



Why We Test The Frequencies We Test

500 1000 2000 3000 4000 6000 8000 Hz

The frequencies between 500-8000 Hz are generally the frequencies found in human speech. While it is true that a young healthy human ear can detect frequencies up to 20,000 Hz, most speech sounds fall within the 500-8000 Hz range.

Years ago, scientists devised an arbitrary scale in which 256 Hz equaled “middle C” for purposes of research. “C” was equivalent to 1 Hz. Octaves of “C” were 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, and so on.

Eventually, these true octaves were “rounded-off” for the convenience of professionals sharing and discussing test results and for ease of calibrating the audiometers. Thus was born **500 1000 2000 3000 4000 6000 8000 Hz**. (note that 3000 Hz and 6000 Hz are not true octaves, but rather fall between octaves.

It is important to recognize that speech is made up of complex frequencies. That is, few if any speech sounds are pure tones (like 1000 Hz for example). However, we get a fairly accurate picture of an individual’s audible frequency range and how well one can hear in a particular frequency range by obtaining thresholds at these frequencies.

What can an audiologist or physician learn from a pure tone air conduction audiogram?

Low Frequency Impairment

500 1000 2000 3000 4000 6000 8000 Hz

We refer to low frequencies as the frequencies between 500-2000 Hz. Abnormal hearing thresholds in this range may indicate medically related conditions such as impacted ear wax, middle ear infection, or even trauma to the eardrum.

Low frequency losses may also indicate potentially more significant conditions, like the early stages of Meniere’s disease, for example.

Otosclerosis, a condition resulting in progressive low frequency loss due to middle ear fixation, is another cause of suspicion when low frequency loss is noted.

With low frequency hearing loss, potential reasons for conductive impairment are first considered. However, not all low frequency losses are conductive. Meniere’s Disease is a good example, as Meniere’s disease is a sensorineural impairment confined to the inner ear.

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A classic audiometric configuration pointing to a conductive loss is referred to as a “flat” audiogram. A flat audiogram shows loss with equal or near equal hearing thresholds across the entire range of frequencies (assuming that the subjects hearing is usually otherwise normal). For example, if you were to take a hearing test with an earplug in one ear (or both ears), the resulting audiogram would be a flat audiogram.

High Frequency Impairment

500 1000 2000 3000 4000 6000 8000 Hz

We refer to high frequencies as those falling between 3000-8000 Hz. It is in the high frequency range where noise induced hearing loss is first generally noted. In fact, noise-induced hearing loss classically reveals itself at 4000 Hz. This audiometric configuration, often referred to as the “4000 Hz Notch”, shows a depressed threshold at 4000 Hz. Interestingly, the two frequencies on either side of 4000 Hz, 3000 Hz and 6000 Hz, classically show better threshold levels than that of the threshold level at 4000 Hz.

High frequency hearing loss is most often a sensorineural impairment. That is, the loss is due to damage in the inner ear or along the pathway of nerves going from the inner ear to the brain. To date, sensorineural loss is irreversible.

The Importance Of Testing 8000 Hz

500 1000 2000 3000 4000 6000 8000 Hz

The State Of Kentucky is currently the only state requiring the test frequency of 8000 be included as part of the standard occupational hearing test battery.

Unless specifically requested by our clients, the T K Group obtains thresholds at 8000 Hz. The importance of knowing threshold at 8000 Hz is significant for the review of audiograms conducted by our in-house audiologists.

8000 Hz is helpful in determining the validity of the overall audiogram. Audiometric configurations with 8000 Hz included also give our audiologists a better picture when asked to make a determination of noise-induced hearing loss versus hearing loss attributed to the normal processes of aging (Presbycusis).

As previously mentioned, audiograms showing a “4000 Hz Notch” raise the suspicion of noise-induced damage to the hearing mechanism. In contrast, age-related hearing loss most often shows a “sloping” audiometric configuration. That is, hearing level thresholds get progressively worse extending through 8000 Hz. In other words, we usually do not see a “rebound” (or better threshold) at 6000 and 8000 Hz in cases of age-related hearing loss.

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Air-conduction thresholds can tell the trained eye a generous amount of information in a short period of time. Hopefully, the next time you look at a hearing test, you will not just see “X”s, “O”s, or numbers.

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