

SOUND4

PHASE
BEATS
BALANCED SIGNAL

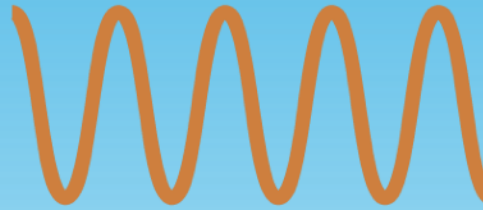
TOMMASO ROSATI
SOUND ART



SOURCE

WAVE

AUDITORY
SYSTEM



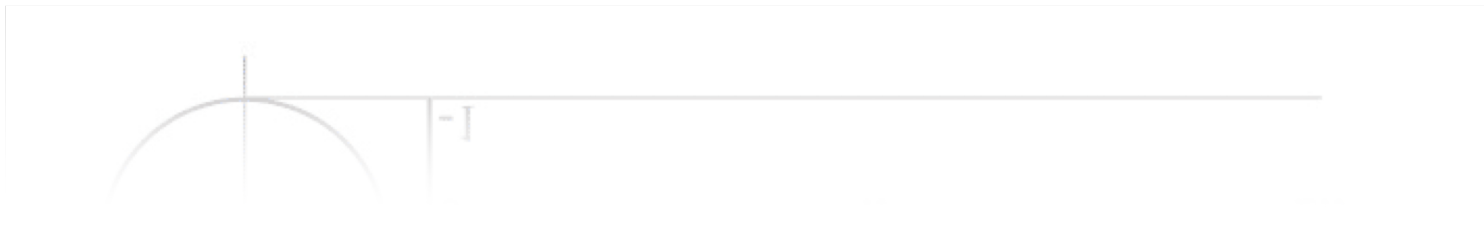
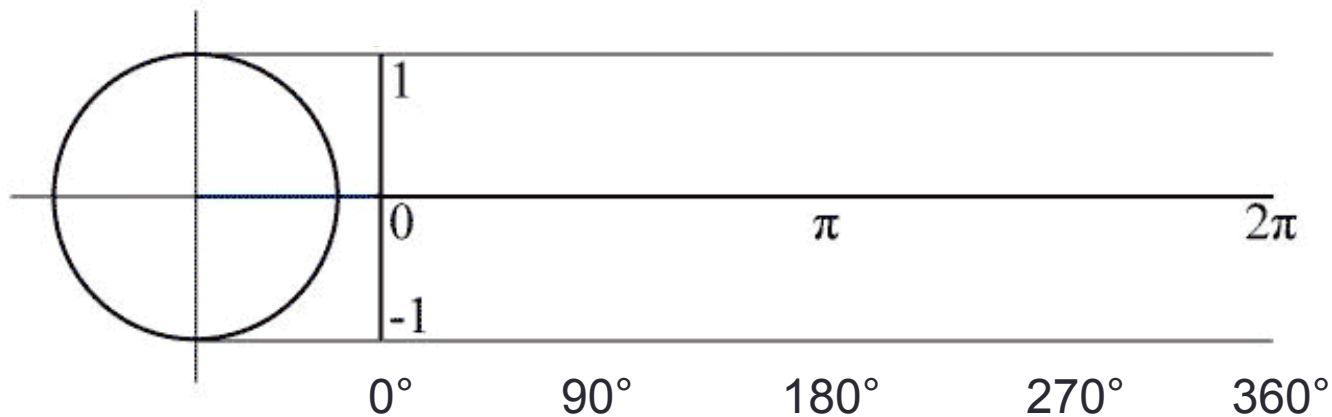
ELASTIC MEDIUM

