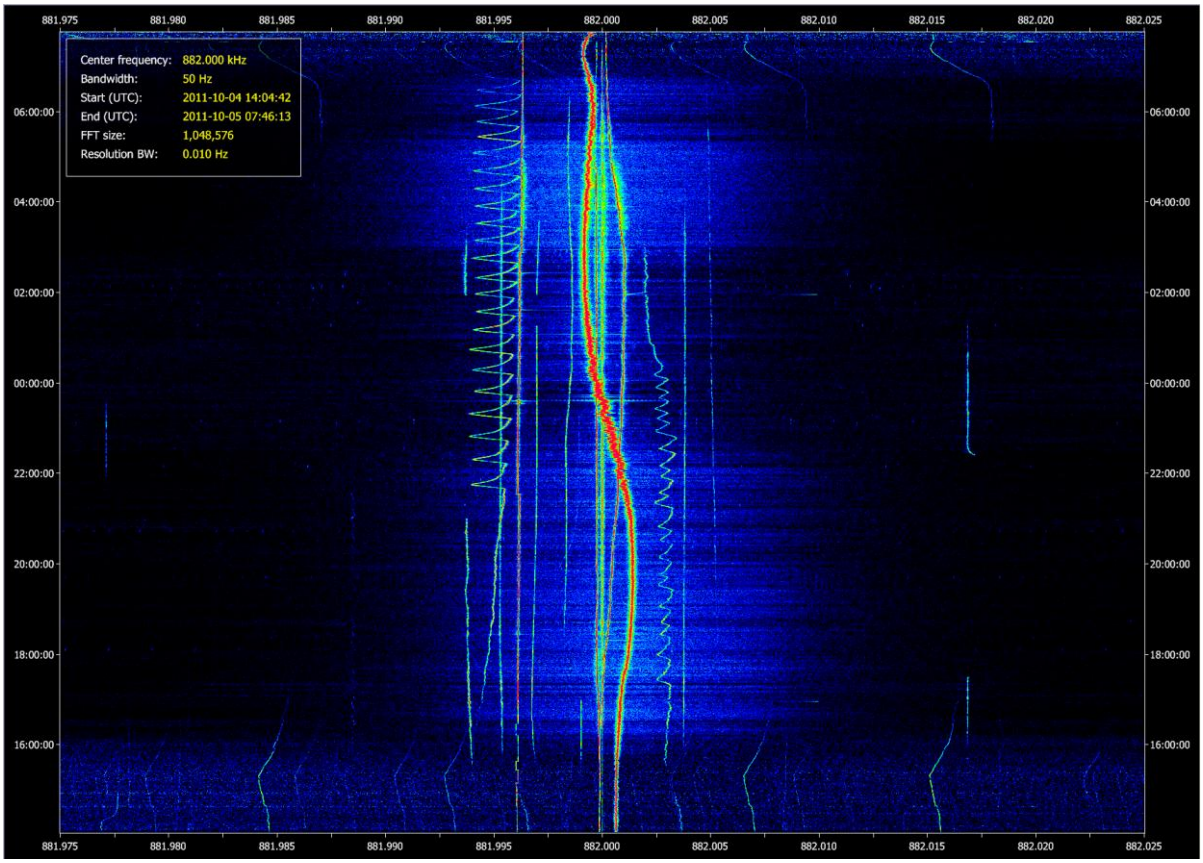

SDR Data File Analyser

A professional series application

SDR-RADIO.com

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1 Introduction

Most SDR consoles which display data in real-time can also record the raw IQ data to a series of files for later analysis. This program is designed to analyse these recordings:

- Displays of up to 5,000 by 100,000 pixels,
- Playback using own demodulator (AM, FM, sideband, …),
- Signal history,
- Zoom in on an area of interest.

1.1 System Requirements

This software makes heavy use of your system while analysing IQ files. The recommended minimum system configuration is:

- Windows 7 64-bit,
- I5, i7 or XEON,
- 16GB RAM (minimum),
- SSD (recommended) or fast array of raided disks.

