Report from the Expert Group on laboratory alignment for the measurement of tyre rolling resistance installed under Regulation (EC) No 1222/2009 and listed on the Commission registry of Expert Groups to the European Commission - 2015

Inter-laboratory Alignment Procedure for Rolling Resistance Measurement for Implementation of the tyre labelling scheme according to Regulation (EC) No 1222/2009

Content

1. Executive Summary

Tyres, mainly because of their rolling resistance, account for 20 % to 30 % of the fuel consumption of vehicles. A reduction of the rolling resistance of tyres may therefore contribute significantly to the energy efficiency of road transport and thus to the reduction of emissions. Fuel-efficient tyres are cost-effective since fuel savings more than compensate for the increased purchase price of tyres stemming from higher production costs.

The Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor sets out minimum requirements for the rolling resistance of tyres.

Technological developments make it possible to significantly decrease energy losses due to tyre rolling resistance beyond those minimum requirements. To reduce the environmental impact of road transport, it is therefore appropriate to lay down provisions to encourage end-users to purchase more fuel-efficient tyres by providing harmonised information on that parameter.

The Regulation[1] (EC) No 1222/2009 of the European Parliament and of the Council as amended by Commission Regulation[2] (EU) No 228/2011 and by Commission Regulation[3] (EU) No 1235/2011establishes a framework for the provision of harmonised information on tyre parameters through labelling, allowing end-users to make an informed choice when purchasing tyres. The information to be provided under Articles 4, 5 and 6 of the Regulation (EC) No 1222/2009 on the fuel efficiency class, the external rolling noise class and measured value, and the wet grip class of tyres shall be obtained by applying the harmonised testing methods referred to in Annex I of the Regulation (EC) No 1222/2009. The fuel efficiency class must be determined on the basis of the rolling resistance coefficient (RRC) according to the specified 'A' to 'G' scale and measured in accordance with UNECE Regulation No 117 and its subsequent amendments.

As described in the Annex IVa to the Regulation (EC) No 1222/2009 the procedure for inter-laboratory comparison for rolling resistance (RR) should be based upon the generation of assigned RRC values. For the definition of these "**assigned values"**, the establishment of reference laboratories is essential.

A Network of Laboratories (including an Expert Group) was created under Regulation (EC) No 1222/2009, composed of volunteer test laboratories (Technical Services, Tyre Manufacturers) to perform inter-laboratory comparison tests on different samples of tyres, in order to establish reference data for rolling resistance measurements. The alignment method for laboratories has to measure tyre rolling resistance at the worldwide level.

The 'Expert Group on laboratory alignment for the measurement of tyre rolling resistance' has been set up on 3/9/2010. Main activities of the group are dedicated to the creation of an alignment method for laboratories having to measure tyre rolling resistance in accordance with the Regulation (EC) 1222/2009. The group met several times in 2010/2011 for the alignment of reference laboratories for the measurement of tyre rolling resistance under the Regulation, and in 2013/2014 for the first assessment of the stability and validity of the assigned values of the initial alignment according to Annex IVa, point 3 of the Regulation. Next re-assessment of the assigned values of the reference laboratories alignment is foreseen in 2016/2017.

Due to the periodic review of the stability of the Network of Reference Laboratories according to the Regulation, a new round of alignment among the Reference Laboratories was done. This final report includes the new alignment equations that will be applicable as of **January 1st, 2015**.

A document giving a proposal of guidance on how to handle the process of changing alignment equations, both for Reference and Candidate Laboratories is included in Annex F.

The experience gained during the past years and the two inter-laboratory comparison tests led the group to suggest some amendments to Annex IVa of Regulation (EC) No 1222/2009. (See Annex G)

[1] Official Journal of the European Union, L342/46-58, 22.12.2009: REGULATION (EC) No 1222/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters

[2] Official Journal of the European Union L 62/1-16, 9.3.2011: COMMISSION REGULATION (EU) No 228/2011 of 7 March 2011 amending Regulation (EC) No 1222/2009 of the European Parliament and of the Council with regard to the wet grip testing method for C1 tyres

[3] Official Journal of the European Union L 317/17-23, 30.11.2011: COMMISSION REGULATION (EU) No 1235/2011 of 29 November 2011 amending Regulation (EC) No 1222/2009 of the European Parliament and of the Council with regard to the wet grip grading of tyres, the measurement of rolling resistance and the verification procedure

2. Introduction

The Regulation (EC) No 1222/2009 is setting a labelling classification based upon absolute rolling resistance coefficient (RRC) values. Under Annex I to the Regulation, the rolling resistance (RR) shall be measured according to the UN-ECE Regulation R117 and its subsequent amendments.

According to the experience gained by the European tyre industry from previous Round-Robin tests for tyre rolling resistance, and to the first round of the inter-laboratory alignment procedure for tyre rolling resistance measurement under Regulation (EC) No 1222/2009 performed in 2011, the deviations in test results observed could reach up to more than 1 N/kN between laboratories.

Due to this observed dispersion between measurement machines, a machine alignment procedure is necessary to get comparative Rolling Resistance Coefficient (RRC) values and give an appropriate competitive playground for the declaration of RRC labelling values according to the Regulation (EC) 1222/2009.

2.1. Members of the Expert Group

Conveners (revolving):

IDIADA (Spain),
TÜV SÜD (Germany),
UTAC (France).

Tyre manufacturers:

Apollo Vredestein,
Bridgestone,
Continental,
Goodyear,
Michelin,
Pirelli,
ETRTO (European Association)

Independent Test Laboratories:

UTAC (France),
IDIADA (Spain),
TÜV SÜD Product Service (Germany).

Observers:

NOKIAN (Tyre manufacturer)
ETRMA (European Association)
JASIC (Japan),
RDW (Netherlands),
VCA (United Kingdom)
Swedish Energy Agency (Sweden),

2.2. Approach for laboratory alignment

The procedure is based upon the generation of assigned RRC values as described in Annex IVa to Regulation (EC) 1222/2009.

The Expert Group proposed a two-steps process for laboratory alignment:

In the first step, a Network of Laboratories for the definition of assigned values was created. According to Annex IVa of Regulation 1222/2009, the assigned values of each alignment tyre were determined by the Network of

Reference Laboratories in 2011. After two years the network has to assess the stability and validity of the assigned values.

No new member has been added to the previous group of participants in 2011 to the Network of Laboratories in accordance with the rules described in the "Guideline working document on Reference Laboratories as defined in Commission Regulation (EU) No 1235/2011 of 29 November 2011 amending Regulation (EC) No 1222/2009 of the European Parliament and of the Council with regard to the wet grip grading of tyres, the measurement of rolling resistance and the verification procedure".

This Network of Reference Laboratories is operating the RR test machines and equipment as listed in Annex A.

The preparation of the laboratory alignment procedure consisted in the following actions:

- Assess number of alignment tyres for each category C1/C2 and C3
- Fix details of alignment tyres (class, dimension, load index, standard or reinforced)
- Set up logistics, shipment between laboratories,
- Recommend tyre storage conditions.
- Establish the test procedure and test conditions for inter-laboratory comparison.

Based on the assigned values the Laboratories in the Network are correlated and aligned versus this "virtual reference laboratory".

In the second step, once the Laboratories Network has been established and the alignment vs. the assigned values has been completed, any Candidate Laboratory can be aligned with any of the Network Laboratories.

2.3.Procedure for Inter-laboratory alignment

The Network of Laboratories was created Sept 3, 2010 by the Committee on the Labelling of Tyres under Regulation (EC) 1222/2009 and has been reactivated in 2013 in order to assess the stability and validity of the assigned values.

2.3.1.Choice of laboratories

According to the rules described in the "Guideline working document on reference laboratories as defined in Commission Regulation (EU) No 1235/2011 of 29 November 2011 amending Regulation (EC) No 1222/2009 of the European Parliament and of the Council with regard to the wet grip grading of tyres, the measurement of rolling resistance and the verification procedure", no new member fulfil the conditions to be added to the previous group of participants in 2011 to the Network of Laboratories.

The 10 Laboratories participating to the Inter laboratory alignment process are identified as follow:

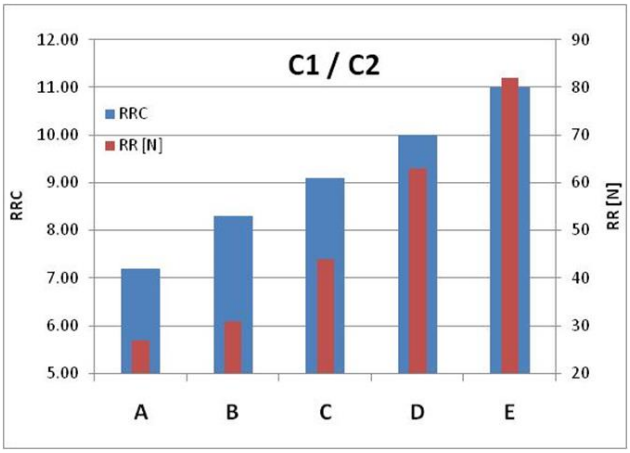
Test Laboratory	Laboratory ID
TUV SUD	Lab 0
UTAC	Lab 1
IDIADA	Lab 2
Michelin	Lab 3
JASIC	Lab 4
Goodyear	Lab 5
Continental	Lab 6
Bridgestone	Lab 7
Pirelli	Lab 8
Apollo-Vredestein	Lab 9

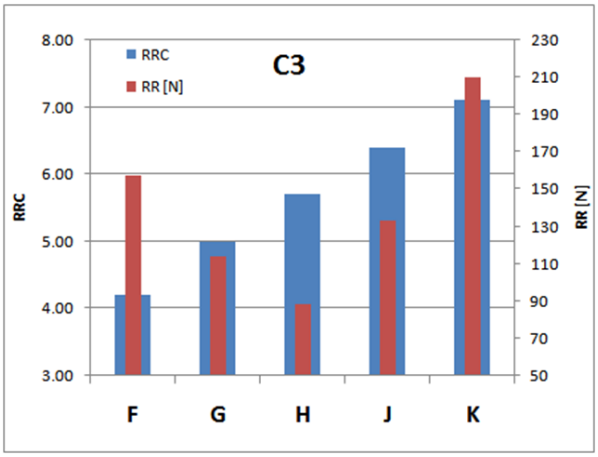
Description and information of the machines to be used for the inter-laboratory alignment are given in Annex A.

2.3.2. Choice of alignment tyres

Five sets of alignment tyres for C1/C2 and five sets of alignment tyres for C3 category were selected by the Expert Group; selection of tyres was accomplished in such way to cover the Load Index and Rolling Resistance, coefficient and force, ranges in conformity with the requirements of Regulation ECE R117.

Selection of alignment tyres, aligned RRC and RR force:





The alignment tyres were provided by industry

Tyre ID	Supplier	Size	Design
A	Bridgestone	185/55R15 82H	EP150
B	Michelin	175/65R14 82T	Energy Saver Plus
C	Apollo-Vredestein	205/55R16 91H	Quatrac 3
D	Continental	255/45R19 100V	CrossContact
E	BS forJASIC	235/70R16 106H	D840
F	Continental	385/65 R 22.5 LI 160	HTL2
G	Michelin	245/70 R17.5 143/141J	XTA2+ Energy TL
H	Goodyear	205/65R17.5 LI 129	RHT II
J	Goodyear	265/70R17.5 LI139	RHD II
K	Pirelli	12R22.5 LI 152	PLUS TR25

Test conditions:

Tyre ID	Size	Design	Load [N]	Infl. [kPa]	Rim width ["]	Speed [km/h]
A	185/55R15 82H	EP150	3 728	210	6,00	80
B	175/65R14 82T	Energy Saver Plus	3 728	210	5,00	80
C	205/55R16 91H	Quatrac 3	4 827	210	6,50	80
D	255/45R19 100V	CrossContact	6 278	210	8,50	80
E	235/70R16 106H	D840	7 456	210	7,00	80
F	385/65 R 22.5 LI 160	HTL2	37 523	900	11,75	80
G	245/70 R17.5 143/141J	XTA2+ Energy TL	22 722	875	7,50	60
H	205/65R17.5 LI 129	RHT II	15 426	900	6,00	80
J	265/70R17.5 LI139	RHD II	20 263	800	7,50	80
K	12R22.5 LI 152	PLUS TR25	29 602	850	9,00	80

2.3.3. Pre-tests on each batch of tyres

As stipulated by the Expert Group, the industry provided the alignment tyres with minimum production variation. But as tyres are never strictly identical, a process of initial measurement of each tyre (4 times) was established in order to assess the tyre category set´s individual variance; each of the laboratories providing initial measurements did tests with one whole batch of alignment tyres (same category, brand and design).

Tyre ID	Supplier	Pre-Tests at	Size	Design
A	Bridgestone	IDIADA	185/55R15 82H	EP150
B	Michelin	Michelin	175/65R14 82T	Energy Saver Plus
C	Apollo-Vredestein	Apollo-Vredestein	205/55R16 91H	Quatrac 3
D	Continental	Continental	255/45R19 100V	CrossContact
E	BS forJASIC	IDIADA	235/70R16 106H	D840
F	Continental	Continental	385/65 R 22.5 LI 160	HTL2
G	Michelin	UTAC	245/70 R17.5 143/141J	XTA2+ Energy TL
H	Goodyear	Bridgestone	205/65R17.5 LI 129	RHT II
J	Goodyear	TUV	265/70R17.5 LI139	RHD II
K	Pirelli	Pirelli	12R22.5 LI 152	PLUS TR25

2.3.4. Tire availability at Reference Laboratories, status March 10, 2014, with new numbering

Test Laboratory	Laboratory ID	EP150	Energy Saver Plus	Quatrac 3	Cross Contact	D840	HTL2	XTA2+ Energy TL	RHT II	RHD II	PLUS TR25
TUV SUD	Lab 0	A0	B0	C0	D0	E0	F0	G0	H0	J0	K0
UTAC	Lab 1	A1	B1	C1	D1	E1	F1	G1	H1	J1	K1
IDIADA	Lab 2	A2	B2	C2	D2	E2	F2	G2	H2	J2	K2
Michelin	Lab 3	A3	B3	C3	D3	E3	F3	G3	H3	J3	K3
JASIC	Lab 4	A4	B4	C4	D4	E4	F4	G4	H4	J4	K4
Goodyear	Lab 5	A5	B5	C5	D5	E5	F5	G5	H5	J5	K5
Continental	Lab 6	A6	B6	C6	D6	E6	F6	G6	H6	J6	K6
Bridgestone	Lab 7	A7	B7	C7	D7	E7	F7	G7	H7	J7	K7
Pirelli	Lab 8	A8	B8	C8	D8	E8	F8	G8	H8	J8	K8
Apollo-Vredestein	Lab 9	A9	B9	C9	D9	E9					
			To be kept by the laboratory								

2.3.5. Alignment tests for C1-C2 tyres

Each sample of each set of 10 C1-C2 tyres has been tested 4 times on one of the 10 machines dedicated to this class of tyres

2.3.6. Alignment tests for C3 tyres

Each sample of each set of 9 C3 tyres has been tested 4 times on one of the 8 machines dedicated to this class of tyres

3. Results

The analysis of the results of the pre-tests shows that all the Rolling Resistance Machines used comply with the requirement on Sigma m of Regulation (EC) No 1222/2009.

All the results have been collected and recorded on the template report shown in Annex B.

The data formats to be used for the computations and results are included in Annex IVa of Regulation (EC) No 1222/2009:

- The measured RRC values corrected from drum diameter and temperature shall be rounded to 2 digits after the comma.

- Then the computations will be made with all digits: There will be no further rounding except on the final alignment equations.
- All standard deviation values will be displayed with 3 digits after comma.
- All RRC values will be displayed with 2 digits after comma.
- All alignment coefficients (A1l, B1l, A2c and B2c) will be rounded and displayed with 4 digits after comma.

Deliverables of the Network of Reference Laboratories Expert Group:

➢ For pre-tests:

- Raw data and aligned data
- Qualification of the data
- Precision and uncertainty values
- Correction factor for each batch
- Conclusions

➢ For alignment tests:

- Raw data and aligned data
- Qualification of the data
- Precision and uncertainty values
- Assigned values
- Qualification of the assigned value
- Alignment curves for reference laboratories
- Precision and uncertainty of predicted values

3.1.Pre-tests results

Each tyre of one batch has been tested on one machine four times and the average and the standard deviation of the three last measurements has been calculated.

The pre-tests batches include two additional tyres for each batch and the group decide to choose the alignment tyres to be use in each batch by considering the following criteria appropriate and effective:

Excludes any tyre that has got a standard deviation above the limit (5.0 %) for the three last measurements (Raw values), then in case all the tyres respect the standard deviation condition (Raw values), removes the tyres that do not allow to respect the gap range (0.5 N/kN < gap < 1.5 N/kN) between two consecutive RRC mean values (Raw values) for each batch. In other words removes the higher and/or lower values.

The analysis, based on the three last measurements (out of four) for each tyre, results in exclusion of the following samples from the batches:

Batch A Tyres A06 & A08
Batch B Tyres B03, B07 & B12
Batch C Tyres C03 & C04
Batch D Tyres D02 & D09
Batch E Tyres E00 & E01

Batch F Tyres F04 & F06
Batch G Tyres G00, G04 & G06
Batch H Tyres H04 & H06
Batch J Tyres J09 & J10
Batch K Tyre K07

Then, the repeatability of the pre-tests data was analysed, these data include the variation of the RR measurement process as well as the evolution of the tyres during the pre-tests. The goal of the pre-tests was to analyse the variation within a batch of tyres and to use the results to apply a correction factor. The data and the analysis of these data are given in Annex C to this report.

Another outcome from these pre-tests was the maximum variation of the measured RR coefficient for a set of 10 or 9 carefully selected tyres:

- For C1-C2 = -2.13%, +1.87%
- For C3 = -3.23%, +2.71%

Even if we could consider that these results are not so bad for manufactured products, a correction factor will be used to normalize the values for future computerization of regression function for each machine.

The pre-tests results shown that the measured Cr values of the C1-C2 tyre set during the pre-tests do not comply with the requirement set out in Annex IVa paragraph 2.2. (a). (i) of the Regulation (EC) No 1222/2009. This non-compliance was confirmed even with the use of aligned data.

The group decided to add an extra batch of tyres with a low coefficient of rolling resistance centred around 6.20 N/kN. The justification to add a 6th tyre is to improve the RRC range in order to better represent the operating range of the reference machines regarding the distribution of measuring values and reduce the amount of extrapolation vs. low RRC values.

This new batch of 10 tyres X was selected and pre-tested by Continental according to the rules described above.

TEST PLAN TEXT			**Tests Lab Alignment**					
GROUP NO.			**TIRE SIZE**		**205/55 R 16**			
ORDER NO:			**TRADE NAME**		**CONTINENTAL CONTI.ECONTACT**			
REMARK			**LI/SSY**		**091Q TLN021**		**RIM**	**6 1/2 J X 16**
Load	**4829**	**N**	**Inflation Pressure**		**210**	**kPa**		
						Cr not aligned		
	Tire No.	**Load /N**	**RRF /N**	**RR Skim /N**	**RRC**	**Average 2 - 4**	**Stdev 2 - 4**	**Correction**
X0	**1**	**4829**	**29,96**	**12,67**	**6,20**			
	1	**4829**	**29,86**	**12,66**	**6,18**			
	1	**4828**	**29,82**	**12,67**	**6,18**	**6,190**	**0,0173**	**1,000**
	1	**4828**	**29,98**	**12,74**	**6,21**			
X1	**2**	**4828**	**29,94**	**12,64**	**6,20**			
	2	**4829**	**29,92**	**12,69**	**6,20**			
	2	**4828**	**29,76**	**12,77**	**6,16**	**6,200**	**0,0400**	**0,998**
	2	**4828**	**30,11**	**12,73**	**6,24**			
X2	**3**	**4828**	**29,99**	**12,57**	**6,21**			
	3	**4829**	**29,91**	**12,76**	**6,19**			
	3	**4828**	**29,95**	**12,72**	**6,20**	**6,180**	**0,0265**	**1,001**
	3	**4829**	**29,71**	**12,86**	**6,15**			
X3	**4**	**4828**	**30,09**	**12,54**	**6,23**			
	4	**4828**	**30,00**	**12,72**	**6,21**			
	4	**4829**	**29,94**	**12,79**	**6,20**	**6,193**	**0,0208**	**0,999**
	4	**4828**	**29,78**	**12,82**	**6,17**			
X4	**5**	**4829**	**29,75**	**12,62**	**6,16**			
	5	**4828**	**29,66**	**12,69**	**6,14**			
	5	**4829**	**29,82**	**12,78**	**6,18**	**6,160**	**0,0200**	**1,005**
	5	**4828**	**29,72**	**12,80**	**6,16**			
X5	**6**	**4829**	**30,10**	**12,67**	**6,23**			
	6	**4828**	**29,96**	**12,73**	**6,21**			
	6	**4829**	**30,05**	**12,70**	**6,22**	**6,203**	**0,0208**	**0,998**

	6	**4828**	**29,86**	**12,66**	**6,18**			
X6	**7**	**4830**	**30,26**	**12,74**	**6,27**			
	7	**4829**	**30,03**	**12,90**	**6,22**			
	7	**4829**	**29,89**	**12,78**	**6,19**	**6,207**	**0,0153**	**0,997**
	7	**4829**	**29,97**	**12,76**	**6,21**			
X7	**8**	**4830**	**30,12**	**12,74**	**6,24**			
	8	**4829**	**30,06**	**12,67**	**6,22**			
	8	**4830**	**30,09**	**12,72**	**6,23**	**6,217**	**0,0153**	**0,995**
	8	**4829**	**29,96**	**12,65**	**6,20**			
*****	**9**	**4829**	**30,30**	**12,76**	**6,27**			
	9	**4829**	**30,31**	**12,76**	**6,28**			
	9	**4829**	**29,99**	**12,77**	**6,21**	**6,223**	**0,0513**	
	9	**4828**	**29,82**	**12,80**	**6,18**			
******	**10**	**4829**	**29,81**	**12,78**	**6,17**			
	10	**4829**	**29,68**	**12,71**	**6,15**			
	10	**4829**	**29,59**	**12,76**	**6,13**	**6,133**	**0,0153**	
	10	**4829**	**29,53**	**12,63**	**6,12**			
X8	**11**	**4828**	**30,17**	**12,70**	**6,25**			
	11	**4829**	**30,02**	**12,71**	**6,22**			
	11	**4829**	**29,74**	**12,70**	**6,16**	**6,180**	**0,0346**	**1,001**
	11	**4829**	**29,73**	**12,68**	**6,16**			
X9	**12**	**4829**	**29,79**	**12,70**	**6,17**			
	12	**4829**	**29,79**	**12,78**	**6,17**			
	12	**4828**	**29,63**	**12,75**	**6,14**	**6,150**	**0,0173**	**1,006**
	12	**4830**	**29,66**	**12,55**	**6,14**			

* Tyre 9 must be eliminated due to sigma > 0.05

** Tyre 10 is the other one to eliminate due to its gap with the average Cr

After eliminating these two tyres the average is 6.188 and the coefficients of correction is calculated by dividing this average (6.188) by each individual average from test 2 to 4.

The chosen tyres was renamed in X0, X1, ……X9

The pre-tests results for tyre X are given in Annex C, paragraph 1.6.

3.2.Alignment tests results

Each tyre has been tested on one machine four times and the correction factor of the tested tyre was applied to each measurement then the average of three corrected last measurements has been calculated. The data and the analysis of these data are given in Annex D to this report.

Based on the experience gained during the first inter-laboratory round in 2011, all individual data have been used for the calculation of the linear regression function for each laboratory.

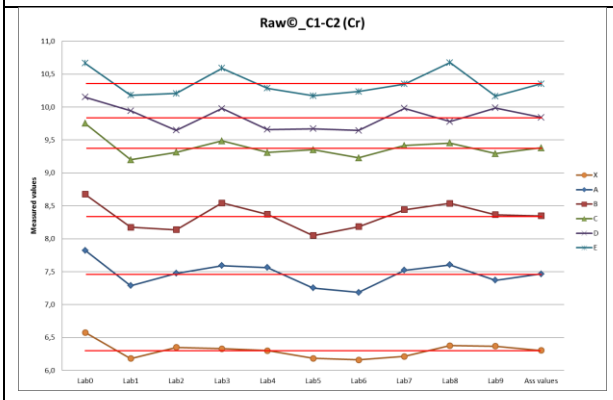
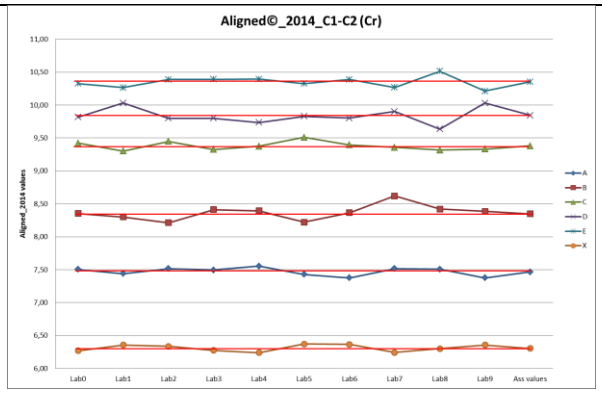
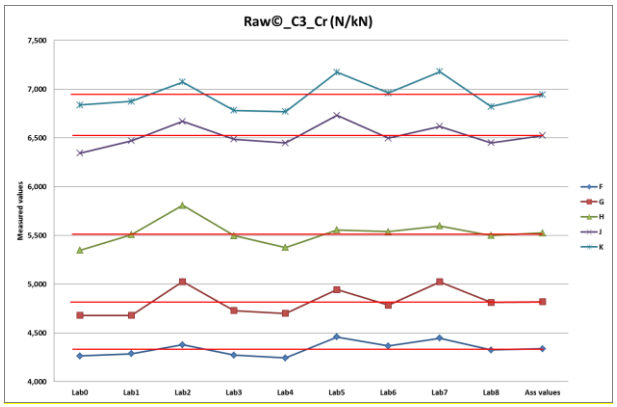
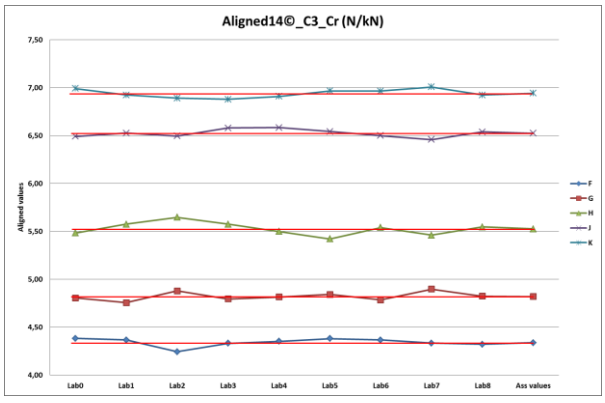
4. Conclusion

Pre-tests are still needed to monitor the dispersion of each batch of tyres and to improve the accuracy of alignment equation for each machine. Independent from the variation from one laboratory to another (if they are compliant with the requirement of Annex IVa of Regulation (EC) No 1222/2009) the system is robust.

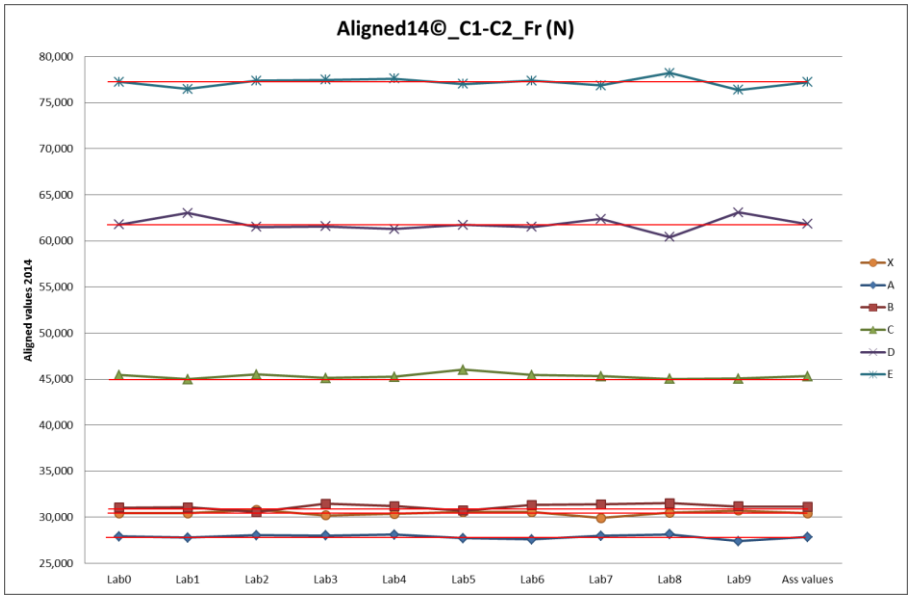
The experience gained confirms that a first test in the same conditions is necessary before starting the series of measurements.

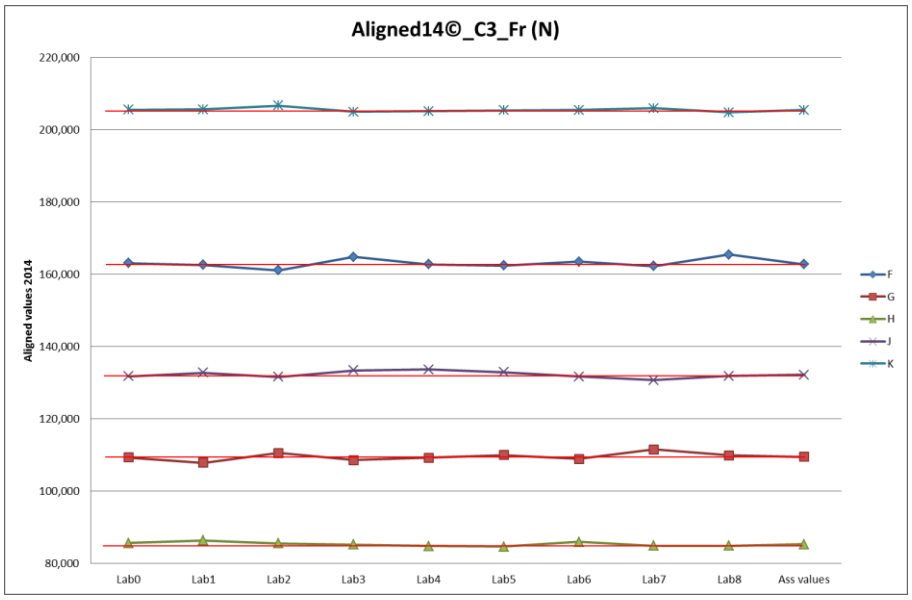
The statistical analysis confirms that the correlation is very high.

The accuracy of measured values is improved by this alignment procedure:

Maximum deviation from assigned values before alignment For C1-C2 = -3.79% / +4.77%	Maximum deviation from assigned values after alignment For C1-C2 = -2.11% / +3.24%
	
Maximum deviation from assigned values before alignment For C3 = -3.21% / +5.13%	Maximum deviation from assigned values after alignment For C3 = -2.17% / +2.21%
	

The results of the additional statistical analysis of the rolling resistance force values (Fr) open further potential to improve the correlation of the alignment process; the following graphs show the effect of the alignment using force measurement values on the aligned values of the particular reference laboratories:





Other documents are annexed to this report:

- Annex E: the template for candidate / reference laboratory alignment.
- Annex H: Statistical analysis on the Force values of rolling resistance.

