



# JBL INTELLIVOX BEYOND BEAM STEERING



## INTRODUCTION

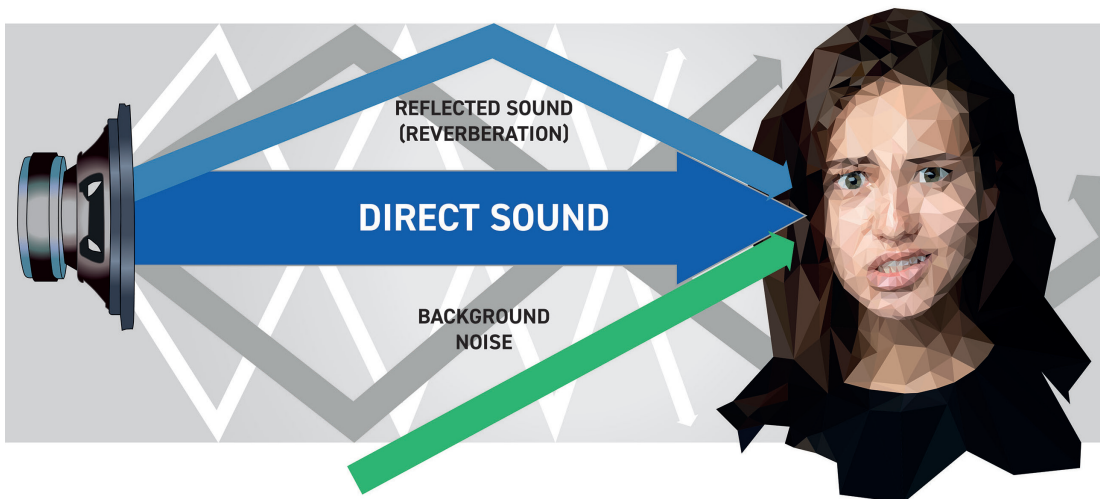
When designing an intelligible sound system for a less than ideal acoustic space, the biggest challenge is achieving a high direct to reverberant sound ratio. In other words, we need to maximize the sound arriving directly at the listener's ear, while at the same time reducing the sound energy that hits and then bounces off hard, acoustically reflective surfaces such as walls, ceilings, windows and sometimes even floors.

The solution may seem simple but in practice it can be difficult to achieve with conventional loudspeakers. Even the most precise dispersion pattern will simply cover the area it is aimed at, regardless of whether that area is filled with a person, a soft furnishing, a glass panel or a marble floor. This is where the JBL Intellivox range can provide unique advantages.

JBL Intellivox products use our highly advanced Digital Directivity Synthesis (DDS) beam shaping algorithm. This allows custom shaping of the directivity pattern for the JBL Intellivox arrays to produce a beam which is tailored to precisely match the audience area within the space in which they are installed. As a result, the sound is aimed directly where it is needed – straight at the listener while avoiding the hard, reflective surfaces.

JBL Intellivox products use our highly advanced Digital Directivity Synthesis (DDS) beam shaping algorithm.

## THE PROBLEM



*Sound bounces off hard surfaces and reaches a listener's ear hundreds of milliseconds after the direct sound has already arrived. This disorientating effect combined with background noise can make a sound system seem unintelligible.*

When listening to a sound system within any space, you hear much more than just the sound system itself. What reaches your ears is in fact a combination of direct sound from the loudspeakers, reflected sound from the walls, floor and ceiling, and the ambient background noise of the space you are in. Worse still, all of those sources arrive at your ears at different times. It's a lot for the listener to process; sometimes too much. Think of the last time you were in an airport or railway station – too much reflected sound and background noise can make an important announcement hard to discern while background music becomes a distant, muffled distraction. The same is true in any acoustically challenging space.

## THE SOLUTION

The solution is to avoid those hard, reflective surfaces. To do so, we need to create a narrow beam of sound that can be aimed directly at the listener.



JBL Intellivox can cover a large area from a single device. One JBL Intellivox DS500 can cover more than 5,000m<sup>2</sup> with an even SPL.

