

Demonstration 2. Critical Bands by Masking (1:50)

This demonstration of the masking of a single 2000-Hz tone by spectrally flat (white) noise of different bandwidths is based on the experiments of Fletcher (1940). First, we use broadband noise and then noise with bandwidths of 1000, 250, and 10 Hz.

In order to determine the level of the tone that can just be heard in the presence of the noise, in each case, we present the 2000-Hz tone in 10 decreasing steps of 5 decibels each.

Since the critical bandwidth at 2000 Hz is about 280 Hz, you would expect to hear more steps in the 2000-Hz tone staircase when the noise bandwidth is reduced below this value.

Since the spectrum level of the noise is kept constant, its intensity (and its subjective loudness) will decrease markedly as the bandwidth is decreased.

Commentary

"You will hear a 2000-Hz tone in 10 decreasing steps of 5 decibels. Count how many steps you can hear. Series are presented twice."

"Now the signal is masked with broadband noise."

"Next the noise has a bandwidth of 1000 Hz."

"Next noise with a bandwidth of 250 Hz is used."

"Finally, the bandwidth is reduced to only 10 Hz."

References

- H.Fletcher (1940), "Auditory patterns," Rev. Mod. Phys. *12*, 47-65.
- B.Scharf (1970), "Critical bands," in *Foundations of Modern Auditory Theory*, Vol. 1, ed. J.V.Tobias (Academic Press, New York). pp. 157-202.
- E.Zwicker, G.Flottorp, and S.S.Stevens (1957), "Critical bandwidth in loudness summation," J. Acoust. Soc. Am. *29*, 548-57.