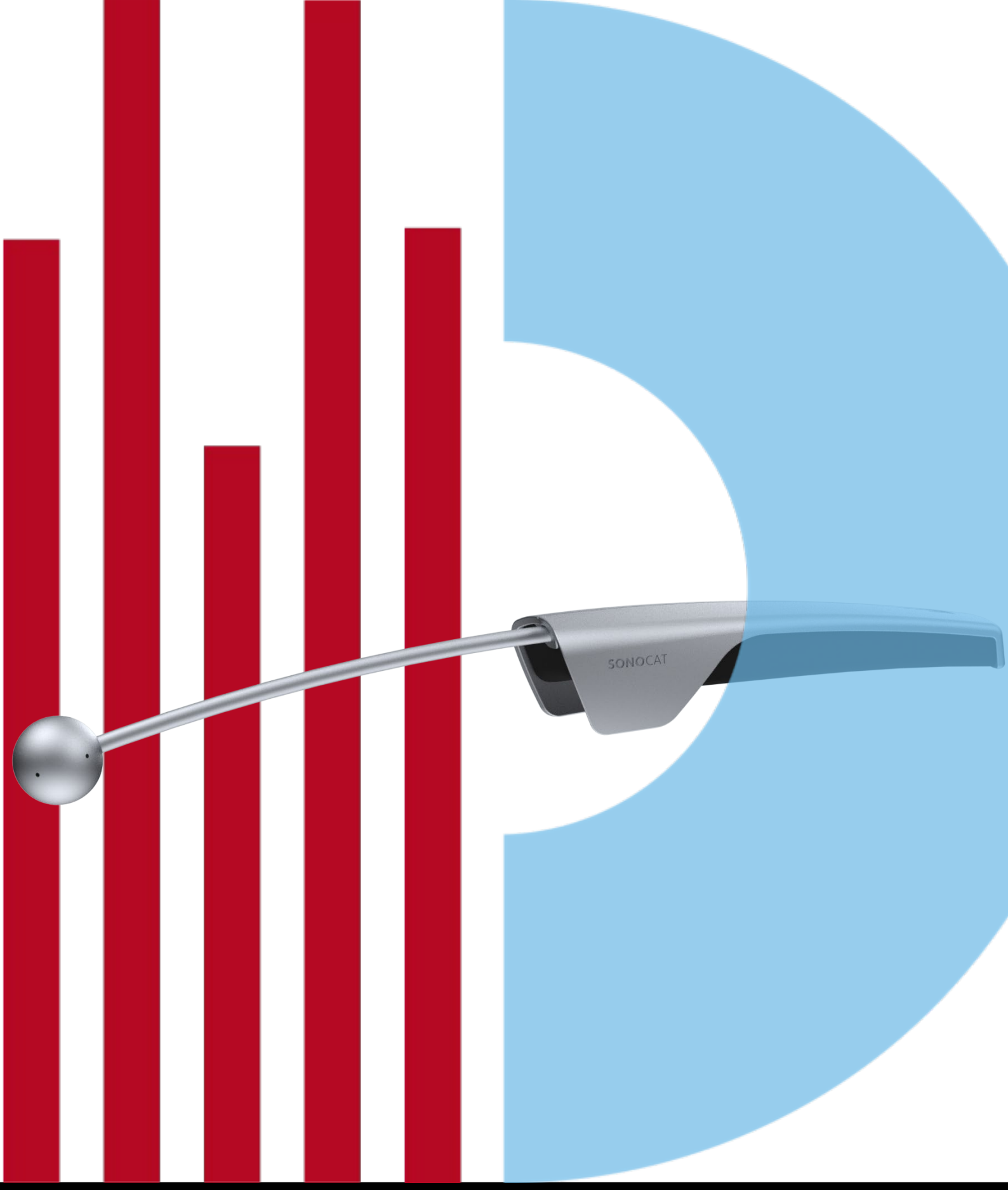



# Sonocat

# Finding acoustic transfer-paths between 2 rooms in a concert hall

# Introduction

For the purpose of determining sound transmission from concert room 2 to room 1, Sonocat measurements were taken close to various sound-radiating surfaces in room 1. In these measurements, the sound intensity of that sound-radiating surface was determined. A constant loud sound source was used in room 2 for this purpose.

