

IWGMU proposal for R117 C2 noise temperature correction update

GRBP - 78th session

Agenda

- 1 Recap - R117 C1 temperature correction update**
- 2 Temperature sensitivity of C2 3PMSF and non 3PMSF tyres**
- 3 Next steps**

Verifying and updating the R117 C1 temperature correction

- In general, the available data of R117 measurements with the same tyres at a wide temperature range is very limited and often of a poor correlation between the temperature and the measured rolling noise (e.g., $R^2 < 0,5$)
- To improve this situation ETRTO performed 2 activities in parallel:

①



- Proving ground investigation with a high effort to achieve a goal of $R^2 > 0,7$ for the correlation between temperature and tyre rolling noise

②



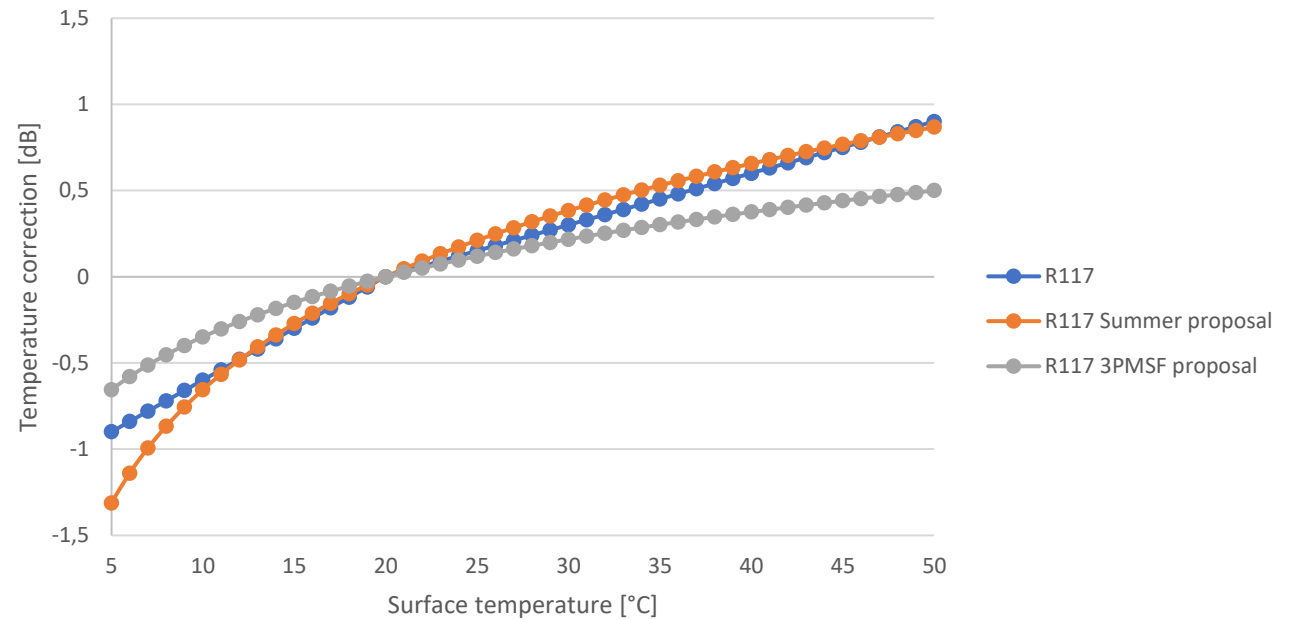
- Experimental drum investigation to exclude as many uncertainties as possible

Proposal for R117 C1 temperature correction update

$$L_{corr} = -K1 \times LOG \left(\frac{\vartheta_{ref} + K2}{\vartheta_{test} + K2} \right)$$

	Non-3PMSF	3PMSF
K1	2,18	1,35
K2	0	2,29
ϑ_{ref}	20	20

R117 temperature correction updat proposal



ETRTO proposal for R117 C1 tyres, based on the collected data:

- The **collected data** from both the proving ground and the drum test **confirm a logarithmic shape** for the temperature correction **as already used in R51**



- NORMAL TYRES:** the logarithmic shape shall be introduced in R117, by **updating the current correction equation** based on surface temperature
- 3PMSF TYRES:** introducing a **dedicated logarithmic shape - temperature correction equation**, to better represent the low temperature sensitivity of 3PMSF compounds

