



# Active noise reduction: performance of personal devices

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## ABSTRACT

In recent years active noise reduction (ANR) technology has become more commonly available in personal hearing devices such as earmuffs, headphones, headsets and earphones. In the absence of ANR technology these personal devices are less effective at reducing low frequency environmental noise compared to reducing high frequency environmental noise. ANR technology is a well suited addition to these devices as it is best at reducing low frequency environmental noise and hence improves the performance of these devices in an area in which they are normally poor performers. An experiment was conducted which involved performing objective tests on 13 devices that incorporated ANR technology (earmuffs, headphones, headsets and in-ear earphones) using an acoustic test fixture (ATF). The devices were divided into four groups based mainly on structure. The characteristics of the passive and active performance of these devices are presented. Each device was examined on its attenuation of broadband noise, overload response, internally generated noise, impulse noise response, and stability to movement. The results show a large range of responses between devices in terms of attenuation and overload, and highlight distinctive differences between the device groupings. The maximum active noise attenuation was 19 dB on average (range 16-25 dB) for circumaural and in-ear devices; and 8 dB on average (range 5-11 dB) for supraaural devices. The industrial devices performed well in high noise conditions, maintaining their active noise reduction up to at least 125 dB SPL. The noise generated by the active electronics was 25 dBA on average (range: 19-32 dBA). Although the ANR technology in all the devices was found to reduce environmental noise in the lower frequency region it was also found to increase it in some other frequency regions. The addition of ANR technology did not offer any further reduction in impulse noise level and in many cases resulted in poorer impulse noise reduction.

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