

NordTyre - the potential for noise reduction using less noisy tyres and road surfaces

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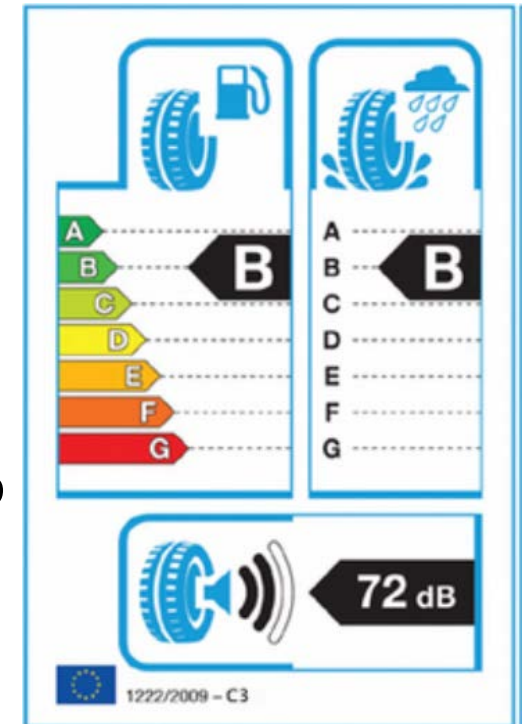
Rasmus Stahlfest Holck Skov,

DELTA - a part of FORCE Technology



Background and challenge

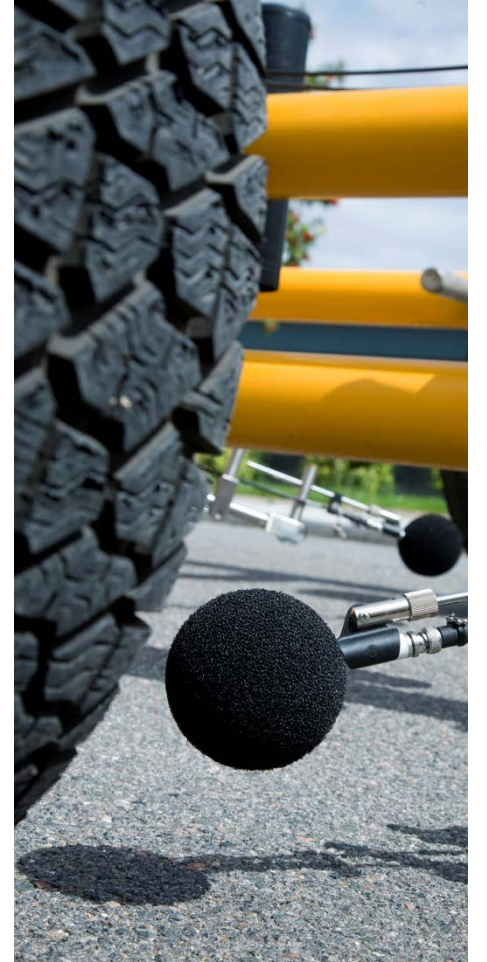
- Traffic noise is a big and expensive challenge for Nordic road administrations
- In 2009, new European tyre noise limits were introduced
- Labelling of new tyres by November 2012 became mandatory in EU and EEC countries. 3 parameters:
 - Wet grip
 - Rolling resistance
 - Noise
- A need to know how “low noise” tyres and road surfaces could contribute to traffic noise mitigation



➔ Investigated in the NordTyre projects 2011 to 2017

NordTyre financed through NordFoU

- A co-operation between the national road and transport administrations in Denmark, the Faroe Islands, Finland, Iceland, Norway and Sweden
- Purpose to create research and development synergies within the areas which present shared challenges and needs between the Nordic countries
- NordFoU' organizes joint research projects between the NordFoU partners
- Financed by partners interested – common pot



Active people and organisations

Steering group

- Espen Andersson (Chair), Norwegian Public Roads Administration
- Jannicke Sjøvold, Norwegian Public Roads Administration
- Jakob Fryd, Danish Road Directorate
- Julia Bermlid, Swedish Transport Administration

Advisory group

- Luc Goubert, Belgian Road Research Centre
- Ulf Sandberg, Swedish National Road and Transport Research Institute, VTI
- Ingunn Milford, Multiconsult, Norway
- Jan Boe Kielland, independent noise expert, Norway
- Panu Sainio, Aalto University, Finland
- Roger Williams (until 2015), independent tyre expert, United Kingdom

