CSE310 Final Project

MINI RF Jammer, FM Radio Receiver

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MINI RF Jammer

Current Progress:

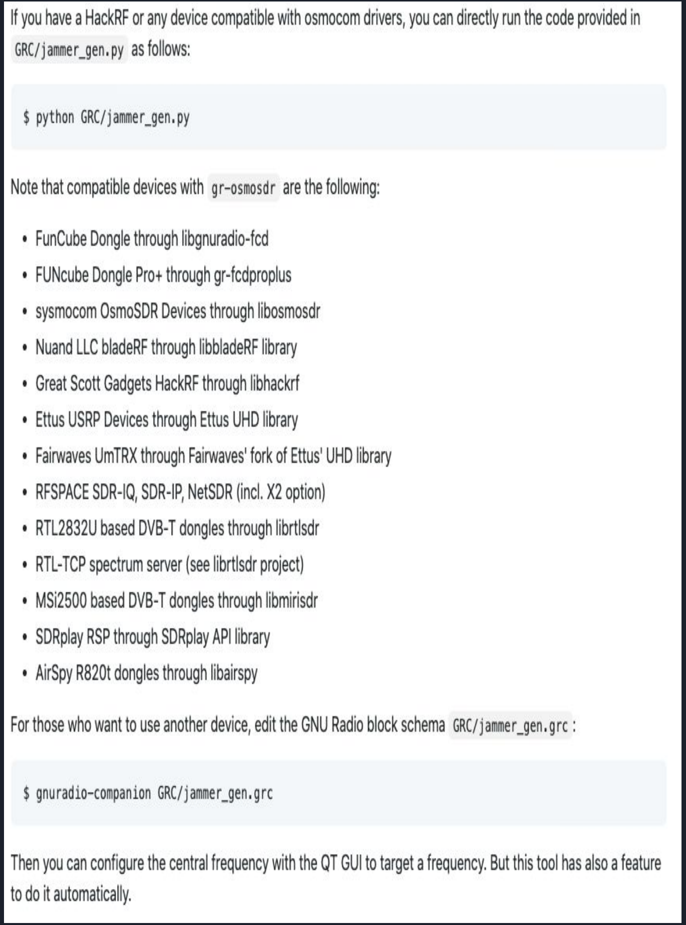
1. Installed driver for Adalm-Pluto on Windows and Ubuntu 20.04
2. Installed libiio
3. GNU Radio Installed
4. Modmobmap Installed on Ubuntu

Issues:

Execute flow graph failed

Possible Reason:

- Open Source file not compatible with plutoSDR
- Libiio is not properly configured or installed



If you have a HackRF or any device compatible with osmocom drivers, you can directly run the code provided in `GRC/jammer_gen.py` as follows:

```
$ python GRC/jammer_gen.py
```

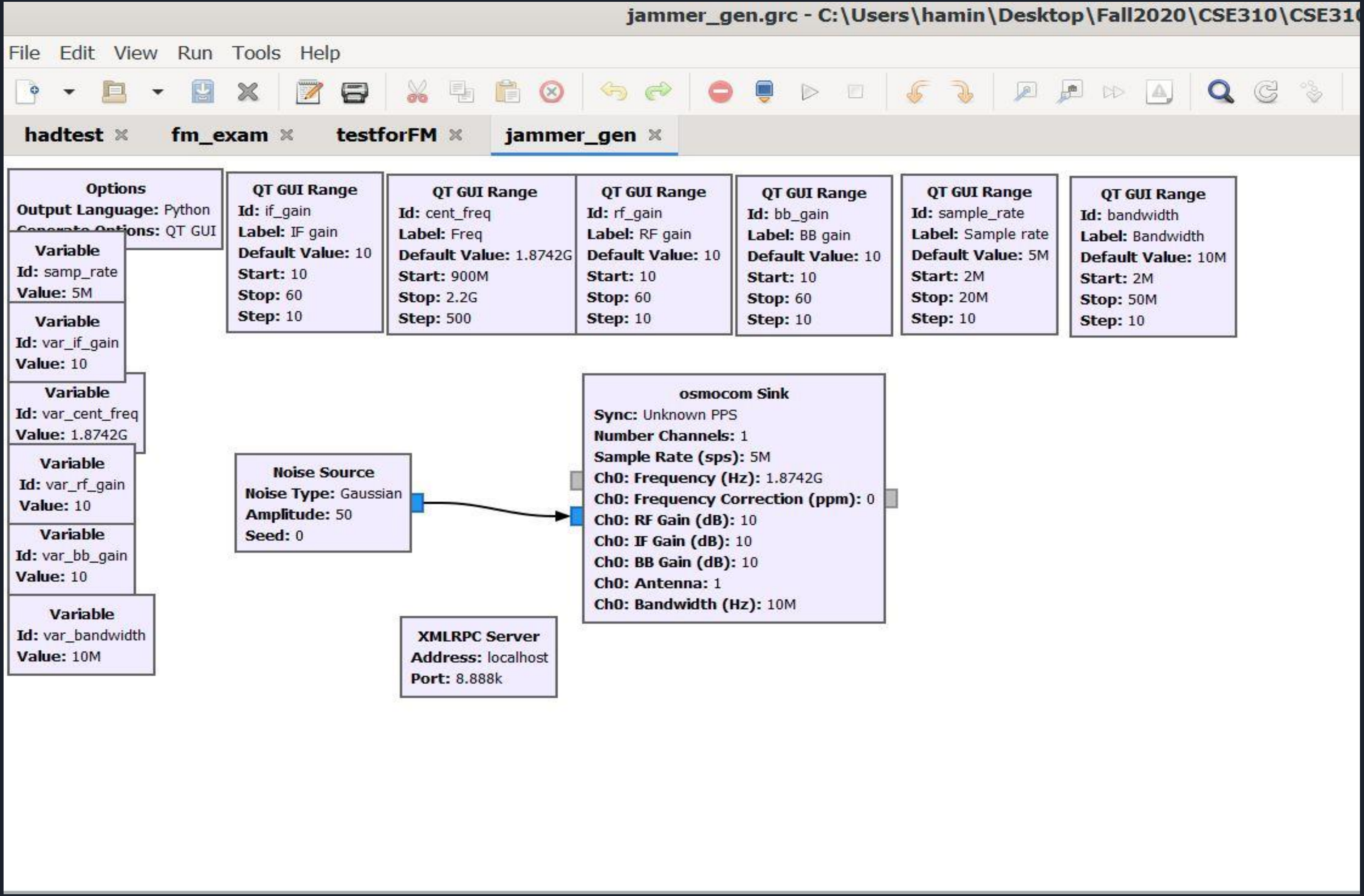
Note that compatible devices with `gr-osmosdr` are the following:

- FunCube Dongle through libgnuradio-fcd
- FUNcube Dongle Pro+ through gr-fcdproplus
- sysmocom OsmoSDR Devices through libosmosdr
- Nuand LLC bladeRF through libbladeRF library
- Great Scott Gadgets HackRF through libhackrf
- Ettus USRP Devices through Ettus UHD library
- Fairwaves UmTRX through Fairwaves' fork of Ettus' UHD library
- RFSPACE SDR-IQ, SDR-IP, NetSDR (incl. X2 option)
- RTL2832U based DVB-T dongles through librtlsdr
- RTL-TCP spectrum server (see librtlsdr project)
- MSi2500 based DVB-T dongles through libmirisdr
- SDRplay RSP through SDRplay API library
- AirSpy R820t dongles through libairspy

For those who want to use another device, edit the GNU Radio block schema `GRC/jammer_gen.grc` :

```
$ gnuradio-companion GRC/jammer_gen.grc
```

Then you can configure the central frequency with the QT GUI to target a frequency. But this tool has also a feature to do it automatically.


jammer_gen.grc - C:\Users\hamin\Desktop\Fall2020\CSE310\CSE31
File
Edit
View
Run
Tools
Help
hadtest
fm_exam
testforFM
jammer_gen

Options
Output Language: Python
Generate Options: QT GUI

Variable
Id: samp_rate
Value: 5M

Variable
Id: var_if_gain
Value: 10

Variable
Id: var_cent_freq
Value: 1.8742G

Variable
Id: var_rf_gain
Value: 10

Variable
Id: var_bb_gain
Value: 10

Variable
Id: var_bandwidth
Value: 10M

QT GUI Range
Id: if_gain
Label: IF gain
Default Value: 10
Start: 10
Stop: 60
Step: 10

QT GUI Range
Id: cent_freq
Label: Freq
Default Value: 1.8742G
Start: 900M
Stop: 2.2G
Step: 500

QT GUI Range
Id: rf_gain
Label: RF gain
Default Value: 10
Start: 10
Stop: 60
Step: 10

QT GUI Range
Id: bb_gain
Label: BB gain
Default Value: 10
Start: 10
Stop: 60
Step: 10

QT GUI Range
Id: sample_rate
Label: Sample rate
Default Value: 5M
Start: 2M
Stop: 20M
Step: 10

