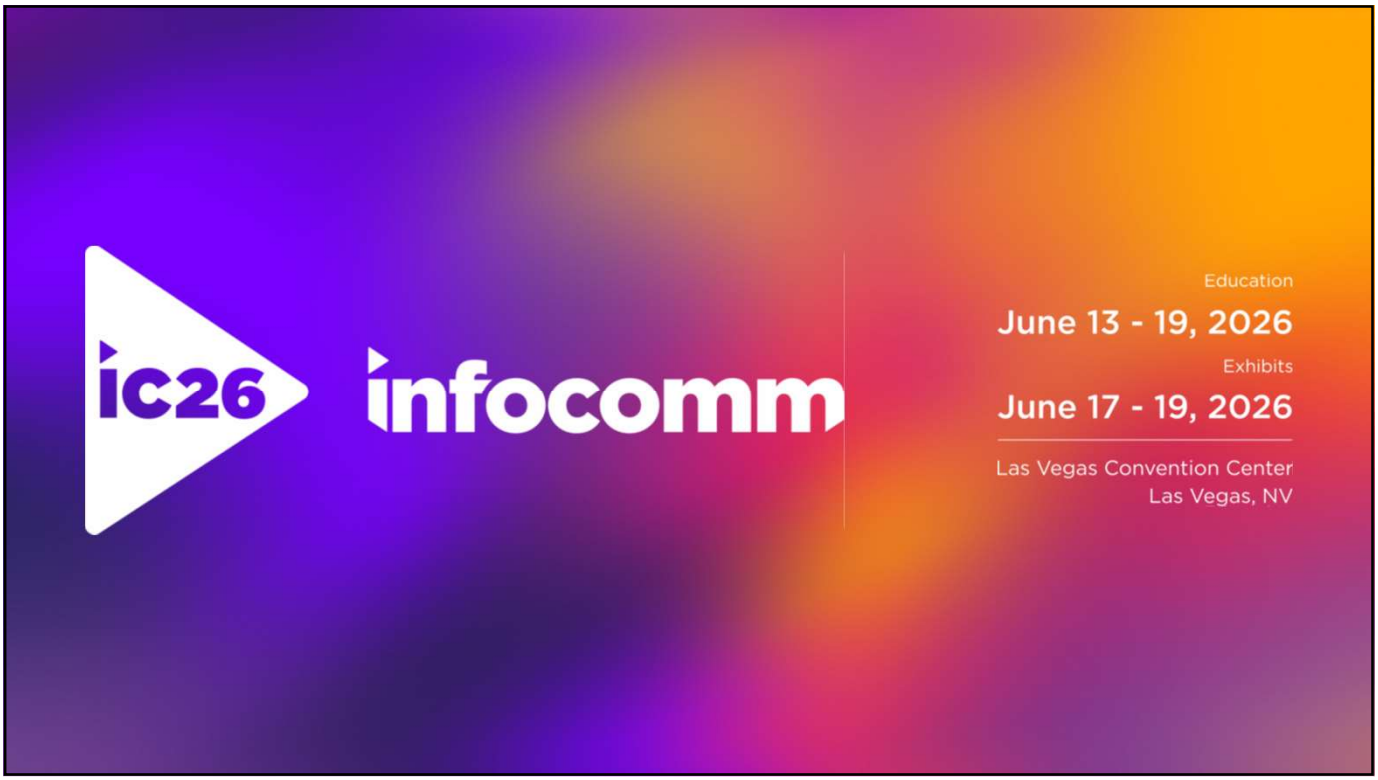

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ic26 infocomm

How do you currently set performance expectations with your clients?

2

Acoustic Measurement for Effective Room Design

Jim Maltese, CTS-D, CTS-I, CQD, CQT
Rebecca Sullins, CTS-D, CTS-I

3

James Maltese – CTS-D, CTS-I, CQD, CQT

- VP of Quality Standards, Level 3 AV
- Avixa Educator of the Year 2017
- Board Member, AQAV
- Quality Committee Chairman, PSNI
- Avid scouter, ham radio

4

Rebecca Sullins – CTS-D, CTS-I, ANP

- Senior Design Engineer; AmpThink
- BFA in Sound Design and Engineering from the North Carolina School of the Arts.
- Former Chair, Certification Steering Committee, Women's Council Local Leader
- Avid pool player and hobby collector.

