

# Practical guidance for testers

Part 2

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- Negotiating on-site and when not to test
- Being a PCT detective: adding consultancy
- Room modes: how to spot and reduce them

# Negotiating on-site

- Connect on a personal level
- Talk to the right person
- Be clear about what you need why
- Give them time to respond

## When not to test

- Non-compliance
- Guaranteed to fail

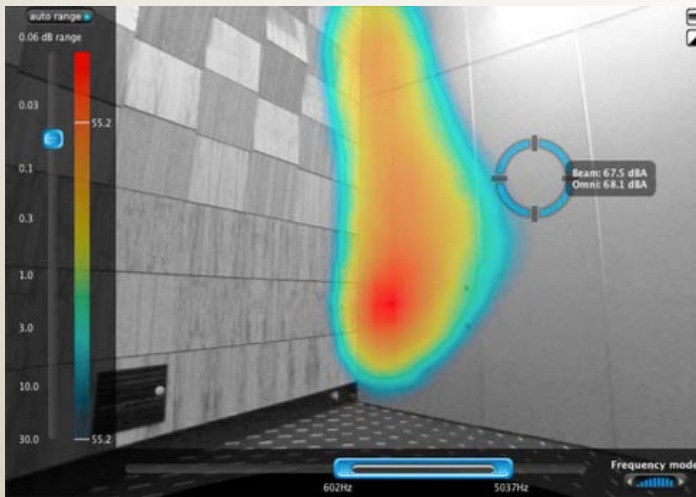
# Being a PCT detective: common issues

- Background noise
- Bridging
- Holes
- Flanking



# Being a PCT detective: adding consultancy

- Diagnostic equipment



Acoustic camera (image source, Norsonic)



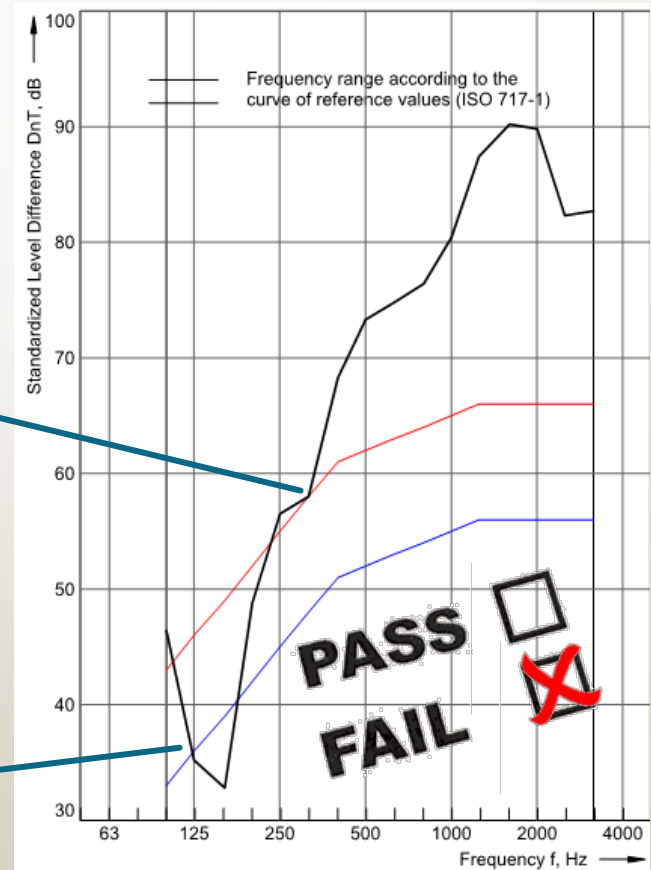
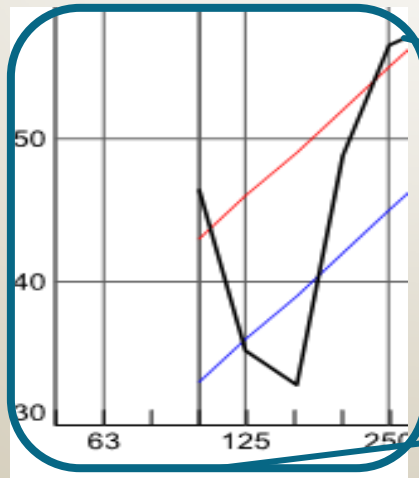
Ultrasonic leak detector

- Use your ears
- Use your hands!

