

Results of the CP-Meeting 26. April 2017 in Amsterdam

Participants:

B. Frost (UK) – Chairman

H. Kubota (J)

T. Kojima (J)

P. Dietz (NL)

J. Stokreef (NL)

A. Gunneriusson (SE)

O. Bartels (D)

P. Teyssier (OICA)

B. Bereczki (OICA)

H. Hunold (CLEPA)

J. Schaefer (CLEPA)

By phone:

M. Lee (ROK)

D Lescail (F) (partly)

Guest:

Prof. Martens (TNO)

The target of the meeting was to understand boundary conditions of radar sensors to detect rear vehicles,

with regard to:

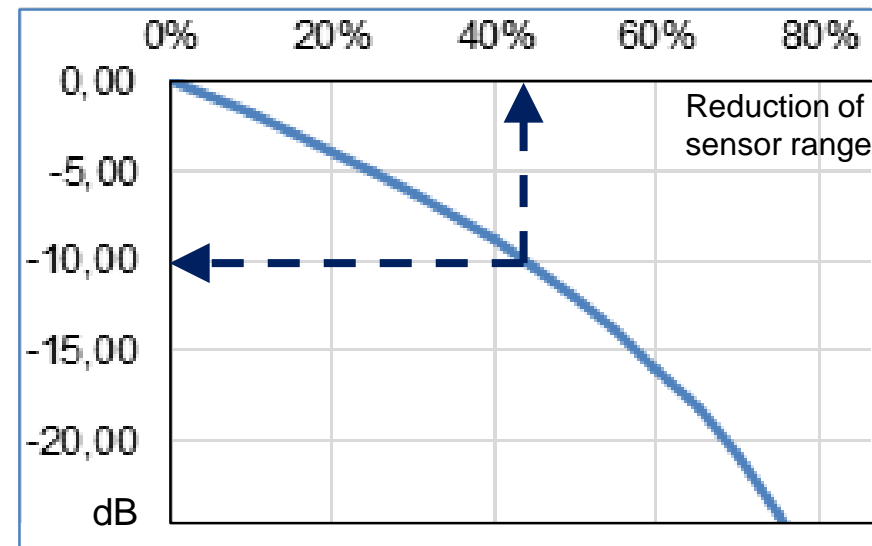
- Physical/technical limitations
- Legal restrictions (transmitting power)

Physics:

The range of a radar sensor is affected by different physical factors, which are measured in [dB]

- Radar reflection performance of the vehicle
- Vehicle integration
- Tolerance and ageing of components
- Environmental conditions (rain, snow, dirt etc.)

This leads to a reduction of the sensor range!



Physics:

Radar reflection performance of the vehicle

Vehicle integration

Tolerance and ageing of components

Environmental conditions (rain, snow, dirt etc.)

Typical* Radar Cross Section values:

Passenger car: ~ 10 dBm²

Motorcycle: ~ 5 dBm²

(Pedestrian: ~ 1 dBm²)

*: Reflection value may vary due to design of the vehicle („stealth design“)

Radar reflection performance of the vehicle

Vehicle integration

Tolerance and ageing of components

Environmental conditions (rain, snow, dirt etc.)

Sensor integration behind the bumper (especially at rear sensors) has a strong influence on the sensor range.

Especially metallic paintings have a attenuation of up to 10 dB on the signal

Comments of CPs:

This should be considered by the vehicle manufacturer by using a integration in the vehicle without or with only limited attenuation.

A reduced sensor distance because of „design“ issues (e.g. colour) is not acceptable

Radar reflection performance of the vehicle

Vehicle integration

Tolerance and ageing of components

Environmental conditions (rain, snow, dirt etc.)

Radar sensors are high precision components.

Production/integration tolerances and „aging“ effects may lead to a performance reduction of $\sim 4,5$ dB.

Comments of CPs:

The CPs understood this impact on the sensor performance.

What is about maintenance/repair, when the performance is reduced?

Does the sensor detect, when a certain reduction of the performance is reached?

Physics:

Radar reflection performance of the vehicle

Vehicle integration

Tolerance and ageing of components

Environmental conditions (rain, snow, dirt etc.)

The sensor range of a radar sensors is affected by weather conditions and contamination. Especially rain, snow and ice can reduce the sensor performance. The sensor is detecting this „blindness“, but need a certain threshold. The value for this is ~ 5dB.

Comments of CPs:

The CPs understood this impact on the sensor performace.

Does the sensor detect, when a certain reduction of the performance is reached?

How can this be tested, as the normal test will be performed at „good weather“.

Legal restrictions (transmitting power)

	Harmonized EU standard	Transmit power	Range (no bumper)	Status	International recommendation
76-77 GHz	ETSI EN 301 091	EU, US, China: 50 dBm	150m?	Worldwide coverage	vehicle usage Front
77-81 GHz	ETSI EN 302 264	EU: -9dBm/MHz JPN: 45dBm	30-100m > 150m	Status 2017 > EU, RUS, JPN	vehicle usage Side/Rear

Comments of CPs:

As this is not clear what the „recommendation“ means, this should be clarified with EC. (B. Frost and H. Hunold)

Sensor range discussion:

- Several CPs expect a sensor range of ~60-80m.
- Industry focus on the minimum requirements and not on „typical“ values.

Proposal from Industry to calculate the minimum sensor range:

Value (best) incl simple bumper		70 m
-10% for test		63 m
ageing	3dB	
Environment	4dB	
Bumper	- dB	
Sum	7dB	-34%
		41,58 m

**Not finally
concluded!**