T E S T R E P O R T
No.: 19-1-0207401T03a-C1

According to:

47 CFR Part 15.249
RSS-210 Issue 10

for
Veoneer US, Inc.

24 GHz SRS Radar Sensor
NB24G175V3

FCC ID: WU8NB24G175V3
ISED Certification Number: 8436B-NB24G175V3

Laboratory Accreditation
ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01 D-PL-12047-01-03 D-PL-12047-01-04
accredited according to DIN EN ISO/IEC 17025:2018

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The test results relate only to the individual items which have been tested. This report shall not be reproduced in parts without the written approval of the testing laboratory © Copyright: All rights reserved by CETECOM

Table of contents

1. SUMMARY OF TEST RESULTS 3

1.1. Tests measurement overview according of US CFR Title 47, Subpart 15.249 3
and RSS-210 Issue 10 3
1.2. Attestation: 4

2. ADMINISTRATIVE DATA 5

2.1. Identification of the testing laboratory 5
2.2. Test location 5
2.3. Organizational items 5
2.4. Applicant's details 5
2.5. Manufacturer's details 5

3. EQUIPMENT UNDER TEST (EUT) 6

3.1. TECHNICAL DATA OF MAIN EUT DECLARED BY APPLICANT* 6
3.2. EUT: Type, S/N etc. and short descriptions used in this test report* 6
3.3. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions 6
3.4. EUT set-ups 6
3.5. EUT operating modes 6

4. DESCRIPTION OF TEST SYSTEM SET-UP'S 8

4.1. Test system set-up for radiated magnetic field measurements below 30 MHz 8
4.2. Test system set-up for radiated electric field measurement 30 MHz to 960MHz 9
4.3. Test system set-up for radiated electric field measurement above 960MHz 10

5. MEASUREMENTS 11

5.1. Field strength of emissions (wanted signal) 11
5.2. Occupied bandwidth 12
5.3. Radiated field strength emissions, below 30 MHz 13
5.4. Radiated field strength emissions, 30 MHz – 960 MHz 15
5.5. Radiated field strength emissions, 960 MHz – 40 GHz 17
5.6. Radiated field strength emissions, above 40 GHz 19
5.7. Antenna requirements 21
5.8. Measurement uncertainties 22

6. ABBREVIATIONS USED IN THIS REPORT 23

7. ACCREDITATION DETAILS OF CETECOM'S LABORATORIES AND TEST SITES 23

8. INSTRUMENTS AND ANCILLARY 24

8.1. **Used equipment** 24

9. VERSIONS OF TEST REPORTS (CHANGE HISTORY) 28

Table of annex

Separate document annex 1: Measurement diagrams

Separate document annex 2: External photographs of EUT

Separate document annex 3: Test set-up photographs

The listed attachments are an integral part of this report.

1. Summary of test results

The test results apply exclusively to the test samples as presented in this report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests. Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

1.1. Tests measurement overview according of US CFR Title 47, Subpart 15.249 and RSS-210 Issue 10

Test cases	References & Limits		Test conditions (temperature and voltage)	EUT set-up	EUT operating mode	Result
	Standards	Test Limit				
Field strength of emissions (wanted signal)	47 CFR Part 15.249 (a), (c) RSS-210 Issue 10 B.10(a)	108 dBµV/m (Average) 128 dBµV/m (Peak) @ 24 GHz – 24.25 GHz	Nominal	1	1, 2	passed
Occupied bandwidth (26 dB BW, 99 % BW)	47 CFR Part 15.249 RSS-210 Issue 10 B.10 ANSI C63.4 § 13.7.	f (lowest) > 24 GHz f (highest) < 24.25 GHz	Nominal	1	1, 2	passed
Field strength of emissions (radiated spurious)	47 CFR Part 15.209 (a) / Part 15.249 (a)(c)(d) RSS-210 Issue 10 B.10(a)(b) RSS-Gen Issue 5	See sections 5.3.3., 5.4.3., 5.5.3., 5.6.3.	Nominal	1	1	passed
Antenna requirement	-	§15.203	-	-	-	passed

1.2. Attestation:

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to FCC. All requirements as shown in above table are met in accordance with enumerated standards.
The current version of the Test Report 19-1-0207401T03a-C1 replaces the Test Report 19-1-0207401T03a dated 06.05.2020. The replaced Test Report is herewith invalid.

.....	.....
Dipl.-Ing. Jeß Niels	B.Sc. Piotr Sardyko
Responsible for test section	Responsible for test report

Digital unterschrieben von Piotr Sardyko
DN: cn=Piotr Sardyko, o=CETECOM GmbH, ou=Radio Communications & EMC, email=piotr.sardyko@cetecom.com, c=DE

2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Volker Wittmann
Deputy:	Dipl.-Ing. Ninovic Perez

2.2. Test location

2.2.1. Test laboratory

Company name:	See section 2.1. Identification of the testing laboratory

2.3. Organizational items

Responsible for test report and project leader:	B.Sc. P. Sardyko
Receipt of EUT:	2020-Feb-10
Date(s) of test:	2020-Feb-12 to 2020-Apr-06
Date of report:	2020-May-25
---	---
Version of template: 13.02	

2.4. Applicant’s details

Applicant’s name:	Veoneer US, Inc.
Address:	26360 American Drive Southfield, MI 48034 USA
Contact person:	Ms. Claire O'Neill

2.5. Manufacturer’s details

Manufacturer’s name:	Please see Applicant's details
Address:	Please see Applicant's details

3. Equipment under test (EUT)

3.1. TECHNICAL DATA OF MAIN EUT DECLARED BY APPLICANT*

*Main function	24 GHz Radar Sensor		
Transmit frequency	24.05 GHz – 24.25 GHz		
Antenna polarization	vertical		
Antenna Array Max Realized Gain	13.26 dBi		
Type of modulation/ waveforms	Stepped FM Pulsed, CW Pulsed, FSK Pulsed		
Bandwidth	< 245 MHz		
Antenna Type	☒ Integrated ☐ External, no RF- connector ☐ External, separate RF-connector		
Power supply	☒ DC power supply: 8 – 16 V		
Temperature	-40 °C to +85 °C		
Interfaces	CAN		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

*: customer information

3.2. EUT: Type, S/N etc. and short descriptions used in this test report*

Short descrip-tion**	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A S03	24 GHz SRS Radar Sensor	Automotive Radar Sensor NB24G175V3	19493000031	635679400F_00	636775900A_00

*: customer information

3.3. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

AE short descrip-tion *	Auxiliary Equipment	Type	S/N serial number	SW software status
AE 1 S17	Notebook	Dell Latitude E5470	8RG7PC2	Windows 10 + SW NBU V2.5
AE 2 S09	Cable for power supply. 2 m.	-	-	-
AE 3 S13	USB/CAN Adapter	Gridconnect 1630W	IPEH-002021 163072	-

* AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.4. EUT set-ups

EUT set-up no.*	Combination of EUT and AE	Remarks
set. 1	EUT A + AE 1 + AE 2 + AE 3	Radiated RF-setup. AE 1 and AE 3 are used only to start an appropriate operating mode.

* EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.5. EUT operating modes

The board supports BSD, RCTA, and LCA functions and features:
BSD- Blind Spot Detection
RCTA- Rear Cross Traffic Alert
LCA- Lane Change Assist

The EUT works with two operating modes (both continuously transmitting and receiving):

EUT op. mode no.*	Op. mode	Remarks
Op. mode 1	LCA + BSD	See description below
Op. mode 2	RCTA	See description below

* EUT op. mode no. is used to simplify the identification of the EUT op. modes in this test report.

The BSD algorithm detects and reports “Objects of Interest" on either side of the vehicle, within a specified “blind spot” zone. The feature generates a signal which is used to drive a visual display placed in the outside view mirror to alert the driver to the presence of objects of interest within the defined SBZA zone.

The LCA algorithm detects and reports to the driver that a highway licensable vehicle is rapidly approaching the host vehicle in one of the adjacent lanes. The feature generates a signal which is used to drive a visual display placed in the outside view mirror and/or request a chime or vibrating seat cushion, to alert the driver to the approach of objects of interest within the defined LCA zone.

The RCTA algorithm detects and reports “Objects of Interest” behind the host vehicle, within a specified RCTA coverage zone. The feature generates a signal which is used to drive a visual display to alert the driver of the presence of objects of interest that may cause a collision with the host vehicle within the defined RCTA zone.

The Radar Sensor consists of two transmit antennae (A, B) and two receive antenna (C, D) (see Figure below). The transmit waveform consists of 3 separate waveforms within each cycle. These include the Stepped FM Pulsed waveform, the CW Pulsed waveform, and the FSK Pulsed waveform. Within each waveform, the four TX-RX channel pairs are sequentially scanned. Cycle Time = 80 ms.