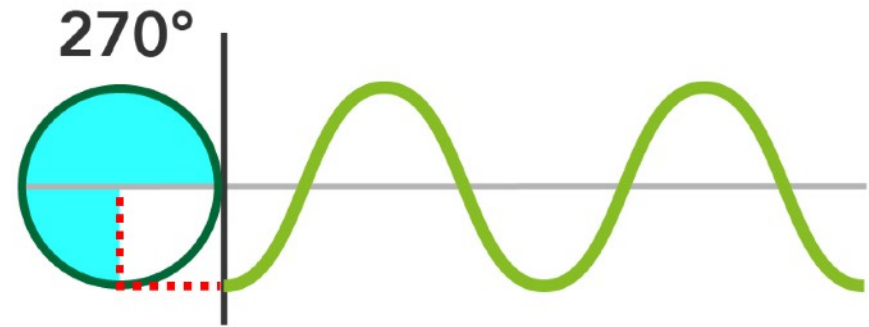
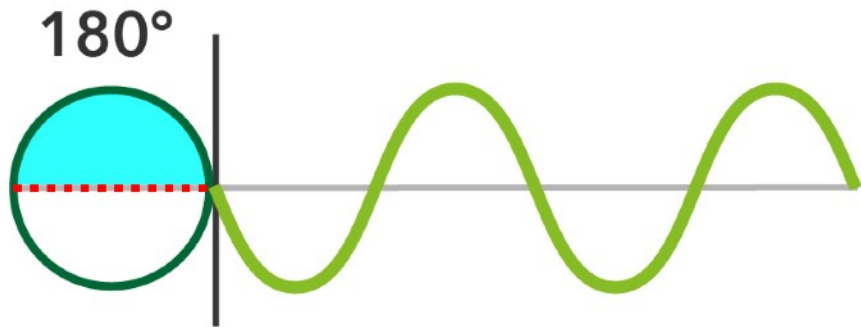
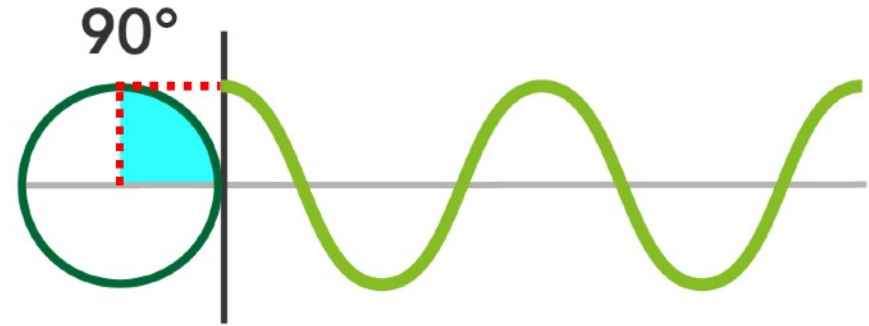
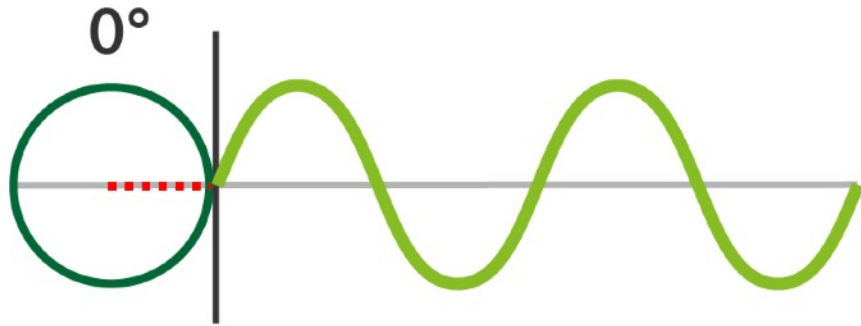


Phase

Phase φ (phi) parameter indicates the position where the wave cycle is at a given instant.

