Product application Webinar

# Subwoofer arrays using X218WF

*April 30, 2020*

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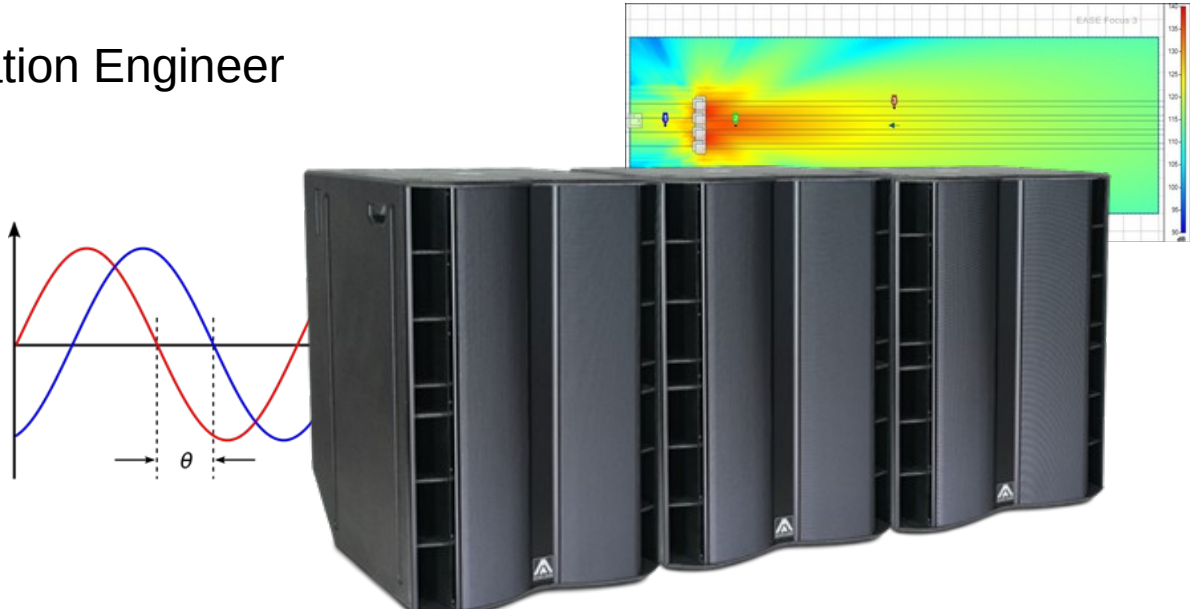
Adrian Ramos, R&D Application Engineer

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2. Essential acoustics concepts
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4. Basic cardioid subwoofer configuration
5. Advanced subwoofer configurations

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# Introduction to subwoofer arrays

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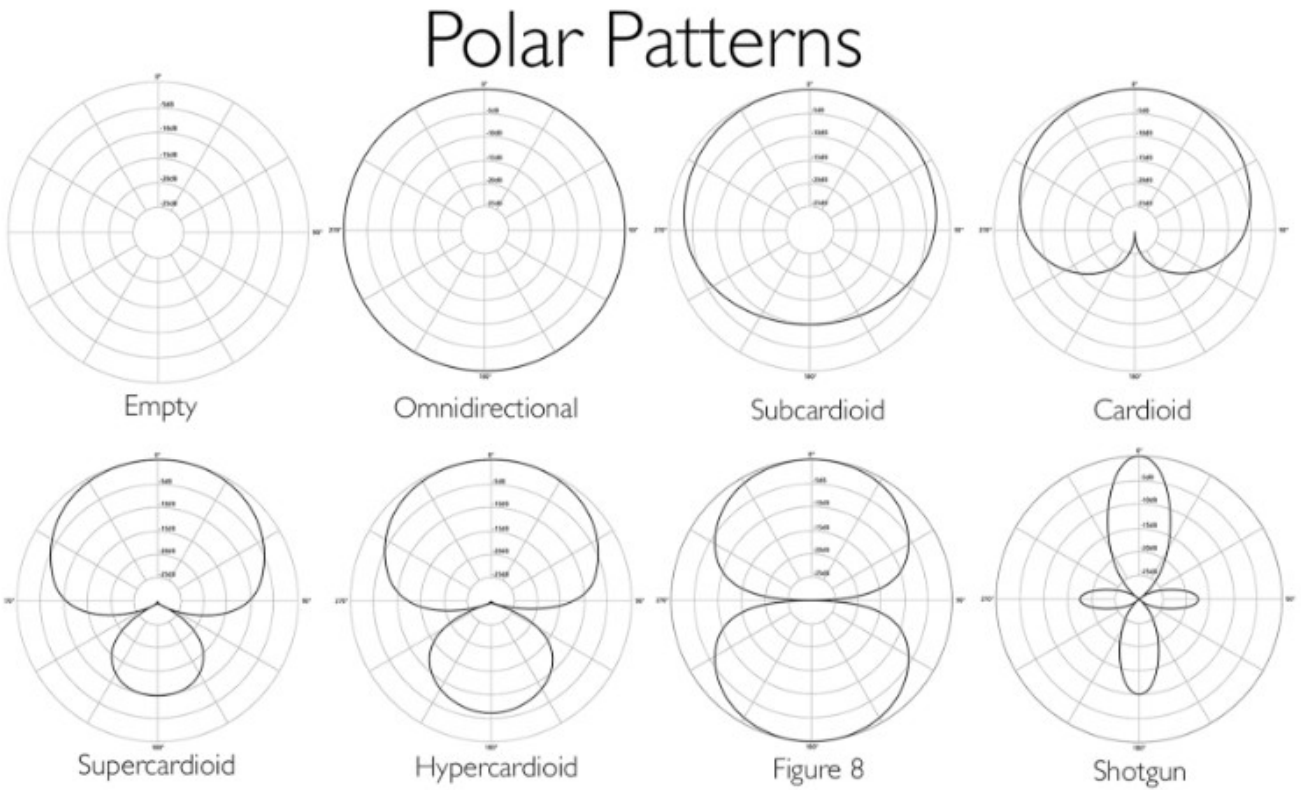
# Essential acoustics concepts

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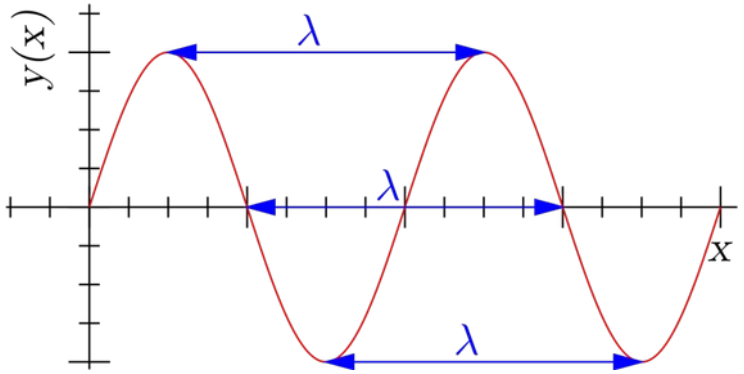
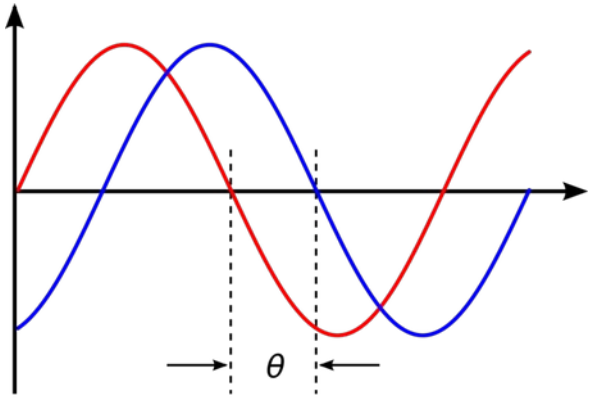
# Essential acoustics concepts

λ = Wave**length** = distance = meters




θ = Phase = time difference = seconds




$$\lambda = \frac{speed\ of\ sound}{frequency} = \frac{331.4 + 0.6 \cdot {}^{o}C}{frequency} = (331.4 + 0.6 \cdot {}^{o}C) \cdot T$$

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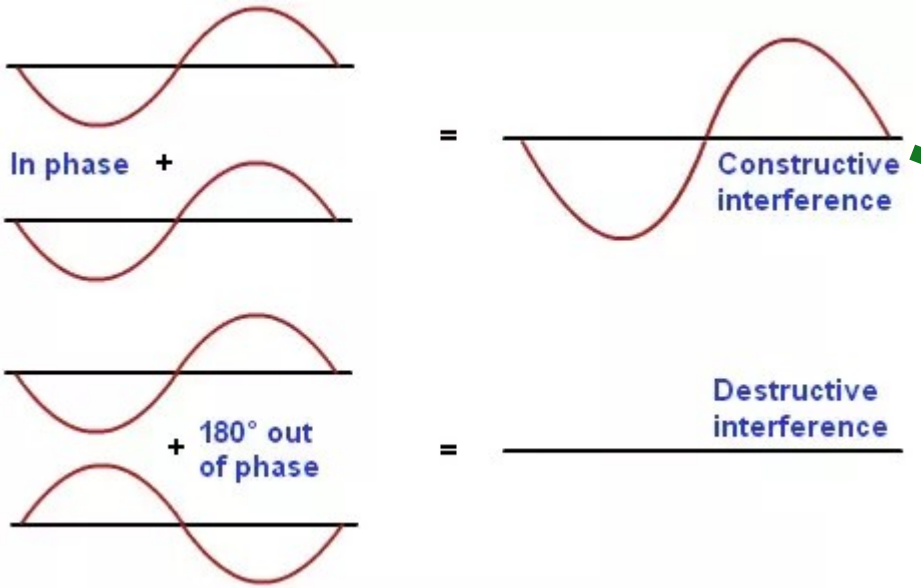
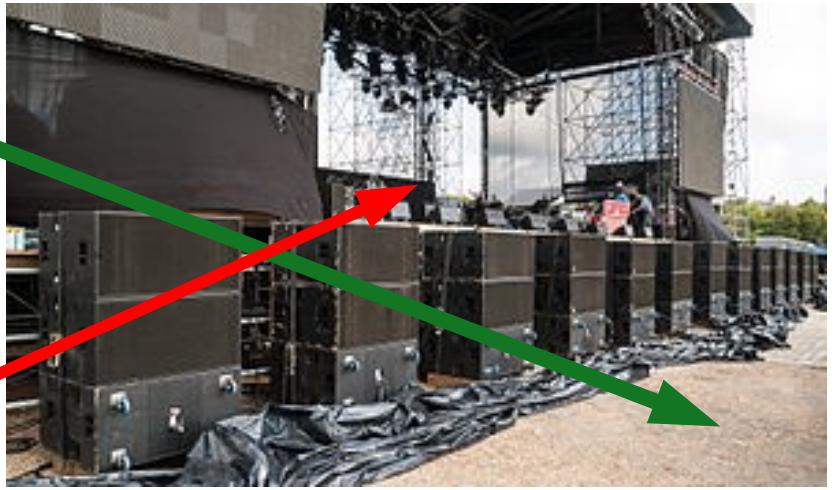
# Essential acoustics concepts