1.2 Licence

This program requires a licence. When downloaded the built-in licence is automatically activated. To see the status of the licence look in the output window, for example:

```
19:17:11> Licence
19:17:11>     Activation key ....: E2HZ0-N0F05-51CGC-B8886-4J1CW-VNZQSP
19:17:11>     Computer key ......:
19:17:11>     Computer name .....: DEEP-THIRST
19:17:11>     Status ............: Valid
19:17:11>     Valid .............: Yes
19:17:11>     Needs activation ..: No
19:17:11>     Expiration ........: 05/28/12 00:00:00
19:17:11>     Version ...........: 1.5 (1.5)
```

1.3 Installing

Installation is simple. Download the latest kit, accept all defaults. The default installation folder is *C:\Program Files\SDR-RADIO-PRO.com*

2 Starting

2.1 Recordings

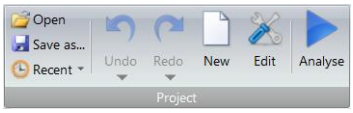
Before using this program you must make a recording using either the standard SDR-RADIO.com Console or the SDR-RADIO.com Multi-View Console (available Q3 2012). Recordings are saved as a series of .WAV files with internal meta-data, for example:

- 27-Jan-2012-1204 7.225MHz 000.wav
- 27-Jan-2012-1204 7.225MHz 001.wav
- …
- 27-Jan-2012-1204 7.225MHz 099.wav

2.2 Projects

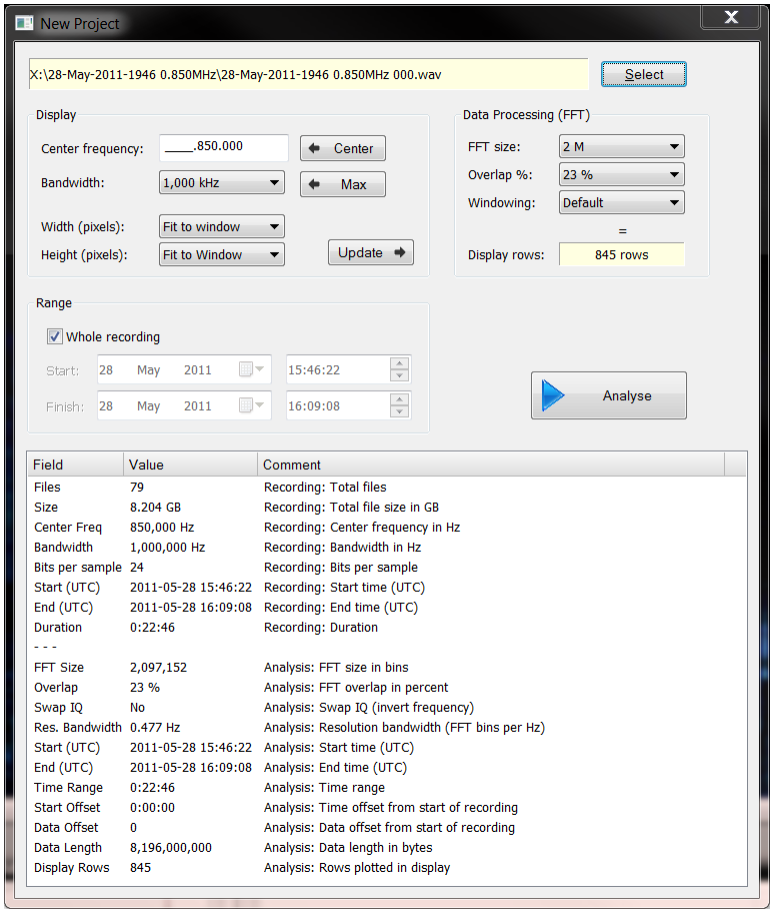
The basic concept is that of a Project, where a project contains:

- A list of IQ data recording files,
- The meta-data generated when these files are analysed,
- The various project settings such as width and height of the display.



To create your first project: From the ribbon bar select *New* in the *Project* panel, the *Edit Project* window is displayed (see below).