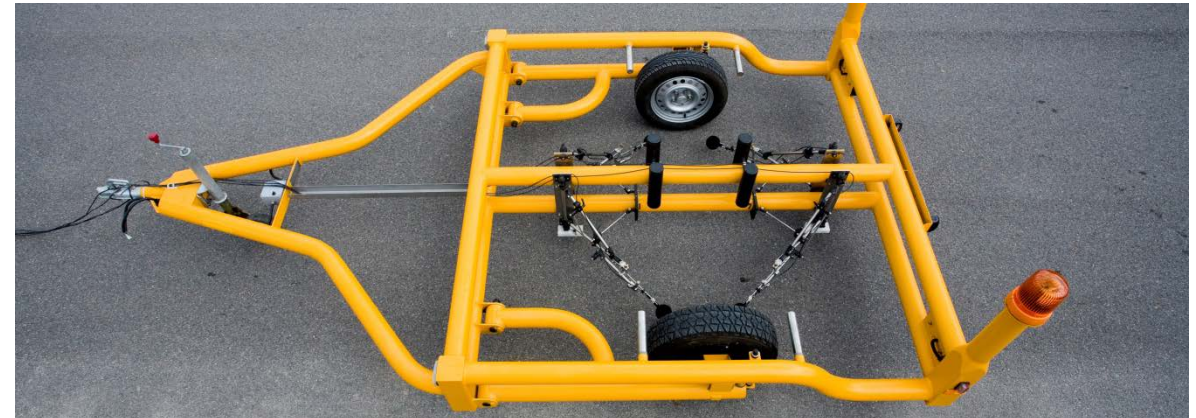
The people who did the work

Project group

- Jørgen Kragh, Danish Road Directorate (until May 2016 when he retired)
- Rasmus Stahlfest Holck Skov, Danish Road Directorate, now DELTA a part of FORCE Technology
- Jens Oddershede, Danish Road Directorate, now DELTA a part of FORCE Technology
- Hans Bendtsen, Danish Road Directorate

Subcontractors

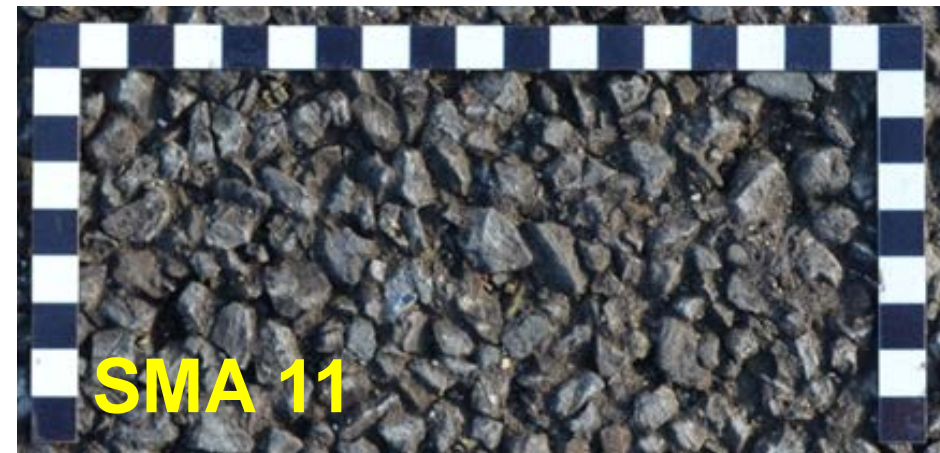
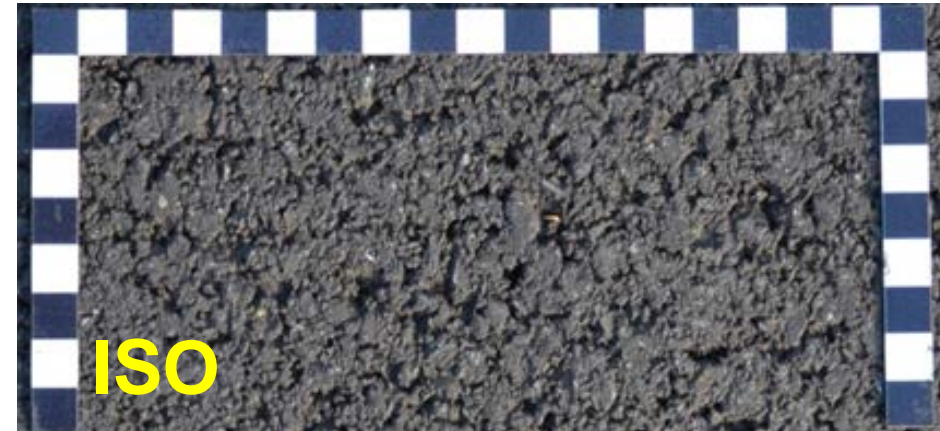
- SINTEF, Norway
- Testworld Ltd, Finland
- Technical University of Gdansk, Poland
- M+P Consulting Engineers, The Netherlands
- DELTA a part of FORCE Technology



Noise labelling

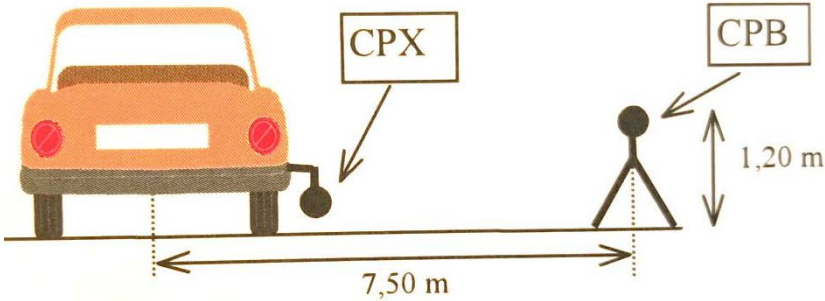
Measurement procedure

- Type approval noise measurements performed on ISO test track
- Vehicle coast-by at 80 km/h (passenger car), 70 km/t (truck)
- Smooth densegraded surface
- Nordic surfaces typically SMA 11 (DK) or SMA 16 (S and N)
- Results are truncated (rounded down to the nearest integer)
- 1 dB subtracted to account for uncertainty
- The noise level measured may exceed the noise label value by up to 1.9 dB

