‘Walking into’ the music K.M.Bond BA BE

The profound implication of Olson’s result is that it predicts that a spherical speaker will be surrounded by a relatively smooth sound pressure field. This potentially reduces the amount of work we do while listening. For instance, kinaesthetic research reports that listeners automatically and subconsciously make *micro-movements* of their bodies and heads when listening, quite possibly to place sounds accurately in space: near and far, left and right, up and down. Spheres, with their uniform sound fields, reduce the amount of work this involves.

To see why, try this virtual experiment. Imagine yourself floating 5 metres away from a 500 cm spherical speaker that is also floating in infinite, air-filled space. The sphere is projecting a single, pure tone (say, 600 Hz) that is also diffracting around it. Floating slowly toward the sphere, you’ll perceive a gradual increase in volume, the reverse if you back away.

Now replace the sphere with an equivalent speaker box (a parallelepiped). Floating forward, the increase in volume will be less steady. At some points, volume will rise quickly with a small forward movement. At other times, you will move some distance forward before noticing any change. Similar step-like changes in volume are also heard when moving away from the box. The size and position of the steps is dictated by the interaction of the main signal from the speaker interacting with the diffracted signals arriving from the box’s edges.[1]

Now repeat the experiment with a signal of the same strength at a slightly lower frequency (say, 580 Hz). For the sphere, the results are very similar as for 600 Hz. The box will, again, produce step-like changes in volume, *although in different positions than for 600 Hz*. The longer wavelength of the signal means that for 580 Hz, at the same distance from the sphere, the diffracted signals now arrive at different amplitudes than for the 600 Hz diffractions. To get the same volume at 580 Hz as at 600 Hz at any given point, you may have to move your head a little, a kind of *positional equalisation.*

In technical terms, diffraction means that each frequency projected from the box surrounds it with a uniquely varying sound pressure field. Changing the frequency emitted from the box changes the box edge diffractions and the total sound pressure at almost *all* points in the sound field. This does not happen with a spherical speaker.[2]

Back in the real world, our ears and brains are already working hard to untangle the music from sundry room reflections, room resonances and stereophonic artefacts (such as crosstalk and comb filter effects). Speaker boxes’ non-uniform frequency-dependent sound fields add to the work load. Spheres, on the other hand, reduce the listener’s work load and remove a hindrance to the illusion of live performance.
It is understandable that when listeners first hear the relatively smooth sound field of spheres, they frequently express a sense of relief, or ease. In fact, with a good recording playing, you’ll feel that you can actually walk into the music.

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[1] In this thought experiment, there are no reflections and we are well in front of the speaker, so that the diffractions will arrive at our ears both delayed *and* out-of-phase. See Wright, J., ‘Fundamentals of Diffraction’, *Journal of the Audio Engineering Society*, Vol. 45, No. 5, May 1997, p. 348.
[2] ibid., p. 355.