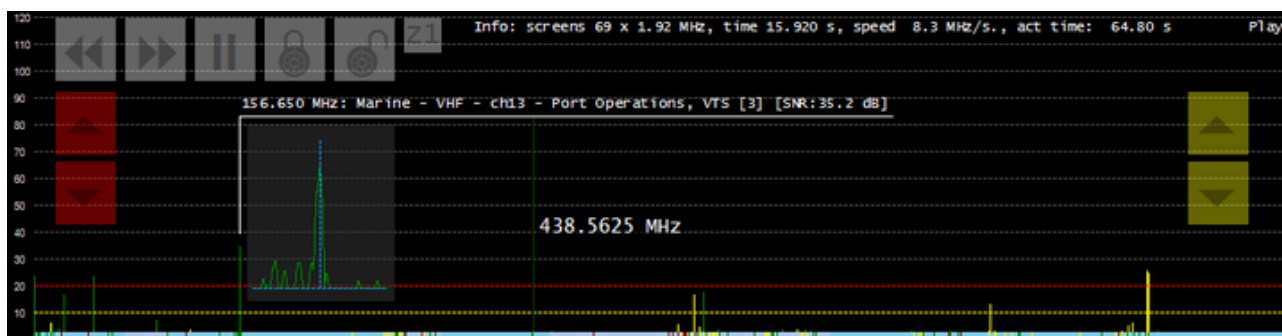
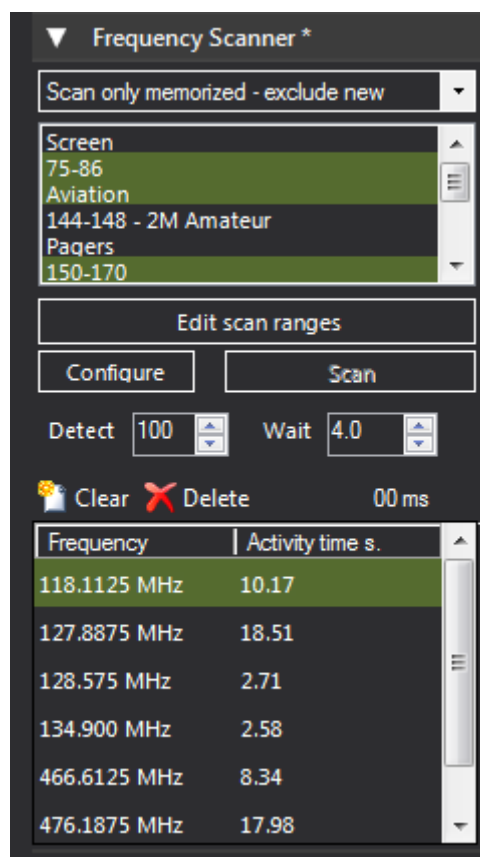
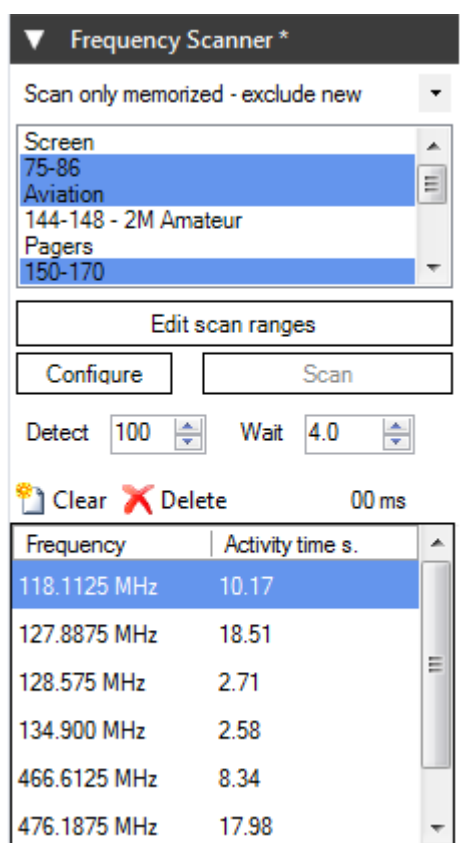


Frequency Scanner v2.2 – SDR# plug-in

original by TSSDR (Vasili) – Modified/Updated plug-in and documentation by [thewraith2008](#) – January 2022



The Channel Analyser



SDR# Side panel (light and dark theme)

NOTE: This scanner plug-in is NOT compatible with the experimental (airspy) version that exists, do not mix these plug-ins. ([See more here](#))

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Description

The *Frequency scanner* (also known as *Fast Scanner*) can scan the current screen RF bandwidth or a selected set of defined frequency ranges that are within the frequency range of a SDR dongle searching for active signals.

The scanner can be adjusted to trigger at certain levels for active signals.

When the scanner is started, the user can add/remove lockouts for frequencies.

These lockouts can be for frequencies with activity that is of no interest or birdies or digital signals. These lockout states can be set temporary (session) or are stored and are used the next time scanner is used.

The *Frequency scanner* can use the database created by either the standard *Frequency Manager* or the *Frequency Manager* (FreqMan) plug-in ^{*1} created by Vasili.

When used, this database can be used to only scan those memorised frequencies or to exclude them from the scan depending on the scan mode used.

The *Frequency Manager* database is also used to display the stored frequency “Group” and “Name” on the screen for the active frequency or at position of the mouse cursor.

NOTE: The frequency entries in the *Frequency Manager* database must match the value of the VFO when scanning. This can be dependant on the start frequency and step size been used. If these conditions are **not** met, then the scanner will not stop on (or exclude) the frequency when activity is seen.

The *Frequency scanner* is mainly suited to analogue transmissions, but could possibly work also with conventional digital transmissions (not trunking) when a suitable decoder is used.

Many features and improvements have been made to the *Frequency scanner*.

See the [features](#) list on next page or the changelog.

SDRs with wider bandwidths (than a RTL 2.4Mbps) will be able to achieve higher scan rates.

- This can be dependant on SDR# version and PC specs

^{*1} An alternate *Frequency Manager* (FreqMan created by Vasili).

This alternate *Frequency Manager* plug-in **does** seem to work with this scanner plug-in.

The FreqMan database contains a few additional elements in the *frequencies.xml* which the standard *Frequency Manager* does not have. This plug-in may not utilise all of these elements.

