Ultra High End Audio

Aurum Acoustics Amplifier/Speaker System
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Possibly the most unusual sound at the Festival du Son et L'Image this year, was the *Aurum Acoustics Integris Active 300B* system designed by Newfoundlander Derrick Moss certainly gets top marks for innovation and dedication to purpose. Who else would think to combine *Bryston* solid state with single-ended *300B* tubes driving a speaker system of high efficiency, and come up with a 98-dB sensitivity design that is tri-amped with 6 watts each on midrange and tweeter, and roughly 75 watts per channel to a pair of 12" sealed-box woofers?

This approach results in the first full-range (20-20K) single-ended hybrid audio system ever designed. Who woulda thunk it? There are quite a few side benefits to this sideways look at high resolution audio. First of all, the great bugaboo of single-ended amplifier designs, harmonic distortion, is nicely side stepped by running the 7" cone midrange driver over a limited bandwidth, 350 to 2000 Hz, which allows just over a 2-octave range, and thus only first and second harmonics to be reproduced. The 1" dome tweeter takes over above, with its own 6-watts at high sensitivity.

The input gain stage uses 6SN7 tubes, surrounded by, among others parts, custom-made *Cardas* capacitors, and an oversized *Plitron* toroidal transformer that feeds multiple power supplies. According to the fact sheet, "Extensive use of chokes and large-value capacitors (including DC filaments) minimize noise for maximum low-level resolution."

"Loudspeaker crossover functions are 4th order Linkwitz-Riley at 375 Hz and 2000 Hz." "The sealed woofer enclosure is optimized for fully extended deep bass response: frequency response is only -6 dB at 18 Hz, an ideal match for normal room gain effects. The amplifier system includes toggle switches for each channel to decrease extension if necessary."

And let's make a further sideways step to explore *sensitivity*, a subject that has fascinated me since I heard my first *Klipschorn* more than thirty years ago, and my first *Avant Garde* horn system at Robert Deutsch's house a few years back. There's something about the microdynamics you get with high efficiency (or sensitivity) speakers that seems achievable no other way; yes, you must have very low noise electronics, because when you get above 96 dB, hum and hiss are accentuated, but when you do, little details start to pop out of the speakers in a way that's simply fascinating.

I guess we come back to the question of problem solving. Once you've got the midrange dealt with, then what do you have to do above and below? Well, you need bullet-proof bass below, and clean, sweet treble above. Derrick has solved the bottom by putting into his amplifier a pair of *Bryston 2B* circuit boards with his own power supply and active EQ circuit to make the system flat (and tight) to 20 Hz with solid state power. The top requires another 6 watts of 300B amplification into a high sensitivity tweeter that will play at well over 100 dB with no sweat.

Let's do the math. At 98-dB sensitivity at one-watt/one-metre, 2 watts produce 101 dB, 4 watts 104 dB, and 6 watts close to 107 dB. Are we close to the threshold of pain yet? And where is our distortion at listening levels between 85 and 103 dB, a normal tolerance for orchestral listening at realistic levels in a good-sized room? You may well ask this question.

I spent 23 years as a subscriber to the Toronto Symphony Orchestra, starting with Karel Ancerl, then Mahler-crazy Andrew Davis, and Germanically inclined Gunter Herbig followed, with my final concerts under Scandinavian Jukka Pekka Saraste, who could have played a lot more *Sibelius* as far as I was concerned.

Davis loved it loud, and pushed the hall beyond its limits (Roy Thomson Hall was then quite echoey and overly harsh acoustically; I always called it a "HiFi Hall" because it sounded like some of the systems I heard from time to time), especially in the bigger works. I got curious and took my portable SPL meter to a few of these concerts, and found that the volume level even at full forte seldom exceeded 100 dB, and then only for very short climaxes.

Of course, in the hall you're, say, 50 feet from the orchestra, while listening to a home system you'll be 8 to 20 feet away from the speakers. The hope is to create orchestral levels that are realistic, but at a closer distance. Therefore, as the folks at Dolby discovered, peak levels at home are preferably between 85 and 95 dB, especially when listening on a multichannel system.

All this leads me to my conclusions about Derrick Moss's unique creation. It has the dynamics of a very big system with no strain, plenty of detail and clarity, with a wonderful ambient field created between, behind, and around the speakers. The multi-amplifier system is very well designed in terms of crossover points and driver sensitivities, so the overall effect is very seamless, realistic sound. It has a touch of the warmth you'd find in a good hall, but also great tonal accuracy.

And with pop music, it can really play extraordinarily loud without losing definition (Jennifer Warnes' *The Hunter* sounded just about as good as I've ever heard it at higher levels than I normally would listen, with particular tunefulness in the bass, and delicacy in all the guitar and percussion production effects you find in all her records).