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- 2 **Temperature sensitivity of C2 3PMSF and non 3PMSF tyres**
- 3 **Next steps**

Verifying and updating the R117 C2 temperature correction

- In general, the available data of R117 measurements with the same tyres at a wide temperature range is very limited and often of a poor correlation between the temperature and the measured rolling noise (e.g., $R^2 < 0,5$)

①

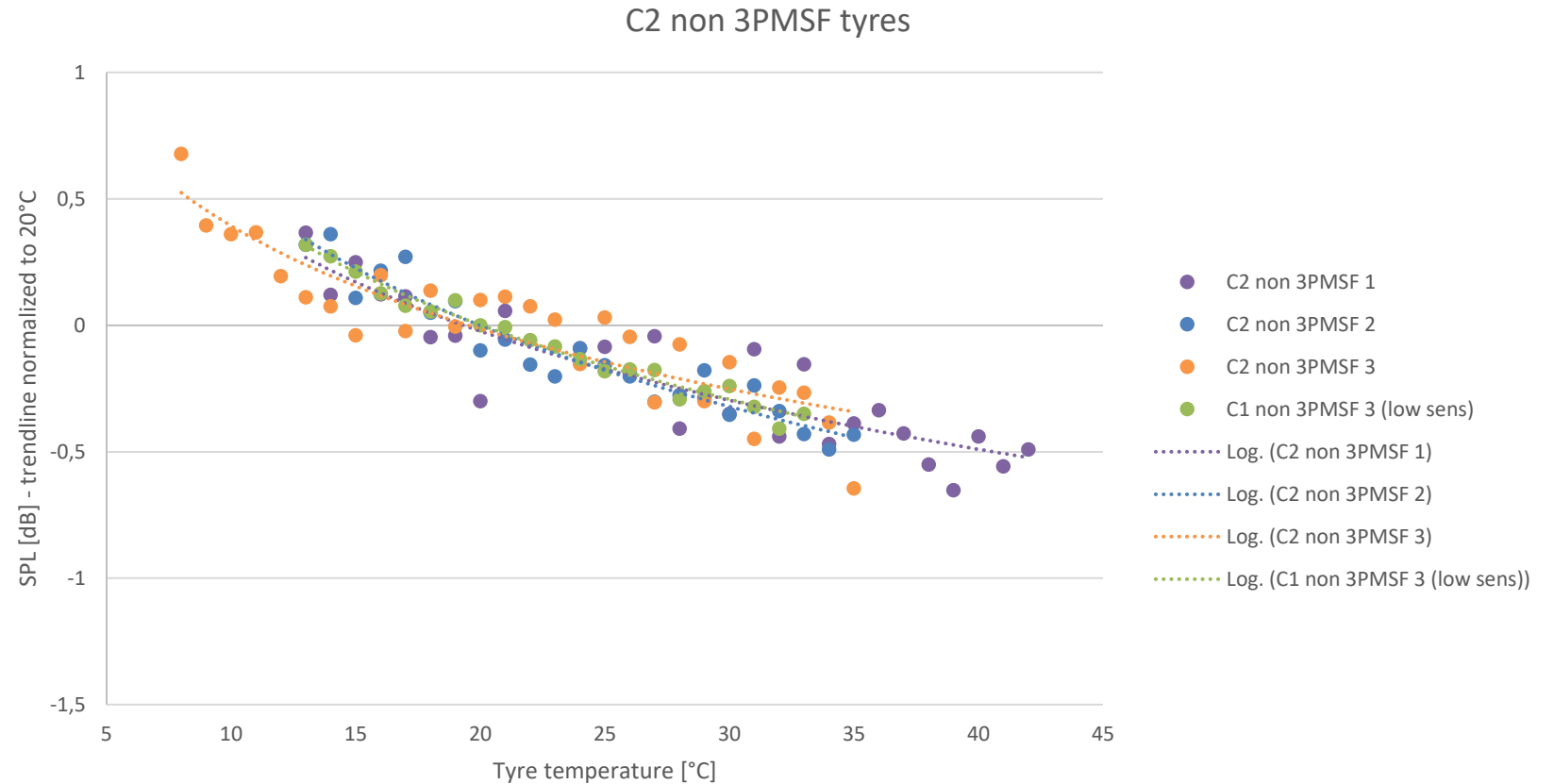


- Experimental drum investigation to exclude as many uncertainties as possible

