
Subject: The Acoustic Center: How it applies to Loudspeaker Measurements

Posted by [Wayne Parham](#) on Wed, 27 Jul 2011 15:44:49 GMT

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I've seen a lot of misinformation spread around the internet, so I thought it might be helpful to post some links to useful information here. Hopefully this will dispel some myths.

To obtain accurate SPL measurements, one usually needs to measure at a distance and then calculate back to find an effective 1W/1M figure. If you measure too close, the value is usually way off. Also, the distance to a point source determines its delay reaching the listener, because of the speed of sound. So the acoustic center is important for that reason too.

Here are some links with more information on the subject:

A note on the concept of acoustic center, by Jacobsen, Figueroa and Rasmussen

Sound system engineering, by Don Davis, Eugene Patronis (Third Edition)

Far Field Criteria for Loudspeaker Balloon Data, Pat Brown (Syn-Aud-Con)

Comparing Loudspeaker Specs, Rick Kamlet, Pat Brown and Dan Field (Pro AV Magazine)

Also, three AES papers on the subject:

Applications of the Acoustic Centre, Vanderkooy, John, AES:122 (May 2007) Paper:7102

The Acoustic Center: A New Concept for Loudspeakers at Low Frequencies, Vanderkooy, John, AES:121 (Oct 2006) Paper:6912

On the Movement of a Horn's Acoustic Center, Ureda, Mark, AES:106 (May 1999) Paper:4986

Applications of the Acoustic Centre:
"This paper focuses on uses for the acoustic centre concept, which in this paper represents a particular point for a transducer that acts as the origin of its low-frequency radiation or reception. The concept, although new to loudspeakers, has long been employed for microphones when accurate acoustic pressure calibration is required. A theoretical justification of the concept is presented and several calculation methods are discussed. We first apply the concept to subwoofers, for which the acoustic centre is essentially a cabinet dimension away from the centre of the cabinet."

There are so many papers like this, written on the subject of the acoustic center, it's nearly impossible to reference them all. Many of them are on the differences between different cabinet shapes, like rectangular boxes, rounded-edge boxes, spheres, etc. Those shift the acoustic center by diffraction, some putting it pretty far out in front of the speaker. Other configurations put the acoustic center far behind the cabinet. All are frequency dependent, meaning the acoustic center moves with frequency.

I encourage anyone reading this to search for academic papers on the subject. Even a quick Google search turns up a lot of useful information:

Google Search: Acoustic Center Concept for Loudspeakers at Low Frequencies
The take-away from all this is the mouth or face of a loudspeaker should not be assumed to be its acoustic center. Since precision of the acoustic center position is required for close measurements, it makes sense to measure at a distance so that deviations in the position of the acoustic center have less influence.

