Demastering Your Music Tracks (Part 2)

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"How", "How Much", and "When" To Demaster Your Music Tracks

The process of restoring full frequency response to natural levels, what it sounds like, and when is it okay to deviate from the 1/f target spectral curve

First, make sure that your setup has been EQed flat from the low 20 Hz band to 15-20 kHz. This is extremely important. If this step is not done, the demastered track that you produce will all have defects in their frequency response that reflects a "demastering of your loudspeakers and your music tracks". This is an extremely undesirable situation to be in.

Install Audacity version 2.1.0 on your computer. Open the application after installation, and go to the preferences dialog, then select "Spectrograms". Set your preferences to the following values:

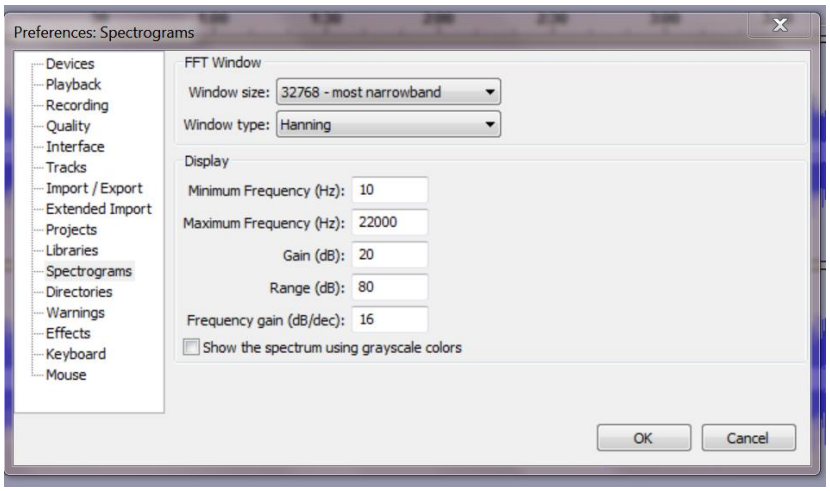

Figure 1 Audacity's Spectrogram Preferences View

The "length of filter" slide in the Audacity equalization curve dialog: increasing this value will make the low frequency filter response much more responsive to the control point inputs. This means that you can shape the Equalization curve filter more effectively in the very low frequency region to avoid sub-20 Hz boosting if you have concerns about this.

When you can play an opened track through your loudspeakers, you're ready to start the equalization process. Here is the Audacity demastering sequence that I use:

1. open the track (ctrl-O) that you want to work on--one that has plenty of instruments and vocals, including bass and drums
2. hit ctrl-shift-F to maximize the traces in window for easier viewing