# Room modes: Why are they a problem?

$$\begin{aligned} D_{nT,w} &= 62 \text{ dB} \\ C_{tr} &= -13 \text{ dB} \\ D_{nT,w} + C_{tr} &= 49 \text{ dB} \end{aligned}$$

“It’s not the wall, it’s the room...”

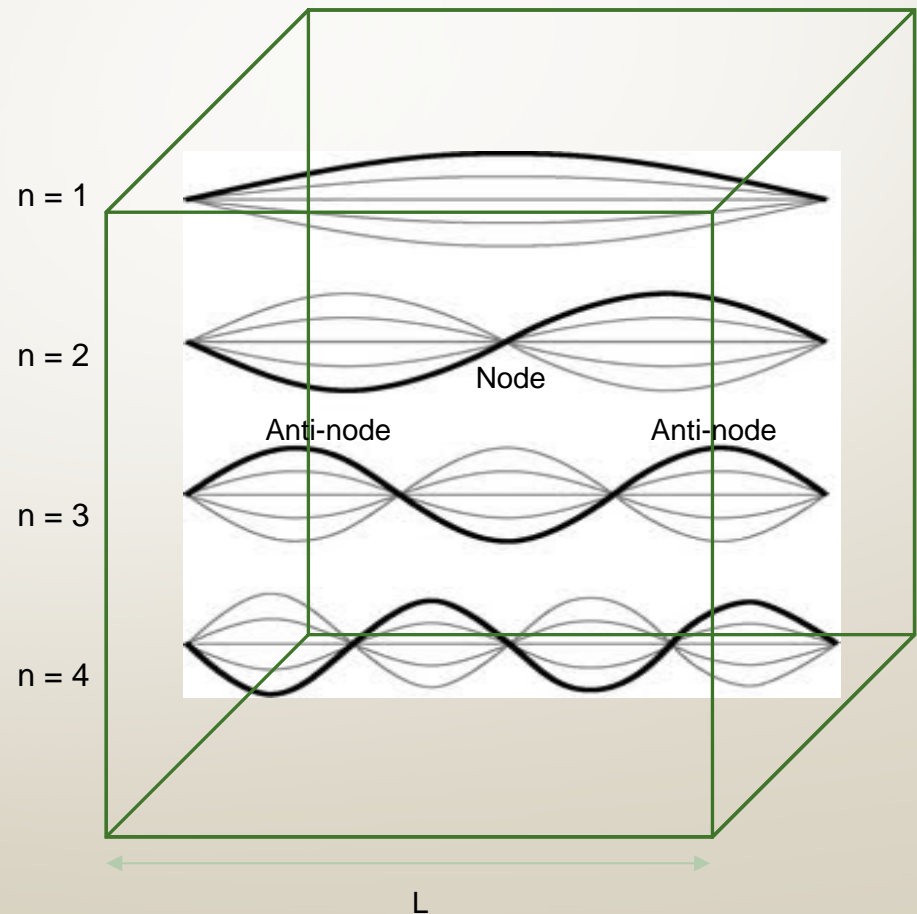


# Room modes: quick theory recap

Standing waves

$$f = \frac{nc}{2L}, \quad n = 1, 2, \dots$$

- Regions of high and low pressure
