

Preliminary Test Results of JPL's Ultrawideband Receiver Package for the ngVLA

Jose Velazco, Andrew Janzen, Daniel Hoppe, Lorene Samoska, Ezra Long, Jim Bowen, Larry D'Addario, Melissa Soriano, Joseph Lazio

Jet Propulsion Laboratory, California Institute of Technology
Pasadena CA, 91109, USA

The very large array (ngVLA) is a next generation of interferometric radio telescope concept. It will cover the 1 to 110 GHz frequency range and will offer order of magnitude aperture improvements over its counterparts at that frequency range.

At JPL we are working on the prototype development of a receiver package for the ngVLA. The ultrawideband receiver (UWR) package has been designed to operate in the 8 to 48 GHz and covers two of the downlink frequency ranges of JPL's Deep Space Network, namely 8.4-8.5 GHz and 31.8-32.3 GHz. The UWR consists of a feed horn, low-noise amplifiers (LNAs), cryogenic refrigerator package and a down converter stage. Both the feed and LNAs are cryo-cooled. The goal is to downconvert the 8-48 GHz signal frequencies to analog intermediate frequencies that could be digitized with state-of-the-art analog to digital converters.

The feed we constructed is a quad ridge feed horn, which features a teflon rod in the middle for performance improvement at the higher frequency range. The feed is also furnished with two 2.4 mm connectors, orthogonal to each other. We have pursued two LNA designs for wideband operation in the 8-48 GHz range: 35 nm InP HEMTs from Northrop Grumman Corporation and 70 nm GaAs m-HEMTs from the French company OMMIC. The chosen refrigerator is a model GA1 variable speed Quantum refrigerator with a normal speed power consumption of 1.5 kW. We have also designed and fabricated two vacuum windows made out Rohacell and Kapton, respectively. In this talk we will present test results of the feed horn, LNAs and of the entire system, including its cryogenic package and vacuum windows.