C2 NON 3PMSF - Drum investigation



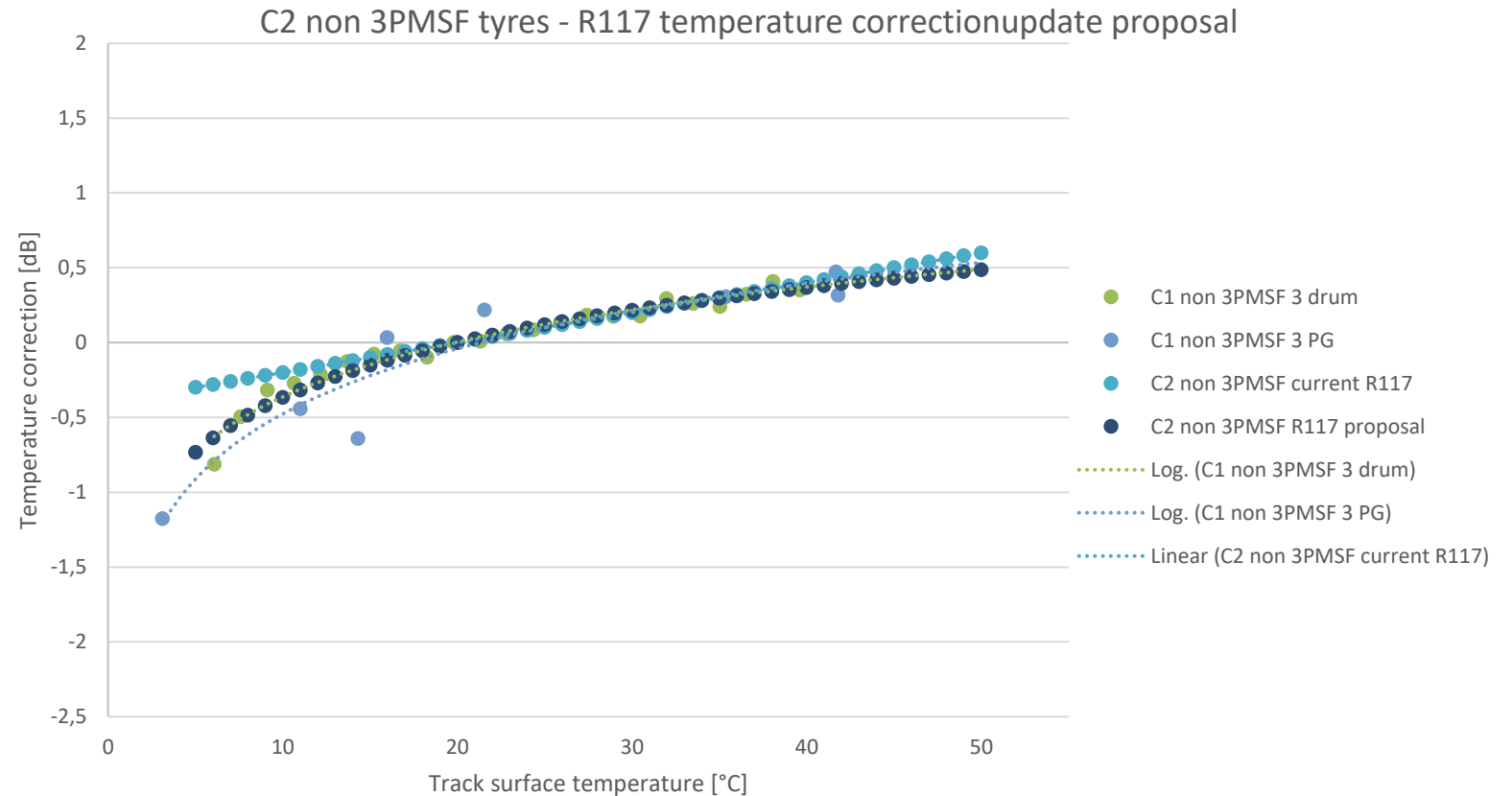
- Three production tyres were tested
- Tyres cooled down to 5° C.
- Mounted at the test stand, using an ISO replica drum surface, measuring:
 - Tyre rolling noise
 - Tyre temperature during the warmup
 - Measurement was run until a steady state tyre temperature was reached



- C2 non 3PMSF tyres show a comparable temperature sensitivity then low temperature sensitive C1 non 3PMSF tyres.