- Anti-nodes: doubled sound pressure



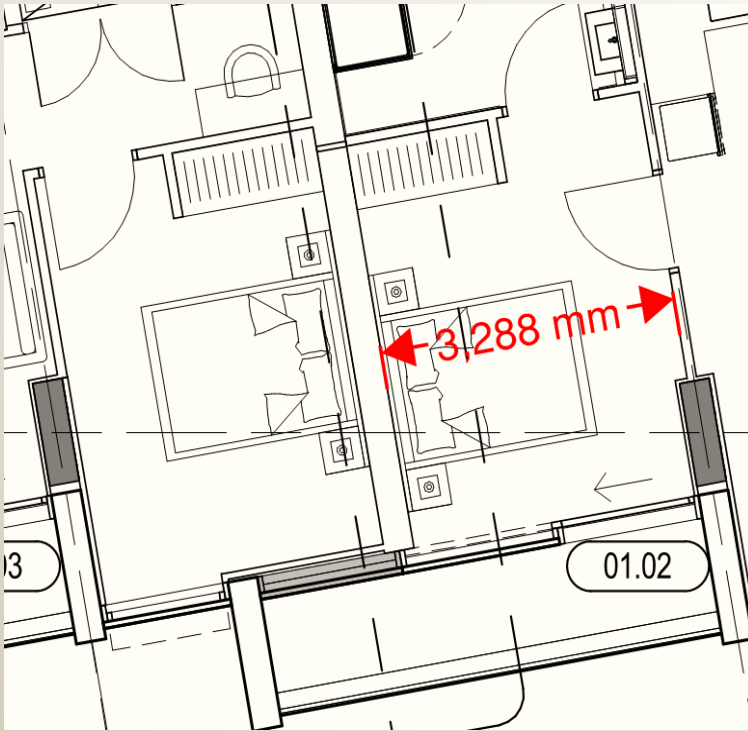
# Room modes: onsite implications

- Regions of high and low pressure
- Speed of sound:  $343 \text{ ms}^{-1}$

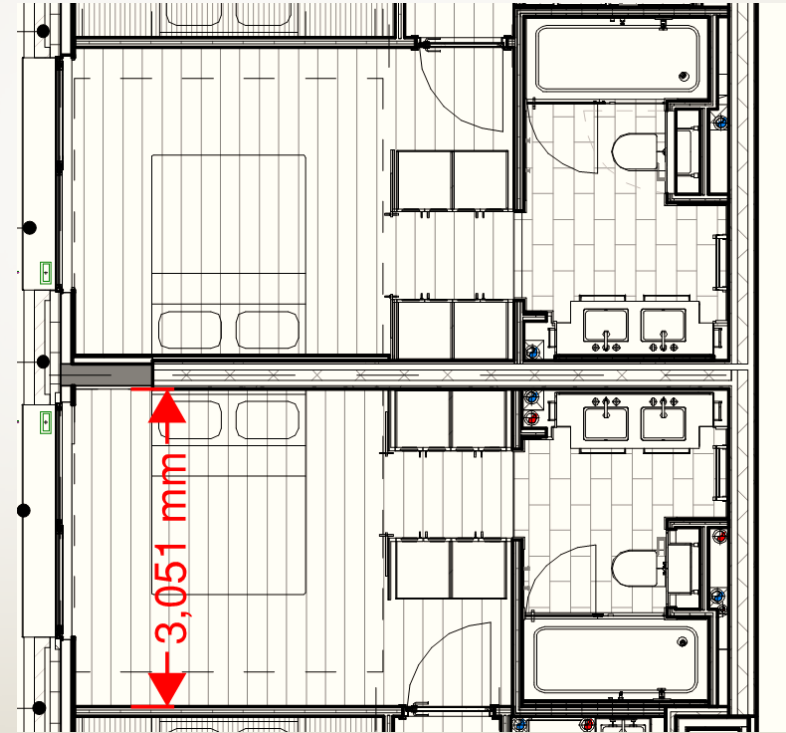
Room dimension (m)	Frequency of standing wave (Hz)		
	n=1	n=2	n=3
5.0	34	68	102
4.0	43	86	129
3.0	51	102	153
2.5	67	134	201
2.0	86	172	258