Annex A – Equipment information

	TUV SUD N°0		UTAC N°1		IDIADA N°2		Michelin N°3		JASIC N°4	
Tyre delivery address	TÜV SÜD Product Service GmbH Daimlerstrasse 15 85748 Garching/Munich, Germany		Groupe UTAC CERAM Autodrome de Linas-Montlhéry 91319 Montlhéry Cedex France		IDIADA Automotive Technology, S.A. Workshop homologation Division Pol Ind L'Albornar, AP2 exit 12 E-43710 SANTA OLIVA		CERL Michelin - Magasin F43 Compte W. TODO-BOM Zone Industrielle de Ladoux 63118 Cébazat France		Bridgestone Corporation Technical centre 3-1-1, Ogawahigashi-cho, Kodaira-shi, Tokyo 187-8531 Japan	
Contact person	Lars NETSCH Alexander KNOERZER		Marc-Antoine SCORIANZ Jérôme PASCHAL		Ignacio LAFUENTE David GALLEGOS		Walter TODO-BOM		Attention : Tire Standard and Regulation (3010) Jun Makino/Kiyoshi Sato	
Tel +email	+49 89 32950 -767 or -787 lars.netsch@tuev-sued.de alexander.knoerzer@tuev-sued.de		0033(0)169804085 marc-antoine.scorianz@utaceram.com jerome.paschal@utaceram.com		+34 977166016 ilafuente@idiada.com david.gallegos@idiada.com		+33 473106407 walter.todo-bom@fr.michelin.com		+81-42-342-6331 jun.makino@bridgestone.com kiyoshi.satou@bridgestone.com	
Tyre type	C1 / C2	C3	C1 / C2	C3	C1 / C2	C3	C1 / C2	C3	C1 / C2	C3
Location	Garching/Germany		Linas-Montlhéry / France		Santa-Oliva/Spain		Ladoux - France		Tokyo / Japan	
Machine Identification #	H8	H4	BAN0226-VL	BAN0226-PL	10 223	10 224	1P/V V2	RRPL A1	RD	RE
Machine operational	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Machine complies to performance criteria Network Laboratories	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Measurement method	Power	Power	Torque	Torque	Torque	Torque	Deceleration	Deceleration	Force	Force
Drum diameter [m]	2.0	1,7	2.0	2.0	1.7	1,7	2,706	2,706	2	3
Drum surface	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel
Max. test load [kg]	1 835	10 194	2 000	6 000	1 500	7 000	2 039	8 155	1 500	8 000

	Goodyear N°5		Continental N°6		Bridgestone N°7		Pirelli N°8		Vredestein N°9	
Tyre delivery address	Goodyear Innovation Center Luxembourg Avenue Gordon Smith L-7750 Colmar-Berg Luxembourg		Continental Reifen Deutschland GmbH Jaedekamp 30 30419 Hannover		TEST SRL VIA Padova, 6 00040 Pomezia Rome - Italy		Pirelli Tyre SpA Sperimentazione Indoor via Chiese; 51 20126 Milano ITALY		Apollo Vredestein B.V. Testdepartment Ir. E.L.C. Schiffstraat 370 7547 RD Enschede The Netherlands	
Contact person	Florian NICOLAS		Hans-Jörg KÖSTER		Riccardo GIOVANNOTTI		Andrea VERGANI		Jos de GIER	
Tel +email	florian_nicolas@goodyear.com		+49 5119763232 hans-joerg.koester@conti.de		+39 06 5056608 riccardo.giovannotti@bridgestone.eu		+39 02 6442 9806 andrea.vergani@pirelli.com		+31 643783269 jos.degier@apollotyres.com	
Tyre type	C1 / C2	C3	C1 / C2	C3	C1 / C2	C3	C1 / C2	C3	C1 / C2	C3
Location	Colmar-Berg, Luxembourg		Hannover /Germany		Rome / Italy		Milan - Italy (C1/C2) Izmit - Turkey (C3)		Enschede / Netherlands	
Machine Identification #	M/C # 4	M/C # 5	M1300	M1100	T34001	HU-2	MIQ 2075	US2-45127	Testmachine 12	-
Machine operational	yes	yes	yes	yes	yes	yes	yes	yes	yes	-
Machine complies to performance criteria Network Laboratories	yes	yes	yes	yes	yes	yes	yes	yes	yes	-
Measurement method	Torque	Torque	Torque	Torque	Torque	Torque	Torque	Torque	Torque	-
Drum diameter [m]	2	1,7	2	2	2	1,7	2	2	2	-
Drum surface	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	Smooth steel	-
Max. test load [kg]	1 250	5 000	2 039	5 097	1 275	6 120	2 000	6 000	2 500	-

Annex B – Data report template

TIRE ROLLING RESISTANCE PRETEST PROTOCOL

Test Lab

General Data

Test Lab/Location:		Report No.	
Test-Rig:	H4	Test Date:	
Drum Ø [m]:	1,70	Drum Surface:	smooth steel
Test Conditions:	ECE-R 117	Test Method:	Power method

Test-Rim

Diameter x Width[´´]:		Material:	

Tire

Tire-ID:		Tire Class (C1, C2, C3):	2
DOT-Nr.:		Brand-/Trade Name:	
Tire Manufacturer:		Reinforced yes/no:	
Size:		Speed Index:	
Nominal Diameter (m):	0,64	Load Index:	123

Set Test-Data

Setting	Warm-up [min]:	Speed [km/h]:	Load [daN]:	Camb. [°]:	p_{cold} [kPa]:	T_{amb} [°C]:
1			483	0,0		25,0
2			483	0,0		25,0
3			483	0,0		25,0
4			483	0,0		25,0

Measurements

Rec.	Speed [km/h]:	Load [daN]:	T_{amb} [°C]:	
1	80,0	483	26,0	**Remark:** Average ambient temperature during whole process
2	80,0	483	26,2	
3	80,0	483	23,0	
4	80,0	483	23,0	

Results (non corrected results)

Rec.	Skim Test Load (N)	F_r [N]:	Temp_corr ?	F_{PL} [N]:	Automatic Calc. c_r[N/kN]:
1	100,0	43,47	1	12,00	9,00
2	100,0	43,57	1	11,00	9,02
3	100,0	43,37	1	12,00	8,98
4	100,0	43,37	1	11,00	8,98

Corrected Results (Temperature 25°C, Drum diameter 2.0m)

Rec.	Correction Formula	Automatic Calc. F_r [N]:	F_{PL} [N]:	Automatic Calc. c_r[N/kN]:
1	0,010	42,57	11,75	8,81
2		42,67	10,77	8,83
3		42,47	11,75	8,79
4		42,47	10,77	8,79

Aligned Results acc. EU 1235/2011 (Temperature 25°C, Drum diameter 2.0m)

1	Slope 0,9690	Intercept 0,1144	[redacted]	[redacted]	8,65
2			[redacted]	[redacted]	8,67
3			[redacted]	[redacted]	8,63
4			[redacted]	[redacted]	8,63

Reference Lab Test Protocol Version 1.2, 20 October, 2014

Comments:

If Fr (N) in fields H31 to H34 and RRC in fields T31 to T34 are already temperature corrected, enter Temp_corr = 1 (otherwise 0)

Temperature correction coefficient is 0.008 for Class C1 tyres, 0.010 for Class C2 and C3 tyres with a load index equal or lower than 121, 0.006 for Class C3 tyres with a load index greater than 121

Annex C - Pre-tests results

1. Pre-tests results for C1-C2 tyres

1.1. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre A

1.1.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
A0	3	7.53	0.017	0.230	0.035
A1	3	7.55	0.045	0.597	0.090
A2	3	7.56	0.032	0.425	0.064
A3	3	7.54	0.021	0.276	0.042
A4	3	7.57	0.012	0.152	0.023
A5	3	7.69	0.038	0.492	0.076
A6	3	7.63	0.040	0.530	0.081
A7	3	7.54	0.058	0.765	0.115
A8	3	7.57	0.010	0.132	0.020
A9	3	7.58	0.015	0.201	0.031

1.1.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
7.510	7.550	4.303	7.487
7.502	7.604	4.303	7.441
7.527	7.600	4.303	7.483
7.520	7.567	4.303	7.492
7.560	7.586	4.303	7.545
7.650	7.736	4.303	7.599
7.581	7.672	4.303	7.526
7.478	7.609	4.303	7.400
7.559	7.581	4.303	7.545
7.566	7.601	4.303	7.545

Confidence interval T up	Demi amplitude T
7.573	0.043
7.665	0.112
7.643	0.080
7.595	0.052
7.602	0.029
7.787	0.094
7.727	0.100
7.687	0.143

1.1.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
A0	10.81	2.81
A1	2.85	19.06
A2	1.01	9.69
A3	5.64	4.06
A4	0.10	1.25
A5	62.40	13.44
A6	11.11	15.31
A7	5.64	31.25
A8	0.30	0.94
A9	0.13	2.19

1.1.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global average	7.58
Repeatability standard deviat	0.033
Limit of repeatability	0.091
Repeatability exp uncertainty	0.065
Reproducibility stand deviat	0.055
Limit of reproducibility	0.155
Reproducibility exp uncertaint	0.111

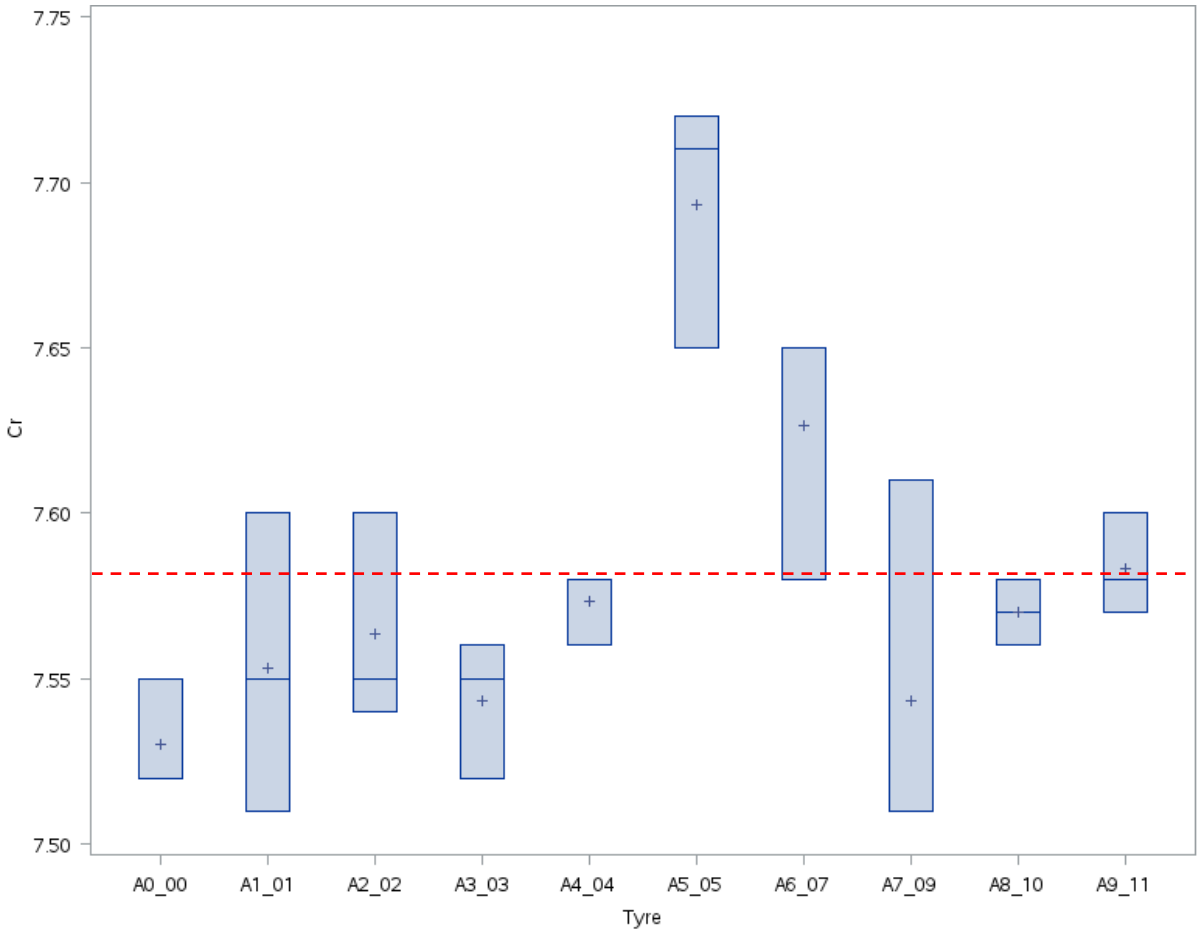
1.1.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe exp uncert percent	0.86
Repro exp uncert percent	1.46

1.1.6. Variation part of the Tyre out of the trial total variation

Variable	Cr
Variation part Tyre	65.36

1.1.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



1.2. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre B

1.2.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
B0	3	8.61	0.015	0.177	0.031
B1	3	8.59	0.052	0.605	0.104
B2	3	8.62	0.020	0.232	0.040
B3	3	8.55	0.035	0.411	0.070
B4	3	8.46	0.026	0.313	0.053
B5	3	8.54	0.012	0.135	0.023
B6	3	8.52	0.026	0.311	0.053
B7	3	8.56	0.030	0.350	0.060
B8	3	8.58	0.025	0.293	0.050
B9	3	8.43	0.036	0.428	0.072

1.2.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
8.589	8.624	4.303	8.569
8.531	8.649	4.303	8.461
8.597	8.643	4.303	8.570
8.514	8.593	4.303	8.466
8.430	8.490	4.303	8.394
8.524	8.550	4.303	8.508
8.490	8.550	4.303	8.454
8.526	8.594	4.303	8.485
8.548	8.605	4.303	8.514
8.389	8.471	4.303	8.340

Confidence interval T up	Demi amplitude T
8.645	0.038
8.719	0.129
8.670	0.050
8.641	0.087
8.526	0.066
8.565	0.029
8.586	0.066
8.635	0.075
8.639	0.063
8.520	0.090

1.2.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
B0	11.10	2.61
B1	5.89	30.22
B2	16.45	4.48
B3	0.19	13.81
B4	21.48	7.84
B5	0.22	1.49
B6	1.89	7.84
B7	0.63	10.07
B8	2.90	7.09
B9	39.25	14.55

1.2.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	8.55
Repeatability standard deviat	0.030
Limit of repeatability	0.084
Repeatability exp uncertainty	0.060
Reproducibility stand deviat	0.066
Limit of reproducibility	0.185
Reproducibility exp uncertaint	0.132

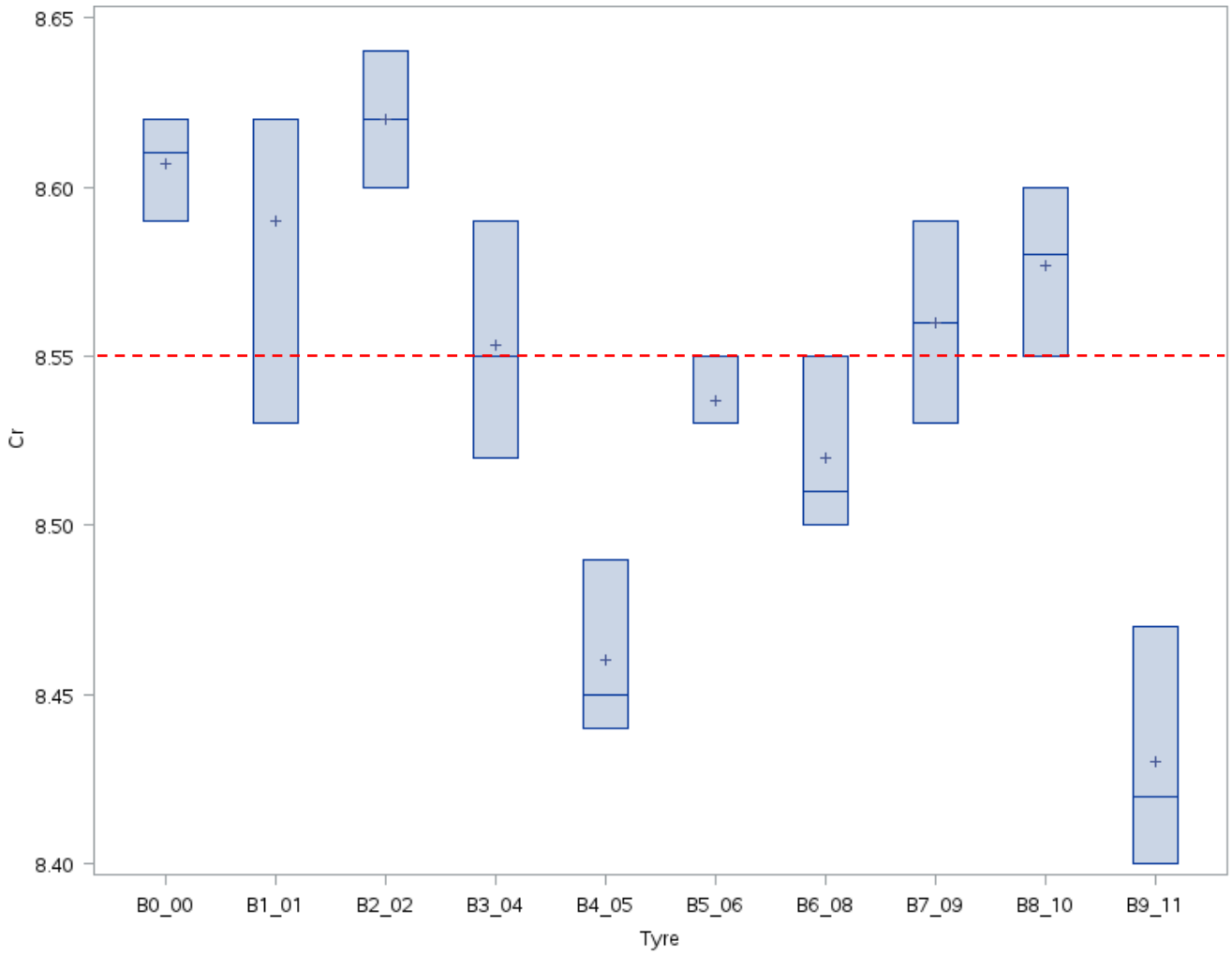
1.2.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.70
Repro exp uncert percent	1.55

1.2.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	79.52

1.2.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



1.3. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre C

1.3.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
C0	3	9.24	0.006	0.063	0.012
C1	3	9.30	0.032	0.346	0.064
C2	3	9.26	0.025	0.272	0.050
C3	3	9.25	0.006	0.062	0.012
C4	3	9.29	0.021	0.224	0.042
C5	3	9.37	0.025	0.269	0.050
C6	3	9.28	0.025	0.271	0.050
C7	3	9.27	0.023	0.249	0.046
C8	3	9.32	0.031	0.328	0.061
C9	3	9.34	0.021	0.223	0.042

1.3.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
9.230	9.243	4.303	9.222
9.267	9.340	4.303	9.223
9.235	9.292	4.303	9.201
9.240	9.253	4.303	9.232
9.263	9.310	4.303	9.235
9.338	9.395	4.303	9.304
9.255	9.312	4.303	9.221
9.241	9.293	4.303	9.209
9.282	9.351	4.303	9.241
9.313	9.360	4.303	9.285

Confidence interval T up	Demi amplitude T
9.251	0.014
9.383	0.080
9.326	0.063
9.261	0.014
9.338	0.052
9.429	0.063
9.346	0.063
9.324	0.057
9.393	0.076
9.388	0.052

1.3.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
C0	19.47	0.63
C1	1.07	19.38
C2	4.99	11.88
C3	12.93	0.63
C4	0.11	8.13
C5	38.58	11.88
C6	0.36	11.88
C7	3.85	10.00
C8	4.51	17.50
C9	14.13	8.13

1.3.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	9.29
Repeatability standard deviat	0.023
Limit of repeatability	0.065
Repeatability exp uncertainty	0.046
Reproducibility stand deviat	0.045
Limit of reproducibility	0.126
Reproducibility exp uncertaint	0.090

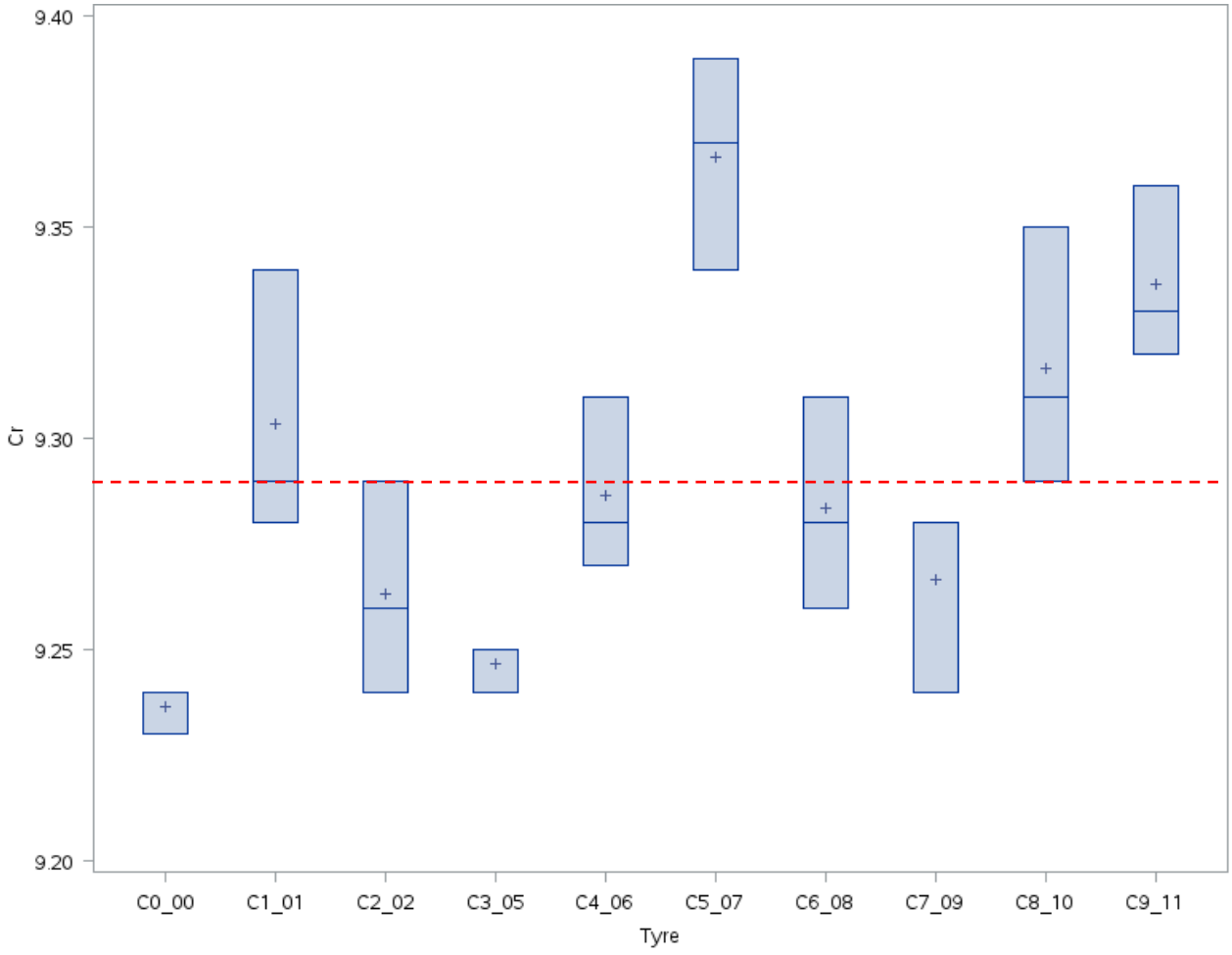
1.3.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.50
Repro exp uncert percent	0.97

1.3.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	73.59

1.3.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



1.4. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre D

1.4.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
D0	3	9.57	0.025	0.263	0.050
D1	3	9.55	0.017	0.181	0.035
D2	3	9.64	0.025	0.261	0.050
D3	3	9.57	0.030	0.313	0.060
D4	3	9.50	0.015	0.161	0.031
D5	3	9.61	0.023	0.240	0.046
D6	3	9.68	0.031	0.316	0.061
D7	3	9.69	0.021	0.215	0.042
D8	3	9.56	0.035	0.367	0.070
D9	3	9.38	0.010	0.107	0.020

1.4.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
9.545	9.602	4.303	9.511
9.530	9.570	4.303	9.507
9.608	9.665	4.303	9.574
9.536	9.604	4.303	9.495
9.479	9.514	4.303	9.459
9.581	9.633	4.303	9.549
9.642	9.711	4.303	9.601
9.663	9.710	4.303	9.635
9.524	9.603	4.303	9.476
9.369	9.391	4.303	9.355

Confidence interval T up	Demi amplitude T
9.636	0.063
9.593	0.043
9.699	0.063
9.645	0.075
9.535	0.038
9.664	0.057
9.753	0.076
9.738	0.052
9.651	0.087
9.405	0.025

1.4.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
D0	0.00	10.67
D1	0.79	5.06
D2	5.41	10.67
D3	0.02	15.17
D4	8.24	3.93
D5	1.47	8.99
D6	14.53	15.73
D7	17.50	7.30
D8	0.16	20.79
D9	51.88	1.69

1.4.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	9.57
Repeatability standard deviat	0.024
Limit of repeatability	0.068
Repeatability exp uncertainty	0.049
Reproducibility stand deviat	0.092
Limit of reproducibility	0.257
Reproducibility exp uncertaint	0.184

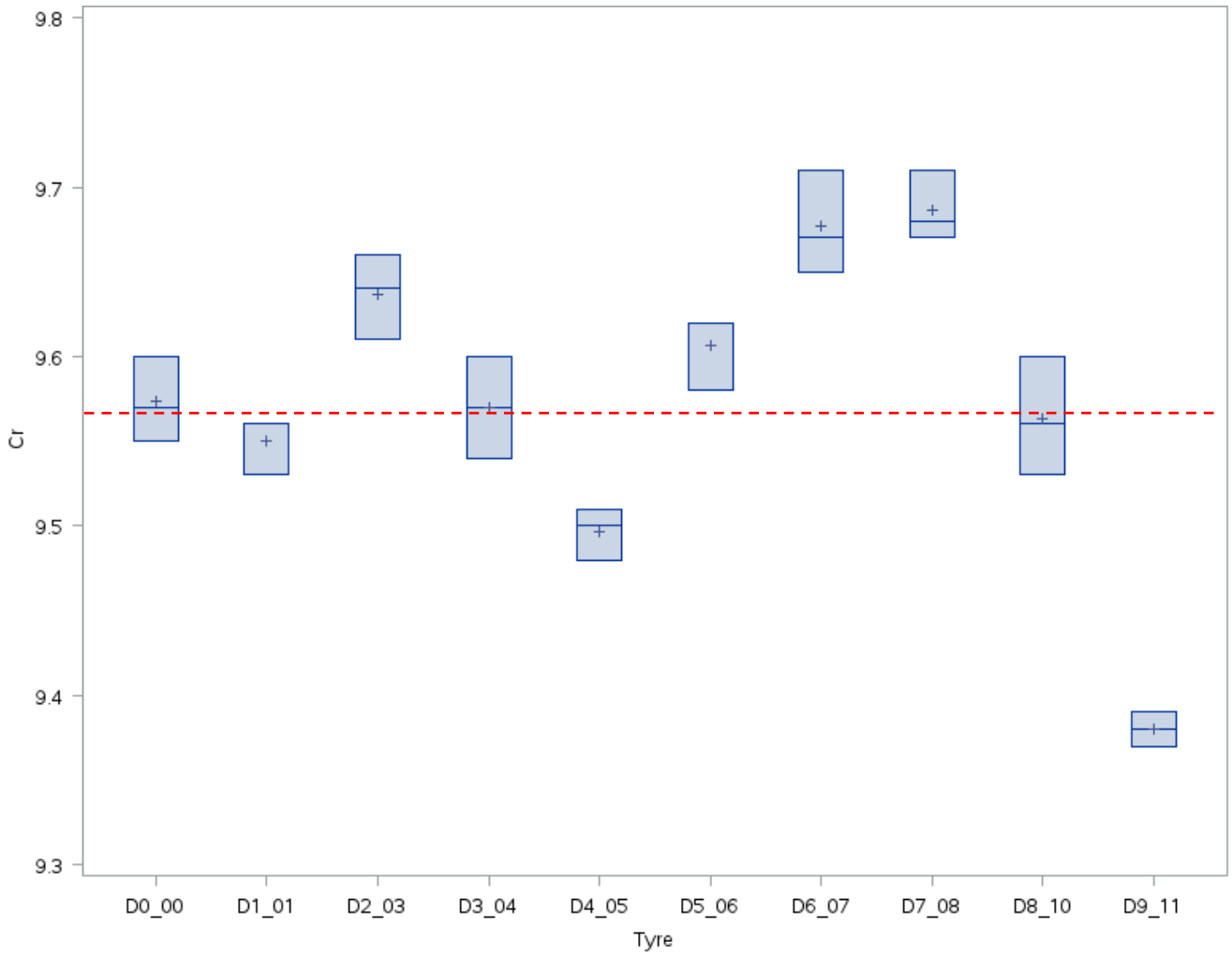
1.4.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.51
Repro exp uncert percent	1.92

1.4.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	92.98

1.4.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



1.5. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre E

1.5.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
E0	3	10.38	0.012	0.111	0.023
E1	3	10.41	0.026	0.254	0.053
E2	3	10.51	0.025	0.240	0.050
E3	3	10.36	0.042	0.402	0.083
E4	3	10.47	0.046	0.438	0.092
E5	3	10.47	0.035	0.336	0.070
E6	3	10.46	0.020	0.191	0.040
E7	3	10.38	0.017	0.167	0.035
E8	3	10.30	0.025	0.244	0.050
E9	3	10.39	0.025	0.242	0.050

1.5.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
10.364	10.390	4.303	10.348
10.380	10.440	4.303	10.344
10.478	10.535	4.303	10.444
10.310	10.404	4.303	10.253
10.418	10.522	4.303	10.356
10.427	10.506	4.303	10.379
10.437	10.483	4.303	10.410
10.360	10.400	4.303	10.337
10.268	10.325	4.303	10.234
10.358	10.415	4.303	10.324

Confidence interval T up	Demi amplitude T
10.405	0.029
10.476	0.066
10.569	0.063
10.460	0.103
10.584	0.114
10.554	0.087
10.510	0.050
10.423	0.043
10.359	0.063
10.449	0.063

1.5.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
E0	3.20	1.57
E1	0.00	8.24
E2	24.81	7.45
E3	8.00	20.39
E4	9.44	24.71
E5	8.40	14.51
E6	6.51	4.71
E7	2.61	3.53
E8	35.44	7.45
E9	1.61	7.45

1.5.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	10.41
Repeatability standard deviat	0.029
Limit of repeatability	0.082
Repeatability exp uncertainty	0.058
Reproducibility stand deviat	0.068
Limit of reproducibility	0.191
Reproducibility exp uncertaint	0.137

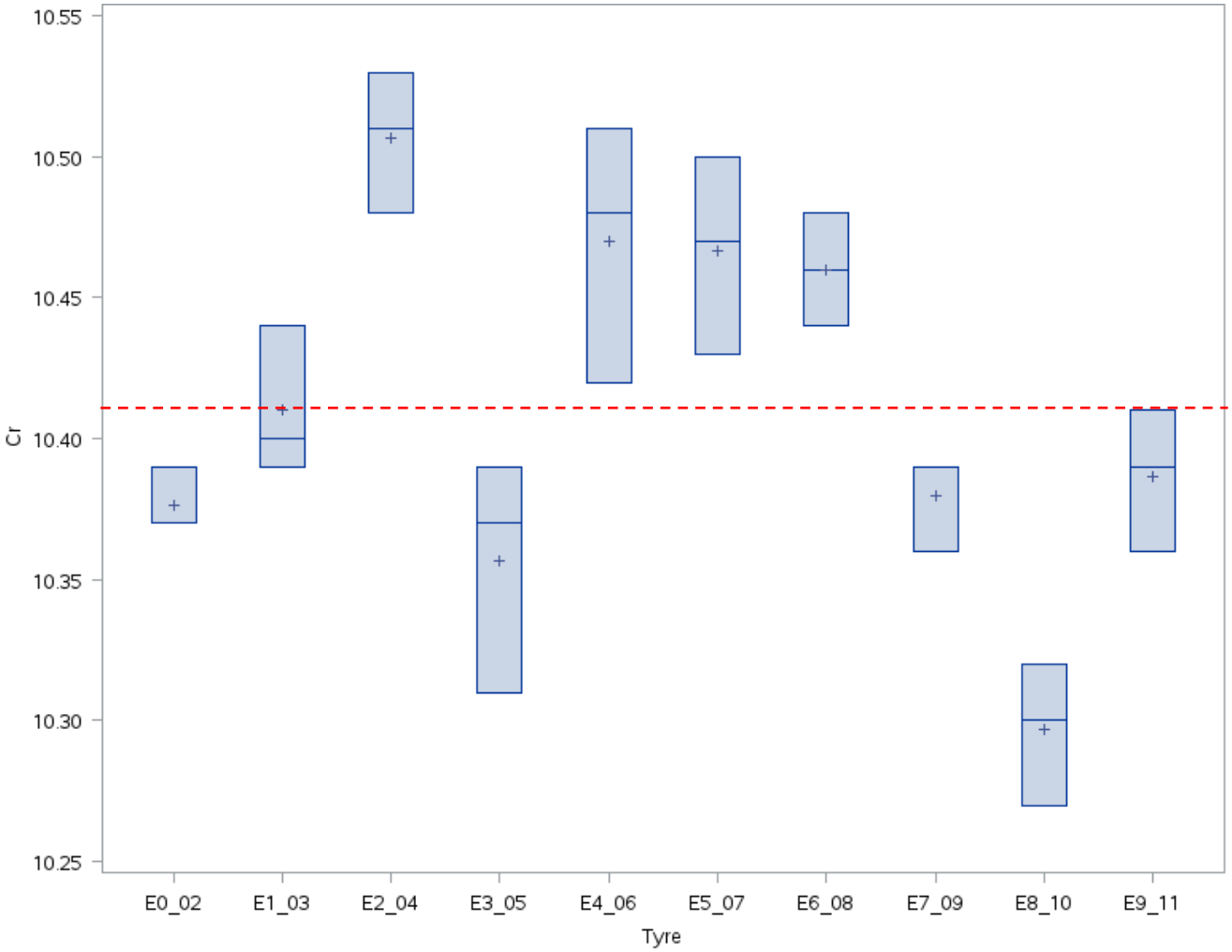
1.5.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.56
Repro exp uncert percent	1.31

1.5.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	81.78

1.5.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



1.6. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre X

1.6.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
X0	3	6.19	0.021	0.34	0.04
X1	3	6.19	0.035	0.57	0.07
X2	3	6.18	0.026	0.43	0.05
X3	3	6.19	0.021	0.34	0.04
X4	3	6.15	0.015	0.25	0.03
X5	3	6.20	0.020	0.32	0.04
X6	3	6.20	0.015	0.25	0.03
X7	3	6.22	0.015	0.25	0.03
X8	3	6.18	0.035	0.56	0.07
X9	3	6.15	0.021	0.34	0.04

1.6.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
6.16	6.21	4.303	6.13
6.15	6.23	4.303	6.11
6.15	6.21	4.303	6.11
6.17	6.22	4.303	6.14
6.14	6.17	4.303	6.12
6.18	6.22	4.303	6.15
6.19	6.22	4.303	6.17
6.20	6.23	4.303	6.18
6.14	6.22	4.303	6.09
6.12	6.17	4.303	6.09

Confidence interval T up	Demi amplitude T
6.24	0.05
6.28	0.09
6.25	0.07
6.25	0.05
6.19	0.04
6.25	0.05
6.24	0.04
6.25	0.04
6.27	0.09
6.20	0.05

1.6.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
X0	0.04	7.83
X1	1.51	22.29
X2	0.67	12.65
X3	1.51	7.83
X4	24.23	4.22
X5	5.09	7.23
X6	7.67	4.22
X7	23.23	4.22
X8	0.67	21.69
X9	35.37	7.83

1.6.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	6.19
Repeatability standard deviat	0.02
Limit of repeatability	0.07
Repeatability exp uncertainty	0.05
Reproducibility stand deviat	0.03
Limit of reproducibility	0.08
Reproducibility exp uncertaint	0.06

1.6.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.76
Repro exp uncert percent	0.94

1.6.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	34.01

2. Correction Factors for C1-C2 tyres

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
A0	7,52	7,55	7,52	7,53	1,006	min	98,50%
A1	7,51	7,60	7,55	7,55	1,003	max	100,64%
A2	7,55	7,60	7,54	7,56	1,002	range	2,14%
A3	7,56	7,55	7,52	7,54	1,005		
A4	7,56	7,58	7,58	7,57	1,001		
A5	7,72	7,71	7,65	7,69	0,985		
A6	7,65	7,65	7,58	7,63	0,994		
A7	7,61	7,51	7,51	7,54	1,005		
A8	7,57	7,56	7,58	7,57	1,001		
A9	7,60	7,57	7,58	7,58	0,999		
		Avg. total		7,58			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
B0	8,60	8,62	8,59	8,60	0,993	min	99,13%
B1	8,62	8,62	8,53	8,59	0,995	max	101,37%
B2	8,64	8,60	8,62	8,62	0,991	range	2,23%
B3	8,59	8,52	8,55	8,55	0,999		
B4	8,49	8,44	8,45	8,46	1,010		
B5	8,55	8,53	8,53	8,54	1,001		
B6	8,50	8,55	8,51	8,52	1,003		
B7	8,56	8,59	8,53	8,56	0,998		
B8	8,55	8,60	8,58	8,58	0,996		
B9	8,42	8,47	8,40	8,43	1,014		
		Avg. total		8,55			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
C0	9,24	9,23	9,24	9,24	1,006	min	99,19%
C1	9,34	9,29	9,28	9,30	0,999	max	100,58%
C2	9,29	9,24	9,26	9,26	1,003	range	1,40%
C3	9,25	9,24	9,25	9,25	1,005		
C4	9,31	9,27	9,28	9,29	1,000		
C5	9,39	9,37	9,34	9,37	0,992		
C6	9,26	9,31	9,28	9,28	1,001		
C7	9,24	9,28	9,28	9,27	1,003		
C8	9,35	9,31	9,29	9,32	0,997		
C9	9,36	9,32	9,33	9,34	0,995		
		Avg. total		9,29			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
D0	9,60	9,57	9,55	9,57	1,000	min	98,84%
D1	9,56	9,56	9,53	9,55	1,003	max	102,07%
D2	9,66	9,64	9,61	9,64	0,993	range	3,23%
D3	9,60	9,57	9,54	9,57	1,000		
D4	9,51	9,50	9,48	9,50	1,008		
D5	9,62	9,62	9,58	9,61	0,997		
D6	9,71	9,65	9,67	9,68	0,989		
D7	9,71	9,68	9,67	9,69	0,988		
D8	9,53	9,60	9,56	9,56	1,001		
D9	9,37	9,39	9,38	9,38	1,021		
		Avg. total		9,57			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
E0	10,37	10,39	10,37	10,38	1,003	min	99,09%
E1	10,44	10,40	10,39	10,41	1,000	max	101,11%
E2	10,53	10,51	10,48	10,51	0,991	range	2,02%
E3	10,39	10,37	10,31	10,36	1,005		
E4	10,51	10,48	10,42	10,47	0,994		
E5	10,50	10,47	10,43	10,47	0,995		
E6	10,44	10,48	10,46	10,46	0,995		
E7	10,39	10,39	10,36	10,38	1,003		
E8	10,32	10,30	10,27	10,30	1,011		
E9	10,41	10,36	10,39	10,39	1,002		
		Avg. total		10,41			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
X0	6,18	6,17	6,21	6,19	1,000	min	99,11%
X1	6,19	6,16	6,23	6,19	0,999	max	100,72%
X2	6,19	6,20	6,15	6,18	1,002	range	1,62%
X3	6,21	6,20	6,17	6,19	0,999		
X4	6,14	6,17	6,15	6,15	1,006		
X5	6,20	6,22	6,18	6,20	0,998		
X6	6,22	6,19	6,20	6,20	0,998		
X7	6,22	6,23	6,20	6,22	0,996		
X8	6,22	6,16	6,16	6,18	1,002		
X9	6,17	6,13	6,14	6,15	1,007		
		Avg. total		6,19			

3. Pre-tests results for C3 tyres

3.1. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre F

3.1.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
F0	3	4.43	0.026	0.597	0.053
F1	3	4.42	0.036	0.816	0.072
F2	3	4.43	0.017	0.391	0.035
F3	3	4.41	0.025	0.571	0.050
F4	3	4.43	0.021	0.470	0.042
F5	3	4.42	0.021	0.471	0.042
F6	3	4.39	0.026	0.603	0.053
F7	3	4.42	0.026	0.599	0.053
F8	3	4.42	0.025	0.569	0.050

