



DIRECT ACOUSTICS

Zone Array Speaker Systems – Marquee

Project. **High Peak**

Proposal No. **238/001**

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Proposal for High Peak - Zone Array Speaker Systems for Marquees

Direct Acoustic Solutions

Direct Acoustics assist in controlling amplified music, obtaining licences and gaining planning consent for entertainment venues in noise sensitive locations. We achieve this by using intelligent speaker systems, specifically designed process-limiting software and isolated mass barriers, as required. Using these techniques, Direct Acoustics minimise and control the problematic bass frequencies that conventional speakers systems and traditional soundproofing cannot.

Direct Acoustics manufacture, install, service and manage equipment and mitigation strategies to obtain maximum volume levels whilst abiding by specific Institute of Acoustic (IOA) guidelines and Environmental Health law.

Using the experience we have gained working exclusively with noise sensitive venues, we are able to make a unique offering to High Peak by developing and designing a bespoke sound system, frequency specific control platform and attenuation methods for their specific marquee, landscape and environment.

Brief

Direct Acoustics have been invited to propose a suitable speaker design for a marquee development.

The speaker design and process limiting platform are required to have the capacity to control and attenuate the breakout of noise from the High Peak marquee until 00:00 hours.

The predominant sound source will be amplified music.

Approach

In order to protect the nearby residential properties from amplified music, Direct Acoustics are proposing the installation of a highly directional speaker system, called a Zone Array.

Together with bespoke process limiting, we can provide the venue with a means to control amplified music without disturbing residents in nearby houses.

At close proximity, a conventional speaker system will not provide adequate protection and the venue would be at increased risk of receiving noise complaints.



The speaker system is usually concealed behind the marquee ivory linings. The image above is used to provide an understanding of location and orientation.

Zone Array

The Zone Array is a modular speaker system, enabling hundreds of loudspeakers to be installed across a single plane. Due to the alignment and orientation of the speakers, the system becomes highly directional. Through this directionality, it is possible to control acoustic temperatures and volume levels within specific areas, as required.

Further technical specifications relating to the Zone Array can be found in the attached appendix.

Benefits include:

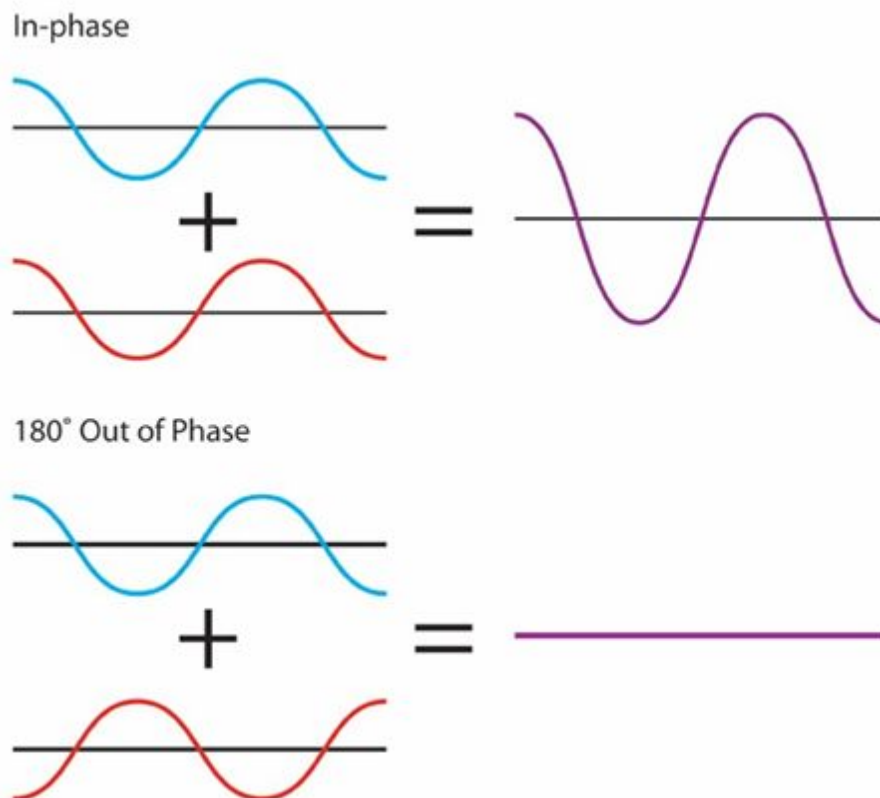
- Solving noise problems
- Guests can converse at tables away from the dancefloor
- Increased volume levels within the venue
- Avoiding installing a cut-off limiting device
- Keeping staff within Noise at Work regulations
- Multiple use of a single space within a venue
- Provide support for planning and licensing applications.