See also chapter 3.1.

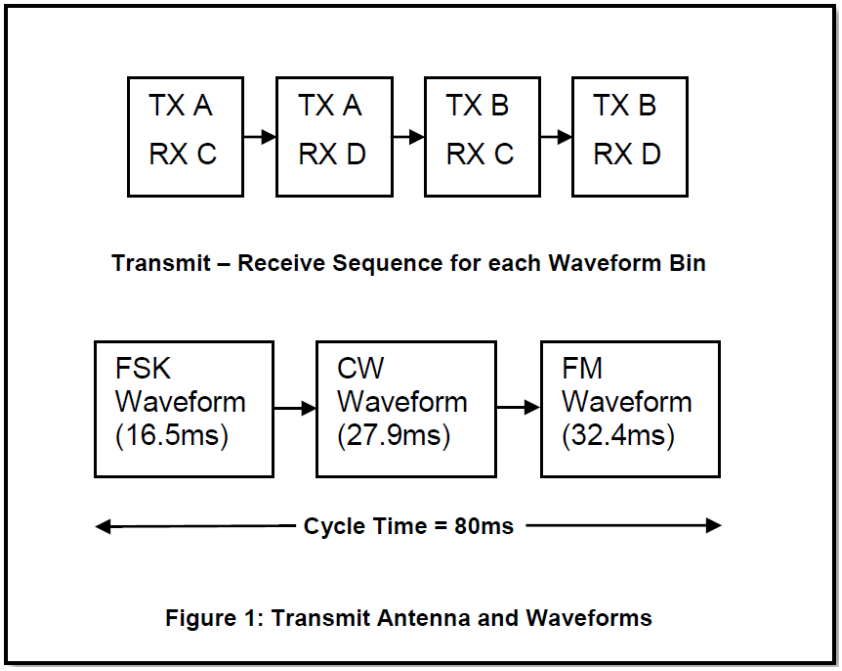


Figure 1: Transmit Antenna and Waveforms

4. Description of test system set-up's

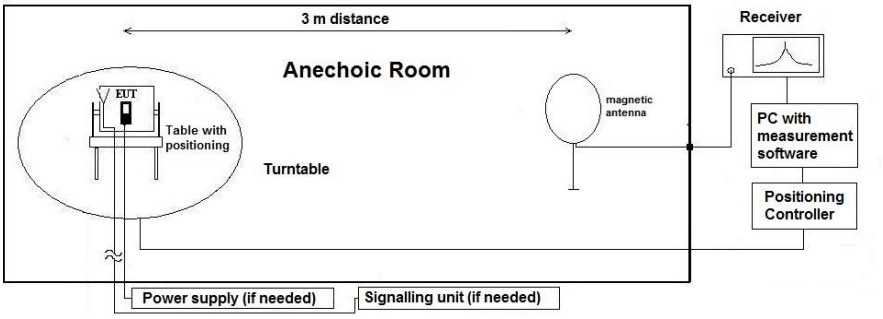
4.1. Test system set-up for radiated magnetic field measurements below 30 MHz

Specification: ANSI C63.4-2014 §5.3, §8.2.1, §8.3.1.1+§8.3.2.1 , ANSI C63.10-2013 chapter 6.4 (§6.4.4.2)

General Description: Evaluating the radiated field emissions are done first by an exploratory emission measurement and a final measurement for most critical frequencies determined.

The loop antenna was placed at 1 m height above ground plane and 3 m measurement distance from set-up for investigations. Because of reduced measurement distance, correction data were applied, as stated in chapter "General Limit - Radiated field strength emissions below 30 MHz". The tests are performed in the semi anechoic room recognized by the regulatory commission.

Schematic:



Testing method:

Exploratory, preliminary measurement
The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (step 90°, range 0°to 360°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT), the emission spectrum was recorded. The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a data reduction table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies
Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position).

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$E_C = E_R + AF + C_L + D_F - G_A$

$M = L_T - E_C$

AF =Antenna factor
C_L = Cable loss
D_F= Distance correction factor
E_C = Electrical field – corrected value
E_R = Receiver reading
G_A= Gain of pre-amplifier (if used)
L_T = Limit
M = Margin

All units are dB-units, positive margin means value is below limit.

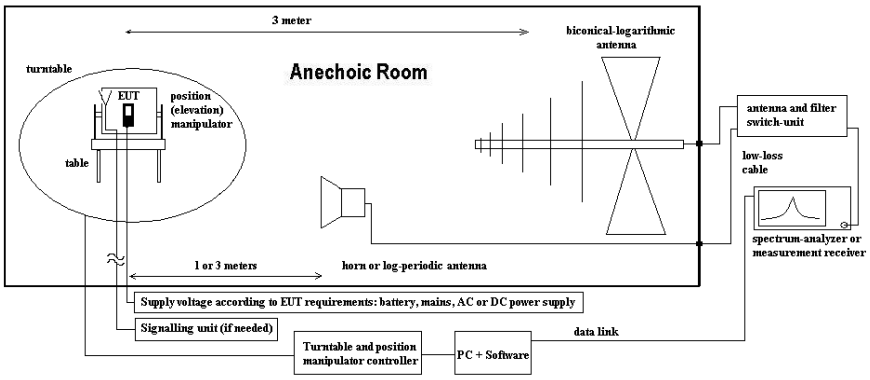
Distance correction: Reference for applied correction (extrapolating) factors due to reduced measurement distance:
ANSI C63.10:2013, §6.4.4.2 - Equations (2) + (3) + (4)

4.2. Test system set-up for radiated electric field measurement 30 MHz to 960MHz

Specification: ANSI C63.4-2014 chapter 8.2.3, ANSI C63.10-2013 chapter 6.5

General Description: Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

Schematic:



Testing method:

Exploratory, preliminary measurements
The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1.0 m and 1.82 m as worst-case determined by an exploratory emission measurements. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies
Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc. either on 10 m OATS or 3 m semi-anechoic room.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height between 1 m and 4 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$E_C = E_R + AF + C_L + D_F - G_A$ (1)

$M = L_T - E_C$ (2)

AF = Antenna factor
C_L = Cable loss
D_F = Distance correction factor (if used)
E_C = Electrical field – corrected value
E_R = Receiver reading
G_A = Gain of pre-amplifier (if used)
L_T = Limit
M = Margin

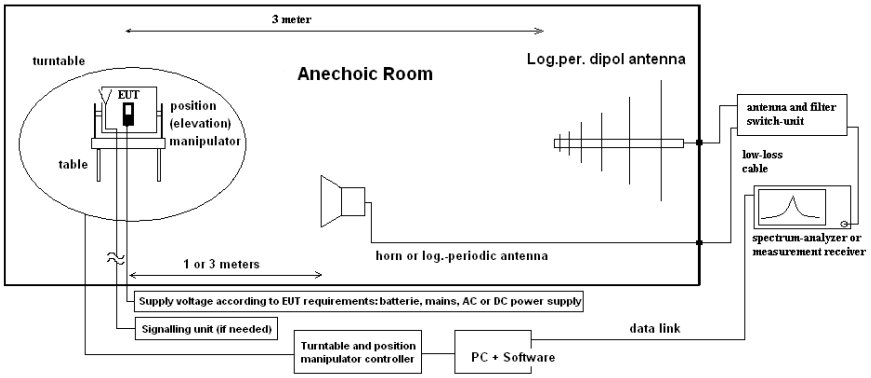
All units are dB-units, positive margin means value is below limit.

4.3. Test system set-up for radiated electric field measurement above 960MHz

Specification: ANSI C63.10-2013, chapter 10.3

General Description: The tests are performed in a CISPR 16-1-4:2010 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 1 m or 3 m. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT.

