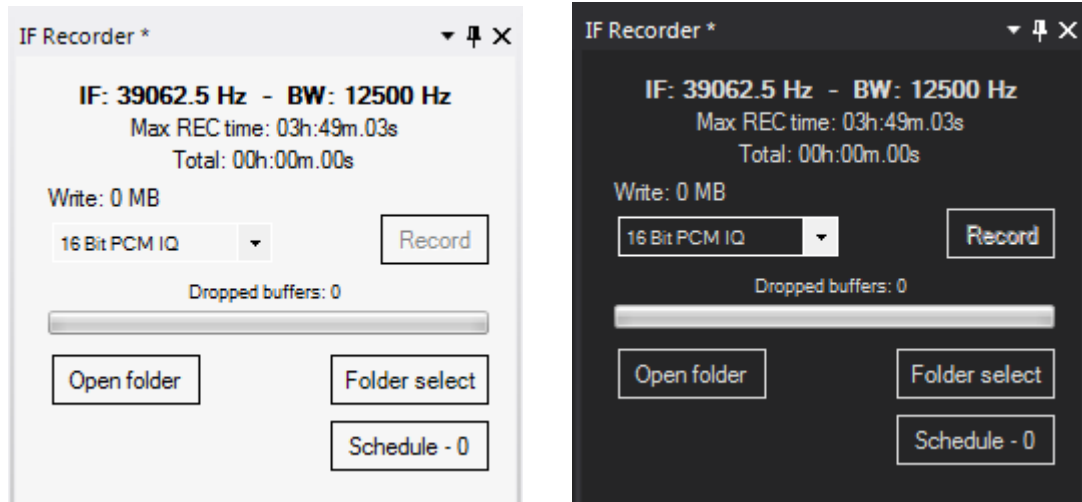# IF Recorder – A SDR# plug-in

original by Vasili (TSSDR) - Modified/Updated plug-in and documentation by **thewraith2008 – March 2022**

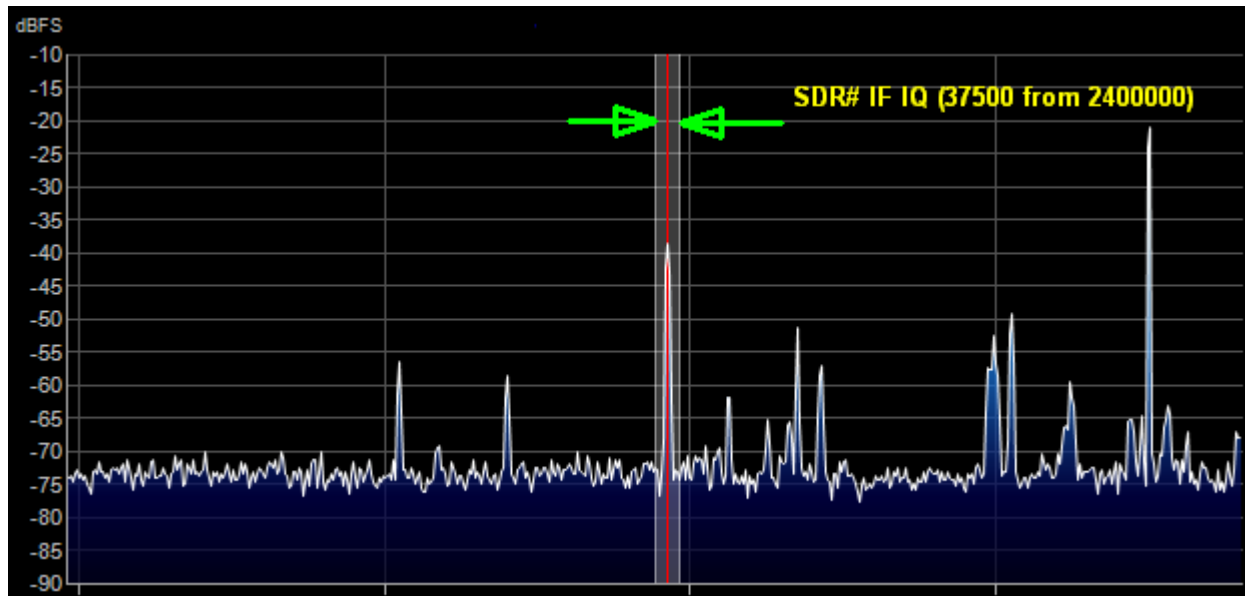**SDR# Side panel** (light and dark theme)

