Student's Name

Department, Institutional Affiliation

Course Name and Number

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Due Date

RTL SDR Configuration via MATLAB

1. Introduction:

In this report, we will learn how to configure a RTL-SDR dongle with MATLAB. RTL-SDR dongles are used in signal processing where a live FM signal is captured via dongles and is processed to listen to the FM signals and design filters. A RTL-SDR dongle allows the reception of a wide range of FM signals.

2. Objective:

Given the use of these dongles, it is essential to know how these devices are configured in MATLAB. So, we will learn how these dongles are integrated via MATLAB.

3. Hardware and Software:

3.1 Hardware

3.1.1 DVB-T+DAB+FM USB 2.0

3.1.2 Laptop with a USB port available

3.2 Software

3.2.1 MATLAB

3.2.2 Hardware support package for the RTL-SDR dongle

4 Configuration Procedure:

4.1 Check the Communications Toolbox Support Package for RTL-SDR Radio:

First, check for the RTL_SDR [1] hardware support package [2] by going to the *HOME* page of MATLAB. There, in the right corner, look for the *Add-Ons* button, and scroll down this option until you see *Manage Add-Ons*. A window of installed packages will appear. *Communications Toolbox Support Package for RTL-SDR Radio* should appear under the list of installed packages; if not, install it by using the *Add-Ons* option on the *HOME* page.

4.2 Connect the dongle to the USB port:

Connect the RTL-SDR dongle to an available USB port of the laptop, and a solid (usually blue) light will turn on, representing that the USB is connected.

4.3 MATLAB Configuration:

In the empty script of MATLAB, write a simple code to configure the dongle at the desired frequency and set its PPM (parts per million) offset value, as these dongles are manufactured en masse and will have a small frequency error. Parameters like the

number of samples and decimation factor depend on the application which is meant to be designed. Define a communication receiver object to capture the signal.

4.4 Code Snippet:

A code snippet describing the receiver object can be seen in Figure 1, where the central frequency is set to the frequency of the FM station we want to capture:

```
hSDRrRx = comm.SDRRTLReceiver(...
    'RadioAddress', '0',...
    'CenterFrequency',      expFreq, ...
    'EnableTunerAGC',       true, ...
    'SampleRate',           FESR, ...
    'SamplesPerFrame',      nSample, ...
    'FrequencyCorrection', PPM, ...
    'OutputDataType',       'double');
```

Figure 1 RTL-SDR Receiver Object

4.5 Results:

Once the device is successfully configured, print statements can be used to observe the state of the connections, as seen in Figure 2. Once I configured the dongle, I used the signal object received to plot the spectrum of the signal [3], as in Figure 3.

```
ans =

  1×3 cell array

    {'Default'}    {'Primary Sound Driver'}    {'Speakers (Realtek High Definit...'}

RTL-SDR device connected.
Receive time 136.533333 [s]
Audio player queue underrun by 8192 samples.
```

Figure 2 Device Connected

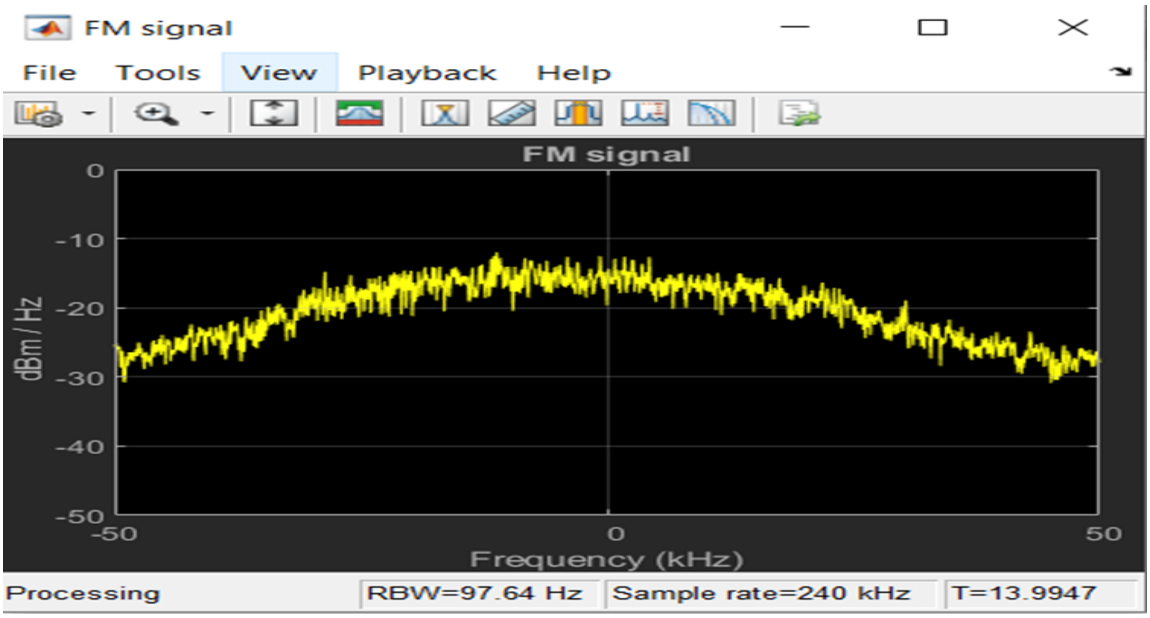

Figure 3 Received Signal

References

"rtl-sdr," [Online]. Available: https://www.rtl-sdr.com/about-rtl-sdr/.

MATALB. [Online]. Available: https://se.mathworks.com/matlabcentral/fileexchange/44991-communications-toolbox-support-package-for-rtl-sdr-radio?s_tid=srchtitle_support_results_1_rtl%20sdr.

MATLAB. [Online]. Available: https://se.mathworks.com/help/comm/rtlsdrradio.html?searchHighlight=rtl%20sdr&s_tid=srchtitle_support_results_2_rtl%20sdr.