PHOENIX TESTLAB

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Test Report

Report Number:

F220453E2

Equipment under Test (EUT):

TCC NGA Mid MY19

Applicant:

Robert Bosch GmbH

Manufacturer:

Robert Bosch GmbH

ilac-MRA

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

[1] **ANSI C63.4:2014** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[2] **FCC 47 CFR Part 2:** General Rules and Regulations

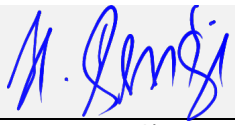
[3] **FCC 47 CFR Part 15:** Radio Frequency Devices (Subpart B)

[4] **ICES-003 Issue 7: (October 2020)** Spectrum Management and Telecommunications. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement

[5] **RSS-Gen, Issue 5 Amendment 2 (2021-02)** General Requirements for Compliance of Radio Apparatus

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.
“Passed” indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account as stated in clause 10.2.8.2 of ANSI C63.4 (2014). However, the measurement uncertainty is calculated and shown in this test report.

Tested and written by:		Paul NEUFELD 04.07.2022
	Signature	
Reviewed and approved by:		Holger BENTJE 04.07.2022
	Signature	

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents: Page

1 Identification

1.1 Applicant

Name:	Robert Bosch GmbH
Address:	Robert-Bosch-Str. 200, 31139 Hildesheim
Country:	Germany
Name for contact purposes:	Mr. Thomas DARGEL
Phone:	+49 5121 49-5599
eMail address:	Thomas.Dargel@de.bosch.com
Applicant represented during the test by the following person:	

1.2 Manufacturer

Name:	Robert Bosch GmbH
Address:	Robert-Bosch-Str. 200, 31139 Hildesheim
Country:	Germany
Name for contact purposes:	Mr. Thomas DARGEL
Phone:	+49 5121 49-5599
eMail address:	Thomas.Dargel@de.bosch.com
Manufacturer represented during the test by the following person:	

1.3 Test Laboratory

The tests were carried out by:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-06 and D-PL-17186-01-05, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

Test object: *	Radios with Bluetooth for vehicular use (Trucks)
Model name: *	TCC NGA Mid MY19
Model number: *	7 620 002 029
Order number: *	-
FCC ID: *	2AUXS-TCCNGAMID
IC certification number: *	25847-TCCNGAMID
PMN: *	TCC NGA Mid MY19
HVIN: *	TCC NGA Mid MY19
FVIN: *	V0405

	EUT number		
	1 (internal antenna)	2 (temporary antenna connector)	3
Serial number: *	815CM2039K0000102	815CM2039K0000112	-
PCB identifier: *	Main PCB: 8 638 910 805 Switch PCB: 8 638 911 786 Supply Box PCB: 8 638 518 679	Main PCB: 8 638 910 805 Switch PCB: 8 638 911 786 Supply Box PCB: 8 638 518 679	-
Hardware version: *	44	43	-
Software version: *	19/46	19/46	-

* Declared by the applicant

One EUT was used for all tests.

Note: PHOENIX TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

General EUT data			
Power supply EUT: *	DC		
Supply voltage EUT: *	U_{nom}= 24.0 V_{DC}	U_{min}= 12.0 V_{DC}	U_{max}= 32.0 V_{DC}
Temperature range: *	-20°C to +70°C		
Lowest / highest internal clock frequency: *	32.768 kHz / 2480 MHz		

* Declared by the applicant

Bluetooth® radio module			
Fulfils radio specification: *	Bluetooth 2.0 (Bluetooth classic + EDR)		
Radio module: *	ALPS UGZZ8		
Antenna type: *	SMD Chip Antenna		
Antenna name: *	TDK		
Antenna gain: *	1.6 dBi		
Antenna connector: *	None (temporary		
Supply voltage WLAN module: *	U_{nom} = -- VDC	U_{min} = 3.0 VDC	U_{max} = 3.6 VDC
Type of modulation: *	BT (1 Mbps PHY)	GFSK	
	BT (2 Mbps PHY)	π/4-DQPSK	
	BT (3 Mbps PHY)	8DPSK	
Operating frequency range: *	BT (1 Mbps PHY)	2402 – 2480 MHz	
	BT (2 Mbps PHY)	2402 – 2480 MHz	
	BT (3 Mbps PHY)	2402 – 2480 MHz	
Number of channels: *	BT (1 Mbps PHY)	79 (1 MHz channel spacing)	
	BT (2 Mbps PHY)	79 (1 MHz channel spacing)	
	BT (3 Mbps PHY)	79 (1 MHz channel spacing)	

