



# VXL SERIES

## Advantages of Line-Array Speakers

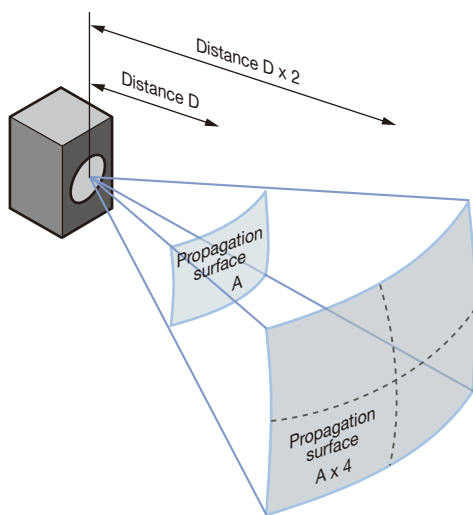


## ■ Line-Array Speakers

The term “line-array” is used to describe a speaker system having multiple speaker units with the same characteristics arranged vertically to emulate a linear acoustical source. In contrast to standard speakers, which operate as a point source from which sound propagates over a wide dispersion angle in both the horizontal and vertical planes, the sound propagating from a line-array speaker disperses very little in the vertical plane. One of the advantages of these systems is, therefore, lower attenuation of sound pressure over distance.

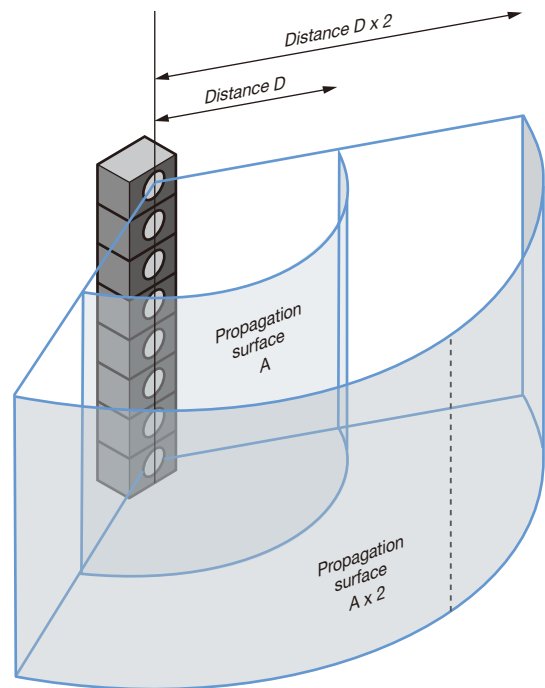
### Conceptual view of sound propagation

Standard speaker (point source)



Sound waves propagate in the shape of a sphere, spreading out horizontally and vertically. With every doubling of distance, the surface area of the propagation front increases by a factor of four. In other words, the sound intensity per unit area drops by a factor of four, and the sound pressure level attenuates by 6 dB.

Line-array speaker (line source)



Sound waves propagate in the shape of a cylinder, spreading out horizontally but not vertically. With every doubling of distance, the surface area of the propagation front increases by a factor of two. In other words, the sound intensity per unit area drops by a factor of two, and the sound pressure level attenuates by 3 dB.

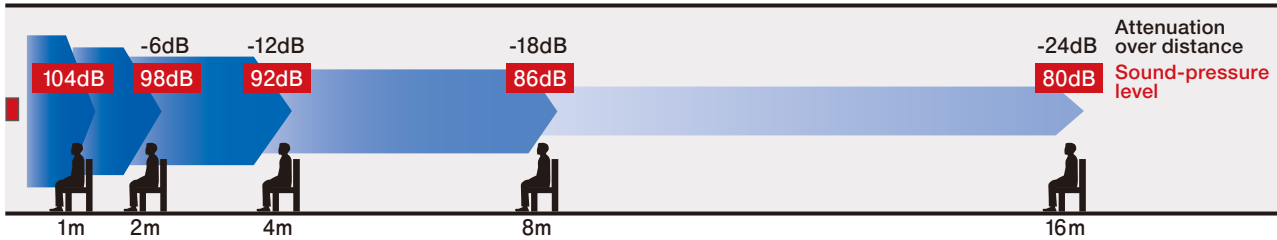
## ■ Three advantages of line-array speakers

The line-array speaker offers the following three advantages over standard point-source speakers.

### ① Sound reinforcement with more consistent sound pressure

With this type of speaker, sound pressure is affected less by distance, allowing for clearer, more consistent sound reinforcement. As a result, ample sound pressure can be delivered to back-of-house without making front-of-stage excessively loud.