# Room modes: look ahead



- Small room size

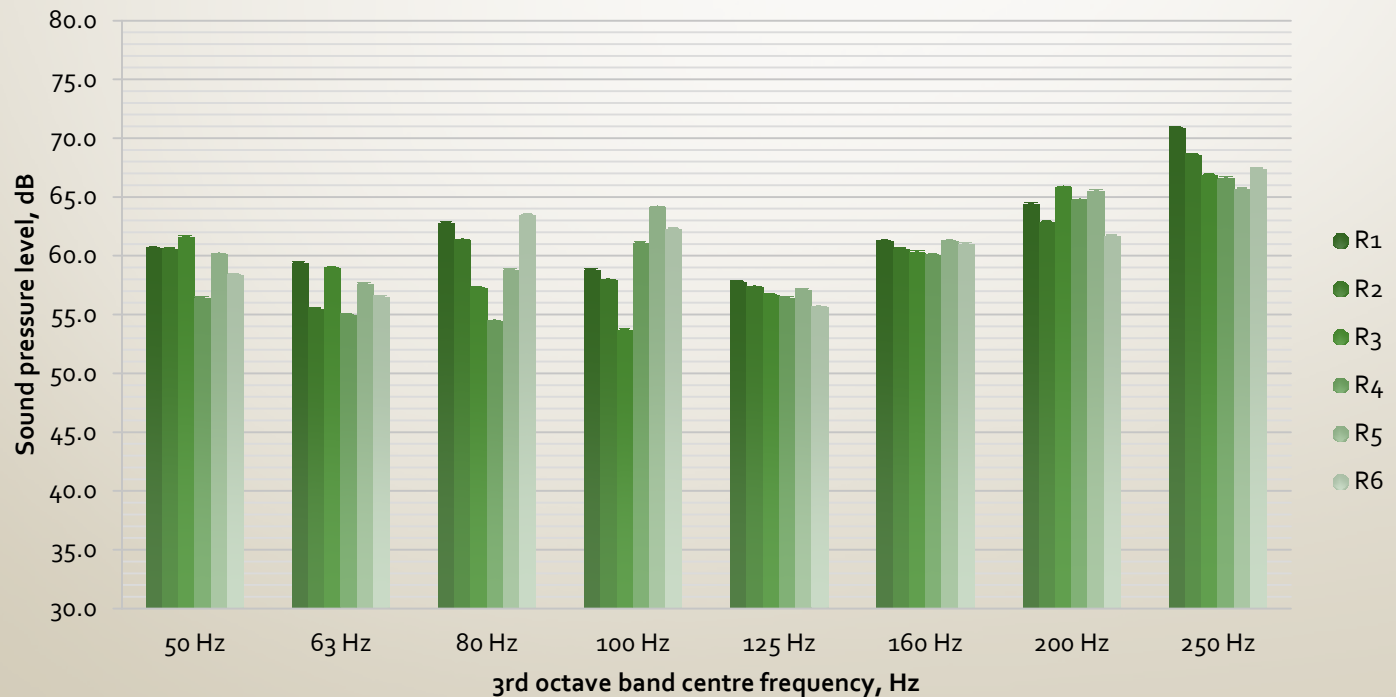