5

Acoustics – the man, the myth, the legend.

- What are acoustics?
- What measurements should we be taking?
- How do these measurements affect the way we design rooms and systems?

6

ACOUSTICS:

a science that deals with the production, control, transmission, reception, and effects of sound

7

Key 3 Measurements

For Successful Conference Rooms:

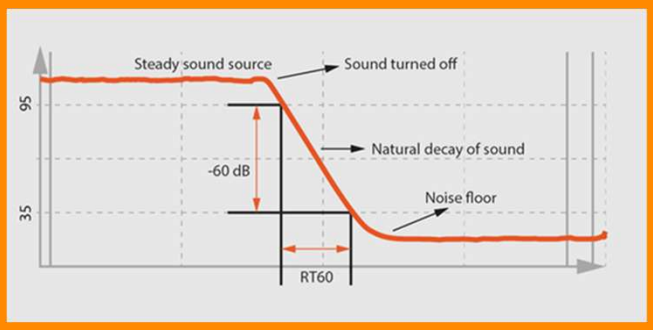
- RT60
- NC
  - Ambient Noise
- SNR at Mic

8

Reverberation Time (RT60)

- How long sound bounces around a space

- Poor RT60 =
  - Poor intelligibility
  - Poor AEC



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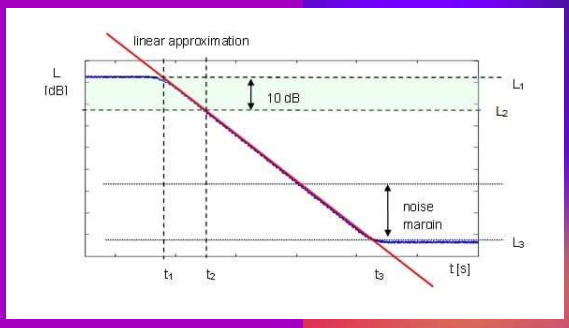
Reverb and Early Decay Time [EDT]

- EDT is the time it takes the initial sound to decay from 0 > -10dB.
- Much more location dependent than full RT60.

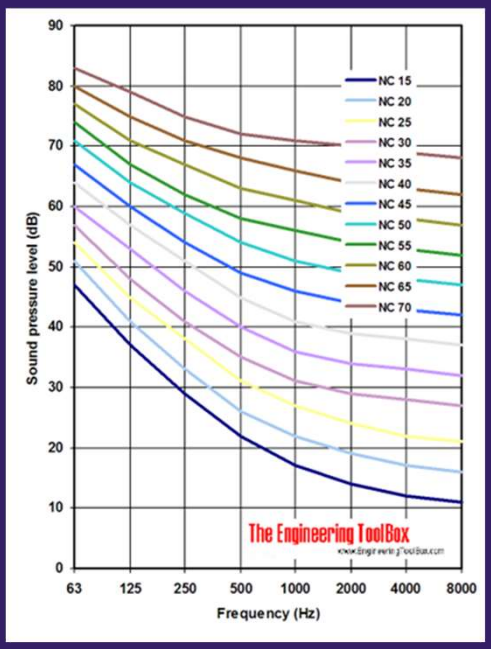


Courtesy of Svantek Academy

10

Noise Criteria (NC)

- Full-spectrum measurements taken in a room to establish the noise floor.
- Poor NC = Poor AEC



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Noise Criteria (NC)

Use the lowest curve that is not exceeded by any measurement.