3.1.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
4.400	4.460	4.303	4.364
4.379	4.461	4.303	4.330
4.410	4.450	4.303	4.387
4.378	4.435	4.303	4.344
4.410	4.457	4.303	4.382
4.393	4.440	4.303	4.365
4.360	4.420	4.303	4.324
4.390	4.450	4.303	4.354
4.395	4.452	4.303	4.361

Confidence interval T up	Demi amplitude T
4.496	0.066
4.510	0.090
4.473	0.043
4.469	0.063
4.485	0.052
4.468	0.052
4.456	0.066
4.486	0.066
4.486	0.063

3.1.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
F0	8.42	12.00
F1	0.08	22.29
F2	8.42	5.14
F3	10.19	10.86
F4	14.23	7.43
F5	0.34	7.43
F6	56.90	12.00
F7	0.08	12.00
F8	1.35	10.86

3.1.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	4.42
Repeatability standard deviat	0.025
Limit of repeatability	0.070
Repeatability exp uncertainty	0.050
Reproducibility stand deviat	0.025
Limit of reproducibility	0.070
Reproducibility exp uncertaint	0.050

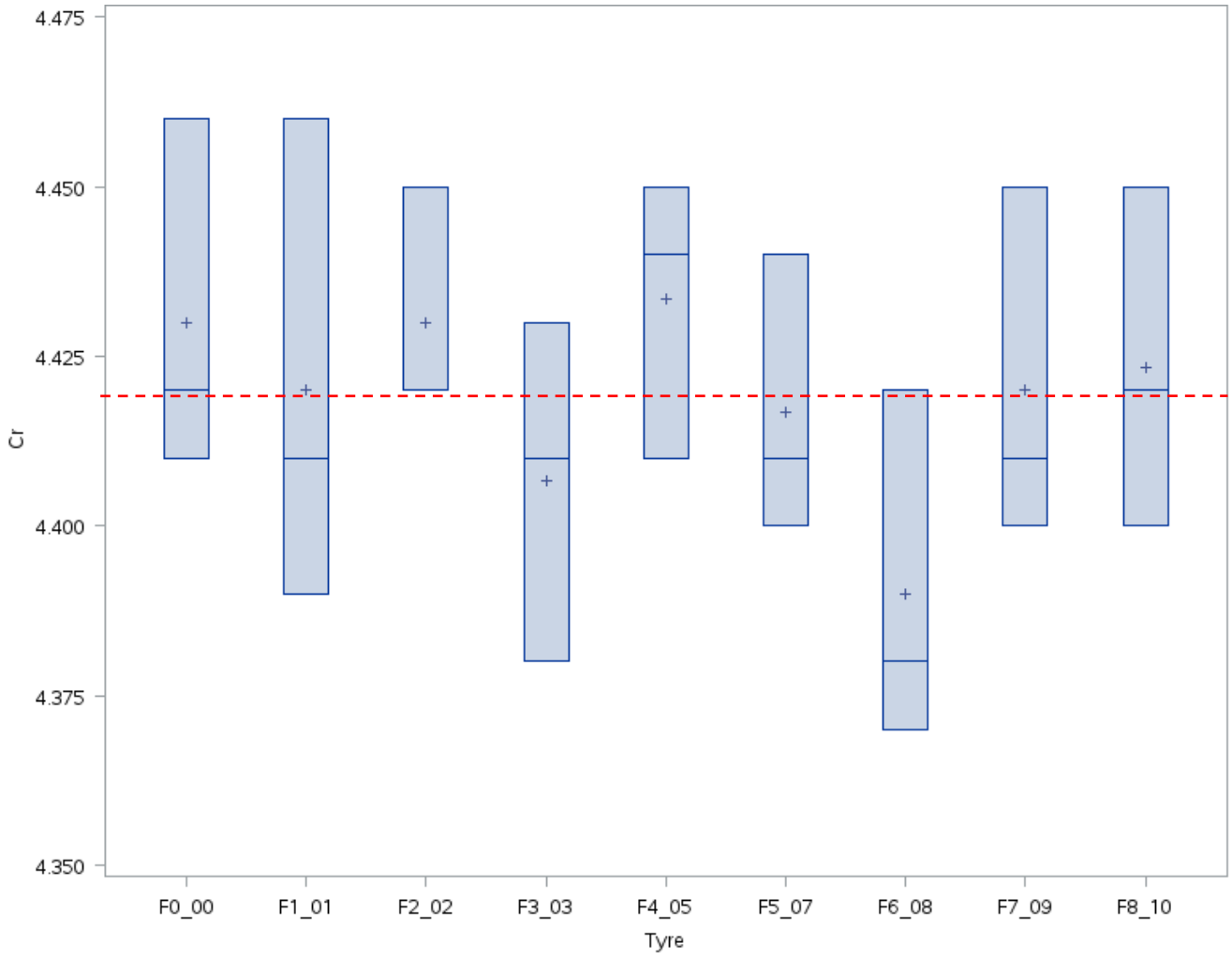
3.1.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	1.13
Repro exp uncert percent	1.13

3.1.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	0.00

3.1.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



3.2. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre G

3.2.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
G0	3	4.93	0.025	0.511	0.050
G1	3	4.86	0.015	0.314	0.031
G2	3	4.90	0.017	0.353	0.035
G3	3	4.90	0.026	0.540	0.053
G4	3	4.85	0.032	0.663	0.064
G5	3	4.89	0.030	0.613	0.060
G6	3	4.84	0.012	0.238	0.023
G7	3	4.89	0.040	0.818	0.080
G8	3	4.74	0.035	0.740	0.070

3.2.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
4.898	4.955	4.303	4.864
4.846	4.881	4.303	4.825
4.880	4.920	4.303	4.857
4.870	4.930	4.303	4.834
4.810	4.883	4.303	4.767
4.856	4.924	4.303	4.815
4.830	4.856	4.303	4.815
4.845	4.935	4.303	4.791
4.704	4.783	4.303	4.656

Confidence interval T up	Demi amplitude T
4.989	0.063
4.901	0.038
4.943	0.043
4.966	0.066
4.927	0.080
4.965	0.075
4.872	0.029
4.989	0.099
4.831	0.087

3.2.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
G0	15.41	9.36
G1	0.06	3.45
G2	4.71	4.43
G3	4.71	10.34
G4	1.80	15.27
G5	2.28	13.30
G6	2.43	1.97
G7	2.28	23.65
G8	66.31	18.23

3.2.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	4.87
Repeatability standard deviat	0.027
Limit of repeatability	0.077
Repeatability exp uncertainty	0.055
Reproducibility stand deviat	0.058
Limit of reproducibility	0.163
Reproducibility exp uncertaint	0.116

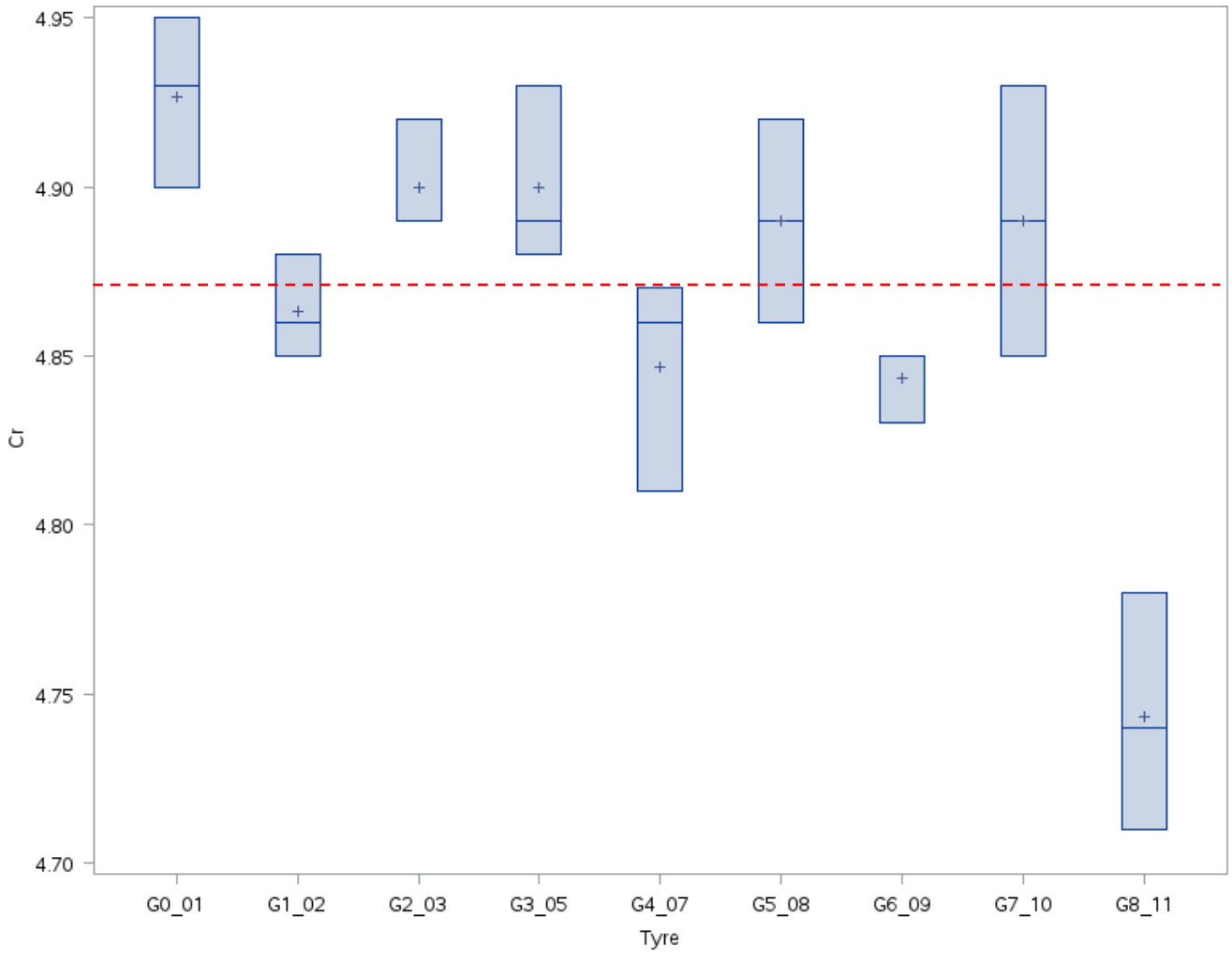
3.2.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	1.13
Repro exp uncert percent	2.39

3.2.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	77.79

3.2.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre – Cr



3.3. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre H

3.3.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
H0	3	5.60	0.029	0.516	0.058
H1	3	5.56	0.020	0.360	0.040
H2	3	5.49	0.026	0.482	0.053
H3	3	5.57	0.025	0.452	0.050
H4	3	5.63	0.012	0.205	0.023
H5	3	5.73	0.021	0.364	0.042
H6	3	5.57	0.026	0.475	0.053
H7	3	5.59	0.035	0.628	0.070
H8	3	5.65	0.036	0.638	0.072

3.3.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
5.564	5.629	4.303	5.525
5.537	5.583	4.303	5.510
5.460	5.520	4.303	5.424
5.538	5.595	4.303	5.504
5.620	5.646	4.303	5.605
5.703	5.750	4.303	5.675
5.540	5.600	4.303	5.504
5.554	5.633	4.303	5.506
5.609	5.691	4.303	5.560

Confidence interval T up	Demi amplitude T
5.668	0.072
5.610	0.050
5.556	0.066
5.629	0.063
5.662	0.029
5.778	0.052
5.636	0.066
5.681	0.087
5.740	0.090

3.3.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
H0	0.01	13.09
H1	4.19	6.28
H2	33.26	10.99
H3	2.87	9.95
H4	3.42	2.09
H5	46.39	6.81
H6	2.30	10.99
H7	0.08	19.37
H8	7.49	20.42

3.3.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	5.60
Repeatability standard deviat	0.027
Limit of repeatability	0.074
Repeatability exp uncertainty	0.053
Reproducibility stand deviat	0.070
Limit of reproducibility	0.196
Reproducibility exp uncertaint	0.140

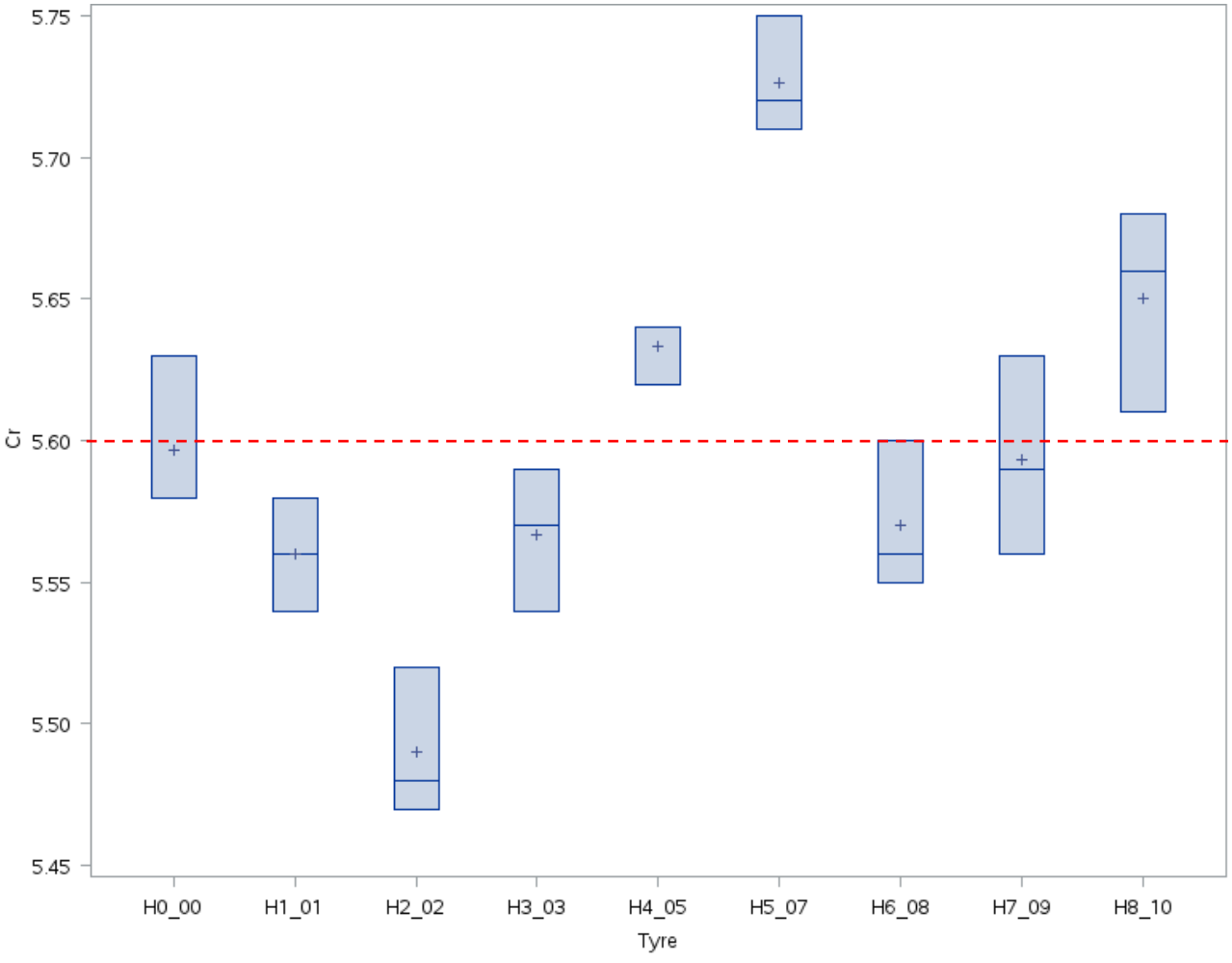
3.3.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.95
Repro exp uncert percent	2.50

3.3.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	85.55

3.3.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



3.4. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre J

3.4.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
J0	3	6.37	0.038	0.594	0.076
J1	3	6.38	0.006	0.091	0.012
J2	3	6.40	0.006	0.090	0.012
J3	3	6.35	0.023	0.363	0.046
J4	3	6.35	0.025	0.396	0.050
J5	3	6.38	0.010	0.157	0.020
J6	3	6.38	0.025	0.394	0.050
J7	3	6.42	0.012	0.180	0.023
J8	3	6.38	0.031	0.479	0.061

3.4.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
6.330	6.416	4.303	6.279
6.370	6.383	4.303	6.362
6.397	6.410	4.303	6.389
6.327	6.379	4.303	6.296
6.325	6.382	4.303	6.291
6.369	6.391	4.303	6.355
6.355	6.412	4.303	6.321
6.404	6.430	4.303	6.388
6.349	6.418	4.303	6.307

Confidence interval T up	Demi amplitude T
6.467	0.094
6.391	0.014
6.418	0.014
6.411	0.057
6.416	0.063
6.405	0.025
6.446	0.063
6.445	0.029
6.459	0.076

3.4.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
J0	1.46	32.09
J1	0.40	0.75
J2	15.57	0.75
J3	21.58	11.94
J4	21.58	14.18
J5	0.00	2.24
J6	0.26	14.18
J7	38.89	2.99
J8	0.26	20.90

3.4.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	6.38
Repeatability standard deviat	0.022
Limit of repeatability	0.062
Repeatability exp uncertainty	0.045
Reproducibility stand deviat	0.027
Limit of reproducibility	0.077
Reproducibility exp uncertaint	0.055

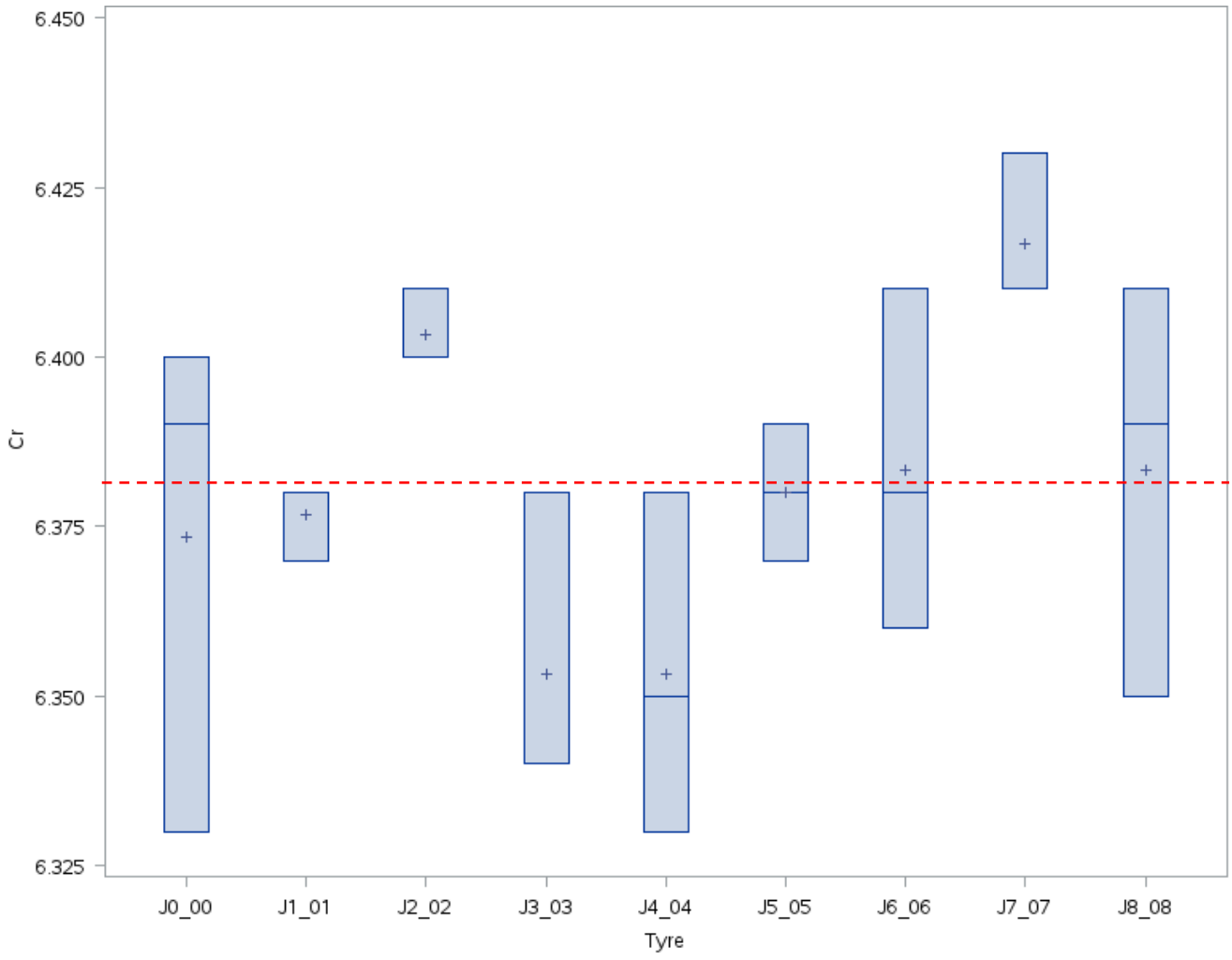
3.4.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.70
Repro exp uncert percent	0.86

3.4.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	34.21

3.4.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre – Cr



3.5. Pre-tests results on Coefficient of rolling resistance (Cr) for tyre K

3.5.1. Average; standard deviation; coefficient of variation; expanded uncertainty in repeatability conditions

Tyre	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
K0	3	7.03	0.031	0.435	0.061
K1	3	7.07	0.025	0.356	0.050
K2	3	7.01	0.035	0.501	0.070
K3	3	6.95	0.031	0.440	0.061
K4	3	6.95	0.023	0.332	0.046
K5	3	6.97	0.036	0.517	0.072
K6	3	6.93	0.025	0.363	0.050
K7	3	7.00	0.040	0.578	0.081
K8	3	7.00	0.026	0.378	0.053

3.5.2. Confidence interval of the average per tyre at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
6.992	7.061	4.303	6.951
7.045	7.102	4.303	7.011
6.974	7.053	4.303	6.926
6.912	6.981	4.303	6.871
6.927	6.979	4.303	6.896
6.929	7.011	4.303	6.880
6.905	6.962	4.303	6.871
6.951	7.042	4.303	6.896
6.970	7.030	4.303	6.934

Confidence interval T up	Demi amplitude T
7.103	0.076
7.136	0.063
7.101	0.087
7.023	0.076
7.011	0.057
7.060	0.090
6.996	0.063
7.097	0.100
7.066	0.066

3.5.3. Between and within contribution for the factor tyre

Tyre	CEi	CDi
K0	8.33	10.94
K1	43.54	7.42
K2	3.34	14.45
K3	12.08	10.94
K4	8.68	6.25
K5	2.62	15.23
K6	20.58	7.42
K7	0.25	19.14
K8	0.59	8.20

3.5.4. Global average; precision values; uncertainties of measurement

Variable	Cr
Global average	6.99
Repeatability standard deviat	0.031
Limit of repeatability	0.086
Repeatability exp uncertainty	0.062
Reproducibility stand deviat	0.051
Limit of reproducibility	0.143
Reproducibility exp uncertaint	0.102

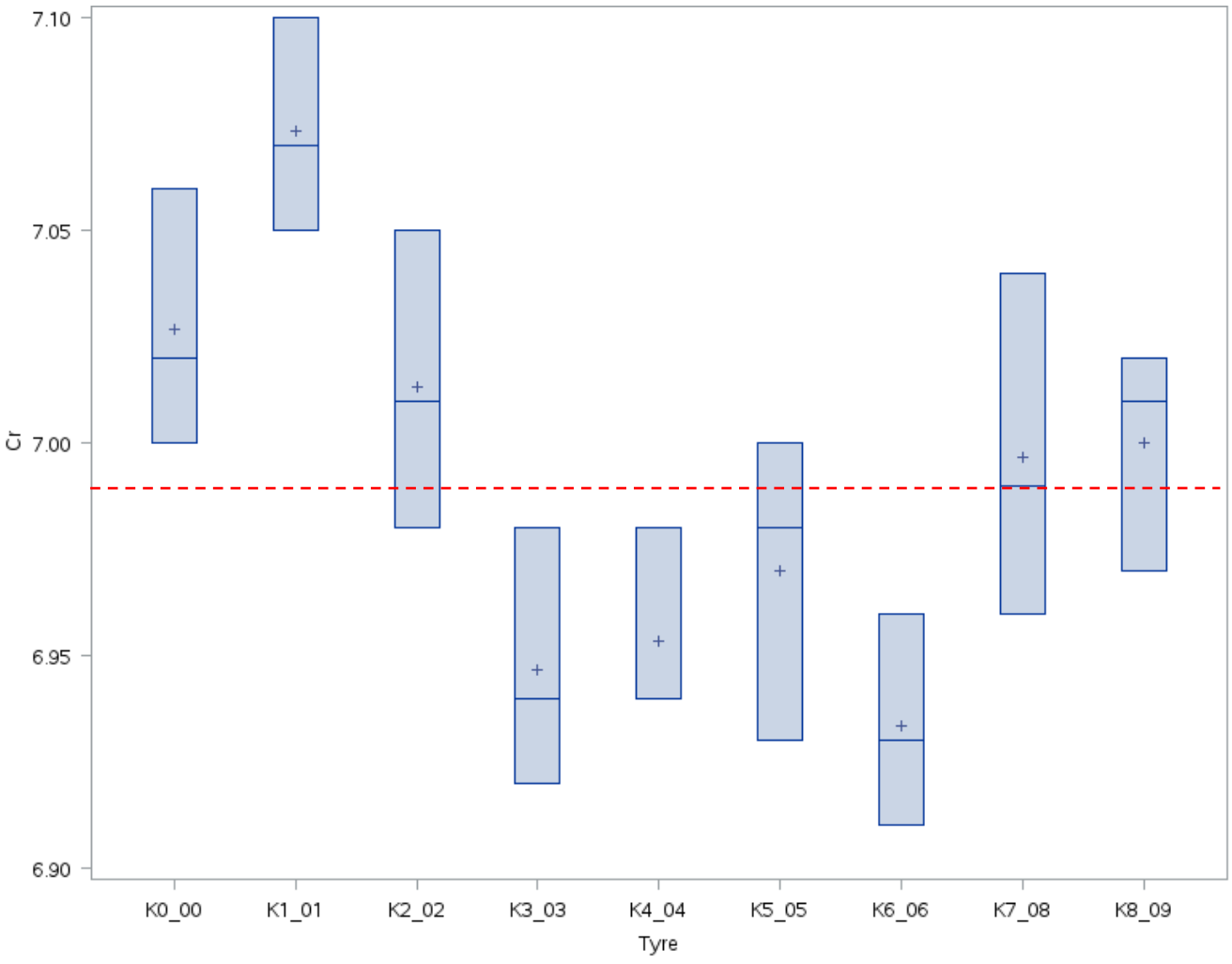
3.5.5. Express of the expanded uncertainties of measurement under repeatability and reproducibility condition in percent of the global average

Variable	Cr
Repe exp uncert percent	0.88
Repro exp uncert percent	1.46

3.5.6. Part of variation in percent of the tyres on the total variation

Variable	Cr
Variation part Tyre	63.65

3.5.7. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions and confidence interval of the average at the confidence level of 95% per characteristic and per Tyre - Cr



4. Correction Factors for C3 tyres

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
F0	4,46	4,42	4,41	4,43	0,997	min	99,67%
F1	4,46	4,41	4,39	4,42	1,000	max	100,66%
F2	4,45	4,42	4,42	4,43	0,997	range	0,98%
F3	4,43	4,41	4,38	4,41	1,003		
F4	4,45	4,44	4,41	4,43	0,997		
F5	4,44	4,40	4,41	4,42	1,001		
F6	4,42	4,37	4,38	4,39	1,007		
F7	4,45	4,41	4,40	4,42	1,000		
F8	4,45	4,42	4,40	4,42	0,999		
		Avg. total		4,42			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
G0	4,95	4,93	4,90	4,93	0,988	min	98,79%
G1	4,88	4,85	4,86	4,86	1,001	max	102,61%
G2	4,92	4,89	4,89	4,90	0,993	range	3,82%
G3	4,93	4,89	4,88	4,90	0,993		
G4	4,81	4,86	4,87	4,85	1,004		
G5	4,92	4,89	4,86	4,89	0,995		
G6	4,85	4,85	4,83	4,84	1,005		
G7	4,85	4,93	4,89	4,89	0,995		
G8	4,78	4,74	4,71	4,74	1,026		
		Avg. total		4,87			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
H0	5,63	5,58	5,58	5,60	1,000	min	97,76%
H1	5,58	5,54	5,56	5,56	1,007	max	101,98%
H2	5,52	5,47	5,48	5,49	1,020	range	4,21%
H3	5,59	5,54	5,57	5,57	1,006		
H4	5,62	5,64	5,64	5,63	0,994		
H5	5,75	5,72	5,71	5,73	0,978		
H6	5,60	5,55	5,56	5,57	1,005		
H7	5,63	5,59	5,56	5,59	1,001		
H8	5,66	5,68	5,61	5,65	0,991		
		Avg. total		5,60			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
J0	6,39	6,40	6,33	6,37	**1,001**	min	99,43%
J1	6,38	6,37	6,38	6,38	**1,001**	max	100,43%
J2	6,40	6,41	6,40	6,40	**0,996**	range	0,99%
J3	6,34	6,38	6,34	6,35	**1,004**		
J4	6,38	6,33	6,35	6,35	**1,004**		
J5	6,38	6,37	6,39	6,38	**1,000**		
J6	6,41	6,36	6,38	6,38	**1,000**		
J7	6,41	6,41	6,43	6,42	**0,994**		
J8	6,41	6,39	6,35	6,38	**1,000**		
		Avg. total		**6,38**			

Tyre	Test 2	Test 3	Test 4	Avg.	Correction Factor		
K0	7,06	7,02	7,00	7,03	**0,995**	min	98,83%
K1	7,10	7,07	7,05	7,07	**0,988**	max	100,82%
K2	7,05	7,01	6,98	7,01	**0,997**	range	2,00%
K3	6,98	6,94	6,92	6,95	**1,006**		
K4	6,98	6,94	6,94	6,95	**1,005**		
K5	7,00	6,98	6,93	6,97	**1,003**		
K6	6,96	6,93	6,91	6,93	**1,008**		
K7	7,04	6,99	6,96	7,00	**0,999**		
K8	7,02	7,01	6,97	7,00	**0,999**		
		Avg. total		**6,99**			

Annex D - Alignment tests results - Cr (N/kN)

1. Raw data

1.1. C1-C2 tyres

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	X0	6,58	6,60	6,58	6,54	6,573	0,031	1,000	6,576	6,60	6,58	6,54	0,031
Lab1	X1	6,25	6,20	6,17	6,18	6,183	0,015	0,999	6,180	6,20	6,17	6,18	0,015
Lab2	X2	6,40	6,37	6,31	6,34	6,340	0,030	1,002	6,350	6,38	6,32	6,35	0,030
Lab3	X3	6,27	6,30	6,37	6,33	6,333	0,035	0,999	6,330	6,30	6,37	6,33	0,035
Lab4	X4	6,32	6,26	6,28	6,25	6,263	0,015	1,006	6,300	6,30	6,32	6,29	0,015
Lab5	X5	6,30	6,24	6,15	6,19	6,193	0,045	0,998	6,183	6,23	6,14	6,18	0,045
Lab6	X6	6,22	6,21	6,15	6,16	6,173	0,032	0,998	6,160	6,20	6,14	6,15	0,032
Lab7	X7	6,28	6,22	6,27	6,23	6,240	0,026	0,996	6,213	6,19	6,24	6,20	0,026
Lab8	X8	6,44	6,36	6,38	6,36	6,367	0,012	1,002	6,377	6,37	6,39	6,37	0,012
Lab9	X9	6,34	6,36	6,30	6,31	6,323	0,032	1,007	6,368	6,40	6,34	6,35	0,032
									6,304				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	A0	7,94	7,80	7,77	7,75	7,773	0,025	1,006	7,823	7,85	7,82	7,80	0,025
Lab1	A1	7,31	7,24	7,31	7,24	7,263	0,040	1,003	7,287	7,26	7,33	7,26	0,041
Lab2	A2	7,53	7,48	7,42	7,48	7,460	0,035	1,002	7,474	7,49	7,43	7,49	0,035
Lab3	A3	7,62	7,58	7,57	7,52	7,557	0,032	1,005	7,591	7,61	7,60	7,55	0,032
Lab4	A4	7,46	7,56	7,60	7,51	7,557	0,045	1,001	7,561	7,56	7,60	7,51	0,045
Lab5	A5	7,46	7,40	7,38	7,31	7,363	0,047	0,985	7,253	7,29	7,27	7,20	0,047
Lab6	A6	7,27	7,24	7,24	7,21	7,230	0,017	0,994	7,184	7,19	7,19	7,16	0,017
Lab7	A7	7,45	7,51	7,47	7,48	7,487	0,021	1,005	7,521	7,54	7,50	7,51	0,021
Lab8	A8	7,67	7,57	7,59	7,63	7,597	0,031	1,001	7,605	7,58	7,60	7,64	0,031
Lab9	A9	7,38	7,39	7,36	7,37	7,373	0,015	0,999	7,368	7,38	7,35	7,36	0,015
									7,467				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	B0	8,79	8,77	8,69	8,74	8,733	0,040	0,993	8,674	8,71	8,63	8,68	0,040
Lab1	B1	8,23	8,20	8,22	8,23	8,217	0,015	0,995	8,174	8,16	8,18	8,19	0,015
Lab2	B2	8,29	8,22	8,17	8,23	8,207	0,032	0,991	8,135	8,15	8,10	8,16	0,032
Lab3	B3	8,50	8,57	8,53	8,55	8,550	0,020	0,999	8,542	8,56	8,52	8,54	0,020
Lab4	B4	8,48	8,33	8,23	8,30	8,287	0,051	1,010	8,370	8,41	8,31	8,38	0,052
Lab5	B5	8,10	8,07	8,03	8,02	8,040	0,026	1,001	8,048	8,08	8,04	8,03	0,026
Lab6	B6	8,20	8,18	8,14	8,16	8,160	0,020	1,003	8,184	8,20	8,16	8,18	0,020
Lab7	B7	8,37	8,42	8,49	8,46	8,457	0,035	0,998	8,442	8,41	8,48	8,45	0,035
Lab8	B8	8,66	8,59	8,57	8,55	8,570	0,020	0,996	8,538	8,56	8,54	8,52	0,020
Lab9	B9	8,32	8,32	8,22	8,22	8,253	0,058	1,014	8,366	8,43	8,33	8,33	0,059
									8,347				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	C0	9,81	9,75	9,67	9,67	9,697	0,046	1,006	9,753	9,81	9,73	9,73	0,046
Lab1	C1	9,28	9,24	9,19	9,20	9,210	0,026	0,999	9,197	9,23	9,18	9,19	0,026
Lab2	C2	9,42	9,36	9,25	9,25	9,287	0,064	1,003	9,314	9,39	9,28	9,28	0,064
Lab3	C3	9,54	9,46	9,42	9,44	9,440	0,020	1,005	9,485	9,51	9,46	9,48	0,020
Lab4	C4	9,39	9,33	9,29	9,30	9,307	0,021	1,000	9,311	9,33	9,29	9,30	0,021
Lab5	C5	9,59	9,48	9,43	9,37	9,427	0,055	0,992	9,350	9,40	9,35	9,29	0,055
Lab6	C6	9,35	9,26	9,22	9,18	9,220	0,040	1,001	9,227	9,27	9,23	9,19	0,040
Lab7	C7	9,53	9,37	9,44	9,36	9,390	0,044	1,003	9,414	9,39	9,46	9,38	0,044
Lab8	C8	9,77	9,50	9,49	9,45	9,480	0,026	0,997	9,454	9,47	9,46	9,42	0,026
Lab9	C9	9,45	9,38	9,30	9,34	9,340	0,040	0,995	9,294	9,33	9,25	9,29	0,040
									9,380				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	D0	10,32	10,13	10,19	10,13	10,150	0,035	1,000	10,151	10,13	10,19	10,13	0,035
Lab1	D1	9,97	9,95	9,91	9,89	9,917	0,031	1,003	9,942	9,98	9,93	9,91	0,031
Lab2	D2	9,82	9,69	9,66	9,78	9,710	0,062	0,993	9,647	9,63	9,60	9,72	0,062
Lab3	D3	10,04	9,99	9,94	9,99	9,973	0,029	1,000	9,978	9,99	9,94	9,99	0,029
Lab4	D4	9,58	9,57	9,60	9,57	9,580	0,017	1,008	9,658	9,65	9,68	9,65	0,017
Lab5	D5	9,81	9,74	9,70	9,67	9,703	0,035	0,997	9,670	9,71	9,67	9,64	0,035
Lab6	D6	9,88	9,78	9,72	9,74	9,747	0,031	0,989	9,643	9,68	9,62	9,64	0,030
Lab7	D7	10,09	10,13	10,08	10,08	10,097	0,029	0,988	9,979	10,01	9,96	9,96	0,029
Lab8	D8	9,89	9,80	9,76	9,74	9,767	0,031	1,001	9,778	9,81	9,77	9,75	0,031
Lab9	D9	9,87	9,80	9,79	9,76	9,783	0,021	1,021	9,986	10,00	9,99	9,96	0,021
									9,843				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	E0	10,68	10,58	10,67	10,64	10,630	0,046	1,003	10,665	10,62	10,71	10,68	0,046
Lab1	E1	10,27	10,17	10,22	10,15	10,180	0,036	1,000	10,181	10,17	10,22	10,15	0,036
Lab2	E2	10,45	10,29	10,31	10,30	10,300	0,007	0,991	10,206	10,20	10,22	10,21	0,010
Lab3	E3	10,63	10,56	10,57	10,47	10,533	0,055	1,005	10,589	10,62	10,63	10,52	0,055
Lab4	E4	10,41	10,34	10,33	10,36	10,343	0,015	0,994	10,285	10,28	10,27	10,30	0,015
Lab5	E5	10,24	10,24	10,23	10,21	10,227	0,015	0,995	10,172	10,19	10,18	10,16	0,015
Lab6	E6	10,30	10,29	10,27	10,29	10,283	0,012	0,995	10,235	10,24	10,22	10,24	0,011
Lab7	E7	10,31	10,34	10,31	10,31	10,320	0,017	1,003	10,351	10,37	10,34	10,34	0,017
Lab8	E8	10,65	10,57	10,56	10,54	10,557	0,015	1,011	10,674	10,69	10,68	10,66	0,015
Lab9	E9	10,21	10,15	10,15	10,12	10,140	0,017	1,002	10,164	10,17	10,17	10,14	0,017
									10,352				

