VE3OOI SIGNAL DECTOR SOFWARE

- ✓ Software written to use Python 3
  - ➢ https://www.python.org/downloads/
  - ➢ Invoke from DOS prompt "python Signal_Detector_TKv0.2.py". Double click on python file may also work
- ✓ Software using PC sound card to process audio from a Radio or an Internet Radio (e.g., WebSDR, KiwiSDR)
- ✓ It performs a FFT and looks for the audio frequency specified in the software
- ✓ It also uses a Lock In detection based on a reference of the audio frequency specified in the software
- ✓ It displays the FFT and Lock In calculated audio signal "strength/magnitude" in a graph. It also displays an alert if the audio frequency was detected
- ✓ It can optionally save the FFT and Lock In calculated audio signal "strength/Magnitude" in a CSV file for offline analysis

Program Overview

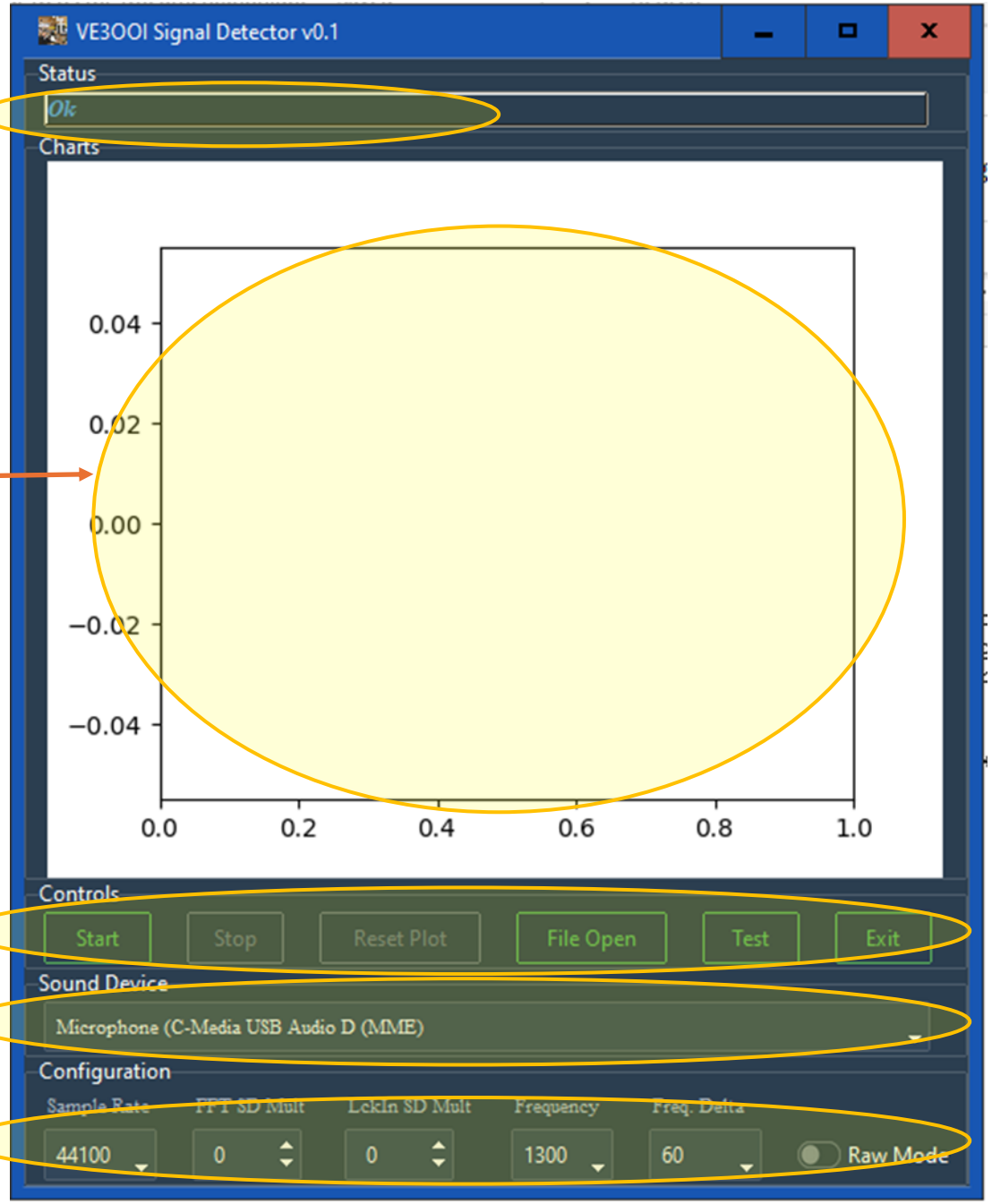
Status window. Displays FFT and Lock In magnitude in real time.