Features

- Static and Dynamic noise floor operation
- Five scan modes (for detecting new and scan/exclude existing memorised frequencies)
- Define multiple frequency ranges with ability to scan some or all of them
- Signal delay detection adjustment (in mS)
- Wait (delay) after transmission (before continuing to scan again)
- Show frequency group/names as defined in the *Frequency Manager* database
- Display list of new frequencies and their activity time (only on some scan modes)
- Automatically clear above entries in list at X intervals when activity time is under X time
- Auto skip transmission when active longer than X time
- Auto lockout transmissions which activity exceeds X time
- Auto reset noise floor at X intervals
- Select transmission with highest signal level (within current segment/RF bandwidth)
- SDR# audio mute control (to use instead of SDR# squelch)
- Adjust channel analyser window position and on screen buttons transparency/fade speed
Position channel analyser (Top^{*1}, Bottom, Left, Right)
- Auto suspend drawing of channel analyser for improved CPU usage.
With different suspend levels available.
- Output a 'Now Playing' string to file with delay option for use with streaming audio.
 - i.e. *Icecast + butt* or *RadioFeed*
- Backup the previous session '*scanner_entries.xml*' file at SDR# start.
- Works on a Airband that is using the 8.33 KHz step size frequency allocation ^{*2}
- Merges the '*8.33 channel selector*' plug-in into this plug-in to improve manual tuning
- Logging of frequency activity to CSV file (create rules for including elements into log)
- Logging to file and displaying of a sessions frequency activity hit count
- Channel analyser zoom in/out with active channel tracking
- Display SNR of active frequency
- Display detected CTCSS/DCS (requires additional custom versions of those plug-ins)
- Display small spectrum view (detection channel bandwidth) of the active frequency
- Permanent and temporary lockout modes (Temporary lockouts last for each scan session)
- Easily purge either permanent or temporary lockouts if needed.
- Auto purge temporary lockouts if needed.

^{*1} A bug in SDR# v1717-1739 - NOTE: As of SDR# v1740+ this issue has been fixed

Setting 'Top' causes the rendering of the channel analyser to be squashed. (see image below)
Using 'Top' with pre-SDR# v1717 and 1740+ is OK.



Continued...

*² Calculates correct frequency spacing with no incremental drift in frequency over the range.

Like the frequencies as shown here: (in column 'Actual Frequency')

["https://ukradiotransmissions.wordpress.com/2019/02/06/new-8-33khz-airband-channel-spacing-frequencies-a-conversion-chart-and-explanation/"](https://ukradiotransmissions.wordpress.com/2019/02/06/new-8-33khz-airband-channel-spacing-frequencies-a-conversion-chart-and-explanation/)

Installation for SDR# up to v1800:

Copy the file '*SDRSharp.FrequencyScanner.dll*' to your SDR# folder

Copy the file '*SDRSharp.PluginsCom.dll*' to your SDR# folder

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

- Tip: Add the line under the "Frequency Manager" entry

```
<add key="Frequency Scanner" value="SDRSharp.FrequencyScanner.FrequencyScannerPlugin,SDRSharp.FrequencyScanner" />
```

Installation for SDR# above v1800:

Copy the file '*SDRSharp.FrequencyScanner.dll*' to your SDR# **Plugins** folder

Copy the file '*SDRSharp.PluginsCom.dll*' to your SDR# **Plugins** folder

There is no need to edit the file '*Plugins.xml*'

NOTE: The *frequencies.xml* and *scanner_entries.xml* file if you copy an existing copy, is still required to be in the SDR# root folder.

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*)
- An example is the option '**Auto update radio settings**' in the *Band plan* plug-in.
To avoid conflicts with the *Frequency Scanner* plug-in where both are trying to set the same settings (Detector, Step size)

Usage

You are expected to read all the documentation to understand the plug-in controls and their usage. see sections '[SDR# sidepanel](#)' and '[Configuration window sections](#)' to understand plug-in controls and the various options.

Default settings of the plug-in should get the scanner up and running.

Dongle set-up for SDR# must be completed before using scanner plug-in (and is not covered here)

General usage:

- Entries must exist in the *Frequency Manager* for some scan modes to work
- Select one of the scan modes
- Define *scan ranges* to use for scanning
You only need to do this once or if adding new ranges
- (Multi) Select any of the defined scan ranges (as added above)
- Start SDR#
- Click *Scan*
- In the *Channel analyser* panel, set trigger and hysteresis levels to suit your preference.
- Set or clear lockouts as required.
- Look in '*Configure*' and choose options to your preference.

NOTE: Disable the option '**Auto update radio settings**' in the *Band plan* plug-in to avoid conflicts with the *Frequency Scanner* plug-in both trying to set the same settings (Detector, Step size)

If scanner does not seem to lock on to signal and assuming trigger and hysteresis levels are set OK

- Check scan mode used
- Try and increase the *Detect* value by +20. [default is 100]
- VFO and *Frequency Manager* database must exactly match for correct operation. ^{*1}
- Check the defined scan range to make sure start frequency and step size will align to the expected channel frequencies.

^{*1} The scanner channelises the range of frequencies it scans, these channels must be the same frequency as what is used in the database for the scanner to detect activity or to skip it.

NOTE: Any changes to *Frequency Manager* entries while scanning will require the scanner to be stop/started so the scanner can use/see any of the new changes.

SDR# side panel – List of controls top to bottom ([see image](#))

Drop-down box: Selects '*scan mode*'

- *Scan all with save new*
 - Scans/stops on all frequencies in the defined scan ranges.
 - Adds new frequencies to the *frequencies activity list* when they are not stored in the *Frequency Manager's* database.
 - No entries in the *Frequency Manager* database are required.
- *Scan all without save new*
 - Scans/stops all frequencies in the defined scan ranges.
 - Does **not** add any frequencies to the *frequency activity list*. (which is hidden)
 - No entries in the *Frequency Manager* database are required.
- *Scan only memorized – exclude new*
 - Only scans/stops on frequencies in the defined ranges that are stored in the *Frequency Manager's* database.
 - Does **not** add any frequencies to the *frequency activity list*. (which is hidden)
 - Entries in the *Frequency Manager* **are** required
- *Scan only new - exclude memorized*
 - Only scans/stops on new frequencies that are in the defined ranges that are **not** stored in the *Frequency Manager* database.
 - New frequencies that are **not** in the *Frequency Manager's* database are added to the *frequency activity list*.
 - Frequencies that exist in *Frequency Manager's* database will be ignored when scanning.
 - Entries in the *Frequency Manager* database are optional.
- *Scan only enabled in manager**
 - Only scans/stops on frequencies that are in the defined ranges that are stored in the *Frequency Manager* database which are checked (**only in Vasili's FreqMan**).
 - This mode is only useful if you use Vasili's *FreqMan* plug-in.
Scanning will never stop on any frequency if you don't use the *FreqMan* plug-in or do not have any database entries selected.
 - In *FreqMan*, to the right of frequency entries, there is an option that is used to indicate that the checked frequencies should only be scanned ignoring all other frequencies.
 - Does **not** add any frequencies to the *frequency activity list*. (which is hidden)
NOTE: If a checked frequency is in the scanners lockout list, then it will be locked out during scan.
 - Entries in the Vasili's *FreqMan* database are required.