* Declared by the applicant

AM / FM tuner				
Europe	Tuning Range Low Limit	Tuning Range High Limit	Step with Auto-Tuning	Step with Manual Tuning
FM	87.5MHz	108.0MHz	100kHz	100kHz
MW	531kHz	1620kHz	9kHz	9kHz
LW	153kHz	282kHz	3kHz	1kHz
KW/SW	5800kHz	6250kHz	5kHz	5kHz
NAFTA	Tuning Range Low Limit	Tuning Range High Limit	Step with Auto-Tuning	Step with Manual Tuning
FM	87.9MHz	107.9MHz	200kHz	200kHz
AM	530kHz	1710kHz	10kHz	10kHz
South America	Tuning Range Low Limit	Tuning Range High Limit	Step with Auto-Tuning	Step with Manual Tuning
FM	87.9MHz	107.9MHz	200kHz	100kHz
AM	530kHz	1710kHz	10kHz	10kHz

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
USB (Front)	Type-A Plug	Not connected during test	n/a	n/a
Aux (Front)	headphone jack	Not connected during test	n/a	n/a
Aux (Rear)	headphone plug	Not connected during test	n/a	n/a
12 V switched out	-	Not connected during test	n/a	n/a
High Speed CAN	D-Sub plug	Not connected during test	n/a	n/a
Radio antenna	-	Not connected during test	n/a	n/a
Power supply (24 V)	Banana connector	Laboratory power supply	~ 3m	no
Speaker RF	Banana connector	Connected to 4Ω Load	~ 3m	no
Speaker LF	Banana connector	Connected to 4Ω Load	~ 3m	no
Ext mute	none	Not connected during test	n/a	n/a

Equipment used for testing	
DC power supply: *2	Power Supply TOE8752-32 (DC) (PM. No. 480009)
USB fibre optic converter: *2	Opto USB2.0, MK Messtechnik (PM. No. 482617)
Laptop PC: *2	Fujitsu S26391-K326-V110 (PM. No. 200784)
USB to serial converter cable: *1	TTL-232R-3V3
Car radio: *1	AGCO HIGH (For the purpose of unblocking Daimler radios)

*1 Provided by the applicant
*2 Provided by the laboratory

Ancillary Equipment	
Connector: *1	Mains connector

*1 Provided by the applicant
*2 Provided by the laboratory

1.6 Dates

Date of receipt of test sample:	29.03.2022
Start of test:	22.04.2022
End of test:	26.04.2022

2 Operational States

Description of function of the EUT:

The EUT is a car radio with Bluetooth classic + EDR (Bluetooth 4.2) for integration in trucks.

The following states were defined as the operating conditions:

For the EMC test, the FM receiver was active on 89.9 MHz and a resistor bank with 4 Ω resistors was connected to the front / rear speaker cables of the EUT. Also the display was active and the volume of the EUT was on the maximum setting. During the tests, the EUT was supplied with +24.0 V DC. The Bluetooth functionality was not active during the tests. All other interfaces of the were not connected during the tests.

