Initial Comment
These instructions were not written by the author of IF Average. They are based on what I have been able to figure out by extensively working with the plugin. That means I may be wrong in some cases, but I have tried to be as thorough as possible.
Greg Latta AA8V

What Is IF Average And How Does It Work?
IF Average takes a 2.4 MHz piece of spectrum (not adjustable) centered on the frequency set in the main SDR# window. It then calculates the Fast Fourier Transform (FFT) of this piece of spectrum. The FFT divides this spectrum into a discreet number of equally spaced frequencies given by the setting in the FFT Resolution box. The level (in dB) of each frequency present is calculated and then graphed in the IF Average output window, which is separate from the main SDR# display. This is done over and over again.

As the FFTs are calculated, corresponding levels are averaged together and, after the number of FFTs specified by the Dynamic Averaging setting are processed the dynamic (or running) average is then displayed in the IF Average output window. This is then updated regularly every time an additional FFTs equal to the setting of Intermediate Average are processed. Thus, a dynamic or running average is kept.

At any time the linear coefficients (not in dB) of the dynamic average can be output to a text file for further scientific analysis. The text files can also be output at regular intervals over any specified length of time.

What is a Typical Use for IF Average?
IF Average is designed to lower the noise in the spectrum display so that the spectrum of very weak signals, normally masked by the noise, can be seen. This type of spectrum is normally encountered in radio astronomy.

Idiosyncrasies
This plugin has many idiosyncrasies that you will have to get used to. Here are some of them:

1. There are several "boxes" in the plugin. You might think that you can type a value into these boxes. However, they are display boxes only. You must select a value using the slider, select or up-down button, mouse wheel, or left clicking on the slider track. Trying to type in a value does not work. The exceptions to this are the Path and Files Name boxes.

2. When you check the "Window" box that opens the output window for the plugin, the output window has a tendency to hide behind the SDR# window, even when first opened. To make sure you see it, take SDR# out of full screen mode and resize it. Move it around until you can find the IF Average window. Position the two windows so you can always see both of them at the same time. The IF Average window can be resized at will.

Uncheck this box when you are finished using IF Average before you close the IF Average plugin or close SDR#. Otherwise the window will stay open, even after you close SDR#.

3. The setting for Dynamic Averaging is rather strange, as explained in the section below on Dynamic Averaging.

SETTINGS:

Window
Checking this box opens the IF Average output window. This window is separate from the main SDR# window. (IF Average has no effect on the main SDR# window.) The output window has a tendency to hide behind the SDR# window, even when first opened. To make sure you see it, take SDR# out of full screen mode and resize it. Move it around until you can find the IF Average window. Position the two windows so you can always see both of them at the same time. The IF Average window can be resized at will.

Uncheck this box when you are finished using IF Average <u>before</u> you close the IF Average plugin or close SDR#. Otherwise the window will stay open, even after you close SDR#.

FFT Resolution
This controls the number of points that will be output and the frequency resolution of the output. The frequency resolution of the output is approximately 2400 kHz/FFT resolution. For example, with a value of 1024 the frequency resolution of the output is approximately 2400 kHz/1024 = 2.34 kHz. Press the select button and choose a value. Higher values increase the frequency resolution, but they also increase the CPU load. <u>Too high of a value here may cause your computer to crash</u>. I find that 1024 works quite well.

Intermediate Average
Determines the number of new FFTs that must be taken before the dynamic average is updated. This control also interacts with and affects the setting of the Dynamic Averaging control. Press the select button and choose a value. Lower values improve the response time of the dynamic average. Higher values make the response time more sluggish.

Gain
The gain control changes the gain in the IF Average window only. Turn this up to enlarge small peaks, and turn it down to lower large peaks. When the gain is set to 22 the dBFS reading in the IF Average window approximately matches that in the main SDR# window. You cannot type a value into the box for this control. You must select a value using the slider, left clicking on the slider track, or hovering over the slider track and using the mouse wheel. I find using the mouse wheel works the best.

Level
The level control functions very much like the offset control in the main window. Changing it moves the IF Average window display up and down. You cannot type a value into the box for this control. You must select a value using the slider, left clicking on the slider track, or hovering over the slider track and using the mouse wheel. I find using the mouse wheel works the best.

Dynamic Averaging
This setting controls the number of Fourier transforms that are averaged together and used to maintain the dynamic average. Setting this to higher values improves the reduction in noise. Setting it higher also increases the time needed to obtain a stable display of the dynamic average.

You cannot type a number into the box for this control. Use the slider, left click on the slider track, or use the mouse wheel to set the value. Note the following:

1. Moving the slider with the mouse causes large jumps in the value.

2. The minimum setting of this is equal to what is entered into the Intermediate Average box. Move the slider a bit to the right and then all the way to the left set the value to the minimum.

3. Left clicking with the mouse on the slider track to the right of the of the slider causes the value to increase by an amount equal to 10x the value set for Intermediate Average box. Left clicking with the mouse on the left side of the slider (if you can) causes the value to decrease by an amount equal to 10x the value set for Intermediate Average box.

4. Hovering over the slider track and using the mouse wheel smoothly changes the value in increments equal to the actual setting of the Intermediate Average box.

Changing the value of the Intermediate Average after setting the Dynamic Averaging will change the Dynamic Averaging setting!

Stop/Start
Stop – pauses the averaging process.
Start – if pressed after Reset is pressed it completely restarts the averaging process.
Start – if pressed after Stop (pause) is pressed, it continues the averaging process.

Background
Pressing this takes a snapshot of the current dynamic FFT and then subtracts it from future averages. This remains activated until Reset is pressed.

Reset
Resets any background to zero and completely resets the averaging process.

Export Single AV
Exports the current dynamic average as a text (.txt) file. It will ask you to navigate to a folder and provide a filename.

Multiple Files
Number of Files to Save:
Enter the number of files you wish to save.

Delay Between Rec. (s)
Enter how many seconds you want between the saving of each file.

Path
Set the folder where you want the files stored.

Files Name
Set the base file name. The files are saved with the name filename_xxxx.txt where xxxx is the number of the file. For example, if the filename is myfile the files are saved as:
myfile_0001.txt
myfile_0002.txt
etc.

Stop
Terminate the multiple save process early. Files already written are kept.

Multiple Save

Start the multiple save process. The button blanks out indicating recording is taking place.

Suppose you want to save a file every 5 minutes for 3 hours:

1. This implies you want 60/5 = 12 files per hour, so set the number of files to 3 x 12 = 36
2. 5 minutes is 5 x 60s = 300s, so set the delay to 300s.
3. Choose the folder where you want the files saved.
4. Choose the base filename.
5. Be sure IF Average is running, and press Multiple Save. It will blank out until the process is completed.
6. If you wish to stop the process early, just hit Stop. The files already written will not be affected.

Saved File Structure
The saved files are in text (.txt) format.

If the file was obtained by using "Export Single AV":
The first line contains the number of FFTs into the next intermediate averaging cycle at the time the file was generated followed by the Dynamic Average setting in parentheses.
The first column is the frequency.
The second column is the Fourier coefficient/relative voltage/amplitude. It is NOT in dB.

If the file was obtained by using "Multiple Files":
The first line is the date and time the file was saved followed by the Dynamic Average setting.
The first column is the frequency
The second column is the Fourier coefficient/relative voltage/amplitude. It is NOT in dB.