

Informal document **GRB-59-05-Rev.1**
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agenda item 9)

Influence of road surface on tyre rolling sound emission

Report from the NordTyre project,
part 2: Passenger car tyres.

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Scope of project:

- To investigate the noise performance of normal passenger car tyres on typically used road surfaces in the Nordic countries (Norway, Sweden and Denmark) and to clarify which combinations of road surfaces and tyres that will yield the lowest tyre/road noise levels.
- Furthermore, to compare the noise levels on these road surfaces with the labelled noise levels (Reg. (EC) No.1222/2009), as well as measured noise levels on ISO-surfaces (ECE Reg.117). Correlation between measured noise levels and measured/labelled values for rolling resistance, wet/snow/ice-grip were also investigated.
- Project sponsors: The Nordic Road Administrations.
- Project leader: Jørgen Kragh, The Danish Road Directorate.

Measurement program - tyres:

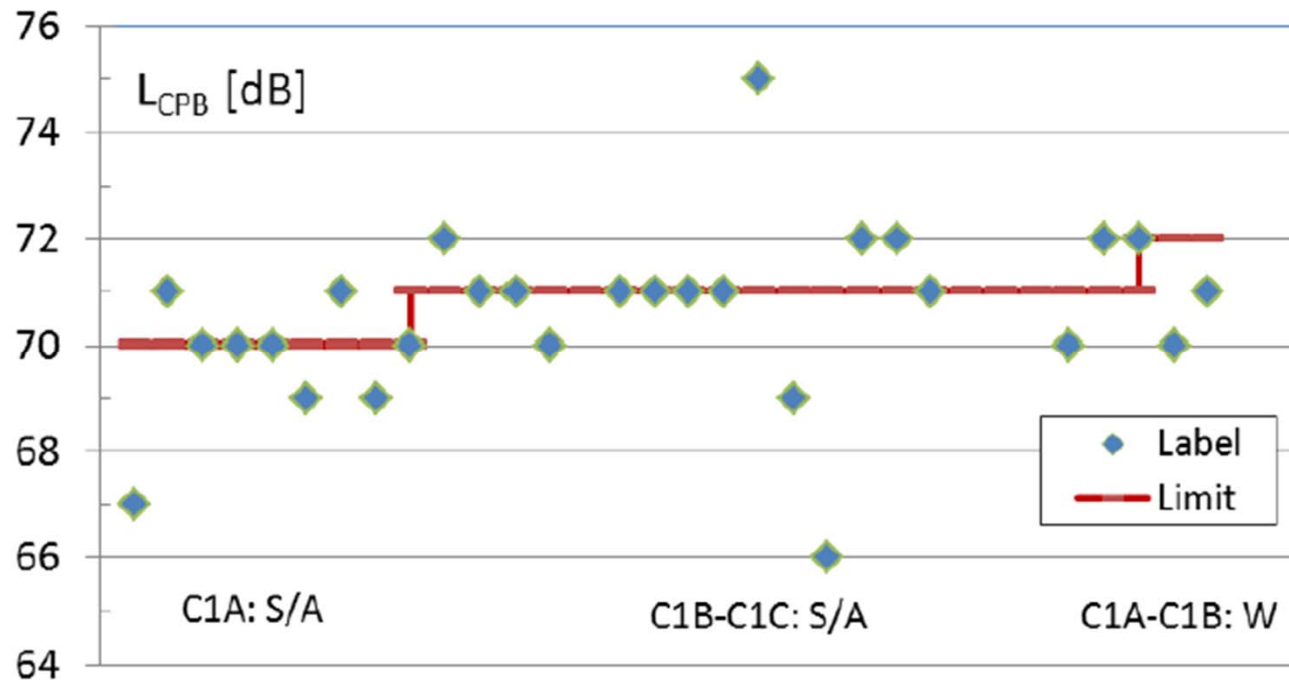
- 31 tyres were tested: all class C1A, B and C.
- 20 summer tyres, 4 all-seasons tyres, 5 winter tyres (non-studded) and 2 special tyres (including the SRTT)
- Tyre sizes from 175 mm (14") to 225 mm (16")
- Labelled Noise values: 66-75 dB(A)
- Labelled Rolling resistance: Class B-F
- Labelled Wet grip: Class A-E
- Price variation: From 54 to 139 € (in Denmark)
- Measuring method: CPX (ISO/DIS 11918-2). All measurement results corrected to "coast-by-levels" (ECE Reg.117). Speed: 80 km/h.

