

Using Spectrogram to Align The K2's SSB Filters

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In September of 1999, Alan Childress, KM4DT, first brought our attention to the freeware program Spectrogram, and he first mentioned its use in aligning the K2's CW filters. Because it was such a radical concept, I think his comments tended to fall on deaf ears. Later, both W3GDZ and I wrote instructions for using Spectrogram (<http://www.visualizationsoftware.com/gram.html>¹), to align the Elecraft K2's CW filters.

Subsequent to both of those sets of instructions, Don Wilhelm, W3FPR, posted a fine description of the procedures he'd used to align his K2 for SSB reception, using Spectrogram. Again, it fell thru the cracks of the reflector and was lost. I doubt that many K2 owners picked up on it, and that's too bad.

So, in response to several more recent requests, and in order to not have to re-write an individual paper for each future response to the subject, I am going to attempt to use Don's basic procedure and then set down some simple steps for basic alignment of the K2's SSB filters using Spectrogram. (I hope I can do justice to Don's initial efforts).

NOTE: If you have installed the **KAF2** AF filter, BE SURE to set **AFIL** to **OFF** before aligning the filters.

SPECTROGRAM SETUP & ALIGNMENT PROCEDURE

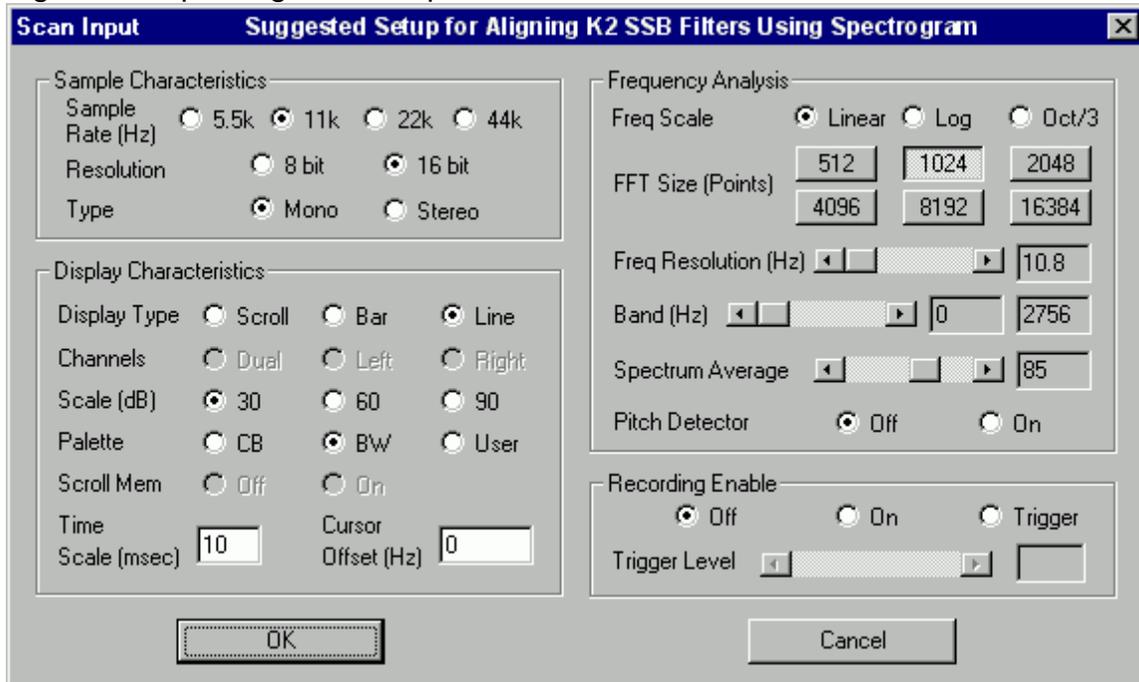
1. Install Spectrogram onto your PC according to the SETUP instructions.
2. Connect your K2's HEADPHONE output to the MIC INPUT of your PC's sound card via an appropriate jumper cable.
3. Turn the K2 on and tune to a band which exhibits a moderate amount of background noise, but NO specific received signals (or connect the output of an antenna noise bridge, or a broadband noise generator to the ANT jack on your K2). Set the K2 to 20M LSB and FL1 (OPT1 for the SSB option)
4. Start the SPECTROGRAM program running on your PC. Press [F3] to start a spectral scan and [Esc] to stop scanning.

Note that when Spectrogram starts, you are presented with a setup screen similar to that shown in Figure 1 (see next page).