NOTE: The '**save new**' does not mean it will save new frequencies to the *Frequency Manager*. It saves them to the *frequency activity list* (in the SDR# side panel) ([see below](#)).
This plug-in will not modify the *Frequency Manager* database

List-box: List of user *defined scan ranges* to choose from (can multi-select these entries)

- NOTE: "*Screen*" only scans the current visible bandwidth using the current selected mode, filter bandwidth and step size (which has minimum limit of 3.125 KHz).

Button: *Edit scan ranges* (to create or edit the above listed user defined scan ranges)

Continued...

Button: *Configure* (opens window with the available scanner options)

Button: *Scan* (starts or stops scanning)

- The tooltip will show number of channels and selected scan ranges been scanned
- Only if using SDR# v1778+, if channel analyser window is closed, right clicking this button will reopen the channel analyser window.

Up/Down: *Detect* (Slows down scan speed to allow for better detection of an active signal)

- The value acts as a delay to allow the 'receiver' to stabilise so the plug-in does not miss active signals during detection. [default is 100]

Up/down: *Wait* (How long to delay after a transmission has ended before resuming scan)

The below controls are only shown depending on the **scan mode** selected

Grid button: *Clear All* (entries from frequency activity list below)

Grid button: *Delete* (a highlighted entry from frequency activity list below)

Grid: *Frequencies activity list* (for new active frequencies that are not in the database)

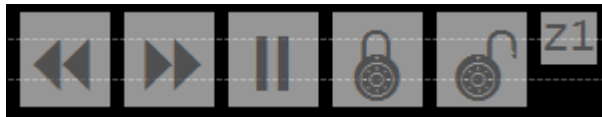
- Lists new frequency activity with duration of activity seen during a session
- Only adds a new entry if frequency does not exist in *Frequency Manager* database.
- It's usage depends on the scan mode used:
 - *Scan all with save new*
 - *Scan only new - exclude memorized*
- Double clicking entry or highlighting entry and pressing **return** moves to that frequency.

Channel analyser panel ([see image](#))

The channel analyser is a representation of all the defined frequency ranges been scanned.

- It will show updated (SNR) signal levels of frequencies in the scan range on every pass.
- It will show the lockout state (as indicated by colour) for each frequency in scan range.
- It shows the *Group* and *Name*, hit count, SNR and spectrum view of the active frequency.
- It shows the *Group* and *Name* and hit count at the position where mouse cursor is.
- Can optional show a small spectrum view of the active channel bandwidth
- Some debug info is optionally shown here
- Setting permanent/temporary lockout states for each frequency is done in this panel.
see below
- The active signal detection range is also set from here. (trigger and hysteresis - see below)
- **NOTE: If close channel analyser window, use **right** click on "Stop scan" button to re-open.**

On screen buttons allow for scanner control:



Buttons: Scan reverse, Scan forward, Play/Pause, Lockout, Remove Lockout, Zoom type

Scan reverse and **Scan forward** controls direction of scanning or to skip current active frequency.

Play and **Pause** are effectively a hold (scan) feature for the active frequency.

- When scanning and pause is pressed, one of two things will occur (on top of the expected pausing of the scanning).
 1. Will set the VFO to the first memorized frequency (that is not locked out) from centre of spectrum view.
 2. If a memorized frequency is not found in current spectrum view, then VFO will be set to the centre frequency.

Lockout and **Remove lockout** buttons are only for the current active/paused on frequency.

- These buttons are disabled while scanning is in progress.
- Permanent or temporary lockout mode can be toggled by right clicking either button.
- Button background colour will indicate lockout mode:
 - Permanent (Grey) [default]
 - Temporary (OrangeRed)

Changing the lockout state for a frequency is done by left clicking either:

- The **Lockout/Remove lockout** buttons for an active/playing frequency.
- Directly^{*1} on the channel analyser panel (where no other buttons are) at the location where the frequency is. Use zoom if needed to more accurately select frequency.

^{*1} Area on screen you can click depends on option 'Restrict lockout click area'

If click **Lockout/Remove lockout** buttons when active frequency is not in view (i.e. zoomed in)

- ~~Will hear beep and there will be no change to the lockout state.~~
Frequency must be in view to change state. **Should no longer be able to do this.**

Continued...

Changing lockout state for a range of frequencies - Caution using this

NOTE: Area on screen you can click depends on option '*Restrict lockout click area*'

Using mouse, you can lockout or remove lockouts in a range of frequencies all at once.

Left click hold, then drag to position then release left button to set range of frequencies to affect.

When **left** clicked inside of marked range, it will lockout all frequencies inside of marked range.

When **right** clicked inside of marked range, it will remove lockouts from all frequencies inside of marked range.

NOTE: This will change any existing lockouts in the range selected.

NOTE: The label at cursor position will indicate the range of frequencies selected.

You can move the existing **end** range only by right clicking past the end position.

Left clicking outside of range (and clear of any buttons) will clear range with no changes made.

NOTE: Any change of zoom level will clear any set range.

Zoom type - Z1/Z2 allows quick toggling of the zoom type option in channel analyser

Zooming in the channel analyser panel can be done with the mouse scroll wheel (up/down).

The zoom will centre the frequency in the channel analyser.

The zoom works one of two ways depending on option *Zoom type*

1. **Z1:** Will zoom in on (last) active frequency.
2. **Z2:** Will zoom in on frequency at the position of mouse cursor.

For **Z1**, place mouse cursor anywhere in channel analyser panel and use the scroll wheel up/down or the scroll wheel (centre) click for 'quick zoom' to zoom in on the (last) active frequency.

For **Z2**, place mouse cursor at the frequency you wish to zoom in on and then use the scroll wheel up/down or the scroll wheel (centre) click for 'quick zoom' to zoom.

NOTE: You must return to no zoom before you can begin to zooming on new frequency.

NOTE: Quick zoom works the following way:-

- When zoom is 1 it will zoom in.
- When zoom is > 1, it will reset zoom back to 1.

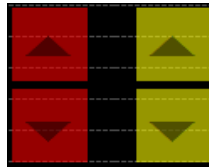
NOTE: When Z1 and using zoom, the channel analyser will track the change in frequency when it becomes active.

NOTE: When zooming with Z2, there will be a marker at the centre of the channel analyser to help identify the targeted channel/frequency.

This centre channel/frequency may not actually be the channel/frequency you wished to focus on if you did not or couldn't point to the frequency you wanted.