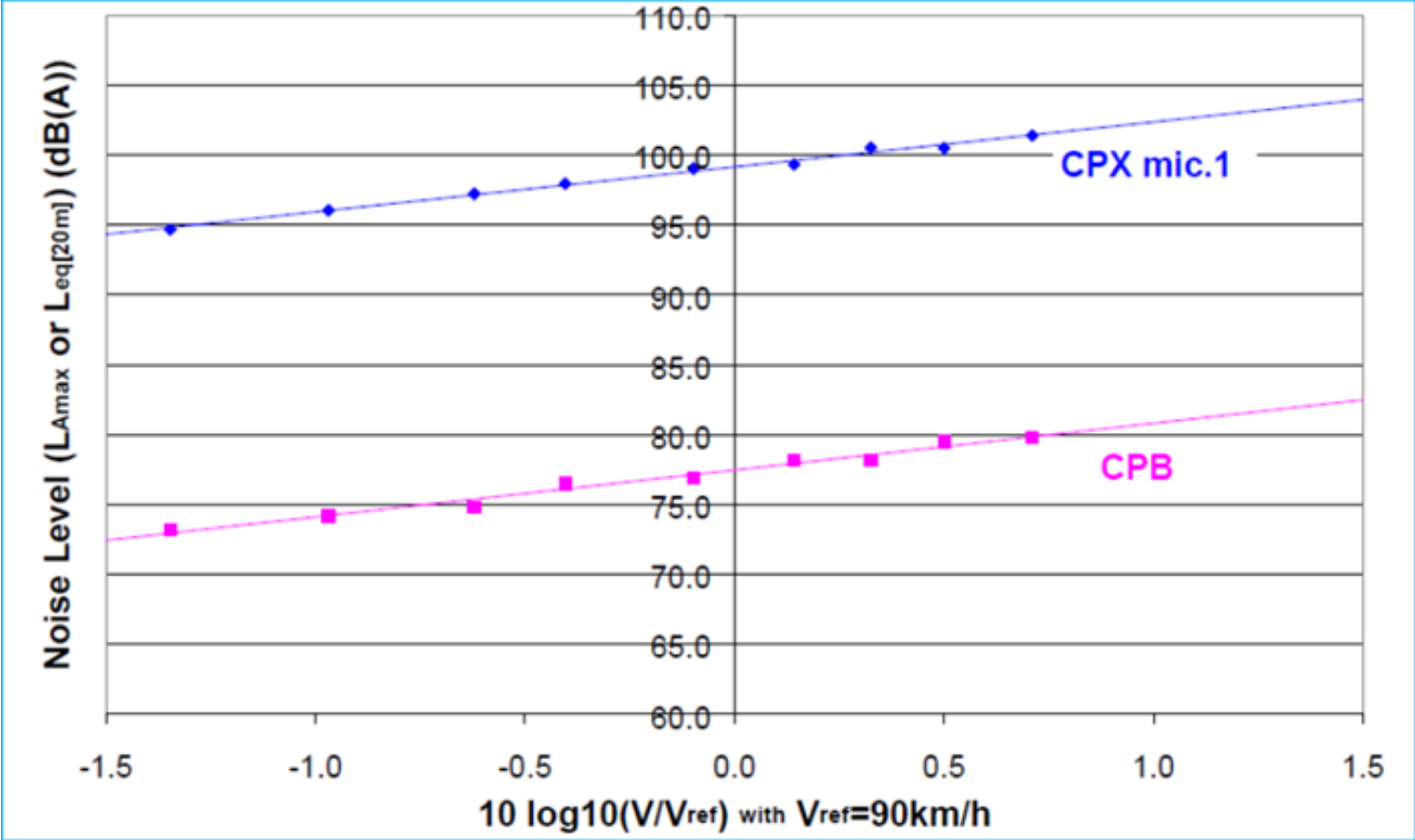


CPX versus Controlled Pass-By measurements

LCPC/IFSTTAR experiment



For non-porous pavements and for some porous asphalt pavements, the typical difference between CPX and CPB noise levels in the French data is 22 dB

