FCC Measurement/Technical Report on

CMWA6600
IMx1 Gateway

FCC ID: 2AVQ2-CMWA6600
& contains XPYEMMYW161

IC: 25894-CMWA6600
& contains 8595A-EMMYW161

Test Report Reference: MDE_SKF_1901_FCC_01

Test Laboratory:
7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

Deutsche Akkreditierungsstelle
D-PL-12140-01-01
D-PL-12140-01-02
D-PL-12140-01-03

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1 APPLIED STANDARDS AND TEST SUMMARY

1.1 APPLIED STANDARDS

Type of Authorization
Certification for an Intentional Radiator.

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-18 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz

Note:
The tests were selected and performed with reference to the FCC Public Notice "Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules, 558074 D01 15.247 Meas Guidance v05r02, 2019-04-02".
ANSI C63.10–2013 is applied.

1.2 FCC-IC CORRELATION TABLE

Correlation of measurement requirements for DTS (e.g. WLAN 2.4 GHz, Bluetooth® Low Energy) equipment from FCC and IC

DTS equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 5: 8.8
Occupied bandwidth	§ 15.247 (a) (2)	RSS-247 Issue 2: 5.2 (a)
Peak conducted output power	§ 15.247 (b) (3), (4)	RSS-247 Issue 2: 5.4 (d)
Transmitter spurious RF conducted emissions	§ 15.247 (d)	RSS-Gen Issue 5: 6.13 / 8.9/8.10; RSS-247 Issue 2: 5.5
Transmitter spurious radiated emissions	§ 15.247 (d); § 15.209 (a)	RSS-Gen Issue 5: 6.13 / 8.9/8.10; RSS-247 Issue 2: 5.5
Band edge compliance	§ 15.247 (d)	RSS-247 Issue 2: 5.5
Power density	§ 15.247 (e)	RSS-247 Issue 2: 5.2 (b)
Antenna requirement	§ 15.203 / 15.204	RSS-Gen Issue 5: 8.3
Receiver spurious emissions	–	–

1.3 MEASUREMENT SUMMARY

47 CFR CHAPTER I FCC PART 15 Subpart C §15.247 **§ 15.207**

Conducted Emissions at AC Mains
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Operating mode, Connection to AC mains				
worst case, via ancillary/auxiliary equipment Remark: computer peripheral setup	AC_DC_ae08_cond	2020-03-04	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.247 **§ 15.247 (a) (2)**

Occupied Bandwidth (6 dB)
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency				
Mira-Mesh, high	S01_AC02	2020-06-04	Passed	Passed
Mira-Mesh, low	S01_AC02	2020-06-04	Passed	Passed
Mira-Mesh, mid	S01_AC02	2020-06-04	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.247 **IC RSS-Gen & IC TRC-43; Ch. 6.7 & Ch. 8**

Occupied Bandwidth (99%)
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Operating Frequency				
high	S01_AC02	2020-02-03	N/A	Performed
low	S01_AC02	2020-02-03	N/A	Performed
mid	S01_AC02	2020-02-03	N/A	Performed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.247 **§ 15.247 (b) (3)**

Peak Power Output
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency, Measurement method				
Mira-Mesh, high, conducted	S01_AC02	2020-05-13	Passed	Passed
Mira-Mesh, low, conducted	S01_AC02	2020-05-13	Passed	Passed
Mira-Mesh, mid, conducted	S01_AC02	2020-05-13	Passed	Passed

47 CFR CHAPTER I FCC PART 15 § 15.247 (d)
Subpart C §15.247

Spurious RF Conducted Emissions
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode Radio Technology, Operating Frequency	Setup	Date	FCC	IC
Mira-Mesh, high	S01_AC02	2020-04-09	Passed	Passed
Mira-Mesh, low	S01_AC02	2020-04-09	Passed	Passed
Mira-Mesh, mid	S01_AC02	2020-04-09	Passed	Passed

47 CFR CHAPTER I FCC PART 15 § 15.247 (d)
Subpart C §15.247

Transmitter Spurious Radiated Emissions
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode Radio Technology, Operating Frequency, Measurement range	Setup	Date	FCC	IC
Mira-Mesh, high, 1 GHz - 26 GHz	S01_AE06	2020-02-26	Passed	Passed
Mira-Mesh, high, 30 MHz - 1 GHz	S01_AE05	2020-02-13	Passed	Passed
Mira-Mesh, low, 1 GHz - 26 GHz	S01_AE06	2020-02-26	Passed	Passed
Mira-Mesh, low, 30 MHz - 1 GHz	S01_AE05	2020-02-13	Passed	Passed
Mira-Mesh, mid, 1 GHz - 26 GHz	S01_AE04	2020-02-10	Passed	Passed
Mira-Mesh, mid, 30 MHz - 1 GHz	S01_AE05	2020-02-13	Passed	Passed
Mira-Mesh, mid, 9 kHz - 30 MHz	S01_AE06	2020-02-26	Passed	Passed

47 CFR CHAPTER I FCC PART 15 § 15.247 (d)
Subpart C §15.247

Band Edge Compliance Conducted
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode Radio Technology, Operating Frequency, Band Edge	Setup	Date	FCC	IC
Mira-Mesh, high, high	S01_AC02	2020-02-03	Passed	Passed
Mira-Mesh, hopping, high	S01_AC02	2020-02-03	Passed	Passed
Mira-Mesh, hopping, low	S01_AC02	2020-02-03	Passed	Passed
Mira-Mesh, low, low	S01_AC02	2020-02-03	Passed	Passed

47 CFR CHAPTER I FCC PART 15 § 15.247 (d)
Subpart C §15.247

Band Edge Compliance Radiated
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode Radio Technology, Operating Frequency, Band Edge	Setup	Date	FCC	IC
Mira-Mesh, high, high	S01_AE04	2020-02-10	Passed	Passed

47 CFR CHAPTER I FCC PART 15 § 15.247 (e)
Subpart C §15.247

Power Density
The measurement was performed according to ANSI C63.10 **Final Result**

OP-Mode	**Setup**	**Date**	**FCC**	**IC**
Radio Technology, Operating Frequency				
Mira-Mesh, high	S01_AC02	2020-06-04	Passed	Passed
Mira-Mesh, low	S01_AC02	2020-06-04	Passed	Passed
Mira-Mesh, mid	S01_AC02	2020-06-04	Passed	Passed

Performed:
The test is carried out and the result is reported, but no verdict is assigned because no limit applies.

2 REVISION HISTORY / SIGNATURES

Report version control			
Version	**Release date**	**Change Description**	**Version validity**
initial	2020-06-18	--	valid
--	--	--	--

COMMENT: -

(responsible for accreditation scope)
Dipl.-Ing. Andreas Petz

(responsible for testing and report)
Dipl.-Ing. Daniel Gall

7 layers GmbH, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

3 ADMINISTRATIVE DATA

3.1 TESTING LABORATORY

Company Name:	7layers GmbH
Address:	Borsigstr. 11 40880 Ratingen Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no:	DAkkS D-PL-12140-01-01| -02 | -03
FCC Designation Number:	DE0015
FCC Test Firm Registration:	929146
ISED CAB Identifier	DE0007; ISED#: 3699A
Responsible for accreditation scope:	Dipl.-Ing. Marco Kullik Dipl.-Ing. Andreas Petz
Report Template Version:	2020-03-18

3.2 PROJECT DATA

Responsible for testing and report:	Dipl.-Ing. Daniel Gall
Employees who performed the tests:	documented internally at 7Layers
Date of Report:	2020-06-18
Testing Period:	2020-02-03 to 2020-06-04

3.3 APPLICANT DATA

Company Name:	SKF Sverige AB
Address:	Aurorum 30 977 75 Lulea Sweden
Contact Person:	Mr. Ludo Gommers

3.4 MANUFACTURER DATA

Company Name:	please see Applicant Data

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	Enlight Collect Gateway
Product name	IMx1 Gateway
Type	CMWA6600
Declared EUT data by the supplier	
Voltage Type	DC (24 V nom.) or PoE (DC, 48 V nom.)
Voltage Level	DC input: 9..36 V; PoE: 44..57 V (DC)
Tested Modulation Type	GFSK (802.15.4 based mesh radio network)
General product description	Radio Transceiver supporting WLAN, BT-LE and 802.15.4 based mesh radio ("Mira-Mesh").
Specific product description for the EUT	The IMx-1 Enlight Collect Gateway is gateway for SKF wireless sensor vibration monitoring network.
The EUT provides the following ports:	DC, LAN1+PoE, LAN2, Speed Sensor, Enclosure
Tested data rates	1 Mbps
Special software used for testing	special firmware offers commanding from linux sub-system

4.2 EUT MAIN COMPONENTS

Sample Name	**Sample Code**	**Description**
#ac02	DE1384000ac02	with temporary antenna connector for mira-mesh radio
Sample Parameter	**Value**	
Serial No.	RC 0009	
HW Version	PCB Rev 4 - PCBA Rev 4.2	
SW Version	Test FW Test FW 1.10	
Comment	intended mainly for conducted radio testing	
Integral Antenna	yes	

Sample Name	**Sample Code**	**Description**
#ae04	DE1384000ae04	automatic soldered / machine-made shielding(s)
Sample Parameter	**Value**	
Serial No.	RC 0040	
HW Version	PCB Rev 4 - PCBA Rev 4.2	
SW Version	Test FW 1.10	
Comment	intended mainly for radiated radio testing	
Integral Antenna	yes	

Sample Name	Sample Code	Description
#ae05	DE1384000ae05	added further capacitance at C185 in the antenna matching path
Sample Parameter	**Value**	
Serial No.	RC 0040	
HW Version	PCB Rev 4 - PCBA Rev 11 (WIP)	
SW Version	Test FW 1.10	
Comment	intended mainly for radiated radio testing	
Integral Antenna	yes	

Sample Name	Sample Code	Description
#ae06	DE1384000ae06	added capacitor C194 in the RF conducted path (MKW41Z output matching network); removing C185; added "WiFi auto-re-connect to the test-SW
Sample Parameter	**Value**	
Serial No.	RC 0040	
HW Version	PCB Rev 4 - PCBA Rev 11 (WIP)	
SW Version	Test FW 1.16	
Comment	intended mainly for radiated radio testing	
Integral Antenna	yes	

Sample Name	Sample Code	Description
#ae08	DE1384000ae08	added capacitor C194 in the RF conducted path; Reduced EMC sensitivity: D33 and R174 have been removed, R176 has been added; PERI_EN=PERI_ON fixed; Added 100 nF parallel to R16 and R17; C30 replaced by MOV.
Sample Parameter	**Value**	
Serial No.	RC 0040	
HW Version	PCB Rev 4 - PCBA Rev 11 (WIP)	
SW Version	Test FW 1.16	
Comment	intended mainly for radiated radio testing	
Integral Antenna	yes	

NOTE:The short description is used to simplify the identification of the EUT in this test report.

4.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Device	**Details (Manufacturer, Type Model, OUT Code)**	**Description**
-	-	No ancillary equipment has been provided.

4.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it.
But nevertheless Auxiliary Equipment can influence the test results.

