How Humans Perceive Sound

TI Precision Labs – Audio fundamentals

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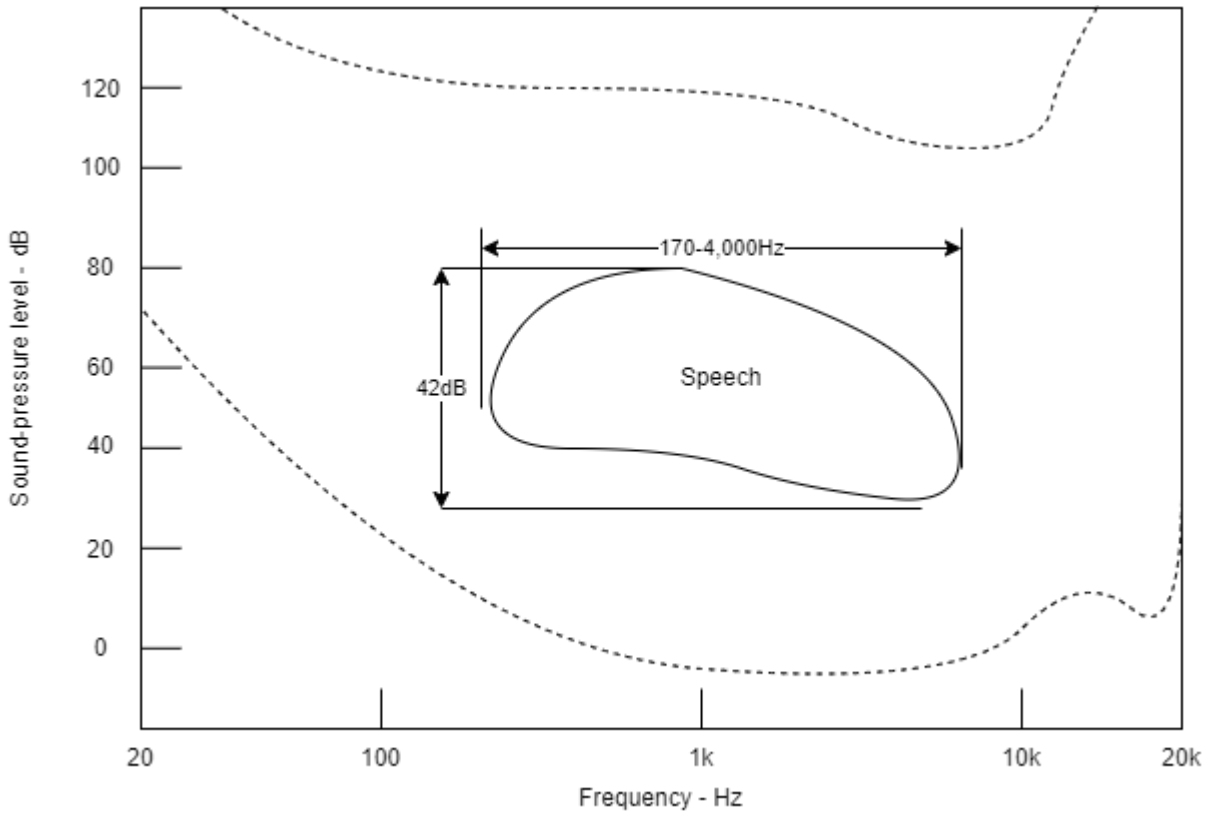
Psychoacoustics | Introduction

