
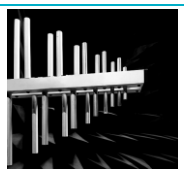
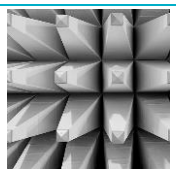

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-9982/20-02-03-B

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

Robert Bosch Power Tools GmbH
Max-Lang-Straße 40-46
70771 Leinfelden-Echterdingen / GERMANY
Phone: +49 711 758-0
Contact: Julian Pfaundler
e-mail: Julian.Pfaundler@de.bosch.com

Manufacturer

Robert Bosch Tool Corp.
Mount Prospect, IL 60056 USA

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS-220, Issue 1	Devices Using Ultra-Wideband (UWB) Technology

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Battery driven detector**
Model name:	**D-tect200C**
IC:	909H-DTECT200C
FCC ID:	TXTDTECT200C
Frequency:	1800 MHz to 5800 MHz
Technology tested:	UWB
Antenna:	Integrated antenna
Power supply:	Li-Ion battery 10,8V/ 12V Max
Temperature range:	-10°C to +50°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

M. Walla

cn=Meheza Walla, o=CTC advanced GmbH, ou=WAL-200806, email=meheza.walla@ctcadvanced.com, c=DE
2022.02.02 16:04:04 +01'00'

Meheza Walla
Lab Manager
Radio Communications & EMC

Test performed:

p.o. F. Heussner

cn=Frank Heussner, o=CTC advanced GmbH, ou=HNR-210329, email=Frank.Heussner@ctcadvanced.com, c=DE
2022.02.02 15:54:40 +01'00'

Sebastian Janoschka
Lab Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

This test report replaces the test report with the number 1-9982/20-02-03-A and dated 2022-01-03.

2.2 Application details

Date of receipt of order:	2020-07-24
Date of receipt of test item:	2020-09-07
Start of test:*	2020-10-05
End of test:*	2020-11-06
Person(s) present during the test:	-/-/I

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Test laboratories sub-contracted

None

3 Test standard/s and references

Test standard	Date	Description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS-220, Issue 1	July 2018	Devices Using Ultra-Wideband (UWB) Technology
RSS-GEN, Issue 5	March 2019	General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

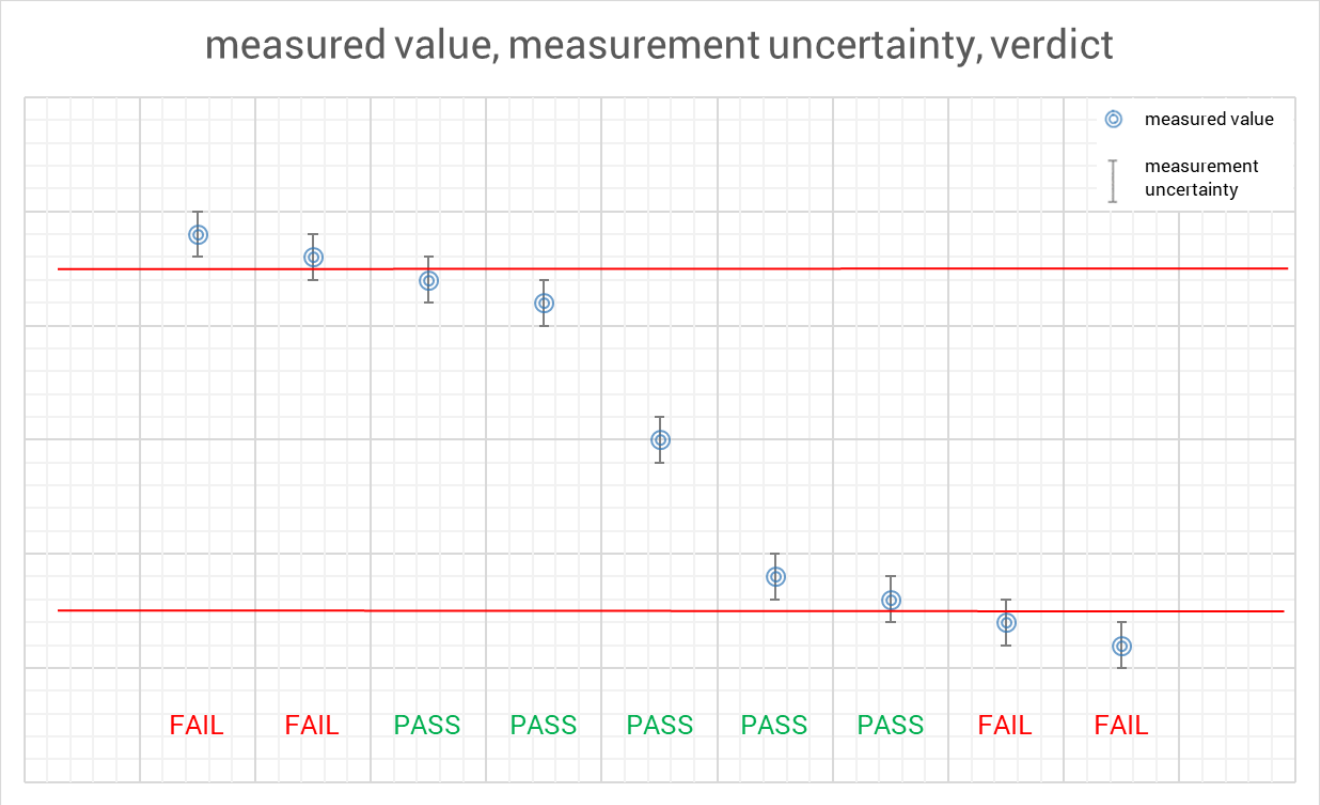
Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+23 °C during room temperature tests +50 °C during high temperature tests -10 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		1020 hPa
Power supply	:	V_{nom} V_{max} V_{min}	Li-Ion battery 10,8V/ 12V Max -/- V -/- V

5 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.



6 Test item

6.1 General description

Kind of test item	:	Battery driven detector
Type identification	:	D-tect200C
S/N serial number	:	Test device 1 / EUT 1: 027005120 Test device 2 / EUT 2: 027005089 Test device 3 / EUT 3: 027005111
Hardware status	:	C-Sample
IC-ID	:	909H-DTECT200C
FCC ID	:	TXTDTECT200C
Software status	:	Build Date 20200821.0
Frequency band	:	1800 MHz to 5800 MHz
Type of radio transmission : Use of frequency spectrum	:	SFCW
Type of modulation	:	SFCW
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	Li-Ion battery 10,8V/ 12V Max, 2.0 Ah battery pack used
Temperature range	:	-10°C to +50°C

6.2 Test modes

A special SW is used for continuous transmission (device 2 / EUT 2).

To verify the emissions of the digital circuitry, a specifically prepared device (device 3 / EUT 3) is used in which the UWB emissions are turned off.

6.3 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-9982/20-02-01_AnnexA
1-9982/20-02-01_AnnexB
1-9982/20-02-01_AnnexD

Measurement	**Test Report, Number of plot**	**Annex D, Number of photo**	**Comment**
TX Radiated Emissions, 9 kHz to 1 GHz	3, 4	20, 21, 22, 23	No representative wall used; DUT facing downwards onto anechoic material; (According to ANSI 63.10 section 10.2 and 10.3)
TX Radiated Emissions, 960 MHz to 18 GHz	2, 5, 6, 7, 8, 11, 12, 13, 14	9, 10, 11	Representative, absorbing wall used; full sphere scan;
TX Radiated Emissions, 18 GHz to 40 GHz	9, 10	15, 16, 17, 18	No representative wall used, full sphere scan
Efficient use of spectrum	15, 16	24	Representative wall used
Substitution		12, 13, 14	
-/-		5, 6, 7, 8	Only for reference, since DUT wouldn't be seen with wall

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

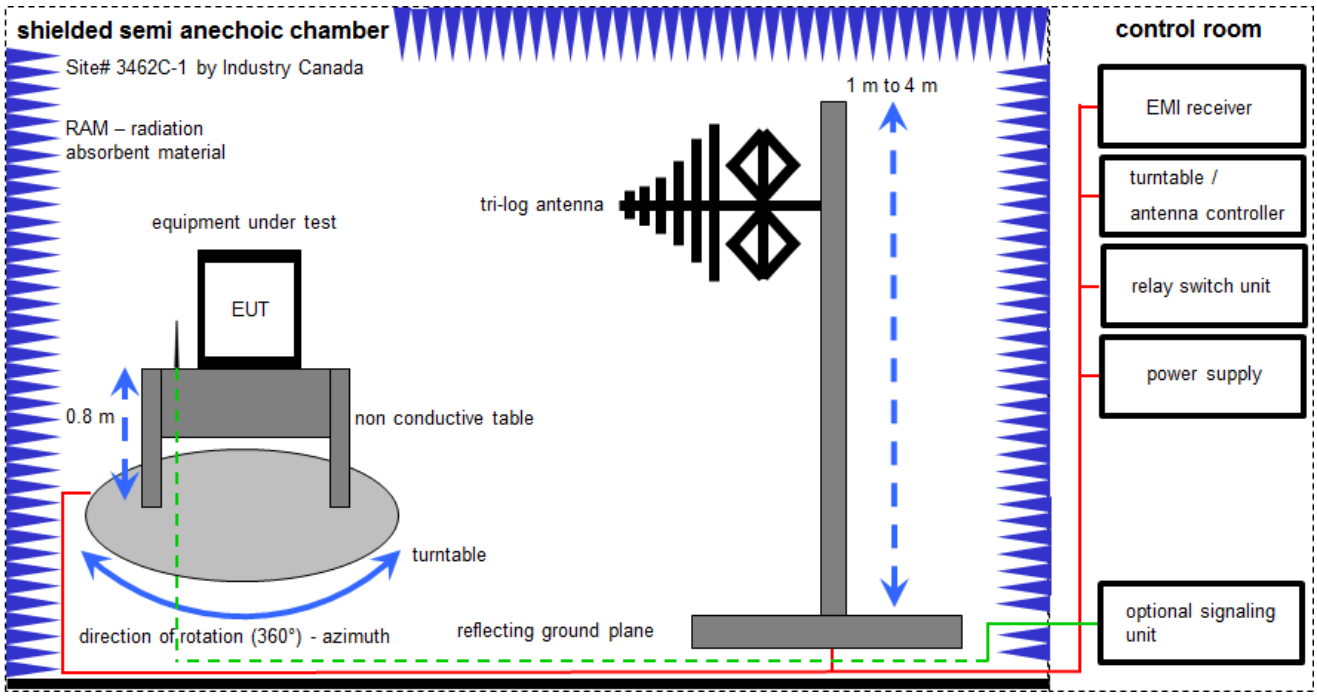
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

