



Possibility of “Pass-by-Light” Noise- measurement of vehicles of Category L

„Pass-by-Light“-Test : PbL-Test

Background: Stationary Noise

Stationary Noise Measurement & Values were established > 50 years !

Intention was:

If Noise in Motion is too loud, Stationary Noise is also higher !

If Stationary Noise is measured as too loud, you know that Noise in Motion is also higher than Type Approval Value and/or Limit Value!

Worked well for PTI- and Road-side-checks of L-Cat.-vehicles for e.g.:



Wrong silencers



Racing Silencer



**Mechanical
Manipulations**

**Stationary Noise Measuring does not entirely reflect
measure the driving noise of manipulated motorcycles,
due to vehicle technology changes !**



Extremely modified gear ratio



Mechanical variable flap systems



Remote control of flap systems



Intelligent steered flap systems



**Soundgenerator
(may be in future?)**

UN-R 41.04 Annex 3 Paragraph 3

3.1 *A test procedure for in-use compliance tests may be defined by a Contracting Party, taking due account of any differences from the test conditions used at type-approval.*

3.2 Therefore UN-R41.04 approved motorbikes has to show on a sticker:



- (a) **Gear (i)** (or gear selector position of vehicles tested “non-locked”),
- (b) Pre-acceleration length I_{PA} [m],
- (c) Average vehicle speed at V_{AA} [km/h] for tests in gear (i); and
- (d) Sound pressure level $L_{wot,(i)}$ [dB(A)] in gear (i).

The Study German has done should find out:

- **if it is possible to measure UN-R41.04 approved bikes with “road-side-check equipment”,**
- **taking into account all differences to Annex 3 measurements.**

Therefore 12 motorbikes were tested:

- Original (not modified; Series/Standard)
- With NORESS
- With manipulated OEM- or NORESS

N o.	Manu- facturer	Type	Commercial Name	Additional measured loud conditions
1	Kawasaki	EN650A	Vulcan S	---
2	Kawasaki	LE650E	Versys 650 ABS	---
3	Kawasaki	ER300A	Z300	NORESS Variant B
4	Triumph	V201	Explorer	NORESS Variant A
5	Triumph	DE01	Thruxton	NORESS Variant B
6	BMW	R12WR	R 1200 RS	NORESS Variant A and C
7	Yamaha	RN45	MT-10	OEM silencer (fixed flap)
8	Yamaha	RM14	MT07 Tracer	---
9	Ducati	AA	Multistrada 1200 S	---
10	Ducati	MA	Monster 1200 R	NORESS Variant A
11	Ducati	BA	Hypermotard 939	---
12	Ducati	GA	Xdiavel	---

NORESS A
SLIP-On 1-1; Flap System
fixed wide open !



NORESS B
SLIP-On; 1-2; 2 dB-
Eaters; One Removed!



**Manipulation of
OEM-Flap System:**

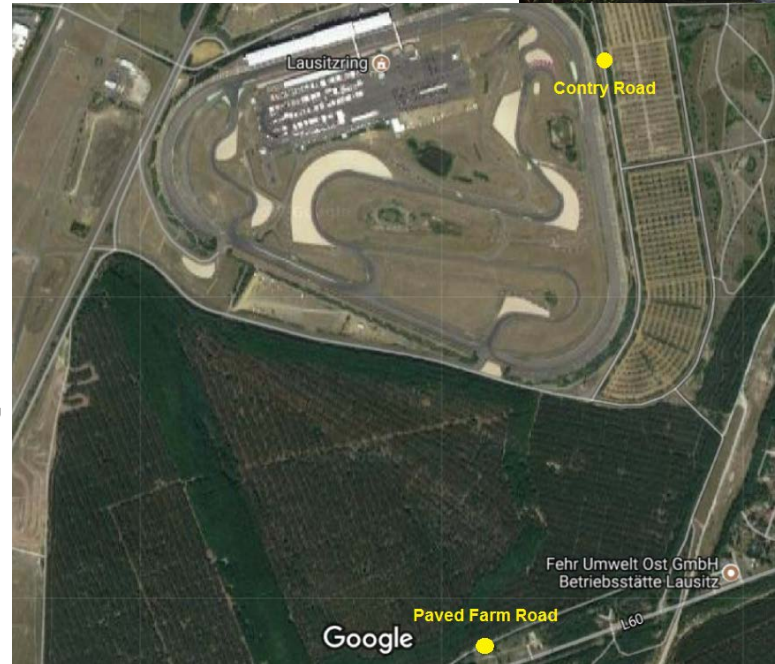


NORESS C
SLIP-On; 1-1; Approved
to BMW R 1200 RS!



