

Audyssey DSX Guidance (Speakers, Room Treatment, & Theory)

This guide consolidates items discussed in the Official Audyssey Thread regarding certain aspects of the Audyssey DSX technology. If you have a question which has not been addressed in the guide below, please post it in the Official Audyssey Thread. - giomania

For basic information on DSX, please visit: <http://www.audyssey.com/technology/dsx.html>

I. Choosing Speakers and DSX Configurations

A. Audyssey recommends Wide and Height channel speakers which are identical to the main channel (L, C, R) speakers.

1. When this is not possible, smaller speakers from the same "family" should work very well, especially after you run MultEQ.
 - a. MultEQ should be able to match the timbre.
2. If the Wide and Height channel speakers are a different make / model from the main channel (L, C, R) speakers, MultEQ will still attempt to match the timber, but these results will vary.
 - a. If there are huge directivity differences in the speaker designs, this will be more difficult.
3. The allowable frequency range of the wide and height channel speakers is 20Hz – 20kHz.

B. Wide versus Height Channel Speakers

1. Wide channel speakers will make the most noticeable improvement, as they provide cues that are significantly more important than the Height channels. The Wide channels are really part of the front speakers; they are not considered surround speakers.
 - a. The recommended placement for the Wide speakers is at a $\pm 60^\circ$ azimuth (angle), but there is a $\pm 10^\circ$ placement tolerance which still provides very good results.
 - b. To get the most benefit from the Wide speakers, it is important to have them at the same height as the front channel speakers.
 - 1) Placing the Wide channel speakers at a different height from the front channel speakers may influence how you perceive left-to-right pans.

C. Height versus Surround Back Speakers

1. When implementing a 9.1 DSX setup from an existing 7.1 setup with Surround and Surround Back speakers already installed, Audyssey does not recommend removing the Surround Back speakers.
 - a. The addition of the Wide channel speakers to a 7.1 system is one of the Audyssey DSX configurations noted on their web site (9.1 Surround B = 7.1 plus Audyssey Wides).

II. Surround Speakers Options: Dipole versus Direct Radiation

- A. Dipole versus direct radiation speakers in the surround location is an interesting debate. The producer of the content gets to decide, and there should be a flag in the content so their intention is carried through to the playback system. Arguing for one speaker type on a purely theoretical basis without including the content creators in the discussion is futile.
1. Generally, Dipoles surrounds are better for movie content because they better simulate the array of speakers in a movie theater. There is content that "breaks" dipole surrounds: Discrete sounds found in surround music don't localize as intended with Dipole speakers.
 2. Direct radiator speakers are preferred by some in the music industry, but the amount of music surround content is miniscule compared to movie content. There is content that "breaks" direct radiators: Applause seems to come just from that speaker, when it should be enveloping.
 - a. If 3-4 direct radiation speakers per side could be used for surrounds, that would work more like what is heard in the theater. Since this is not practical, Dipole surrounds were proposed by Tom Holman as a practical way of having a single speaker simulate the effect of a surround array.
- B. Many content producers try hard to achieve a very diffuse sound field in the surrounds, and that effect is lost if you have direct radiation speakers. Other content producers want to pinpoint effects, and that effect is lost if you have dipole radiation speakers.
- C. Neither speaker type solves the problem of seamless panning of sound from front to back. The Wide speakers in DSX fill that gap and make it possible.
- D. Basically, if you have Dipole surround speakers instead of direct radiators, you can still use them with Audyssey DSX.

III. Height Channel Speaker Placement

- A. Audyssey recommends the ideal Height channel speaker location as $\pm 45^\circ$ azimuth and a 45° elevation (from ear height). This potentially places the Height speakers close to the seating area, depending on your ceiling height. This guidance presents several challenges with clearances and aesthetics.
1. A room with 8 foot ceilings and the listeners' ears 44 inches from the floor would place the Height speakers about 5 ½ feet forward of the listening position.
 2. In rooms with average ceiling heights, the potential for bumping your head on the bottom of a ceiling-mounted speaker is probable.
 3. The sight of a speaker hanging from the ceiling in the middle of a room may not be appealing in a multi-use space.
- B. A compromise for the Height channel speakers is to mount them as close to the ceiling as possible, but closer to the boundary walls. This will result in an elevation less than 45° (from ear height).

1. This compromise will still provide a benefit, but not as great a benefit as the optimal 45° elevation.

IV. Room Acoustic Treatment with DSX

- A. If you have an acoustically treated room, the first reflection points of any additional speakers (i.e. Wide channel speakers) must also be treated.
 1. Uncontrolled first reflections from loudspeakers are not generally desirable because they don't come from the correct angle or arrive at the correct time.

V. DSX Wide channel Theory

- A. First side-wall reflections play a great role in determining subjective impression. Acoustical and psycho-acoustical research has shown that if the time, direction, and frequency response of the reflections is properly controlled, they can add significantly to the perception of Auditory Source Width (ASW), and thus improve our perception of spaciousness.
 1. The first side-wall reflections from your front speakers arrive a few milliseconds after the direct sound, depending on the size of your room. This reflected sound is not controlled in angle, delay, level, or frequency response.
 2. There is a difference between undesirable uncontrolled reflections and desirable controlled reflections.
- B. Research discovered the most important direction of reflected sound is $\pm 60^\circ$ azimuth relative to the front channel speakers. Audyssey DSX provides a pair of Wide channels at $\pm 60^\circ$ with appropriate frequency response and perceptual processing to match these requirements.
 1. The content from the Wide channel speakers represents what the reflections from the front speakers would be if they were *perfect* with respect to delay, level, and frequency response.
 2. The Wide speakers mimic reflected sound in some sense, but not by reproducing ambient sound only or by adding reverberation.
- C. The purpose of the DSX Wide channel speakers is not the same as synthesized channels in matrix methods, which use clever algorithms to deliver mostly ambient, de-correlated sound to the extra channels.
 1. While we are able to hear phantom sounds between the front and surround speakers, the sound which DSX is reproducing has to come from $\pm 60^\circ (\pm 10^\circ)$.
 - a. The extra channels are responsible for delivering a very precisely shaped (in frequency, time, and level) signal that has to come from a well defined location, which is not possible to control with a phantom image.