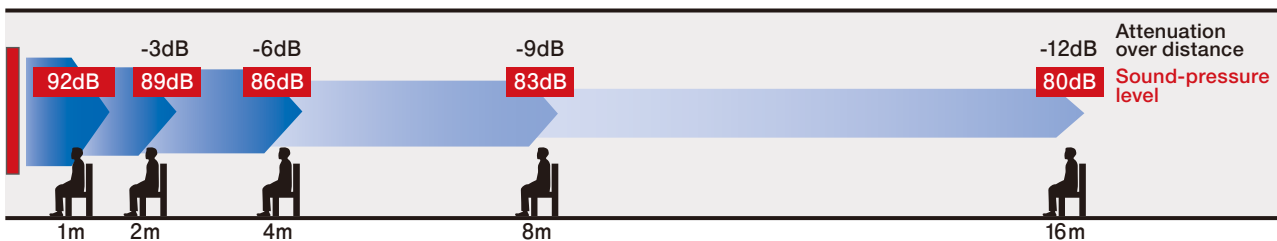
Standard speaker (point source)



More attenuation over distance—i.e., sound pressure attenuates by 6 dB for each doubling. Sound pressure is thus affected to a greater degree by distance, resulting in excessive in-front-of-stage volume.



Line-array speaker (line source)

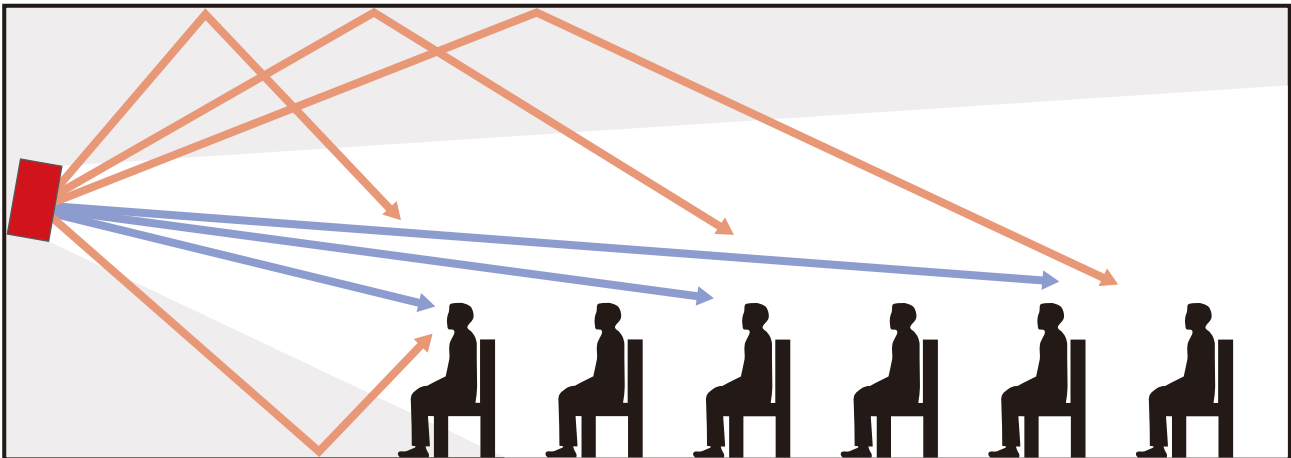


Less attenuation over distance—i.e., sound pressure attenuates by 3 dB for each doubling. Sound pressure is not affected as much by distance, so in-front-of-stage volume does not need to be excessive.

## ② Clear sound reinforcement

Undesirable reflection can be reduced, thereby ensuring clearer reinforcement of sound even in highly reverberant spaces.

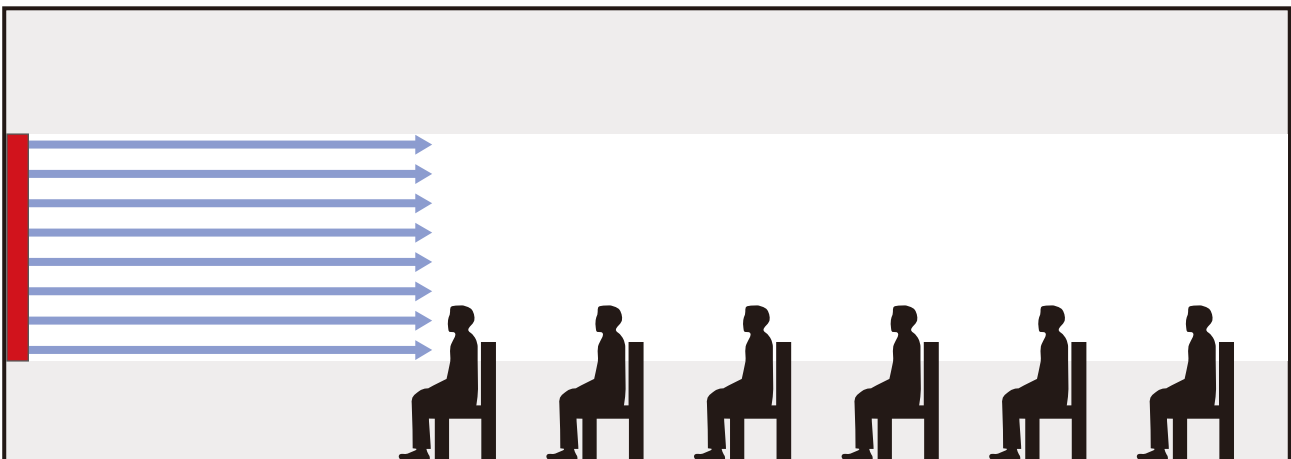
Standard speaker (point source)



Because the sound also disperses widely in the vertical plane, a significant amount of reflection occurs at the roof and floor surfaces. These reflections are heard as reverberation and make the reinforced sound less clear.



