

Basics of Noise and Its Measurement

Nachiketa Tiwari

Indian Institute of Technology, Kanpur

Nature of Sound

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Indian Institute of Technology, Kanpur

Nature of Sound

Reflection

Rarefaction

Interference (beats)

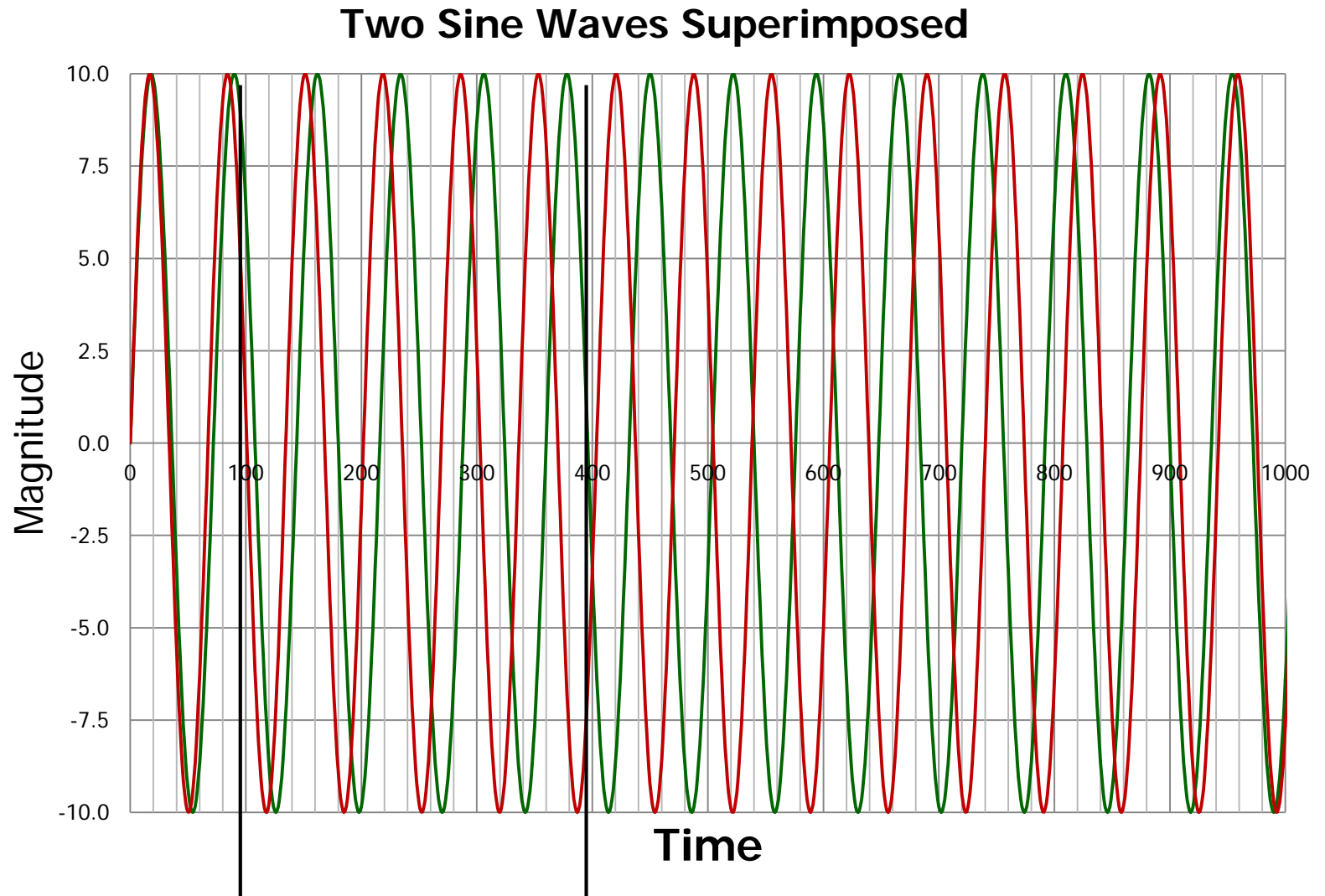
Diffraction

Dispersion

Absorption, transmission

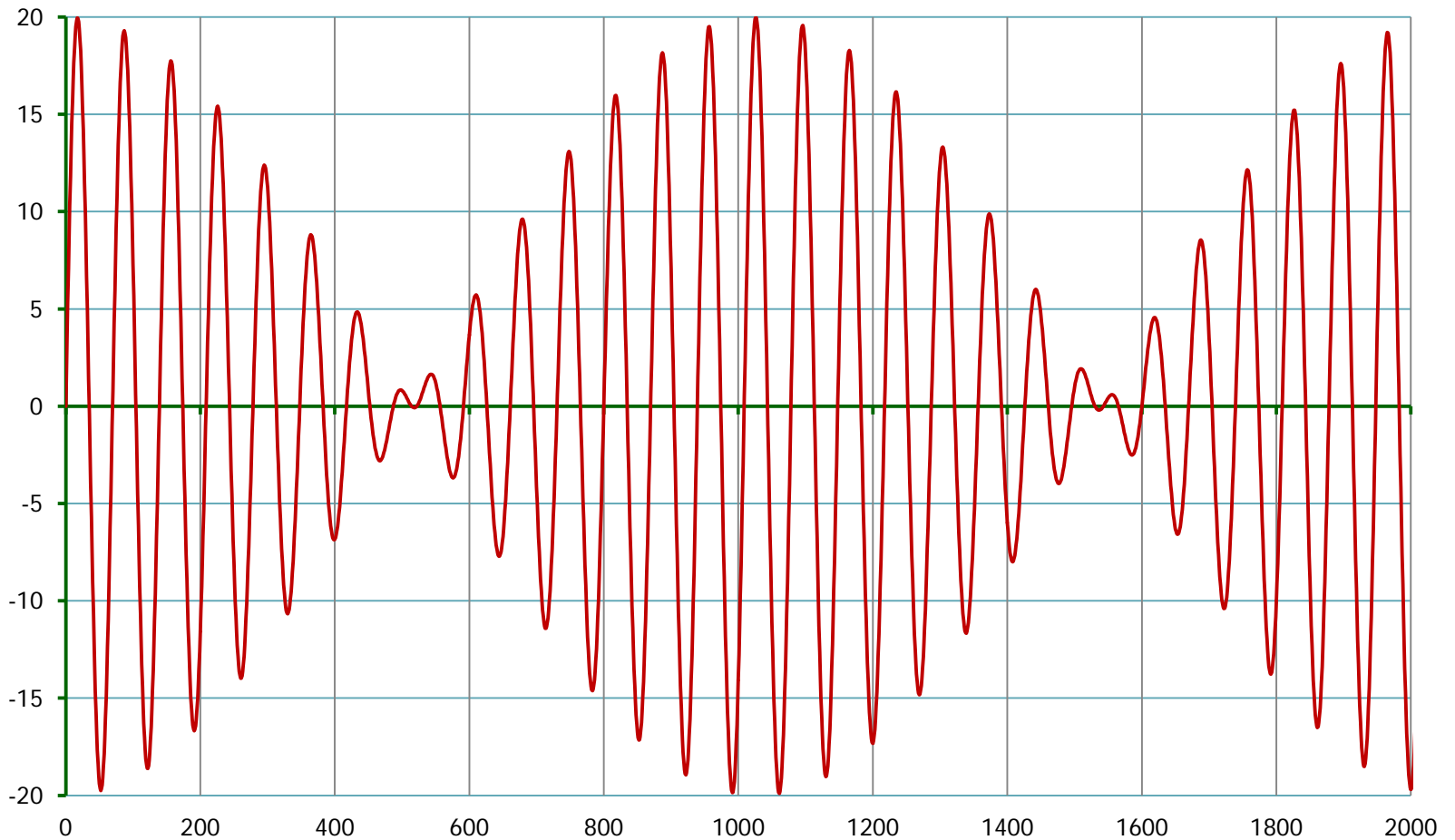
Example of Beats

Beats



Beats

Beat Waveform



Nature of Sound

$$P_{total} = P_0 + p$$

$$P_0 = 1,01,325 \text{ Pa}$$

Typical Sound Pressures

