

The Next-Generation Very Large Array: Reference Design Overview

Robert Selina

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).

The basic ngVLA design emerging from these discussions is an interferometric array with approximately ten times the sensitivity and one hundred times higher spatial resolution than the VLA and ALMA radio telescopes, optimized for operation in the wavelength range 0.3cm to 3cm. The ngVLA would open a new window on the Universe through ultra-sensitive imaging of thermal line and continuum emission down to milliarc-second resolution, as well as unprecedented broadband continuum polarimetric imaging of non-thermal processes. The science case and supporting requirements have matured sufficiently to permit design development of the major components of the array.

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.

We will provide an overview of the current system Reference Design of the ngVLA. The key requirements and supporting concepts for major system elements such as the antenna, receiving electronics, and central signal processing will be presented. We will also describe the major development activities that are presently underway to advance towards a conceptual and preliminary design for the facility.