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Noise Criteria (NC) Standards

TYPE OF ROOM	RECOMMENDED NC LEVEL	EQUIVALENT SOUND LEVEL Dba
Conference Rooms	25-30	35-40
Open-Plan Offices	35-40	45-50
Lecture and Classrooms	25-30	35-40
Movie Theater	30-35	40-45
Libraries	35-40	40-50
Broadcast Studio	15-25	25-35
Concert and Recital Halls	15-20	25-30

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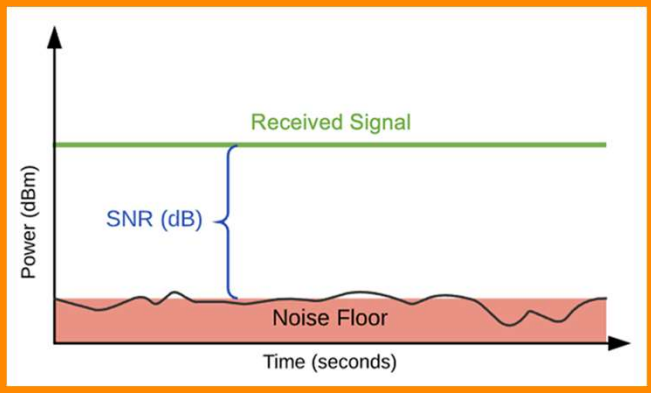
Ambient Noise

14

Signal to Noise Ratio [SNR]

- Difference in level between signal and noise (dB)
- More dB = More Better
- Don't forget there are two different SNR ratings in any system
  - Acoustic SNR
  - System SNR



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3 Key Values

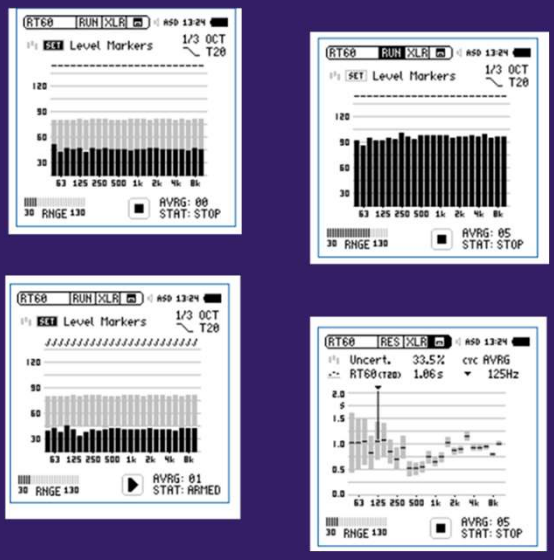
For Successful DSP performance:

- RT60 < 0.5s
- NC < NC30
  - Ambient < 35 dBA
- SNR @ Mic > 25 dB

16

How to Measure RT60

- Audio Analyzer
- Need to excite the room and measure decay at all octaves
- Look for worst case, not “averages”



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How to Measure RT60

- ISO 3382 and ASTM E2235 define measurement standards
- Use an omnidirectional source
  - Minimum of two sources should be used.
  - Sources should be 1.5 M above floor.
- Measure from multiple locations
  - Take into account walls, overhangs, balconies, and other architectural anomolies.

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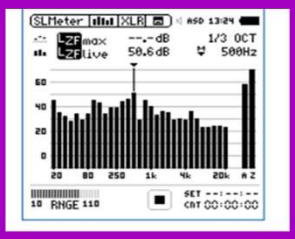
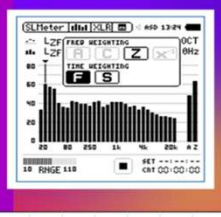
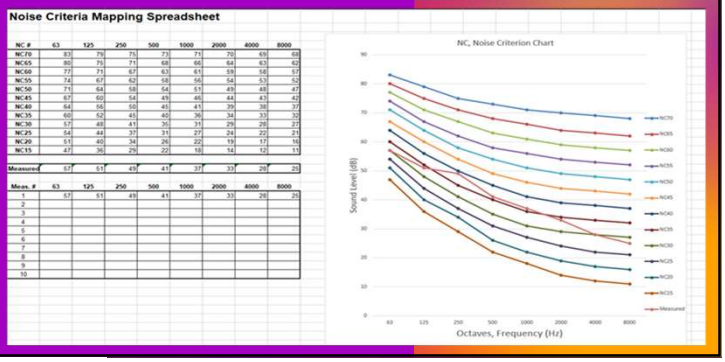
How to Measure NC

- RTA or Audio Analyzer
- Fit to curve ($0)
- Software ($$$)







