FAQ L2

Design and technology

Why are L2 and L2D nearly perfect line source elements?
PULS technology traces its roots back to the essence of WST, and one of its key criteria, the Active Radiating Factor, or ARF. This defines the ratio of the emitting surface area of an array, for K Series the ARF of the HF elements is between 80-85%, this is due to the mechanical limitations of a variable curvature line source (VCLS). PULS technology, with its more densely packed HF elements, allows L Series to increase this factor to close to 100% with. This near perfect ARF gives L2 and L2D a much-improved starting point out of the box.

Why a fixed progressive arrangement?
We analyzed multiple projects of various genre that used K2 and Kara II, searching for commonalities or differentiators, and two related themes stood out. First, regardless of the venue genre, and with very few exceptions, the audience geometries had very similar shapes. The angle got steeper and higher as the audience distance increased. And second, together with the audience geometry trend came a similar theme in array curvature, a very typical J-shape arrangement was seen in almost all cases.

We were able to define a fixed mechanical arrangement that rationalized transport, size, weight, handling and deployment and also provided the best possible sonic results before applying electronic enhancement.

Does a fixed progressive arrangement reduce flexibility?
Yes it does, but in specific way. An element of L2/L2D is the equivalent of 4 K2 or 7-8 Kara II, and therefore cannot be divided to attain a less coverage or smaller array size in the same way. However, the added sonic performance and the savings in deployment time and effort are truly significant and will overcome the lack of flexibility for the projects where L2/L2D can be used.

This means that L2/L2D may not work for every project, L Series is an additional tool in our partners toolset and not a replacement for any current products. For example, in smaller theaters users may prefer shorter arrays of Kara II or for long green field applications larger K2 arrays may be preferred. For any project or application which match L Series strengths it will give significant advantages for those operators.

How can L2 and L2D achieve this SPL to weight performance?
By removing excess hardware and optimizing internal volume we could reduce weight. If we consider the individual elements of a variable curvature line array, duplicate top and bottom enclosure panels are necessary to seal the internal volume for each element. Additionally, between each element an air gap exists, taking up volume without adding low frequency energy. On top of this, as each element needs to provide the full range of inter-element angles, so the same 4-point rigging system is also repeated.

L2 and L2D are designed as if four individual traditional line array elements were packaged into a single large element, resulting in three positive outcomes. First, the air gaps are transformed into internal volume, then the reductions in the duplicated wooden panels and the number of rigging points reduce weight. And as the "individual elements" can be closer together, the distance between HF drivers is reduced, maximizing the Active Radiating Factor (ARF), and therefore increasing efficiency.

The sonic performance in the high and low frequencies is expanded while, for a given SPL, the weight is dramatically reduced.

How does the integrated cardioid work?
The patented design of L Series integrated cardioid offers a broadband, wide angle reduction of SPL at the back and the side of the array. This is achieved through a precise alignment between the front-firing 10" driver and the 12" drivers mounted on the side of the enclosures. This singular design allows the energy emitted by the 12" drivers to exit from the front and the rear of the enclosure, and not from the side. Bringing two distinct advantages. It provides greater polar control, with broadband cancelation at the back (towards the stage or neighboring offsite area) and ensures an uncompromised sound quality and impact at the front (towards the audience).

Each 12" driver has its own large internal volume, with a vented port (laminar vent) at the back of the element, contributing to the deep LF contour of the L2/L2D.

As L2 and L2D are shorter than other arrays of comparable power, how is the control of energy handled?
Naturally, as L2 and L2D are shorter than comparable arrays, it is fair to assume that the control of energy is lessened. On the contrary, L2 and L2D achieve greater broadband vertical control than comparable standard line arrays.
The enhanced Autofilter used with L2/L2D takes into consideration the size of the array and the area outside of the audience (above and below the array) in its algorithms. It applies filters intelligently in order to minimize the secondary lobes and drastically reduce energy outside of the audience geometry. And as the Autofilter algorithm is full range it is effective even at low frequencies.

The optimal results obtained with the enhanced Autofilter are possible because of the high discretization design of L Series. Each HF driver, each MF module and each LF driver are individually processed and adjusted utilizing 16 channels of DSP. This adjustment granularity, combined with the high ARF, permit a level of control that is simply is not possible from a traditional line array.

Why are we providing two main SPL values for L2 and L2D?
L2 and L2D are unique types of loudspeakers, that will be used on projects where we typically deploy a standard constant curvature or variable curvature line array, therefore, one needs to have comparable technical data. We provide two main SPL values for L2 and L2D, outside of the ones linked to a Panflex setting, to ensure both a full comprehension of the potential of an element and a fair comparison to other systems.

The first value relates to the entire element, and therefore defines the potential of one L2 and one L2D, this should be regarded as our regular measurement. The second value relates only to the top module of the element and allows direct comparison between a module of L2 or L2D and our other VCLS enclosures.

Will there be an L1 or L3 added to the L Series?
That's a very good question, thanks for asking.

