

VHD5

Subwoofer Configurations



Our intention over the 10 days of field testing, was to evaluate baseline performance in real-world, practical applications, by measuring system response using sophisticated test-equipment and more importantly, our ears to determine the best results.

The purpose being, to determine the optimum sub configurations that would provide a balanced and flat full-range system, with excellent coverage and tonal quality. The cabinets under test were the VHD4.21 and VHD2.18J subwoofers.

We also set out to review the mechanical, audio and software performance of the system, so that we could be sure that each configuration would complement the overall sound of the VHD5 system. To this end, we listened to all of the sub configurations included in this document alongside a full VHD5 system.

The testing we conducted, was the most thorough and comprehensive undertaken by KV2 Audio to date, and reflects our commitment to provide high quality audio systems that perform to a very high standard in real-world applications.

This document deals with the physical setup and delay parameters of the various sub configurations, that will provide engineers with a solid starting point, and enable them to select a configuration that is applicable to almost any event, and one that will yield predictable results. It includes notes and observations made by the KV2 Engineering staff during the testing, in an effort to show sound engineers what to expect from each configuration.

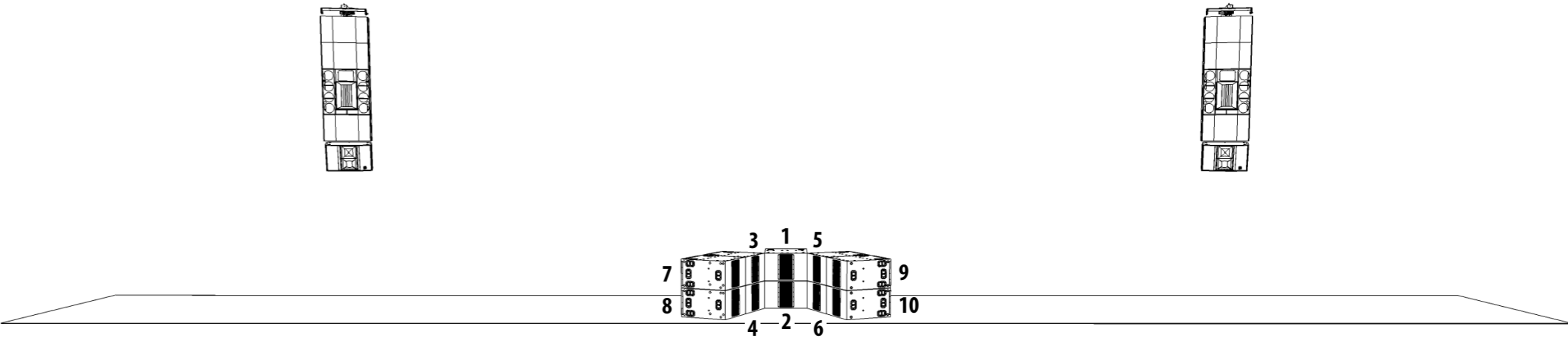
Please be aware when reading this document, that the polar plots shown here are measured at a distance of 30m from the centre of the soundstage, at 1 metre intervals in a 360° polar pattern.

The listening notes describe bass response at a distance averaging 10m upstage of the sub bass position. This explains the difference in the listening observations, compared to the polar plots.

A	VHD4.21 - Centre Ground Stack (10) - U Shape
B	VHD4.21 - Centre Ground Stack (6) - U Shape
C	VHD4.21 - Ground Sub Array (8) - Cardioid Top Middle Pair
D	VHD2.18J - Flown (16 per side) - 2 Columns - 8 Cardioid + VHD4.21 (1)
E	VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid
F	VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle
G	VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle + VHD4.21

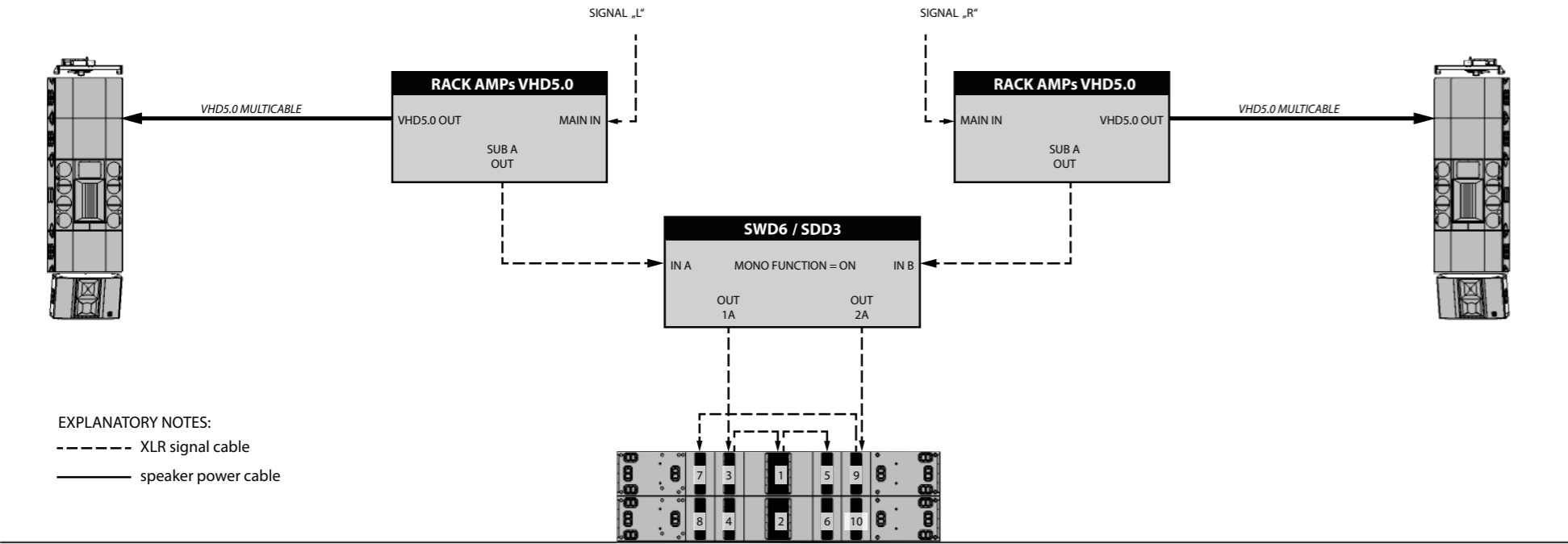
Listening observations

This 2 high, VHD4.21 array offers excellent front coverage, extremely even across the entire width of the listening space. Average of 16dB attenuation front to back at 10m on axis. The rear cabinets are parallel to the stage, with the side facing cabinets at 25°, hinging from the front corners of the rear cabinets. The only downside is the extreme bass level at the centre of the point source.