Device	**Details (Manufacturer, Type Model, HW, SW, S/N)**	**Description**
6005D (30 V / 5 A)	Peaktech, 6005D (30 V / 5 A):Laboratory Power Supply 120 V 60 Hz, -, -, 81062045	Laboratory Power Supply 120 V 60 Hz
AC Adapter 65W RE06	Fujitsu Ltd., AC Adapter 65W RE06:A13-065N3A, -, -, 186905OL04	A13-065N3A
Keyboard EMC Keyb 2 (Logitech)	Logitech, Keyboard EMC Keyb 2 (Logitech):K120 Y-U0009, -, -, 1331MG02J988	K120 Y-U0009
Laptop RE06	Fujitsu Ltd., Laptop RE06:Lifebook U758, -, -, DSAL009842	Lifebook U758
Mouse 1 (Logitech)	Logitech, Mouse 1 (Logitech):M-BT58, -, -, HC60915A2XC	M-BT58
TFT Display 5 (LG)	LG, TFT Display 5 (LG):L17MB-P, -, -, 412WAPL0U560	L17MB-P

4.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup	Combination of EUTs	Description and Rationale
S01_AE06	#ae06,	Setup for radiated measurements, #ae06 supplied by DC
AC_DC_ae08_cond	#ae08, Keyboard EMC Keyb 2 (Logitech), TFT Display 5 (LG), Laptop RE06, AC Adapter 65W RE06, 6005D (30 V / 5 A), Mouse 1 (Logitech),	Setup for conducted measurements at AC Mains, #ae08 supplied by DC
S01_AE08	#ae08,	Setup for radiated measurements, #ae08 supplied by DC
S01_AE05	#ae05, Keyboard EMC Keyb 2 (Logitech), TFT Display 5 (LG), Laptop RE06, AC Adapter 65W RE06, 6005D (30 V / 5 A), Mouse 1 (Logitech),	Setup for radiated measurements, #ae05 supplied by DC
S01_AE04	#ae08,	Setup for radiated measurements, #ae04 supplied by DC
S01_AC02	#ac02,	Setup for conducted measurements, #ac02 supplied by DC

4.6 OPERATING MODES / TEST CHANNELS

This chapter describes the operating modes of the EUTs used for testing.

Test Channels:	**low**	**mid1**	**mid2**	**high**
Channel:	2	40	41	80
Frequency [MHz]	2402	2440	2441	2480

DTS Radio Technology: Mira-Mesh (proprietary)	**2.4 GHz ISM** **2400 - 2483.5 MHz**

The test samples can be set to a local TX mode using commands available in the special test firmware. Operation on any fixed channel or in sequential hopping mode (covering the entire range between 2402 and 2480 MHz) is possible as special test modes.
A guide related to the test mode(s) is provided by the applicant.

4.7 PRODUCT LABELLING

Please refer to the documentation of the applicant.

5 TEST RESULTS

5.1 CONDUCTED EMISSIONS AT AC MAINS

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.1.1 TEST DESCRIPTION

The test set-up was made in accordance to the general provisions of ANSI C 63.10
The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50µH || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software EMC-32 from R&S.

Step 1: Preliminary scan
Intention of this step is, to determine the conducted EMI-profile of the EUT.
EMI receiver settings:
- Detector: Peak – Maxhold & Average
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 2.5 kHz
- IF–Bandwidth: 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement
Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.
EMI receiver settings:
- Detector: Quasi-Peak
- IF Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:
1) Neutral lead - reference ground (PE grounded)
2) Phase lead - reference ground (PE grounded)
3) Neutral lead - reference ground (PE floating)
4) Phase lead - reference ground (PE floating)

The highest value is reported.

5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.207

Frequency (MHz)	QP Limits (dBµV)	AV Limits (dBµV)
0.15 – 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

5.1.3 TEST PROTOCOL

Temperature: 23 °C
Air Pressure: 1004 hPa
Humidity: 34 %

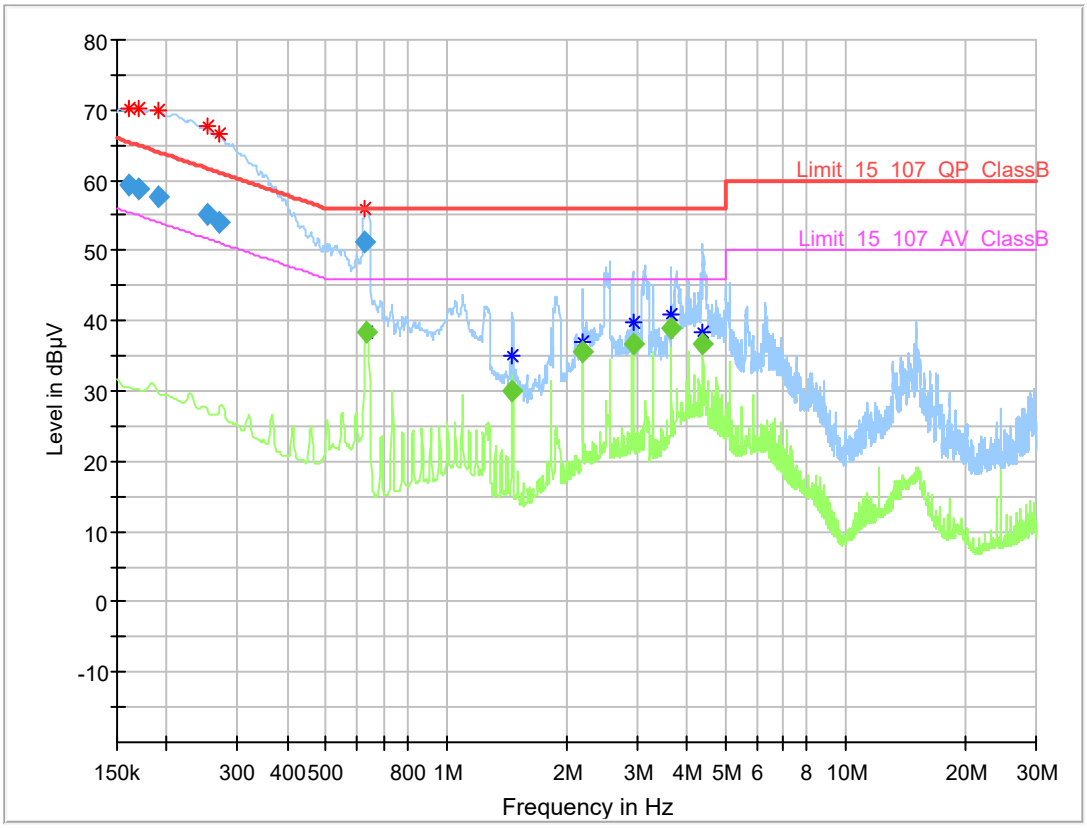
Power line	**PE**	**Frequency [MHz]**	**Measured value QP [dBµV]**	**Measured value AV [dBµV]**	**Limit [dBµV]**	**Margin [dB]**
L1	FLO	0.161	59.3		65.4	6.1
L1	FLO	0.170	58.9		65.0	6.1
L1	FLO	0.191	57.7		64.0	6.3
L1	FLO	0.251	55.2		61.7	6.6
L1	FLO	0.272	54.1		61.1	7.0
N	GND	0.627	51.3		56.0	4.7
N	GND	0.632		38.3	46.0	7.7
L1	FLO	1.466		30.0	46.0	16.0
L1	FLO	2.198		35.7	46.0	10.3
L1	FLO	2.931		36.7	46.0	9.3
L1	FLO	3.665		39.0	46.0	7.0
L1	FLO	4.398		36.6	46.0	9.4

Remark: Please see next sub-clause for the measurement plot.

5.1.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Operating mode = worst case, Connection to AC mains = via ancillary/auxiliary equipment (AC_DC_ae08_cond)

Test Description:	Conducted Emissions
Test Standard:	FCC §15.107, ANSI C63.4, FCC §15.207, ANSI C63.10
EUT / Setup Code:	DE1384000ae08
Operating Conditions:	120 V 60 Hz, WLAN b-mode 2.4 GHz band TX CH13 (2472 MHz) & Mira-mesh 2.4 GHz band TX CH1 (2402 MHz)
Comment:	computer peripheral setup, lab supply, 24 V DC
Legend:	Trace: blue = PK, green = CISPR AV; Star: red or blue = critical frequency; Rhombus: blue = final QP, green = final CISPR AV
Tested Port / used LISN:	AC mains => ESH3-Z5 (EUT connected via Lab Supply)
Termination of other ports:	AC of AUX (Laptop, TFT) => 2nd LISN ESH3-Z5 +50 Ohm



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.161250	59.33	---	65.40	6.07	1000.0	9.000	L1	FLO	10.1
0.170250	58.85	---	64.95	6.10	1000.0	9.000	L1	FLO	10.1
0.190500	57.70	---	64.02	6.31	1000.0	9.000	L1	FLO	10.1
0.251250	55.16	---	61.72	6.56	1000.0	9.000	L1	FLO	10.1
0.271500	54.07	---	61.07	7.00	1000.0	9.000	L1	FLO	10.1
0.627000	51.29	---	56.00	4.71	1000.0	9.000	N	GND	10.1
0.631500	---	38.33	46.00	7.67	1000.0	9.000	N	GND	10.1
1.466250	---	29.96	46.00	16.04	1000.0	9.000	L1	FLO	10.2
2.197500	---	35.68	46.00	10.32	1000.0	9.000	L1	FLO	10.2
2.931000	---	36.74	46.00	9.26	1000.0	9.000	L1	FLO	10.3
3.664500	---	39.03	46.00	6.97	1000.0	9.000	L1	FLO	10.3
4.398000	---	36.56	46.00	9.44	1000.0	9.000	L1	FLO	10.4

5.1.5 TEST EQUIPMENT USED

- Conducted Emissions FCC

5.2 OCCUPIED BANDWIDTH (6 DB)

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.2.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (widest) emission bandwidth.

The EUT was connected to spectrum analyzer via a short coax cable with a known loss.

Analyzer settings:

- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Span: 1.6 MHz
- Trace: Maxhold
- Sweeps: >300, till trace is stabilised
- Sweeptime: 18.99 µs (FFT)
- Detector: Peak

5.2.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (a) (2)
Systems using digital modulation techniques may operate in the 902-928 MHz and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.3 TEST PROTOCOL

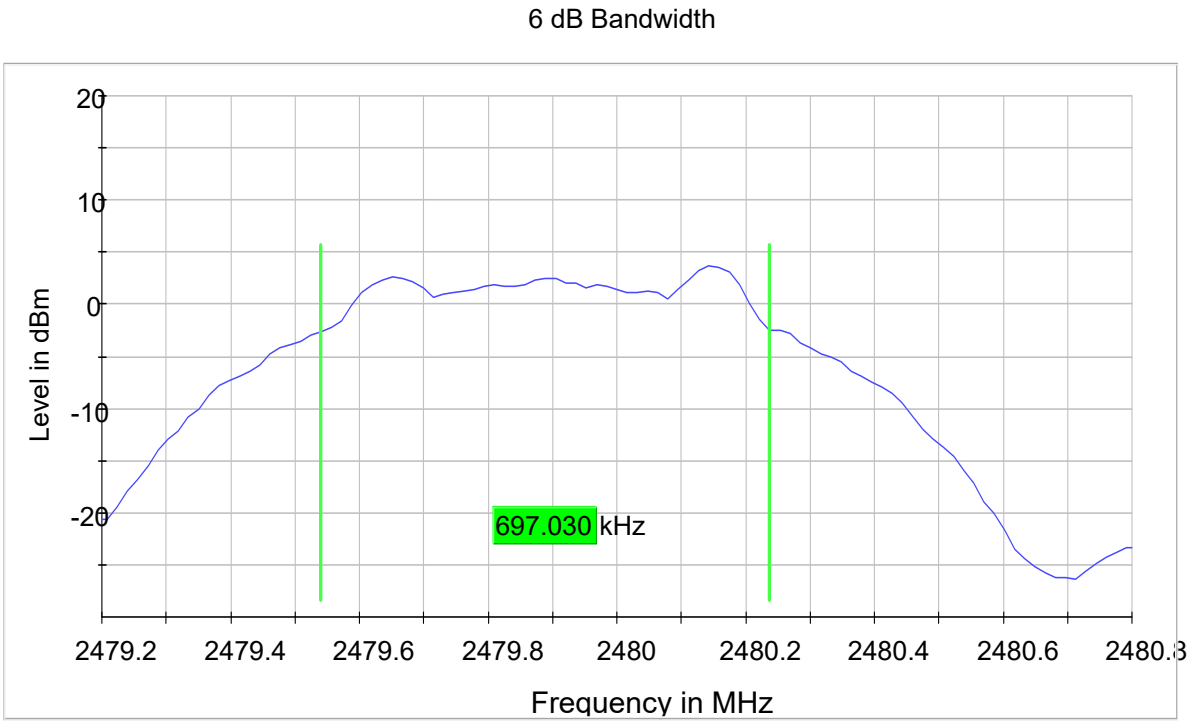
Ambient temperature:	21 °C
Air Pressure:	989 hPa
Humidity:	44 %
Mira-Mesh	

Band	Channel No.	Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]	Margin to Limit [MHz]
2.4 GHz ISM	2	2402	0.729	0.5	0.229
	40	2440	0.745	0.5	0.245
	80	2480	0.697	0.5	0.197

Remark: Please see next sub-clause for the measurement plot.

