SUPPRESSION OF SELF-GENERATED RFI EMISSIONS FOR THE EVLA

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When fully operational, the Expanded Very Large Array (EVLA) will be a digital radio telescope with four channels of gigaHertz-speed sampling in each antenna vertex room. The multi-stage, frequency conversion process requires strong, adjacent-band local oscillator (LO) signals in near physical proximity to each feed. Twelve, 10 GHz digital fiber optic data links are used to convey the signals from each of 27 antennas to the correlator. A high-speed correlator is located at the VLA central control building. To ensure that Radio Frequency Interference (RFI) emissions from the digital and LO circuitry located at each antenna and in the central control building do not overwhelm the astronomical signals which the telescope is designed to detect, an extensive program of shielding is being implemented, including an extensive emissions and shielding testing program.

This report describes the efforts by the National Radio Astronomy Observatory (NRAO) in Socorro, New Mexico to characterize the emissions from each module, and describes the design and testing of the RFI shielding used for the EVLA racks, bins, and modules. Sensitivity limits and RFI detrimental levels taken from the ITU-R-RA.769 handbook and established by EVLA program astronomical measurements were used to determine the minimum shielding levels required at critical frequencies for radiating devices located at the antennas. As a result, hierarchical layers of printed circuit board, module, bin, rack, and room shielding are being used to provide the greater than 120 dB of shielding required by these specifications. To reduce Control Building emissions, a high-performance, commercial shielded room is being installed to house the centrally located correlator.

Based on the extensive testing, it is expected that the EVLA will be able to operate free of self-generated interference. This is being done within budget by verifying that in each case the shielding used is slightly greater than that required to prevent corruption of long-integration, astronomical data.

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