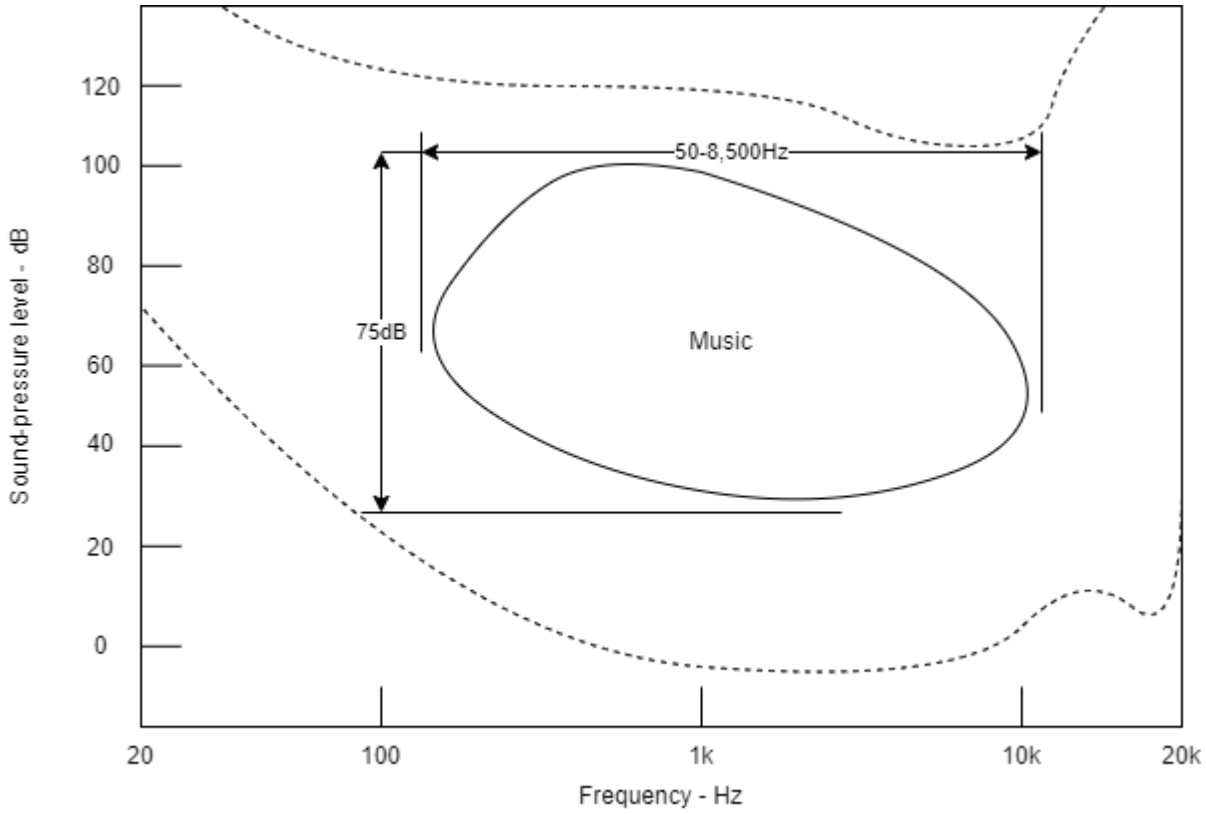
- Loudness and dB scale
  - How is sound measured?
- Limits of perception
  - What can humans hear?
- Sound localization
  - How speaker placement affect the sound perception?
- Harmonics
  - How harmonics affect the perceived sounds?