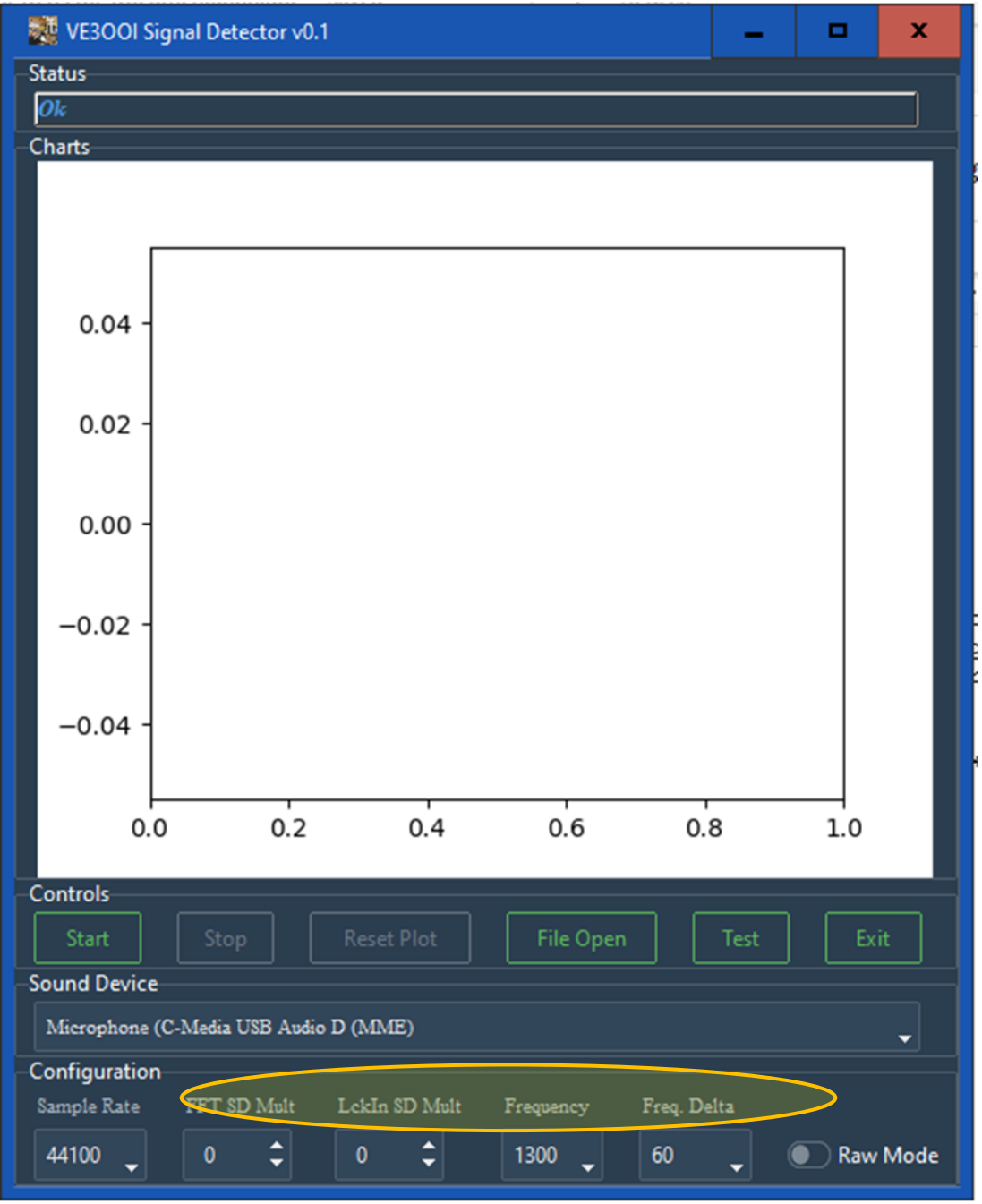
Graph showing FFT and Lock In magnitudes vs time

