

TEST REPORT

Test report no.: 1-4238_17-01-10-A



BNetzA-CAB-02/21-102

Testing laboratory

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-03

Applicant

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Manufacturer

Åkerströms Björbo AB

Björbovägen 143

78545, Björbo / SWEDEN

Test standard/s

CFR47 Part 15.250

Operation of wideband systems within the band 5925-7250 MHz

RSS-210 Issue 9

Wideband Devices Operating Within the Band 5925-7250 MHz

Annex K

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

Test Item

Kind of test item: Radio remote control

Model name: MC11-OPS

FCC ID: 2AK36MC11-OPS

IC: 22697-MC11OPS

Frequency: 6254 – 6869 MHz

Technology tested: Wideband

Antenna: Integrated antenna

Power supply: 5 V DC by power supply

Temperature range: -30°C to +50°C

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

Test report authorized:

p.O.

Karsten Gerald
Lab Manager
Radio Communications & EMC

Test performed:

Benedikt Gerber
Lab Manager
Radio Communications & EMC

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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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2.2 Application details

Date of receipt of order:	2017-01-10
Date of receipt of test item:	2017-01-09
Start of test:	2017-01-10
End of test:	2017-01-12
Person(s) present during the test:	Mr. Henrik Sihm

3 Test standard/s

Test standard	Date	Test standard description
CFR47 Part 15.250	2017/01	Operation of wideband systems within the band 5925-7250 MHz
RSS-210	2010/12	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +50 °C during high temperature tests -30 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	5 V DC by USB power supply -/- V -/- V

5 Test item

5.1 General description

Kind of test item	:	Radio remote control
Type identification	:	MC11-OPS
HMN	:	TBD
PMN	:	TBD
HVIN	:	MC11-OPS
FVIN	:	TBD
S/N serial number	:	see table
HW hardware status	:	see table
SW software status	:	see table
Frequency band	:	5925-7250 MHz
Type of radio transmission	:	Wideband systems
Use of frequency spectrum	:	
Type of modulation	:	Pulse modulated
Number of channels	:	1 channel (6254 – 6869 MHz)
Antenna	:	Integrated antenna
Power supply	:	5 V DC by USB power supply
Temperature range	:	-30°C to +50°C

5.2 Equipment under test

EUT	Name	Serial number	Hardware status	Software Status
1	Remote control	Prototype	MDS	V3.38

5.3 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:

- 1-4238/17-01-10_AnnexA
- 1-4238/17-01-10_AnnexB
- 1-4238/17-01-10_AnnexD

6 Test laboratories sub-contracted

None

7 Sequence of testing

7.1 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, 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 height is 1.5 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 premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- 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.

7.2 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 $\pm 45^\circ$ 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.

7.3 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.

7.4 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.

8 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).

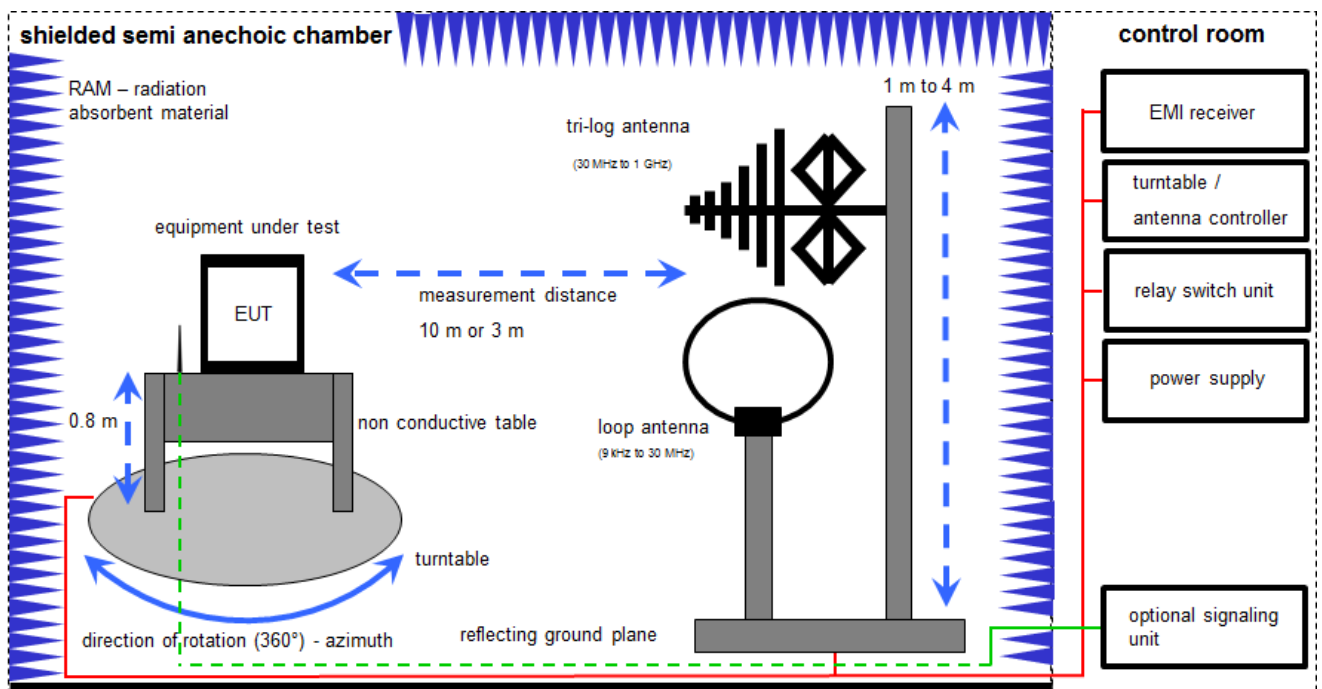
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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
vlk!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

