AKUSTIKVERKSTAN

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Akustikverkstan AB, St Bryne, 531 94 Järpås, tel +46 (0)706 - 59 37 99 pontus.thorsson@akustikverkstan.se

LABORATORY MEASUREMENTS ON THE EFFICIENCY OF SOUND REDUCING FURNITURE PADS OF TYPE SILENT SOCKS

SUMMARY

Laboratory tests on Silent socks type sound reducing furniture pads have been conducted according to a simplification of EN ISO 3741 using an adapted drawing machine. The simplification was that only one microphone was used. The test results were evaluated as sound power levels (L_W), i e a measure of the sound source strength.

Measurements have been done regarding the efficiency, i e the sound reduction, of several types of chair feet pads. Comparisons were made for three different types of chairs on two different types of floor surfaces. The results are summarised in the table below. It is clearly evident that pads can reduce chair scraping sound levels considerably. Silent socks reduce the chair scraping sound by between 6 and 20 dB(A) depending on the chair and the floor surface. The effect is about the same as with tennis balls.

A reduction of 6 dB(A) corresponds to a large difference; about 10 dB(A) corresponds, normally, to an perceived sound reduction of 50 %. A reduction of 20 dB(A) is very significant.

Chair	Pad	L_W, dB(A) Linoleum	L_W, dB(A) Plastic
Sjuan	-	69	63
	IKEA	62	60
	Tennis ball	58	57
	Silent socks	60	56
Kinnarps Dina	-	79	86
	Ackurat	72	86
	Tennis ball	61	81
	Silent socks	62	80
Brio Mac	-	77	79
	IKEA	61	61
	Tennis ball	56	59
	Silent socks	57	69

1. CLIENT

Eva Eriksson Produktdesign, Fiskhamnsgatan 10, 5th floor, S-414 55 Göteborg
Contact person: Eva Eriksson, tel. +46 (0)31-245276

2. ASSIGNMENT

To measure sound levels from chairs that are dragged across a floor under laboratory conditions, i e under conditions that are as controlled and repeatable as possible.

3. DESCRIPTION OF MEASUREMENTS

The measurements were carried out in Akustikverkstan's reverberation room in Skultorp, 22/10/2008. A flooring surface (plastic or linoleum) of size 1.5 x 2.5 m was placed on the concrete floor. The chairs were dragged using a specially designed drawing machine that dragged the chairs by applying a mass to give a constant horizontal dragging force (see figure 1). The dragging line was secured to the back of the chair and the chair was dragged forwards. A dragging force of 4.5 kg was applied, and a weight of 5 kg was placed on the seat, at the rear to prevent the chair tipping forward when being dragged.

The machine allowed a dragging distance of about 1.5 m which normally took about 2 s to cover. The measurement microphone was placed 1.0 m away from and perpendicular to the centre of the dragging track and 0.8 m above the floor. The measurements were performed according to EN ISO 3741, apart from the fact that only one microphone position was used. The purpose of the measurements was to compare different furniture pads, and consequently the simplification was not considered significant.

The sound pressure level was measured in all one-third octave bands between 25 Hz and 20 kHz. Each combination of chair, pad and flooring was tested minimally three times. A test series with nine drawings is shown in Appendix 1: *Results*.

Figure 1. Test arrangement.

4. TEST OBJECTS

Three chairs were used in the tests:

1. "Sjuan" from Fritz Hansen
2. "Dina" from Kinnarps
3. "Mac" with plastic seat and back from Brio

The furniture pads used in the tests are presented below. Because of the variation in the size of the chair legs, it was not possible to use all the pads on all the chairs.

1. Self-adhesive felt pad from IKEA
2. Plastic foot with embedded felt base from Ackurat (type IFSF25212218S)
3. Tennis ball
4. Silent socks from Eva Eriksson Produktdesign

The flooring material used was Forbo Marmoleum 2.5 mm Ergoflex (linoleum) and Forbo Smaragd Ergoflex (plastic).