Measurement program – road surfaces:

- **A total of 31 road surfaces were tested:**
- In Denmark: 15 surfaces: AC/SMA, 6-11 mm, including some thin layer texture optimized surfaces
- In Sweden: 5 surfaces: AC/SMA, 6-16 mm
- In Norway: 10 surfaces: AC/SMA, 6-16 mm
- 2 ISO 10844 surfaces: Volvo/Hällered (S) and IKA/Aachen (D)
- At TUG/Gdansk (PL): 2 drum surfaces (ISO and DAC12)

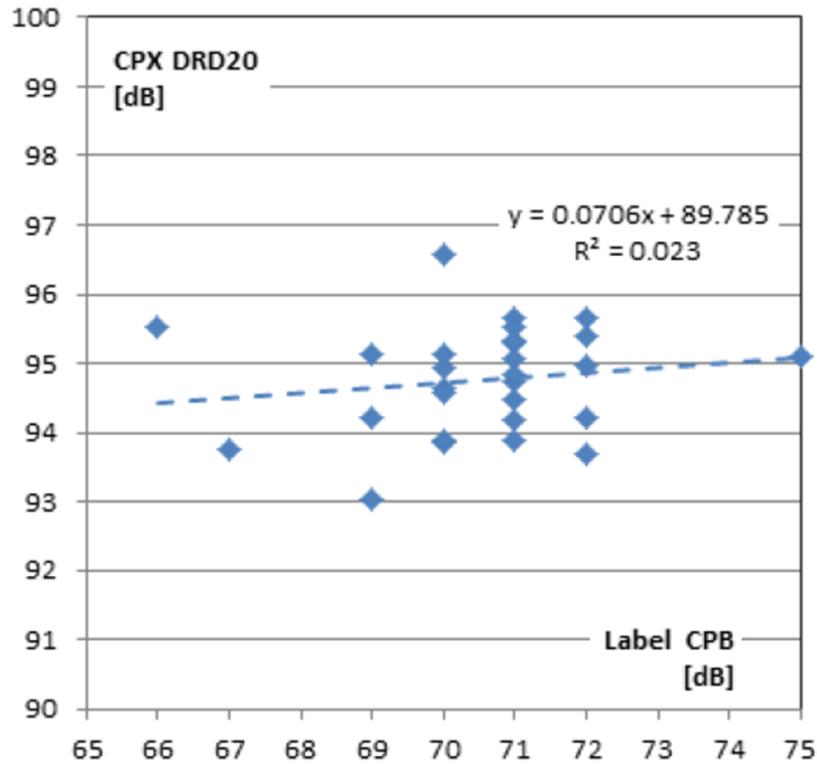
NOTE THAT NO POROUS SURFACES WERE INCLUDED IN THE PROJECT!

Some results – labelled noise level compared to noise limits in the new EU directive.