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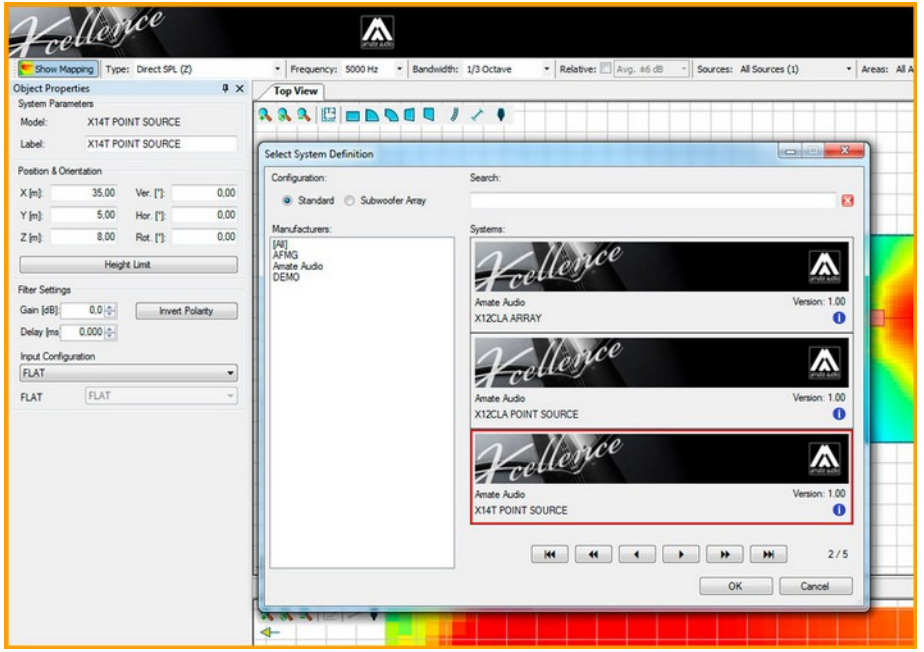
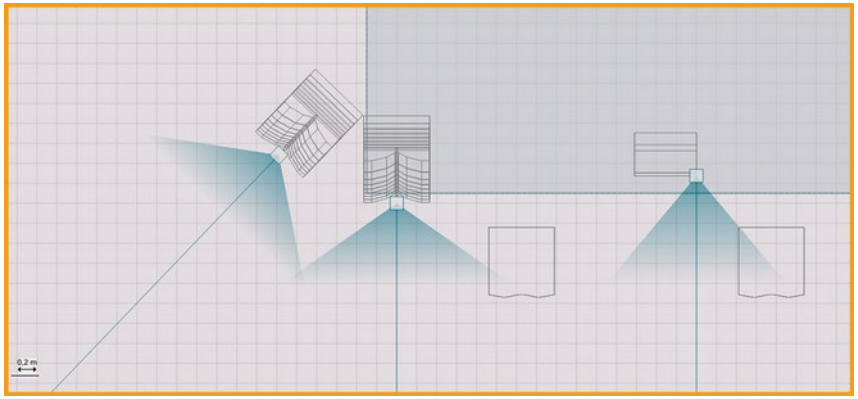
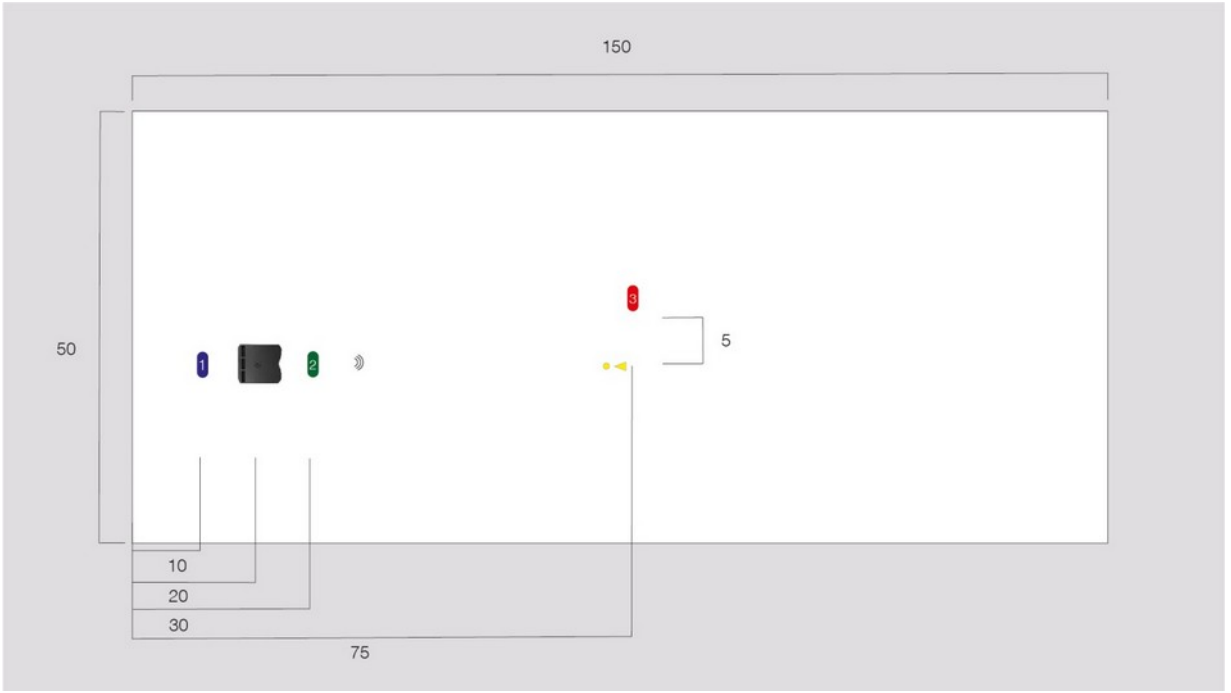
# EASE Focus 3 Project



EASE Focus 3 + Amate Audio speaker library: download

# EASE Focus 3 Project

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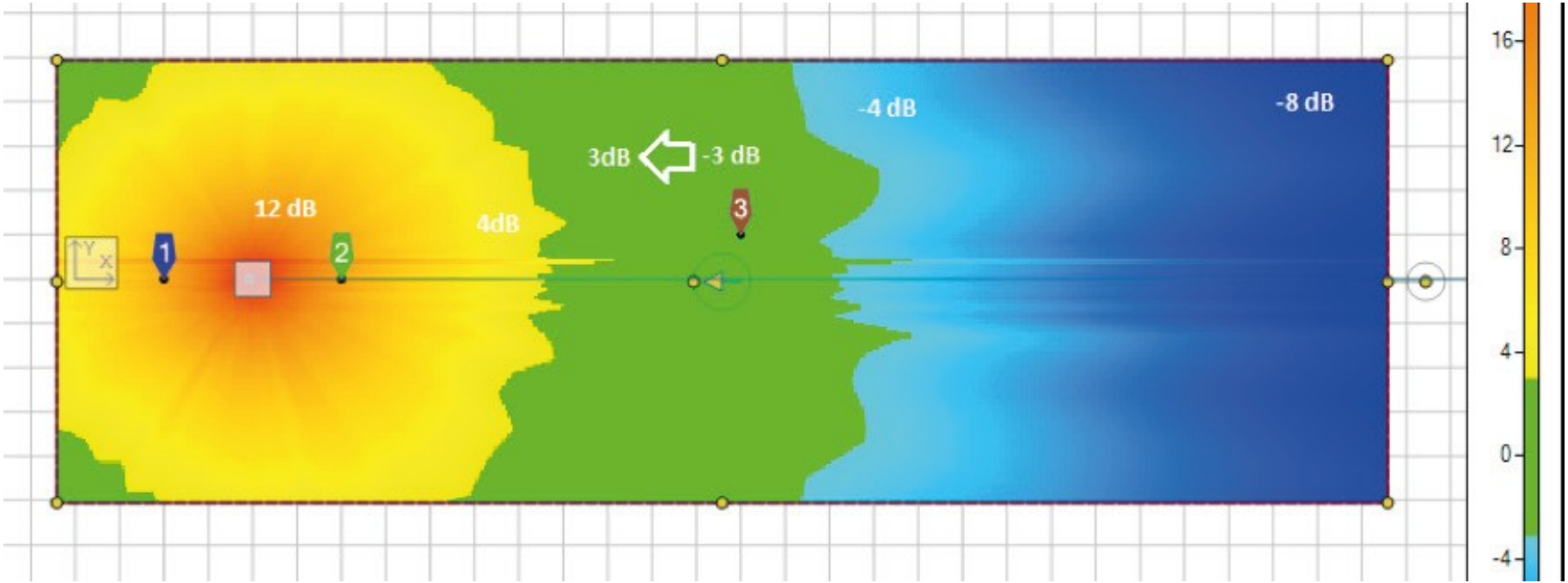
# EASE Focus 3 Project

