

Antenna Electronics Reference Design for the Next-Generation Very Large Array

Jim Jackson, Robert Selina and Steven Durand
National Radio Astronomy Observatory, Socorro, NM 87801
www.nrao.edu

As part of its mandate as a national observatory, the NRAO is looking toward the long range future of radio astronomy and fostering the long term growth of the US astronomical community. NRAO has sponsored a series of science and technical community meetings to consider the science mission and design of a next-generation Very Large Array (ngVLA), building on the legacies of the Atacama Large Millimeter/submillimeter Array (ALMA) and the Very Large Array (VLA).

In preparation for the Astro2020 Decadal Survey, the project has prepared a Reference Design, which is a baseline for cost estimation, performance simulation, and technical risk assessment. Given the intended use of the Reference Design, priority has been placed on mature technologies and concepts that can be credibly costed and evaluated for technical readiness. Development of leading edge technologies is proceeding in parallel to the Reference Design activities.

The design of the antenna electronics, reference distribution and data transmission systems are anticipated to be major construction and operations cost drivers for the facility. The electronics must achieve a high level of performance, while maintaining low operation and maintenance costs and a high level of reliability.

This presentation will focus on an overview of the Antenna Electronics Reference Design. The signal path from the output of the wideband receivers to the input of the Central Signal Processor (CSP) at the array center will be presented. This includes the integrated downconverter/digitizer modules, antenna fiber optics, digital backend, data transmission system and signal routing control. Aspects of the mechanical packaging, monitor & control and local oscillator, reference & timing required by this system will also be discussed.