Menu

- **Description**
- **Features**
- **Installation**
- **Usage**
- **SDR# side panel – List of controls top to bottom**
- **Notes, bugs, limits or other things of possible interest**
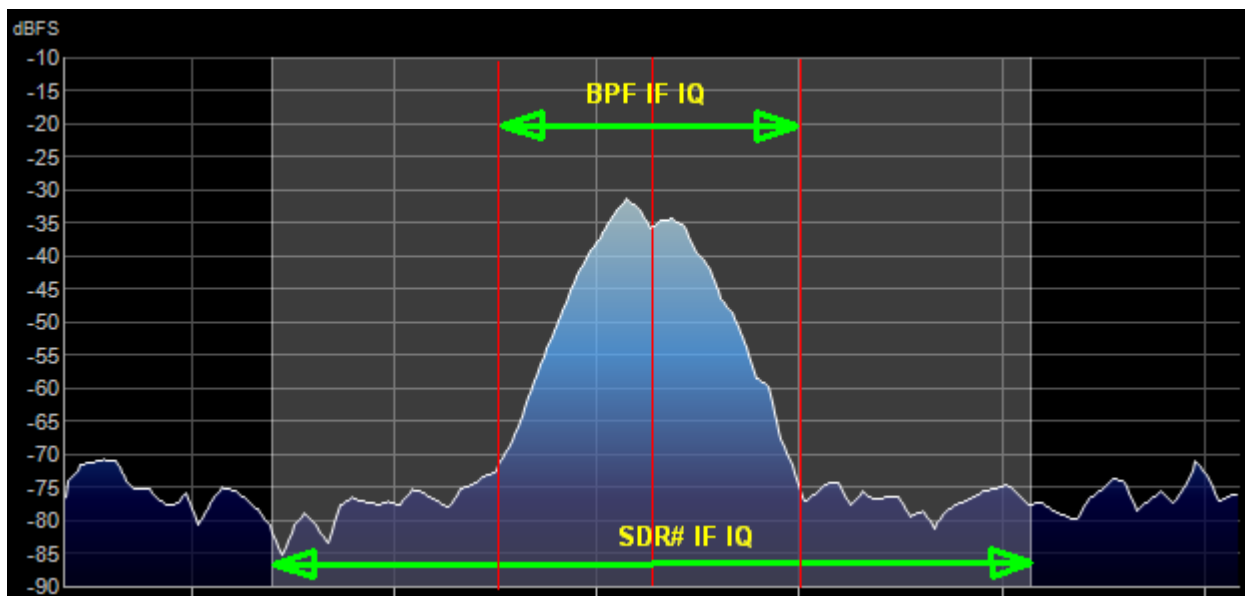- **Thanks**

Description

The *IF Recorder* plug-in allows recording of the SDR# (IF) DecimatedAndFilteredIQ data that is created from the full samplerate IQ data supplied from an SDR dongle (via frontend/driver).

The benefit of the *IF Recorder* is that it will make considerably smaller IQ WAV files using the lower (IF) bandwidth allowing for longer record times by only capturing around the target frequency (VFO).

Shows full dongle bandwidth @ 2,400,000 sps with the IF highlighted @ 37,500 sps

The SDR# bandwidth control acts as a bandpass filter (BPF) to further reduce unwanted signals from the final captured IF IQ data (in the WAV file).

Shows the zoomed in view of the IF IQ (37,500) to be recorded with BPF marked out (12,500)

Recordings can be started manually or via a simple scheduling.

Continued...

The recording can be single or continuous which will record to the 2 Gb file format limit or until there is no HDD space remaining. In the case of continuous recording, a new file will be created when the 2 Gb file format limit is reached and will continue until stopped or there is no HDD space remaining.

<u>Features</u>

- Records only the SDR# IF IQ at the VFO from visible spectrum bandwidth.
  - IF recording allows for longer record time in a smaller file size.
- Continuously record spanning multiple 2 Gb files.
- Record to a single file to a maximum of 2 Gb.
- Record using a simple scheduling.
- Display the IF and Filter bandwidth values to be used for recording.
- Display on going record duration and file size and number of files recorded (each session).
- Reports if available HDD space is getting low before recording is started.
- Will stop recording if HDD space runs out preventing loss of recording.
- Works with SDR# 1700-1854 (as of writing)
- Works with light and dark themes in SDR# 1717+ (Telerik UI)(Limited)

SDR# side panel controls and labels

IF: x - BW: x (label)
Shows the SDR# IF IQ bandwidth/samplerate that will be used to record to the IQ WAV file and the filtered bandwidth (BPF) that will be applied to it.

Max file Rec time: (label)
Shows the maximum time that can be recorded to a 2Gb WAV file at the current IF bandwidth.
- If the available HDD space is less than 2gb, then the MAX record time will be based on remaining HDD space.

<mark>NOTE: If this label colour turns red, then HDD space is getting low.</mark>
- Low HDD space will be indicated when HDD space is less then 2 GB
- Tool-tip for this label will show remaining HDD space (only when label is red)

Total: (label)
Shows duration of current recording.
- If more than one file has been recorded then this will cycle approx. every 4 seconds between current file duration and total recording time (for all files).

