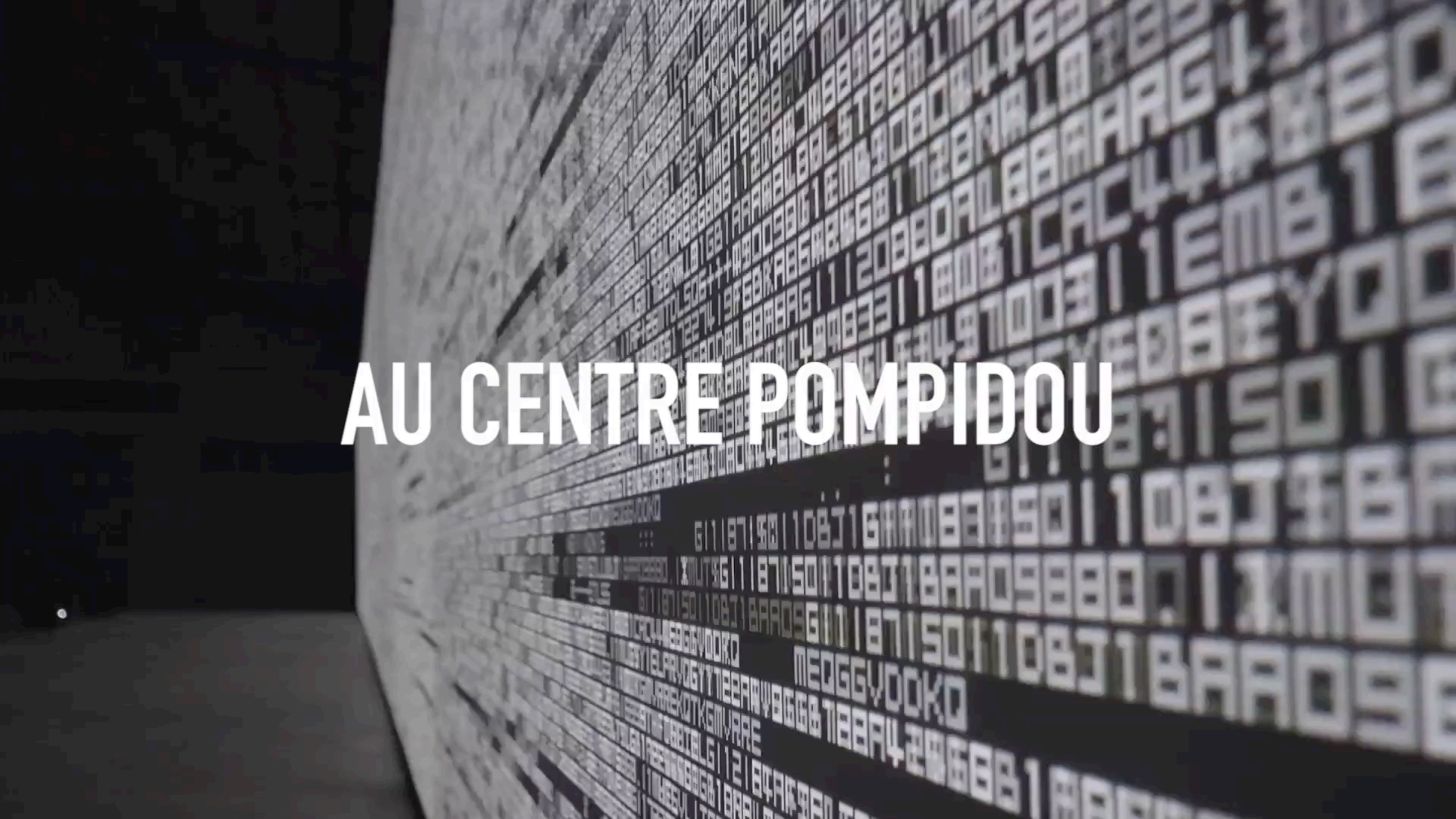