*Increasing the direct sound that is received by the listener helps to improve intelligibility*

## COVERAGE

If the solution sounds simple then the technology to achieve that solution is refreshingly clever. Thanks to the Digital Directivity Synthesis (DDS) beam shaping algorithm, JBL Intellivox products can provide even the most challenging of spaces with consistent, even and most importantly intelligible coverage.

Nor does the size of a space need to be a barrier to achieving clear sound and happy listeners. JBL Intellivox can precisely cover a large area from just one device. For example, a single JBL Intellivox DS500 can cover over 5,000m<sup>2</sup> with an even Sound Pressure Level (SPL) over the audience or listener area.

## INTELLIGIBILITY

From ornate houses of worship where sermons need to be heard and understood to transport hubs with vaulted ceilings and walls made of glass, intelligibility of speech and music is arguably the most important measure of success in any audio installation. It's also one of the hardest to achieve.

Literally describing how easy it is to understand amplified speech or music in a given space, intelligibility relies upon two key factors:

- The Direct to Reverberant Ratio – The ratio of direct sound to reverberant sound;
- The Signal to Noise Ratio – The ratio of unwanted noise versus desired signal.

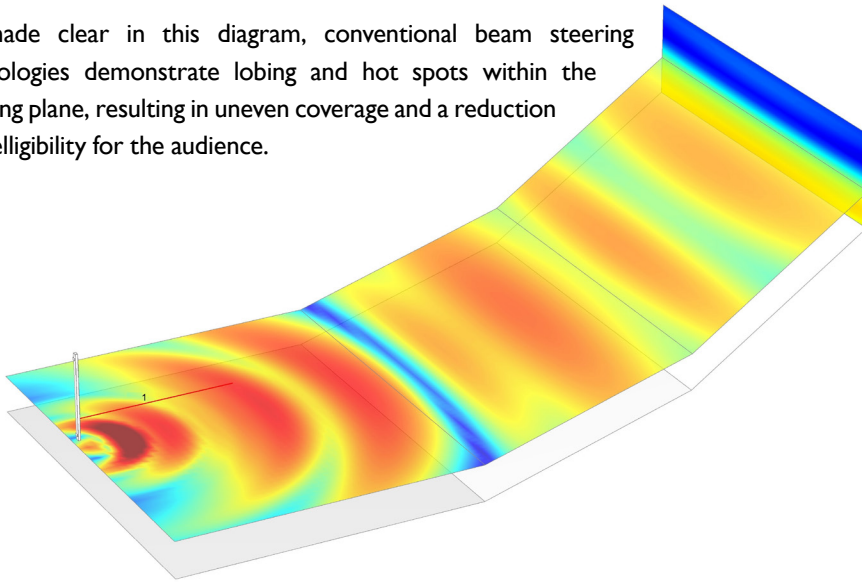
## BEAM STEERING VERSUS DDS BEAM SHAPING... WHAT'S SO SPECIAL?

Beam steering is a well used phrase in modern commercial audio, but not all solutions are created equal. That becomes clear when less nuanced technologies are compared to Digital Directivity Synthesis (DDS).

Over the following pages, we'll look at how conventional beam steering interacts with complex audience planes, and why we experience unavoidable hot spots and reduced intelligibility caused by interference between the beams. The effect is a reduction in the overall performance of the array as the multiple beams segment and cause cancellations or interference lobes.

## CONVENTIONAL BEAM STEERING...

As made clear in this diagram, conventional beam steering technologies demonstrate lobing and hot spots within the listening plane, resulting in uneven coverage and a reduction in intelligibility for the audience.

