

FCC Measurement/Technical Report on EP-800

Contains FCC ID: L2C-EG25G
Contains FCC ID: TLZ-CM276NF

Simultaneous Transmissions Report

Test Report Reference: MDE_BVUS_2403_FCC_03_rev01

Test Laboratory:

7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

7layers GmbH
Borsigstraße 11
40880 Ratingen, Germany
T +49 (0) 2102 749 0
F +49 (0) 2102 749 350

Geschäftsführer/
Managing Directors:
Jörg-Timm Kilisch
Bernhard Retka

www.7layers.com

Registergericht/registered:
Düsseldorf HRB 75554
USt-Id.-Nr./VAT-No. DE203159652
Steuer-Nr./TAX-No. 147/5869/0385

*a Bureau Veritas
Group Company*

Table of Contents

1	Applied Standards and Test Summary	3
1.1	Applied Standards	3
1.2	FCC-IC Correlation Table	4
1.3	Measurement Summary	5
2	Revision History / Signatures	6
3	Administrative Data	7
3.1	Testing Laboratory	7
3.2	Project Data	7
3.3	Applicant Data	7
3.4	Manufacturer Data	8
4	Test object Data	9
4.1	General EUT Description	9
4.2	EUT Main components	9
4.3	Ancillary Equipment	9
4.4	Auxiliary Equipment	10
4.5	EUT Setups	10
4.6	Operating Modes / Test Channels	10
4.7	Product labelling	11
5	Test Results	12
5.1	Field strength of spurious radiation	12
6	Test Equipment	23
6.1	Test Equipment Hardware	23
6.2	Test Equipment Software	27
7	Antenna Factors, Cable Loss and Sample Calculations	28
7.1	LISN R&S ESH3-Z5 (150 kHz – 30 MHz)	28
7.2	Antenna R&S HFH2-Z2 (9 kHz – 30 MHz)	29
7.3	Antenna R&S HL562 (30 MHz – 1 GHz)	30
7.4	Antenna R&S HF907 (1 GHz – 18 GHz)	31
7.5	Antenna EMCO 3160-09 (18 GHz – 26.5 GHz)	32
7.6	Antenna EMCO 3160-10 (26.5 GHz – 40 GHz)	33
8	Measurement Uncertainties	34
9	Photo Report	35

1 APPLIED STANDARDS AND TEST SUMMARY

1.1 APPLIED STANDARDS

Type of Authorization

Certification for a cellular mobile device.

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2, 24 and 27, (10-1-23 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 27; Miscellaneous Wireless Communications Services
Subpart C – Technical standards

§ 27.50 – Power and duty cycle limits

§ 27.53 – Emission limits

§ 27.54 – Frequency stability

Part 24, Subpart E – Broadband PCS

§ 24.232 – Power and antenna height limits

§ 24.235 – Frequency stability

§ 24.238 – Emission limitations for Broadband PCS equipment

The tests were selected and performed with reference to:

- ANSI C63.26: 2015
- FCC KDB 971168 applying "Measurement guidance for certification of licensed digital transmitters" 971168 D01 v03r01, 2018-04-09

In general tests are performed according to the ANSI standard. If the KDB is used for testing in addition to the ANSI, the result of the affected test is marked with ^{KDB}).

Type of Authorization

Certification for a cellular device.

1.2 FCC-IC CORRELATION TABLE

Correlation of measurement requirements for Cellular Mobile Devices from FCC and ISED Canada

Measurement	FCC reference	ISED reference
Field strength of spurious radiation	§ 2.1053 § 27.53	RSS-GEN Issue 5 & AMD 1 & AMD 2, 6.13 RSS-130 Issue 2: 4.7.1/4.7.2 RSS-139 Issue 4: 5.6 RSS-199 Issue 4, 5.6
Field strength of spurious radiation	§ 2.1053 § 24.236	RSS-GEN Issue 5 & AMD 1 & AMD 2, 6.13 RSS-133 Issue 6 & AMD 1: 6.5

1.3 MEASUREMENT SUMMARY

47 CFR CHAPTER I FCC PART 24 Subpart E

§ 2.1053 § 24.236

Field strength of spurious radiation

The measurement was performed according to ANSI C63.26: 2015;
5.5.2.3.1

Final Result

OP-Mode	Setup	Date	FCC	IC
Technology, Radio Technology, Operating Frequency, ChBW, Ressource Blocks, Measurement method				
E-UTRA, eFDD 2 QPSK, mid channel TX on 1880 MHz, 10 MHz, 1 & WLAN 2.4 GHz CH1 TX on 2412 MHz, radiated	S01_DD03	2024-11-21	Passed	Passed

47 CFR CHAPTER I FCC PART 24 Subpart E

§ 2.1053 § 24.236

Field strength of spurious radiation

The measurement was performed according to ANSI C63.26: 2015;
5.5.2.3.1

Final Result

OP-Mode	Setup	Date	FCC	IC
Technology, Radio Technology, Operating Frequency, ChBW, Ressource Blocks, Measurement method				
E-UTRA, eFDD 25 QPSK, mid channel TX on 1882.5 MHz, 10 MHz, 1 & WLAN 5.0 GHz CH36 TX on 5180 MHz, radiated	S01_DD03	2024-12-01	Passed	Passed

47 CFR CHAPTER I FCC PART 27 Subpart C

§ 2.1053 § 27.53

Field strength of spurious radiation

The measurement was performed according to ANSI C63.26: 2015;
5.5.2.3.1

Final Result

OP-Mode	Setup	Date	FCC	IC
Technology, Radio Technology, Operating Frequency, ChBW, Ressource Blocks, Measurement method				
E-UTRA, eFDD 4 QPSK, mid channel TX on 1732.5 MHz, 10 MHz, 1 & BT Classic CH0 TX on 2402 MHz, radiated	S01_DD03	2024-12-01	Passed	Passed

N/A: Not applicable
N/P: Not performed

2 REVISION HISTORY / SIGNATURES

Report version control			
Version	Release date	Change Description	Version validity
initial	2025-02-07	--	valid
rev01	2025-12-24	-4G Band 41 added on page 9 -Declaration and justification on Simultaneous transmission modes used added on page 10 -New plots for simultaneous transmission for LTE eFDD2 and WLAN CH1 were added on pages 18 and 19 -New plots for simultaneous transmission for LTE eFDD4 and BT CH0 were added on pages 21 and 22	valid

COMMENT:

Not all applicable tests were performed. According to "KDB996369 D04 Module Integration Guide v02" spot checks for only radiated spurious emissions tests were performed, because the device contains a pre-certified Cellular Module Quectel EG25GGD-MINIPCIE LTE Cat 4 and pre-certified Wi-Fi/Bluetooth module AzureWave AW-CM276NF module.