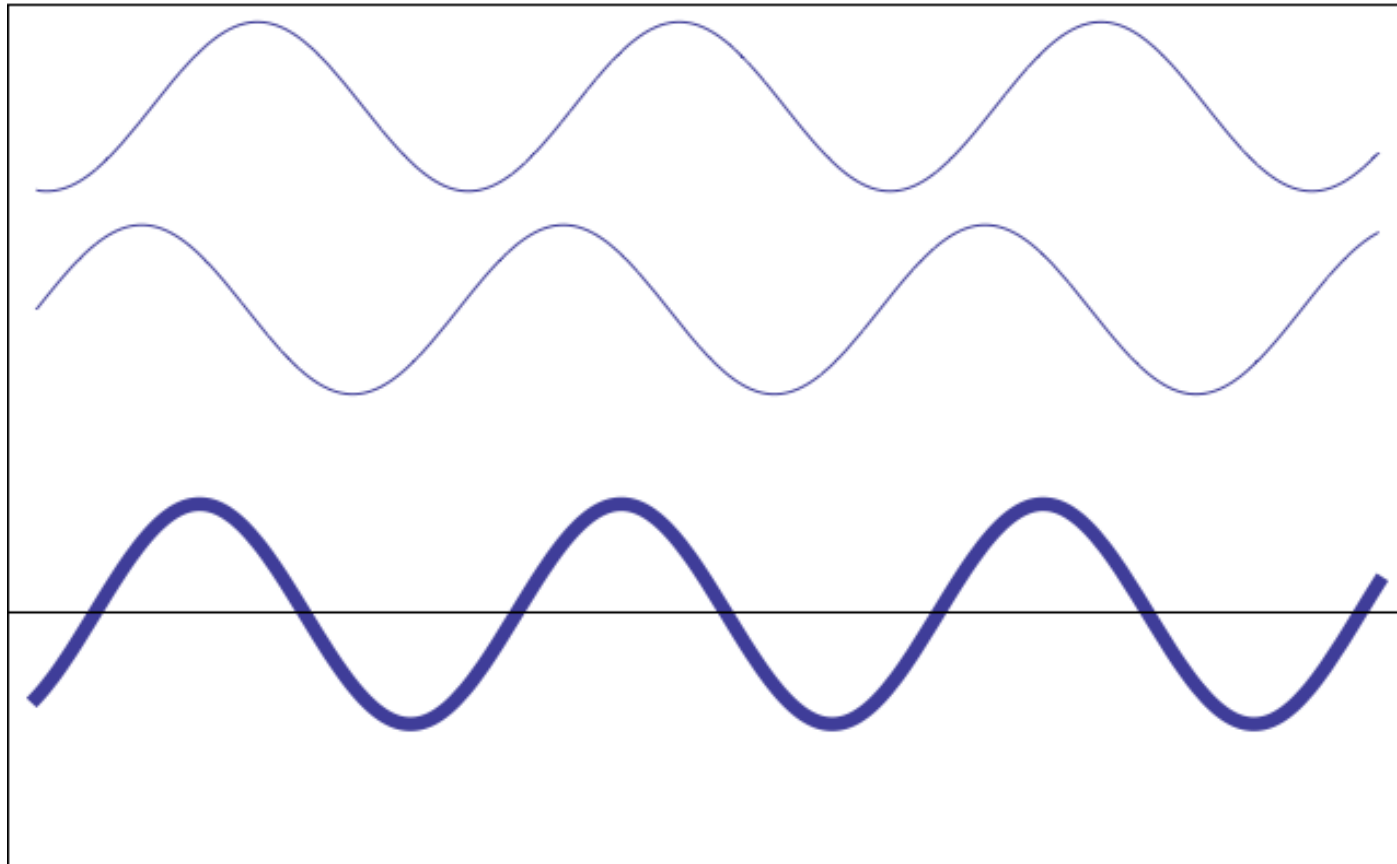
It's measured in degrees (0° , 90° , 180° ...).