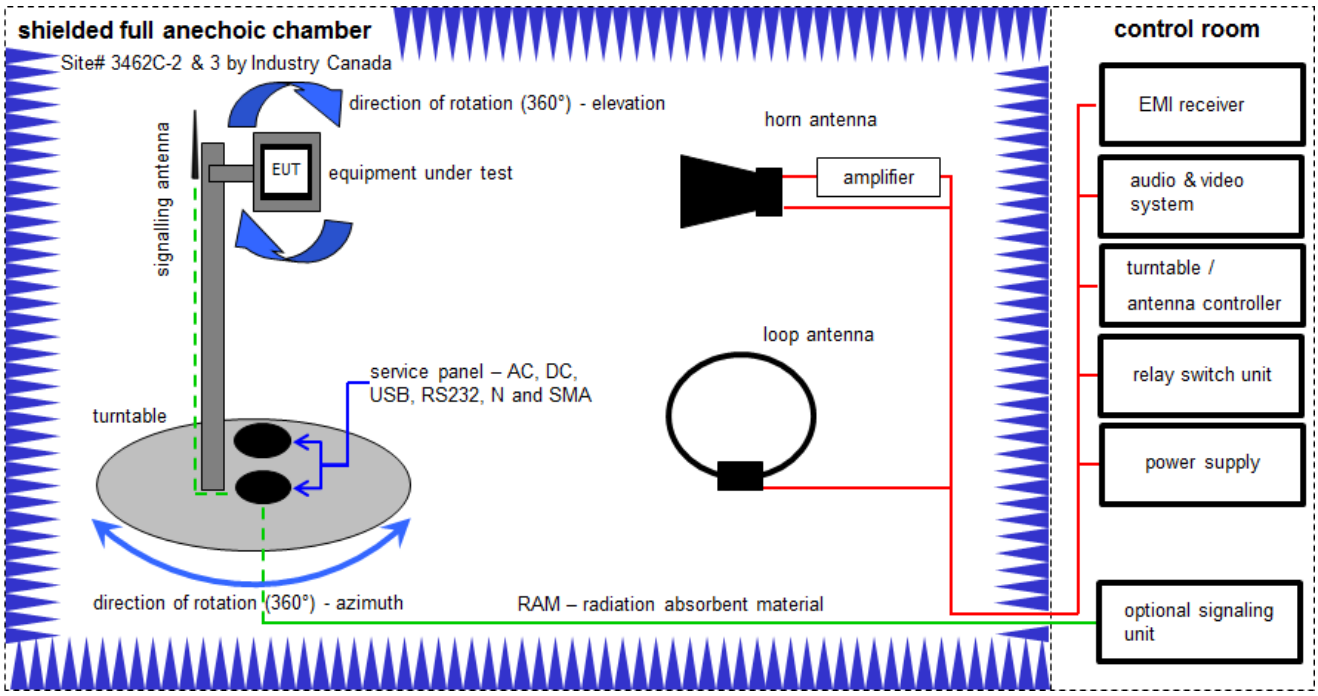
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
3	93	Meßkabine 1	HF-Absorberhalle	MWB AG 300023		300000551	ne	-/-	-/-
4	n. a.	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	21.05.2019	20.11.2020
5	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
6	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
7	n. a.	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	295	300003787	vlKl!	19.02.2019	18.02.2021
9	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	16.12.2019	15.12.2020

7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter / 1 meter

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:
OP [dBm] = -39.0 [dBm] + 57.0 [dB] - 12.0 [dBi] + (-36.0) [dB] = -30 [dBm] (1 µW)

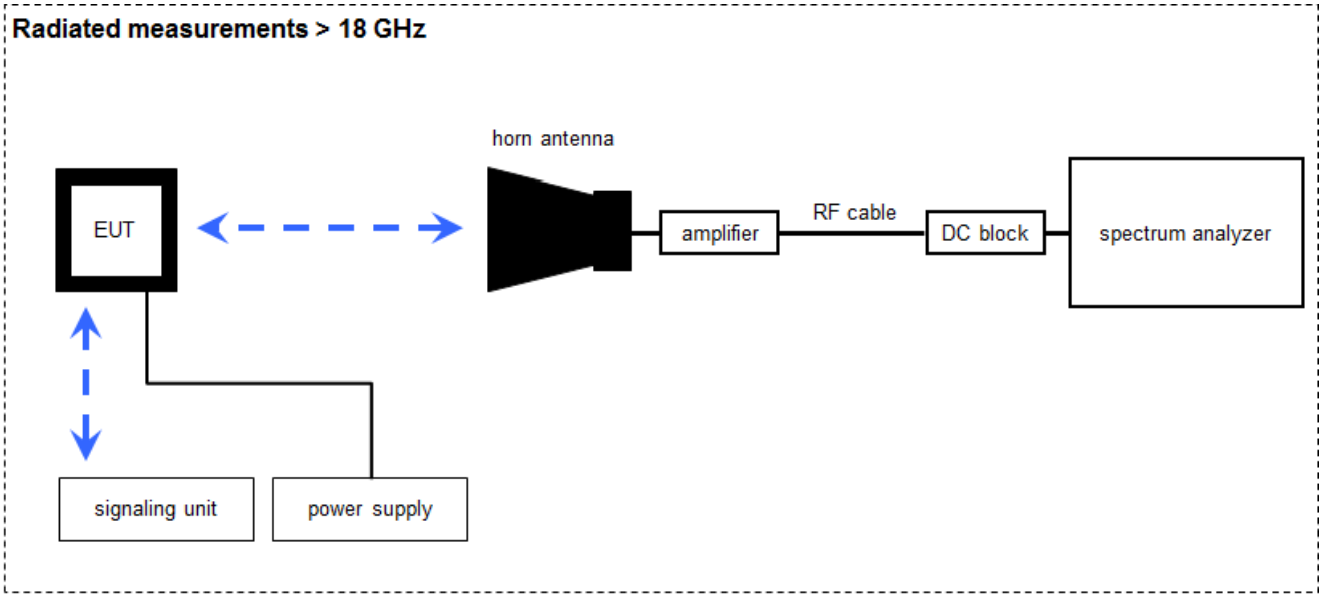
Equipment table (Chamber C):

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A,B,C	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	vIKI!	12.12.2017	11.12.2020
2	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vIKI!	13.06.2019	12.06.2021
3	A,B,C	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
4	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vIKI!	27.12.2019	26.02.2021
5	A,B,C	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
6	A,B,C	Variable isolating transformer	MPL IEC625 Bus Variable isolating transformer	Erfi	91350	300001155	ne	-/-	-/-
7	A,B,C	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2019	10.12.2020
8	B	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
9	B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
10	B	Broadband Amplifier 5-13 GHz	CBLU5135235	CERNEX	22010	300004491	ev	-/-	-/-
11	A,B,C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
12	A,B,C	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO		300004682	ne	-/-	-/-
13	A,B,C	PC	ExOne	F+W		300004703	ne	-/-	-/-
14	B	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-
15	C	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	295	300003787	vIKI!	19.02.2019	18.02.2021

Equipment table (OTA):

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A,B,C	Power supply GPIB dc power supply, 0-50 Vdc, 0-2 A	6633A	HP	2851A01222	300001530	vIKI!	10.12.2019	09.12.2022
2	A,B,C	CTIA-Chamber	CTIA-Chamber AMS 8500	ETS-Lindgren Finnland		300003327	ne	-/-	-/-
3	A,B,C	CTIA-Chamber - Positioning Equipment	CTIA-Chamber - Positioning Equipment	EMCO/2		300003328	ne	-/-	-/-
4	A,B,C	Signal- and Spectrum Analyzer	FSW26	R&S	101455	300005697	k	12.12.2019	11.12.2020
5	A,B,C	PC	Precision M4800	DELL	19414201934	300004957	-/-		
6	A,B,C	EMC Software Chamber A	EMC32-MEB	R&S	n.a.	300005477	-/-		
7	A,B,C	RF Amplifier	AMF-7D-01001800-22-10P	MITEQ	n.a.	n.a.	ev		
8	A	Std. Gain Horn Antenna 11.90-18.00 GHz	1824-20	Flann	263	300002471	ev	-/-	-/-
9	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	ev	-/-	-/-
10	C	Breitband Doppelsteg-Hornantenne 0.5-6 GHz, 300 W	BBHA 9120 E	Schwarzbeck	212	300003214	vIKI!	22.06.2018	21.06.2021

7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna e.g. 50 cm

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance;
G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:
OP [dBm] = -59.0 [dBm] + 44.0 [dB] - 20.0 [dBi] + 5.0 [dB] = -30 [dBm] (1 µW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No CTC	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ev	-/-	-/-
2	A	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda		300000487	ev	-/-	-/-
3	A	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	k	19.02.2019	18.02.2021
4	A	Broadband LNA 18-50 GHz	CBL18503070PN	CERNEX	25240	300004948	ev	-/-	-/-
6	A	Power Supply	LA30/5GA	Zentro	2046	300000711	NK!	-/-	-/-

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

*)Note: The sequence will be repeated three times with different EUT orientations.

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

9 Measurement uncertainty

Test case	Uncertainty
Equivalent isotropically radiated power (e.i.r.p.)	Conducted value ± 1 dB Radiated value ± 3 dB
Permitted range of operating frequencies	± 100 kHz
Conducted unwanted emissions in the spurious domain (up to 40 GHz)	± 1 dB
Radiated unwanted emissions in the spurious domain (up to 40 GHz)	± 3 dB
Conducted unwanted emissions in the spurious domain (40 to 50 GHz)	± 4 dB
Radiated unwanted emissions in the spurious domain (40 to 50 GHz)	± 4 dB
Conducted unwanted emissions in the spurious domain (50 to 300 GHz)	± 5 dB
Radiated unwanted emissions in the spurious domain (50 to 300 GHz)	± 5 dB
DC and low frequency voltages	± 3 %
Temperature	± 1 °C
Humidity	± 3 %

10 Summary of measurement results

☒	**No deviations from the technical specifications were ascertained**
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR47 §15.209, §15.509, §15.521	see table	2022-02-02	-/-

Test specification clause	Test case	Temperature conditions	Power source	Pass	Fail	NA	NP	Remark
§15.503, §15.509 (a)	10 dB Bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.509, §15.209 (d)(e)(f)	TX Radiated Emissions	Nominal	Nominal	☒	☐	☐	☐	complies
§15.509 (c)	Efficient use of spectrum	Nominal	Nominal	☒	☐	☐	☐	complies
§15.521 (b) §§15.203 & 15.204	Antenna requirement	-/-	-/-	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

11 Additional comments

Reference documents: None

Configuration descriptions: None

Special test descriptions: 1) A representative wall using absorptive material is being used according to ETSI EN 302 065-4 V1.1.1 (2016-11) ANNEX D.2
Wall attenuation values are within given values according to Table D.1

Table D.1: Representative wall attenuation values

Frequency (GHz)	Attenuation values for the representative wall in dB	
	average	maximum
1	7.00	9.00
2	10.00	12.00
3	12.00	14.00
4	14.00	16.00
5	16.00	18.00
6	18.00	20.00
7	20.00	22.00
8	22.00	24.00

2) The following devices have been used for the stated measurements:

Device 2 / EUT 2:
- 10 dB Bandwidth
- TX Radiated Emissions
- Efficient use of spectrum

Device 3 / EUT 3:
- Emissions from digital circuitry (part of chapter: TX Radiated Emissions)

12 Measurement results

12.1 10 dB - Bandwidth

Description:

§ 15.503 (a) *UWB bandwidth.* For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L. The frequency at which the highest radiated emission occurs is designated f_M.