(responsible for accreditation scope)
Dipl.-Ing. Robert Machulec



(responsible for testing and report)
MSc. Joel Asongwe



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-12140-01-00
FCC Designation Number: DE0015
FCC Test Firm Registration: 929146
ISED CAB Identifier DE0007; ISED#: 3699A

Responsible for accreditation scope: Dipl.-Ing. Robert Machulec
Report Template Version: 2024-11-06

3.2 PROJECT DATA

Responsible for testing and report: MSc. Joel Asongwe
Employees who performed the tests: documented internally at 7Layers
Date of Report: 2025-12-24
Testing Period: 2024-11-21 to 2025-12-24

3.3 APPLICANT DATA

Company Name: Aptiv Services US, LLC
Address: 5725 Innovation Drive
Troy, Michigan 48098
United States of America
Contact Person: Mrs. Kinga Stawicka-Wibowo

3.4 MANUFACTURER DATA

Company Name: please see Applicant Data

Address:

Contact Person:

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	The EP-800 expands on the capabilities of Aptiv's entry-level VDR, the EP-600. The EP-800 can collect data from twice as many CAN channels, and it adds support for Automotive Ethernet, LIN, and DoIP. In addition, it has four times the compute power and has more storage, more USB ports, a 6D accelerometer, and an integrated security chip. It also includes a unique OLED display.
Product name	EP-800
Type	EP-800
Declared EUT data by the supplier	
General product description	The EUT is integrating a cellular module. It is supporting the following Cellular bands: 2G: 850 MHz / 1900 MHz 3G: 2 / 4 / 5 4G: 2 / 4 / 5 / 7 / 12 / 13 / 25 / 26 / 38 / 41 The EUT is supporting Wi-Fi/Bluetooth in 2.4 GHz and Wi-Fi 5 GHz bands.
Voltage Level	12 V
Voltage Type	DC

4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT dd03	DE1094019dd03	Radiated Sample
Sample Parameter	Value	
Serial No.	-	
HW Version	HW 1.0	
SW Version	SW 1.6.3	
Comment	-	

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.

-	-	-
---	---	---

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
-	-	-

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_DD03	EUT dd03,	Radiated sample

4.6 OPERATING MODES / TEST CHANNELS

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

- eFDD 2 QPSK 10 MHz 1 RB channel 18900 + WLAN 2.4 GHz TX b-mode CH1
- eFDD 25 QPSK 10 MHz 1 RB channel 26365 + WLAN 5.0 GHz TX a-mode CH36
- eFDD 4 QPSK 10 MHz 1 RB channel 20175 + Bluetooth classic TX 1-DH1 CH0

Simultaneous RF Transmission declaration by the applicant.

- **BT Classic** and **BLE** can only be used in a mutually exclusive manner.
- **WLAN** can be configured to operate on the 2.4GHz band or the 5 GHz band, but not both simultaneously.
- **WLAN** and **BT Classic** (or **BLE**) can be simultaneously configured to both be "operational", but only a maximum of one of these protocols is transmitting at a time.
- **Cellular** can be used simultaneously with any of the other wireless protocols.

For testing BT Classic was chosen as worst case in terms of output power. Also for b-mode WLAN (worst case average power). A-mode for WLAN 5 GHz was chosen as it was the worst case in terms of RSE. Please refer to the module AzureWave AW-CM276NF with module report reference RF161216E08-1.

4.7 PRODUCT LABELLING

4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

5 TEST RESULTS

5.1 FIELD STRENGTH OF SPURIOUS RADIATION

Standard **FCC PART 24/27**

The test was performed according to:

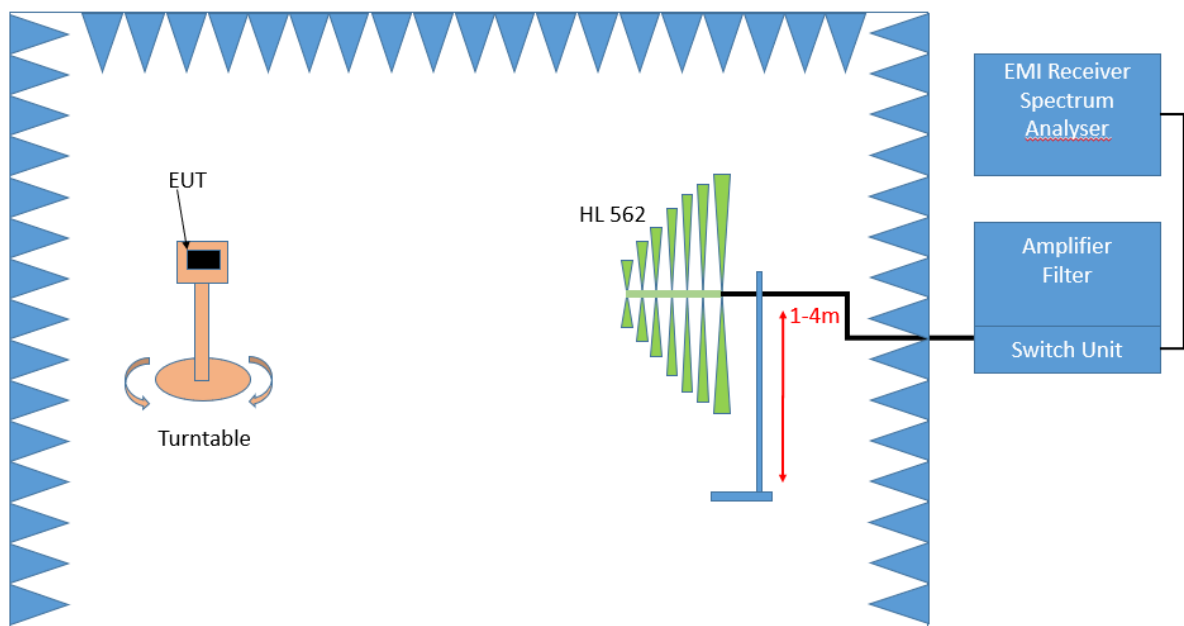
ANSI C63.26: 2015; 5.5.2.3.1

5.1.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable radiated spurious emission measurements per § 2.1053 and RSS-GEN 6.13. The limit and requirements come from the applicable rule part and ISED RSS-Standard for the operating band of the cellular device.

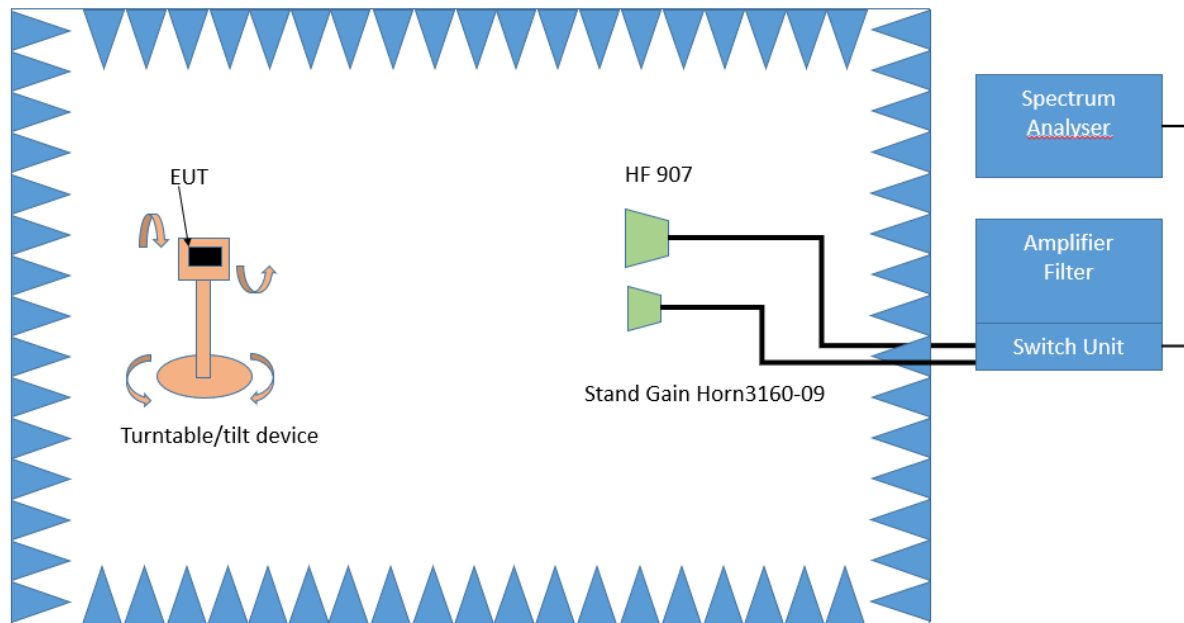
The EUT was connected to the test setup according to the following diagram:

Frequency Range: 30 MHz – 1 GHz:



Test Setup; Spurious Emission Radiated (SAC), 30 MHz- 1GHz

Frequency Range: 1 GHz – 26.5 GHz



Test Setup; Spurious Emission Radiated (FAC), 1 GHz-26.5 GHz

The test set-up was made in accordance to the general provisions of ANSI C63.26 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 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
- RBW: 100 kHz
- VBW: 300 kHz
- Sweep time: coupled
- 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 $\pm 45^\circ$ 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
- Measured frequencies: in step 1 determined frequencies
- RBW: 100 kHz
- VBW: 300 kHz
- Sweep time: coupled
- Turntable angle range: $\pm 45^\circ$ 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 RMS detector

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

EMI receiver settings for step 4:

- Detector: RMQ
- Measured frequencies: in step 1 determined frequencies
- RBW: 100 kHz
- VBW: 300 kHz
- Sweep 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° .

- Antenna distance: 3 m
- Detector: Peak
- RBW: 1 MHz
- VBW: 3 MHz
- Sweep time: coupled
- Turntable angle range: -180° to 90°
- Turntable step size: 90°
- Polarisation: Horizontal + Vertical

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 in step 2 is omitted. Instead of this, a maximum search with a step size $\pm 45^\circ$ for the elevation axis is performed.

The turn table azimuth will slowly vary by $\pm 22.5^\circ$.

The elevation angle will slowly vary by $\pm 45^\circ$

EMI receiver settings (for all steps):

- Detector: Peak,
- RBW: 1 MHz
- VBW: 3 MHz
- Sweep time: coupled

Step 3:

Spectrum analyser settings for step 3:

- Detector: RMS
- Measured frequencies: in step 1 determined frequencies
- RBW: 1 MHz
- VBW: 3 MHz
- Sweep Time: 1 s

5.1.2 TEST REQUIREMENTS / LIMITS**FCC Part 2.1053; Measurement required: Field strength of spurious radiation:**

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate.

Part 24, Subpart E – Broadband PCS**§ 24.238 – Emission limitations for Broadband PCS equipment**

- a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.
- b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RSS-133; 6.5 Transmitter Unwanted Emissions

Mobile and base station equipment shall comply with the limits in (1) and (2) below.

1. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts).
2. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

FCC Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§27.53 – Emission limits

Band 4/10/66:

(h) *AWS emission limits—(1) General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.

RSS-139; 6.6 Transmitter Unwanted Emissions

Equipment shall comply with the limits in (i) and (ii) below.

- i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.
- ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

5.1.3 TEST PROTOCOL

Ambient temperature: 22 °C Relative humidity: 43

eFDD2 TX on 1880 MHz & WLAN 2.4 GHz TX on 2412 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
-	-	PEAK	1000	-13	-

eFDD25 TX on 1882.5 MHz & WLAN 5.0 GHz TX on 5180 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
-	-	PEAK	1000	-13	-

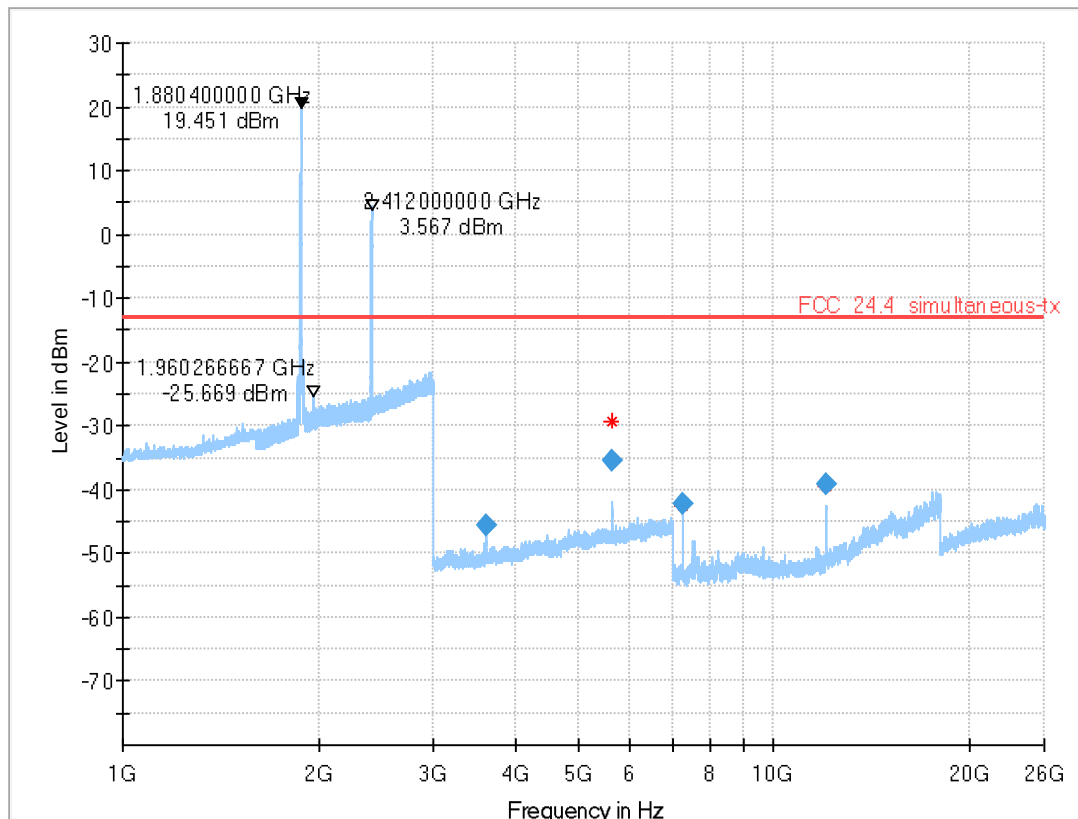
eFDD4 TX on 1732.5 MHz & Bluetooth classic TX on 2402 MHz

Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
-	-	PEAK	1000	-13	-

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

5.1.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Technology = E-UTRA, Radio Technology = eFDD 2 QPSK, Operating Frequency = mid channel,
ChBW = 10 MHz, Ressource Blocks = 1 + WLAN 2.4 GHz CH1 TX on 2412 MHz,
Measurement method = radiated
(S01_DD03)



Final Result

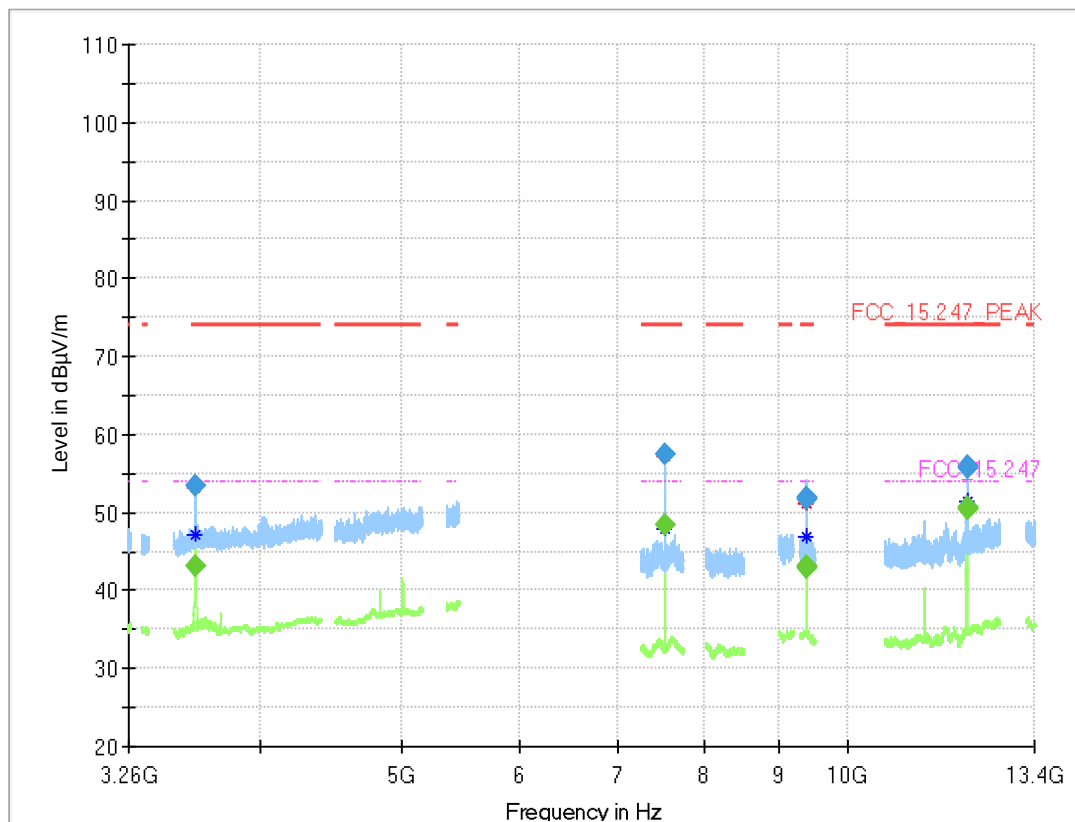
Frequency (MHz)	MaxPeak (dBm)	DET 2 (dBm)	Limit (dBm)	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Elevation	Corr. (dB)
3617.333333	-45.74	---	-13.00	32.74	1000.0	1000.000	150.0	H	-46.0	104.0	-94.2
5640.000000	-35.50	---	-13.00	22.50	1000.0	1000.000	150.0	H	33.0	93.0	-90.3
7237.000000	-42.16	---	-13.00	29.16	1000.0	1000.000	150.0	H	110.0	100.0	-94.5
12057.333333	-39.18	---	-13.00	26.18	1000.0	1000.000	150.0	H	51.0	110.0	-91.9

Comment:

The peaks above the limit line are the wanted Cellular eFDD2 and Wi-Fi CH1 Signals.

The peak at 1960 MHz is the downlink signal from the simulator.

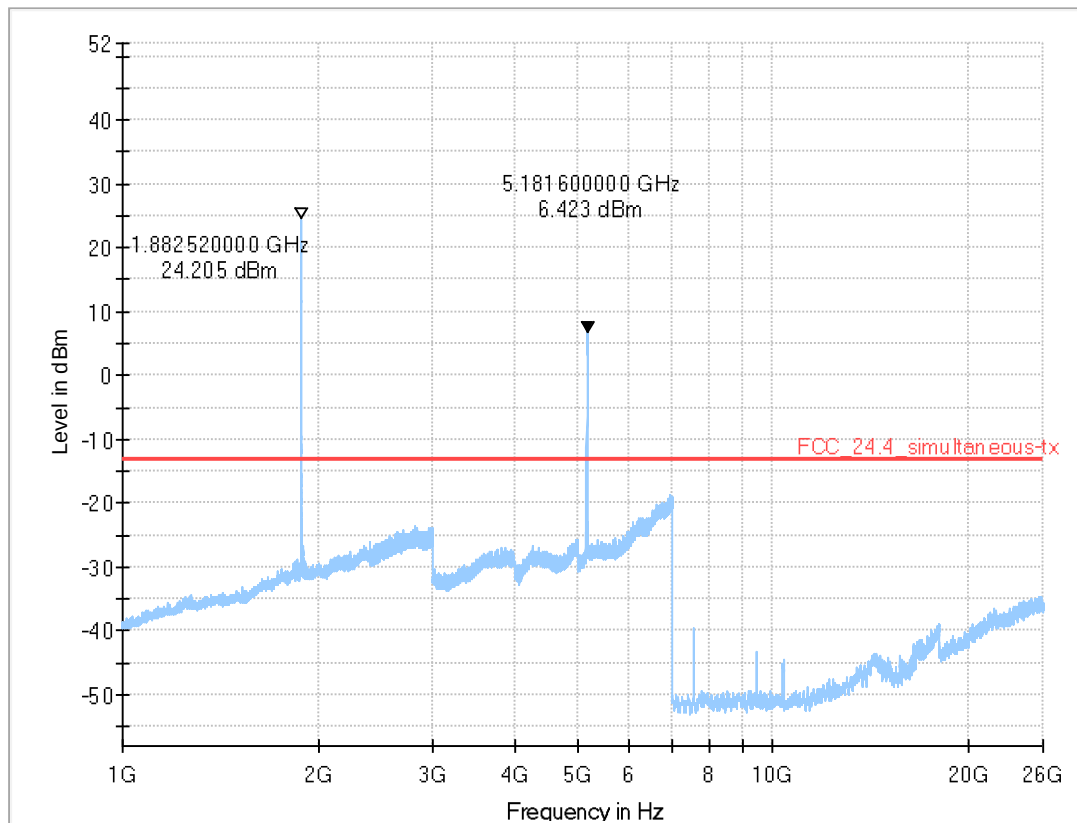
Below we can find a supplementary plot to demonstrate the compliance of the peaks between 3 GHz and 13 GHz according to FCC15.209 limits. Test was performed with same modes as above.



Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
3617.675000	---	43.06	54.00	10.94	1000.0	1000.000	150.0	H	-26.0	-9.0	3.2
3617.675000	53.54	---	74.00	20.46	1000.0	1000.000	150.0	H	-26.0	-9.0	3.2
7520.375000	---	48.47	54.00	5.53	1000.0	1000.000	150.0	V	57.0	85.0	2.3
7520.375000	57.49	---	74.00	16.51	1000.0	1000.000	150.0	V	57.0	85.0	2.3
9400.500000	---	43.07	54.00	10.93	1000.0	1000.000	150.0	V	-39.0	87.0	4.1
9400.500000	51.90	---	74.00	22.10	1000.0	1000.000	150.0	V	-39.0	87.0	4.1
9400.600000	---	42.92	54.00	11.08	1000.0	1000.000	150.0	V	-37.0	88.0	4.1
9400.600000	51.78	---	74.00	22.22	1000.0	1000.000	150.0	V	-37.0	88.0	4.1
12060.865000	---	50.76	54.00	3.24	1000.0	1000.000	150.0	V	61.0	92.0	5.3
12060.865000	55.94	---	74.00	18.06	1000.0	1000.000	150.0	V	61.0	92.0	5.3
12061.285000	---	50.45	54.00	3.55	1000.0	1000.000	150.0	V	62.0	90.0	5.3
12061.285000	55.80	---	74.00	18.20	1000.0	1000.000	150.0	V	62.0	90.0	5.3

Technology = E-UTRA, Radio Technology = eFDD 25 QPSK, Operating Frequency = mid channel, ChBW = 10 MHz, Resource Blocks = 1 + WLAN 5.0 GHz CH36 TX on 5180 MHz, Measurement method = radiated
(S01_DD03)



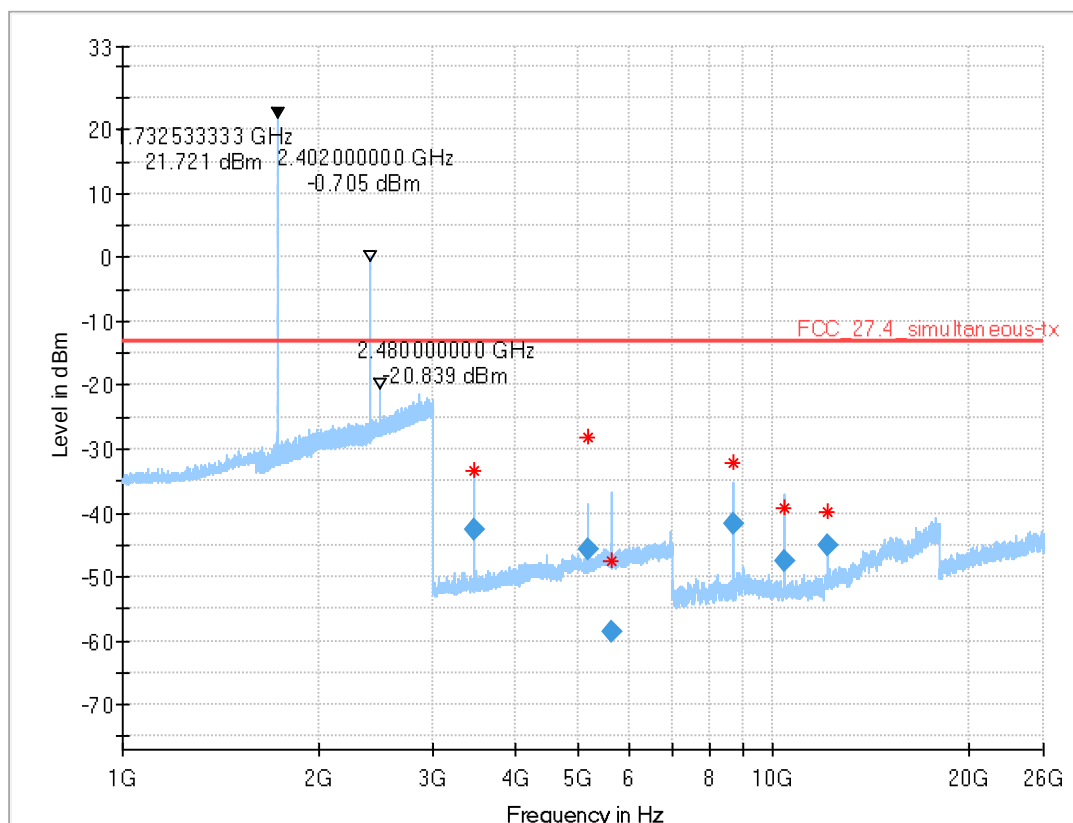
Final Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
---	---	---	---	---	---	---		---	---

Comment:

The peaks above the limit line are the wanted Cellular eFDD25 and Wi-Fi CH36 Signals.

Technology = E-UTRA, Radio Technology = eFDD 4 QPSK, Operating Frequency = mid channel,
ChBW = 10 MHz, Ressource Blocks = 1 + Bluetooth classic CH0 TX on 2402 MHz,
Measurement method = radiated
(S01_DD03)



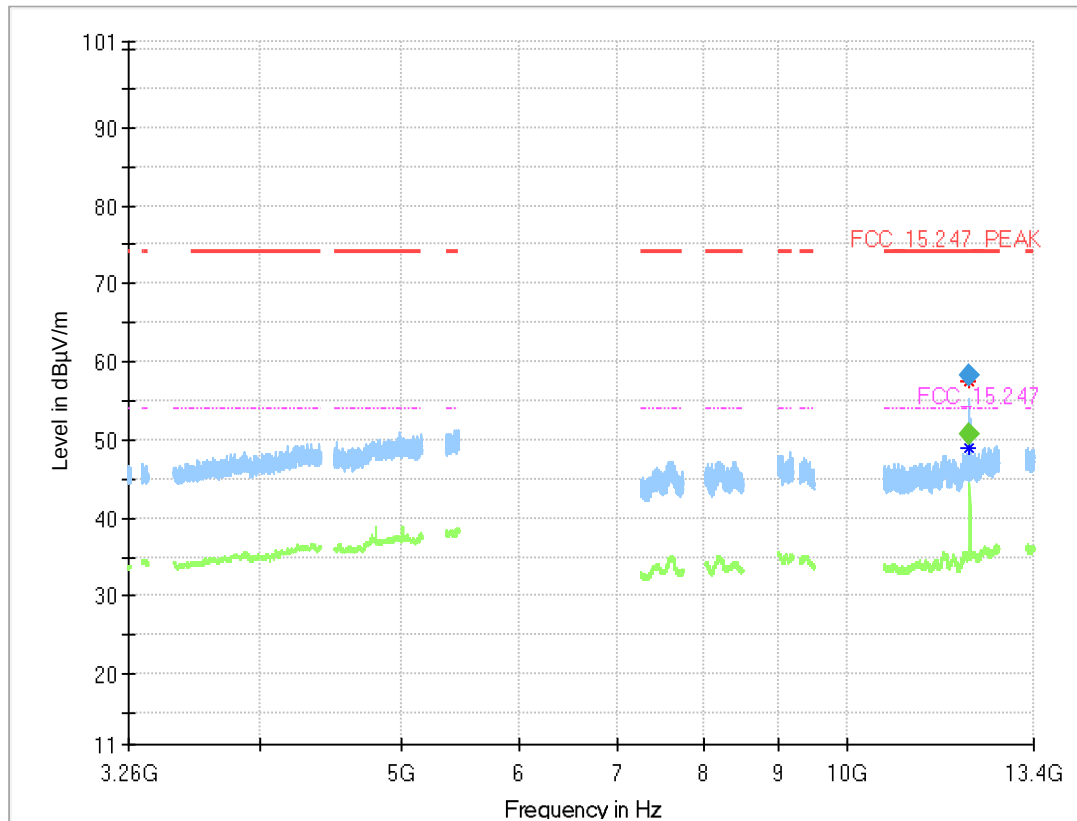
Final Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin	Meas. Time (ms)	Bandwidth h	Height	Pol	Azimuth h	Elevation n	Corr. (dB)
3464.666667	-42.46	-13.00	29.46	1000.0	1000.000	150.0	V	169.0	81.0	-95.1
5198.000000	-45.64	-13.00	32.64	1000.0	1000.000	150.0	H	164.0	100.0	-90.1
5627.333333	-58.67	-13.00	45.67	1000.0	1000.000	150.0	H	86.0	-12.0	-90.4
8663.000000	-41.52	-13.00	28.52	1000.0	1000.000	150.0	H	-126.0	89.0	-93.3
10394.666667	-47.65	-13.00	34.66	1000.0	1000.000	150.0	V	171.0	85.0	-93.4
12128.000000	-45.17	-13.00	32.17	1000.0	1000.000	150.0	V	171.0	89.0	-92.8