1.2. C3 tyres

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	F0	4,30	4,29	4,26	4,27	4,273	0,015	0,997	4,263	4,28	4,25	4,26	0,015
Lab1	F1	4,31	4,31	4,28	4,27	4,287	0,021	1,000	4,286	4,31	4,28	4,27	0,021
Lab2	F2	4,46	4,42	4,37	4,38	4,390	0,026	0,997	4,379	4,41	4,36	4,37	0,026
Lab3	F3	4,29	4,27	4,26	4,25	4,260	0,010	1,003	4,272	4,28	4,27	4,26	0,010
Lab4	F4	4,29	4,26	4,26	4,25	4,257	0,006	0,997	4,243	4,25	4,25	4,24	0,006
Lab5	F5	4,44	4,46	4,43	4,48	4,457	0,025	1,001	4,459	4,46	4,43	4,48	0,025
Lab6	F6	4,34	4,36	4,33	4,32	4,337	0,021	1,007	4,365	4,39	4,36	4,35	0,021
Lab7	F7	4,35	4,41	4,45	4,48	4,447	0,035	1,000	4,446	4,41	4,45	4,48	0,035
Lab8	F8	4,33	4,34	4,33	4,32	4,330	0,010	0,999	4,326	4,34	4,33	4,32	0,010
									4,337				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	G0	4,73	4,74	4,73	4,74	4,737	0,006	0,988	4,679	4,68	4,67	4,68	0,006
Lab1	G1	4,72	4,70	4,67	4,66	4,677	0,021	1,001	4,680	4,70	4,67	4,66	0,021
Lab2	G2	5,07	5,09	5,05	5,04	5,060	0,026	0,993	5,026	5,06	5,02	5,01	0,026
Lab3	G3	4,79	4,77	4,76	4,75	4,760	0,010	0,993	4,728	4,74	4,73	4,72	0,010
Lab4	G4	4,71	4,69	4,68	4,67	4,680	0,010	1,004	4,700	4,71	4,70	4,69	0,010
Lab5	G5	4,95	4,93	4,99	4,98	4,967	0,032	0,995	4,943	4,91	4,97	4,96	0,032
Lab6	G6	4,77	4,76	4,77	4,75	4,760	0,010	1,005	4,783	4,78	4,79	4,77	0,010
Lab7	G7	5,03	5,08	5,04	5,02	5,047	0,031	0,995	5,023	5,06	5,02	5,00	0,030
Lab8	G8	4,70	4,70	4,69	4,68	4,690	0,010	1,026	4,812	4,82	4,81	4,80	0,010
									4,819				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	H0	5,35	5,36	5,34	5,34	5,347	0,012	1,000	5,348	5,36	5,34	5,34	0,012
Lab1	H1	5,52	5,49	5,47	5,45	5,470	0,020	1,007	5,508	5,53	5,51	5,49	0,020
Lab2	H2	5,70	5,73	5,68	5,68	5,697	0,029	1,020	5,809	5,84	5,79	5,79	0,029
Lab3	H3	5,51	5,48	5,47	5,45	5,467	0,015	1,006	5,498	5,51	5,50	5,48	0,015
Lab4	H4	5,45	5,42	5,41	5,40	5,410	0,010	0,994	5,377	5,39	5,38	5,37	0,010
Lab5	H5	5,75	5,74	5,65	5,66	5,683	0,049	0,978	5,556	5,61	5,52	5,53	0,048
Lab6	H6	5,53	5,50	5,49	5,54	5,510	0,026	1,005	5,538	5,53	5,52	5,57	0,027
Lab7	H7	5,67	5,63	5,59	5,56	5,593	0,035	1,001	5,599	5,64	5,60	5,57	0,035
Lab8	H8	5,57	5,54	5,55	5,56	5,550	0,010	0,991	5,499	5,49	5,50	5,51	0,010
									5,526				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	J0	6,40	6,35	6,33	6,33	6,337	0,012	1,001	6,344	6,36	6,34	6,34	0,012
Lab1	J1	6,51	6,49	6,47	6,44	6,467	0,025	1,001	6,470	6,49	6,47	6,44	0,025
Lab2	J2	6,72	6,72	6,68	6,68	6,693	0,023	0,996	6,669	6,70	6,66	6,66	0,023
Lab3	J3	6,51	6,48	6,45	6,45	6,460	0,017	1,004	6,487	6,51	6,48	6,48	0,017
Lab4	J4	6,46	6,43	6,42	6,41	6,420	0,010	1,004	6,447	6,46	6,45	6,44	0,010
Lab5	J5	6,80	6,78	6,71	6,70	6,730	0,044	1,000	6,730	6,78	6,71	6,70	0,044
Lab6	J6	6,55	6,51	6,52	6,47	6,500	0,026	1,000	6,497	6,51	6,52	6,47	0,026
Lab7	J7	6,71	6,68	6,68	6,61	6,657	0,040	0,994	6,619	6,64	6,64	6,57	0,040
Lab8	J8	6,50	6,48	6,44	6,44	6,453	0,023	1,000	6,450	6,48	6,44	6,44	0,023
									6,524				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	K0	6,94	6,89	6,87	6,86	6,873	0,015	0,995	6,838	6,85	6,83	6,82	0,015
Lab1	K1	6,99	6,99	6,96	6,92	6,957	0,035	0,988	6,875	6,91	6,88	6,84	0,035
Lab2	K2	7,15	7,08	7,12	7,09	7,097	0,021	0,997	7,073	7,06	7,10	7,07	0,021
Lab3	K3	6,80	6,77	6,73	6,72	6,740	0,026	1,006	6,782	6,81	6,77	6,76	0,027
Lab4	K4	6,81	6,75	6,74	6,71	6,733	0,021	1,005	6,769	6,79	6,78	6,75	0,021
Lab5	K5	7,22	7,20	7,12	7,14	7,153	0,042	1,003	7,174	7,22	7,14	7,16	0,042
Lab6	K6	6,96	6,94	6,89	6,88	6,903	0,032	1,008	6,960	7,00	6,95	6,94	0,032
Lab7	K7	7,13	7,22	7,13	7,21	7,187	0,049	0,999	7,180	7,21	7,12	7,20	0,049
Lab8	K8	6,90	6,84	6,84	6,81	6,830	0,017	0,999	6,821	6,83	6,83	6,80	0,017
									6,941				

2. Qualification of reference machines

2.1. Sigma m for C1-C2 machines (based on corrected raw data)

Laboratory	Sigma X	Sigma A	Sigma B	Sigma C	Sigma D	Sigma E	**Sigma m**
Lab0	0,031	0,025	0,040	0,046	0,035	0,046	**0,038**
Lab1	0,015	0,041	0,015	0,026	0,031	0,036	**0,029**
Lab2	0,030	0,035	0,032	0,064	0,062	0,010	**0,043**
Lab3	0,035	0,032	0,020	0,020	0,029	0,055	**0,034**
Lab4	0,015	0,045	0,052	0,021	0,017	0,015	**0,031**
Lab5	0,045	0,047	0,026	0,055	0,035	0,015	**0,040**
Lab6	0,032	0,017	0,020	0,040	0,030	0,011	**0,027**
Lab7	0,026	0,021	0,035	0,044	0,029	0,017	**0,030**
Lab8	0,012	0,031	0,020	0,026	0,031	0,015	**0,024**
Lab9	0,032	0,015	0,059	0,040	0,021	0,017	**0,034**

2.2. Sigma m for C3 machines (based on corrected raw data)

Laboratory	Sigma F	Sigma G	Sigma H	Sigma J	Sigma K	**Sigma m**
Lab0	0,015	0,006	0,012	0,012	0,015	**0,012**
Lab1	0,021	0,021	0,020	0,025	0,035	**0,025**
Lab2	0,026	0,026	0,029	0,023	0,021	**0,025**
Lab3	0,010	0,010	0,015	0,017	0,027	**0,017**
Lab4	0,006	0,010	0,010	0,010	0,021	**0,012**
Lab5	0,025	0,032	0,048	0,044	0,042	**0,039**
Lab6	0,021	0,010	0,027	0,026	0,032	**0,024**
Lab7	0,035	0,030	0,035	0,040	0,049	**0,038**
Lab8	0,010	0,010	0,010	0,023	0,017	**0,015**

3. Statistical analysis of the Interlaboratories results – Cr (N/kN)

3.1. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre X

3.1.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard deviation	Coefficient of variation perc	Repeatability exp uncertainty
Lab0	3	6.576	0.031	0.465	0.061
Lab1	3	6.180	0.015	0.247	0.031
Lab2	3	6.350	0.030	0.473	0.060
Lab3	3	6.330	0.035	0.555	0.070
Lab4	3	6.300	0.015	0.244	0.031
Lab5	3	6.183	0.045	0.728	0.090
Lab6	3	6.160	0.032	0.521	0.064
Lab7	3	6.213	0.026	0.424	0.053
Lab8	3	6.377	0.012	0.181	0.023
Lab9	3	6.368	0.032	0.508	0.065

3.1.2. Confidence interval of the average per laboratory at the level 95%

Confidence interval av low	Confidence interval av up	T	Confidence interval T low
6.542	6.611	4.303	6.501
6.162	6.197	4.303	6.142
6.316	6.384	4.303	6.275
6.290	6.369	4.303	6.242
6.283	6.318	4.303	6.262
6.132	6.234	4.303	6.071
6.123	6.196	4.303	6.080
6.183	6.243	4.303	6.147
6.364	6.390	4.303	6.348
6.331	6.404	4.303	6.287

Confidence interval T up	Demi amplitude T
6.652	0.076
6.218	0.038
6.425	0.075
6.417	0.087
6.338	0.038
6.295	0.112
6.239	0.080
6.278	0.065
6.405	0.029
6.448	0.080

3.1.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	51.18	11.03
Lab1	10.55	2.75
Lab2	1.47	10.66
Lab3	0.46	14.55
Lab4	0.01	2.79
Lab5	9.99	23.93
Lab6	14.22	12.15
Lab7	5.65	8.19
Lab8	3.66	1.58
Lab9	2.81	12.37

3.1.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	6.304
Repeatability_standard_deviat	0.029
Limit_of_repeatability	0.081
Repeatability_exp_uncertainty	0.058
Reproducibility_stand_deviat	0.129
Limit_of_reproducibility	0.362
Reproducibility_exp_uncertaint	0.259

3.1.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.92
Repro_exp_uncert_percent	4.10

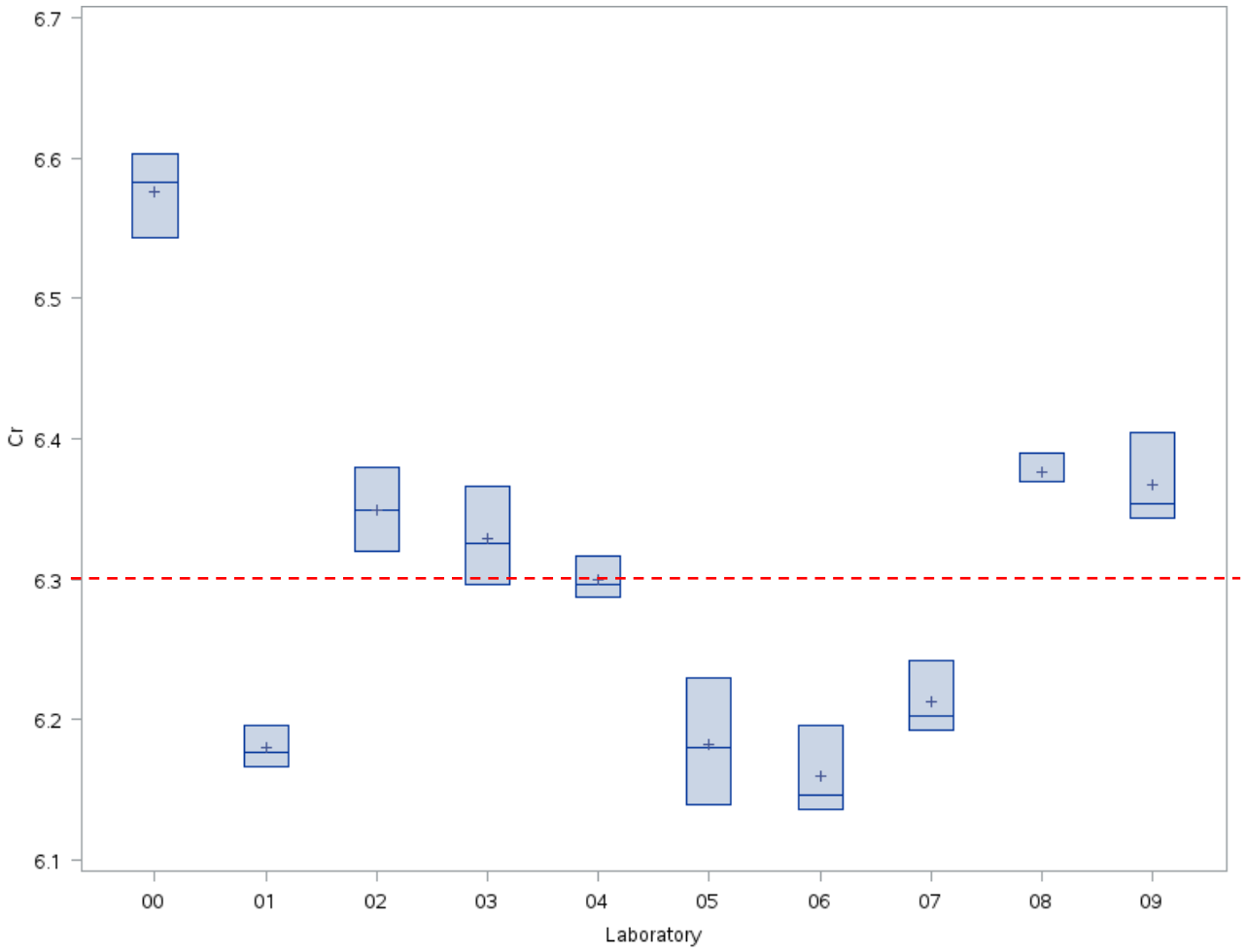
3.1.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	94.94

3.1.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	0.273	0.121	0.036	0.509
Lab1	3	-0.124	0.121	-0.360	0.113
Lab2	3	0.046	0.121	-0.190	0.283
Lab3	3	0.026	0.121	-0.210	0.262
Lab4	3	-0.003	0.121	-0.240	0.233
Lab5	3	-0.121	0.121	-0.357	0.116
Lab6	3	-0.144	0.121	-0.380	0.093
Lab7	3	-0.091	0.121	-0.327	0.146
Lab8	3	0.073	0.121	-0.163	0.310
Lab9	3	0.064	0.121	-0.172	0.300

3.1.8. Box-plot graphics



3.2. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre A

3.2.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	7.823	0.025	0.324	0.051
Lab1	3	7.287	0.041	0.556	0.081
Lab2	3	7.474	0.035	0.464	0.069
Lab3	3	7.591	0.032	0.425	0.065
Lab4	3	7.561	0.045	0.597	0.090
Lab5	3	7.253	0.047	0.642	0.093
Lab6	3	7.184	0.017	0.240	0.034
Lab7	3	7.521	0.021	0.278	0.042
Lab8	3	7.605	0.031	0.402	0.061
Lab9	3	7.368	0.015	0.207	0.031

3.2.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
7.794	7.852	4.303	7.760
7.241	7.333	4.303	7.186
7.435	7.514	4.303	7.388
7.555	7.628	4.303	7.511
7.510	7.612	4.303	7.449
7.200	7.306	4.303	7.137
7.164	7.203	4.303	7.141
7.497	7.545	4.303	7.469
7.570	7.639	4.303	7.529
7.351	7.385	4.303	7.330

Confidence_interval_T_up	Demi_amplitude_T
7.886	0.063
7.388	0.101
7.561	0.086
7.672	0.080
7.673	0.112
7.369	0.116
7.227	0.043
7.573	0.052
7.681	0.076
7.406	0.038

3.2.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	37.18	6.03
Lab1	9.47	15.45
Lab2	0.02	11.32
Lab3	4.55	9.80
Lab4	2.62	19.14
Lab5	13.41	20.37
Lab6	23.47	2.78
Lab7	0.86	4.11
Lab8	5.58	8.79
Lab9	2.85	2.19

3.2.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	7.467
Repeatability_standard_deviat	0.033
Limit_of_repeatability	0.091
Repeatability_exp_uncertainty	0.065
Reproducibility_stand_deviat	0.196
Limit_of_reproducibility	0.550
Reproducibility_exp_uncertaint	0.393

3.2.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.87
Repro_exp_uncert_percent	5.26

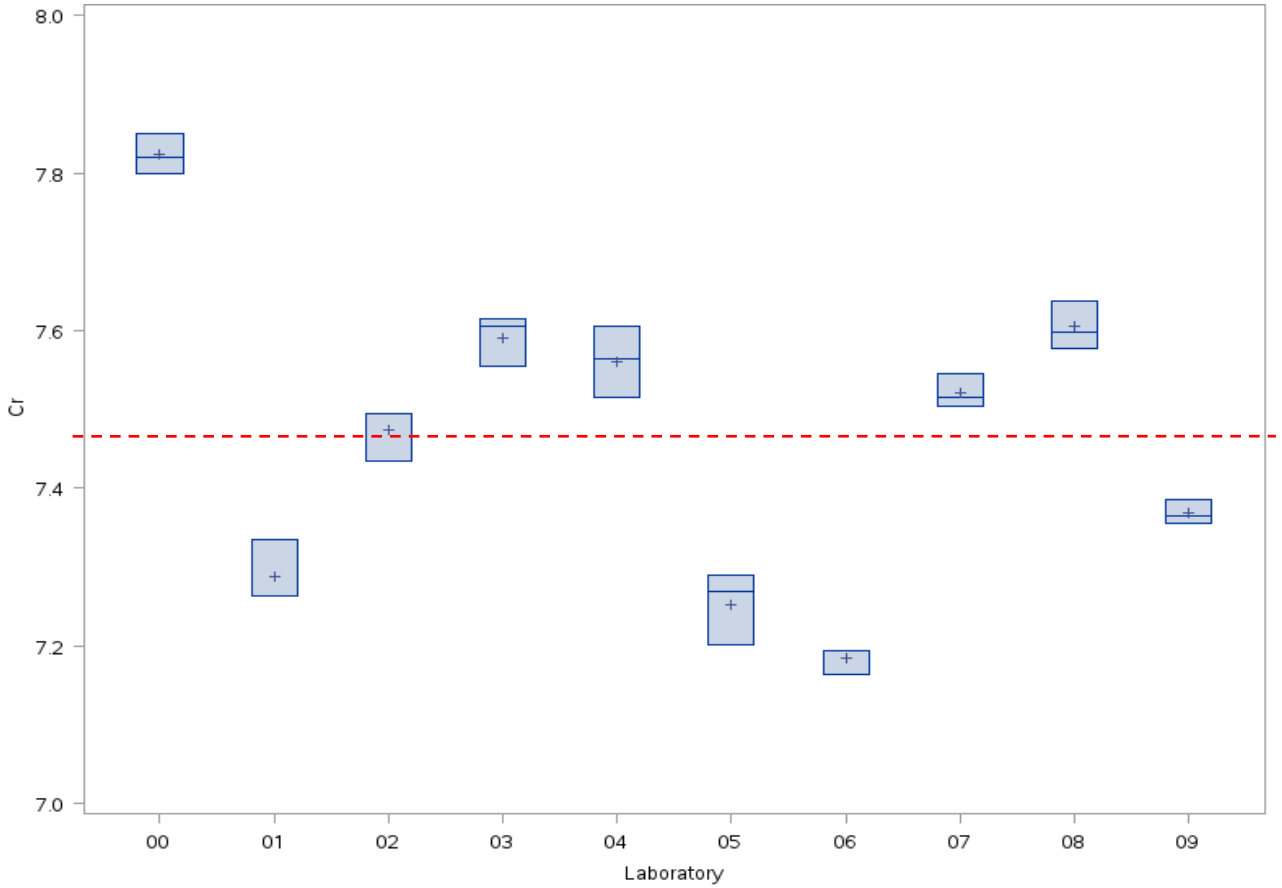
3.2.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	97.24

3.2.7. Trueness study – Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	0.356	0.185	-0.006	0.718
Lab1	3	-0.180	0.185	-0.542	0.182
Lab2	3	0.008	0.185	-0.354	0.370
Lab3	3	0.125	0.185	-0.237	0.487
Lab4	3	0.095	0.185	-0.267	0.457
Lab5	3	-0.214	0.185	-0.576	0.148
Lab6	3	-0.283	0.185	-0.645	0.079
Lab7	3	0.054	0.185	-0.308	0.416
Lab8	3	0.138	0.185	-0.224	0.500
Lab9	3	-0.099	0.185	-0.461	0.263

3.2.8. Box-plot graphics



3.3. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre B

3.3.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	8.674	0.040	0.463	0.080
Lab1	3	8.174	0.015	0.186	0.030
Lab2	3	8.135	0.032	0.392	0.064
Lab3	3	8.542	0.020	0.234	0.040
Lab4	3	8.370	0.052	0.619	0.104
Lab5	3	8.048	0.026	0.329	0.053
Lab6	3	8.184	0.020	0.245	0.040
Lab7	3	8.442	0.035	0.415	0.070
Lab8	3	8.538	0.020	0.233	0.040
Lab9	3	8.366	0.059	0.700	0.117

3.3.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
8.629	8.720	4.303	8.574
8.156	8.191	4.303	8.136
8.099	8.171	4.303	8.056
8.519	8.564	4.303	8.492
8.311	8.429	4.303	8.241
8.018	8.078	4.303	7.982
8.161	8.207	4.303	8.134
8.402	8.482	4.303	8.355
8.516	8.561	4.303	8.489
8.300	8.432	4.303	8.221

Confidence_interval_T_up	Demi_amplitude_T
8.774	0.100
8.211	0.038
8.214	0.079
8.591	0.050
8.499	0.129
8.114	0.066
8.234	0.050
8.529	0.087
8.588	0.050
8.511	0.145

3.3.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	27.94	13.32
Lab1	7.88	1.91
Lab2	11.75	8.39
Lab3	9.89	3.30
Lab4	0.13	22.21
Lab5	23.44	5.80
Lab6	6.97	3.33
Lab7	2.34	10.16
Lab8	9.55	3.28
Lab9	0.09	28.31

3.3.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	8.347
Repeatability_standard_deviat	0.035
Limit_of_repeatability	0.097
Repeatability_exp_uncertainty	0.070
Reproducibility_stand_deviat	0.208
Limit_of_reproducibility	0.583
Reproducibility_exp_uncertaint	0.416

3.3.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.83
Repro_exp_uncert_percent	4.99

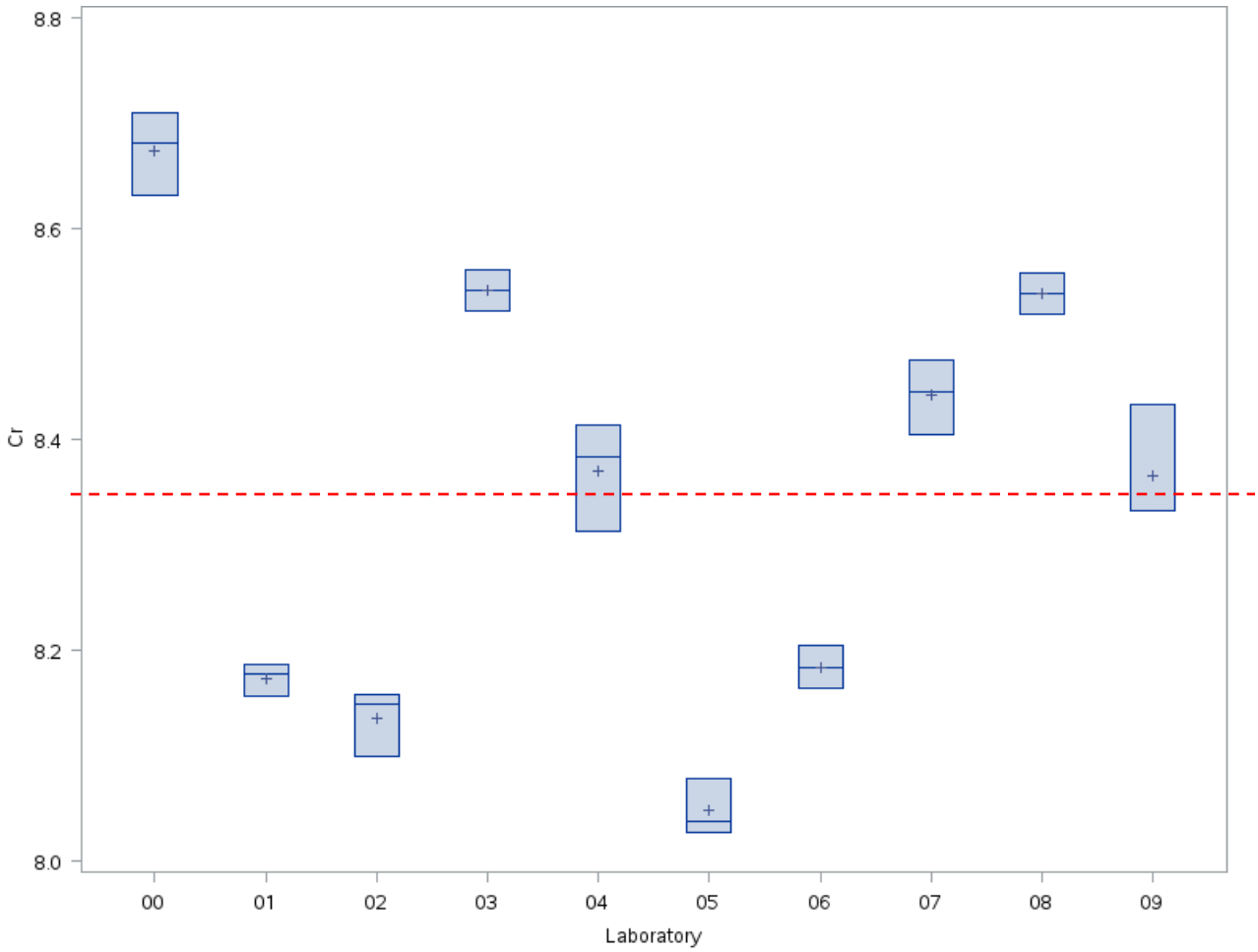
3.3.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	97.21

3.3.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	0.327	0.196	-0.056	0.710
Lab1	3	-0.174	0.196	-0.557	0.210
Lab2	3	-0.212	0.196	-0.595	0.171
Lab3	3	0.194	0.196	-0.189	0.578
Lab4	3	0.023	0.196	-0.361	0.406
Lab5	3	-0.299	0.196	-0.683	0.084
Lab6	3	-0.163	0.196	-0.547	0.220
Lab7	3	0.095	0.196	-0.289	0.478
Lab8	3	0.191	0.196	-0.192	0.574
Lab9	3	0.019	0.196	-0.365	0.402

3.3.8. Box-plot graphics



3.4. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre C

3.4.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	9.753	0.046	0.476	0.093
Lab1	3	9.197	0.026	0.287	0.053
Lab2	3	9.314	0.064	0.684	0.127
Lab3	3	9.485	0.020	0.212	0.040
Lab4	3	9.311	0.021	0.224	0.042
Lab5	3	9.350	0.055	0.584	0.109
Lab6	3	9.227	0.040	0.434	0.080
Lab7	3	9.414	0.044	0.464	0.087
Lab8	3	9.454	0.026	0.279	0.053
Lab9	3	9.294	0.040	0.428	0.080

3.4.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
9.701	9.806	4.303	9.638
9.168	9.227	4.303	9.132
9.242	9.386	4.303	9.156
9.462	9.508	4.303	9.435
9.287	9.334	4.303	9.259
9.288	9.412	4.303	9.214
9.182	9.273	4.303	9.128
9.365	9.464	4.303	9.306
9.424	9.483	4.303	9.388
9.249	9.339	4.303	9.195

Confidence_interval_T_up	Demi_amplitude_T
9.869	0.115
9.263	0.066
9.472	0.158
9.535	0.050
9.362	0.052
9.486	0.136
9.327	0.099
9.523	0.109
9.519	0.066
9.393	0.099

3.4.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	60.33	13.06
Lab1	14.42	4.22
Lab2	1.88	24.55
Lab3	4.77	2.44
Lab4	2.08	2.62
Lab5	0.38	18.06
Lab6	10.09	9.70
Lab7	0.51	11.56
Lab8	2.34	4.21
Lab9	3.20	9.59

3.4.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	9.380
Repeatability_standard_deviat	0.041
Limit_of_repeatability	0.114
Repeatability_exp_uncertainty	0.081
Reproducibility_stand_deviat	0.164
Limit_of_reproducibility	0.458
Reproducibility_exp_uncertaint	0.327

3.4.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.87
Repro_exp_uncert_percent	3.49

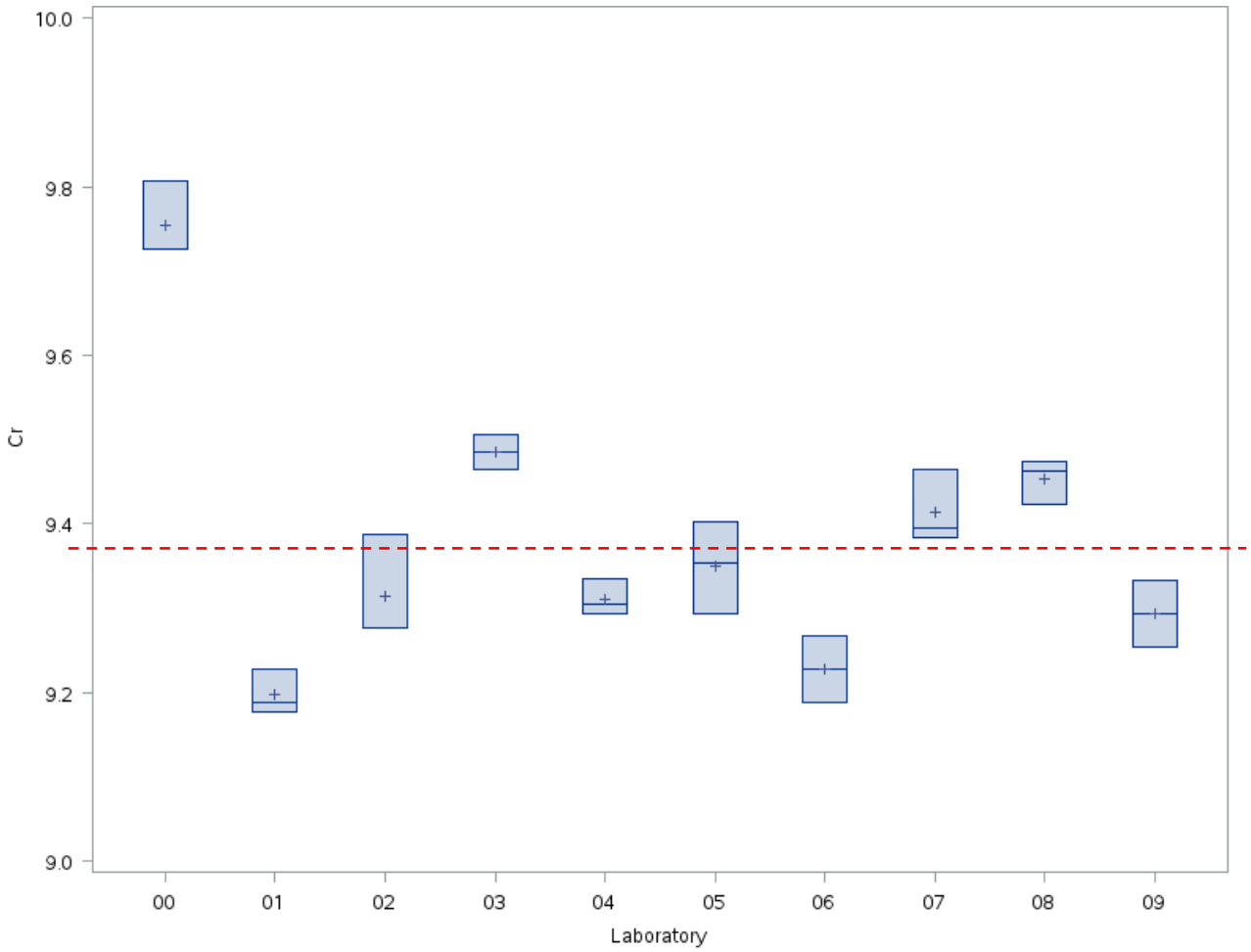
3.4.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	93.83

3.4.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	0.373	0.152	0.075	0.671
Lab1	3	-0.183	0.152	-0.480	0.115
Lab2	3	-0.066	0.152	-0.364	0.232
Lab3	3	0.105	0.152	-0.193	0.403
Lab4	3	-0.069	0.152	-0.367	0.229
Lab5	3	-0.030	0.152	-0.328	0.268
Lab6	3	-0.153	0.152	-0.451	0.145
Lab7	3	0.034	0.152	-0.264	0.332
Lab8	3	0.074	0.152	-0.224	0.372
Lab9	3	-0.086	0.152	-0.384	0.212

3.4.8. Box-plot graphics



3.5. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre D

3.5.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	10.151	0.035	0.341	0.069
Lab1	3	9.942	0.031	0.308	0.061
Lab2	3	9.647	0.062	0.643	0.124
Lab3	3	9.978	0.029	0.289	0.058
Lab4	3	9.658	0.017	0.181	0.035
Lab5	3	9.670	0.035	0.362	0.070
Lab6	3	9.643	0.030	0.313	0.060
Lab7	3	9.979	0.029	0.286	0.057
Lab8	3	9.778	0.031	0.313	0.061
Lab9	3	9.986	0.021	0.213	0.042