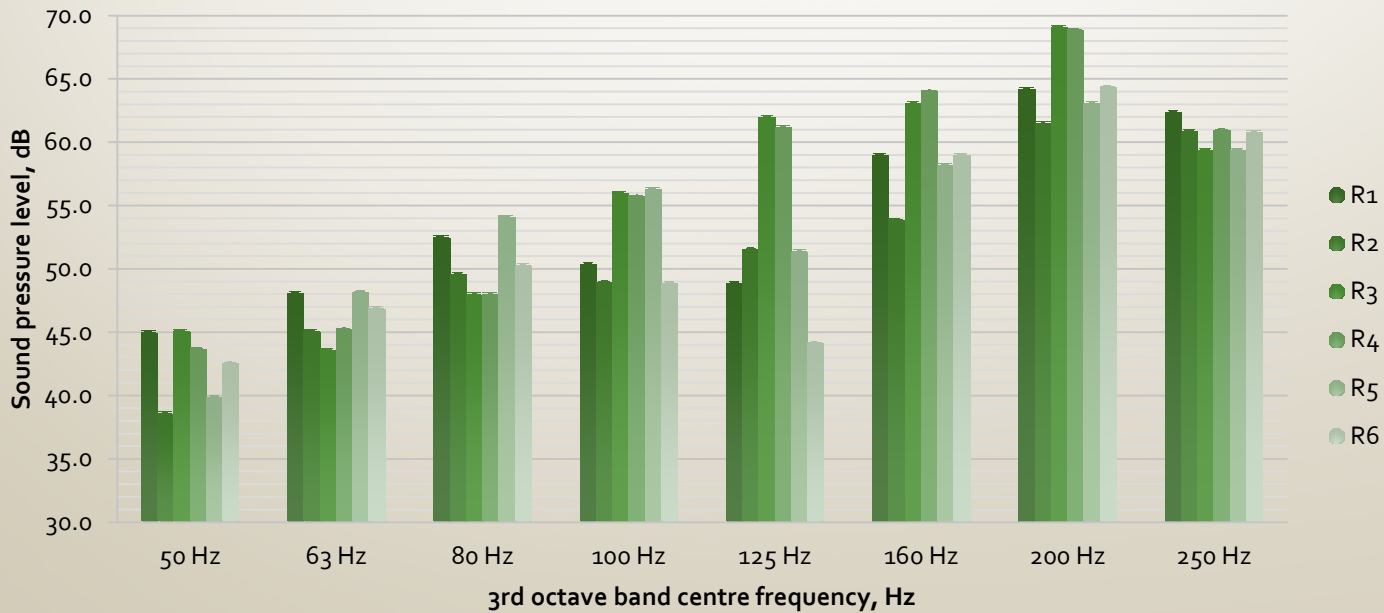
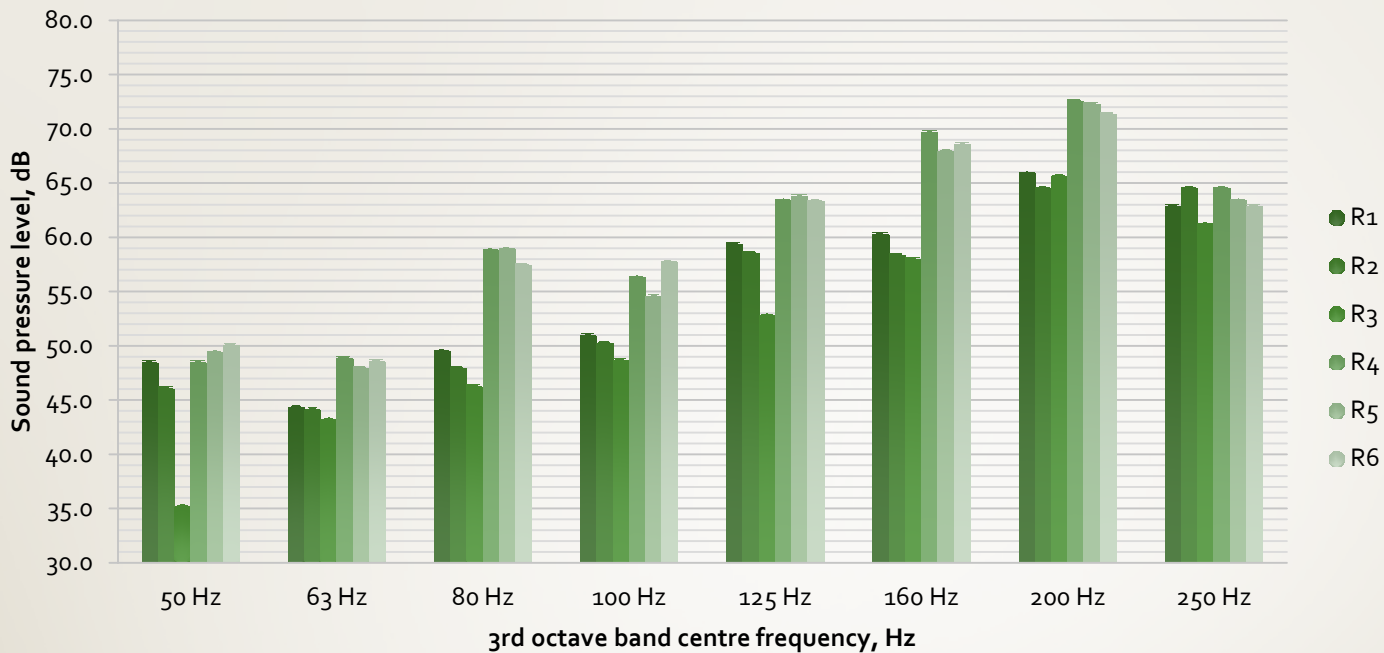
- Mirrored apartments