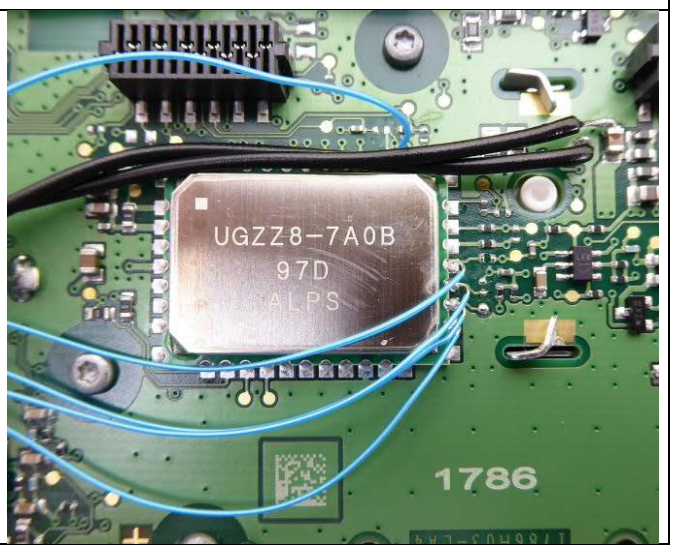
This operation mode was defined by the applicant (Mr. Bernd Meyer).

3 Additional Information

The EUT was not labeled as required by FCC / IC.

The goal of this test is to measure the emissions of the built-in broadcast receiver. Therefore, further peripheral devices were not connected as instructed by the applicant

For the tests, the EUTs were modified as shown below.

Antenna port conducted tests with temporary antenna connector	Radiated tests
	

The sample which was used for the radio tests, was also used for the EMC tests.

4 Overview

Conducted emissions FCC 47 CFR Part 15 section 15.111(a) [3] RSS-GEN 7.4 Receiver conducted emission limits [5]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Antenna power conduction limits for receivers	30 MHz to 5 GHz	-57 dBm	ANSI C63.4	2	Passed

Conducted emissions FCC 47 CFR Part 15 section 15.107 (a), (b) [3] ICES-003 Issue 7 section 3.2.1[4]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
AC supply line Class B	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dB(µV) QP* 56 to 46 dB(µV) AV* 56 dB(µV) QP 46 dB(µV) AV 60 dB(µV) QP 50 dB(µV) AV	ANSI C63.4	-	Not applicable*
*: Decreases with the logarithm of the frequency					

* Not applicable, because the EUT is only intended for use in vehicular environments.

Radiated emissions FCC 47 CFR Part 15 section 15.111(a) [3] RSS-GEN 7.3 Receiver radiated emission limits [5]					
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(µV/m) QP at 3 m 43.5 dB(µV/m) QP at 3 m 46.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) AV at 3 m and 74.0 dB(µV/m) PK at 3 m	ANSI C63.4	1	Passed

Radiated emissions	ICES-003 Issue 7 section 3.2.2 & 7.4 [4] RSS-Gen, Issue 5 Amendment 2 (2021-02) section 7.4 [5]				
Application	Frequency range	Limits	Reference standard	Tested EUT	Status
Radiated Emission Class B	30 to 88 MHz 88 to 216 MHz 216 to 230 MHz 230 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB(µV/m) QP at 3 m 43.5 dB(µV/m) QP at 3 m 46.0 dB(µV/m) QP at 3 m 47.0 dB(µV/m) QP at 3 m 54.0 dB(µV/m) QP at 3 m 54 dB(µV/m) AV at 3 m and 74 dB(µV/m) PK at 3 m	ANSI C63.4	1	Passed

Remark: As declared by the applicant the highest internal clock frequency is 2.48 GHz. Therefore the radiated emission measurement must be carried out up to 5th of the highest internal clock frequency up to 12.4 GHz, in this case the measurement was carried out up to 13 GHz.

The EUT was classified by the applicant as CLASS B equipment.

