Introduction

Pass Labs recently introduced their new Xs Preamplifier and XS 300 Pure Class A (300 watts) monoblock power amplifiers. They are a completely new design compared to their previous components, and have a sound that is almost beyond description in words.

Xs PREAMPLIFIER SPECIFICATIONS

- Design: Solid State Stereo Preamplifier
- Configuration: Two Chassis, Dual Mono
- Circuit: Two Gain Stages Biased into Pure Class A
- Inputs (Each has Choice of XLR or RCA): Five (One is Pass-Through)
- Outputs (Each has Choice of XLR or RCA): Three (Two Master and One Slave), One Set for Tape In and Tape Out
- 12 Volts Remote Power On Jacks
- Power Supply: 100 VA Transformer, 100,000 µF Capacitance per Channel
- Dimensions (Each Chassis): 7″ H x 19″ W x 19″ D
- Weight: 50 pounds Total
- MSRP: $38,000 USD
- Pass Labs
- Tags: Pass Labs, Preamplifiers, Monoblocks, Power Amplifiers, Class A, Audio, Stereo

Xs 300 POWER AMPLIFIER SPECIFICATIONS

- Design: Solid State Mono Power Amplifier
- Configuration: Two Chassis
- Power Output: 300 Watts into 8 Ohms, 600 Watts into 4 Ohms
- Input Impedance: 200 kOhms XLR, 100 kOhms RCA
- Power Supply: 2 KVA Transformer, 400,000 µF Capacitance (16 x 25,000 µF)
- Dimensions (Each Chassis): 11.5” Hx 19” W x 27.5” D
- Weight: Control (Top) Chassis: 130 Pounds; Current Source (Bottom) Chassis: 168 Pounds
- MSRP: $85,000/pair USD
- Pass Labs
- Tags: Pass Labs, Preamplifiers, Monoblocks, Power Amplifiers, Class A, Audio, Stereo

The Design

Pass Labs has long been known for following their own path in designing preamplifiers and power amplifiers. Instead of just attempting to have the lowest distortion possible, they design by listening and let the spectra fall where they may.

The Xs series, which has just started shipping, was designed not only in that manner, but there were no budget constraints as to what components would be inside, or how many prototypes they would

build before settling on the final circuits. This has been going on for at least a year, and my guess, is about 1 million dollars were spent in development.

The results are not simply a benchmark, but a landmark in design and sound quality.
I have never heard anything like these two products. Normally, I would divide the review into one for the preamplifier and one for the monoblock power amplifiers, but they were designed for each other, and that is the way I will review them.

The Xs Preamplifier is exquisite, to put it in one simple word. The industrial design (the looks) is superb, and the electronic circuit is a reflection. Two gain stages, biased into Pure Class A drive each channel of the dual mono configuration. The control circuit is in the top chassis, and the gain stages are in the bottom chassis.

There is a total of 200,000 µF of power supply capacitance, more than some power amplifiers have. As you will see in the bench tests, this preamplifier will drive any load, and the resulting spectrum is astonishing.

The front panel is spartan, with a Mute button, Mode (Panel Brightness, or Off), Input Selector buttons, Remote Control IR window, and the Volume Control (Spans – 89 dB to + 10 dB). The volume control is slightly offset with respect to the horizontal line of the top of the chassis. Very elegant.
The rear panel is full, and this is no small preamp chassis. Each input and output has a choice of XLR balanced or RCA single-ended connectors. The Outputs allow a Slave to follow a Master, and the Slave can be configured to have a different output level than the Master. This would allow the Slave to be used for bi-amping, where the second amplifier has a different input sensitivity, or its speaker has a different sensitivity. Very unique and very flexible.

The two chassis are connected together by two umbilical cords, one for each channel.

The remote control is the same as for other Pass Labs products. Solid metal, easy to use.

The Xs 300 is a massive beast at nearly 300 pounds for the two chassis. There are three gain stages. The input consists of a cascoded quad differential set of Toshiba Jfets, along with a quad set of Toshiba Mosfets that are part of the first and second stages. This provides the voltage gain for the balanced push-pull follower output stage, partially biased by single-ended constant current sources

(the current sources are located in the bottom chassis). The output stage has 10 dB of negative feedback (Loop).

There are 36 pairs of transistors in the output stage (18 devices for each of the two push-pull phases), and 40 devices in the current sources (located in the bottom chassis). So, that is 112 transistors for a 300 watt amplifier. The current sources in the output stage are constant current sources, used solely to bias up the output stage with a single-ended character. The amplifier itself is a voltage source design.

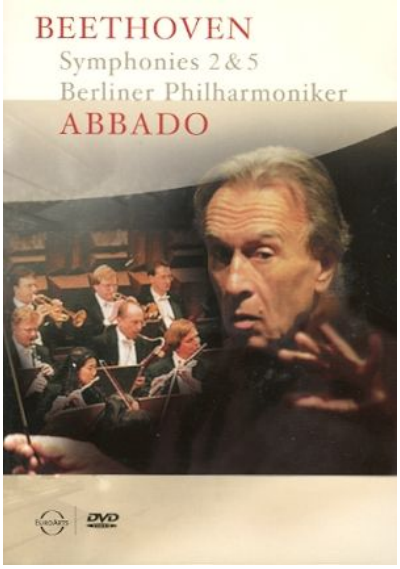
A mass market power amplifier of 100 watts per channel might have 6 output transistors in each amplifier channel.

The front panel of the Xs 300 has an on/off button and a meter that reads straight up as long as the power output does not go above 300 watts into 8 ohms. If you are playing music loud, and which has extreme dynamic transients, the needle moves to the right, indicating that the amplifier is now into Class B output (600 watts peak). The amp is specified to output 600 watts into 4 ohms, but only the first 300 watts are Class A.

Here is a photo of the two Xs 300's placed between my speakers.

The Xs 300's rear panel has the umbilical connectors, an on/off toggle (when it is on, the unit is in 0.5 watt standby power – the front panel on/off button turns the amplifier on for use). There are two sets of speaker binding posts, the most beautiful design I have ever seen. The opening into which you can insert banana plugs has a rubber gasket that keeps dirt from getting into the binding post. The post has a rubber covered surface for ease of gripping and turning, and it will tighten up to a certain point and then it will only make a clicking sound if you try to tighten it further (i.e., over-tightening the post is not possible).

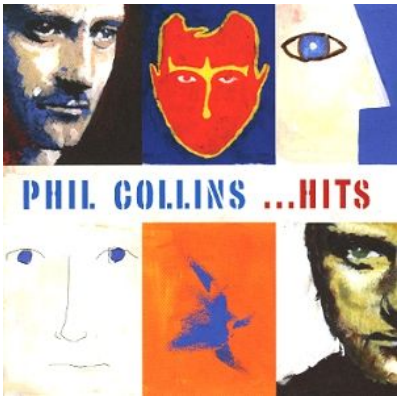
In Use



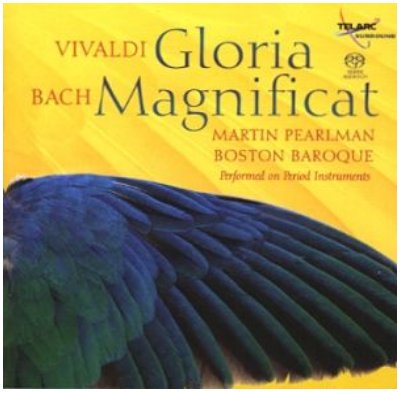
I tested the Xs Preamplifier and a pair of Xs 300 monoblocks with an OPPO BDP-105 universal player, Carver Mark IV ribbon speakers, and Wireworld cables.

Beethoven's *Symphony No. 5* is his most recognizable work, even by those who have no interest in classical music. The opening notes are thunderous, and the dynamic range throughout the piece is very high. The Pass Labs Xs preamplifier and Xs 300 monoblocks (the Xs "package") handled this with ease. I was amazed at the clarity of the violins, even when the full orchestra was playing, but also the deep bass, with its power and depth. Nothing like having 400,000 µF of power supply capacitance to deliver when the signal demands it. This particular disc is a DVD-A (I used the stereo PCM tracks for the test) EuroArts 8-80242-51159-1.