Comment:

The peaks above the limit line are the wanted Cellular eFDD4 signal at 1732.5 MHz and BT at 2402 MHz.

Below we can find a supplementary plot to demonstrate the compliance of the peaks between 3 GHz and 13 GHz according to FCC15.209 limits. Test was performed with same modes as above.



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
12128.170000	---	50.77	54.00	3.23	1000.0	1000.000	150.0	V	153.0	98.0	4.5
12128.170000	58.17	---	74.00	15.83	1000.0	1000.000	150.0	V	153.0	98.0	4.5

Test Equipment used

- Radiated Emissions

6 TEST EQUIPMENT

6.1 TEST EQUIPMENT HARDWARE

- 1 Radiated Emissions
 Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	N5000/NP	Filter for EUT, 2 Lines, 250 V, 16 A	ETS-LINDGREN	241515	N/A	N/A
1.2	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2023-12	2025-12
1.3	ESW44	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz GmbH & Co. KG	101603	2024-03	2026-03
1.4	Anechoic Chamber 01	SAC/FAR, 10.58 m x 6.38 m x 6.00 m	Frankonia Germany EMC Solution GmbH	none	N/A	N/A
1.5	FS-Z60	Harmonic Mixer 40 - 60 GHz	Rohde & Schwarz Messgerätebau GmbH	100178	2023-06	2026-06
1.6	CMWC	Control PC for the CMX500	Rohde & Schwarz GmbH & Co. KG	103129-gL	N/A	N/A
1.7	FS-Z220	Harmonic Mixer 140 - 220 GHz	Rohde & Schwarz Messgerätebau GmbH	101005	2023-05	2026-05
1.8	SGH-05	Standard Gain / Pyramidal Horn Antenna (140 - 220 GHz)	RPG-Radiometer Physics GmbH	075	N/A	N/A
1.9	HL 562 ULTRALOG	Biconical-log-per antenna (30 MHz - 3 GHz) with HL 562E biconicals	Rohde & Schwarz GmbH & Co. KG	830547/003		
1.10	Innco Systems CO3000	Controller for bore sight mast FAC	innco systems GmbH	CO3000/1460/54 740522/P	N/A	N/A
1.11	AMF-7D00101800-30-10P-R	Broadband Amplifier 100 MHz - 18 GHz	Miteq		N/A	N/A
1.12	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012	N/A	N/A
1.13	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-	N/A	N/A
1.14	Anechoic Chamber 03	FAR, 8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	N/A	N/A
1.15	MCU	Controller Maturo	Maturo GmbH	4390315	N/A	N/A
1.16	Opus10 THI (8152.00)	T/H Logger 10	Lufft Mess- und Regeltechnik GmbH	12488	2023-12	2025-12

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.17	FS-Z60	3-port Harmonic Mixer 40-60 GHz		101378	2023-10	2026-10
1.18	PONTIS Con4101	PONTIS Camera Controller		6061510370	N/A	N/A
1.19	HF 906	Double-ridged horn	Rohde & Schwarz	357357/002	2022-07	2025-07
1.20	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785	N/A	N/A
1.21	FSW43	Spectrum Analyzer	Rohde & Schwarz GmbH & Co. KG	103779	2024-12	2026-12
1.22	EP 1200/B, NA/B1	AC Source, Amplifier with integrated variable Oscillator	Spitzenberger & Spies GmbH & Co. KG	B6278	N/A	N/A
1.23	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069	N/A	N/A
1.24	SGH-19	Standard Gain / Pyramidal Horn Antenna (40 - 60 GHz)	RPG-Radiometer Physics GmbH	093	N/A	N/A
1.25	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright Instruments GmbH	09	N/A	N/A
1.26	DS 420S	Turn Table 2 m diameter	HD GmbH	420/573/99	N/A	N/A
1.27	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011	N/A	N/A
1.28	Temperature Chamber KWP 120/70	Temperature Chamber Weiss 01	Weiss	59226012190010	2024-07	2026-07
1.29	MA3000/0800-XP-ET-compact	Bore Sight Antenna Mast	innco systems GmbH	9210522	N/A	N/A
1.30	SMBV100B	Vector Signal Generator	Rohde & Schwarz Messgerätebau GmbH	102458	2022-12	2025-12
1.31	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368	N/A	N/A
1.32	TT 1.5 WI	Turn Table	Maturo GmbH	-	N/A	N/A
1.33	HL 562 ULTRALOG	Biconical-log-per Antenna (30 MHz - 3 GHz)	Rohde & Schwarz GmbH & Co. KG	100609	2022-06	2025-06
1.34	HF 906	Double-ridged horn	Rohde & Schwarz	357357/001		
1.35	HL562E ULTRALOG	Biconical-log-per Antenna (30 MHz - 6 GHz)	Rohde & Schwarz GmbH & Co. KG	102299	2024-07	2027-07
1.36	FS-Z325	Harmonic Mixer 220 - 325 GHz	Rohde & Schwarz Messgerätebau GmbH	101006	2023-06	2026-06

