

Workshop on “Normal Conditions of Use”

Contribution by VDA Germany (OICA member)

EMC working group

May 2023, V1

Introduction

The Joint Research Center of the European Commission presented a proposal to change the operating condition for the emission test on vehicles. This proposal is described in several documents presented to GRE IWG EMC:

- IWG-EMC-31-07e (JRC) MaSu_UNECE R10_v08_Sept 2022_Final.pdf
 - Presentation about several measurement results changing the constant speed against some drive conditions, including several constant speeds, acceleration and deceleration.
- IWG-EMC-32-07 (JRC) MaSu_UNECE_R10_GRE_2022.pptx
 - Final presentation including conclusions and suggestions to change the operating condition in the UN ECE R10 for the emission test on vehicles.
- IWG-EMC-35-05e (JRC) Proposal of EC JRC_Normal_Conditions.pptx
 - Proposal to change the UN ECE R10 based on the measurements done by JRC and conclusions.

Operating conditions

- Operating conditions:
 - UN ECE R10.06 (CISPR 12) measurement method:
 - IDLE for combustion engines and
 - 40 km/h for electric engines.
 - Measurement method from the JRC study:
 - constant driving: 40, 60, 80, 100 and 120 km/h,
 - 0-40-0 km/h acceleration in 10 s and highest regenerative braking power,
 - 0-120-0 km/h acceleration in 30 s highest regenerative braking power,
 - stepped driving 40, 60, 80, 100 and 120 km/h and highest braking and
 - random driving profile up to 120 km/h.
- The JRC from the EC proposed to include an undefined operating condition for the emission test, that need to be agreed between technical service and vehicle manufacturer.

Measurements by Vehicle Manufacturer 1

Steady state: influence of the speed

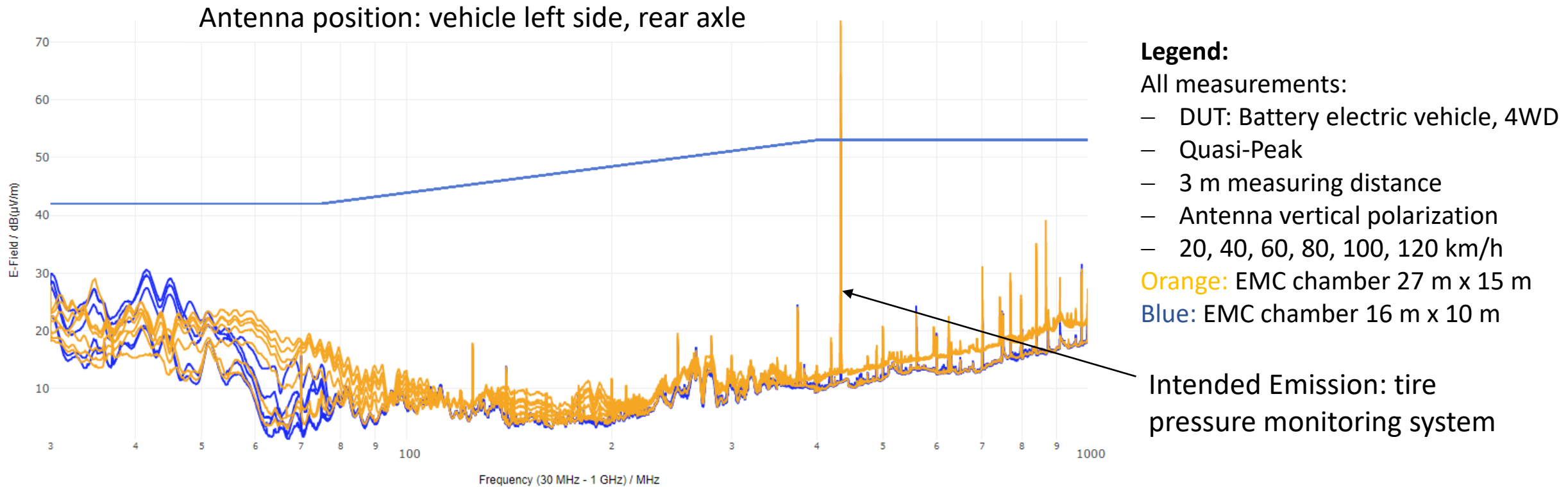
The table shows the difference in the measurement results of an electric vehicle with the speed.