Talk about deep bass power. This Telarc SACD (SACD-60614) is an excellent test, not only with the low pedal notes of the organ, but the ability to keep separate the power of the organ with the sharp contrast of the brass. Even at full volume, I heard no distortion. This is one of the discs where I could make the needle move. *Very* demanding music. *Extremely* accommodating amplifiers. My favorite test disc for bass is Telarc's version of Copland's *Fanfare for the Common Man*. With the Xs 300's, the bass drum that the orchestra used just about brought down the sheet rock in the lab. I have *never* heard bass like that from any amplifier. The entire room shook.



Phil Collins' version of "True Colors" on the album *Phil Collins . . . Hits* is superb (Atlantic 0-7567-83139-2), perhaps even better than the original by Cyndi Lauper. The harmony of voices and the pop of the snare drum, all crystal clear and with transient strength. On Hiromi's album, *Brain*, the first track is a feast. The drummer's lightning fast work on the hi-hat cymbals was more detailed and crisp than I have ever experienced from the recording.



Baroque music all seems to sound like either a funeral or seasonal celebration. This Telarc SACD (SACD-60651) sounds like the latter, and since this review was published on Christmas Eve, so much the better. And because the music has five operatic voices singing with the music, it is a good test for separation. The "package" kept it all neatly tied up, with each instrument and singer in a satin ribbon-wrapped box. Not a test for power or bass depth. But for musicality and detail? Excellent!

Dukas' *La Peri* is one of my favorite pieces of classical music. This rendition is Telarc CD_80515-SA (SACD). In particular, the "Fanfare" is a terrific mixture of all types of brass, including tuba. There again, the deep bass power of the package brought forth that instrument like I was listening to the disc for the first time. Yet, even with the intensity, the trumpets came through with effortless ease, and nary a hint of harshness.

Mozart composed many symphonies. He died very young, but he started composing very young. This particular disc (SACD) stands out for its beautiful recordings of *Symphonies Nos. 38-41* (Linn Records – CKD-308). Mozart composed during the transition from the Baroque to the Classical era, and the music is a combination of both. Some audiophiles don't like Mozart, perhaps just because of this. However, I am a big Mozart fan, exactly because his works do have a relaxed background of Baroque, but with distinct melodies characteristic of the Classical era. They are very listenable, without distracting you if you want to read while the music is playing. And that is just what I did here. I read a great novel, and listened to all four symphonies on this two-disc set. I was not distracted, and

yet, the melodies seemed to synchronize my auditory cortex and made me feel at peace, even though the novel had more than its share of violence.

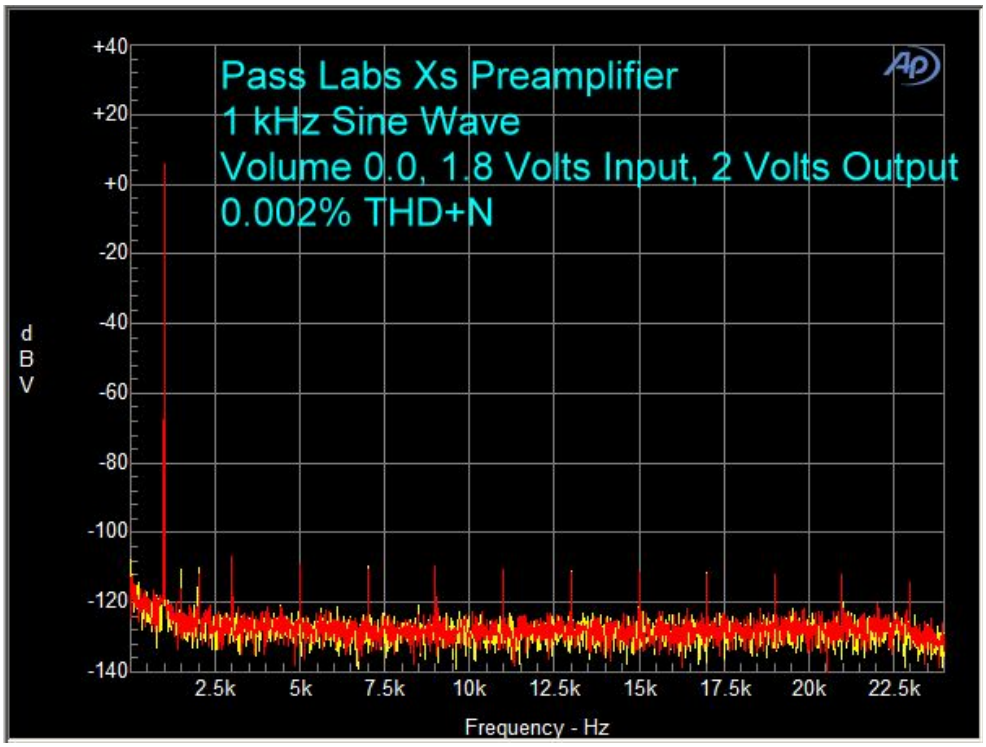
I was listening to the system one afternoon, and the door was open to the outside (a warm day, and the amps were making the room warmer), and my wife walked in, mentioning that the sound of the Pass Labs setup made her want to stop what she was doing in the yard and come in to listen. That's what the Pass Labs components do. Their musicality *invites* you to listen.

On the Bench

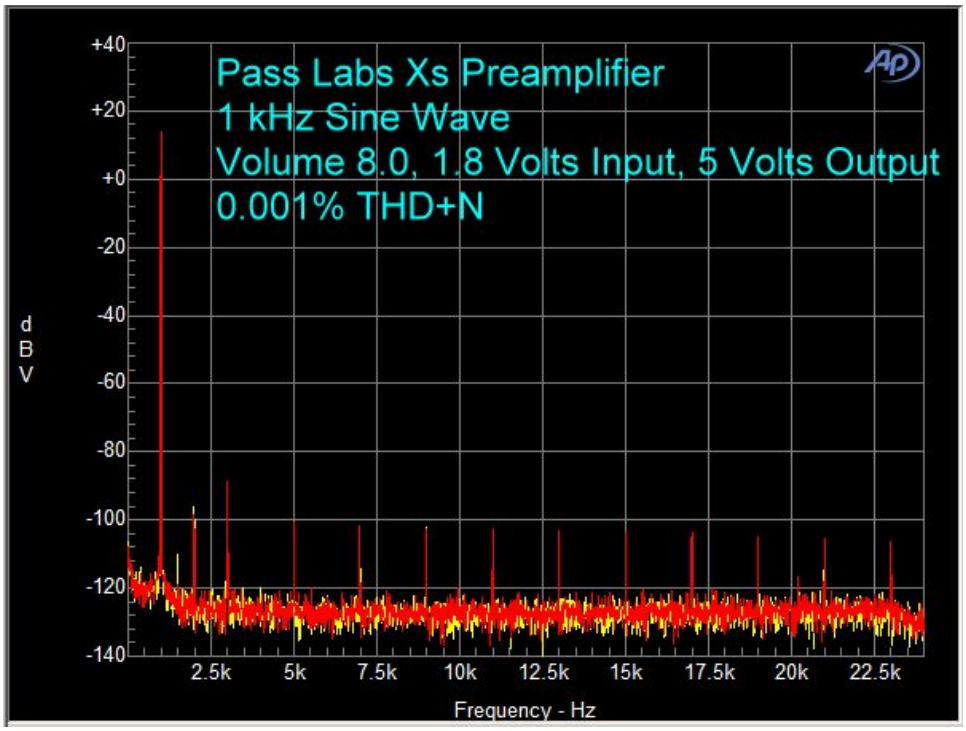
Distortion measurements were made within a bandwidth of 80 kHz, and into a load of 100 kOhms for the preamplifier and 8 ohms for the power amplifier, unless otherwise specified.