5.2.4 MEASUREMENT PLOT (SHOWING THE LOWEST VALUE, "WORST CASE")

Radio Technology = Mira-Mesh, Operating Frequency = mid
(S01_AC02)



5.2.5 TEST EQUIPMENT USED

- R&S TS8997

5.3 OCCUPIED BANDWIDTH (99%)

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.3.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The EUT was connected to spectrum analyzer via a short coax cable with a known loss.
Analyzer settings:

- Resolution Bandwidth (RBW): 10 kHz
- Video Bandwidth (VBW): 30 kHz
- Span: 2 MHz
- Trace: Maxhold
- Sweeps: 200
- Sweeptime: 189.5 µs (FFT)
- Detector: Peak

5.3.2 TEST REQUIREMENTS / LIMITS

No applicable limit:

5.3.3 TEST PROTOCOL

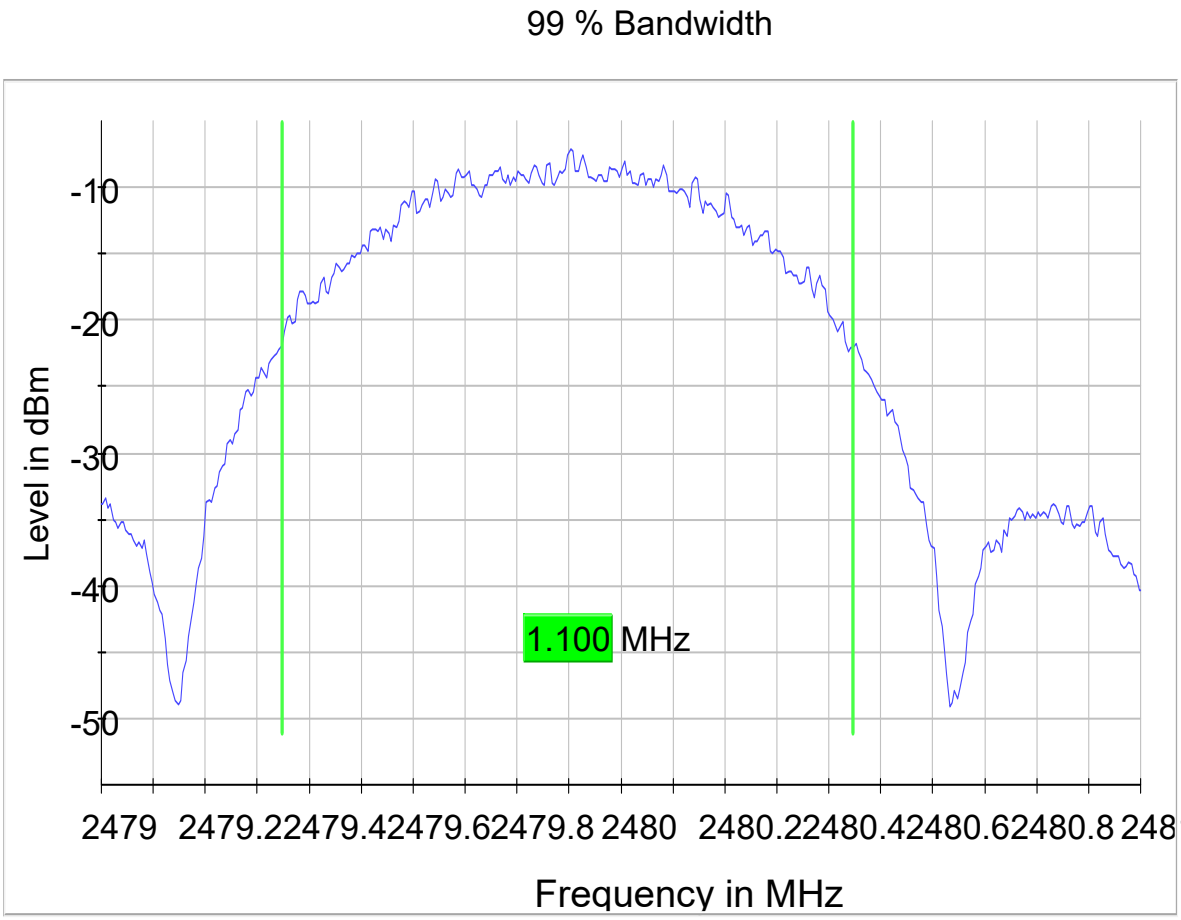
Ambient temperature: 23 °C
Air Pressure: 1010 hPa
Humidity: 30 %
Mira-Mesh

Band	Channel No.	Frequency [MHz]	99 % Bandwidth [MHz]
2.4 GHz ISM	2	2402	1.015
	41	2441	1.015
	80	2480	1.100

Remark: Please see next sub-clause for the measurement plot.

5.3.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Operating Frequency = high
(S01_AC02)



5.3.5 TEST EQUIPMENT USED

- R&S TS8997

5.4 PEAK POWER OUTPUT

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.4.1 TEST DESCRIPTION

DTS EQUIPMENT:
The Equipment Under Test (EUT) was set up to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power. The reference level of the spectrum analyzer was set higher than the output power of the EUT.

The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

Analyzer settings:
- Resolution Bandwidth (RBW): 2 MHz
- Video Bandwidth (VBW): 5 MHz
- Trace: Maxhold
- Sweeps: till trace is stabilised
- Sweeptime: 10 ms
- Detector: Peak

5.4.2 TEST REQUIREMENTS / LIMITS

DTS devices:
FCC Part 15, Subpart C, §15.247 (b) (3)
For systems using digital modulation techniques in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1 watt.

==> Maximum conducted peak output power: 30 dBm (excluding antenna gain, if antennas with directional gains that do not exceed 6 dBi are used).

Frequency Hopping Systems:
FCC Part 15, Subpart C, §15.247 (b) (1)
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

FCC Part 15, Subpart C, §15.247 (b) (2)
For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW)

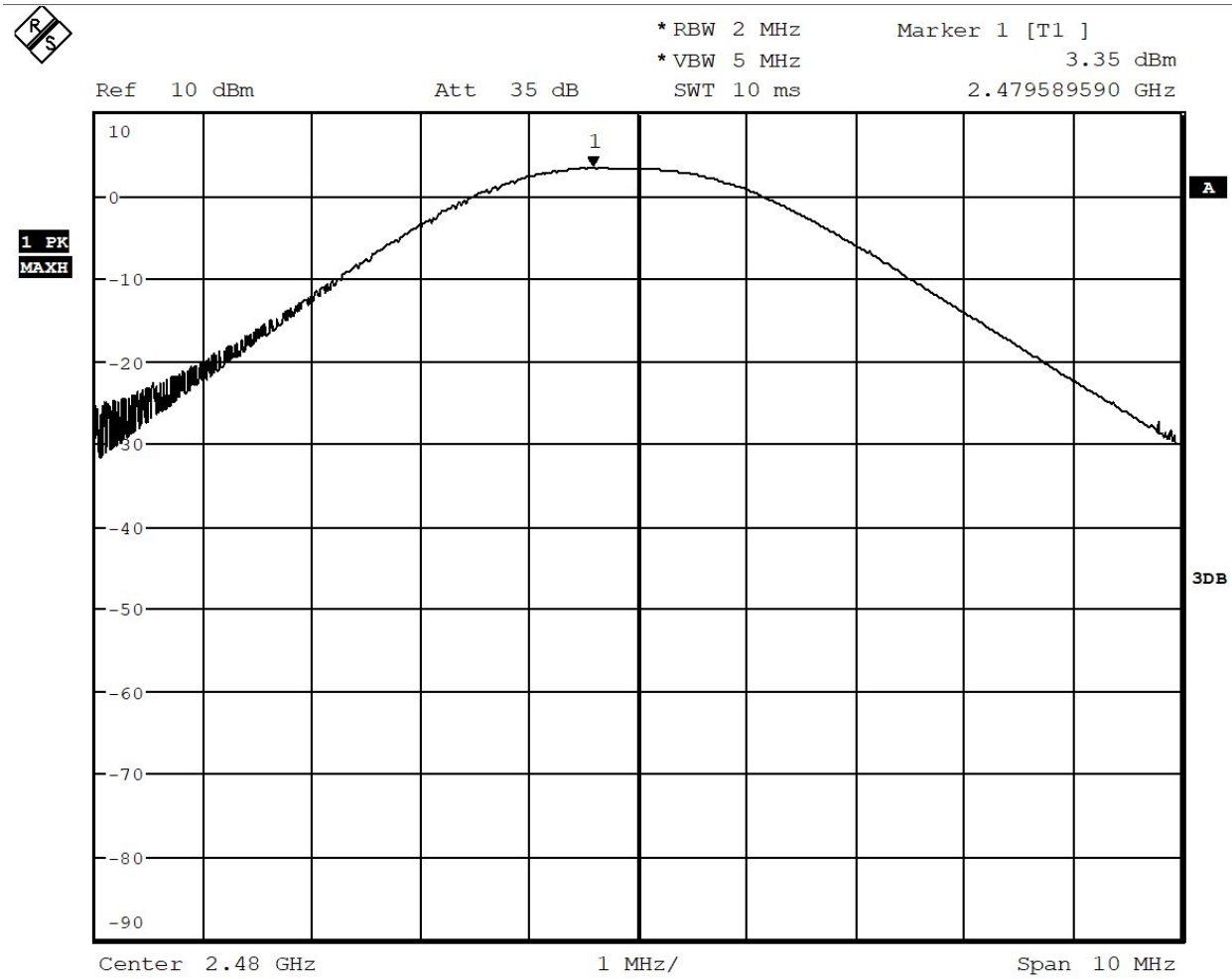
5.4.3 TEST PROTOCOL

Ambient temperature: 23 °C
Air Pressure: 1010 hPa
Humidity: 30 %
Mira-Mesh

Band	Channel No.	Frequency [MHz]	Peak Power [dBm]	Limit [dBm]	Margin to Limit [dB]	E.I.R.P [dBm]
2.4 GHz ISM	2	2402	3.1	30.0	26.9	6.5
	41	2441	3.2	30.0	26.8	6.6
	80	2480	3.4	30.0	26.6	6.8