Wirings

VHD4.21 - Centre Ground Stack (10) - U Shape



Specification

VHD4.21 - Centre Ground Stack (10) - U Shape

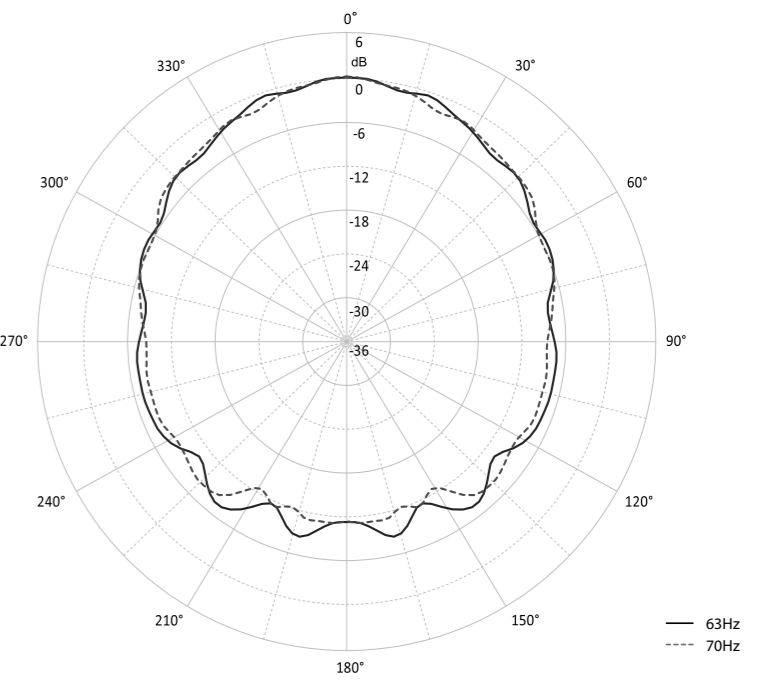
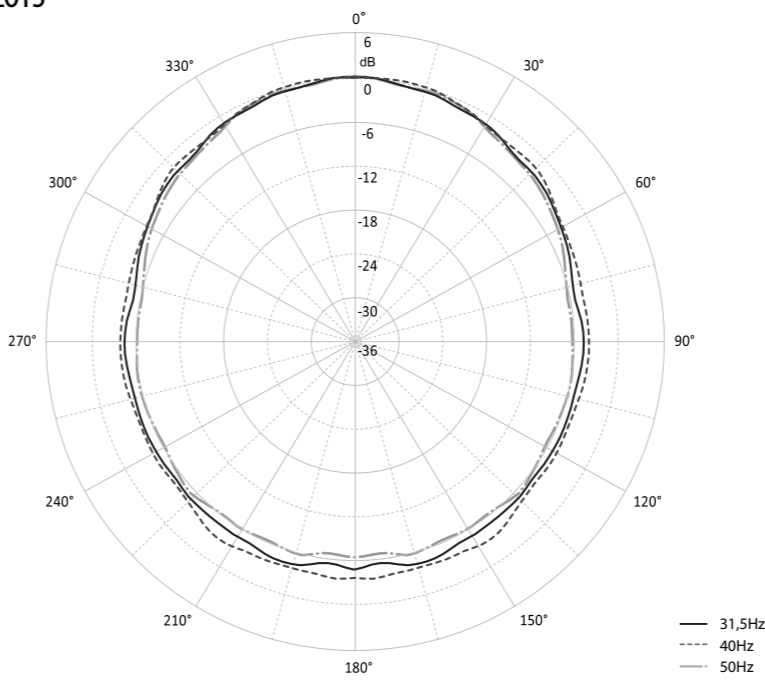
GROUND SUB
GROUND STACKED
FRONT PAIR SUB DELAY

VHD4.21
5x VHD4.21 (10x VHD2.21)
2.1ms

SUB DELAY
CABINETS #
DELAY
ANGLE FROM REAR CAB.

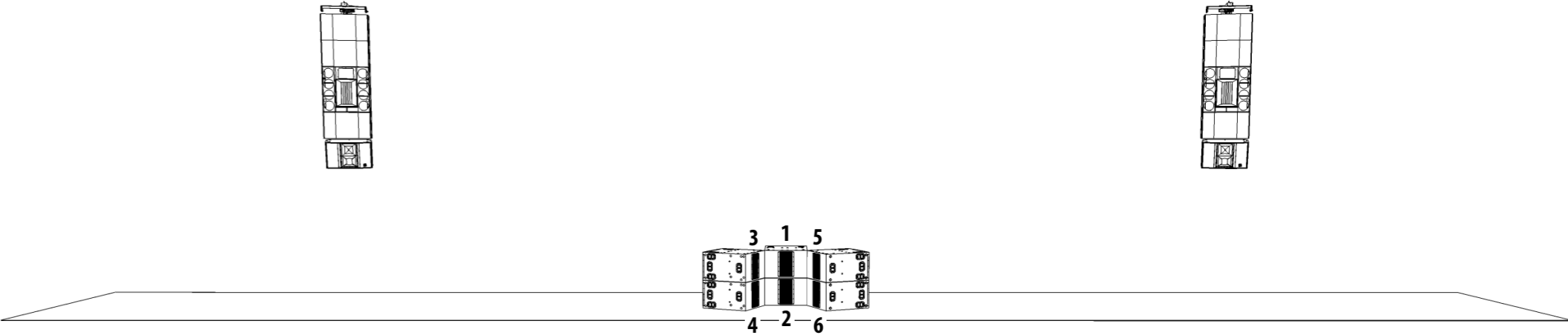
1, 2	3, 4, 5, 6	7, 8, 9, 10
0.0ms	0.0ms	2.1ms
-	25°	25°

POLARPLOTS

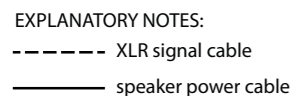


Listening observations

Excellent front coverage, extremely even across the entire width of the listening space. 13dB attenuation front to back at 10m on axis. The only downside is the extreme bass level at the front centre axis of the point source.