First, the Xs Preamplfier:

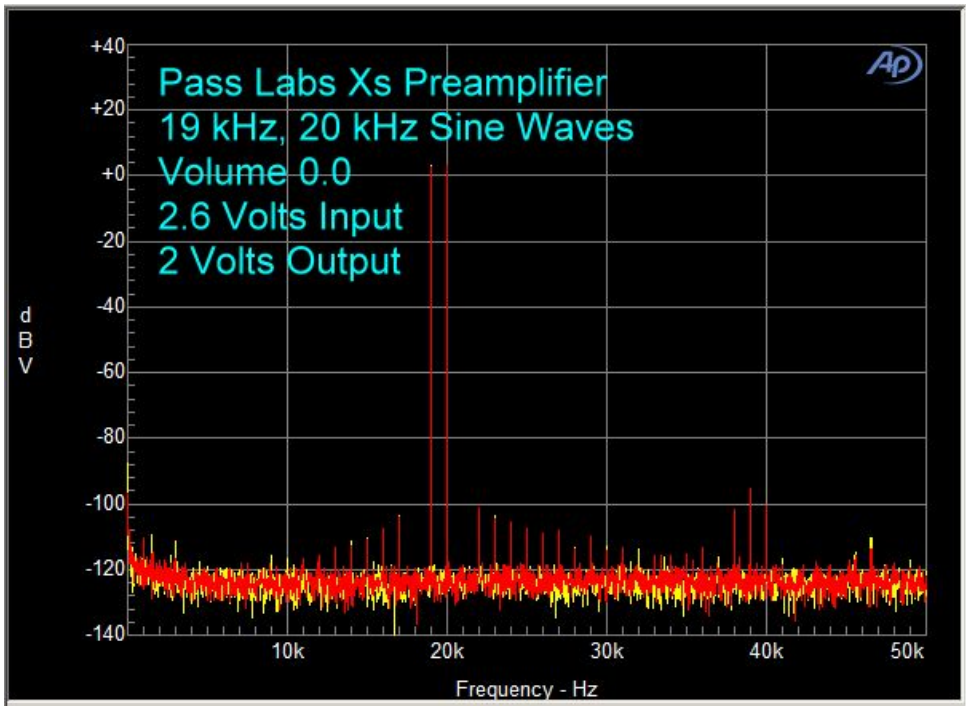
At 1 kHz and 2 volts, THD+N was 0.002%. Notice that there are many harmonics, but they are all below -100 dB, which means, no audible harmonics at all. Fantastic performance, as 2 volts is the range you would most likely be using to drive power amplifiers.



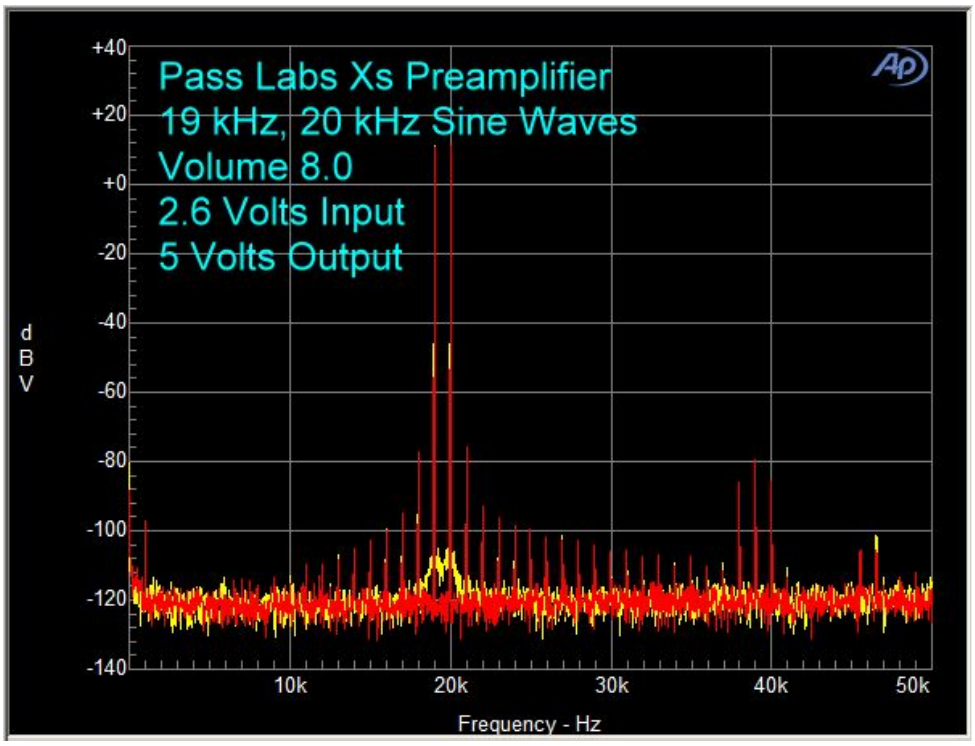
Even at 5 volts output, only one harmonic (the third) is above -100 dB, and it is just marginally so at -90 dB.



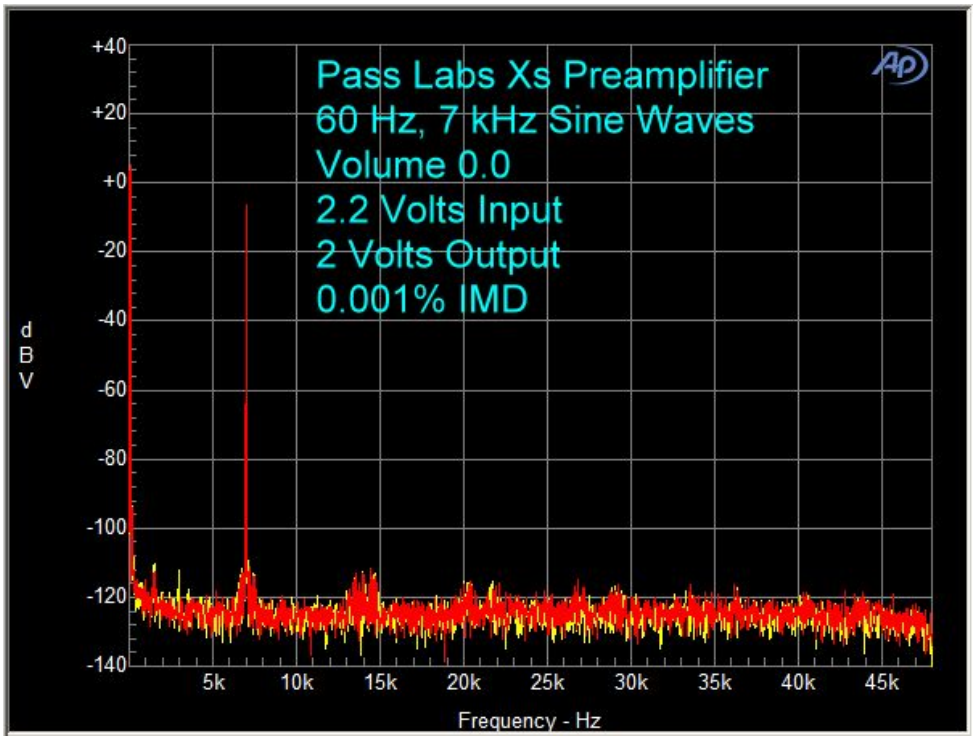
The side bands around these 19 kHz and 20 kHz test tones are essentially also below -100 dB with 2 volts output. The B-A peak at 1 kHz is also below -100 dB. Inaudible. Incredible!



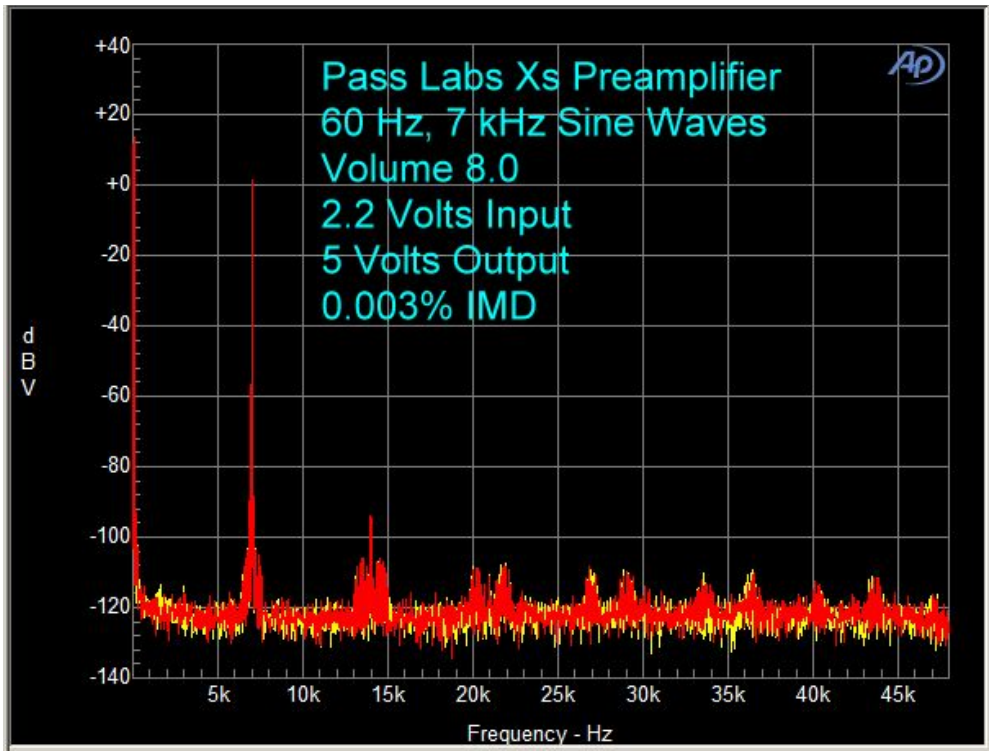
At 5 volts output, most of the side bands are at -100dB or below, with just a few at -80 dB. The B-A peak at 1 kHz is at -98 dB.