5. Adjust the default Spectrogram setup parameters to match those shown in Figure 1. If you prefer to see a white background on the screen, as in the examples to follow, set Palette to BW instead of CB.
6. Press <Enter> or click <OK> to start Spectrogram running.

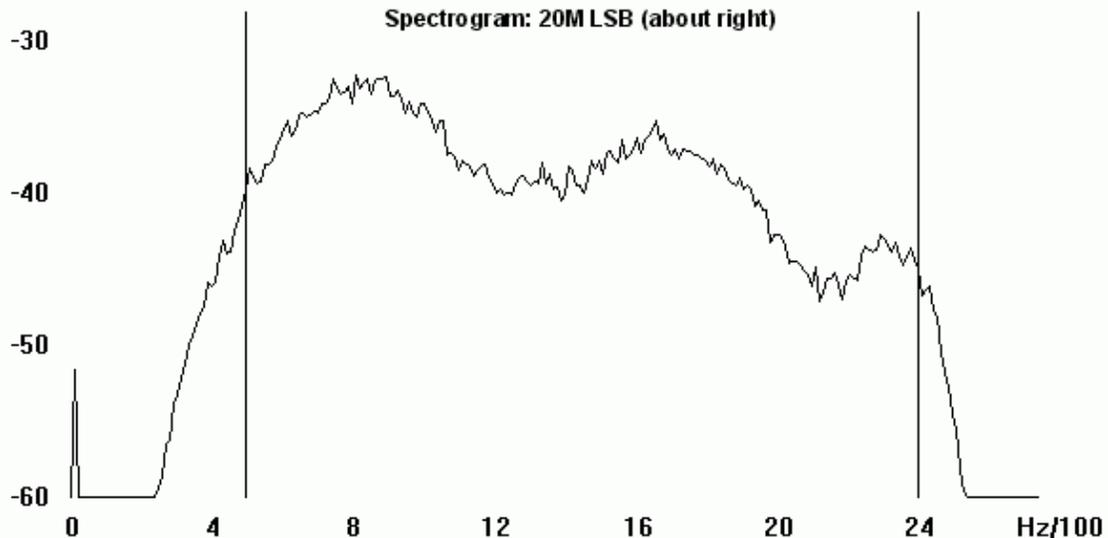
- Once Spectrogram is running, click on Pointers | Freq Mark then set Marker 1 to 500Hz, and Marker 3 to 2400Hz. These are the points I've chosen, you may select others if you see fit. These worked fine for me.

Figure 1. - Spectrogram Set-up Screen



- If your K2 is providing sufficient audio for Spectrogram (not much is required, try to NOT overdrive the audio input to your sound card), in a few seconds you should begin to see a trace of the audio output of the K2. See Figure 2 below). This spectrum display represents the filter response of the K2 in SSB mode for the selected filter.

Figure 2 - Spectrogram of a (more or less) properly tuned 20M LSB signal



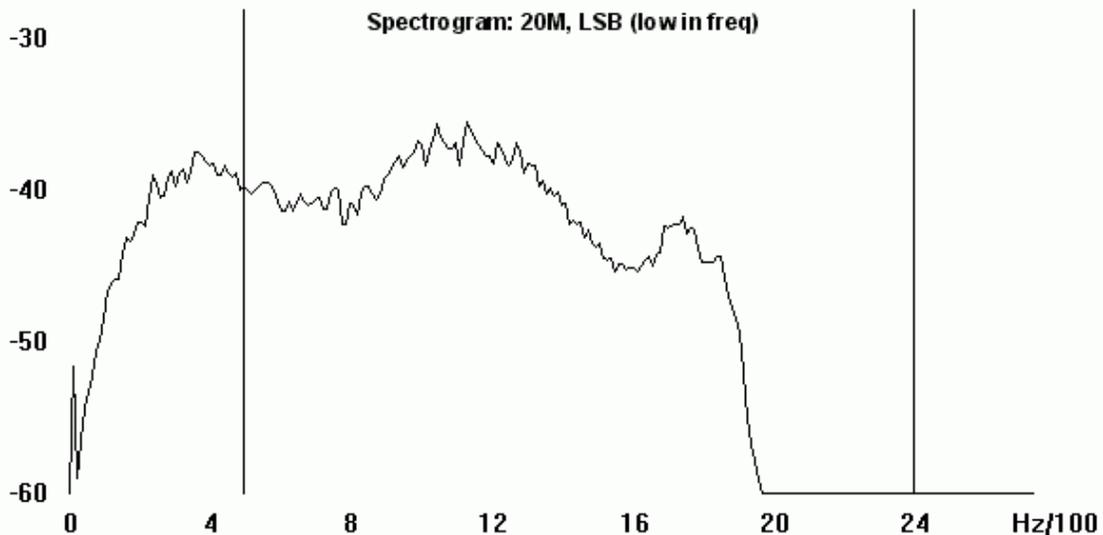
NOTE: Ripple in the passband, and roll-off of the filter traces depicted in this document seems to be representative of all K2s. All examples shown