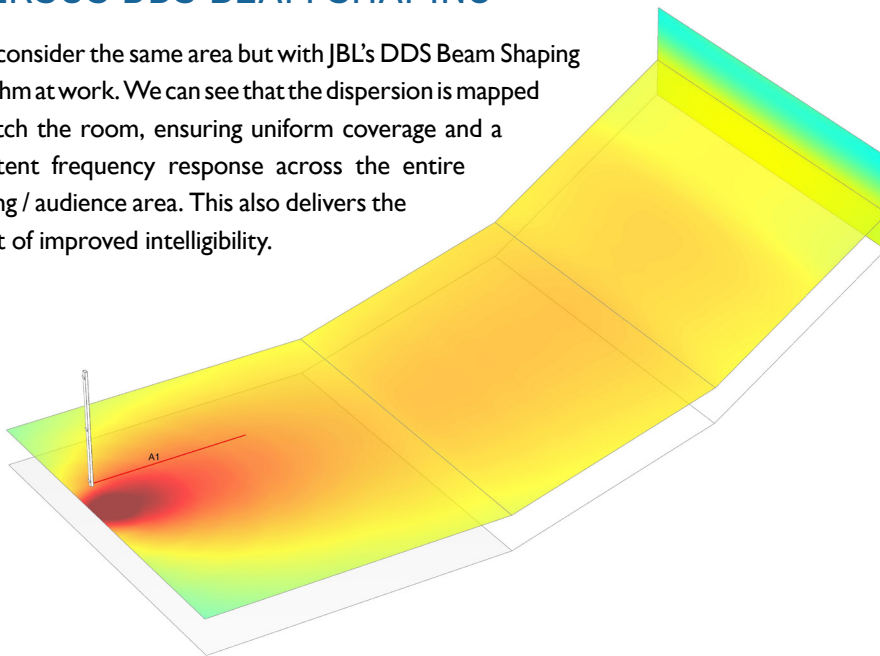


*Beam Steering – Showing lobing and ‘hot spots’ in the listening plane – resulting in uneven coverage*

With JBL’s DDS Beam Shaping algorithm at work, we can see that the dispersion is mapped to match the room.

## ...VERSUS DDS BEAM SHAPING

Now, consider the same area but with JBL’s DDS Beam Shaping algorithm at work. We can see that the dispersion is mapped to match the room, ensuring uniform coverage and a consistent frequency response across the entire listening / audience area. This also delivers the benefit of improved intelligibility.



*JBL’s DDS Beam Shaping – Showing even coverage across the listening plane*

So we see that the distinct benefit of Digital Directivity Synthesis (DDS) beam shaping is that we can achieve the required coverage without having to rely on multiple beam sources, which can rapidly become destructive to the coverage and intelligibility in a space.

## WHY A COLUMN'S ARRAY LENGTH IS IMPORTANT

An array is a collection of loudspeakers that is assembled to achieve a radiation pattern that cannot be achieved with a single driver. Sound waves sum in the target direction, while in other directions they cancel. This cancellation is relative to the wavelength of a given frequency.

This means that for us to control a specific range of frequencies effectively, we must apply some rules as defined by the physics of sound:

- as wavelengths increase, the array length must also increase;
- as wavelengths decrease the distance between array components must also decrease;
- driver spacing at half a given wavelength affords the maximum cancellation off-axis.

When looking at a column loudspeaker you will notice that different column lengths and driver spacings are required to satisfy the above rules. For example, in order to control lower sound frequencies with longer wavelengths, you will require a longer array.