Schematic:



Testing method:

Exploratory, preliminary measurements
The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable continuously (range 0° to 360°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband antenna and software.
The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Formula:

$E_C = E_R + AF + C_L + D_F - G_A$ (1)

$M = L_T - E_C$ (2)

E_C = Electrical field – corrected value
E_R = Receiver reading
M = Margin
L_T = Limit
AF = Antenna factor
C_L = Cable loss
D_F = Distance correction factor (if used)
G_A = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

5. Measurements

5.1. Field strength of emissions (wanted signal)

5.1.1. Test location and equipment

Ref.-No.	Equipment	Type	Serial-No.
Measurement in FAC 2 with the distance between the EUT and the antenna 1.5 m			
412	Fully Anechoic Chamber (2)	ETS Lindgren	120907 (internal number)
714	Spectrum Analyzer	R&S FSW67	104023
302	Antenna	BBHA9170	155
688	RF Amplifier	Miteq JS-18004000-40-8P	1750117
087	Power Supply	EA3013	-

5.1.2. Limits

FCC	See section 1.1.
ISED	See section 1.1.
ANSI	☐ C63.4-2014 ☒ C63.10-2013
Limits, EIRP in dBm	Field strength limit [dBµV/m] for 3 m is 108 dBµV/m. EIRP limit is 12.77 dBm (RMS detector). And 128 dBµV/m ~ 32.77 dBm (Peak detector). EIRP limit was calculated according to the equation (38) in ANSI C63.10-2013: EIRP[dBm] = E[dBµV/m]+ 20log(d [m])−104.77 or E[dBµV/m] = EIRP[dBm] - 20log(d [m]) + 104.77 $EIRP_{limit}$ = [108 + 20log(3)−104.77] dBm = [108 + 9.54−104.77] dBm = 12.77 dBm

5.1.3. Test environment

Temperature	Nominal: 22±3 °C
Rel. humidity	(40±20)% rH
Power supply	Nominal: 12 V

5.1.4. Spectrum-Analyzer settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak/ RMS
Trace-Mode:	Max Hold
Sweep time	41 s @ 500 MHz
Sweep mode	single
Channel Power function	☐
Peak search function	☒

5.1.5. Measurement method:

All the measurements are done according to standards and rules listed in subsection 1.1.

5.1.6. Results

Power measurement Verdict					
Setup / Op. Mode / measuring distance	Nominal condition				
	Peak detector, max peak search (marker) [dBµV/m]**	Peak detector, max peak search (marker frequency) [GHz]	RMS detector, max peak search (marker) [dBµV/m]**	RMS detector, max peak search (marker frequency) [GHz]	
Set. 1 / Op. 1 / 1 m / TnomVnom	105.78	24.062430	98.64	24.059930	**Pass***
Set. 1 / Op. 2 / 1 m / TnomVnom	105.56	24.061930	97.25	24.061930	**Pass**

Remark: For graphical results, pls. see annex 1 to this test report.

* Field strength of emissions (radiated spurious) test will be done with this mode because it has the highest power.

** The measurement was done originally as EIRP (dBm unit). EIRP measurement results were recalculated for field strength of the emission at the measurement distance 3m (dBµV/m unit). Equation for recalculation see in subpart 5.1.2.

5.2. Occupied bandwidth

5.2.1. Test location and equipment

See section 5.1.1.

5.2.2. Limits

See section 1.1.

5.2.3. Test environment

Temperature	Nominal: 22±3 °C
Rel. humidity	(40±20)% rH
Power supply	Nominal: 12 V

5.2.4. Spectrum-Analyzer settings:

99% bandwidth	
Resolution bandwidth	3 MHz
Video bandwidth	10 MHz
Detector mode	Peak
Trace-Mode:	Max Hold
Sweep time	Auto
Sweep mode	continuous
Channel Power function	☐
Peak search function	☒

5.2.5. Measurement method:

All the measurements are done according to standards and rules listed in subsection 1.1.

5.2.6. Results

99% bandwidth					Verdict
Setup / Op. Mode:	f_{Lowest}, [GHz]	$f_{Highest}$, [GHz]	99 % bandwidth [MHz]	Max. radiated peak power (eirp), [dBµV/m]*	
Set. 1/ Op. 1/ TnomVnom/ 1.5 m	24.057921	24.233181	175.26	105.54	**Pass**
Set. 1/ Op. 2/ TnomVnom/ 1.5 m	24.057947	24.233845	175.89	104.77	**Pass**

Remark: For graphical results pls. see annex 1 to this test report.

* The measurement was done originally as EIRP (dBm unit). EIRP measurement results were recalculated for field strength of the emission at the measurement distance 3m (dBµV/m unit). Equation for recalculation see in subpart 5.1.2.

5.3. Radiated field strength emissions, below 30 MHz

5.3.1. Test location and equipment

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☒ 441 EMI SAR	☐ 487 SAR NSA	☐ 347 Radio.lab.		☐	☐
receiver	☒ 377 ESCS30	☐ 001 ESS	☐	☐	☐	☐
spectr. analyz.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
antenna	☐ 574 BTA-L	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☒ 021 EMCO6502
signaling	☐ 757 CMW500	☐ 371 CBT32	☐ 547 CMU	☐ 594 CMW500		
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☐ 482 Filter Matrix	☐ 378 RadiSense	
DC power	☒ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 120 V 60 Hz via PAS 5000			

5.3.2. Requirements

FCC	See section 1.1.			
ISED	See section 1.1.			
ANSI	C63.10-2013			
Frequency [MHz]	Field strength limit [µV/m]	[dBµV/m]	Distance [m]	Remarks
0.009 – 0.490	2400/f (kHz)	67.6 – 20Log(f) (kHz)	300	Correction factor used due to measurement distance of 3 m
0.490 – 1.705	24000/f (kHz)	87.6 – 20Log(f) (kHz)	30	Correction factor used due to measurement distance of 3 m
1.705 – 30	30	29.5	30	Correction factor used due to measurement distance of 3 m

5.3.3. Test condition and test set-up

EUT-grounding		☒ none ☐ with power supply	☐ additional connection
Equipment set up		☒ table top	☐ floor standing
Climatic conditions		Temperature: (22±3 °C)	Rel. humidity: (40±20)% rH
EMI-Receiver or Analyzer Settings	Scan data	☒ 9 – 150 kHz RBW/VBW = 200 Hz Scan step = 80 Hz ☒ 150 kHz – 30 MHz RBW/VBW = 9 kHz Scan step = 4 kHz ☐ other:	
	Scan-Mode Detector Mode: Sweep-Time	☒ 6 dB EMI-Receiver Mode ☐ 3dB Spectrum analyzer Mode Peak (pre-measurement) and Quasi-PK/Average (final if applicable) Repetitive-Scan, max-hold Coupled – calibrated display if continuous signal otherwise adapted to EUT's individual transmission duty-cycle	
General measurement procedures		Please see chapter "Test system set-up radiated magnetic field measurements below 30 MHz"	

5.3.4. Measurement method:

Measurement is done for op. mode 1.

5.3.5. Measurement results:

The results are presented below in summary form only. For more information please consult the diagrams included in annex 1.

Table of measurement radiated spurious results:

Diag. No.	Setup No.	Op. Mode	Max. Signal Level [dBuV/m]	Limit [dBm]
3.1	1	1	19.846 *	**
3.2	1	1	19.290 *	**

* Noise level

** See subsection 5.3.2.

Measurement distance:

Frequency range:	Distance [m]:
9 kHz – 30 MHz	3

5.3.6. Verdict

Pass. No emissions above the limit line. Pls. see annex 1 to this test report.

5.3.7. Correction factors due to reduced meas. distance (f < 30 MHz)

The used correction factors when the measurement distance is reduced compared to regulatory measurement distance, are calculated according Extrapolation formulas valid for EUT's with maximum dimension of 0.625xλ. Formula 2+3+4 as presented in ANSI C63.10, Chapter 6.4.4 are used for the calculations of proper extrapolation factors.