An example of such a measurement is shown below. The Sonocat is held in front of the sound-radiating surface. Due to time constraints, "point" measurements were made and an occasional "scan" measurement. A total of 62 measurements were taken.

In this measurement session, the radiated sound intensities were determined. The normal "active" intensities were also determined. The active intensity is the net intensity; i.e., the radiated intensity minus the intensity reflected back by the room. For a radiating surface, this means that if the value is positive, there is net sound being radiated; if the value is negative, then net energy is flowing into the surface (and thus there is absorption) and more sound is flowing out of the room through that surface than is flowing in. The same surface can radiate sound for one frequency (band) while absorbing sound for another frequency (band).

An example is shown in Figure 1. Here the wooden "sliding doors" in front of the windows are measured in room 1.



Figure 1: measurement m2.

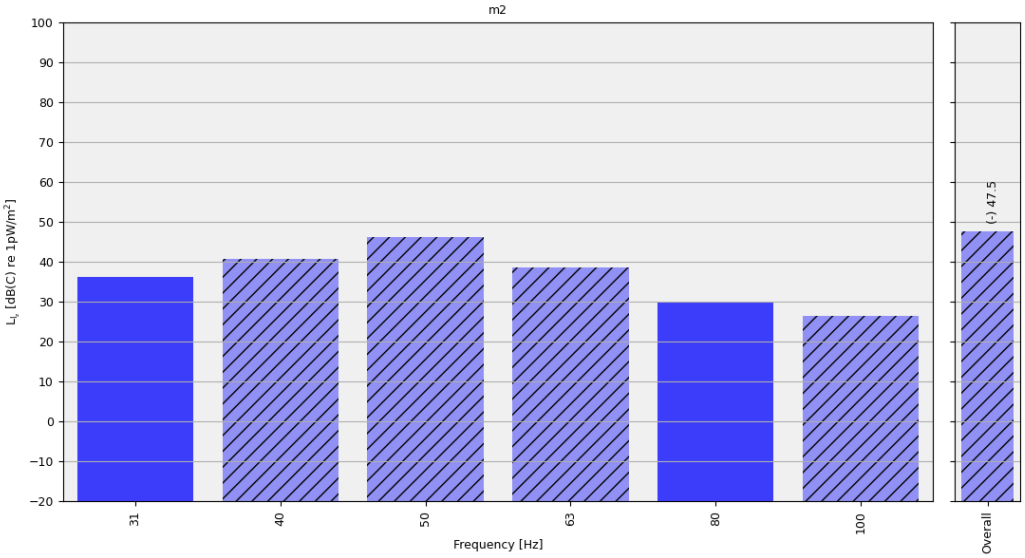



Figure 2. The active noise intensity (C-weighted) at measurement m2.

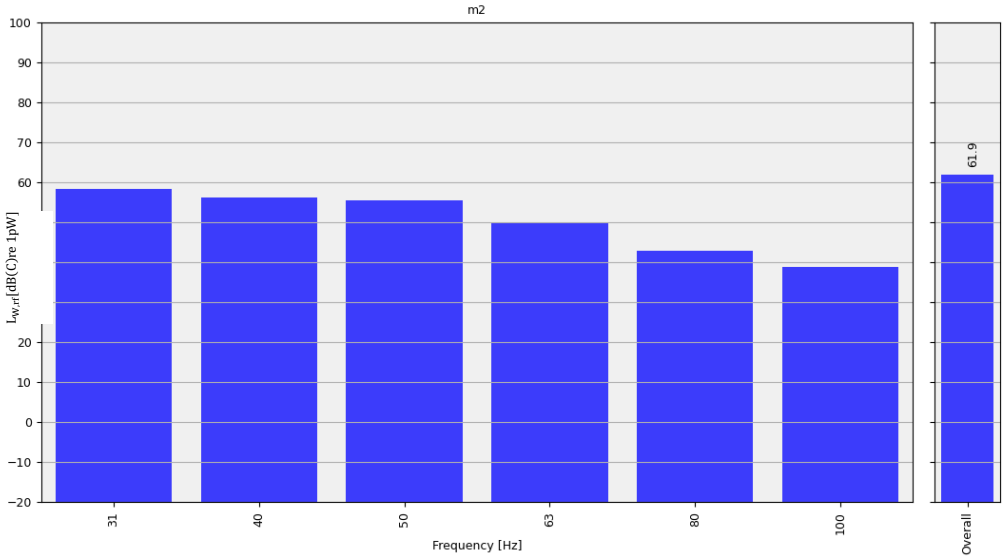



Figure 3. The "emmitted" noise intensity (C-weighted) at measurement m2.

