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As sound travels, it reflects off objects in its path, creating further disturbances in the surrounding air.

When these changes in air pressure vibrate your eardrum, nerve signals are sent to your brain and are interpreted as sound.

Fundamentals of a Sound Wave

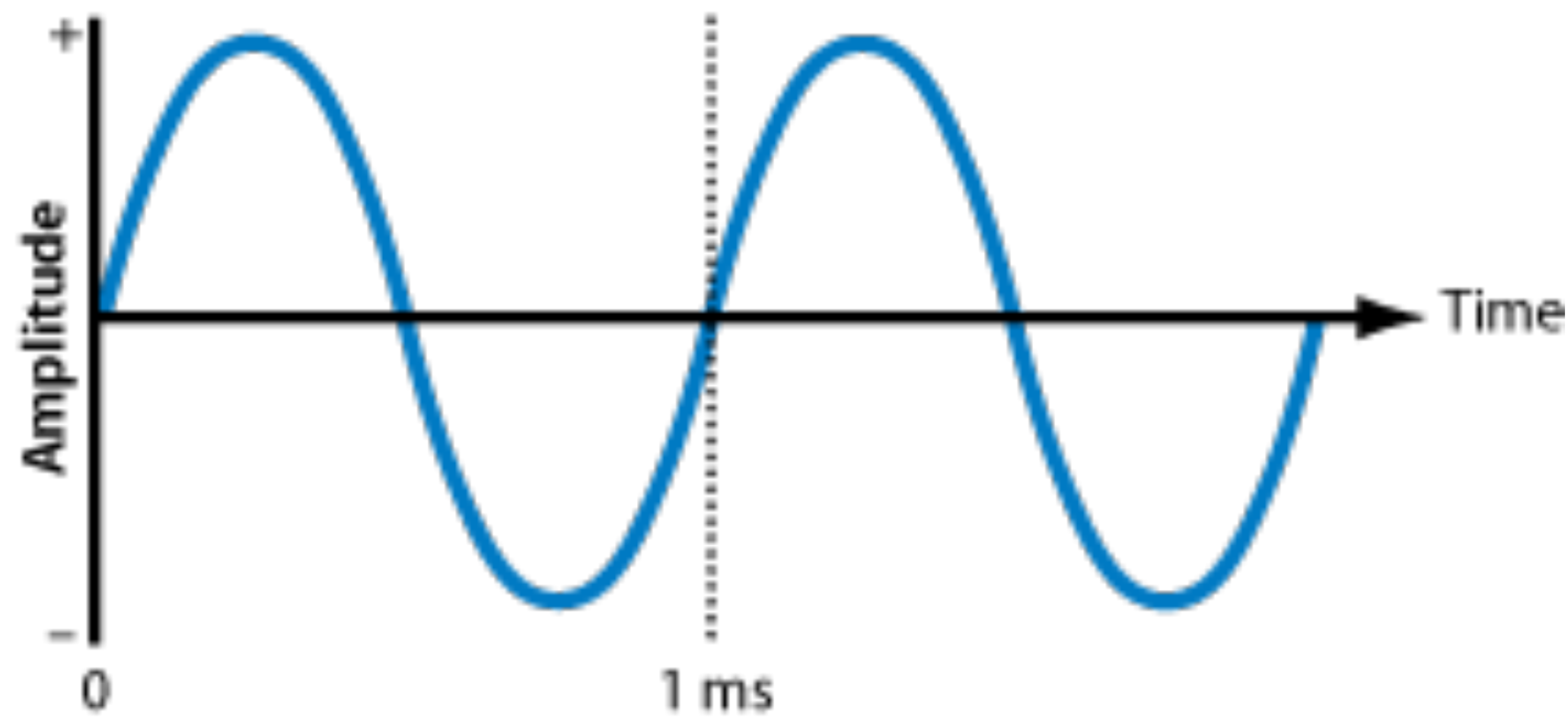
Fundamentals of a Sound Wave

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A sine wave clearly demonstrates the three fundamental characteristics of a sound wave: frequency, amplitude, and phase.