3. Look at the traces, both of them - the top one is the left channel, the bottom is the right channel

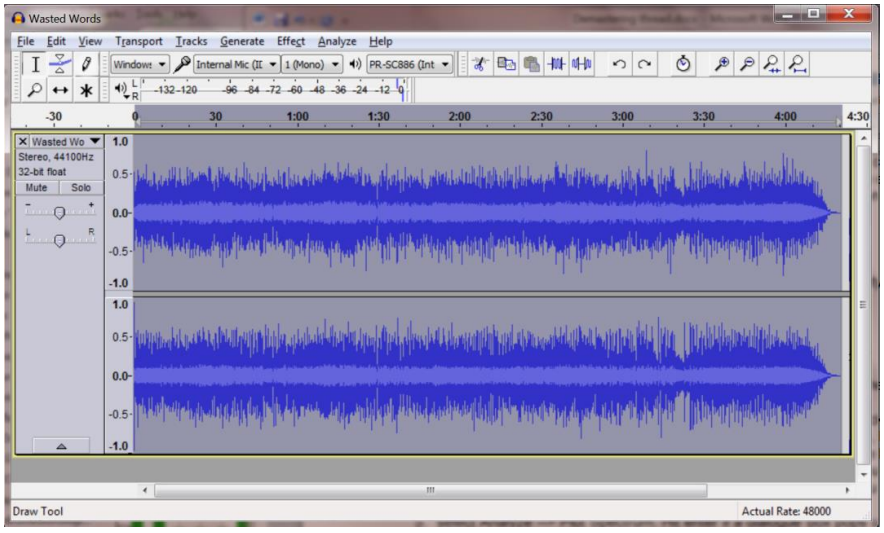

Figure 2 Waveform View of the Second Example Track

4. Select “Analyze --> Plot Spectrum”. Hit enter if a dialogue box pops up telling you that there's too much data to analyze. A frequency spectrum window for the tracks will appear. You can maximize this window using the top right maximize button on the window so that you can see the trace more easily.

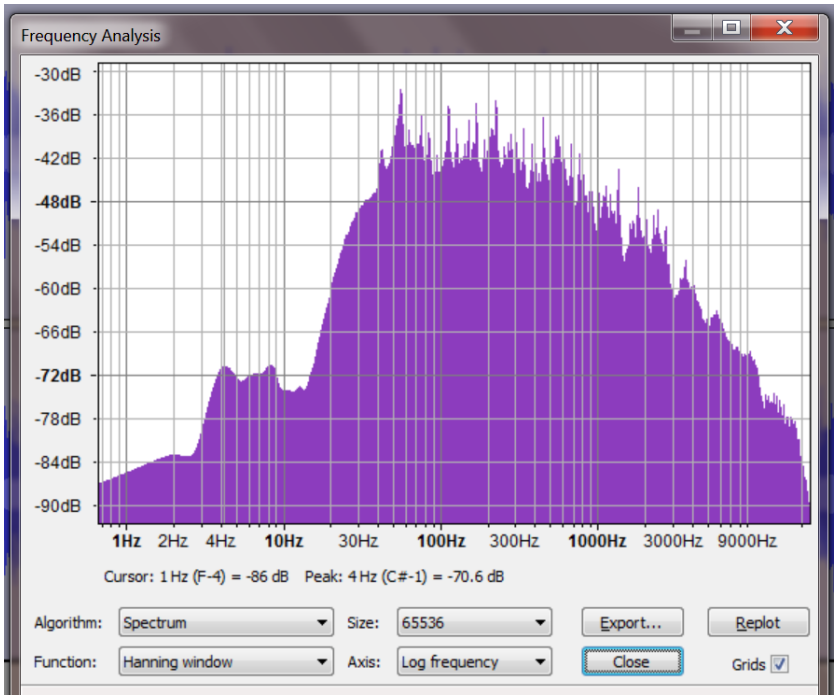

Figure 3 Second Example Track "Plot Spectrum" View Before Correction

5. Notice the shape of this curve, especially the frequencies below 100 Hz, if they drop off quickly in amplitude, then you've got a track that has the missing octave. If this track doesn't have a big drop-off in bass under 80-100 Hz, close this track and open another one from another album/artist, then repeat the steps above until you find one that has the mastering equalization/missing octave problem.
6. Once you've determined that your track has rolled off bass, select Effects --> Equalize... then notice a curve pops up. Here is where you will open one of the example bass boost xml files that you found above in this thread, by clicking on the "Save/Manage Curves" button at the middle-bottom of the curve window. Import that xml file by hitting the "import" button and searching for the XML file that you've saved locally on hard disc. You should see the curve appear when you select if from the list.

