Information

Dolby

What is the LFE channel?

5.1-channel audio consists of five discrete, full range main channels (Left, Center, Right, Left Surround, and Right Surround) plus an optional band-limited Low-Frequency Effects (LFE) channel.

In contrast to the main channels, the LFE channel delivers bass-only information (<120 Hz) and has no direct effect on the perceived directionality of the reproduced soundtrack. Its purpose is to supplement the overall bass content of the program or to ease the burden on the other channels. The LFE channel was originally devised for 70 mm movie productions to deliver a separate bass signal to one or more additional subwoofers placed behind the movie screen. This allowed deep bass effects to be added to movie soundtracks without having to upgrade the existing speakers and amplifiers in the three main screen channels. It also meant that the headroom of the 70 mm magnetic audio recordings would not be taxed at low frequencies, which would have detracted from their loudness capability at mid and high frequencies. Finally, no additional frequency crossovers would need to be retrofitted into existing cinema processors to redirect the bass from the main left, center, and right channels to the subwoofer(s). Taking advantage of the available channel capacity on 70 mm prints to deliver a separate bass effects signal proved to be the most direct, convenient, and economical way to supplement the low-frequency capability of movie soundtracks.

To maintain full compatibility with existing theatres, the Dolby Digital film format includes a separate LFE channel. When movies formatted for the consumer use Dolby Digital, the same tracks as originally produced are usually used, including the LFE track if available. Consumer Dolby Digital products that reproduce multichannel sound must combine the LFE channel in the proper acoustic mixing ratio with the bass from the other channels for proper reproduction.

LFE does not equal subwoofer

Dolby Digital programs may include a bass-only LFE channel, but this channel does not correspond directly to a subwoofer output. It is possible for a program to contain an LFE channel, but a decoder may provide no subwoofer output because all of the bass information in the program, including the LFE channel, can be reproduced by the main speakers. The opposite is also true: it is possible for a program to not contain an LFE channel, yet a decoder may provide a subwoofer output because some or all of the main speakers are unable to reproduce the bass information in the program. The difference between the LFE channel and the subwoofer output is that the LFE channel is used to carry additional bass information in the Dolby Digital program while the subwoofer output represents how some or all of the bass information will be reproduced.

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The LFE channel carries additional bass information to supplement the bass information in the main channels. The signal in the LFE channel is calibrated during soundtrack production to be able to contribute 10 dB higher SPL than the same bass signal from any one of the screen (front) channels. Even if all three screen channels are active, enough bass could be delivered by the LFE channel alone to bring the theatre's subwoofer into acoustic balance with the screen channels. This allows filmmakers to unburden the main channels by diverting the strongest bass to the separate LFE channel, as needed. Under the most demanding program conditions, where the bass is fully loading the left, center, and right channels, the LFE channel could increase the bass intensity by up to 6 dB.

The subwoofer output, on the other hand, is bass information from up to all six channels that has been selected to be reproduced by a subwoofer. The specific combination of bass information in the subwoofer output is determined by the bass management settings chosen for that particular playback system's speakers. For example, in addition to the bass information from the LFE channel, the subwoofer output may include the bass information from the center and surround channels when those speakers are unable to adequately reproduce the bass frequencies.

As can be seen from the above explanation, the terms LFE and subwoofer are not interchangeable, and the distinction between the two terms is very important. Care should be taken to avoid confusion by using these terms appropriately.

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