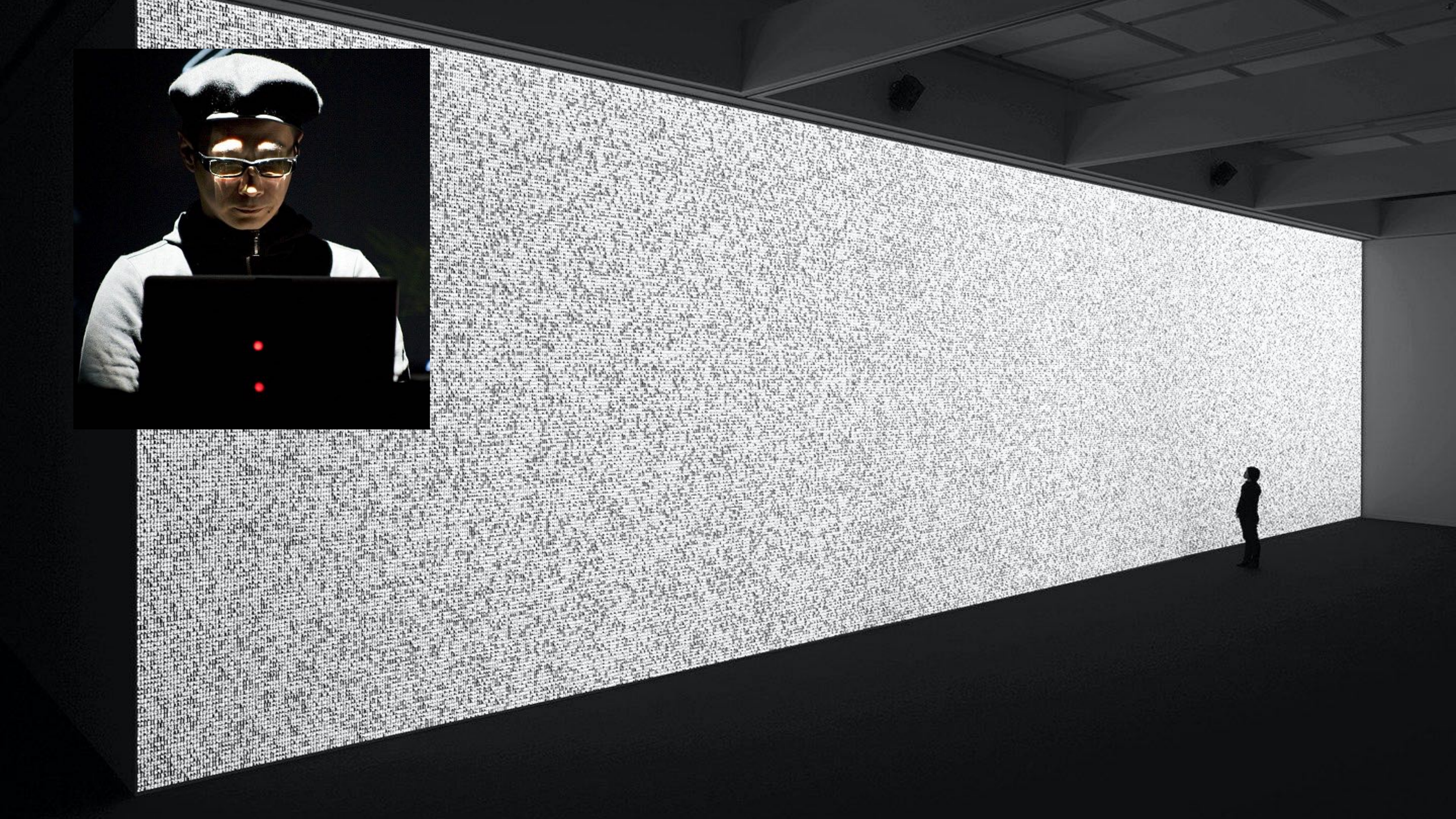
Please sign-in with the sign-in sheet