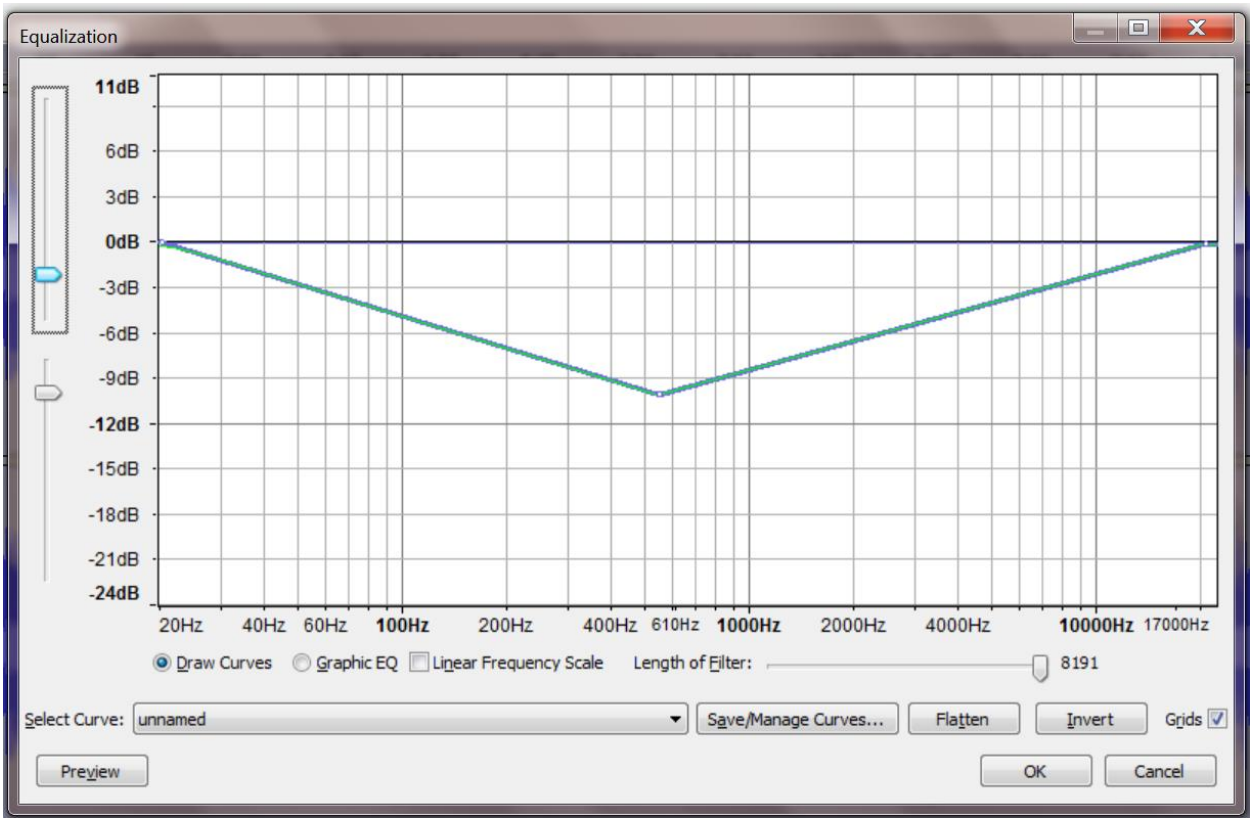

Figure 4 First Equalization Curve Trial for the Second Example

Hit "ok" to close the curve management window, then "ok" again to close and execute the Equalize... filter. You will see the traces change shape - perhaps even turn red, etc.

7. Select “Analyze --> Plot Spectrum” again, then look at the shape of the frequency plot. If there is too much bass below 80-100 Hz, close the spectrum window, and go back to the last step, this time change the amount of boost (either higher or

lower, moving the anchor points where you believe the curve might be better shaped to boost the bass just the right amount. Hit okay to execute the filter and observe the traces and the Spectrum plot again. Iterate until the plots look about right.

