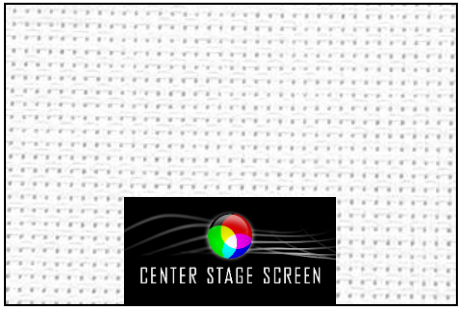
Audio Testing

The purpose of this test is to characterize the acoustic effects that various woven acoustically transparent projection screen fabrics have on the center channel loudspeaker. We will be measuring a reference near-field frequency response of the center channel, again with different combinations of fabrics and analyzing the results.

Center Stage Acoustically Transparent Screen Fabrics



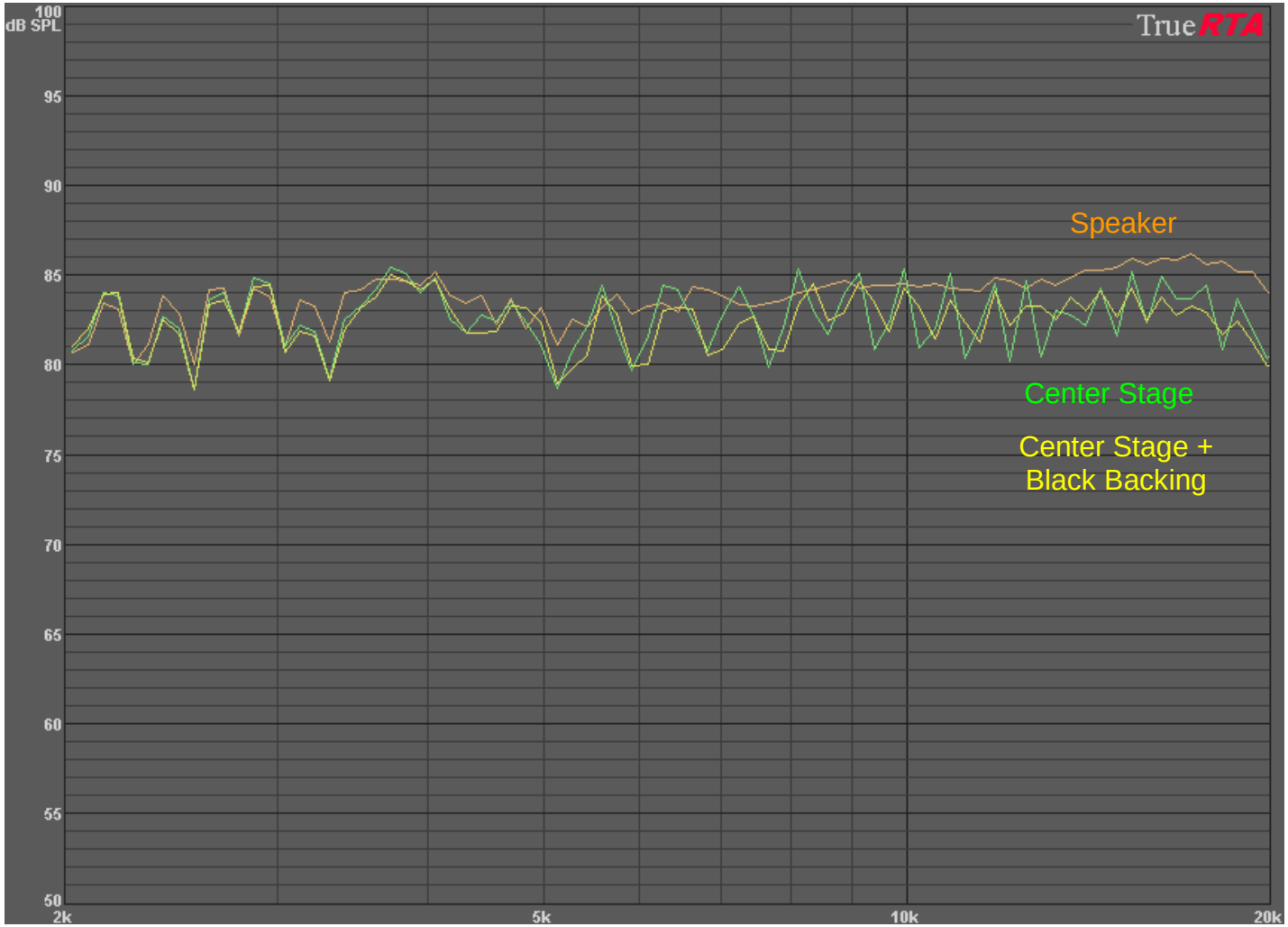
This new woven Center Stage Screen fabric has an extruded vinyl over polyester yarn, in a 0.024" thick symmetrical basket weave pattern, with an average openness of five percent. The two-by-two basket weave pattern is a commonly used weave in acoustically transparent screens. The black backing material is a similar weave pattern, with an average openness of ten percent. As we will see in the results, this layer has measurably lower acoustic attenuation.