Measurement:

Measurement parameter	
Detector:	RMS
Video bandwidth:	1 MHz
Resolution bandwidth:	3 MHz
Trace-Mode:	Max Hold

Test Setup: 7.3

Limits:

§ 15.503 (d)

≥ 500 MHz

§ 15.509 (a)

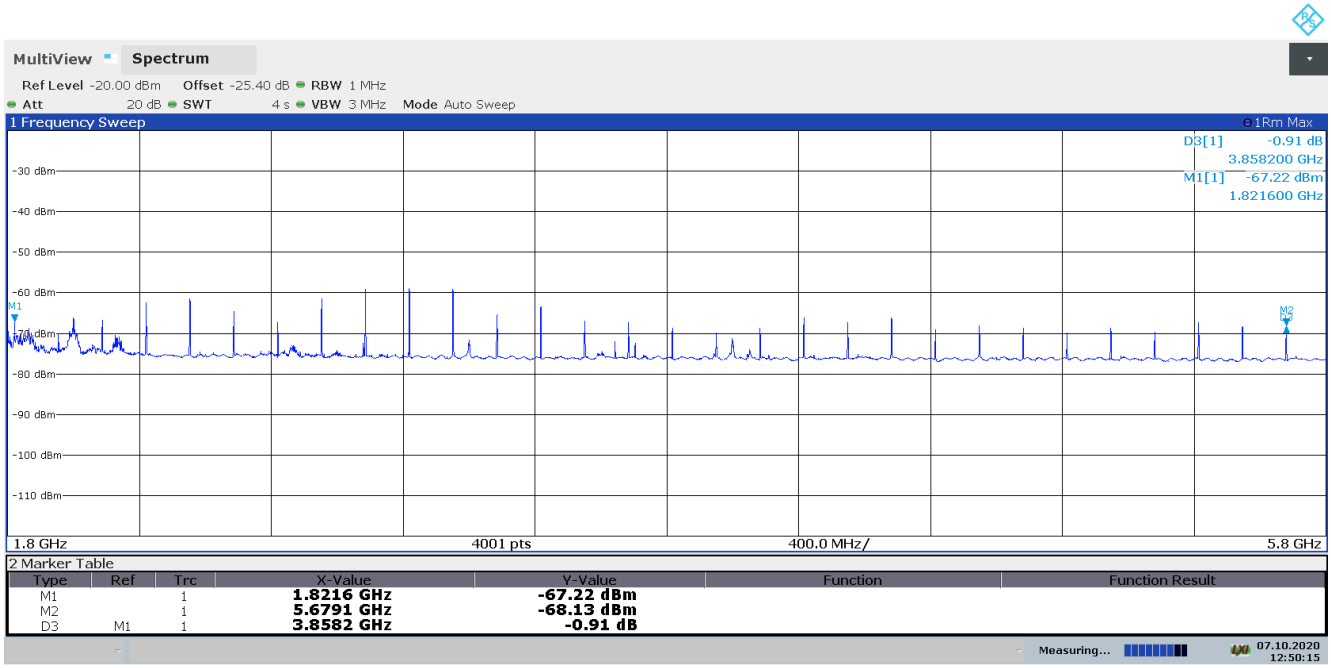
< 10.6 GHz

Results:

EUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]	Plot
2	1.8216	5.6791	3858.2	1

Verdict: **Compliant**

Plot 1:



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12.2 TX Radiated Emissions

Description:

Measurement of the radiated spurious emissions in transmit mode.

Measurement:

§15.209:

Average Measurement parameter	
Detector:	Peak/QPeak
Sweep time:	1 s
Number of points	8001
Resolution bandwidth:	120kHz
Video bandwidth:	≥ RBW
Trace-Mode:	Max Hold

§15.509 (d):

Average Measurement parameter	
Detector:	RMS
Sweep time:	1 ms/pt
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

§15.509 (e):

Average Measurement parameter	
Detector:	RMS
Sweep time:	1 ms/pt
Resolution bandwidth:	1 kHz
Video bandwidth:	100 kHz
Trace-Mode:	Max Hold

§15.509 (f):

Peak Measurement parameter	
Detector:	Max Peak
Resolution bandwidth:	50 MHz
Video bandwidth:	80 MHz
Span:	Zero span
Trace-Mode:	Max Hold

UWB-emission-Limits:

RSS-220 6.2.1 (d)
Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Frequency in MHz	EIRP in dBm
960 to 1610	-65.3
1610 to 1990	-53.3
1990 to 3100	-51.3
3100 to 10600	-41.3
Above 10600	-51.3

RSS-220 6.2.1 (e)
In addition to the limits specified in paragraph (d) of this section; radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Frequency in MHz	EIRP in dBm
1164 to 1240	-75.3
1559 to 1610	-75.3

RSS-220 6.2.1 (g)
The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

RSS-220 Annex 4(c)
Peak measurements shall be made in addition to average measurements. Transmissions shall not exceed 0 dBm e.i.r.p. in any 50 MHz bandwidth when the average limit is -41.3 dBm/MHz. This is the equivalent peak limit as calculated by combining the 6 dB peak-to-average conversion with a resolution bandwidth (RBW) scaling factor of 20 log(1 MHz/50 MHz). Only the 50 MHz bandwidth, centred on the frequency fM where the highest power occurs, needs to be measured to satisfy the peak requirements for all frequencies. A different resolution bandwidth and a correspondingly different peak limit may also be used, in which case the RBW may be set anywhere between 1 MHz and 50 MHz. The peak e.i.r.p. limit is then calculated as 20 log(RBW/50) dBm where the RBW is in MHz. This may be converted to a peak field strength level at 3 metres using E(dBuV/m) = P(e.i.r.p.(dBm)) + 95.2. If the RBW is greater than 3 MHz, the application for certification shall contain a detailed description of the test procedure, the calibration of the test set-up and the instrumentation used in the testing.

RSS-220 Annex 4(m)
Emissions from digital circuitry (used only to enable the operation of the UWB transmitter and that does not control additional functions or capabilities) shall comply with the average and peak power limits applicable to the UWB transmitter. If it can be clearly demonstrated that an emission from a UWB transmitter is due solely to emissions from digital circuitry contained within the transmitter, and that the emission is not intended to be radiated from the transmitter's antenna, the limits for emissions from digital circuitry prescribed in RSS-Gen apply to that emission rather than the UWB limits.

§15.509 (c)
A GPR that is designed to be operated while being hand held and a wall imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

§15.509 (d)
The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following RMS average limits based on measurements using a 1 MHz resolution bandwidth:

Frequency in MHz	EIRP in dBm
960 to 1610	-65.3
1610 to 1990	-53.3
1990 to 3100	-51.3
3100 to 10600	-41.3
Above 10600	-51.3

§15.509 (e)
In addition to the radiated emission limits specified in the table in paragraph (d)(1) of this section, transmitters operating under the provisions of this section shall not exceed the following RMS average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164 to 1240	-75.3
1559 to 1610	-75.3

§15.509 (d)
For UWB devices where the frequency at which the highest radiated emission occurs, fM, is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on fM. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in § 15.521.

§15.521 (c)
Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in §15.209, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of this part.

§15.521(e)
The frequency at which the highest radiated emission occurs, f_M, must be contained within the UWB bandwidth.

§15.521(g)
When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, f_M. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using E(dBuV/m) = P(dBm EIRP) + 95.2. If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

§15.521(h):
The highest frequency employed in §15.33 to determine the frequency range over which radiated measurements are made shall be based on the center frequency, f_C, unless a higher frequency is generated within the UWB device. For measuring emission levels, the spectrum shall be investigated from the lowest frequency generated in the UWB transmitter, without going below 9 kHz, up to the frequency range shown in §15.33(a) or up to f_C + 3/(pulse width in seconds), whichever is higher. There is no requirement to measure emissions beyond 40 GHz provided f_C is less than 10 GHz; beyond 100 GHz if f_C is at or above 10 GHz and below 30 GHz; or beyond 200 GHz if f_C is at or above 30 GHz.

§15.521 (d)
Within the tables in §§15.509, 15.511, 15.513, 15.515, 15.517, and 15.519, the tighter emission limit applies at the band edges. Radiated emission levels at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Radiated emission levels above 960 MHz are based on RMS average measurements over a 1 MHz resolution bandwidth. The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time. Unless otherwise stated, if pulse gating is employed where the transmitter is quiescent for intervals that are long compared to the nominal pulse repetition interval, measurements shall be made with the pulse train gated on. Alternative measurement procedures may be considered by the Commission.