Somma di onde

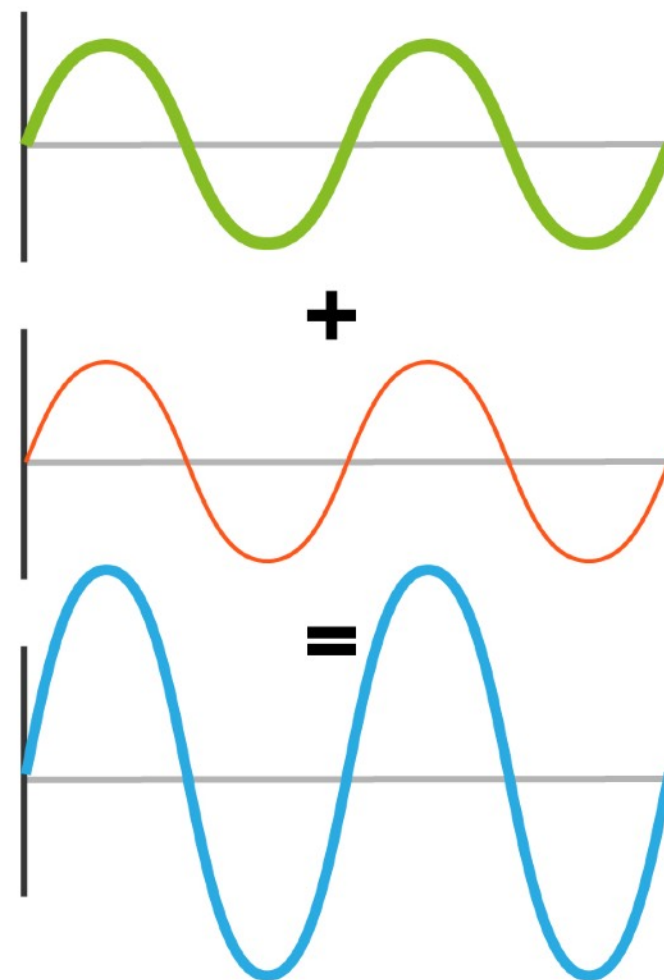
Sommando due onde si ottiene un'onda formata dalla somma algebrica dei valori di ampiezza delle due onde iniziali istante per istante.



in phase

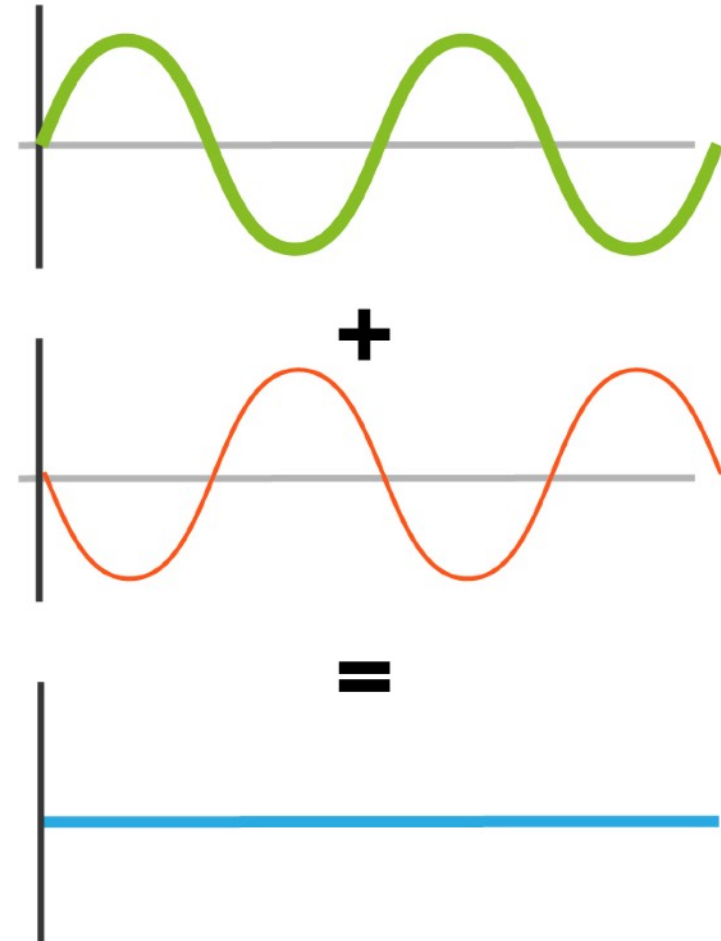
When two waves of equal amplitude and frequency also have identical phases.

