

Audio 101 Part 1

Fayetteville Public Library

What is an Audio Engineer?



- An audio engineer helps with recordings or a live performances using technical skills and equipment
 - Recording Studio (Recording, Mixing, Mastering)
 - Video Games (Foley, Sound Design, ADR)
 - Film (On-set audio)
 - Post Audio (Foley, Sound Design, ADR)
 - Broadcasting
 - Live Sound
 - System Engineer



Recording History

Wax Cylinder -> Vinyl -> Tape -> Digital

VOLUME

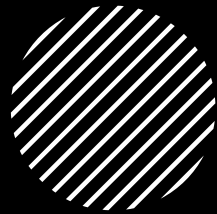


Analog Audio Theory

Frequency, Wavelength, Amplitude, Phase, Fletcher Munson
Curve, Sound Pressure, Decibels, Levels

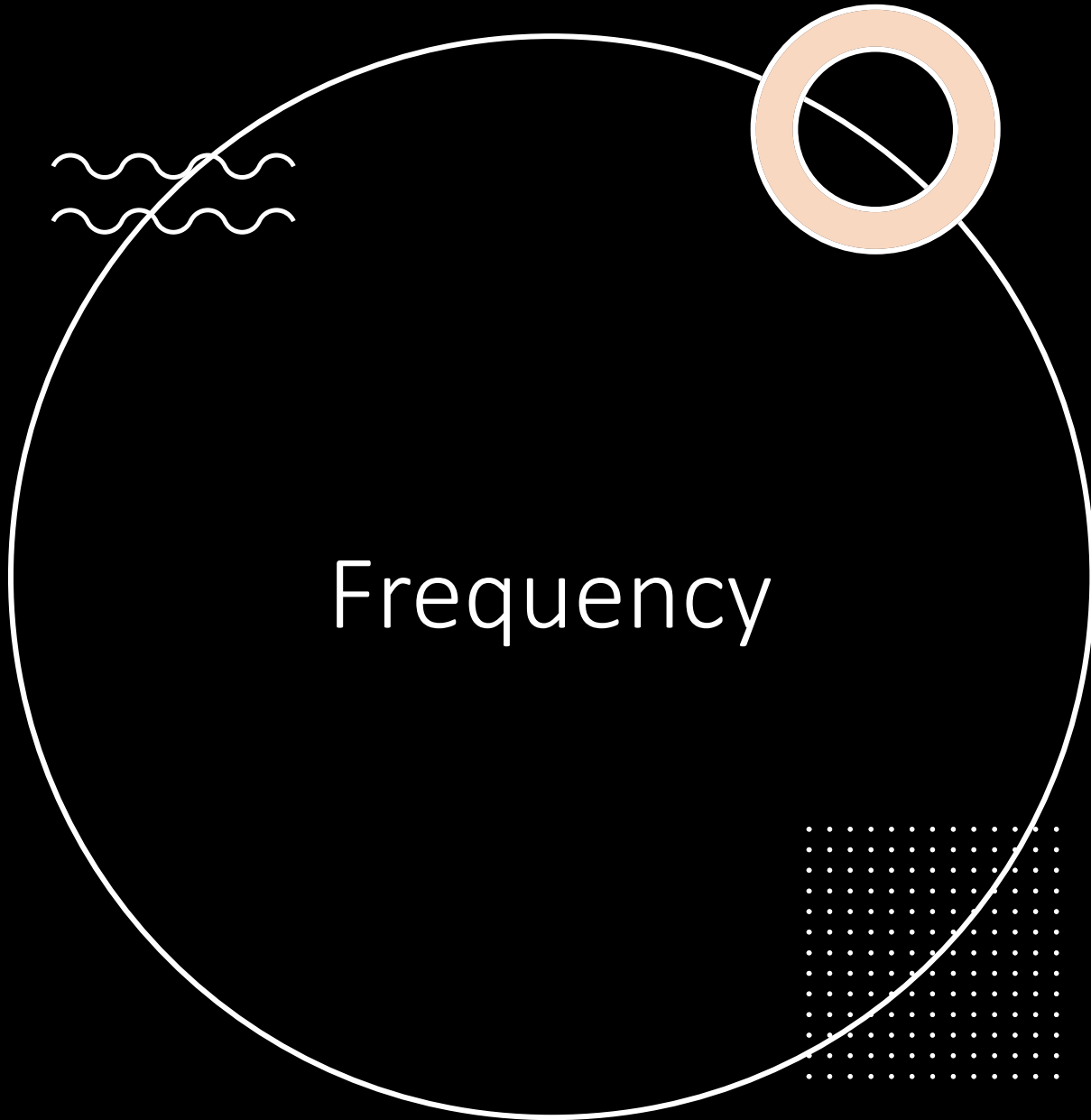


What is Sound?



- In physics, sound is described as a pressure wave that propagates through a medium
- Sound waves are usually described by
 - Frequency/Wavelength
 - Amplitude
 - Speed of Sound
 - Direction



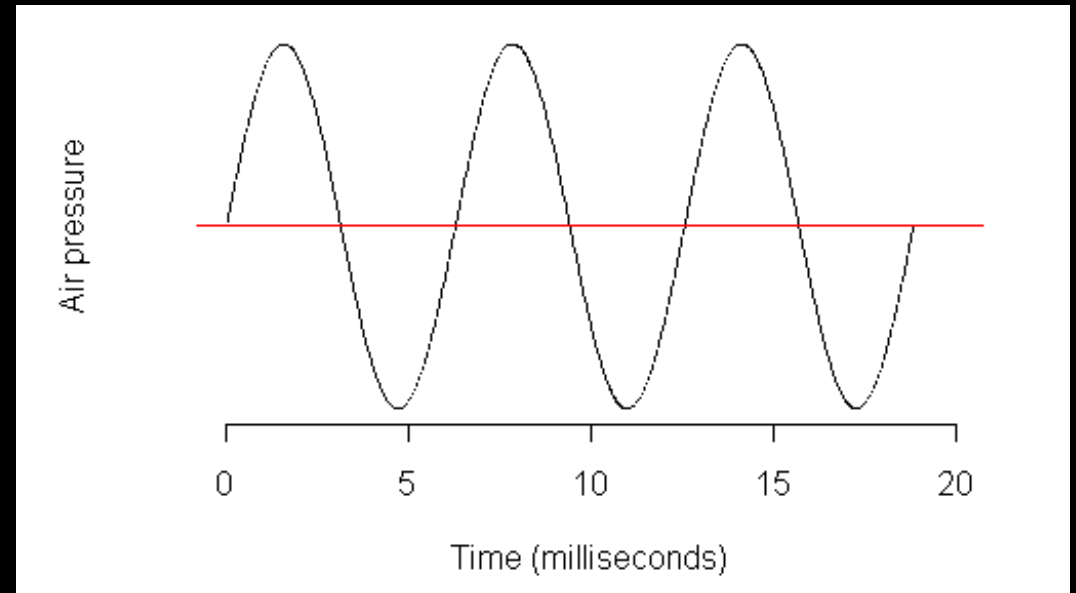


- Frequency is described as $f = 1/t$
 - Frequency (f) = 1(how many times?)/t(period)(how long?)
- Units of frequency are called Hertz
- Hertz = one cycle per second
- Cycle = one complete wave
- In music, a single frequency can be described as a pitch
- Human hearing 20hz – 20khz



Wavelength(λ)