# Room modes: check on site

●  $C_{tr}$  correction

● Variation in SPL



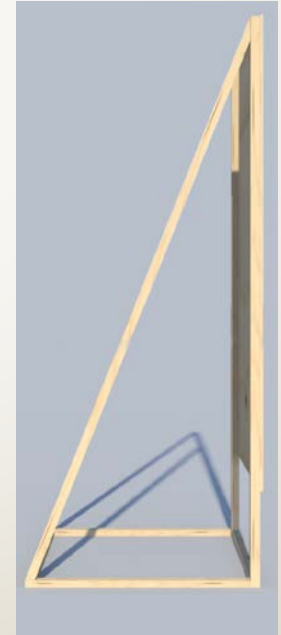


# Room modes: How to reduce their effect

BS EN ISO 140-4

Measurements between empty rooms with identical shape and equal dimensions should preferably be made with **diffusers in each room** (e.g. pieces of furniture, building boards). The area of a diffuser should be **at least 1,0 m<sup>2</sup>**; **three or four objects** will be normally sufficient.

# Room modes: diffuser placement



● ~~Against walls~~

- Free-standing
- Close to anti-node

# Room modes: emergency diffusers

It might not be perfect...

- Site materials
- Absorbers
- Source room door



# Room modes: what's achievable?



$$D_{nT,w} = 63 \text{ dB}$$
$$C_{tr} = -12 \text{ dB}$$
$$D_{nT,w} + C_{tr} = 51 \text{ dB}$$

Frequency  $D_{nT}$  improvement

125 Hz 1.0 dB

160 Hz 4.0 dB

200 Hz 6.5 dB



# Room modes: Practice Guidance

## 2.4.1 Check for room modes.

Check for 6dB rule compliance.

Unfurnished test rooms are rarely diffuse at all frequencies and strong 'modes' can occur, especially in the 80 Hz to 200 Hz frequency bands. To check for the presence of room modes, set the sound level meter to display a real-time, one-third octave spectrum and walk around the source room with the sound source energised.

### Tip:

Opening the door to the source room can help to reduce room modes.

Just make sure that you are not creating a sound path from the source room to the receiver room!

State that doors were opened when writing the report.