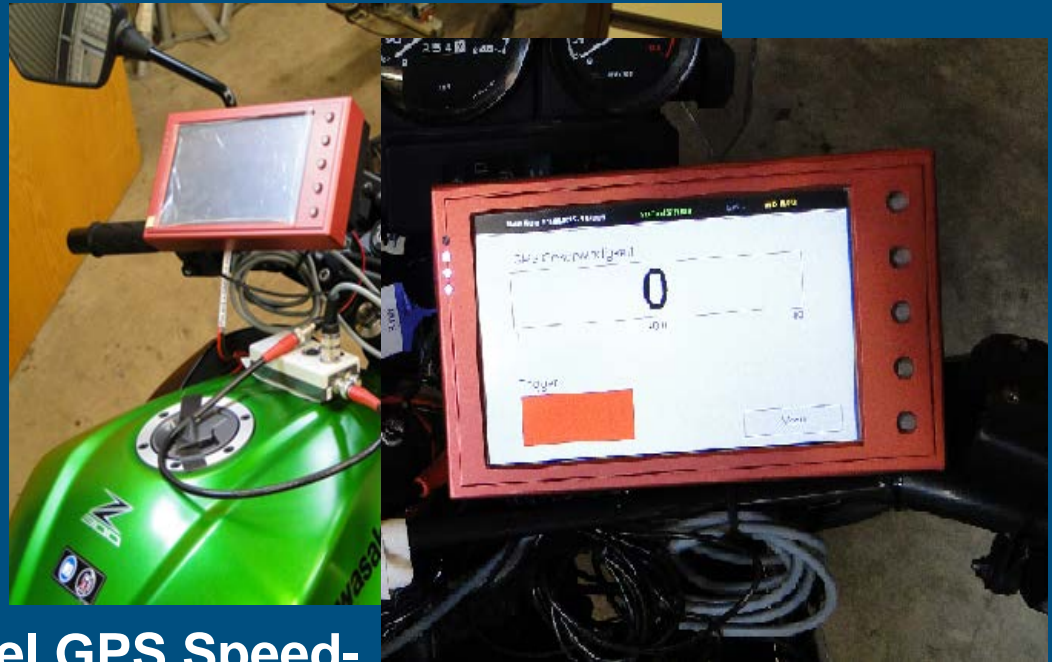
Tests carried out under:

- Annex 3 conditions
(ISO-Test-track, Annex 3 equipment)
- “country road”
with a full two lane cross-section
- "a paved farm road"



Equipment & Tolerances

High Level GPS Speed-Measurement (Price about 7000,-€)



Low Level GPS Speed-Measurement (Price about 100,-€)

Precision Sound Level Meter/Calibration (UN-R 41.04 Annex 3 Par. 1.1.1)

Weather Conditions (Temp., Air Humidity, Wind-Speed) measured by mobile instruments

Average of 5 Measurements per side; $L_{wot} - 1 \text{ dB(A)}$,
Diff. $L_{wot} \leq 2 \text{ dB(A)}$; V_{AA} : $\pm 1 \text{ km/h}$ to Sticker Value