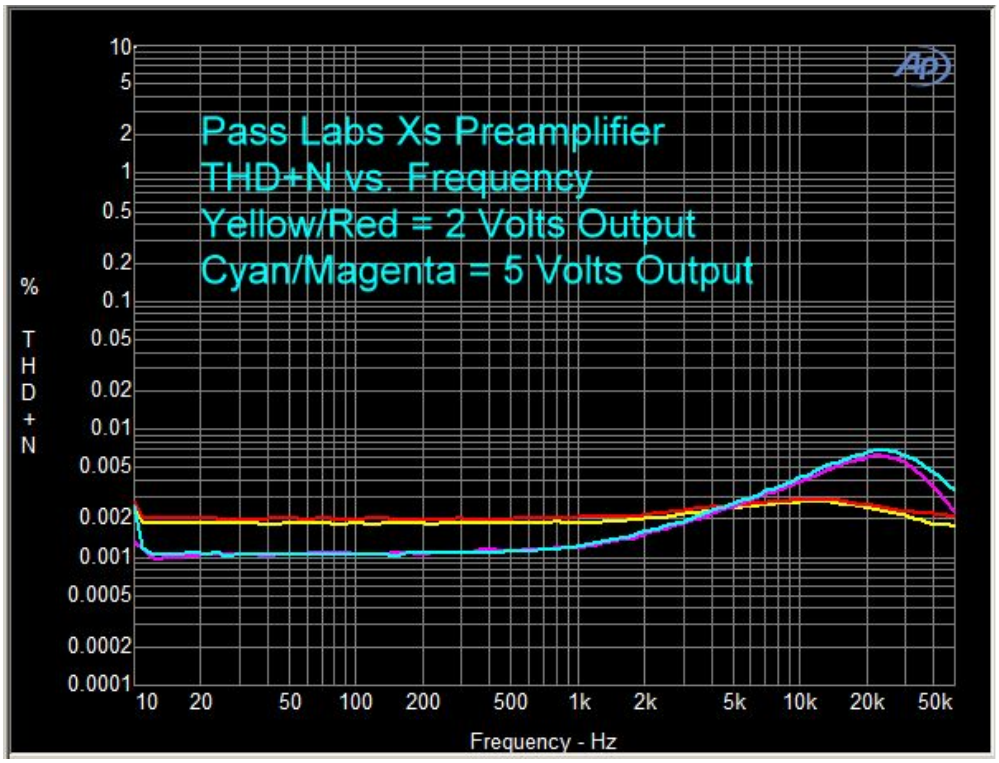
IMD at 2 volts output was only 0.001%.



At 5 volts output, IMD rose slightly, to 0.003%. This is truly landmark performance!

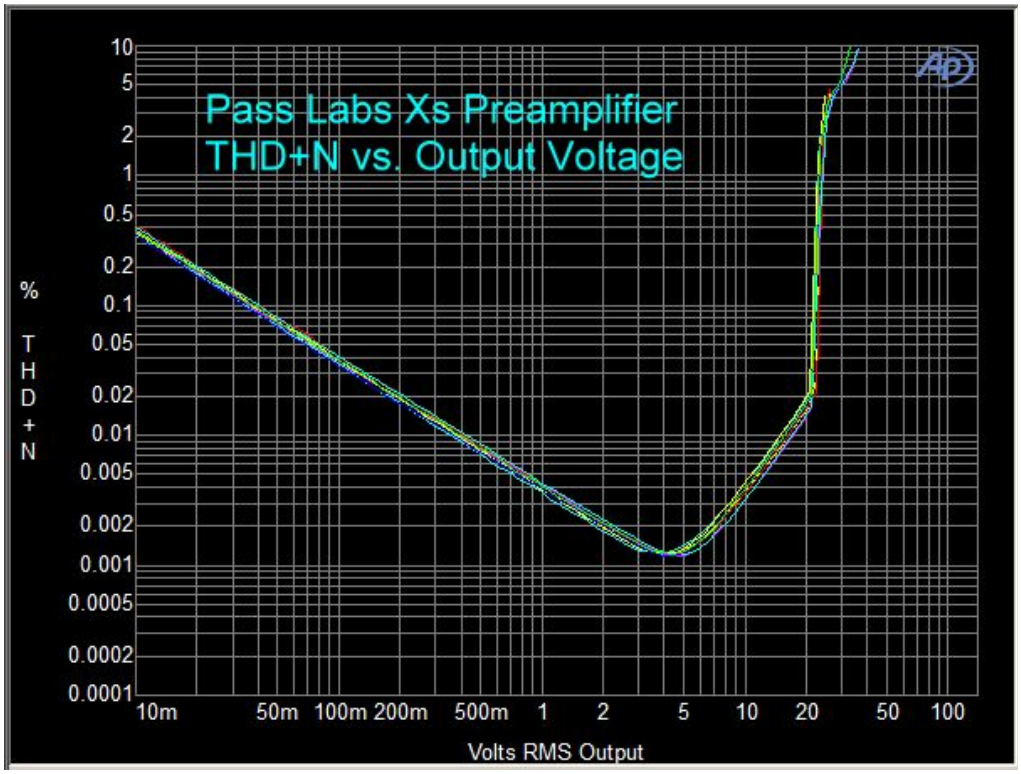


Distortion vs. Frequency is shown below. It shows the typical rise at the high end of the spectrum, but does not go above 0.007% even at 5 volts output.

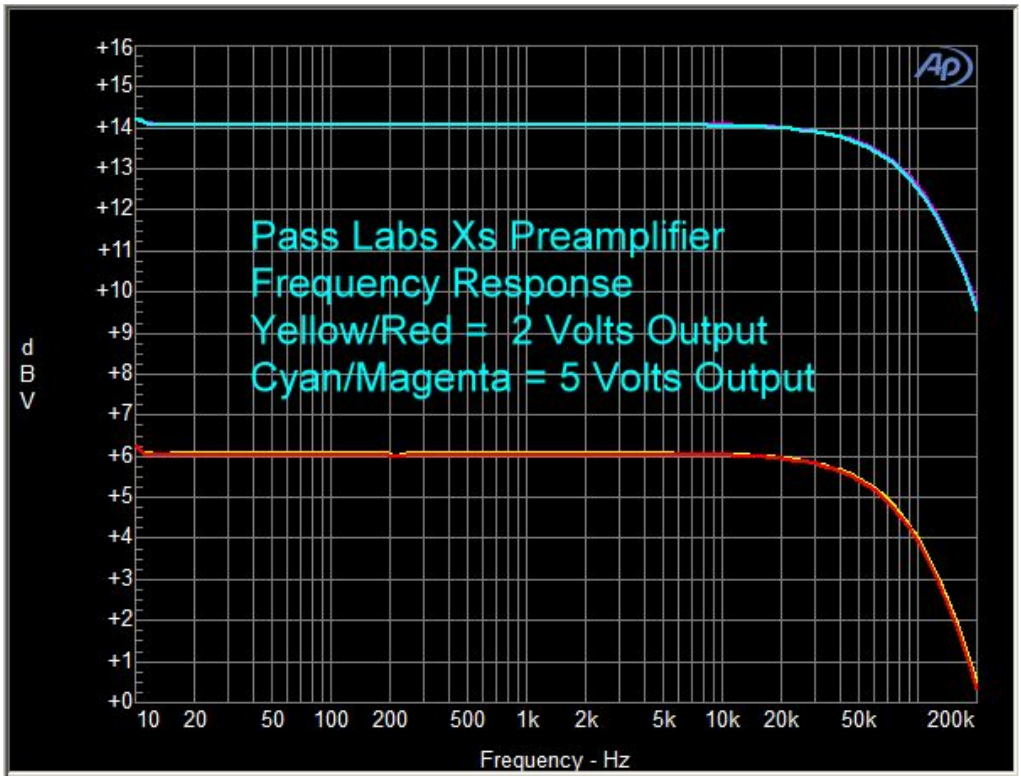


Distortion vs. Output Voltage resulted in a graph where all the lines overlapped, whether at 2 volts output, 5 volts output, 100 kOhms load or 600 ohms load. I have never seen performance like this. It

means the Xs Preamplifier is built to drive any load, and there will be no sagging of the deep bass at high power, which is exactly what I experienced when I cranked the volume.

