detecting VHF satellite emissions using the Orville Wideband Imager

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Low Earth Orbit (LEO) satellite constellations are experiencing rapid growth, a trend which is likely to continue with the on-going expansion of the Starlink, OneWeb, and Kuiper constellations. The telecommunications satellites in these constellations produce both intentional in-band Radio Frequency (RF) emissions as well as unintended out-of-band emissions. These emissions can be detected from radio astronomy telescopes and are a possible source of interference, particularly when the emissions occur at frequencies outside of a licensed satellite communications band. Out-of-band RF emissions from the Starlink constellation have been observed at radio astronomy telescopes such as the LOFAR array in the Netherlands (Vruno, et al. 2023) and the SKA-Low prototype station in Australia (Grigg, 2023.)

This paper provides an overview of the effort to analyze long-term trends in RF emissions from the Starlink satellites, using data from the Orville wideband imager system. Starlink is currently the largest LEO constellation with over 6000 satellites in orbit and which operates in the 10.7 to 12.7GHz band. In contrast the Orville imager observes in the HF and VHF bands from 2.7MHz to 91.2MHz. It is located at the LWA-SV radio telescope in the Sevilleta National Wildlife Refuge, NM (Dowell et al. 2020.) Data products from Orville include five second snapshots containing full linear polarization products with all-sky coverage. Images from the last four years have been archived and made publicly available by The University of New Mexico, a period which overlaps significant growth of the Starlink constellation. Automated processing tools for satellite detection and out-of-band RF emission analysis have been developed to process this archive and will be presented along with preliminary results.