Setup

The center channel is an Infinity IRS Epsilon loudspeaker, with a frequency response to 45 kHz. The center channel amp is a Cary SLAM-100 tube amp, with a frequency response to 100 kHz. The microphone is a calibrated Behringer ECM8000. The fabric was placed eight inches from the speaker, with the microphone 39 inches from the speaker. All of the tests were performed with frequency sweeping, which alleviates Doppler distortion from the speaker and more accurately measures the actual frequency response.

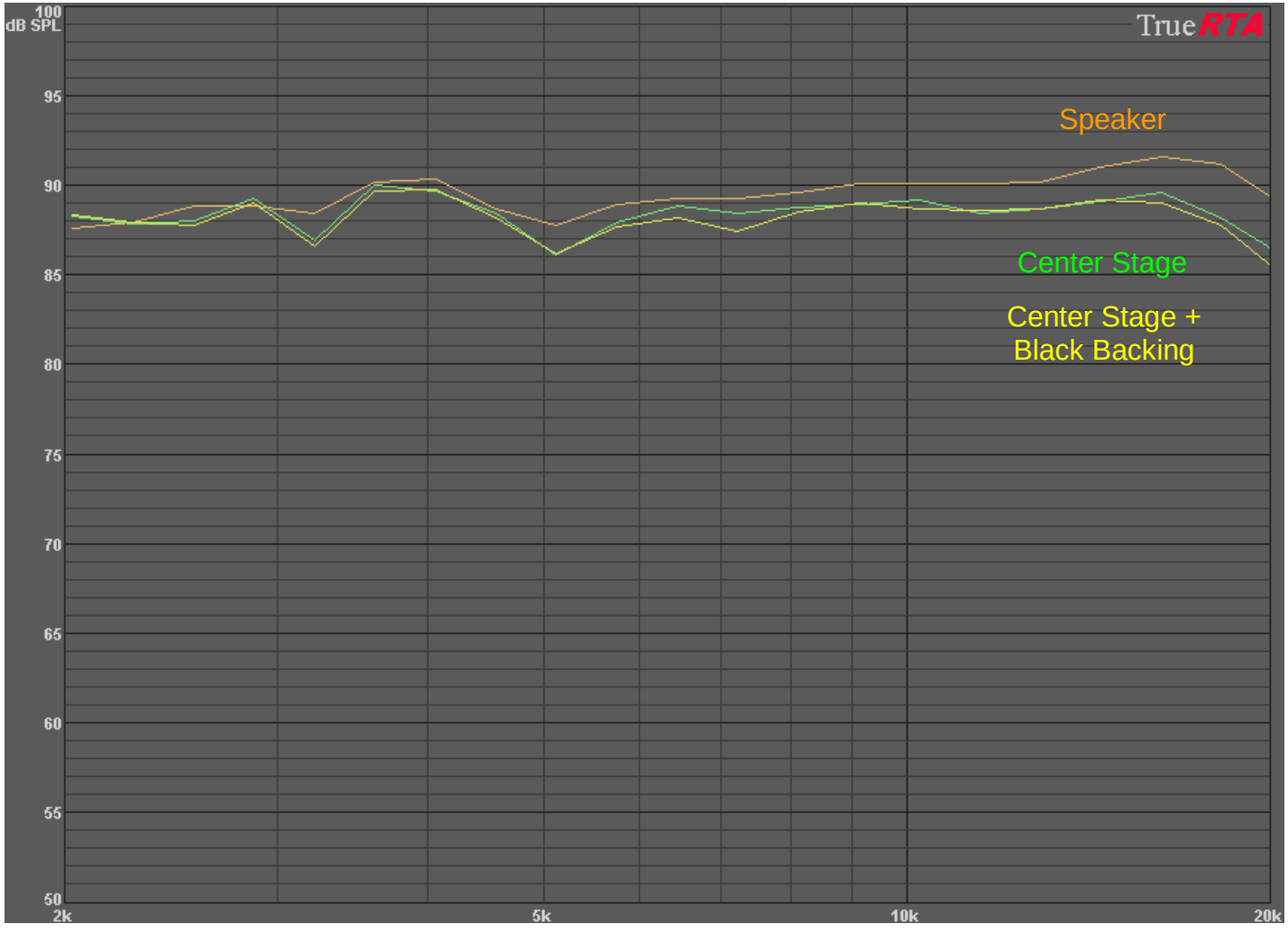
Center Stage, 1/24 octave

This graph shows the reference measurement of the center channel and the Center Stage fabric. This data is unsmoothed, and in 1/24 octave resolution. Human hearing naturally smoothes out frequency into approximately 1/3 octave resolution, but I tend to argue that this is a bit crude. Therefore, all of our measurements will either be in 1/24 octave to try to resolve measurable differences, or 1/6 octave to establish audible effects. The measurement uncertainty was approximately 1dB. We can certainly discard any results where the fabric peaked above the speaker; it could never be acoustically active.