3.5.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
10.112	10.190	4.303	10.065
9.907	9.976	4.303	9.865
9.577	9.717	4.303	9.493
9.945	10.010	4.303	9.906
9.638	9.678	4.303	9.615
9.631	9.710	4.303	9.583
9.609	9.677	4.303	9.568
9.947	10.012	4.303	9.908
9.743	9.812	4.303	9.702
9.962	10.010	4.303	9.933

Confidence_interval_T_up	Demi_amplitude_T
10.237	0.086
10.018	0.076
9.801	0.154
10.049	0.072
9.701	0.043
9.757	0.087
9.718	0.075
10.050	0.071
9.854	0.076
10.038	0.053

3.5.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	30.72	10.47
Lab1	3.15	8.18
Lab2	12.50	33.57
Lab3	5.87	7.27
Lab4	11.12	2.66
Lab5	9.68	10.68
Lab6	12.96	7.97
Lab7	6.02	7.10
Lab8	1.39	8.16
Lab9	6.60	3.94

3.5.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	9.843
Repeatability_standard_deviat	0.034
Limit_of_repeatability	0.095
Repeatability_exp_uncertainty	0.068
Reproducibility_stand_deviat	0.187
Limit_of_reproducibility	0.524
Reproducibility_exp_uncertaint	0.374

3.5.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.69
Repro_exp_uncert_percent	3.80

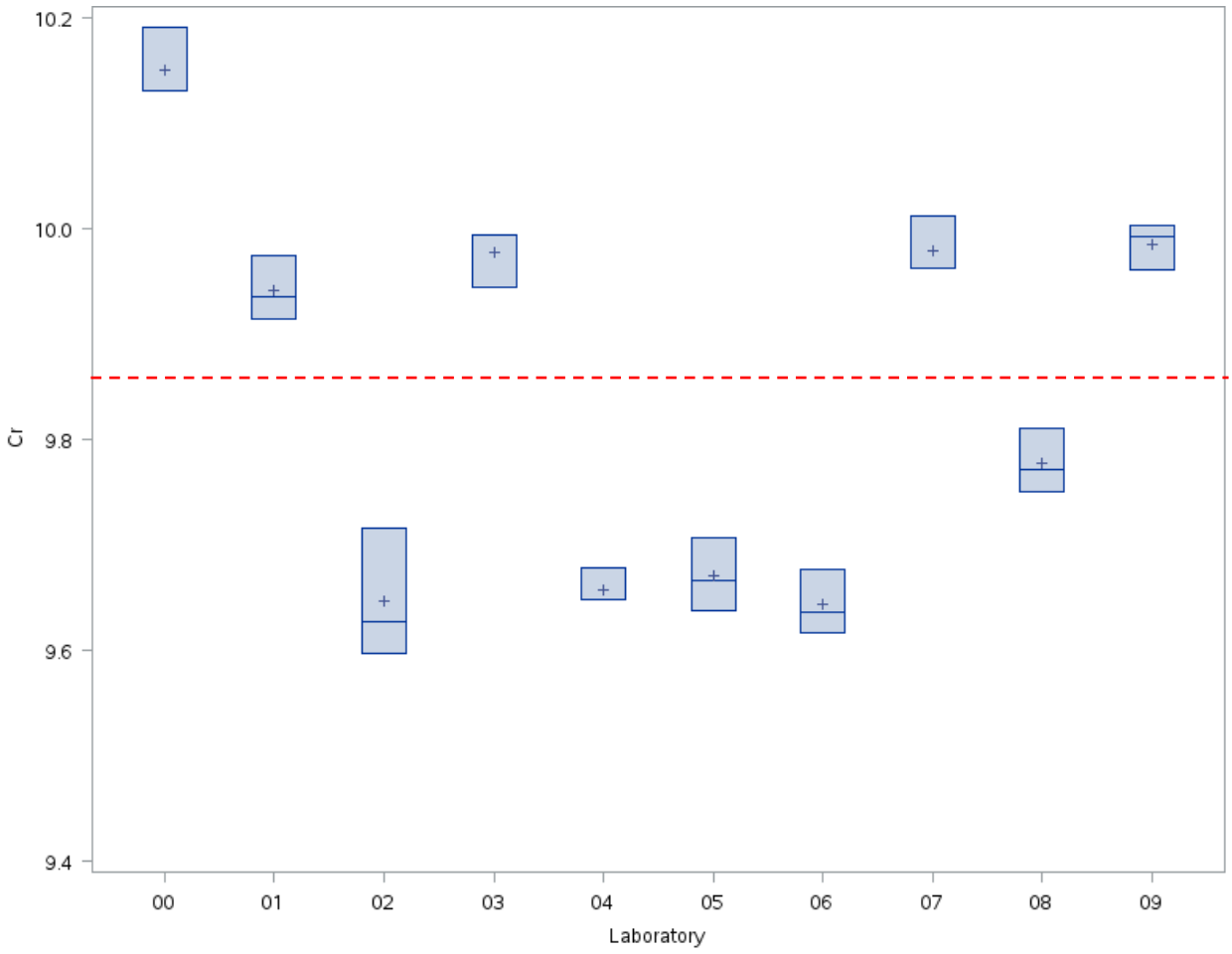
3.5.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	96.72

3.5.7. Trueness study – Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	0.308	0.176	-0.036	0.652
Lab1	3	0.099	0.176	-0.246	0.443
Lab2	3	-0.196	0.176	-0.540	0.148
Lab3	3	0.134	0.176	-0.210	0.478
Lab4	3	-0.185	0.176	-0.529	0.159
Lab5	3	-0.173	0.176	-0.517	0.171
Lab6	3	-0.200	0.176	-0.544	0.144
Lab7	3	0.136	0.176	-0.208	0.480
Lab8	3	-0.066	0.176	-0.410	0.279
Lab9	3	0.143	0.176	-0.201	0.487

3.5.8. Box-plot graphics



3.6. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre E

3.6.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	10.665	0.046	0.431	0.092
Lab1	3	10.181	0.036	0.354	0.072
Lab2	3	10.206	0.010	0.097	0.020
Lab3	3	10.589	0.055	0.523	0.111
Lab4	3	10.285	0.015	0.148	0.030
Lab5	3	10.172	0.015	0.149	0.030
Lab6	3	10.235	0.011	0.112	0.023
Lab7	3	10.351	0.017	0.168	0.035
Lab8	3	10.674	0.015	0.145	0.031
Lab9	3	10.164	0.017	0.171	0.035

3.6.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
10.613	10.717	4.303	10.551
10.140	10.222	4.303	10.091
10.195	10.217	4.303	10.182
10.526	10.651	4.303	10.451
10.268	10.302	4.303	10.247
10.155	10.189	4.303	10.135
10.222	10.248	4.303	10.207
10.331	10.370	4.303	10.308
10.656	10.691	4.303	10.636
10.144	10.183	4.303	10.121

Confidence_interval_T_up	Demi_amplitude_T
10.779	0.114
10.271	0.090
10.231	0.025
10.726	0.138
10.323	0.038
10.210	0.038
10.264	0.029
10.394	0.043
10.712	0.038
10.207	0.043

3.6.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	24.86	26.38
Lab1	7.44	16.23
Lab2	5.41	1.23
Lab3	14.18	38.25
Lab4	1.14	2.88
Lab5	8.21	2.88
Lab6	3.48	1.65
Lab7	0.00	3.77
Lab8	26.26	2.98
Lab9	9.01	3.76

3.6.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	10.352
Repeatability_standard_deviat	0.028
Limit_of_repeatability	0.079
Repeatability_exp_uncertainty	0.057
Reproducibility_stand_deviat	0.211
Limit_of_reproducibility	0.589
Reproducibility_exp_uncertaint	0.421

3.6.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.55
Repro_exp_uncert_percent	4.07

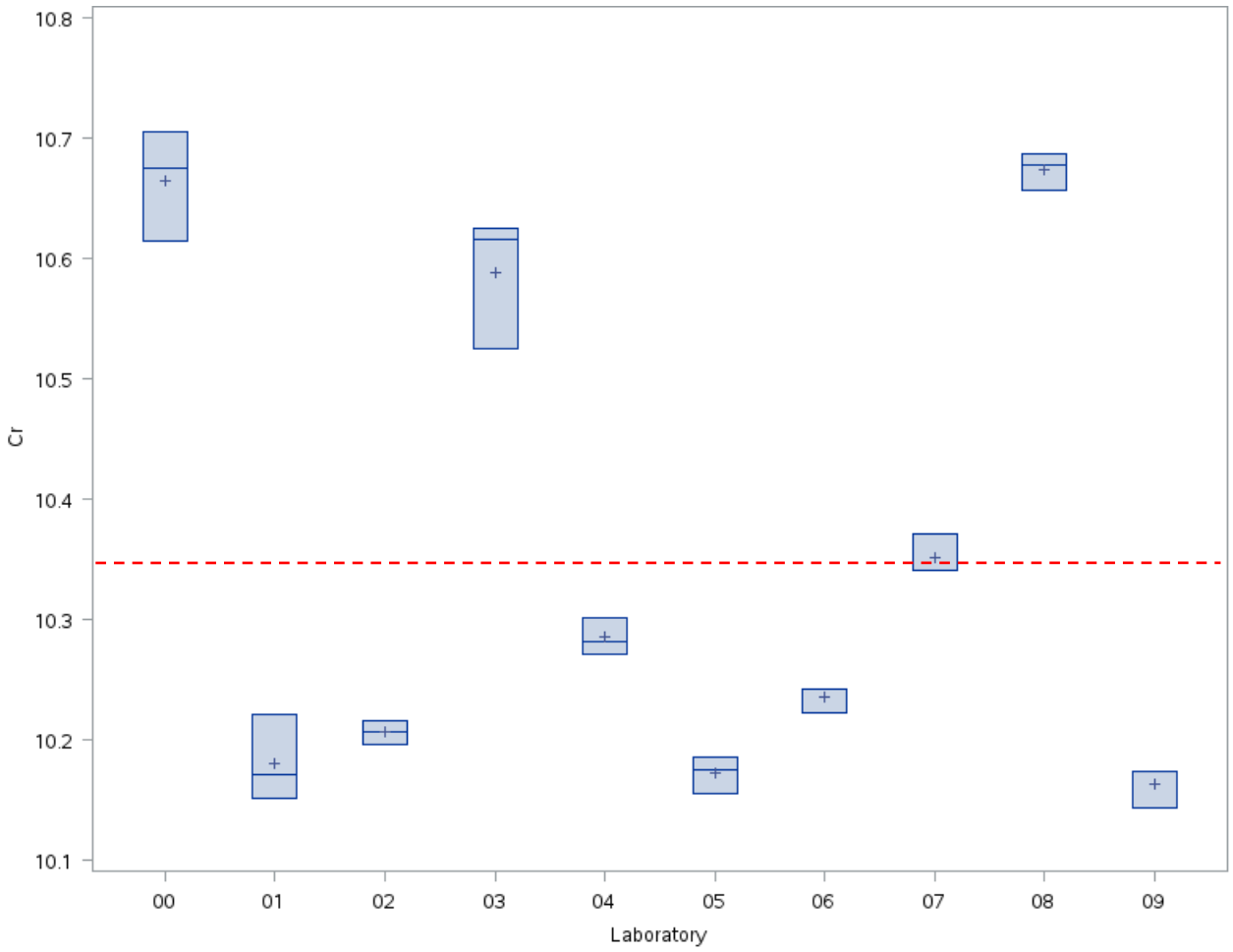
3.6.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	98.19

3.6.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	0.313	0.199	-0.076	0.702
Lab1	3	-0.171	0.199	-0.560	0.218
Lab2	3	-0.146	0.199	-0.535	0.243
Lab3	3	0.236	0.199	-0.153	0.625
Lab4	3	-0.067	0.199	-0.456	0.322
Lab5	3	-0.180	0.199	-0.569	0.209
Lab6	3	-0.117	0.199	-0.506	0.272
Lab7	3	-0.001	0.199	-0.390	0.388
Lab8	3	0.322	0.199	-0.067	0.711
Lab9	3	-0.188	0.199	-0.578	0.201

3.6.8. Box-plot graphics



3.7. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre F

3.7.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	4.263	0.015	0.357	0.030
Lab1	3	4.286	0.021	0.486	0.042
Lab2	3	4.379	0.026	0.603	0.053
Lab3	3	4.272	0.010	0.235	0.020
Lab4	3	4.243	0.006	0.136	0.012
Lab5	3	4.459	0.025	0.565	0.050
Lab6	3	4.365	0.021	0.480	0.042
Lab7	3	4.446	0.035	0.790	0.070
Lab8	3	4.326	0.010	0.231	0.020

3.7.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
4.245	4.280	4.303	4.225
4.262	4.309	4.303	4.234
4.349	4.409	4.303	4.313
4.260	4.283	4.303	4.247
4.236	4.249	4.303	4.229
4.430	4.487	4.303	4.396
4.341	4.389	4.303	4.313
4.406	4.485	4.303	4.358
4.314	4.337	4.303	4.301

Confidence_interval_T_up	Demi_amplitude_T
4.300	0.038
4.337	0.052
4.445	0.066
4.297	0.025
4.257	0.014
4.521	0.063
4.417	0.052
4.533	0.087
4.350	0.025

3.7.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	11.06	5.95
Lab1	5.31	11.10
Lab2	3.41	17.85
Lab3	8.51	2.58
Lab4	17.70	0.85
Lab5	29.13	16.25
Lab6	1.52	11.25
Lab7	23.08	31.60
Lab8	0.28	2.56

3.7.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	4.337
Repeatability_standard_deviat	0.021
Limit_of_repeatability	0.058
Repeatability_exp_uncertainty	0.042
Reproducibility_stand_deviat	0.081
Limit_of_reproducibility	0.228
Reproducibility_exp_uncertaint	0.163

3.7.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.96
Repro_exp_uncert_percent	3.75

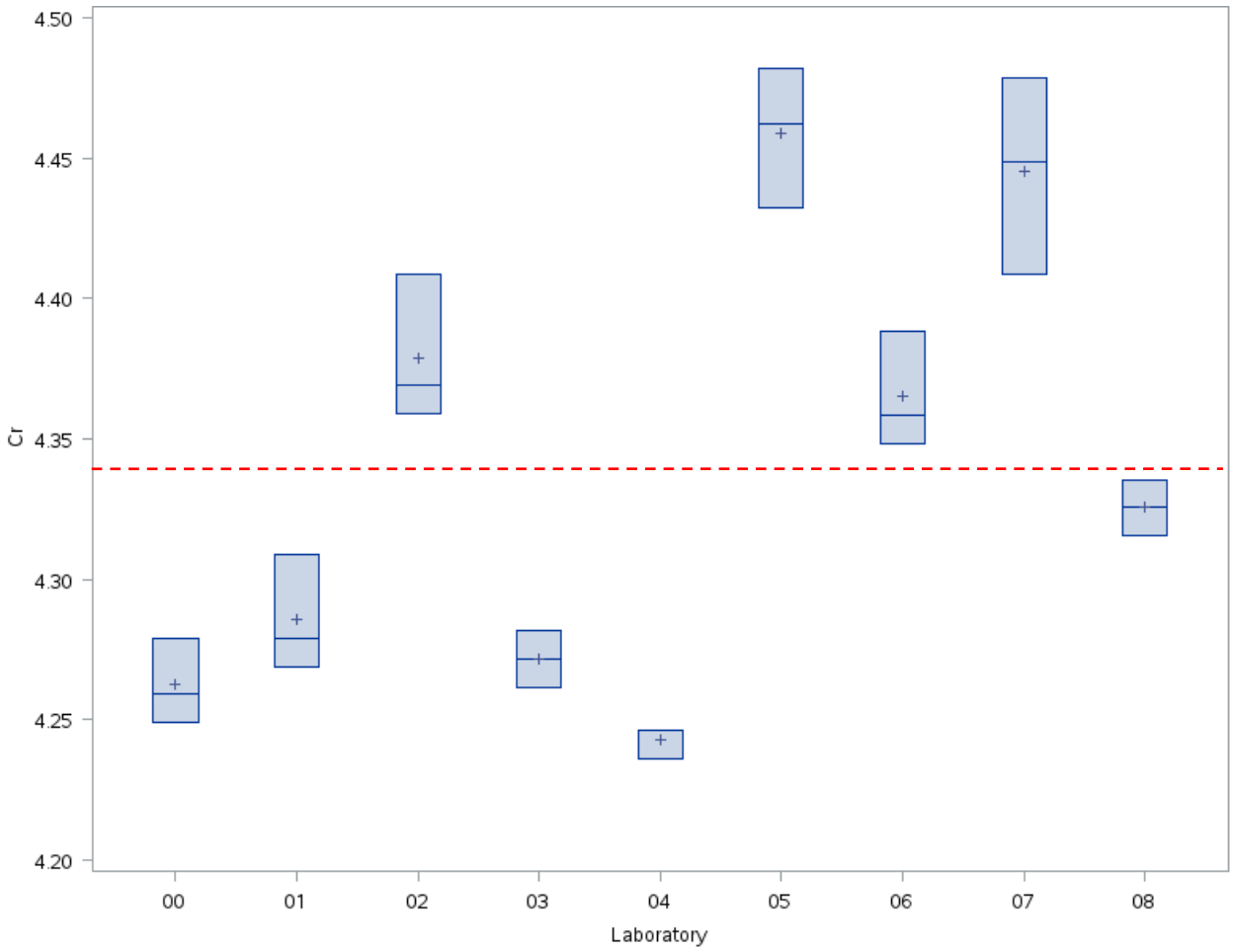
3.7.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	93.45

3.7.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	-0.075	0.075	-0.222	0.072
Lab1	3	-0.052	0.075	-0.199	0.095
Lab2	3	0.042	0.075	-0.105	0.189
Lab3	3	-0.066	0.075	-0.213	0.081
Lab4	3	-0.095	0.075	-0.242	0.052
Lab5	3	0.121	0.075	-0.026	0.268
Lab6	3	0.028	0.075	-0.119	0.175
Lab7	3	0.108	0.075	-0.039	0.255
Lab8	3	-0.012	0.075	-0.159	0.135

3.7.8. Box-plot graphics



3.8. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre G

3.8.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	4.679	0.006	0.122	0.011
Lab1	3	4.680	0.021	0.445	0.042
Lab2	3	5.026	0.026	0.523	0.053
Lab3	3	4.728	0.010	0.210	0.020
Lab4	3	4.700	0.010	0.214	0.020
Lab5	3	4.943	0.032	0.647	0.064
Lab6	3	4.783	0.010	0.210	0.020
Lab7	3	5.023	0.030	0.605	0.061
Lab8	3	4.812	0.010	0.213	0.021

3.8.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
4.673	4.686	4.303	4.665
4.657	4.704	4.303	4.628
4.996	5.056	4.303	4.961
4.717	4.739	4.303	4.703
4.688	4.711	4.303	4.675
4.907	4.980	4.303	4.864
4.772	4.795	4.303	4.758
4.989	5.057	4.303	4.947
4.801	4.824	4.303	4.787

Confidence_interval_T_up	Demi_amplitude_T
4.694	0.014
4.732	0.052
5.091	0.065
4.753	0.025
4.725	0.025
5.023	0.079
4.808	0.025
5.099	0.076
4.838	0.025

3.8.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	12.08	0.93
Lab1	11.93	12.36
Lab2	26.24	19.67
Lab3	5.15	2.81
Lab4	8.83	2.87
Lab5	9.45	29.15
Lab6	0.80	2.88
Lab7	25.49	26.33
Lab8	0.03	3.00

3.8.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	4.819
Repeatability_standard_deviat	0.020
Limit_of_repeatability	0.055
Repeatability_exp_uncertainty	0.040
Reproducibility_stand_deviat	0.143
Limit_of_reproducibility	0.402
Reproducibility_exp_uncertaint	0.287

3.8.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.82
Repro_exp_uncert_percent	5.95

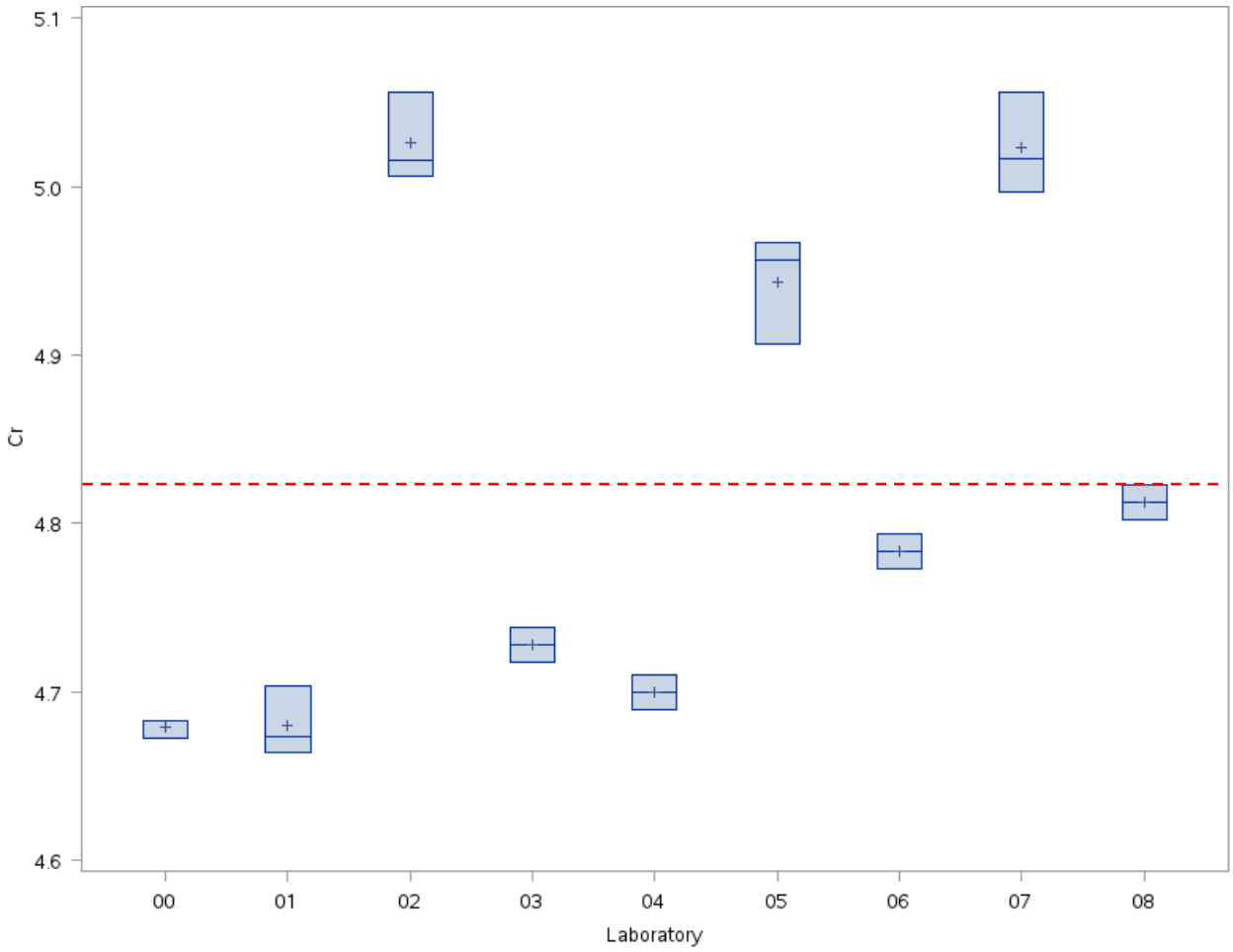
3.8.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	98.10

3.8.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	-0.140	0.134	-0.403	0.123
Lab1	3	-0.139	0.134	-0.403	0.124
Lab2	3	0.207	0.134	-0.057	0.470
Lab3	3	-0.091	0.134	-0.355	0.172
Lab4	3	-0.120	0.134	-0.383	0.144
Lab5	3	0.124	0.134	-0.139	0.387
Lab6	3	-0.036	0.134	-0.300	0.227
Lab7	3	0.204	0.134	-0.060	0.467
Lab8	3	-0.007	0.134	-0.271	0.256

3.8.8. Box-plot graphics



3.9. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre H

3.9.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	5.348	0.012	0.216	0.023
Lab1	3	5.508	0.020	0.366	0.040
Lab2	3	5.809	0.029	0.507	0.059
Lab3	3	5.498	0.015	0.279	0.031
Lab4	3	5.377	0.010	0.185	0.020
Lab5	3	5.556	0.048	0.868	0.096
Lab6	3	5.538	0.027	0.480	0.053
Lab7	3	5.599	0.035	0.628	0.070
Lab8	3	5.499	0.010	0.180	0.020

3.9.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
5.335	5.362	4.303	5.320
5.485	5.531	4.303	5.458
5.776	5.843	4.303	5.736
5.481	5.515	4.303	5.460
5.365	5.388	4.303	5.352
5.502	5.611	4.303	5.436
5.508	5.568	4.303	5.472
5.559	5.638	4.303	5.511
5.488	5.511	4.303	5.475

Confidence_interval_T_up	Demi_amplitude_T
5.377	0.029
5.558	0.050
5.882	0.073
5.536	0.038
5.401	0.025
5.676	0.120
5.604	0.066
5.686	0.087
5.524	0.025

3.9.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	22.12	2.18
Lab1	0.23	6.64
Lab2	56.48	14.19
Lab3	0.55	3.86
Lab4	15.66	1.62
Lab5	0.65	38.08
Lab6	0.11	11.58
Lab7	3.72	20.23
Lab8	0.49	1.61

3.9.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	5.526
Repeatability_standard_deviat	0.026
Limit_of_repeatability	0.073
Repeatability_exp_uncertainty	0.052
Reproducibility_stand_deviat	0.135
Limit_of_reproducibility	0.378
Reproducibility_exp_uncertaint	0.270

3.9.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.94
Repro_exp_uncert_percent	4.89

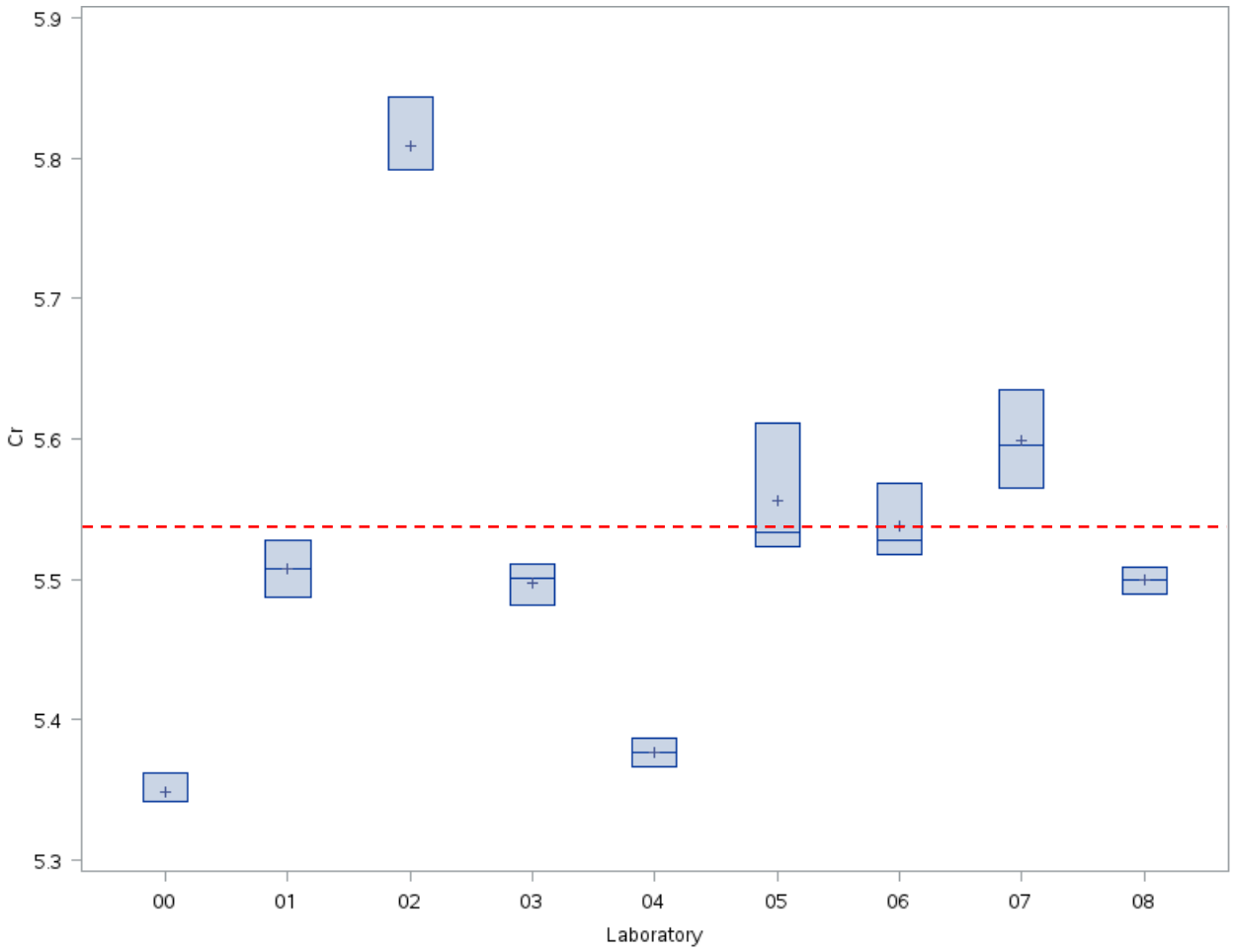
3.9.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	96.28

3.9.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	-0.177	0.126	-0.424	0.069
Lab1	3	-0.018	0.126	-0.264	0.228
Lab2	3	0.283	0.126	0.037	0.530
Lab3	3	-0.028	0.126	-0.274	0.219
Lab4	3	-0.149	0.126	-0.396	0.097
Lab5	3	0.030	0.126	-0.216	0.277
Lab6	3	0.012	0.126	-0.234	0.259
Lab7	3	0.073	0.126	-0.174	0.319
Lab8	3	-0.026	0.126	-0.273	0.220

3.9.8. Box-plot graphics



3.10. Interlaboratories tests results on Coefficient of rolling resistance (Cr) for Tyre J

3.10.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	6.344	0.012	0.182	0.023
Lab1	3	6.470	0.025	0.389	0.050
Lab2	3	6.669	0.023	0.345	0.046
Lab3	3	6.487	0.017	0.268	0.035
Lab4	3	6.447	0.010	0.156	0.020
Lab5	3	6.730	0.044	0.648	0.087
Lab6	3	6.497	0.026	0.407	0.053
Lab7	3	6.619	0.040	0.607	0.080
Lab8	3	6.450	0.023	0.358	0.046

3.10.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
6.331	6.357	4.303	6.315
6.442	6.499	4.303	6.408
6.643	6.695	4.303	6.612
6.468	6.507	4.303	6.444
6.436	6.459	4.303	6.422
6.681	6.780	4.303	6.622
6.467	6.527	4.303	6.431
6.574	6.664	4.303	6.519
6.424	6.476	4.303	6.393

Confidence_interval_T_up	Demi_amplitude_T
6.372	0.029
6.533	0.063
6.726	0.057
6.531	0.043
6.472	0.025
6.839	0.108
6.563	0.066
6.719	0.100
6.508	0.057

3.10.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	26.73	2.07
Lab1	2.35	9.83
Lab2	17.41	8.21
Lab3	1.09	4.69
Lab4	4.82	1.56
Lab5	35.10	29.47
Lab6	0.60	10.85
Lab7	7.45	25.05
Lab8	4.45	8.26

3.10.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	6.524
Repeatability_standard_deviat	0.027
Limit_of_repeatability	0.075
Repeatability_exp_uncertainty	0.054
Reproducibility_stand_deviat	0.125
Limit_of_reproducibility	0.350
Reproducibility_exp_uncertaint	0.250

3.10.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.82
Repro_exp_uncert_percent	3.84

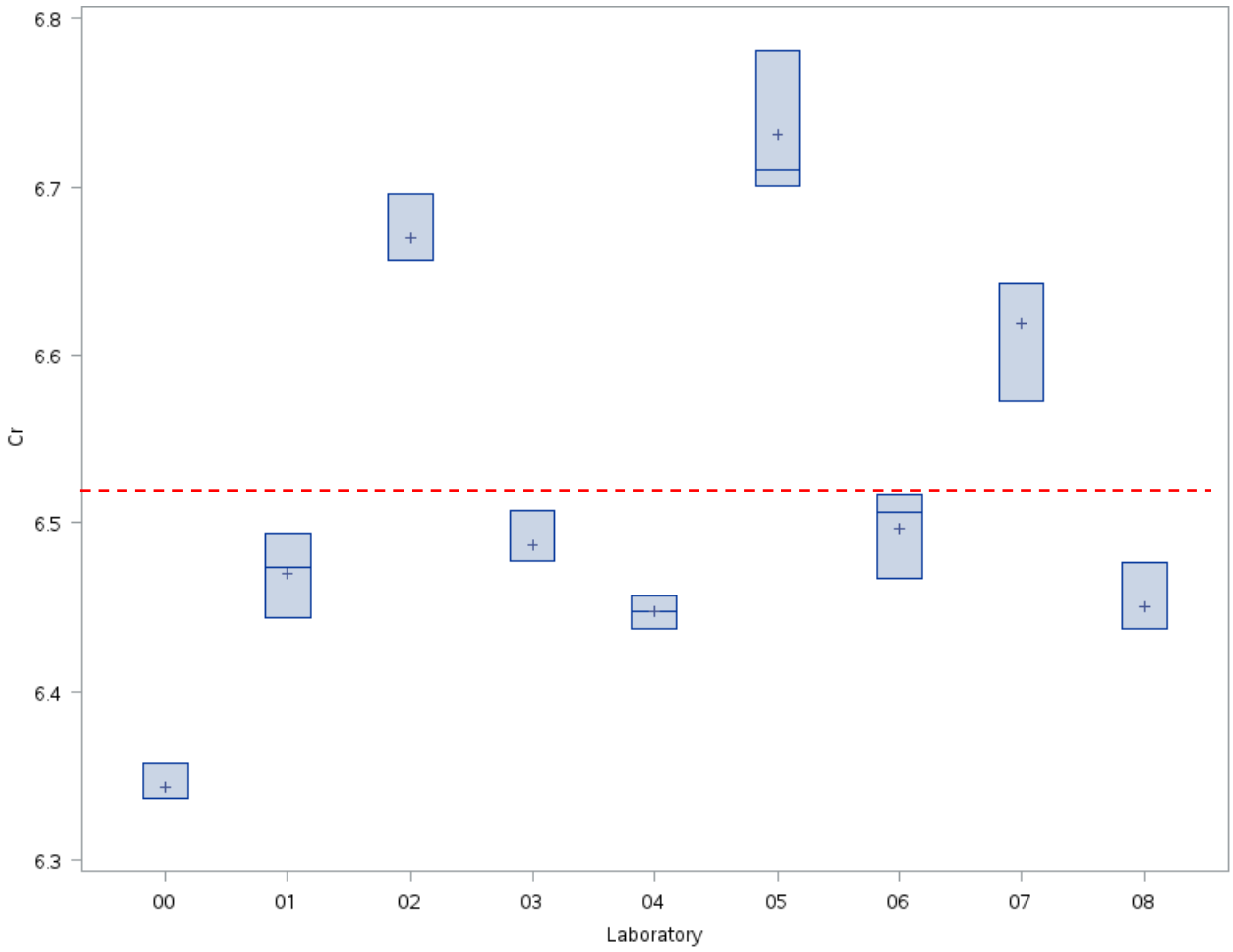
3.10.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	95.43

3.10.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	-0.180	0.116	-0.408	0.048
Lab1	3	-0.053	0.116	-0.281	0.174
Lab2	3	0.145	0.116	-0.082	0.373
Lab3	3	-0.036	0.116	-0.264	0.191
Lab4	3	-0.077	0.116	-0.304	0.151
Lab5	3	0.207	0.116	-0.021	0.434
Lab6	3	-0.027	0.116	-0.255	0.201
Lab7	3	0.095	0.116	-0.133	0.323
Lab8	3	-0.074	0.116	-0.301	0.154

