Configure/Set-up Your Own CubeSat

Lab task description

You will communicate with the satellite with a variety of modulation modes. This will involve using the ground station (Raspberry Pi 4) and an RTL-SDR receiver to read and demodulate the satellite signal.

Lab objective

Successfully decode FSK, BPSK, and SSTV telemetry/transmissions from the satellite.

Lab instruction

FSK Telemetry Decoding:

1. Hold the button on the CubeSat until the Green LED blinks fast 2 times.
2. Let the CubeSat reboot.
3. On your ground station Raspberry Pi 4, open up Open FoxTelem.
4. Select the FSK DUV option.
5. Set the center frequency to the frequency assigned to your satellite. (note this is in kHz, not MHz)
6. On the FFT plot (red graph) use the right click on your mouse to fine tune the desired frequency.
   a. Match the black line to the peak of the signal.
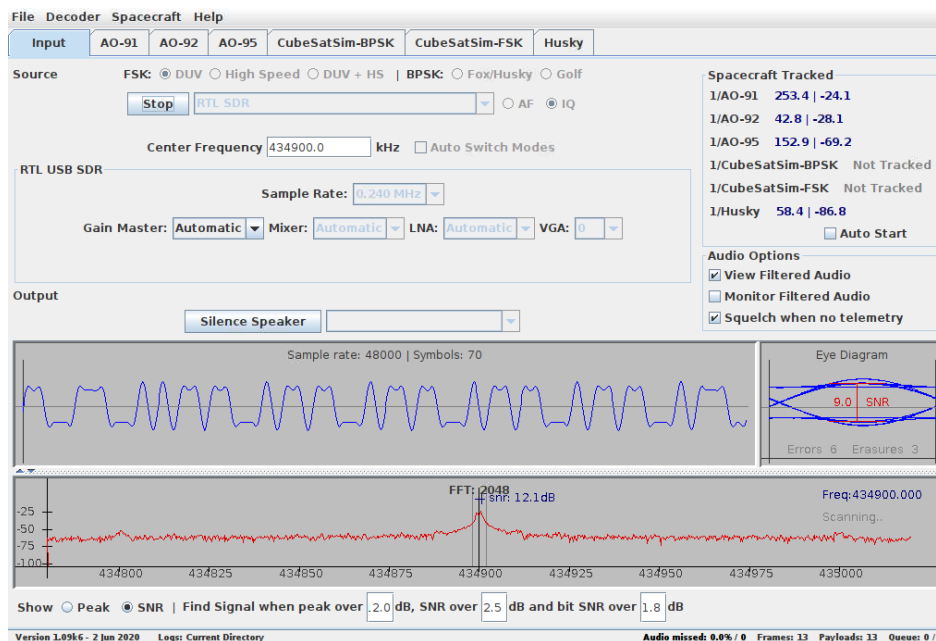
   b.

7. Open the Health tab.
8. You should start seeing the "Telemetry Payloads Decoded" count increase from zero.
    a. If not, try moving the center frequency around.
9. You will begin seeing telemetry data from the satellite!
10. You can try some tests with the satellite:
    a. Shake the satellite, see if the acceleration changes.
    b. Shine a light into one of the solar panels to see if the voltage increases.
    c. Breathe into the temperature/humidity sensor. On the STEM board, it is the purple sensor. Does the temp/humidiity increase?

BPSK Telemetry Decoding:

1. BPSK 1200bps demodulation is faster, than the FSK mode (300bps).
2. To decode using BPSK,hold the button on the CubeSat until the Green LED blinks fast 3 times.
3. Let the CubeSat reboot.
4. On FoxTelem, select the BPSK Fox/Husky option.
5. Use the same steps in the FSK task to center the frequency; line up the peak of the signal to the black line.
6. You should start seeing the "Telemetry Payloads Decoded" count increase from zero
7. Try and perform the same tests, the data should update faster.

SSTV Decoding:

1. Hold the button on the CubeSat until the Green LED blinks fast 4 times.
2. Let the CubeSat Reboot.
3. Open the SSTV Decode app on the Desktop.
4. Select the option to choose another frequency.
5. Enter in the Tx frequency of your satellite.
6. When the blue LED on your satellite lights up, it will start transmitting.
7. You should start decoding some images on the SSTV app.
8. The first image will be a picture of the CubeSat, then the next images will use the camera to snap a photo. The photo will then be transmitted via SSTV.
9. Take a selfie!