VHD4.21 - Centre Ground Stack (6) - U Shape

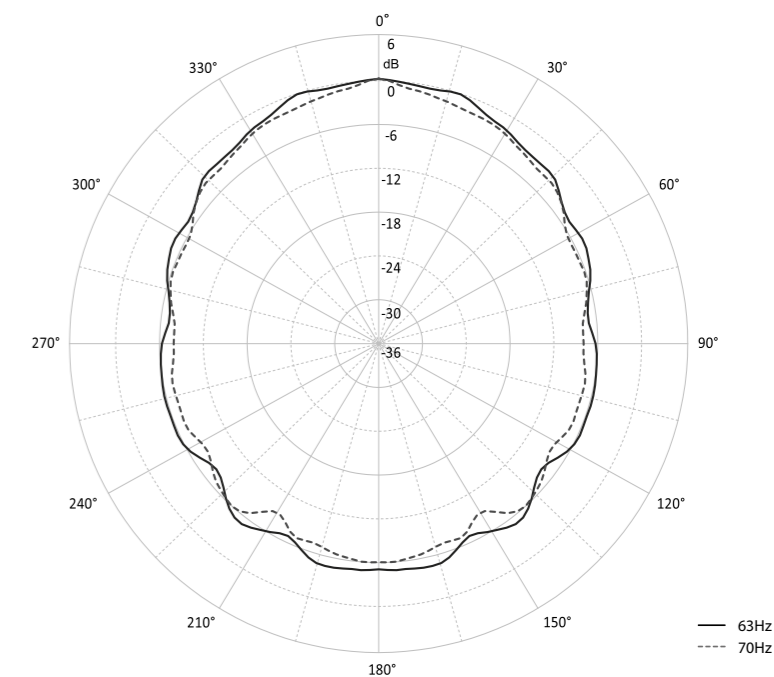


VHD4.21 - Centre Ground Stack (6) - U Shape

VHD4.21

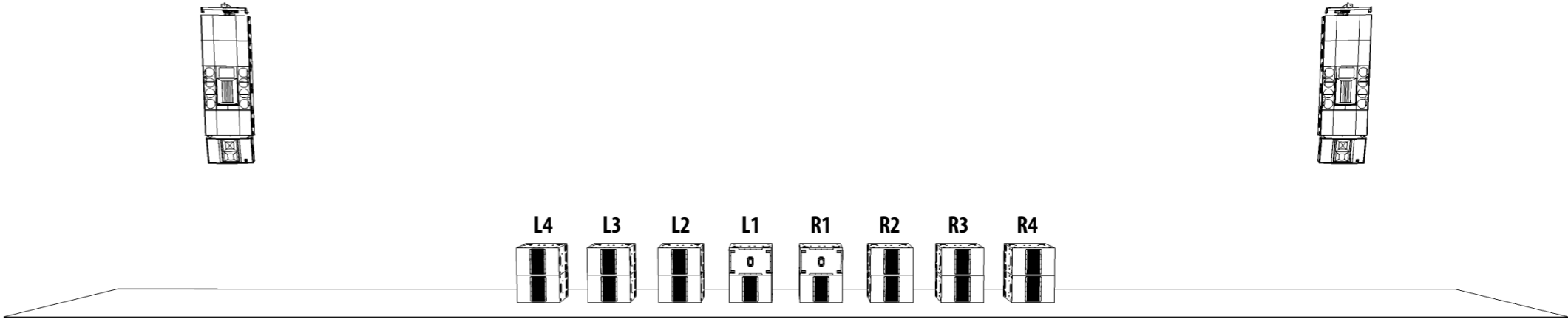
3x VHD4.21 (6x VHD2.21)

SUB DELAY		
CABINETS #	1, 2	3, 4, 5, 6
DELAY	0.0ms	0.0ms
ANGLE FROM REAR CAB.	-	25°



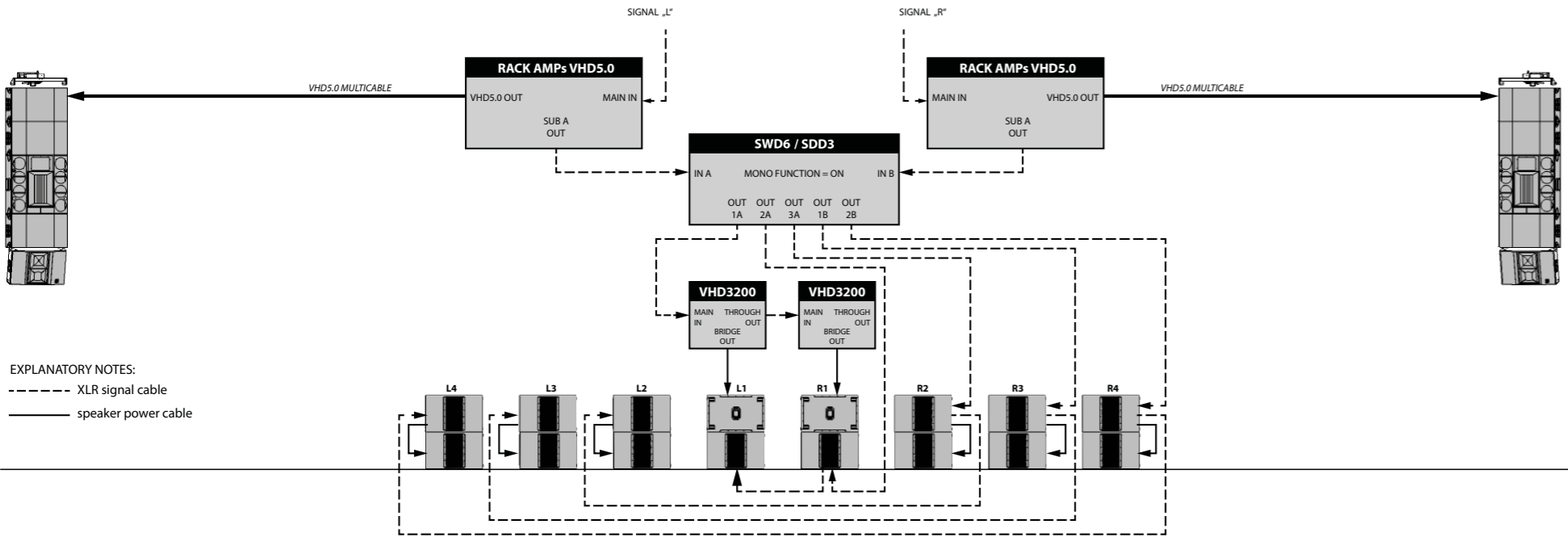
Listening observations

This Sub Arc array captures all of the power of the VHD4.21 bass cabinets and provides an even and powerful sub bass across the entire listening area. The horizontal coverage can be adjusted outwards by progressively increasing the delay times of the cabinets from the centre to the outside 4.21 cabinets. the middle pair of cardioid cabinets give a significant reduction of sub bass on stage. This is all round an excellent powerful sub array setup that offers high quality sub bass with excellent on stage rejection.



Wirings

VHD4.21 - Ground Sub Array (8) - Cardioid Top Middle Pair

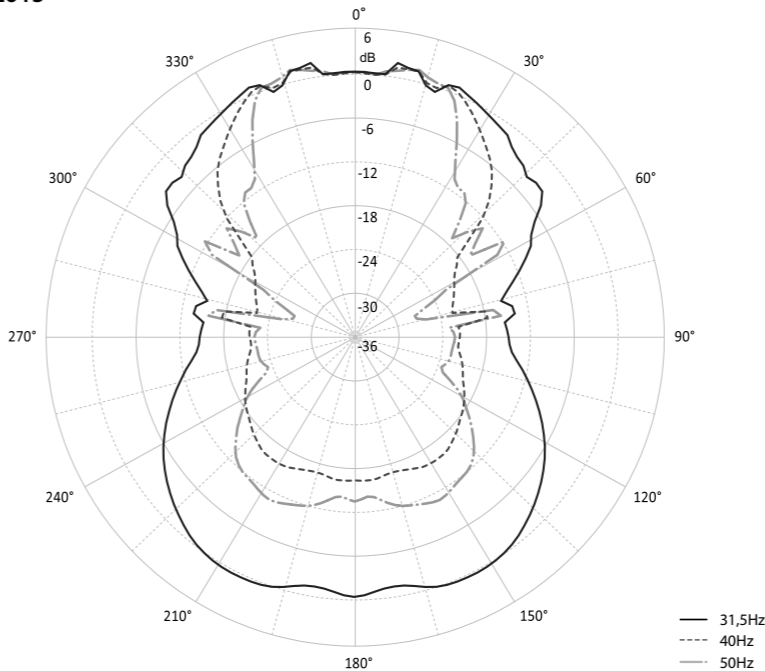


Specification

VHD4.21 - Ground Sub Array (8) - Cardioid Top Middle Pair

GROUND SUB MODEL 1	6x VHD4.21 + 2x VHD4.21 A + 2x VHD2.21 (2x VHD4.21A)
TOTAL NUMBER GROUND STACKED	8x VHD4.21 (16x VHD2.21)
CONFIGURATION	SUB ARC ARRAY (2 H x 8 W)
SPACING BETWEEN CENTRES (m)	1.8m
CARDIOID CAB #'S	1L, 1R
CARDIOID SUB - DELAY /PHASE/ ATTN.	3.95ms / -180° / -4dB
TOTAL WIDTH OF ARRAY (m)	13.68 m