Psychoacoustics | Loudness

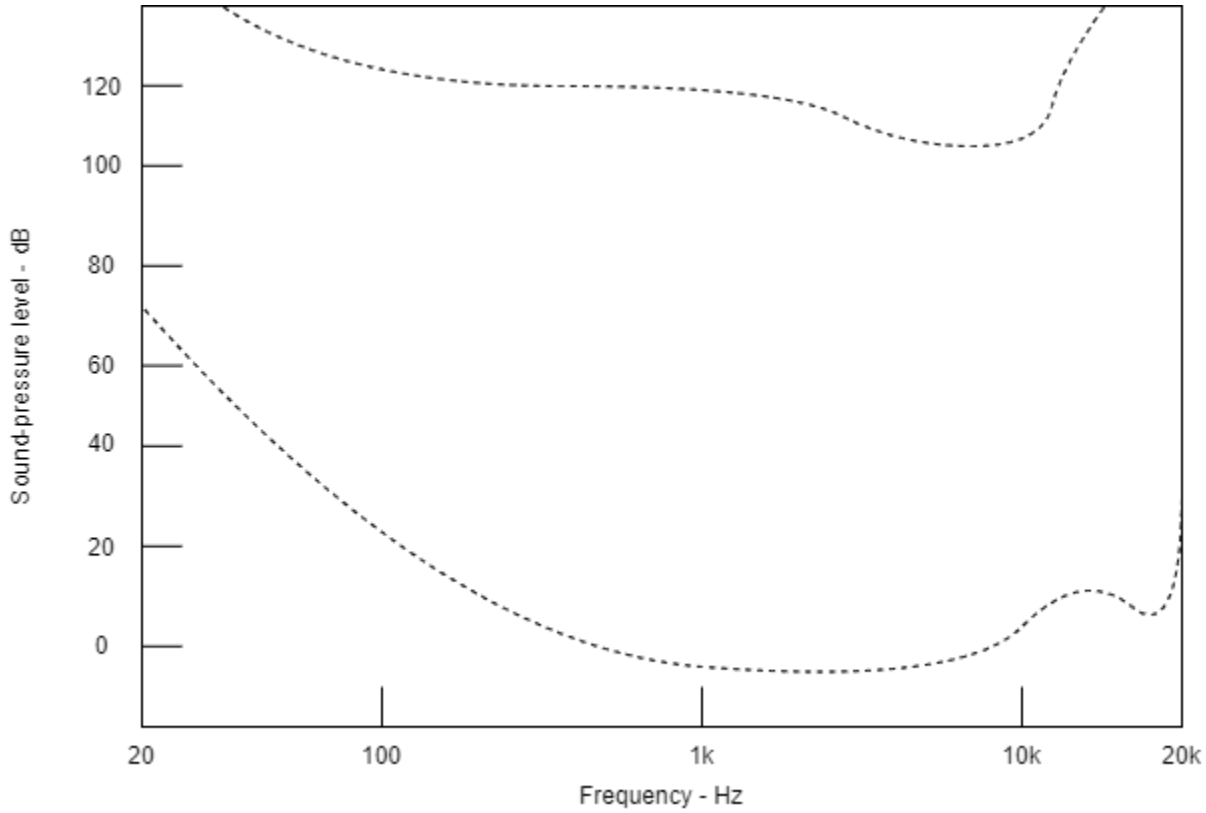
Sound sources (noise) - Examples with distance	Sound pressure level - dB SPL
Jet aircraft, 50 m away	**140**
Threshold of pain	**130**
Threshold of discomfort	**120**
Chainsaw, 1 m distance	**110**
Concert, 1 m from speaker	**100**
Diesel truck, 10 m away	**90**
Curbside of busy road, 5 m	**80**
Vacuum cleaner, distance 1 m	**70**
Conversational speech, 1 m	**60**
Average home	**50**
Quiet library	**40**
Quiet bedroom at night	**30**
Background in TV studio	**20**
Rustling leaves in the distance	**10**
Hearing threshold	**0**