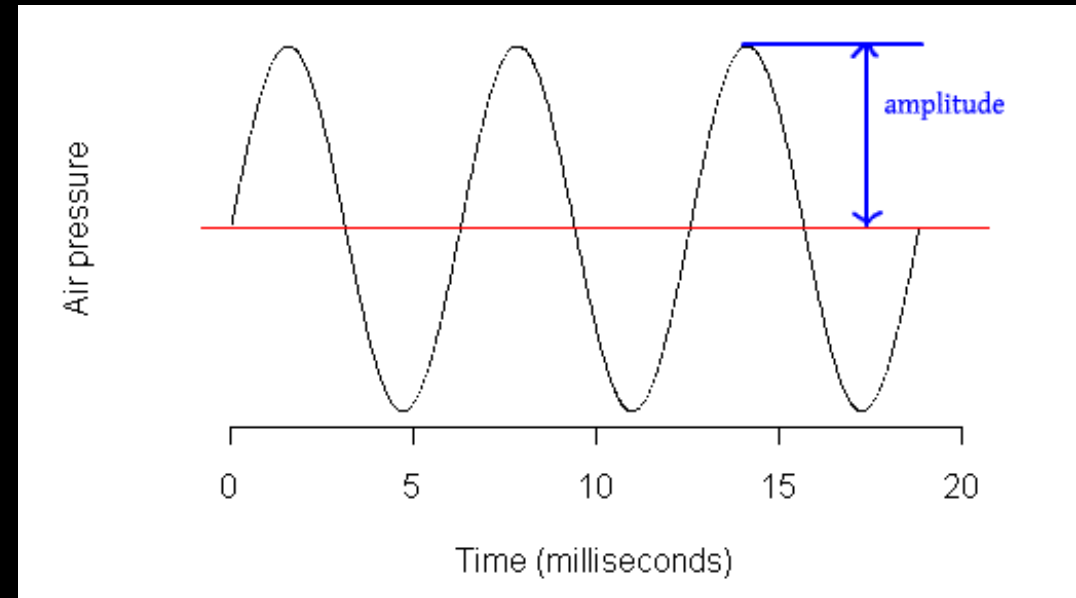
- Wavelength is described as $\lambda = v/f$
 - Wavelength(λ) = velocity(v) / frequency(f)
 - Just remember the distance formula $d = s/t$
- The distance for a full cycle of a wave





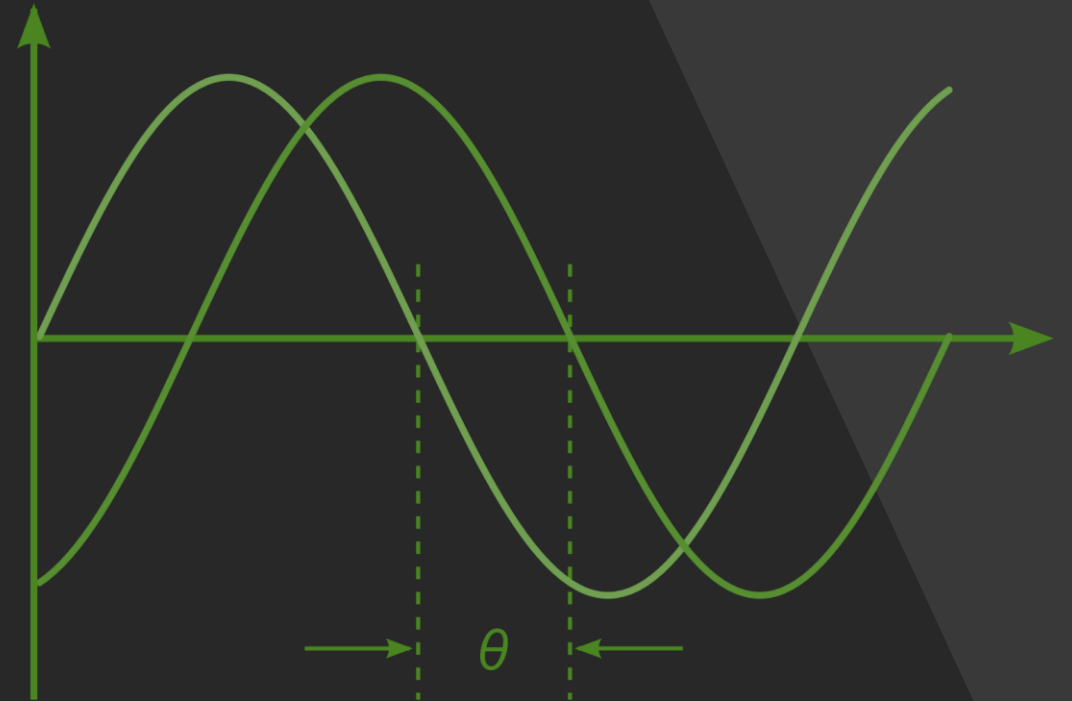
Amplitude

- Can be described as loudness
- Measured in decibels (dB)