8. Select “Effect --> Normalize...” then make sure that the first two check mark boxes are checked. I'd change the value in the text box from -1.0 to -0.3, hit OK, then you will notice that the tracks are rubber-banded to the top and the bottom of each window, actually rescaling the track to match the available loudness bandwidth (you can actually omit this step to save time, unless you see the color red in the display, then you really want to Normalize the traces

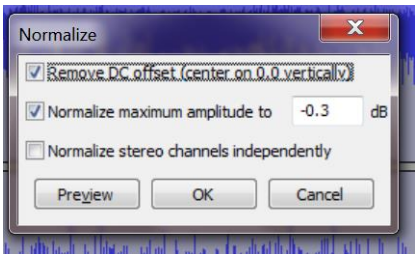

Figure 5 Audacity's Normalize... Dialog Menu

9. Once the plots are closer to a 1/f curve (a straight decreasing plot) hit the play button at the top left of the Audacity window. (You may need to find the right driver/output device in the dialog buttons along the top of the Audacity window until you select the right one and also set up the output to play through your loudspeaker setup. Remember that it's important to hear it on the target set of loudspeakers at about the loudest level that you associate with “concert volume” in order to get the right equalization.

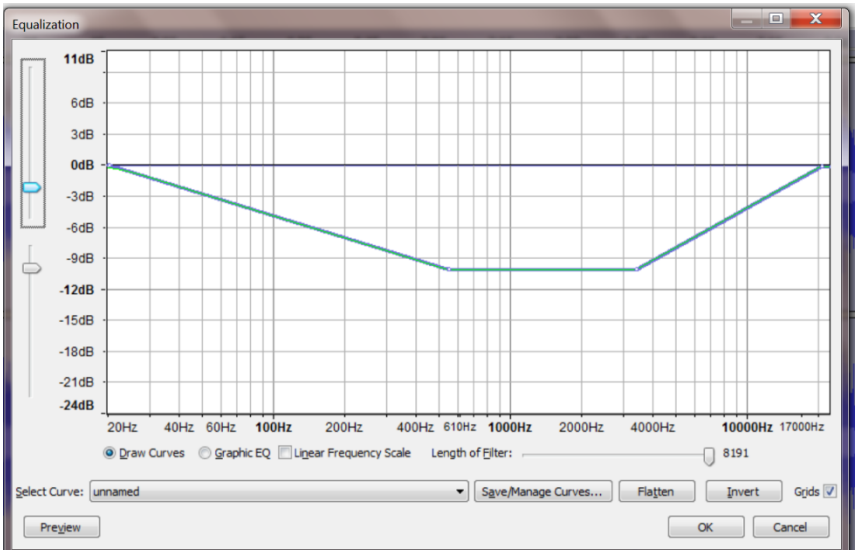

Figure 6 First Update to the Equalization Curve for the Second Example

10. Listen to the tracks play. If it doesn't sound right, get out of the dialog boxes/windows and hit "ctrl-Z" to back up in the sequence of filters and commands until you're back at the original opened track. If you go too far, simply hit ctrl-Y to re-open the track again.
11. Go back to step 8 to repeat the updating of the Equalize... curve until you have the right shape to produce the most pleasing results.