Write: (label)
Shows approx. size of WAV data written to the currently recorded to file.
- If multiple files are recorded in one session, then the number of files that have been recorded will be appended in brackets. e.g. "Write: 256 MB (x)"

Dropped buffers: (label)
Shows number of dropped buffers that has occurred.
- Should remain at zero for good recordings.
- The bar shows amount of buffer used while recording.
  It will vary but should not get to high.

WAV sample format (dropbox)
Selects the WAV sample format to record with:
- *8 bit PCM IQ* – May not be suitable for digital modes
- 16 bit PCM IQ – Can be suitable for digital modes (maybe some limits as to which types)
- *32 bit IEEE Float IQ* – Best and is direct copy of SDR# IQ (float) data stream but is twice size of the 16 bit PCM IQ.

Record/Stop (button)
Start or stop recording
- Left clicking will record creating a new file each time the 2 Gb limit is reached.*
- Right clicking will only record to one file to a maximum file size of 2 GB.*
- * Or until stopped or no HDD space remains.

NOTE: SDR# must be playing to enable button.
NOTE: Will check for sufficient HDD space before recording starts.
NOTE: Stopping SDR# radio playing will also stop recording.
Continued...

NOTE: Changing some SDR# options during recording can negatively affect the recording.
NOTE: Changing detector type during recording is not recommended.
- There is no way to block the user from doing this so be careful
- This may affect IF samplerate in which case recording will be stopped
    - Recording is stop to avoid mixing of samplerates in WAV file. (which is invalid)
    - This will may also affect the filtering bandwidth of IF.
NOTE: Changing radio samplerate during recording is not recommended.
- There is no way to block the user from doing this so be careful
- Recording is stop to avoid mixing of samplerates in WAV file. (which is invalid)

Open Folder (button)
Open folder location where WAVs are saved too.
- Default is to use the SDR# path if has not been set.
- May open to IF sub folder if no recordings have occurred yet. (and only if IF folder has already been created)
- Will open to the last daily sub folder if any recordings have occurred.
- The selected path is shown in the tooltip for button.

Folder select (button)
Sets the base folder location where to save the recorded WAV files too.

When recording, a sub folder "IF" is created for recordings created by the IF Recorder plug-in. In that folder, each recording will be stored in a daily folder. (e.g. C:\IF\2018_08_18)

NOTE:
The "IQ" folder is created (by *Baseband Recorder* plug-in) to separate baseband IQ recordings from IF IQ recordings.
The selected path is shown in the tooltip for button

Schedule - X (button)
Opens a window where schedules can be added or existing ones modified or removed.
The "X" value on the button indicates number of schedules pending.
Defined schedules will be saved and will reloaded on next SDR# start.
- If schedules have already expired on SDR# start, they will be removed.

These schedules are only simple and only suitable for one shot recordings.
- NOTE: It's possible to create overlapping schedules.
  Conflicting schedules will be ignored (only one recording allowed at a time)
  A conflicting schedule will be removed during recording when seen.
- Once a schedule is completed, it will be removed from list.
- When a schedule is active, it will show as a flashing "schedule recording" to the left of the "Configure" button in the SDR# side panel.
- Schedules will record using the currently selected plug-in options.
- Schedule will record to the duration so long as there is enough HDD space otherwise it will stop. (it's up to you to make sure enough HDD space exists)
- SDR# must be playing for a schedule to start recording.
  If SDR# is not playing, then the schedule will be ignored and removed when it triggers.

Continued...

When adding a new schedule entry, the default entry will have the current time +10 minutes for start and +15 minutes for end times. (You must edit these times before yo

Installation

This plug-in should work with SDR# 1700-1716 and v1856+
- Maybe some versions earlier (<1699) or later (v1717-1855) but these are not tested.
- Versions between v1717-1855 are not considered unstable and therefore not supported.

SDR# 1700-1716
Copy the following files to you SDR# folder:
- ***SDRSharp.IFRecorder.dll***
- **SDRSharp.PluginsCom.dll**

Update the file '***Plugins.xml***' (using notepad) with the following line (if it has not been done):

`<add key="IFRecorder" value="SDRSharp.IFRecorder.IFRecorderPlugin,SDRSharp.IFRecorder" />`

SDR# 1800+ (v1856 at time of writing)
Copy the following files to you SDR# "Plugins" folder:
- ***SDRSharp.IFRecorder.dll***
- **SDRSharp.PluginsCom.dll**

No need to edit '***Plugins.xml***'

NOTE: It should be noted that not all SDR# plug-ins may work together very well.
If issues seen or if in doubt, then set-up a fresh SDR# with only this plug-in installed.
- This is the recommended way. (Don't use the *SDR# community installer*)

Initial testing of plug-in
Start SDR#
Check if plug-in is visible in SDR# side panel or hamburger menu (as "IF Recorder")
If present, then you are ready to start using plug-in.
If not present then check installation instructions.