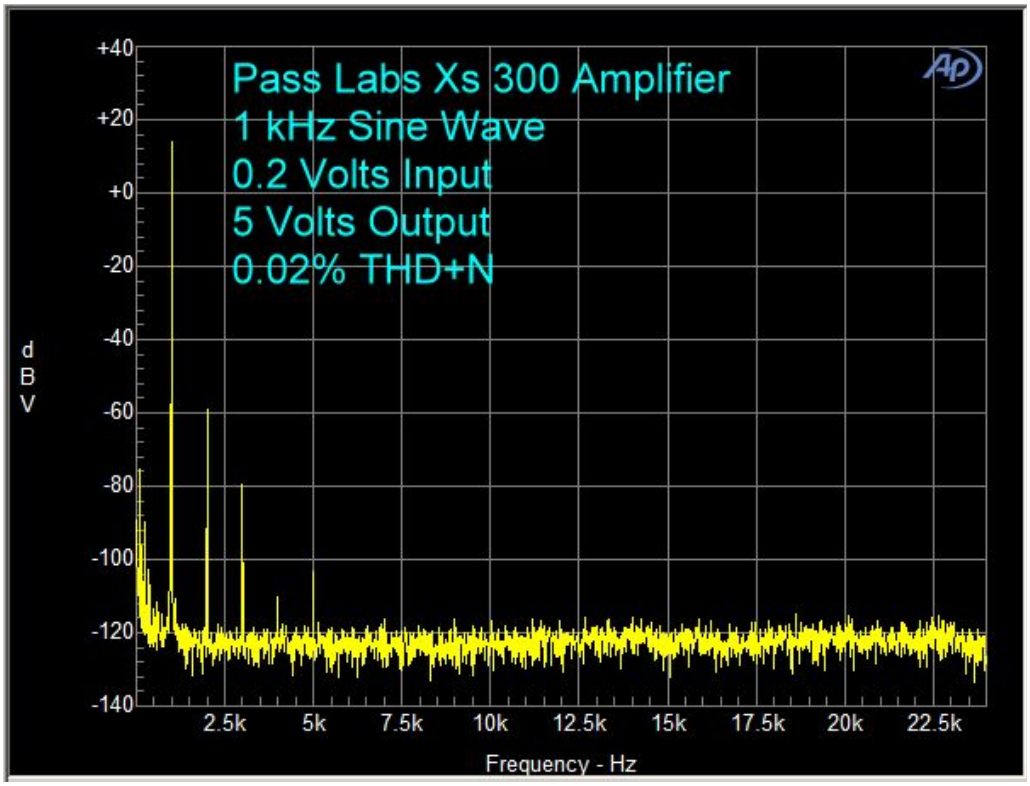


The measured Frequency Response was 20 Hz – 50 kHz, -0.5 dB.

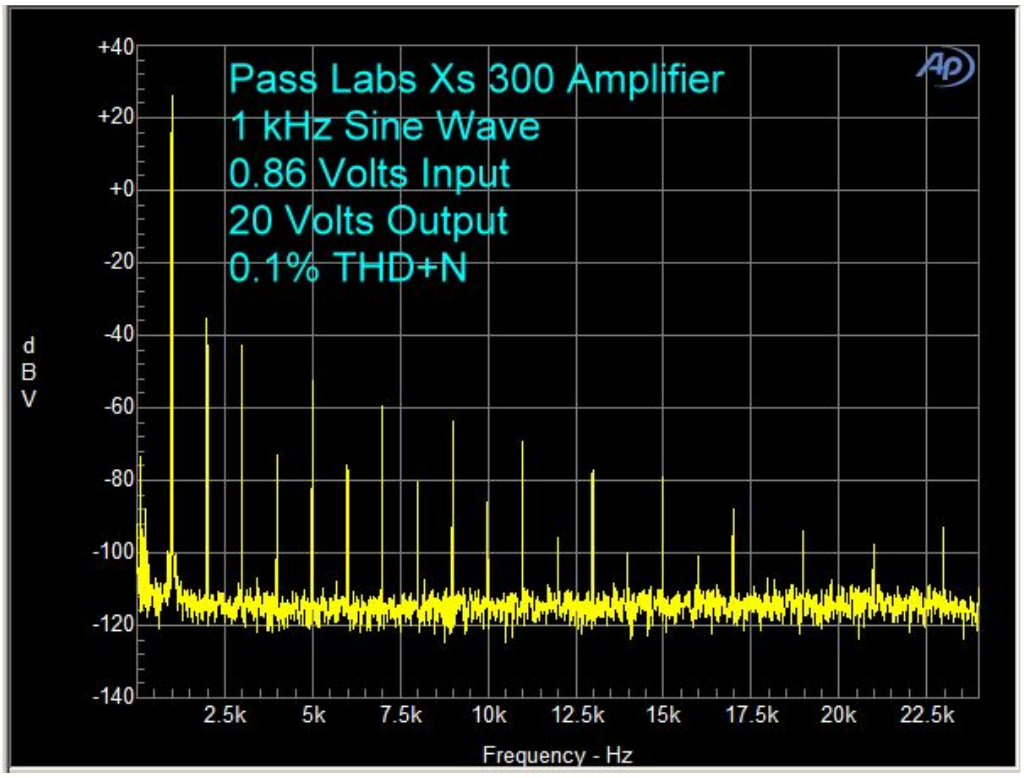


And now, the Xs 300 Monoblock Power Amplifier:

At 5 volts output, THD+N was 0.02%, with the second harmonic being the major peak.

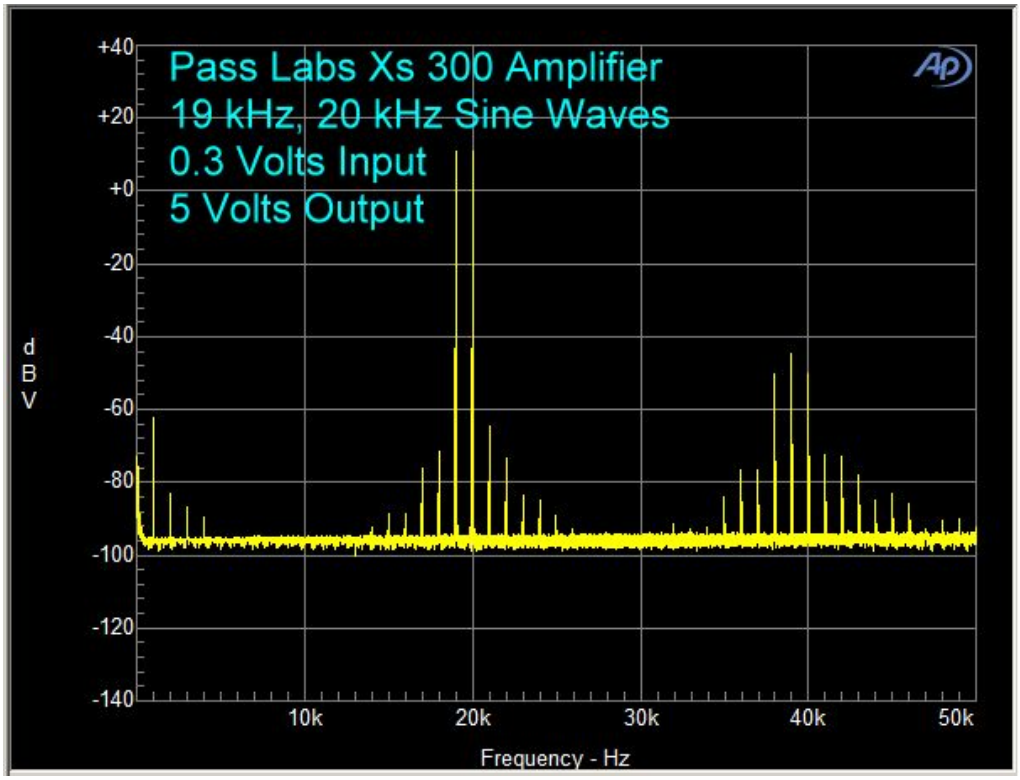


At 20 volts output, distortion rose to 0.1%, with the second harmonic again being the largest, but the third also contributing a major peak.