POLARPLOTS



SUB DELAY	BOTTOM			
CABINETS #	L1, R1	L2, R2	L3, R3	L4, R4
DELAY	0.0ms	0.5ms	1.71ms	5.93ms

SUB CARDIOID DELAY	TOP	
CABINETS #	L1, R1	

D VHD2.18J

Flown (16 per side) - 2 Columns - 8 Cardioid + VHD4.21 (1)

Listening observations

Good front coverage, however a wide null at 30m, 5.5m from the centre axis. Rear low frequency rejection is good, smooth and averaging -10dB right across the stage. This indicates that there is no need for additional cardioid cabinets in the middle of the stage. This is an agreeable sound from the VHD2.18J cabinets in this testing configuration. With the VHD5.0 main system in between the 2 sub hangs, this improves the sound quality, and also reduces the footprint. The addition of the single 4.21 pair adds significant weight to the low end and reduces the effects of the null points. It only reduces the rear rejection by 1-2dB. This delivers a significant improvement on having just the flown 2.18 arrays. We would recommend this as of the best options for a flown VHD2.18J array.

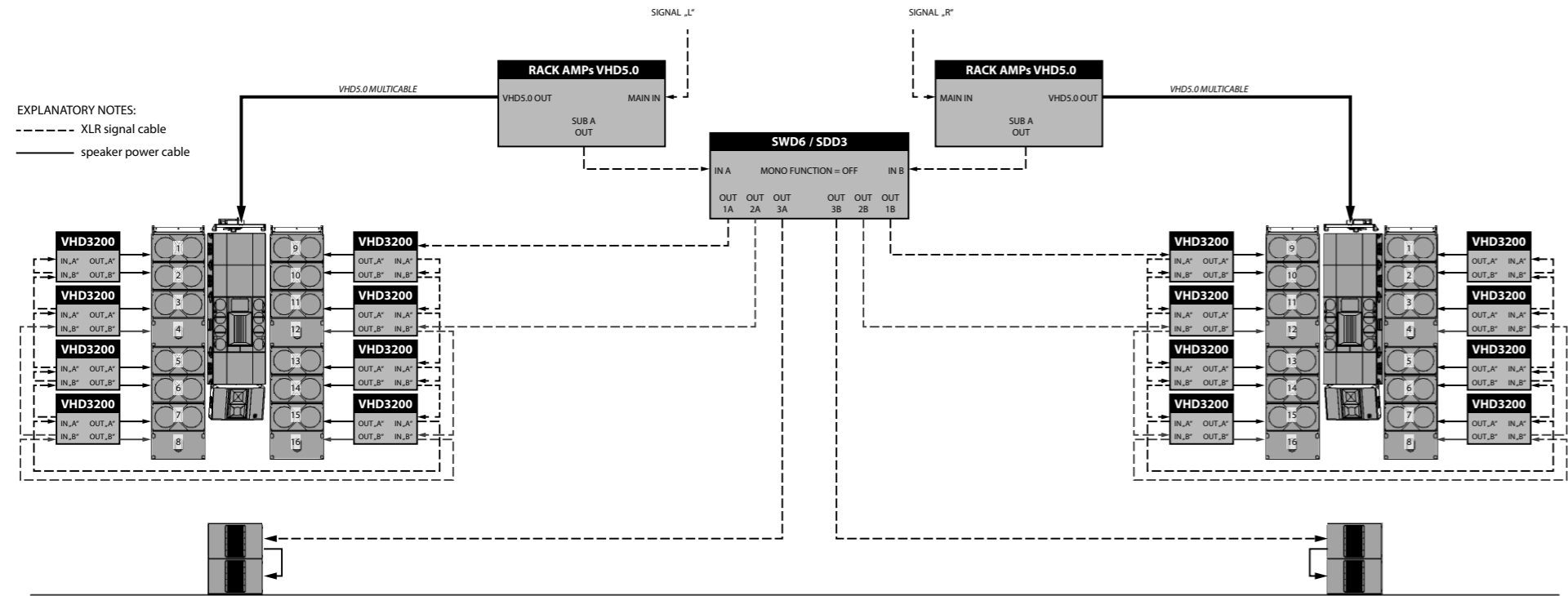
Drawing

VHD2.18J - Flown (16 per side) - 2 Columns - 8 Cardioid + VHD4.21 (1)



Wirings

VHD2.18J - Flown (16 per side) - 2 Columns - 8 Cardioid + VHD4.21 (1)



Specification

VHD2.18J - Flown (16 per side) - 2 Columns - 8 Cardioid + VHD4.21 (1)

FLOWN SUB MODEL

PER SIDE
CONFIGURATION
CARDIOID CAB #'S
DISTANCE BETWEEN CENTRE OF CAB #'S
CARDIOID SUB - DELAY /PHASE/ ATTEN.

VHD2.18J

# PER SIDE	16
CONFIGURATION	SIDE BY SIDE
CARDIOID CAB #'S	4, 8, 12, 16
DISTANCE BETWEEN CENTRE OF CAB #'S	2.4 m
CARDIOID SUB - DELAY /PHASE/ ATTEN.	5.85ms / -180° / +1dB