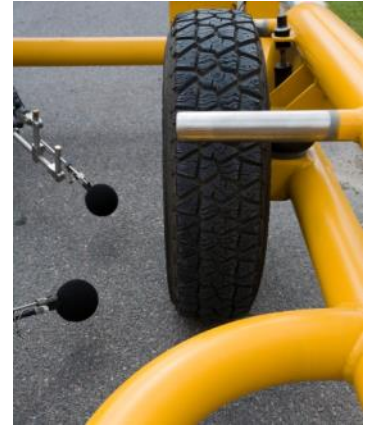


Objectives of the NordTyre projects

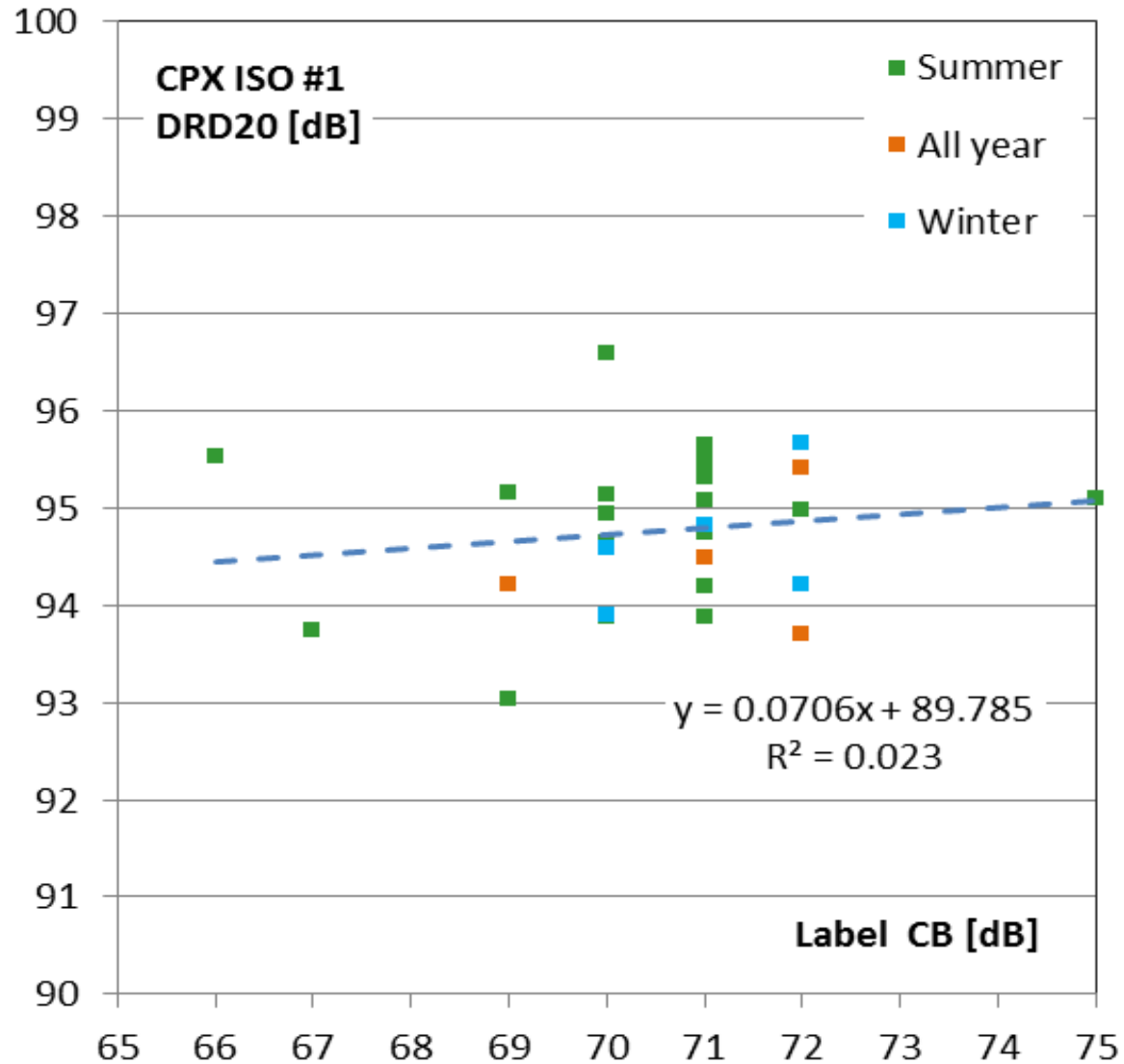
- Clarify the “real” influence of the new tyre noise labelling of passenger car and truck tyres
- Establish scientific evidence on the tyre/road contribution to traffic noise emission from roads in the Nordic countries
- Generate a basis for qualified decision making concerning actions to mitigate traffic noise
- Demonstrate the usefulness or necessity of a second Nordic “roughly textured” ISO reference test surface - creating scientific arguments for a short term revision of EU tyre noise regulation

Tyres for passenger cars

- 31 set of tyres selected and procured in May 2012
- Labelled values looked up on producers homepage in January 2013
- Tested on 30 Nordic road surfaces and two ISO test tracks in 2012
- Test method used – The CPX noise trailer deciBella from DRD. Speed 80 km/h
- DRD has very fine correlation between CPX results and road side measurements