AU CENTRE POMPIDOU




ELECTRONIC
SACKBUT

- How do these pieces activate the ears?

- What techniques does it seem were used to create these sounds (microphones, computer, instruments, etc.)

- How is the work organized; how does it change over time (or how it it structured)?

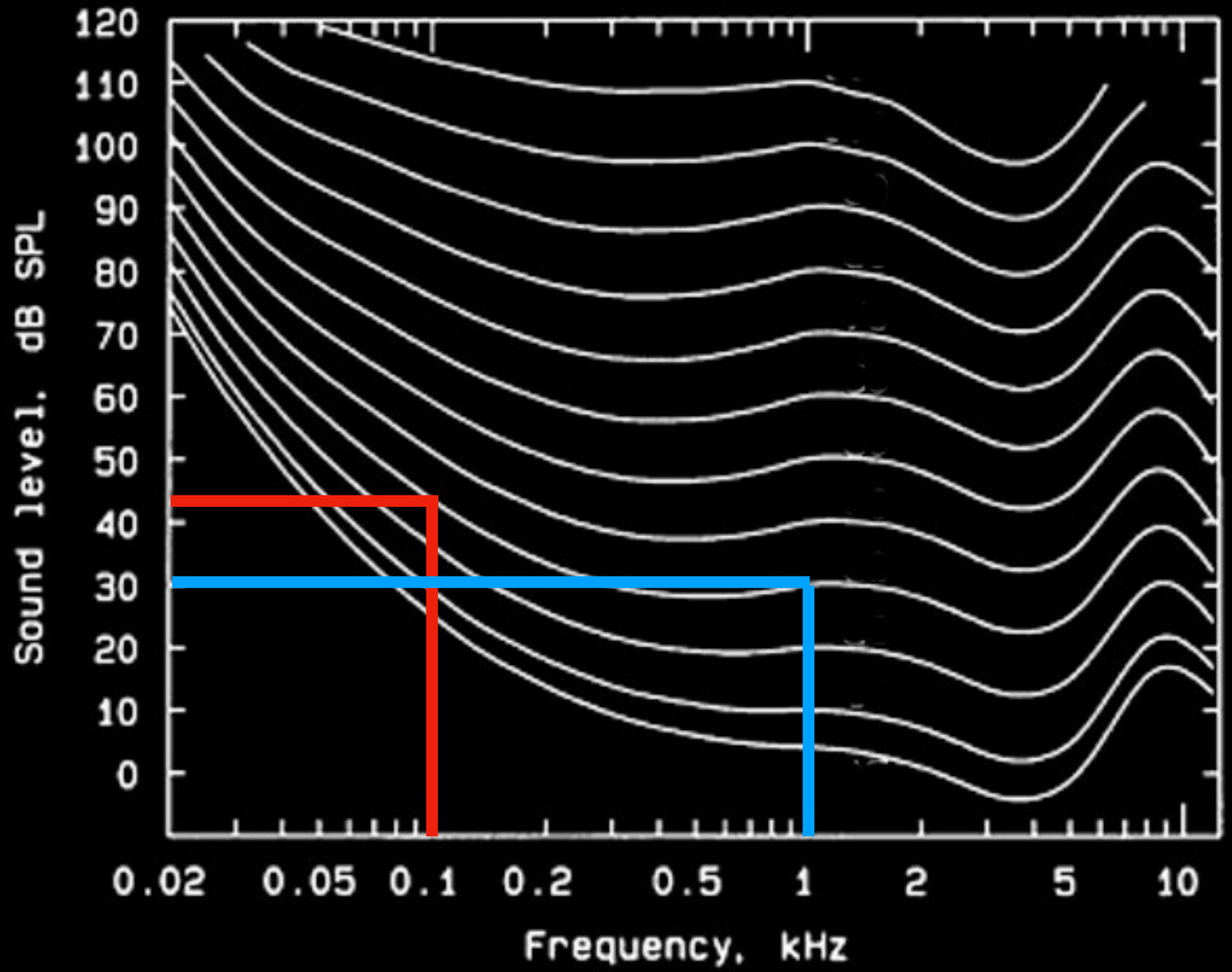
Physical (Acoustics)	Perceptual (psychoacoustics)	Units
amplitude	loudness	decibels (dB)
frequency	pitch	hertz (Hz)
duration	time	seconds (s)
timbre	quality / tone / spectral content	

