Guidance on the Use of Qt Active Emitters for Paging / Background Music Only Applications

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Preface

Since the release of Qt Active Emitter, applications outside of sound masking have arisen where the use of these devices have been requested for both paging only or background music only. This document serves as a set of guidelines for use of the product in these applications.

Coverage

The Qt Emitter spacing requirements for sound masking applications is determined based the dispersion characteristics of the driver to achieve a spatial uniformity of +/- 1 dB. These guidelines are published in Cambridge Sound Management Design Guidelines with the emitter spacing determined on mounting the height of the device. (i.e. 10ft spacing for a 9ft high mounting height).

It is common practice in the professional audio industry to achieve less spatial uniformity in paging and back ground music applications with +/- 3 dB being acceptable in most circumstances. Therefore, it is assumed by many that the more sparsely placed Qt Active Emitters are permissible for paging/music applications. While true to a certain point, other considerations must be considered when determining the number of devices required for a specific paging/music application.

Sound Pressure Level

The Qt Active Emitter has a maximum sound pressure level of 60 dBA for sound masking applications and 74 dBA for other signal sources such as paging and background music. These SPL measurements are based on an **array of active emitters** being present at a measured distance of 1 meter (3.3 ft.).

Inverse Square Law determines that for every doubling of distance from listener to the device, a loss of 6dB will be realized. Therefore, a listener 2 meters (6.6 ft.) away from the devices(s) would experience maximum sound pressure levels of 54 dBA for sound masking and 68 dBA for paging/music signals. The table below calculates maximum SPL at varying ceiling heights for both masking and paging at a seated listener height of 4ft.

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Qt Active Emitter Array Calculated Maximum Sound Pressure Levels by Mounting/Ceiling Height		
Mounting/Ceiling Height	Sound Masking Max SPL	Audio Source Max SPL
8 ft. - (2.4 M)	58 dBA	72 dBA
9 ft. - (2.7 M)	56 dBA	70 dBA
10 ft. - (3 M)	55 dBA	69 dBA
11 ft. - (3.3M)	53 dBA	67 dBA
12 ft. - (3.6 M)	52 dBA	66 dBA
14 ft. - (4.2 M)	50 dBA	64 dBA
16 ft. - (4.8 M)	49 dBA	63 dBA
18 ft. - (5.4 M)	47 dBA	61 dBA
20 ft. - (6.0 M)	46 dBA	60 dBA
24 ft. - (7.3 M)	44 dBA	58 dBA

Frequency Response

The Qt Active Emitter has an effective frequency response of 115Hz to 12,000Hz for paging and background music applications resulting in very good speech intelligibility for office paging applications. This response is predicated on an array of emitter devices which are spaced within approximately one wavelength of the low frequency limit. - or - 12ft (3.6 M) apart or less.

In cases where the Qt Active Emitter device spacing exceeds this 12ft (3.6 M) distance, a decrease in low frequency performance can be expected as the devices will no longer couple at lowest frequencies. This also has the effect of quickly lowering the broadband SPL output of the Qt Active Emitters from those stated previously as the Qt Active Emitter effectively becomes an individual point source device without the aid of coupling from other nearby active emitters.

Signal to Noise Ratio (S/N Ratio)

An effective paging system's sound pressure level must exceed the ambient noise level of a given space by an adequate amount for speech intelligibility to occur. This difference is referenced as a minimum signal to noise ratio of 15 dB in most pro audio / acoustics references. Thus, a good design guideline would be to ensure that the paging/music signal be 15 decibels louder than the ambient noise present within the space if intelligibility is to occur. In quieter office spaces for which the Qt Active Emitter was designed, chances are quite good that this can easily be achieved, but in some reverberant or high noise spaces this excess level can be difficult to obtain.

As an example, an office environment with a constant sound masking level of 48 dBA being the ambient sound level, the paging signal need be only above 63 dBA in level (48 dBA + 15 dB S/N = 63 dBA) to be clearly understood. If, however a noisy warehouse has with an ambient sound pressure level of 65 dBA, the paging level requirement would need to exceed 80 dBA (65 dBA + 15 dB S/N = 80 dBA) as measured at the listener location. By referencing the paragraph on sound pressure level above, one can see that this latter example would not be a good application for the Qt Active Emitter capable of only outputting 74 dBA at a distance of 1 meter.

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Conclusions

Qt Active Emitter mounting heights, device array spacing, and ambient noise levels all play an important role in providing a suitable paging and background music system. One should always consider the noise levels of the environment first to determine the actual amount of sound pressure level needed by adding 15 dB to the ambient noise level of the space to help assure adequate intelligibility. Next, one should determine if that sound pressure level target can be achieved based on the mounting height of the Qt Active Emitter array using the table above. Finally, it is important to understand that both the frequency response and sound pressure levels are predicated on emitter spacing of less than one wavelength of lowest frequency cutoff point.

When the sole purpose of installing Qt Active Emitters is that of paging or background music and when the need for spatial uniformity is less than that of a sound masking system, it is permissible to extend the spacing of devices in the array up to a maximum distance of 12' (3.6 M) regardless of mounting height. The designer should understand however that such spacing will result in greater variations in the frequency response and level of what the listener experiences in mounting heights below 11ft (3.3 M). If it is determined that sound masking need be deployed in these areas where spacing has been extended, readjustment to standard published emitter spacing will be necessary to provide adequate speech privacy and uniformity.

Cambridge Sound Management does not recommend the deployment of Qt Active Emitter products outside the guidelines listed here under any circumstance. Furthermore, Qt Passive Emitters should always adhere to the published design and layout guidelines regardless of application.

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