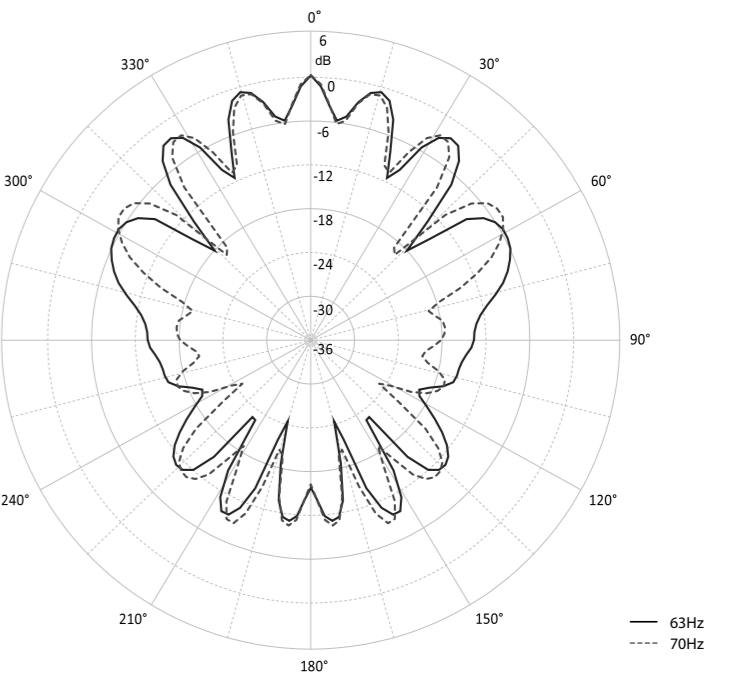
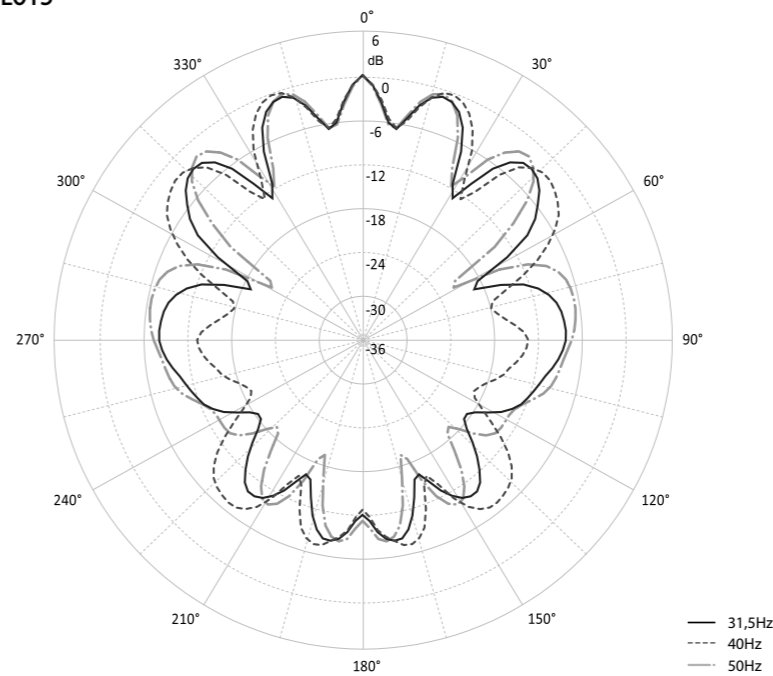
GROUND SUB MODEL 1

PER SIDE GROUND STACKED
CONFIGURATION
DELAY / PHASE
GAIN

VHD4.21

# PER SIDE GROUND STACKED	1
CONFIGURATION	COLUMN 2 HIGH
DELAY / PHASE	1.87ms / 0° * depending on location
GAIN	0

POLARPLOTS



E VHD2.18J

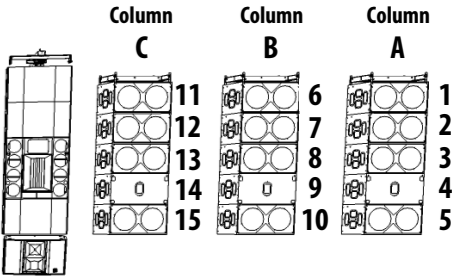
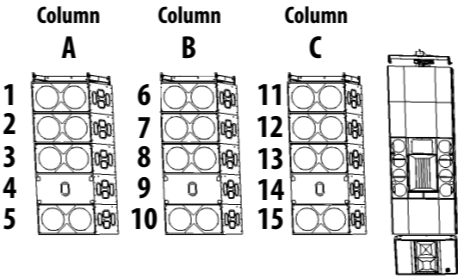
Flown (15 per side) - 3 Columns - 5 Cardioid

Listening observations

Excellent front coverage and weight, with one null at 30m, 5m from the centre axis. Even though there is 1 less cabinet than the double hang, there is the impression of additional weight and low freq. extension in this configuration. This is particularly true on axis of the sub-array. Rear low frequency rejection is excellent, very smooth and averaging -15dB right across the stage. This indicates that there is no need for additional cardioid cabinets in the middle of the stage. There is a slight power alley in the middle downstage area, but it is quite acceptable. This can be adjusted using a combination of system delay and gain adjustment. This is an improvement on the 2 cardioid hangs of 8 cabinets. We will relocate the VHD5.0 main system in between the 3 sub hangs, which should improve the sound quality further, and reduce the footprint.

