

## **AES Netherlands section members perform listening tests**

### **Introduction**

On 9 April, several members of the NL section of the AES gathered to do some listening experiments related to the audibility of phase shifts and brick-wall filtering. The opportunity arose because one of the members (Richard van Everdingen) had acquired a vintage stereo coder. As part of the stereo coding process, each of the two stereo channels has to be filtered aggressively at 15kHz to avoid aliasing and IM with the pilot tone (19kHz) and the upper sideband. This particular filter was flat within +/- 0.1dB out to 15kHz and dropped to -60dB at 19kHz. However, due to the filter, the signal is phase shifted increasingly with frequency, reaching 360 degrees at 15kHz. The purpose of the meeting was to perform informal but controlled listening tests to find out whether this filtering and phase shift are audible.

### **Test setup**

The stereo coder had been internally modified with a pair of coaxial relays that could be switched to bypass the filter circuits. The bypass path had been adjusted to the same level as the filter path within 0.004dB at 1kHz, had a bandwidth out to 400kHz and a 15kHz phase shift too small to detect on a scope. All circuitry related to the 38kHz oscillator and other circuits not related to the filter were disabled. A remote switch, connected through a screened cable, was available to switch the relays while listening. Switch positions were marked '0' and '1' but it was not known which position was the filter and which the bypass path. Each of the four participants (one younger person < 30 years, one mid-aged around 45 years and two more senior > 60 years) listened to some musical excerpts from an SACD through the time-aligned speaker system of our host Hans van Maanen ([www.temporalcoherence.nl](http://www.temporalcoherence.nl)). Each participant operated the switch and was asked if they thought they could hear a difference. One participant declared he could not hear any difference and did not participate further. Next, a suitable musical excerpt with significant high frequency energy was selected and the remaining three participants continued listening through Sennheiser HD800 headphones. Each participant recorded the switch position he thought was without the filter in the loop, and also which switch position he thought sounded best.

### **Results**

All three participants (including the two most senior ones, which included yours truly) reported the same switch position as 'not in the loop' and all stated that they liked that sound the best. It was then revealed that the switch position had been exactly the opposite: the position reported as 'not in the loop' was actually with the filter IN the loop. Consequently, all three participants had reported to prefer the sound with the filter in the loop. In the following discussion, all participants stated that the differences they could hear were very subtle and that concentrated comparison between the two settings were needed to detect differences at all. They described those subtle differences as minor changes in attack and transients and had reported the setting which they thought had the 'sharpest' attack as 'not in the loop'.

### **Conclusions and follow up**

It was agreed that the limited amount of testing and the limited number of participants did not allow conclusions with a high enough confidence factor. Yet, the results were

quite surprising and it was agreed to attempt another test on a well-known controversy: the audibility of digital processing. Inspired by an earlier test reported in the JAES (E.B. Meyer and D. R. Moran, "Audibility of a CD-Standard A/D/A Loop Inserted into High-Resolution Audio Playback," J.Audio Eng. Soc., vol. 55, pp. 775-779, 2007 Sep.), a test will be designed for audibility of the difference between a straight analog signal path versus the same signal send through a (CD-equivalent) A/D – D/A conversion path. A live signal should be picked up by a microphone with a frequency response up to at least 50 kHz and a recorded signal should include complex sounds like e.g. from a symphony orchestra. Reproduction could probably best be done using high-quality headphone sets like the one used in the above described experiment. Stay tuned!

*Reported by Jan Didden*