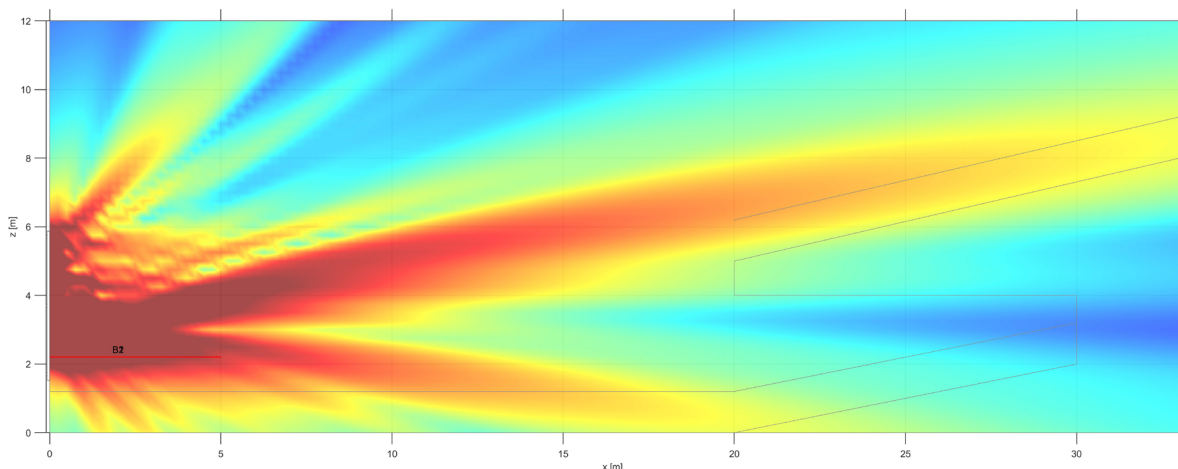
## DDS AND THE BENEFITS OF BEAM SHAPING

Standard beam steering is a useful tool. But when it comes to controlling audio coverage and intelligibility, Beam Shaping is the superior technology. Below we highlight how beam shaping offers more precise and even coverage.

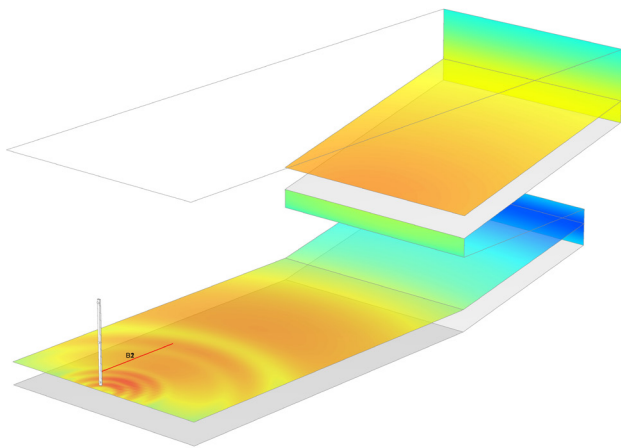
### Characteristics of Standard Beam Steering:

- Limited control over the array;
- Reduced aiming angle;
- Limited vertical opening angles;
- Multiple beams create more undesirable lobes and an increase in unwanted artifacts;
- Suitable only for far field coverage, as more beams are required to try to cover the areas closer to the array and therefore more lobing and uneven coverage occurs.

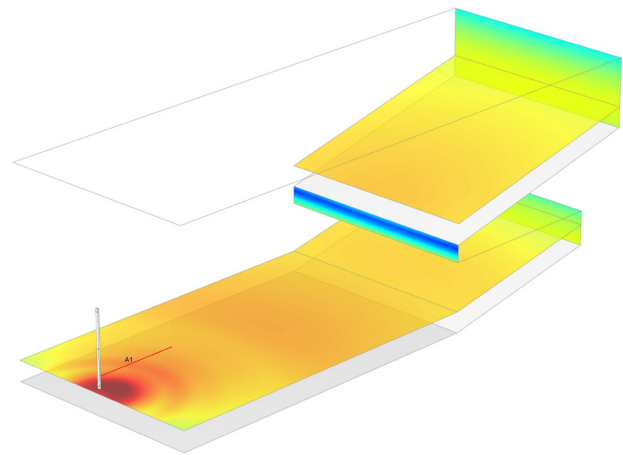
Beam steering is useful. But when controlling audio coverage and intelligibility, Beam Shaping is the superior technology.