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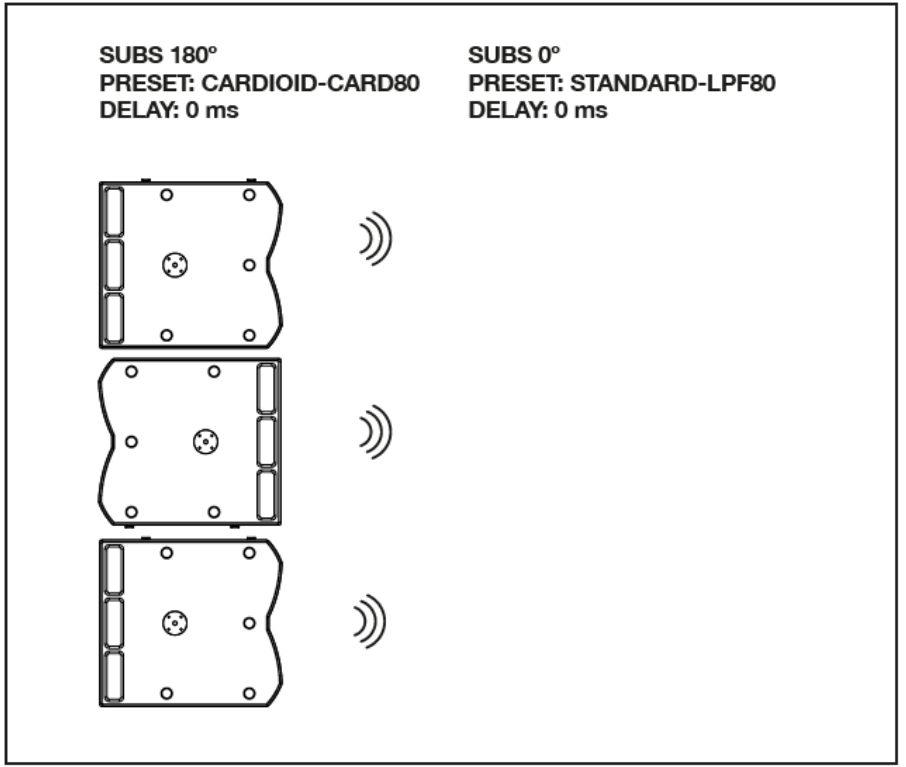
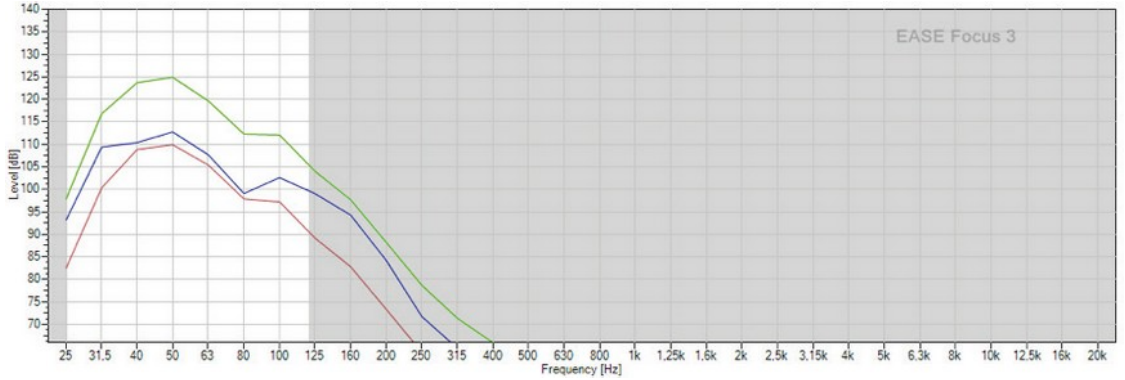
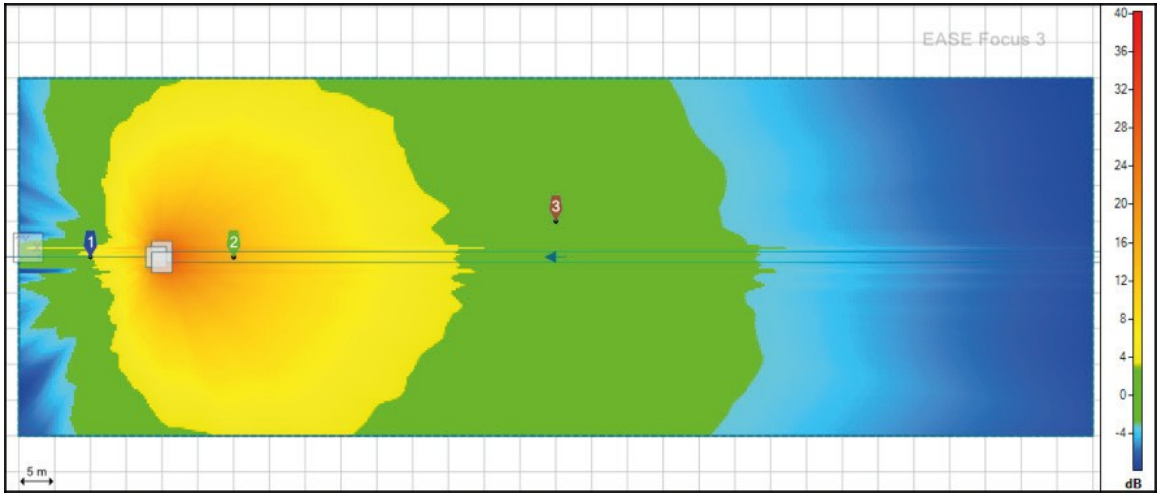
# Basic cardioid subwoofer configurations

3 X218WF Using brand presets:



# Basic cardioid subwoofer configurations

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# Advanced subwoofer configurations

2 x 6 subwoofer bi-directional

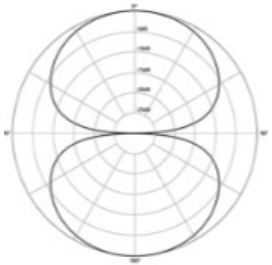
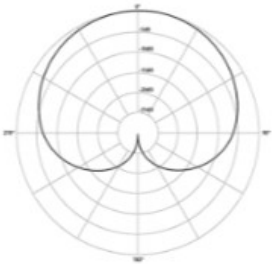


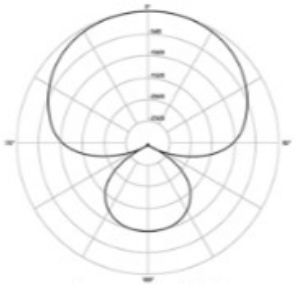
Figure 8

2 x 6 subwoofer cardioid & supercardioid



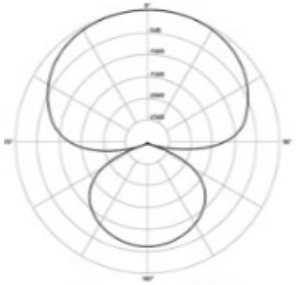
Cardioid

2 x 6 subwoofer L-R cardioid



Supercardioid

12 subwoofer bi-directional & hypercardioid



Hypercardioid

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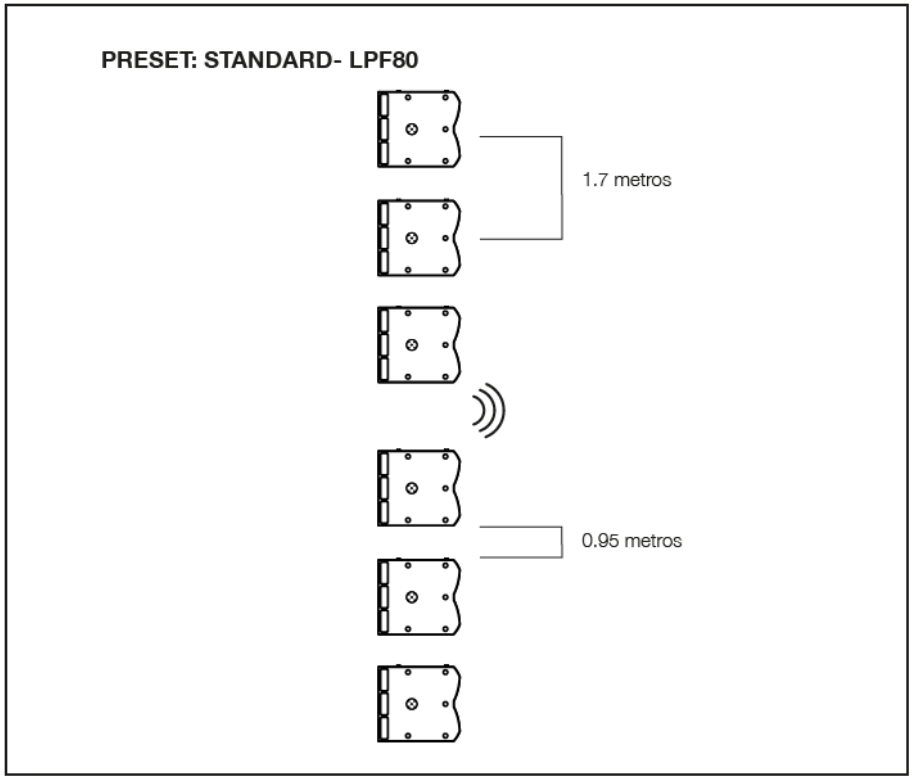
# Advanced subwoofer configurations

6 subwoofer bi-directional:




Spacing: 1.7 meters between subs
Delay: 0ms

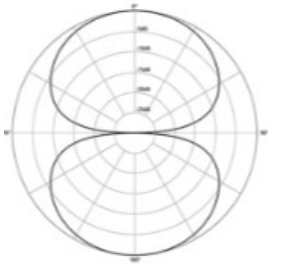


Figure 8

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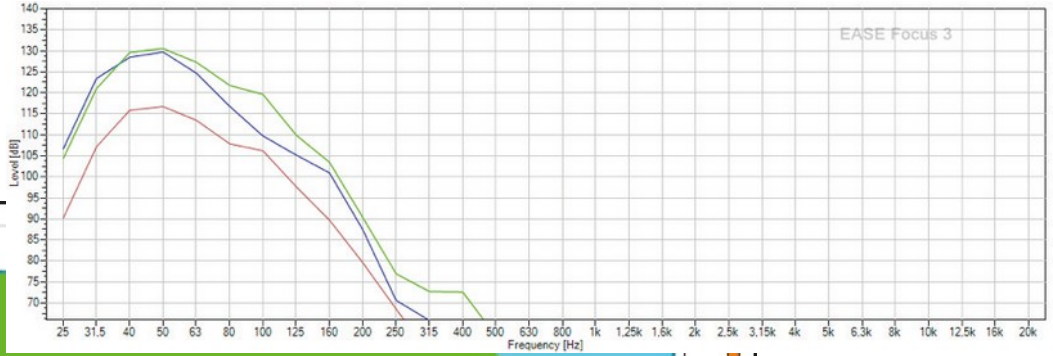
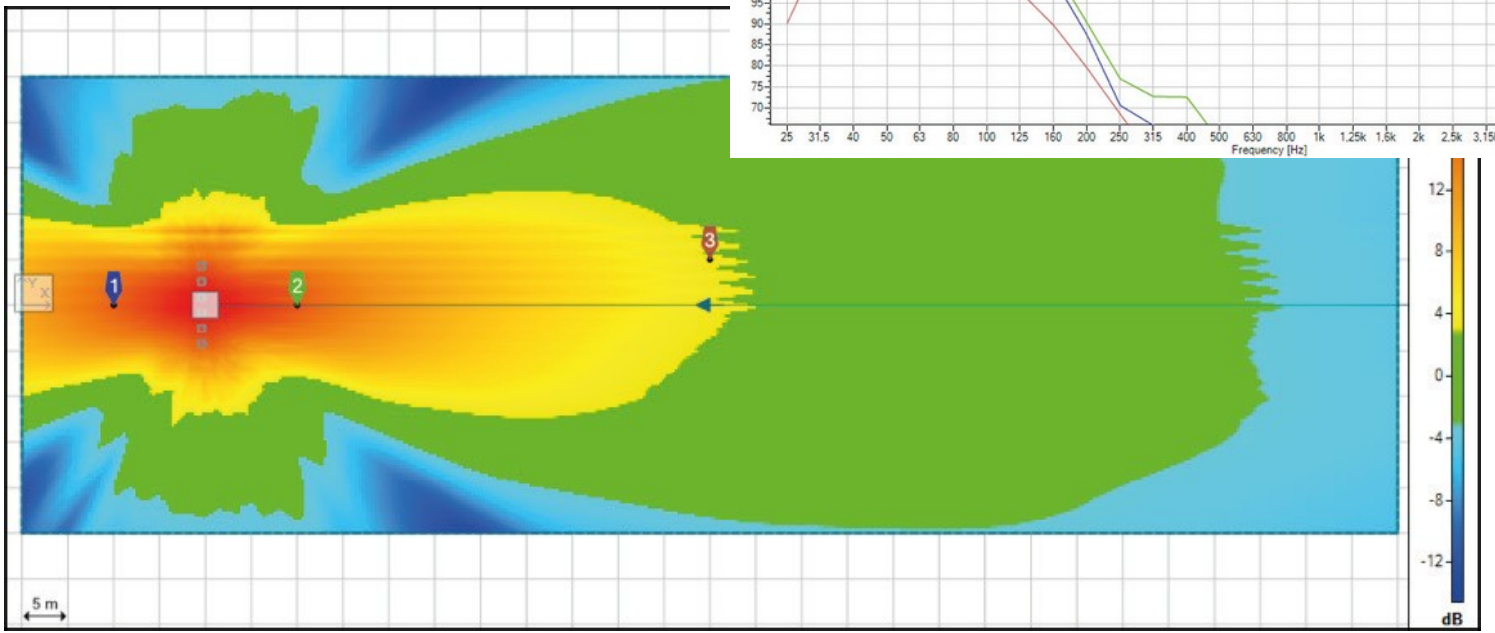
# Advanced subwoofer configurations