5.4.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = Mira-Mesh, Operating Frequency = high, Measurement method = conducted
(S01_AC02)



5.4.5 TEST EQUIPMENT USED

- R&S TS8997

5.5 SPURIOUS RF CONDUCTED EMISSIONS

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.5.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the spurious emissions measurements. The EUT was connected to spectrum analyzer via a short coax cable with a known loss.
Analyzer settings:

- Frequency range: 30 – 25000 MHz
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Trace: Maxhold
- Sweeps: 2
- Sweep Time: 330 s
- Detector: Peak

5.5.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (c)
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.5.3 TEST PROTOCOL

Ambient temperature: 26 °C
Air Pressure: 1017 hPa
Humidity: 31 %
Mira-Mesh

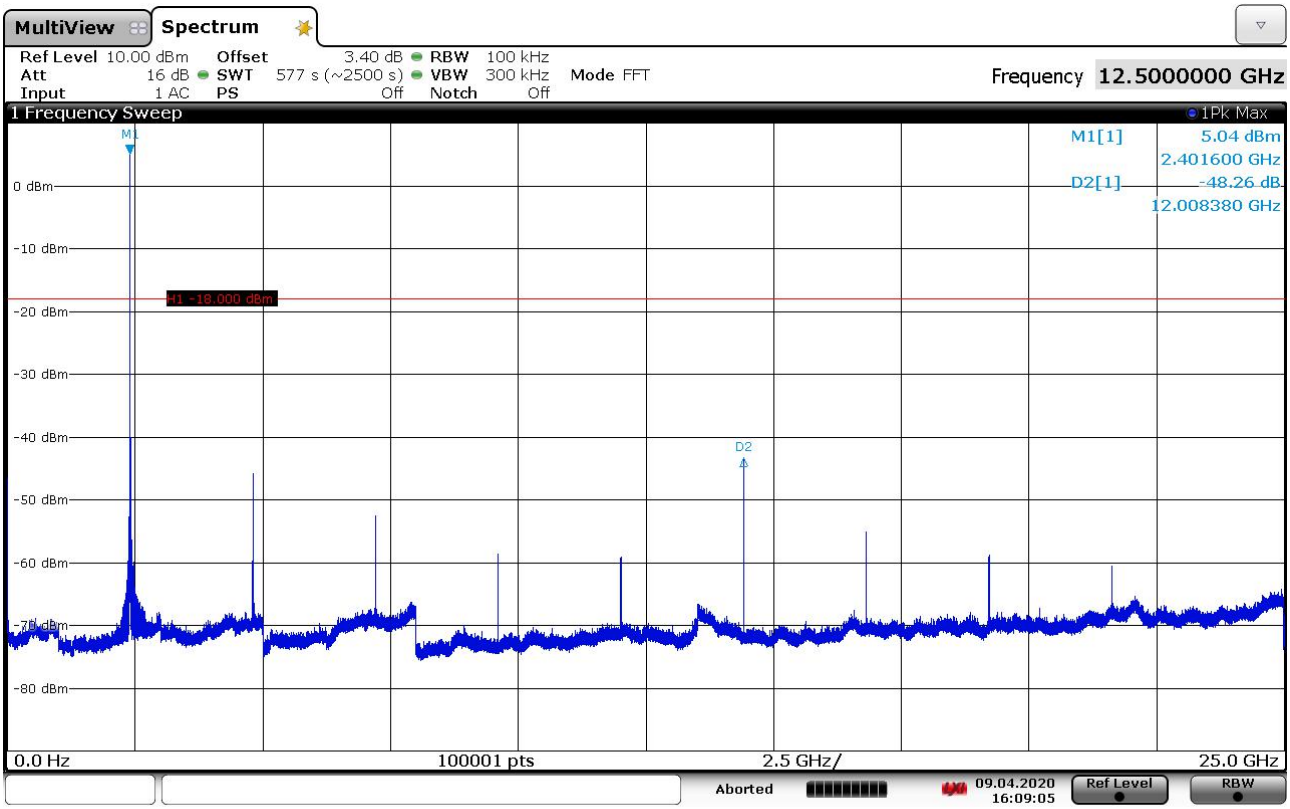
Channel No	Channel Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Ref. Level [dBm]	Limit [dBm]	Margin to Limit [dB]
2	2402	-	-	PEAK	100	1.6	-18.4	-
41	2441	-	-	PEAK	100	1.9	-18.1	-
80	2480	-	-	PEAK	100	2.1	-17.9	-

Note: Antenna gain is not included in the values of Ref. Level and the Limit.

Remark: Please see next sub-clause for the measurement plot.

5.5.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = Mira-Mesh, Operating Frequency = low
(S01_AC02)



16:09:06 09.04.2020

Note: The trace includes the antenna gain.

5.5.5 TEST EQUIPMENT USED

- R&S TS8997

5.6 TRANSMITTER SPURIOUS RADIATED EMISSIONS

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.6.1 TEST DESCRIPTION

The test set-up was made in accordance to the general provisions of ANSI C63.10 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The measurement procedure is implemented into the EMI test software EMC32 from R&S. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is also performed at 3 axes. A pre-check is performed while the EUT is powered from a DC power source.

1. Measurement up to 30 MHz
The Loop antenna HFH2-Z2 is used.

Step 1: pre measurement
- Anechoic chamber
- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 MHz and 0.15 – 30 MHz
- Frequency steps: 0.05 kHz and 2.25 kHz
- IF–Bandwidth: 0.2 kHz and 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.
- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 0.2 - 10 kHz
- Measuring time / Frequency step: 1 s

2. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan
This is a preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: –180° to 90°
- Turntable step size: 90°

- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: Adjustment measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will slowly vary by ± 45° around this value. During this action, the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position, the antenna height will also slowly vary by ± 100 cm around the antenna height determined. During this action, the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: ± 45 ° around the determined value
- Height variation range: ± 100 cm around the determined value
- Antenna Polarisation: max. value determined in step 1

Step 3: Final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

3. Measurement above 1 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

Step 1:

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.

All steps were performed with one height (1.5 m) of the receiving antenna only.

The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.

The turn table step size (azimuth angle) for the preliminary measurement is 45 °.

Step 2:

Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna instep 2 is omitted. Instead of this, a maximum search with a step size ± 45° for the elevation axis is performed.

The turn table azimuth will slowly vary by ± 22.5°.

The elevation angle will slowly vary by ± 45°

EMI receiver settings (for all steps):

- Detector: Peak, Average
- IF Bandwidth = 1 MHz

Step 3:
Spectrum analyser settings for step 3:
- Detector: Peak / Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

5.6.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (d)
... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 - 26000	500@3m	3	54.0@3m
26000 - 40000	500@3m	1	54.0@3m

The measured values above 26 GHz are corrected with an inverse linear distance extrapolation factor (20 dB/decade).

§15.35(b) ..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

5.6.3 TEST PROTOCOL

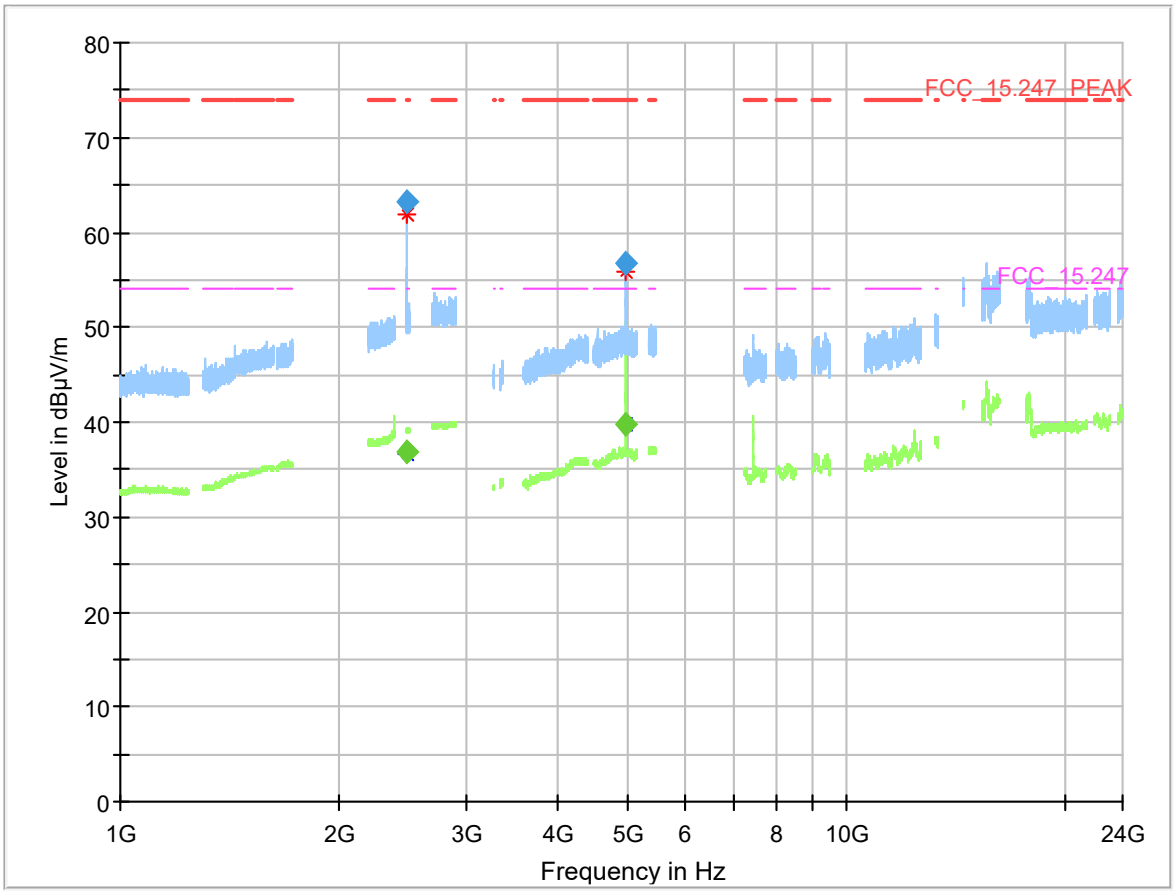
Ambient temperature: 23-25 °C
Air Pressure: 990-1000 hPa
Humidity: 32-38 %
Mira-Mesh
Applied duty cycle correction (AV): 13.5 dB

Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]	Limit Type
2	2402	4803.7	52.1	AV	1000	54.0	1.9	RB
2	2402	4803.7	53.3	PEAK	1000	74.0	20.7	RB
80	2480	2483.9	50.3	AV	1000	54.0	3.7	RB
80	2480	4959.9	53.3	AV	1000	54.0	0.7	RB
80	2480	2483.9	63.3	PEAK	1000	74.0	10.7	RB
80	2480	4959.4	56.7	PEAK	1000	74.0	17.3	RB
41	2441	4882.4	56.8	PEAK	1000	74.0	17.2	RB
41	2441	4882.4	53.2	AV	1000	54.0	0.8	RB

Remark: Please see next sub-clause for the measurement plot.