Results for ISO test surface

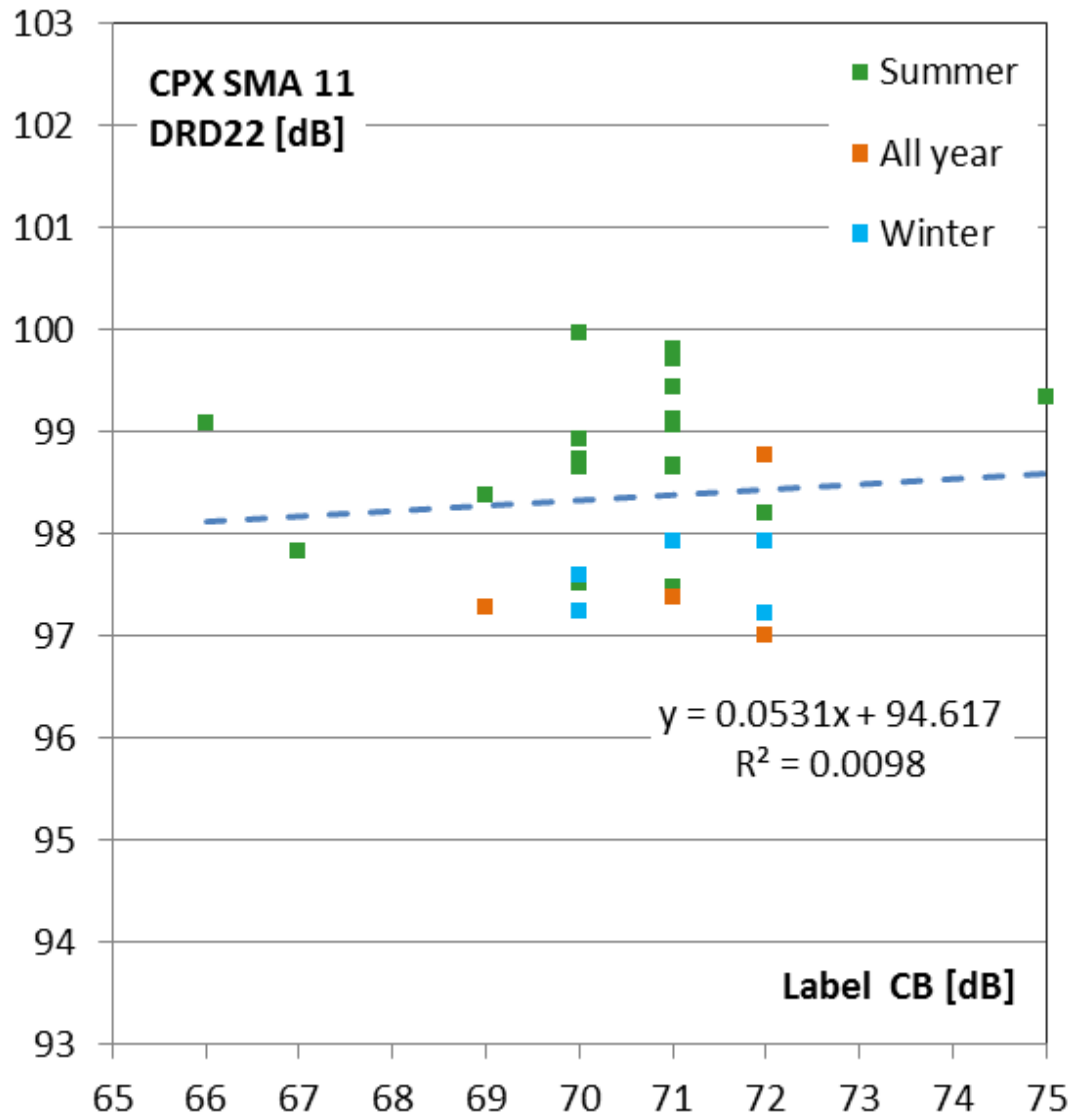


Microphone position of ISO road side test method



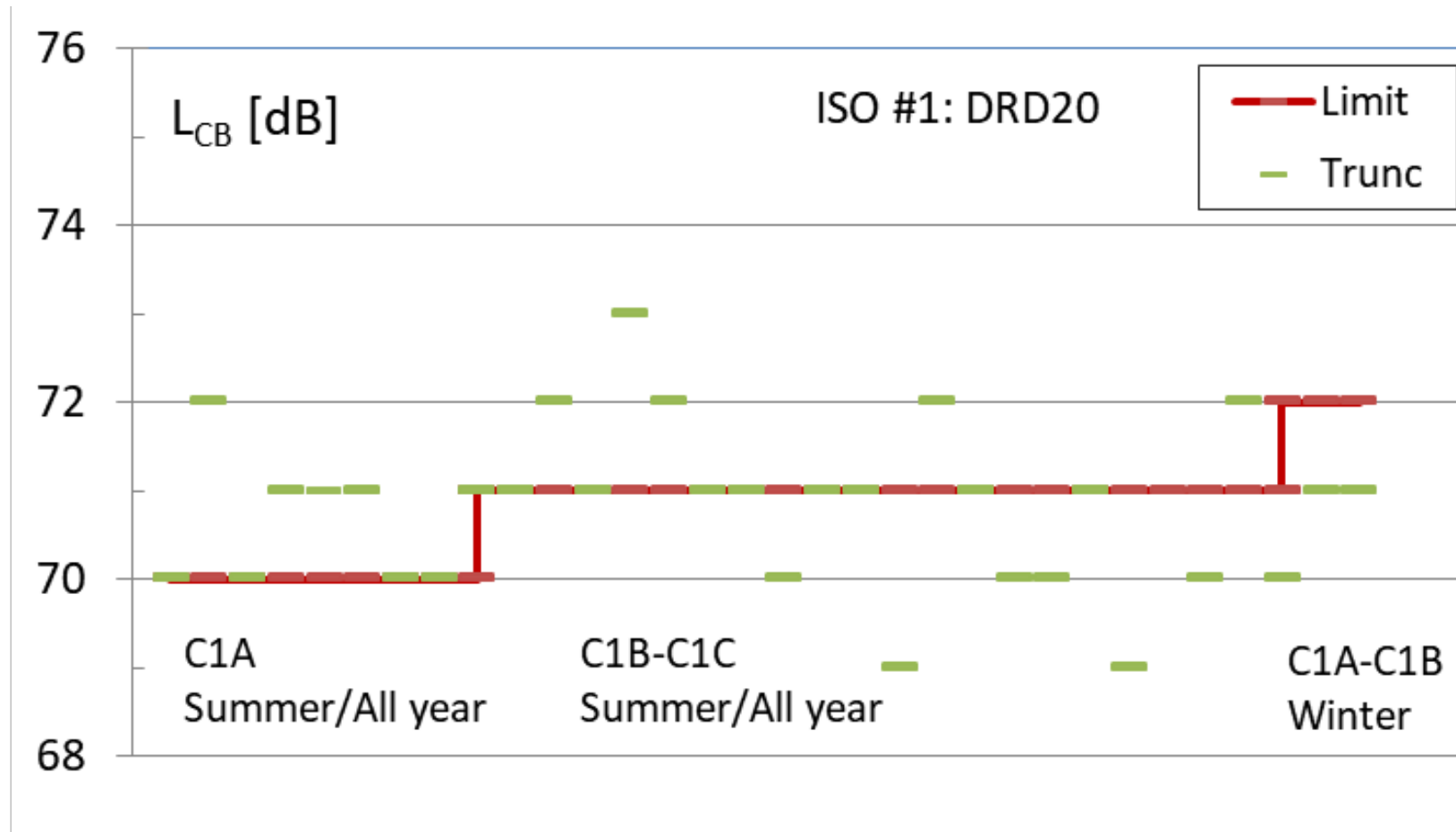
No correlation between measured noise and the labelled values!

