

## **Green Bank RFI Management Cycle 2 Progress Report (Feb 16 - Mar 31, 2004)**

### **1. Direct Observer Support:**

- In preparation for the startup of heavy PF1 observations, extra effort was made to suppress Cable TV and power line RFI during the cycle. Please see Item 3 for details.
- RFI scans prior to GBT01A-061 had indicated that Cable TV RFI would not be problematic during short integrations. However, as a part of that observation, a long integration to observe a spectral line close to the video carrier of Cable TV channel 50 was to be conducted. Thus, to be on the safe side, in cooperation with Milestone Communications, the channel 50 modulator was shut down during the affected part of the observation.
- A shutdown of the amateur propagation beacon at 432.305 MHz on Bald Knob, VA was requested and granted in support of GBT02C-002.
- A RFI call out was supported for GBT03C-009. The Observer needed to use the problematic 470-520 MHz (UHF TV) region of the PF1 450 spectrum. Since the offending signals originate from outside the NRQZ, all we could do was to provide the current RFI profile for that region of the spectrum. Hopefully this facilitated the Observers efforts to work around the relatively strong RFI.
- A meeting with Don Backer and Rich Bradley was held on 24 March, 2004 to discuss the results of some 125 - 200 MHz spectrum monitoring Wesley conducted. Allocations in this range were also researched and summarized. This was done in preparation for an experiment to be conducted in the June - July, 2004 time frame. Though activity in this range is moderate, Wes did identify 147.5 - 150.5 MHz, 162.75 - 171.0 MHz, and 172.25 - 175.25 MHz as being very quiet. It should be noted that due to this project and the Solar Research Project, the spectrum is now in use to 30 MHz at GB. Our community RFI suppression priorities are being adjusted to accommodate this.

### **2. NRQZ Administration:**

- 6 requests for preliminary evaluation on 23 transmitter sites were completed. 22 regular applications for 38 sites were also completed. ERPd restrictions were requested on 2 sites.
- Wes continued the review of site engineering data for license applications as required. He also continued to work with DirectWay to establish a mutually acceptable coordination process.

### **3. Community RFI Management:**

- The RFI Group was very active mitigating power line and Cable TV RFI during the early part of the cycle. By the end of the cycle, things had stabilized considerably and despite a very heavy dose of low-frequency observations, no related Observer complaints were received nor was such RFI seen in scans. The intent is to be proactive in this area. We are therefore hopeful that our ability to stay one step ahead of such RFI, in what seems to be the worst time of the year for it, is indicative of improving proficiency.
- In an effort to assess the RFI risk associated with operating IEEE-STD-802.11b wireless LAN equipment in the vicinity of the Observatory, some Anechoic Chamber testing (please see Item 8 for details), was conducted. Applicable FCC rules and the technical details of the standard were also examined. As these are Part 15 unlicensed devices, NRQZ coordination is not required, but local businesses, such as Snowshoe Resort, voluntarily cooperate with the Observatory in managing such risks. To facilitate this, it has been decided that NRQZ coordination methodology, with a few modifications, will be used. Since the transmitted power is spread over a 22 MHz channel via DSSS modulation, a substantial "limit allowance" will be made due to the decreased SPFD. Using the NRQZ limit and the limit allowance for DSSS, it appears that most 802.11b devices beyond the immediate vicinity and line-of-sight of the Observatory will pose little RFI risk our instruments. A summary of this investigation was submitted to the IPG for discussion. Information will be disseminated further as our position matures.

- An AM radio transmitter, to be used at Snowshoe, was evaluated and found to be unobjectionable.
- As of March 2004, all the major leaks in the Cable TV distribution system have been suppressed in the vicinity of the Observatory. Our experience has been that such leaks are attributable to significant deficiencies, such as fractured shields in the trunk line and corroded or missing RFI gaskets in distribution components. These deficiencies had accumulated over a good number of years, so we believe the level of effort required to maintain the status quo should be much less than was needed to get to this point. A good number of low-level leaks have been tracked to corroded tap plates. The effort to methodically replace these is underway.

#### **4. Spectrum Summaries:**

The PF1 450 spectrum summary was revised and considerable information was collected for the PF1 340 and 800 summaries.