6 subwoofer bi-directional



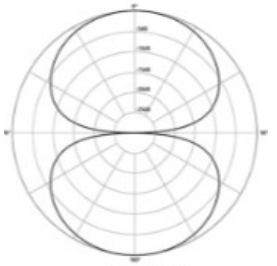



Figure 8

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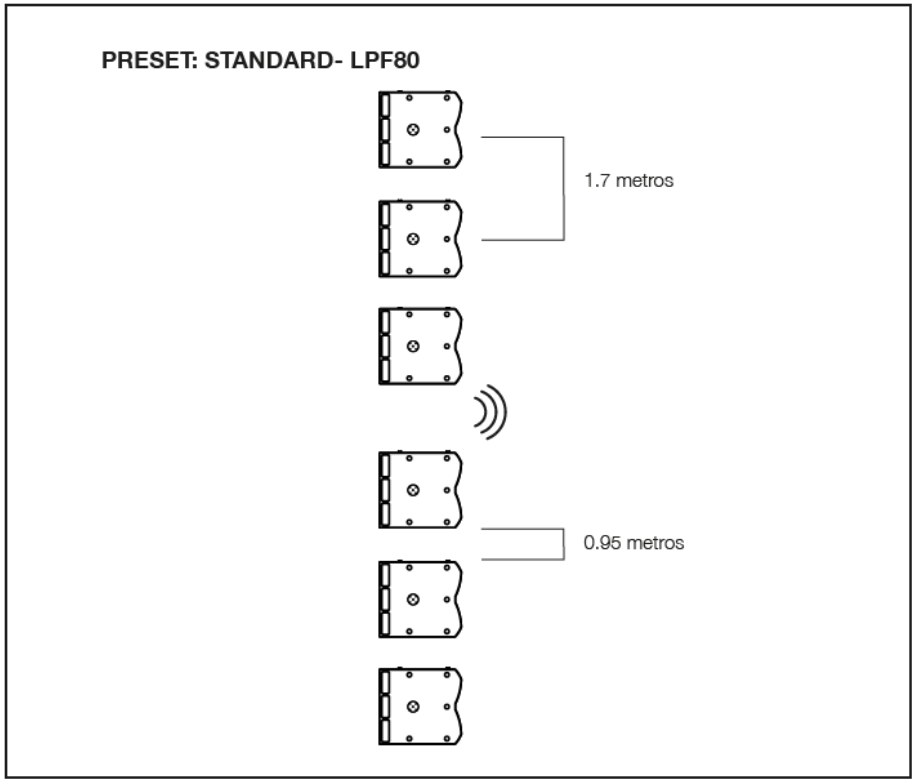
# Advanced subwoofer configurations

6 subwoofer bi-directional (Arc configuration)




Spacing: 1.7 meters between subs
Delay for a 60º coverage:

Box Locations & Delays

| # | X [m] | Y [m] | Z [m] | Delay [ms] | Total Delay [ms] |
|---|---|---|---|---|---|
| 1 | 0,00 | -4,25 | 0,00 | 3,3 | 3,3 |
| 2 | 0,00 | -2,55 | 0,00 | 0,7 | 0,7 |
| 3 | 0,00 | -0,85 | 0,00 | 0,0 | 0,0 |
| 4 | 0,00 | 0,85 | 0,00 | 0,0 | 0,0 |
| 5 | 0,00 | 2,55 | 0,00 | 0,7 | 0,7 |
| 6 | 0,00 | 4,25 | 0,00 | 3,3 | 3,3 |

Filter Settings

Input Configuration: STANDARD

XOVER: LPF80

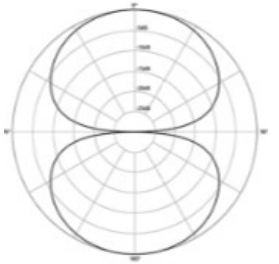
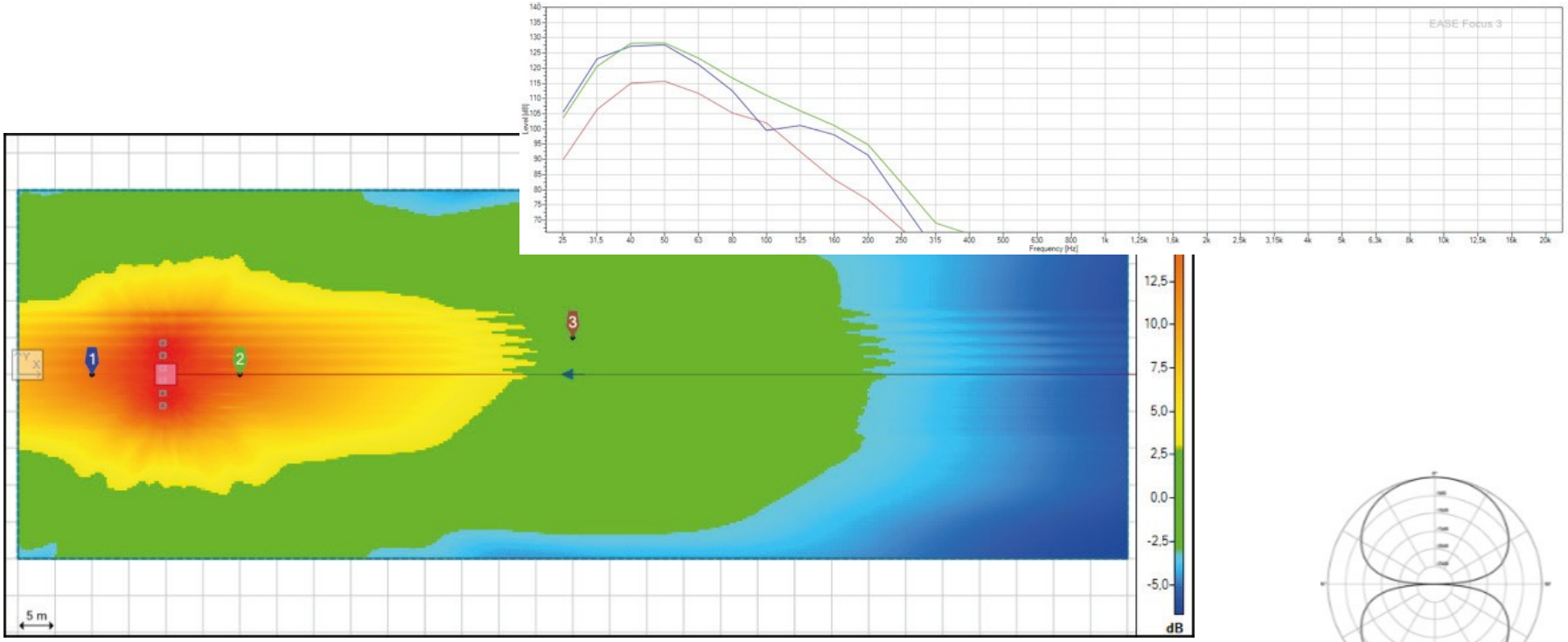


Figure 8

# Advanced subwoofer configurations

6 subwoofer bi-directional (Arc configuration)



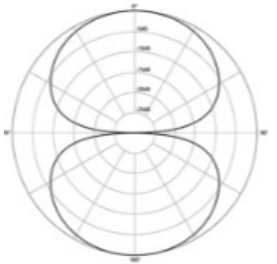



Figure 8

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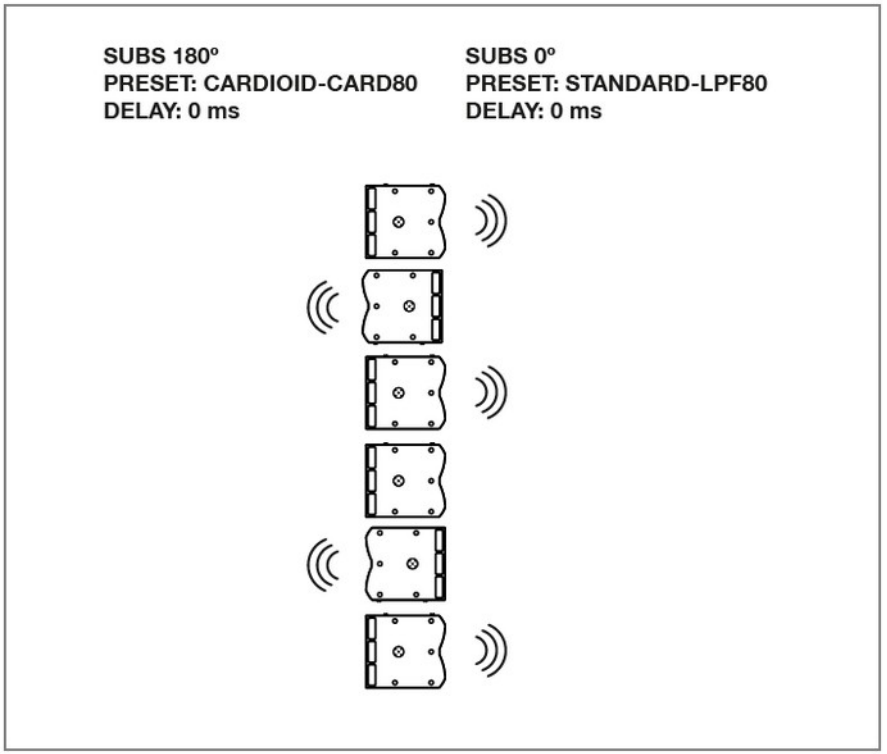
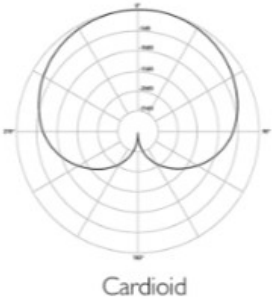
# Advanced subwoofer configurations

