Submitted by the experts from the *European Tyre and Rim Technical Organisation*

Informal document **GRBP-70-21 Rev. 2**
(70th GRB, 11-13 September 2019,
agenda item 6 (d))

The formatting of our amendment proposal to Annex 3, 4.2. to 4.5., as per document ECE-TRANS-WP29-GRBP-2019-19e, is somehow misleading as it does not clearly show that it mainly consists in the inversion of paragraphs 4.2. and 4.3., does not change the technical content but rather emphasises what is the most common practice.

~~*Paragraph 2.20.9.*, amend to read and delete *footnote 9* related to this paragraph:~~

~~"2.20.9. "*Measurement reproducibility* σ_m" **means the** capability of a machine to measure rolling resistance.[9]~~

~~*Insert a new paragraph 2.20.10.:*~~

~~"**2.20.10. "*Measurement repeatability*" means the measurement precision under conditions where independent test results are obtained with the same method and procedure on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time.**"~~

Annex 3, Paragraph 1.1.1., amend to read:

"1.1.1. Calibration

At the beginning and at the end of every measurement session, the entire measurement system shall be checked by means of a sound calibrator that fulfils the requirements for sound calibrators of at least precision Class 1 according to IEC **60942:2017**~~60942:1988~~. Without any further adjustment the difference between the readings of two consecutive checks shall be less than or equal to 0.5 dB(A). If this value is exceeded, the results of the measurements obtained after the previous satisfactory check shall be discarded."

Annex 3, paragraph 4.3. renumber as 4.2. and read:

"**4.2.**~~4.3.~~ Temperature correction

For Class C1 and Class C2 tyres, the ~~final result measured~~ **rolling sound levels $L_i(\vartheta_i)$ obtained at the test surface temperature ϑ_i (where *i* denotes the number of the single measurement)** shall be normalized to a test surface reference temperature ϑ_{ref} by applying a temperature correction, ~~utilizing the temperature ϑ_i at the time of the respective sound recording and~~ according to the following formula:

$$L_i(\vartheta_{ref}) = L_i(\vartheta_i) + K(\vartheta_{ref} - \vartheta_i)$$

where:

~~ϑ_i = the measured test surface temperature,~~

ϑ_{ref} = 20 °C,

For Class C1 tyres, the coefficient K is:
− 0.03 dB(A)/°C when $\vartheta_i > \vartheta_{ref}$ and
− 0.06 dB(A)/°C when $\vartheta_i < \vartheta_{ref}$.

For Class C2 tyres, the coefficient K is − 0.02 dB(A)/°C.

Notwithstanding the above procedure, the temperature correction may be made only on the final reported tyre rolling sound level L_R, utilizing the arithmetic mean value of the measured temperatures, ~~If~~ **if** the measured test surface temperature does not change more than 5 °C within all measurements necessary for the determination of the sound level of one set of tyres~~, the temperature correction may be made only on the final reported tyre rolling sound level as indicated above, utilizing the arithmetic mean value of the measured temperatures. Otherwise each measured sound level L_i shall be corrected, utilizing the temperature at the time of the sound recording~~. **In this case the regression analysis below shall be based on the uncorrected rolling sound levels $L_i(\vartheta_i)$.**

There will be no temperature correction for Class C3 tyres."

Paragraph 4.2. renumber as 4.3. and read:

"**4.3.**~~4.2.~~ Regression analysis of rolling sound measurements

The tyre-road rolling sound level ~~L_R~~ $L_R(\vartheta_{ref})$ in dB(A) is determined by a regression analysis according to:

~~$L_R = \bar{L} - a \cdot \bar{v}$~~

$$L_R(\vartheta_{ref}) = \bar{L} - a \cdot \bar{\tau}$$

where:

$\bar{L}$ is the mean value of the **temperature-corrected** rolling sound levels ~~L_i~~ $L_i(\vartheta_{ref})$, measured in dB(A):

~~$\bar{L} = \frac{1}{n}\sum_{i=1}^{n} L_i$~~

$$\bar{L} = \frac{1}{n}\sum_{i=1}^{n} L_i(\vartheta_{ref})$$

n is the **number of** measurement**s** ~~number~~ ($n \geq 16$),

~~$\bar{v}$~~ $\bar{\tau}$ is the mean value of logarithms of speeds V_i:

~~$\bar{v} = \frac{1}{n}\sum_{i=1}^{n} v_i$ with $v_i = \lg(V_i / V_{ref})$~~

$$\bar{\tau} = \frac{1}{n}\sum_{i=1}^{n} \tau_i \quad \text{with} \quad \tau_i = \log_{10}\left(\frac{V_i}{V_{ref}}\right)$$

a is the slope of the regression line in dB(A):

~~$a = \frac{\sum_{i=1}^{n}(v_i - \bar{v})(L_i - \bar{L})}{\sum_{i=1}^{n}(v_i - \bar{v})^2}$~~

$$a = \frac{\sum_{i=1}^{n}[(\tau_i - \bar{\tau})(L_i(\vartheta_{ref}) - \bar{L})]}{\sum_{i=1}^{n}(\tau_i - \bar{\tau})^2}$$

Paragraph 4.4. amend to read:

"**4.4.** In order to take account of any measuring instrument inaccuracies, ~~the results according to paragraph 4.3. above~~ **the temperature corrected tyre rolling sound level $L_R(\vartheta_{ref})$ in dB(A)** shall be reduced by 1 dB(A) **and then rounded down to the nearest lower whole value to obtain the final result.**"

Paragraph 4.5., delete:

"~~4.5. The final result, the temperature corrected tyre rolling sound level $L_R(\vartheta_{ref})$ in dB(A), shall be rounded down to the nearest lower whole value.~~"

Annex 3 - Appendix 1, amend to read:

"…

5. Valid test results: .....

Run No.	*Test speed km/h*	*Direction of run*	*Sound level left[1a] measured dB(A)*	*Sound level right[1a] measured dB(A)*	*Air temp. °C*	~~*Track*~~ ***Test surface*** *temp. °C*	*Sound level left[1a] temp. corrected[b] dB(A)*	*Sound level right[1a] temp. corrected[b] dB(A)*	*Comments*
1									
2									
3									
4									
5									
6									
7									
8									

~~1~~[a] Relative to the vehicle.

[b] **Omit, if regression according to paragraph 4.3 of Annex 3 is made on the uncorrected rolling sound level values.**

…"

Annex 6, Paragraph 2.2., amend to read:

"2.2. Measuring rim ~~(see Appendix 2)~~

The tyre shall be mounted on a steel or light alloy measuring rim, as follows:

(a) For Class C1 tyres, the width of the rim shall be as defined in ISO 4000-1:**2015**,

(b) For Class C2 and C3 tyres, the width of the rim shall be as defined in ISO 4209-1:2001.

In cases where the width is not defined in the above mentioned ISO Standards, the rim width as defined by one of the standards organizations as specified in Appendix 4 may be used."

Annex 6, Paragraph 6.5, leave as it is in current version of Regulation 117

Annex 6 - Appendix 1, Paragraph 2.2, amend to read:

"2.2. Run-out

In case vehicle rims are used, the run-out ~~Run-out~~ shall meet the following criteria:

(i) for C1 tyres, C2 tyres and for C3 tyres with LI ≤ 121:

(a) Maximum radial run-out: 0.5 mm,

(b) Maximum lateral run-out: 0.5 mm;

(ii) for C3 tyres with LI ≥ 122:

(a) Maximum radial run-out: 2.0 mm,

(b) Maximum lateral run-out: 2.0 mm."