5. MEASUREMENT EQUIPMENT

The equipment shown in table 1 was used in the measurements. The equipment meets class 1 requirement as per EN 61672-1, 60942 and 61260. The date of the most recent calibration is recorded in Akustikverkstan's calibration log. Control calibration of instruments was conducted immediately before and after the tests were carried out.

Instruments	Make and type	Serial number
Microphone calibrator	01dB type Cal01	980207
Sound level meter	01dB SIP95	10573
Microphone capsule	Microtech Gefell MK250	2137
Microphone pre-amplifier	01dB PRE12N	22603
Real time analyser	Norsonic 830	11440
Omnidirectional loudspeaker	AV LV-kub	3
Microphone capsule	Norsonic 1230	24438
Microphone pre-amplifier	Norsonic 1201	23686
Amplifier	Denon POA 2200	-

Table 1: Equipment used during the measurements.

6. RESULTS

The measurements were evaluated both as sound power levels in one-third octave bands and as A-weighted sound power levels. The A-weighted sound power levels are shown in table 2 and the one-third octave values in Appendix 1: *Results*.

Table 2 shows clearly that pads can reduce chair scraping sound levels significantly. A felt pad gives in most cases a distinct reduction, between 0 and 18 dB(A). The widely used method with tennis balls gives in many cases a much larger reduction, between 5 and 21 dB(A). Silent socks reduce chair scraping sound by between 6 and 20 dB(A), about the same efficiency as for tennis balls. The table also clearly shows that the reduction is very dependent on both the types of chair and flooring.

A reduction of 6 dB(A) corresponds to a large difference; about 10 dB(A) corresponds, normally, to an perceived sound reduction of 50 %. A reduction of 20 dB(A) is very significant.

Chair	Pad	L_W, dB(A) Linoleum	L_W, dB(A) Plastic
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Table 2: Measured A-weighted combined sound effect levels for the different tests.

Pontus Thorsson
PhD in acoustics

Reviewed by Anders Bertilsson, 06/11/2008

APPENDIX 1: TEST RESULTS

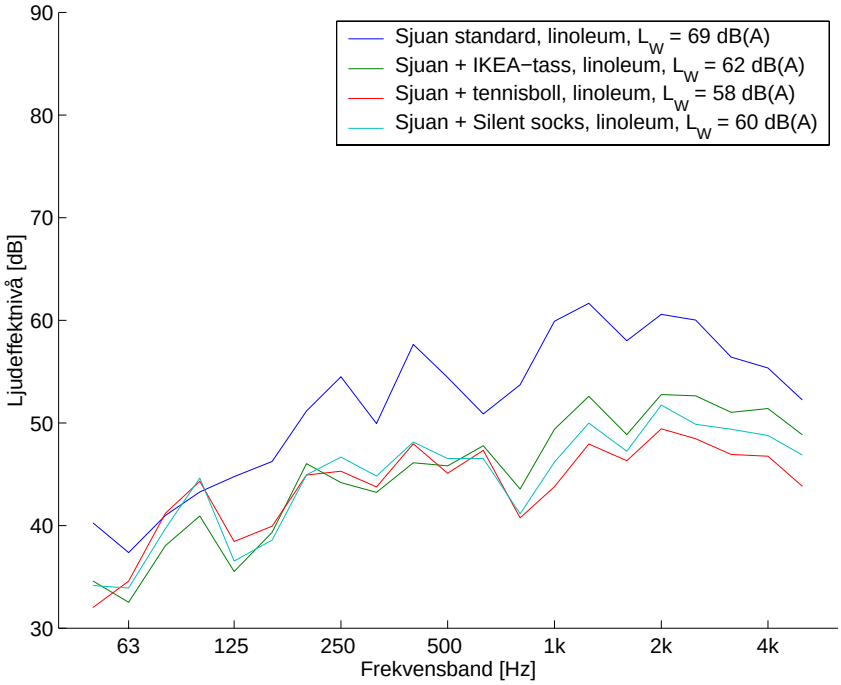

Figure B.1: "Sjuan" on linoleum.