Frequency -Range	f [kHz/MHz]	Lambda [m]	Far-Field Point [m]	Distance Limit accord. 15.209 [m]	1st Condition (dmeas< $D_{near-field}$)	2'te Condition (Limit distance bigger $d_{near-field}$)	Distance Correction accord. Formula
kHz	9,00E+03	33333,33	5305,17	300	fullfilled	not fullfilled	-80,00
	1,00E+04	30000,00	4774,65		fullfilled	not fullfilled	-80,00
	2,00E+04	15000,00	2387,33		fullfilled	not fullfilled	-80,00
	3,00E+04	10000,00	1591,55		fullfilled	not fullfilled	-80,00
	4,00E+04	7500,00	1193,66		fullfilled	not fullfilled	-80,00
	5,00E+04	6000,00	954,93		fullfilled	not fullfilled	-80,00
	6,00E+04	5000,00	795,78		fullfilled	not fullfilled	-80,00
	7,00E+04	4285,71	682,09		fullfilled	not fullfilled	-80,00
	8,00E+04	3750,00	596,83		fullfilled	not fullfilled	-80,00
	9,00E+04	3333,33	530,52		fullfilled	not fullfilled	-80,00
	1,00E+05	3000,00	477,47		fullfilled	not fullfilled	-80,00
	1,25E+05	2400,00	381,97		fullfilled	not fullfilled	-80,00
	2,00E+05	1500,00	238,73		fullfilled	fullfilled	-78,02
	3,00E+05	1000,00	159,16		fullfilled	fullfilled	-74,49
	4,00E+05	750,00	119,37		fullfilled	fullfilled	-72,00
	4,90E+05	612,24	97,44		fullfilled	fullfilled	-70,23
	5,00E+05	600,00	95,49	30	fullfilled	not fullfilled	-40,00
	6,00E+05	500,00	79,58		fullfilled	not fullfilled	-40,00
	7,00E+05	428,57	68,21		fullfilled	not fullfilled	-40,00
	8,00E+05	375,00	59,68		fullfilled	not fullfilled	-40,00
	9,00E+05	333,33	53,05		fullfilled	not fullfilled	-40,00
MHz	1,00	300,00	47,75		fullfilled	not fullfilled	-40,00
	1,59	188,50	30,00		fullfilled	not fullfilled	-40,00
	2,00	150,00	23,87		fullfilled	fullfilled	-38,02
	3,00	100,00	15,92		fullfilled	fullfilled	-34,49
	4,00	75,00	11,94		fullfilled	fullfilled	-32,00
	5,00	60,00	9,55		fullfilled	fullfilled	-30,06
	6,00	50,00	7,96		fullfilled	fullfilled	-28,47
	7,00	42,86	6,82		fullfilled	fullfilled	-27,13
	8,00	37,50	5,97		fullfilled	fullfilled	-25,97
	9,00	33,33	5,31		fullfilled	fullfilled	-24,95
	10,00	30,00	4,77		fullfilled	fullfilled	-24,04
	10,60	28,30	4,50		fullfilled	fullfilled	-23,53
	11,00	27,27	4,34		fullfilled	fullfilled	-23,21
	12,00	25,00	3,98		fullfilled	fullfilled	-22,45
	13,56	22,12	3,52		fullfilled	fullfilled	-21,39
	15,00	20,00	3,18		fullfilled	fullfilled	-20,51
	15,92	18,85	3,00		fullfilled	fullfilled	-20,00
	17,00	17,65	2,81		not fullfilled	fullfilled	-20,00
	18,00	16,67	2,65		not fullfilled	fullfilled	-20,00
	20,00	15,00	2,39		not fullfilled	fullfilled	-20,00
	21,00	14,29	2,27		not fullfilled	fullfilled	-20,00
	23,00	13,04	2,08		not fullfilled	fullfilled	-20,00
	25,00	12,00	1,91		not fullfilled	fullfilled	-20,00
	27,00	11,11	1,77		not fullfilled	fullfilled	-20,00
	29,00	10,34	1,65		not fullfilled	fullfilled	-20,00
	30,00	10,00	1,59		not fullfilled	fullfilled	-20,00

5.4. Radiated field strength emissions, 30 MHz – 960 MHz

5.4.1. Test location and equipment

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☒ 441 EMI SAR	☒ 487 SAR NSA				
receiver	☐ 377 ESCS30	☐ 001 ESS	☐ 489 ESU 40	☒ 620 ESU 26		
spectr. analyz.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK			
antenna	☒ 574 BTA-L	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 392 MT8820A	☐ 371 CBT32	☐ 547 CMU	☐ 594 CMW		
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☒ 482 Filter Matrix		
DC power	☐ 456 EA 3013A	☒ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 120 V 60 Hz via PAS 5000			

5.4.2. Requirements/Limits

FCC		See section 1.1.	
ISED		See section 1.1.	
ANSI		☐ C63.4-2014 ☒ C63.10-2013	
Limit	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [µV/m]	QUASI-Peak [dBµV/m]
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	above 960	500	54.0

5.4.3. Restricted bands of operation (FCC §15.205/ RSS-Gen, Issue 5 Chapter 8.9, Table 5)

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.20725-4.20775	37.5-38.25	1645.5-1646.5	9.3-9.5
6.215-6.218	73-74.6	1660-1710	10.6-12.7
6.26775-6.26825	74.8-75.2	1718.8-1722.2	13.25-13.4
6.31175-6.31225	108-121.94	2200-2300	14.47-14.5
8.291-8.294	123-138	2310-2390	15.35-16.2
8.362-8.366	149.9-150.05	2483.5-2500	17.7-21.4
8.37625-8.38675	156.52475-156.52525	2690-2900	22.01-23.12
8.41425-8.41475	156.7-156.9	3260-3267	23.6-24.0
12.29-12.293	162.0125-167.17	3332-3339	31.2-31.8
12.51975-12.52025	167.72-173.2	3345.8-3358	36.43-36.5
12.57675-12.57725	240-285	3600-4400	--
13.36-13.41	322-335.4	--	--
Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209			

5.4.4. Test condition and measurement test set-up

EUT-grounding		☒ none ☐ with power supply	☐ additional connection
Equipment set up		☒ table top 0.8 m height	☐ floor standing
Climatic conditions		Temperature: (22±3 °C)	Rel. humidity: (40±20)% rH
EMI-Receiver (Analyzer) Settings	Scan frequency range:	☒ 30 – 1000 MHz ☐ other:	
	Scan-Mode	☒ 6 dB EMI-Receiver Mode ☐ 3 dB spectrum analyzer mode	
	Detector	Peak / Quasi-peak	
	RBW/VBW	100 kHz/300 kHz	
	Mode:	Repetitive-Scan, max-hold	
	Scan step	80 kHz	
	Sweep-Time	Coupled – calibrated display if continuous tx-signal otherwise adapted to EUT's individual duty-cycle	
General measurement procedures		Please see chapter "Test system set-up for electric field measurement in the range 30 MHz to 1 GHz"	

5.4.5. Measurement method:
Measurement is done for op. mode 1.

Measurement distance:

Frequency range:	Distance [m]:
30 MHz – 1 GHz	3

5.4.6. Measurement results:
The results are presented below in summary form only. For more information please consult the diagrams included in annex 1.

Table of measurement radiated spurious results:

Diag. No.	Setup No.	Op. Mode	Max. Signal Level [dBµV/m]	Limit [dBµV/m]
3.3	1	1	35	*
3.4	1	1	37	*

* See subsection 5.4.2.

5.4.7. Verdict
Pass. No emissions above the limit line. Pls. see annex 1 to this test report.

5.5. Radiated field strength emissions, 960 MHz – 40 GHz

5.5.1. Test location and equipment

Ref.-No.	Equipment	Type	Serial-No.
Frequency range 960 MHz – 12400 MHz, EUT A			
Measurement in FAR 1 with the distance between the EUT and the antenna 3 m			
443	Fully anechoic chamber 1 (CTC-FAR-EMI-RSE)	ETS-Lindgren / CETECOM	-
732	Spectrum Analyzer	R&S FSW67	104023
497	Power supply	Voltcraft 2256	-
549	Antenna	HL025	1000060
876	RF Amplifier	Narda-Miteq AMF-4D-00100800-18-13P	2079842
Frequency range 12400 MHz – 18000 MHz, EUT A			
Measurement in FAR 2 with the distance between the EUT and the antenna 2 m			
412	Fully anechoic chamber 2	ETS-Lindgren / CETECOM	-
732	Spectrum Analyzer	R&S FSW67	104023
497	Power supply	Voltcraft 2256	-
133	Antenna	EMCO 3115	9012-3629
338	RF Amplifier	Narda Miteq JS42-08001800-16-8P	2079990
Frequency range 18000 MHz – 40000 MHz			
Measurement in FAC 2 with the distance between the EUT and the antenna 1.5 m			
412	Fully anechoic chamber 2	ETS-Lindgren / CETECOM	-
732	Spectrum Analyzer	R&S FSW67	104023
497	Power supply	Voltcraft 2256	-
302	Antenna	BBHA9170	155
688	RF Amplifier	Miteq JS-18004000-40-8P	1750117

5.5.2. Requirements/Limits

FCC	See section 1.1.
ISED	See section 1.1.
ANSI	☐ C63.4-2014 ☒ C63.10-2013
Limits, EIRP in dBm	Field strength limit [dBµV/m] for 3 m is 54 dBµV/m. EIRP limit is -41.23 dBm (RMS detector). And 74 dBµV/m ~ - 21.23 dBm (peak detector). EIRP limit was calculated according to the equation (38) in ANSI C63.10-2013: EIRP[dBm] = E[dBµV/m]+ 20log(d [m])−104.77 $EIRP_{limit}$ = [54 + 20log(3)−104.77] dBm = [54 + 9.54−104.77] dBm = -41.23 dBm

5.5.3. Test condition and measurement test set-up

EUT-grounding		☒ none ☐ with power supply	☐ additional connection
Equipment set up		☒ table top 1.5 m height	☐ floor standing
Climatic conditions		Temperature: (22±3 °C)	Rel. humidity: (40±20)% rH
Spectrum-Analyzer settings	Scan frequency range:	☒ 1 – 18 GHz ☐ 18 – 25 GHz ☒ 18 – 40 GHz ☐ other:	
	Scan-Mode	☐ 6 dB EMI-Receiver Mode ☒ 3 dB Spectrum analyzer Mode	
	Detector	RMS	
	RBW/VBW	1 MHz / 3 MHz	
	Mode:	max-hold	
	Sweep-Time	≤ 1 s over each measurement bin	
General measurement procedures		Please see chapter “Test system set-up for radiated electric field measurements above 1 GHz”	
Voltage		12 V	

5.5.4. Measurement method:

Measurement is done for op. mode 1.

