

Status report to the 187th session of WP.29 (June 2022)

Informal Working Group on Measurement Uncertainty
(IWG MU)

IWG Measurement Uncertainties

Facts and Figures

homepage

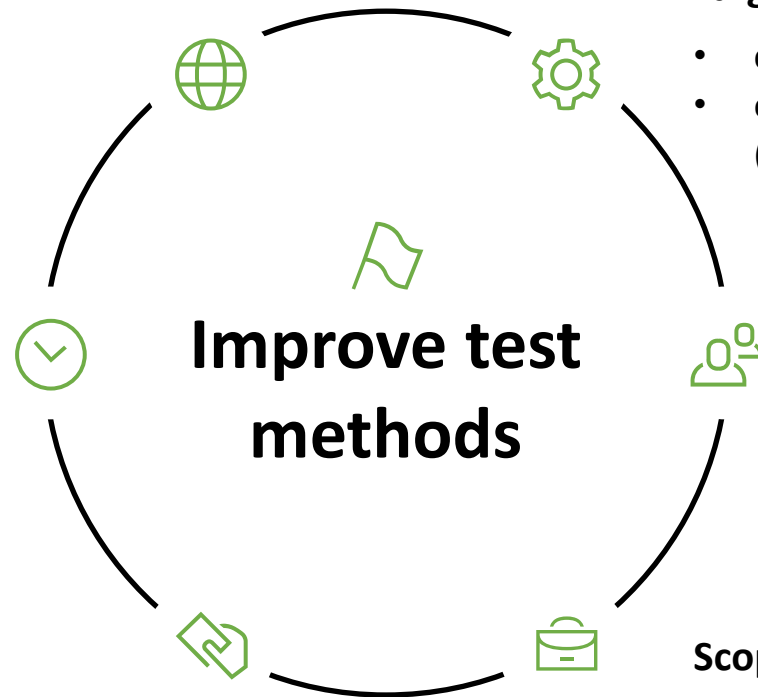
<https://wiki.unece.org/pages/viewpage.action?pageId=92012814>

Time

- established 2019
- extended mandate until September 2023

General Approach

- possible to improve test procedures for UN Regulations not only in GRBP but also for all other GRs
- documented in Consolidated Resolution on Construction of Vehicles (R.E.3) or as a Document for Reference.



Targets

- compensate systematic errors if possible
- evaluate the influence of random errors (remaining quantities)

Roles

Chair: Norway
Secretariat: OICA
CPs: China, EC, France, Germany, India, Italy, Japan, Netherlands, Russian Federation, Spain, UK

Scope on UN Regulations No. 51 & 117

- develop harmonized technical requirements for these UN Regulations of GRBP with consideration to their test protocols.
- develop a practice guide for compensation and/or correction factors.

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Main Results and Output by June 2022

UN Regulation No. 51

- Development of uncertainty budget
- Preparation of vehicle and tyres
- Temperature correction of tyres
- Test track compensation

90 %

UN Regulation No. 117

- preliminary considerations and examinations

25 %

Documents for Reference

- Working Document: General Approach to Estimate Measurement Uncertainties
- Informal Document: How to handle Measurement Uncertainties due to its Regulatory Impact?

75 %

Deliverables by June 2022

UN Regulation 51.03 Amendment 7

- [ECE-TRANS-WP29-2022-84e](#)

Document for Reference

- [ECE-TRANS-WP29-GRBP-2022-9e-rev1](#)

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Uncertainty Evaluation of UN Regulation No. 51

Situation	Input Quantity	estimated deviations of the meas. result (peak-peak)		Impact on Lurb	Probability Distribution	Variance	Standard uncertainty	Share [%]	Combined standard uncertainty	Uncertainty Budgets			95% uncertainty
		Lwot	Lcrs							Type Approval	CoP	Field Tests	
Run to Run	Micro climate wind effect	0,40	0,77	0,53	gaussian	0,02	0,131	0,8%	0,37	0,37	0,37	0,37	0,7
	Driver: Deviation from centered driving	0,50	0,50	0,50	rectangular	0,02	0,144	0,9%					
	Driver: Start of acceleration	0,50	0,00	0,33	rectangular	0,01	0,095	0,4%					
	Speed variations of +/- 1km/h	0,30	0,30	0,30	rectangular	0,01	0,087	0,3%					
	Driver: Load variations during cruising	0,00	0,50	0,17	gaussian	0,00	0,042	0,1%					
	Varying background noise	0,10	0,10	0,10	rectangular	0,00	0,029	0,0%					
Day to Day	Variation on operating temperature of engine and tyres	1,20	0,50	0,96	rectangular	0,08	0,278	3,4%	0,79	0,39	0,79	0,79	1,6
	Barometric pressure (Weather +/-30 hPa)	0,60	0,00	0,40	gaussian	0,01	0,099	0,4%					
	Air temperature effect on tyre noise (5-10°C)	1,00	2,00	1,34	rectangular	0,15	0,387	6,6%					
	Air temperature effect on tyre noise (0-40°C)	1,00	2,00	1,34	rectangular	0,15	0,387	6,6%					
	Varying background noise during measurement	0,60	1,00	0,74	rectangular	0,05	0,212	2,0%					
	Air intake temperature variation	1,50	0,00	0,99	rectangular	0,08	0,286	3,6%					
Site to Site	Residual humidity on test track surface	0,70	1,00	0,80	rectangular	0,05	0,231	2,3%	1,45	0,73	1,45	1,45	2,9
	Altitude (Location of Test Track) 100 hPa/1000m	1,00	0,00	0,66	rectangular	0,04	0,191	1,6%					
	Test Track Surface	3,50	5,00	4,01	rectangular	1,34	1,157	58,7%					
	Microphone Class 1 IEC 61672	1,00	1,00	1,00	gaussian	0,06	0,250	2,7%					
	Sound calibrator IEC 60942	0,80	0,80	0,80	gaussian	0,04	0,200	1,8%					
	Speed measuring equipment continuous at PP	0,07	0,13	0,09	rectangular	0,00	0,026	0,0%					
Vehicle to Vehicle	Acceleration calculation from vehicle speed measurement	0,50	0,00	0,33	rectangular	0,01	0,095	0,4%	1,55	1,55	1,55	3,1	
	Production Variation Tyre and aging of tyres	0,75	1,00	0,83	gaussian	0,04	0,209	1,9%					
	Production Variation in Power	0,40	0,40	0,40	rectangular	0,01	0,115	0,6%					
	Battery state of charge for HEVs	0,00	0,00	0,00	rectangular	0,00	0,000	0,0%					
	Production Variability of Sound Reduction Components	1,10	0,00	0,73	gaussian	0,03	0,182	1,4%					
Impact of variation of vehicle mass	1,60	1,60	1,60	rectangular	0,21	0,462	9,4%						

