

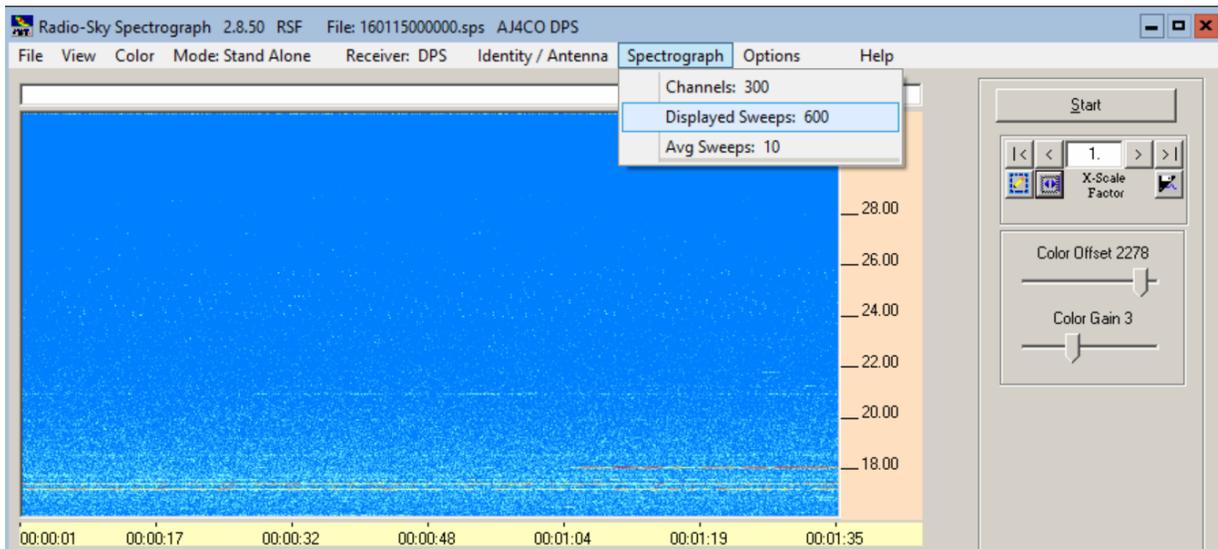
Using the Average Data function for RSS File Review

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RadioSky Spectrograph (RSS) is operated in Stand Alone Mode when reviewing recorded .sps files.

For this example we will use a 24 hour file (160115000000.sps) from AJ4CO. The RSS software has been set under Spectrograph to display 600 sweeps (it can be set to any number between 100 and 1200).

The Avg Sweeps setting under Spectrograph does not apply to the Review mode.



Under File, simply select **Load Data File** and follow the directory to the file you wish to review. When the file is loaded, the first 600 sweeps of the data file are displayed as seen above. Notice that the X-Scale Factor (under the start button) reads 1.

Each 300 channel sweep of the FSX spectrograph takes approximately 150 msec, so 600 sweeps represents 95 seconds of data. This matches the time scale above.

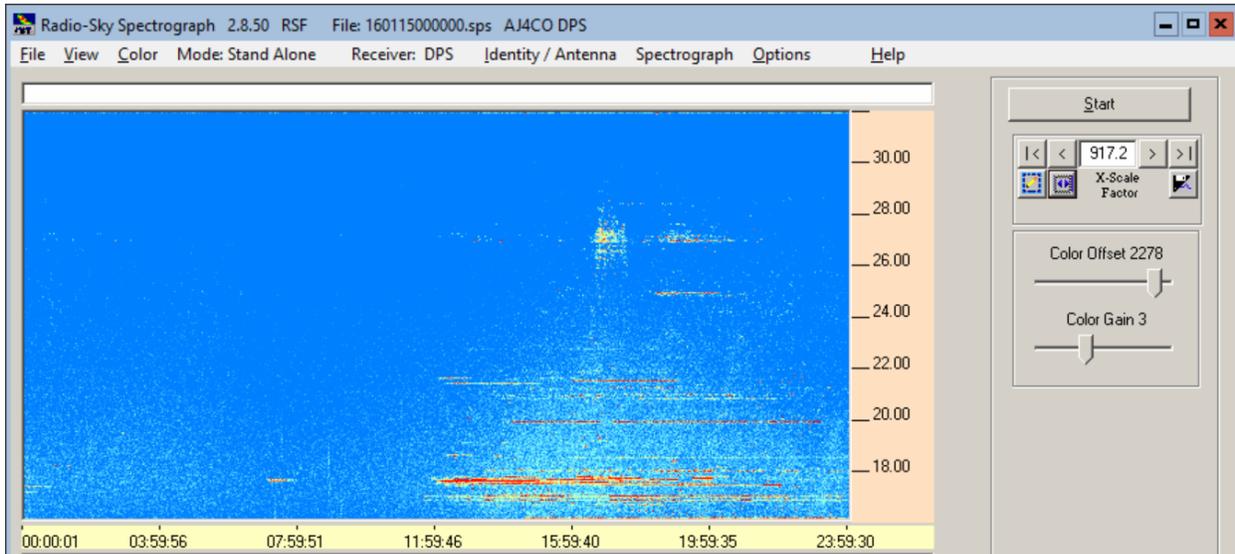
The whole 24 hour (86,400 seconds) file that we want to look at contains about 576,000 sweeps. The display is only 600 pixels wide, displaying 1 sweep per pixel column, and we want to see the whole 24 hour record which contains 576,000 sweeps. There are two choices – either average a bunch of sweeps together, or throw away a bunch of sweeps. (Not to get too alarmed – the extra raw data sweeps are not really thrown away - they are just not used in the display.)

