# DISTRIBUTED MODE LOUDSPEAKER – THE NEXT STEP IN THE DEVELOPMENT OF MEDIA SYSTEMS

***Tymofii Stadniichuk***

*Faculty of Electronics,*

*National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"*

With the development of technologies, there is a need for more universal and compact solutions. The same trends are observed in the field of multimedia and audio systems. In addition to large halls and stadiums, more and more local studios and chamber halls are appearing. Also, compactness may be required in such a new field as virtual or augmented reality and wave field synthesis (Marinus & Werner, 2007).

Any structure, including a flat-panel diaphragm, may be excited or set into motion to radiate sound either pistonically or by using bending wave motion (Neil, 2002). Traditional speakers use the "piston" method of sound creation, where air vibrations create a back-and-forth movement of the entire diaphragm. A distributed mode loudspeaker is the opposite, it is a flat panel where the waves on the surface of the loudspeaker are responsible for the sound waves (Fig 1). Such waves are more natural, they can be found in many places, for example in musical instruments.

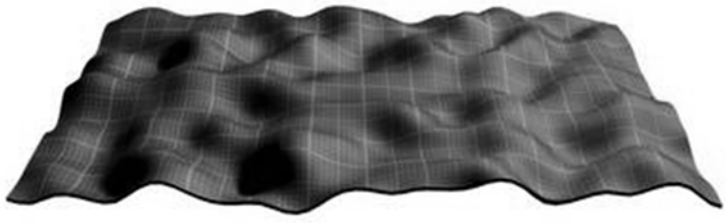

Figure 1. Waves on a flat surface that can create sound

A number of advantages follow from the physical properties of the distributed mode loudspeaker:

- Traditional loudspeakers need multiple "sub-speakers" that cover separate ranges of the audio spectrum, while split-mode loudspeakers only occasionally need one additional speaker for very low frequencies.
- The oscillating surface radiates sound in all directions, while the piston system is limited by the conical shape of the diaphragms.

- A distributed mode loudspeaker does not suffer from a resonant enclosure, as the loudspeaker itself is a flat resonant enclosure, whereas in the design of standard speakers, a lot of time and resources go into designing an enclosure that will not have harmful resonant frequencies.
- And the main advantage is the form factor of the loudspeaker. Its main parameters do not depend on its size (Azima, 1998). Therefore, they can be integrated into any space, inserted into the wall or made part of the interior design.

The main disadvantages arise when working with low frequencies. Long wavelengths follow from low frequencies, so large amplitudes are needed for a clear loud sound. Currently, the only solution to this problem is to increase the surface area of the speaker or to use a separate subwoofer, which is usually used in standard loudspeakers.

Although new technologies in the field of audio and acoustics are usually implemented over several decades, flat speakers can be purchased now in various configurations. Despite the large number of questions and little known technology, it is already used as an inexpensive and high-quality way to fill spaces of any size with sound.

**References:**


1. Azima, H. (1998), *NXT Technology When a Little Chaos is Good For You*. NXT.
2. Neil, M. (2002). Distributed Mode Loudspeakers. *Innovation in Acoustics and Vibration Annual Conference of the Australian Acoustical Society* (pp. 400-405).
3. Marinus, M. B., Werner, P. J. de Bruijn (2007). *On The Applicability of Distributed Mode Loudspeaker Panels for Wave Field Synthesis Based Sound Reproduction.*