<u>**Usage:**</u>

<mark>**Initial plugin set-up:**</mark> (change later to suit you needs)
Set *Sample format*: "**16 Bit PCM IQ**"
Set a *Base folder*.
- Default is the SDR# folder.
- This is the base folder where the WAVs will be saved too.
  e.g. If you set the folder to **C:\WAVs,** then plug-in will also create a sub-folder called "IF" in the base folder path for the daily recording folders to be created at record time.
  When recording, a daily folder will be create which will have the recorded WAV file(s) in it.
  (e.g. folder name: C:\WAVs\IF\2018_08_12)

Preset SDR# for recording:
Start SDR# radio by pressing "play" and set the VFO (frequency)
- For best results, offset your VFO from centre by at least the filtered bandwidth.
  This may help avoid any DC offset that exists.

Select the various SDR# options if you wish to monitor the spectrum during recording
- While most options do not affect the IF IQ recording data directly, they may cause the VFO to shift which will throw out to frequency on playback.
  Other unforeseen issues may arise from fiddling with options during recording.
- The selected mode used makes no difference to the recorded IQ data as it is recorded before the demodulator but it does alter the filtered bandwidth (BPF) used when saved.
- Do not change SDR# options once recording has started.

Adjust 'Bandwidth' to suit signals RF spacing
- e.g. DMR = 12500 Hz. Don't set to tight or signal information may be lost.
- Do not change once recording has started.

Press "Record" to manually record or use the schedules and let it control recording (start/stop).
- Left clicking will start sequential recording
  - Will create a new file each time 2 Gb is reached.*
- Right clicking will start single recording.
  Only records one file to 2 Gb.*
- * Or until stopped or no HDD space remains.

If manually recording, record for X amount of time then press 'Stop'.
- If you leave recording, when the file size hits 2 Gb the plug-in will start recording to a new file and this will continue until you stop it or run out of HDD space.
- If single file recording, when the file size hits the file format limit or set limit, the plug-in will stop recording. (or until you stop it)

The recorded IQ WAV can be replayed with "**File player**" SDR# plug-in.
- While this plug-in can record across multiple files, "**File player**" plug-in can only play one file at a time.

Notes, bugs, limits or other things of possible interest

NOTE:
Not all aspects of this plug-in, whether it be it's usage, features, options, bugs, issues, problems or any other unforeseeable things maybe covered by this documentation.

Changing radio samplerate during recording is not recommended.
Changing detector type during recording is not recommended.
Changing Step size during recording is not recommended.
Changing Snap to Grid during recording is not recommended.
The some above options may cause the centre frequency to shift cause expected results.

The samplerate of the recording will depend on the SDR used.

The sample format used (8, 16, 32 bits) for the SDR# IF IQ data is scaled down to the appropriate data type before it's saved to file with exception of the 32 bit format which is a direct copy of the SDR# IF IQ data stream. It should be noted that the 8 and 16 bit formats are not without some loss of the resolution of the signal and their selection/usage may depend on the signal been recorded. (analogue or digital)

The IF bandwidth used for recording is determined by SDR# using the dongle samplerate and the value of the SDR# bandwidth (in the menu **Radio**). The mode used can also affect samplerate. How this is determined can vary from the SDR# versions used.

NOTE: The selected mode used makes no difference to the recorded IQ data as it is recorded before the demodulator but it does alter the BPF used on the IQ data before it's saved.

NOTE: The maximum file size for a recording by this plug-in is 2 Gb.
The maximum recording duration per file is displayed in the plug-in panel and will depend on IF bandwidth used.

NOTE: File-names are create with timestamp and frequency (19-25-39_418100kHz.wav)
These files will be created in daily folders from the base folder. (C:\IF\2022_01_10)
The "IF" folder is created to separate IF recordings from Baseband recordings (which uses "IQ")

Theme matching does not 100% match all colours used by controls

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BUGs:
None observed

This modified version and documentation by thewraith2008 started in 2021
see *Changelog.txt* for more details about changes and fixes.

Support forum here:
https://forums.radioreference.com/forums/software-defined-radio.193/

NOTE: Support is not guaranteed. Especially if the answers are contained in the documentation or on forum.

Special thanks to the creators of the following software:

SDRSharp (SDR#) by Youssef Touil
- https://airspy.com/
- The IF Recorder plug-in utilises code from the SDR# plug-in API.
  As such, that code used by the plug-in is the property of Youssef Touil (Airspy).

IF Recorder (this original SDR# Plug-in) by Vasili (TSSDR)
- http://rtl-sdr.ru
- Thanks Vasili for allowing me to update this plug-in.