- The margin to the limit decreases with the speed, until an ESD phenomena happened at 120 km/h.
- Nothing in the measurement result induces to believe there is a problem without a thorough investigation.
- This problem is an artefact produced by the chamber and is not representative of the vehicle behavior on the street.
- The chamber complies with UN ECE R10 requirements.

Test number	Speed	Operating condition	Result	Margin to limit (QP)	Note
1	40 km/h	UN ECE R10.06	✓	-10,0 dB	
2	60 km/h	Normal Conditions of use	✓	-10,1 dB	
3	80 km/h	Normal Conditions of use	✓	-9,3 dB	
4	100 km/h	Normal Conditions of use	✓	-7,7 dB	
5	120 km/h	Normal Conditions of use	✗	2,1 dB	ESD problem on the chamber
6	120 km/h	Normal Conditions of use	✓	-6,7 dB	Wheel humidified

Measurements by Vehicle Manufacturer 2

Steady state: comparison of two EMC chambers



Conclusion:

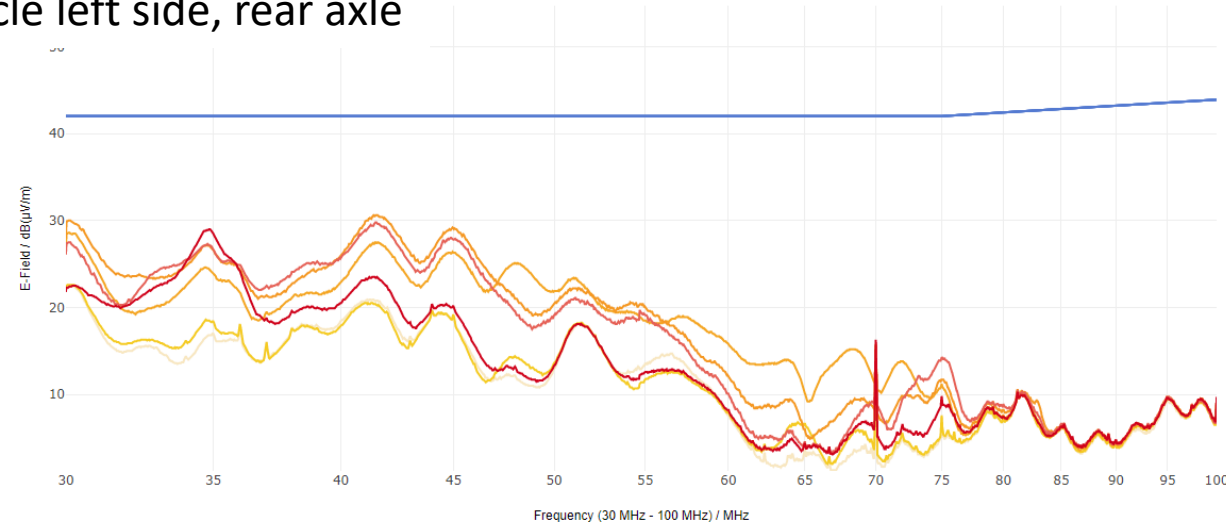
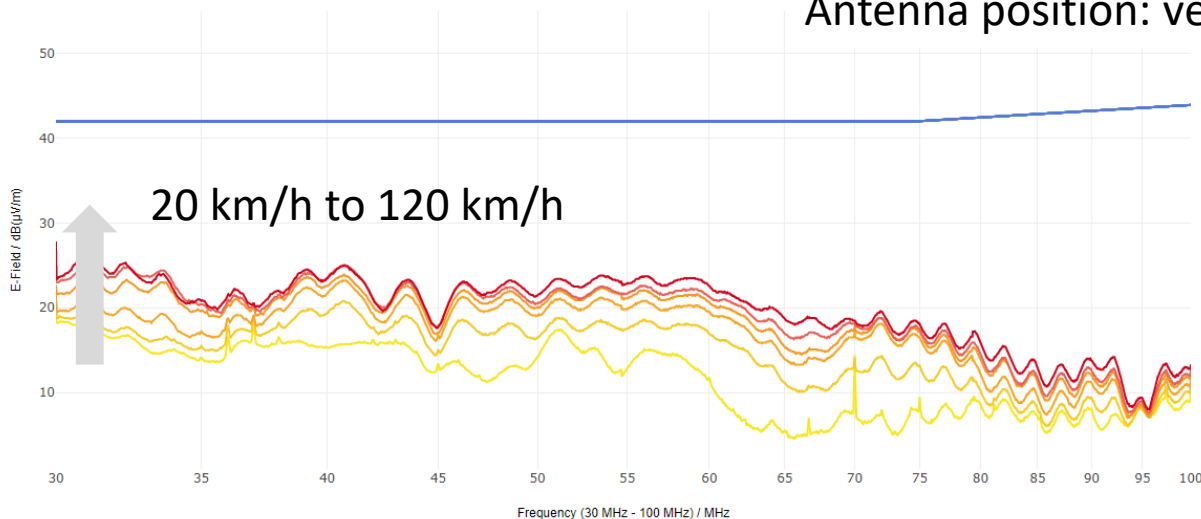
- High deviation between two EMC chambers / dynamometers in the frequency range 50 to 100 MHz.
- Both chambers fully comply with UN ECE R10 (CISPR 12) requirements.