This measurement shows that in the 31 Hz and 80 Hz 1/3-octave bands, there is a net sound transmission to the room flowing through these wooden slotted doors. In the other 1/3-octave bands, there is a net sound penetration. The radiating intensities are clearly higher than the net results and are low frequency higher than high frequency.

## Measurements

Table 1: 23 of 62 measurements done in room 1, grouped by letters.

| N° | Location | Position name | Description |
|---|---|---|---|
| 1 | Podium | M1 | Max Left side of the podium |
| 2 | | M2 | --- |
| 3 | | M3 | |
| 4 | | M4 | |
| 5 | | M5 | |
| 6 | | M6 | Max Right side of the podium |
| 7 | | M7 | Window podium left |
| 8 | | M8 | Window podium right |
| 9 | 1st floor | N1 | Directivity measure - Center 1st floor |
| 10 | | N2 | Left side |
| 11 | | N3 | |
| 12 | | N4 | Left opening |
| 13 | | N5 | Right side |
| 14 | | N6 | |
| 15 | | N7 | |
| 16 | 2nd floor | O1 | Right side |
| 17 | | O2 | |
| 18 | | O3 | |
| 19 | | O4 | Center |
| 20 | | O5 | Directivity measure - Center 2nd floor |
| 21 | | O6 | Left side |
| 22 | | O7 | |
| 23 | | O8 | |

In the following Figures, all measurements are grouped by letter as in Table 1.

- m-measurements: Podium
- n- measurements: 1st floor
- o- measurements: 2nd floor



Figure 4. Cross-section of the concert hall

m- measurements.

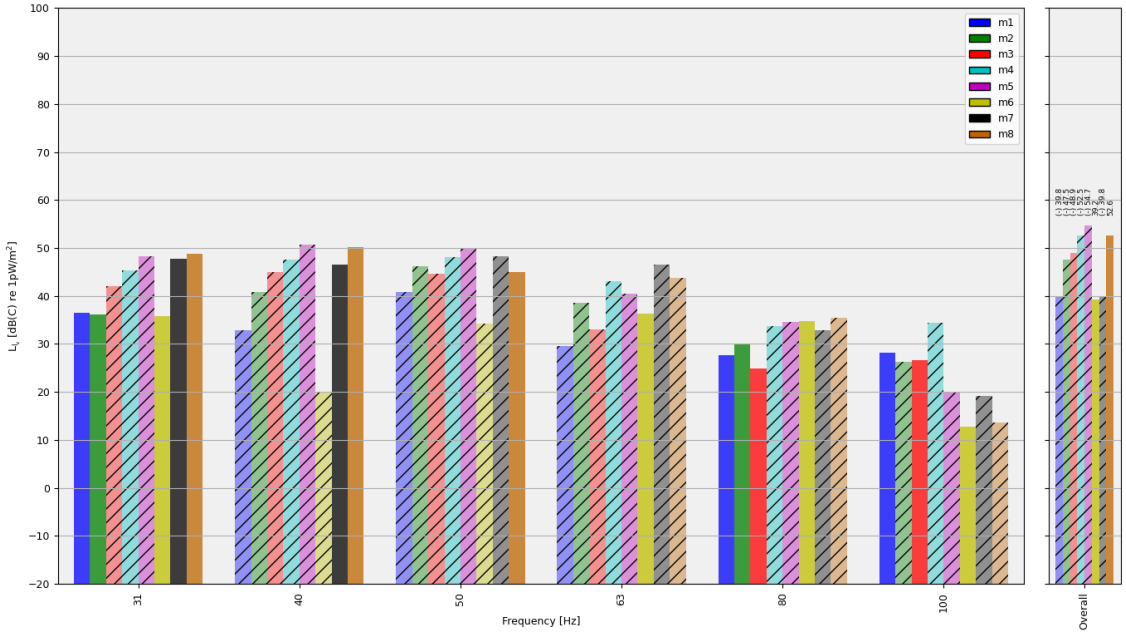



Figure 5. The active sound intensity (C-weighted) for the m-measurements.