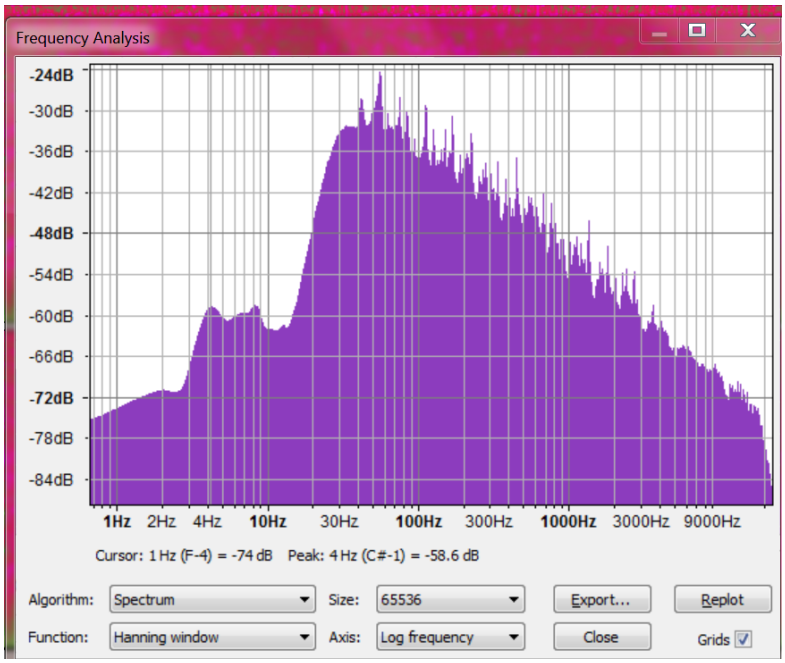

Figure 7 Final "Plot Spectrum" View of the Second Example Corrected Track Showing Straight "1/f" Curve

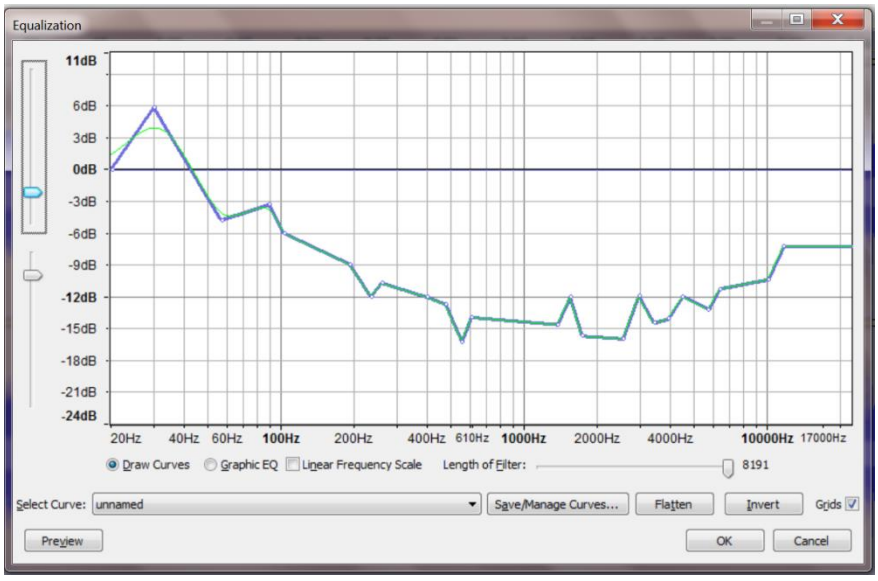

Figure 8 Final Equalization Curve for the Example Track

12. Change the display view from the amplitude envelope default view to the "Spectrogram log(f) view to be able to see the frequency response vs. time via color levels (it takes a few seconds for the computer to render this view).

    The objective is to make the colors of the tracks uniform when looking across each track so that no horizontal bands of louder (or much softer) frequencies exist across both tracks. This is adjusted by the EQ performed on the tracks, adjusting the equalization curve and reapply the adjusted EQ curve to the tracks, looking again at the Spectrogram log(f) view iteratively.