6 subwoofer cardioid

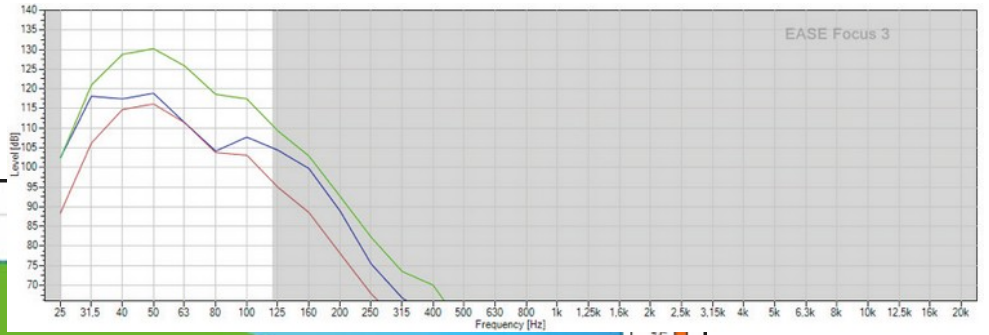


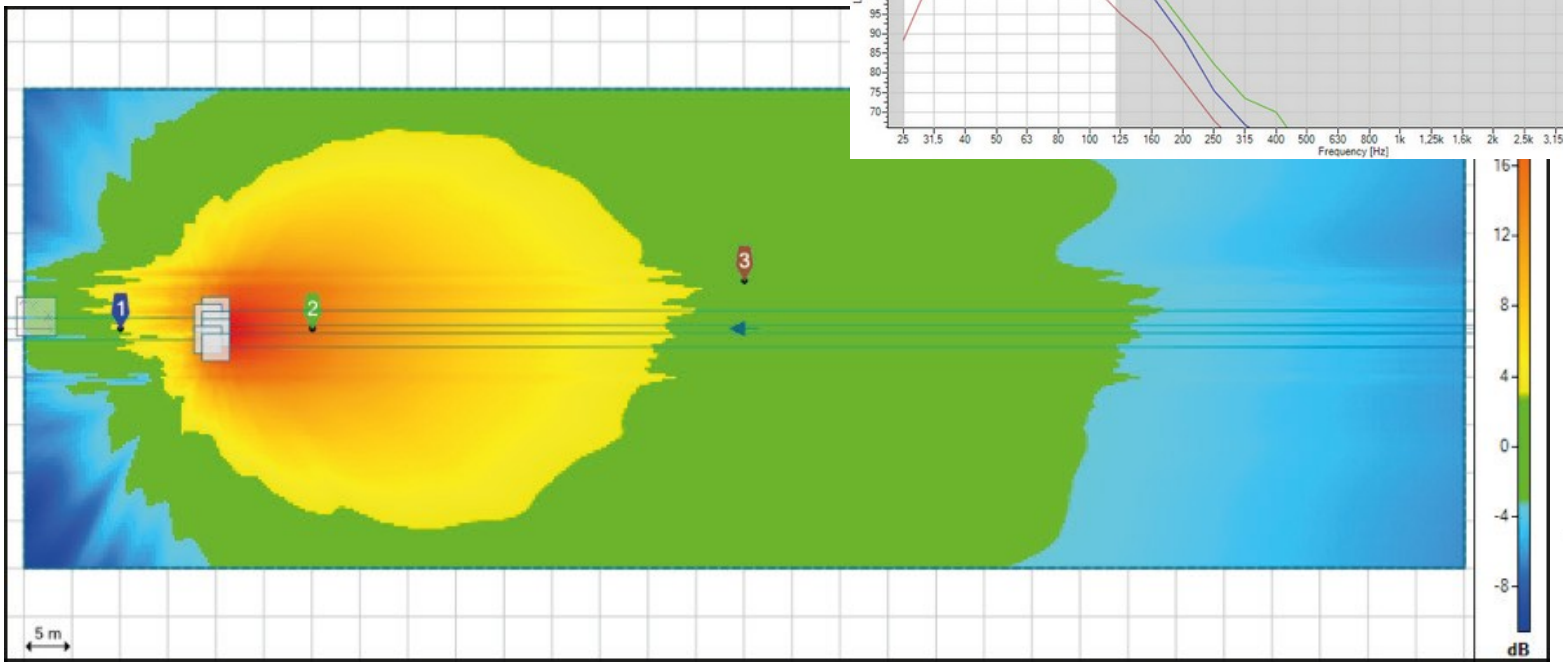

Extended version of the basic 3 subwoofer cardioid array



# Advanced subwoofer configurations

6 subwoofer cardioid





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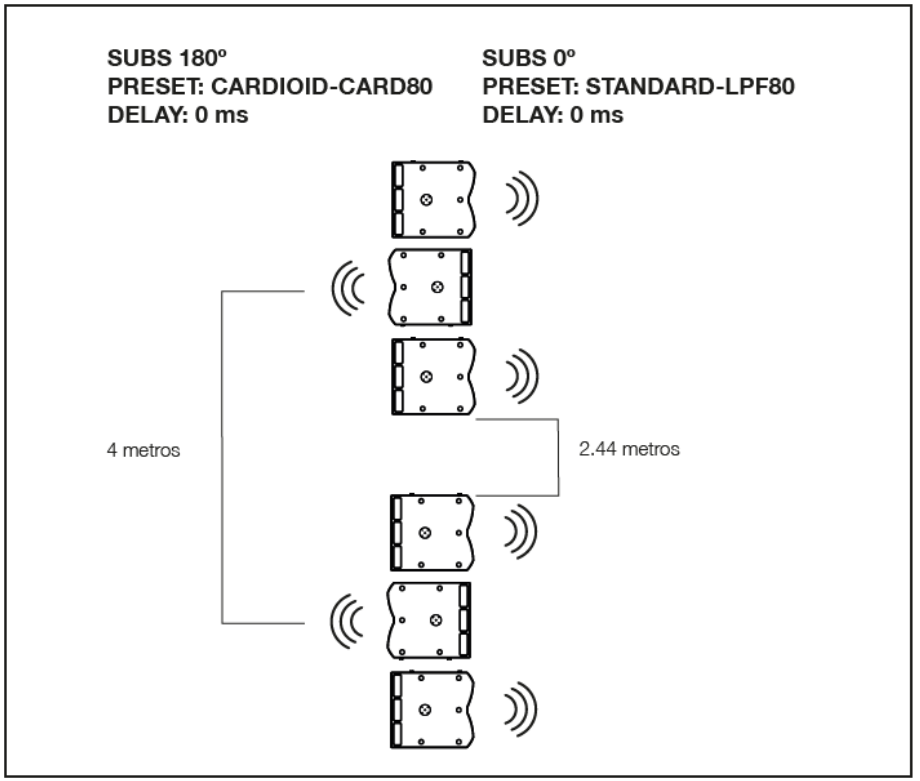
# Advanced subwoofer configurations

6 subwoofer spaced supercardioid




Keeping a **maximum** space of 2.44 meters between the subwoofers changes the polar pattern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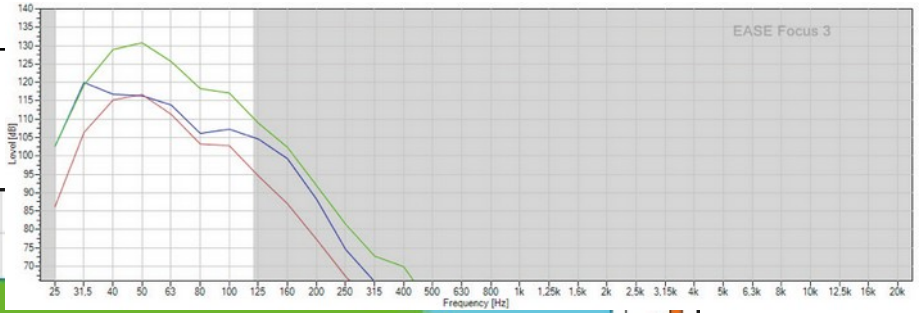
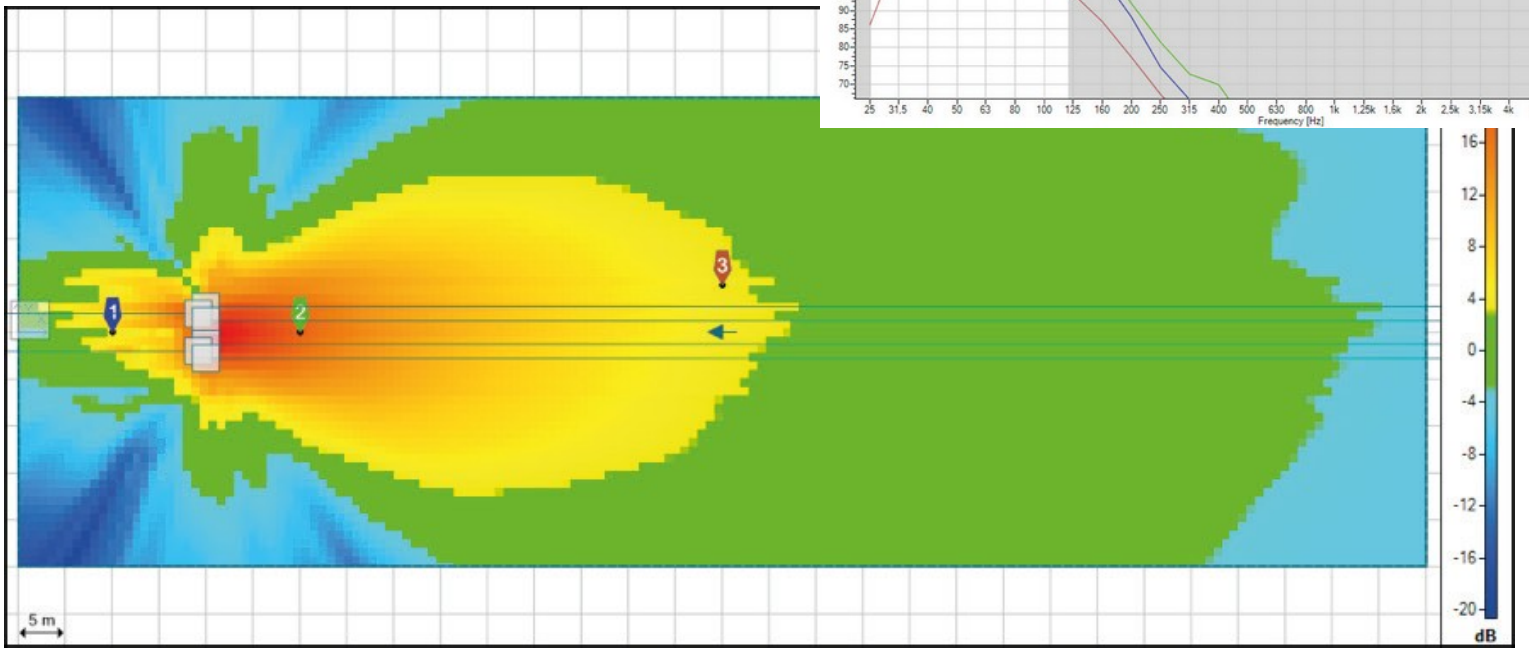
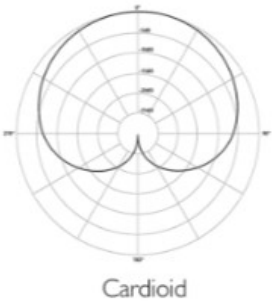
# Advanced subwoofer configurations