Program Main Controls Buttons

Sound Card (drop down) to collect audio data from

Configuration/Thresholds Drop Down Boxes





Signal Detection

The “Frequency” dropdown indicates the audio frequency to search for. The QRRS beacon is set to transmits 1300 Hz audio based on USB frequency on the radio (e.g., radio tuned to 14.1 MHz USB, will hear audio at 1300 Hz)

The software could use a threshold to detect the audio signal by using a calculated FFT baseline and Lock In baseline. The baseline is based on the FFT and Lock In average magnitude when the audio frequency of interest is notch outed (using a digital notch filter). This does not always work well especially if there are strong nearby signals. Strong nearby signals may cause the average to be too high and may exclude the signal of interest

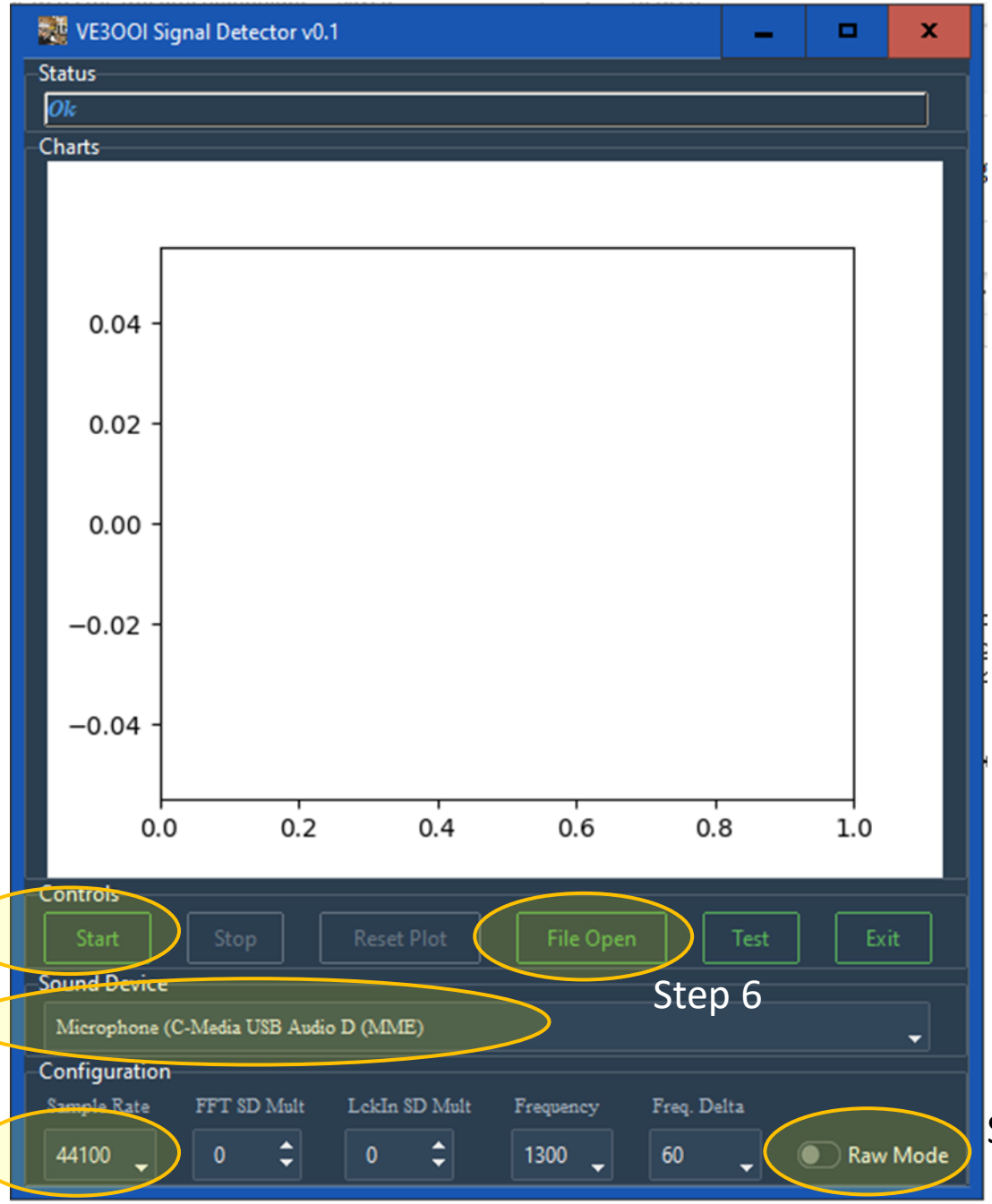
To identify the thresholds, the program first takes the FFT average then calculates the standard deviation. Same for the lock in. The “FFT SD Mult” and “LckIn SD Mult” defines the number of standard deviations that the signal of interest must be greater than for the software to trigger (i.e., indicated signal present).