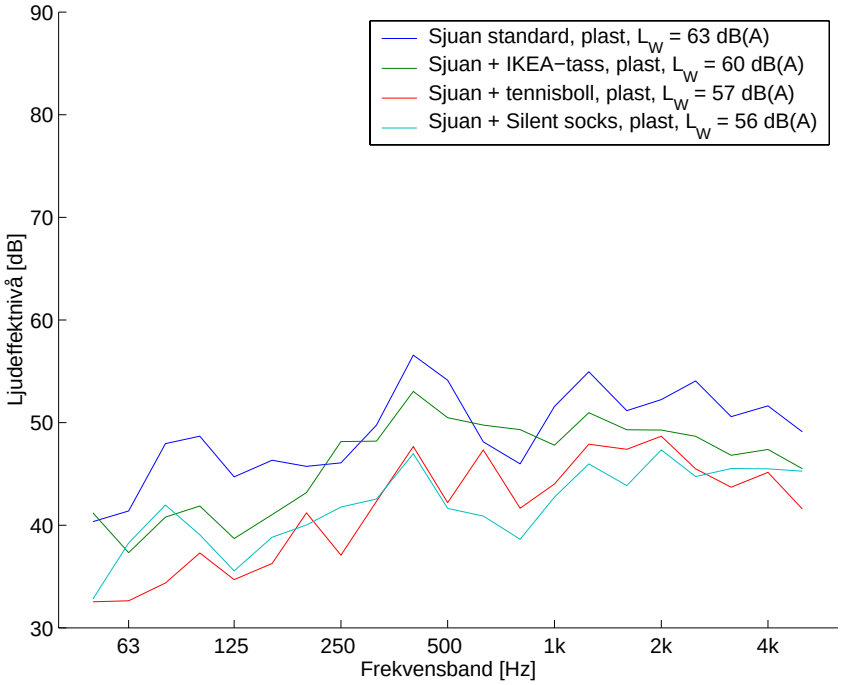

Figure B.2: "Sjuan" on plastic.

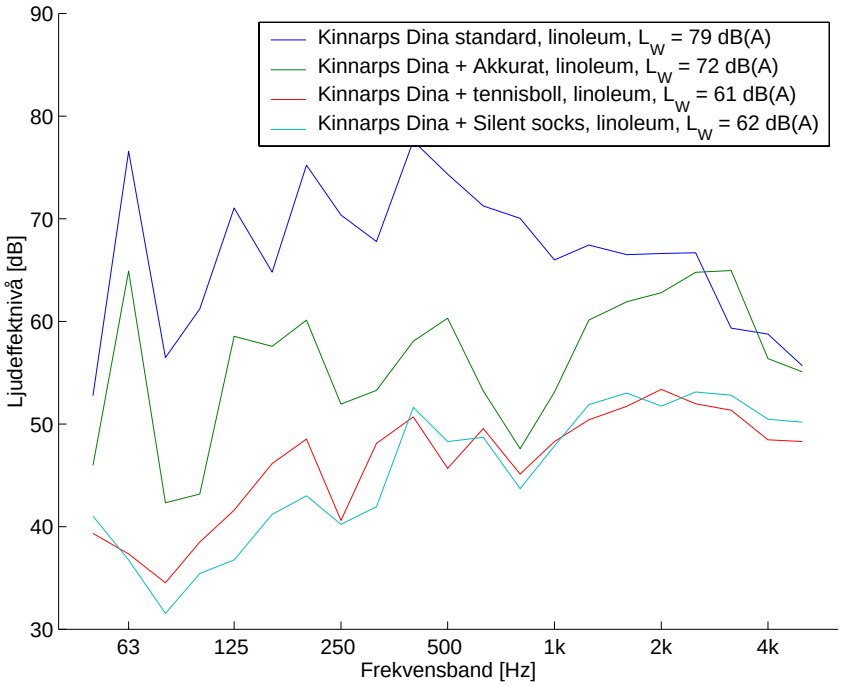

Figure B.3: Kinnarps "Dina" on linoleum.

