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BEST VOICE AUDIO WITH NOKIA BLUETOOTH HEADSETS

Audio quality is one of the most important single aspects that influence the overall user experience of Nokia Bluetooth headsets. That is why Nokia focuses special attention on it. Highly skilled audio specialists are involved in the creation of every product. They integrate the best audio technologies on the market with the state-of-the-art results of Nokia's own technology development and constantly monitor the audio quality in order to outperform the competition.

Nokia provides leading audio for its Bluetooth headsets that consists of the following top 5 audio elements:

- Intelligent background noise reduction
- Acoustical wind noise reduction
- Optimized frequency response
- World-class acoustical design
- Advanced ergonomics

Intelligent background noise reduction. Noise reduction is one of the key audio elements. It is also a challenge to achieve efficient noise reduction without sacrificing on speech quality. Aggressive noise reduction often makes the speech sound unclear and unnatural. Nokia handles both the noise reduction and the speech clarity at the same time without sacrificing one for the other.

In order to provide voice capture with best response characteristics and without noise caused by reflections or air flow near the microphone, the microphone location in the headset and its acoustical performance are carefully considered. For even higher quality in voice capture and the best noise reduction, Nokia uses double microphones and Advanced Digital Signal Processing (DSP) technologies. Nokia's double microphone solution provides increased directivity to enhance sounds coming from the frontal direction, resulting in better capturing and detection of user's speech over surrounding noise. Advanced DSP enhances the voice clarity thanks to special speech detection algorithms.

Another challenge in using noise reduction algorithms is that, due to competing speech sources nearby, the speech signal detection may fail. Some competitors have used separate speech activity sensors that may work in some cases but often fail to separate speech from other similar movement of user's chin, such as chewing. Also, aggressive use of speech activity detection results in fluctuating signal and noise levels. Nokia uses Advanced Digital Signal Processing for constant noise reduction and separates the user's own speech from other voice sources by optimal placing of microphone and intelligent use of directivity provided by the double microphones.

Acoustical wind noise reduction in outdoor usage. Based on audio studies done by Nokia, the best wind noise reduction can be achieved only by acoustical means. Compared to wind noise reduction with digital signal processing the benefit is that the wind doesn't saturate the microphones and deteriorate the captured voice quality. Nokia's solution also has the benefit of being invisible, as it does not include a visually disruptive mechanical voice activity sensor or large protective structures around the microphones. Nokia's approach is to efficiently protect the microphones from air flow. Thus, the speech signal entering the processor has better initial quality and there is no need to focus on wind noise reduction at the signal processing phase.

Optimized frequency response. The results of Nokia extensive study regarding headsets showed that flat frequency response was not preferred by users, but a moderate emphasis of about 4 dB at 3kHz was preferred instead. These results have been taken into account when designing the frequency response for the Nokia Voice headsets. The high frequency emphasis has been designed to produce naturally bright and pleasant sound quality despite of the narrow frequency band used in telecommunication.

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World-class acoustical design. All Nokia Bluetooth headsets are acoustically designed in a way which provides the best possible audio quality. Both microphone and earpiece driver components are selected after thorough investigation and their housings are designed to achieve the best performance. After rigorous user tests, the earpiece adapter rubbers have been designed to optimize the user experience by enhancing the fit in order to maintain controlled leakage. Most headset sales boxes include multiple earpiece adapter rubbers so that every user can find the best fit, taking into account both acoustical performance and usage comfort. The microphone and earpiece drivers are also located so that echoing sounds, reflections or air flow turbulences do not cause disturbing sounds to the sender or receiver.

Advanced ergonomics. Ergonomics is playing a key role in providing the best audio user experience to all users, no matter the shape of their ears. Ergonomics studies have been conducted to produce a series of elements to ensure that all headsets can fit as many people as possible. Ergonomics can be divided into general mechanical ergonomics and personalizable ergonomics. Mechanical ergonomics is worked out from the very beginning of product development by designing the main body in most natural and comfortable way. For example, headset bodies are contoured to provide a comfortable fit next to the face.

There are many of different spare part options that offer personalizable ergonomics. Nokia headsets provide a customized fit with different sized and types of ear buds and ear hooks that can be changed depending on the individuals' preference.

These world-class audio solutions are the results of Nokia's extensive audio validations based on an extensive user study for handsets and accessories together. Due to this validation Nokia not only brings leading audio technologies to the market but, ensures that they are developed and tested in the way users receive high quality audio in real usage situations.

Nokia offers leading audio quality throughout its **Bluetooth headset range**. Ultimate audio is offered in products including all the above mentioned audio elements. Nokia's newest Bluetooth Headset, Nokia Bluetooth Headset BH-607 is the perfect representative of the highest audio level. It offers the most advanced audio in the market utilizing a new type of wind noise protection that includes air flow resistive foam and an optimized grille to block wind from microphones. As well, advanced mechanical and personalizable ergonomics via a curved body design help the product "adapt itself" to chin shape. There are also many options for changeable ear rubbers and a bendable ear hook to fit all ears.

Other products like Nokia Bluetooth Headset BH-804 and Nokia Bluetooth Headset BH-216 have sophisticated audio quality with advanced ergonomics, finetuned frequency response, world-class acoustical design and some features of intelligent background noise reduction like Digital Signal Processing. They also have advanced mechanical ergonomics: BH-216 via a curved body and BH-804 via ultra light and small dimensions. The same technologies are also featured on Nokia's Stereo Bluetooth headset products like Nokia Bluetooth Stereo Headset BH-905 with active noise cancellation and Nokia Bluetooth Stereo Headset BH-504. Even in its most affordable Bluetooth Headsets Nokia offers leading audio quality within the segment through advanced ergonomics, finetuned frequency response and world-class acoustical design.