2.3 Edit Project



This is where you configure all aspects of the project. Press *Select* and select any recording file. All files in the recording sequence are analysed, the results used to determine the suggested default values for the project.

Display

This group of fields controls the visual aspects of the analysis:

- Center frequency must be a valid frequency within the recording range.
- Bandwidth is the frequency range shown on the x-axis (cannot be greater than the recording bandwidth).
- Width and height define the size of the display window in pixels. The program cannot be more than 2,000,000,000 (2GB), this is a restriction imposed by the graphics system used.

- Press *Update* to apply the Height value to the Data Processing (FFT) engine which computes the FFT size and Overlap to match this height as close as possible.

Data Processing (FTT)

This group of fields computes the values used by the background threads which process the recording files using the fast fourier transform algorithm FFT and generate the output data. Normally you use the Display group's Update option to automatically calculate the FFT size and Overlap percent, you can override these values if needed.

Range

This is the time range of the recording used in the analysis.

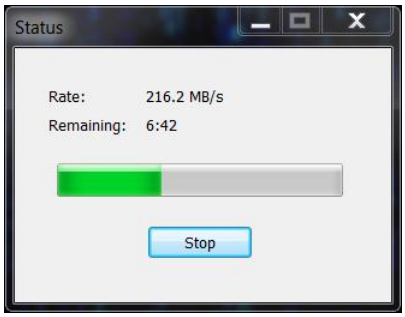
2.4 Analyse

When you start the analysis the recording files are processed sequentially, the speed of the analysis depends on:

- Disk speed (SSD are best),
- CPU speed,
- CPU cores,
- Available RAM.

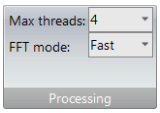
Assuming a fast CPU the analysis speed will be determined by the rate at which the data can be read from your file storage.

Progress



A progress window is displayed which shows the data rate and remaining time until the analysis is complete.

Performance



In the Tools pane of the ribbon bar select the Processing panel.

- Max threads – the number of background threads available for processing the recording files.
- FFT mode – fast or accurate – normally you will not notice any difference between these two settings.