Results for Nordic SMA 11 surface



No correlation between measured noise and the labelled values!

CPX trailer results compared with EU Regulation on noise limits



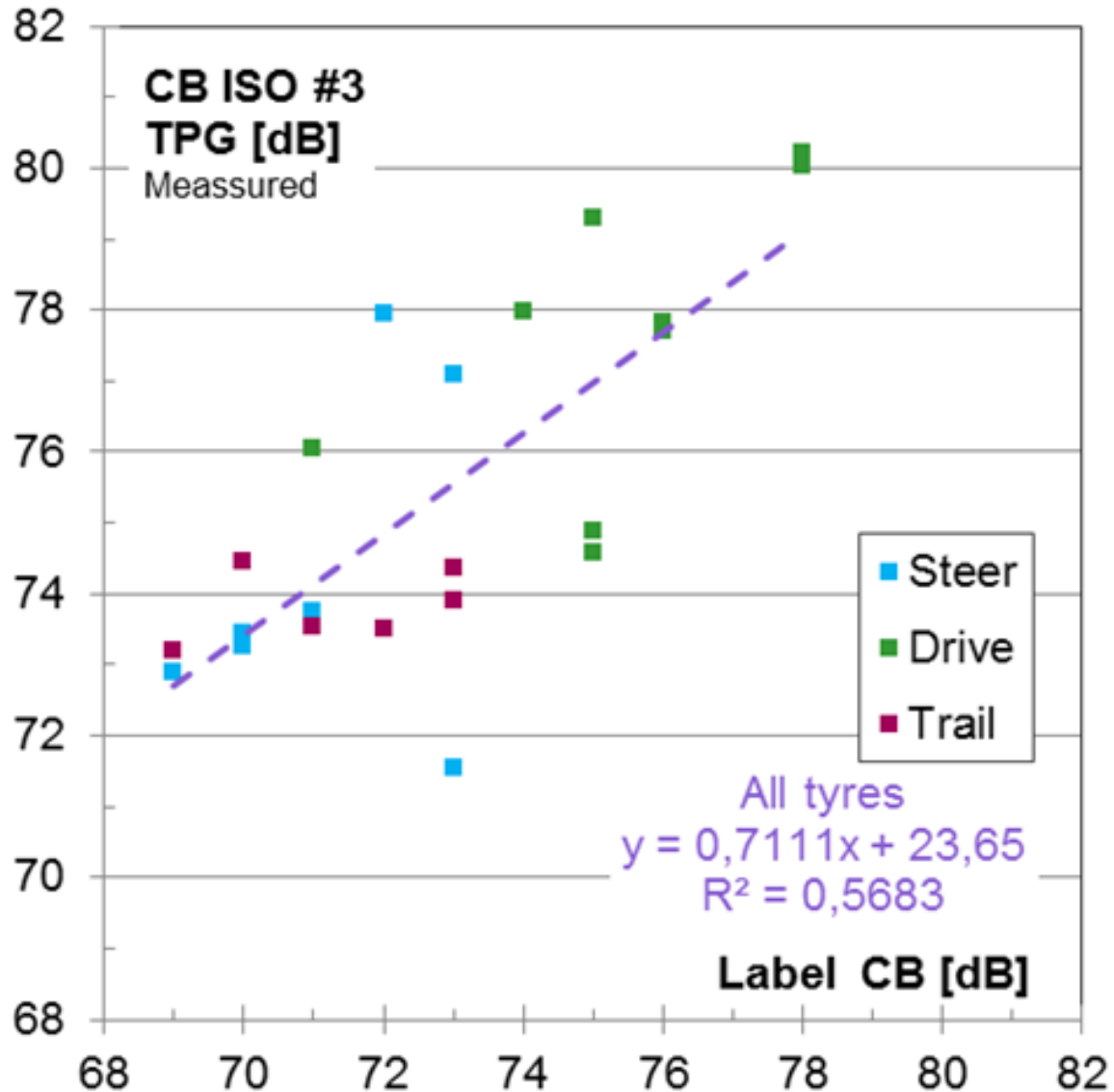
CPX trailer results translated into coast-by noise levels, truncated and rounded down