Emission limits below 960 MHz (§15.209, RSS-220 3.4):

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3
> 960	500 (54 dBµV/m)	3

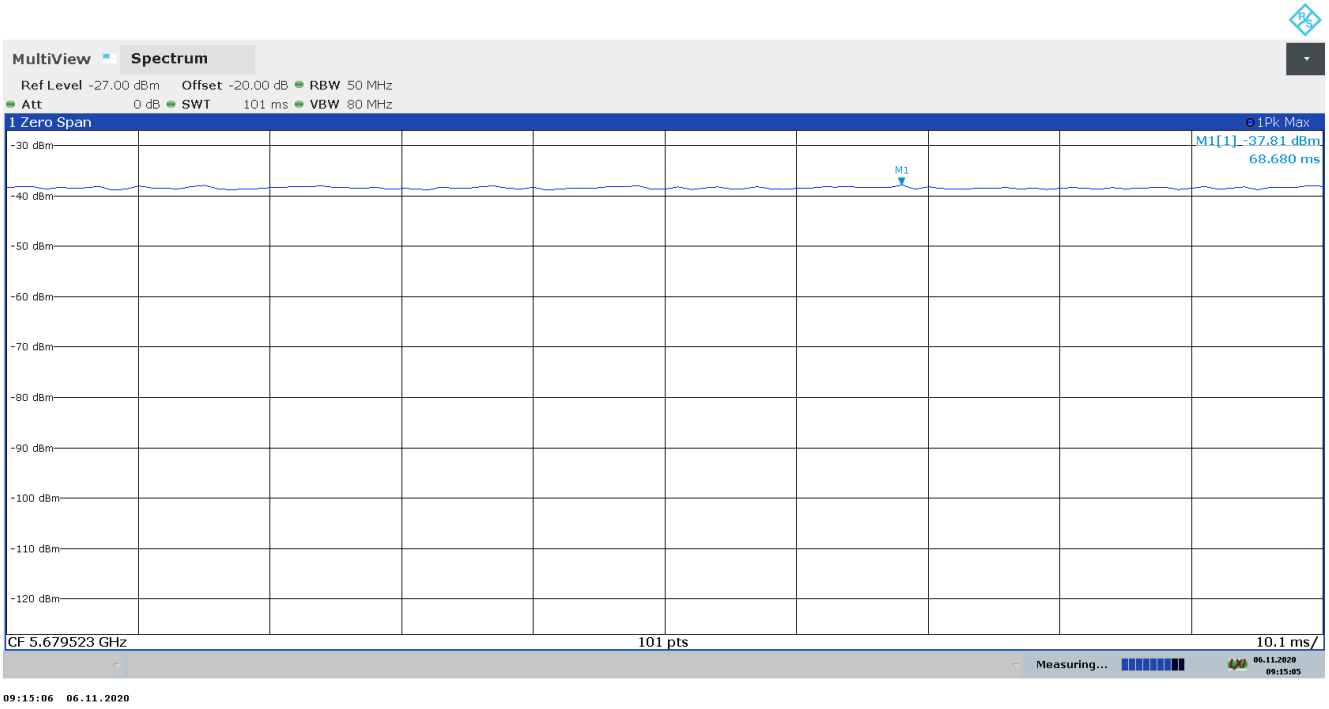
Result:

Measurements of the fundamental emission:

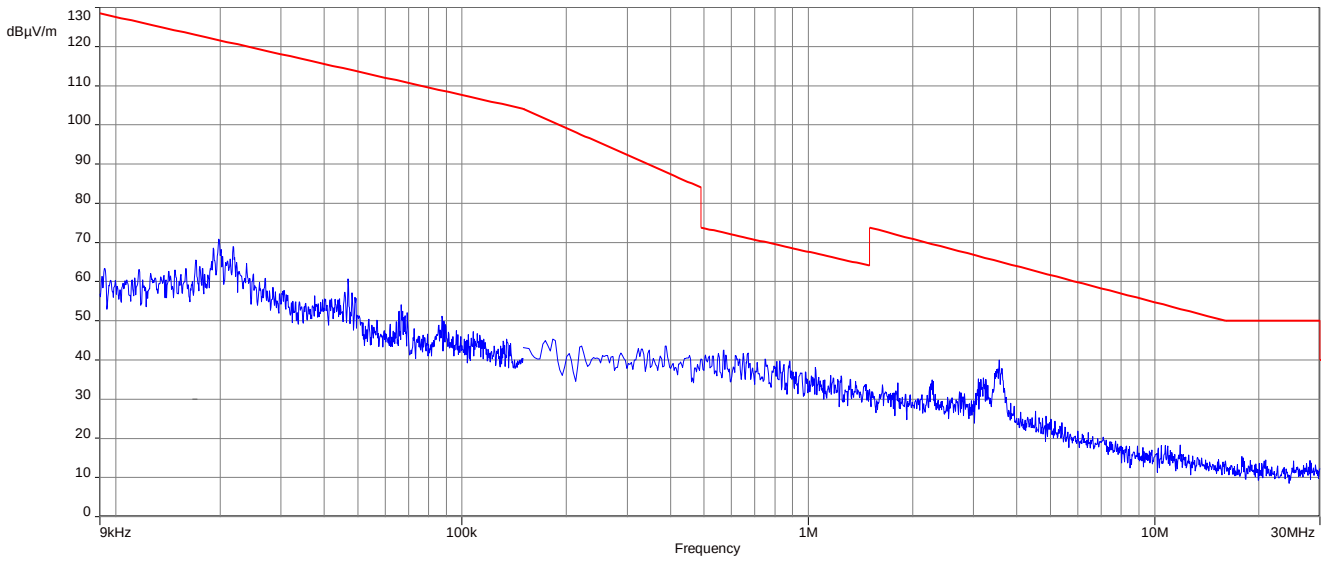
EUT	Frequency /MHz	Max RMS power in dBm/MHz	Max Peak power in dBm/50 MHz	Plot
2	5679.523	-57.71	-37.81	2, 6

Verdict: complies

Plot 2: Peak fundamental emission, EUT 2

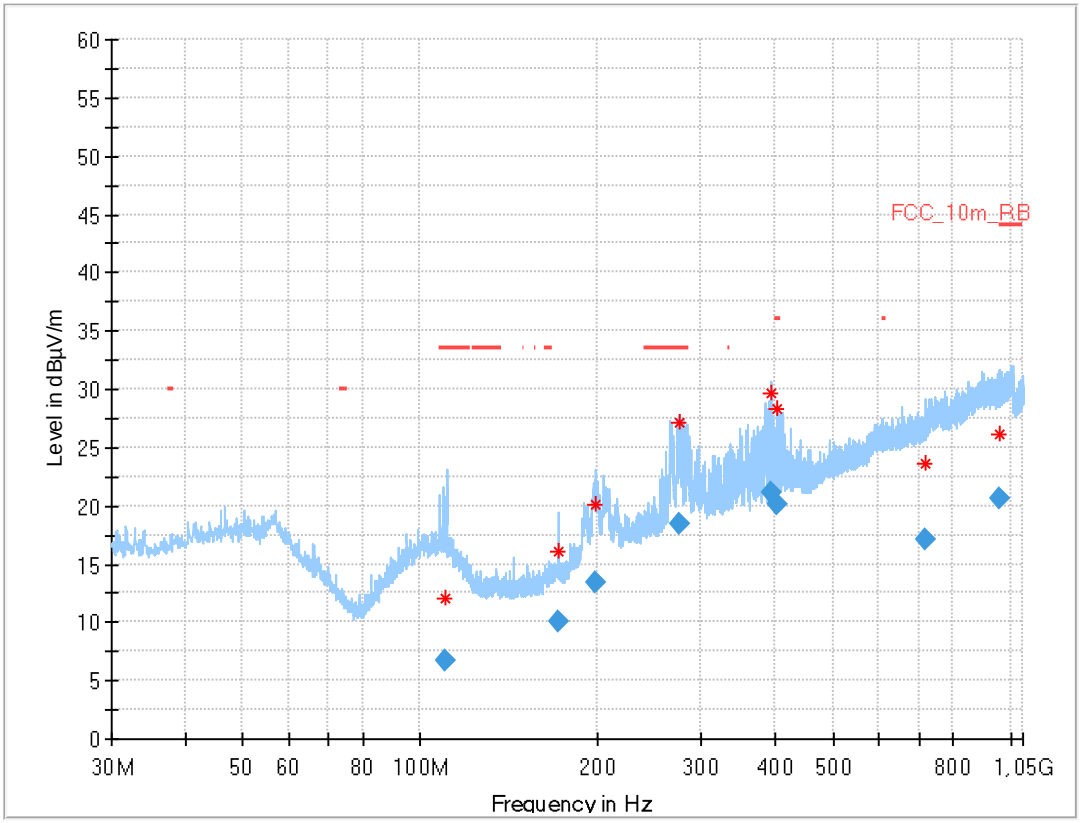


Plot 3: 9 kHz to 30 MHz, EUT 2



Limit according to FCC §15.209 & RSS-220 3.4.

Plot 4: 30 MHz to 1 GHz, EUT 2



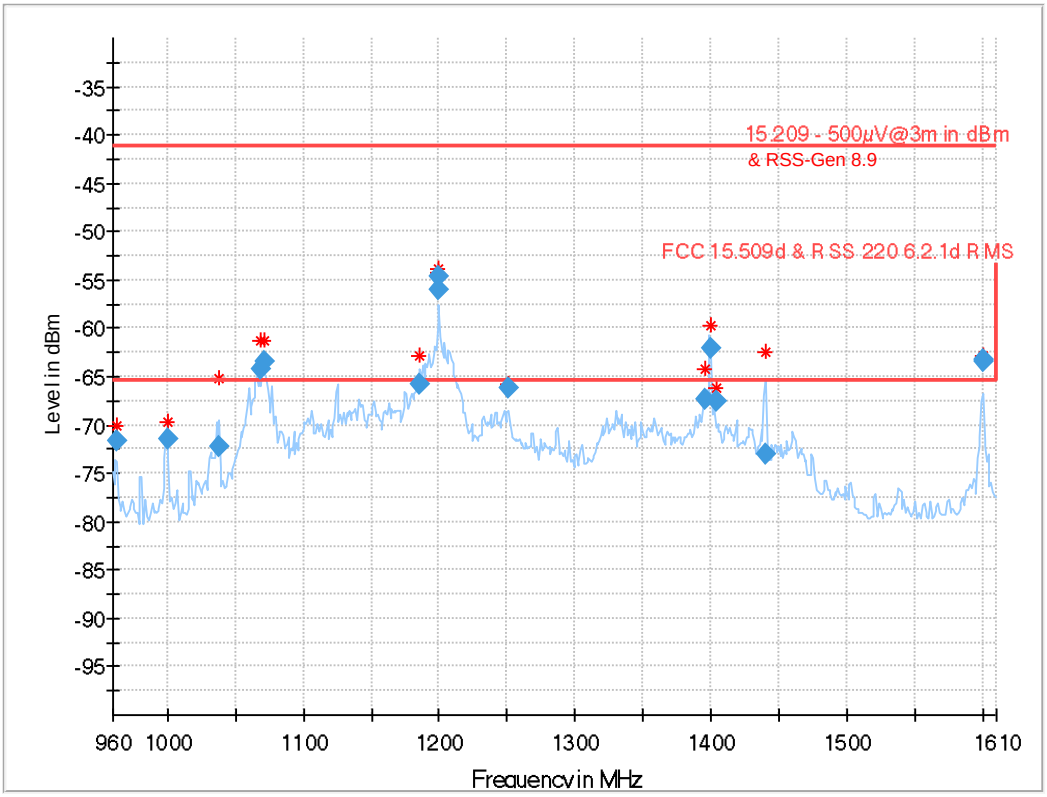
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
110.429	6.72	33.5	26.8	1000	120.0	195.0	H	152	12
171.001	10.00	---	---	1000	120.0	100.0	V	285	10
198.001	13.35	---	---	1000	120.0	100.0	V	46	12
275.432	18.48	33.5	15.0	1000	120.0	400.0	H	94	14
393.738	21.16	---	---	1000	120.0	111.0	V	246	17
401.803	20.06	36.0	15.9	1000	120.0	108.0	V	256	17
718.314	17.08	---	---	1000	120.0	151.0	V	135	21
960.003	20.55	44.0	23.5	1000	120.0	118.0	H	40	24

The measurement conducted @10m. The 3m limit is corrected by 10dB according ANSI 63.10 5.3.3.