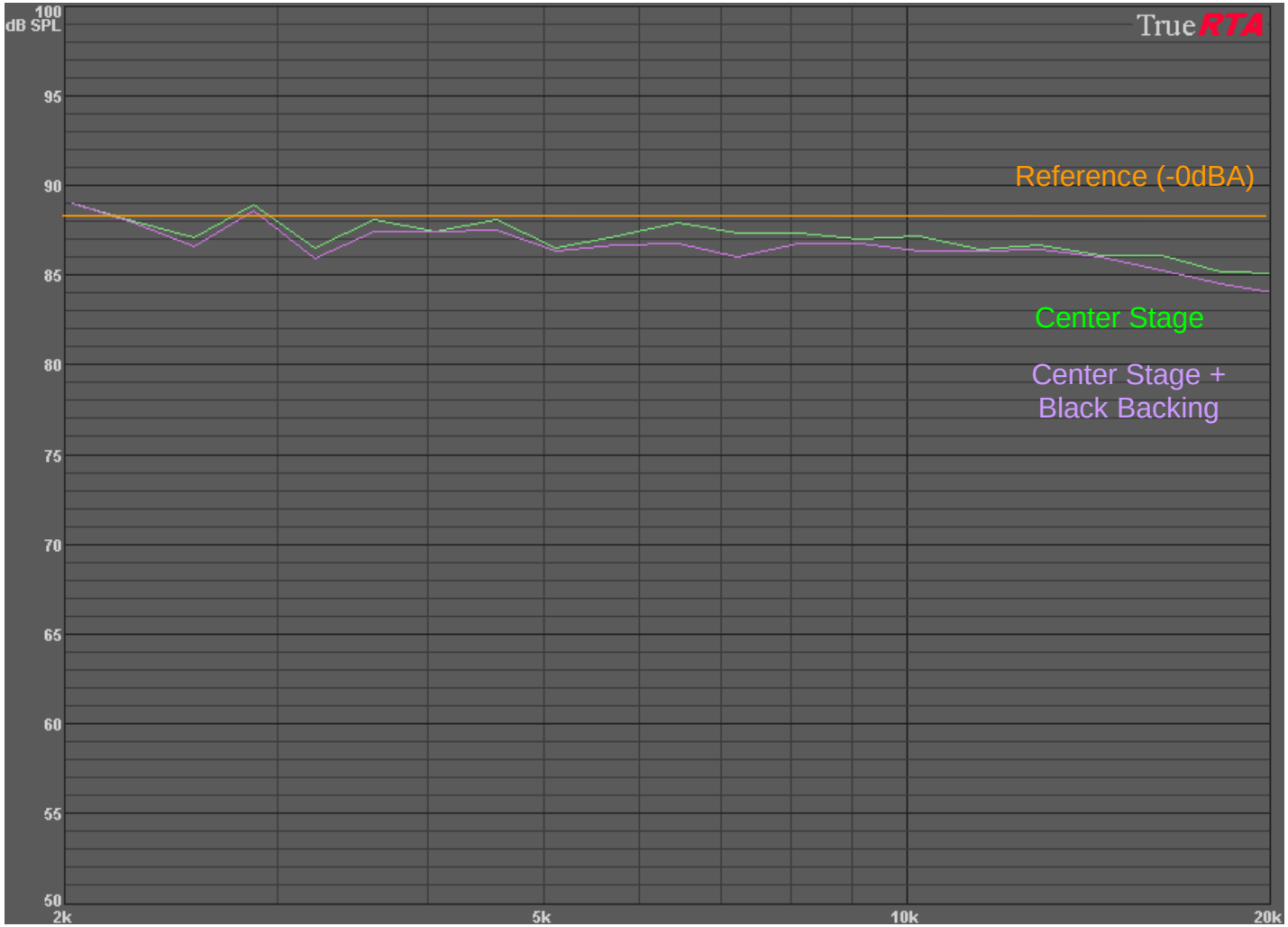
Center Stage, 1/6 octave

To better understand the audible effect of having either the Center Stage Screen with and without the black backing in front of your speaker, this chart show us the results after 1/6 octave smoothing. We can see that the Center Stage attenuates the sound on average 2dB and with a maximum of 3dB loss at 20kHz. Adding the black backing layer only adds a fraction of a dB more attenuation, with a maximum of one additional dB loss at 20kHz.