Line-array speaker (line source)



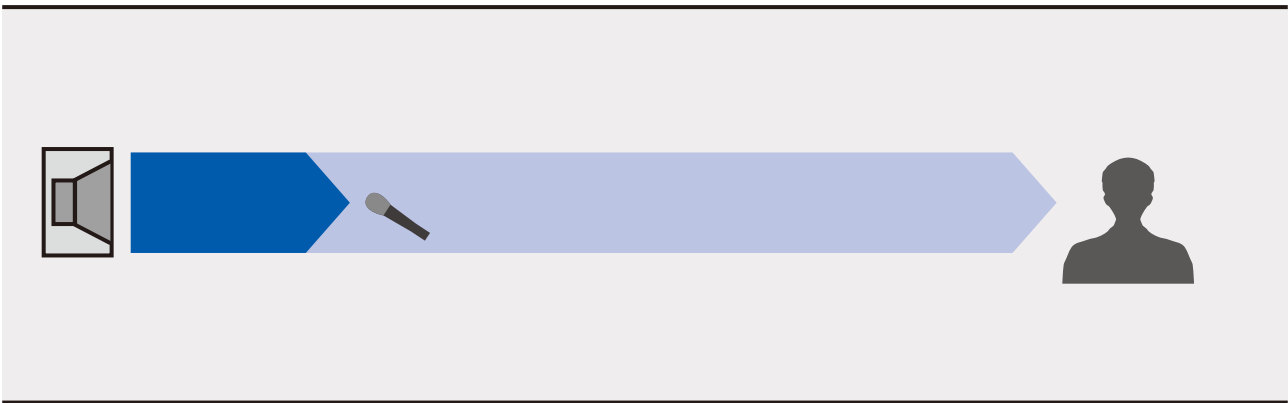
Sound waves disperse very little in the vertical plane, significantly reducing the amount of reflection at the roof and floor surfaces. Traveling directly from array to audience and free of reflections, the reinforced sound is clearer overall.

### ③ Less prone to feedback

As we have seen, the total output from line-array speakers is smaller and undesirable reflections are fewer, making feedback less likely to occur. Another important factor, however, makes the line array less prone to this type of problem, and this is described below.

Whenever a certain sound pressure must be achieved at a specific distance, the line-array speaker, which adds the sound energy output by multiple speaker units, will require less output energy per unit than a standard point-source speaker system. A microphone in close proximity to the array will—as shown in the bottom diagram below—only pick up the relatively small amount of energy from the closest units. The total incoming energy will thus be considerably smaller than with the standard speakers, meaning that feedback is less likely to occur.

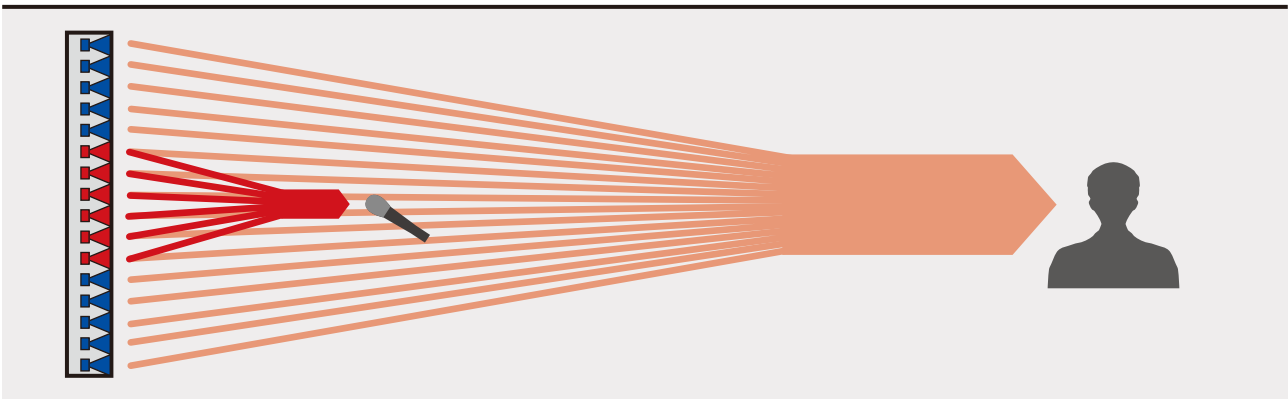
Standard speaker (point source)



The microphone picks up a larger amount of incident energy.  
The reinforced sound comes from a single source, so the energy is not scattered.



Line-array speaker (line source)



The microphone picks up a smaller amount of incident energy.  
The reinforced sound comes from multiple speaker units, and the total energy is distributed among them.  
The energy from only some of these speakers is picked up by the microphone.