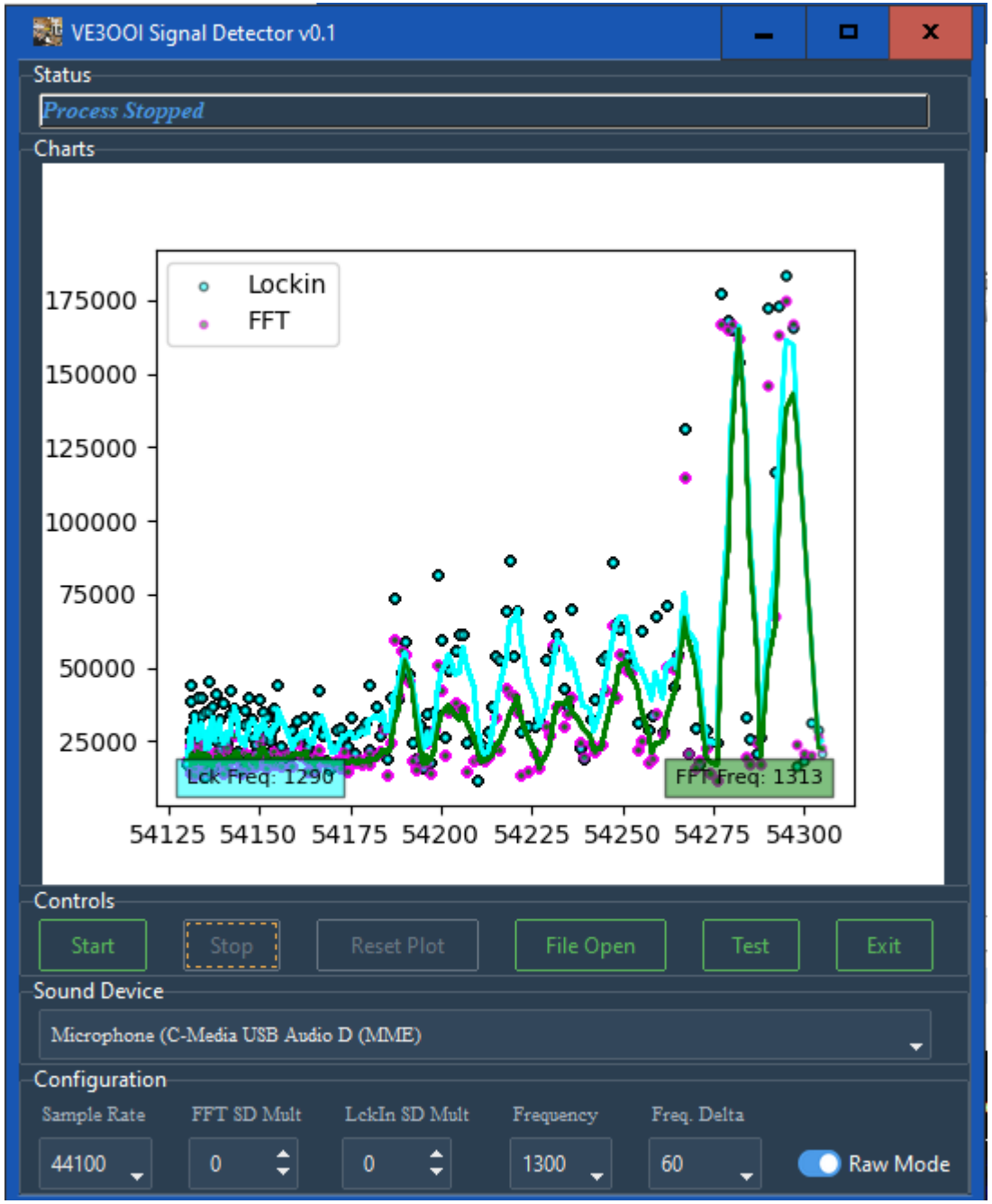
The “Freq Delta” is the amount of error to allow between the signal to be detected and the signal detected. If the detected signal is within this delta, the software triggers detection.