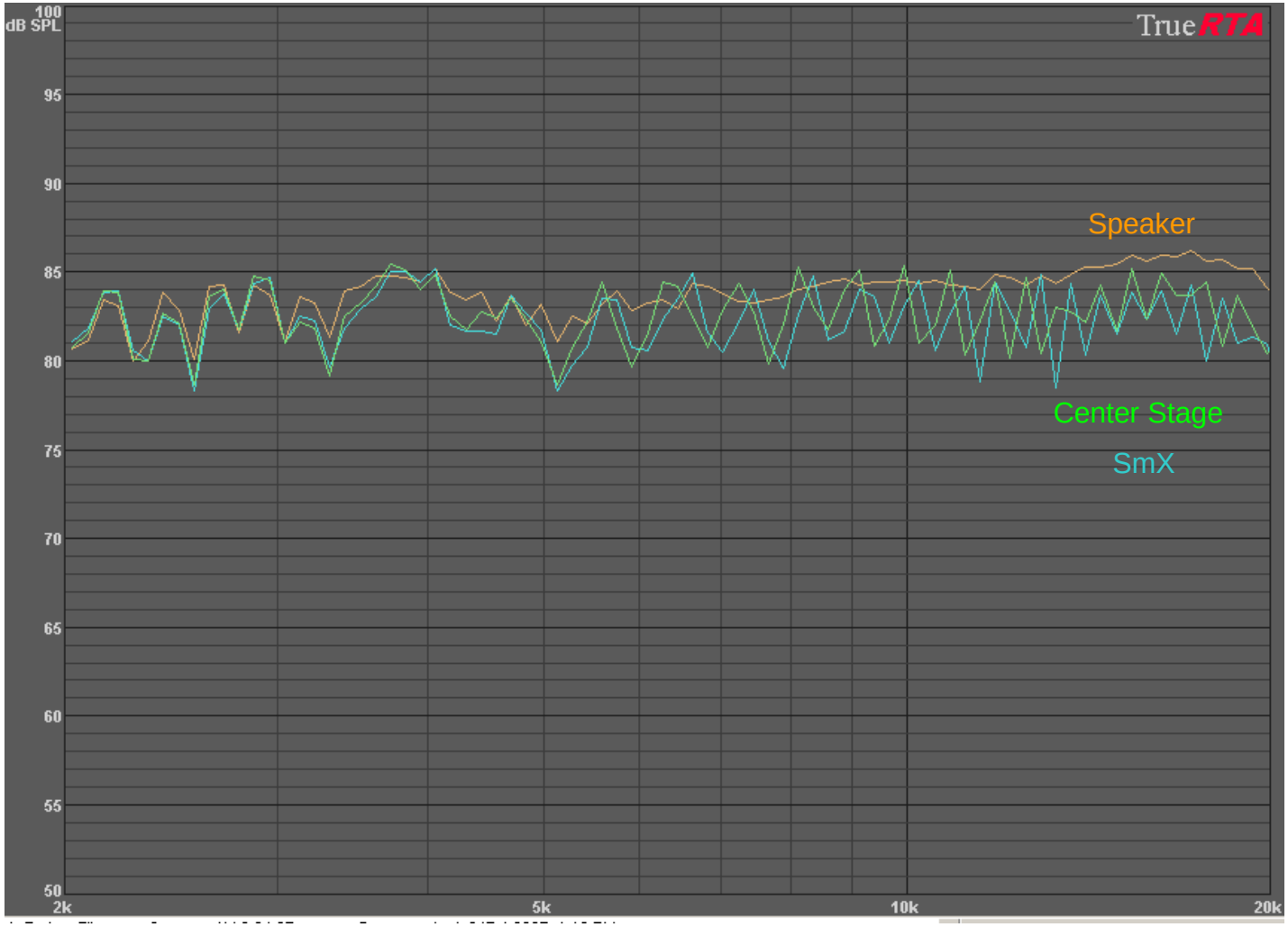
Ref – Center Stage, 1/6 oct

In this chart, we subtracted the response of the Center Stage and the Center Stage/ black backing combination from the speaker's response. Of course, positive results are meaningless and indicative of test uncertainty. This chart shows us that the black backing adds little extra attenuation, and that unsurprisingly the most attenuation occurs in the top octave.