2.5 Saving

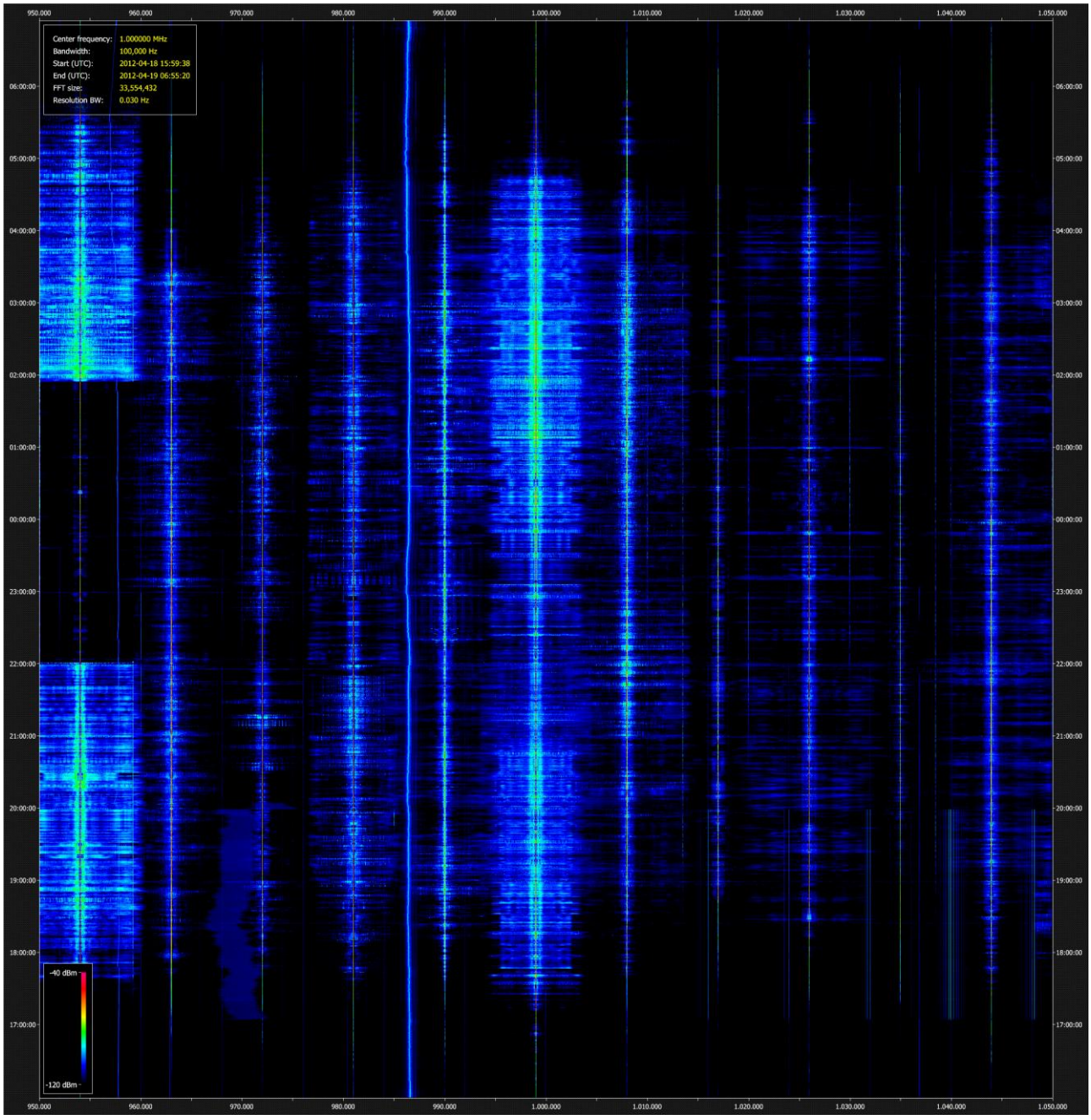
After analysis has finished you must manually save the project: select *Save as* from the project pane in the ribbon bar. You can save the project as many times as you want, you must give each saved file a unique name.

2.6 Open Recent

To open a recent project either select an entry from the Recent button in the Projects pane or select the project using the button.

2.7 Example

An example of a medium wave analysis is shown below.


Center frequency: 1.000000 MHz
Bandwidth: 100,000 Hz
Start (UTC): 2012-04-18 15:59:38
End (UTC): 2012-04-19 06:55:20
FFT size: 33,554,432
Resolution BW: 0.030 Hz
950.000
960.000
970.000
980.000
990.000
1.000.000
1.010.000
1.020.000
1.030.000
1.040.000
1.050.000
06:00:00
05:00:00
04:00:00
03:00:00
02:00:00
01:00:00
00:00:00
23:00:00
22:00:00
21:00:00
20:00:00
19:00:00
18:00:00
17:00:00
-40 dBm
-120 dBm

3 Display

3.1 Appearance

Note: you can change the appearance at any time, changes take effect immediately.
First select the palette from the Pallete dropdown in the ribbon bar's Colours pane. The standard palettes are:

- Black and White
- Blue and White
- Mother Nature
- Radar Glow
- SpectraVue.

The colours used in the display are assigned to the signal traces based on relative signal level. You can either assign this mapping using either:

- Automatic mapping with adjustable contrast, or
- Manual mapping adjusted with the right-hand side colour bar.

3.2 Images

3.2.1 Save

Save the whole image (including any part of image not currently scrolled into view) in any of the common formats: BMP, GIF, JPG or PNG.
The suggested formats are PNG for quality and JPG for minimum storage.

3.2.2 Screenshot

A screenshot only contains the visible area of the display. Screenshots are saved in PNG format.

3.3 Status Bar

The status bar shows:

- The frequency, signal level and recorded time (UTC) for the current mouse position,
- Current CPU used by this program, and
- Current program size (RAM used).