3.10.8. Box-plot graphics



3.11. Results of interlaboratories tests on rolling resistance RR for C3 tyres – Tyre K

3.11.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
Lab0	3	6.838	0.015	0.222	0.030
Lab1	3	6.875	0.035	0.505	0.069
Lab2	3	7.073	0.021	0.293	0.041
Lab3	3	6.782	0.027	0.393	0.053
Lab4	3	6.769	0.021	0.309	0.042
Lab5	3	7.174	0.042	0.582	0.084
Lab6	3	6.960	0.032	0.466	0.065
Lab7	3	7.180	0.049	0.686	0.099
Lab8	3	6.821	0.017	0.254	0.035

3.11.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
6.821	6.855	4.303	6.800
6.836	6.914	4.303	6.789
7.050	7.097	4.303	7.022
6.752	6.813	4.303	6.716
6.746	6.793	4.303	6.717
7.127	7.221	4.303	7.071
6.923	6.997	4.303	6.880
7.124	7.236	4.303	7.058
6.801	6.840	4.303	6.778

Confidence_interval_T_up	Demi_amplitude_T
6.876	0.038
6.961	0.086
7.125	0.052
6.849	0.066
6.821	0.052
7.278	0.104
7.041	0.081
7.303	0.122
6.864	0.043

3.11.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
Lab0	5.03	2.71
Lab1	2.06	14.11
Lab2	8.15	5.04
Lab3	11.84	8.31
Lab4	13.89	5.13
Lab5	25.36	20.43
Lab6	0.16	12.31
Lab7	26.68	28.46
Lab8	6.84	3.51

3.11.4. Global average, results of precision values and measurement uncertainties

Variable	Cr
Global_average	6.941
Repeatability_standard_deviat	0.031
Limit_of_repeatability	0.086
Repeatability_exp_uncertainty	0.062
Reproducibility_stand_deviat	0.165
Limit_of_reproducibility	0.463
Reproducibility_exp_uncertaint	0.331

3.11.5. Results of measurement uncertainties in percentage

Variable	Cr
Repe_exp_uncert_percent	0.89
Repro_exp_uncert_percent	4.76

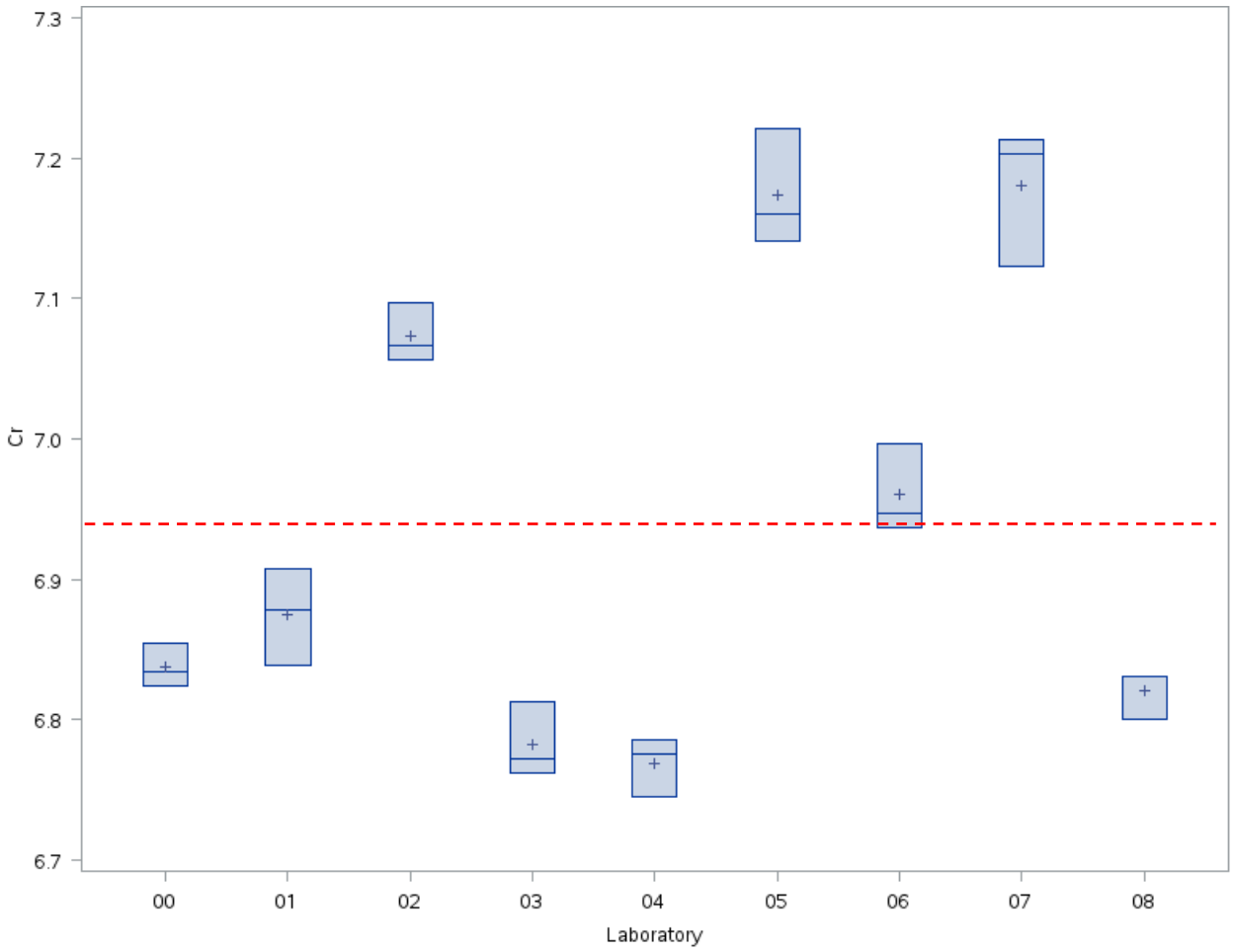
3.11.6. Part of variation in percent of the laboratories on the total variation

Variable	Cr
Variation_part_labo	96.53

3.11.7. Trueness study - Estimation of the bias

Laboratory	number of nonmissing values, Cr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
Lab0	3	-0.104	0.154	-0.406	0.198
Lab1	3	-0.066	0.154	-0.368	0.236
Lab2	3	0.132	0.154	-0.170	0.434
Lab3	3	-0.159	0.154	-0.461	0.143
Lab4	3	-0.172	0.154	-0.474	0.130
Lab5	3	0.233	0.154	-0.069	0.535
Lab6	3	0.019	0.154	-0.283	0.321
Lab7	3	0.239	0.154	-0.063	0.541
Lab8	3	-0.121	0.154	-0.423	0.181

3.11.8. Box-plot graphics



4. Calculation of assigned values

1.1. Estimation of the variance of assigned values on corrected values for C1-C2 tyres

Batch	Assigned value	Repeatabiliy standard deviation	Reproducibility standard deviation	Variance Assigned values	**Standard deviation Assigned values**	Number of laboratories	Number of repetitions	**Inf**	**Sup**	Laboratory Variance
X	6,304	0,029	0,129	0,002	0,040	10	3	6,223	6,384	0,016
A	7,467	0,033	0,196	0,004	0,061	10	3	7,344	7,590	0,037
B	8,347	0,035	0,208	0,004	0,065	10	3	8,217	8,478	0,042
C	9,380	0,041	0,164	0,003	0,051	10	3	9,278	9,482	0,025
D	9,843	0,034	0,187	0,003	0,058	10	3	9,726	9,960	0,034
E	10,352	0,028	0,211	0,004	0,066	10	3	10,220	10,485	0,044

1.2. Estimation of the variance of assigned values on corrected values for C3 tyres

Batch	Assigned value	Repeatabiliy standard deviation	Reproducibility standard deviation	Variance Assigned values	**Standard deviation Assigned values**	Number of laboratories	Number of repetitions	**Inf**	**Sup**	Laboratory Variance
F	4,337	0,021	0,081	0,001	0,026	9	3	4,285	4,390	0,006
G	4,819	0,020	0,143	0,002	0,047	9	3	4,725	4,914	0,020
H	5,526	0,026	0,135	0,002	0,044	9	3	5,437	5,615	0,018
J	6,524	0,027	0,125	0,002	0,041	9	3	6,442	6,606	0,015
K	6,941	0,031	0,165	0,003	0,054	9	3	6,833	7,050	0,026

5. Regression functions

5.1. Regression functions for C1-C2 machines[4] - Cr (N/kN)

Lab.	Intercept $B1_l$	Standard error Intercept	Slope $A1_l$	Standard error Slope	s (Residual standard deviation)	R^2
0	-0,2571	0,0702	0,9924	0,0078	0,0465	0,999
1	0,3198	0,1468	0,9767	0,0170	0,1037	0,995
2	-0,3345	0,1288	1,0503	0,0149	0,0846	0,997
3	0,1613	0,0803	0,9659	0,0091	0,0558	0,999
4	-0,3233	0,1156	1,0417	0,0133	0,0761	0,997
5	0,2429	0,1328	0,9913	0,0155	0,0931	0,996
6	0,2852	0,0827	0,9871	0,0097	0,0583	0,998
7	0,2028	0,0984	0,9722	0,0112	0,0687	0,998
8	0,0515	0,1814	0,9802	0,0205	0,1242	0,993
9	-0,1103	0,1771	1,0157	0,0204	0,1191	0,993

5.2. Regression functions for C3 machines – Cr (N/kN)

Lab.	Intercept $B1_l$	Standard error Intercept	Slope $A1_l$	Standard error Slope	s (Residual standard deviation)	R^2
0	0,0661	0,0646	1,0126	0,0116	0,0436	0,998
1	0,1296	0,0684	0,9885	0,0121	0,0467	0,998
2	-0,0605	0,1325	0,9825	0,0225	0,0873	0,993
3	-0,0032	0,0760	1,0143	0,0135	0,0507	0,998
4	0,0610	0,0552	1,0112	0,0099	0,0372	0,999
5	0,1380	0,0945	0,9513	0,0161	0,0645	0,996
6	-0,0016	0,0524	1,0004	0,0092	0,0350	0,999
7	-0,0153	0,1114	0,9778	0,0190	0,0740	0,995
8	-0,1899	0,0336	1,0426	0,0059	0,0217	1,000

[4] **$A1_l$ and $B1_l$ are the coefficients defined in annex IVa of Regulation (EC) N° 1222/2009**

Annex E - Template for candidate / reference laboratory alignment

1. General information of Applicant (Candidate laboratory)

Company: _____
Address: _____
City: _____ P.O. Box: _____
Contact person: _____ Position: _____
Telephone: _____ Fax: _____ E-mail: _____

a) Tyre manufacturer □ b) Independent laboratory □

Is your company integrated in a Group? □ Yes □ No
If yes, indicate which one: _____

Candidate machine identification
Trade Mark: _____ Serial number: _____
Test Lab location: _____ Year of make: _____
Date of last calibration: _____
The laboratory is certified/accredited/compliant to ISO 17025 □
The facility is certified / compliant to ISO /TS 16949 □
The laboratory complies with the specifications of ISO 28580 Annex A on test equipment tolerances □
Drum Ø [mm]: _____
Drum Surface: _____
Drum material: _____

Where to send the test tyres after testing:
Address: _____
City: _____ P.O.Box:_____
Contact person:_____

Test tyres provided:
Tyre type: □ C1/C2 □ C3
Method: □ Force □ Torque □ Power □ Deceleration

Test results of the n+1 measurements (corrected for drum diameter and room temperature)

Tyre : Make - Size – Designation	$RRC_{1,c}$ (kg/t)	$RRC_{2,c}$ (kg/t)	$RRC_{3,c}$ (kg/t)	$RRC_{4,c}$ (kg/t)	……	$RRC_{n+1,c}$ (kg/t)

Candidate machine measurement reproducibility: σ_m (kg/t): _____

All the information included by the company in this form will be confidential.

2. General information of the Reference laboratory

Company: _____
Address: _____
City: _____ P.O. Box: _____
Contact person: _____ Position: _____
Telephone: _____ Fax: _____ E-mail: _____

a) Tyre manufacturer ☐ b) Independent laboratory ☐

Reference machine identification
Trade Mark: _____ Serial number: _____
Test Lab location: _____ Year of make: _____
Date of last calibration: _____
The laboratory is certified/accredited/compliant to ISO 17025 ☐
The facility is certified / compliant to ISO /TS 16949 ☐
The laboratory complies with the specifications of ISO 28580 Annex A on test equipment tolerances ☐
Drum Ø [mm]: _____
Drum Surface: _____
Drum material: _____

Test characteristics:
Method: ☐ Force ☐ Torque ☐ Power ☐ Deceleration

Test results, average of measurement 2 – 4, corrected for drum diameter and temperature:

Tyre : Make - Size – Designation	$RRC_{2,l}$(kg/t)	$RRC_{3,l}$(kg/t)	$RRC_{4,l}$(kg/t)	RRC avg. (kg/t)

3. Alignment equation

Regression formula[5]: **RRC = aligned value (kg/t)**
$RRC_{m,c}$ = candidate's measurement (kg/t)

$$RRC = a * RRC_{m,c} + b$$

a = _____ **b = _____**

$$a = A1_l * A2_c$$
$$b = A1_l * B2_c + B1_l$$

Coefficient of determination[6]: R^2 = _____

Date: _____
Stamp and Signature: _____

[5] **$A1_l$, $B1_l$, $A2_c$ and $B2_c$ are the coefficients defined in annex IVa of Regulation (EC) N° 1222/2009**
RRC is the assigned value of the rolling resistance coefficient aligned to EU Reference.
$RRC_{m,l}$ is the individual measured value of the rolling resistance coefficient by the reference laboratory (l) (including temperature and drum diameter corrections)
$RRC_{m,c}$ is the individual measured value of the rolling resistance coefficient by the candidate laboratory (c) (including temperature and drum diameter corrections)
[6] **Coefficient of determination R^2 is defined as the sum of squares due to the regression divided by the total sum of squares. Usually, R^2 is interpreted as representing the percentage of variation of the dependent variable explained by variation of the independent variables.**

Annex F - Proposal of guidance on how to handle the process of changing alignment equations, both for Reference and Candidate Laboratories

1. The applicable alignment equation is determined based on the measurement date:
   A RR test result generated before Jan. 1st, 2015 will be aligned with the old equation and a test result generated from Jan. 1st, 2015 will be aligned with the new equation.

2. If a Candidate Laboratory or another machine was aligned before 1st January 2015, its current alignment equation is still valid during 2 years following its alignment report issue date.

3. If a validation check is done by a Testing service or another Test Laboratory from 1st January 2015 on a Label grade, it can be done according to the following multi-steps approach:

   a. For validation test result generated from 1st January 2015
      => Apply the alignment equation applicable from 1st January 2015

   After this first step (a) if the results confirm the level of the Label grade, the tyre is declared conform.
   If the results do not confirm the level of the Label grade the second step (b) shall be applied.

   b. If Label grade was originally based on an alignment report generated after 1st January 2015, the tyre is declared non-conform and the procedure defined in annex IVa of Regulation (EC) N° 1222/2009 shall be applied.
      If Label grade was originally based on an alignment report generated before 1st January 2015
      => Alignment equation applicable before 1st January 2015 will be applied to these 2015 validation results.

   After this second step (b) if these new results confirm the level of the Label grade, the tyre is declared conform.
   If these new results do not confirm the level of the Label grade, the tyre is declared non-conform and the procedure defined in annex IVa of Regulation (EC) N° 1222/2009 shall be applied.

Annex G – Draft of annex IVa and justification

"ANNEX IVa
Laboratory alignment procedure for the measurement of rolling resistance

1. DEFINITIONS

For the purpose of the laboratory alignment procedure, the following definitions apply:

(1) "Reference laboratory" means a laboratory that is part of the network of laboratories ~~the references,~~ the name of which have been published for the purpose of the alignment procedure in the *Official Journal of the European Union*, and is able to achieve the accuracy of test results determined in section 3 with his reference machine;

(2) "Candidate laboratory" means a laboratory participating in the alignment procedure that is not a reference laboratory;

(3) "Alignment tyre" means a tyre that is tested for the purpose of performing the alignment procedure;

(4) "Alignment tyres set" means a set of five or more alignment tyres for the alignment of one single machine.

(5) "Assigned value" means a theoretical value of the Rolling Resistance Coefficient of one alignment tyre as measured by a theoretical laboratory which is representative of the network of reference laboratories that is used for the alignment procedure.

(6) "Machine" means every tyre testing spindle in one specific measurement method. For example, two spindles acting on the same drum shall not be considered as one machine.

2. GENERAL PROVISIONS

2.1. Principle

The measured (*m*) Rolling Resistance Coefficient ~~(RRC_m)~~ in a reference laboratory (*l*), ($RRC_{m,l}$), shall be aligned to the assigned values of the network of reference laboratories.

The measured (*m*) Rolling Resistance Coefficient obtained by a machine in a candidate laboratory (*c*), $RRC_{m,c}$ ~~RRC_m in a candidate laboratory (*c*)~~ ,shall be aligned through one reference laboratory of the network of its choice.

2.2. Tyre selection requirements

A set of five or more alignment tyres shall be selected for the alignment procedure in compliance with the criteria below. One set shall be selected for C1 and C2 tyres together, and one set for C3 tyres.

(a) The set of alignment tyres shall be selected so as to cover the range of different *RRCs* of C1 and C2 tyres together, or of C3 tyres. In any event, the difference between the highest RRC_m of the tyre set, and the lowest RRC_m of the tyre set shall be**, before**~~after~~ alignment, at least equal to

(i) 3 kg/t for C1 and C2 tyres, and

(ii) 2 kg/t for C3 tyres

(b) The RRC_m in the candidate or reference laboratories ($RRC_{m,c}$~~e~~ or $RRC_{m,l}$~~t~~) based on declared RRC values of each alignment tyre of the set shall be spaced out**, before alignment**, as follows and distributed uniformly:

(i) 1.0 +/- 0.5 kg/t for C1 and C2 tyres, and

(ii) 1.0 +/- 0.5 kg/t for C3 tyres.

~~(c) The selected tyre section width of each alignment tyre shall be:~~

~~(i) ≤ 245 mm for machines measuring C1 and C2 tyres, and~~

~~(ii) ≤ 385 mm for machines measuring C3 tyres.~~

~~(d) The selected tyre outer diameter of each alignment tyre shall be:~~

~~(i) between 510 to 800 mm for machines measuring C1 and C2 tyres, and~~

~~(ii) between 771 to 1143 mm for machines measuring C3 tyres.~~

(~~e~~**c)** Load index values shall adequately cover the range of the tyres to be tested, ensuring that the Rolling Resistance Force (RRF) values also cover the range of the tyres to be tested. **The ratio of Rolling Resistance Force (RRF) between the highest RRF and the lowest RRF of the tyre set shall be, before alignment, at least equal to 2, both for C1/C2 and C3 tyres.**

Each alignment tyre shall be checked prior to use and replaced when:

(~~i~~**a)** it shows a condition which makes it unusable for further tests, and/or

(iib) there are deviations of $RRC_{m,c}$ or $RRC_{m,l}$ ~~RRC_m~~ greater than 1.5 per cent relative to earlier measurements after correction for any machine drift.

2.3. Measurement method

The reference laboratory shall measure each alignment tyre four times and retain the three last results for further analysis, in accordance with paragraph 4 of Annex 6 of UNECE Regulation No 117 and its subsequent amendments and applying the conditions set out in paragraph 3 of Annex 6 of UNECE Regulation No117 and its subsequent amendments.

The candidate laboratory shall measure each alignment tyre (n+1) times with n being specified in section 5 and retain the n last results for further analysis, in accordance with paragraph 4 of Annex 6 of UNECE Regulation No 117 and its subsequent amendments and applying the conditions set out in paragraph 3 of Annex 6 of UNECE Regulation No117 and its subsequent amendments.

Each time an alignment tyre is measured, the tyre/wheel assembly shall be removed from the machine and the entire test procedure specified in paragraph 4 of Annex 6 of UNECE Regulation No117 and its subsequent amendments shall be followed again from the start.

The candidate or reference laboratory shall calculate:

(a) the measured value of each alignment tyre for each measurement as specified in Annex 6, paragraphs 6.2 and 6.3, of UNECE Regulation No 117 and its subsequent amendments (i.e. corrected for a temperature of 25°C and a drum diameter of 2 m),

(b) the mean value of the three (in the case of reference laboratories) or n (in the case of candidate laboratories) last measured values of each alignment tyre, and

(c) the standard deviation (σ_m) as follows:

$$\sigma_m = \sqrt{\frac{1}{p} \cdot \sum_{i=1}^{p} \sigma^2{}_{m,i}}$$

$$\sigma_{m,i} = \sqrt{\frac{1}{n-1} \cdot \sum_{j=2}^{n+1} \left(Cr_{i,j} - \frac{1}{n} \cdot \sum_{j=2}^{n+1} Cr_{i,j} \right)^2}$$ (formula corrected, modifications not tracked)

where:

i is the counter from 1 to p for the ~~number of~~ alignment tyres
j is the counter from 2 to n+1 for the ~~number of~~ n last repetitions of each measurement ~~for~~ of a given alignment tyre
n+1 is the number of repetitions of tyre measurements (n+1=4 for reference laboratories and n+1 ≥4 for candidate laboratories)
p is the number of alignment tyres (p ≥ 5)

2.4. Data formats to be used for the computations and results

- The measured RRC values corrected from drum diameter and temperature shall be rounded to 2 decimal places.
- Then the computations shall be made with all digits: there shall be no further rounding except on the final alignment equations.
- All standard deviation values shall be displayed to 3 decimal places.
- All RRC values will be displayed to 2 decimal places.
- All alignment coefficients ($A1_l$, $B1_l$, $A2_c$ and $B2_c$) shall be rounded and displayed to 4 decimal places.

3. REQUIREMENTS APPLICABLE TO THE REFERENCE LABORATORIES AND DETERMINATION OF THE ASSIGNED VALUES

The assigned values of each alignment tyre shall be determined by a network of reference laboratories. ~~After~~ Every second~~two~~ year~~s~~ the network shall assess the stability and validity of the assigned values.

Each reference laboratory participating in the network shall comply with the specifications of Annex 6 of UNECE Regulation No117 and its subsequent amendments and have a standard deviation (σ_m) as follows:

(i) not greater than 0.05 kg/t for class C1 and C2 tyres, and

(ii) not greater than 0.05 kg/t for class C3 tyres.

The sets of alignment tyres, conforming to the specification of section 2.2 shall be measured in accordance with section 2.3 by each reference laboratory of the network.

The assigned value of each alignment tyre is the average of the measured values given by the reference laboratories of the network for this alignment tyre.

4. PROCEDURE FOR THE ALIGNMENT OF A REFERENCE LABORATORY TO THE ASSIGNED VALUES

Each reference laboratory (*l*) shall align itself to ~~the~~each new set ~~-~~of assigned values ~~of the alignment tyre set~~ and always after any significant machine change or any drift in machine control tyre monitoring data.

The alignment shall use ~~using~~ a linear regression technique on all individual data.~~,~~ The regression coefficients, $A1_l$ and $B1_l$, shall be calculated as follows:

$$RRC = A1_l * RRC_{m,l} + B1_l$$

where:

RRC is the assigned value of the rolling resistance coefficient;
$RRC_{m,l}$ is the individual measured value of the rolling resistance coefficient by the reference laboratory "*l*" (including temperature and drum diameter corrections)

5. REQUIREMENTS APPLICABLE TO CANDIDATE LABORATORIES

Candidate laboratories shall repeat the alignment procedure at least once every second ~~two~~ years for every machine and always after any significant machine change or any drift in machine control tyre monitoring data.

A common set of five different tyres, conforming to the specification of section 2.2 shall be measured in accordance with section 2.3 firstly by the candidate laboratory and later on by one reference laboratory. More than five alignment tyres may be tested at the request of the candidate laboratory.

The alignment tyre set shall be provided by the candidate laboratory to the selected reference laboratory.

The candidate laboratory (*c*) shall comply with the specifications of Annex 6 of UNECE Regulation No117 and its subsequent amendments and preferably have standard deviations (σ_m) as follows:

(i) not greater than 0.075 kg/t for C1 and C2 tyres, and

(ii) not greater than 0.06 kg/t for C3 tyres.

If the standard deviations (σ_m) of the candidate laboratory are higher than the above values with ~~three~~ four measurements, the last three ones being used for the computations, then the number n+1 of measurement repetitions shall be increased as follows:

n +1 = 1+$(\sigma_m/\gamma)^2$, rounded up to the nearest higher integer value

where:

γ = 0.043 kg/t for Class C1 and C2 tyres
γ = 0.035 kg/t for Class C3 tyres

6. PROCEDURE FOR THE ALIGNMENT OF A CANDIDATE LABORATORY

One reference laboratory (*l*) of the network shall calculate the linear regression function on all individual data of the candidate laboratory (*c*). ~~,~~ The regression coefficients, $A2_c$ and $B2_c$, shall be calculated as follows:

$$RRC_{m,l} = A2_c \times RRC_{m,c} + B2_c$$

where:

$RRC_{m,l}$ is the individual measured value of the rolling resistance coefficient by the reference laboratory (l) (including temperature and drum diameter corrections)
$RRC_{m,c}$ is the individual measured value of the rolling resistance coefficient by the candidate laboratory (c) (including temperature and drum diameter corrections)

If the coefficient[2] of determination R^2 is lower than 0.97 the candidate laboratory shall not be aligned.

The aligned *RRC* of tyres tested by the candidate laboratory is calculated as follows:

$$RRC = (A1_l \times A2_c) \times RRC_{m,c} + (A1_l \times B2_c + B1_l)$$

Justification:

~~In paragraph 2.3 of Annex IVa, it is written: "The candidate laboratory shall measure each alignment tyre (n+1) times with n being specified in section 5 and retain the n last results for further analysis"~~
~~In paragraph 5, n is the number of repetitions used to get the correct accuracy. This is consistent with paragraph 2.3.~~
~~But the formula in paragraph 2.3 is not consistent:~~

[2] **Coefficient of determination R2 is defined as the sum of squares due to the regression divided by the total sum of squares. Usually, R^2 is interpreted as representing the percentage of variation of the dependent variable explained by variation of the independent variables.**

~~$$\sigma_{m,i} = \sqrt{\frac{1}{n-2} \cdot \sum_{j=2}^{n} \left(Cr_{i,j} - \frac{1}{n-1} \cdot \sum_{j=2}^{n} Cr_{i,j} \right)^2}$$~~

~~In this formula, n is the total number of repetitions and should be replaced by n+1.~~

~~The correctl formula should be:~~

~~$$\sigma_{m,i} = \sqrt{\frac{1}{n-1} \cdot \sum_{j=2}^{n+1} \left(Cr_{i,j} - \frac{1}{n} \cdot \sum_{j=2}^{n+1} Cr_{i,j} \right)^2}$$~~

Paragraph 1.1 Reference laboratory is linked to reference machine

Paragraph 1.4 One batch of tyres for each candidate machine

Paragraph 1.6. Clarification needed in case e.g. the same machine features two measurement spindles.

Paragraph 2.1. Rephrasing needed for seek of clarification.

Paragraph 2.2 (a) Clarification needed to specify when the requirement shall be met "before".

Paragraph 2.2 (b) Clarification needed to specify when the requirement shall be met "before".

Paragraph 2.2 (c) & (d) : suppression of the constraints on tyre width and outer diameter, to allow more flexibility in the choice of alignment tyres.

Pargraph 2.2. (e) Renumbered as (c) & (d) were suppressed

Paragraph 2.2. (c) [previously (e)] introduction of the "ratio of the RR Forces", as a criteria for alignment tyres set selection. It is based on the experience gained during the last alignment, where for C1/C2 tyres, the ratio of the lowest/highest RR force is 2.8, for the C3 tyre set the ratio is 2.4. Fixed values in [N] may create issues in the future with RR forces further decreasing, preventing to get a suitable tyre set complying with the requirement set.

Paragraph 2.2. subclauses (i) & (ii) were introduced to avoid mis-references, as (a) & (b) were already used.

Paragraph 2.3: In paragraph 2.3 of Annex Iva, it is written: "The candidate laboratory shall measure each alignment tyre (n+1) times with n being specified in section 5 and retain the n last results for further analysis". In paragraph 5, n is the number of repetitions used to get the correct accuracy. This is consistent with paragraph 2.3. But the formula in paragraph 2.3 is not consistent:

$$\sigma_{m,i} = \sqrt{\frac{1}{n-2} \cdot \sum_{j=2}^{n} \left(Cr_{i,j} - \frac{1}{n-1} \cdot \sum_{j=2}^{n} Cr_{i,j} \right)^2}$$

In this formula, n is the total number of repetitions and should be replaced by n+1.

The correct formula should be:

$$\sigma_{m,i} = \sqrt{\frac{1}{n-1} \cdot \sum_{j=2}^{n+1} \left(Cr_{i,j} - \frac{1}{n} \cdot \sum_{j=2}^{n+1} Cr_{i,j} \right)^2}$$

Paragraph 3. The review of the assigned values shall be kept ~~iterative~~ every second year in order to monitor the stability and validity of the assigned value.

~~Paragraph 4. Clarification needed to manage possible impacts due to machine's components change or possible machine's drift.~~

Paragraph 5. The candidate machines must be re-aligned every second year.

Pragraph 5. Measurement order criteria needed to specify the Candidate Laboratory shall perform the tests before the Reference Laboratory selected.

Paragraph 5. (ii) Four measurements are needed, the first one in order to stabilise the tyre.

Paragraph 6. Introduction of a criterion on the Coefficient of Determination R^2. To limit scatter along the linear regression line and improve the uncertainty of prediction.

Annex H - Alignment tests results - Fr (N)

1. Raw data

1.1. C1-C2 tyres

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	X0	31,80	31,90	31,70	31,60	31,733	0,153	1,000	31,749	31,92	31,72	31,62	0,153
Lab1	X1	30,17	29,91	29,76	29,81	29,827	0,076	0,999	29,809	29,89	29,74	29,79	0,076
Lab2	X2	30,95	30,76	30,47	30,60	30,610	0,145	1,002	30,658	30,81	30,52	30,65	0,145
Lab3	X3	30,34	30,48	30,79	30,61	30,627	0,156	0,999	30,608	30,46	30,77	30,59	0,156
Lab4	X4	30,60	30,28	30,33	30,20	30,270	0,066	1,006	30,449	30,46	30,51	30,38	0,066
Lab5	X5	30,42	30,13	29,72	29,90	29,917	0,206	0,998	29,867	30,08	29,67	29,85	0,205
Lab6	X6	30,04	29,98	29,72	29,75	29,817	0,142	0,998	29,751	29,91	29,65	29,68	0,142
Lab7	X7	30,34	30,03	30,30	30,11	30,147	0,139	0,996	30,016	29,90	30,17	29,98	0,138
Lab8	X8	31,12	30,70	30,80	30,72	30,740	0,053	1,002	30,788	30,75	30,85	30,77	0,053
Lab9	X9	30,62	30,72	30,42	30,47	30,537	0,161	1,007	30,750	30,93	30,63	30,68	0,162
									30,444				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	A0	29,60	29,10	29,00	28,90	29,000	0,100	1,006	29,185	29,29	29,18	29,08	0,101
Lab1	A1	27,23	27,00	27,27	26,95	27,073	0,172	1,003	27,162	27,09	27,36	27,04	0,173
Lab2	A2	28,10	27,95	27,71	27,96	27,873	0,142	1,002	27,927	28,00	27,76	28,01	0,142
Lab3	A3	28,46	28,29	28,29	28,11	28,230	0,104	1,005	28,360	28,42	28,42	28,24	0,104
Lab4	A4	27,91	28,27	28,42	28,02	28,237	0,202	1,001	28,254	28,29	28,44	28,04	0,202
Lab5	A5	27,84	27,60	27,51	27,25	27,453	0,182	0,985	27,042	27,19	27,10	26,84	0,179
Lab6	A6	27,12	27,00	27,00	26,88	26,960	0,069	0,994	26,788	26,83	26,83	26,71	0,069
Lab7	A7	27,78	28,01	27,88	27,90	27,930	0,070	1,005	28,058	28,14	28,01	28,03	0,070
Lab8	A8	28,61	28,25	28,30	28,48	28,343	0,121	1,001	28,373	28,28	28,33	28,51	0,121
Lab9	A9	27,53	27,56	27,46	27,48	27,500	0,053	0,999	27,481	27,54	27,44	27,46	0,053
									27,863				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	B0	32,80	32,70	32,40	32,60	32,567	0,153	0,993	32,346	32,48	32,18	32,38	0,152
Lab1	B1	30,66	30,54	30,62	30,66	30,607	0,061	0,995	30,446	30,38	30,46	30,50	0,061
Lab2	B2	30,94	30,68	30,50	30,75	30,643	0,129	0,991	30,377	30,41	30,23	30,48	0,128
Lab3	B3	31,73	31,98	31,85	31,90	31,910	0,066	0,999	31,879	31,95	31,82	31,87	0,066
Lab4	B4	31,71	31,09	30,77	31,04	30,967	0,172	1,010	31,278	31,40	31,08	31,35	0,174
Lab5	B5	30,20	30,11	29,94	29,93	29,993	0,101	1,001	30,023	30,14	29,97	29,96	0,101
Lab6	B6	30,58	30,50	30,36	30,42	30,427	0,070	1,003	30,516	30,59	30,45	30,51	0,070
Lab7	B7	31,22	31,40	31,66	31,57	31,543	0,132	0,998	31,488	31,34	31,60	31,51	0,132
Lab8	B8	32,30	32,03	31,97	31,90	31,967	0,065	0,996	31,849	31,91	31,85	31,78	0,065
Lab9	B9	31,03	31,05	30,68	30,68	30,803	0,214	1,014	31,224	31,47	31,10	31,10	0,217
									31,142				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	C0	47,30	47,10	46,60	46,70	46,800	0,265	1,006	47,074	47,38	46,87	46,97	0,266
Lab1	C1	44,79	44,61	44,30	44,36	44,423	0,164	0,999	44,363	44,55	44,24	44,30	0,164
Lab2	C2	45,55	45,22	44,74	44,69	44,883	0,293	1,003	45,016	45,35	44,87	44,82	0,293
Lab3	C3	46,09	45,78	45,60	45,69	45,690	0,090	1,005	45,907	46,00	45,82	45,91	0,090
Lab4	C4	45,28	45,18	44,86	45,03	45,023	0,160	1,000	45,043	45,20	44,88	45,05	0,160
Lab5	C5	46,34	45,77	45,54	45,27	45,527	0,250	0,992	45,157	45,40	45,17	44,90	0,248
Lab6	C6	45,05	44,71	44,46	44,34	44,503	0,189	1,001	44,538	44,75	44,50	44,38	0,189
Lab7	C7	46,01	45,26	45,61	45,23	45,367	0,211	1,003	45,484	45,38	45,73	45,35	0,212
Lab8	C8	47,20	45,86	45,84	45,64	45,780	0,122	0,997	45,652	45,73	45,71	45,51	0,121
Lab9	C9	45,63	45,33	44,93	45,10	45,120	0,201	0,995	44,898	45,11	44,71	44,88	0,200
									45,313				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	D0	64,80	63,60	64,00	63,60	63,733	0,231	1,000	63,738	63,60	64,00	63,60	0,231
Lab1	D1	62,56	62,46	62,21	62,06	62,243	0,202	1,003	62,400	62,62	62,37	62,22	0,203
Lab2	D2	61,72	60,95	60,76	61,43	61,047	0,345	0,993	60,650	60,55	60,36	61,03	0,343
Lab3	D3	63,13	62,87	62,52	62,80	62,730	0,185	1,000	62,756	62,90	62,55	62,83	0,185
Lab4	D4	60,14	60,20	60,29	60,22	60,237	0,047	1,008	60,727	60,69	60,78	60,71	0,048
Lab5	D5	61,60	61,15	60,91	60,73	60,930	0,211	0,997	60,723	60,94	60,70	60,52	0,210
Lab6	D6	62,03	61,41	61,03	61,17	61,203	0,192	0,989	60,554	60,76	60,38	60,52	0,190
Lab7	D7	63,35	63,59	63,32	63,27	63,393	0,172	0,988	62,656	62,85	62,58	62,53	0,170
Lab8	D8	62,10	61,55	61,30	61,20	61,350	0,180	1,001	61,418	61,62	61,37	61,27	0,180
Lab9	D9	62,00	61,55	61,45	61,30	61,433	0,126	1,021	62,704	62,82	62,72	62,57	0,128
									61,833				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	E0	79,70	78,90	79,60	79,40	79,300	0,361	1,003	79,562	79,16	79,86	79,66	0,362
Lab1	E1	76,47	75,83	76,15	75,65	75,877	0,253	1,000	75,884	75,84	76,16	75,66	0,253
Lab2	E2	77,97	76,84	76,95	76,87	76,887	0,057	0,991	76,187	76,14	76,25	76,17	0,056
Lab3	E3	79,43	78,90	78,92	78,12	78,647	0,456	1,005	79,059	79,31	79,33	78,53	0,459
Lab4	E4	77,78	77,15	77,05	77,30	77,167	0,126	0,994	76,732	76,72	76,62	76,86	0,125
Lab5	E5	76,40	76,39	76,28	76,14	76,270	0,125	0,995	75,864	75,98	75,87	75,74	0,125
Lab6	E6	76,85	76,73	76,65	76,74	76,707	0,049	0,995	76,347	76,37	76,29	76,38	0,049
Lab7	E7	76,88	77,16	76,93	76,89	76,993	0,146	1,003	77,223	77,39	77,16	77,12	0,146
Lab8	E8	79,43	78,89	78,76	78,66	78,770	0,115	1,011	79,645	79,77	79,63	79,53	0,117
Lab9	E9	76,16	75,70	75,74	75,50	75,647	0,129	1,002	75,824	75,88	75,92	75,68	0,129
									77,233				