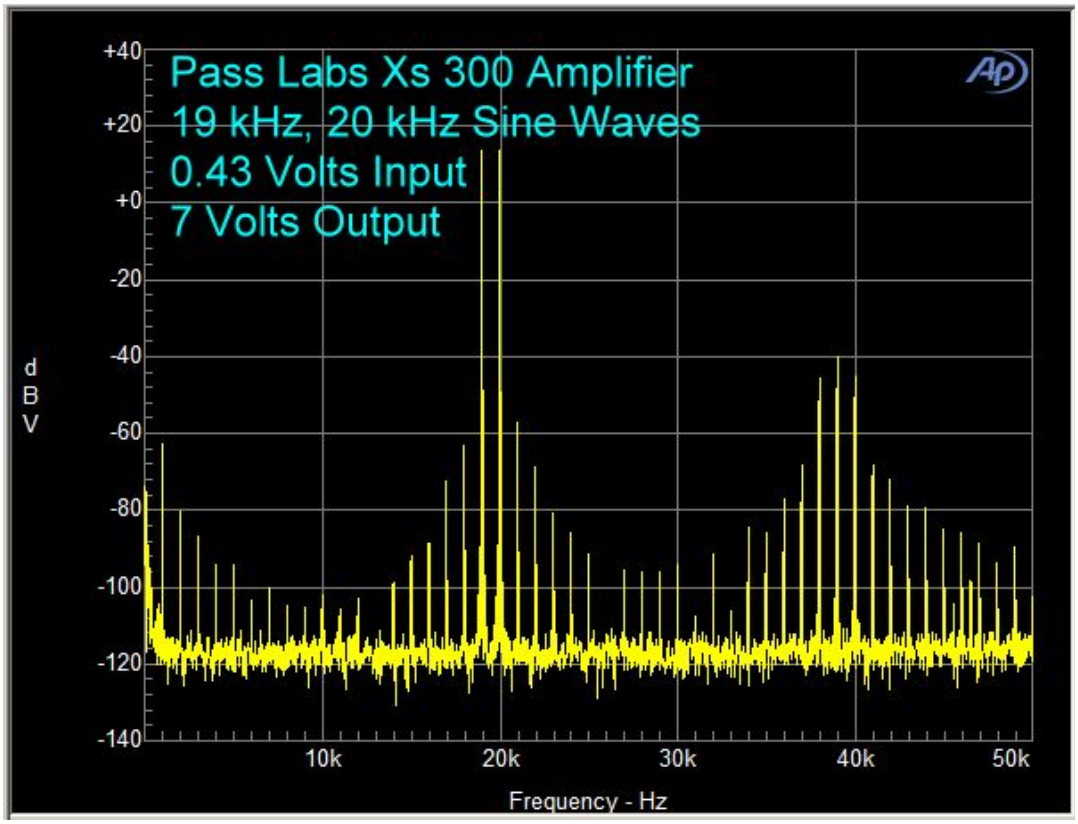


Using 19 kHz and 20 kHz sine waves, at 5 volts output, the noise floor was at -100 dB instead of -120 dB as it was in the previous graphs. I had an issue with noise contamination due to using a dedicated 240 volt outlet to power the Xs 300's. This outlet has its own dedicated ground as well. The other components in the test (including the Audio Precision) were connected to 120 volt outlets, which have a different ground.

At first, I eliminated the PC and used a laptop with battery power. This helped a bit, and then I connected the grounds of the 120 volt outlet to the ground of the 240 volt outlet. This helped even more, but for the 19 kHz, 20 kHz test, below about 7 volts, this -100 dB noise floor was visible. I could see the noise fluctuating on the Audio Precision, but at 7 volts output from the amplifier, and above, the noise seems to have been suppressed.

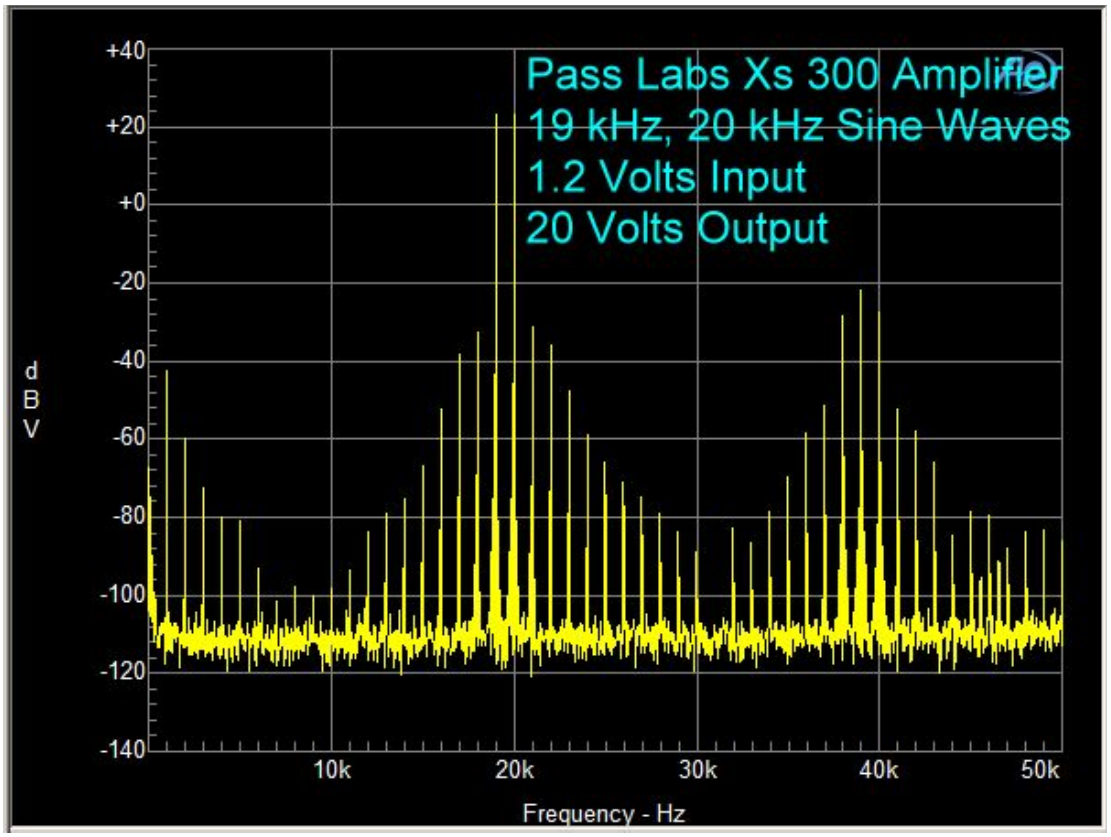


Moving the output up to 7 volts resulted in the normal noise floor of ~ -120 dB. There are quite a few side bands, and the B-A peak is at -63 dB. This is part of the sculptured sound that the Pass Labs created for the Xs 300. They listened, made adjustments, listened, made more adjustments, etc., and when they were all happy, that was the design, with the distortion peaks falling wherever they might.

