

Very Large Array “Spectrum Weather” Monitoring Project

Principal Investigator: Remy Nguyen, Electronics Engineer, National Radio Astronomy Observatory (NRAO), and Frank Schinzel, Staff Scientist, NRAO

Project Summary: Radio Frequency Interference (RFI) is a growing issue, even at remote sites like the Very Large Array. Radio telescopes essentially measure broadband radio noise from space and therefore require undisturbed access to the radio spectrum using the most sensitive radio receivers in the world. Unfortunately, our modern life—with exponential growth in wireless technologies—clashes with that requirement. The New Mexico Spectrum Monitor (NMSM) continuously collects data from 0.1-10 GHz at the VLA site to assess the spectrum availability for observations on an ongoing basis. The SpectrumX summer student will work with Remy Nguyen (Electronics Engineer) and Frank Schinzel (Staff Scientist) on both hardware and software aspects of this project. The current spectrum monitoring system consists of a 0.1-10 GHz omnidirectional antenna located on a 50-foot tower. These data are taken 24/7 and produce a daily waterfall and averaged daily spectra for analysis. Plans are in place to incorporate data from a directional antenna (located at the same site) to make follow-up observations. These data are being archived so that they can be compared with Advanced Spectrum Monitor (ASM) data that will be produced once the ASM (currently being assembled at the Central Development Laboratory, or CDL) is deployed. The summer student will work with Remy Nguyen and Frank Schinzel to interpret the ~6 months of RFI monitoring data from the omnidirectional system that will exist by the time the project starts. If possible, follow-up investigations will be made with the on-site directional antenna. Data analysis could include the identification of trends in spectrum use (daily, weekly, seasonally) and the classification of sources (local vs non-local) of received transmissions. Depending on student interest and ability, they could also assist in building and testing an X-band and Ku-band receiver for the direction-finding antenna.

Project Purpose: The goal of the project is to use data from the New Mexico Spectrum Monitor (NMSM) to better understand the RFI environment at the Very Large Array (VLA).

Student’s Role: The summer student will work with Remy Nguyen and Frank Schinzel to interpret the ~6 months of RFI monitoring data from the omnidirectional system that will exist by the time the project starts. If possible, follow-up investigations will be made with the on-site directional antenna. Data analysis could include the identification of trends in spectrum use (daily, weekly, seasonally) and the classification of sources (local vs non-local) of received transmissions. Depending on student interest and ability, they

could also assist in building and testing an X-band and Ku-band receiver for the direction-finding antenna.

Preferred Skills/Background: Python programming, understanding of Radio Frequency (RF) design, previous use of testing and measurement tools (e.g. spectrum analyzers)