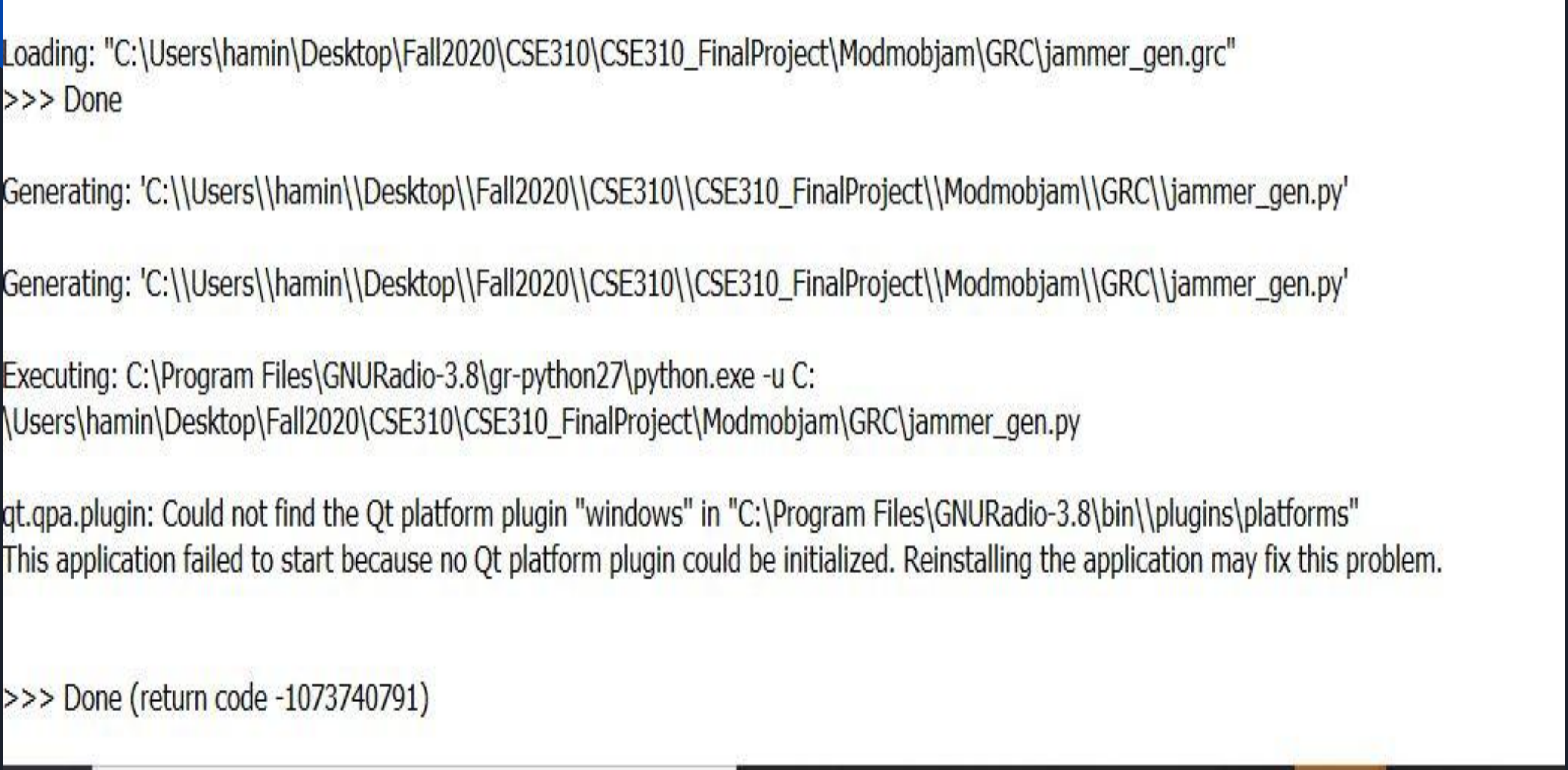
QT GUI Range
Id: bandwidth
Label: Bandwidth
Default Value: 10M
Start: 2M
Stop: 50M
Step: 10

Noise Source
Noise Type: Gaussian
Amplitude: 50
Seed: 0

osmocom Sink
Sync: Unknown PPS
Number Channels: 1
Sample Rate (sps): 5M
Ch0: Frequency (Hz): 1.8742G
Ch0: Frequency Correction (ppm): 0
Ch0: RF Gain (dB): 10
Ch0: IF Gain (dB): 10
Ch0: BB Gain (dB): 10
Ch0: Antenna: 1
Ch0: Bandwidth (Hz): 10M

XMLRPC Server
Address: localhost
Port: 8.888k

Unable to find the correct Plugins



```
Loading: "C:\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\Modmobjam\GRC\jammer_gen.grc"
>>> Done

Generating: 'C:\\Users\\hamin\\Desktop\\Fall2020\\CSE310\\CSE310_FinalProject\\Modmobjam\\GRC\\jammer_gen.py'

Generating: 'C:\\Users\\hamin\\Desktop\\Fall2020\\CSE310\\CSE310_FinalProject\\Modmobjam\\GRC\\jammer_gen.py'

Executing: C:\Program Files\GNURadio-3.8\gr-python27\python.exe -u C:
\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\Modmobjam\GRC\jammer_gen.py

qt.qpa.plugin: Could not find the Qt platform plugin "windows" in "C:\Program Files\GNURadio-3.8\bin\\plugins\platforms"
This application failed to start because no Qt platform plugin could be initialized. Reinstalling the application may fix this problem.


>>> Done (return code -1073740791)
```

FM Radio

Current Progress:

By using the GNU Radio Companion, we are trying to set the Pluto SDR to receive the FM signal.