Source	Pressure (Pa)
Krakatoa explosion at 160 km	20,000 Pa (RMS)
.30-06 rifle -1 m to shooter's side	7,265
Jet engine at 30 m	632
Threshold of pain	63.2
Hearing damage possible	20
Jet at 100 m	6.32 – 200
Hearing damage (long-term exposure)	0.356
Passenger car at 10 m	0.02 – 0.20
TV (set at home level) at 1 m	0.02
Normal talking at 1 m	0.002 – 0.02
Very calm room	6.32×10^{-4}
Leaves rustling, calm breathing	6.32×10^{-5}
Auditory threshold at 1 kHz	2×10^{-5}

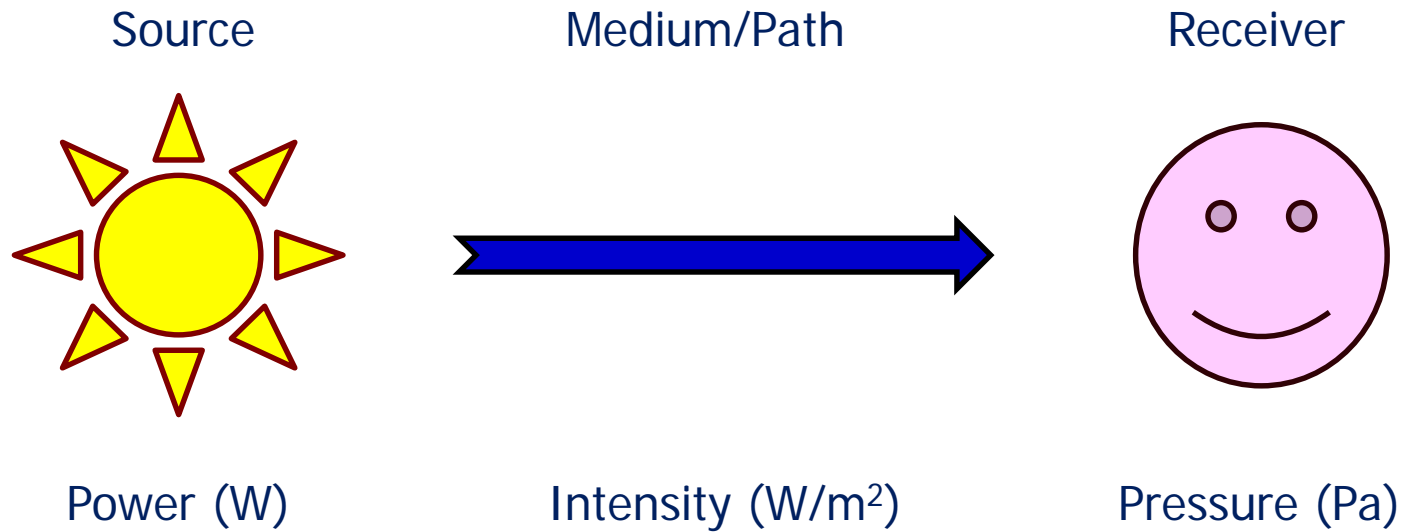
*Pressure due
to a currency
coin on table
= 97 Pa*

Source:
Wikipedia

The Need for Logarithmic Scales

- Audible sound pressure ranges from 2×10^4 Pa to 2×10^{-5} Pa
- Therefore *logarithmic scales* are preferred in order to represent the entire audible pressure range.

Measuring Sound



References

- Acoustics, Beranek Leo L., Acoustical Society of America, 1993.
- Introduction to Acoustics, Finch Robert D., Pearson Prentice Hall, 2005.
- Fundamentals of Acoustics, Kinsler Lawrence E., et al, 4th ed., John Wiley & Sons, 2005.
- Sound and Structural Vibration, Fahy Frank, et al, 2nd ed., Academic Press 2007.