1.2. C3 tyres

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	F0	161,44	161,05	159,69	160,17	160,303	0,690	0,997	159,901	160,65	159,29	159,77	0,688
Lab1	F1	161,61	161,55	160,54	160,14	160,743	0,727	1,000	160,703	161,51	160,50	160,10	0,726
Lab2	F2	167,24	165,73	164,12	164,42	164,757	0,856	0,997	164,343	165,31	163,71	164,01	0,854
Lab3	F3	161,26	160,49	160,15	159,61	160,083	0,444	1,003	160,527	160,94	160,59	160,05	0,445
Lab4	F4	161,04	159,76	159,65	159,33	159,580	0,223	0,997	159,060	159,24	159,13	158,81	0,223
Lab5	F5	166,69	167,30	166,29	168,12	167,237	0,917	1,001	167,321	167,38	166,37	168,20	0,917
Lab6	F6	162,96	163,63	162,46	161,95	162,680	0,861	1,007	163,751	164,71	163,53	163,02	0,867
Lab7	F7	163,30	165,64	167,09	168,18	166,970	1,274	1,000	166,928	165,60	167,05	168,14	1,274
Lab8	F8	162,45	162,82	162,40	162,01	162,410	0,405	0,999	162,247	162,66	162,24	161,85	0,405
									162,753				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	G0	107,52	107,52	107,33	107,62	107,490	0,147	0,988	106,189	106,22	106,03	106,32	0,146
Lab1	G1	107,11	106,70	106,10	105,91	106,237	0,412	1,001	106,318	106,78	106,18	105,99	0,413
Lab2	G2	115,04	115,70	114,78	114,60	115,027	0,590	0,993	114,253	114,92	114,01	113,83	0,586
Lab3	G3	109,12	108,65	108,29	108,24	108,393	0,224	0,993	107,664	107,92	107,56	107,51	0,222
Lab4	G4	107,16	106,47	106,32	106,21	106,333	0,131	1,004	106,780	106,92	106,77	106,66	0,131
Lab5	G5	112,49	111,90	113,36	113,10	112,787	0,779	0,995	112,257	111,37	112,83	112,57	0,775
Lab6	G6	108,39	108,06	108,37	107,97	108,133	0,210	1,005	108,663	108,59	108,90	108,50	0,211
Lab7	G7	114,25	115,43	114,41	114,13	114,657	0,684	0,995	114,118	114,89	113,87	113,59	0,681
Lab8	G8	106,74	106,79	106,53	106,22	106,513	0,285	1,026	109,291	109,58	109,31	108,99	0,293
									109,504				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	H0	82,56	82,76	82,37	82,37	82,500	0,225	1,000	82,527	82,79	82,40	82,40	0,225
Lab1	H1	85,13	84,67	84,41	84,09	84,390	0,291	1,007	84,975	85,26	84,99	84,67	0,293
Lab2	H2	88,02	88,34	87,63	87,66	87,877	0,402	1,020	89,614	90,09	89,36	89,39	0,409
Lab3	H3	85,15	84,66	84,70	84,43	84,597	0,146	1,006	85,081	85,14	85,18	84,91	0,147
Lab4	H4	84,10	83,64	83,43	83,32	83,463	0,163	0,994	82,948	83,12	82,91	82,81	0,162
Lab5	H5	88,68	88,52	87,15	87,41	87,693	0,728	0,978	85,731	86,54	85,20	85,45	0,711
Lab6	H6	85,40	84,91	84,81	85,47	85,063	0,356	1,005	85,499	85,34	85,24	85,91	0,358
Lab7	H7	87,40	86,88	86,33	85,66	86,290	0,611	1,001	86,370	86,96	86,41	85,74	0,612
Lab8	H8	85,86	85,50	85,64	85,65	85,597	0,084	0,991	84,817	84,72	84,86	84,87	0,083
									85,284				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	J0	129,81	128,83	128,34	128,34	128,503	0,283	1,001	128,645	128,97	128,48	128,48	0,283
Lab1	J1	131,82	131,40	131,05	130,38	130,943	0,518	1,001	131,019	131,48	131,13	130,46	0,519
Lab2	J2	136,19	136,12	135,39	135,40	135,637	0,419	0,996	135,150	135,63	134,90	134,91	0,417
Lab3	J3	132,12	131,43	131,00	131,15	131,193	0,218	1,004	131,752	131,99	131,56	131,71	0,219
Lab4	J4	130,94	130,20	130,10	129,89	130,063	0,158	1,004	130,617	130,75	130,65	130,44	0,159
Lab5	J5	137,77	137,33	135,90	135,79	136,340	0,859	1,000	136,348	137,34	135,91	135,80	0,859
Lab6	J6	132,66	131,84	132,10	131,19	131,710	0,469	1,000	131,649	131,78	132,04	131,13	0,469
Lab7	J7	135,97	135,29	135,39	133,83	134,837	0,873	0,994	134,074	134,52	134,62	133,07	0,868
Lab8	J8	131,56	131,29	130,60	130,41	130,767	0,463	1,000	130,706	131,23	130,54	130,35	0,463
									132,218				

										Corrected individ values 2-4			
Mesures		1	2	3	4	Moy 2-4	Sig 2-4	Corr Factor	Corrected Avg	2	3	4	sigma
Lab0	K0	205,59	203,94	203,26	203,06	203,420	0,461	0,995	202,369	202,89	202,21	202,01	0,459
Lab1	K1	206,88	206,69	205,97	204,81	205,823	0,949	0,988	203,409	204,27	203,55	202,41	0,937
Lab2	K2	211,50	209,68	210,94	209,79	210,137	0,698	0,997	209,449	208,99	210,25	209,10	0,696
Lab3	K3	201,55	200,48	199,70	199,22	199,800	0,636	1,006	201,057	201,74	200,96	200,47	0,640
Lab4	K4	201,71	199,90	199,37	198,73	199,333	0,586	1,005	200,395	200,96	200,43	199,79	0,589
Lab5	K5	213,83	213,25	210,80	211,28	211,777	1,298	1,003	212,396	213,87	211,42	211,90	1,302
Lab6	K6	206,16	205,45	204,05	203,61	204,370	0,961	1,008	206,051	207,14	205,73	205,28	0,969
Lab7	K7	210,93	213,74	210,90	213,15	212,597	1,499	0,999	212,405	213,55	210,71	212,96	1,497
Lab8	K8	204,05	202,58	202,66	201,54	202,260	0,625	0,999	201,982	202,30	202,38	201,26	0,624
									205,501				

2. Qualification of reference machines

2.1. Sigma m for C1-C2 machines (based on corrected raw data)

Laboratory	Sigma X	Sigma A	Sigma B	Sigma C	Sigma D	Sigma E	**Sigma m**
Lab0	0,153	0,101	0,152	0,266	0,231	0,362	**0,228**
Lab1	0,076	0,173	0,061	0,164	0,203	0,253	**0,169**
Lab2	0,145	0,142	0,128	0,293	0,343	0,056	**0,210**
Lab3	0,156	0,104	0,066	0,090	0,185	0,459	**0,221**
Lab4	0,066	0,202	0,174	0,160	0,048	0,125	**0,141**
Lab5	0,205	0,179	0,101	0,248	0,210	0,125	**0,185**
Lab6	0,142	0,069	0,070	0,189	0,190	0,049	**0,132**
Lab7	0,138	0,070	0,132	0,212	0,170	0,146	**0,151**
Lab8	0,053	0,121	0,065	0,121	0,180	0,117	**0,117**
Lab9	0,162	0,053	0,217	0,200	0,128	0,129	**0,158**

2.2. Sigma m for C3 machines (based on corrected raw data)

Laboratory	Sigma F	Sigma G	Sigma H	Sigma J	Sigma K	**Sigma m**
Lab0	0,688	0,146	0,225	0,283	0,459	**0,409**
Lab1	0,726	0,413	0,293	0,519	0,937	**0,621**
Lab2	0,854	0,586	0,409	0,417	0,696	**0,616**
Lab3	0,445	0,222	0,147	0,219	0,640	**0,381**
Lab4	0,223	0,131	0,162	0,159	0,589	**0,305**
Lab5	0,917	0,775	0,711	0,859	1,302	**0,936**
Lab6	0,867	0,211	0,358	0,469	0,969	**0,645**
Lab7	1,274	0,681	0,612	0,868	1,497	**1,045**
Lab8	0,405	0,293	0,083	0,463	0,624	**0,415**

3. Statistical analysis of the Interlaboratories results – Fr (N)

3.1. Interlaboratories tests results on rolling resistance RR for C1-C2 tyres – Tyre X

3.1.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	31.749	0.153	0.481	0.306
01	3	29.809	0.076	0.256	0.153
02	3	30.658	0.145	0.475	0.291
03	3	30.608	0.156	0.508	0.311
04	3	30.449	0.066	0.217	0.132
05	3	29.867	0.205	0.687	0.410
06	3	29.751	0.142	0.477	0.284
07	3	30.016	0.138	0.460	0.276
08	3	30.788	0.053	0.172	0.106
09	3	30.750	0.162	0.526	0.324

3.1.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
31.576	31.921	4.303	31.369
29.722	29.895	4.303	29.619
30.493	30.822	4.303	30.296
30.432	30.784	4.303	30.222
30.374	30.523	4.303	30.285
29.634	30.099	4.303	29.357
29.590	29.911	4.303	29.398
29.859	30.172	4.303	29.673
30.728	30.848	4.303	30.656
30.567	30.933	4.303	30.348

Confidence_interval_T_up	Demi_amplitude_T
32.128	0.380
29.998	0.190
31.019	0.361
30.995	0.387
30.612	0.164
30.376	0.510
30.103	0.353
30.359	0.343
30.920	0.132
31.152	0.402

3.1.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	50.22	12.34
01	11.92	3.08
02	1.34	11.19
03	0.79	12.79
04	0.00	2.30
05	9.85	22.25
06	14.20	10.65
07	5.43	10.08
08	3.49	1.48
09	2.76	13.84

3.1.4. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	30.444
Repeatability_standard_deviat	0.138
Limit_of_repeatability	0.385
Repeatability_exp_uncertainty	0.275
Reproducibility_stand_deviat	0.624
Limit_of_reproducibility	1.746
Reproducibility_exp_uncertaint	1.247

3.1.5. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.90
Repro_exp_uncert_percent	4.10

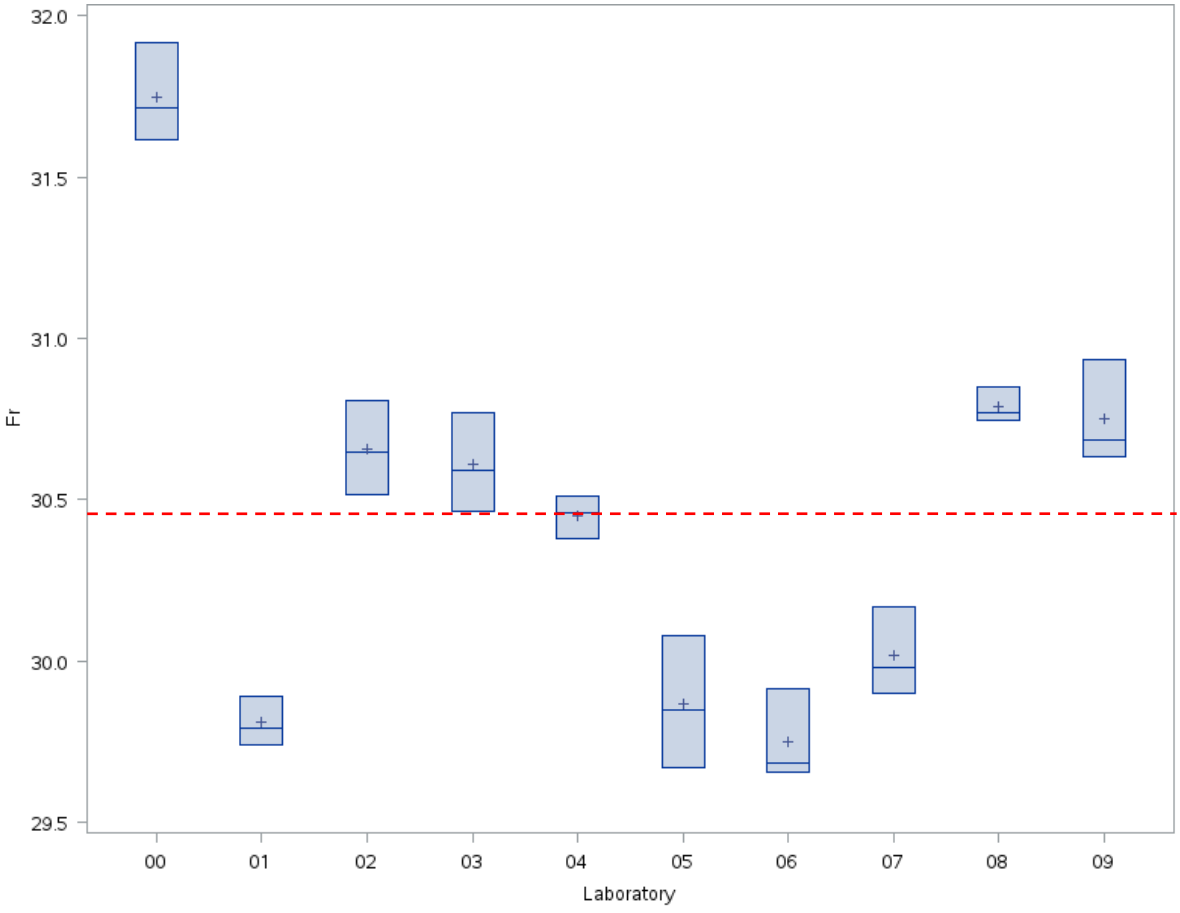
3.1.6. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	95.14

3.1.7. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	1.304	0.582	0.163	2.445
01	3	-0.635	0.582	-1.776	0.505
02	3	0.213	0.582	-0.927	1.354
03	3	0.164	0.582	-0.977	1.305
04	3	0.004	0.582	-1.136	1.145
05	3	-0.578	0.582	-1.718	0.563
06	3	-0.693	0.582	-1.834	0.447
07	3	-0.429	0.582	-1.569	0.712
08	3	0.344	0.582	-0.797	1.484
09	3	0.306	0.582	-0.835	1.447

3.1.8. Box-plot graphics – Tyre X



3.2. Interlaboratories tests results on rolling resistance RR for C1-C2 tyres – Tyre A

3.2.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	29.185	0.101	0.345	0.201
01	3	27.162	0.173	0.636	0.345
02	3	27.927	0.142	0.508	0.284
03	3	28.360	0.104	0.368	0.209
04	3	28.254	0.202	0.716	0.404
05	3	27.042	0.179	0.662	0.358
06	3	26.788	0.069	0.257	0.138
07	3	28.058	0.070	0.251	0.141
08	3	28.373	0.121	0.427	0.242
09	3	27.481	0.053	0.192	0.106

3.2.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
29.071	29.299	4.303	28.935
26.966	27.357	4.303	26.733
27.767	28.088	4.303	27.575
28.242	28.478	4.303	28.100
28.025	28.483	4.303	27.752
26.839	27.244	4.303	26.597
26.710	26.866	4.303	26.617
27.979	28.138	4.303	27.884
28.236	28.510	4.303	28.072
27.421	27.540	4.303	27.349

Confidence_interval_T_up	Demi_amplitude_T
29.435	0.250
27.591	0.429
28.280	0.352
28.619	0.259
28.756	0.502
27.487	0.445
26.959	0.171
28.233	0.175
28.674	0.301
27.612	0.131

3.2.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	35.53	5.92
01	10.00	17.44
02	0.08	11.76
03	5.02	6.37
04	3.11	23.90
05	13.71	18.74
06	23.50	2.77
07	0.78	2.89
08	5.30	8.57
09	2.97	1.63

3.2.4. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	27.863
Repeatability_standard_deviat	0.131
Limit_of_repeatability	0.366
Repeatability_exp_uncertainty	0.262
Reproducibility_stand_deviat	0.747
Limit_of_reproducibility	2.091
Reproducibility_exp_uncertaint	1.494

3.2.5. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.94
Repro_exp_uncert_percent	5.36

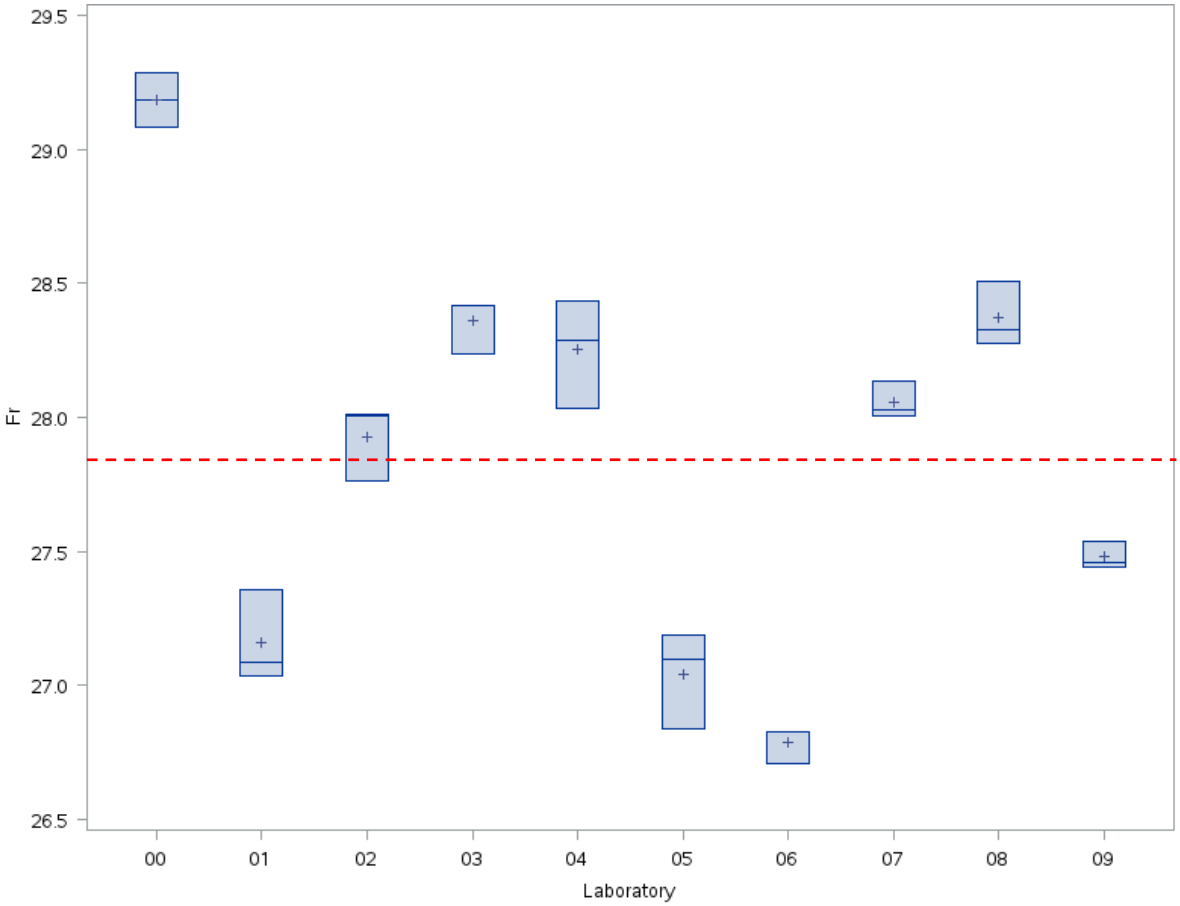
3.2.6. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	96.93

3.2.7. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	1.322	0.701	-0.053	2.696
01	3	-0.701	0.701	-2.076	0.673
02	3	0.064	0.701	-1.310	1.439
03	3	0.497	0.701	-0.878	1.871
04	3	0.391	0.701	-0.983	1.766
05	3	-0.821	0.701	-2.196	0.553
06	3	-1.075	0.701	-2.450	0.299
07	3	0.195	0.701	-1.179	1.570
08	3	0.510	0.701	-0.864	1.885
09	3	-0.382	0.701	-1.757	0.992

3.2.8. Box-plot graphics – Tyre A



3.3. Interlaboratories tests results on rolling resistance RR for C1-C2 tyres – Tyre B

1.1. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	32.346	0.152	0.469	0.303
01	3	30.446	0.061	0.200	0.122
02	3	30.377	0.128	0.421	0.256
03	3	31.879	0.066	0.205	0.131
04	3	31.278	0.174	0.556	0.348
05	3	30.023	0.101	0.337	0.203
06	3	30.516	0.070	0.231	0.141
07	3	31.488	0.132	0.419	0.264
08	3	31.849	0.065	0.204	0.130
09	3	31.224	0.217	0.693	0.433

1.2. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
32.174	32.518	4.303	31.969
30.378	30.515	4.303	30.295
30.232	30.521	4.303	30.059
31.805	31.953	4.303	31.716
31.081	31.475	4.303	30.846
29.908	30.137	4.303	29.771
30.436	30.596	4.303	30.341
31.339	31.637	4.303	31.161
31.775	31.922	4.303	31.688
30.979	31.469	4.303	30.686

Confidence_interval_T_up	Demi_amplitude_T
32.723	0.377
30.597	0.151
30.694	0.318
32.042	0.163
31.710	0.432
30.274	0.252
30.691	0.175
31.816	0.327
32.010	0.161
31.761	0.538

1.3. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	27.06	14.27
01	9.06	2.29
02	10.96	10.14
03	10.14	2.66
04	0.34	18.75
05	23.43	6.36
06	7.33	3.08
07	2.23	10.77
08	9.32	2.61
09	0.12	29.08

1.4. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	31.142
Repeatability_standard_deviat	0.127
Limit_of_repeatability	0.356
Repeatability_exp_uncertainty	0.254
Reproducibility_stand_deviat	0.778
Limit_of_reproducibility	2.178
Reproducibility_exp_uncertaint	1.556

1.5. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.82
Repro_exp_uncert_perce	**5.00**

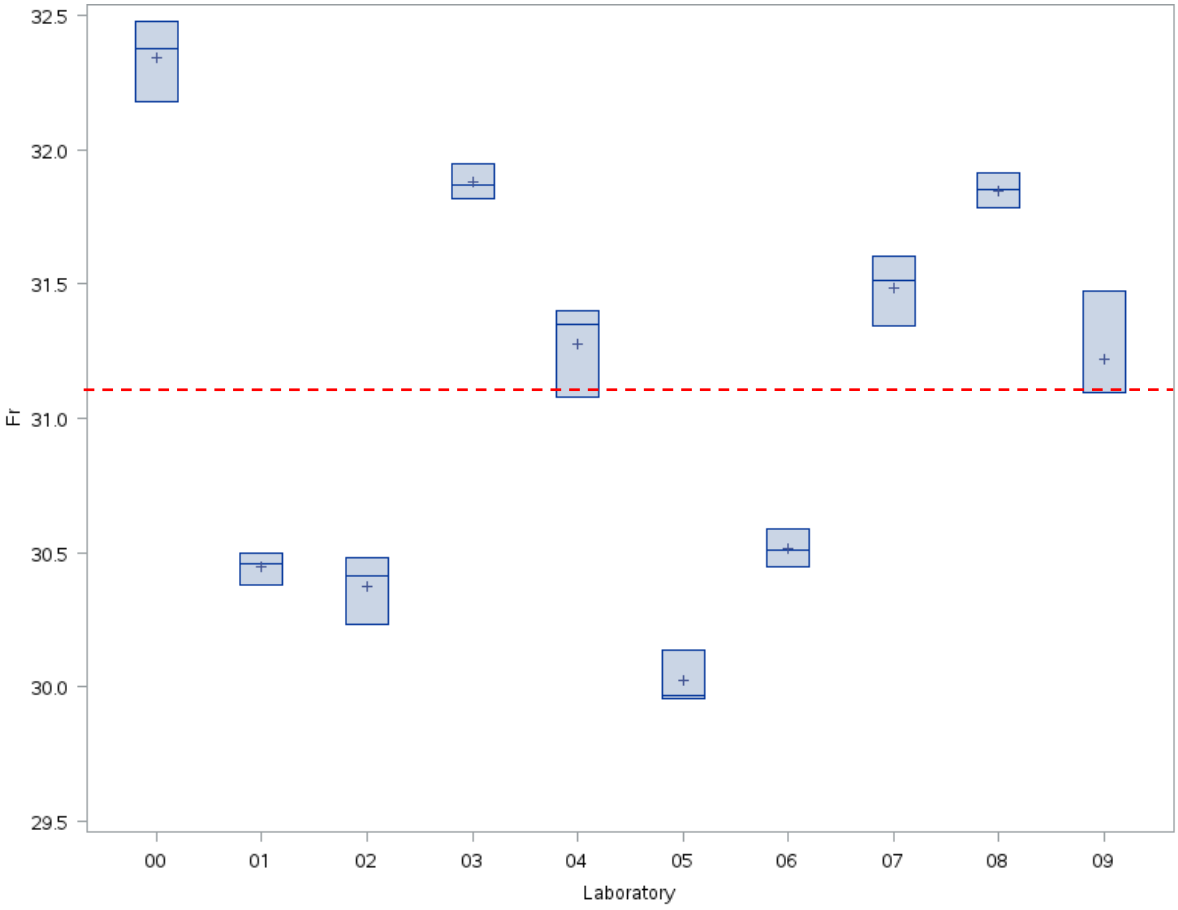
1.6. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	97.34

1.7. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	1.203	0.732	-0.230	2.637
01	3	-0.696	0.732	-2.130	0.738
02	3	-0.766	0.732	-2.199	0.668
03	3	0.736	0.732	-0.697	2.170
04	3	0.135	0.732	-1.298	1.569
05	3	-1.120	0.732	-2.554	0.314
06	3	-0.626	0.732	-2.060	0.807
07	3	0.346	0.732	-1.088	1.779
08	3	0.706	0.732	-0.728	2.140
09	3	0.081	0.732	-1.353	1.515

1.8. Box-plot graphics – Tyre B



3.4. Interlaboratories tests results on rolling resistance RR for C1-C2 tyres – Tyre C

1.9. *Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions*

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	47.074	0.266	0.565	0.532
01	3	44.363	0.164	0.370	0.328
02	3	45.016	0.293	0.652	0.587
03	3	45.907	0.090	0.197	0.181
04	3	45.043	0.160	0.356	0.320
05	3	45.157	0.248	0.550	0.496
06	3	44.538	0.189	0.424	0.378
07	3	45.484	0.212	0.466	0.424
08	3	45.652	0.121	0.266	0.243
09	3	44.898	0.200	0.445	0.400

1.10. *Confidence interval of the average per laboratory at the level 95%*

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
46.772	47.375	4.303	46.412
44.177	44.549	4.303	43.955
44.684	45.348	4.303	44.287
45.805	46.010	4.303	45.683
44.861	45.224	4.303	44.645
44.876	45.438	4.303	44.541
44.325	44.752	4.303	44.069
45.244	45.724	4.303	44.958
45.515	45.790	4.303	45.351
44.672	45.124	4.303	44.401

Confidence_interval_T_up	Demi_amplitude_T
47.735	0.661
44.771	0.408
45.745	0.729
46.132	0.225
45.441	0.398
45.774	0.617
45.008	0.469
46.010	0.526
45.954	0.301
45.394	0.496

1.11. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	56.78	17.08
01	16.55	6.50
02	1.62	20.78
03	6.47	1.97
04	1.34	6.19
05	0.45	14.86
06	11.00	8.61
07	0.54	10.82
08	2.11	3.55
09	3.16	9.63

1.12. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	45.313
Repeatability_standard_deviat	0.204
Limit_of_repeatability	0.570
Repeatability_exp_uncertainty	0.407
Reproducibility_stand_deviat	0.796
Limit_of_reproducibility	2.230
Reproducibility_exp_uncertaint	1.593

1.13. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.90
Repro_exp_uncert_percent	3.51

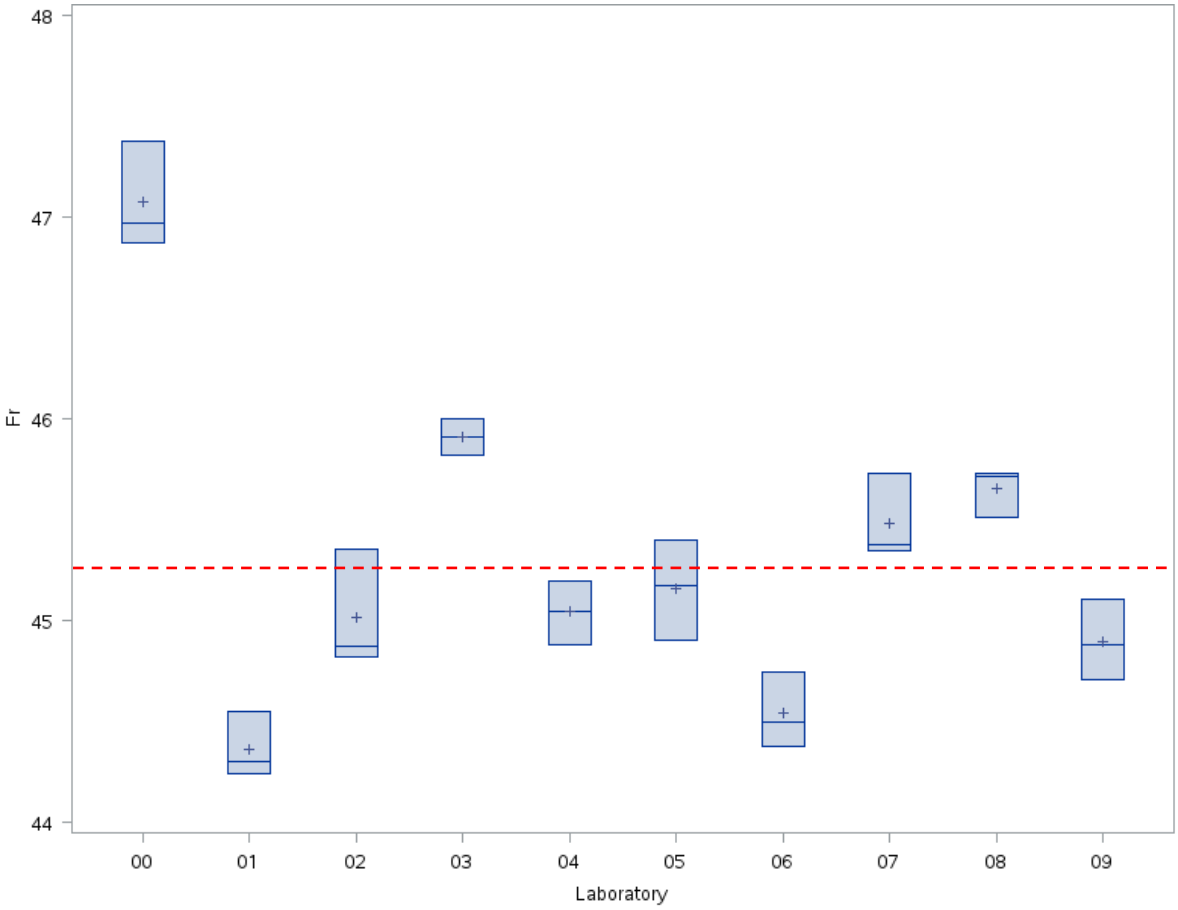
1.14. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	93.46

1.15. *Trueness study - Estimation and significativity of the bias*

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	1.760	0.739	0.312	3.208
01	3	-0.950	0.739	-2.398	0.498
02	3	-0.297	0.739	-1.745	1.151
03	3	0.594	0.739	-0.854	2.042
04	3	-0.270	0.739	-1.719	1.178
05	3	-0.156	0.739	-1.604	1.292
06	3	-0.775	0.739	-2.223	0.673
07	3	0.171	0.739	-1.277	1.619
08	3	0.339	0.739	-1.109	1.787
09	3	-0.416	0.739	-1.864	1.033

1.16. *Box-plot graphics – Tyre C*



3.5. Interlaboratories tests results on rolling resistance RR for C1-C2 tyres – Tyre D

1.17. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	63.738	0.231	0.362	0.462
01	3	62.400	0.203	0.325	0.405
02	3	60.650	0.343	0.566	0.686
03	3	62.756	0.185	0.295	0.371
04	3	60.727	0.048	0.078	0.095
05	3	60.723	0.210	0.346	0.420
06	3	60.554	0.190	0.314	0.380
07	3	62.656	0.170	0.272	0.340
08	3	61.418	0.180	0.294	0.361
09	3	62.704	0.128	0.205	0.257

1.18. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
63.476	63.999	4.303	63.164
62.171	62.629	4.303	61.896
60.261	61.038	4.303	59.797
62.547	62.966	4.303	62.296
60.673	60.781	4.303	60.609
60.485	60.960	4.303	60.201
60.339	60.769	4.303	60.082
62.463	62.849	4.303	62.233
61.214	61.623	4.303	60.970
62.559	62.849	4.303	62.385

Confidence_interval_T_up	Demi_amplitude_T
64.312	0.574
62.903	0.503
61.502	0.852
63.217	0.460
60.846	0.118
61.245	0.522
61.026	0.472
63.079	0.423
61.867	0.448
63.023	0.319

1.19. *Between and within contribution for the factor laboratory*

Laboratory	CEi	CDi
00	30.50	13.11
01	2.70	10.08
02	11.76	28.92
03	7.17	8.44
04	10.27	0.56
05	10.35	10.84
06	13.74	8.88
07	5.70	7.11
08	1.44	8.00
09	6.38	4.05

1.20. *Global average, results of precision values and measurement uncertainties*

Variable	Fr
Global_average	61.833
Repeatability_standard_deviat	0.202
Limit_of_repeatability	0.565
Repeatability_exp_uncertainty	0.403
Reproducibility_stand_deviat	1.162
Limit_of_reproducibility	3.253
Reproducibility_exp_uncertaint	2.323