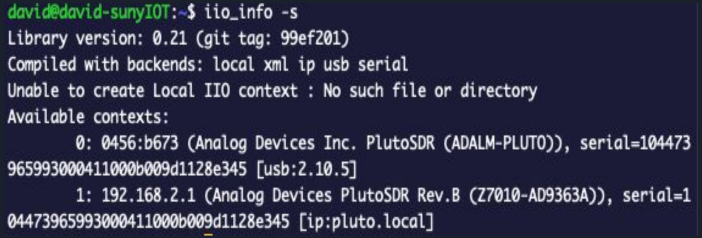
Issues:

1. GNU Radio Companion cannot detect the Adalm-Pluto, we might have to find a way to solve this problem. GNU Radio
2. Companion does not have GUI block for the Pluto SDR Source or the Sink.
3. “Unable to create Local IIO context…”
4. The author of open source(provided from the instruction) used RTL_SDR instead of Adalm Pluto. Pluto is not osmocom driver compatible.

Possible Alternative Solution:

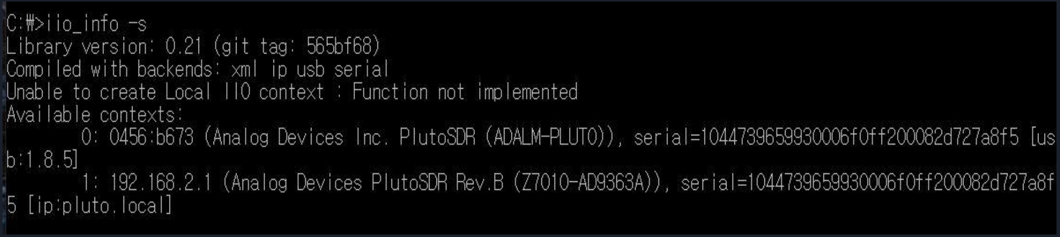
1. Connect the Adalm-Pluto with the SDRAngel and try to transmit the frequency.
2. Use GQRX to connect with Adalm-Pluto. GQRX has the FM radio as build-in plugin and supports Adalm-Pluto.

Ubuntu 20.04

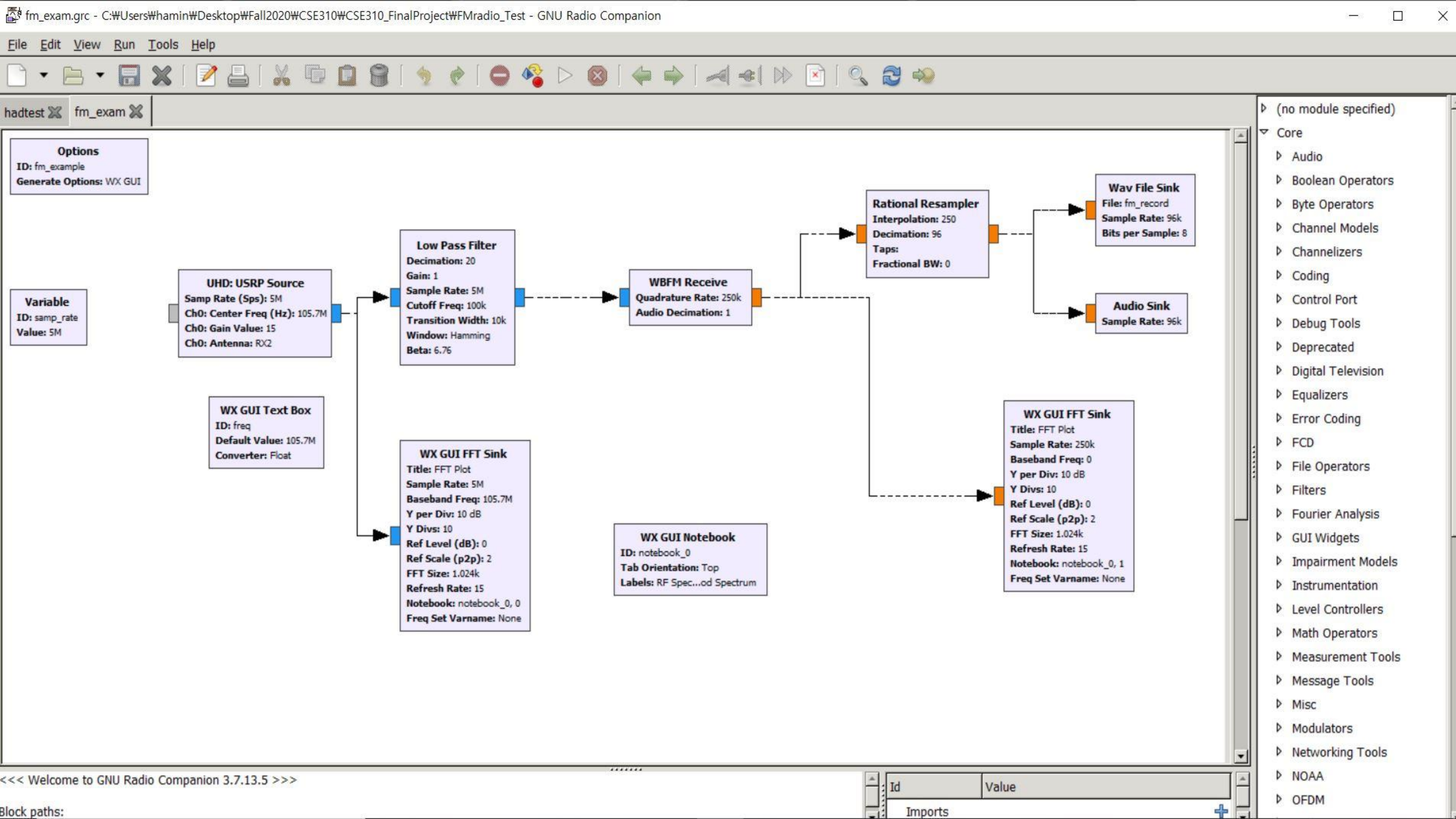


```
david@david-sunyIOT:~$ iio_info -s
Library version: 0.21 (git tag: 99ef201)
Compiled with backends: local xml ip usb serial
Unable to create Local IIO context : No such file or directory
Available contexts:
        0: 0456:b673 (Analog Devices Inc. PlutoSDR (ADALM-PLUTO)), serial=104473
965993000411000b009d1128e345 [usb:2.10.5]
        1: 192.168.2.1 (Analog Devices PlutoSDR Rev.B (Z7010-AD9363A)), serial=1
0447396599300041100b009d1128e345 [ip:pluto.local]
```