In this case, adding them together results in a wave with the same frequency and phase but **twice the amplitude**



in antiphase

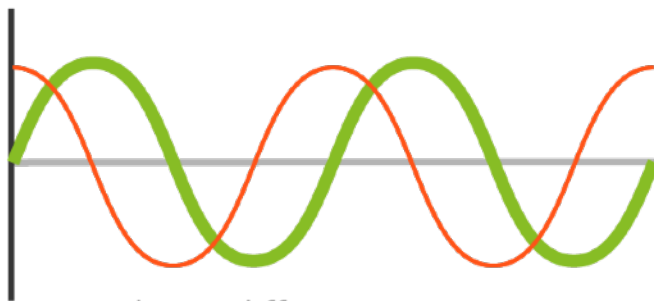
When two waves of equal amplitude and frequency have a phase difference of 180° . In this case, the "magic" happens by adding them together: we obtain **silence**.



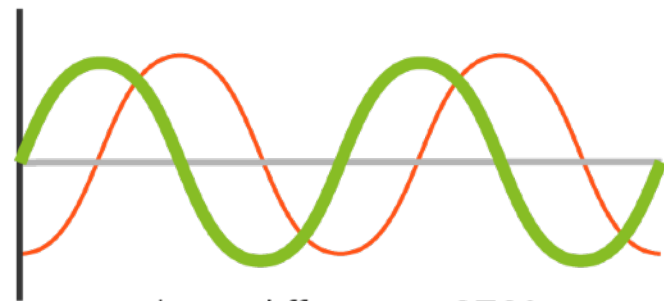
out-of-phase

All other cases. The wave you get with the sum depends on how close the two initial waves are to phase or antiphase, instant by instant.

When they are close to the phase, you get an increase in amplitude; when close to the antiphase, you get a decrease in amplitude.