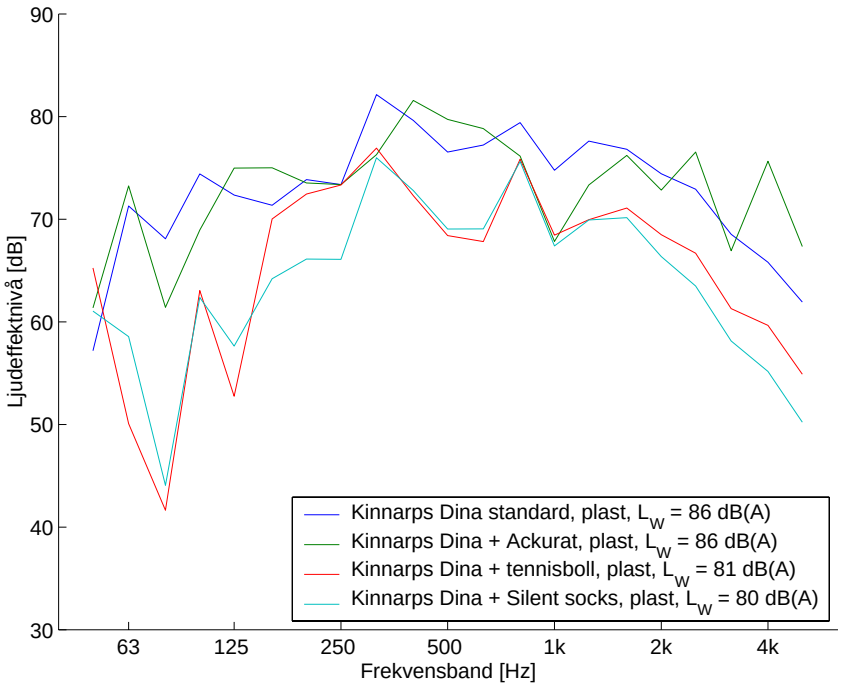

Figure B.4: Kinnarps "Dina" on plastic.

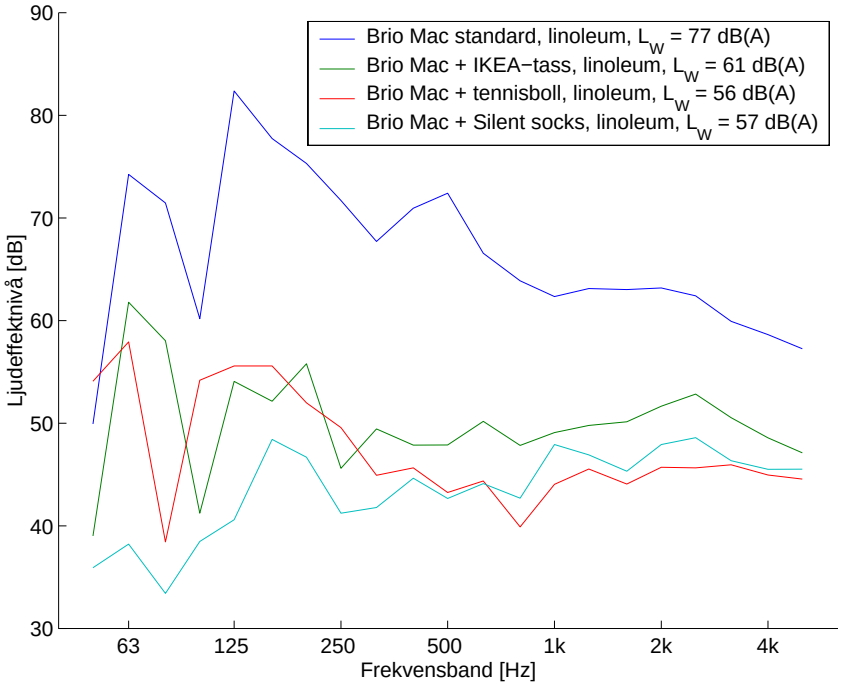

Figure B.5: Brio "Mac" on linoleum.