5 Results

5.1 Test setups

5.1.1 Radiated: 30 MHz to 1 GHz

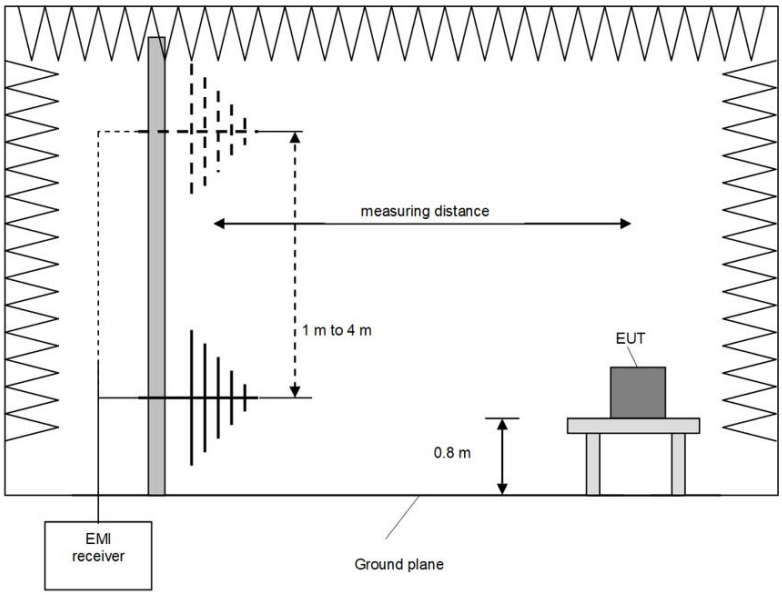
5.1.1.1 Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	30 MHz to 1 GHz	30 kHz	120 kHz	-	Peak Average
Frequency peak search	± 120 kHz	10 kHz	120 kHz	1 s	Peak
Final measurement	30 MHz to 1 GHz	-	120 kHz	1 s	QuasiPeak



Procedure preliminary measurement:

The following procedure is used:

1) Set the measuring antenna to 1 m height.
2) Monitor the frequency range at horizontal polarization of the measuring antenna and an EUT / turntable azimuth of 0 °.
3) Rotate the EUT by 360° to maximize the detected signals.
4) Repeat steps 2 to 3 with the vertical polarization of the measuring antenna.
5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.1.2 Radiated: 1 GHz to 40 GHz

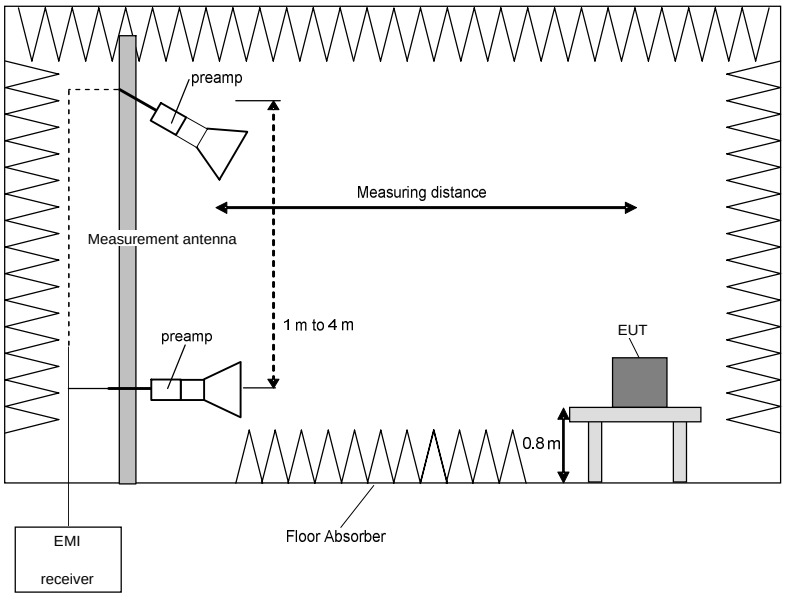
5.1.2.1 Preliminary and final measurement 1 GHz to 40 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber at a measuring distance of 3 meters, with floor absorbers between EUT and measuring antenna. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions. While changing the height, the measuring antenna gets tilted so that it is always aiming at the EUT.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	1 - 40 GHz	250 kHz	1 MHz	-	Peak Average
Frequency peak search	+ / - 1 MHz	50 kHz	1 MHz	100 ms	Peak
Final measurement	1 - 40 GHz	-	1 MHz	100 ms	Peak Average


preamp
Measuring distance
Measurement antenna
1 m to 4 m
preamp
EUT
0.8 m
EMI
receiver
Floor Absorber

Procedure preliminary measurement:

The following procedure is used:

1) Set the measuring antenna to 1 m height.
2) Monitor the frequency range at horizontal polarization of the measuring antenna and an EUT / turntable azimuth of 0 °.
3) Rotate the EUT by 360° to maximize the detected signals.
4) Repeat steps 2 to 3 with the vertical polarization of the measuring antenna.
5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.2 Radiated emissions

5.2.1 Test setup (Maximum unwanted emissions)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
☒	Radiated: 30 MHz to 1 GHz / 1 GHz to 40 GHz	5.1.1 / 5.1.2	-

5.2.2 Test method (Maximum unwanted emissions)

☒ Test method (radiated) see sub-clause 5.1.1 / 5.1.2 as described herein

5.2.3 Test results (Maximum unwanted emissions)

5.2.3.1 Test results (30 MHz – 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	34 %

Date:	22.04.2022
Tested by:	P. NEUFELD

Position of EUT: For tests for f between 30 MHz to 1 GHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: The EUT was tested in normal position (lying on the table).

Calculations:

Result [dBµV/m] = Reading [dBµV] + Correction [dBµV/m]

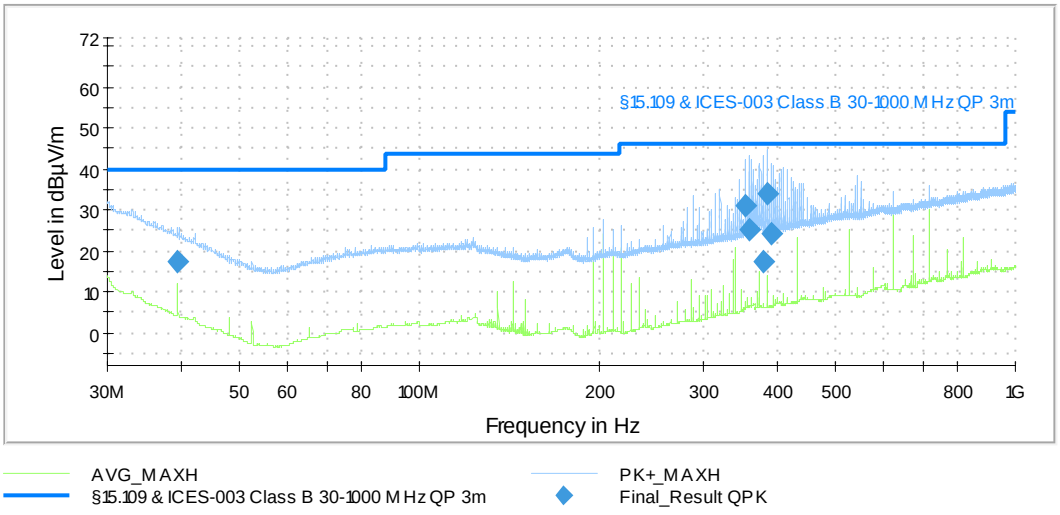
Correction [dBµV/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

Margin [dB] = Limit [dBµV/m] - Result [dBµV/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with "◆" are the measured results of the standard subsequent measurement in a semi-anechoic chamber.

Worst case plot:

Spurious emissions from 30 MHz to 1 GHz (operation mode – see chapter 2):



Result tables:

(Operation mode – see chapter 2):

Frequency [MHz]	Result (QP) [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Readings [dBµV]	Correction [dB/m]	Height [cm]	Azimuth [deg]	Pol. (H/V)	Position #
39.370	17.2	40.0	22.8	-3.2	20.5	120.0	-18	V	--
352.000	31.0	46.0	15.1	10.2	20.7	102.0	233	H	--
357.790	25.3	46.0	20.7	4.5	20.8	104.0	244	H	--
377.580	17.6	46.0	28.4	-3.7	21.3	100.0	249	H	--
384.000	33.9	46.0	12.1	12.5	21.5	102.0	249	H	--
389.800	24.0	46.0	22.0	2.3	21.7	102.0	251	H	--

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1 - 9

5.2.3.2 Test results (radiated 1 GHz to 13 GHz)

Ambient temperature:	22 °C
Relative humidity:	31 %

Date:	26.04.2022
Tested by:	P. NEUFELD

Position of EUT: For tests for f between 1 GHz and the 5th harmonic, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: The EUT was tested in normal position (lying on the table).