A cross section of a Beam Steered array covering a room and a balcony



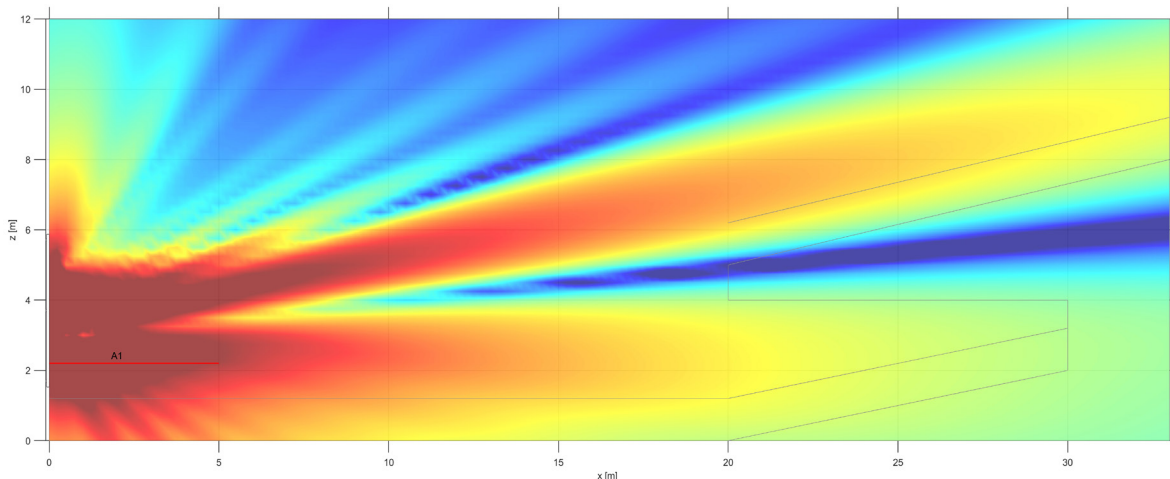
A beam Steered array providing uneven coverage over both audience planes while aiming to avoid balcony front



DDS Beam Shaping giving even SPL coverage over both audience planes and avoiding placing energy on the balcony front.

### Characteristics of JBL Intellivox Digital Directivity Synthesis (DDS) Beam Shaping:

- Unrivalled beam control – hugely versatile coverage possibilities;
- Much improved nearfield coverage (compared to beam steering);
- Unrivalled frequency response – The DDS algorithm optimizes both frequency and SPL across listener planes;
- Single coherent beam, even when covering complex audience planes
- Independent control of near field vs. far field coverage
- Custom lobe matches the geometry of the space
- Ability to avoid reflective areas in the space, such as balcony fronts



Cross section of JBL Intellivox DDS Beam Shaping array covering a room and balcony

## THE JBL INTELLIVOX PRODUCT RANGE

Below is a handy guide to assist you in choosing the most suitable JBL Intellivox product for your project.

DS Range	DSX Range	Length	Typical Throw Distance
DS115	DS115	1.15m	10 - 15m
DS180	DSX180	1.80m	10 - 25m
DS280	DSX280HD	2.80m	20 - 35m
DS380	DSX380HD	3.80m	30 - 40m
DS430	DSX430	4.30m	35 - 55m
DS500	DSX500	5.00m	50 - 70m

For applications that require high sound pressure levels or full range sound reinforcement, the JBL Intellivox HP High Power series can be used.

JBL Intellivox High Power	Length	Typical Throw Distance
HP-DS170	1.70m	15 - 30m
HP-DS370	3.70m	25 - 50m

## GREAT SOUND, SMART AESTHETICS

The JBL Intellivox range offers subtle aesthetics specifically designed to unobtrusively blend-in with the venue's decor, putting architectural requirements first and ensuring that the listener is never distracted. These elegant, slim columns are also designed to ensure ease of deployment, mounting, servicing and maintenance.

Some reasons to choose JBL Intellivox in your next project:

- Slim and unobtrusive design
- No need for mechanical aiming – units mount flush to the wall
- Units can be recessed into surfaces right up to the front grill and are therefore hidden
- Free color matching service available to visually blend into the building
- Can be integrated into buildings of all ages and styles

With an array of sizes and boundless application uses, JBL Intellivox offers pristine sound quality with ultimate control. This is why JBL Intellivox is heard but not often seen in houses of worship, shopping malls, transport hubs, outdoor public areas and event spaces across the world.