C2 non 3PMSF correction – referencing to C1 results

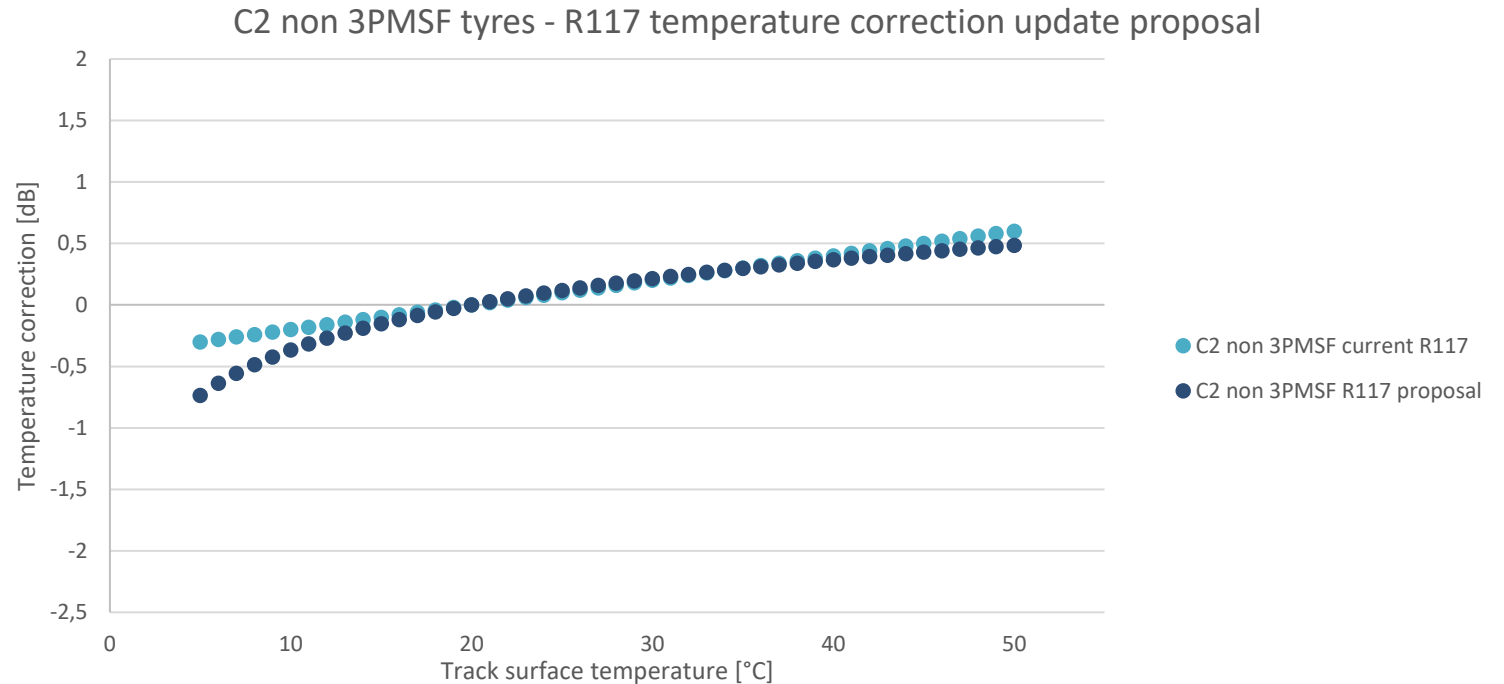
- The current R117 C2 temperature correction matches above 15°C with the temperature sensitivity of low sensitive C1 tyres.
- To compensate the discrepancy below 15°C an updated C2 non 3PMSF temperature correction is derived based on the results of low sensitive C1 tyres.



Proposal for R117 C2 non 3PMSF temperature correction update

$$L_{corr} = -K1 \times LOG \left(\frac{\vartheta_{ref} + K2}{\vartheta_{test} + K2} \right)$$