Coverage Factor
k=2 (95%)

Overall Combined Uncertainty +/-	Expanded uncertainty (95%) +/-
1,55	3,11

Type Approval	CoP	Field Tests
1,1	3,8	4,6

Uncertainty Evaluation

- A table of the contribution of each of the quantities to the overall measurement uncertainties has been established.
- The quantities have been grouped into categories:
 - Run-to-run
 - Day-to-day
 - Site-to-site
 - Vehicle-to-vehicle
- For each of these groups, the impact on the overall pass-by noise level (L_{urban}) has been established (based on experience & measurements or theoretical calculations).
- The combined uncertainty is calculated for each category separately, and an "uncertainty budget" is shown for each of these categories:
 - Type-Approval,
 - COP and
 - Field Tests (vehicles in use).

Run to run	Variations expected within the same test facility and slight variations in ambient conditions found within a single test series
Day to day	Variations expected within the same test facility but with variations in ambient conditions and equipment properties that can normally be expected during the year
Site to site	Variations between test facilities where, apart from ambient conditions, equipment, staff, and road surface conditions are different
V to vehicle	Variations of vehicles

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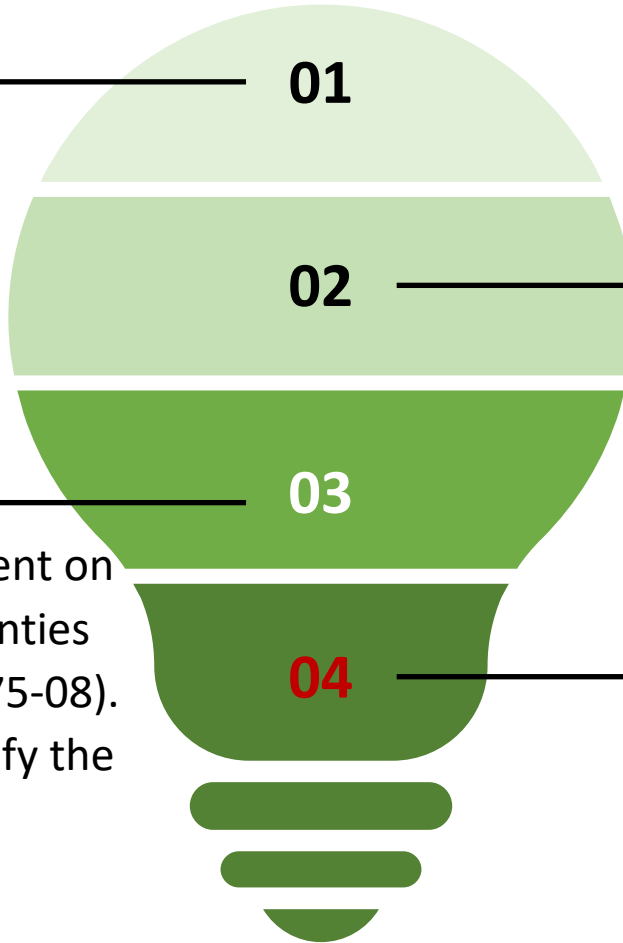
Status and Next Steps

01 Results of Investigations

IWG MU has worked on the measurement uncertainties of UN Reg. No. 51 and will continue to do so for No. 117 (tyre rolling sound).

03 Implementation of Results

IWG MU presented an Informal Document on "How to handle Measurement Uncertainties due to their regulatory impact" (GRBP-75-08). The main topic of this paper was to notify the missing link between the DfR and its implications for UN Regulations.



02 General Approach

IWG MU has developed the Document for Reference (DfR): A general approach how to handle measurement uncertainties.

04 Amendment of Procedure

IWG MU will amend the Document for Reference (DfR) with the Implementation Procedure to UN Regulations
in the 76th GRBP (Sept. 2022)
and 189th WP.29 (Mar. 2023)

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PROPOSED Implementation Procedure



Investigation of Measurement Uncertainties

Direct Implementation to Regulations

Recommended Procedure

- Table of uncertainties should be attached as an annex to every regulation that deals with measurements
- Everytime a regulation will be amended according to the test methods the “Annex of Measurement Uncertainties” should be updated, too.
- If there is up to now no “Annex of Measurement Uncertainties” available, this should be added within the next amendment of this regulation.

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Conclusion & Discussion

- ✓ This procedure was endorsed by GRBP in 75th session.
- 🖥️ Presentation to 187th session of WP.29 was recommended:
“Potential to overtake this approach to other GRs?”
- ❓ Ask for comments and feedback of WP.29.



Thank you for your attention!