4 Zoom

To zoom into a region of interest:

1. Make sure the mouse is configured to enable Zooming by selecting *Zoom* in the ribbon bar's Mouse panel.
2. Using the left mouse button select the region of interest.

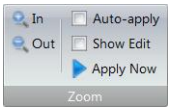
The selected area defines a special analysis which contains:

- Center frequency
- Bandwidth,
- Time range.

The recording files are re-analysed over the selected range and the results displayed in an almost identical second window.

If you press the Shift button while dragging with the left mouse button then the Zoom is not applied automatically. Pressing shift enables changing the selected area, just release the shift button and the zoom analysis starts.

4.1 Options



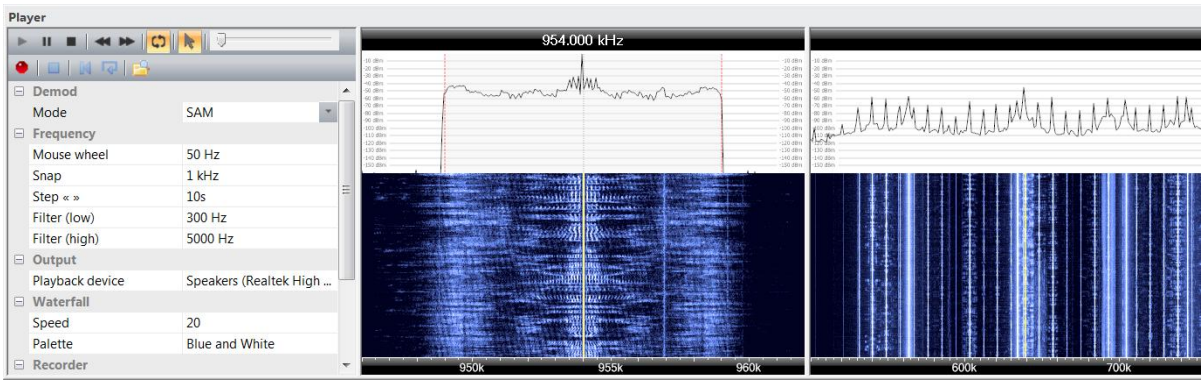
The options are:

- In – Zoom into the selected area (reduces the zoom rectangle).
- Out – Zoom into the selected area (increases the zoom rectangle).
- Auto-apply – when the left mouse button is released the analysis of the zoom area starts automatically.
- Show Edit – before starting the zoom analysis the Edit Project window is displayed with the options selected for the analysis.
- Apply Now – starts the zoom analysis.

4.2 Changing Size

To change the size of the zoom display select *Edit* in the *Project* pane, select a new height, then press the Analyse button. The analysis runs again, this time with the new height.

5 Player



5.1 Starting

Not only can you display the data, you can play it just like any other recording. Press *Player* in the ribbon bar's *View* panel to display the Player pane.

5.2 Operation

The player supports all the features you would expect, these are selected in the options pane on the right.

Player Toolbar

From left to right:

- Play,
- Pause,
- Stop,
- Rewind,
- Fast Forward,
- Auto-Repeat,
- Left mouse button enable,

- Volume level.

Recording Toolbar

From left to right:

- Start recording,
- Stop,
- Restart (current contents are overwritten),
- Restart (current file is saved, new file is created.

Options

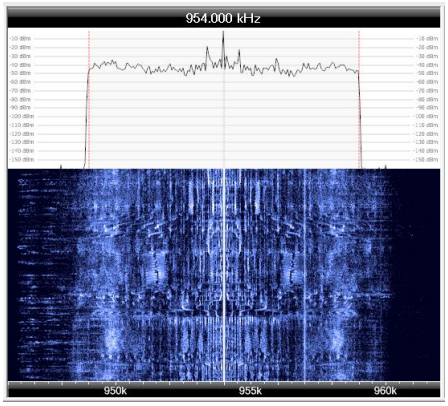
Demod	
Mode	SAM
Frequency	
Mouse wheel	50 Hz
Snap	1 kHz
Step « »	10s
Filter (low)	300 Hz
Filter (high)	5000 Hz
Output	
Playback device	Speakers (Realtek High Definition Audio)
Waterfall	
Speed	20
Palette	Blue and White
Recorder	
Folder	V:\Recordings\Test
Format	MP3

Here you configure the player.