6 subwoofer spaced super cardioid

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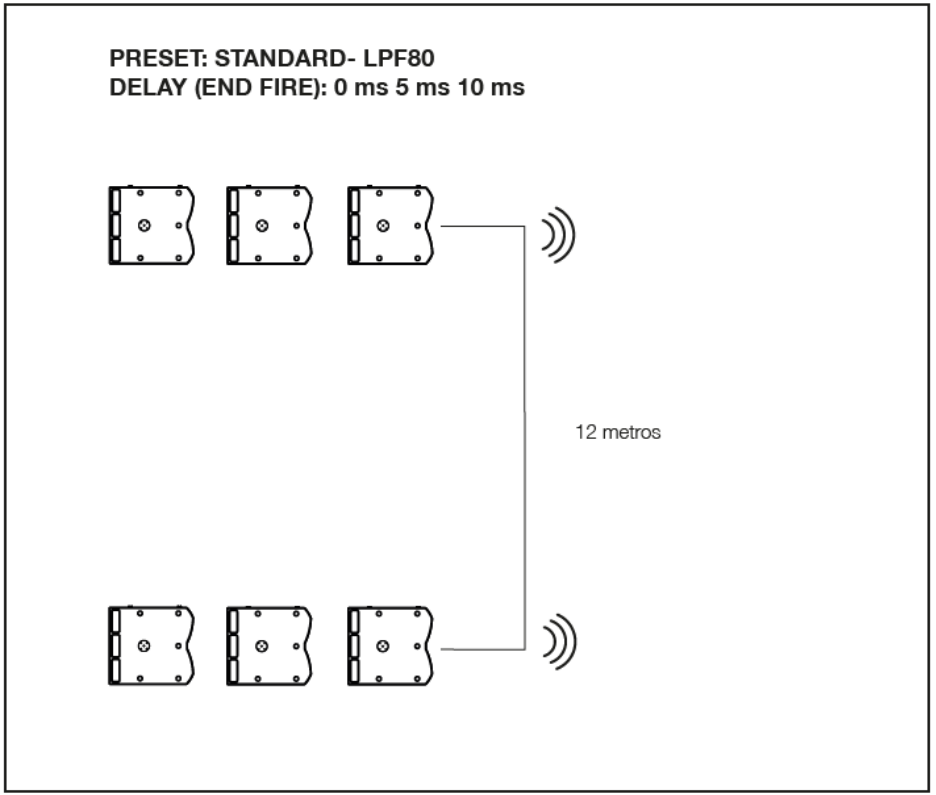
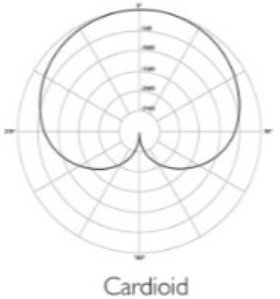
# Advanced subwoofer configurations

6 subwoofer L-R end-fire




Ok so, why not using cardioid configurations in L-R?

Let’s see what happens...

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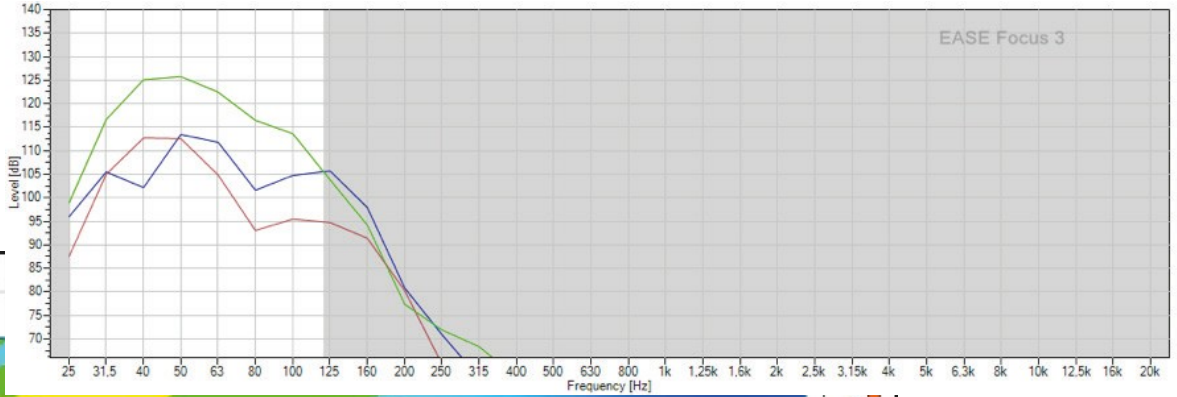
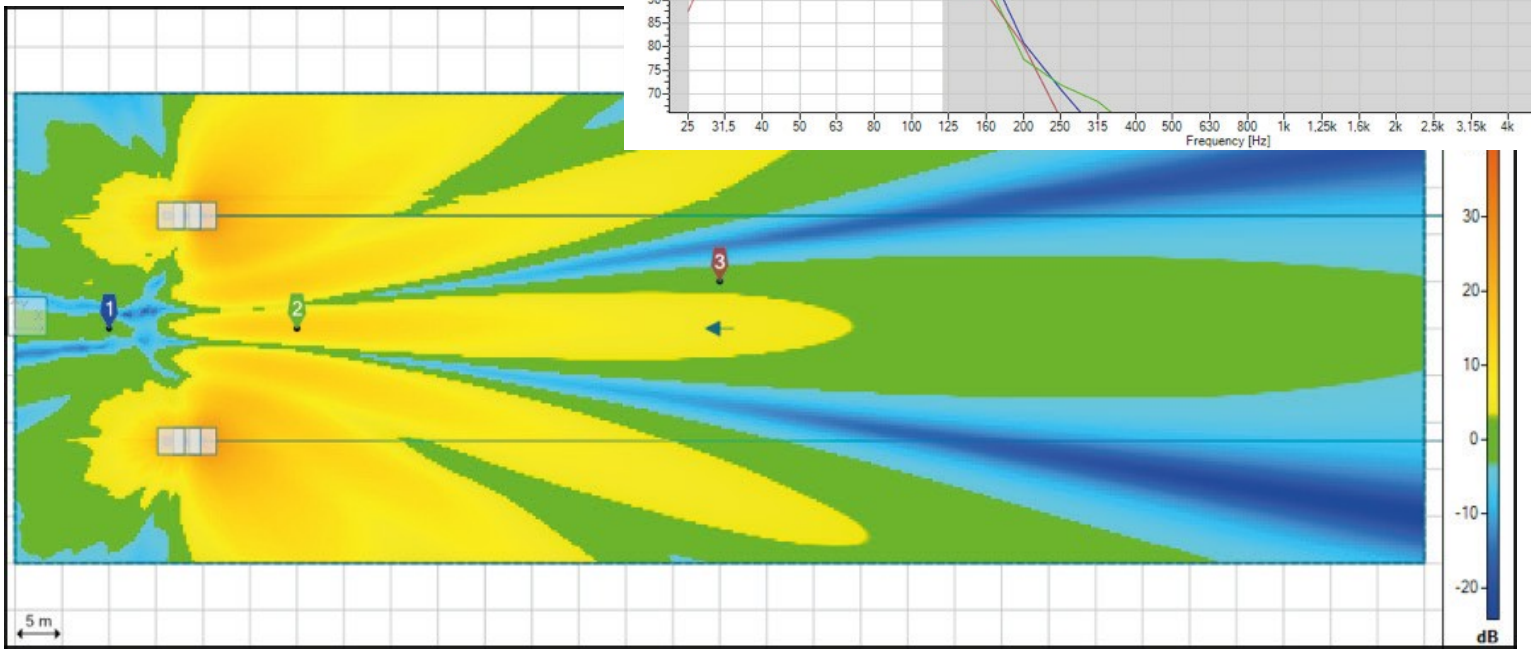
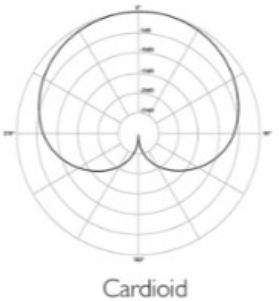
# Advanced subwoofer configurations