Windows 10



```
C:₩>iio_info -s
Library version: 0.21 (git tag: 565bf68)
Compiled with backends: xml ip usb serial
Unable to create Local IIO context : Function not implemented
Available contexts:
        0: 0456:b673 (Analog Devices Inc. PlutoSDR (ADALM-PLUTO)), serial=1044739659930006f0ff200082d727a8f5 [us
b:1.8.5]
        1: 192.168.2.1 (Analog Devices PlutoSDR Rev.B (Z7010-AD9363A)), serial=1044739659930006f0ff200082d727a8f
5 [ip:pluto.local]
```



Options
ID: fm_example
Generate Options: WX GUI

Variable
ID: samp_rate
Value: 5M

UHD: USRP Source
Samp Rate (Sps): 5M
Ch0: Center Freq (Hz): 105.7M
Ch0: Gain Value: 15
Ch0: Antenna: RX2

Low Pass Filter
Decimation: 20
Gain: 1
Sample Rate: 5M
Cutoff Freq: 100k
Transition Width: 10k
Window: Hamming
Beta: 6.76

WBFM Receive
Quadrature Rate: 250k
Audio Decimation: 1

Rational Resampler
Interpolation: 250
Decimation: 96
Taps:
Fractional BW: 0

Wav File Sink
File: fm_record
Sample Rate: 96k
Bits per Sample: 8

Audio Sink
Sample Rate: 96k

WX GUI Text Box
ID: freq
Default Value: 105.7M
Converter: Float

WX GUI FFT Sink
Title: FFT Plot
Sample Rate: 5M
Baseband Freq: 105.7M
Y per Div: 10 dB
Y Divs: 10
Ref Level (dB): 0
Ref Scale (p2p): 2
FFT Size: 1.024k
Refresh Rate: 15
Notebook: notebook_0, 0
Freq Set Varname: None

