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NORDIC ROUND ROBIN TEST ON HEARING PROTECTORS

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INTRODUCTION

In 1980 the Nordic countries agreed upon a common standard for hearing protectors. The standard is divided into two parts. The first part of the standard states the requirements to acoustical attenuation for the rating of hearing protectors into three different classes. Class 1: low attenuation, class 2: high attenuation and class L: especially low frequency attenuation. The limits are based on the lower quartile of data from 20 test subjects, see table 1.

Table 1. Minimum attenuation in lower quartile

| | 250 | 500 | 1000 | 2000 | 3150 | 4000 | 6300 | 8000 | Hz |
|---------|-----|-----|------|------|------|------|------|------|----|
| Class 1 | 5 | 10 | 15 | 20 | 22 | 22 | 22 | 22 | dB |
| Class 2 | 12 | 20 | 30 | 30 | 30 | 30 | 30 | 30 | dB |
| Class L | 22 | 30 | 35 | 22 | 22 | 22 | 22 | 22 | dB |

The first part of the standard also contains the requirements to heat- and cold resistance, the stability of the headband's elasticity, fire resistance, corrosion, etc. The second part of the standard specifies the test methods which shall be used. For the acoustical attenuation the test methods are essentially the same as the new international standards ISO 4869 and ISO/DIS 6290.

The aim of the common Nordic standard is to make a certification (and thus a classification) of a hearing protector in one country valid in the other countries too.

As the test methods are rather new and only limited experience yet has been obtained in the testing laboratories, it was felt necessary to perform a Round Robin Test among the Nordic testing laboratories before the certification procedure was put into force.

THE ROUND ROBIN TEST

Four laboratories participate in the Round Robin Test:

Dept. of Technical Audiology, Technical University, Stockholm, Sweden

Audiological Laboratory, Rikshospitalet, Oslo, Norway

Institute of Occupational Health, Vanda, Finland

The Acoustics Laboratory, Technical University, Lyngby, Denmark.

The latter laboratory serves as coordinator for the Round Robin Test.

The NORDTEST organization supports the project by financing the common expenses such as purchase of hearing protectors, travelling expenses for a meeting between the laboratories and preparation of the common report.

Hearing protectors

Four types of earmuffs and two types of ear plugs are included in the test:

plugs: Bilsom propp-o-plast glasswool.

E.A.R. foam plug.

muffs: Bilsom yellow 2301. Liquied filled cushions, plastic headband.

Optac, Optigard. Foam filled cushions, plastic headband.

Racal, Sonogard. Liquied filled cushions, steel headband.

Exel, Silenta Super. Foam filled cushions, steel headband.

The protectors were bought from usual safety equipment suppliers. After initial measurements at the coordinating laboratory the set of muffs was circulated between the laboratories (DK + SF + S + N + DK). Each laboratory received a set of plugs directly from the coordinating laboratory.

Measurements

20 test subjects participated in the subjective test. The attenuation is determined as the difference in hearing threshold with and without the hearing protector in place. The thresholds are determined for 1/3 octave noise bands with center frequencies from 125 Hz to 8000 Hz. The sound field is approximately diffuse at the position of the test subject's head.

The objective measurements are performed by means of a test fixture containing a microphone. The measurements are performed at all the 1/3 octave noise bands from 63 Hz to 8000 Hz.

At the time of writing the measurements are in progress. The Round Robin Test is expected to be finished in August-September 1983.

RESULTS FROM INITIAL MEASUREMENTS

Preliminary results from the coordinating laboratory are given in fig. 1 and 2. Figure 1 show the insertion loss for the muff-type protectors. Figure 2 show subjective attenuation values, and table 2 contain the corresponding standard deviations.

The objective data are not expected to be equal to the subjective data.

Figure 1. Preliminary objective results.

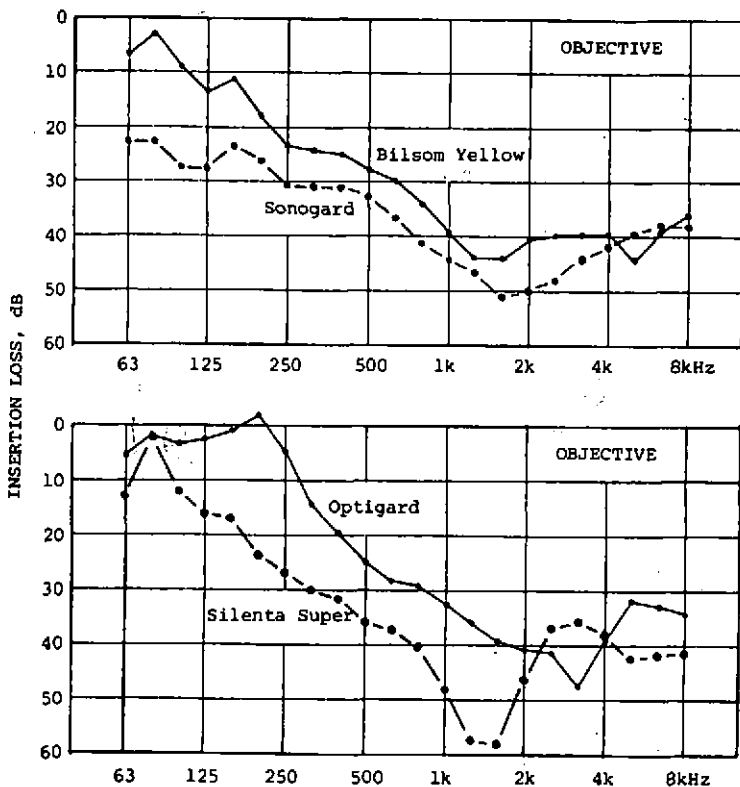


Table 2. Standard deviations, subjective measurements.

| | 125 | 250 | 500 | 1000 | 2000 | 3150 | 4000 | 6300 | 8000 | Hz |
|---------------|-----|-----|-----|------|------|------|------|------|------|----|
| Bilson Yellow | 3.2 | 3.1 | 3.2 | 3.1 | 3.5 | 3.1 | 3.5 | 4.1 | 4.1 | dB |
| Optigard | 3.2 | 3.5 | 4.8 | 2.6 | 3.9 | 3.3 | 4.3 | 5.6 | 6.1 | dB |
| Sonogard | 3.6 | 3.7 | 3.4 | 3.6 | 3.1 | 3.5 | 5.2 | 5.5 | 4.9 | dB |
| Silenta Super | 3.8 | 4.2 | 3.0 | 3.7 | 4.2 | 3.6 | 4.4 | 4.8 | 6.3 | dB |
| Propp-o-plast | 6.5 | 6.9 | 6.3 | 5.7 | 6.3 | 6.3 | 7.0 | 6.9 | 6.6 | dB |
| E.A.R. | 7.1 | 8.1 | 7.9 | 7.0 | 5.1 | 5.3 | 7.2 | 8.0 | 8.5 | dB |

Figure 2. Preliminary subjective results.