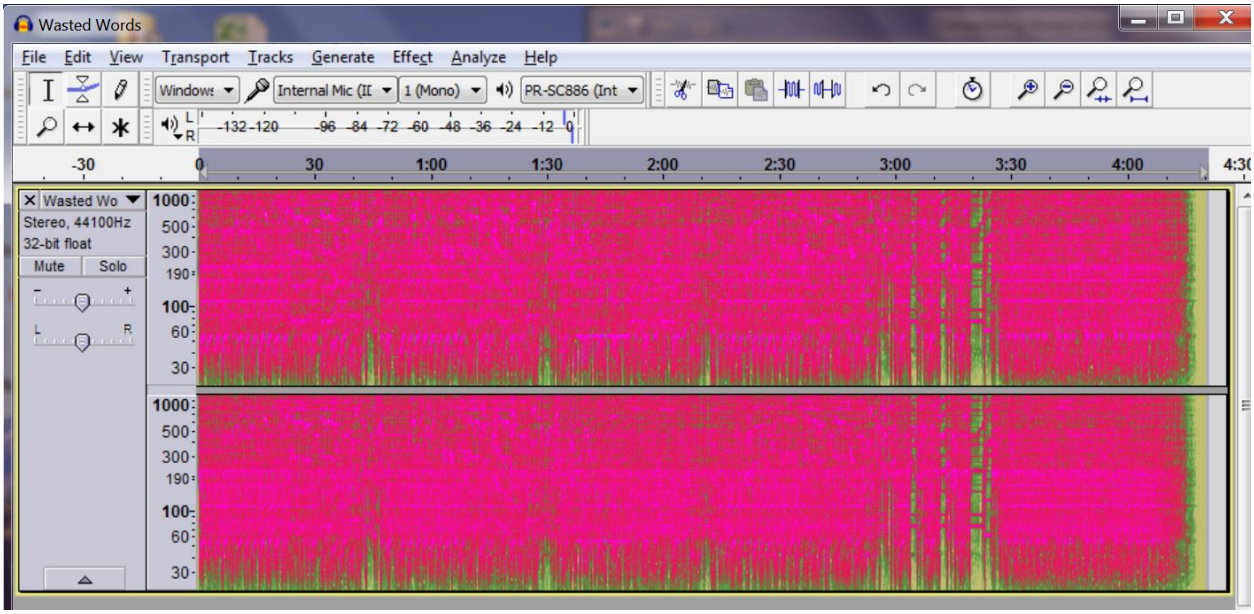

Figure 9 Audacity's Spectrogram Log(f) view for the Second Example After Correction

13. When you are done, hit ctrl-shift-E to save the file to your hard drive. You can also save the equalization file within Audacity from the Equalize dialog by punching the "Save/Manage Curves…" button at the bottom of the dialog box. The equalization curve can be reused and/or modified for later tracks on the same album to save time. They can also be exported in XML format so that others that are also demastering the same album can use them, or be used to send to others that may use them to help you learn and correct the EQ curves.

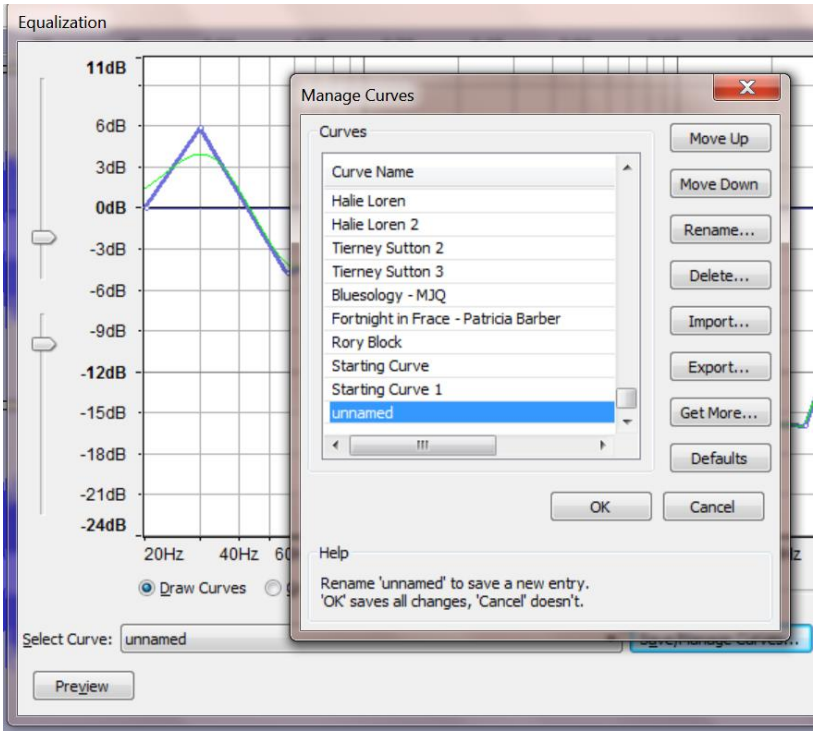

Figure 10 Equalization Curve Save Dialog Menu

How to arrive at EQ levels ("How Much"):

There are three factors that help set the demastering EQ levels:

1. Now knowing the spectral analysis of kick drums and string basses from the sources that I mentioned at the top of this thread, adjusting both the lowest frequency of the spectrum plot to peak around 30-50 Hz, with slow roll-off down to the mid-20 Hz region for kick drum impulses. The spectral plot shape was used both as a starting point and as a last check on the next two factors.