Calculation:

Max Peak [dBµV/m] = Reading [dBµV] + Correction [dBµV/m]

Average [dBµV/m] = Reading [dBµV] + Correction [dBµV/m]

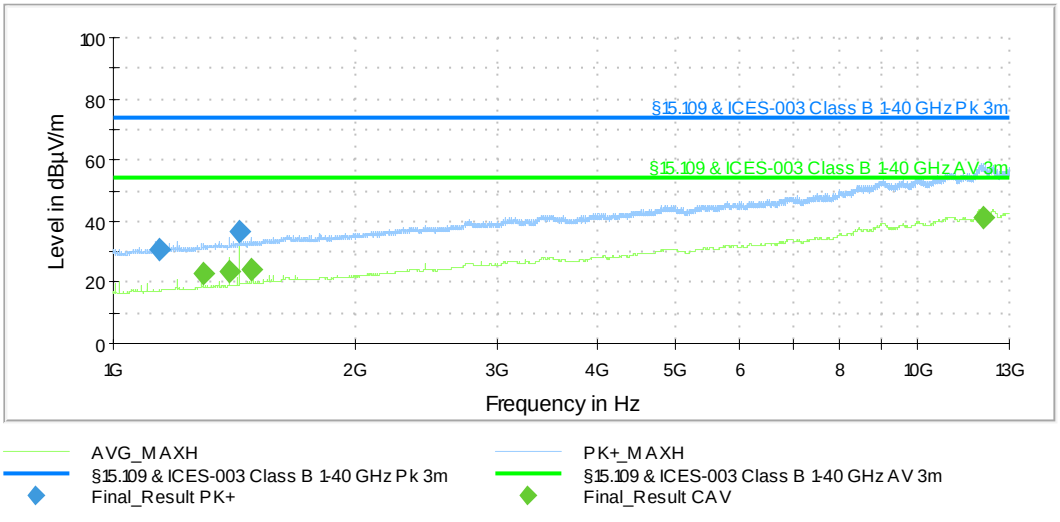
Correction [dBµV/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]+DCCF* [dB]
* (if applicable – only for Average values, that are fundamental related)

Margin [dB] = Limit [dBµV/m] – Max Peak | Average [dBµV/m]

The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with various EUT and antenna positions.
The top measured curve represents the peak measurement. The measured points marked with "◆" are frequency points for the final peak detector measurement. These values are indicated in the following table. The bottom measured curve represents the average measurement. The measured points marked with "◆" are frequency points for the final average detector measurement.

Worst case plots:

Spurious emissions from 1 GHz to 13 GHz (Operation mode – see chapter 2):



Result tables:

Operation mode 1:

Frequency [MHz]	MaxPeak [dB(µV/m)]	Average [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB(µV/m)]	Height [cm]	Pol [H/V]	Azimuth [deg]	Corr. [dB]
1141.400	30.5	---	74.0	43.5	150.0	H	234	-9.7
1296.000	---	22.8	54.0	31.2	260.0	H	119	-8.0
1392.000	---	23.4	54.0	30.6	102.0	V	197	-7.6
1435.900	36.3	---	74.0	37.7	100.0	V	1	-6.9
1488.000	---	24.3	54.0	29.7	252.0	V	36	-6.7
12050.300	---	40.9	54.0	13.1	102.0	H	236	23.9

Test result: Passed

Test equipment (please refer to chapter 7 for details)
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5.3 Conducted emissions at antenna port receiver

5.3.1 Test method

Preliminary and final measurement 30 MHz to 18 GHz

The preliminary and final measurements are performed at the antenna port of receivers that operate (tune) in the frequency range 30 to 960 MHz and CB receivers that provide terminals for the connection of an external receiving antenna.