5.5.5. Measurement results:

The results are presented below in summary form only. For more information please consult the diagrams included in annex 1.

Table of measurement radiated spurious results:

Diag. No.	Setup No.	Op. Mode	Max. Signal Level [dBµV/m]**	Frequency [GHz]	Limit [dBµV/m]	Dtector
3.5	1	1	48.56	*	74.00	Peak
3.6	1	1	36.20	*	54.00	RMS
3.6	1	1	48.73	*	74.00	Peak
3.7	1	1	36.22	*	54.00	RMS
3.7	1	1	48.88	*	74.00	Peak
3.8	1	1	61.01	12.092320	74.00	Peak
3.9	1	1	50.70	12.029920	54.00	RMS
3.9	1	1	61.13	12.092320	74.00	Peak
3.10	1	1	44.73	*	54.00	RMS
3.10	1	1	60.22	11.175520	74.00	Peak
3.11	1	1	60.30	*	74.00	Peak
3.12	1	1	48.45	*	54.00	RMS
3.12	1	1	60.33	*	74.00	Peak
3.13	1	1	55.23	*	74.00	Peak
3.14	1	1	40.23	*	54.00	RMS
3.14	1	1	60.32	*	74.00	Peak
3.15	1	1	34.23	*	54.00	RMS
3.15	1	1	47.23	*	74.00	Peak
3.16	1	1	53.99	24.25	54.00	RMS
3.16	1	1	73.28	24.25	74.00	Peak

* Noise level

** The measurement was done originally as EIRP (dBm unit). EIRP measurement results were recalculated for field strength of the emission at the measurement distance 3m (dBµV/m unit). Equation for recalculation see in subpart 5.1.2.

5.5.6. Verdict

Pass. No emissions above the limit line. Pls. see annex 1 to this test report.

5.6. Radiated field strength emissions, above 40 GHz

5.6.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

Ambient Climatic conditions			Temperature: (22±2) °C		Rel. humidity: (45±15)% rH	
test site	☐ 443 FAR Spuri	☐ 348 EMI cond.	☐ 443 EMI FAR	☐ 347 Radio.lab.	☐ 337 OATS	☒ 412 OTA1
equipment	☐ 331 HC 4055	☐	☐	☐	☐	☐
spectr. Analyz.	☒ 732 FSW67	☐ 264 FSEK	☐ 264 FSEK	☐ 584 FSU		☐
antenna meas f > 40 GHz	☒ 748 FH-PP 4060					
antenna meas f > 50 GHz	☒ 792 FH-PP 075		☒ 794 FH-PP 110		☐ 795 SGH-26-WR	
antenna meas f > 90 GHz	☒ 793 FH-PP 140		☐ 750 FH-PP 220			
antenna meas f > 220 GHz	☐ 791 FH-PP3-25					
antenna subst	☐ 071 HUF-Z2	☐ 020 EMCO3115	☐ 063 LP 3146	☐ 303 BBHA9170	☐ 1144 SGH-26-WR	☐
Other:	☒ Adapter Q-Band to 1.85mm		☒ RF cable PFA61-B1B1-1M0 TESTeLINK C03411			
Signalgener.	☐ 008 SMG	☐ 140 SMHU	☐ 263 SMP04	☐	☐	☐
mixer	☒ 713 FS-Z75	☒ 712 FS-Z110	☒ 711 FS-Z140	☐ 715 FS-Z220	☐ 716 FS-Z325	
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
DC power	☐ 086 LNG50-10	☒ 497 Voltcraft 2256	☒ 354 NGPE 40	☐ 349 car battery	☐ 350 car battery	☐
line voltage	☐ 230 V 50 Hz via public mains		☐060 120 V 60 Hz via PAS 5000			

5.6.2. Reference

Standard	See section 1.1. in the report.

5.6.3. Limits:

FCC	See section 1.1.
ISED	See section 1.1.
ANSI	☐ C63.4-2014 ☒ C63.10-2013
Limits, EIRP in dBm	Field strength limit [dBµV/m] for 3 m is 54 dBµV/m. EIRP limit is -41.23 dBm. 74 dBµV/m ~ - 21.23 dBm (RMS/ Peak detector). Harmonics: 68 dBµV/m / 88 dBµV/m ~ - 27.23 dBm / -7.23 dBm (RMS/ Peak detector). EIRP limit was calculated according to the equation (38) in ANSI C63.10-2013: EIRP[dBm] = E[dBµV/m]+ 20log(d [m])−104.77 $EIRP_{limit}$ = [54 + 20log(3)−104.77] dBm = [54 + 9.54−104.77] dBm = -41.23 dBm

5.6.4. Test environment

Temperature	Nominal: 22±3 °C
Rel. humidity	(40±20)% rH
Power supply	Nominal: 12 V

5.6.5. Spectrum-Analyzer settings*:

Resolution Bandwidth (RBW)	1 MHz
Video Bandwidth (VBW)	Minimum 3 times the resolution bandwidth
Sweep time	≤ 1 s / auto / > 80 s @ 1 GHz
Detector	RMS/ Peak detector
Sweep mode	Single/ continuance sweep, MAX-HOLD

* See also settings on the screenshots from the spectrum analyzer in Annex 1

5.6.6. Measurement method:

Measurement is done for op. mode 1. The measuring sweeps are repeated with Maxhold function activated. Thus the measuring diagrams in annex 1 covers emissions of the EUT in all 3D directions. The alignment where the EUT transmits the maximum power is also determined.

The measurements are made with the mixer. There is a ref level line in some measurements. This line is not to be mistaken for limit line.

There are many image signals and mixer products to see on some measurement graphs. Signal ID function is used for the most measurement above 55 GHz for the purpose to distinguish these image signals and mixer

products from the real signals. Here is the description of Signal ID function from user manual for R&S FSW Signal and Spectrum Analyzer (1173.9411.02 ─ 31):

two sweeps are performed alternately. Trace 1 shows the trace measured on the upper side band (USB) of the LO (the test sweep), trace 2 shows the trace measured on the lower side band (LSB), i.e. the reference sweep.

*The reference sweep is performed using an LO setting shifted downwards by 2*IF/<Harmonic order>. Input signals in the desired sideband that are converted using the specified harmonic are displayed in both traces at the same position on the frequency axis. Image signals and mixer products caused by other harmonics are displayed at different positions in both traces. The user identifies the signals visually by comparing the two traces.*

Since the LO frequency is displaced downwards in the reference sweep, the conversion loss of the mixer may differ from the test sweep. Therefore the signal level should only be measured in the test sweep (trace 1).

According to the description of the Signal ID function above the following measurement procedure was developed: the measurement was done with Signal ID function ON, when there are any emissions on the measurement graph or with Signal ID function OFF, when there are no emissions at all. On the measurement graph with Signal ID function ON there are two traces at first, LSB and USB. These traces can cover each other. For this reason two more graphs are made and included in the test report for each measurement. One graph with only USB trace and one graph with only LSB trace. These two already saved graphs are opened and compared on the wide enough screen. The scaling of the both graphs is the same. So the graphs can be easily compared by the switching between them (at first one graph is showed on the screen and then the second one). Each area of both traces is compared manually in this way. When there is an emission at the same frequency at LSB as well as at USB trace then it is a real signal. Such signal will be flagged with a marker and later remeasured. **No image signals and mixer products are flagged with the marker.** There are too many image signals and mixer products. When all they will be flagged with the marker then it looks not clearly.

For this reason one more measurement will be done with the operating mode 1 with extended sweep time (ST). SWT > 80 s @ 1 GHz. The measurement will be done in the position with the highest power determined in the first part of the measurement. Image signals and mixer products are easily distinguished on the plots for such a measurement. This measurement is not really demanded. Aber it acts as a good instrument to ensure and clarify the measurements results from the first part of the measurement.

Calculation of the boundary near/far field:

The aperture dimensions of the antenna shall be small enough so that the measurement distance in m is equal to or greater than the Rayleigh (**far-field**) distance (i.e., $R_m = 2D^2 / \lambda$), where D is the largest dimension of the antenna aperture in m and λ is the free-space wavelength in m at the frequency of measurement.

Antenna range, [GHz]	D, [m]	Highest frequency in the measurement, [GHz]	Lowest wavelength λ in the measurement, [m]	Boundary for near/far field, [m]
40-60	0.0384	55	0,005450772	0.54
55-75	0.03072	75	0.003997233	0.47
75-110	0.020757	96	0.002725386	0.28
90-140	0.016696	140	0.002141375	0.26

Measurement distance:

Measurement frequency range:	Measurement distance, [m]	Boundary for near/far field, [m]
40 GHz – 55 GHz	1	0.54
55 GHz – 75 GHz	1	0.47
75 GHz – 90 GHz	0.26	0.26
90 GHz – 96 GHz	0.32	0.28
96 GHz – 110 GHz	0.20	0.20

5.6.7. Measurement results:
The results are presented below in summary form only. For more information please consult the diagrams included in annex 1.