2. Listening carefully to the recording all the way through, twice, at concert volume on the setup, checking for naturalness of the performance. My in-room response is actually rising toward the bottom end, so if anything the resulting bass line using the supplied filter on the recorded tracks should actually be a slightly less than sitting in the studio with the players at the microphone positions, which is the reference position for these tracks that were recorded in a fairly reverberant studio. Studios of that time didn't have effective bass absorbers below about 100 Hz since those devices had yet to be invented, so the bass lines and kick drums were routinely attenuated at the consoles or at mastering time. (Fortunately here the bass attenuation most likely occurred at mastering since they are so alive sounding.)

3. Comparing actual in-room performance carefully with a reference disc that has excellent mastering and similar instrumentation/genre.

I find that most people are surprised by the actual levels of jazz string bass resonance and kick drum room pressurization especially after listening to two-channel recordings with attenuated bass for most of their lives. The high bass frequency SPLs exist both on-stage and in the audience. In fact, string bass and kick drum levels are always the most dramatic difference between most two channel recordings and real life in my experience. (Now I know why.)

If you listen to Brian Bromberg's *Wood* bass-restored tracks, you will hear a very aggressive palette of instrument subharmonic percussive effects in addition to the normal frequencies of the string bass. These performances are almost never reproduced anywhere near actual studio recording levels in two channel recordings, but these bass transients are present in real life. From attending many such performances over the years of jazz string bass and kick drums, and listening at home in surround sound recordings such as the three DVDs by Krall (*Live in Paris* DVD, *Live in Rio* BD, *Love Scenes* DTS 5.1 DVD) in addition to other jazz combo recordings including Stanley Clarke's captivating electric and double bass playing in a *Return to Forever* BD that I also use for reference in my setup. Listening on headphones to an unprocessed string bass/kick drum recording is, I find, actually a bit disorienting due to the big transients involved. This recording, restored, needs a good listening room to play back well.

There are some other observations and implications of demastering your tracks:

1. The "harshness" of fully horn-loaded loudspeakers relative to direct radiating loudspeaker can now be explained. And it's not the fault of the loudspeaker, but rather the selected music tracks having treble boost. Kudos to Klipsch and other horn loudspeaker manufacturers for not trying to "pre-EQ their loudspeakers" to compensate for the generally poor mastering and quality of released popular music tracks.

2. The tendency for many people to be satisfied with Klipsch La Scala and Belle bass performance can now be explained: the low bass that these two bass bin types cannot reproduce well has typically been removed from popular music tracks to begin with. I find that many people are astounded by having good low bass available to them.

3. I believe that we've got generations of folks that are used to hearing "canned music" that has these two characteristics - and many of those people like to think of themselves as "audiophiles" on other forums and owning other brands of loudspeakers, etc. YMMV.

4. It is now clear that there are many "closet EQers" that are boosting their low frequencies--pretty much all the time. There is a get-out-of-jail-free-card reason why they have been doing this--and for a very long time, indeed.

5. It's going to be interesting to see what happens when it becomes clear that audiophiles can recover at least some of the fidelity lost by popular mastering practices over the years. Will these listeners prefer to hear their old recordings mastered more naturally (and much less harshly) or will they continue to listen to their old recordings stoically unchanged to the insights above?

6. Perhaps now the "anti-EQ audiophile crowd" will begin to see why digital EQ/restoration is actually their friend and necessary for hearing true "hi-fi".