Making Listening Safe

EN50332-3, EN62368-1

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Convenor TC108X/WG3

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<td>Audio, video and similar electronic apparatus - Safety requirements</td>
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<td>IEC/EN 60950-1</td>
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<td>Information technology equipment - Safety - Part 1: General requirements</td>
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<td>2013</td>
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Scientific Committee on Emerging and Newly Identified Health Risks

SCENIHR

Potential health risks of exposure to noise from personal music players and mobile phones including a music playing function

23rd of September, 2008
Mandate

Commission Decision of June 23, 2009

Exposure to sound levels shall be time limited to avoid hearing damage. At 80 dB(A) exposure time shall be limited to 40 hours/week, whereas at 89 dB(A) exposure time shall be limited to 5 hours/week.

For other exposure levels a linear intra- and extrapolation applies. Account shall be taken of the dynamic range of sound and the reasonably foreseeable use of the products.

PMPs shall provide adequate warnings on the risks involved in using the device and to the ways of avoiding them and information to users in cases where exposure poses a risk of hearing damage.
Exposure

SCENIHR:

2.5 - 10 million people in Europe to develop HL because of PMPs

Gourévitch et al., 2014

Threatening

OSHA

NIOSH

Safe

Exposure Duration (per day)
Exposure and PMPs

SCENIHR:

2.5 - 10 million people in Europe to develop HL because of PMPs
EN 50332-1, EN 50332-2

 Doesn’t work with ITU and EBU broadcast standards
EN 50332-1, EN 50332-2

High “pressure” needed to get enough output
Greetings esteemed members of the WHO

Mastering for McCartney, Springsteen, Bowie, Queen, Dire Straits, Stones, Madonna, Sinatra, Police, Eagles, Roxy Music, Coldplay, U2, AC/DC, Clapton etc. etc.

The art of music is one of the highest expressions of intelligence devised by human beings.

New ITU and EBU standards finally free us from having to needlessly squash the literal life-giving qualities out of the music and programs.

The prevention of HL should please not cancel these long-awaited improvements and jeopardize music heritage further.
Threatening noise levels may cause damage that does not effect hearing thresholds, but gradually degrades auditory nerve fibers.

“Compressed music delivered by most portable music players is closer to noise than the original music because the overall intensity of the whole spectrum is higher. This global increase and the disappearance of quiet transients could harm the auditory system on a long-term basis...”
Sound Exposure
A-weighted sound pressure, $p$, squared and integrated over a stated period of time, $T$.

\[ E = \frac{1}{T} \int_{0}^{T} p(t)^2 \, dt \]

Sound Exposure Level
Logarithmic measure of sound exposure relative to the threshold of hearing in humans.

\[ SEL = 10 \log_{10} \left( \frac{E}{E_0} \right) \]

EN50332-3: Estimation more precise with known transducers. Methodology based on diffuse field corrected estimation.
Sound Dose

Mandatory *warning* for 80 dBA sound exposure level per week, i.e. 40 hours normalized.

Gain drop until warning acknowledged

Short-term Exposure Level

*Limited* to 100 dBA integrated over 30 s

- or -

*Warning* for >100 dBA integrated over 30 s
Headphone listening could maybe exhaust primary auditory pathway more than natural listening, at the same sound exposure (conjecture)
Conclusions

Well indicated to legislate on sound exposure in PMPs

Europe
Mandatory requirements since 2013 (phase 1, 2)
Limits are in concordance with latest medical research
Dose estimation to reduce false warnings, to protect music heritage

IEC
Phase 1 and 2 implemented in IEC 62368-1, clause 10.6
No need for other international PMP standards on this issue
EU Commission (2009). **On the safety requirements to be met by European standards for personal music players pursuant to Directive 2001/95/EC.**


D. Hammershøi et al. (2015). *AES 58th Conference Paper.* **Dose Estimate by Personal Music Players Based on Weighted Output Voltage.**


J. Tønnesvang et al. (2015). *Klim.* **The Four Quadrant Model.**

ITU-R BS.1770, EBU R128

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