## PRODUCT RANGE JBL INTELLIVOX



### DS115

The JBL Intellivox-DS115 offers remarkable directivity and is capable of throwing 10-15m while maintaining an even sound pressure over the audience area. Primarily designed to be used as a fill system in larger JBL Intellivox installations, it provides high frequency coverage in off axis or shadowed areas.

Its compact array length make the JBL Intellivox-DS115 suitable for easy and unobtrusive implementation in even the most architecturally sensitive environment. The JBL Intellivox-DS115, with its extended high frequency response, is well suited for music applications and can offer full range operation when combined with a JBL active subwoofer system.

Learn more on our [website](#)



### DS180

A single JBL Intellivox-DS180 is capable of covering a distance of 10-25m while maintaining an even sound pressure over the audience area. The DS180 is ideally suited for smaller less reverberant environments where improved speech intelligibility is required. It also can be used as a fill system in larger JBL Intellivox installations, providing coverage in shadow zones.

Its modest array length makes the JBL Intellivox-DS180 suitable for easy and unobtrusive implementation in even the most architecturally sensitive environment.

Learn more on our [website](#)



### DS280

With its extended frequency response, the JBL Intellivox-DS280 offers excellent speech intelligibility even in demanding acoustic conditions. It is capable of providing a constant sound pressure level over a distance of 20-35m, although a substantial extension of this range can be achieved in less demanding acoustical conditions.

As with every member of the family, the DS280 also offers automatic volume control via a built-in ambient mic, eight user-definable presets and eight band parametric EQ, the network ready DS280 offers an extensive set of surveillance functions have also been implemented to meet the stringent demands of typical life safety applications.

Learn more on our [website](#)



### DS380

Offering wide horizontal dispersion and controlled vertical beam shaping the JBL Intellivox-DS380 delivers excellent speech intelligibility even in demanding acoustic conditions. It is capable of providing a constant sound pressure level over a distance of 30-40m, although a substantial extension of this range can be achieved in less demanding acoustical conditions.

The compact array length and slim, unobtrusive design makes the JBL Intellivox-DS380 suitable for easy implementation in even the most architecturally sensitive environment. It is particularly suited for applications such as transport hubs, houses of worship, lecture halls, conference facilities, atriums and museums.

Learn more on our [website](#)



### DS430

At 4.3m, the JBL Intellivox-DS430 is the second tallest family member from the fully integrated digitally controlled loudspeaker arrays. Its array length not only offers long throw capability but also extended control at lower frequencies, making it ideally suited to highly reverberant environments.

Offering wide horizontal dispersion and controlled vertical beam shaping, a single JBL Intellivox-DS430 is capable of throwing a distance of 35-55m while maintaining an even sound pressure level. The network ready DS430 offers an extensive set of surveillance functions have also been implemented to meet the stringent demands of typical life safety applications.

Learn more on our [website](#)





### DS500

The JBL Intellivox-DS500 is the flagship of the range and has been installed in high profile projects all around the world. It has proven to be a versatile and accurate solution for all venues requiring excellent speech intelligibility under highly reverberant conditions. With an acoustic length in excess of 4m the JBL Intellivox-DS500 not only offers long throw capability but also greater control at lower frequencies.

The increased low-mid frequency control offered by the array combined with its slim design makes the JBL Intellivox-DS500 suitable for easy and unobtrusive implementation in very large, highly reverberant and architecturally sensitive environments.

Learn more on our [website](#)



### DSX180

At a height of 1.8m, the JBL Intellivox-DSX180 is ideally suited for smaller, less reverberant environments where improved speech intelligibility is required. With an extended frequency response up to 18kHz, it also can be used as a 'fill system' in larger JBL Intellivox installations, providing coverage in shadow zones.

Its modest array length makes the JBL Intellivox-DSX180 suitable for places of worship, conference facilities, lecture halls and AV presentation rooms. An extensive set of surveillance functions have also been implemented to meet the demands of typical voice alarm applications. The LF response of the system can be extended using a JBL subwoofer.