Limit according to FCC §15.209 & RSS-220 3.4.

Plot 5: 960 MHz to 1610 MHz, EUT 2



*as stated by the customer and as shown in plot 11 and 13, the emissions within the frequency range discussed here are presumably due to the digital circuit of the device. According to §15.521 (c), emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in §15.209, rather than the limits specified in § 15.509 (d).

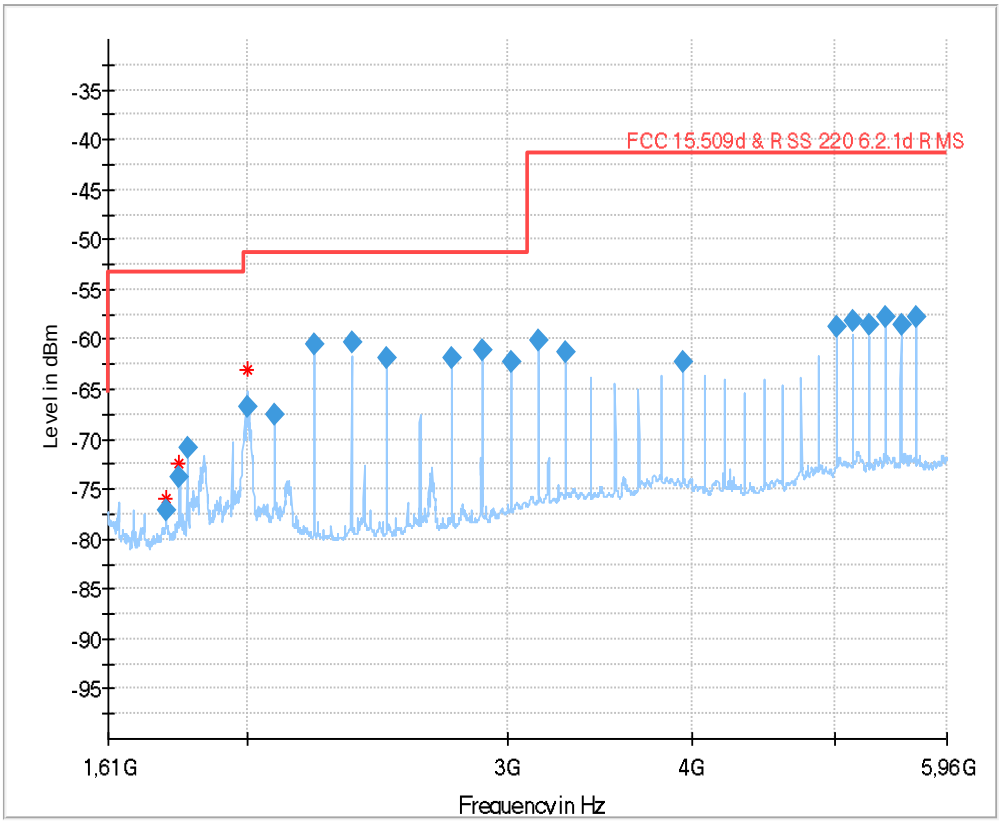
The same applies according to RSS-220 Annex 4 (m). Therefore, the limits stated in RSS-Gen 8.9 are considered applicable.

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2013 9.6.

Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
962.708000	-71.61	-41.23	30.38	1000.000	H	204.0	45.0	-138.4
999.978000	-71.52	-41.23	30.29	1000.000	H	145.0	15.0	-139.4
1037.489000	-72.22	-41.23	30.99	1000.000	H	147.0	120.0	-139.3
1068.854000	-64.16	-41.23	22.93	1000.000	H	135.0	91.0	-139.5
1071.783000	-63.43	-41.23	22.20	1000.000	V	145.0	22.0	-139.5
1185.719000	-65.70	-41.23	24.47	1000.000	V	165.0	75.0	-139.6
1199.805000	-56.05	-41.23	14.82	1000.000	V	165.0	45.0	-139.9
1199.994000	-54.69	-41.23	13.46	1000.000	V	157.0	60.0	-139.9
1250.800000	-66.22	-41.23	24.99	1000.000	H	167.0	54.0	-139.1
1396.136000	-67.33	-41.23	26.10	1000.000	V	182.0	75.0	-139.1
1399.872000	-62.12	-41.23	20.89	1000.000	V	175.0	56.0	-139.1
1403.655000	-67.61	-41.23	26.38	1000.000	H	180.0	165.0	-139.2
1440.181000	-73.03	-41.23	31.80	1000.000	H	175.0	29.0	-138.9
1599.920000	-63.41	-41.23	22.18	1000.000	V	235.0	56.0	-138.1
1600.241000	-63.25	-41.23	22.02	1000.000	V	235.0	61.0	-138.1