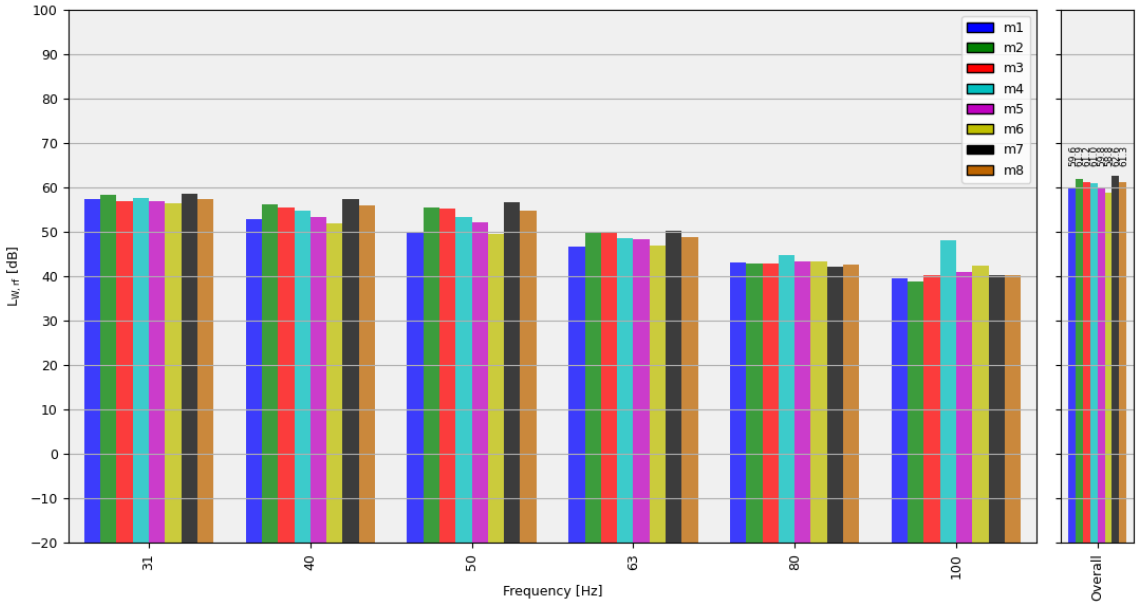



Figure 6. The "emitted" sound intensity (C-weighted) for the m-measurements.

From the figure, it can be concluded that, low frequency, most of the noise enters at measurements 7 and 8 the room; when the wooden sliding doors are opened.

