

CONTROL OF SITE RFI EMISSIONS AT THE ALLEN TELESCOPE ARRAY

Robert W. Ridgeway, David R. DeBoer, Geoff Bower  
National Radio Astronomy Observatory, SETI Institute, University of California in Berkeley

Abstract Submission Form  
2004 National Radio Science Meeting

Abstract: ridgeway10795

Date Received: September 24, 2004

URSI-BOULDER, Co. 2005

Control of Site RFI emissions at the Allen Telescope Array

ABSTRACT: The Allen Telescope Array (ATA), located at Hat Creek, California will consist of 350 offset parabolic antennae. Radio frequency interference (RFI) levels that are undetectable in typical radio communications will cause interference to the ATA. This is especially true if the RFI is present during a significant portion of the total observation time and over a large part of the bandwidth, as is the case with a digital signal Processor. Potential RFI emissions from the ATA correlator and other digital equipment would have all of these undesired qualities and must be prevented.

Cryogenic, low noise amplifiers directly modulating a laser beam provide for a very special quality. Ultra wideband analog fiber optic transmission systems can now quietly convey signals from each antenna to the RF converters, IF Digitizers, and correlator. A very high level of shielding must be implemented here to ensure that (RFI) emissions from these high-speed circuitry do not overwhelm potential extraterrestrial emissions which the telescope is designed to detect. The ITU harmful level standards for phased array radio astronomy can be applied in this case, where the band-width of 1Hz would not be unusual. The array factor for the ATA will greatly improve the resistance to any RFI not in the main beam.

The harmful levels are converted to effective isotropic radiated power (EIRP) dBW at the average distance to the nearest neighboring antenna. The loop back loss from each antennas electronics to its feed is measured and used to specify the minimum required shielding for this means of propagation. The EIRP, and average distance of digital equipment RFI coming from the central building must also be considered. The emissions of key components are measured in a reverberation chamber. Super shielded boxes that can provide the needed shielding ( $\geq 150$ db) for various levels of PCB radiation have been designed to fit the requirements. These boxes can provide this extraordinary shielding with off the shelf filters and connectors. Due to the interleaved perimeter design there is no need for expensive gaskets. These extreme levels of shielding will be useful to only a few other specialized RF facilities like planetary radar, encryption device enclosures, and shielding against directed energy weapons. Because of careful RFI planning and extensive level measurement and shielding, it is expected that the ATA will be able to operate free of site-generated RFI.

1. (a) Robert Ridgeway  
1007 Bullock St.  
Socorro, NM  
87801 USA  
rridgewa@nrao.edu
- (b) 505-835-7163
- (c)
2. J - Radio Astronomy
3. (a)
4. C - Contributed Paper
5. David DeBoer might also choose to present?