SRS Design

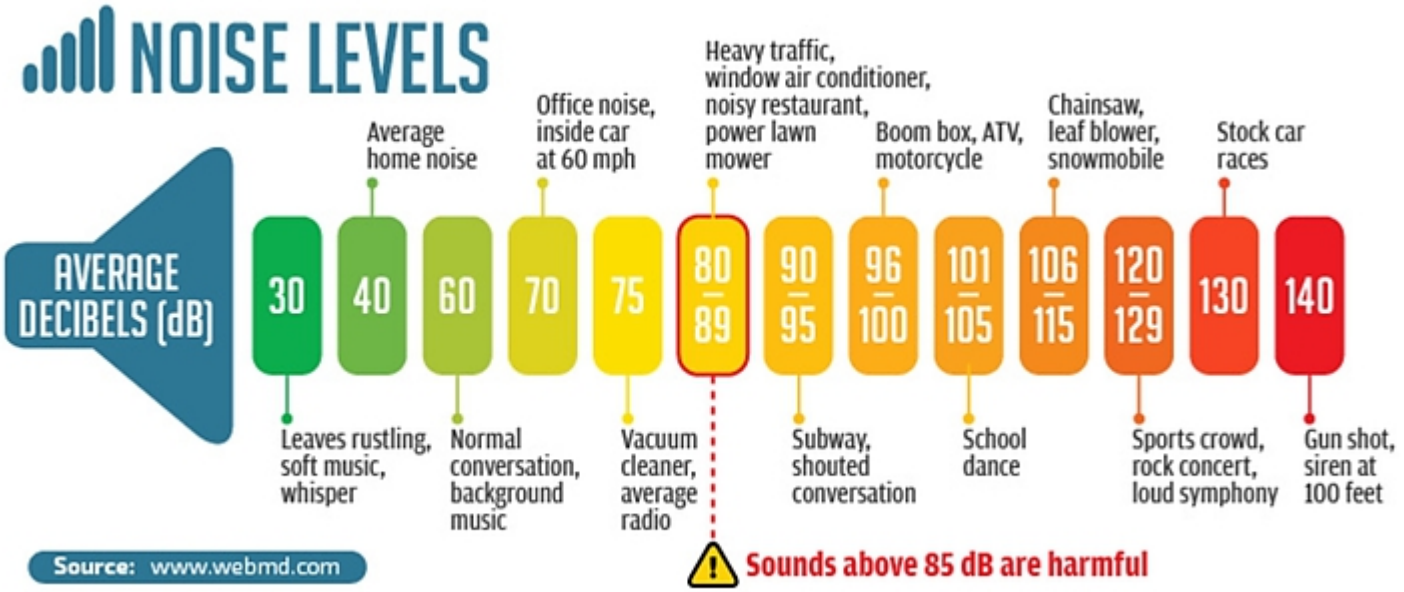
Introduction to Design

How to design? ..

- The design process is very similar to the PA system design. We start from loudspeaker stage.
- First is to determine the loudspeaker
- The basic selection of loudspeaker will depend on
  - Ambient noise
  - Room dimension

Loudspeaker

- The purpose of a loudspeaker is to deliver the sound to the audiences, thus it must be loud enough
- How loud is enough?



Loudspeaker

- We must consider the ambient noise. We can refer to the sound chart, but normally we assume the ambient level of ~ 60 to 70 dB
- So for the audience to be able to distinguish between the desired sound and noise, SPL from the loudspeaker must be greatly above the ambient noise. The greater the difference the better it is, but we assume the absolute minimum to be 10 dB.
- Then we need to consider the peak factor in the input signal. Peak factor is the difference between RMS and peak signal. Allow 10 dB.
- Our target level is normally 80 to 90 dB (60 to 70dB + 10dB + 10dB)
- But remember that if it's too loud the audience can become uncomfortable (again, refer to sound chart)

Loudspeaker

- Room dimensions (length in particular) will determine whether you actually need loudspeakers or when you need it, how powerful should it be
- Why? Remember SPL variation with distance? Inverse square law ..
- Obviously we don't need loudspeaker when we talked to each other
- We could still manage without it in a small discussion room
- You might need a small speaker system in a lecture room
- A bigger and better system will be needed for auditorium, etc
- The basic formula for direct sound is (at x metre)