The Zone Array has been built primarily to provide a solution for venues that are struggling to control noise, specifically bass. Using constructive and destructive interference to both create and localise low frequencies, the system can achieve results in scenarios of extreme sensitivity, where conventional speaker systems and/or traditional soundproofing methods have proved ineffective.

Phase Cancellation - Engineering the control and dispersion of sound and unwanted noise.

Destructive Interference - Sound waves clashing into one another creating “noise cancellation”. This works on the axis toward the noise sensitive dwelling.

Constructive Interference - Sound waves coupling together to create full frequency sound on the dance floor. This constructive coupling will only occur directly underneath the Zone Array. Only 1m away you will be into the destructive interference phase.



Targeted Sound

Using a Zone Array speaker system allows you to select specific areas, creating “hot zones” of sound within a single space. Outside of these zones, volume levels decay at a much faster rate than a comparative conventional speaker system. This means whilst areas requiring high volume levels, i.e. dancefloors, can be catered for without compromise, surrounding areas such as tables and bars can be individually treated according to the specific requirements and noise sensitivity of each venue or event.

Distributed Speaker System

As described above, the Zone Array speaker system provides highly directional sound to the dancefloor area. In order to provide an even background sound throughout the venue, an additional distributed speaker system should be used.

Standard speaker cabinets are omnidirectional in the way they radiate sound. Therefore, multiple smaller speakers installed throughout the rest of the marquee, away from the dancefloor, are employed to provide an even distribution of sound throughout the entire venue.

Best coverage within a pole tent High Peak propose to use, is to install the distributed speaker system at the top of the external marquee legs.

The distributed speaker system can be used to provide background music during the wedding breakfast or for daytime events, speeches and presentations, as well as reinforcement of the Zone Array in the evenings.



Control

The Symetrix Prism DSP (digital signal processor) is the control unit of our installations. It enables all inputs/outputs to be processed and limited to the requirements of each venue and any planning/licensing conditions.

This process limiter controls the output power and therefore the volume level of the visiting DJ or band, who are able to plug in directly via an XLR patch point.

Through an open architecture software program, Direct Acoustics have created a frequency specific limiting module that has the capacity to remove and control troublesome frequencies, dependent on venue specific criteria.

This enables us to setup and limit levels within the venue, to ensure minimal impact upon the nearest noise sensitive receptors.

The Symetrix Prism can be setup and password protected in conjunction with relevant authorities to prevent tampering.



Amplification

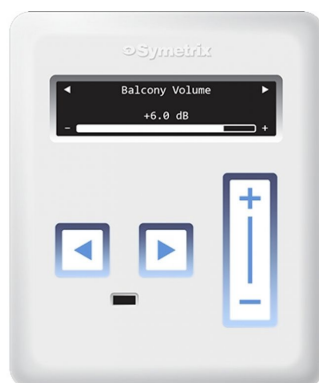
The Zone Array will be powered by multiple Powersoft K3 amplifiers. This amplifier consists of 2 x 2,800W (2 Ohms) & 2 x 2,600W (4 Ohms) channels.

The Powersoft Range has been selected due to its exceptional quality of sound, overall reliability and energy saving technology.



Control Units and Racking

As part of our installation the equipment rack is positioned in a back-of-house location, away from potential interference by visiting acts. Volume control, source selection and preset recall are controllable via a wired interface (Symetrix ARC-3) or phone/tablet device.



Setup

Upon final installation, there will be an opportunity to acoustically soundscape the marquee at High Peak. Multiple zones can be limited and equalised to suit a variety of potential events. Setup sessions can be arranged with Direct Acoustics' sound engineers to finalise the acoustic impact of the marquee.

During this process it will be possible to identify multiple presets that can be easily recalled by the management to suit the requirements of each event.

Silent Stages

The Zone Array and Distributed PA systems will control the output power and volume level of any amplification equipment we run through the Symetrix Prism process limiter.