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.37	CMW500	Callbox OIL-RE, SUW	Rohde & Schwarz GmbH & Co. KG	155999-Ei	2023-01	2026-01
1.38	CMU 200	"CMU1" Universal Radio Communication Tester	Rohde & Schwarz GmbH & Co. KG	102366	N/A	N/A
1.39	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675	N/A	N/A
1.40	MA4985-XP-ET	Bore Sight Antenna Mast	innco systems GmbH	none	N/A	N/A
1.41	CMW500	Callbox OIL-RE, SUA-160 MHz	Rohde & Schwarz GmbH & Co. KG	168926-LH	2024-07	2026-07
1.42	SGH-08	Standard Gain / Pyramidal Horn Antenna (90 - 140 GHz)	RPG-Radiometer Physics GmbH	064	N/A	N/A
1.43	Temperature Chamber VT 4002	Temperature Chamber Vötsch 03	Vötsch	58566002150010	2024-07	2026-07
1.44	CMW500	Callbox OIL-RE, SUA	Rohde & Schwarz GmbH & Co. KG	163529-bw	2023-01	2026-01
1.45	CMW500	Callbox OIL-RE, SUA-160 MHz	Rohde & Schwarz GmbH & Co. KG	168927-cv	2023-08	2026-08
1.46	SGH-12	Standard Gain / Pyramidal HornAntenna (60 - 90 GHz)	RPG-Radiometer Physics GmbH	326	N/A	N/A
1.47	VLFX-650+	Low Pass Filter DC650 MHz	Mini-Circuits	15542	N/A	N/A
1.48	JUN-AIR Mod. 6-15	Air Compressor	JUN-AIR Deutschland GmbH	612582	N/A	N/A
1.49	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008	N/A	N/A
1.50	FS-Z140	Harmonic Mixer 90 -140 GHz	Rohde & Schwarz Messgerätebau GmbH	101007	2023-05	2026-05
1.51	HFH2-Z2	Loop Antenna + 3 Axis Tripod	Rohde & Schwarz GmbH & Co. KG	829324/006	2024-04	2027-04
1.52	Voltcraft M-3860M	Digital Multimeter 01 (Multimeter)	Conrad	IJ096055	N/A	N/A
1.53	CMW500	Callbox OIL-RE, SUA-160 MHz	Rohde & Schwarz GmbH & Co. KG	168925-vc	2023-06	2026-06
1.54	SB4-100.OLD20-3T/10 Airwin 2 x 1.5 kW	Air compressor (oil-free)	airWin Kompressoren UG	901/00503	N/A	N/A
1.55	UNI-T UT195E	True RMS Digital Multimeter	UNI-T UNI-TREND TECHNOLOGY (CHINA) CO., LTD.	C190729561	N/A	N/A

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.56	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037	N/A	N/A
1.57	AS 620 P	Antenna Mast (pneumatic polarisation)	HD GmbH	620/37	N/A	N/A
1.58	TD1.5-10kg	EUT Tilt Device (Rohacell)	Maturo GmbH	TD1.5-10kg/024/3790709	N/A	N/A
1.59	SGH-03	Standard Gain / Pyramidal Horn Antenna (220 - 325 GHz)	RPG-Radiometer Physics GmbH	060	N/A	N/A
1.60	FS-Z90	Harmonic Mixer 60 - 90 GHz	Rohde & Schwarz Messgerätebau GmbH	101686	2023-06	2026-06
1.61	Innco Systems CO3000	Controller for bore sight mast SAC	innco systems GmbH	CO3000/967/39371016/L	N/A	N/A
1.62	NRV-Z1	Sensor Head B	Rohde & Schwarz GmbH & Co. KG	827753/006		
1.63	HF 907-2	Double-ridged horn	Rohde & Schwarz	102817	2022-07	2025-07
1.64	CMX500	Radio Communication Tester New Radio 5G	Rohde & Schwarz GmbH & Co. KG	101305-LP	2023-06	2026-06
1.65	AM 4.0	Antenna Mast 4 m	Maturo GmbH	AM4.0/180/11920513	N/A	N/A
1.66	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2024-10	2027-10

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

6.2 TEST EQUIPMENT SOFTWARE

Semi-Anechoic Chamber:	
Software	Version
EMC32 Measurement Software	10.60.10
INNCO Mast Controller	1.02.62
INNCO Mast Height	34.10
INNCO Mast Elevation	36.11
MATURO Controller	1.24
MATURO Mast	12.19
MATURO Turn-Table	30.10
Fully-Anechoic Chamber:	
Software	Version
EMC32 Measurement Software	10.60.10
MATURO Controller	1.30
MATURO Turn-Unit	11.10
MATURO Mast	12.10
MATURO Turntable	12.11
INNCO Controller	1.03.02
INNCO Mast Height	34.10
INNCO Mast Elevation	36.11
TS 8997	
WMS32 Measurement Software	11.60.00 (till 2024-03-19), 11.70.00 + Hotfix 01
Conducted AC Emissions:	
Software	Version
EMC32 Measurement Software	10.60.20

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

$$U_{\text{LISN}} (\text{dB } \mu\text{V}) = U (\text{dB } \mu\text{V}) + \text{Corr. (dB)}$$

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

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction = $-40 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

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)

($d_{\text{Limit}} = 3 \text{ m}$)

Frequency	AF R&S HL562	Corr.
MHz	dB (1/m)	dB
30	18.6	0.6
50	6.0	0.9
100	9.7	1.2
150	7.9	1.6
200	7.6	1.9
250	9.5	2.1
300	11.0	2.3
350	12.4	2.6
400	13.6	2.9
450	14.7	3.1
500	15.6	3.2
550	16.3	3.5
600	17.2	3.5
650	18.1	3.6
700	18.5	3.6
750	19.1	4.1
800	19.6	4.1
850	20.1	4.4
900	20.8	4.7
950	21.1	4.8
1000	21.6	4.9

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))
dB	dB	dB	dB	dB	m	m
0.29	0.04	0.23	0.02	0.0	3	3
0.39	0.09	0.32	0.08	0.0	3	3
0.56	0.14	0.47	0.08	0.0	3	3
0.73	0.20	0.59	0.12	0.0	3	3
0.84	0.21	0.70	0.11	0.0	3	3
0.98	0.24	0.80	0.13	0.0	3	3
1.04	0.26	0.89	0.15	0.0	3	3
1.18	0.31	0.96	0.13	0.0	3	3
1.28	0.35	1.03	0.19	0.0	3	3
1.39	0.38	1.11	0.22	0.0	3	3
1.44	0.39	1.20	0.19	0.0	3	3
1.55	0.46	1.24	0.23	0.0	3	3
1.59	0.43	1.29	0.23	0.0	3	3
1.67	0.34	1.35	0.22	0.0	3	3
1.67	0.42	1.41	0.15	0.0	3	3
1.87	0.54	1.46	0.25	0.0	3	3
1.90	0.46	1.51	0.25	0.0	3	3
1.99	0.60	1.56	0.27	0.0	3	3
2.14	0.60	1.63	0.29	0.0	3	3
2.22	0.60	1.66	0.33	0.0	3	3
2.23	0.61	1.71	0.30	0.0	3	3

($d_{\text{Limit}} = 10 \text{ m}$)

30	18.6	-9.9
50	6.0	-9.6
100	9.7	-9.2
150	7.9	-8.8
200	7.6	-8.6
250	9.5	-8.3
300	11.0	-8.1
350	12.4	-7.9
400	13.6	-7.6
450	14.7	-7.4
500	15.6	-7.2
550	16.3	-7.0
600	17.2	-6.9
650	18.1	-6.9
700	18.5	-6.8
750	19.1	-6.3
800	19.6	-6.3
850	20.1	-6.0
900	20.8	-5.8
950	21.1	-5.6
1000	21.6	-5.6

