RUTGERS
WINLAB | Wireless Information Network Laboratory

Distributed Spectrum Monitoring and Channel Sounding

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Introduction

- The rapid development of wireless communication technologies has increased the need to use the radio frequency spectrum in an efficient way
- The goal of our project is to use SDR to observe the transmission process and collect the transmitted data and use ML to improve the efficiency of transmission

Objectives

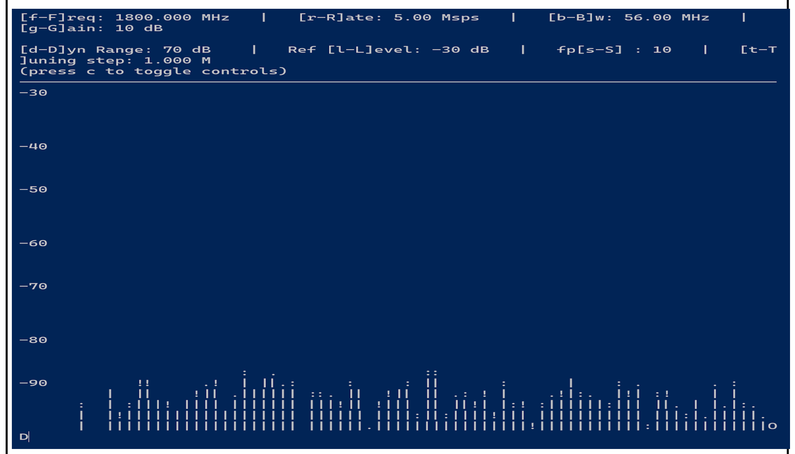
- **Spectrum Monitoring:** Basically, means monitoring frequencies as it provides the information needed to optimize spectrum for maximum utilization
- **Channel Sounding:** Channel sounding is a technique that enhances the radio environment for wireless communication
- Use ML to for channel characterization

Devices utilized

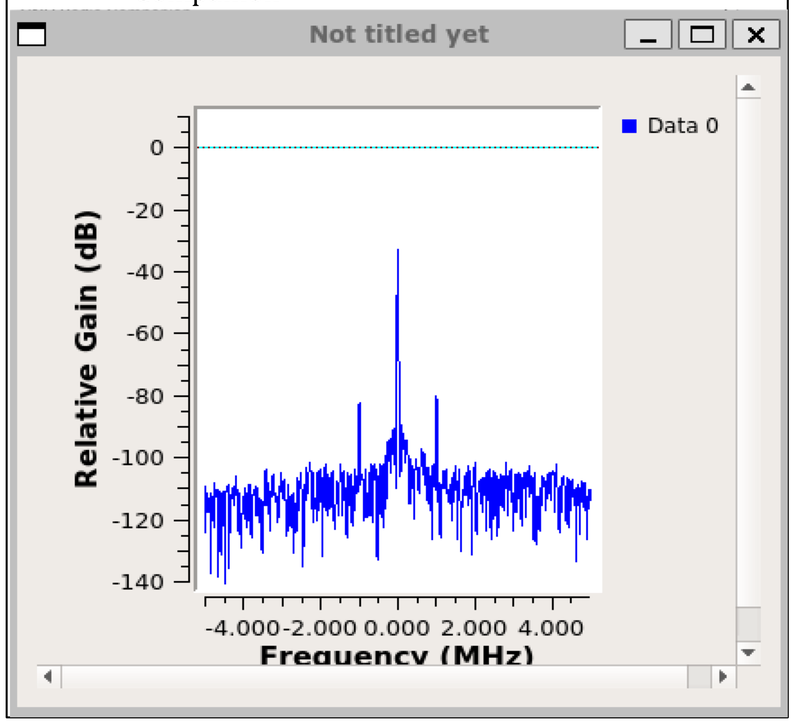
- Sandboxes in Orbit facilities
- USRP2
- USRPX310

Experiments

1. Working with USRP2
   - Transmit and receive a single frequency over the air to demonstrate the use of Universal software Radio peripheral Hardware Drivers (UHD)
   - The output displays a frequency spectrum in the terminal. It shows a peak at 1800MHz.

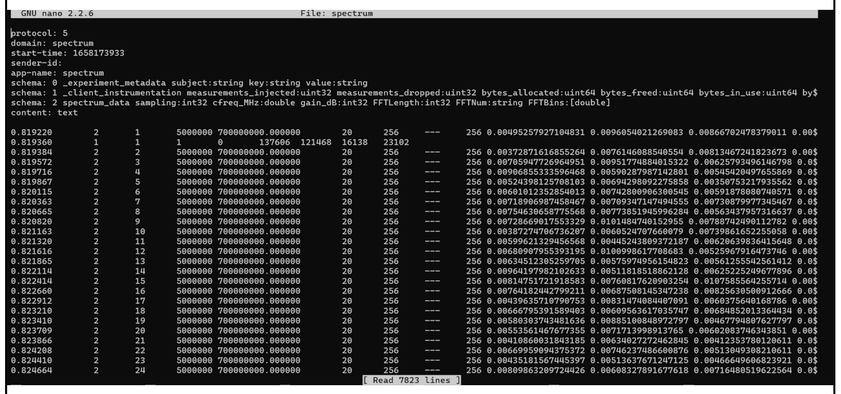


2. Working with USRP X310
   - Used two USRP X310s on ORBIT Sandbox 2 to transmit and receive a single frequency over the air
   - The spectrum was plotted using GNU Companion



Data Collection

- Using USRP2 and WISERD we collected the spectrum data



UHD, USRP and GNU

- **USRP:** Universal Software Radio Peripheral (USRP) is software-defined RF architecture which is used to design, prototype, and deploy wireless systems with custom signal processing
- **UHD:** USRP Hardware Driver (UHD) is a software API (Application Program Interface) that supports application development on all USRP SDR products
- **GNU Radio:** Is a simulation software for SDR development (Software Defined Radio)

Future Work

- With the collected data, use AI and ML approaches to build intelligent networks, in order to adapt their spectral behaviour
- Based on the behavior of different wireless user, use algorithm to assign limit spectrum capacity in a more efficient way

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