- Demod
    - Mode – the demodulation mode, all common modes are supported.
- Frequency
    - Mouse wheel – the frequency increment as the mouse wheel is rotated.
    - Snap – when tuning by clicking in either the main display or either the player waterfalls the frequency is rounded to the nearest integer multiple of this value, or more simply it ‘snaps’ to this value. This is the same as a fixed tuning increment.

    - Step «» – the playback change in seconds or minutes when either the rewind or fast forward buttons are pressed.
    - Filter (low), Filter (high) – the lower and upper frequencies of the demodulation filter (you can also drag the filter bars in the waterfall).
- Output
    - Playback device – the output device for audio playback.
- Waterfall
    - Speed – the waterfall display speed in lines per second.
    - Palette – the colour scheme.
- Recorder
    - Folder – where the audio recordings are saved.
    - Format – either MP3 or WAV (48kHz, 16-bit, mono).

5.3 Audio Waterfall



This waterfall shows the signal being passed to the demodulator. You can drag the filter by clicking either of the two vertical filter bars with the left mouse button.

6 Tags

So you've recorded the data, analysed the data – now let's add tags to the display to highlight the signals of interest.

6.1 Pane

From the View pane in the ribbon toolbar select Tags.

6.2 Adding

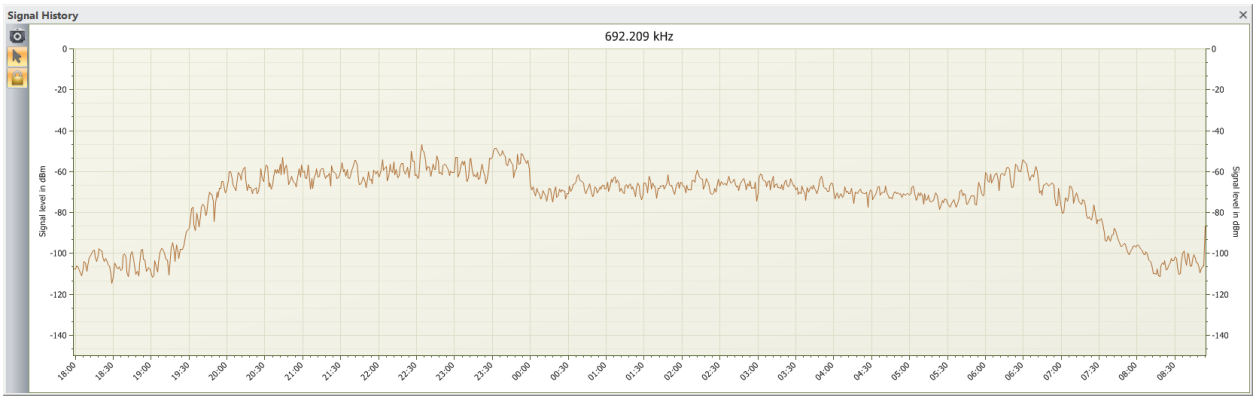
There are two ways you can add a tag:

1. Right-click on the signal and select Add Tag from the popup menu,
2. Drag a rectangle with the left mouse button; then press the Add button in the Tags toolbar.

6.3 Displaying

To display tags select the Show button the Tags toolbar.

7 Signal History



This is a very simple but at the same time useful tool which displays the signal level for the selected frequency over the entire analysis time range. To select the frequency of interest you must first make sure that the mouse is configured to select the signal history frequency, to do this click the mouse pointer button in the signal history toolbar.

8 Settings

There are various support settings which you may find useful. From the Tools pane in the ribbon bar look at the Settings panel.

- Registry – browse the registry settings used by this program.
- Program Installation – browse the files in the folder where the program is installed.
- User Files – browse the files in the folder where any user settings are stored.
- Properties – displays the properties grid where you customise the program.

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