Setting up SDR and the Antenna

Software-defined radio (SDR) is a radio communication system where information is received and decoded

Hardware Setup

1. Assemble the antenna by screwing the telescoping monopole onto the threaded base (Figure 1).

2. Remove the protective covers from the connectors on the SDR dongle

Figure 1 The telescoping antenna (above) and threaded base (below)

3. Screw the connector at the end of the antenna cable to the matching threaded connector on the dongle (Figure 2).
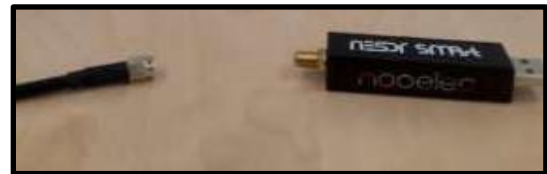

Figure 2: The ends of the antenna (left) and dongle (right) are connected.

4. The completed assembly can be seen in Figure 3.

Figure 3 The completed assembly.

Installing Supporting Software

.NET Installation

5. Download the most recent version of the .NET redistributable (currently 8.0) should be downloaded or installed before installing SDR#.

   https://dotnet.microsoft.com/en-us/download/dotnet/8.0/runtime
   (last accessed April 11, 2024)

6. From the "Run desktop apps" selection, click the "Download x86" version As SDR# is a 32 bit application, there have been problems with the 64 bit version of .NET; the 32 bit "x86" version has been more reliable. (Figure 4).

Figure 4 The .Net download screen. For best results select x86

7. Once the file has been downloaded, double-click to run the installation.

SDR# Installation

8. Go to https://airspy.com/download/ and click on the "download" button (Figure 5).

Figure 5 The download button is light blue and on the far right side of the screen.9

9. Extract (unzip) sdrsharp-x86.zip onto the computer.

10. Double-click on install-rtlsdr from within the extracted folder (Figure 5). This will start a command prompt used to download all required drivers. The command prompt will automatically close.
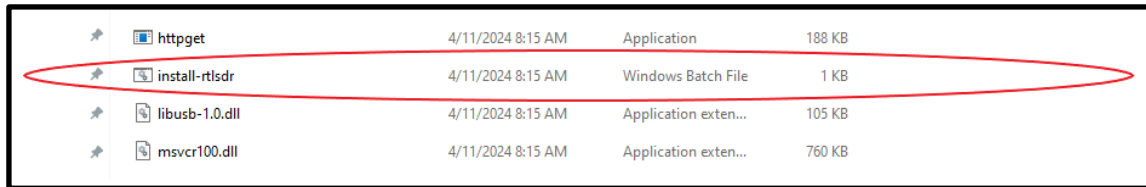

Figure 5: The install file for SDR# is circled in red.

11. Plug in the dongle and wait for any plug and play pop up to complete the installation

12. In the folder where the sdrsharp files were extracted to, find the file called Zadig. Right click and select "Run as administrator".

13. Select Options from the menu bar. In the pop-up that appears ensure the following is selected:
   - List All Devices
   - Create a Catalog File
   - Sign Catalog & Install Autogenerated Certificate

   Make sure the following is NOT selected:
   - Ignore Hubs or Composite Parents
   - Advanced Mode
   - Log Verbosity

    (Figure 6)

Figure 6 Correct configuration within the options menu.

14. Select RTL2832UHIDIR or RTL2832U from the drop-down list in the center of the Zadig dialog box.

    Do NOT select "Bulk-In, Interface (Interface 0)", "Bulk-In, Interface (Interface 1) " or "USB Receiver (Interface 0)") (Figure 7)

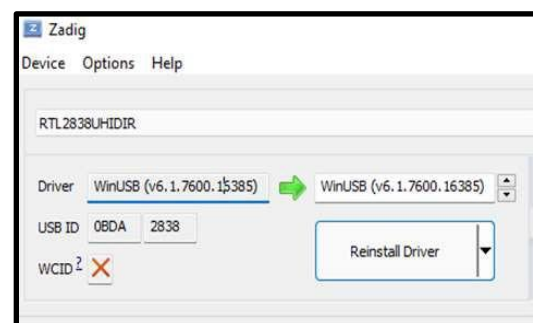15. Ensure that WinUSB is selected in the box next to where it says driver (Figure 7).

Figure 7 Correct configuration for driver selection.

16. Click Install Driver or Replace Driver. A warning may appear saying that the publisher cannot

be verified, but click "Install this driver software anyway".

IMPORTANT: This driver has only been installed onto the USB port that the dongle is plugged into. Note which USB port has the dongle plugged into. If the dongle is moved to another port, or an additional dongle is used, zadig.exe will need to installed for any USB port used.

17. Open SDRSharp by clicking on the SDRSharp application icon which is in the same folder as Zadig (Figure 8).
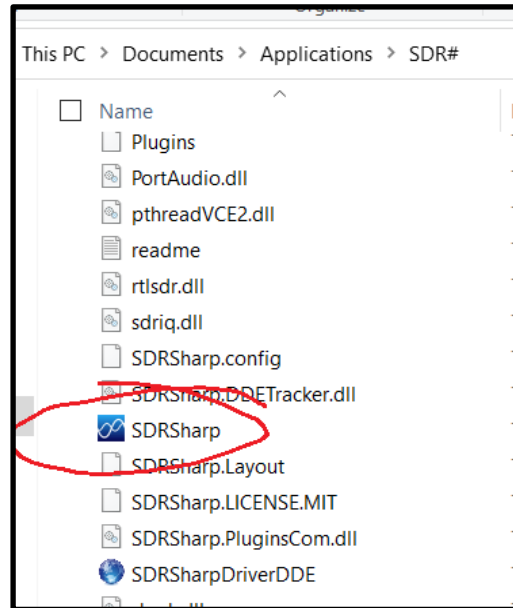

Figure 8: The SDR# icon is circled in red.