According **FCC §95.3379 (a)**
Table of measurement radiated spurious results:

Diag. No.	Setup No.	Op. Mode	Max. Signal Level [dBµV/m]**	Limit [dBµV/m]**	Detector
3.19-3.21	1	1	73.48	88.00***	(RMS)
3.22-3.24	1	1	62.35	68.00***	(peak)
3.25-3.27	1	1	73.80	88.00***	(RMS)
3.28*	1	1	55.23	74.00	(peak)
3.29*	1	1	45.23	54.00	(RMS)
3.30*	1	1	55.23	74.00	(peak)
3.31-3.33*	1	1	57.23	74.00	(peak)
3.34-3.36*	1	1	48.23	54.00	(RMS)
3.37-3.39*	1	1	58.23	74.00	(peak)
3.40*	1	1	61.55	74.00	(peak)
3.41*	1	1	49.60	54.00	(RMS)
3.42	1	1	62.48	74.00	(peak)

* Noise level
** The measurement was done originally as EIRP (dBm unit). EIRP measurement results were recalculated for field strength of the emission at the measurement distance 3m (dBµV/m unit). Equation for recalculation see in subpart 5.1.2.
*** Limits for harmonics.

5.6.7.1. Verdict
Pass. No real emissions above the limit line. Pls. see annex 1 to this test report.

5.7. Antenna requirements

5.7.1. Requirements/Limits
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

5.7.2. Verdict
The antenna is permanently affixed to the module. **PASS**.

5.8. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved.
For uncertainty determination, each component used in the concrete measurement set-up was taken in account and its contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%						Remarks
Conducted emissions (U_{CISPR})	CISPR 16-2-1	9 kHz - 150 kHz 150 kHz - 30 MHz	4.0 dB 3.6 dB						-
Radiated emissions Enclosure	CISPR 16-2-3	30 MHz - 1 GHz 1 GHz - 18 GHz	4.2 dB 5.1 dB						E-Field
Disturbance power	CISPR 16-2-2	30 MHz - 300 MHz	-						-
Power Output radiated	-	30 MHz - 4 GHz	3.17 dB						Substitution method
		24 GHz	3.24 dB						
		76 GHz -77 GHz	3.32 dB						
Power Output conducted	-	Set-up No.	Cel-C1	Cel-C2	BT1	W1	W2	--	
		9 kHz - 12.75 GHz	N/A	0.60	0.7	0.25	N/A	--	-
		12.75 GHz - 26.5 GHz	N/A	0.82	--	N/A	N/A	--	
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	0.70	N/A	0.69	--	N/A - not applicable
		2.8 GHz - 12.75 GHz	1.48	N/A	1.51	N/A	1.43	--	
		12.75 GHz – 18 GHz	1.81	N/A	1.83	N/A	1.77	--	
		18 GHz - 26.5 GHz	1.83	N/A	1.85	N/A	1.79	--	
Power density	-	1 GHz – 2.8 GHz	1.40 dB						--
Radiated emissions Enclosure	-	150 kHz - 30 MHz	5.0 dB						Magnetic field
		30 MHz - 1 GHz	4.2 dB						E-field
		1 GHz - 18 GHz	3.17 dB						Substitution Method
		18 GHz - 33 GHz	3.60 dB						
		33 GHz - 50 GHz	3.99 dB						
		40 GHz - 60 GHz	3.95 dB						
		50 GHz - 75 GHz	3.24 dB						External Mixer
		75 GHz - 90 GHz	3.32 dB						
		90 GHz - 140 GHz	4.94 dB						
		140 GHz - 225 GHz	5.42 dB						

Table: measurement uncertainties, valid for conducted/radiated measurements

6. Abbreviations used in this report

The abbreviations	
ANSI	American National Standards Institute
AV , AVG, CAV	Average detector
EIRP	Equivalent isotropic radiated power, determined within a separate measurement
EGPRS	Enhanced General Packet Radio Service
ERP	Effective radiated power
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
ISED	Innovation, Science and Economic Development Canada
n.a.	not applicable
Op-Mode	Operating mode of the equipment
PK	Peak
QP	Quasi peak detector
RBW	resolution bandwidth
RF	Radio frequency
RSS	Radio Standards Specification, Documents from Industry Canada
Rx	Receiver
TCH	Traffic channel
Tx	Transmitter
VBW	Video bandwidth

7. Accreditation details of CETECOM's laboratories and test sites

Ref.-No.	Accreditation Certificate	Valid for laboratory area or test site	Accreditation Body
-	D-PL-12047-01-01	All laboratories and test sites of CETECOM GmbH, Essen	DAkkS, Deutsche Akkreditierungsstelle GmbH
337 487 558 348 348	(MRA US-EU 0003)	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurem.	FCC, Federal Communications Commission Laboratory Division, USA
337 487 550 558	-- 3462D-2 3462D-2 3462D-3	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR)	ISED, Innovation, Science and Economic Development Canada
487 550 348 348	R- 4452 G- 20013 C- 20009 T- 20006	Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurem.	VCCI, Voluntary Control Council for Interference by Information Technology Equipment, Japan
OATS = Open Area Test Site, SAR = Semi Anechoic Room, FAR = Fully Anechoic Room			

8. Instruments and Ancillary

8.1. Used equipment

The “Ref.-No” in the left column of the following tables allows the clear identification of the laboratory equipment.

8.1.1. Test software and firmware of equipment

Ref.-No.	Equipment	Type	Serial-No.	Version of Firmware or Software during the test
012	Signal Generator (EMS-cond.)	SMY 01	839069/027	Firm.= V 2.02
013	Power Meter (EMS cond.)	NRVD	839111/003	Firm.= V 1.51
017	Digital Radiocommunication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT = D2.87 13.01.99
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	Firm.= V 3.1DHG
261	Thermal Power Sensor	NRV-Z55	825083/0008	EPROM-Datum 02.12.04, SE EE 1 B
262	Power Meter	NRV-S	825770/0010	Firm.= 2.6
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04, SW-DSP=1.02, Hardboot=1.02, Softboot=2.02
298	Univ. Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f. all band used
323	Digital Radiocommunication Tester	CMD 55	825878/0034	Firm.= 3.52 .22.01.99
335	CTC-EMS-Conducted	System EMS Conducted	-	EMC 32 V 8.52
340	Digital Radiocommunication Tester	CMD 55	849709/037	Firm.= 3.52 .22.01.99
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	Firm. UCS 500=001925/3.06a02, rc=ISMIEC 4.10
377	EMI Test Receiver	ESCS 30	100160	Firm.= 2.30, OTP= 02.01, GRA= 02.36
378	Broadband RF Field Monitor	RadiSense III	03D00013SNO-08	Firm.= V.03D13
389	Digital Multimeter	Keithley 2000	0583926	Firm. = A13 (Mainboard) A02 (Display)
392	Radio Communication Tester	MT8820A	6K00000788	Firm.= 4.50 #005, IPL=4.01#001,OS=4.02#001, GSM=4.41#013, W-CDMA= 4.54#004, scenario= 4.52#002
436	Univ. Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=5.14, Mess-Software= GSM:5.14 WCDMA:5.14 (current Testsoftw. F. all band to
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.52
442	CTC-SAR-EMS	System EMS field (SAR)	-	EMC 32 Version 8.40
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	Spuri 7.2.5 or EMC 32 Ver. 9.15.00
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	EMC 32 Version 9.15.00
460	Univ. Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used,
489	EMI Test Receiver	ESU40	1000-30	Firmware=4.43 SP3, Bios=V5.1-16-3, Spec. =01.00
491	ESD Simulator dito	ESD dito	dito307022	V 2.30
524	Voltage Drop Simulator	VDS 200	0196-16	Software No. 000037 Version V4.20a01
526	Burst Generator	EFT 200 A	0496-06	Software No. 000034 Version V2.32
527	Micro Pulse Generator	MPG 200 B	0496-05	Software No. 000030 Version V2.43
528	Load Dump Simulator	LD 200B	0496-06	Software No. 000031 Version V2.35a01
546	Univ. Radio Communication Tester	CMU 200	106436	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used
584	Spectrum Analyzer	FSU 8	100248	2.82_SP3
597	Univ. Radio Communication Tester	CMU 200	100347	R&S Test Firmware Base=5.01, GSM=5.02 WCDMA= not installed, Mainboard= µP1=V.850
607	Signal Generator	SMR 20	832033/011	V1.25
620	EMI Test Receiver	ESU 26	100362	4.43_SP3
670	Univ. Radio Communication Tester	CMU 200	106833	µP1 =V8.50, Firmware = V.20
689	Vector Signal Generator	SMU200	100970	02.20.360.142
692	Bluetooth Tester	CBT 32	100236	CBT V 5.40, FW: V.2.41 (FPGA Digital, V. 3.09 FPGA RF)
699	Audio Analyzer	UPL16	833494/005	3.06