Psychoacoustics | Limits of perception

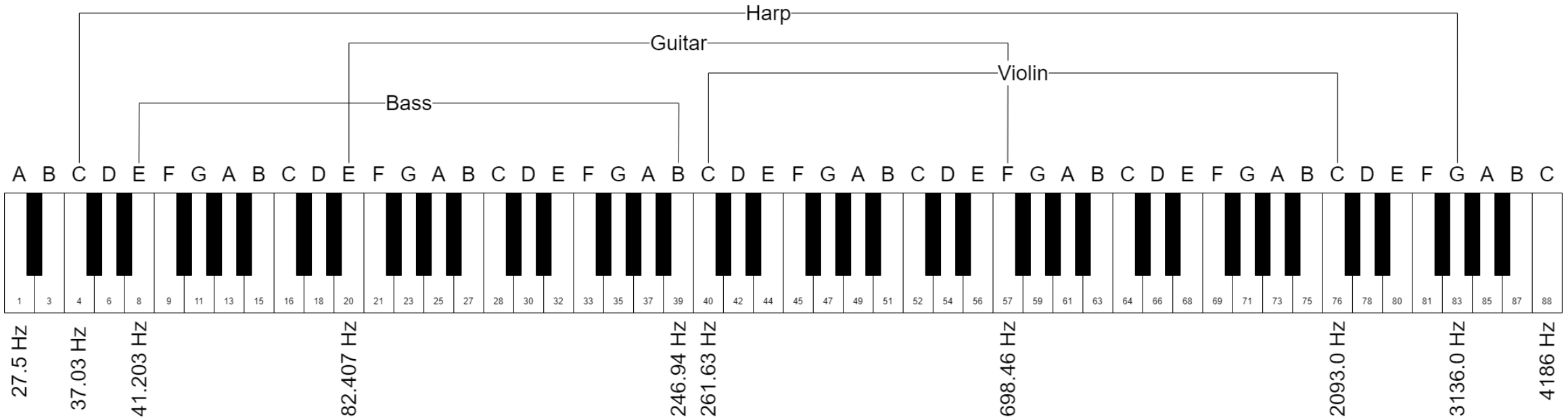




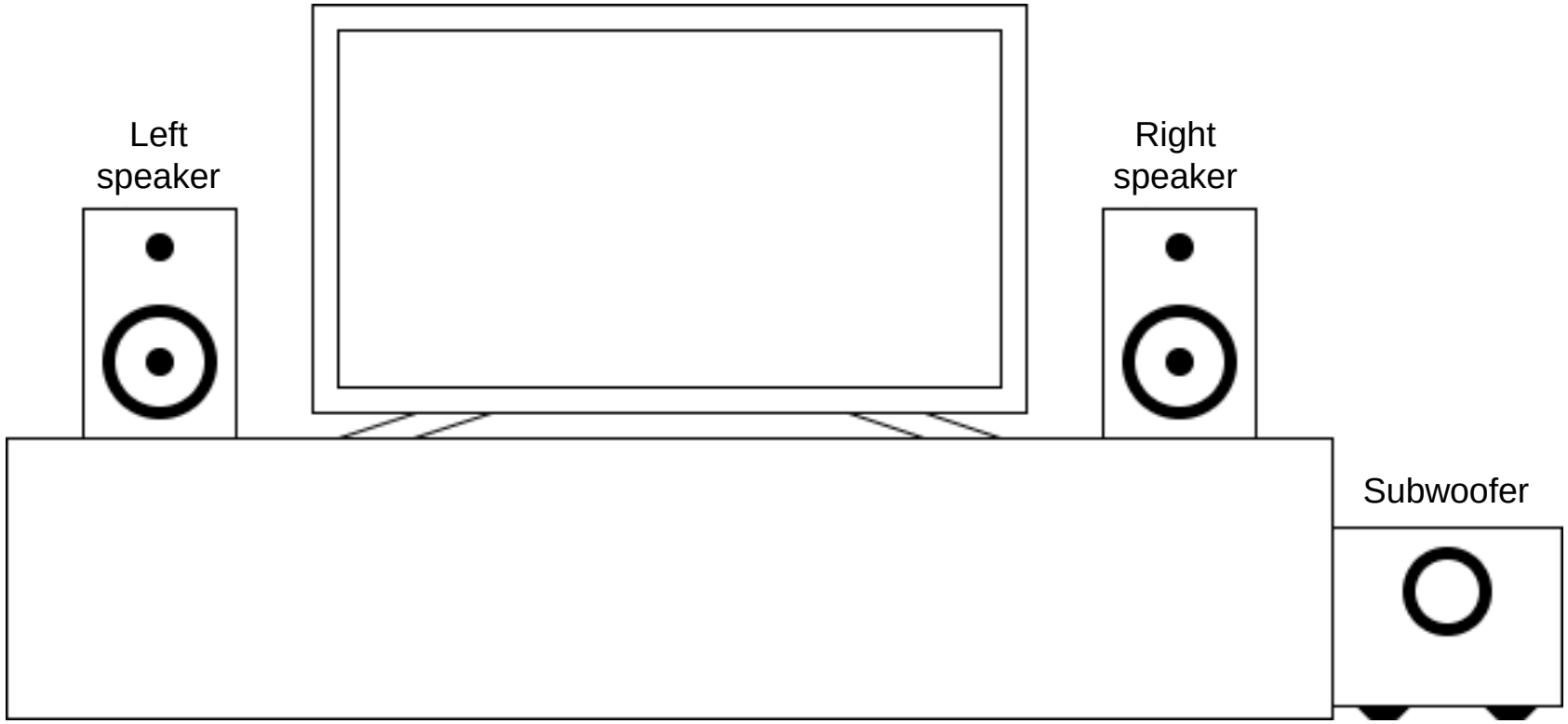
Psychoacoustics | Limits of perception



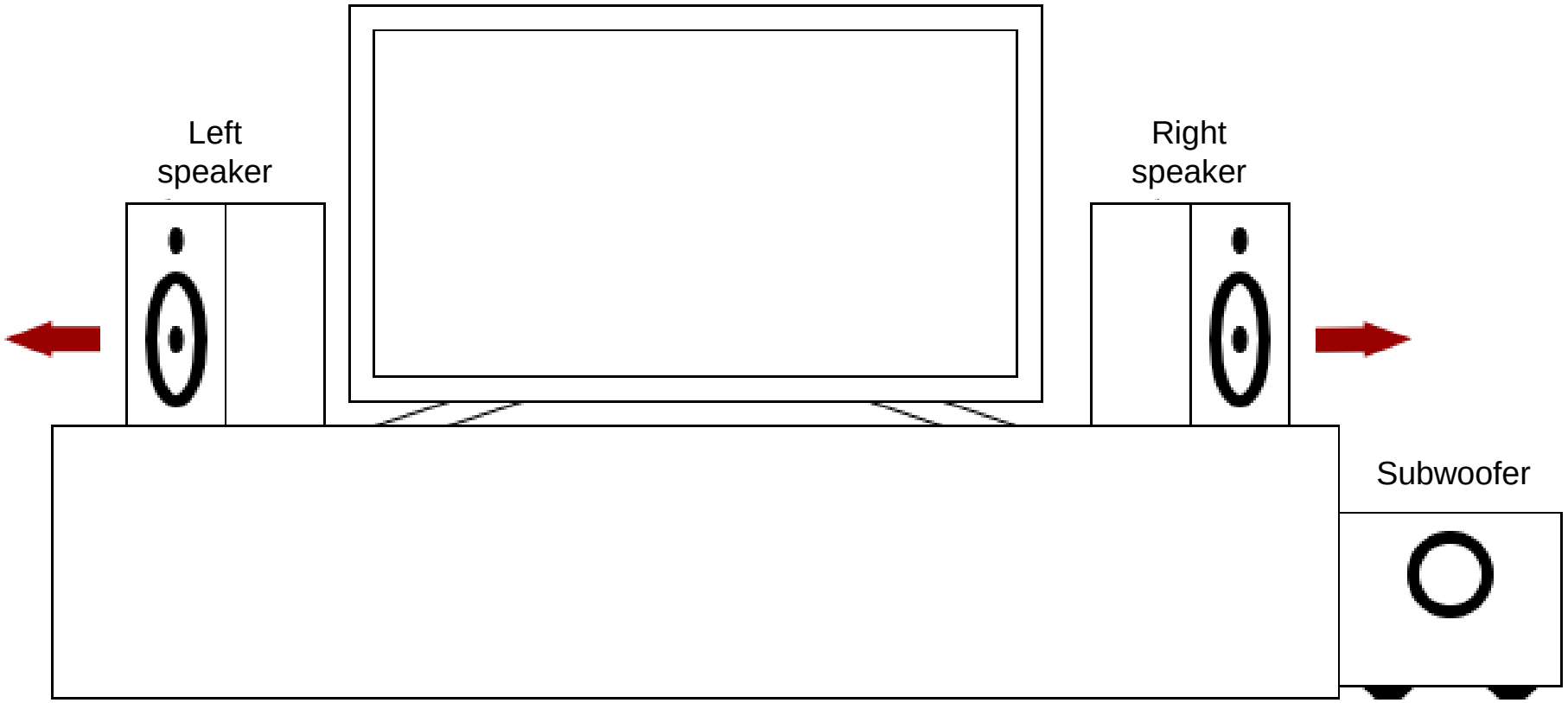
