

**PHYSICS****ECHOS, DECIBELS AND BEATS**REFLECTION OF SOUND WAVES (Echos)

Just like mirrors which reflect light, when sound waves radiate out from a source, strike a rigid obstacle, the angle of reflection equals the angle of incidence of the sound wave.

ECHOES -

APPLICATIONS OF SOUND WAVE REFLECTION TECHNOLOGY

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Some biologics (dolphins and bats) have the ability to echo locate with their voices and ears.



PHYSICS

ECHOS, DECIBELS AND BEATS

SOUND INTENSITY

The power or volume of sound is measured in **Bels**. To make the scale easier to understand, the **decibel (dB)** is more commonly used.

INTENSITY (dB)	SOURCE
0	Threshold of Hearing
10	Normal Breathing
20	Average Whisper at 2m
30	Empty Theatre
40	Residential Area at Night
50	Quiet Restaurant
60	Two-Person Conversation
70	Busy Street Traffic
80	Vacuum Cleaner
90	Loud Stereo in an Average Room
100	Maximum Level in a Concert Hall (13 th Row)
110	Pneumatic Chisel
120	Maximum Level of Some Rock Groups
130	Threshold of Pain
140	Military Jet Taking off
150	Wind Tunnel
160	Instant Ear Drum Perforation
188	Blue Whale

**PHYSICS****ECHOS, DECIBELS AND BEATS**SOUND INTENSITY

Sound intensity is measured using a ***logarithmic scale***. This means that every integer on the scale is 10 times more powerful than the previous integer.

For example, a sound intensity of 8 Bels (80dB) is 10 times louder than a sound intensity of 7 Bels (70dB).

Ex: How many times louder is a passing subway train at 90 dB than a quiet restaurant at 50 dB?

**PHYSICS****ECHOS, DECIBELS AND BEATS**BEAT FREQUENCY

In Phase -

Out of Phase -

Beat Frequency:



<http://www.walter-fendt.de/ph14e/beats.htm>

<http://web.mit.edu/jorloff/www/beats/beats.html>

Ex: A sound, 256 Hz, is played simultaneously with another note. In 5.0 seconds, 20 beats are heard. What are the possible frequencies of the second note?