Learn more on our [website](#)



### DSX280 HD

The JBL Intellivox-DSX280 HD is capable of providing a constant sound pressure level up to 93dB (peak) over a distance of 20-35m. The individually driven horn loaded dome tweeters provide unsurpassed high frequency vertical beam control while improving the horizontal coverage and enhancing the subjective sound quality of the system for both speech and music.

Its compact array length makes the JBL Intellivox-DSX280 HD suitable for implementation in even the most architecturally sensitive environment. While the slim, unobtrusive design and higher fidelity make it the perfect solution for places of worship, lecture theatres, conference facilities, atriums, museums and transport hubs.

Learn more on our [website](#)



### DSX380 HD

The DSX380HD is an active, beam shaping, self-powered column loudspeaker array. The 16 custom designed 4 loudspeakers and four discretely controlled, 1 dome tweeters are driven by a 16-channel Class-D amplifier. Combined with the built-in 32-bit floating point DSP common to the whole family, this ensures years of reliable operation.

Capable of providing a constant sound pressure level over a distance of 30-40m, The DSX380HD offers an extensive set of surveillance functions have also been implemented to meet the demands of life safety applications. The unit can be controlled using our proprietary WinControl software which offers user friendly control of the beam steering parameters, audio processing, pre-sets and surveillance features.

Learn more on our [website](#)



### DSX430

Measuring 4.3m and combining 13 4" full range loudspeakers with eight 10mm ferrofluid cooled, coaxially mounted tweeters, the JBL Intellivox-DSX430 is the second tallest member of the family. A single JBL Intellivox-DSX430 is capable of throwing over a distance of 35-55m while maintaining an even sound pressure level up to 94dB (peak) over the throw distance. Its array length not only offers long throw capability but also extended control at lower frequencies.

The unit relies on WinControl software which offers user-friendly control of the beam steering parameters, audio processing, pre-sets and surveillance features. While an extensive set of surveillance functions have also been implemented to meet the demands of life safety applications.

Learn more on our [website](#)



### DSX500

The JBL Intellivox-DSX500 is the flagship of the JBL Intellivox DSX range and a perfect option for transport hubs, large places of worship, lecture theatres, large conference facilities, atriums and museums. With a length of 5m and a slim, unobtrusive design, it not only offers long throw capability but also greater control at lower frequencies. A single JBL Intellivox-DSX500 is capable of throwing 50-70m while maintaining an even sound pressure level up to 99dB (peak) over the throw distance.

The 28 4" loudspeakers and eight 1" dome tweeters are driven by a 16-channel Class-D amplifier. Combined with the built-in 32-bit floating point DSP common to the whole family, this ensures years of reliable operation.

Learn more on our [website](#)

PRODUCT RANGE  
**JBL INTELLIVOX**  
**HIGH POWER**



**HP-DS170**

Measuring 1,7m in height, the JBL Intellivox HP-DS170 is a self-contained, high-power and high-output, 2-way, wide-bandwidth beam-shaping powered column loudspeaker with a high degree of outdoor capability. JBL Intellivox's IP55-rated High Power models have been designed to solve the problems of speech intelligibility and musical reinforcement in large, highly reverberant spaces, such as sports facilities, houses of worship, theatres and transport hubs.

Featuring 10 high efficiency, 6.5" loudspeakers and two coaxially mounted 1" compression drivers, each with dedicated amplification, the JBL Intellivox HP-DS170 is capable of delivering up to 106dB SPL over a distance of 15-30m and has a horizontal dispersion of 100°.

Learn more on our [website](#)



**HP-DS370**

With an IP55 rating making it suitable for outdoor applications, the active, beam shaping JBL Intellivox HP-DS370 is a self-powered column loudspeaker array that delivers up to 108dB SPL over a distance of 25-50m, as well as a frequency response to 18kHz.

The HP-DS370's long array length not only offers long throw capability but also greater control at low frequencies. For full range applications JBL Beam Shaping Subwoofers can be used in conjunction with the HP-DS370 to provide enhancement and control at low frequencies, resulting in a full-range high-fidelity performance system.

Learn more on our [website](#)



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