Setting Trigger and Hysteresis for scanning

These two levels control at what point the scanner stops scanning and at what point it resumes scanning.



Buttons: Red adjusts detect *trigger* level, Yellow adjusts *hysteresis* level

Red horizontal line (*Trigger*):

When received signal goes above red line, scanning will be stopped and will start listening.

Yellow horizontal line (*Hysteresis*)

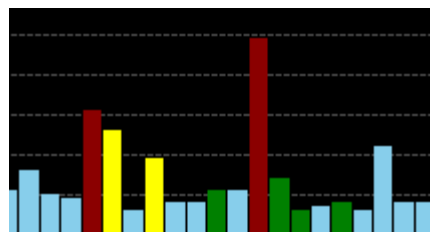
After the above has occurred for red line, when a received signal goes below yellow line, the *wait* (delay) period starts to countdown, when countdown expires then the scanning will continue.

or

If signal goes above red line again during the *wait* (delay) period, the *wait* (delay) counter will be reset and the scanner will remain on current frequency.

After signal has gone above red line and caused the scanner to pause, the signal can be anywhere above yellow line to remain paused and not go into *wait* (delay) state or continue scanning.

Colours of the channel analyser



Blue	= Frequency is not in <i>Frequency Manager</i> database and is not locked out ^{*1}
DarkRed	= Frequency not is in <i>Frequency Manager</i> database but is locked out
Yellow	= Frequency is in <i>Frequency Manager</i> database but is locked out
Green	= Frequency is in <i>Frequency Manager</i> database and is not locked out

Temporary lockout mode (not shown in image)

OrangeRed	= Frequency is in <i>Frequency Manager</i> database and is temporarily locked out
DarkViolet	= Frequency not in <i>Frequency Manager</i> database and is temporarily locked out

^{*1} Also a lighter blue used to to separate the different defined frequency scan ranges been scanned (if more than one has been selected)

Configuration window tabs section

Configuration window - Scanner options

Static noise floor

- Uses peak level values for scanning (This is prone to stopping on random noise)
- Use with '*Channel bandwidth for signal level detection*' option to improve signal selectivity

Dynamic noise floor

- Uses the SNR level values for scanning
- NOTE: When first started, reset or changed, one pass of all ranges is needed before scanning starts. (This creates the baseline noise floor to use)
The scanner state will show 'Resetting', This is required to reset level values.

Use narrow CH bandwidth for signal level detection (2500-7000) [3000]

- This option determines the width of the channel bandwidth used to detect the signal level e.g. If 3000 Hz is used, then it's +/- 1500 Hz from centre.
- This can help minimise seeing noise or spurs that are a few KHz off frequency as the signal or bleed over from an adjacent channel.
- When disabled, the channel bandwidth used is the 'Bandwidth' as define for each scan range used during scan.
- If the value selected is higher than the 'Bandwidth' value, then 'Bandwidth' value will be used instead.
- Using a low value maybe to restrictive for detection where signals are not on frequency
When SDR PPM not set correctly
Transmitting station is off frequency

NOTE: Requires scanner to be stop/started for change to take affect.

Auto skip [1-3600 sec]

- Will skip currently active transmission and continue scanning if it is active for more than set time [10 seconds].
- See option *Reset timer on 'over'* to extend function.

Auto lock [1-3600 sec]

- Will auto lockout the currently active frequency and continue scanning if it is active for more than set time [30 seconds].
- See option *Reset timer on 'over'* to extend function.
- NOTE: When enabled and temporary lockout mode is active:
When the Auto lock triggers, it will change the temporary lockout state instead of the permanent lockout state.

Reset timer on 'over' – Only used with *Auto skip*/*Auto lock*

- When enabled, will reset the auto skip/lock timer on every 'over' seen.
- This will allow longer on going activity to continue without triggering the auto skip/lock.
- If a carrier, single over or single/multiple overs on a repeater is greater than the set duration, then auto skip/lock will trigger.

Continued...

Reset noise floor [1-1440 min]

- Causes noise floor reference level values to be reset at set intervals [30]
- ~~This action will occur regardless of what is currently happening in scanner.~~
- Reset will occur only after activity has stopped (and resumes scanning)
- One pass is required to reset levels before scanning resumes

Delete rows with activity – Scan mode dependant

- Will automatically delete at set intervals [10 sec] the entries that are in the *Frequencies activity list* on SDR# side-panel when activity time is less than set value [0.5 seconds].
- This will also affect when activity is logged.
NOTE: Check-box state is ignored for this logging feature.

Select channel with maximum level

- Selects the highest signal in the currently visible spectrum to listen too.

Use audio mute (using this option is recommended)

- All this does is put the SDR# mute button under plug-in control.
- On scanner start, it mutes the audio.
- On scanner stop, it un-mutes the audio.
- When the scanner stops on a active frequency, it un-mutes the audio.
- When the scanner continues scanning, it mutes the audio.
- This is not a squelch but in a way is working like one. i.e. It blocks the noise floor.
- **Disables SDR# squelch when option enabled (see why below)**
Using the SDR# squelch with scanner may cause unexpected results.
 - Doesn't mean you can't use the SDR# squelch though, just so your aware of the limits.
 - e.g. Scanner may stop on a active frequency but no audio will be heard because the SDR# squelch could be set higher than the scanner trigger level.
- Stores squelch states for AM/FM on scan start and restores on stop.

Noise protection delay ON/OFF [5/3] (used with 'Use audio mute')

- **OFF:** This will delay the un-muting action of the SDR# mute after the scanner stops on an active frequency.
This is to stop any noise heard at beginning of the un-muting.
- **ON:** This will delay the muting action of the SDR# mute after signal activity was seen.
- The delay value is a count and does not represent any unit of time (mS, S).
The value will delay by an unspecified amount. Probably in the order of a few tens of mS
- Don't use if also decoding digital signals as well.

Continued...

Force manual audio mute when paused

- When scan is paused, the SDR# mute becomes under forced manual control
- This means that the audio mute will remain in last state and will not respond to the signal levels any more in paused mode.

NOTE: If '*Use audio mute*' and '*Force manual audio mute when paused*' are enabled.

When scanning and *Pause* is pressed, it is now possible to manually change *SDR# mute* state.

- This will mean that *SDR# mute* will not automatically function in the paused state:
e.g. If is muted when *Pause* is pressed and change frequency to another active frequency, then you will have to manually un-mute it.
If is un-muted when pause is pressed and change frequency to another active frequency, audio will be heard.
When active frequency stops been active and no squelch is used, then noise floor will be heard.
- In pause mode, the scanner does not register manual frequency changes and so does not detect signal levels on the new frequency therefore cannot auto mute the audio.