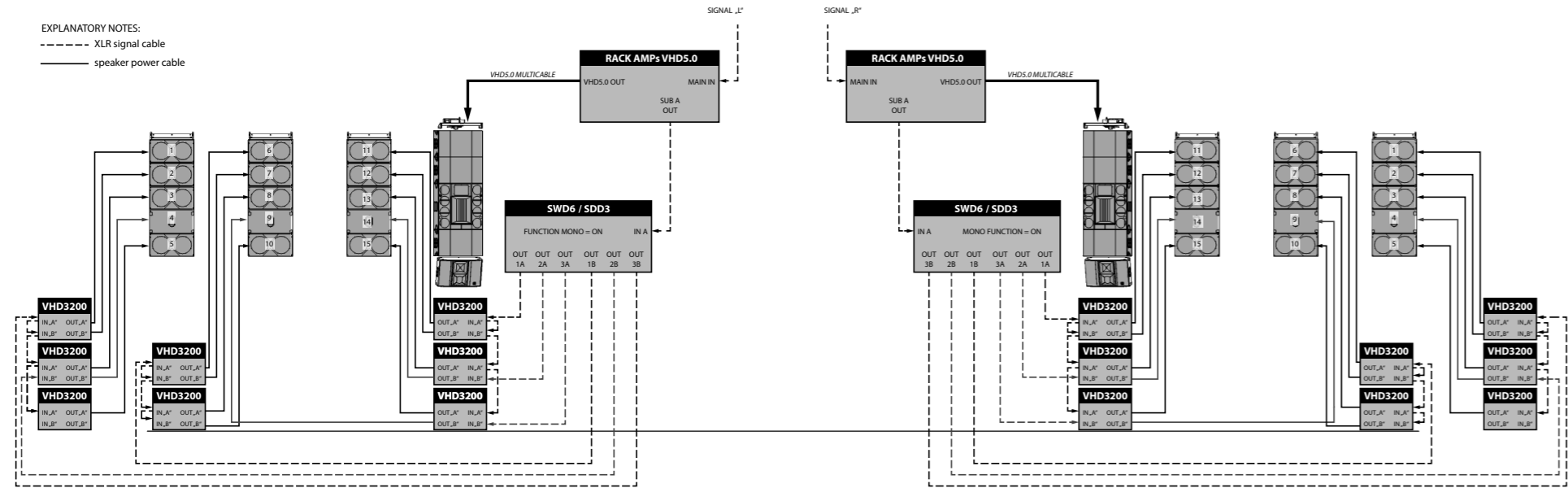
Drawing

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid



Wirings

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid

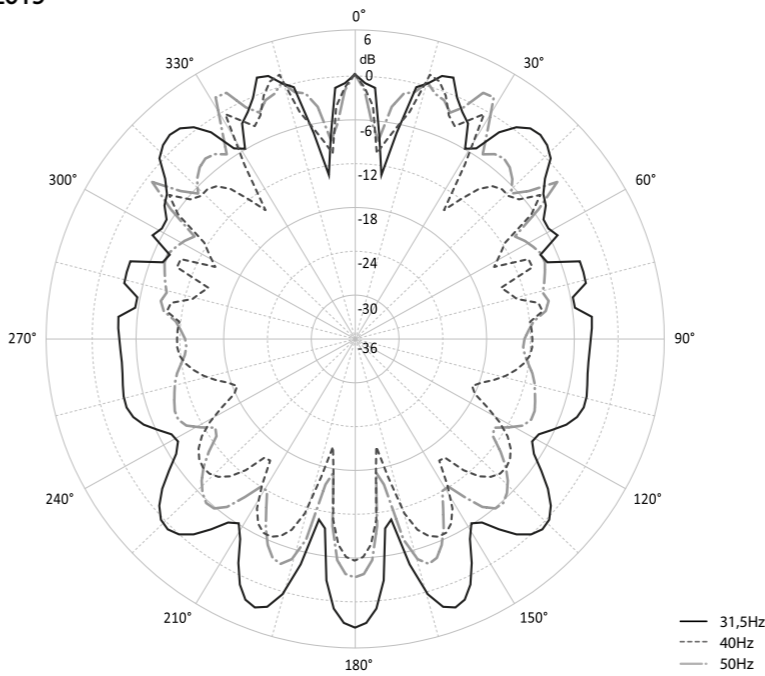


Specification

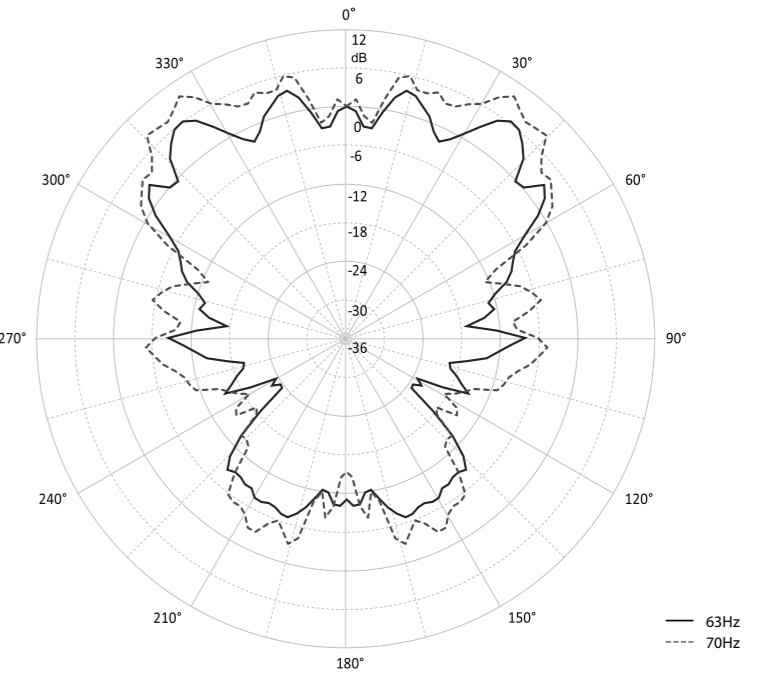
VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid

FLOWN SUB MODEL	VHD2.18J
# PER SIDE	15x VHD2.18J
CONFIGURATION	SIDE BY SIDE
CARDIOID CAB #'S	4, 9, 14
DISTANCE BETWEEN CENTRE OF CAB #'S	2.4 m

POLARPLOTS



FLOWN SUB MODEL	VHD2.18J
SUB DELAY - COLUMN A, B, C	4.2ms / 1.7ms / 0.0ms
CARDIOID SUB DELAY / PHASE / ATTEN.	4.95ms / -180° / +3dBr



F VHD2.18J

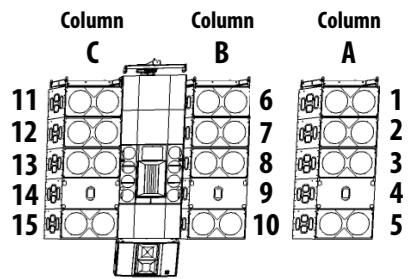
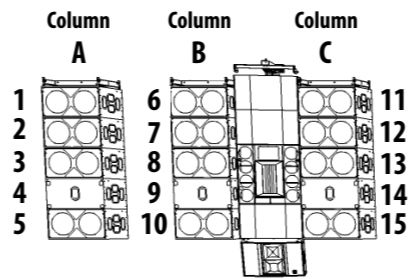
Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle

Listening observations

Excellent front coverage and weight, with one null at 30m, 5m from the centre axis and a second null closer to the stage at 45° off axis. Even though there is 1 less cabinet than the double hang, there is the impression of additional weight and low freq. Extension in this configuration. This is particularly true on axis of the sub-array. Rear low frequency rejection is excellent, very smooth and averaging -15dB right across the stage. This indicates that there is no need for additional cardioid cabinets in the middle of the stage. There is a slight power alley in the middle, but it is quite acceptable. This can be adjusted using a combination of system delay and gain adjustment. This is certainly the best sound we have heard from the VHD2.18J cabinets in this testing process. With the VHD5.0 main system in between the 3 sub hangs, this has increased the sound quality significantly, and reduced the footprint as well. VHD5.0 in between subs creates a much smoother response throughout the soundstage.