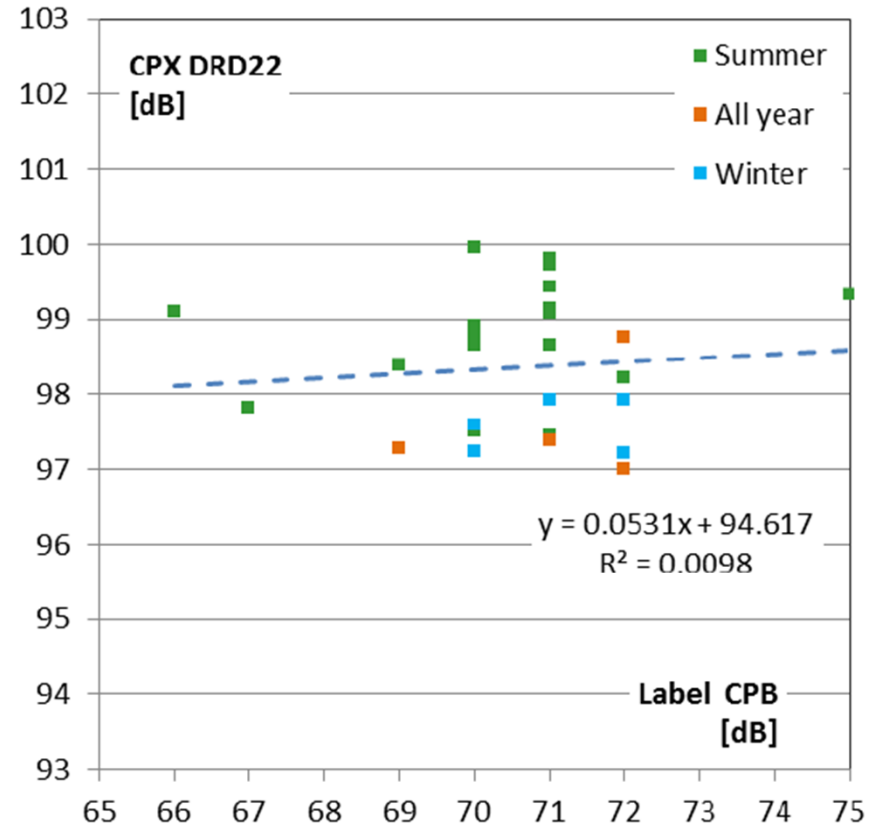


Note that the measurements were performed in 2012, at a time before the introduction of the new limits in Nov.2012[1].

Relationship between the labelled values and the measured values on the Volvo ISO-track and on SMA11 (Swedish)



ISO10844 (S)

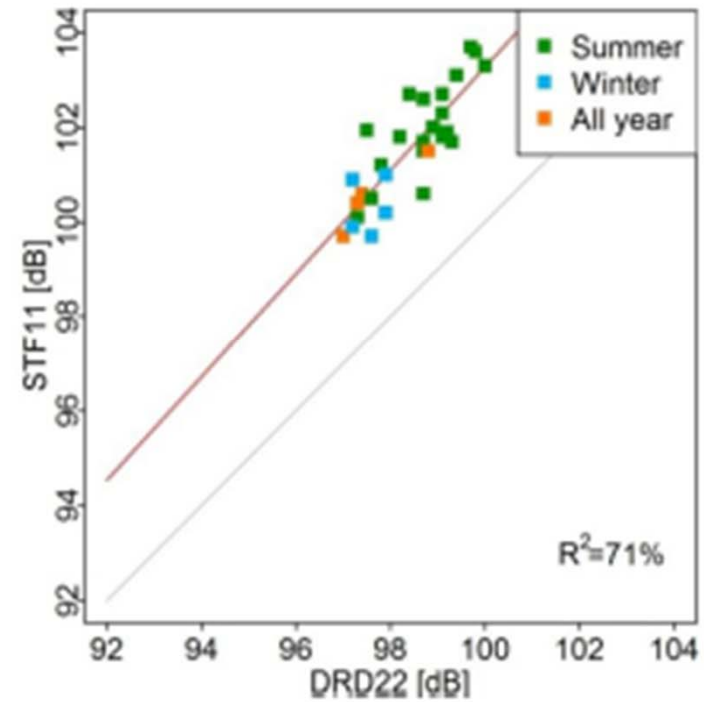
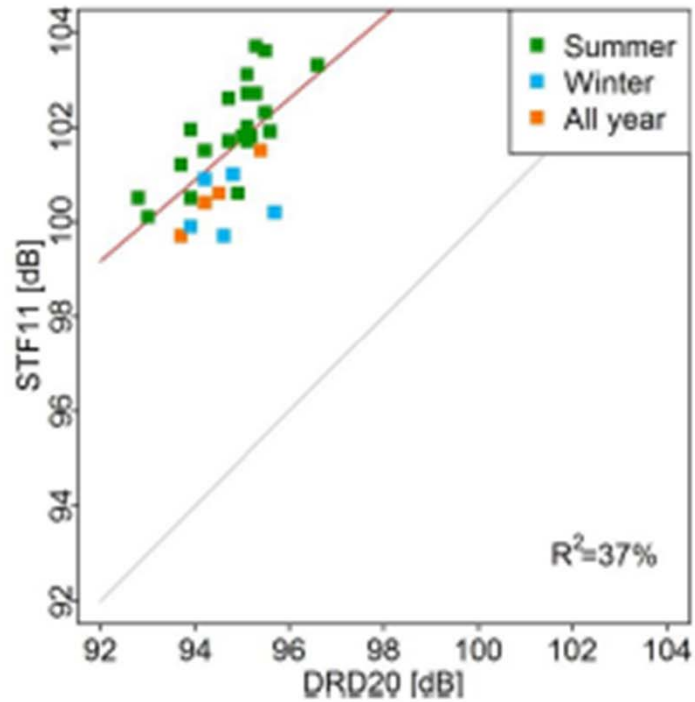


