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ACOUSTIC EXCELLENCE[®]

How Far will that Speaker “Throw”?

Sound reinforcement systems are characterized by a wide variety of technical specifications. Although the term “throw” is not a technical specification the term is frequently used to describe a specific performance parameter. A frequent question is “How far will this speaker “throw”?”

Unfortunately, the answer to this question requires additional information before it can be properly answered. The “throw” question is asked in order to try and understand a loudspeaker system’s ability to project some specific sound pressure level (SPL) over some specific distance. There are specific system performance parameters that must be considered, such as the system 1 watt at 1 meter sensitivity and the system power handling. (NOTE: The system 1 watt at 1 meter can be a function of the system directivity, or Q, and to that extent the term “throw” and the system Q are related but not identical. Two loudspeaker systems, both with the same Q will only have the same “throw” if the on axis 1 watt at 1 meter sensitivity and power handling are also identical. Additionally, a loudspeaker system with a lower Q but higher 1 watt at 1 meter sensitivity and higher power handling will actually “throw” farther than the “high Q” system!)

In addition to the loudspeaker performance parameters the desired SPL at a specific distance is required to properly answer the question and in reality, what is really being asked is “How loud can I get the system at some distance”?

An example may help here:

Customer Question One: “How far will the One Systems 212CIM throw”?

Engineer Answer (with a question unfortunately): “What SPL do you require”?

The reason the second question is asked is to determine the performance requirements for the venue.

Customer Answer: “This is a softball field and we have measured A weighted crowd sound pressure levels at 90dB and that crowd is 75 feet from the location of the loudspeaker mounting position”.

Engineer Answer: "Great, the One Systems 212CIM is rated at 1 watt at 1 meter to produce a sound pressure level of 99dB. So, 75 feet is 22.8 meters, and that means that at 1 watt of input the SPL will be reduced by 27.1dB. (Spherical spreading loss only i.e., a 6dB loss for every doubling of distance, and no atmospheric losses are assumed at this distance, although there will be some based on actual wind and humidity conditions!)

Now, if we take the 1 watt at 1 meter level of 99dB and reduce it by the distance of 75 feet we see that the 212CIM will produce a sound pressure level of 71.8dB with a one watt input.

The customer has specified the crowd level of 90dBA (this is very loud!) and since we would like to have 3dB or more level above the crowd in order to make our announcement or music or other program material intelligible we calculate that we will need approximately 93dB of SPL. This will require a power input to the loudspeaker system of 132 watts.

So, the 212CIM will "throw" 75 feet, but we only know this because we know what SPL we need to achieve at this distance! (Without knowing the necessary SPL we have no way of answering the question!)

Customer Question Number 2: "But, we also have a baseball field where we have to mount the speaker on the score board in center field and we need to have good intelligibility at the back of the stands behind home plate, so, will the 212CIM "throw" 450 feet?...will that work too"?

Engineer Answer Number 2: "Will the crowd be talking at normal speech levels or screaming"?

Customer Answer: "What's the difference"?

Engineer Answer: "Well, let's see...assuming spherical spreading only (6dB loss for every doubling of distance) the SPL at 450 (137 meters) feet will be reduced by almost 43dB (42.7dB to be exact), so the SPL at 1 watt of power input to the 212CIM will be only 56.3dB!

So, let's add some power and see what happens. If we are trying to get 3dB above average speech levels, we will need about 63dB since normal "talking" is about 60dB. That means we would need 4.7 watts of power...no problem, the 212CIM will "throw" 450 feet without any issues"!

Customer Answer: "But you silly engineer, this is a sporting event, we need to get louder than that"!

Engineer Response: "OK, let's see what we can do at 85dB SPL...we need 741 watts. This can be done, but we're getting up fairly high in power levels, but OK, make sure you have an amplifier with plenty of power, so we have good head room!

Now, if you only need 82dB (still fairly loud), we only need 370 watts...easy to do.

But, if you need 88dB you will need 1482 watts...NOT recommended and you should use the One Systems Cross Field Array"!

SUMMARY:

Based on the examples above the One Systems 212CIM will throw 450 feet, no problem, or maybe a problem, or not at all...

IT ALL DEPENDS ON WHAT SPL YOU REQUIRE AT A SPECIFIED DISTANCE AND WHAT POWER LEVEL IS AVAILABLE AND SAFE FOR THE SYSTEM!

The calculations above apply to ALL manufacturers and to ALL speaker systems.

Do some loudspeakers throw farther than others? Of course they do and it's easy to compare the two speakers based solely on the system 1 watt at 1 meter sensitivity AND system power handling.

However, asking "how far will the 212CIM throw" (or ANY speaker from ANY manufacturer), can only be answered by asking more about the acoustic requirements of the system, then running calculations based on those requirements and the loudspeaker system's sensitivity.

When a manufacturer specifies a "throw" distance for a loudspeaker system without asking what the required SPL is they are providing incorrect information. It is unfortunate that the term "throw" exists at all, as it frequently leads to system installations where inappropriate loudspeaker systems are specified for the acoustic space.

A far better question is: "What SPL can I achieve at "X" distance with this system and at what input power level"?

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