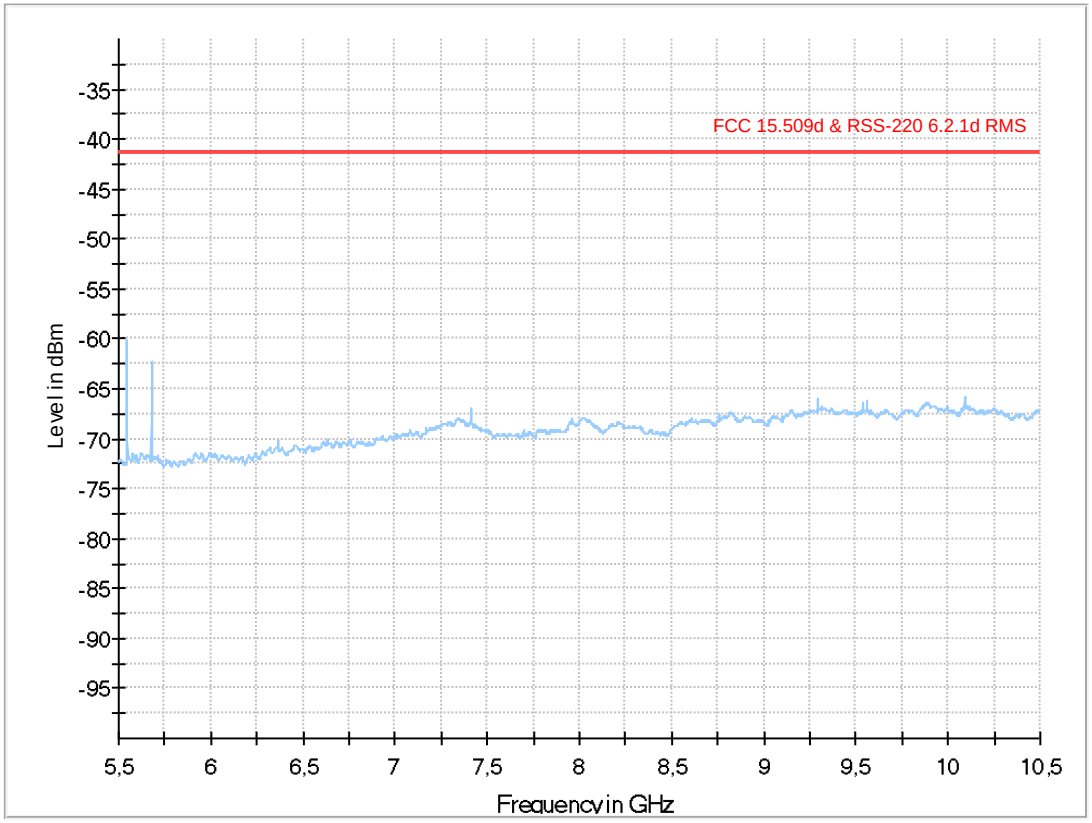
Plot 6: 1610 MHz to 5.96 GHz, EUT 2



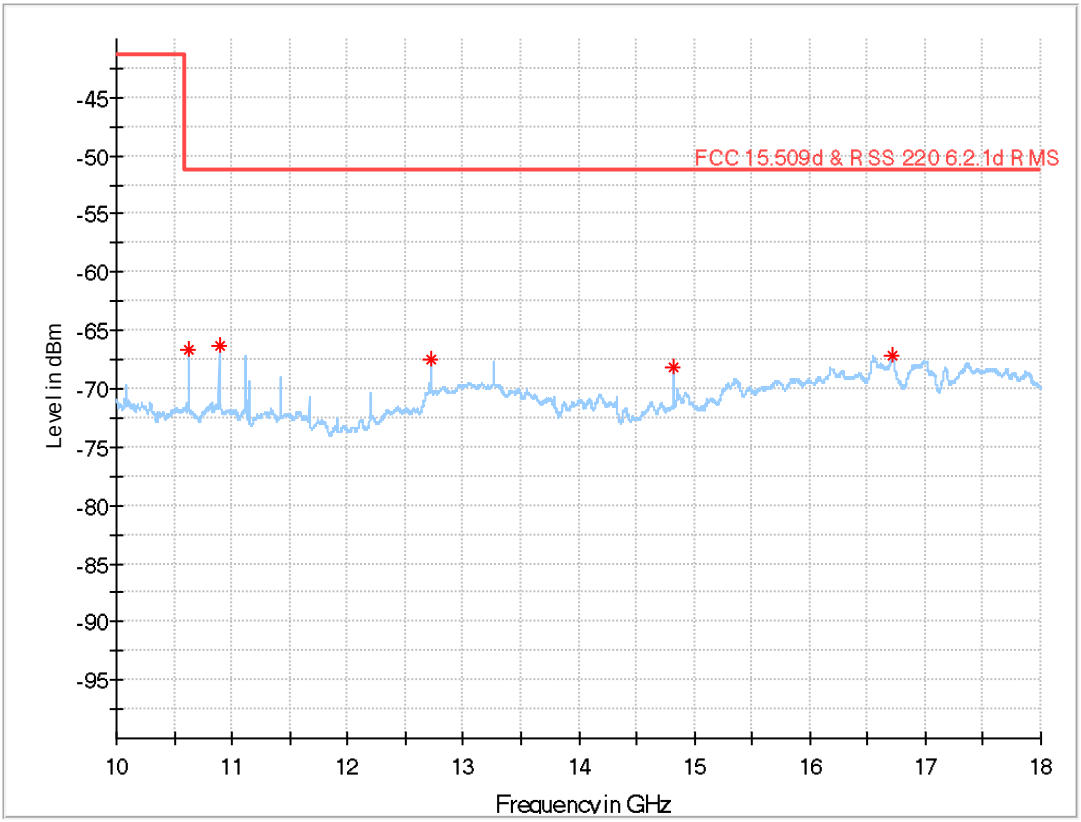
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1761.619000	-77.22	-53.30	23.92	1000.000	V	215.0	0.0	-136.8
1798.934000	-73.87	-53.30	20.57	1000.000	V	175.0	105.0	-137.1
1821.535000	-70.78	-53.30	17.48	1000.000	V	-5.0	114.0	-137.0
1998.731000	-66.84	-51.30	15.54	1000.000	V	178.0	135.0	-136.1
2087.625000	-67.45	-51.30	16.15	1000.000	H	134.0	65.0	-135.6
2220.636000	-60.48	-51.30	9.18	1000.000	V	106.0	140.0	-135.6
2353.673000	-60.35	-51.30	9.05	1000.000	V	106.0	138.0	-134.8
2486.716000	-61.88	-51.30	10.58	1000.000	V	340.0	135.0	-134.7
2752.799000	-61.93	-51.30	10.63	1000.000	V	209.0	2.0	-133.9
2885.829000	-61.13	-51.30	9.83	1000.000	V	207.0	1.0	-133.4
3018.828000	-62.32	-51.30	11.02	1000.000	H	112.0	0.0	-132.4
3151.893000	-60.18	-41.30	18.88	1000.000	H	112.0	0.0	-131.5
3284.903000	-61.26	-41.30	19.96	1000.000	H	112.0	0.0	-130.9
3950.098000	-62.30	-41.30	21.00	1000.000	H	236.0	0.0	-129.4
5014.352000	-58.84	-41.30	17.54	1000.000	H	130.0	92.0	-127.7
5147.402000	-58.21	-41.30	16.91	1000.000	H	130.0	93.0	-127.3
5280.380000	-58.55	-41.30	17.25	1000.000	H	137.0	142.0	-127.6
5413.430000	-57.80	-41.30	16.50	1000.000	H	230.0	61.0	-126.9
5546.467000	-58.56	-41.30	17.26	1000.000	H	230.0	62.0	-127.2
5679.523000	-57.71	-41.30	16.41	1000.000	H	227.0	63.0	-127.0

Plot 7: 5.5 GHz to 10.5 GHz, EUT 2



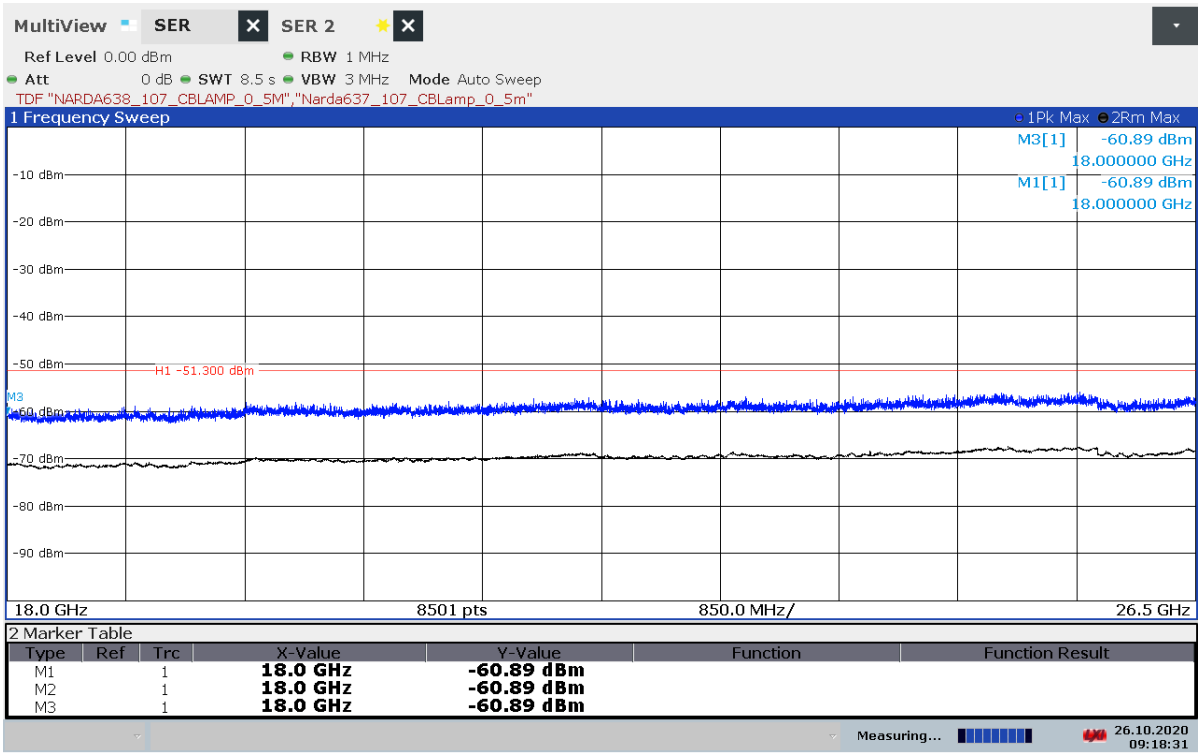
Plot 8: 10.5 GHz to 18 GHz, EUT 2



Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10622.000000	-66.68	-51.30	15.38	1000	V	110.0	0.0	-127.3
10888.000000	-66.27	-51.30	14.97	1000	V	210.0	90.0	-127.0
12730.000000	-67.47	-51.30	16.17	1000	V	240.0	90.0	-125.5
14818.000000	-68.23	-51.30	16.93	1000	H	250.0	150.0	-125.0
16715.000000	-67.10	-51.30	15.80	1000	V	130.0	90.0	-122.3

Plot 9: 18 GHz to 26.5 GHz, EUT 2



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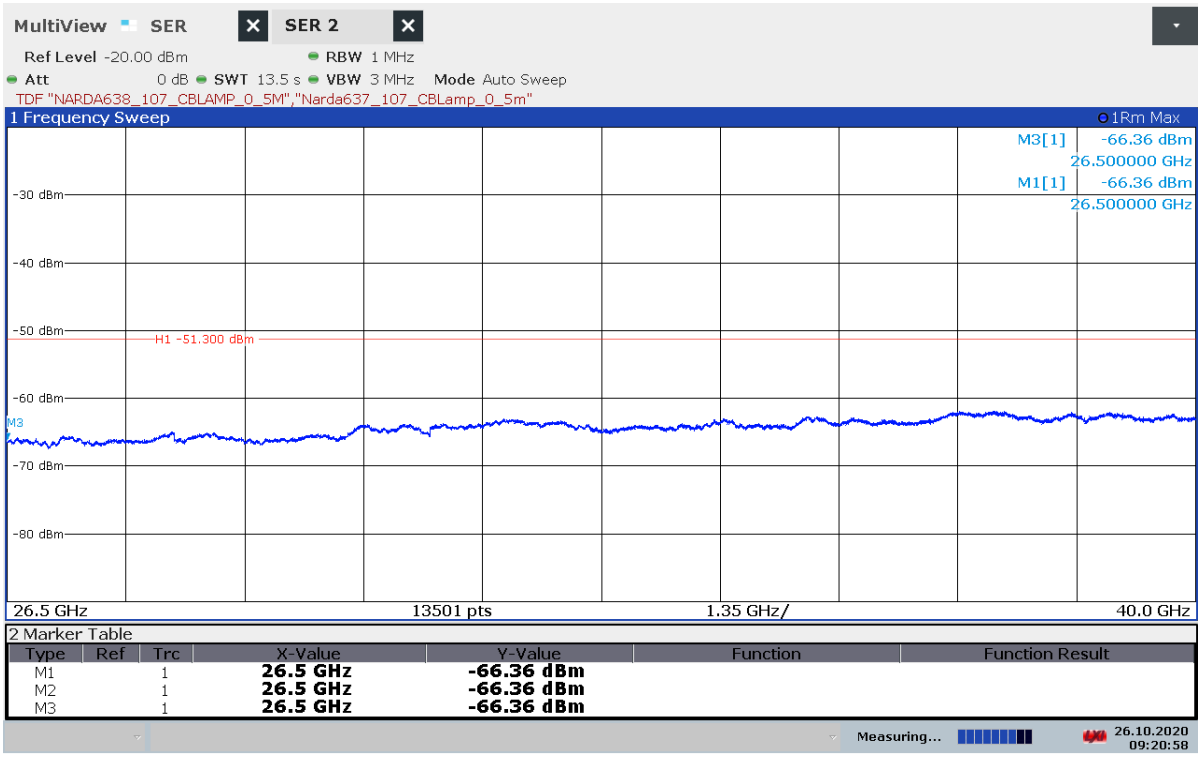
Limit according to FCC 15.509d & RSS-220 6.2.1d RMS