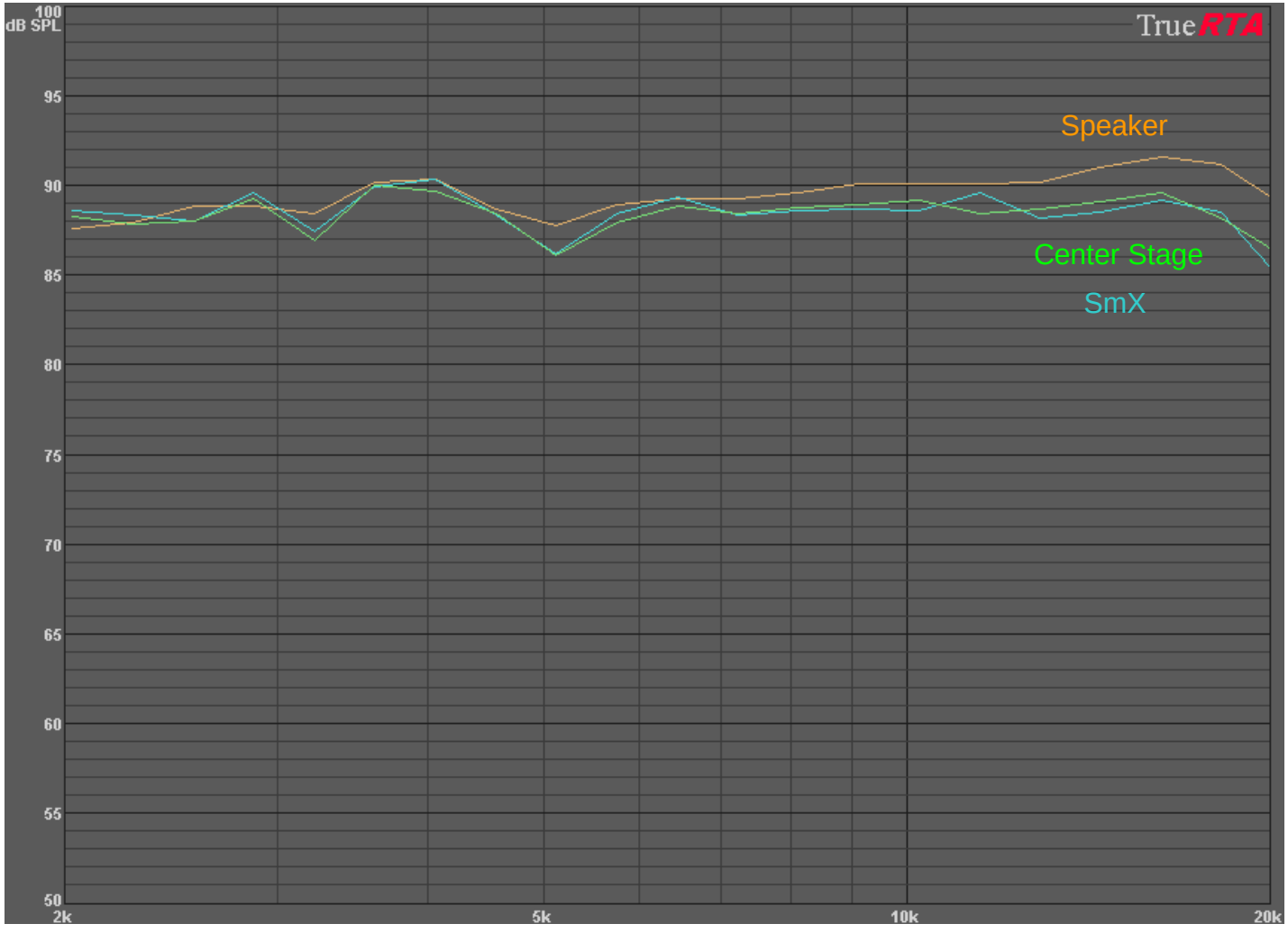
And in this corner…

This chart is a high resolution comparison between the Center Stage and SmX screen materials. SmX screen material, as of the second batch that was shipped, is also a symmetrical two-by-two basket weave material that measures 0.024” thick, and a measured openness of approximately five percent. Unsurprisingly, the two fabrics behave identically within the test uncertainty. Is there an audible difference? (Hint: no)