The resolution bandwidth of the EMI Receiver is set to the following values:

Test	Frequency range	Resolution bandwidth*
Preliminary measurement	30 MHz to 1 GHz	100 kHz
Final measurement	30 MHz to 1 GHz	120 kHz
Preliminary measurement	1 - 18 GHz	1 MHz
Final measurement	1 - 18 GHz	1 MHz

* All tests were performed using a peak detector, since when the measurement is passed with a peak detector a pass can be assumed for all other detector types.

Spurious emission limits

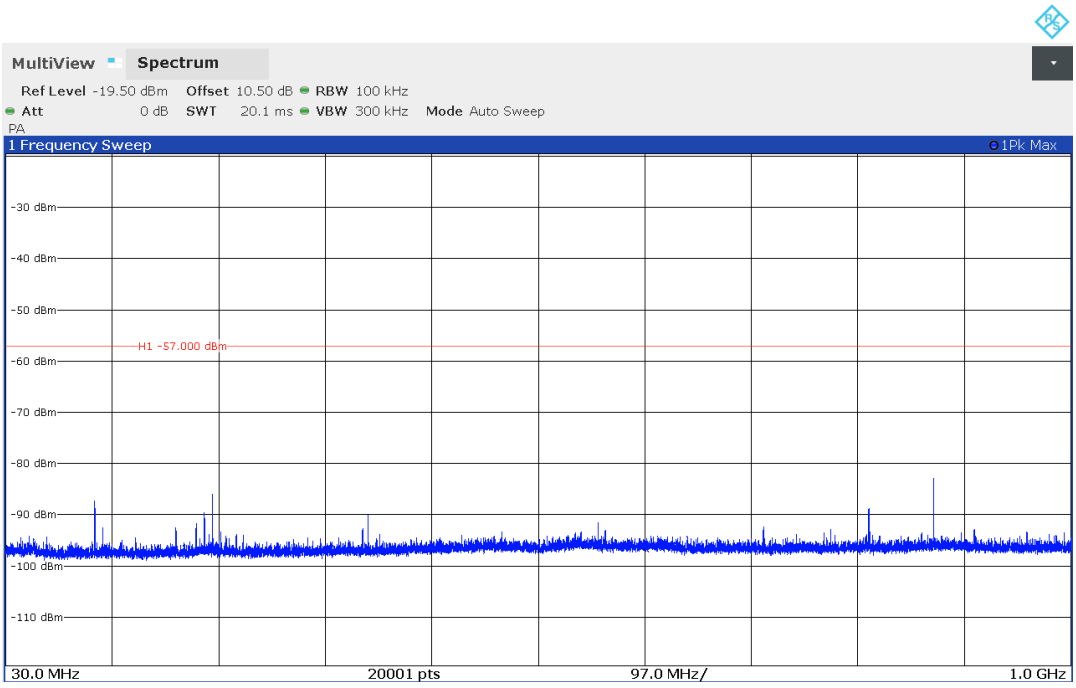
Frequency range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	120 kHz
1 GHz to 18 GHz	-57 dBm	1 MHz