Tyres for trucks

- 30 sets of truck tyres representative for the Scandinavian tyre population procured in 2014
- 8 steering axle, 12 drive axle (9 original, 3 retreated), Trailer axle tyres (6 original, 4 retreated)
- Tested on four road surfaces including SMA surface and ISO test surface
- Using the coast-by test procedure
- On Twente Proving Ground in the Netherlands



Results for ISO test surface

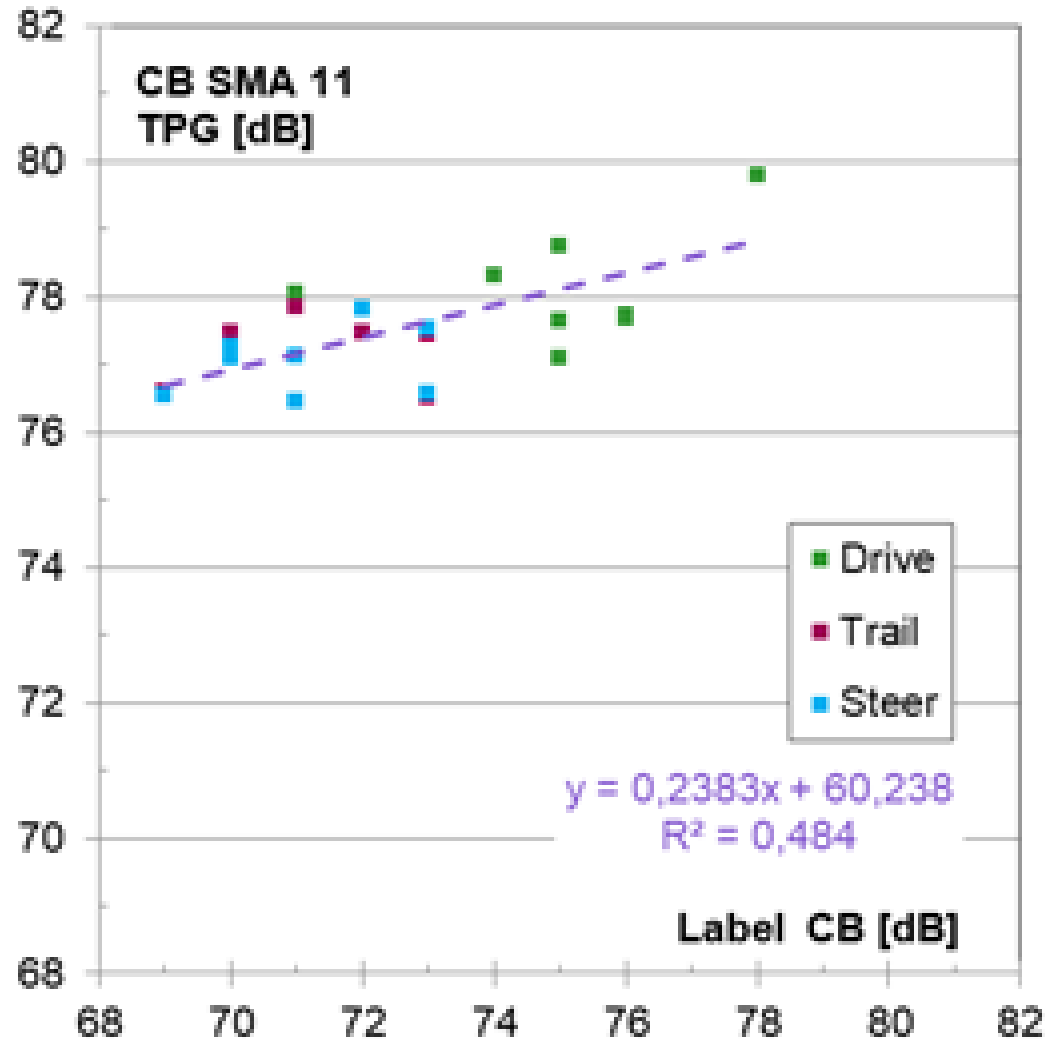


Retreaded tyres not regulated and therefore not included

Some correlation between measured noise and the labelled values!