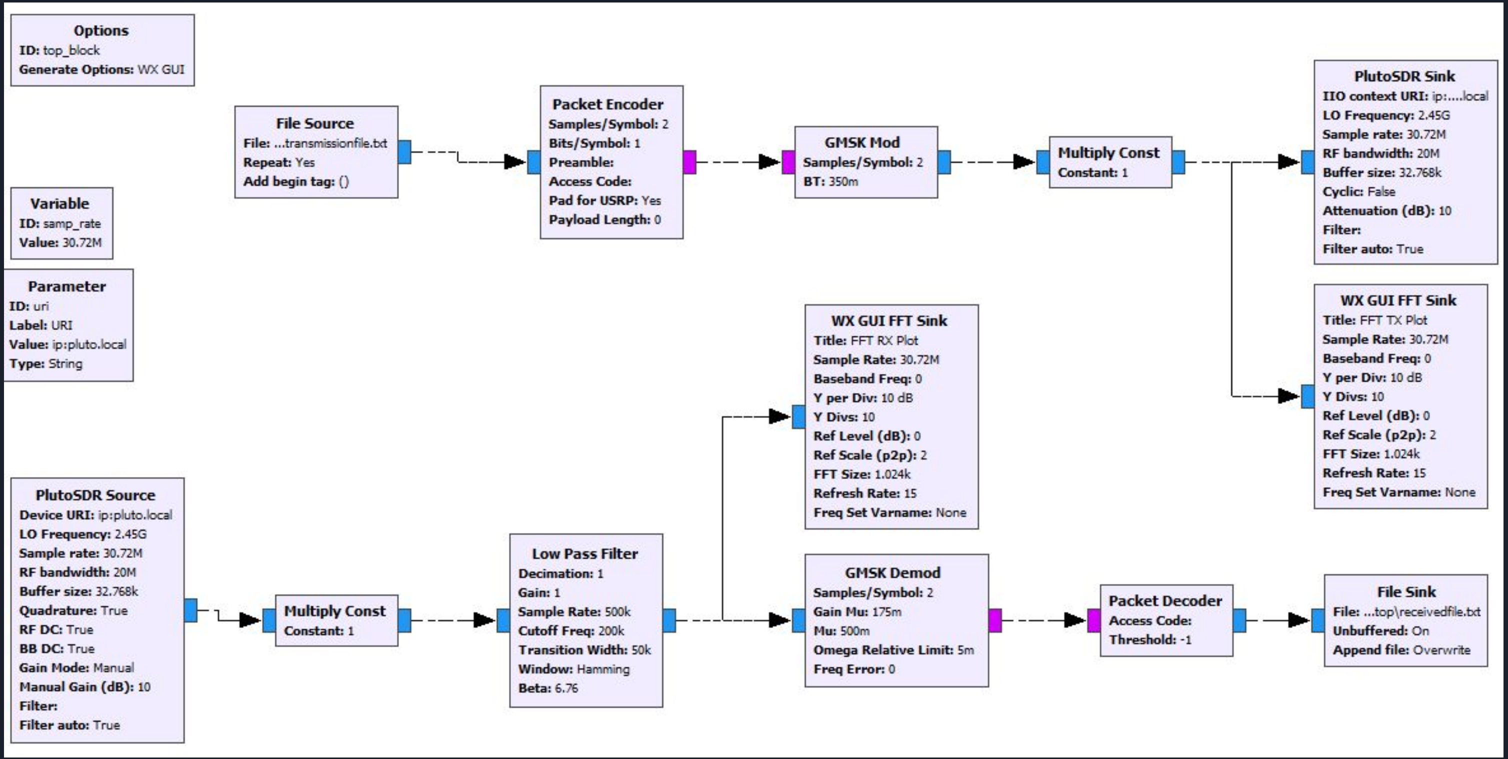
WX GUI Notebook
ID: notebook_0
Tab Orientation: Top
Labels: RF Spec...od Spectrum

WX GUI FFT Sink
Title: FFT Plot
Sample Rate: 250k
Baseband Freq: 0
Y per Div: 10 dB
Y Divs: 10
Ref Level (dB): 0
Ref Scale (p2p): 2
FFT Size: 1.024k
Refresh Rate: 15
Notebook: notebook_0, 1
Freq Set Varname: None

```
<<< Welcome to GNU Radio Companion 3.7.13.5 >>>

Block paths:
```

Alternative Open Source for PlutoSDR



Options
ID: top_block
Generate Options: WX GUI

Variable
ID: samp_rate
Value: 30.72M

Parameter
ID: uri
Label: URI
Value: ip:pluto.local
Type: String

File Source
File: ...transmissionfile.txt
Repeat: Yes
Add begin tag: ()

Packet Encoder
Samples/Symbol: 2
Bits/Symbol: 1
Preamble:
Access Code:
Pad for USRP: Yes
Payload Length: 0

GMSK Mod
Samples/Symbol: 2
BT: 350m

Multiply Const
Constant: 1

PlutoSDR Sink
IIO context URI: ip:....local
LO Frequency: 2.45G
Sample rate: 30.72M
RF bandwidth: 20M
Buffer size: 32.768k
Cyclic: False
Attenuation (dB): 10
Filter:
Filter auto: True

WX GUI FFT Sink
Title: FFT TX Plot
Sample Rate: 30.72M
Baseband Freq: 0
Y per Div: 10 dB
Y Divs: 10
Ref Level (dB): 0
Ref Scale (p2p): 2
FFT Size: 1.024k
Refresh Rate: 15
Freq Set Varname: None

PlutoSDR Source
Device URI: ip:pluto.local
LO Frequency: 2.45G
Sample rate: 30.72M
RF bandwidth: 20M
Buffer size: 32.768k
Quadrature: True
RF DC: True
BB DC: True
Gain Mode: Manual
Manual Gain (dB): 10
Filter:
Filter auto: True

Multiply Const
Constant: 1

Low Pass Filter
Decimation: 1
Gain: 1
Sample Rate: 500k
Cutoff Freq: 200k
Transition Width: 50k
Window: Hamming
Beta: 6.76

WX GUI FFT Sink
Title: FFT RX Plot
Sample Rate: 30.72M
Baseband Freq: 0
Y per Div: 10 dB
Y Divs: 10
Ref Level (dB): 0
Ref Scale (p2p): 2
FFT Size: 1.024k
Refresh Rate: 15
Freq Set Varname: None