Operation and deployment

How many L2 or L2D can I fly?
Arrays of up to four elements can be flown. As a downfill focused enclosure L2D is designed to be used at the bottom of an array, therefore the maximum number of flown elements is three L2 and one L2D. Where narrower vertical dispersion is preferred four L2 can be flown together.

Could L2 or L2D be used on their own?
Yes, a single element of L2 or L2D can be flown on their own, using the same bumper. With 60° of vertical dispersion and a J-shape geometry, the L2D can be a simple, yet high-performing, solution for small to medium size theaters or other spaces with large vertical coverage needs.

Can I ground stack L2 or L2D?
Yes, L2 and L2D can be ground stacked on their dedicated chariots, L2-CHARIOT and L2D-CHARIOT. The chariots facilitate transport and handling and can also be locked in place for loudspeaker operation. The chariots permit an up-tilt to the loudspeaker of 20° and the K2-JACK can be used to stabilize and give more tilt angle of up to 8° to the chariot.

Could I use L2D ground stacked upside down if I need a 60° upward angle?
It is not recommended, due to the dispersion pattern of L2D being inverted. The 60° vertical coverage would rotate too fast in the horizontal plane. Meaning that the widest 140° horizontal coverage would be where tighter horizontal control and throw would be wanted. Inversely, where wider coverage would be ideal, closer to the loudspeaker, only 110° would be possible.

How does the Panflex work with L2 and L2D?
Panflex works on L2 and L2D in the same way as with other L-Acoustics loudspeakers. The combination of the user-adjustable fins and the associated preset provides a specific horizontal pattern. There are four modules in each L Series enclosure. L2 has four individually adjustable Panflex, one for each of the four modules. L2D has two Panflex which can be adjusted for the top two modules only. Users can choose from 110° or 70° symmetrical or 90° asymmetrical on either side for each Panflex. The horizontal pattern is controlled down to 500 Hz thanks to Panflex, below this frequency the integrated cardioid transducer arrangement controls the low-end energy.

Can I change the Panflex on every L Series module?
For L2, users can change the Panflex settings for each of the modules, creating four independent horizontal pattern adjustment zones. For L2D, the top two modules feature Panflex, while the bottom two provide a fixed, progressive horizontal pattern that starts at 110° and ends at 140°.

Are L2 and L2D compatible with our four-channel amplified controllers?
No, both L2 and L2D need 16 channels of amplification, addressed via a single 32-point connector, and require specific DSP algorithms that are only available with LA7.16 and LA7.16i. Neither of these options is possible with the four-channel amplified controllers.

Can I parallel cable L Series enclosures?
No, L2 and L2D cannot be used in parallel. Firstly, there is a single connector at the back of each loudspeaker. Secondly, the cabling gauge would not tolerate the current requirements and, as the cables use 1.5 mm^2 (AWG16) conductors, the impedance of the loudspeakers would be too low and induce excessive SPL loss over medium and long cable runs. And lastly, and perhaps most importantly, the results of the Autofilter algorithm and the integrated cardioid would be compromised, and therefore the overall system performance.

What is the recommended subwoofer for L2/L2D?
The recommended subwoofer for L2 and L2D is KS28. To obtain a concert-rated contour and adequate balance of energy, two KS28 should be deployed per L2 or L2D. The height of two KS28 corresponds to the height of one L2/L2D, so flying KS28 behind L2/L2D is a good approach and provides additional cardioid rejection.

Can I extend L2/L2D's LF contour with other subwoofers?
Yes, L2/L2D can be used with KS21 as well. To obtain a similar contour as with the KS28, four KS21 should accompany one L2 or L2D.

What is the fade out algorithm of the Autofilter and how does it work?
The fade out algorithm is part of the updated Autofilter functionality, its goal is to create a smooth reduction in energy between the audience and stage areas. The algorithm uses Dmin as the starting reference point and ensures that the energy is as low as possible across the full frequency spectrum from the bottom of the array to 5m behind it.

This reduces the energy on stage very efficiently, but also creates a smooth transition between the main system and the front-fill system. Or when L2 is used as a delay system, between it and the main system.

Can I change the fade out parameter to have a sharper or smoother energy decrease?
No, the fade out parameters cannot be changed by the user. Just like Autofilter, it is part of a series of algorithms that are calculated based on all the user data points (Dmin, Dref, Dmax, SPL profile, …) to provide the optimimal result.

What is the maximum amount of vertical control available thru Autofilter? What if my audience zone needs less vertical coverage than the native one of L Series?
The vertical control of L2 is set by the positions of Dmin and Dmax in Soundvision. The refined Autofilter algorithm will fit the available energy within the zone defined between Dmin and Dmax, taking into consideration the available HF resources. It is therefore possible to focus the coverage of an L2 array to what is desired.

To take an extreme example, one could decide to reduce the vertical coverage to half of an element, whilst more than two L2 elements are deployed. Autofilter applies the fade out algorithim to reduce energy intelligently up to Dmin. In most cases, this will reduce the amount of energy on stage.

At the top of the coverage, the vertical control is defined by Dmax. The algorithm acts to actively reduce the energy beyond Dmax.