Enable selective level checking

- Normally, all channels have their levels evaluated.
- This option when enabled, will change it so only the selected frequencies will have their levels evaluated. (see below for how each scan mode handles this)
- This may save some CPU cycles.
- Will make the channel analyser clearer to read showing only the intended frequency levels.

Scan modes: (will also include frequencies that are locked out)

- "*Scan all with save new*" - Normal: All channels have their levels evaluated.
- "*Scan all without save new*" - Normal: All channels have their levels evaluated.
- "*Scan only memorized - exclude new*"- Only the frequencies that exist in the Frequency Manager DB will be checked for signal.
- "*Scan only new - exclude memorized*"- Only the frequencies that do NOT exist in the Frequency Manager DB will be checked for signal.
- "*Scan only enabled in manager**"- Only the frequencies that exist in the Vasili's *Frequency Manager (FreqMan)* DB that are enabled for scanning will be checked for signal.

Configuration window – Channel analyser options

Channel analyser position [Bottom] *¹

- Sets position within SDR# spectrum/waterfall view-port ([see bug with top position here](#))
- SDR# 1778+ allows the channel analyser to be positioned anywhere

Hide channel analyser

- Option is only available in SDR# 1778+
- To use, close the channel analyser window (X). (Must already be scanning)
To open again, **right** click “Stop scan”
- Saves CPU cycles when not visible
 - Can use this when all has been set-up

Auto suspend draw [4] + suspend level[0]

- Stops the drawing of any channel analyser activity (scan state/levels/marker/labels) when not needed after the interval (**saves CPU cycles**)
- Suspend level determines what will still be shown/updated in the channel analyser when suspended.
- NOTE: Each level (2-3) will also show what was allowed in the lower levels.
 - 0 = All drawing suspend (Scan state, Debug info, Active frequency marker/label, Channel markers and channel levels)
 - This will see everything frozen in the panel (only for this level)
 - 1 = Allow scan state and debug info (if enabled)
 - 2 = Allow the active channel marker and label and channel level.
 - 3 = Allow the small spectrum view (if enabled).
- Mouse over only the Rev, FF, Play, Lockout and Zoom type buttons will not interrupt the suspend mode.

NOTE:

For larger number of frequencies scanned, the higher the CPU usage will be for SDR# (plug-in). The reason for this is because of the increased work load the channel analyser panel has to do in refreshing the levels for the larger number of channels that need to be displayed and updated in the panel.

A work around for this is to use the feature '*Auto suspend draw*'.

This should be set to 4 seconds and use one of the suspend levels mentioned above.

Buttons alpha (min [10], max [150], fade [1])

- Adjust minimum and maximum transparency levels of *channel analyser* buttons and speed at which buttons fade to minimum transparency level.

Restrict lockout click area

- Restricts the click area for set/clear and set range for lockouts to the 80-100% region at bottom of the channel analyser screen.
- This may help avoid accidental set/clear of lockouts.

Continued...

Disable Channel Analyser focus [Uncheck]

- When left unchecked, this helps the zoom work without having to click on SDR# window.
 - Checking (enabling) this option will stop this focusing action if it is some how undesirable.
- See below:

NOTE: If working with a smaller window over top of SDR# and with channel analyser visible, when you mouse over channel analyser it will cause SDR# to come to front.

Check (enable) this option to stop that from happening.

Show session hits (or count for frequency activity while scanning)

- ' [x]' will be appended to frequency label line shown in channel analyser for both active frequency and where the mouse points.
- Clicking 'Stop scan' will clear the sessions hit counters
- [see next option for the logging of these counters](#)

Log (session hits) totals at end of each session

- When a **session is ended**, if any frequencies have a hit count greater than 0, they will be output to log file. (20xx_xx_xx_session_activity_hits.txt)
 - The “20xx_xx_xx_session_activity_hits.txt” contains:
 - Start and end date/times of session (for that day)
 - Scan mode and ranges used in session
 - Frequency[MHz]: Group – Name [total # hits for session]
- The “20xx_xx_xx_session_activity_hits.txt” file will contain all sessions for that day.
- The “20xx_xx_xx_session_activity_hits.txt” save path is determined in logging options.
- If a session spans more than a day, then the entries will reside in the “20xx_xx_xx” file for the day it was started.
- NOTE: On large scan ranges, the creation of the log file at end of session may cause a delay in stopping that session.

Show active SNR

- Adds the SNR value to the end of the active frequency label in channel analyser.

Show active channel spectrum

- Shows a small spectrum view in the channel analyser next to active frequency marker.
- The spectrum size is the channel bandwidth used to detect a signal.
Channel bandwidth can be 'Bandwidth' used by current defined range or
The value in 'Use narrow CH bandwidth for signal level detection' if enabled.

Show debug info

- Shows additional scanner information.
 - Number of segments used to scan all defined scan ranges.
 - Time to scan all segments (excludes play activity time)
 - Speed of scan (Mhz/S)
 - Activity time (while receiving)

Configuration window – General options

Use 8.33 Khz selector

- Helps correctly tune the VFO to [8.33 Khz frequency allocation](#) when manually tuning.
- Only operates between 118-137 Mhz and when using the SDR# step size of '8.33 Khz'
- You don't need to use this option for scanning 8.33 Khz.
- **NOTE: This is a merger of the '8.33 channel selector' plug-in.**
- **If you have the '8.33 channel selector' plug-in installed, then remove it and try this implementation. Don't use both.**

Show 8.33 KHz channel name (in main spectrum)

- Maps VFO frequency to a 8.33 KHz channel name.
- **Only works when tuned to 118-137 MHz and when enable 'Use 8.33 KHz selector' and when the SDR# step size is set to 8.33 Khz**
- Tracks with VFO changes
- Tracks when scanning (when above options set)
- Other plug-ins may use the same space to display information (see Y Offset option below)

The 8.33 KHz 'channel name' looks like a frequency value but it's not used as one.

The real frequency is shown in the SDR# VFO.

In a region that is using 8.33 KHz frequency allocation (i.e. EU), If controller says go to 118.105, they mean the channel not the frequency.

Y Offset

- Used to offset the (above) '8.33 KHz channel name' label down the spectrum window i.e. This maybe required if 'Band Plan' is positioned on top.

Use 'Now Playing' file and delay mS [0]

- Creates the file 'scanner_now_playing.txt' with the 'Frequency: Group – Name'
 - Can be used with a streaming audio solution i.e. *Icecast + butt* or *RadioFeed*
- 'scanner_now_playing.txt' is created in the SDR# folder.
- Use *delay mS* to synchronise the 'Now Play' metadata to audio at listener end. This may not be the same for all listeners (because of lag)

Auto hide frequency list scrollbar

- Hides the scrollbar when mouse is not over the list

This may make the UI look better when hiding the scrollbar when using dark themes as the scrollbar colour (white) cannot be changed to match theme in use.