were made using the K2 SSB Option filter, with C180 (RF Board) removed. The ripple and roll-off are both more pronounced if only the CW filter is used for SSB reception.

NOTE: As of June 2000, a mod is available for 'flattening out' the passband and significantly reducing the roll-off of the K2 SSB Option filter. Look for the "**K2 2nd Xfil SSB Filter Mod**". This mod is well worth the effort to add.

9. If the trace displayed on the screen appears to be more like that shown on Figure 3 (below), then the BFO is set too close to the center of the filter, and audio response will be probably be much too bassy.

Figure 3 - Spectrogram of an improperly tuned 20M LSB signal (too low-pitched)

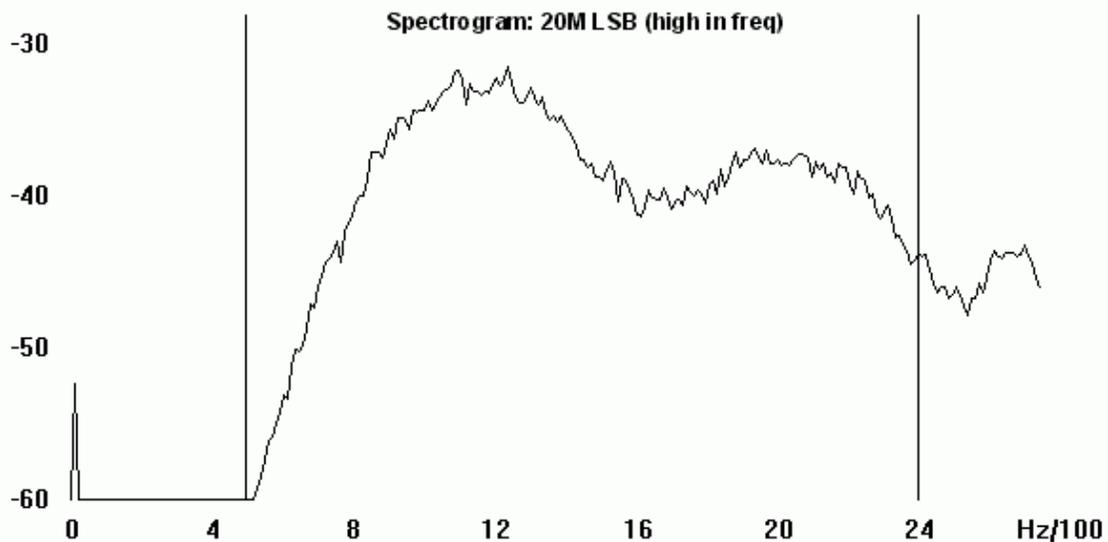


If this is the case, on the K2, select MENU | CAL | FIL and then press [Band-] to access the BFO adjustment menu. Turn the VFO dial to cause the trace to move higher on the scale, until it closely approximates that shown in Figure 2.

Note that the SSB trace may overlap the upper and lower frequency markers, as in Figure 2. It was my intent to try to get the major portion of the displayed frequency response to be more or less centered WITHIN the two frequency markers.

10. If your trace appears to be more like that shown in Figure 4 (next page), then the BFO is set too far away from the filter center and should be adjusted (using the same method as directed in step 9 (above)) to move the trace downward on the scale, until it closely approximates that shown in Figure 2.
11. Once you are satisfied with your setting for the BFO for this particular filter bandwidth, press [Xfil] to select the next available Filter bandwidth, and then repeat steps 9 and 10 for this filter as well. Repeat steps 9 thru 10 for all remaining filter bandwidths for this mode.

Figure 4 - Spectrogram of an improperly tuned 20M LSB signal (too high-pitched)



12. Press [Mode] to change to USB (Figure 5, next page) and repeat steps 9 thru 11 for all filter bandwidths for this mode as well.
13. Once you have completed the SSB filter alignment procedures, take time to switch between the LSB and USB modes and note that the response curve of the filter is reversed between the two modes. In LSB mode, lower frequencies have a better frequency response than the higher frequencies, and in USB mode, the higher frequencies have a better response.