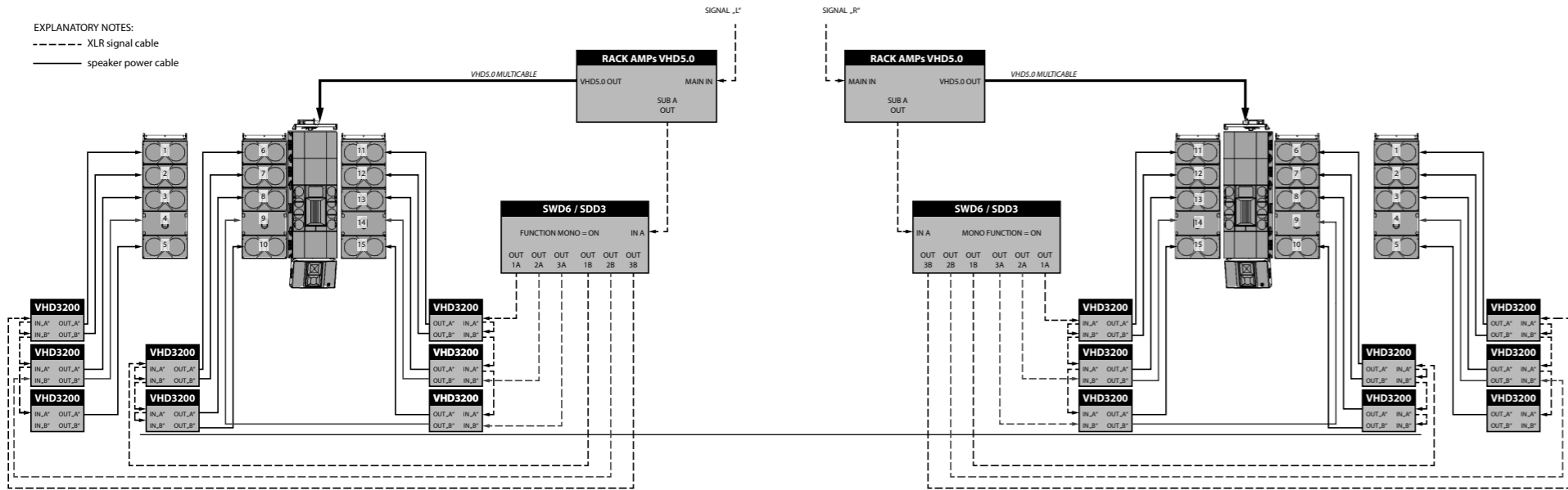
Drawing

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle



Wirings

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle



Specification

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle

FLOWN SUB MODEL

PER SIDE

CONFIGURATION

CARDIOID CAB #'S

DISTANCE BETWEEN CENTRE OF CAB #'S

VHD2.18J

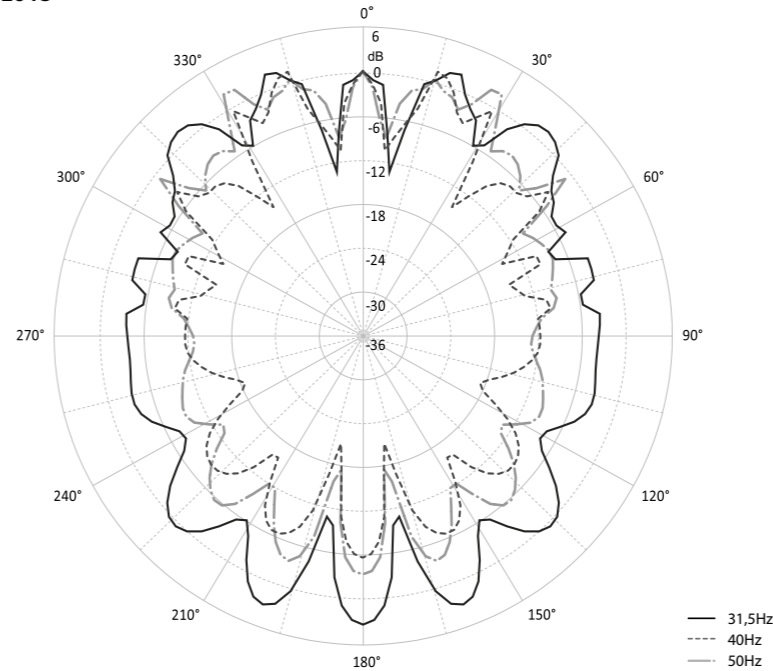
15x VHD2.18J

SIDE BY SIDE

4, 9, 14

2.4 m

POLARPLOTS



FLOWN SUB MODEL

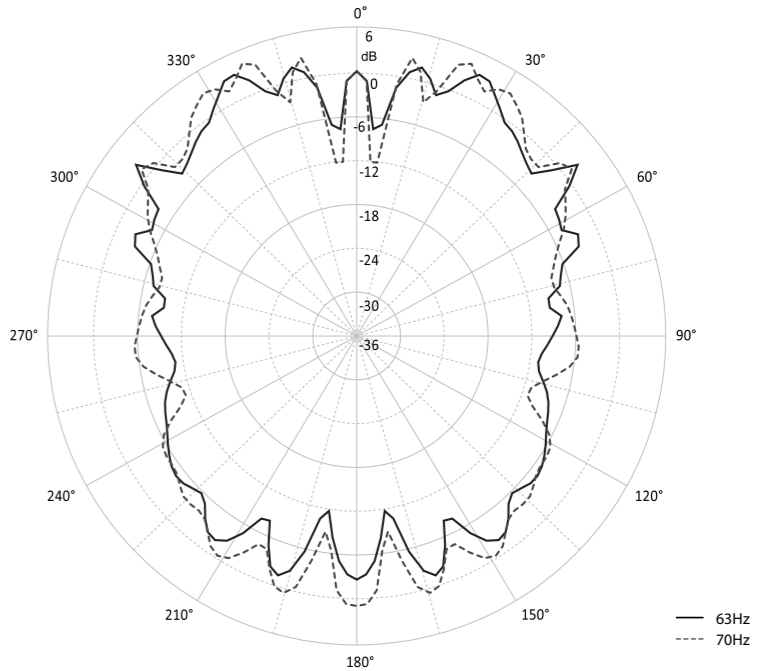
SUB DELAY - COLUMN A, B, C

CARDIOID SUB DELAY / PHASE / ATTEN.dB

VHD2.18J

4.2ms / 1.7ms / 0.0ms

4.95ms / -180° / +3dBr



G VHD2.18J

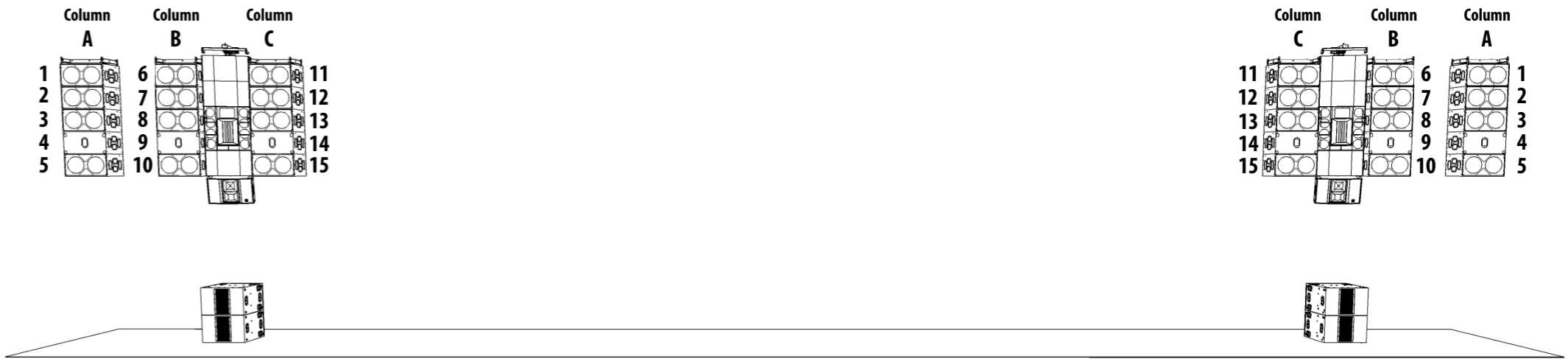
Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle + VHD4.21

Listening observations

Excellent front coverage and weight, with one null at 30m, 5m from the centre axis and a second null closer to the stage at around 45° off axis, (depending on the centre frequency). Even though there is 1 less cabinet than the double hang, there is the impression of additional weight and low freq. extension in this configuration. This is particularly true on axis of the sub-array. Rear low frequency rejection is excellent, very smooth and averaging -15dB right across the stage. This indicates that there is no need for additional cardioid cabinets in the middle of the stage. There is a slight power alley in the middle, but it is quite acceptable. This can be adjusted using a combination of system delay and gain adjustment. With the VHD5.0 main system in between the 3 sub hangs, this has increased the sound quality significantly, whilst also reducing the footprint. VHD5 in between subs creates a much smoother response throughout the soundstage. The addition of the single VHD4.21 pair adds significant punch and weight to the bass and reduces the effect of the nulls. There is almost no reduction in the rear rejection pattern onstage. An excellent all-round solution and highly recommended.