18. When SDR# opens, go to the main menu (three white lines at the top left. Put your cursor over Source and from the menu that appears select RTL-SDR USB (Figure 9).
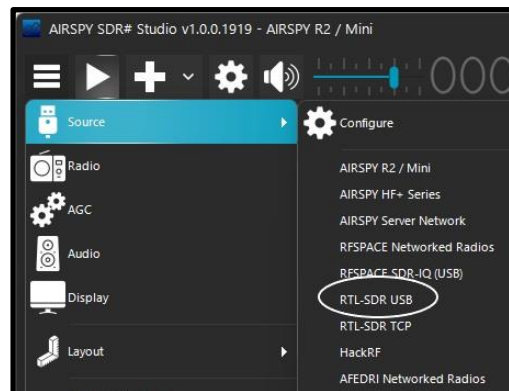

Figure 9: The correct source is circled in white.

19. Set the Gain. The gain adjuster is located on the main page of SDR#. Look at the bottom of the menu bar that is located on the left side of the screen (Figure 10). By default, the RTL- SDR's gain is set to zero. Increase this gain by moving the RF Gain slider up. Gain is an amplification factor—it increases the strength of the signal so that the software can detect it. Gain values of around 40 are commonly used. Alternatively, the AGC (automatic gain control) option can be enabled.
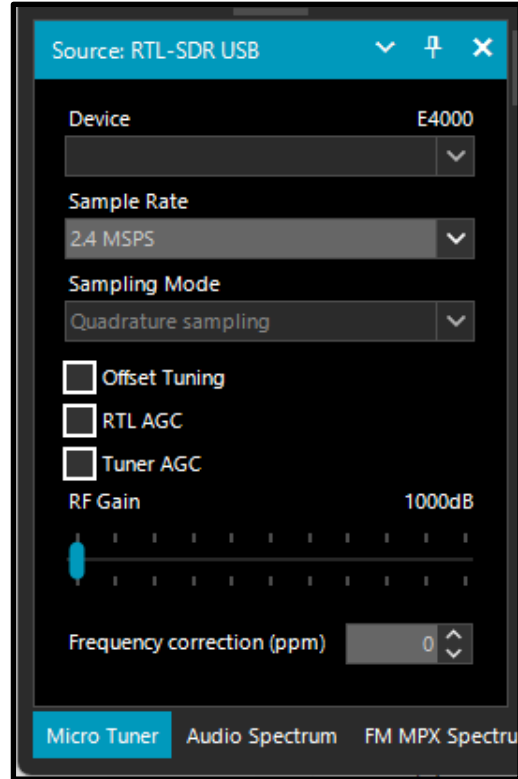
#

Figure 10: The gain adjustment bar is at the bottom of this picture.

20. Press the Play button. The RTL-SDR software radio should now be playing some static and showing an RF spectrum and waterfall display (Figure 11). Using the frequency range at the top of the program window, tune to different broadcast signals.
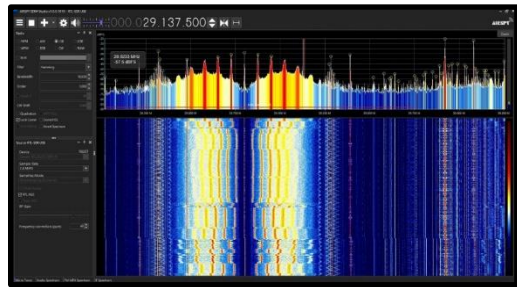

Figure 11: The waterfall produced by SDR

See the SDR# users guide at https://www.rtl-sdr.com/sdrsharp-users-guide/ for more information on the use of SDR# and its various settings.

Improving Reception

Ground Plane

The performance of the monopole antenna can be improved by placing it on a flat metallic surface that has a radius similar to or larger than the length of the antenna (Figure 12). Even if the metal disc has a smaller radius, it will help in most cases to improve reception. The metallic surface could be anything - most easily it could be something like the lid from a coffee tin, or the tin cover of a metal cookie or chocolate box. Placing it on a metallic surface completes the antenna as a quarter wave ground plane.
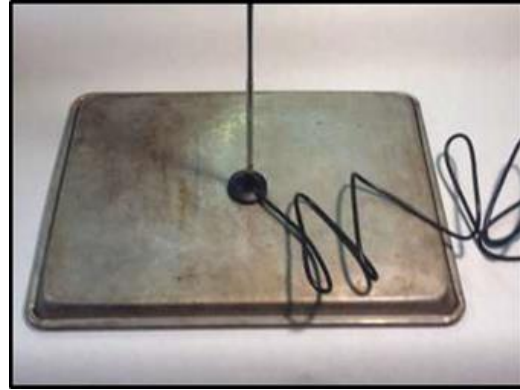

Figure 12: The ground plane set up under the antenna.

Coax Choke

Another improvement that can improve performance is to create a common mode coax choke. A choke will stop unwanted currents in the coax shield. This helps to remove the effect of the coax cabling becoming a part of the antenna and undesirably skewing the radiation pattern. To create a coax choke find cylindrical object about 2 - 3 cm in diameter, like a marker pen and create about 5 - 10 turns of coax cabling around it (Figure 13). A ferrite core can be used it as the winding center for even better performance. With a ferrite core there are fewer turns required for the same effect as with a non- ferrite core (Figure 14). Make the winding as close to the antenna base as possible.

Figure 13: A simple coax choke made from a circle of cable.

Figure 14: a coax choke with a ferrite core.