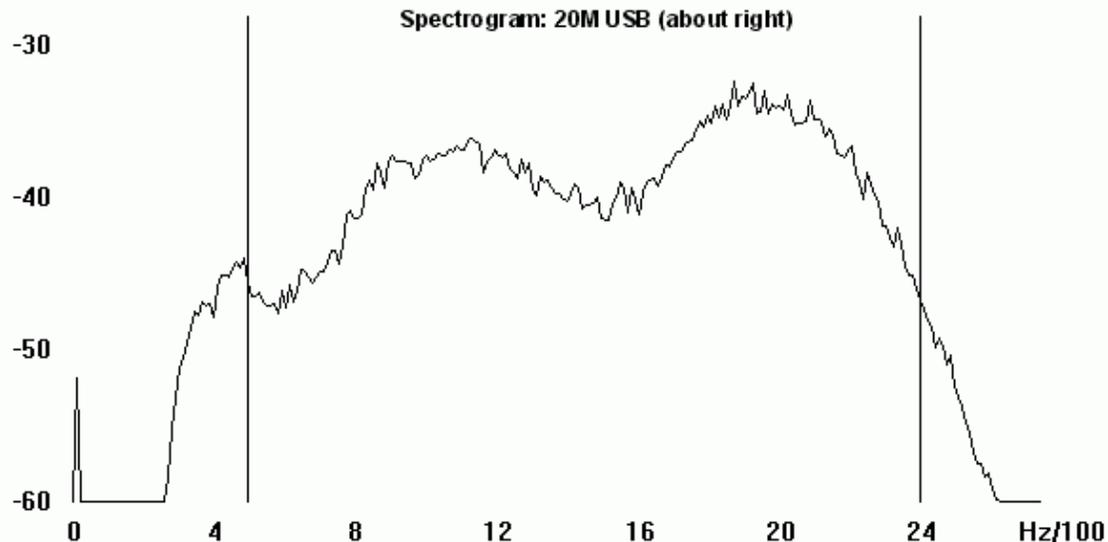
This helps to account for the fact that (on 17M thru 160M) LSB signals generally 'sound' better than USB signals.

Since the oscillator injection (mixing) scheme for the K2 is inverted on the bands 15M thru 10M, USB signals sound better than LSB signals.

This completes the alignment of the K2 SSB filters using Spectrogram.

I would appreciate receiving ANY and all corrections to anything stated herein, and would urge others to devise and post other methods of using Spectrogram to perform this task. There MUST be other ways to do it.

Figure 5 - Spectrogram of a (more or less) properly tuned 20M USB signal



Note that since low frequencies are rolled-off in this mode (on this band), I tuned the BFO for the USB filter a bit lower than normal, in an attempt to de-accentuate the high frequency response just a bit. Of course, this is at the expense of a bit of high frequency roll-off, but the result seems to have been worth the effort.

REGARDING SETTING UP THE K2'S CW FILTERS FOR SSB

The CW filter does not demonstrate as flat a frequency response as that of the SSB Option filter... in fact it will probably show a number of sharp peaks and valleys. As a result you may find that the SSB audio obtained through this filter will be either a bit restricted at the high end or the low end (or both) of the audio spectrum, depending upon band and SSB mode.

When setting the CW filter for SSB, proceed in the SAME manner as outlined above, BUT be sure to set the desired bandwidth for each filter *before* you attempt to set it's BFO. With the more narrow bandwidths, realize that the audio spectrum may not completely fill out the 'marked' audio bandwidth. As a result, it will be up to you to decide whether you wish to emphasize the upper, middle, or lower portions of the audio spectrum available to you.

Footnote ¹ *Spectrogram* (for PC compatibles only) is available from:

<http://www.visualizationsoftware.com/gram.html>

However, the most recent release of this software is **no longer** freeware and is available for a \$25 fee, a small price to pay for such a helpful alignment tool. A 'limited-use' (demonstration) version of *Spectrogram* also available from the author. This version allows you to use the software for ten (10) minutes at a time, thus requiring you to close the program and re-start it if you must use it longer than ten minutes. In actual use, once you become familiar with the software, ten minutes is MORE than ample time to adjust all of the K2's filters, as the entire process can usually be completed in about 5-6 minutes time.