Some of all this may be due to the *Integris CDP* CD player, which Derrick has fashioned from various high end gear, with the best possible parts, but that's a review Bob Oxley (our Newfoundland correspondent) is currently contemplating. It brings the cost up to near $40,000, but from what I heard from this unconventional system, it's all worth it.

Derrick Moss Comments On His System Parameters,Especially the SET Aspect, & Provides A Measurement Of The System

The 300B amp sections measure a very clean 5 watts each and arguably a decent 6 but no more. Most importantly they are superb at 1w and below where they are heard 99.9% of the time. 5 watts is the lowest rated power output of any 300B amp I'm aware of (most run 8-13 watts) and I'm proud of it! Why? Well firstly, because of the active crossover and narrow operating bandwidth of each 300B and the exceptional efficiency of the loudspeaker design there's surprisingly little juice needed.

By comparison, virtually all other low-power SET amps must be run hard to their limits and beyond in most applications; those amps are designed for maximum power transfer which is a goal contrary to low distortion. They run the tubes hard to their maximum rated dissipation but we operate at about 55% (great for extending tube life - not inconsequential for a $1000 set of tubes). Low impedance output transformers also maximize power transfer but do so at the expense of higher distortion at all power levels; our custom transformers have double the typical impedance and while this lowers amplifier efficiency it significantly improves linearity.

Another important area of choice is the driver tube where we use the 6SN7 at a similarly moderate and carefully chosen operating operating point. In our design the 6SN7 circuit distortion characteristics are remarkably like our 300B circuit - the end result is that they produce only small amounts of 2nd order harmonics which (when combined in an inverted amplifier) just about perfectly neutralize each other. This is a characteristic we optimized especially for maximizing low level linearity. There's a bunch more details in there too but that would make this already overly long paragraph totally insufferable. Anyway, total system power works out to 2x90 + 4x5 = 200 watts. A nice round number!

The tweeter has a reasonably high sensitivity of 92dB but with no-power-sucking passive crossover (our exclusive NPSPC technology!) and the lesser power demand above 2kHz, we're quite well off in that regard. Also, within the active crossover implementation we rebalance the gain so sensitivity mismatch is a non-issue. In practice we find that our mid and tweeter amps operate with very similar power demands. When clipping issues do arise, because we're listening at unrealistically loud levels as you aptly point out, it's usually the midrange that gives in first, though.

The woofer to mid crossover point is now altered slightly to 350Hz. You wouldn't have known that of course and it's virtually inconsequential. I have attached a screencapture below (I hope it shows) of the onaxis quasi-anechoic SPL. The only real quibble may be the 2dB dip at 3kHz (some would say a good thing) - this is a diffraction artifact that measures worst on-axis but does not exist in the far off-axis measurements. Those off-axis measurements fall away quite smoothly as well for an excellent power response and evenhanded reflected/ambient room sound. The top octave dipsy-doodle is partly due to the fact that the sloped baffle aims the tweeter over the mic and the 10-20kHz wavelengths from opposite edges of the dome tweeter will interfere with each other at some frequencies (this is normal off-axis behaviour for most domes but conveniently hidden in the common on-the-tweeter-axis measurement for most perpendicular-baffled speakers). The other cause is the selection of a tweeter without ferrofluid - the tweeter is quite safe from thermal stress with a 5 watt amplifier and it also sounds slightly more open and finely detailed than the ferrofluid-equipped version which is slightly flatter-measuring in the top octave.

LF extension is still a nice -6dB at 18Hz. We are adding additional LF contour controls to the circuit which should be a boon. The toggle switches (one per channel for discrete adjustment if needed in an asymmetrical room) will allow two quick LF shelf cut options - great for some recordings that are a bit off-balance down low. A pair of potentiometers per channel will also allow both the upper and lower ranges of the woofers to be trimmed up and down. These pots will be semi-hidden screwdriver adjustment types that will allow the system to be dialed in for the preferred tonality in a wide range of room settings. We feel that this type of real room tuning adjustment is most viably accomplished with variable LF trimming rather than messing with mid and treble settings and screwing up the power response. These options will maintain the high resolution and make the system adaptable to a wide range of room settings and personal tastes - far more substantial and meaningful than messing with the cabling to compensate for a problem or need in the room acoustics.

AM Comments on the Measurement: Derrick also uses LMS for measurements, so it's fairly easy for me to interpret these curves. He's measured the bass and treble sections of the system, and the overall frequency response. What's notable is that he's done it at 90 dB SPL, which is very loud, and it shows how linear this system is at levels well above what most of us would tolerate or enjoy. But it also shows a remarkable lack of compression, in the highs, especially, with a little extra energy around 12 kHz.

In the lower octaves, the *Integris* is down about 8 dB at 15 Hz, but turntable lovers can contour the bass to avoid tonearm resonance problems if they occur. But the flatness and extension of bass at this high level attests to the considerable dynamics of this system. It's an unusual approach that yields exceptional sound quality and power.