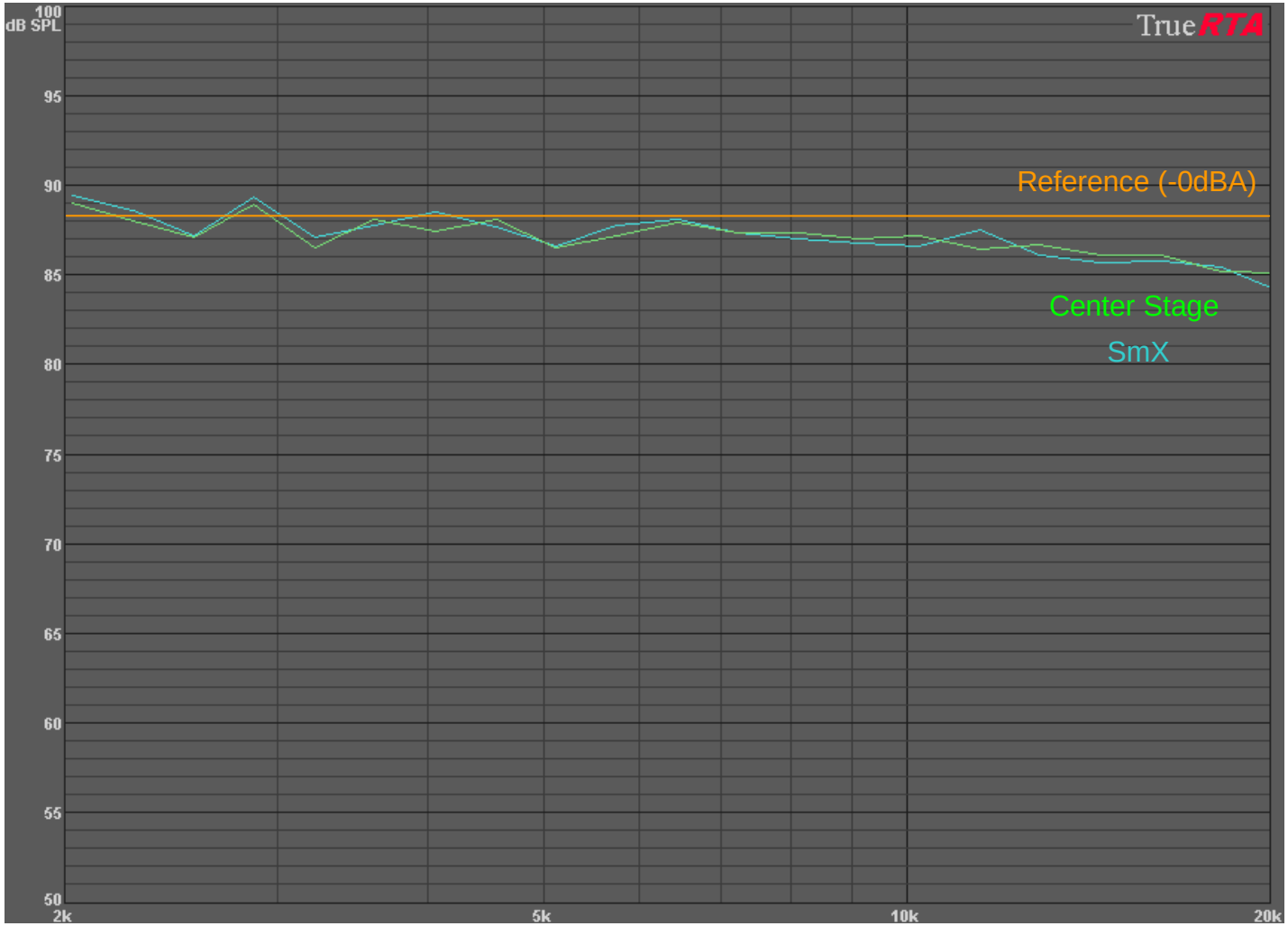
Center Stage, SmX, 1/6 oct

When we smooth the data to a 1/6 octave curve to understand any audible differences between the two fabrics, differences between the two materials still are not apparent. They both behave in a 1/6 octave sweep within less than a decibel, which again represents our test uncertainty.



Ref – Stage, SmX, 1/6 oct.

To further flatten the frequency response curves of the two fabrics, we will now subtract their results from the reference speaker's. Again, any results above the speaker's reference line are not meaningful. Perhaps the SmX can create sound (that would surely be patentable), but the Center Stage is strictly passive. This chart shows us that there aren't any audible differences between the two fabrics, as we expected.



Conclusions

Moving the fabric closer to the speaker spaced out the peaks with a 1/24 octave measurement, but psycho acoustically it is better to have the frequency response peaks closer together and not within the resolution of our hearing. With 1/6 octave measurements, we could not measure any differences relative to where the fabric was to the speaker. We can therefore say that perhaps some space between the speaker and the screen is beneficial, but you're not disadvantaged if your application requires your screen to be nearly touching your speaker.

We could determine from the tests the general attenuation that these PVC woven fabrics provide, and their tendency to attenuate benignly in the frequency ranges with appreciable content, and slightly more at the highest frequencies. Acoustically transparent screens are more precisely *translucent*, but the similarly constructed woven fabrics