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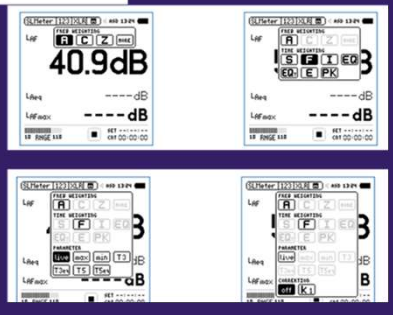
How to Measure Ambient Noise [AN]

- SPL Meter
  - Very easy
- A-weighted
  - Mimics the response of the human ear.
- Slow
- “dBA-slow”



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How to Measure Ambient Noise [AN]

- Verify measurements at multiple times/locations in room.
  - Traffic noises, HVAC, etc. can all vary widely at different times of day.
- Human response is more subjective to frequent noise intrusions than a higher, steady level.
  - Remember this when documenting measurements.

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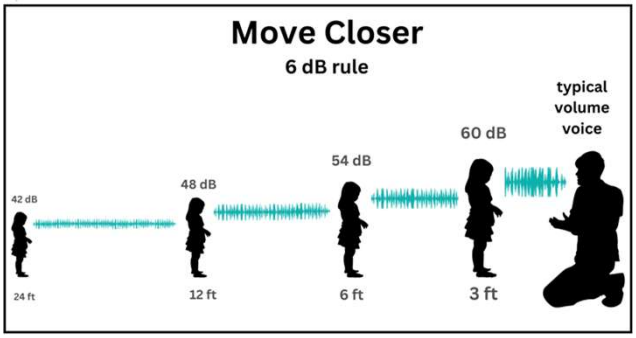
How to Measure SNR @ Mic

- Subtract ambient noise from “talker level”
- Standard Talker is 60 dB @ 1m [3ft]
- Drops 6 dB every doubling of distance



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How to Measure SNR @ Mic

- Subtract ambient noise from “talker level”
- Standard Talker is 60 dB @ 1m [3ft]
- Drops 6 dB every doubling of distance

Mic	Distance	Level
Gooseneck	.3m	70 dB
Table	1m	60 dB
Ceiling	3m	50 dB

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How to Measure SNR @ Mic

Mic	Distance	Level @ Mic	SNR @ Mic
Gooseneck	.3m	70 dB	30 dB
Table	1m	60 dB	20 dB
Ceiling	3m	50 dB	10 dB

Target SNR @ Mic: 25 dB
Standard Talker is 60 dB @ 1m
Ambient Noise is 40 dBA-slow

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How to Measure SNR @ Mic

Mic	Distance	Level @ Mic	SNR @ Mic
Gooseneck	.3m	70 dB	18 dB
Table	1m	60 dB	8 dB
Ceiling	3m	50 dB	-2 dB

Target SNR @ Mic: 25 dB
Standard Talker is 60 dB @ 1m
Ambient Noise is 52 dBA-slow

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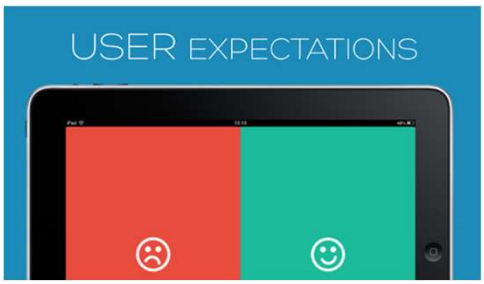
How to Balance Your Budget

RT60 > 0.5s
NC35+
SNR @ Mic > 25 dB



- Set user expectations
- Hire an acoustician
- Change the design

26

New Construction

- Meet early with the programming team
- Confirm architect appreciates the effect acoustics has on AV
- Measure ASAP

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Existing Spaces

- Get in early. Early in both the overall project timeline and your own.
- The more input you have on materials, architecture, and infrastructure, the fewer problems you'll have later.
- Have your measurements lead your design choices.
- The measurement survey is incredibly valuable! $$$
- Manage end-user expectations.
- Use benchmarking tools to help the client understand the benefits of good acoustic design.

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What is Your Call to Action?

- Pick one
- Apply it
- Observe how it affects your projects

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Keep in Touch!

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We Value Your Feedback!

Please take a moment to complete the session evaluation in the App

Thank you!

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