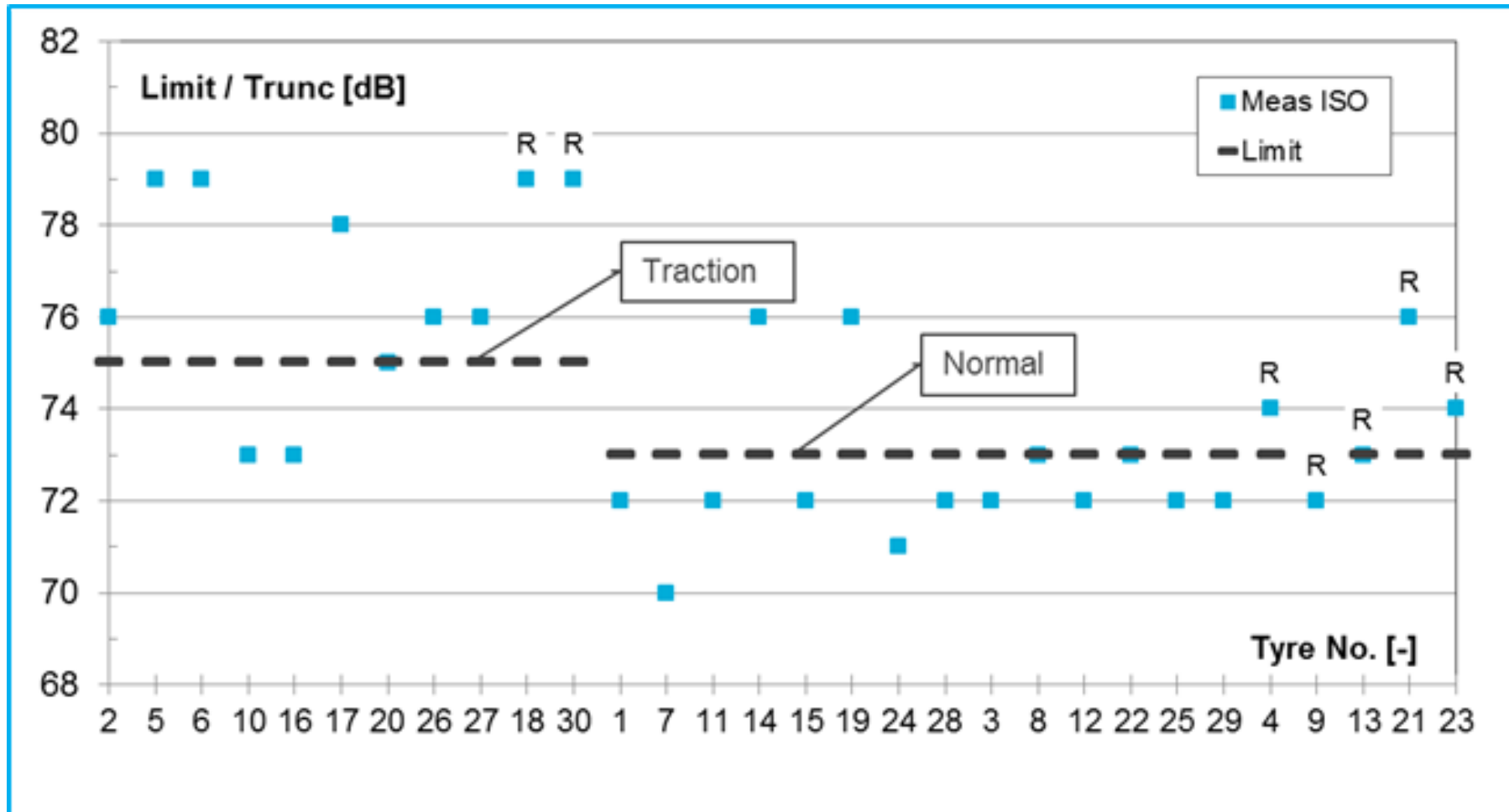


Results for Nordic SMA 11 surface



No good correlation
between measured noise
and the labelled values!

Measured results compared with EU regulation noise limits



Measured results truncated and rounded down

Retreaded more noisy than original tyres

Potential effects to society of regulating tyre/road noise

Conditions considered:

- Selecting and using only the 25 % tyres with lowest noise
- Denmark changing all pavements from SMA 11 to SMA 8
- Norway changing all pavements from SMA 16 to SMA 8
- Predictions made on the national noise mappings

Results:

Indicator	Norway	Denmark
	Total reduction in %	Total reduction in %
Percent Highly Annoyed / % HA	19 %	13 %
Noise annoyance index / SPI	11 %	6 %

Conclusions and actions

- The labelled values do not represent actual noise of tyres operating on typical Nordic pavements
- If the labelling system worked ok, there would be a good potential for noise reduction
- Campaigns and tax incentives encouraging car owners to buy the least noisy tyres possible
- Encouraging public organizations and private companies to require the use of the least noisy tyres
- Further decreasing the noise levels limits in the tyre type approval system



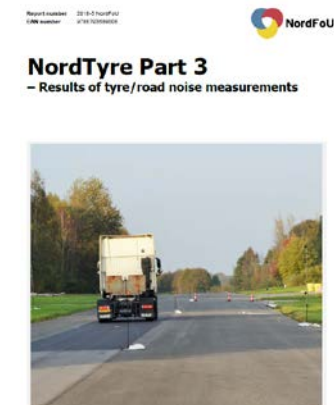
Research needs identified in the NordTyre projects

- Reasons for poor correlation between labelled and measured values must be determined
- Suggestions to improve labelling system to obtain acceptable correlation between labelled and measured values on actual road surfaces
- Develop a more rough-textured reference surface, suitable in countries using such
- Establish stricter specifications of test track properties (ISO 10844)
- Development of a procedure for inter-calibration of test tracks (see e g ppr at Inter-Noise 2017)
- Investigate the variation of noise levels within tyre families
- Investigate how tyre/road noise develops over time as tyres get older and worn
- Investigate tonality of truck tyre noise emission and tonality perceived by road neighbours

The five reports

- Analysis of data from passenger car tyres
- Noise from Truck Tyres
- Potential Society Effects of Regulation tyre/road noise
Summary report of the NordTyre Projects

- Two background reports with data:
 - NordTyre CPX Measurement journal
 - NordTyre Part 3
Results of tyre/road noise measurements
- Download: <http://www.nordfou.org>





Thank you!

Any questions?