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Beating effect 5

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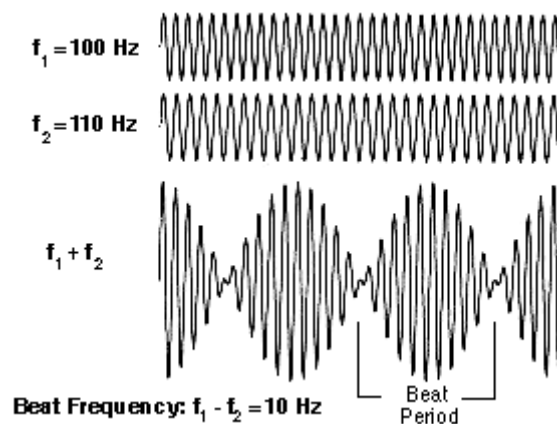
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$$f_{beat1} = \frac{f_1 + f_2}{2}, f_{beat2} = \frac{f_1 - f_2}{2}$$

가 .
 , $(f_1 + f_2) / 2$ $(f_1 - f_2) / 2$ 가 가 .
 , 가 440Hz 가 가 444Hz 가 ,
 4Hz 가 $(440\text{Hz} + 444\text{Hz}) / 2 = 442\text{Hz}$ $(444\text{Hz} -$
 $440\text{Hz}) / 2 = 2\text{Hz}$ “ ” “ ”
 , .



Beating effect

Beat phenomenon occurs when two sound waveforms have different frequencies. This phenomenon manifests as two frequencies: the average of the two frequencies $[(f_1 + f_2) / 2]$ and half the difference between the two frequencies $[(f_1 - f_2) / 2]$, known as beat frequencies. For example, if one sound has a frequency of 440Hz and another sound has a frequency of 444Hz, there is a 4Hz difference between them. In this case, the beat frequencies would be $(440\text{Hz} + 444\text{Hz}) / 2 = 442\text{Hz}$ and $(444\text{Hz} - 440\text{Hz}) / 2 = 2\text{Hz}$. This phenomenon can evoke a sensation of “vibration” or “waves” to the listener and is often utilized in music to emphasize certain frequencies or alter the timbre.

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