Review of Last Class

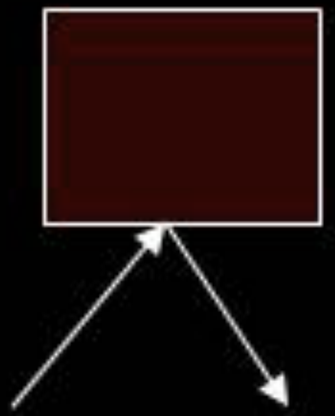
- Acoustics vs. Psychoacoustics (Objective vs. Subjective)
- Waves
  - Longitudinal vs. Transverse
  - Compression vs. Rarefaction
  - Periodic vs. Aperiodic
  - Sine waves = unnatural, single frequency
- Amplitude vs. Loudness, Decibels (dB)
  - Inverse Square Law (double distance -> quarter intensity)
    - intensity = 1 / distance^2
- Frequency vs. Pitch, Hertz (Hz)
  - frequency = 1 / period
  - 20 Hz to 20 kHz - human hearing range

Equal Loudness Contours

(Fletcher-Munson Curves)

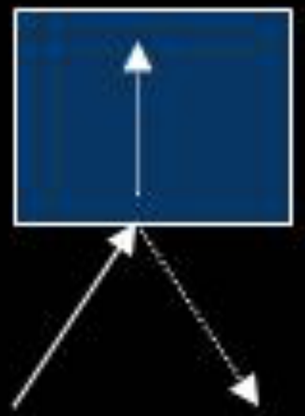


sound & space



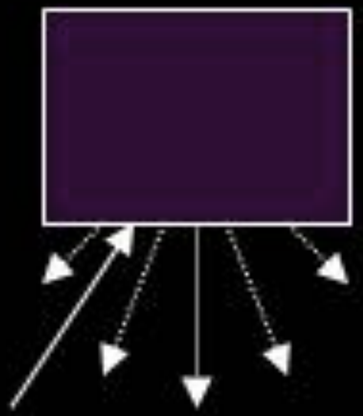
Reflection:

Most of sound is reflected which is almost as loud as incoming sound



Absorption:

Absorbing power is determined by material used

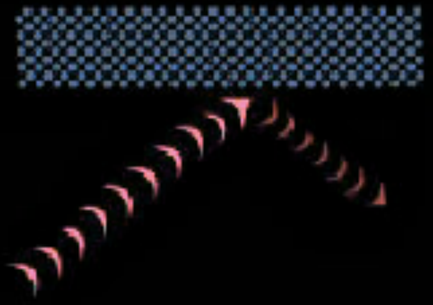


Diffusion:

Scatters sound depending on desired effect

Reflection

Absorption



Diffusion

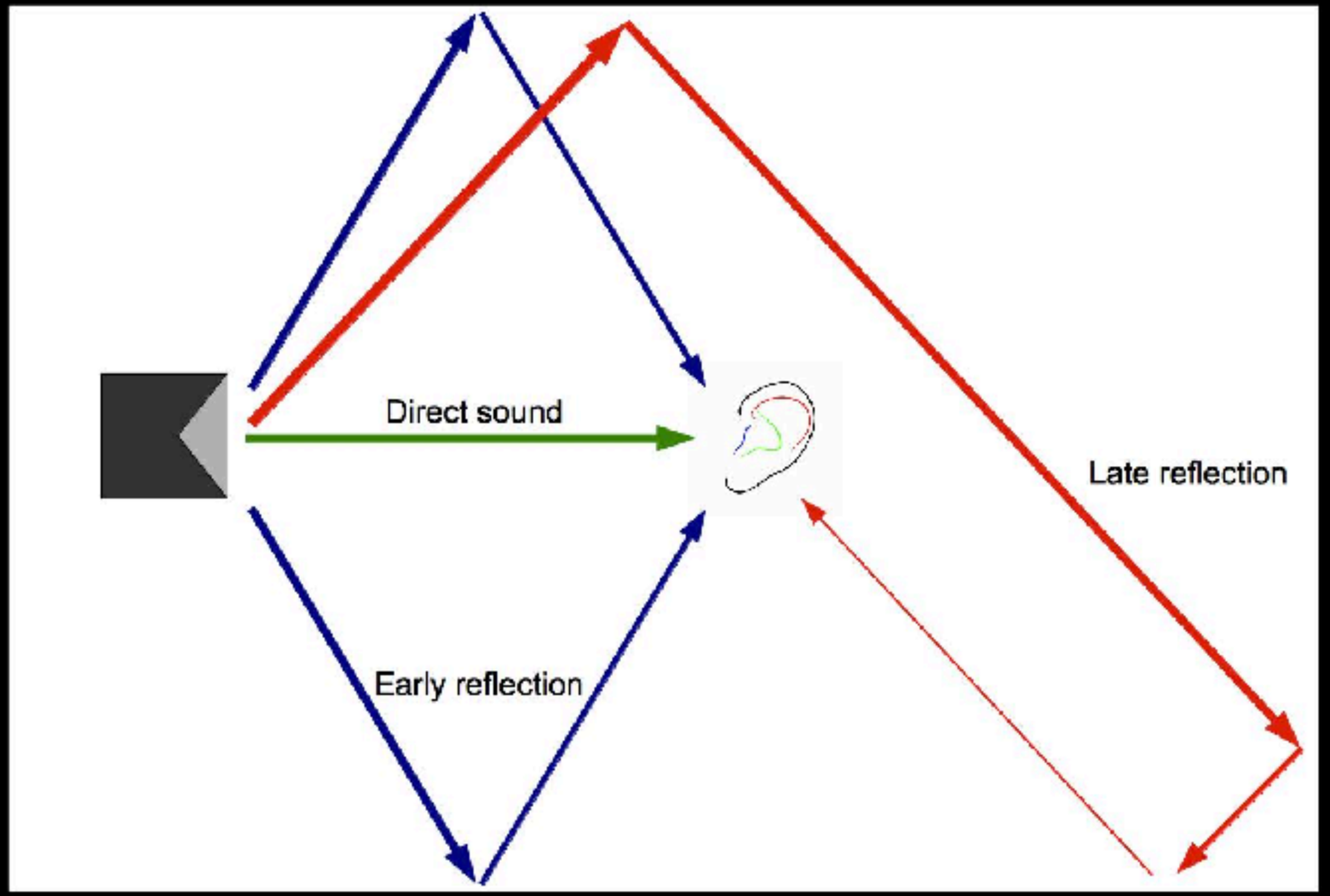
Room Acoustics

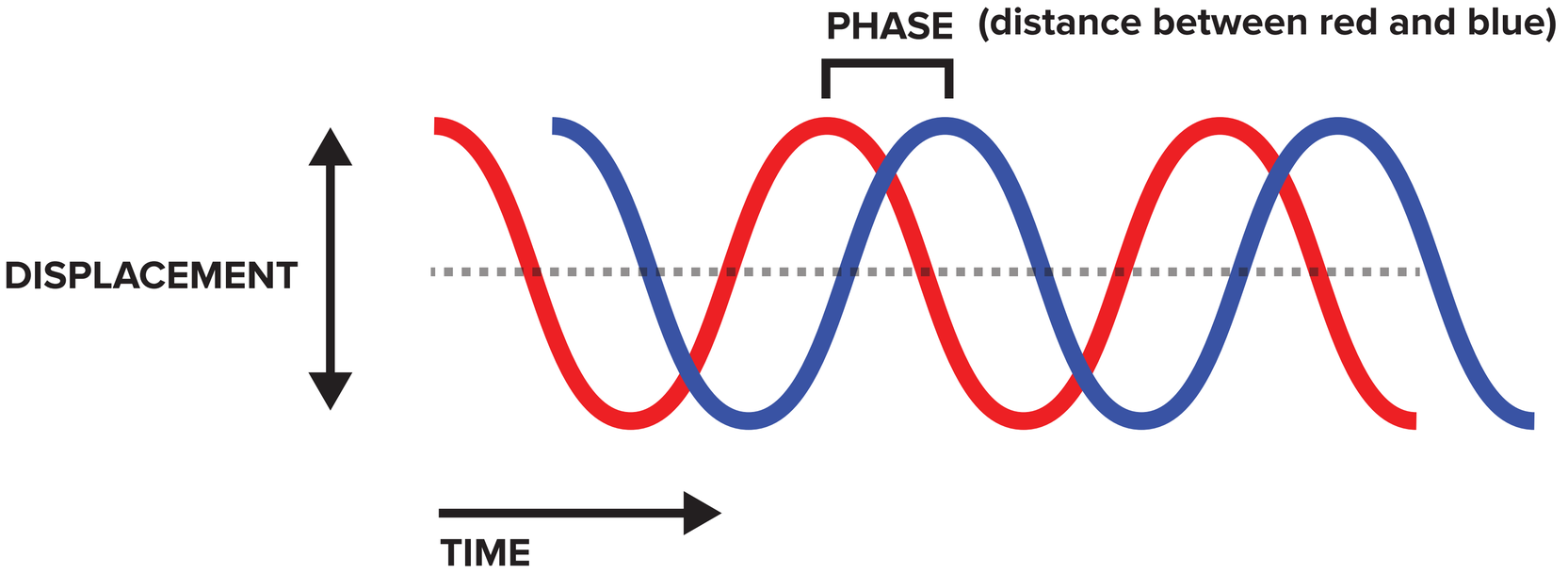
DIFFRACTION - Long waves will bend around (or move through) objects.