Use generic theme colours

- Only for SDR# 1717+ with Telerik themes
- When enabled, will use predefined colours (for light or dark) regardless of theme.
- When **not** enabled, will match some of the selected themes colours.
- Some colouring for Telerik controls use a gradient. This cannot be mimicked with standard form controls. One colour is chosen for this type.
- If theme is changed during a SDR# session, then it will keep using the last loaded colours. A SDR# restart is required for colour matching to take affect.

Configuration window – Logging

NOTE: The logging feature may not be 100% at the moment

NOTE: Will exclude logging entries for activity that is 500 mS or less.

Enable activity logging

- Enables the logging of frequency activity to file

Open save path

LOG file(s) save path

- Sets the path where any log files will be saved too.
- Activity log file name is pre-set to “yyyy_mm_dd_activity.csv”
- Session hit total file name is pre-set to “yyyy_mm_dd_session_activity_hits.txt”
- NOTE: If this path is changed externally (e.g. deleted/renamed), then it will default back to using the SDR# folder

Rules for creating log entries

- Use the available keywords to create entry for log
- Keywords: date, time, time_24h, freq_hz, freq_mhz, detector, snr_max, name, hits, duration "any text", + [default = time + freq_mhz + name + duration].
- NOTE: 'name' will be “Group – Name”
- NOTE: 'time' keyword must be followed by a space character (' ') to work correctly.
- If any elements are wrong for the rule, then “-error!” will show

Elements separator

- Sets the delimiter to use between each element for entry in the CSV file [default = ' ; ']

Configuration window – Purge

Purge permanent lockouts

- Will confirm this action

Purge temporary lockouts

- Will confirm this action

Purge temporary lockouts at intervals [120] [1-1440 minutes]

- Will purge at set interval regardless of when temporary lockout was added

End of configuration window tabs section

Edit scan ranges window

Enter valid values into fields to define a scan range entry.

Any invalid fields will be indicated in **red** (and you cannot move out of field until correct)

See "Defining scan range guidelines" [below](#)

See "When scanning the Airband that uses 8.33KHz allocation" [below](#)

Note values are in **Hz**. (except *Name and Detector and Group*)

- **Name** is the label for scan range (Shown in the SDR# side panel)
- **Start (Hz)** is where to start scanning from
- **End (Hz)** is where to stop scanning at
- **Detector**
Valid detector values: *AM, NFM, WFM, LSB, USB, DSB, RAW, CW*. *1
- **Bandwidth (Hz)** is the filter channel bandwidth SDR# should use for a frequency range
This is the same as what you would use in **SDR# Radio > Bandwidth**
NOTE: If this is larger than the step size, then the step size value will be used instead.
Minimum value is 5000 Hz (5 KHz)
- **Step size** is spacing between each channel assigned in a scanned frequency range
Minimum value is 3125 Hz (3.125 KHz)
- **Group** is used to filter the used frequencies from *Frequency Manager* for scanning.
Only works with the scan mode '*Scan only memorized - exclude new*' to filter groups to be used while scanning.
Leaving this field blank will allow scanner to see all frequencies in all groups (Normal)
Filling this field in will only allow those frequencies who's group matches to be allowed to be seen while scanning. Note lockouts still apply.
The 'Group' must be as shown in 'Frequency Manager' (not case sensitive)
More than one group can be used. Just separate them with a comma " , "

NOTE: You will not be able to click **OK** until all fields are valid.

To delete entry, highlight row then click '**Delete row**'.

- **There will be no confirmation of this action.**

Cancel to exit and **not** save any changes.

Display format for list entries

- Formats the fields: **Start, End, Bandwidth** and **Step size** from Hz to display MHz or KHz.
- **NOTE: When editing, you will still need to enter values as Hz**

*1 Not all detector modes may work with scanner.

NOTE: Using small step sizes on large scan ranges can drastically affect CPU usage. It can also affect the scanners ability to stop on the right channel/frequency. It may stop on the channel/frequency just before the channel/frequency that is active. (i.e. adjacent channel interference)

Defining scan range guidelines

The scanner does not just detect any frequency activity between a range of frequencies. The channel list that the scanner creates must align with the channel spacing (step size) of the band been scanned. Because of how the scanner scans frequencies, the defined start frequency must be at the same “channel” spacing (step size) used for that band and where adding the step size will land on the next channel.

e.g. In example below, activity on 27.000 would not be seen because it does not align to the 10KHz step size starting from 26.965.

Example from the 27 MHz CB band (26.965 - 27.405 MHz @ 10 KHz step size - AM)

CH – Frequency

1 – **26.965 (Start frequency)**

2 – 26.975 (CH1 [start frequency] + step size)

3 – 26.985 (CH2 + step size)

4 – 26.995 (CH3 + step size)

5 – 27.005 (CH4 + step size)

...

40 – 27.405 (CH39 + step size)

Additional details can be found in the section below “[Other information](#)”

When scanning an Airband that uses 8.33KHz allocation

Special code is used to calculate the correct frequencies when the 8.33 KHz step size is used. This will perform the necessary rounding of the start frequency and of the range frequencies.

You **must** set the start frequency range to a non 8.33KHz frequency e.g.:

- xxx000000
- xxx025000
- xxx075000
- xxx100000

If a 8.33KHz frequency is used (e.g. 118133300), then it will be rounded down to one of the above.

- e.g. rounded to 118125000

When you define a frequency range, you **must** use exactly '8333' as 'step size'.

Failure to do this will mean the frequencies scanned will be wrong and you may not hear anything.

NOTE: Some scan modes require that 8.33 KHz Airband frequencies stored in the *Frequency Manager* must match the [8.33 KHz band allocation frequencies](#) exactly for the scanner to work correctly.

NOTE: The normal 8.33KHz SDR# step size does not accurately tune the VFO when manually tuning. Use the '8.33 KHz selector' option (in this plug-in) to fix this. (not required for scanning)

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.

NOTE:

Changing the dongle 'SampleRate' or 'Decimation' values while using the scanner plug-in is not advised as it most likely will crash SDR#.

BUG:

Hash noise heard on a frequency that should be analogue audio. (this is a rare intermittent issue)

Altering frequency or some options in SDR# 'Radio' will see issue fixed (until next time)
When scanner continues scanning, this will also fix issue.

