Monitoring Radio Frequency Interference: The Quiet Skies Project

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The Quiet Skies Project is a result of the Research Experience for Teacher (RET) program during the summer of 2004. Teachers were involved in discovering the relationship between radio frequency interference (RFI) and radio astronomy observations. Steve Rapp participated in astronomy observations with the Green Bank Telescope in order to characterize RFI issues at radio observatories and worked closely with the Green Bank Interference Protection Group. This work included such tasks as mitigation of locally-generated RFI from power poles and running radiation propagation studies for transmitters within the National Radio Quiet Zone.

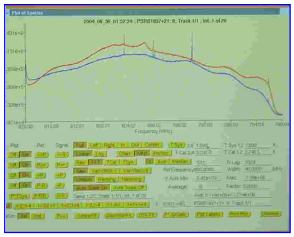
A curriculum was created to allow high school students to participate in a research effort to determine RFI levels in their communities. The aim of the project is to promote student awareness of radio astronomy and radio frequency interference through an inquiry-based science curriculum. It is hoped that the project will go national by 2007.

A prototype RFI detector was created and tested at four wavelengths; 850, 900, 1425, and 1675 MHz. High school students are using a beta version of the detector to explore the occurrence of RFI at their schools and in their communities. The student goals of the Quiet Skies Project are to:

- Measure interference levels at their schools and in their communities;
- Reduce and transmit their data to an NRAO data base;
- Use online spectrum allocation data, and local information to determine possible causes of interference in their area;
- Analyze the complex trade-offs between radio astronomy's need for quiet skies, and other commercial, and non-commercial uses of the spectrum and share their insights with others.

Research Experience: Monitoring RFI

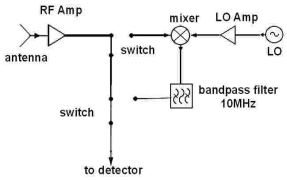
Looking for Power Line RFI

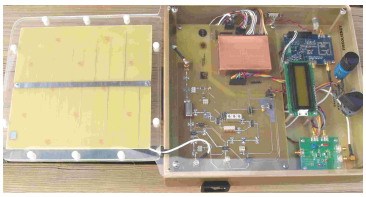


RFI at the GBT

Classroom Application

During mid-December the final version of the Quiet Skies RFI Detector was received. Shown below is a schematic of the detector and a photo.



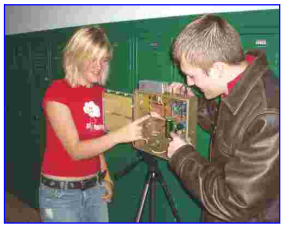


The Quiet Skies (QS) Detector operates in two modes. In *wideband* mode the detector is sensitive to the full range of the receiver: 500 MHz - 2,000 MHz. In *narrowband* mode, the detector is tunable over a range of frequencies from 710 - 1490 MHz. (1665 MHz is not available at this time, but will be added later.) In *narrowband* mode, a filter with a bandwidth of 10 MHz is employed.

The QS Detector was taken to two schools and some preliminary explanation of the detector was made. Students are very excited about being able to participate. My Physics and Astronomy classes will participate in the study. Our goal is to produce a Quiet Skies Map of RFI in southwest Virginia.

The QS activities will take place right after the students have been introduced to the electromagnetic spectrum. Activities will include students using the *Students Investigating Virginia's Radio Frequency Interference* website to explore web-links on RFI and formulate a definition for RFI. The students will be directed to web-links on spectrum allocation and other links that might be appropriate. We will then discuss the Quiet Skies Project and the RFI detector.

The students will also be assigned a radio astronomy lab activity on Pulsars and RFI. This is radio telescope simulation of pulsar detection, periods, and distances. Students will decide if RFI could be a problem in discerning the pulsar on the graph. The students will also use *Microcomputer Spectrum Analysis Model* software to do propagation studies to see how obstacles may attenuate RFI.



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