SMA11 (S)

Lack of correlation between labelled and measured noise values (ISO) could be due to:

- The NordTyre measurements have been done on a specific tyre, with a specific dimension. The noise label value for this tyre could be for other dimensions (wider/narrower), but within this class of tyre.
- The labelled value must take into account a normal production variation in levels for a certain tyre line.
- Variation over different ISO-surfaces, measurement uncertainty (different measuring methods, including different loading), etc. (worst case?)

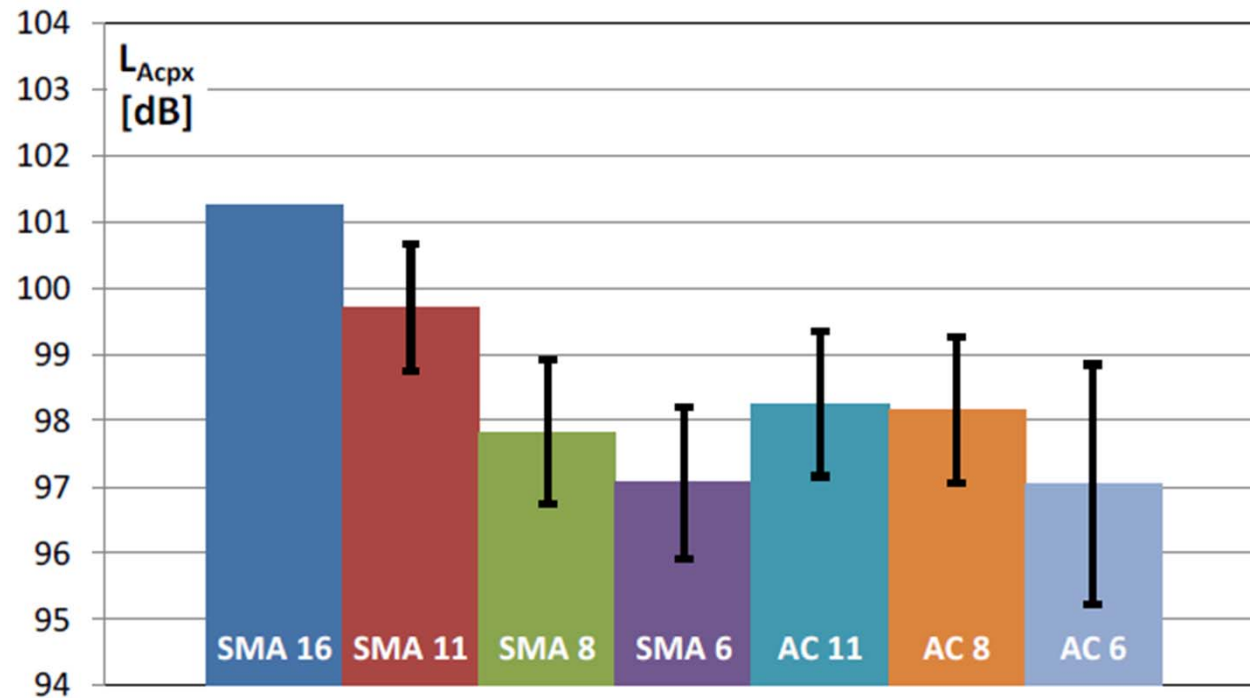
Correlation between measured noise levels on different road surfaces:



Left: SMA16 (N) and ISO (S)

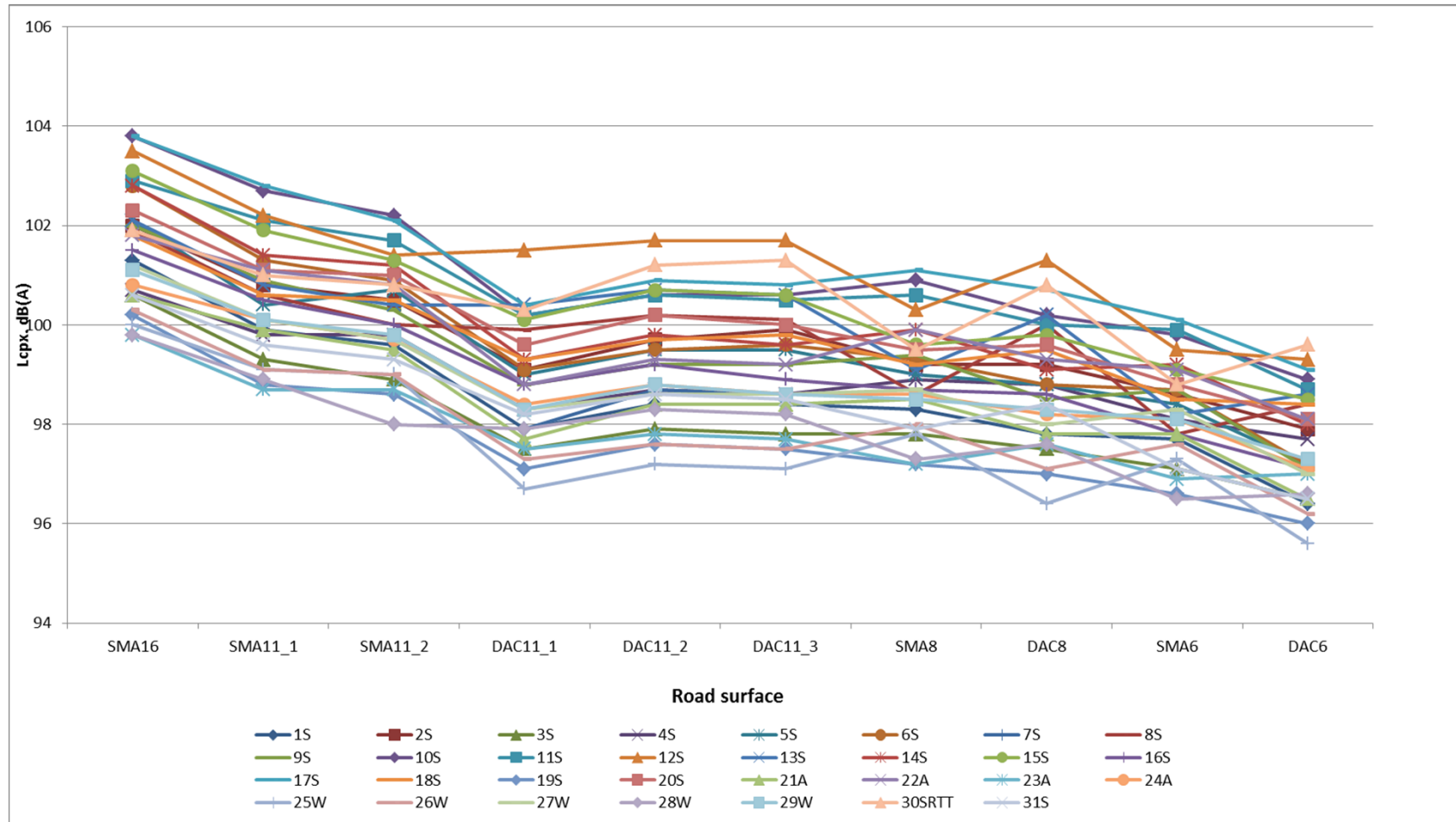
Right: SMA16 (N) and SMA11 (S)

Variation of tyre/road noise levels due to pavement families:



Average tyre/road noise levels(CPX) and standard deviation for pavement families in the Nordic countries.