The "Raw Mode" switch enables/disables threshold detection and display FFT and Lock In magnitudes i.e., if “Raw Mode” is disabled, it will use the thresholds and delta defined to determine if the signal is present

Program Usage

1. Ensure Python 3 is installed
2. Invoke program by double clicking the python program (Signal_Detector_TKv0.2.py) or by entering the following at the command line prompt (“python Signal_Detector_TKv0.2.py”)
3. Select the appropriate sound card that the audio is present on from the “Sound Card” drop down box.
   - Note that sound card preferences are displayed strange in python. The Sound card along with the supported Windows sound driver is displayed. The example below show a Microphone interface from the C-Media USB sound card using the MME windows sound driver. Each sound card may have 2 or 3 entries displayed and you may need to do trial and error to find the correct one to use
4. Select the sample rate for the audio card. Most sound cards support 44.1 or 48 KHz. Select a rate higher than 44.1 only of 44.1 is not supported by your sound card.
5. Enable Raw Mode.
6. Click “File Open” to create a CSV file to store the data.
7. Click “Start” to begin the software
8. You **MUST** click “Stop” to exit the programs. This stops all threads running in the background.




VE3OOI Signal Detector v0.1
Status
Process Stopped
Charts
Lockin
FFT
175000
150000
125000
100000
75000
50000
25000
Lck Freq: 1290
FFT Freq: 1313
54125 54150 54175 54200 54225 54250 54275 54300
Controls
Start
Stop
Reset Plot
File Open
Test
Exit
Sound Device
Microphone (C-Media USB Audio D (MME)
Configuration
Sample Rate
FFT SD Mult
LckIn SD Mult
Frequency
Freq. Delta
44100
0
0
1300
60
Raw Mode


VE3OOI Signal Detector v0.1
Status
Lockin: 1290.0:10825.261 FFT: 1162.8:28743.783
Charts
Lockin
FFT
175000
150000
125000
100000
75000
50000
25000
0
FFT Freq: 1098
54740 54760 54780 54800 54820 54840 54860 54880 54900
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Microphone (C-Media USB Audio D (MME)
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FFT SD Mult
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0
0
1300
60
Raw Mode