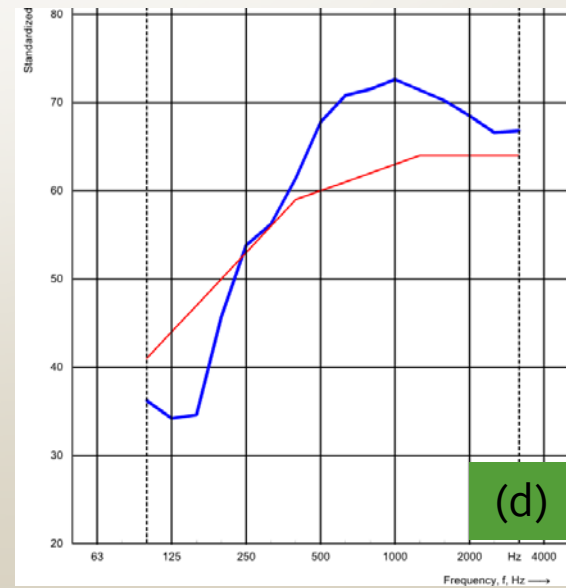
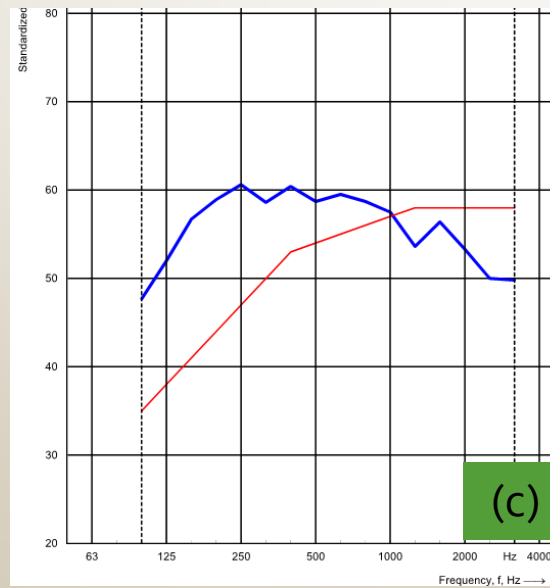
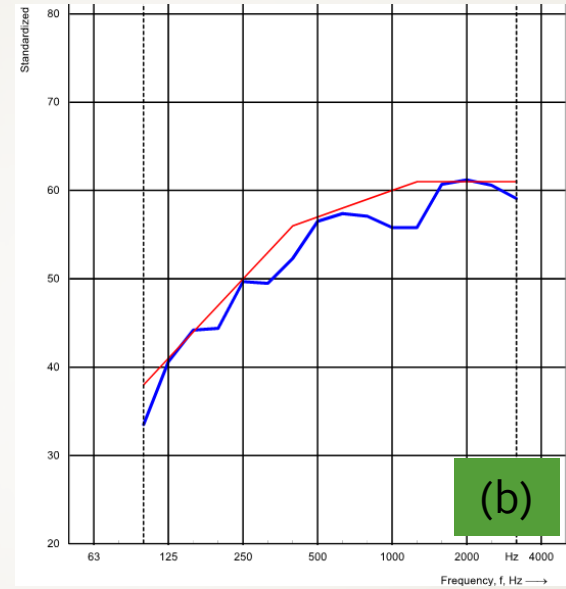
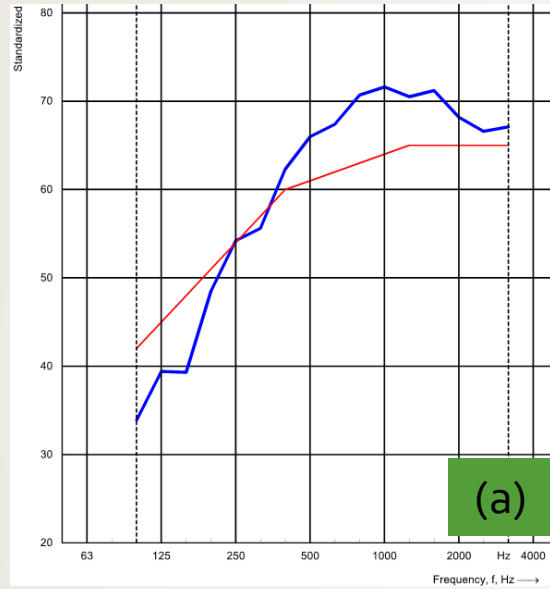
Observe the level of the 80 Hz, 100 Hz, 125 Hz, 160 Hz and 200 Hz frequency bands and make a note of the minimum and maximum levels shown on the display, at those frequencies.

If the variation between minimum and maximum in any of the frequencies listed is around 9 dB or less, this can be considered 'normal' and the effect on the measurements is likely to be minimal. However, if the variation between minimum and maximum is 10 dB or higher (swings of up to 17 dB can be observed where rooms are strongly 'modal') the effect is likely to be significant and likely to affect the SNQ.

Where room modes are detected as described above, the ISO Standards suggest the use of diffusers. These are rigid boards about 1m square and four may be required in each room.



# Quiz:



**THANK YOU**  
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