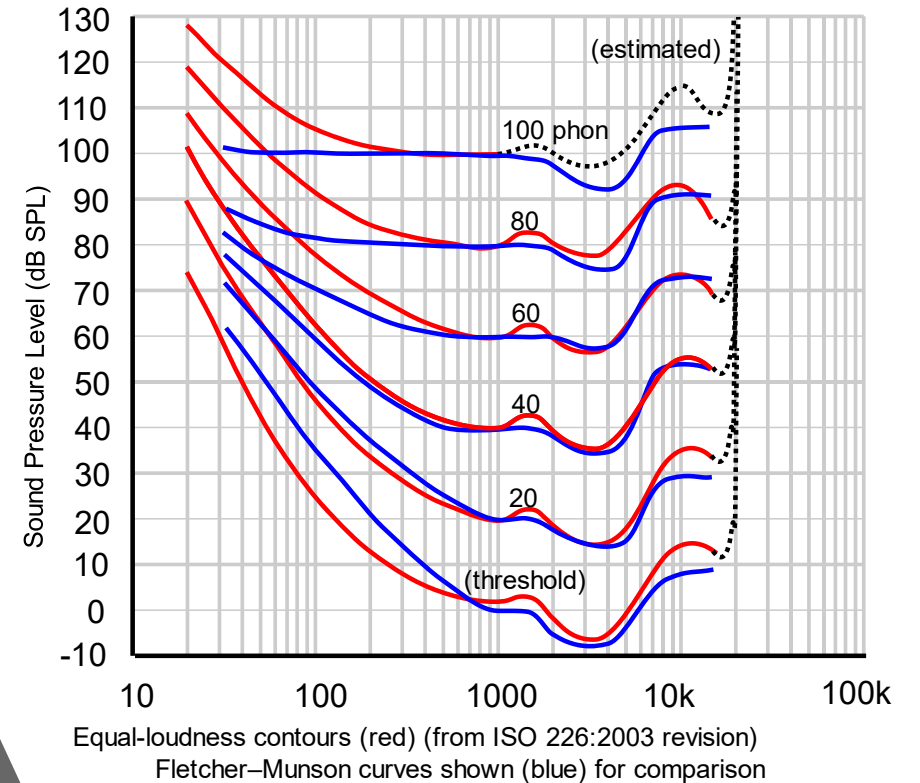
Phase Shift

- Phase shift is the difference between two periodic signals
- Phase is measured by angular units such as radians or degrees, audio engineers usually degrees
- Two signals that are the same will null each other out at 180 degree



Fletcher-Munson Curve

- Indicate the ear's sensitivity to different frequencies at various levels
- Lower levels = more midrange
- Higher levels = more treble and bass



Decibels

- Relative unit, not absolute
 - Logarithmic
 - Easier to work with
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Environmental Noise	<i>dBA</i>
Jet engine at 100'	140
	<i>125</i>
Pain Begins	
Pneumatic chipper at ear	120
Chain saw at 3'	110
Power mower	107
Subway train at 200'	95
Walkman on 5/10	94
<i>Level at which sustained exposure may result in hearing loss</i>	<i>80-90</i>
City Traffic	85
Telephone dial tone	80
Chamber music, in a small auditorium	75-85
Vacuum cleaner	75
Normal conversation	60-70
Business Office	60-65
Household refrigerator	55
Suburban area at night	40
Whisper	25
Quiet natural area with no wind	20
Threshold of hearing	0

Levels

- Mic - Mic level is the voltage of signal generated by a microphone. This is the lowest, or weakest, level signal of the four and requires a preamplifier to bring it up to line level.
- Instrument - Instrument level signals fall between mic level (lower) and line level (higher) signals. These signals refer to any level put out by an instrument, commonly from an electric guitar or bass. A preamplifier is required to bring the signal up to line level.
- Line - Line level signals are the highest-level signals before amplification. This is the type of signal that typically flows through your recording system after the preamplifier stage and before the amplifier that powers your speakers.