6 subwoofer L-R cardioid

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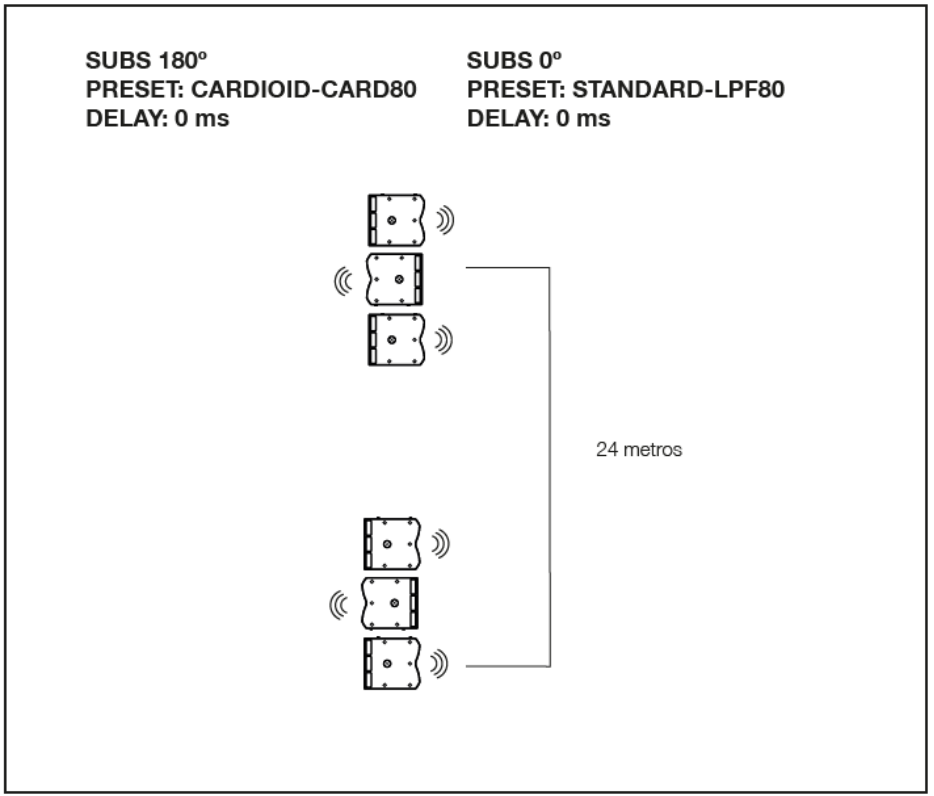
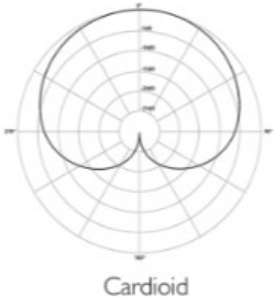
# Advanced subwoofer configurations

6 subwoofer L-R cardioid

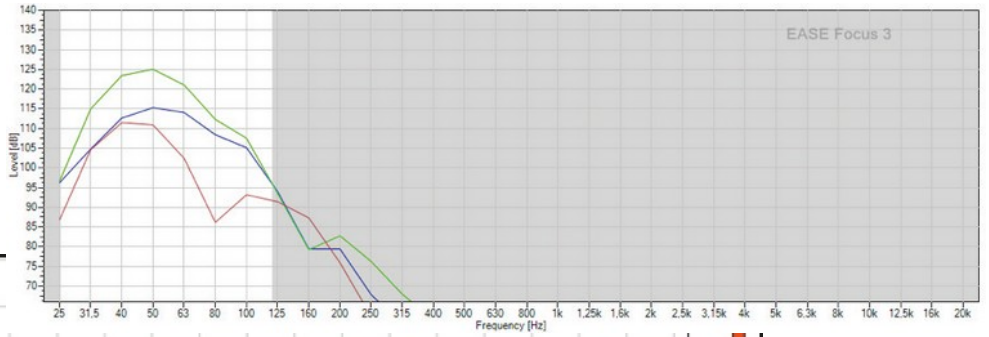


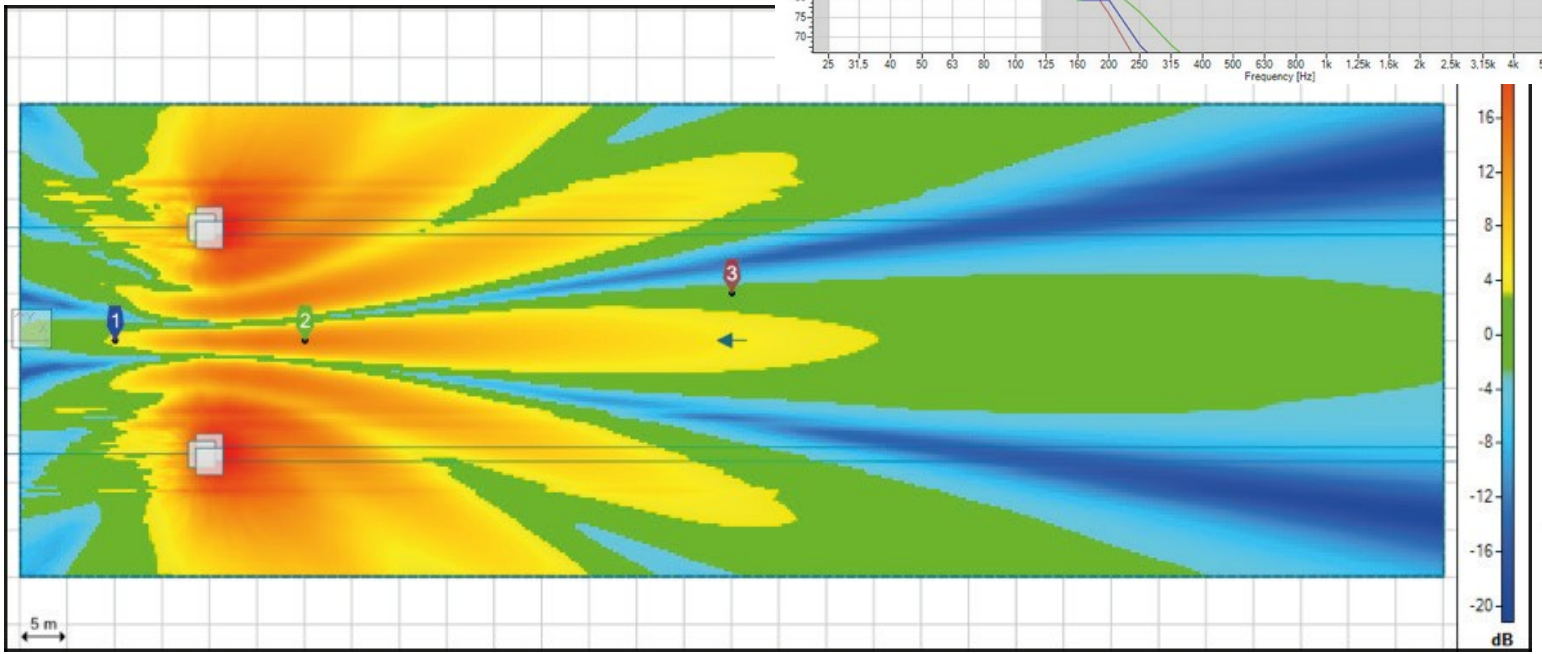

Even keeping 24 meters of separation the resulting frequency response is odd

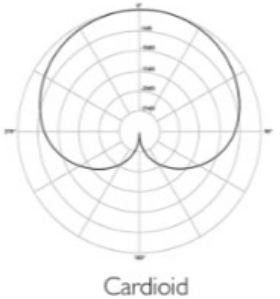


# Advanced subwoofer configurations

6 subwoofer L-R cardioid

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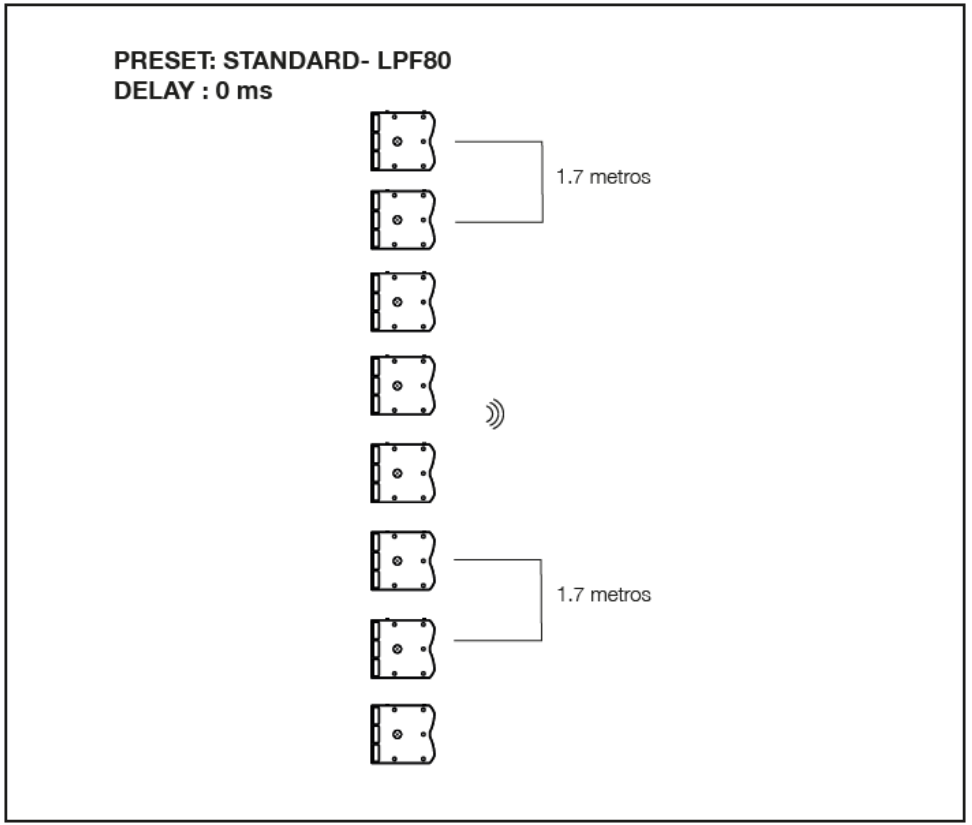
# Advanced subwoofer configurations

12 subwoofer bi-directional




Adding subwoofers in a horizontal array **with a maximum separation of 1.7 meters** results in a narrower directivity!