Psychoacoustics | Limits of perception



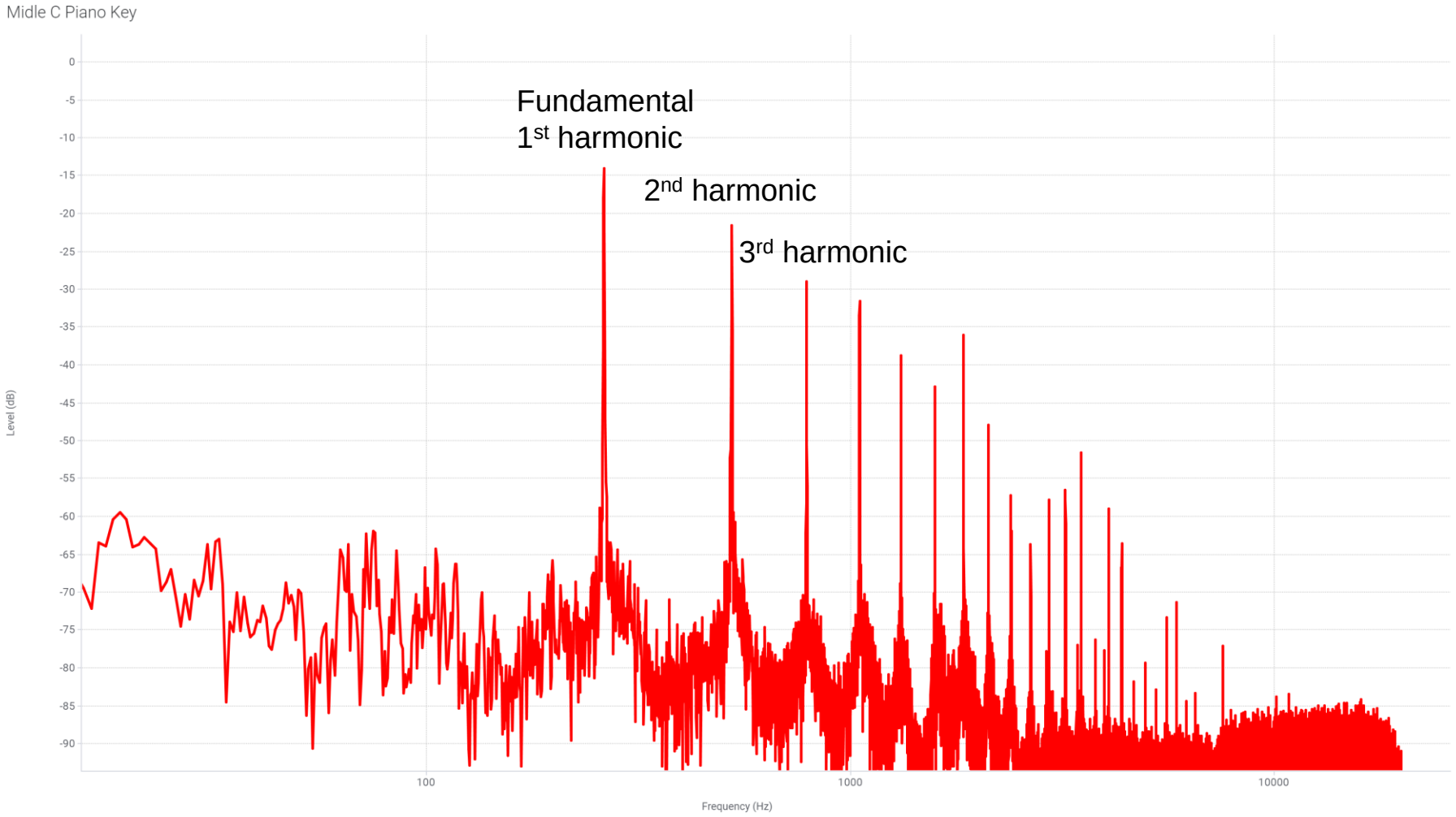
Psychoacoustics | Sound localization



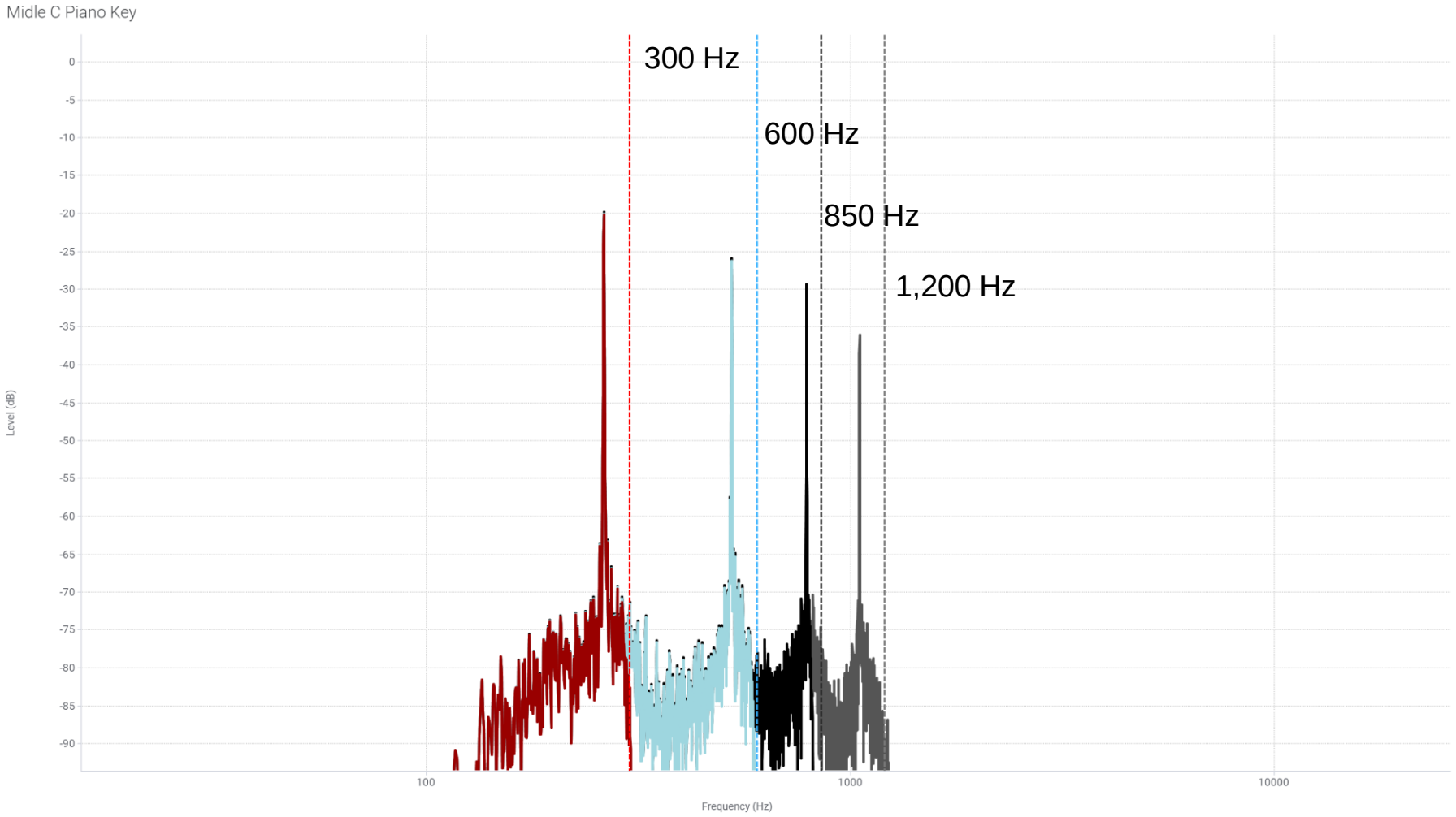
Psychoacoustics | Sound localization



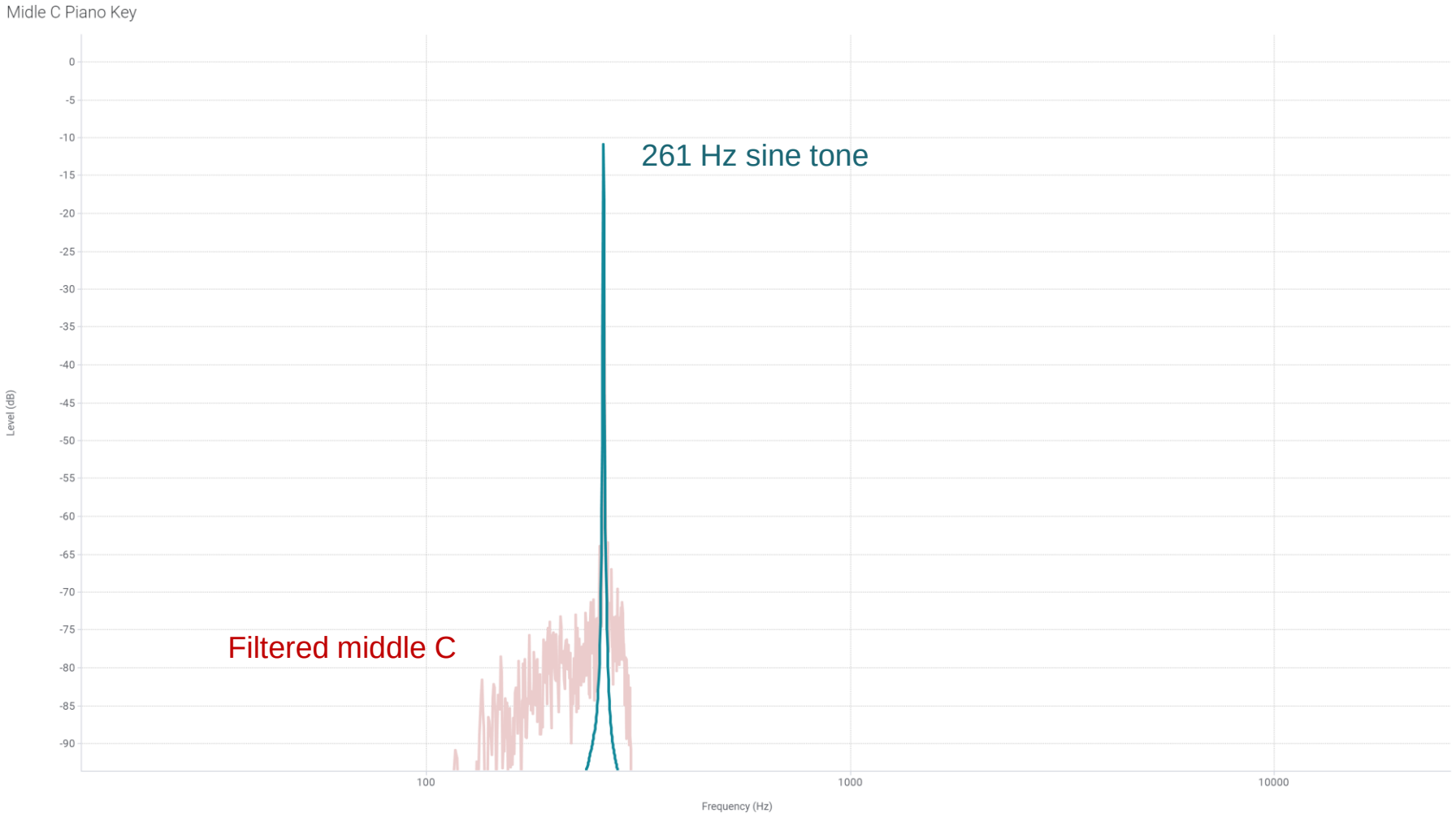
Psychoacoustics | Harmonics



Psychoacoustics | Harmonics



Psychoacoustics | Harmonics



Psychoacoustics | Summary

- Loudness and dB scale
  - How is sound measured?
    - dB-SPL, non-linearity and distance to sound source.
- Limits of perception
  - What can humans hear?
    - Frequency and loudness thresholds. Speech and music frequency content.
- Sound localization
  - How speaker placement affect the sound perception
    - Acoustic shadow depends on sound frequency.
- Harmonics
  - How harmonics affect the perceived sounds?
    - Natural and artificial harmonics. Harmonic or overtone series.

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