5.6.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

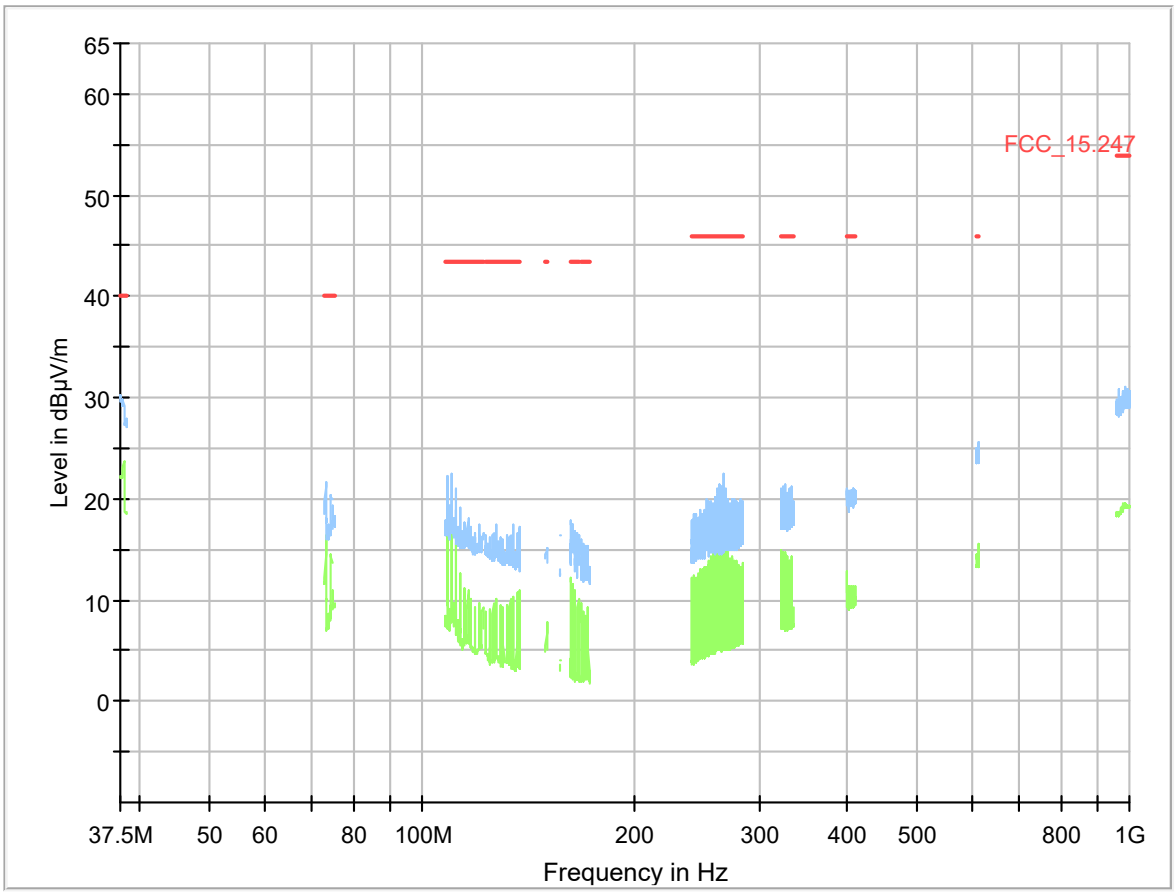
Radio Technology = Mira-Mesh, Operating Frequency = high, Measurement range = 1 GHz - 26 GHz
(S01_AE06)



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation
2483.913	---	36.8	54.00	17.24	1000.0	1000.000	150.0	V	38.0	-15.0
2483.913	63.3	---	74.00	10.69	1000.0	1000.000	150.0	H	-19.0	75.0
4959.388	56.7	---	74.00	17.28	1000.0	1000.000	150.0	H	-129.0	105.0
4959.875	---	39.8	54.00	14.16	1000.0	1000.000	150.0	H	-130.0	95.0

Radio Technology = Mira-Mesh, Operating Frequency = mid, Measurement range = 30 MHz - 1 GHz
(S01_AE05)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Corr. (dB/m)	Comment
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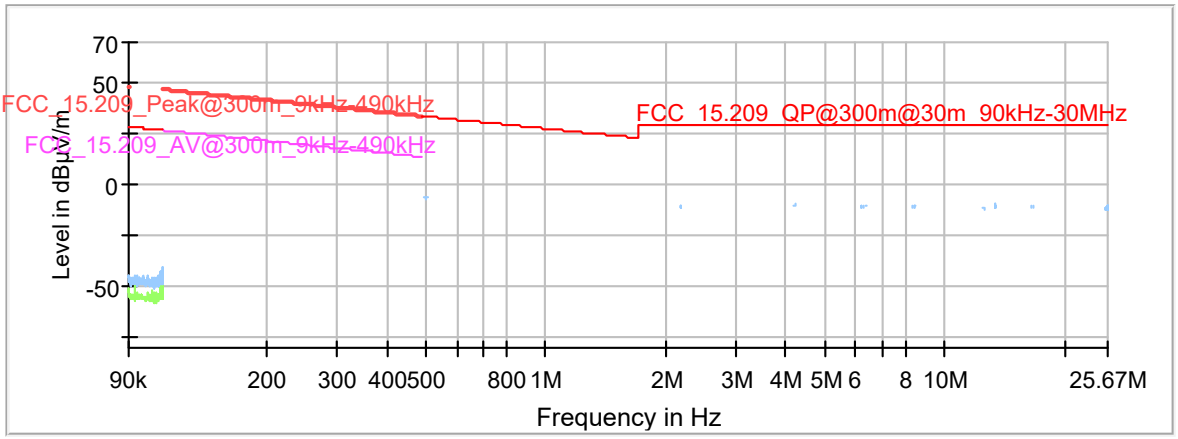
Radio Technology = Mira-Mesh, Operating Frequency = high, Measurement range = 9 kHz - 30 MHz
(S01_AE06)



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Corr. (dB/m)
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5.6.5 TEST EQUIPMENT USED

- Radiated Emissions

5.7 BAND EDGE COMPLIANCE CONDUCTED

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.7.1 TEST DESCRIPTION

For the conducted measurement, the Equipment Under Test (EUT) is placed in a shielded room. The reference power was measured in the test case "Spurious RF Conducted Emissions". The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

Analyzer settings:

- Span: 16.5 MHz
- Detector: Peak
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Sweeptime: 18.9 µs (FFT)
- Sweeps: 100
- Trace: Maxhold

5.7.2 TEST REQUIREMENTS / LIMITS

FCC Part 15.247 (d)
"In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. ...
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c))."

For the conducted measurement the RF power at the band edge shall be "at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power..."

5.7.3 TEST PROTOCOL

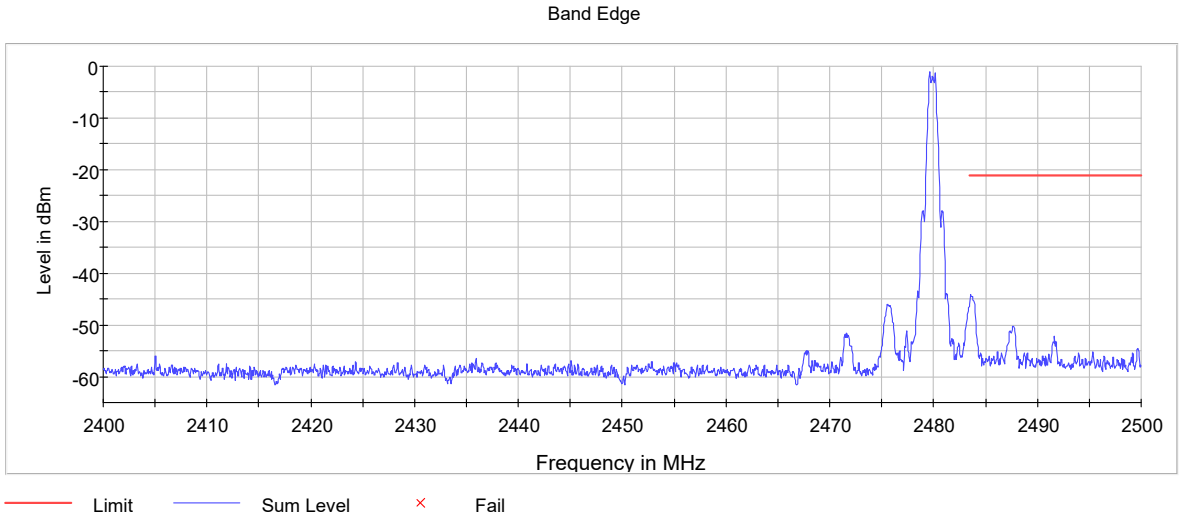
Ambient temperature: 23 °C
Air Pressure: 1010 hPa
Humidity: 30 %
Mira-Mesh

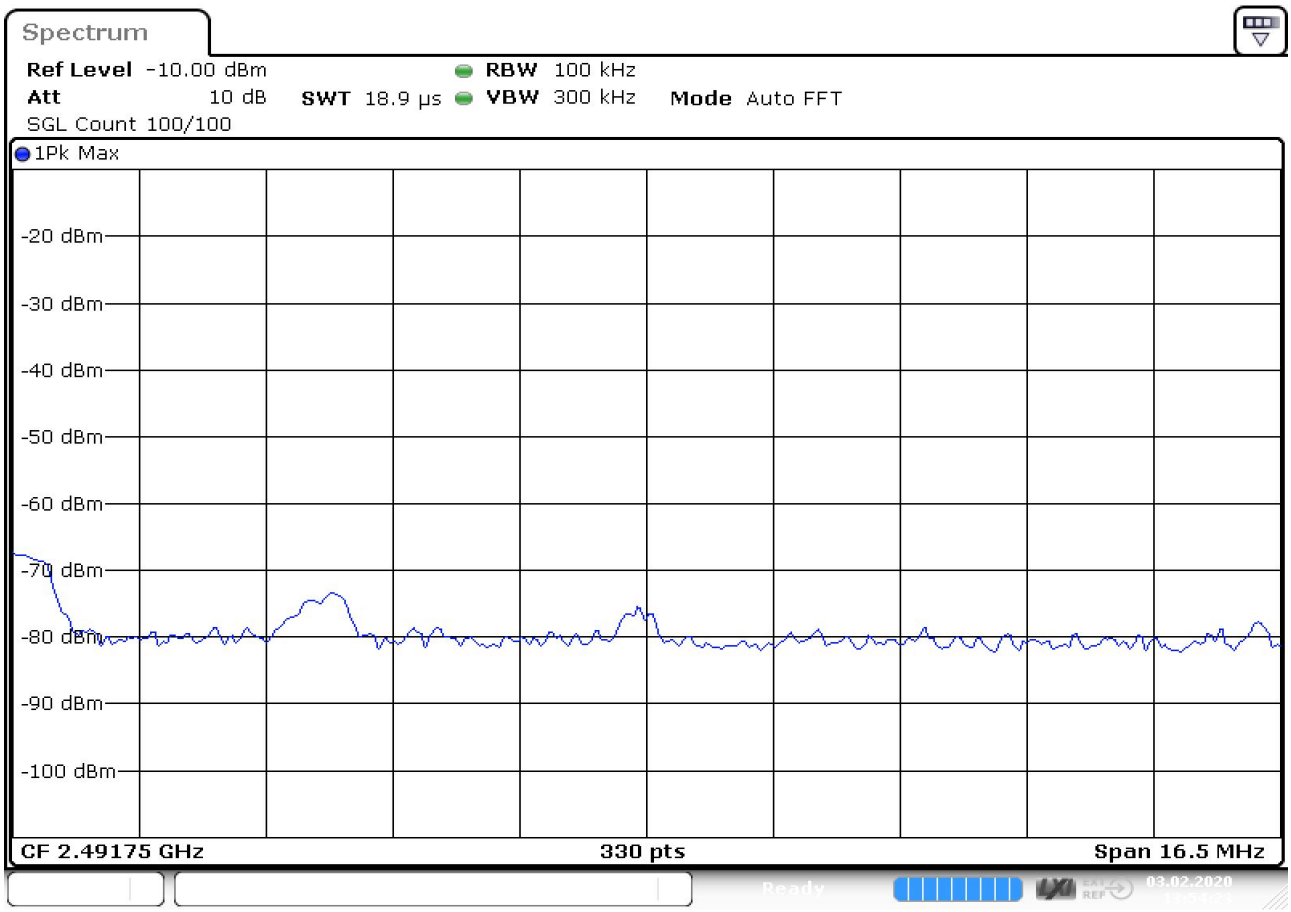
Channel No.	Channel Center Frequency [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Ref. Level [dBm]	Limit [dBm]	Margin to Limit [dB]
2	2402	2400.0	-46.1	PEAK	100	-1.5	-21.5	24.6
80	2480	2483.5	-44.1	PEAK	100	-1.1	-21.1	23.0
hopping	hopping	2400.0	-54.1	PEAK	100	-0.8	-20.8	33.3
hopping	hopping	2483.5	-55.7	PEAK	100	-0.7	-20.7	35.0

Remark: Please see next sub-clause for the measurement plot.