1.21. *Results of measurement uncertainties in percentage*

Variable	Fr
Repe_exp_uncert_percent	0.65
Repro_exp_uncert_percent	3.76

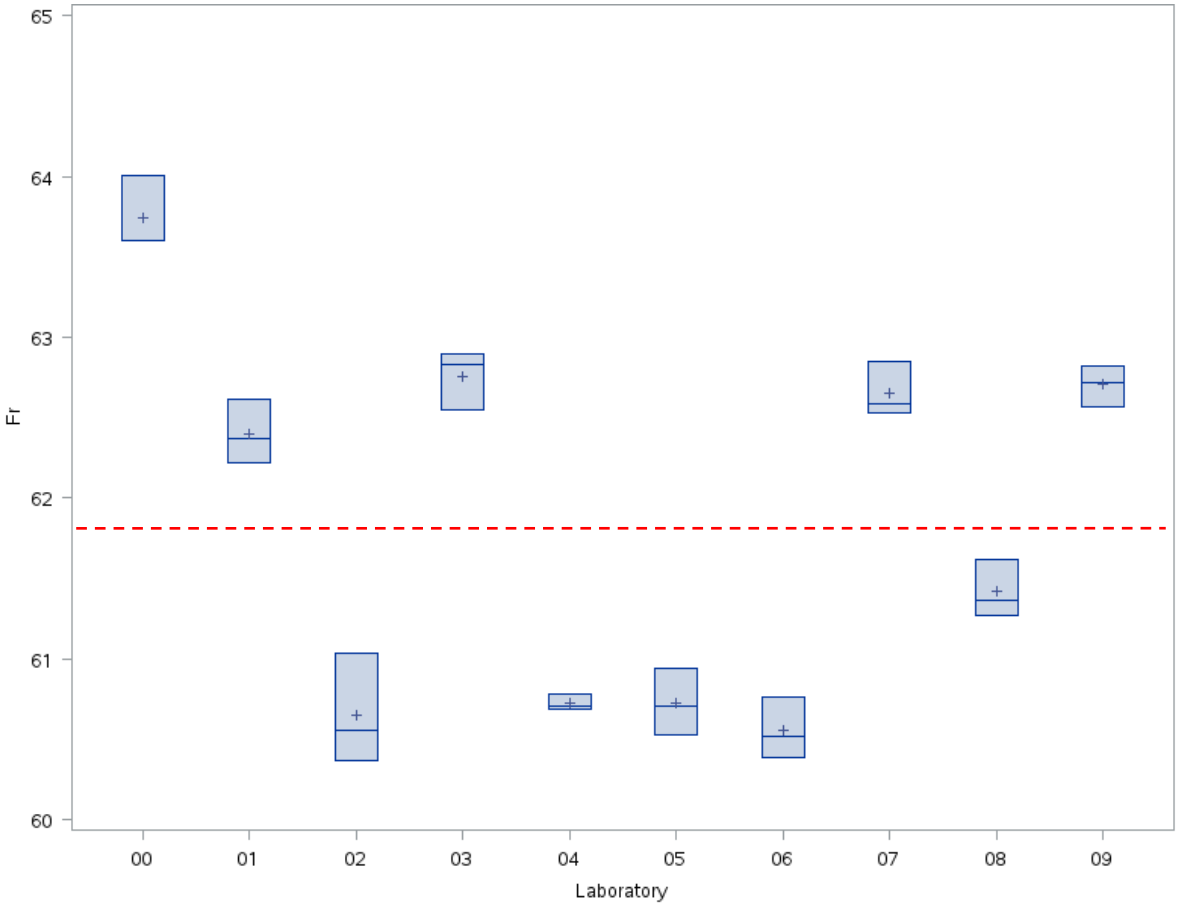
1.22. *Part of variation in percent of the laboratories on the total variation*

Variable	Fr
Variation_part_labo	96.98

1.23. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	1.905	1.091	-0.233	4.043
01	3	0.567	1.091	-1.571	2.705
02	3	-1.183	1.091	-3.321	0.955
03	3	0.924	1.091	-1.215	3.062
04	3	-1.105	1.091	-3.244	1.033
05	3	-1.110	1.091	-3.248	1.028
06	3	-1.279	1.091	-3.417	0.860
07	3	0.823	1.091	-1.315	2.962
08	3	-0.414	1.091	-2.552	1.724
09	3	0.871	1.091	-1.267	3.010

1.24. Box-plot graphics – Tyre D



3.6. Interlaboratories tests results on rolling resistance RR for C1-C2 tyres – Tyre E

1.25. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	79.562	0.362	0.455	0.723
01	3	75.884	0.253	0.334	0.507
02	3	76.187	0.056	0.074	0.113
03	3	79.059	0.459	0.580	0.917
04	3	76.732	0.125	0.163	0.250
05	3	75.864	0.125	0.164	0.249
06	3	76.347	0.049	0.064	0.098
07	3	77.223	0.146	0.189	0.292
08	3	79.645	0.117	0.146	0.233
09	3	75.824	0.129	0.170	0.258

1.26. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
79.153	79.972	4.303	78.664
75.597	76.171	4.303	75.255
76.123	76.250	4.303	76.047
78.540	79.578	4.303	77.920
76.590	76.873	4.303	76.421
75.723	76.005	4.303	75.555
76.292	76.403	4.303	76.225
77.058	77.389	4.303	76.860
79.513	79.777	4.303	79.355
75.678	75.970	4.303	75.504

Confidence_interval_T_up	Demi_amplitude_T
80.461	0.899
76.513	0.629
76.327	0.140
80.199	1.139
77.043	0.311
76.174	0.310
76.469	0.122
77.586	0.363
79.934	0.290
76.144	0.320

1.27. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	24.24	26.51
01	8.13	12.99
02	4.89	0.64
03	14.90	42.60
04	1.12	3.17
05	8.36	3.15
06	3.50	0.49
07	0.00	4.33
08	25.99	2.75
09	8.87	3.36

1.28. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	77.233
Repeatability_standard_deviat	0.222
Limit_of_repeatability	0.622
Repeatability_exp_uncertainty	0.444
Reproducibility_stand_deviat	1.588
Limit_of_reproducibility	4.445
Reproducibility_exp_uncertaint	3.175

1.29. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.58
Repro_exp_uncert_percent	4.11

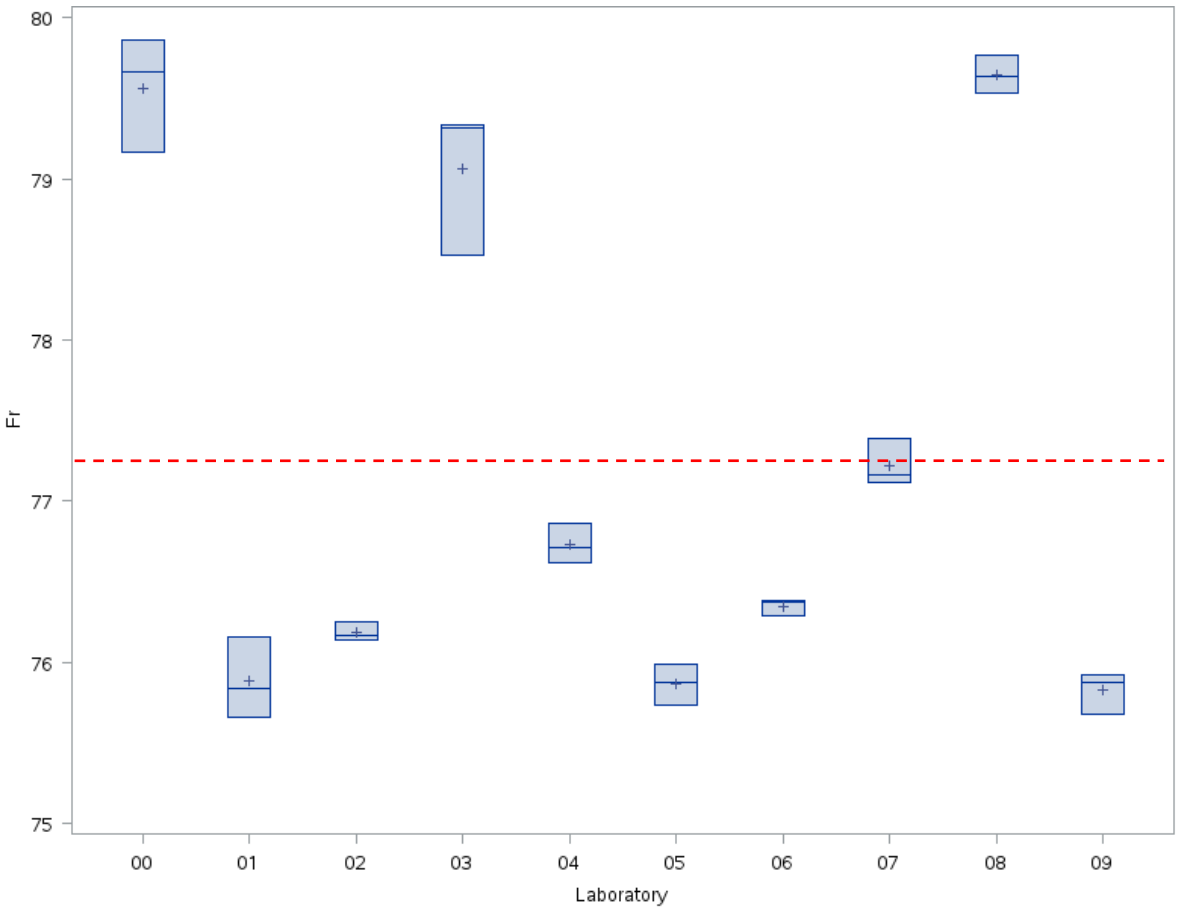
1.30. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	98.04

1.31. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	2.330	1.496	-0.603	5.262
01	3	-1.349	1.496	-4.281	1.584
02	3	-1.046	1.496	-3.979	1.886
03	3	1.827	1.496	-1.106	4.759
04	3	-0.501	1.496	-3.434	2.432
05	3	-1.368	1.496	-4.301	1.564
06	3	-0.885	1.496	-3.818	2.047
07	3	-0.009	1.496	-2.942	2.923
08	3	2.412	1.496	-0.521	5.344
09	3	-1.409	1.496	-4.341	1.524

1.32. Box-plot graphics – Tyre E



3.7. Interlaboratories tests results on rolling resistance RR for C3 tyres – Tyre F

1.33. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	159.901	0.688	0.430	1.376
01	3	160.703	0.726	0.452	1.453
02	3	164.343	0.854	0.520	1.708
03	3	160.527	0.445	0.277	0.890
04	3	159.060	0.223	0.140	0.445
05	3	167.321	0.917	0.548	1.834
06	3	163.751	0.867	0.529	1.734
07	3	166.928	1.274	0.763	2.548
08	3	162.247	0.405	0.249	0.809

1.34. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
159.123	160.680	4.303	158.192
159.881	161.525	4.303	158.898
163.377	165.310	4.303	162.222
160.024	161.031	4.303	159.422
158.808	159.312	4.303	158.507
166.283	168.359	4.303	165.042
162.769	164.732	4.303	161.597
165.486	168.370	4.303	163.763
161.789	162.705	4.303	161.241

Confidence_interval_T_up	Demi_amplitude_T
161.611	1.709
162.508	1.805
166.465	2.122
161.633	1.106
159.613	0.553
169.599	2.278
165.904	2.154
170.093	3.165
163.252	1.005

1.35. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	11.14	8.84
01	5.76	9.85
02	3.46	13.61
03	6.79	3.70
04	18.69	0.93
05	28.58	15.70
06	1.36	14.03
07	23.87	30.29
08	0.35	3.06

1.36. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	162.75
Repeatability_standard_deviat	0.772
Limit_of_repeatability	2.160
Repeatability_exp_uncertainty	1.543
Reproducibility_stand_deviat	3.086
Limit_of_reproducibility	8.640
Reproducibility_exp_uncertaint	6.172

1.37. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.95
Repro_exp_uncert_percent	3.79

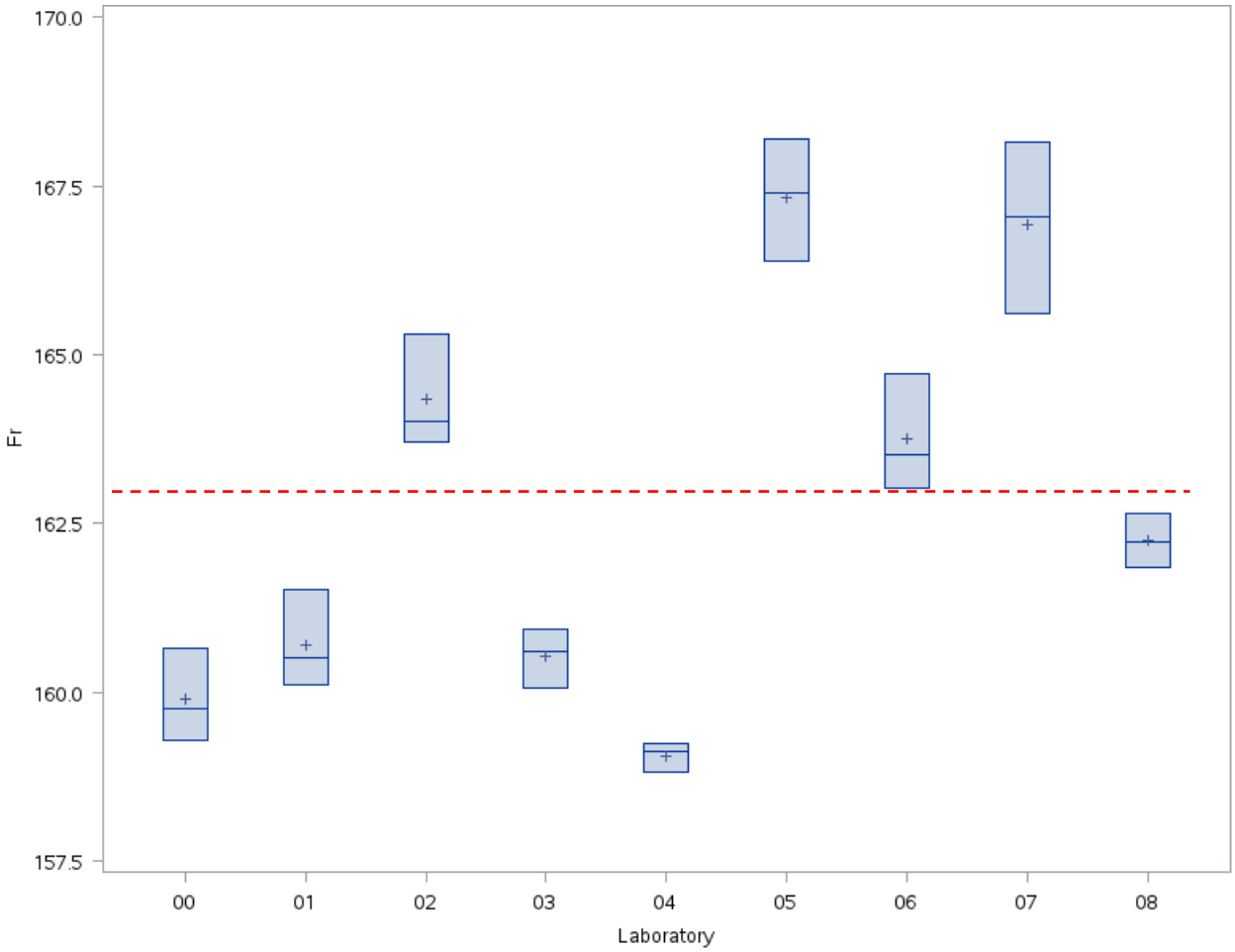
1.38. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	93.75

1.39. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	-2.852	2.848	-8.434	2.730
01	3	-2.051	2.848	-7.633	3.532
02	3	1.590	2.848	-3.992	7.172
03	3	-2.226	2.848	-7.808	3.356
04	3	-3.693	2.848	-9.276	1.889
05	3	4.567	2.848	-1.015	10.150
06	3	0.997	2.848	-4.585	6.579
07	3	4.175	2.848	-1.408	9.757
08	3	-0.507	2.848	-6.089	5.076

1.40. Box-plot graphics – Tyre F



3.8. Interlaboratories tests results on rolling resistance RR for C3 tyres – Tyre G

1.41. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	106.189	0.146	0.137	0.291
01	3	106.318	0.413	0.388	0.825
02	3	114.253	0.586	0.513	1.172
03	3	107.664	0.222	0.206	0.444
04	3	106.780	0.131	0.123	0.262
05	3	112.257	0.775	0.691	1.550
06	3	108.663	0.211	0.194	0.422
07	3	114.118	0.681	0.597	1.362
08	3	109.291	0.293	0.268	0.586

1.42. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
106.024	106.354	4.303	105.827
105.851	106.785	4.303	105.292
113.590	114.916	4.303	112.797
107.413	107.916	4.303	107.112
106.632	106.929	4.303	106.455
111.380	113.134	4.303	110.331
108.424	108.901	4.303	108.139
113.348	114.889	4.303	112.426
108.960	109.622	4.303	108.564

Confidence_interval_T_up	Demi_amplitude_T
106.551	0.362
107.343	1.025
115.709	1.456
108.216	0.552
107.106	0.326
114.183	1.926
109.186	0.524
115.810	1.692
110.019	0.727

1.43. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	13.06	1.18
01	12.07	9.48
02	26.81	19.12
03	4.02	2.75
04	8.82	0.96
05	9.01	33.45
06	0.84	2.48
07	25.31	25.82
08	0.05	4.77

1.44. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	109.50
Repeatability_standard_deviat	0.447
Limit_of_repeatability	1.251
Repeatability_exp_uncertainty	0.894
Reproducibility_stand_deviat	3.263
Limit_of_reproducibility	9.137
Reproducibility_exp_uncertaint	6.526

1.45. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.82
Repro_exp_uncert_percent	5.96

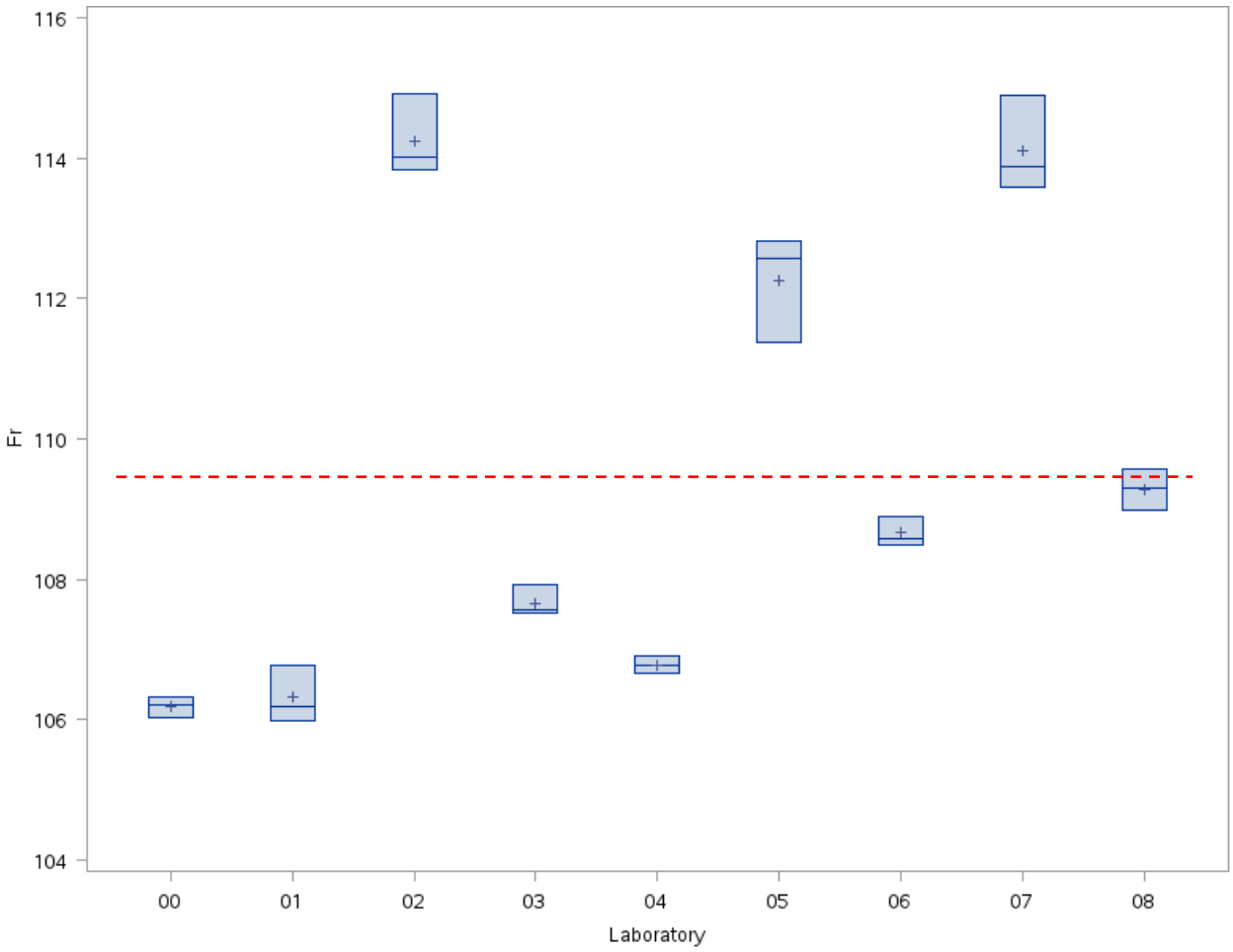
1.46. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	98.13

1.47. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	-3.315	3.057	-9.307	2.678
01	3	-3.186	3.057	-9.178	2.806
02	3	4.749	3.057	-1.243	10.741
03	3	-1.839	3.057	-7.832	4.153
04	3	-2.723	3.057	-8.716	3.269
05	3	2.753	3.057	-3.239	8.746
06	3	-0.841	3.057	-6.833	5.151
07	3	4.615	3.057	-1.378	10.607
08	3	-0.213	3.057	-6.205	5.780

1.48. Box-plot graphics – Tyre G



3.9. Interlaboratories tests results on rolling resistance RR for C3 tyres – Tyre H

1.49. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	82.527	0.225	0.273	0.450
01	3	84.975	0.293	0.344	0.585
02	3	89.614	0.409	0.457	0.819
03	3	85.081	0.147	0.172	0.293
04	3	82.948	0.162	0.195	0.323
05	3	85.731	0.711	0.830	1.423
06	3	85.499	0.358	0.418	0.715
07	3	86.370	0.612	0.708	1.223
08	3	84.817	0.083	0.098	0.166

1.50. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
82.272	82.782	4.303	81.968
84.644	85.306	4.303	84.248
89.150	90.077	4.303	88.596
84.915	85.247	4.303	84.717
82.765	83.130	4.303	82.546
84.926	86.536	4.303	83.964
85.094	85.903	4.303	84.611
85.678	87.062	4.303	84.851
84.723	84.911	4.303	84.610

Confidence_interval_T_up	Demi_amplitude_T
83.087	0.560
85.701	0.727
90.631	1.017
85.445	0.364
83.349	0.401
87.498	1.767
86.387	0.888
87.889	1.519
85.023	0.206

1.51. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	22.64	3.71
01	0.29	6.26
02	55.80	12.27
03	0.12	1.57
04	16.26	1.91
05	0.59	37.03
06	0.14	9.36
07	3.51	27.37
08	0.65	0.51

1.52. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	85.284
Repeatability_standard_deviat	0.390
Limit_of_repeatability	1.091
Repeatability_exp_uncertainty	0.779
Reproducibility_stand_deviat	2.073
Limit_of_reproducibility	5.806
Reproducibility_exp_uncertaint	4.147

1.53. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.91
Repro_exp_uncert_percent	4.86

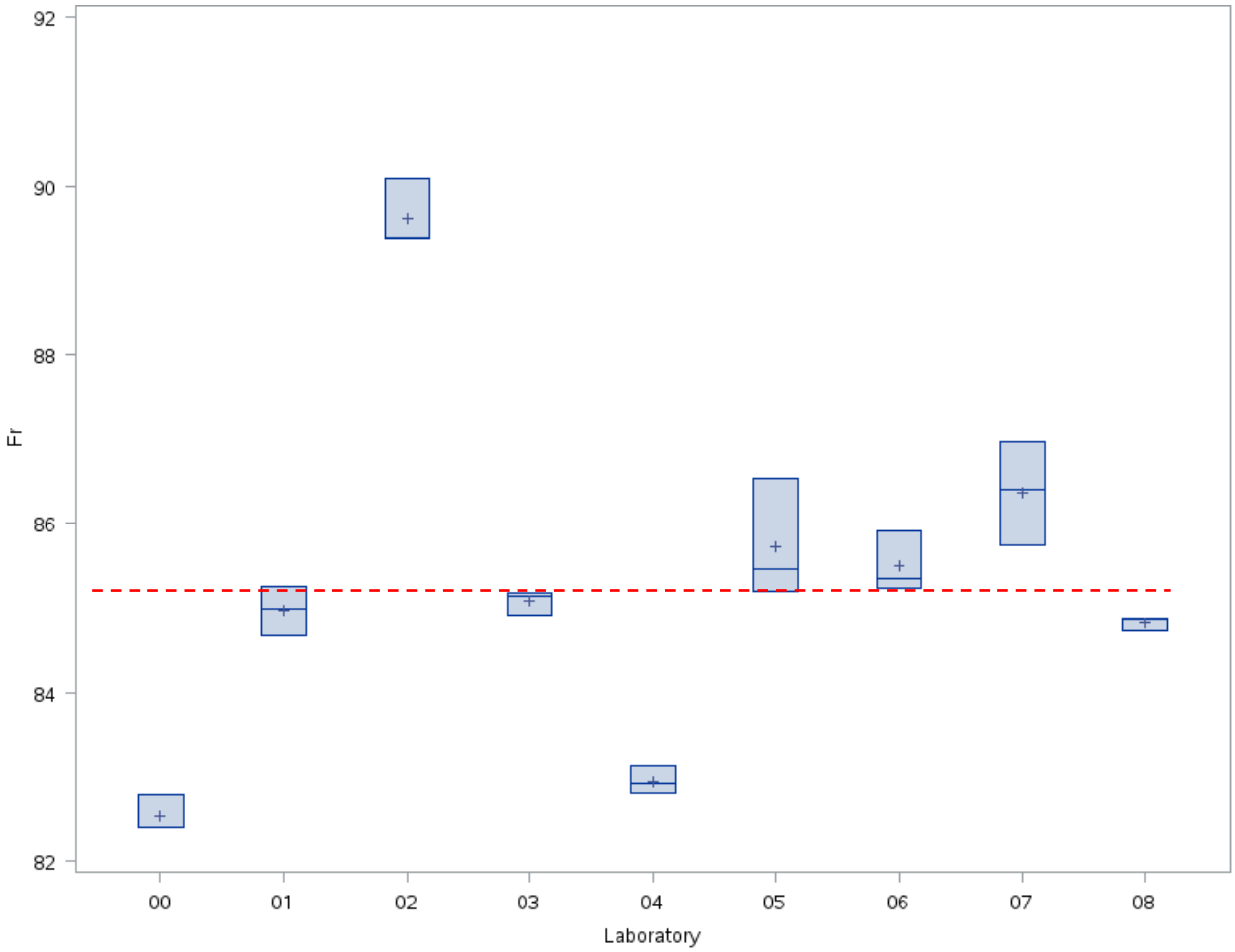
1.54. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	96.47

1.55. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	-2.757	1.932	-6.543	1.029
01	3	-0.310	1.932	-4.096	3.476
02	3	4.329	1.932	0.543	8.115
03	3	-0.204	1.932	-3.990	3.582
04	3	-2.337	1.932	-6.123	1.449
05	3	0.446	1.932	-3.340	4.233
06	3	0.214	1.932	-3.572	4.001
07	3	1.086	1.932	-2.701	4.872
08	3	-0.468	1.932	-4.254	3.318

1.56. Box-plot graphics – Tyre H



3.10. Interlaboratories tests results on rolling resistance RR for C3 tyres – Tyre J

1.57. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	128.645	0.283	0.220	0.566
01	3	131.019	0.519	0.396	1.037
02	3	135.150	0.417	0.309	0.834
03	3	131.752	0.219	0.166	0.438
04	3	130.617	0.159	0.122	0.318
05	3	136.348	0.859	0.630	1.718
06	3	131.649	0.469	0.356	0.937
07	3	134.074	0.868	0.648	1.737
08	3	130.706	0.463	0.354	0.926

1.58. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
128.325	128.966	4.303	127.942
130.433	131.606	4.303	129.731
134.678	135.622	4.303	134.114
131.504	132.000	4.303	131.207
130.437	130.797	4.303	130.222
135.376	137.320	4.303	134.213
131.119	132.179	4.303	130.485
133.091	135.057	4.303	131.917
130.182	131.230	4.303	129.556

Confidence_interval_T_up	Demi_amplitude_T
129.349	0.704
132.308	1.288
136.186	1.036
132.296	0.545
131.012	0.395
138.482	2.134
132.813	1.164
136.231	2.157
131.856	1.150

1.59. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	26.21	3.18
01	2.95	10.66
02	17.66	6.90
03	0.45	1.90
04	5.26	1.00
05	35.03	29.27
06	0.66	8.70
07	7.08	29.89
08	4.69	8.49

1.60. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	132.21
Repeatability_standard_deviat	0.529
Limit_of_repeatability	1.482
Repeatability_exp_uncertainty	1.059
Reproducibility_stand_deviat	2.505
Limit_of_reproducibility	7.013
Reproducibility_exp_uncertaint	5.009

1.61. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.80
Repro_exp_uncert_percent	3.79

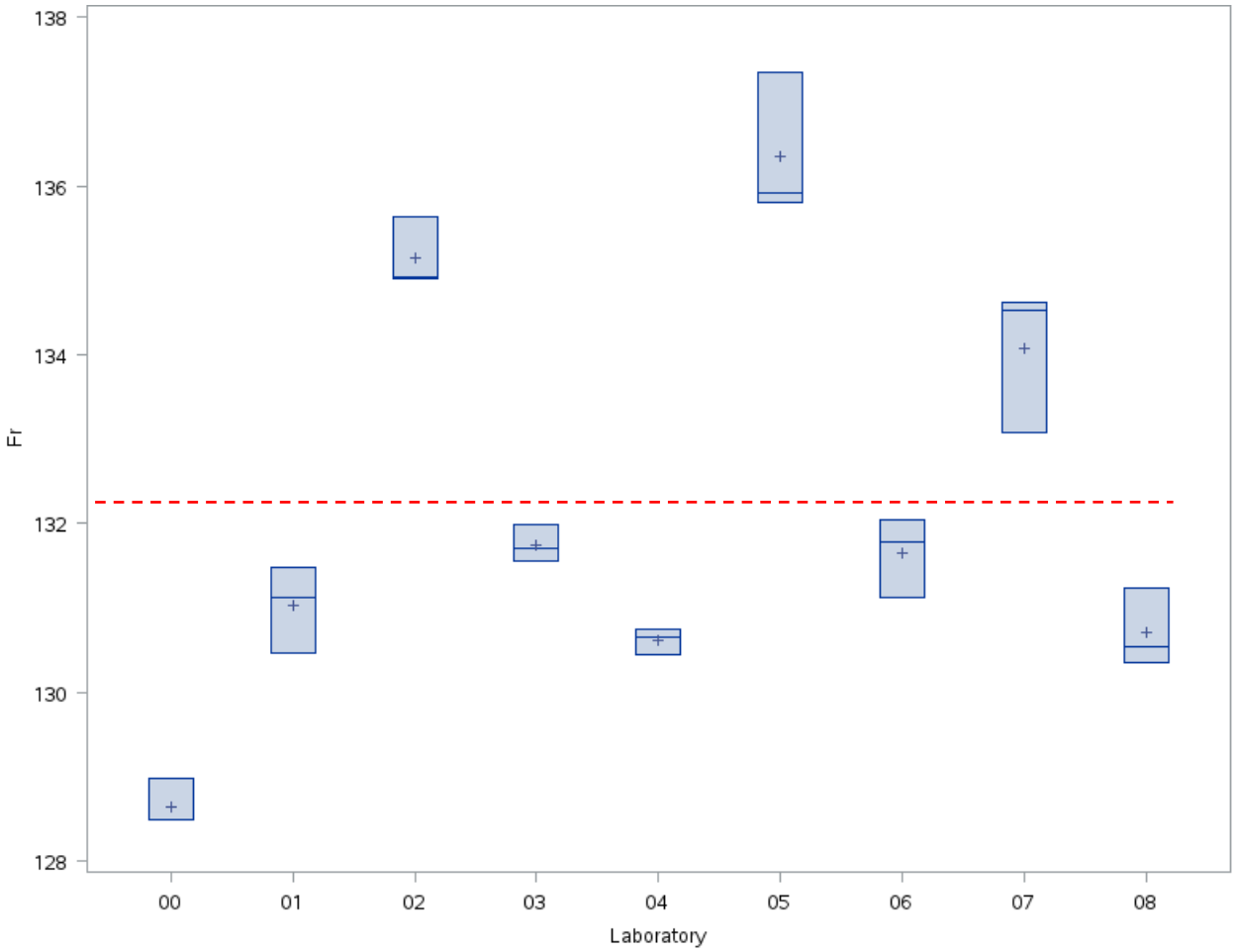
1.62. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	95.53

1.63. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	-3.573	2.326	-8.131	0.986
01	3	-1.198	2.326	-5.757	3.361
02	3	2.932	2.326	-1.626	7.491
03	3	-0.466	2.326	-5.025	4.093
04	3	-1.601	2.326	-6.160	2.958
05	3	4.130	2.326	-0.429	8.689
06	3	-0.569	2.326	-5.128	3.990
07	3	1.856	2.326	-2.703	6.415
08	3	-1.512	2.326	-6.071	3.047

1.64. Box-plot graphics – Tyre J



3.11. Interlaboratories tests results on rolling resistance RR for C3 tyres – Tyre K

1.65. Average, standard deviation, coefficient of variation in percentage, expanded uncertainty in repeatability conditions

Laboratory	N	Average	Standard_deviation	Coefficient_of_variation_perc	Repeatability_exp_uncertainty
00	3	202.369	0.459	0.227	0.918
01	3	203.409	0.937	0.461	1.875
02	3	209.449	0.696	0.332	1.391
03	3	201.057	0.640	0.318	1.280
04	3	200.395	0.589	0.294	1.178
05	3	212.396	1.302	0.613	2.604
06	3	206.051	0.969	0.470	1.937
07	3	212.405	1.497	0.705	2.995
08	3	201.982	0.624	0.309	1.248

1.66. Confidence interval of the average per laboratory at the level 95%

Confidence_interval_av_low	Confidence_interval_av_up	T	Confidence_interval_T_low
201.850	202.889	4.303	201.229
202.348	204.470	4.303	201.080
208.662	210.236	4.303	207.721
200.333	201.781	4.303	199.467
199.729	201.062	4.303	198.932
210.922	213.869	4.303	209.161
204.955	207.147	4.303	203.645
210.711	214.100	4.303	208.685
201.276	202.688	4.303	200.432

Confidence_interval_T_up	Demi_amplitude_T
203.509	1.140
205.738	2.329
211.177	1.728
202.647	1.590
201.858	1.463
215.630	3.235
208.458	2.407
216.125	3.720
203.532	1.550

1.67. Between and within contribution for the factor laboratory

Laboratory	CEi	CDi
00	5.35	2.77
01	2.39	11.57
02	8.49	6.37
03	10.77	5.39
04	14.21	4.57
05	25.90	22.32
06	0.16	12.36
07	25.98	29.52
08	6.75	5.13

1.68. Global average, results of precision values and measurement uncertainties

Variable	Fr
Global_average	205.50
Repeatability_standard_deviat	0.919
Limit_of_repeatability	2.572
Repeatability_exp_uncertainty	1.837
Reproducibility_stand_deviat	4.847
Limit_of_reproducibility	13.573
Reproducibility_exp_uncertaint	9.695

1.69. Results of measurement uncertainties in percentage

Variable	Fr
Repe_exp_uncert_percent	0.89
Repro_exp_uncert_percent	4.72

1.70. Part of variation in percent of the laboratories on the total variation

Variable	Fr
Variation_part_labo	96.41

1.71. Trueness study - Estimation and significativity of the bias

Laboratory	number of nonmissing values, Fr	Bias	Inc_bias	IC_inf_bias	IC_sup_bias
00	3	-3.132	4.515	-11.982	5.717
01	3	-2.092	4.515	-10.942	6.757
02	3	3.947	4.515	-4.903	12.797
03	3	-4.444	4.515	-13.294	4.405
04	3	-5.106	4.515	-13.956	3.743
05	3	6.894	4.515	-1.956	15.744
06	3	0.550	4.515	-8.300	9.400
07	3	6.904	4.515	-1.946	15.754
08	3	-3.520	4.515	-12.369	5.330

1.72. Box-plot graphics – Tyre K