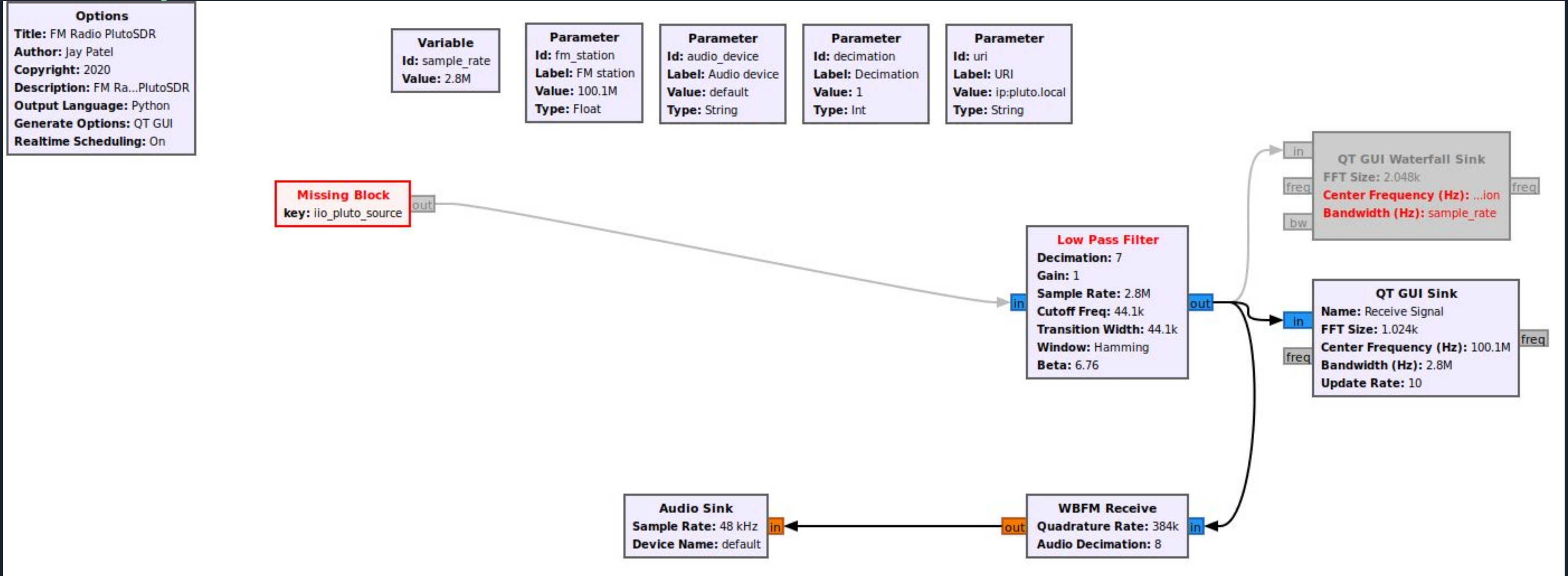
GMSK Demod
Samples/Symbol: 2
Gain Mu: 175m
Mu: 500m
Omega Relative Limit: 5m
Freq Error: 0

Packet Decoder
Access Code:
Threshold: -1

File Sink
File: ...top\receivedfile.txt
Unbuffered: On
Append file: Overwrite

https://github.com/patel999jay/ADALM-Pluto-File-Transfer

Error: Cannot find plutoSDR



Options
Title: FM Radio PlutoSDR
Author: Jay Patel
Copyright: 2020
Description: FM Ra...PlutoSDR
Output Language: Python
Generate Options: QT GUI
Realtime Scheduling: On

Variable
Id: sample_rate
Value: 2.8M

Parameter
Id: fm_station
Label: FM station
Value: 100.1M
Type: Float

Parameter
Id: audio_device
Label: Audio device
Value: default
Type: String

Parameter
Id: decimation
Label: Decimation
Value: 1
Type: Int

Parameter
Id: uri
Label: URI
Value: ip:pluto.local
Type: String

Missing Block
key: iio_pluto_source

QT GUI Waterfall Sink
FFT Size: 2.048k
Center Frequency (Hz): ...ion
Bandwidth (Hz): sample_rate