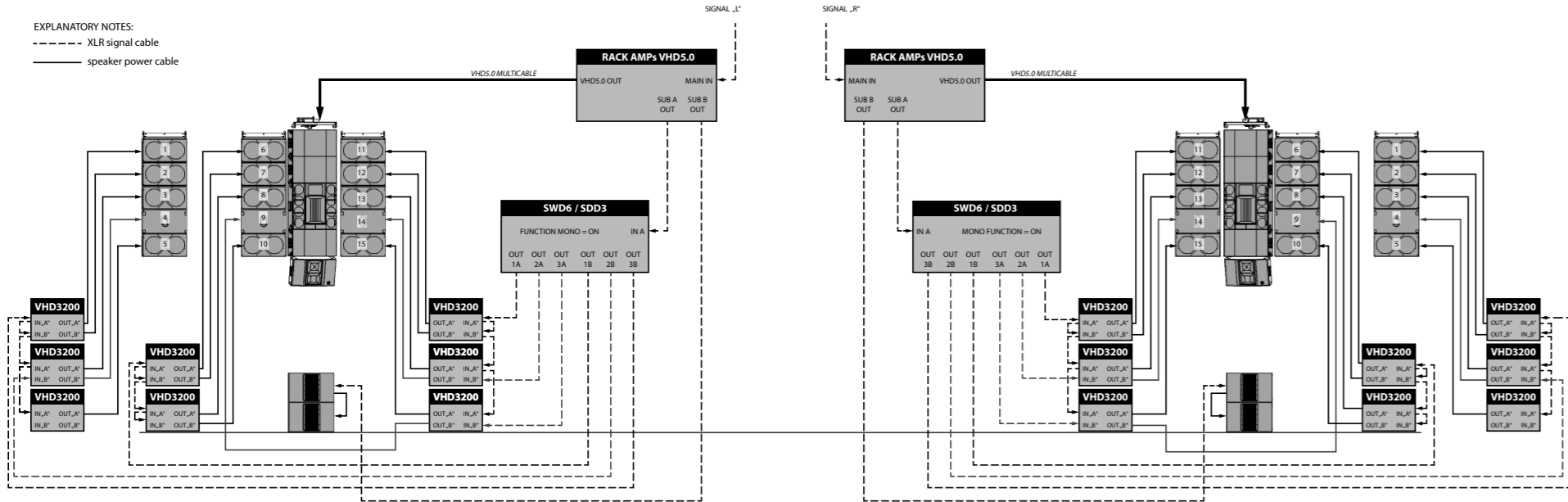
Drawing

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle + VHD4.21



Wirings

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle + VHD4.21



Specification

VHD2.18J - Flown (15 per side) - 3 Columns - 5 Cardioid + VHD5 middle + VHD4.21

FLOWN SUB MODEL

PER SIDE
CONFIGURATION
CARDIOID CAB #'S
DISTANCE BETWEEN CENTRE OF CAB #'S
SUB DELAY - COLUMN A, B, C
CARDIOID SUB DELAY / PHASE / ATTEN.

VHD2.18J

15x VHD2.18J
SIDE BY SIDE
4, 9, 14
2.4 m
4.2ms / 1.7ms / 0.0ms
4.95ms / -180° / +3dB

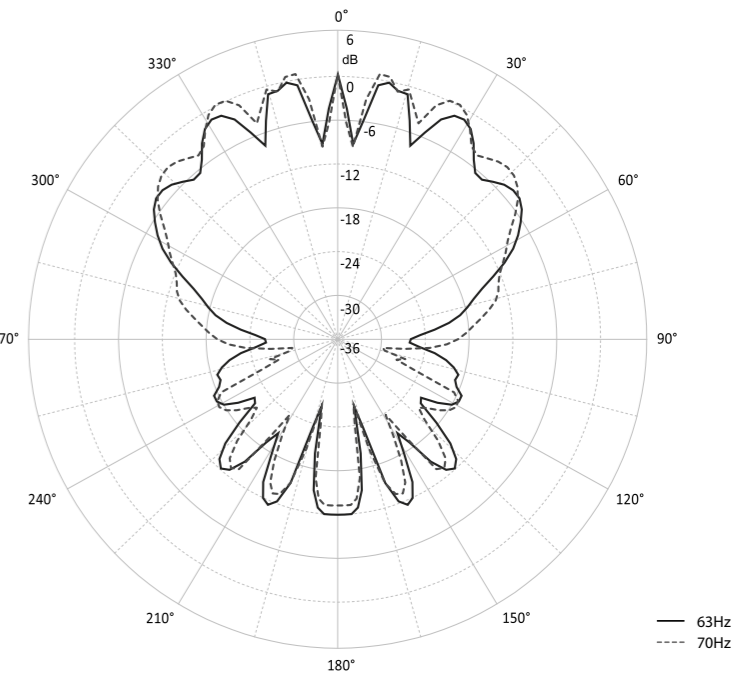
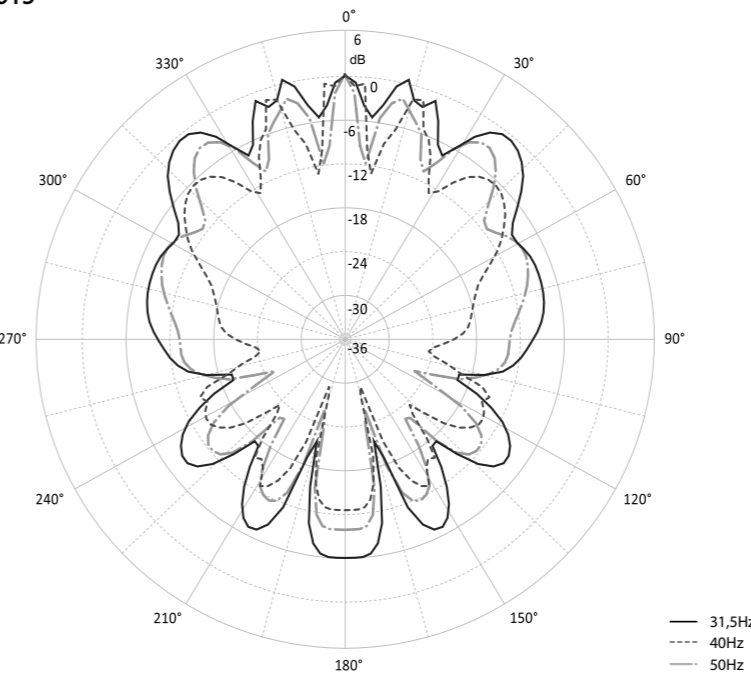
GROUND SUB MODEL

PER SIDE
CONFIGURATION
DELAY / PHASE
GAIN

VHD4.21

1x VHD4.21
COLUMN 2 HIGH
2.586ms / 0° * depending on location
0

POLARPLOTS





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