The choice to average or not gets made under **Options>File Review**. If you select **Average Data** then sweeps will be averaged together – if you don't select Average Data then sweeps will get thrown away.

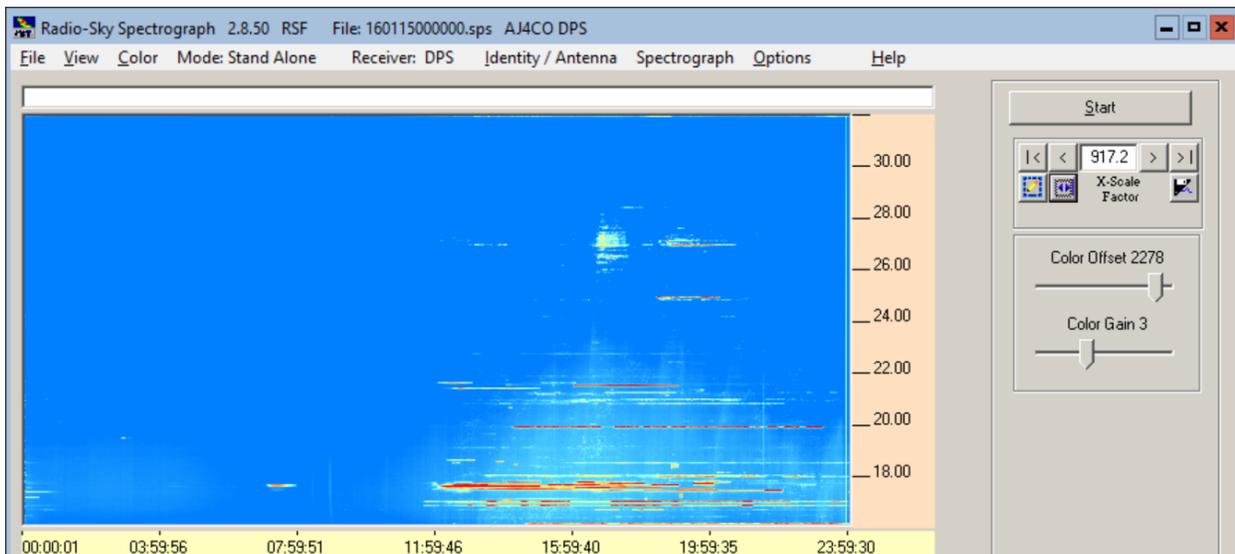
To display the full 24 hour record click the double arrow button just to the right of the pencil icon.

For our first example we will not select Average Data – so RSS will simply discard 576,000-600 = 575,400 sweeps. That is, it will display 1 sweep and then ignore the next 917 sweeps and then display the next sweep and so on. Those 917 ignored sweeps between displayed sweeps represent about 137 seconds.

The full 24 hour spectrogram with NO averaging seen below looks pretty grainy.



Next we will reload the same data file with Average Data turned ON. Averaging 917 scans together to generate each displayed scan has produced a much smoother display.



Averaging clearly reduces the noise fluctuations seen in the display. Statistical fluctuation are reduced by the square root of the number of samples, which suggests in this case that the statistical noise has been reduced by $\text{SQRT}(917)$ which is a factor of 30. In this example each display sweep (pixel column) is the result of averaging 137 seconds of data.

Different display durations will result in different X-scale factors. For example, only half as many scans will be averaged when looking at a 12 hour record.

Summary

The number of sweeps being displayed, and the use of the File Review Average Data mode both affect the sweep averaging as indicated by the X-scale factor. These settings in turn affect the amount of noise reduction achieved.

Note that the Average Sweeps selection under Spectrograph has nothing to do with the Review mode – this is the average applied to real time data in Client mode or to local live data being collected in Stand Alone or Server modes.

When a dual receiver is used, the average display check box applies to both upper and lower spectra.