Plot 10: 26.5 GHz to 40.0 GHz, EUT 2



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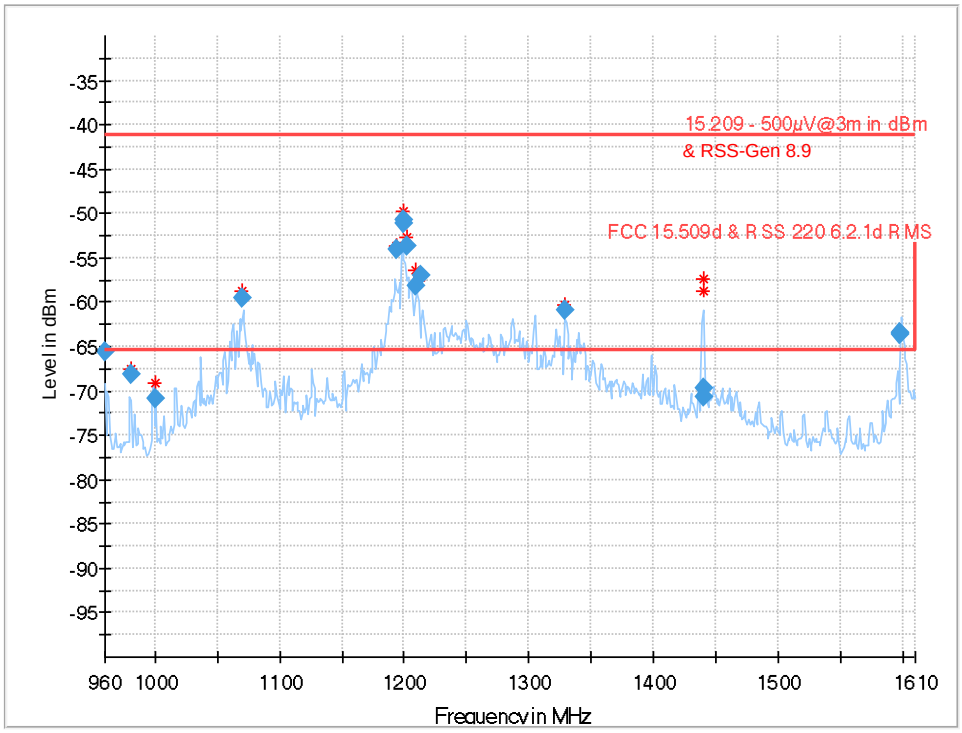
Limit according to FCC 15.509d & RSS-220 6.2.1d RMS

Detailed discussion of the frequency range from 960 MHz to 1610 MHz:

To verify the emissions of the digital circuitry, a specifically prepared device (EUT 3) is used in which the UWB emissions are turned off.

Plot 11: 960 MHz to 1610 MHz, EUT 3

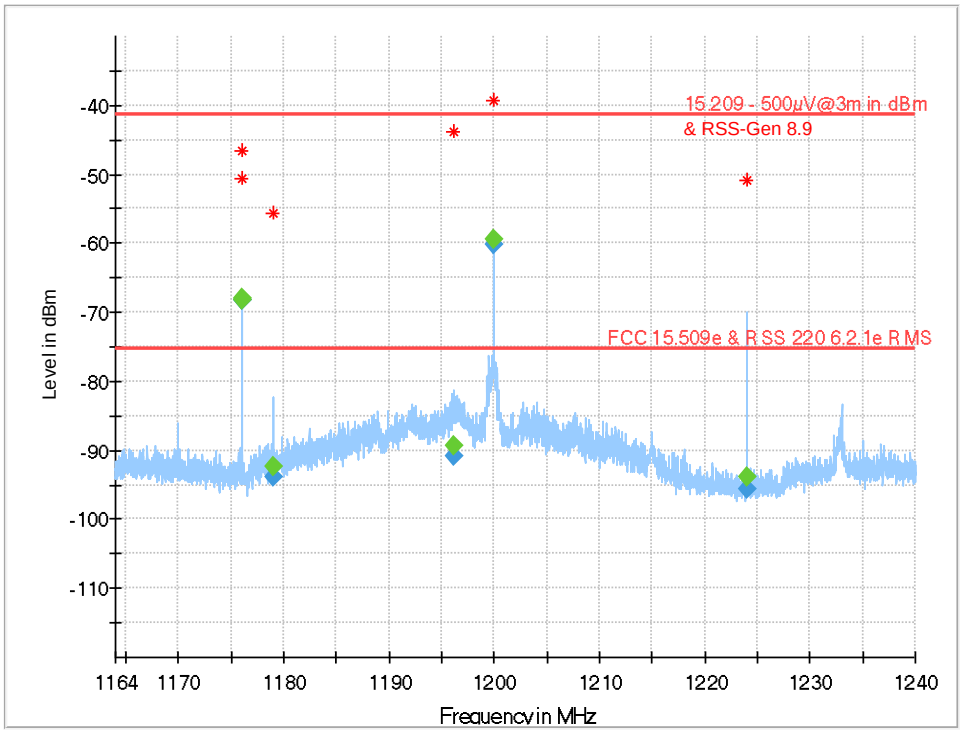


Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
960.013000	-65.65	-41.23	24.42	1000.000	H	197.0	77.0	-138.4
980.817000	-68.18	-41.23	26.95	1000.000	V	188.0	139.0	-139.3
1000.194000	-70.88	-41.23	29.65	1000.000	H	175.0	156.0	-139.4
1069.675000	-59.43	-41.23	18.20	1000.000	H	143.0	93.0	-139.5
1193.473000	-53.98	-41.23	12.75	1000.000	V	165.0	38.0	-139.7
1199.906000	-50.78	-41.23	9.55	1000.000	V	155.0	13.0	-139.9
1199.908000	-51.06	-41.23	9.83	1000.000	V	155.0	15.0	-139.9
1201.586000	-53.74	-41.23	12.51	1000.000	H	177.0	3.0	-139.9
1208.985000	-58.25	-41.23	17.02	1000.000	H	175.0	1.0	-139.9
1213.917000	-56.90	-41.23	15.67	1000.000	V	155.0	62.0	-139.9
1329.492000	-60.89	-41.23	19.66	1000.000	V	177.0	6.0	-139.3
1439.721000	-70.59	-41.23	29.36	1000.000	V	165.0	155.0	-138.9
1439.977000	-69.77	-41.23	28.54	1000.000	V	156.0	165.0	-138.9
1597.942000	-63.61	-41.23	22.38	1000.000	V	198.0	66.0	-138.1
1597.946000	-63.45	-41.23	22.22	1000.000	V	205.0	60.0	-138.1

The comparison of the results shown in plot 5 and plot 11 indicate that the emissions observed in this frequency range are due to the digital circuitry of the device. Hence, according to §15.521 (d) the limits mentioned in §15.209 are considered applicable.

Plot 12: 15.509 (e), lower GPS Band. EUT 2

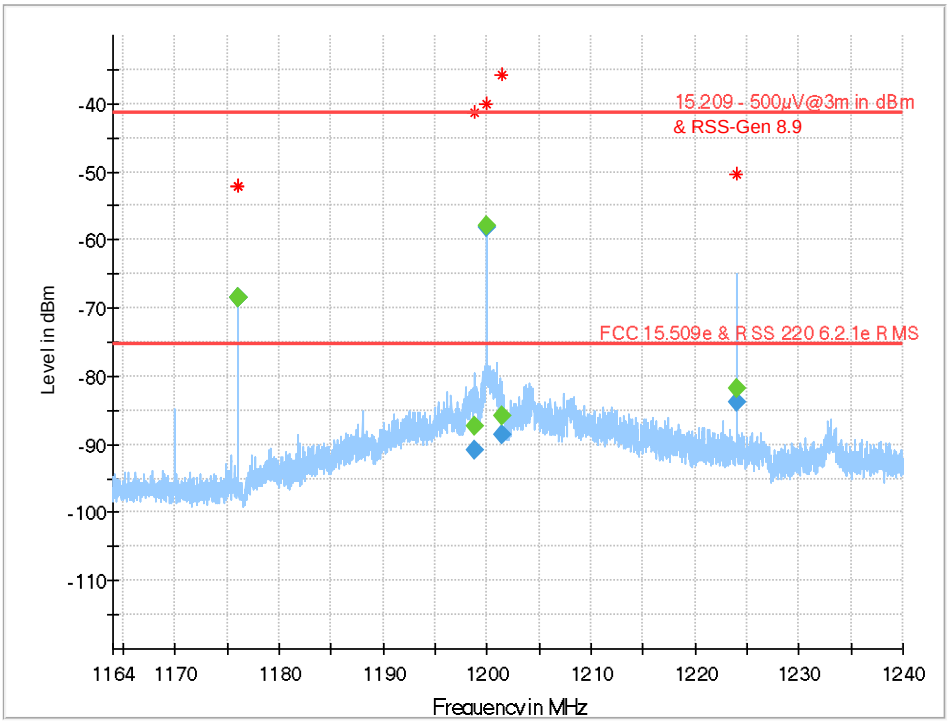


*as discussed above, the limits mentioned in CFR §15.209 are considered applicable.

Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1175.993536	-68.09	-41.23	26.86	1.000	V	142.0	23.0	-144.0
1175.993538	-68.32	-41.23	27.09	1.000	V	142.0	16.0	-144.0
1178.988614	-93.82	-41.23	52.59	1.000	V	131.0	123.0	-144.0
1196.083372	-90.91	-41.23	49.68	1.000	V	130.0	99.0	-144.2
1199.993667	-60.06	-41.23	18.83	1.000	V	149.0	15.0	-144.3
1224.003070	-95.68	-41.23	54.45	1.000	V	158.0	35.0	-144.4

Plot 13: 15.509 (e), lower GPS Band, EUT 3

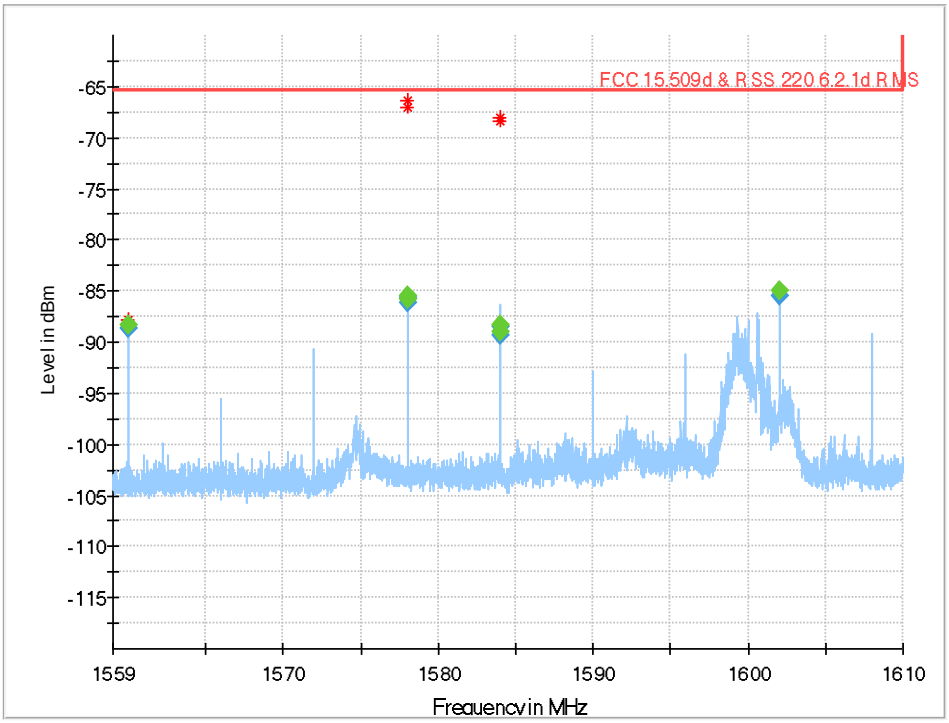


*for comparison to verify that the emissions are due to the digital circuitry.

Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1175.996325	-68.47	-41.23	27.24	1.000	V	152.0	41.0	-144.0
1175.996326	-68.50	-41.23	27.27	1.000	V	153.0	23.0	-144.0
1198.812557	-90.74	-41.23	49.51	1.000	V	158.0	37.0	-144.2
1199.997042	-58.08	-41.23	16.85	1.000	H	145.0	103.0	-144.3
1201.450333	-88.47	-41.23	47.24	1.000	V	163.0	31.0	-144.3
1223.997000	-83.75	-41.23	42.52	1.000	V	152.0	15.0	-144.4

Plot 14: 15.509 (e), upper GPS Band, EUT 2



Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1559.991000	-88.71	-65.30	23.41	1.000	H	188.0	107.0	-141.7
1577.991323	-85.61	-65.30	20.31	1.000	V	167.0	49.0	-141.6
1577.991342	-86.21	-65.30	20.91	1.000	V	164.0	75.0	-141.6
1583.991295	-88.54	-65.30	23.24	1.000	V	221.0	45.0	-141.6
1583.991308	-89.34	-65.30	24.04	1.000	V	215.0	45.0	-141.6
1601.991200	-85.51	-65.30	20.21	1.000	V	175.0	62.0	-141.8

12.3 §15.509(c) Efficient use of spectrum

Description:

(c) A GPR that is designed to be operated while being hand held and a wall imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

Measurement:

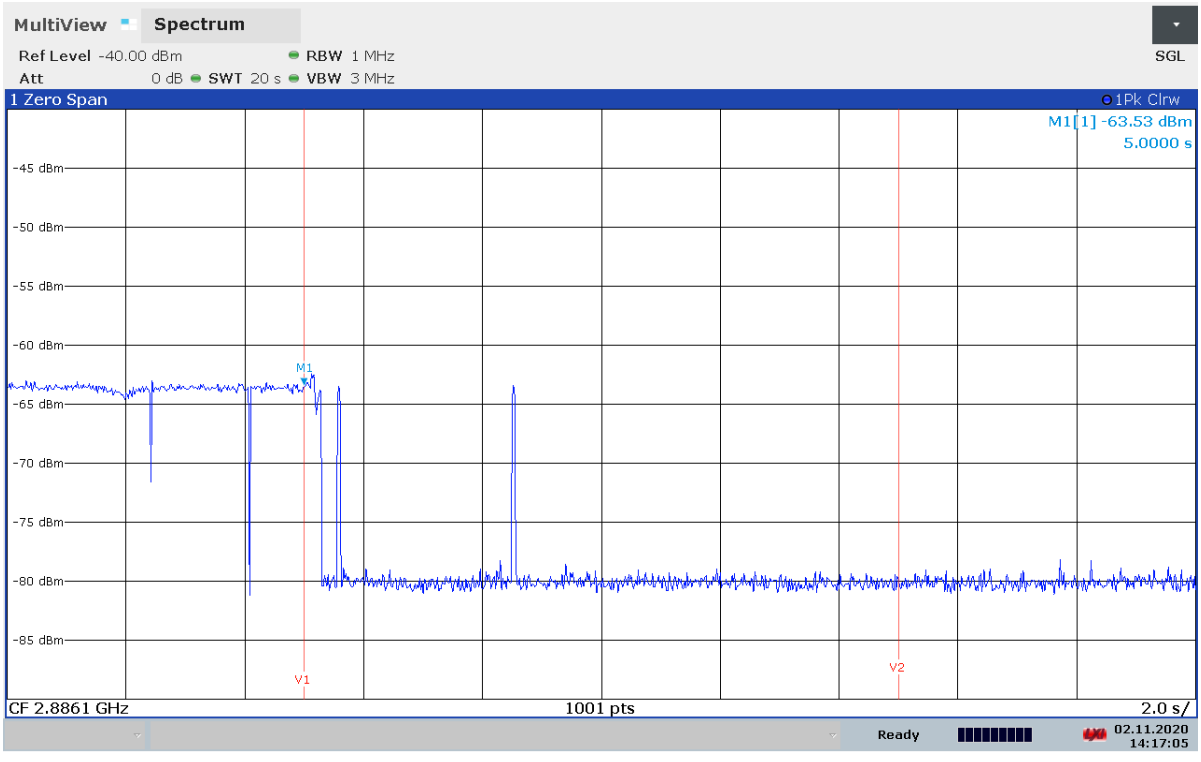
Measurement parameter	
Detector:	Peak
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span	Zero

Limits:

The imaging system ceases transmission within 10 seconds of the remote switch being released.

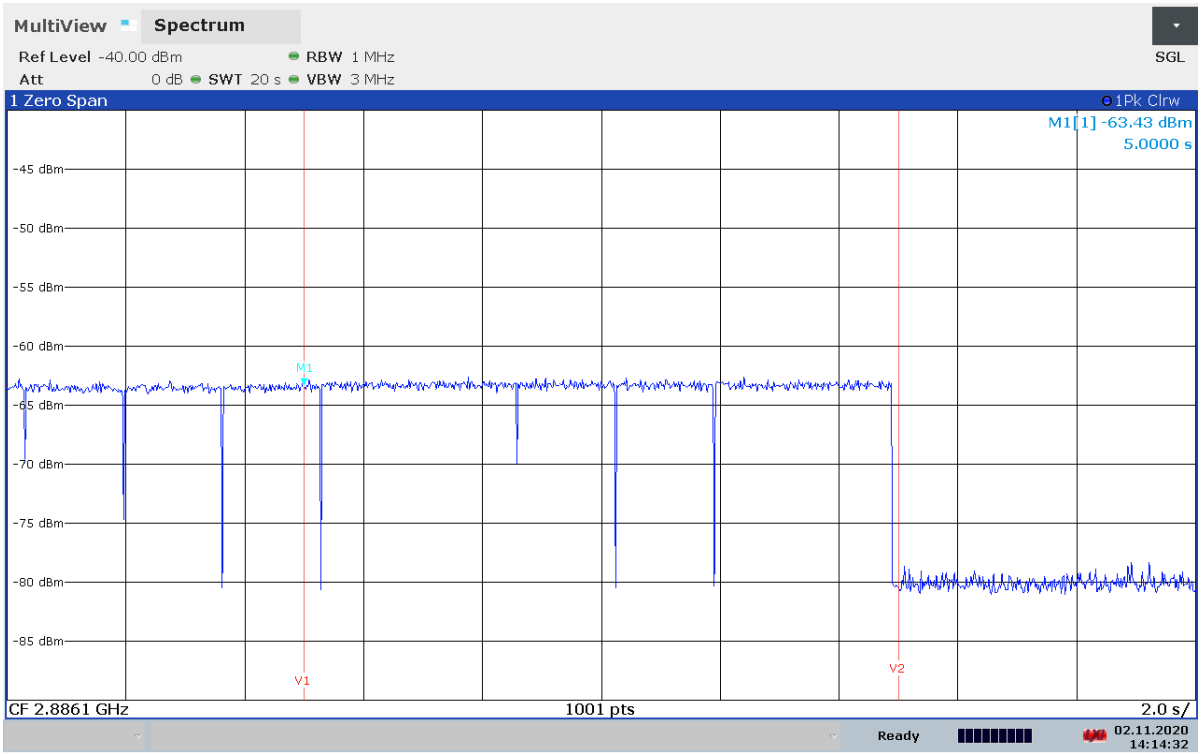
Results:

Plot 15: Contact between device and representative wall interrupted



Vertical line V1: Point in time when the contact between the device and the representative wall is interrupted.
Vertical line V2:10 s after the contact between the device and the representative wall is interrupted.

Plot 16: Movement of the device at the representative wall stopped



14:14:33 02.11.2020

Vertical line V1: Point in time when the movement of the device at the representative wall is stopped.
Vertical line V2:10 s after the movement of the device at the representative wall is stopped.

Verdict: Compliant

12.4 Antenna requirements

Description:

§15.521(b)
Manufacturers and users are reminded of the provisions of §§15.203 and 15.204.

Integrated patch antenna.

Verdict: **Compliant**

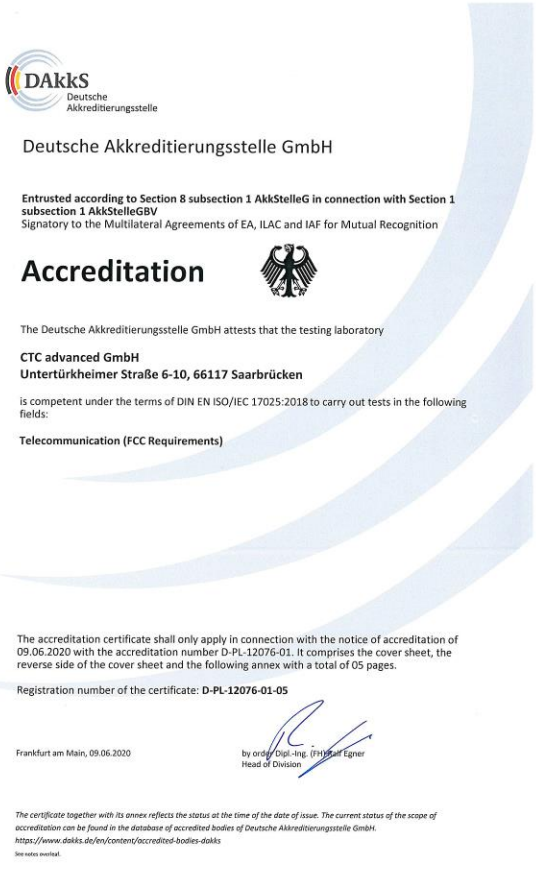
Annex A Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
GPR	Ground penetrating radar
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2020-12-16
A	Photo reference table added according customer demand	2022-01-03
B	Explanation for 10m measurement, information on limits, information on used EUTs and some clarification information according to customer demands added	2022-02-02

Annex C Accreditation Certificate

first page	last page
	

Note: The current certificate annex is published on the website (link see below) of the Accreditation Body DAkkS or may be received by CTC advanced GmbH on request

https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf

########## END OF TEST REPORT ##########