5.3.2 Test results final measurement 30 MHz to 18 GHz

Ambient temperature:	22 °C
Relative humidity:	20 %

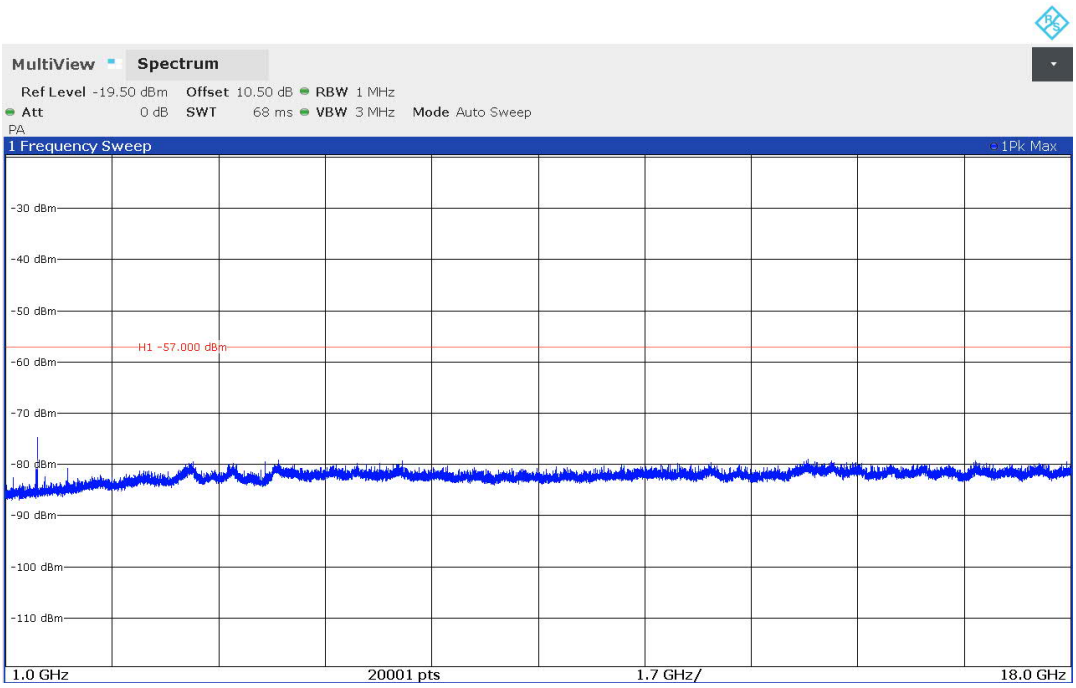
Date:	01.07.2022
Tested by:	P. NEUFELD

Measurement at FM1/AM antenna port



Spurious emissions level				
Frequency [MHz]	**Level [dBm]**	**Limit [dBm]**	**Margin [dB]**	**Result**
No significant emissions found, all emissions are more than 20 dB below the limit.				
Measurement uncertainty: +1.5 dB / -1.9 dB				

Measurement at FM1/AM antenna port



Spurious emissions level				
Frequency [MHz]	**Level [dBm]**	**Limit [dBm]**	**Margin [dB]**	**Result**
1508.700	-74.7	-57.0	17.7	Passed
-	-	-	-	-
-	-	-	-	-
Measurement uncertainty: +1.5 dB / -1.9 dB				

Test result: Passed

Test equipment (please refer to chapter 6 for details)
12

6 Measurement Uncertainties

Conducted measurements		
Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) U_{lab}
Conducted emissions from 150 kHz to 30 MHz with LISN	CISPR 16-4-2	2.8 dB

Radiated measurements		
Radiated field strength M276		
R&S HL562E @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	4.8 dB
R&S HL050 @ 3 m	-	
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 18 – 40 GHz	-	5.9 dB

7 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Attenuator 6 dB	WA2-6	Weinschel	8254	410119	Calibration not necessary	
2	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	18.03.2021	03.2024
3	Software	EMC32	Rohde & Schwarz	100970	482972	Calibration not necessary	
4	RF Switch Matrix	OSP220	Rohde & Schwarz		482976	Calibration not necessary	
5	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
6	Antennasupport	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
7	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
8	Semi Anechoic Chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
9	EMI Testreceiver	ESW44	Rohde & Schwarz	101828	482979	08.12.2021	12.2023
10	Low Noise Amplifier 100 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	18.02.2022	02.2024
11	Log.-Per. antenna	HL050	Rohde & Schwarz	100908	482977	13.08.2019	08.2022
12	Signal & Spectrum Analyzer	FSW43	Rohde & Schwarz	100586 & 100926	481720	19.11.2021	11.2022

8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA/RSM	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	03.03.2021	02.03.2023
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	25.02.2021	24.02.2023

9 Report History

Report Number	Date	Comment
F220453E2	04.07.2022	Initial Test Report
-	-	-
-	-	-

10 List of Annexes

Annex A	Test Setup Photos	4 pages
Annex B	EUT External Photos*1*2	6 pages
Annex C	EUT Internal Photos*3	7 pages

*1 Most photographs were provided by the applicant
*2 The photograph of side view 2 was shot with an EUT which was modified for the radio tests.
*3 All internal photographs were provided by the applicant.