## n-measurements

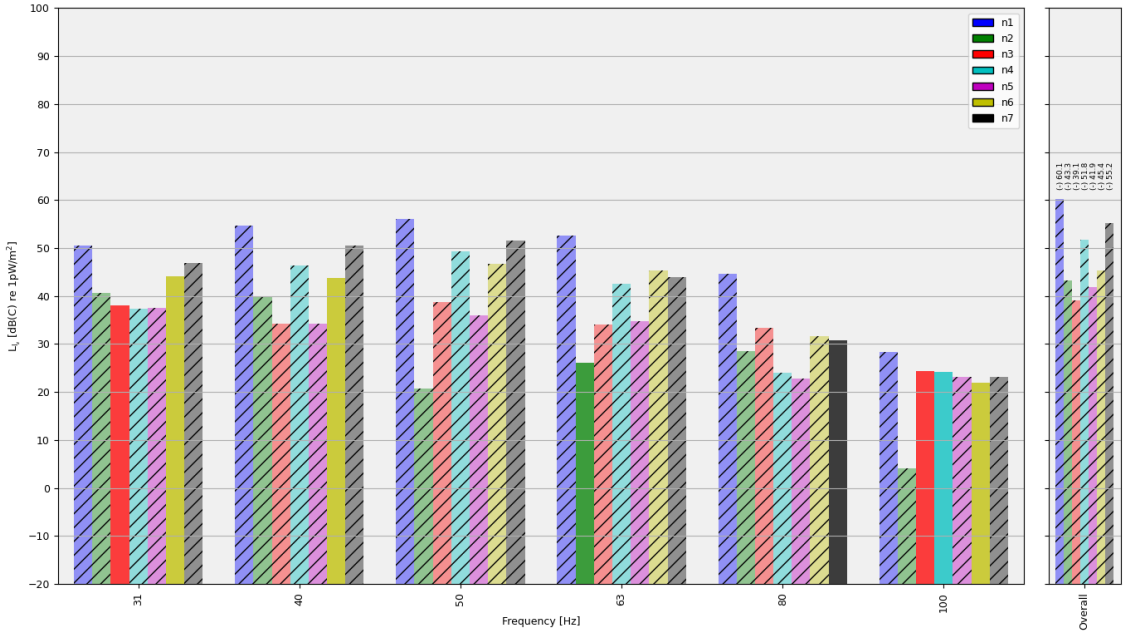



Figure 7. The active sound intensity (C-weighted) for the n-measurements.

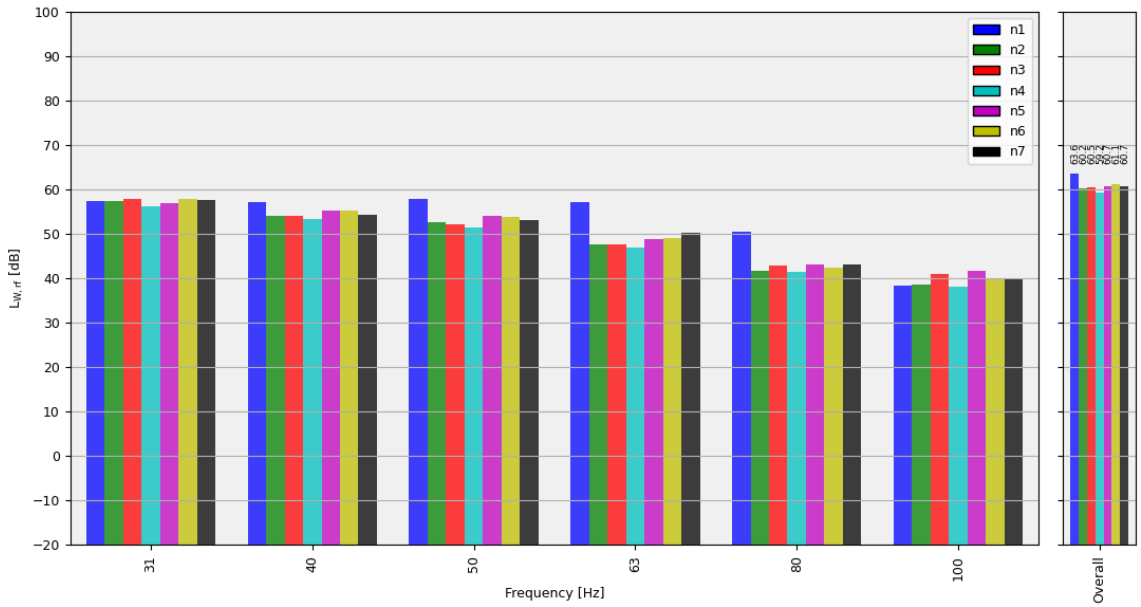



Figure 8. The "emitted" sound intensity (C-weighted) for the n-measurements.

From both figures it can be concluded that the vast majority of the sound intensity is negative so the sound is being absorbed here.

o-measurements.