Frequency

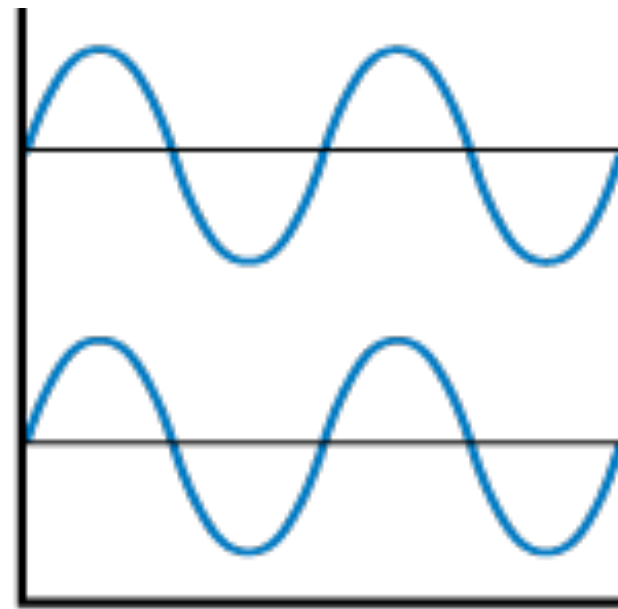
Frequency is the rate, or number of times per second, that a sound wave cycles from positive to negative to positive again. Frequency is measured in cycles per second, or hertz (Hz). Humans have a range of hearing from 20 Hz (low) to 20,000 Hz (high). Frequencies beyond this range exist, but they are inaudible to humans.

Amplitude

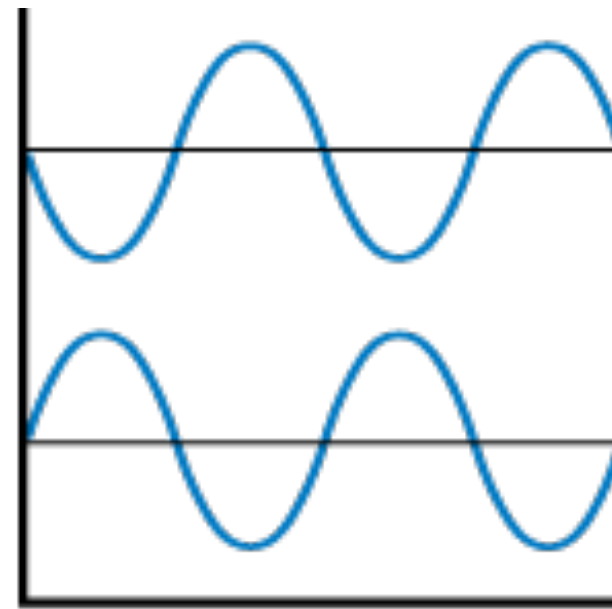
Amplitude (or intensity) refers to the strength of a sound wave, which the human ear interprets as volume or loudness.

Phase

Phase compares the timing between two similar sound waves.



Separate signals



In phase

Mixed signals



Out of phase

Frequency Spectrum of Sounds

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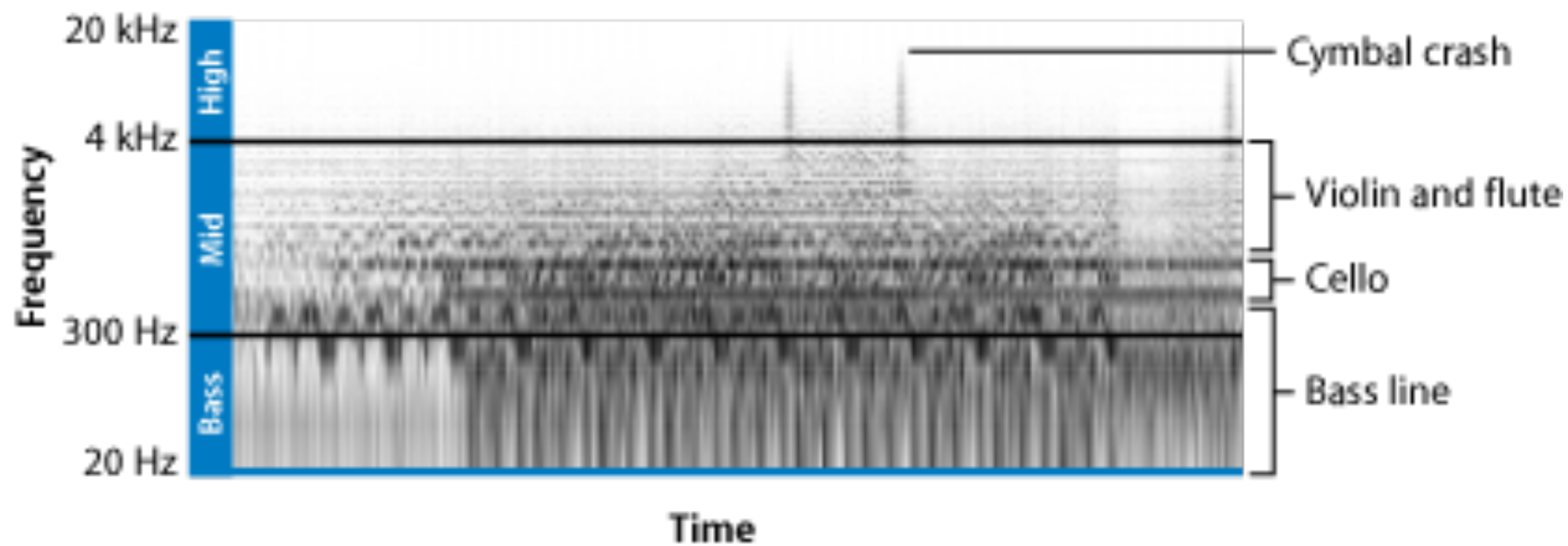
Sounds contain energy in different frequency ranges, or bands. If a sound has a lot of low-frequency energy, it has a lot of bass.

