



RADIO EARMUFFS & NOISE EXPOSURE



Some new earmuff models have built-in AM/FM radios. When using these earmuffs in industrial settings, doesn't the radio just add more noise to damage hearing? What are the noise levels under the earcup when the radio is turned on?

When headset radios first appeared in stores several decades ago, they were not marketed as hearing protectors – a good thing, since they offered very little attenuation of noise. At some frequencies, the headsets were even found to *amplify* background noise (with the radio turned off) due to resonance in the earcup. To be a hearing protector, an earmuff must be designed to be a hearing protector from the start.

The volume settings of typical portable stereo headsets have been measured at 81 dBA at 50% volume setting, 91 dBA at 75% volume, and 96 dBA at 100% volume¹ – a hazardous noise level if listened to continuously for several hours. Ideally, a radio headset would allow the enjoyment of music at safe levels, but also reduce the background disturbance in a noisy environment.

Today's new hearing protectors do just that: built-in radios contain circuitry that limits their radio output. When the radio is turned on (active mode), the sound output is electronically limited to 82 dB. The noise level of the radio will certainly fluctuate (even though there is an 82 dB maximum cutoff in the circuitry, the **average** noise level of the signal may be much lower). But for the sake of the following example, let's just assume the worst case radio noise – a constant noise level of 82 dB from the radio – worn in environmental noise of 90 and 100 dB.

When two noise sources are added together, the decibels are added logarithmically, not arithmetically. This means that the sum of two identical sound sources (90 dB + 90 dB) would sum to equal 93 dB. Using a logarithmic calculator,² let's determine the effective exposure for 90 and 100 dB of environmental noise, with an assumed 20 dB of attenuation from the earmuff, and constant radio signal of 82 dB:

Total Effective Exposure for a Radio Earmuff Worn in 90 and 100 dB of Noise	
Noise Level 90 dB	Noise Level 100 dB
Attenuation -20 dB	Attenuation -20 dB
Passive exposure = 70 dB	Passive Exposure = 80 dB
Plus radio noise +82 dB	Plus radio noise +82 dB
Effective exposure = 82 dB	Effective exposure = 84 dB

Since the radio output is limited to a safe 82 dB maximum, the radio adds very little sound energy to effective exposures in high noise levels. In a high-noise job that is also repetitive or monotonous, a radio earmuff can add significantly to worker satisfaction and enjoyment, without sacrificing hearing protection.

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Footnotes:

¹ Cited in Occupational Safety & Health Administration: Standards Interpretation; Use of Walkman Radio, Tape, or CD Players and Their Effect When Hearing Protection is in Use (April 1987), http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19542, accessed 2004.

² There are several decibel calculators available on-line, such as <http://www.csgnetwork.com/decibelamplificationcalc.html>

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