phase difference: **90°**

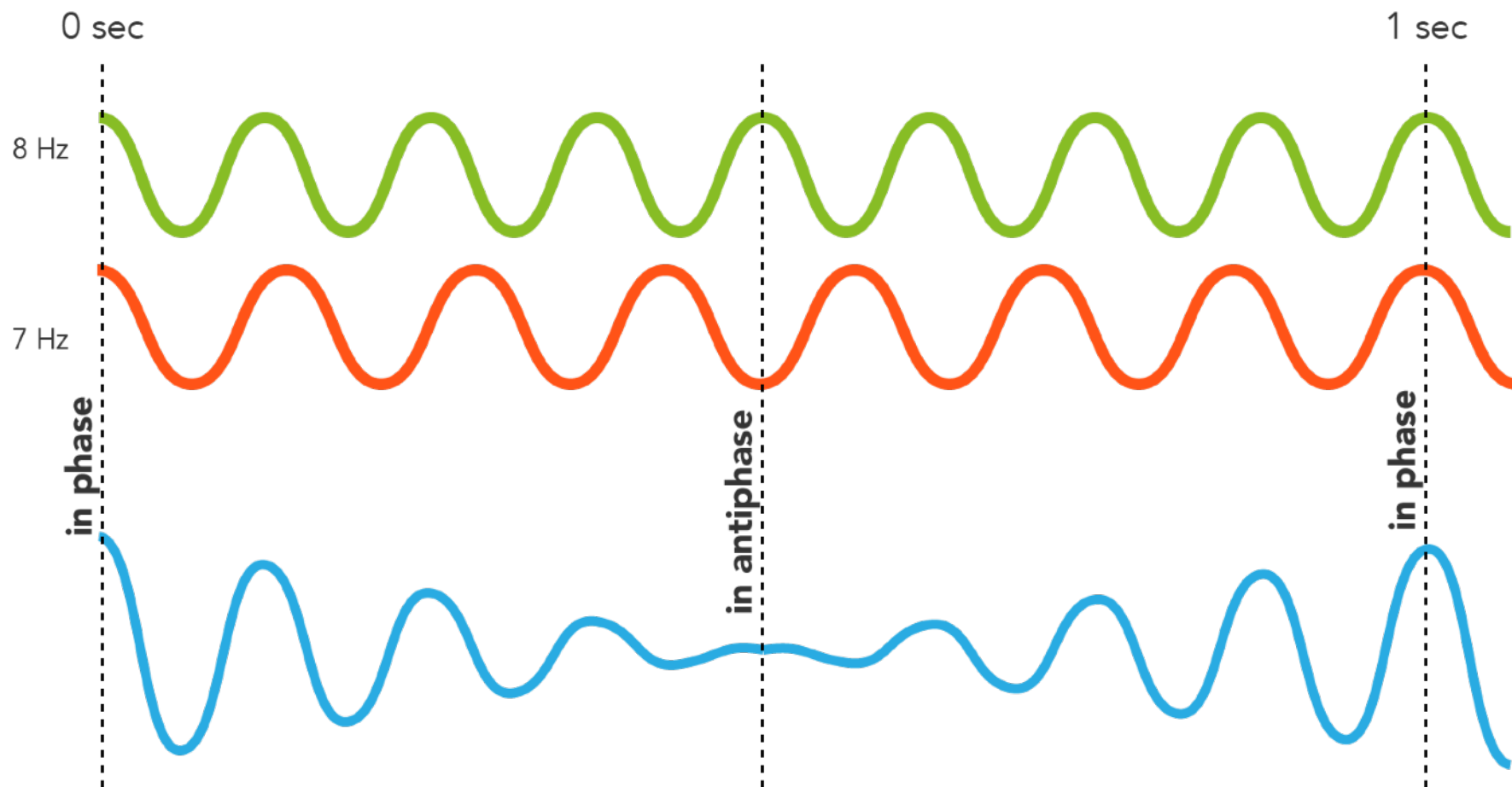


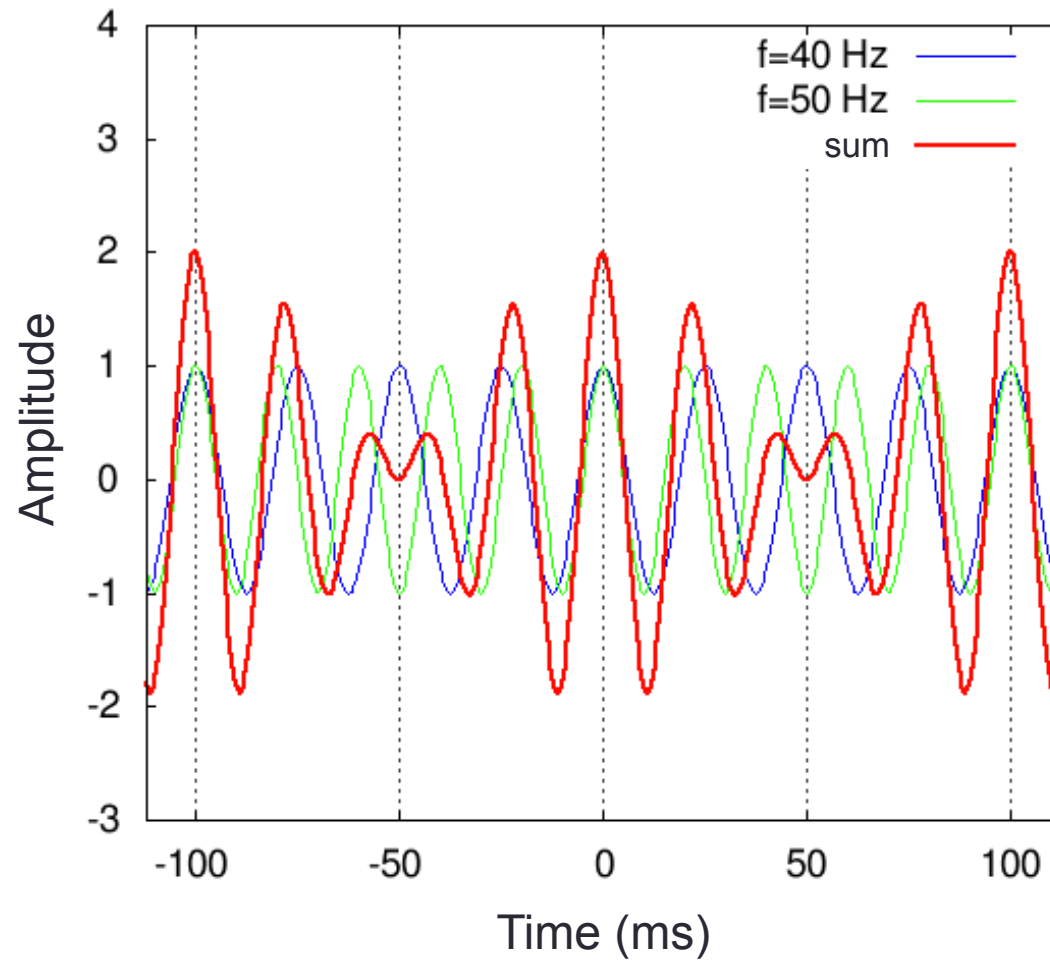
phase difference: **270°**

Beats

Beats frequency
= number of pulses
= $\text{freq1} - \text{freq2}$

Beats are a phase-related physical phenomenon that occurs when two waves with equal amplitudes and very close but not equal frequencies are added together. ($\text{freq1} - \text{freq2} < 20\text{Hz}$).

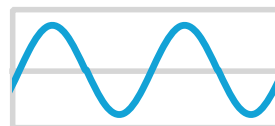
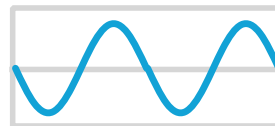




