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A practical guide for choosing suitable subwoofer positions in a live sound environment

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Introduction

If you have been to enough music events that use a sound system, then you will undoubtedly have noticed that some sound better than others. This can be for a huge variety of reasons and sometimes, most simply it is the artist that is the problem. In other cases, you may find that the bass frequencies lack clarity, punch and power or do not exist at all. Without a good bass sound, the whole experience is compromised, and the music loses its soul. It is the bass frequencies that get you tapping your feet, nodding your head and wanting to move.

So, if it is so important, why does it often go wrong?

An undesirable bass sound can be the result of ineffective mixing, poor quality equipment anywhere along the signal path or even bad room acoustics. These issues can all be solved, though some will take considerably more time and money than others. We are available for consultation to improve any of these areas. Fortunately, the most common and simplest reason is that the subwoofers are in the wrong place.

This guide will provide some simple guidance for positioning your subwoofers in the best possible places.

The guide:

The advice in this guide is suitable for small- medium sized venues (think up to approx. 400 seated) and assumes the user has access to omni-directional subwoofers, as these are the most common. The recommended maximum distances between units is based on a crossover frequency of up to 100 Hz.

Please also note that to achieve good results, it is essential that the room acoustics be factored into any decisions involving sound reinforcement positioning. For example, where strong room modes are present, the position of a subwoofer in-particular can result in significant variations in level across the frequency spectrum, often heard as an increase in level when certain notes are played on the bass guitar. Though room acoustics are not discussed in this guide, the principles presented here will generally be useful for improving the quality of the bass sound in most scenarios.

If you have one subwoofer:

This should be placed on the centre line of the room. It is most likely omni-directional and will provide the most even coverage from this position.

If you have two subwoofers:

Where possible, place these about the centre line of the room. They should be no more than 1.1 m apart and the combined length (outer edge of the sub to the outer edge of the next) must be less than 3 m. The system will become very directional beyond that length.

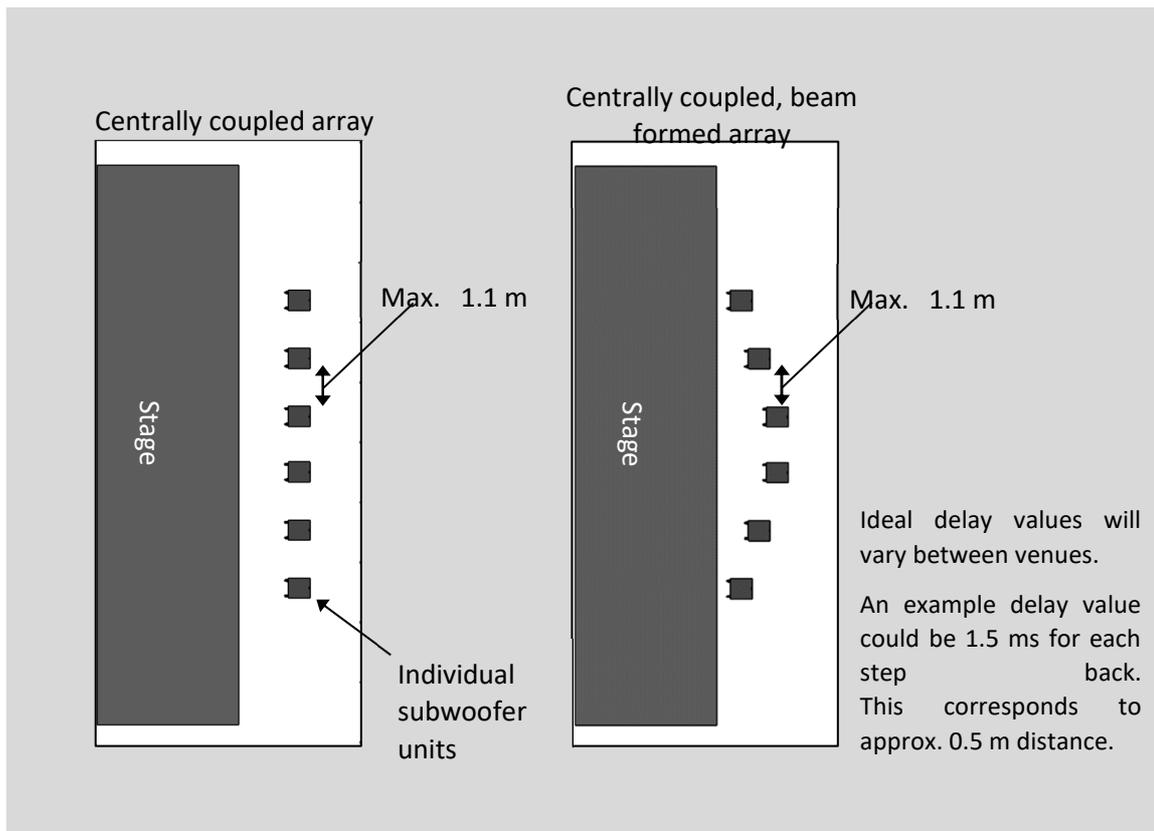
More than two subwoofers:

If you have access to more than two subwoofers, then the advice becomes more complicated and the size of the room will influence the placement. Centrally placed arrays are preferable where possible.

Central array options

If the audience area will be no wider than the width of a coupled sub array when each unit is spaced at 1.1 m (a maximum of 1.5 m at a push), then a coupled sub array will be the best approach.

If the audience area is wider than a coupled sub array, then consider using a beam forming technique (also known as beam steering) to widen the directivity of the array. This will allow you to effectively cover an audience area approximately twice the width of the array. Beamforming can be achieved by delaying the signal to the outer subwoofers, either by using a DSP (digital signal processor) or physically positioning the subwoofers closer to the stage. An example is shown in the image below.



Left/ Right Array options

Where the subwoofers cannot be positioned centrally, then consider placing them at the Left and Right corners of the stage. Particular care should be taken when using Left/ Right configurations as these will introduce lobing effects and constructive and destructive interference patterns across the audience.

If placed in a horizontal array (not stacked) that is less than 3 m long, the bass sound will cover the whole audience area but have large variations in level at certain frequencies across the audience.

If the array is to be longer than 3 m then it becomes highly directional, like a beam. Beam forming can be used to prevent the formation of a channel in the centre of the room being absent of bass. The details of this are very dependent on the size of the audience area and length of the array. As a guide, the arrays either side of stage can use beam forming to widen the coverage pattern or to steer it towards the centre of the room. Either way, there will still be variations in level across the audience area.

Conclusions

Where possible, place your subwoofers centrally in front of the performance area. If this is not possible, for instance where there is no raised stage area, then place the subs as close to the centre line of the room as possible and seek advice to minimise unwanted variations in level.

It is important to note that the advice included in this guide is not fully comprehensive. There will be situations that are not covered and instances where the advice is not applicable. If you are unsure or wish to seek further help, we are available for consultation. Together with our expertise and partners in the industry, we can solve any of the issues discussed in this guide.

11 February 2021