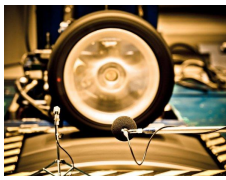
	Non 3PMSF
K1	1,22
K2	0
ϑ_{ref}	20



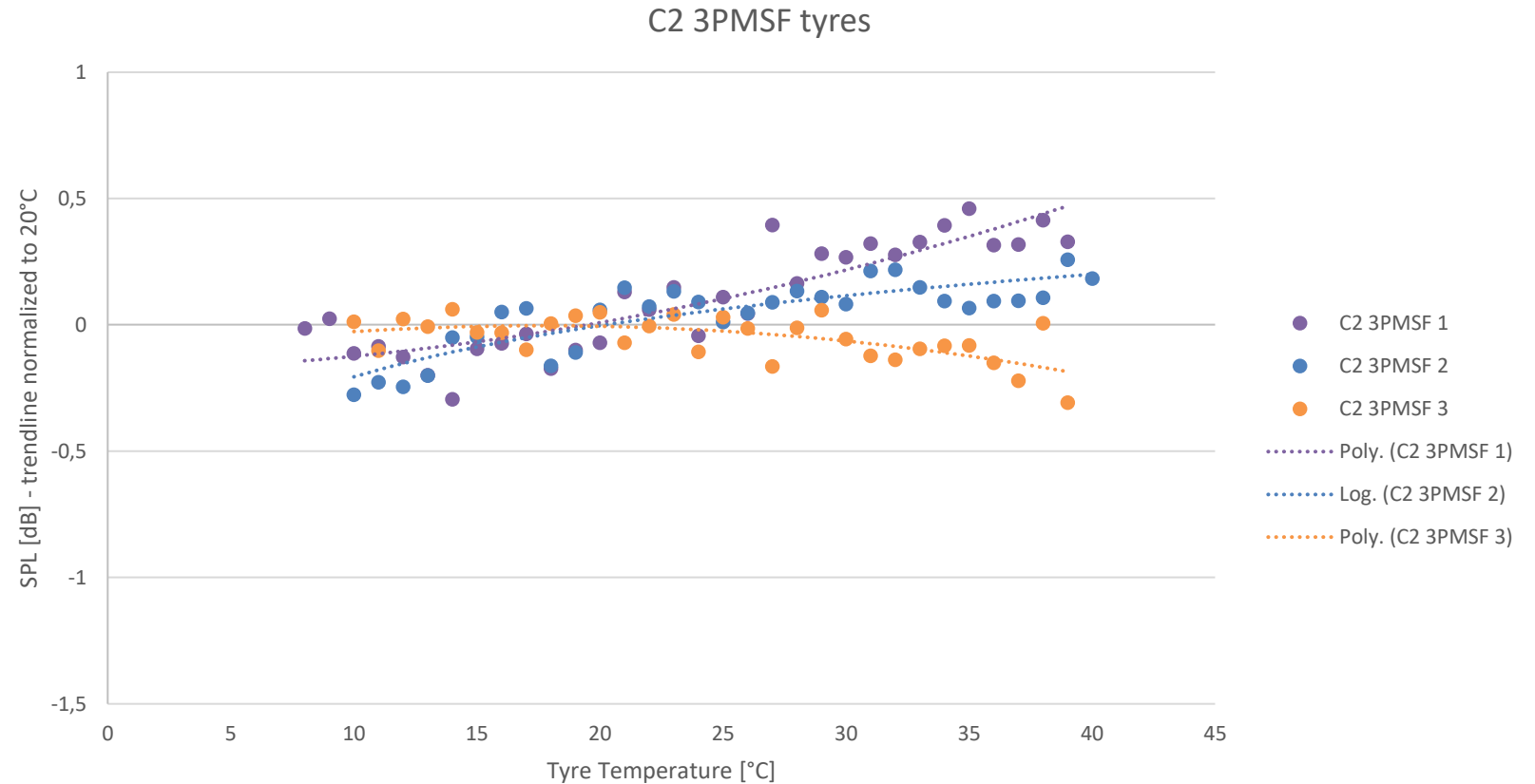
ETRTO proposal for R117 C2 non 3PMSF tyres, based on the collected data:

- **Introducing a logarithmic shape - temperature correction equation**, to better represent the low temperature sensitivity of non 3PMSF C2 tyres

C2 3PMSF - Drum investigation



- Three production tyres were tested
- Tyres cooled down to 5° C.
- Mounted at the test stand, using an ISO replica drum surface, measuring:
 - Tyre rolling noise
 - Tyre temperature during the warmup
 - Measurement was run until a steady state tyre temperature was reached