Measured Values

Motorcycle	Ducati Multistrada 1200 S D Air		Ducati Xdlavel		Yamaha MT07		Kawasaki Z300		Yamaha MT10		Kawasaki Versys		Triumph Explorer XCA		Kawasaki Vulcan S		BMW R 1200 RS		Ducati Hypermotard 939		Ducati Monster 1200 R		Level dB(A)
	A	B	Standard	Standard	Standard	RESS	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	
1	80.1	80.1	80.1	81.1	76.3	74.0	74.0	78.3	78.3	78.3	78.5	78.3	78.3	81.4	81.4	76.1	76.1	82.0	82.0	78.0	80.0	80.0	80.0
2	85.2	79.9	80.1	76.2	89.6	74.5	89.6	78.2	80.6	79.3	79.3	78.2	80.6	84.1	81.9	80.8	87.6	82.2	79.2	89.6	89.6	82.6	82.6
3	5.1	-0.2	-1.0	-0.1	15.6	0.5	15.6	-0.1	2.3	0.8	0.8	-0.1	2.3	2.7	0.5	-0.7	5.6	0.2	1.2	9.6	9.6	2.6	2.6
4	85.6	80.8	81.4	76.4	89.0	75.3	89.0	78.2	81.3	79.6	79.6	78.2	81.3	84.9	83.0	81.8	88.6	82.6	79.7	89.9	89.9	84.0	84.0
5	0.4	0.9	1.3	0.2	-0.6	0.8	-0.6	0.0	0.7	0.3	0.3	0.0	0.7	0.8	1.1	-0.7	1.0	0.4	0.5	0.3	0.3	1.4	1.4
6	5.5	0.7	0.3	0.1	15.0	1.3	15.0	-0.1	3.0	1.1	1.1	-0.1	3.0	3.5	1.6	0.3	6.6	0.6	1.7	9.9	9.9	4.0	4.0
7	83.9	79.7	80.0	74.9	88.8	73.3	88.8	77.4	78.8	78.3	78.3	77.4	78.8	83.0	81.2	81.0	87.3	81.4	78.3	88.7	88.7	82.0	82.0
8	-1.3	-0.2	-0.1	-1.3	-0.8	-1.2	-0.8	-0.8	-1.8	-1.0	-1.0	-0.8	-1.8	-1.1	-0.7	0.2	-0.3	-0.8	-0.9	-0.9	-0.9	-0.6	-0.6
9	3.8	-0.4	-1.1	-1.4	14.8	-0.7	14.8	-0.9	0.5	-0.2	-0.2	-0.9	0.5	1.6	-0.2	-0.5	5.3	-0.6	0.3	8.7	8.7	2.0	2.0
1 L _{wot} TA (type approval)			4 maximum value country road						7 maximum value paved farm road														
2 max. value ISO-test track			5 diff. ISO to max. value country road						8 diff. ISO to max. value paved farm road														
3 difference ISO to TA-value			6 diff. TA to max. value country road						9 diff. TA to max. value paved farm road														

Table 3 Measured values

Analysis and Results of PbL-Test measurements

Speed-Tolerance V_{AA} , of ± 1 km/h is feasible for the driver and equipment

Speed-Tolerance V_{PP} , of ± 2 km/h produces same level SPL-Values

Mass-Tolerances of Vehicle & Driver up to 6% of MRO has no influence

Measured SPL Country-Road doesn't differ more than +1,4 / -0,7 dB(A) to ISO
(higher values caused by minimally reflecting hill)

Measured SPL Paved-Farm-Road doesn't differ more than -0,1 / -1,3 dB(A) to ISO
(lower values caused by sound absorbing influence of trees soft soil beside driving lane)

“High- & Low-Level GPS-Speed-Measurement-Equipment” is OK for PbL-Tests

Conclusion

Significantly noisier L-Cat-Vehicles can easily be identified by PbL-Test

If driving lane shows

-similarity to ISO-track (e.g. surface layer, evenness, longitudinal gradient ...)

-but deviation from cross-section (width, evenness, roadside vegetation)

the PbL-Test can be used for motorbikes.

Sound Level Increment

For the PbL-Test Final Result + 5 dB(A) should be added to the

Sticker-SPL-Level to come to the classification OK or Not-OK.

The Increment of + 5 dB(A) consists by the Surcharges

- Influences caused by alternative test section + 1dB(A)
 - Influences caused by different Vehicle test speed + 1dB(A)
 - Influences caused by different Vehicle MRO incl. Driver + 1dB(A)
 - Serial production spread of the vehicle + 1dB(A)
 - Influences caused by aging of vehicle & its components + 1dB(A)
-
- Total + 5 dB(A)**

Example:



Sticker value $L_{wot(i)}$ 82 dB(A) means that 87 dB(A) as a final result during PbL-Test would be the highest value which will be accepted as OK !

[82 dBA) + 5 dB(A) PbL-Increment]

87 dB(A) in general also means the highest accepted final result during PbL-Test of vehicles which have an 77 dB(A) Annex 3 L_{urban} Limit Value !

[77 dB(A) + 5 dB(A) because of 6.2.3 + 5 dB(A) PbL-Increment]

Germany wants to establish a national PbL-Test-directive for UN-R 41.04 approved motorbikes and its NORESS for Road-Side-Checks and PTI in the future.

Thanks for your attention!