#### **5. IPG Instrumentation Calibration, Repair and Improvements:**

- Network based operation of the ICOM R9000 Communications Receiver at the RFI Monitoring Station was accomplished. More assets to follow.
- Efforts to establish a GBT based monitoring capability continued. Preliminary system design was completed during the cycle and cost drivers were identified. Design of the gimbal mounted antenna assembly is underway.
- The RFI Group has adopted the (OVLBI) Stabil-Therm Gravity Oven. After replacing two temperature controllers, the unit is functional and is now being used to recycle the desiccant packs for the windows in the Jansky Lab shielded rooms.
- Four additional cables for the SE test set were completed. An additional 13 cables for Rick's RFI filter box were also completed. Note that the high power amplifier used in our SE test set has been at LCF for repair since late 2003. LCF has been very unresponsive to our inquires of late.
- A mount for the power line RFI Mini Locator was installed in the Monitoring Truck. This will facilitate on-the-move and hands free use of the unit.

#### **6. On-Site RFI Management:**

- The following PTCS components were tested and no harmful emissions were seen:
  - Telebyte Model 285 RS232 to 485 interface converter
  - Wyler inclinometer
  - Texas Electronics windspeed sensor
- A General Data Acquisition (GDAQ) interface with a three-axis accelerometer assembly was also tested for PTCS and harmful emissions in the vicinity of 100 MHz were detected. These were mitigated by properly grounding the GDAQ to the accelerometer assembly.
- RFI testing of the antenna positioner for the outdoor antenna range indicated the need for three additional filtered connectors. These were ordered and received. Once installed, other than the control PC, no harmful emissions were detected from the system.
- An Interlink Remote Point Navigator was tested and found to exceed the in-house limit considerably.

#### **7. Outreach:**

- Some RFI Group members met with Jim Williams of Milestone Communications to advise him on power line RFI hunting and suppression. Power line RFI is problematic for two of their three over-the-air antenna sites in Pocahontas county. Near the end of the discussion, understanding the scope of the problem, Jim noted that it might be easier to move their Durbin head end and over-the-air antenna site to the Green Bank area where power line RFI is kept at bay by the Observatory. Though flattering, needless to say, the idea of moving another potential RFI source to the area got Wesley's attention in short order.

- A visit from one of US Cellular's lead engineers, Larry Leech, was hosted. Mr. Leech continues to be supportive of the Observatory and is voluntarily working with us to mitigate a RFI issue associated with a Cellular tower on Muddy Creek Mountain outside the NRQZ. His visit was primarily a social call, but the problematic site was discussed. Some testing was conducted to follow up on some issues that were raised.
- Denise fielded a call from a Lewisburg resident regarding Cellular coverage. Apparently, Cellular sales reps in his area are blaming the NRQZ for coverage that is not meeting expectations. Our message to Cellular customers that far removed from the Observatory continues to be that good coverage is more a function of the market than of the NRQZ.
- Several IPG members participated in the Quiet Skies kick off meeting. Quiet Skies is a school based RFI related outreach effort that is being led by Sue Ann Heatherly and Ron Maddalena. The RFI group will provide some hands-on RFI Management experience for teachers in support of this effort.

### **8. Other:**

- In cooperation with Black Bear Paging, testing was conducted to identify the source of the relatively strong 462.875 MHz signal that is routinely seen in the PF1 450 band. It was thereby confirmed that the signal originates from a simulcast digital paging transmitter operated by Black Bear Paging on Keeney Mountain near Alderson, WV. Keeney Mountain is one of a few know transmitter sites just outside the NRQZ, that have a fairly low diffraction loss path to the GBT. The scope of this problem is limited and some voluntary cooperation has been encountered at these sites. The situation does however give cause to wish that the NRQZ could have been just a wee bit bigger. During the testing, once the Keeney Mountain site had been shut down, a much weaker pager transmitter was seen. A concern is that this may be one of the 10 simulcast towers in the NRQZ. Wesley and Denise will follow up on this.
- Two notebook computers with integrated wireless LAN cards and two access points, one of which included a phased array antenna, were profiled in the Anechoic Chamber. Since this was our first attempt to profile the emissions of an intentional radiator with our new Anechoic Chamber setup, measurements against a known standard were conducted as a sanity check. The measurement error was deemed to be within acceptable tolerances.
- A review of FCC NPRMS on cognitive radio and BPL was conducted and GB input was provided to CV. GB input on the recent discussion topic of SDARS repeaters was also provided.
- The IPG Position Paper was revised per Phil's input and resubmitted.
- Gary provided some training on the operation of the antenna positioners in the Anechoic Chamber.
- Jeff fielded a call from NTIA regarding interference temperature and cognitive radio .
- The RFI Group participated in the Quarterly NRAO and Friends RFI Watch Telecon. They were joined by Galen Watts.

Report prepared by Jeff Acree