5.7.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = Mira-Mesh, Operating Frequency = high, Band Edge = high (S01_AC02)





Date: 3.FEB.2020 13:54:24

Note: The plot shows raw data, i.e. no path correction is applied to the level.

5.7.5 TEST EQUIPMENT USED

- R&S TS8997

5.8 BAND EDGE COMPLIANCE RADIATED

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.8.1 TEST DESCRIPTION

Please see test description for the test case "Spurious Radiated Emissions"

5.8.2 TEST REQUIREMENTS / LIMITS

For band edges connected to a restricted band, the limits are specified in Section 15.209(a)

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 - 26000	500@3m	3	54.0@3m
26000 - 40000	500@3m	1	54.0@3m

The measured values above 26 GHz are corrected with an inverse linear distance extrapolation factor (20 dB/decade).

§15.35(b) ..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

5.8.3 TEST PROTOCOL

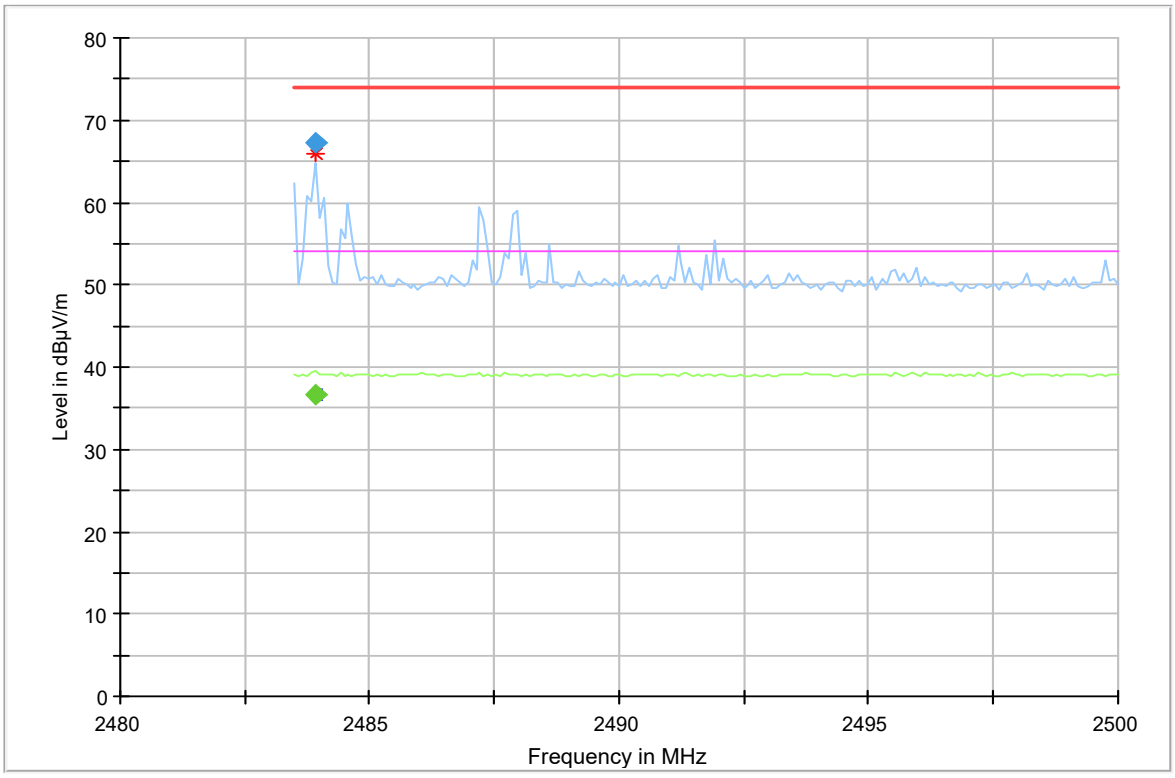
Ambient temperature: 24 °C
Air Pressure: 990 hPa
Humidity: 33 %
Mira-Mesh
Applied duty cycle correction (AV): 13.5 dB

Ch. No.	Ch. Center Freq. [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]	Limit Type
80	2480	2483.5	67.2	PEAK	1000	74.0	6.8	BE
80	2480	2483.5	50.2	AV	1000	54.0	3.8	BE

Remark: Please see next sub-clause for the measurement plot.

5.8.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = Mira-Mesh, Operating Frequency = high, Band Edge = high (S01_AE04)



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation
2483.913	---	36.7	54.00	17.26	1000.0	1000.000	150.0	H	-30.0	-12.0
2483.913	67.2	---	74.00	6.78	1000.0	1000.000	150.0	H	-22.0	-7.0

5.8.5 TEST EQUIPMENT USED

- Radiated Emissions

5.9 POWER DENSITY

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.9.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room to perform the Power Density measurements.
The results recorded were measured with the modulation which produces the worst-case (highest) power density.

The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

Analyzer settings:

- Resolution Bandwidth (RBW): 10 kHz
- Video Bandwidth (VBW): 30 kHz
- Trace: Maxhold
- Sweeps: >300 till trace is stabilised
- Sweeptime: 1.65 ms
- Detector: Peak

5.9.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (e)

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
…
The same method of determining the conducted output power shall be used to determine the power spectral density.

FCC Part 15, Subpart C, §15.247 (f)

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques.
…
The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

5.9.3 TEST PROTOCOL

Ambient temperature: 21 °C
Air Pressure: 989 hPa
Humidity: 44 %

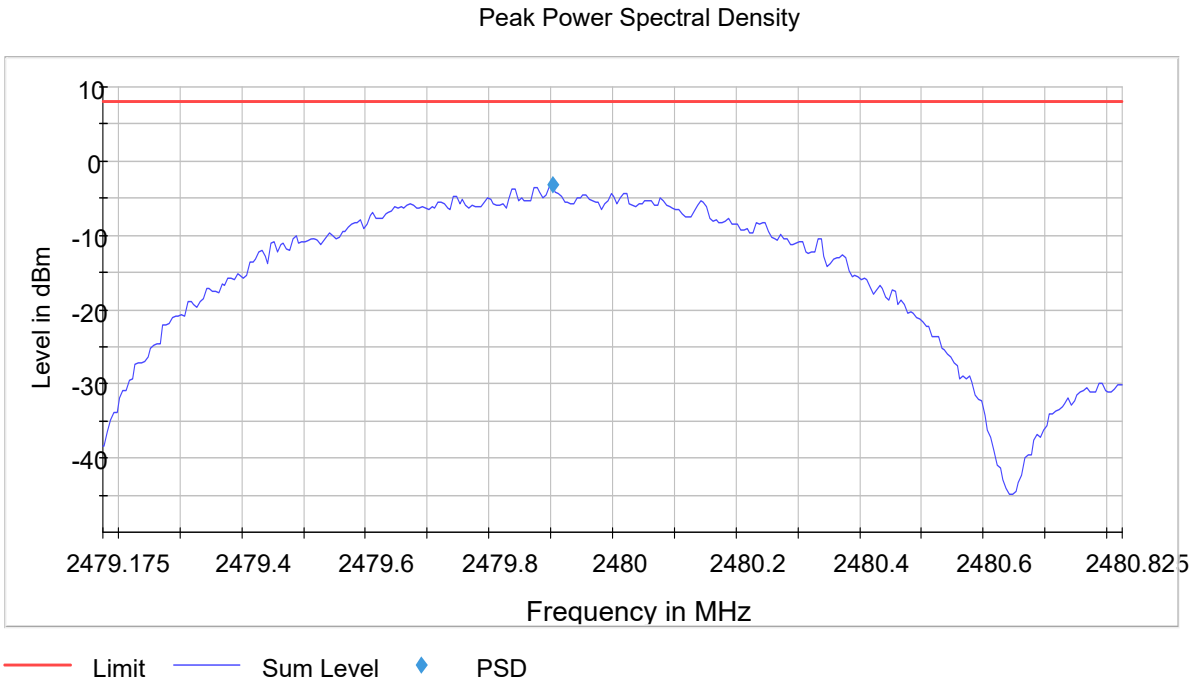
Radio Technology
Mira-Mesh

Channel No.	Frequency [MHz]	Power Density [dBm/ 10 kHz]	Limit [dBm/ 3 kHz]	Margin to Limit [dB]
2	2402	-4.6	8.0	12.6
40	2440	-3.4	8.0	11.4
80	2480	-3.1	8.0	11.1

Remark: Please see next sub-clause for the measurement plot.

