

# Audio Mode Switching in A/V Receivers

## The issue

5.1 sound in home theater systems, which we first experienced on DVDs, is now coming to us from TV broadcasts with 5.1-channel Dolby<sup>®</sup> Digital audio. DVD is typically one content type that plays in one format from start to finish. Television differs in that it is a series of programmes of different content types, linked by commercials or announcements; some will be 5.1, some will be 2-channel stereo. Consequently, home theater systems and A/V receivers need to be able to handle transitions between TV programmes that are typically not present on DVDs.

Ideally this type of switch from a 5.1-channel programme to a different 2-channel programme or vice versa, occurs during silence between programmes, but this is not always the case. Even when it does, the audio mute that home theater systems and A/V receivers implement over such a switch of format can be longer than the silence between programmes, with the result that the first sounds of the new programme can be lost.

Dolby is currently engaging in conversations with manufactures of home theater systems and A/V receivers in order to improve this situation, which is analogous to the wide screen to 4:3 aspect ratio switching issue which the display industry has now come to terms with quite successfully.

## The technical background

The key issue is the behaviour of home theater systems and A/V receivers when a receiver changes from 5.1 channels (3/2 audio coding mode) to 2 channels (2/0) or vice versa. This is a completely valid transition within the Dolby Digital signal: it does not imply that there is any discontinuity in the stream, only that the value of the audio coding mode (acmod) parameter has changed. The behaviour of home theater systems and A/V receivers under these conditions varies significantly with manufacturer and model, according to their individual design criteria. However, almost all mute their outputs for some period of time when such a transition occurs. The muting period ranges from a few milliseconds to well over a second and there are various reasons for this, such as the loading of matrix surround decoding to provide 2- to 5-channel audio decoding, but the result is that part of an audio programme may become inaudible during this period.

Some broadcasters maintain the correct audio coding mode for each programme as it allows the system to work as originally designed and the majority of newer receivers in the market seem to behave satisfactorily. Others have attempted to circumvent this muting issue by adopting various approaches, although none are ideal from an audio quality point of view. One common method is to leave the Dolby Digital encoders in the 3/2 mode at all times, whether the programme contains 5.1 or 2 channels of audio. This has the unfortunate effect of preventing receivers from enabling their matrix surround decoding features which may be appropriate for the 2-channel programming; it also leaves the A/V receiver display permanently indicating 5.1. Another method is to up-mix stereo audio to create a credible 5.1 signal. This process is not straightforward and needs to be carefully monitored as it can cause undesirable effects, especially when the 5.1 is later downmixed to stereo in the home. Dolby is working on solutions here too.