



DTS POSITION ON “DOLBY REVIEWS DTS...”

Part Two

6 April 2000

Last year, Dolby Laboratories published its own “evaluation” of a competitor’s product, the DTS encoder/decoder set. The paper reported certain measurement results and anonymous listener preferences, along with speculation and opinion. The paper was circulated widely enough to warrant a statement from DTS. Now Dolby is circulating a further paper in response to our statement.

As before, certain of Dolby’s assertions demand our comment. To our knowledge, everything in the DTS paper of 21 November 2000 is true and accurate, so some of our earlier statements are repeated below.

1. Response of DTS at 754 kbit/s. Here Dolby corrects their earlier flat statement by adding a -3 dB frequency. Their measured response is in fact characteristic of the implementation in this decoder, not the encoder or any CD or DVD made with it. More importantly, Dolby does not address our central point, which was that the amplitude spec should not be considered in isolation. Whereas Dolby Digital has slightly wider response at high frequencies than DTS at 754 kbit/s, Dolby combines channels at high frequencies and DTS does not.

2. Response of the LFE channel. In our earlier paper, DTS was very specific about the CAE-4 encoder’s LFE response: flat to 100 Hz, -3 dB at 116 Hz, -6 dB at 125 Hz. We repeat the numbers here.

Dolby’s graphs showing an earlier rolloff represent their measurement of the encoder and CAD-4 decoder together, and substantially reflect the response of the reconstruction filter in the decoder, not the encoder or DTS content on disc. With the more powerful DSPs which have appeared since that decoder design, other optimizations are achievable. But the CAD-4 represents a balanced approach, as will be seen presently.

Dolby’s graphs show only amplitude response, but the effects of group delay must also be considered.

The DTS CAE-4 + CAD-4 exhibits a small advancement of the LFE channel relative to a main channel, from 10 to 50 degrees over the range 20 Hz - 120 Hz, with about 45 degrees of advancement at 80 Hz. (About 1.6 ms; see Figure 1.)

In contrast, the long LFE group delay of the Dolby Digital DP569 encoder + DP562 decoder (about 7.8 ms relative to a main channel) is shown in Figure 2. Between 60 Hz and 70 Hz, the LFE and main channels are 180 degrees out of phase with one another. At 80 Hz (shown) there is about 225 degrees retardation.

This large time offset will cause pronounced acoustical cancellation. Even more troubling, there will be strong *electrical* cancellation between the LFE channel and bass content which is redirected from the main channels to the subwoofer by bass management. This will have a profound effect on bass reproduction and cannot be compensated by the user in any way.

The group delay derives from a filter in the Dolby encoder which can be switched out. However, it is standard procedure to encode with this filter in to avoid aliasing; indeed Dolby describes the hazards of not using the filter later in their paper. The Dolby Digital content itself on disc reflects these characteristics.

It is curious that Dolby would focus on rolloff at the upper end of the LFE channel -- or the LFE channel at all -- since it is their published recommendation to limit LFE content to 80 Hz, or to avoid the LFE channel altogether for music (“Some guidelines for producing music in 5.1 channel surround”). This is necessary advice for Dolby Digital, given the above.

3. Cumulative gain. DTS repeats that we have not modified the CAE-4 for a purported cumulative effect, and remain mystified by the contradictory statement attributed to an unnamed studio that such an effect existed and then was removed. Dolby themselves state that the DTS encoders they tested do not exhibit this effect.

Despite this, Dolby says that DTS has provided no evidence that an 0.6 dB difference in level is inaudible. We repeat that a 0.6 dB cumulative measurement integrating additive and subtractive coding errors would not likely correlate with any perceived effect. Regarding evidence, inaudibility cannot be proved, only supported by statistical data. Audibility, in contrast, can be proved, so the burden is Dolby’s -- any valid test being subject to standard protocols and absent participants with vested interests.

4. 6.1 discrete versus matrix. To our earlier statement that Dolby Digital Surround EX soundtracks are compromised by the limitations of matrix technology, Dolby responds that there is no compromise because the theatrical presentation also employs a matrix and the same master.

It is difficult to believe that Dolby advances this argument with any conviction. Whether in cinema or home, the creative intent of the mixing engineer is constrained by the limitations of the matrix. In the theatres, DTS makes the best of the matrix by offering a high-performance matrix decoder operating in the digital domain. In the home, DTS offers both high-performance matrix decoding and a fully discrete back channel capability.

We do not understand Dolby's concerns about subjective differences between the matrix and discrete versions when the discrete version is prepared under the direction and with the approval of the original mixing engineer.

5. *Two Against Nature*. Dolby devotes two pages and two graphs to a matter which can be stated in one sentence: *An error was made in the Dolby Digital encoding.*

In their original paper, Dolby had asserted as fact an unresearched speculation that the DTS soundtrack on *Two Against Nature* had been sweetened. Their retraction is made without expression of regret.

Conclusion. We refer the reader to our earlier paper, which contains additional detail and many points not further debated by Dolby. We hope for a second time that there will be no need to continue with charges and refutations. Both companies' time is better spent tending to the merits of their own products and advancing multichannel sound in general.

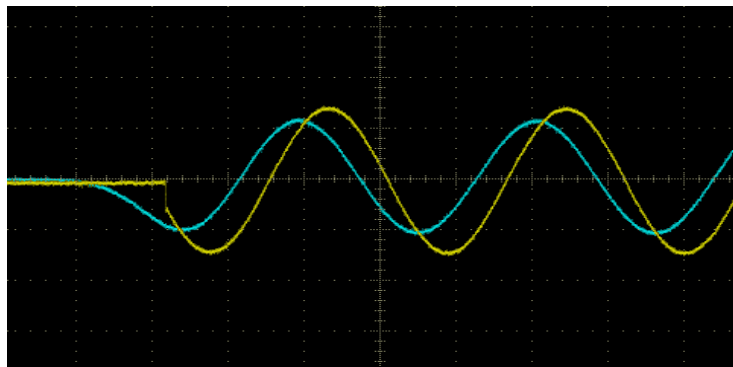


Figure 1. DTS CAE-4 + CAD-4, 80 Hz: LFE leads main by about 45 degrees.

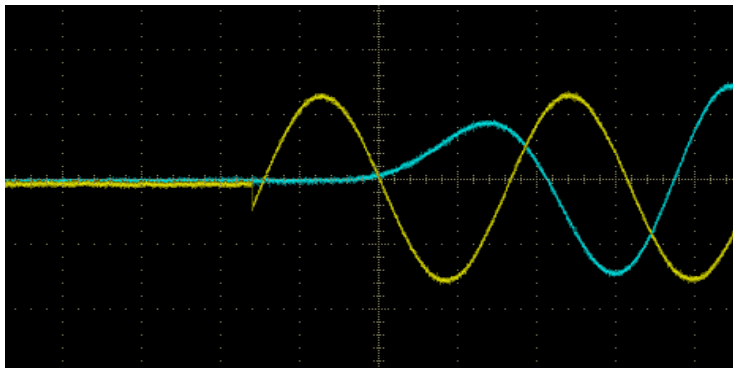


Figure 2. Dolby DP569 + DP562, 80 Hz: LFE lags main by about 225 degrees.