Frequency Spectrum of Sounds

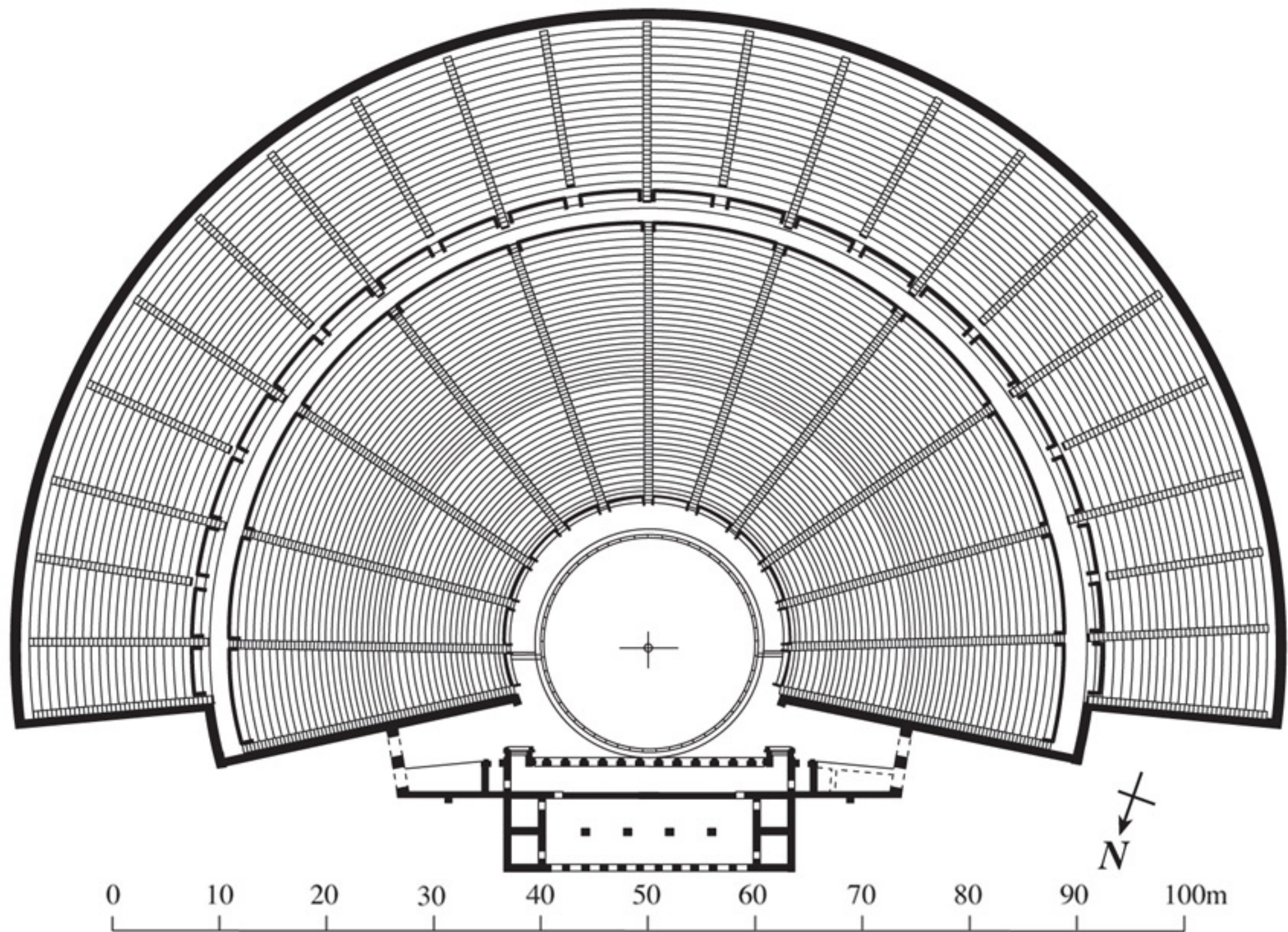
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High-frequency energy beyond the midrange is called treble.







Epidaururs (modern Epidauros, Greece)

Cavea width: 119 m, orchestra width: 24.65 m; capacity: 11,750-14,700; ca. 300-340 BC..

Plan (T.H. after Gerkan)