all perform very similarly. We could not measure meaningful acoustical differences between any of the thin, basket-weave screen fabrics shown in the chart on the right. From a sonic perspective, any of these fabrics would perform excellently in front of your speakers.

	Threads/Inch (x)	Threads/Inch (y)	Sum	Thickness	Gain
Center Stage	46.5	43	89.5	0.024"	1.16
SmX	47	42.5	89.5	0.024"	1.16
Draper AT1200	56	50	106	0.017"	0.85
SheerWeave 2390	56	49	105	0.017"	0.85
Vutec Soundscreen	56	50	106	0.018"	0.85
SheerWeave 2000	46	44	90	0.019"	0.85

When we export the data, we can then calculate the average attenuation of Center Stage screens across different frequency bands. You can see from the table that you can't just say that the screen will attenuate "*x*," without a more detailed answer. We will generally say that the Center Stage attenuates the sound on average 2dB, and that adding the black backing will increase the average attenuation to 3dB.

	Center Stage	Black Backing
Average 2k-20kHz, dBA	-1.2	-0.2
Average 10k-20kHz, dBA	-2.3	0.0
Average 16k-20kHz, dBA	-2.5	-0.8
Average 19k-20kHz, dBA	-3.1	-0.8

While we've focused this test on the acoustic effects of these screens, keep in mind their benefits. They alleviate the acoustical distortions that televisions or fixed-frame solid screens impart. You can use either an identical center channel, or free yourself from the lobing problems of traditional horizontally placed MTM center channels. They allow you to play the audio from where the video occurs, ideally spreading the front soundstage perfectly horizontal with the image. With the new screen fabrics, you can get all of these acoustical benefits without compromising your image quality.