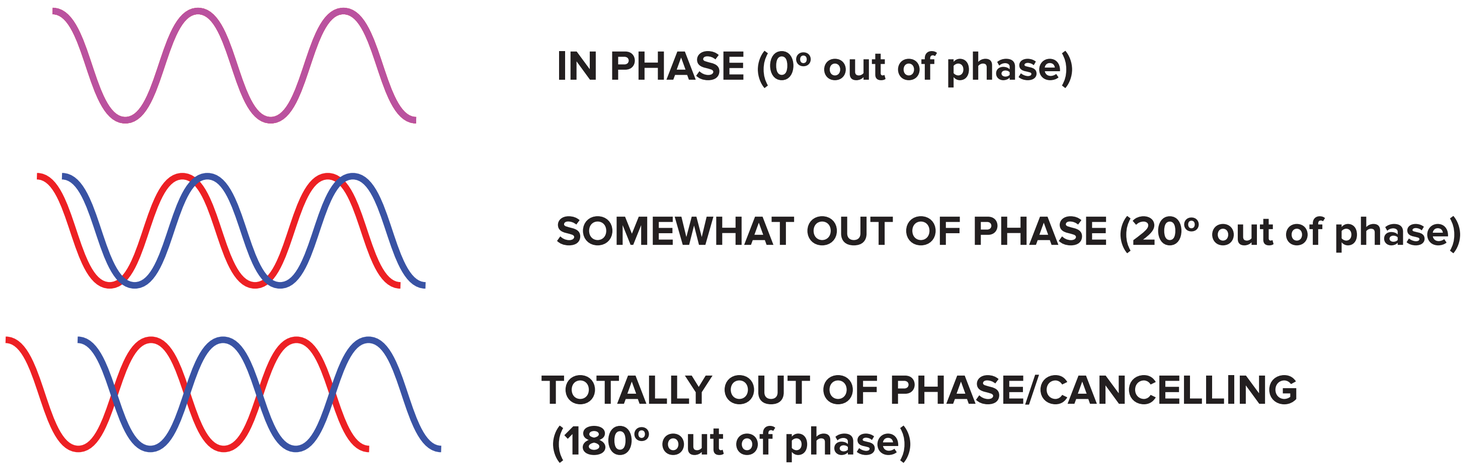
ABSORPTION <---> REFLECTION
Hard surfaces reflect, soft surfaces absorb.
Short wavelengths become trapped in soft material - carpets, drapes, etc.