0.29	0.04	0.23	0.02	-10.5	10	3
0.39	0.09	0.32	0.08	-10.5	10	3
0.56	0.14	0.47	0.08	-10.5	10	3
0.73	0.20	0.59	0.12	-10.5	10	3
0.84	0.21	0.70	0.11	-10.5	10	3
0.98	0.24	0.80	0.13	-10.5	10	3
1.04	0.26	0.89	0.15	-10.5	10	3
1.18	0.31	0.96	0.13	-10.5	10	3
1.28	0.35	1.03	0.19	-10.5	10	3
1.39	0.38	1.11	0.22	-10.5	10	3
1.44	0.39	1.20	0.19	-10.5	10	3
1.55	0.46	1.24	0.23	-10.5	10	3
1.59	0.43	1.29	0.23	-10.5	10	3
1.67	0.34	1.35	0.22	-10.5	10	3
1.67	0.42	1.41	0.15	-10.5	10	3
1.87	0.54	1.46	0.25	-10.5	10	3
1.90	0.46	1.51	0.25	-10.5	10	3
1.99	0.60	1.56	0.27	-10.5	10	3
2.14	0.60	1.63	0.29	-10.5	10	3
2.22	0.60	1.66	0.33	-10.5	10	3
2.23	0.61	1.71	0.30	-10.5	10	3

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$
 U = Receiver reading
 AF = Antenna factor
 Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
 distance correction = $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$
 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.
MHz	dB (1/m)	dB
1000	24.4	-19.4
2000	28.5	-17.4
3000	31.0	-16.1
4000	33.1	-14.7
5000	34.4	-13.7
6000	34.7	-12.7
7000	35.6	-11.0

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)		
dB	dB	dB	dB		
0.99	0.31	-21.51	0.79		
1.44	0.44	-20.63	1.38		
1.87	0.53	-19.85	1.33		
2.41	0.67	-19.13	1.31		
2.78	0.86	-18.71	1.40		
2.74	0.90	-17.83	1.47		
2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
3000	31.0	-23.4
4000	33.1	-23.3
5000	34.4	-21.7
6000	34.7	-21.2
7000	35.6	-19.8

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
dB	dB	dB	dB	dB	
0.47	1.87	0.53	-27.58	1.33	
0.56	2.41	0.67	-28.23	1.31	
0.61	2.78	0.86	-27.35	1.40	
0.58	2.74	0.90	-26.89	1.47	
0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
7000	35.6	-57.3
8000	36.3	-56.3
9000	37.1	-55.3
10000	37.5	-56.2
11000	37.5	-55.3
12000	37.6	-53.7
13000	38.2	-53.5
14000	39.9	-56.3
15000	40.9	-54.1
16000	41.3	-54.1
17000	42.8	-54.4
18000	44.2	-54.7

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)
dB	dB	dB	dB	dB	dB
0.56	1.28	-62.72	2.66	0.94	1.46
0.69	0.71	-61.49	2.84	1.00	1.53
0.68	0.65	-60.80	3.06	1.09	1.60
0.70	0.54	-61.91	3.28	1.20	1.67
0.80	0.61	-61.40	3.43	1.27	1.70
0.84	0.42	-59.70	3.53	1.26	1.73
0.83	0.44	-59.81	3.75	1.32	1.83
0.91	0.53	-63.03	3.91	1.40	1.77
0.98	0.54	-61.05	4.02	1.44	1.83
1.23	0.49	-61.51	4.17	1.51	1.85
1.36	0.76	-62.36	4.34	1.53	2.00
1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

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

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

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 GHz	AF EMCO 3160-10 dB (1/m)	Corr. dB	cable loss 1 (inside chamber) dB	cable loss 2 (outside chamber) dB	cable loss 3 (switch unit) dB	cable loss 4 (to receiver) dB	distance corr. (-20 dB/ decade) dB	d _{Limit} (meas. distance (limit) m	d _{used} (meas. distance (used) 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

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

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.

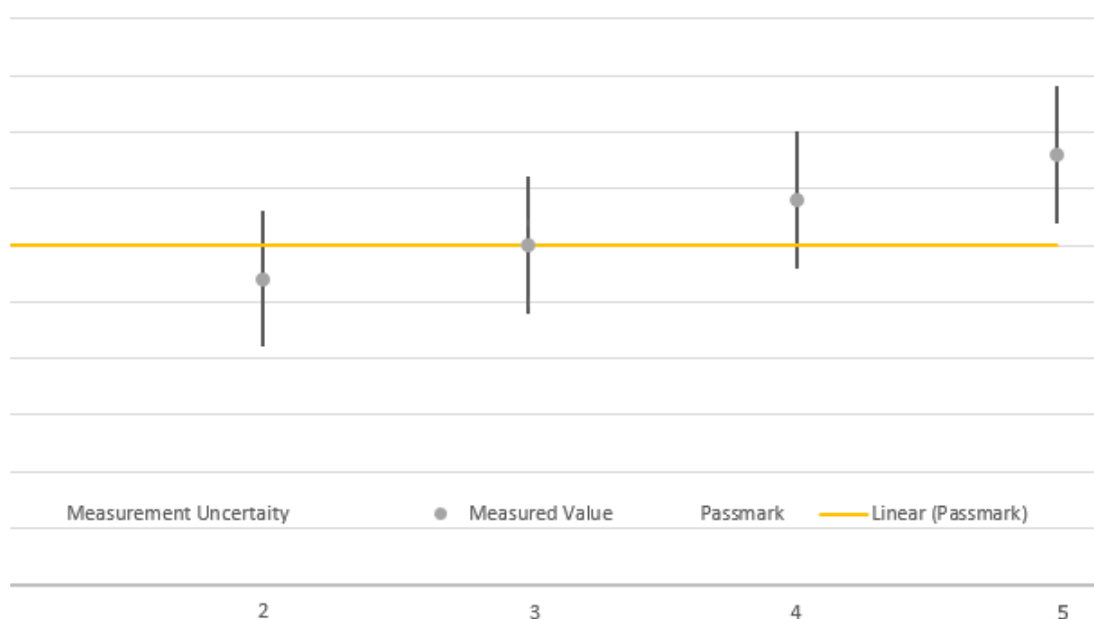
distance correction = $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

8 MEASUREMENT UNCERTAINTIES

Test Case(s)	Parameter	Uncertainty
- Field strength of spurious radiation	Field Strength	± 5.5 dB
- Emission and Occupied Bandwidth	Power Frequency	± 2.9 dB ± 11.2 kHz
- RF Output Power - Peak to Average Ratio	Power	± 2.2 dB
- Band Edge Compliance - Spurious Emissions at Antenna Terminal	Power Frequency	± 2.2 dB ± 11.2 kHz
- Frequency Stability	Frequency	± 25 Hz



icts in this test report are given according the above diagram:

Measured Value	Uncertainty Range	Verdict
below pass mark	below pass mark	Passed
below pass mark	within pass mark	Passed
on pass mark	within pass mark	Passed
above pass mark	within pass mark	Failed
above pass mark	above pass mark	Failed

ns, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called sk principle.

9 PHOTO REPORT

Please see separate photo report.

*****END OF TEST REPORT*****