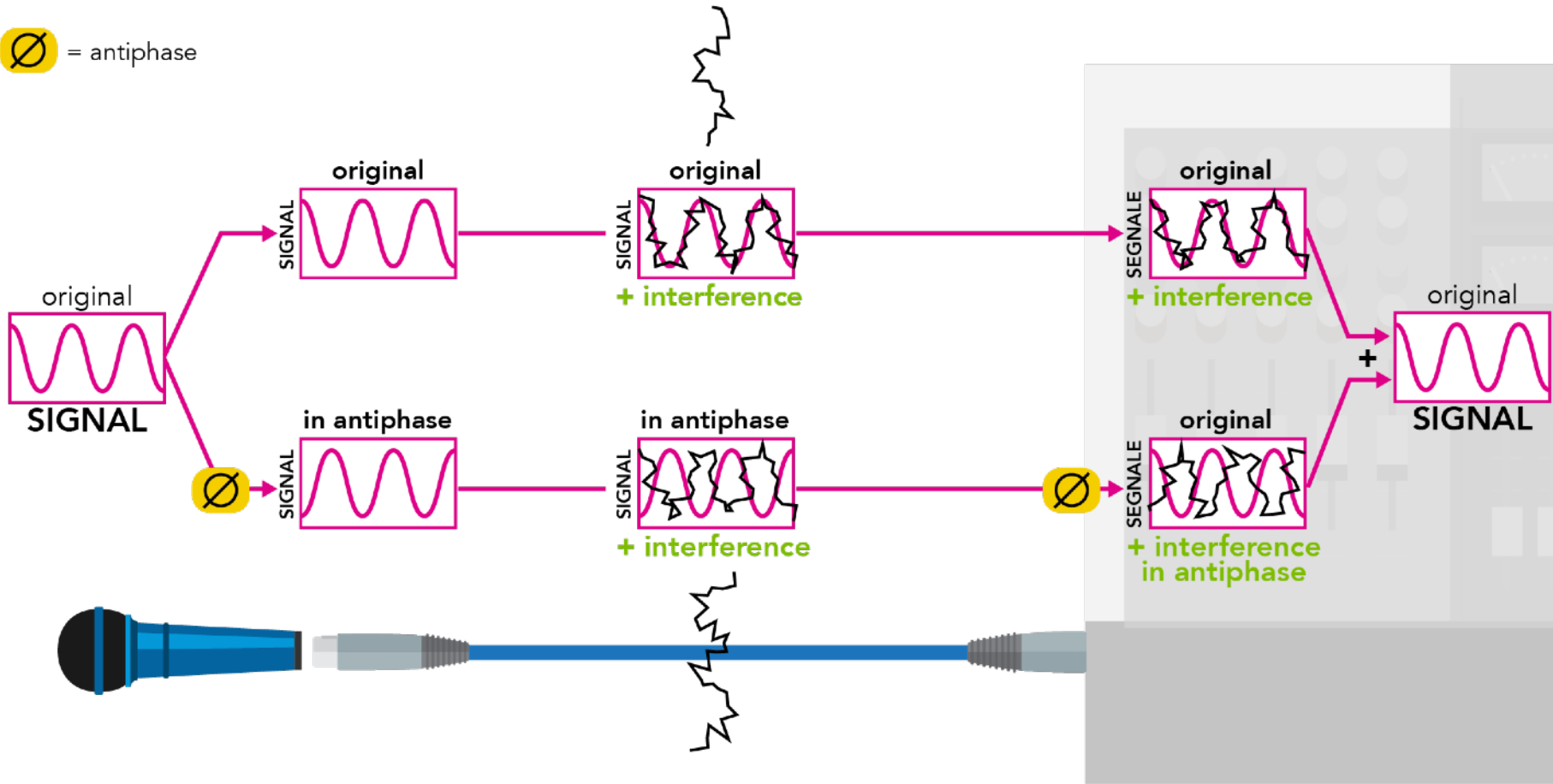
Balanced signal

It is a signal that preserves information even for long distances while minimizing the intervention of external interference.

It's possible due to
phase inversion



= antiphase



What runs through the cables?



▶ unbalanced
MONO
signal



▶ **STEREO**
signal



▶ balanced
MONO
signal



Delete the centre sounds on a stereo song

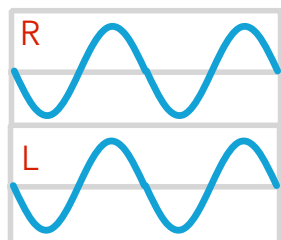
Thanks to phase opposition, it is possible, for example, to eliminate the voice of a song if it was positioned in the centre of the stereo front during the mix (along with all other sounds positioned in the centre).



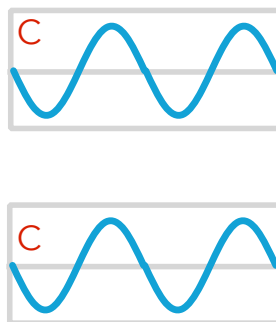
- 1) divide the stereo signal into 2 mono signals
- 2) position the two central mono
- 3) invert the phase of one of the two signals
- 4) sum the two signals



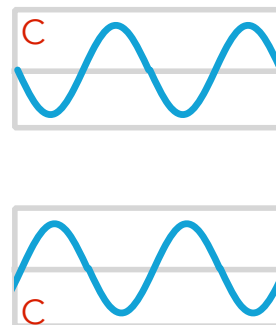
Original track



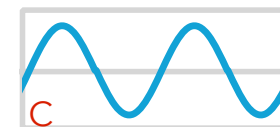
1) 2) Divide in 2 mono



3) Invert the phase of one



4) Sum the 2 signals





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