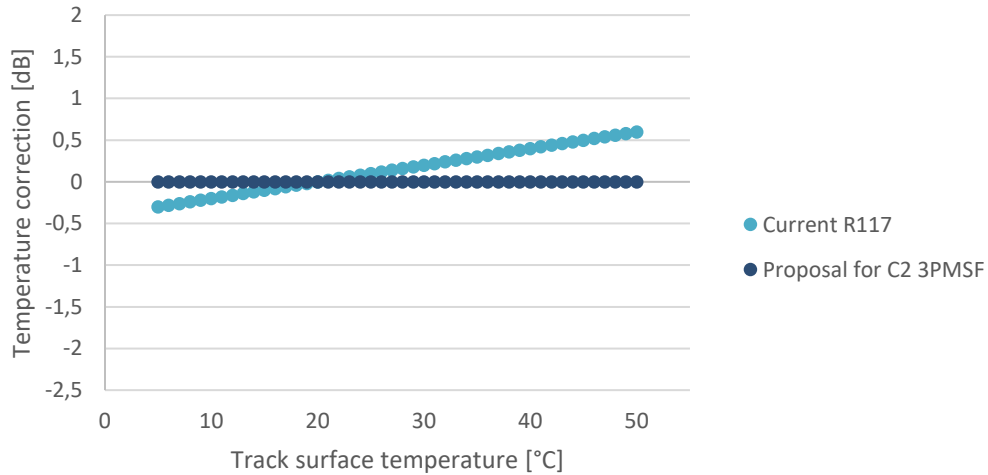


- C2 3PMSF tyres show such low temperature sensitivity that no temperature correction can be derived.

ETRTO proposal for C2 temperature correction update

3PMSF

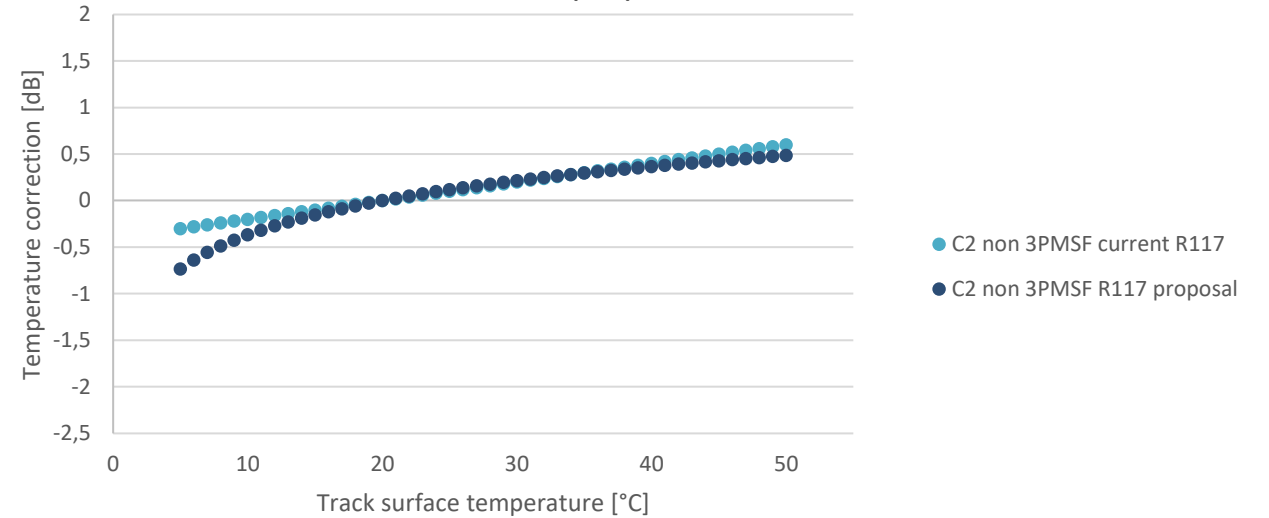
C2 3PMSF tyres - R117 temperature correction update proposal



	3PMSF
K1	0
K2	0
ϑ_{ref}	20

Non 3PMSF

C2 non 3PMSF tyres - R117 temperature correction update proposal



	Non 3PMSF
K1	1,22
K2	0
ϑ_{ref}	20

$$L_{corr} = -K1 \times LOG \left(\frac{\vartheta_{ref} + K2}{\vartheta_{test} + K2} \right)$$

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Next steps

- Ask for support from ISO regarding the observed proving ground variations (track vs. air temperature) and data collection for a discussion in the next revision cycle of ISO 10844.
- Continue the investigations regarding the connection between tyre, air and surface temperature.

Thank you!