Installing and Scanning with RTLSDR

RTLSDR scanner generates a visual representation of received radio signal.

Installing the RTLSDR scanner

- 1. Go to <u>https://github.com/EarToEarOak/RTLSDR-Scanner/releases</u> and download the file rtlsdr_scanner-setup-win32.exe (Figure 14).
- R-Scanner Music Q II Pull requests 2 ⊙ Actions E Projects © Security Int Insights V1.3.2: Merge pull request #42 from GeoffMac © EartoEarOak released this on May 3, 2018 Hadated Int. Lawsthed by update checker Prop (Front to is)that. Flares #3 Assets 3 © rthat summer setup-win32.exe © Source code (Jip) © Source code (Jip)

Figure 1 Download page for RTLSDR Scanner

2. Opening the downloaded file will run a Windows installer that will automatically download and install the various dependencies that are required for the software to run.

Select the full install option. When the installer progresses to the "Choose components", make sure that all the dependencies are selected for installation (Figure 15).



Figure 2 The Choose components window with all options selected.



 After installing RTLSDR Scanner, navigate to the newly created application folder (likely to be C:/Program Files (x86)/RTLSDR Scanner and open the BBCR2 file to run the application. A black box may appear while the program is loading. This program may take longer than expected to load.



Figure 3 Double click to run BBCR2

4. When RTLSDR Scanner opens, as a test scan the FM frequency band (88-108 MHz) to identify known FM stations in the local area. Enter the lower and upper bounds of the range of frequencies to be scanned in the Start and Stop boxes at the bottom of the window (Figure 16). Set the gain with the pull down menu. A value

Set the gain with the pull down menu. A value around 40 is generally appropriate (Figure 17).



Figure 4 The start and stop boxes are circled in red. The gain box is circled in green.

5. Press Start to begin scanning.

The mode can be set to either continuous or single. In continuous mode the scanner will



continuously refresh the spectrum every time it finishes one pass, in single mode the scanner will perform one scan and then stop. There are several things that can be done to improve the quality of the graph. The dwell time indicates how long the scanner will analyze the signal for a frequency range before recording the values. The longer the dwell time the cleaner the peaks in the graph. However, it will take the computer longer to create a graph from this data. Another value that will affect the cleanness of the graph is the FFT size. This value is the number of samples that are collected. The more samples collected the clearer the peaks in the graph. However, the greater the number of samples collected, the slower the computer will analyze the data to create a graph.

RTLSDR Scanner can also display the band scan as a spectrogram or 3D spectrograph by changing the settings in the Display pull down box.

Scanning at frequencies below the FM band will be limited by the efficacy of the provided monopole antenna. Reception above the FM band can be improved by extending the telescoping antenna to a length of approximately 1/4 wavelength of the desired frequency. For example at 100 MHz

$$\lambda = \frac{c}{f} = \frac{3 x \, 10^8 \, m/s}{100 \, x \, 10^6 \, s^{-1}} = 3 \, m \qquad \text{so:} \ \frac{1}{4} \, \lambda = 0.75 \, m$$

To improve the reception of a particular signal, adjust the length of the antenna. First, use the speed of sound and the frequency to find the wavelength.

$$\lambda = \frac{c}{f}$$

Example: 100 MHz

$$\lambda = \frac{c}{f} = \frac{3 \, x \, 10^8 \, m/s}{100 \, x \, 10^6 \, s^{-1}} = 3 \, m$$

Now that the wavelength is known, the optimal length for the antenna can be found using the formula below.

$$1/4 \lambda =$$

Example: Continuing with the 100MHz example from above we get



$$1/4 \lambda = 0.75 m$$

Depending on the chosen settings and the computer's capabilities, scanning bandwidths of 50 MHz should work reasonably well. Larger bandwidths can use a great deal of computer processing power, but performance may vary. To improve performance, scan in chunks, adjusting antenna length to the appropriate length for the chosen frequency range.