5.9.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = Mira-Mesh
(S01_AC02)



5.9.5 TEST EQUIPMENT USED

- R&S TS8997

6 TEST EQUIPMENT

1 Conducted Emissions FCC
Conducted Emissions AC Mains for FCC standards

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2019-10	2020-10
1.2	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2019-05	2021-05
1.3	ESH3-Z5	Two-Line V-Network (AUX)	Rohde & Schwarz GmbH & Co. KG	828304/029	2019-06	2021-06
1.4	EP 1200/B, NA/B1	AC Source, Amplifier with integrated variable Oscillator	Spitzenberger & Spies GmbH & Co. KG	B6278		
1.5	Chroma 6404	AC Source	Chroma ATE INC.	64040001304		
1.6	CBT	Bluetooth Tester "CBT-02" incl. BLE-Option	Rohde & Schwarz	100302	2018-03	2021-03
1.7	Shielded Room 02	Shielded Room 4m x 3m	Frankonia Germany EMC Solution GmbH	-		
1.8	ESH3-Z5	Two-Line V-Network (EUT)	Rohde & Schwarz GmbH & Co. KG	829996/002	2019-06	2021-06
1.9	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2019-01	2021-01
1.10	Opus10 THI (8152.00)	T/H Logger 02	Lufft Mess- und Regeltechnik GmbH	7489	2019-05	2021-05
1.11	CBT	Bluetooth Tester "CBT-01"	Rohde & Schwarz GmbH & Co. KG	100589	2018-05	2021-05

2 R&S TS8997
EN300328/301893 Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	SMB100A	Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	107695	2017-07	2020-07
2.2	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2018-04 2020-05	2020-04 2022-05
2.3	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2018-04 2020-04	2020-04 2022-04
2.4	Temperature Chamber VT 4002	Temperature Chamber Vötsch 03	Vötsch	58566002150010	2018-04 2020-05	2020-04 2022-05
2.5	A8455-4	4 Way Power Divider (SMA)		-		
2.6	Opus10 THI (8152.00)	T/H Logger 03	Lufft Mess- und Regeltechnik GmbH	7482	2019-06	2021-06
2.7	UNI-T UT195E	True RMS Digital Multimeter	UNI-T UNI-TREND TECHNOLOGY (CHINA) CO., LTD.	C190729561		

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.8	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2019-11	2022-11
2.9	OSP120	Switching Unit with integrated power meter	Rohde & Schwarz	101158	2018-05	2021-05
2.10	Temperature Chamber VT 4002	Temperature Chamber Vötsch 05	Vötsch	58566080550010	2018-04 2020-05	2020-04 2022-05

3 Radiated Emissions

Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.1	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2019-10	2020-10
3.2	N5000/NP	Filter for EUT, 2 Lines, 250 V, 16 A	ETS-LINDGREN	241515		
3.3	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2019-05	2021-05
3.4	ESW44	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz GmbH & Co. KG	101603	2019-12	2021-12
3.5	Anechoic Chamber 01	SAC/FAR, 10.58 m x 6.38 m x 6.00 m	Frankonia	none	2018-06	2020-06
3.6	HL 562 ULTRALOG	Biconical-log-per antenna (30 MHz - 3 GHz) with HL 562E biconicals	Rohde & Schwarz GmbH & Co. KG	830547/003	2018-07	2021-07
3.7	AMF-7D00101800-30-10P-R	Broadband Amplifier 100 MHz - 18 GHz	Miteq			
3.8	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012		
3.9	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
3.10	Anechoic Chamber 03	FAR, 8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2018-06	2020-06
3.11	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2018-04 2020-04	2020-04 2022-04
3.12	PONTIS Con4101	PONTIS Camera Controller		6061510370		
3.13	NRVD	Power Meter	Rohde & Schwarz GmbH & Co. KG	828110/016	2019-08	2020-08
3.14	HF 906	Double-ridged horn	Rohde & Schwarz	357357/002	2018-09	2021-09

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.15	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
3.16	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2019-02	2021-02
3.17	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronic GmbH	00083069		
3.18	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright Instruments GmbH	09		
3.19	DS 420S	Turn Table 2 m diameter	HD GmbH	420/573/99		
3.20	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
3.21	foUSB-M Converter 2	Fibre optic link USB 2.0	PONTIS Messtechnik GmbH	4471520061		
3.22	SMB100A	Signal Generator 100 kHz - 40 GHz	Rohde & Schwarz Vertriebs-GmbH	181486	2019-11	2021-11
3.23	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
3.24	TT 1.5 WI	Turn Table	Maturo GmbH	-		
3.25	HL 562 ULTRALOG	Biconical-log-per Antenna (30 MHz - 3 GHz)	Rohde & Schwarz GmbH & Co. KG	100609	2019-05	2022-05
3.26	HF 906	Double-ridged horn	Rohde & Schwarz	357357/001	2018-03	2021-03
3.27	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronic GmbH	00086675		
3.28	MA4985-XP-ET	Bore Sight Antenna Mast	innco systems GmbH	none		
3.29	CBT	Bluetooth Tester "CBT-02" incl. BLE-Option	Rohde & Schwarz	100302	2018-03	2021-03
3.30	JUN-AIR Mod. 6-15	Air Compressor	JUN-AIR Deutschland GmbH	612582		
3.31	foEthernet_M	Fibre optic link Ethernet / Gb-LAN	PONTIS Messtechnik GmbH	4841516023		
3.32	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
3.33	HFH2-Z2	Loop Antenna	Rohde & Schwarz	829324/006	2018-01	2021-01
3.34	Opus10 THI (8152.00)	T/H Logger 12	Lufft Mess- und Regeltechnik GmbH	12482	2019-06	2021-06
3.35	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2019-01	2021-01
3.36	UNI-T UT195E	True RMS Digital Multimeter	UNI-T UNI-TREND TECHNOLOGY (CHINA) CO., LTD.	C190729561		
3.37	foEthernet_M	Fibre optic link Ethernet / Gb-LAN	PONTIS Messtechnik GmbH	4841516022		

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.38	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
3.39	AS 620 P	Antenna Mast (pneumatic polarisation)	HD GmbH	620/37		
3.40	6005D (30 V / 5 A)	Laboratory Power Supply 120 V 60 Hz	Peaktech	81062045		
3.41	TD1.5-10kg	EUT Tilt Device (Rohacell)	Maturo GmbH	TD1.5-10kg/024/3790709		
3.42	Innco Systems CO3000	Controller for bore sight mast SAC	innco systems GmbH	CO3000/967/39371016/L		
3.43	NRV-Z1	Sensor Head B	Rohde & Schwarz GmbH & Co. KG	827753/006	2019-08	2020-08
3.44	HF 907-2	Double-ridged horn	Rohde & Schwarz	102817	2019-04	2022-04
3.45	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
3.46	AFS42-00101800-25-S-42	Broadband Amplifier 25 MHz - 18 GHz	Miteq	2035324		
3.47	AM 4.0	Antenna Mast 4 m	Maturo GmbH	AM4.0/180/11920513		
3.48	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2018-07	2021-07

The calibration interval is the time interval between “Last Calibration” and “Calibration Due”.

7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

Frequency		Corr.	LISN insertion loss ESH3-Z5	cable loss (incl. 10 dB atten-uator)
MHz		dB	dB	dB
0.15		10.1	0.1	10.0
5		10.3	0.1	10.2
7		10.5	0.2	10.3
10		10.5	0.2	10.3
12		10.7	0.3	10.4
14		10.7	0.3	10.4
16		10.8	0.4	10.4
18		10.9	0.4	10.5
20		10.9	0.4	10.5
22		11.1	0.5	10.6
24		11.1	0.5	10.6
26		11.2	0.5	10.7
28		11.2	0.5	10.7
30		11.3	0.5	10.8

Sample calculation

U_{LISN} (dB µV) = U (dB µV) + Corr. (dB)
U = Receiver reading
LISN Insertion loss = Voltage Division Factor of LISN
Corr. = sum of single correction factors of used LISN, cables, switch units (if used)
Linear interpolation will be used for frequencies in between the values in the table.

7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

Frequency	AF HFH-Z2)	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-40 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
0.009	20.50	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.01	20.45	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.015	20.37	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.02	20.36	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.025	20.38	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.03	20.32	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.05	20.35	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.08	20.30	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.1	20.20	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.2	20.17	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.3	20.14	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.49	20.12	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.490001	20.12	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.5	20.11	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.8	20.10	-39.6	0.1	0.1	0.1	0.1	-40	30	3
1	20.09	-39.6	0.1	0.1	0.1	0.1	-40	30	3
2	20.08	-39.6	0.1	0.1	0.1	0.1	-40	30	3
3	20.06	-39.6	0.1	0.1	0.1	0.1	-40	30	3
4	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
5	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
6	20.02	-39.5	0.2	0.1	0.1	0.1	-40	30	3
8	19.95	-39.5	0.2	0.1	0.1	0.1	-40	30	3
10	19.83	-39.4	0.2	0.1	0.2	0.1	-40	30	3
12	19.71	-39.4	0.2	0.1	0.2	0.1	-40	30	3
14	19.54	-39.4	0.2	0.1	0.2	0.1	-40	30	3
16	19.53	-39.3	0.3	0.1	0.2	0.1	-40	30	3
18	19.50	-39.3	0.3	0.1	0.2	0.1	-40	30	3
20	19.57	-39.3	0.3	0.1	0.2	0.1	-40	30	3
22	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
24	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
26	19.54	-39.3	0.3	0.1	0.2	0.1	-40	30	3
28	19.46	-39.2	0.3	0.1	0.3	0.1	-40	30	3
30	19.73	-39.1	0.4	0.1	0.3	0.1	-40	30	3

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
distance correction = -40 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values

7.3 ANTENNA R&S HL562 (30 MHZ – 1 GHZ)

(d_{Limit} = 3 m)

Frequency	AF R&S HL562	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
30	18.6	0.6	0.29	0.04	0.23	0.02	0.0	3	3
50	6.0	0.9	0.39	0.09	0.32	0.08	0.0	3	3
100	9.7	1.2	0.56	0.14	0.47	0.08	0.0	3	3
150	7.9	1.6	0.73	0.20	0.59	0.12	0.0	3	3
200	7.6	1.9	0.84	0.21	0.70	0.11	0.0	3	3
250	9.5	2.1	0.98	0.24	0.80	0.13	0.0	3	3
300	11.0	2.3	1.04	0.26	0.89	0.15	0.0	3	3
350	12.4	2.6	1.18	0.31	0.96	0.13	0.0	3	3
400	13.6	2.9	1.28	0.35	1.03	0.19	0.0	3	3
450	14.7	3.1	1.39	0.38	1.11	0.22	0.0	3	3
500	15.6	3.2	1.44	0.39	1.20	0.19	0.0	3	3
550	16.3	3.5	1.55	0.46	1.24	0.23	0.0	3	3
600	17.2	3.5	1.59	0.43	1.29	0.23	0.0	3	3
650	18.1	3.6	1.67	0.34	1.35	0.22	0.0	3	3
700	18.5	3.6	1.67	0.42	1.41	0.15	0.0	3	3
750	19.1	4.1	1.87	0.54	1.46	0.25	0.0	3	3
800	19.6	4.1	1.90	0.46	1.51	0.25	0.0	3	3
850	20.1	4.4	1.99	0.60	1.56	0.27	0.0	3	3
900	20.8	4.7	2.14	0.60	1.63	0.29	0.0	3	3
950	21.1	4.8	2.22	0.60	1.66	0.33	0.0	3	3
1000	21.6	4.9	2.23	0.61	1.71	0.30	0.0	3	3

(d_{Limit} = 10 m)

30	18.6	-9.9	0.29	0.04	0.23	0.02	-10.5	10	3
50	6.0	-9.6	0.39	0.09	0.32	0.08	-10.5	10	3
100	9.7	-9.2	0.56	0.14	0.47	0.08	-10.5	10	3
150	7.9	-8.8	0.73	0.20	0.59	0.12	-10.5	10	3
200	7.6	-8.6	0.84	0.21	0.70	0.11	-10.5	10	3
250	9.5	-8.3	0.98	0.24	0.80	0.13	-10.5	10	3
300	11.0	-8.1	1.04	0.26	0.89	0.15	-10.5	10	3
350	12.4	-7.9	1.18	0.31	0.96	0.13	-10.5	10	3
400	13.6	-7.6	1.28	0.35	1.03	0.19	-10.5	10	3
450	14.7	-7.4	1.39	0.38	1.11	0.22	-10.5	10	3
500	15.6	-7.2	1.44	0.39	1.20	0.19	-10.5	10	3
550	16.3	-7.0	1.55	0.46	1.24	0.23	-10.5	10	3
600	17.2	-6.9	1.59	0.43	1.29	0.23	-10.5	10	3
650	18.1	-6.9	1.67	0.34	1.35	0.22	-10.5	10	3
700	18.5	-6.8	1.67	0.42	1.41	0.15	-10.5	10	3
750	19.1	-6.3	1.87	0.54	1.46	0.25	-10.5	10	3
800	19.6	-6.3	1.90	0.46	1.51	0.25	-10.5	10	3
850	20.1	-6.0	1.99	0.60	1.56	0.27	-10.5	10	3
900	20.8	-5.8	2.14	0.60	1.63	0.29	-10.5	10	3
950	21.1	-5.6	2.22	0.60	1.66	0.33	-10.5	10	3
1000	21.6	-5.6	2.23	0.61	1.71	0.30	-10.5	10	3

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Tables show an extract of values.

