# Performance Estimates for the Next-Generation Very Large Array

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The next generation Very Large Array (ngVLA) will be interferometric array with approximately ten times the sensitivity and ten 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 design for the ngVLA is now mature enough to make a much more detailed calculation of sensitivity than has been possible before. Previous estimates (e.g., Carilli et al. 2015; Selina & Murphy 2017) have suffered from uncertainties in design specifics, some of which have been reduced through further development. Furthermore, it is of interest to compare these sensitivity numbers directly with existing and near-future instruments in the frequency range of ngVLA (1.2 to 116 GHz), namely the current Karl G. Jansky Very Large Array (VLA), the Atacama Large Millimeter/submillimeter Array (ALMA) and the Square Kilometer Array phase 1 (SKA1-mid). We find that the ngVLA, with its current design, is roughly a factor of 10 more sensitive than VLA and ALMA, and factor of 6-7 more sensitive than SKA1-mid (current deployment baseline) for spectral line observations, and almost a factor of 20 more sensitive than all three for continuum observations due to increased available bandwidth.

We base our sensitivity calculation on the one for ALMA presented in Butler & Wootten (1999), with modifications, along with current best estimates of receiver and antenna performance, combined with atmospheric models based on measured VLA site characteristics.