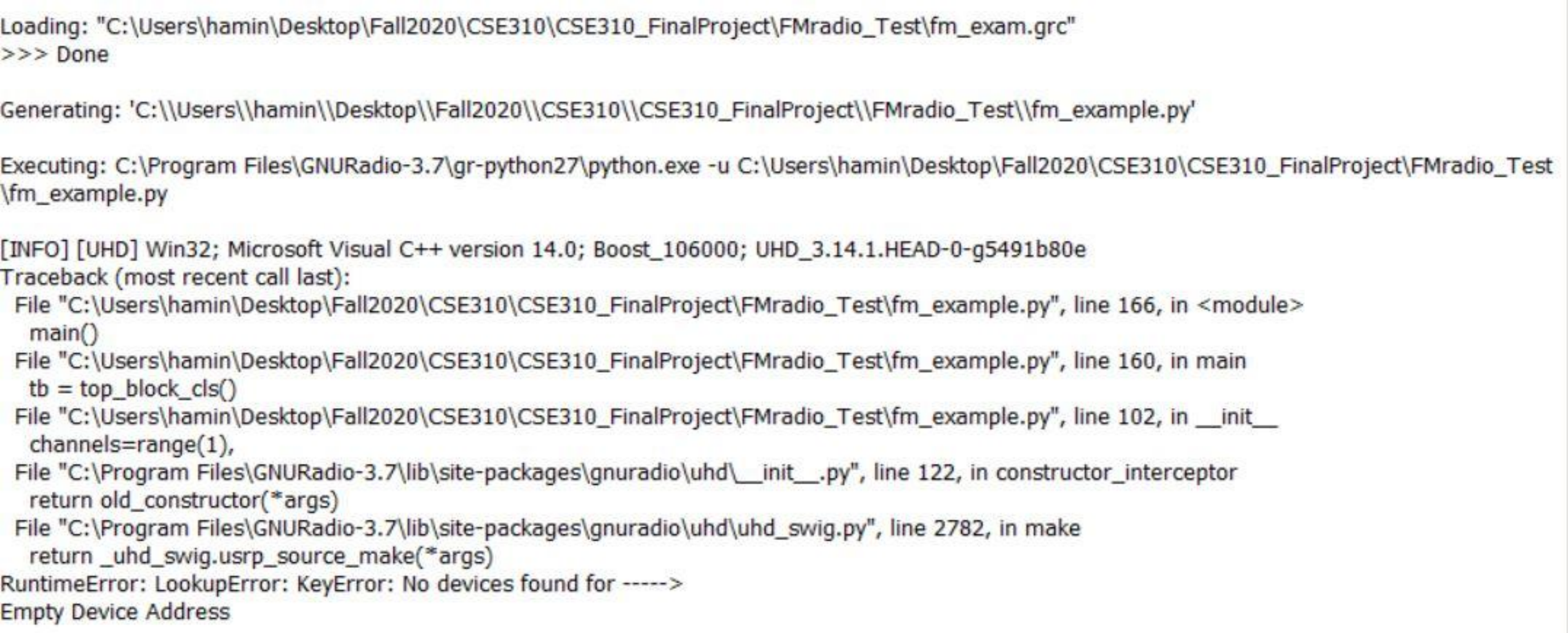
Low Pass Filter
Decimation: 7
Gain: 1
Sample Rate: 2.8M
Cutoff Freq: 44.1k
Transition Width: 44.1k
Window: Hamming
Beta: 6.76

QT GUI Sink
Name: Receive Signal
FFT Size: 1.024k
Center Frequency (Hz): 100.1M
Bandwidth (Hz): 2.8M
Update Rate: 10

Audio Sink
Sample Rate: 48 kHz
Device Name: default

WBFM Receive
Quadrature Rate: 384k
Audio Decimation: 8

Error: Cannot Detect the Device



```
Loading: "C:\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\FMradio_Test\fm_exam.grc"
>>> Done

Generating: 'C:\\Users\\hamin\\Desktop\\Fall2020\\CSE310\\CSE310_FinalProject\\FMradio_Test\\fm_example.py'

Executing: C:\Program Files\GNURadio-3.7\gr-python27\python.exe -u C:\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\FMradio_Test
\fm_example.py

[INFO] [UHD] Win32; Microsoft Visual C++ version 14.0; Boost_106000; UHD_3.14.1.HEAD-0-g5491b80e
Traceback (most recent call last):
  File "C:\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\FMradio_Test\fm_example.py", line 166, in <module>
    main()
  File "C:\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\FMradio_Test\fm_example.py", line 160, in main
    tb = top_block_cls()
  File "C:\Users\hamin\Desktop\Fall2020\CSE310\CSE310_FinalProject\FMradio_Test\fm_example.py", line 102, in __init__
    channels=range(1),
  File "C:\Program Files\GNURadio-3.7\lib\site-packages\gnuradio\uhd\__init__.py", line 122, in constructor_interceptor
    return old_constructor(*args)
  File "C:\Program Files\GNURadio-3.7\lib\site-packages\gnuradio\uhd\uhd_swig.py", line 2782, in make
    return _uhd_swig.usrp_source_make(*args)
RuntimeError: LookupError: KeyError: No devices found for ----->
Empty Device Address
```

Stretch Goal

1. Learn & try how to jam other frequency (e.g., that of bluetooth, high-band 5G)
2. Build a system that sends and receive certain (possibly encrypted) radio signals using SDR like a walkie-talkie.
3. Try with different SDR devices such as bladeRF or RTL_SDR; try other framework such as GQRX.
4. Intercept signals between devices