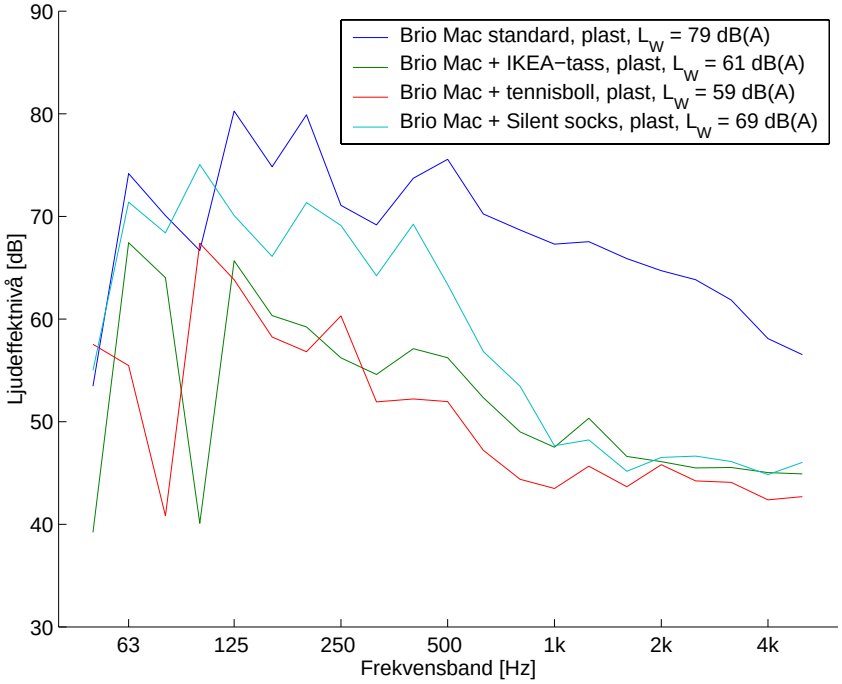

Figure B.6: Brio "Mac" on plastic.

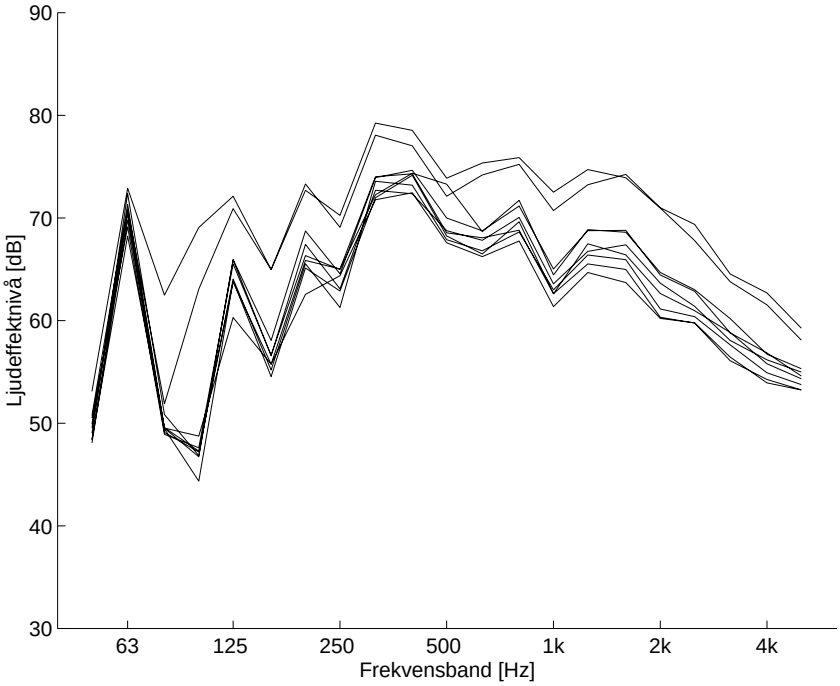

Figure B.7: Method test with nine draggings over the surface which together gave standard deviation 3 dB. The figure shows clearly that the measurement method captures the characteristic scraping sound from the chairs since the spectrums have similar forms. This could also be heard clearly when carrying out the tests.