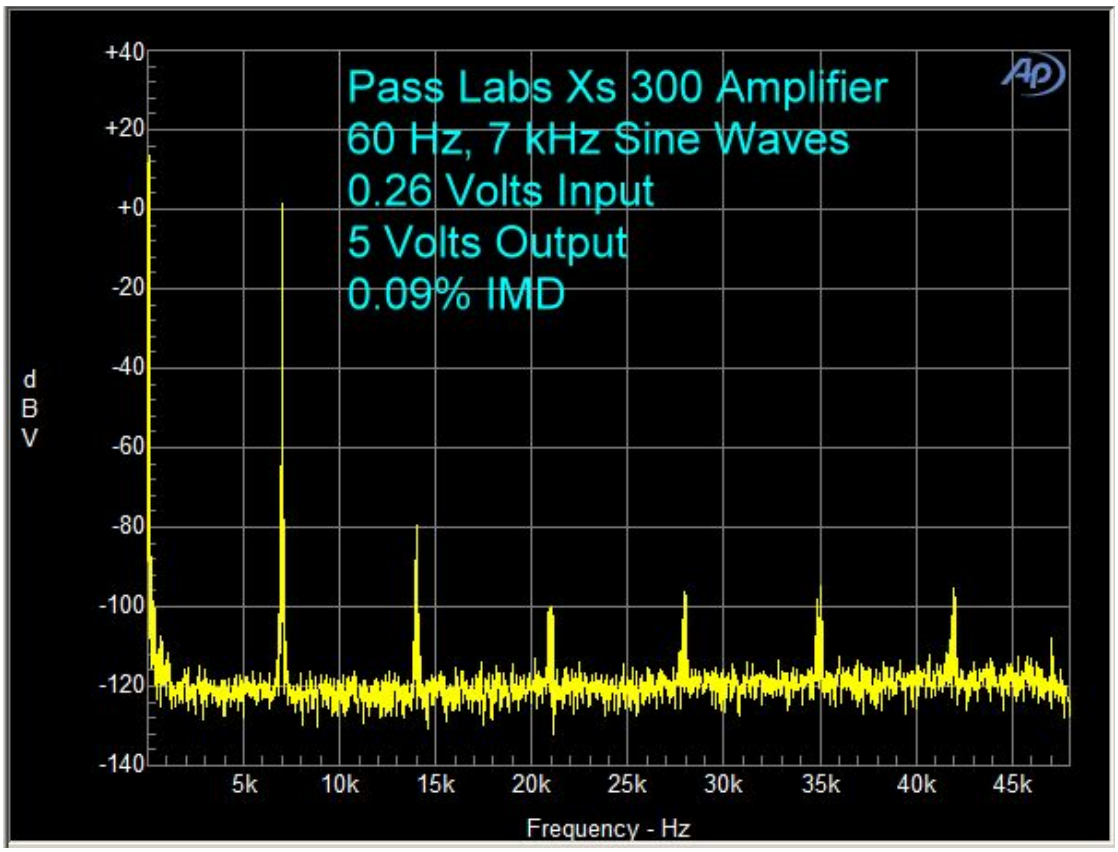


At 20 volts output, the B-A peak is at -42 dB. If I had just looked at the graph, but never heard the amplifier, I would have predicted some audible distortion. But it didn't occur. Here is the reason. Pass Labs used extremely high quality parts, a massive power supply, and more than 100 output devices. They created the sound by changing a capacitor or resistor here and there, but these were not band aids to fix problems. They were there to create a pleasing sound, one that was similar to a Pure Class A triode power amplifier (50 watts) that they designed beforehand, and decided that they would build the Xs 300 to mimic that sound, but not be deficient in the bass or high frequencies.

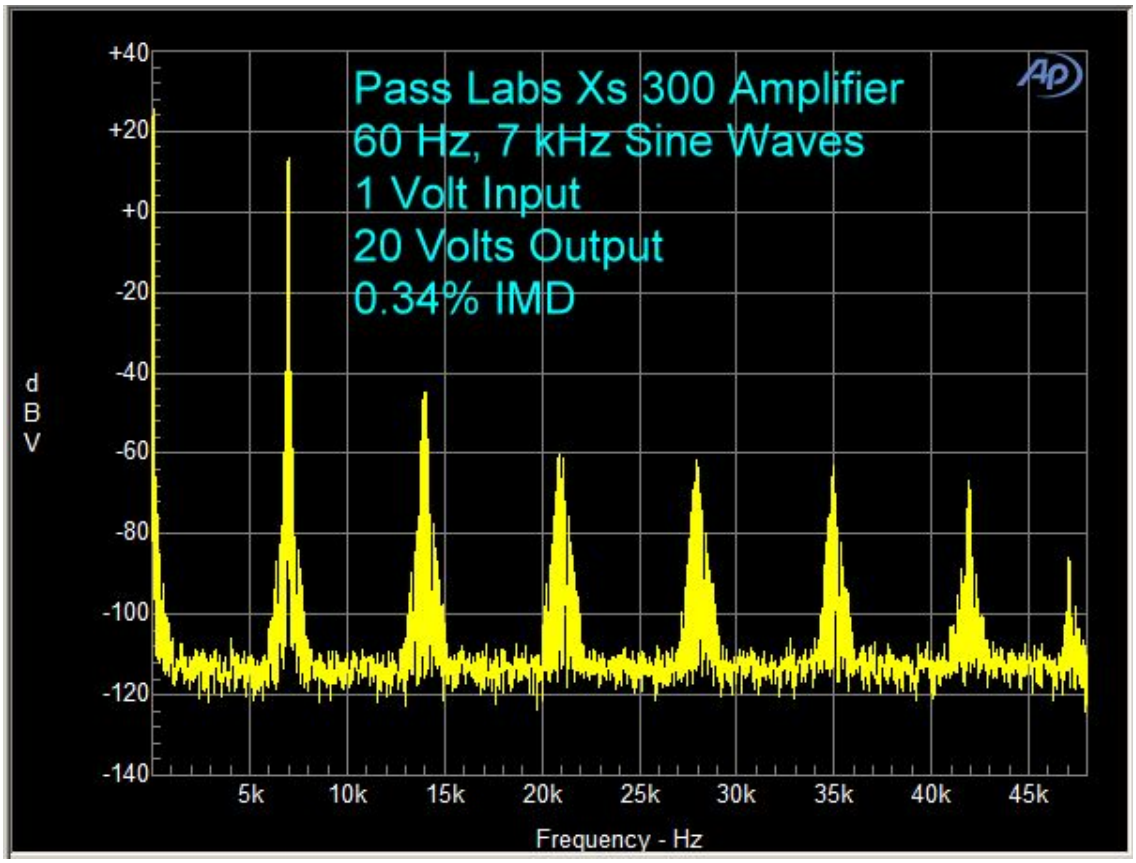
A mass market amplifier (such as in an inexpensive receiver) that has distortion peaks like these, has those peaks because of trying to keep the costs down, using lower quality parts, and using a lot of negative feedback to fix issues in a weak power supply. So, the amplifier produces high distortion peaks from stress, not because the amplifier was designed to sound a specific way. The Xs 300 produces them because it was engineered to do so. It plays the music stress-free, just coasting along, with the peaks added for "flavor" by changing the value of a few parts and listening to the results. Secondly, the Xs 300 is operating in Class A, which makes it very fast. So, short transients, like the leading edge of a ride cymbal "ping" come through clearly.



At 5 volts output, IMD was 0.09%.

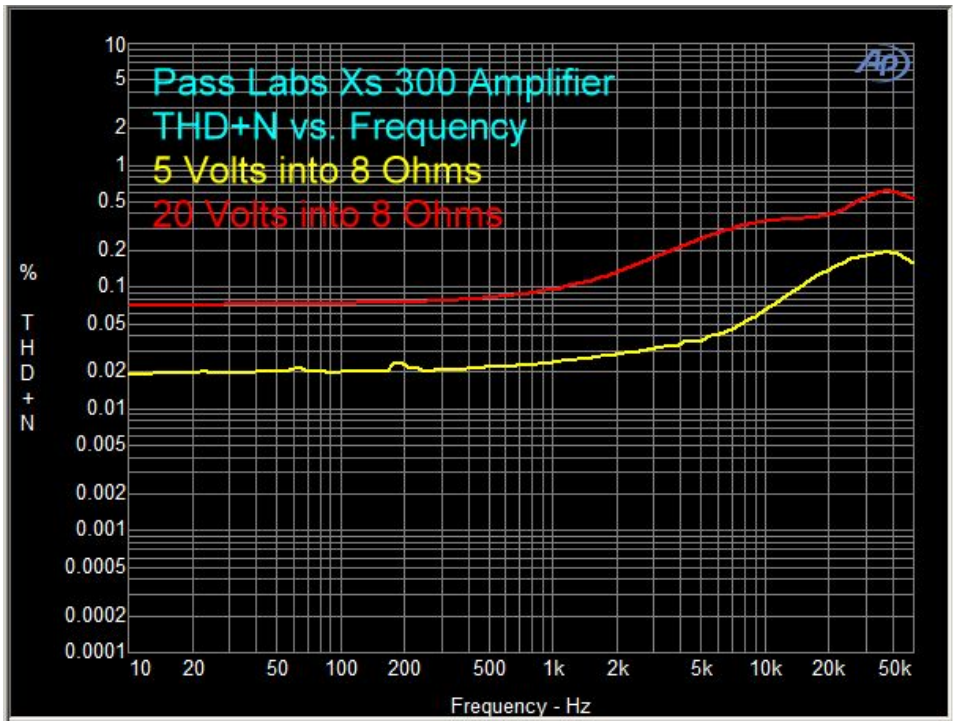


And at 20 volts output, IMD was 0.34%. Again, these are results that were “built into” the design.