8.1.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	23.05.2021
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	22.05.2022
020	Horn Antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.07.2021
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	30.05.2021
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	23.05.2021
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1g	20.10.2020
086	DC - power supply, 0 -10 A	LNG 50-10	-	Heinzinger Electronic	pre-m	2	
087	DC - power supply, 0 -5 A	EA-3013 S	-	Elektro Automatik	pre-m	2	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	30.05.2021
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	30.05.2021
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	BOCONSULT	36 M	-	22.05.2022
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36 M	1c	08.04.2023
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	36 M	-	10.03.2020
248	attenuator	SMA 6dB 2W	-	Radiall	pre-m	2	
249	attenuator	SMA 10dB 10W	-	Radiall	pre-m	2	
252	attenuator	N 6dB 12W	-	Radiall	pre-m	2	
256	attenuator	SMA 3dB 2W	-	Radiall	pre-m	2	
257	hybrid	4031C	04491	Narda	pre-m	2	
260	hybrid coupler	4032C	11342	Narda	pre-m	2	
261	Thermal Power Sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24 M	-	30.05.2020
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	30.05.2020
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	30.05.2020
266	Peak Power Sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	30.05.2020
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	pre-m	2	
270	termination	1418 N	BB6935	Weinschel	pre-m	2	
271	termination	1418 N	BE6384	Weinschel	pre-m	2	
272	attenuator (20 dB) 50 W	Model 47	BF6239	Weinschel	pre-m	2	
273	attenuator (10 dB) 100 W	Model 48	BF9229	Weinschel	pre-m	2	
274	attenuator (10 dB) 50 W	Model 47 (10 dB) 50 W	BG0321	Weinschel	pre-m	2	
275	DC-Block	Model 7003 (N)	C5129	Weinschel	pre-m	2	
276	DC-Block	Model 7006 (SMA)	C7061	Weinschel	pre-m	2	
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	1c	20.10.2020
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	1c	20.10.2020
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel	pre-m	2	
302	horn antenna 40 GHz (Meas 1)	BBHA9170	155	Schwarzbeck	36 M	-	15.04.2023
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	30.05.2020
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	23.05.2021
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
354	DC - Power Supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	2	
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	21.05.2021
389	Digital Multimeter	Keithley 2000	0583926	Keithley	pre-m	-	
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	01.07.2020
396	Thermo/Hygrometer	Thermo/Hygrometer	-	Conrad	24 M	-	09.01.2021
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	25.05.2020
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	10.03.2020
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	05.06.2017
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	20.10.2020
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	20.10.2020
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	20.10.2020
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
459	DC -Power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
460	Univ. Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	30.05.2020
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	30.05.2020

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	36 M	-	30.05.2021
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	36 M	-	30.04.2021
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	-	30.05.2021
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-10P	1244554	Miteq	12 M	-	20.10.2020
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren / CETECOM	24 M	-	16.04.2021
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	30.06.2020
502	band reject filter	WRCG 1709/1786-1699/1796-	SN 9	Wainwright	pre-m	2	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	pre-m	2	
512	notch filter GSM 850	WRCA 800/960-02/40-6EEK	SN 24	Wainwrght	12 M	1c	20.10.2020
517	relais switch matrix	HF Relais Box Keithley System	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	23.05.2021
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	pre-m	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
546	Univ. Radio Communication Tester	CMU 200	106436	R&S	12 M	-	05.08.2020
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.07.2021
550	System CTC S-VSWR Verification SAR-EMI	System EMI Field SAR S-VSWR	-	ETS Lindgren/CETECOM	24 M	-	02.10.2021
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	20.10.2020
558	System CTC FAR S-VSWR	System CTC FAR S-VSWR	-	CTC	24 M	-	08.05.2021
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	03.05.2022
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
594	Wideband Radio Communication Tester	CMW 500	101757	Rohde & Schwarz	12 M	-	26.06.2020
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	pre-m	-	
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	30.05.2021
602	peak power sensor	NRV-Z32 (Reserve)	835080	Rohde & Schwarz	24 M	-	
611	DC power supply	E3632A	KR 75305854	Agilent	pre-m	2	
612	DC power supply	E3632A	MY 40001321	Agilent	pre-m	2	
613	Attenuator	R416120000 20dB 10W	Lot. 9828	Radiall	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	30.05.2020
617	Power Splitter/Combiner	ZFSC-2-2-S+	S F987001108	Mini Circuits	-	2	
618	Power Splitter/Combiner	50PD-634	600994	JFW Industries USA	-	2	
619	Power Splitter/Combiner	50PD-634	600995	JFW Industries, USA	-	3	
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	30.05.2020
621	Step Attenuator 0-139 dB	RSP	100017	Rohde & Schwarz	pre-m	2	
625	Generic Test Load USB	Generic Test Load USB	-	CETECOM	-	2	
634	Spectrum Analyzer	FSM (HF-Unit)	826188/010	Rohde & Schwarz	pre-m	2	
637	High Speed HDMI with Ethernet 1m	HDMI cable with Ethernet 1m	-	KogiLink	-	2	
638	HDMI Kabel with Ethernet 1,5 m flach	HDMI cable with Ethernet	-	Reichelt	-	2	
640	HDMI cable 2m rund	HDMI cable 2m rund	-	Reichelt	-	2	
641	HDMI cable with Ethernet	Certified HDMI cable with	-	PureLink	-	2	
644	Amplifierer	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
670	Univ. Radio Communication Tester	CMU 200	106833	Rohde & Schwarz	24 M	-	30.05.2020
671	DC-power supply 0-5 A	EA-3013S	-	Elektro Automatik	pre-m	2	
678	Power Meter	NRP	101638	Rohde&Schwarz	pre-m	-	
683	Spectrum Analyzer	FSU 26	200571	Rohde & Schwarz	12 M	-	30.05.2020
686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	-	-	
687	Signal Generator	SMF 100A	102073	Rohde&Schwarz	12 M	-	07.02.2021
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
690	Spectrum Analyzer	FSU	100302/026	Rohde&Schwarz	24 M	-	30.05.2021
691	OSP120 Base Unit	OSP120	106833	Rohde & Schwarz	12 M	-	30.05.2020
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	36 M	-	29.05.2020
693	TS8997	CTC-Radio Lab 1_TS8997	-	Rohde&Schwarz	12 M	5	13.02.2021
697	Power Splitter	ZN4PD-642W-S+	165001445	Mini-Circuits	-	2	
701	CMW500 wide. Radio Comm.	CMW500	158150	Rohde & Schwarz	24 M	-	05.11.2021
703	INNCO Antennen Mast	MA 4010-KT080-XPET-ZSS3	MA4170-KT100-XPET-	INNCO	pre-m	-	
704	INNCON Controller	CO 3000-4port	CO3000/933/38410516/L	INNCO Systems GmBh	pre-m	-	
711	Harmonic Mixer 90 GHz - 140GHz	RPG FS-Z140	101004	RPG	36 M	-	
712	Harmonic Mixer 75 GHz - 110GHz	FS-Z110	101468	Rohde & Schwarz	12 M	-	04.11.2020
713	Harmonic Mixer, 50 GHz - 75GHz	FS-Z75	101022	Rohde & Schwarz	24 M	-	05.07.2021
714	Signal Analyzer 67GHz	FSW67	104023	Rohde & Schwarz	12 M	-	04.07.2020