Reflected sound is REVERBERATION, a series of echoes, and reverb time depends on the size and material of the space

Reflections and Reverberation



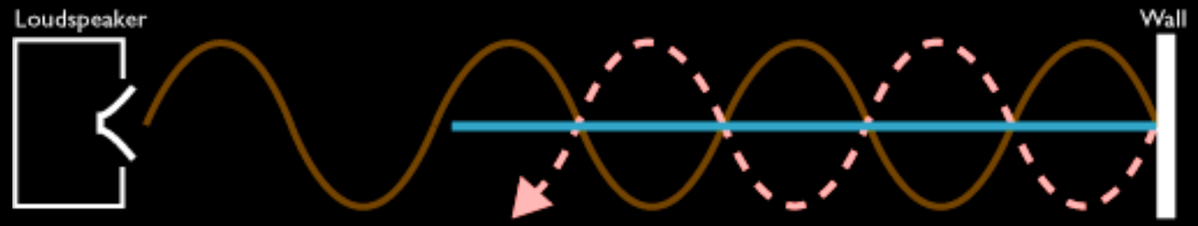

PHASE (distance between red and blue)
DISPLACEMENT
TIME


IN PHASE (0° out of phase)
SOMEWHAT OUT OF PHASE (20° out of phase)
TOTALLY OUT OF PHASE/CANCELLING
(180° out of phase)

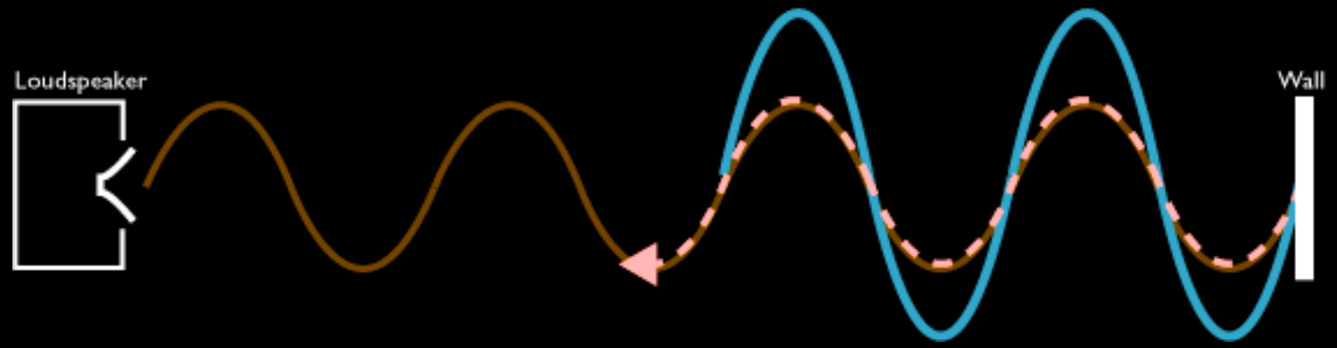
Room Resonance

Destructive vs Constructive Interference

Room modes. Standing waves out-of-phase cancellation.
Reflected frequency (red) refects back out-of phase, resulting in cancellation (blue).



Room modes. Standing waves combine in-phase.
Reflected frequency (red) reflects back in-phase, resulting in an increase in amplitude (blue).

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REC
DR-05X
RECORD
LINEAR PCM RECORDER


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TASCAM
OMNI MIC R
DR-100MKII LINEAR PCM RECORDER
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PB CONTROL
INPUT
I/O LOOP
QUICK
ENTER/
MARK
STOP
PLAY/PAUSE
RECORD
AUTO