7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, atten-uator & pre-amp)	cable loss 4 (to receiver)		
MHz	dB (1/m)	dB	dB	dB	dB	dB		
1000	24.4	-19.4	0.99	0.31	-21.51	0.79		
2000	28.5	-17.4	1.44	0.44	-20.63	1.38		
3000	31.0	-16.1	1.87	0.53	-19.85	1.33		
4000	33.1	-14.7	2.41	0.67	-19.13	1.31		
5000	34.4	-13.7	2.78	0.86	-18.71	1.40		
6000	34.7	-12.7	2.74	0.90	-17.83	1.47		
7000	35.6	-11.0	2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, atten-uator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	
3000	31.0	-23.4	0.47	1.87	0.53	-27.58	1.33	
4000	33.1	-23.3	0.56	2.41	0.67	-28.23	1.31	
5000	34.4	-21.7	0.61	2.78	0.86	-27.35	1.40	
6000	34.7	-21.2	0.58	2.74	0.90	-26.89	1.47	
7000	35.6	-19.8	0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay inside chamber)	cable loss 2 (High Pass)	cable loss 3 (pre-amp)	cable loss 4 (inside chamber)	cable loss 5 (outside chamber)	cable loss 6 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	dB
7000	35.6	-57.3	0.56	1.28	-62.72	2.66	0.94	1.46
8000	36.3	-56.3	0.69	0.71	-61.49	2.84	1.00	1.53
9000	37.1	-55.3	0.68	0.65	-60.80	3.06	1.09	1.60
10000	37.5	-56.2	0.70	0.54	-61.91	3.28	1.20	1.67
11000	37.5	-55.3	0.80	0.61	-61.40	3.43	1.27	1.70
12000	37.6	-53.7	0.84	0.42	-59.70	3.53	1.26	1.73
13000	38.2	-53.5	0.83	0.44	-59.81	3.75	1.32	1.83
14000	39.9	-56.3	0.91	0.53	-63.03	3.91	1.40	1.77
15000	40.9	-54.1	0.98	0.54	-61.05	4.02	1.44	1.83
16000	41.3	-54.1	1.23	0.49	-61.51	4.17	1.51	1.85
17000	42.8	-54.4	1.36	0.76	-62.36	4.34	1.53	2.00
18000	44.2	-54.7	1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
Tables show an extract of values.

7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

Frequency	AF EMCO 3160-09	Corr.	cable loss 1 (inside chamber)	cable loss 2 (pre-amp)	cable loss 3 (inside chamber)	cable loss 4 (switch unit)	cable loss 5 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB
18000	40.2	-23.5	0.72	-35.85	6.20	2.81	2.65
18500	40.2	-23.2	0.69	-35.71	6.46	2.76	2.59
19000	40.2	-22.0	0.76	-35.44	6.69	3.15	2.79
19500	40.3	-21.3	0.74	-35.07	7.04	3.11	2.91
20000	40.3	-20.3	0.72	-34.49	7.30	3.07	3.05
20500	40.3	-19.9	0.78	-34.46	7.48	3.12	3.15
21000	40.3	-19.1	0.87	-34.07	7.61	3.20	3.33
21500	40.3	-19.1	0.90	-33.96	7.47	3.28	3.19
22000	40.3	-18.7	0.89	-33.57	7.34	3.35	3.28
22500	40.4	-19.0	0.87	-33.66	7.06	3.75	2.94
23000	40.4	-19.5	0.88	-33.75	6.92	3.77	2.70
23500	40.4	-19.3	0.90	-33.35	6.99	3.52	2.66
24000	40.4	-19.8	0.88	-33.99	6.88	3.88	2.58
24500	40.4	-19.5	0.91	-33.89	7.01	3.93	2.51
25000	40.4	-19.3	0.88	-33.00	6.72	3.96	2.14
25500	40.5	-20.4	0.89	-34.07	6.90	3.66	2.22
26000	40.5	-21.3	0.86	-35.11	7.02	3.69	2.28
26500	40.5	-21.1	0.90	-35.20	7.15	3.91	2.36

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

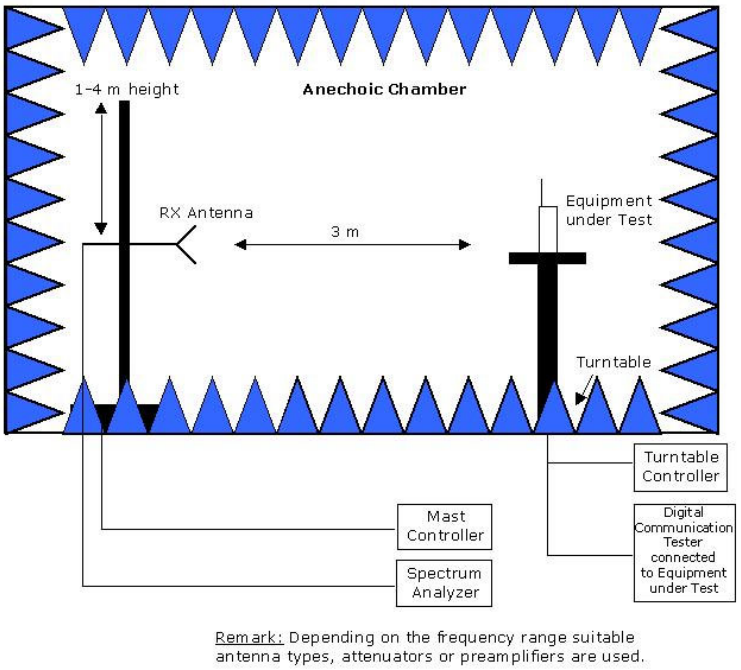
7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

Frequency	AF EMCO 3160-10	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
GHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
26.5	43.4	-11.2	4.4				-9.5	3	1.0
27.0	43.4	-11.2	4.4				-9.5	3	1.0
28.0	43.4	-11.1	4.5				-9.5	3	1.0
29.0	43.5	-11.0	4.6				-9.5	3	1.0
30.0	43.5	-10.9	4.7				-9.5	3	1.0
31.0	43.5	-10.8	4.7				-9.5	3	1.0
32.0	43.5	-10.7	4.8				-9.5	3	1.0
33.0	43.6	-10.7	4.9				-9.5	3	1.0
34.0	43.6	-10.6	5.0				-9.5	3	1.0
35.0	43.6	-10.5	5.1				-9.5	3	1.0
36.0	43.6	-10.4	5.1				-9.5	3	1.0
37.0	43.7	-10.3	5.2				-9.5	3	1.0
38.0	43.7	-10.2	5.3				-9.5	3	1.0
39.0	43.7	-10.2	5.4				-9.5	3	1.0
40.0	43.8	-10.1	5.5				-9.5	3	1.0

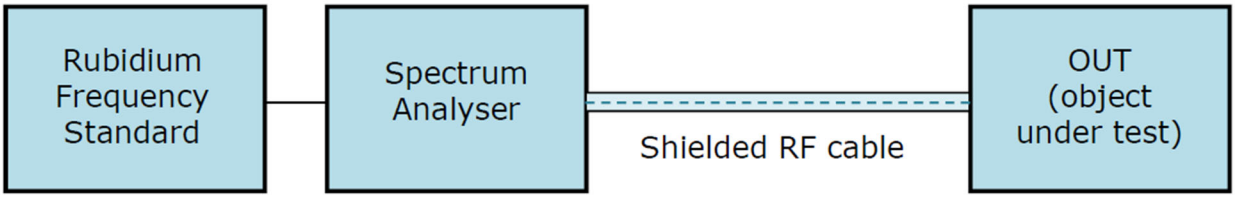
Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

8 SETUP DRAWINGS



Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting groundplane.



Drawing 2: Setup for conducted radio tests.

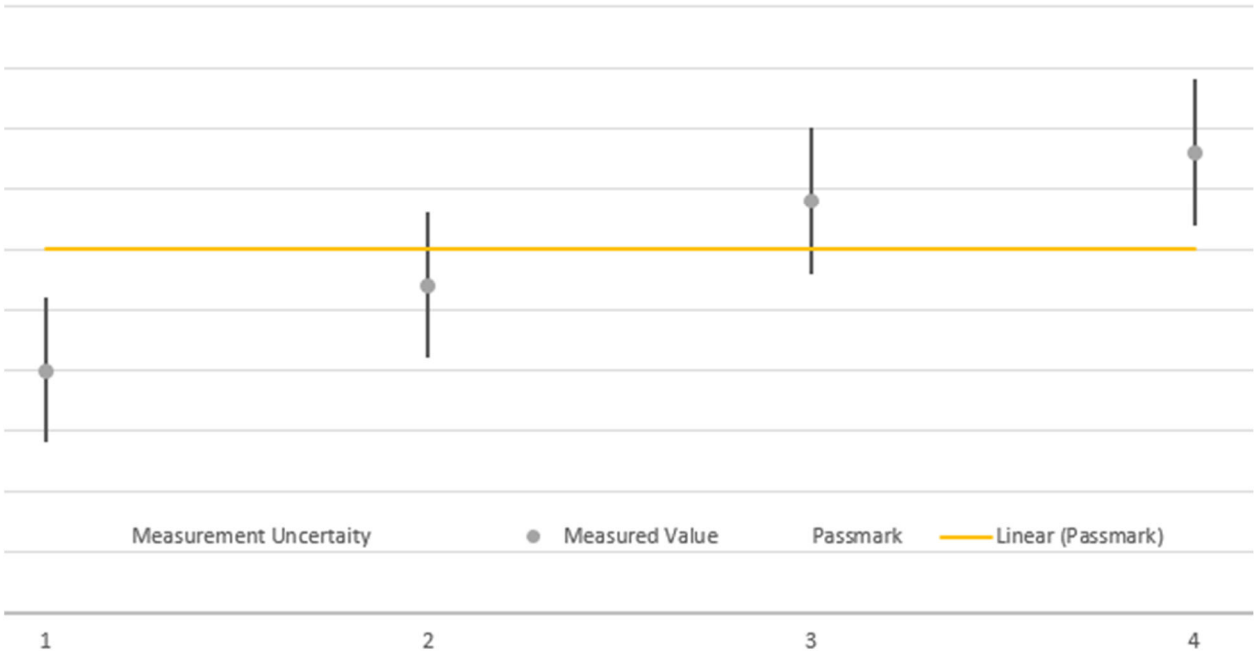
9 PHOTO REPORT

Please see separate photo report.

10 MEASUREMENT UNCERTAINTIES

Test Case	Parameter	Uncertainty
AC Power Line	Power	± 3.4 dB
Field Strength of spurious radiation	Power	± 5.5 dB
6 dB / 26 dB / 99% Bandwidth	Power Frequency	± 2.9 dB ± 11.2 kHz
Conducted Output Power	Power	± 2.2 dB
Band Edge Compliance	Power Frequency	± 2.2 dB ± 11.2 kHz
Frequency Stability	Frequency	± 25 Hz
Power Spectral Density	Power	± 2.2 dB

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor) k = 1.96. This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	above pass mark	within pass mark	Failed
4	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called shared risk principle.