

# The Inaudible Loudspeaker

*'An under-sampled line array for improved sound stability and optimal multi-sensory integration in audio-visual applications'*

- OmniWave is a both monaurally and binaurally detectable auditory summing location that is derived from the combined signals of two or more OmniDrives.
- The OmniDrive is an omnidirectional loudspeaker that radiates coherent sound in a torodial pattern.
- It needs at least two OmniDrive speakers, either spaced out in parallel or perpendicularly to the median plane of a listener, to realize an OmniWave virtual sound source.
- The OmniWave virtual sound source may appear as a virtual point source or a virtual line source accordingly.
- The constituent OmniDrives are mutually angled over 90 degrees. They are listened off-axis and at 45 degrees preferably.
- Their combined wavefronts, each being direction dependently modified by reflections on the outer ear, sum to a HRTF-neutral plane wave on the ear drum, thereby disabling the listeners ability to localize the OmniDrives as distinct sound objects.
- The perception of the resulting Monaural Summing Location, a vertical phantom point source, is not bound to a sweet spot; moving the head or walking around does not alter it's sound qualities and due to the flat power response of the system, it blends naturally with it's acoustic environment.
- Therefore false localization cues and angle dependent colouration do not distract the listener from the sound information to be transmitted.
- An arrangement of two or more vertical OmniWave arrays perpendicularly to the inter-aural axis, constitutes a sound display with Continuous Phantom Imaging.
- Such a 'curtain of sound' will be audibly stable and visually transparent, un-independent of the movements and position of the listener. By adjusting its geometry the desired 'sweet spot' is fully scalable.
- The combined reproduction of an audio signal with one or more OmniWave sources and a single 'conventional' loudspeaker does not produce audible comb filtering.

- Also, the combined sound waves of an acoustic source and its audio representation by one or more OmniWave sources does not suffer from spatial aliasing.
- As the Continuous Phantom Imaging auditory display is independent of any acoustic profiling of the loudspeakers, localization cues embedded in a recording, and/or those directly derived from an amplified acoustical source, will reach the eardrum undisturbed, thereby enabling a three dimensional mental representation of the sound scene.
- Omniwave enables integration of visual and auditory cues for a coherent representation of objects in order to create meaningful perceptual experiences.