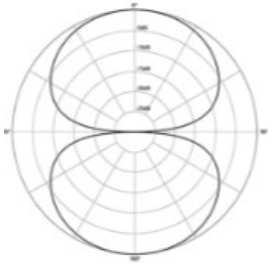


Figure 8

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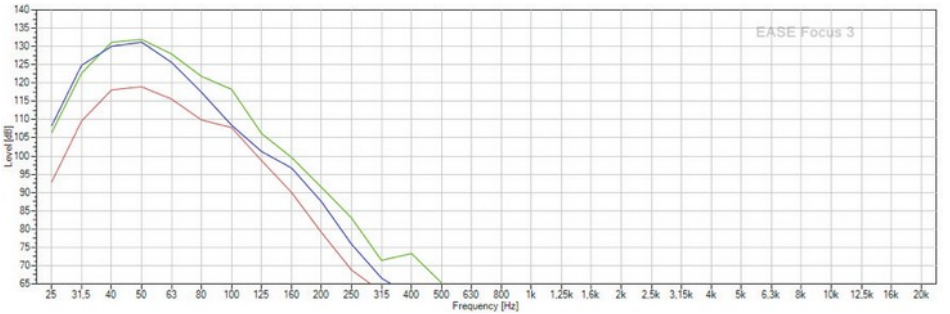
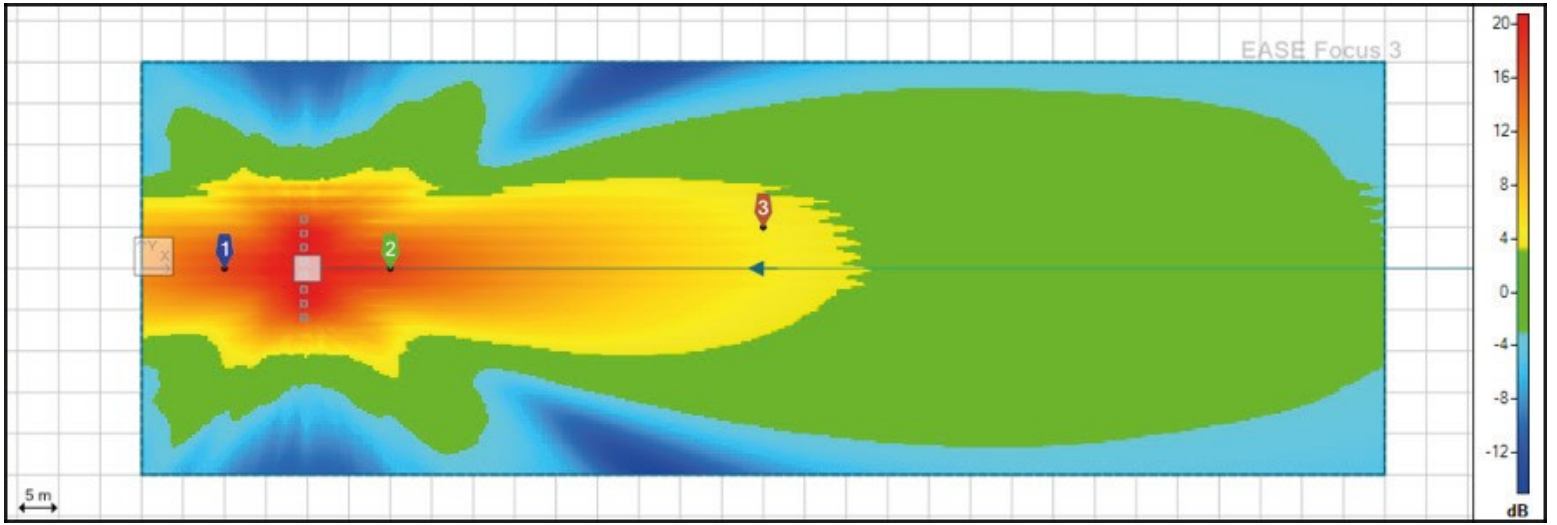
# Advanced subwoofer configurations

12 subwoofer bi-directional



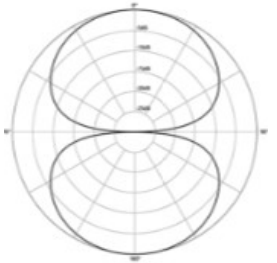



Figure 8

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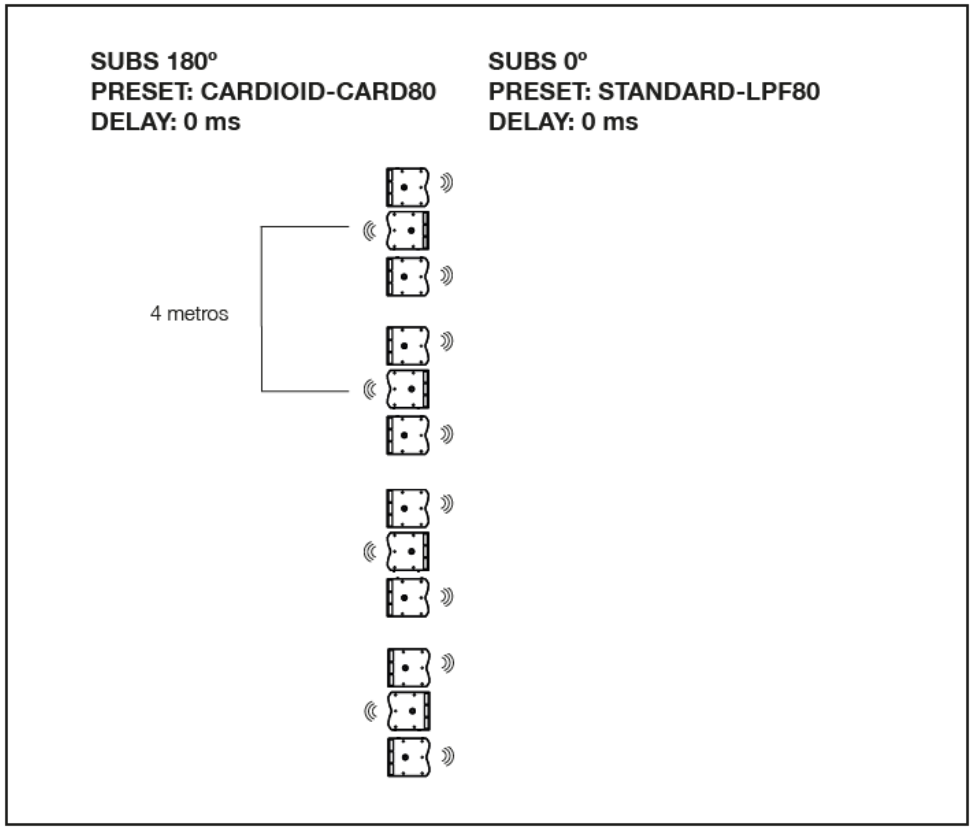
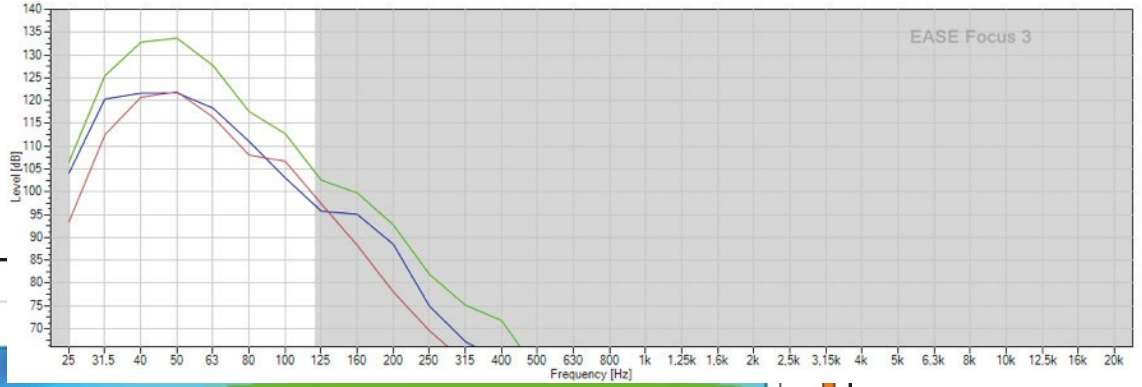
# Advanced subwoofer configurations

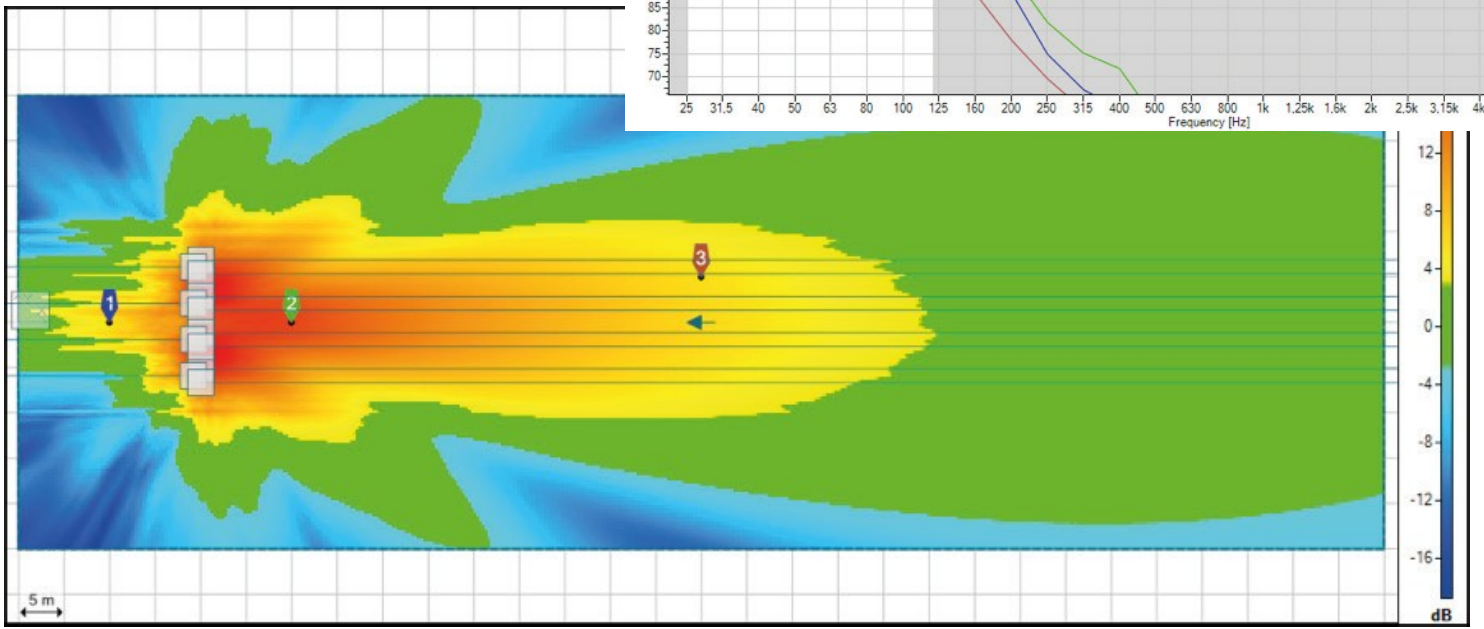
12 subwoofer hypercardioid




# Advanced subwoofer configurations

12 subwoofer hypercardioid





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# Conclusions (I)

- ✔ When several subwoofers are deployed side by side, keeping the same distance between them,  we have a “Subwoofer array”
- ✔ Keep in mind that the longer your subwoofer array, the more directional it will be (to the front and to the back!)
  - ✔ Workaround: add delays to change the directivity of the subwoofer array
- ✔ Keep the distance between subwoofers below 1.7m (between centres)

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# Conclusions (II)

- Use a cardioid configuration when you need to avoid low frequency behind the subwoofers (stage, wall, etc.)
- Using the CARDIOID preset in the “Looking back” subwoofers is all you need to create a cardioid with Amate Audio subwoofers
- Modifying the distance between each cardioid “triplet” can make hypercardioid configurations
- More information in the “Subwoofer Array Application Guide” that will be released after the seminar

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# Reminder: best practices

- ✔ Always avoid “stereo” subwoofer configurations
- ✔ (One more time!)Keep the distance between subwoofers below 1.7m
- ✔ Whenever possible, use an independent signal send on your mixing desk to independently control the subwoofer level
- ✔ Use EASEFocus 3 to predict subwoofer performance in advance

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