The Flux Density Scale at the Very Large Array

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The Very Large Array (VLA) is one of the world's premier radio telescopes. It is an interferometer composed of 27 telescopes of diameter 25 meters, each equipped with eight receiver bands covering frequencies from 74 MHz to 50 GHz. Baselines up to 35 kilometers allow sub-arcsecond resolution. The VLA is located on the plains of San Augustin, in New Mexico.

Since the VLA is extremely good at getting relative flux densities of sources (as long as they are not over-resolved by the interferometer), but not so good at getting absolute flux densities, the calibration of VLA data is obtained by observation of astronomical sources whose flux density is assumed to be known by other means. We have adopted the Baars et al. scale at frequencies less than 15 GHz, using Cygnus A as the primary calibrator at 74 MHz, and 3C295 at all other frequencies.

A set of secondary calibrators, including 3C48, 3C84, 3C123, 3C138, 3C147, 3C196, and 3C286, are monitored against 3C295 very carefully in each D-configuration of the VLA, or roughly every 16 months. This provides a set of sources for calibration of VLA data at the lower frequencies, as well as providing information on the intrinsic variability of these secondaries.

We have recently (in the last 5 years) engaged in an extensive program to attempt to determine adequate sources for calibration at frequencies greater than 15 GHz at the VLA. Along with the monitoring of the above listed secondaries (which we also observe at high frequency), we have also been monitoring several planets (Venus, Mars, Uranus, and Neptune), planetary nebulae (NGC 7027 and NGC 6572), and the evolved star MWC 349. We obtain good agreement between models and observations for Mars and NGC 7027, and the flux density scale at high frequencies (20 to 50 GHz) at the VLA is now based on these models and observations.

The current status of calibration and the flux density scale at the VLA will be presented, including results on variability of sources and the flux density scale at high frequencies.