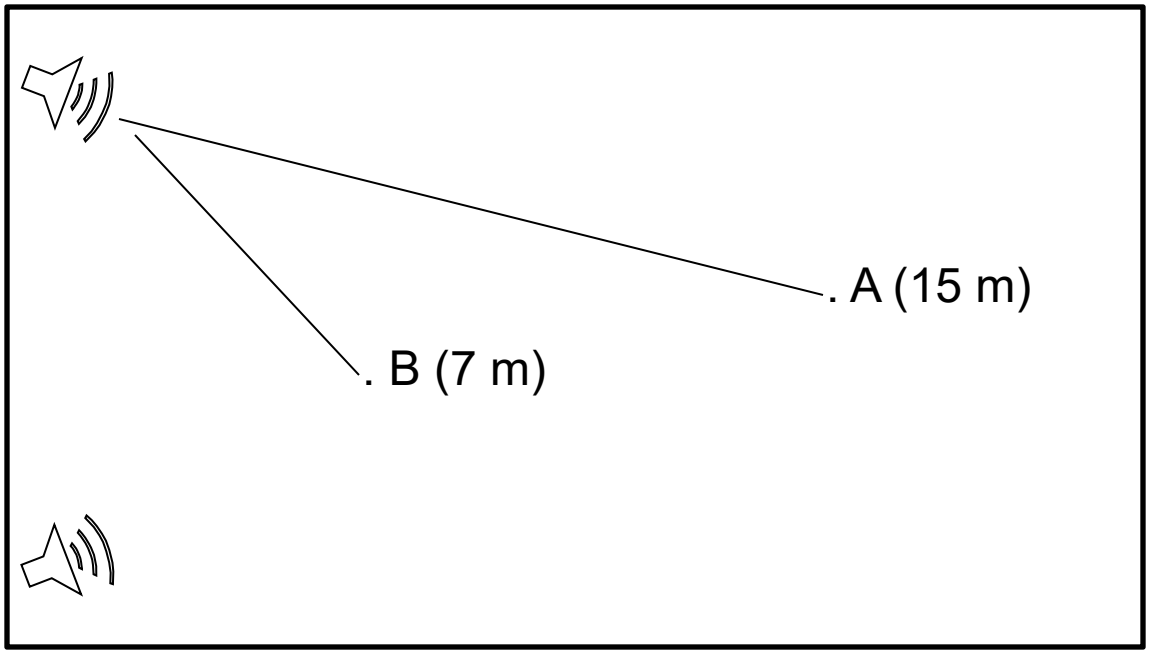
  SPL(@ x) = SPL (@1W 1m) + 10log(rating) – 20log (x)
- We need to find loudspeaker with enough sensitivity "SPL (@1W 1m)" and sensible power "10log(rating)" to overcome the loss due to distance "20log (x)" to give the desired " SPL(@ x)"

SRS Design

Loudspeaker example

Example ..

- 20m x 10m room
- Design a simple SRS



Example ..

- Our objective is to have 80 to 90 dB of SPL at audience area
- The basic formula for direct sound is

  SPL(@ x) = SPL (@1W 1m) + 10log(rating) – 20log (x)
- We need to find loudspeaker with enough sensitivity "SPL (@1W 1m)" and sensible power "10log(rating)" to overcome the loss due to distance "20log (x)" to give the desired " SPL(@ x)"
- At point B,

  SPL (@1W 1m) + 10log(rating) = 90 dB + 20log (7)

  SPL (@1W 1m) + 10log(rating) = 107 dB

  We can choose a 15" loudspeaker with SPL (@1W 1m) of 100dB and drive it at only 6W (rated at 600W), but is it sensible? Discuss

Example ..

Or we can choose a 6" loudspeaker with SPL (@1W 1m) of 92dB and drive it at 30W (rated at 50W). Which is better and why?

- Using the same speaker what would the SPL at point A, 15 m away

  SPL(@ B) = 92dB + 10log(30) – 20log (15)

  SPL(@ B) = 83dB

- The best tool is still simulation software, but direct SPL calculation will at least give some ideas
- In this example the chosen loudspeaker is fullrange 50W 8Ω.
- We can start to draw the layout and achematic

Amplifier

- Loudspeakers used in SRS are normally low impedance type (8Ω, 4Ω etc). In our example the loudspeakers are 2 nos 50W 8Ω.
- We choose dual channel power amplifier to cater for 2 nos loudspeaker. The amplifier rated power should be around twice the loudspeaker rating. So we choose 2 X 100W (8Ω) power amplifier.

Unit Perunding Akustik

Thank You For Listening