Steady state: comparison of two EMC chambers

EMC chamber 27 m x 15 m

EMC chamber 16 m x 10 m

Antenna position: vehicle left side, rear axle



Legend:

All measurements:

- DUT: Battery electric vehicle, 4WD
- Quasi-Peak
- 3 m measuring distance
- Antenna vertical polarization
- 20, 40, 60, 80, 100, 120 km/h

Conclusion:

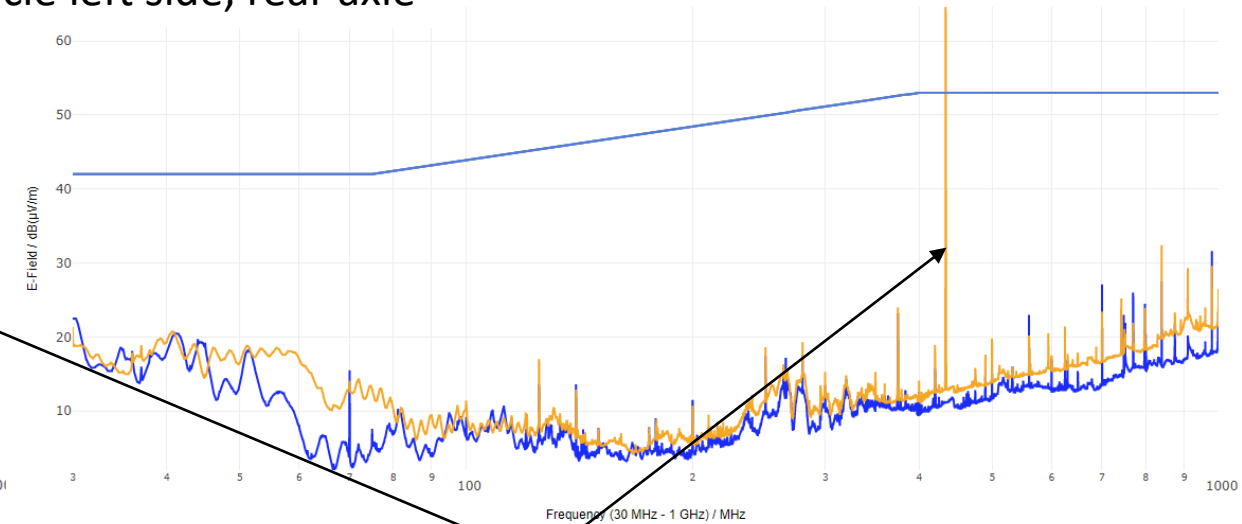
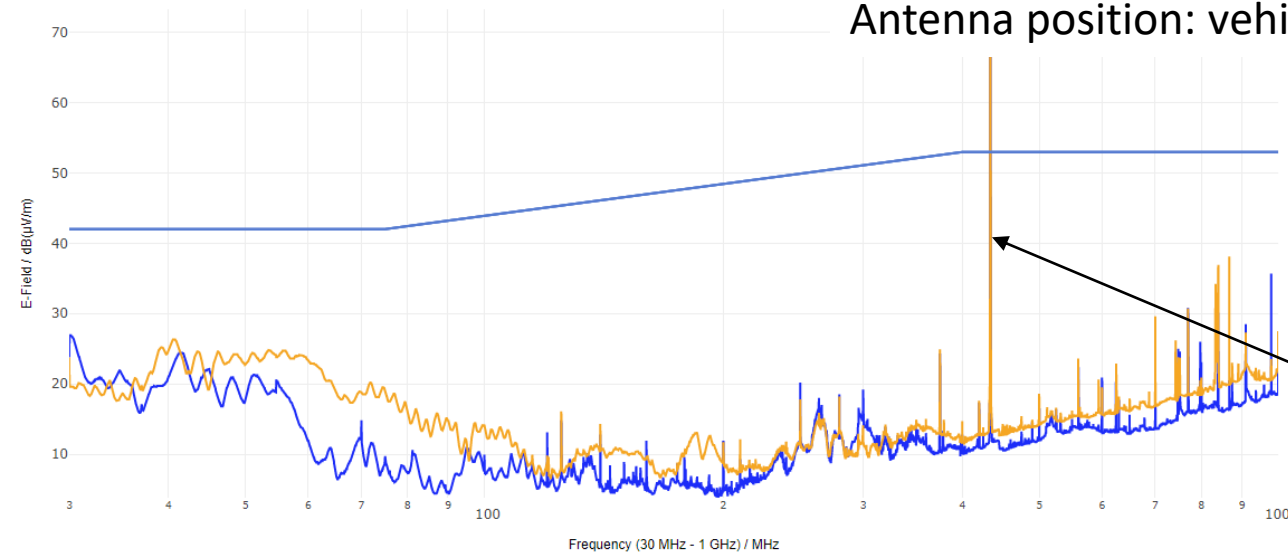
- In most cases increase of the speed will lead to higher emission.
- The dynamometer can be the root cause for higher emission.
- Higher emission limit is tolerable for higher speed, because interferer is present for a very short period of time.
- Measurements at higher speed do not provide added value.

Comparison: Dynamic driving condition – 40 km/h

Dynamic driving condition: 0-40-0 km/h

Steady state 40 km/h

Antenna position: vehicle left side, rear axle



Legend:

All measurements:

- DUT: Battery electric vehicle, 4WD
- Quasi-Peak
- 3 m measuring distance
- Antenna vertical polarization

Orange: EMC chamber 27 m x 15 m

Blue: EMC chamber 16 m x 10 m

Intended Emission: tire pressure monitoring system

Conclusion:

A dynamic driving condition does not lead to higher emission in general, but measurements are time consuming and difficult to reproduce.

Conclusion

VDA supports the OICA position: “IWG-EMC-36-05 (OICA) comment_JRC on normal condition of use”.

with the following comments:

- Additional measurements have shown several artefacts on dynamometers and measurement chambers. These artefacts were induced by the change of the stable operating conditions.
- Disregarding the ESD artefact already explained in this presentation, other artefacts can be found in different chambers, which comply to the requirements of UN ECE R10 (CISPR 12) for semi-anechoic chambers.
- Test procedure shall be applicable for all types of vehicles, not only passenger cars.
- In general the task to find new operating modes shall be transferred to CISPR D committee for evaluation on future versions of the CISPR 12 as a reference for UN ECE R10.