Marquees that permit bands and live music beyond 23:00 may need to also consider the non-amplified nature of the instruments on stage and additional equipment live acts require to perform. These are as follows:

- Drum Kit – Non Amplified
- Guitar Amplifiers – Amplifies signal from guitars
- Stage Wedge Monitors - Speakers pointing at the musicians

All of the above create sound and therefore potential noise issues.

All can be overcome by creating a silent stage and using:



- Drum Kit – A Digital Drum Kit



- Guitar Amplifiers – replaced with Direct Injection Boxes



- Stage Wedge Monitors – Either in-house monitors and ran back to the process limiter or in-ear monitors will work.

This will require further discussion with High Peaks management should you choose Direct Acoustics as your solution provider.

Demonstration and Testing

We can demonstrate and test the effectiveness of the Zone Array speaker system in free field condition at the proposed site location by installing a demonstration Zone Array system. This allows us take a selection of L_{A90} ambient measurements and L_{Aeq} measurements with the system running and present acoustic data back to the management in report form.



There are over 70 venues that are now using the Zone Array speaker system. With regards to High Peaks requirements, a few of venues that might be of interest have been listed below.

New Hall Hotel, Sutton Coldfield - 36 x Zone Array
Grange Farm, Peterborough - 64x Zone Array
Mountains Country House, Kent - 48x Zone Array

I hope this meets your requirements. Please don't hesitate to get in touch if you have any questions.

Regards,

Richard Anderson

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Technical Appendix

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- Technical Specification
 - Frequency Specific Data
-

Technical Specification of Zone Array

Zone Array Speaker Panel (NL4)

- Frequency Response: 50Hz - 18kHz/120W(RMS)/72 Ω
- Power: 60W (RMS)
- Impedance: 8 Ω
- Connection: NLF4 speakON IN/OUT
- Dimension: 600mm x 600mm x 70mm
- Weight: 5.4Kg
- Material: 0.8mm Aluminum
- Perforation: 3939
- Attenuator: Melamine Foam Insert

Frequency Specific Data from Zone Array Over Distance

Location/Source	Source Input	L_{Aeq}	Reduction	Total Reduction
Dance Floor - Zone Array	Pink Noise	99.11		
2m - Zone Array	Pink Noise	88.67	10.44	10.44
4m - Zone Array	Pink Noise	74.47	14.2	24.64
8m - Zone Array	Pink Noise	65.81	8.66	33.3
16m - Zone Array	Pink Noise	59.1	6.71	40.01
32m - Zone Array	Pink Noise	53.76	5.34	45.35

Location/Source	LZeq 63Hz	LZeq 125Hz	LZeq 250Hz	LZeq 500Hz	LZeq 1kHz	LZeq 2kHz	LZeq 4kHz	LZeq 8kHz	LZeq 16kHz
DF Zone Array	89.65	97.83	99.16	92.45	89.87	83.23	76.07	79.07	55.89
2m Zone Array	78.38	81.34	80.97	81.58	76.44	81.39	72.52	72.74	50.08
4m Zone Array	72.96	70.22	69.42	66.11	64.15	63.18	53.62	53.33	30.63
8m Zone Array	64.44	61.44	60.39	61.29	54.65	54.11	41.38	37.7	15.64
16m Zone Array	57.66	49.57	40.74	55.1	48.32	45.51	32.63	27.37	11.75
32m Zone Array	52.93	42.81	37.6	50.64	43.69	38.75	26.13	19.87	10.96

Location/Source	LZeq 63Hz	LZeq 125Hz	LZeq 250Hz	LZeq 500Hz	LZeq 1kHz	LZeq 2kHz	LZeq 4kHz	LZeq 8kHz	LZeq 16kHz
DF Zone Array	89.65	97.83	99.16	92.45	89.87	83.23	76.07	79.07	55.89
2m Zone Array	78.38	81.34	80.97	81.58	76.44	81.39	72.52	72.74	50.08
4m Zone Array	72.96	70.22	69.42	66.11	64.15	63.18	53.62	53.33	30.63
8m Zone Array	64.44	61.44	60.39	61.29	54.65	54.11	41.38	37.7	15.64
16m Zone Array	57.66	49.57	40.74	55.1	48.32	45.51	32.63	27.37	11.75
32m Zone Array	52.93	42.81	37.6	50.64	43.69	38.75	26.13	19.87	10.96