Subject: Re: The Movement of Waves and Particles
Posted by Wayne Parham on Thu, 01 Mar 2007 05:50:01 GMT
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An omnidirectional sound source spreads as a sphere. When constrained, it spreads as a partial sphere. For example, sound radiating into halfspace spreads as a hemisphere. If you have an omnidirectional sound source sitting on the ground, that's the pattern it will make. If the sound source is directional, it will form a sort of 3D pie slice, a cone that represents a fraction of the spherical wavefront. Of course, things can disrupt wave propogation, causing the wavefront shape to change.Think about the wave that travels on the surface of a pool that forms when one rock is thrown in. It travels away from the point of impact as an expanding circle. Throw in two rocks, and interference causes a new pattern to form. Disrupt the wavefront with an object that reflects it, and the returning wave interacts in much the same way. The ripples in the pond let us visualize what's happening.When an object, small in relation to wavelength, is placed in the path of the moving wavefront, it does not act like a reflector. Waves will pass right by as if it weren't there. If an object is large in relation to wavelength, then it acts like a reflector. But the behavior of a reflector that is spaced nearby acts differently than one that is far away. If a reflector is near -

constructive and destructive nodes cause pockets in space where reduced amplitude nodes form.

single source, but are not cancelling each other strongly either.This explains the behavior of sound through ducts of various shapes and sizes. Sound travels around corners at low frequencies, basically passing right by. At higher frequencies, sound bounces from wall to wall. A reflected sound source acts something like another sound radiator, interacting with the source and other reflections. Remember that low frequencies have long wavelengths and high frequencies have short wavelengths, so what determines "high" or "low" frequency, "long" or "short" wavelength, is the distance to reflectors or other sound sources. You can visualize wave movement using an FEA program or using ripples in water to get an idea what it looks like in 2D space. Then just understand that the same thing you see as a circle on a 2D surface translates to a sphere in 3D space. A checkerboard pattern of nulls in 2D translates to a 3D array of nodes, like a Rubik's cube.