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
715	Harmonic Mixer, 140 GHz - 220GHz	FS-Z220	101009	RPG Radiometer Physics	36 M	-	03.08.2020
747	Spectrum Analyzer	FSU 26	200152	Rohde & Schwarz	12 M	-	04.07.2020
748	Pickett-Potter Horn Antenna	FH-PP 4060	010001	Radiometer Physiscs	36 M	-	
750	Pickett-Potter Horn Antenna	FH-PP 220	010011	Radiometer Physics	36 M	-	
751	Digital Optical System	optoCAN-FD Transceiver	17-010416	mk-messtechnik GmbH	-	-	
752	Digital Optical System	optoCAN-FD Transceiver	17-010083	mk-messtechnik GmbH	-	-	
753	Digital Optical System	optoCAN-FD Transceiver	17-010084	mk-messtechnik GmbH	-	-	
754	Digital Optical System	optoCAN-FD Transceiver	17-010415	mk-messtechnik GmbH	-	-	
755	Digital Optical System	optoLAN-100-MAX	17-010795	mk-messtechnik GmbH	-	-	
757	WIDEBAND RADIO COMMUNICATION	CMW500	163673	Rohde&Schwarz	12 M	-	30.05.2020
758	Signal Generator	SMU 200A	100754	Rohde & Schwarz	24 M	-	11.10.2020
781	Power Supply	PS 2042-10 B	2815450369	Elektro-Automatik GmbH	-	-	
782	Power Supply	PS 2042-10 B	2815450348	lektro-Automatik GmbH &Co.KG	-	-	
783	Spectrum Analyzer	FSU 26	100414	Rohde & Schwarz	12 M	-	30.05.2020
784	Power Supply	NGSM 32/10	00196	Rohde & Schwarz	12 M	-	
785	RSP	RF Step Attenuator 0…139.9dB	860712/012	Rohde & Schwarz	12 M	-	
786	SAR Probe	ES3DV3	3340	Speag	36 M	-	14.02.2021
787	OSP	OSP B157WX	101264	Rohde & Schwarz	24 M	-	30.05.2020
788	Precision Omnidirectional Dipole	POD 618	6182558/Q	Seibersdorf Labaratories	36 M	-	30.06.2021
789	Precision Omnidirectional Dipole	POD 16	162496/Q	Seibersdorf Laboratories	36 M	-	30.06.2021
790	Horn Antenna	ASY-SGH-124-SMA	29F14182337	Antenna System Solutions	36 M	-	08.10.2021
791	Pickett-Potter Horn Antenna	FH-PP-325	10024	Radiometer Physics	36 M	-	
792	Pickett-Potter Horn Antenna	FH-PP 075	10006	Radiometer Physics	36 M	-	
793	Pickett-Potter Horn Antenna	FH-PP 140	10008	Radiometer Physics	36 M	-	
794	Pickett-Potter Horn Antenna	FH-PP 110	10014	Radiometer Physics	36 M	-	
795	SGH Antenna	SGH-26-WR10	1144	Anteral S.L.	36 M	-	
798	WR-22 Rectangular Gain Horn	SAR-2309-22-S2	13254-01	SAGE Millimeter, Inc.	36 M	-	
799	Transceiver	optoLAN-Gb	18-014746	mk messtechnik	pre-m	-	
801	Spectrum Analyzer	FSP 13	100960	Rohde & Schwarz	24 M	-	14.01.2021
802	Exposure Level Tester	ELT-400	O-0026	NARDA Safety Solutions	24 M	-	30.01.2021
803	Probe	ELT probe 3cm²	O-0026	Narda Safety Test Solution	24 M	-	30.01.2021
805	Thermo-Hygrometer	Web-Thermo-Hygrometer	02749814	W&T	24 M	-	
806	AC2600 Smart Wifi Router	Netgear Nighthawk x4S	5K5188590067B	Netgear	-	-	
807	Direct Coupler	Direct Coupler C-05020-10	511	ET Industries	-	-	
808	Diode Power Sensor	NRV-Z1	829894/001	Rohde & Schwarz	24 M	-	24.05.2021
809	Standard gain Horn Antenna	WR-159 Horn Antenna	-	Pasternack Enterprises Inc.	-	-	
810	Horn Antenna WR90	90-HA20	J202064946	TACTRON Elektronik GmbH &	-	-	
811	Waveguide to Coax Adapter	ADP-WC-WR90-SMA-F-F	J504072436	TACTRON elektronik GmbH &	-	-	
812	1-18 GHz Amplifier	ASG18B-4010	-	Wright Technologies, Inc.	pre-m	-	
813	Band Reject Filter	WRCJV10-5855-5875-5905-	10	Wainwright Instruments GmbH	pre-m	-	
814	Band Reject Filter	WRCJV10-5855-5875-5905-	11	Wainwright Instruments GmbH	pre-m	-	
816	GPIB-USB-HS	187965G-01L	16AE772	National Instruments	-	-	
817	GBIP-USB-HS	187965G-01L	16AC1EE	National Instruments	-	-	
818	GPIB-USB-HS	187965G-01L	16AE8D0	Natinal Instruments	-	-	
819	GPIB-USB-HS	187965G-01L	16AB93C	National Instruments	-	-	
820	GPIB-USB-HS	187965G-01L	16AE294	National Instruments	-	-	
821	GPIB-USB-HS	187965G-01L	16ACB9C	National Instruments	-	-	
822	GPIB-USB-HS	187965G-01L	16AE5B2	National Instruments	-	-	
823	Broadband Field Meter	NBM-550	H-0929	NARDA Safety Test Solutions	36 M	-	19.07.2022
824	E-Field Probe	EF 0691	H-0851	Narda Safety Test Solutions	36 M	-	06.08.2022
825	H-Field Probe	HF 3061	D-0805	NARDA Safety Test Solutions	36 M	-	06.08.2022
826	Electric and magnetic Field Analyzer	EHP-50F	510WY90125	NARDA Safety Test Solutions	36 M	-	01.10.2022
827	Transceiver	optoUSB-2.0	19-017001	mk-messtechnik GmbH	-	-	
828	Transceiver	optoUSB-2.0	19-017002	mk-messtechnik GmbH	-	-	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
829	Battery Pack BP-84	Battery Pack BP-84	19-017271	mk-messtechnik GmbH	-	-	
830	SIGNAL ANALYZER	FSV3030	101247	Rohde&Schwarz	12 M	-	02.10.2020
831	Rubidium Frequency Standard	8040B CS-Rub5	100050	Rohde & Schwarz	36 M	-	
871	Wideband Power Sensor	NRP-Z81	104631	Rohde & Schwarz	12 M	-	24.03.2021
872	Power Meter	NRX	101831	Rohde&Schwarz	24 M	-	28.01.2022
873	Schirmbox	WTS-80	P3101	CETECOM GmbH	pre-m	-	
874	Signal Generator	SMP22	100028	Rohde & Schwarz	36 M	-	20.05.2020
877	Verstärker	JS42-08001800-16-8P	2079991 / 2079992	Miteq	pre-m	-	
878	Verstärker	JS4_00102600-38-5P	838697	Miteq	pre-m	-	
879	Verstärker	JS44-18004000-40-8P	1750117	Miteq	pre-m	-	
880	Laptop	Latitude 7400	JVDM2X2	Dell	no	-	
881	Laptop	Latitude 7400	37RJ2X2	Dell	no	-	
882	Laptop	Latitude 7400	4GYJ2X2	DELL	no	-	
883	Switchmatrix	OSP-B200S2 Satellite OSP	101432	Rohde & Schwarz	36 M	-	24.02.2023
884	Switchmatrix	OSP320 BASE UNIT 3HU WO	101391	Rohde & Schwarz	36 M	-	24.02.2023
885	Power Supply	Power Supply EA3632A	75305850	EA	no	-	
886	HD Kamera	dAV-Cr-HD-30-ww	19-018438	mk Messtechnik	no	-	
887	HD Camera	dAV-Cr-HD-30-ww-PS	19-018439	mk Messtechnik	no	-	
889	rack mount receiver	dAV-Rr-HD 19"	018247	mk Messtechnik	no	-	
890	HD camera	dAV-Cr-HD-30-ww-PS	19-018440	mk Messtechnik	no	-	
891	rack mount receiver	dAV-Rr-HD 19"	19-018248	mk Messtechnik	no	-	

8.1.3. Legend

Note / remarks		Calibrated during system calibration:
	1a	System CTC-SAR-EMS (Ref.-No. 442)
	1b	System-CTC-EMS-Conducted (Ref.-No. 335)
	1c	System CTC-FAR-EMI-RSE (Ref.-No . 443)
	1d	System CTC-SAR-EMI (Ref.-No . 441)
	1e	System CTC-OATS (EMI radiated) (Ref.-No. 337)
	1 f	System CTC-CTIA-OTA (Ref.-No . 420)
	1 g	System CTC-FAR-EMS (Ref.-No . 444)
	2	Calibration or equipment check immediately before measurement
	3	Regulatory maintained equipment for functional check or support purpose
	4	Ancillary equipment without calibration e.g. mechanical equipment or monitoring equipment
	5	Test System

Interval of calibration	12 M	12 month
	24 M	24 month
	36 M	36 month
	24/12 M	Calibration every 24 months, between this every 12 months internal validation
	36/12 M	Calibration every 36 months, between this every 12 months internal validation
	Pre-m	Check before starting the measurement
	-	Without calibration

9. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2020-May-06
C1	- Certification number is corrected on the first page - Issue Number for RSS-210 is added - All EIRP results are recalculated for field strength results - OBW 99% was remeasured with RBW=3 MHz - OBW 26 dB was deleted from the measurement results	2020-May-25

The End of Test Report