Seen when using: (only what I use)

- SDR# many versions (1700, 1716 to 1784)
- Detector modes: AM/NFM
- BW: 10000 and 12500
- Step size: 12500 and 25000
- Filter Audio: ON

Not sure why this is a problem as I cannot see anything obviously wrong with internal SDR# parameters. (Frequency/Detector/FilterBandwidth/Step size or others available)

Maybe the fast switching of frequency the scanner does makes this issue manifest in SDR#.

Observations

Not sure if it's a RTL-dongle problem or something with SDR#.

This has now been observed using a RTL-SDR.COM and Airspy R2 dongle.

- Both of these dongles use the tuner IC: R820T2.

When issue seen, the channel analyser shows signal present.

- Frequency Scanner plug-in uses ProcessorType.RawIQ

Main spectrum in SDR# looks normal

Observed signal using "Zoom FFT" with "IF" and "Audio" spectrum's showing.

- No signal (or even noise floor) seen in IF spectrum (have image)
- Same noise levels show in audio spectrum whether signal is present or not (have image)
- "Zoom FFT" uses:
 - ProcessorType.DecimatedAndFilteredIQ
 - ProcessorType.FilteredAudioOutput

Continued...

When see issue and use "Recording" to record "Baseband" IQ (16 bit PCM - no dropped buffers)

- The playback of the IQ file is not 100% but can see signal.

When see issue and use "Recording" to record "Audio" (16 bit PCM - no dropped buffers)

- The playback of the file is not 100% and only the noise floor is heard.

"Recording" uses ProcessorType.RawIQ and ProcessorType.FilteredAudioOutput

When see issue and use "IF Recorder" to record "IF" (16 bit PCM - no dropped buffers)

- No signal or noise floor is seen
- "IF Recorder" using ProcessorType.DecimatedAndFilteredIQ

NOTE: "Baseband Recorder" uses ProcessorType.RawIQ

- Not tried, should be same as "Recording" above

This makes be think that something maybe occurring in the processing chain in SDR# but where?
Dongle IQ samples to IF samples() to Audio samples

This plug-in does not seem at fault here as it has nothing to do with supplying IQ data or playing audio.

BUG:

Scanning becomes lagged with audio crashing sound. This seems to be related to the RTLSDR driver. A restart of SDR# will fix this (until it occurs again). It's unknown why this occurs.

NOTE: I suspect that the IC RTL2832U is at fault here.

BUG:

It's not recommended to use this plug-in with any SDR# versions from v1717 to v1822.
Many changes to the SDR# UI (Telerik) caused many issues with SDR# itself and plug-ins.

No support is given when using one of these versions.

Continued...

There exists a experimental (airspy) version of the scanner plug-in. (from Vasili)
This plug-in is NOT compatible with that version, do not mix these plug-ins.

As of v2.0.0.0, both versions of the *Frequency Scanner* features have been merged. (see below)

Both plug-ins use the same named files '*scanner_entryes.xml*' and '*frequencies.xml*' but the structure of these files are different between plug-in versions.

- It creates a different structured file '*scanner_entryes.xml*'
- Uses a different structured file '*frequencies.xml*' which is created by a different *Frequency Manager* (*FreqMan* from Vasili) that is not the standard one that comes with SDR#.

Most parts of the 'airspy' version plug-in already have been merged.

Scanner: Noise protection added ON delay.

Channel analyser: Separation of ranges by alternating colour (blue)

Channel analyser: Auto refresh

Scan Mode: "Scan only enabled in manager"

Scanner: WDT: Reset noise floor

Scanner: Dynamic noise floor

Channel analyser: Active channel spectrum

Channel analyser: Show SNR value for active frequency

Parts of the 'airspy' version plug-in NOT merged.

I have opted to keep the channel analyser panel the same layout as the original version.

The 'airspy' version uses a different '*scanner_entryes.xml*' file which stores the set lockouts for each defined range.

- This would have the advantage of been able to use multiple same range entries which have different lockouts set.
- I may look into adding this as an option in the future. (no timeline as to if and when)

Other information

This text below a scratch pad of various notes for miscellaneous information on features or quirks and issues of the scanner.

On SDR# start-up, the *Frequency scanner* plug-in will backup the '*scanner_entryes.xml*' as '*scanner_entryes.xml.bak*'. If you accidentally clear your lockouts or delete a scan range entry, then you can restore to the previous saved copy.

To restore, just close SDR# and delete the file '*scanner_entryes.xml*' and rename the BAK file '*scanner_entryes.xml.bak*' by removing the '.bak' extension.

Basic scanner operation

The scanner breaks up the defined range into segments that are the size of the visible bandwidth of which is the dongle bandwidth * usable bandwidth. (e.g $2.4 * 0.8 = 1.92$ MHz).

Each segment is set (centred in VFO) and the scanner tests the level of each frequency in that segment. If no active levels are detected in that segment, then the next segment is set until there is activity detected in one of them.

If a level is detected in one of the segments that is above the set trigger level, then scanning will pause on that frequency until it is no longer is active, then scanning will resume.

E.g. A defined range of 118-137MHz with step size of 10KHz will have 10 segments (with 761 channels) when used with a 2.4MHz dongle.

NOTE: Because of how SDR# (1707+) free tuning now works, a step size (e.g. 25KHz) is subtracted from the visible bandwidth when the channel list is created. This may result in additional segments been used. This is required so detection of frequencies on each edge of a segment will occur without problems. (SDR# tries to jump to next 'page' while the plug-in tries to set it back again)

NOTE: 'usable bandwidth' is a value usually set by the SDR driver.

For scan modes:

- Scan only memorized - exclude new
- Scan only new - exclude memorized
- Scan only enabled in manager*

Channels (start frequency + (step size + N)) must have the same frequency as what is used in the *Frequency Manager* database for the scanner to detect activity or to skip it.

For all scan modes, the above applies as well when displaying details from the DB when exists.

Any changes made to the entries in the *Frequency Manager* will not be seen by the scanner until the scanner is stopped/started.

VFO tuning and SDR# zoom while scanning

- The scanner must keep each segment centred to function in a predictable manner.
- To achieve this, the segment centre is checked and corrected as needed.
It is also required to force *Free tuning* mode (<>) in SDR# so the scanner can tune to any frequency in the segment (visible spectrum).
- A side affect of doing this, is zooming (using right-hand side vertical slider) can cause the expected centre frequency to shift causing scanning problems.

During scanning, the zoom will be reset back to 0 zoom.

When scanning is paused, the zoom can be use but will be reset to 0 when scanning resumes.

If you which to see the frequency spectrum zoomed in on VFO, then use the *Zoom FFT* plug-in.

NOTE: On SDR# 1716 and earlier *Zoom FFT* will share/split the screen with *Frequency Scanner*.