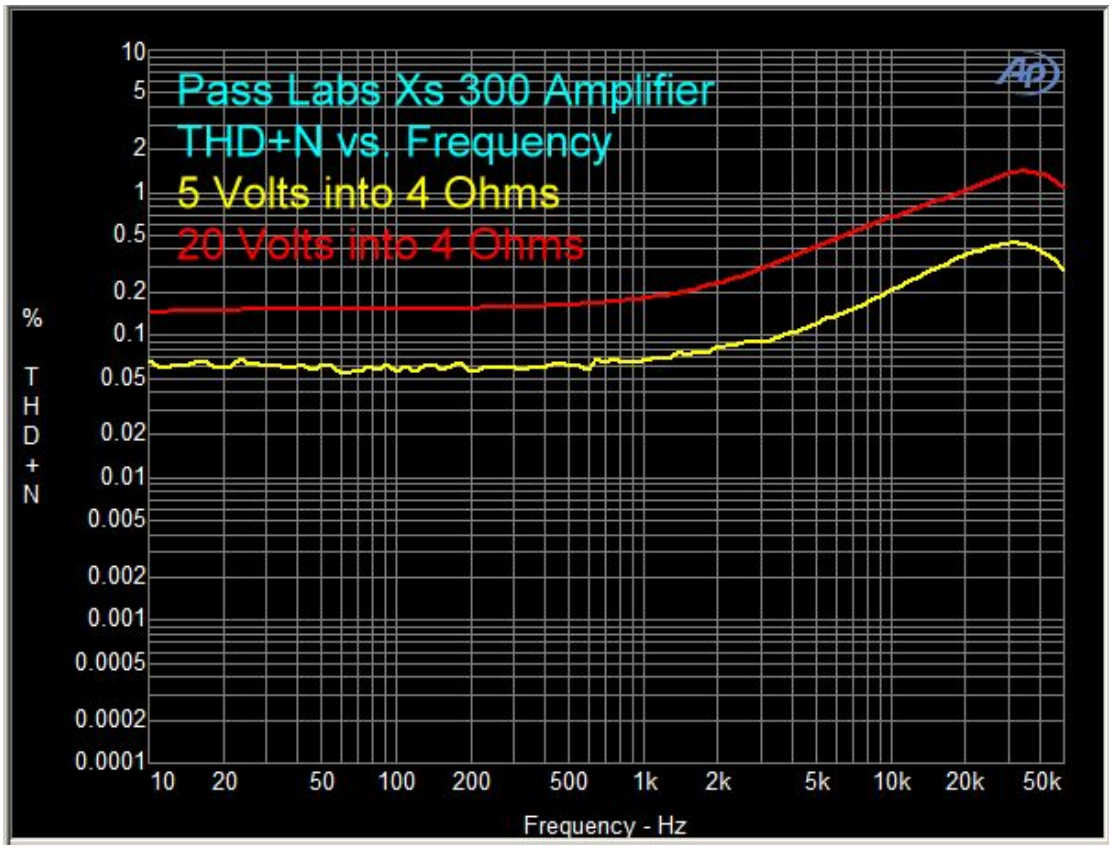


THD+N vs. Frequency is shown below.

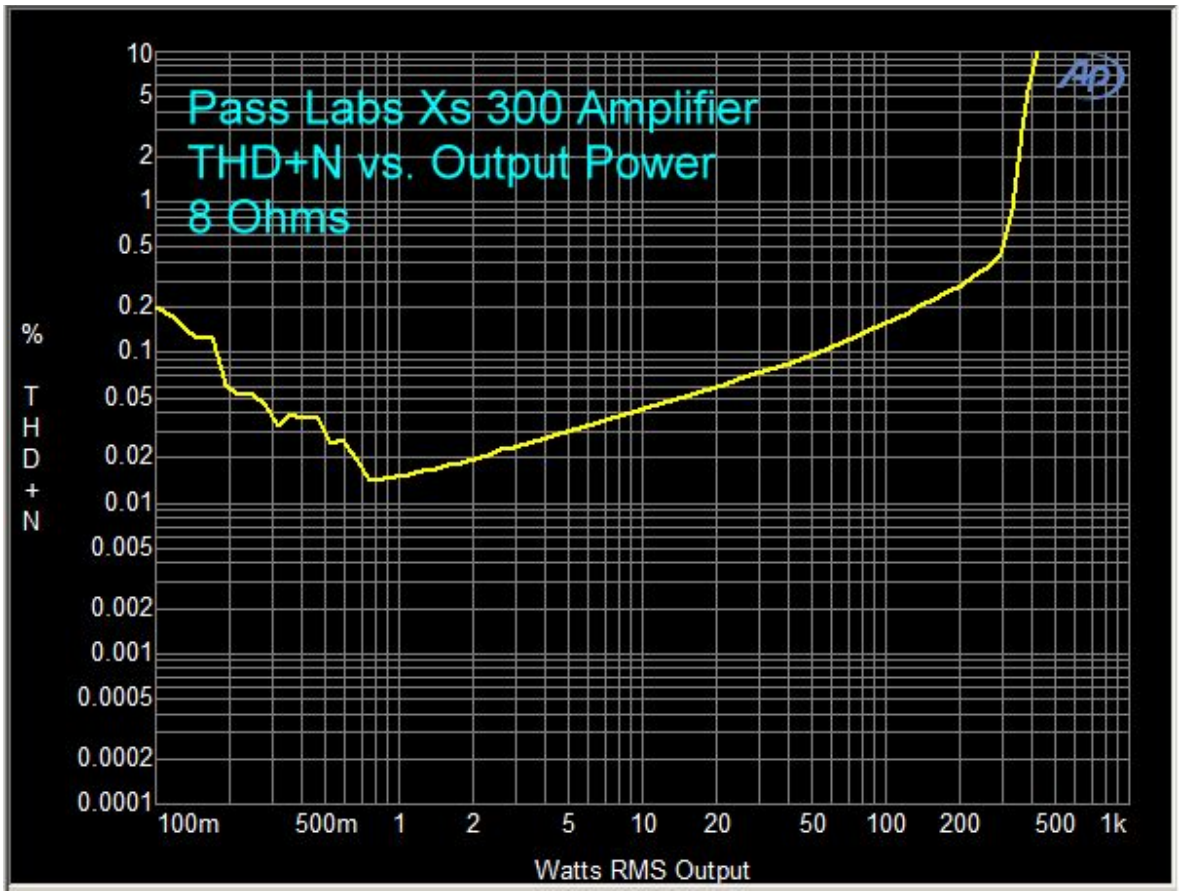
At 8 ohms, with 5 and 20 volts output, distortion maxed out in the audible spectrum at 0.4% and 20 kHz at 20 volts output.



At 4 ohms and 20 volts output, distortion was right at clipping (1% THD+N) at 20 kHz.



Distortion vs. Output at 8 ohms indicates that the Xs 300's hard knee is exactly at the rated output of 300 watts. I'm sure this is a reflection of the Pure Class A bias at full output. Clipping was at 340 watts. The jagged part of the graph at low wattage output reflects the noise contamination from using a 120 volt supply and 240 volt supply for the various components that I described earlier. It's not the amplifier's problem. It's my problem, and I am working on solving it. I have purchased a 240 v to 120 v step-down transformer that I hope will do the trick. Both the Xs Preamplifier and the OPPO BDP-105 will be powered with the transformer (and the Audio Precision when I run the tests). This will result in all of the components having the same ground.



At 4 ohms, the hard knee was at 500 watts, and clipping occurred at 550 watts.

Conclusions

I imagine it is never boring at the Pass Labs offices. They always seem to be trying something new. For the Xs Preamplifier, it was a preamp with the lowest possible distortion. For the Xs 300, it was an amplifier that would have a triode-like midrange, but with the deep bass and treble of solid state. I believe they achieved their goal. These are truly fantastic products and a milestone in design.