Quick Start Guide for the OpenHPSDR mRX PS CFC Audio Tools

Initial Settings: To start, go through the levels of the basic audio chain components to assure that they are set optimally. The steps below will help you to establish a good starting point:

1. With the TX multimeter set for MIC, select your source (Mic in, Line in, or VAC) and then set the audio level so your voice peaks are regularly reaching close to 0 dB. Note that if you are using a dynamic microphone you may need to enable the “20 dB Mic Boost” option.

2. With the TX multimeter set for EQ, open the Equalizer menu at the top of the GUI console and select the "10-Band Equalizer" option. Note that you can customize the frequency point for each EQ slider but it is suggested that you try the default values initially. Adjust the equalizer sliders so that your audio source produces a relatively flat response with no over-emphasis in any part of your voice. Dynamic microphones tend to have a heavy low-end and electrets can be overly bright so each type typically needs to be treated differently. When you have flattened out the response of your audio source so there is no obvious over-emphasis, set the EQ Preamp slider so your voice peaks are regularly reaching close to but not exceeding 0 dB.

3. With the TX multimeter set for LEVELER, adjust the Leveler’s Max Gain setting so your voice peaks are regularly reaching 0 dB.

4. With the TX multimeter set for ALC, check to make sure your voice peaks are reaching 0 dB. If necessary, adjust the LEVELER so that your voice peaks regularly hit 0 dB. Note that this is essential for the Pure Signal algorithm to operate properly.

5. In the Transmit tab set your Transmit Filter to the desired bandwidth and then save your settings to a Transmit Profile.

CFC Introduction: The CFC (Continuous Frequency Compression) components include the PRE-EQ, CFC, POST-EQ, and the PHASE ROTATOR. Note that all of the CFC settings are stored within the TX profile that they are saved in to allow unique settings within each TX profile that you create. The steps below are suggestions for establishing a starting point to allow you to use the components to optimize your transmit audio. To start out, if you have COMP enabled in the Console GUI, disable it for now. (Note that you may elect to enable that later if you wish to add a “hard limiting” wideband compression effect to your transmit profile. Enabling CESSB will significantly raise your average power output and further accentuate the hard limiting effect when COMP is enabled.) Also, if Pure Signal is enabled, temporarily disable it so that the audio you hear with MON enabled is not pre-distorted.

1. PRE-EQ: In step 2 of the basic audio chain adjustments above, you set the EQ sliders to produce a relatively flat response for the microphone or audio rack that you are using and have set the Preamp slider so that you do not exceed 0 dB on voice peaks while monitoring the EQ with the TX multimeter. Note that when the CFC option is enabled, the basic EQ will

function as the Pre-EQ stage. If you are satisfied that your settings produce a relatively flat audio response, you can move on to the next step.

2. CONTINUOUS FREQUENCY COMPRESSOR: In the DSP menu tab select the CFC tab and place a check in the "CFC Enable" and "Post-CFC EQ Enable" boxes. The CFC interface offers an over-all gain slider called PRE-COMP and 10 individual sliders that allow you to assign different levels of compression to each assigned frequency point. While listening to your transmit audio with MON enabled, adjust the frequency band sliders upward or downward to control the amount of "punch" you wish to add to your voice in each area of the voice spectrum. When you have established settings that produce the desired level of density for your voice, you can change the over-all compression level by adjusting the PRE-COMP slider upward or downward.

3. POST-EQ: While listening to your transmitted signal with MON enabled, use the Post-EQ form to tailor your transmit audio's frequency response. Again, you can assign custom frequency values to each of the 10 sliders but it is suggested that you use the defaults initially. The Post-EQ sliders give you complete control over the tonal quality of your signal to enhance clarity, brightness, and low-end response. As a last step, set your TX multimeter to ALC COMP and adjust the POST EQ GAIN slider so that you see several dB of ALC compression as you speak.

4. When you are satisfied with your CFC settings, go back to the Transmit menu tab and save your profile.

5. Additional Adjustments: The TX multimeter has two new meter scales that can be very informative as you experiment with creating transmit profiles. The new "CFC" meter displays the output level of the CFC components from -30dB to +12dB and the new "CFC Comp" meter displays peak compression levels that exceed 0dB on a meter scale from 0dB to +25dB. As an example of how to use the new metering, try increasing the PRE-COMP gain slider and decreasing the POST EQ GAIN slider to create more punch and loudness in areas of your audio that you have emphasized with your CFC slider settings. As the PRE-COMP slider is advanced you will see the peak compression level of the multiband compressor increase in the "CFC Comp" meter. For a less aggressive sounding profile, try reducing the PRE-COMP slider until the "CFC" meter deflects to 0dB on voice peaks and then use the POST EQ GAIN slider to make up the difference in over-all gain. The two new meters give a nice visual indication of what is happening as you set the balance between the two CFC gain sliders.

6. PHASE ROTATOR: This feature can be used to improve the symmetry of your voice in your transmitted audio. It's a very individual adjustment as everyone's voice has very different symmetry characteristics. The steps below will get you started:

- Set the Panadapter in OpenHPSDR to display the Scope.
- Select a transmit profile that has a fairly wide response and set the mode to LSB or USB.
- While transmitting, enable the phase rotator, and as you speak observe your voice pattern on the Scope display.
- If your voice has more energy above the horizontal zero axis reduce the number of

stages until better symmetry is observed.
- If your voice has more energy below the horizontal zero axis increase the number of stages until better symmetry is observed.
- Try setting the FREQ of the Phase Rotator to something other than 338 Hz if you believe most of the energy in your voice is higher or lower.
- When you have found a setting that is symmetrical with similar energy above and below the horizontal zero axis, save your TX profile.

Summary: Remember that while you are operating you can manually toggle COMP on or off to add a hard limiting effect to your transmit audio if desired. If you have enabled CESSB its hard limiting effect will also be present each time COMP is enabled. Remember, if COMP is enabled when you save your Transmit Profile these features will be on by default.

For those who wish to enable the console COMP button and CESSB, excessive output from the CFC components may make your transmitted audio sound somewhat harsh. To minimize this, try reducing the PRE-COMP slider so that the "CFC" meter displays maximum peaks of 0dB. Note that when COMP and CESSB are enabled, the output is hard-limited at 0dB as shown with the "ALC Comp" meter. A new adjustment for COMP and CESSB users is available that allows you to exceed 0dB of ALC compression with COMP and CESSB enabled to make it possible to use the look-ahead algorithm at the ALC level to incorporate soft-limiting in the final stage. You can try this new feature by moving to the DSP menu tab and then the AGC/ALC menu and using the new ALC "Max Gain" setting to increase "ALC Comp" in 1dB steps from 1dB to 10dB. Several dB of "ALC Comp" should increase your over-all loudness without added harshness.

Note that these CFC adjustment steps should be considered a starting point for optimizing your transmitted audio. When you have become comfortable with the interface, you might wish to experiment with changing the frequency points for the CFC sliders so they span the transmitted bandwidth of each transmit profile you are working on. As an example, for a 3.0k sideband profile try the following values: 50, 150, 300, 500, 750, 1250, 1750, 2000, 2500, 3000. There's nothing magical about those numbers so experiment with values that give you the best tonal control for your intended bandwidth.

The CFC Audio Tools will provide you with an impressive amount of control over the transmit audio your station produces. Also, keep in mind that if you are more comfortable with the traditional transmit audio adjustments in OpenHPSDR, they are still there!