It's recommended to disable SDR#s squelch and allow the scanner to control the audio mute of SDR# instead. (see "Use audio mute" and "Noise protection delay - ON/OFF")

If you only use the squelch, there is a possibility that the signal may not be heard because it has reached to level of "Trigger level" use by the scanner but not the squelch level used by SDR#.

NOTE: SDR# squelch is automatically turn OFF when "Use audio mute" is enabled

Don't try and use the SDR# slice feature when using the scanner.

This will produce unexpected results.

The *Frequency Scanner* plug-in "Start scan" button should be disabled from within a slice anyway.

When the channel analyser window is stretched vertically, it does **not** scale any part of this area.
The only thing changed is the range available for a maximum signal.

There are no plans to scale this area at this stage.

Indicating when the active frequency is not in the 'Frequency Manager' database. (While scanning)

- Only for scan modes:
 - 'Scan all with save new'
 - 'Scan all without save new'
 - 'Scan only new - exclude memorized'

In the channel analyser, the horizontal line under the active frequency label will be thicker and will be coloured 'OrangeRed'.

Something to remember with this scanner (and probably all scanners) is that scanning is done relative to the start frequency and continues up based on the step size used. You will not see the scanner stopping on frequencies that are not aligned to start frequency + (step size * N).

Here is an **example**, If you wanted to scan some frequencies that started at 300 MHz with a step size of 6.25 KHz. The scanner only scans the frequencies shown in green shown below. It would not see activity if it were on say 300,010,000.

300,000,000 (5 KHz, **6.25 KHz**, 8.33 KHz, 10 KHz, 12.5 KHz) - **Start frequency**

300,008,300 (8.33 KHz)

300,005,000 (5 KHz)

300,006,250 (**6.25 KHz**)

300,010,000 (5 KHz, 10KHz)

300,012,500 (**6.25 KHz**, 12.5 KHz)

300,015,000 (5 KHz)

300,016,600 (8.33 KHz)

300,018,750 (**6.25 KHz**)

300,020,000 (5 KHz, 10 KHz)

300,025,000 (5 KHz, **6.25 KHz**, 8.33 KHz, 12.5 KHz)

300,030,000 (5 KHz, 10 KHz)

300,031,250 (**6.25 KHz**)

300,033,300 (8.33 KHz)

300,035,000 (5 KHz)

300,037,500 (**6.25 KHz**, 12.5 KHz)

300,040,000 (5 KHz, 10 KHz)

300,041,600 (8.33 KHz)

300,043,750 (**6.25 KHz**)

300,045,000 (5 KHz)

300,050,000 (5 KHz, **6.25 KHz**, 8.33 KHz, 10 KHz, 12.5 KHz)

...

You can see in above list, that some step sizes will see the same frequency but frequencies can be missed from another step size when one step size is chosen.

When "Auto suspend draw" is enabled, the mouse inside the channel analyzer will behave as follows:

If you enter channel analyzer where the top buttons area (FWD/REV/Play/Lockout/ZoomType) is, then the auto suspend draw will not be interrupted but the buttons will light up as usual.

If you keep the mouse pointer in this top button area and don't move the mouse, then after three seconds the button fading will begin fading and the pointer will show as a hand until moved again. If you leave the top button area into the main area of the channel analyzer, then auto suspend draw will be interrupted.

The *Frequency Scanner* plug-in will need to change some SDR# options when scanning. Because of this, the plug-in will remember some SDR# option states when “Start Scan” is pressed and will restore them when “Stop Scan” is pressed.

- **Squelch (AM/NFM)** – (will be disabled if “Use audio mute” is enabled)
 - **Snap To Grid** - (disabled while scanning, see below)
 - **Tuning Style/Limit** - (set to 'Free tuning' while scanning)
-

Enabling ***Snap to Grid*** when scanning is not recommend for the following reasons

- It interferes with changing segments.
If *Snap to Grid* is enabled and if you hear a beep when scanning, this may indicate the problem is occurring.
- If scanner stops on a frequency that is not the expected one, then the *Snap to Grid* is interfering with VFO tuning.

I will not be allowing *Snap to Grid* to be enable as it works horribly with the scanner plug-in. It will be disabled on 'Scan start' and every time a new segment is set.

If the scanner lands on a frequency that is not *Snap to Grid* aligned, *Snap to Grid* moves the VFO off the expected frequency. This appears as random stopping on in-active frequency.

The scanner will be either be on the wrong frequency or tries to re-tune it, then *Snap to Grid* will change it again. (this repeats over and over)

This is worst with 8.33 KHz step size as SDR# is always wrong calculating the correct 8.33 KHz frequency.

If this re-tuning occurs on the edges of the visible spectrum, it could cause the (segment) centre frequency to change. The plug-in will try and correct this and re-tune the correct (segment) centre frequency again. (this will repeat over and over with beeping)

Snap to Grid also is only aligned to x.0000 so if you use a start offset other than x.0000 (because frequencies just use a odd spacing) then *Snap to Grid* is not very useful.

e.g. Start: 415.0125 with step size: 25 KHz. The next frequency would be 415.0375 but *Snap to Grid* sets it to 415.0250.

The only thing I will do with *Snap to Grid* is to store it's state at scan start, and restore it on scan stop.

Development of this plug-in is focused around SDR# v1716 (the last non Telerik UI)

While the *Frequency Scanner* plug-in will work with the newer SDR# Telerik UI, I (and others) have found it affects the performance of the plug-in drastically.

I don't use the newer SDR# (1784+) as it's too resource hungry and too much effort to maintain the layout and to locate options when needed in a hurry.

Note about the *time* and *speed* values shown in the channel analyser (Debug Info)

These values are only an indicator of time/speed. (don't expect precision here)

These values will be more “accurate” when there was no activity on a pass.

These values represent the time spent on one pass scanning for activity

- 1 pass = From the start of the selected defined scan range to the start again
It does not include time paused on a frequencies
- These values will fluctuate depending on how activity appears across segments during a pass

This modified version and documentation by thewraith2008 started in February 2020 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/>

Frequency Scanner (this original SDR# Plug-in) by Vasili (TSSDR)

- <http://rtl-sdr.ru>
- Thanks Vasili for allowing me to update this plug-in.

Necessary Disclaimer:

- This program is "as is"
- This program most probably contains errors, bugs or whatever and that it may crash itself, SDR#, the plug-ins, windows or your car. You accept that you use it at your own risk.
- I make no promises to update it or support it.
- I'm under no obligation to implement anything.
- The creator of SDR# has the right to change their code as they see fit. Because of this, this program/plugin can and probably will break.
- Not reading the read-me/set-up and usage documentation files may cause you issues.