Variation in tyre/road noise levels of 31 tyres on 10 Norwegian dense surfaces [2].



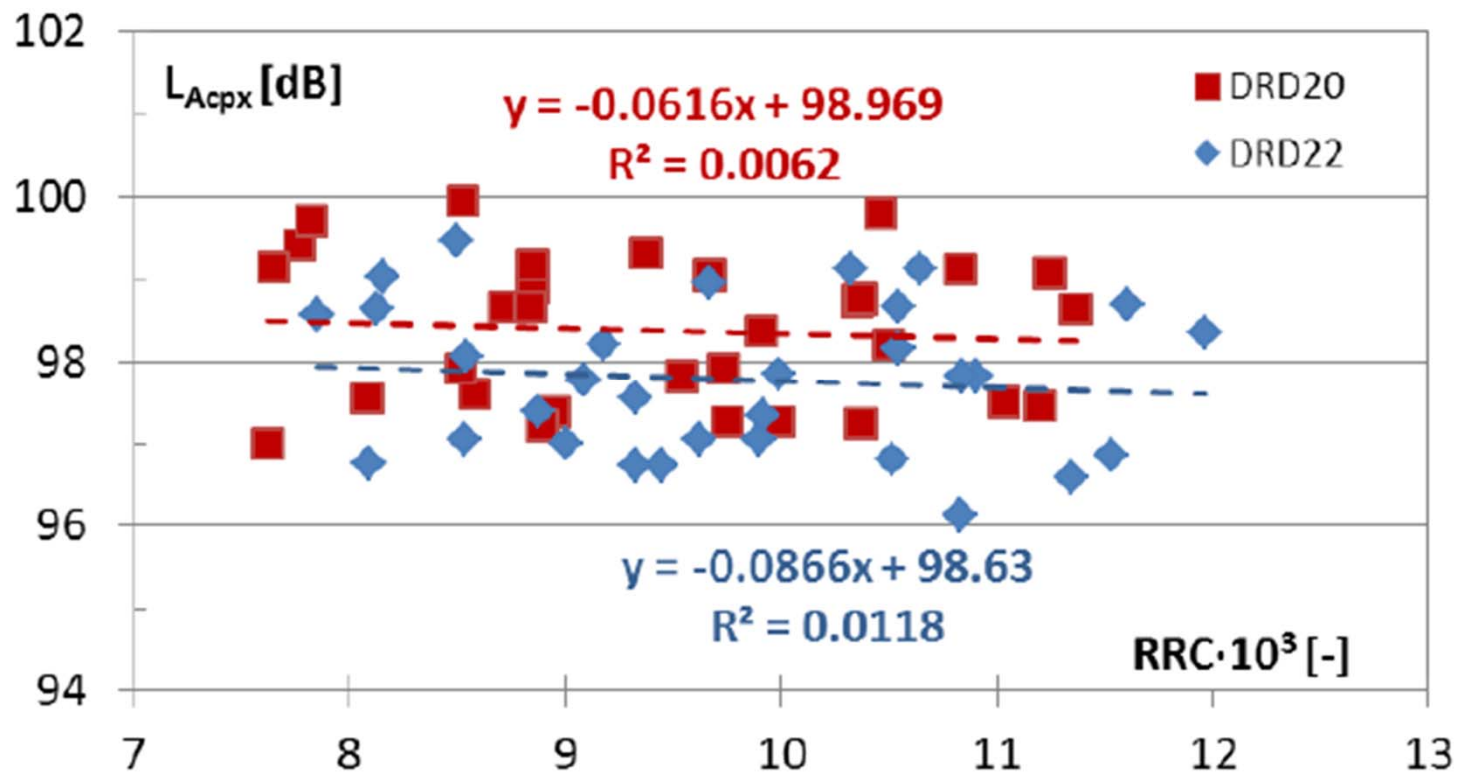
Average noise reduction by changing road surface from the most noisy (SMA16) to another pavement family:

Pavement	SMA 16	SMA 11	SMA 8	SMA 6	AC 11	AC 8	AC 6
Noise reduction[dB]	0	1.5	3.4	4.2	3.0	3.1	4.2

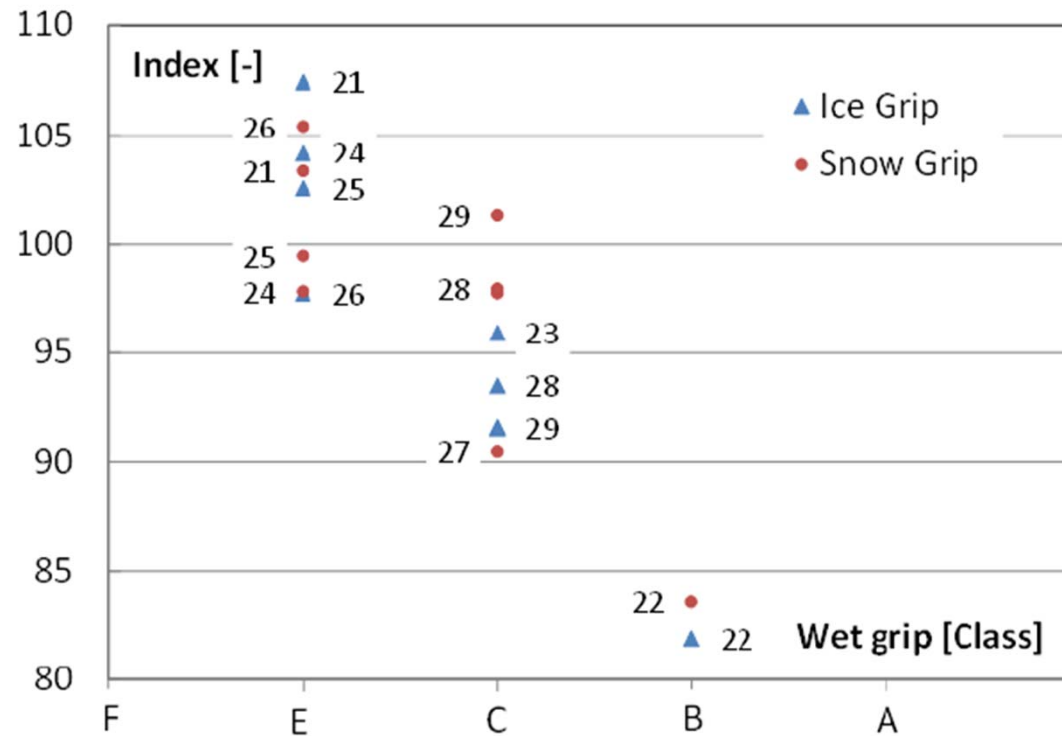
Some conclusions:

- Variation in noise levels of tyres: about **4 dB(A)** and variation between average of road surfaces: about **4 dB(A)**.
- The difference between the most noisy tyre on the most noisy surface, with the most quiet tyre on the quietest road surface is **11 dB(A)**.
- Remember that there is no porous surface involved in this project!
- The effect of removing the most noisy tyres based on label values is zero (on the average noise level), due to lack of correlation. If removing the most noisy surface and keeping the most quiet tyres, the effect is about **5.4 dB(A)**.
- The ISO surface represents Nordic surfaces OK.

Relationship between measured Rolling Resistance (RRC) and measured noise levels on two road surfaces; ISO/DRD20(AC8d) and SMA11/DRD22(S):



Relationship between measured ice and snow grip index and labelled wet grip index:



Some conclusions:

- Rolling resistance (RRC) were found to be uncorrelated with tyre/road noise levels
- There is a trend for less good breaking performance on ice and snow, the better the labelled wet grip.

In 2014, the project will continue dealing with truck tyres.

Thank you for your attention!

References:

1. Kragh, J., Oddershede, J.: NordTyre – Car tyre labelling and Nordic traffic noise. Proceedings of Internoise 2013, Innsbruck 15-18. Sept. 2013.
2. Berge, T.: Noise performance of the SRTT tyre compared to normal passenger car tyres. Proceedings of Internoise 2013, Innsbruck 15-18. Sept. 2013.

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