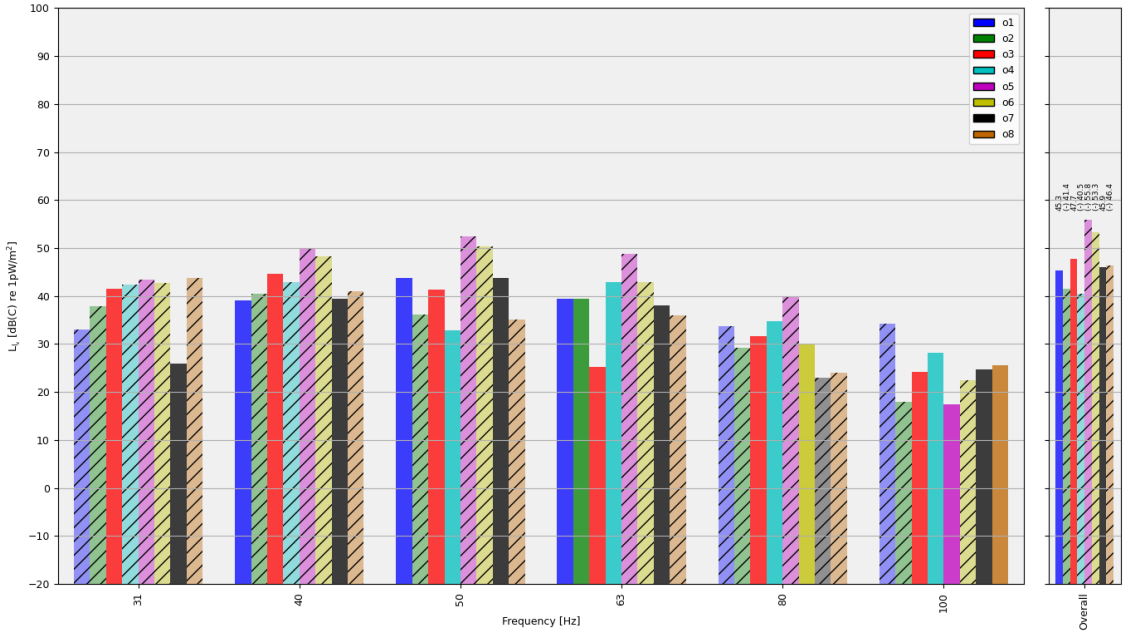



Figure 9. The active sound intensity (C-weighted) for the o-measurements.

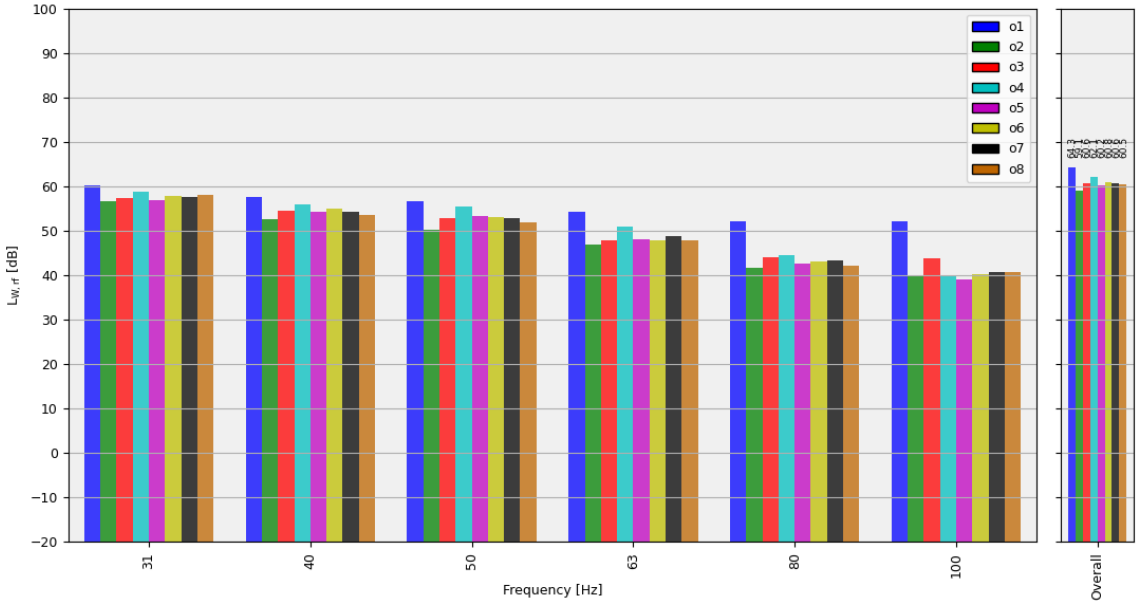



Figure 10. The "emitted" sound intensity (C-weighted) for the o-measurements.

In these measurements, o1, o3, o4 and o7 are possible locations where sound enters the room. At the other surfaces, sound is being absorbed.