8.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz 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 confirmed with specifications ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices. 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.



$$FS = UR + CL + AF$$

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

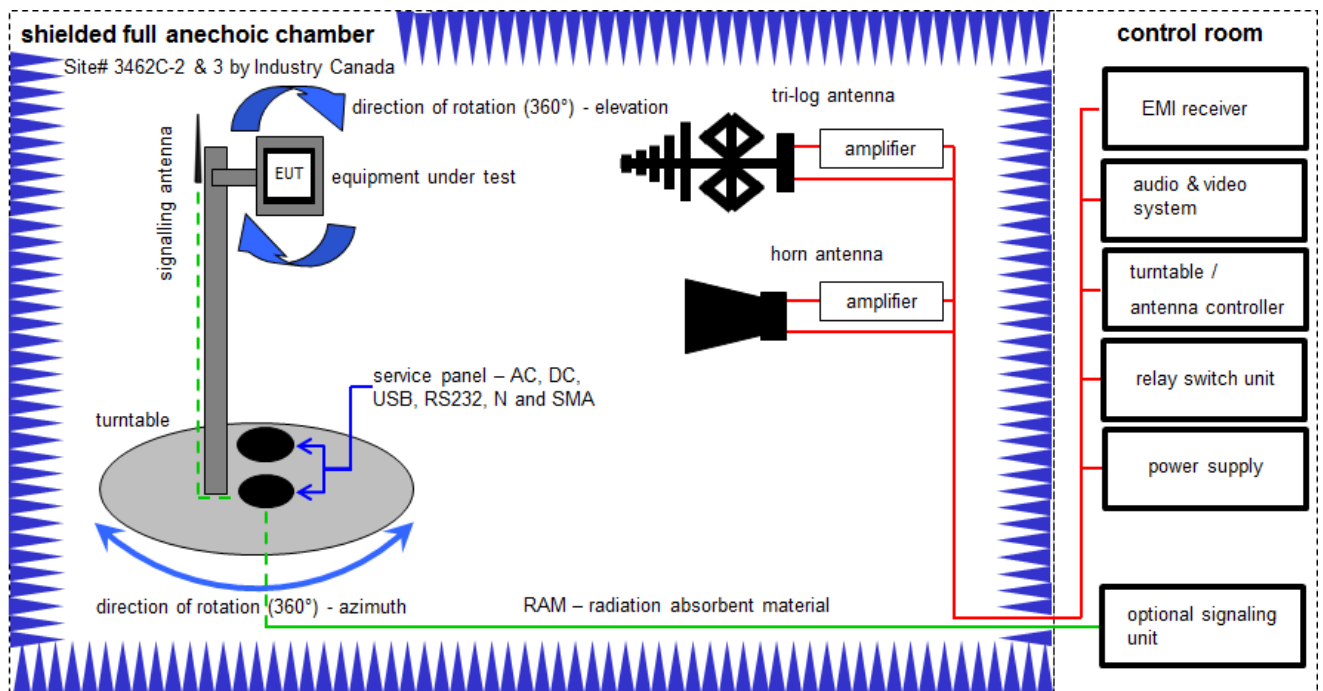
Example calculation:

$$FS \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V/m]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB/m]} = 31.05 \text{ [dB}\mu\text{V/m]} \text{ (35.69 } \mu\text{V/m)}$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No CTC	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	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
4	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018
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	295	300003787	k	25.04.2016	25.04.2018
9	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	29.01.2016	29.01.2017
10	n. a.	Double Ridge Broadband Horn Antenna 1-10 GHz	BBHA9120 B	Schwarzbeck	188	300003896	k	20.05.2015	20.05.2017

8.2 Shielded fully anechoic chamber



$$OP = AV + D - G + CA$$

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

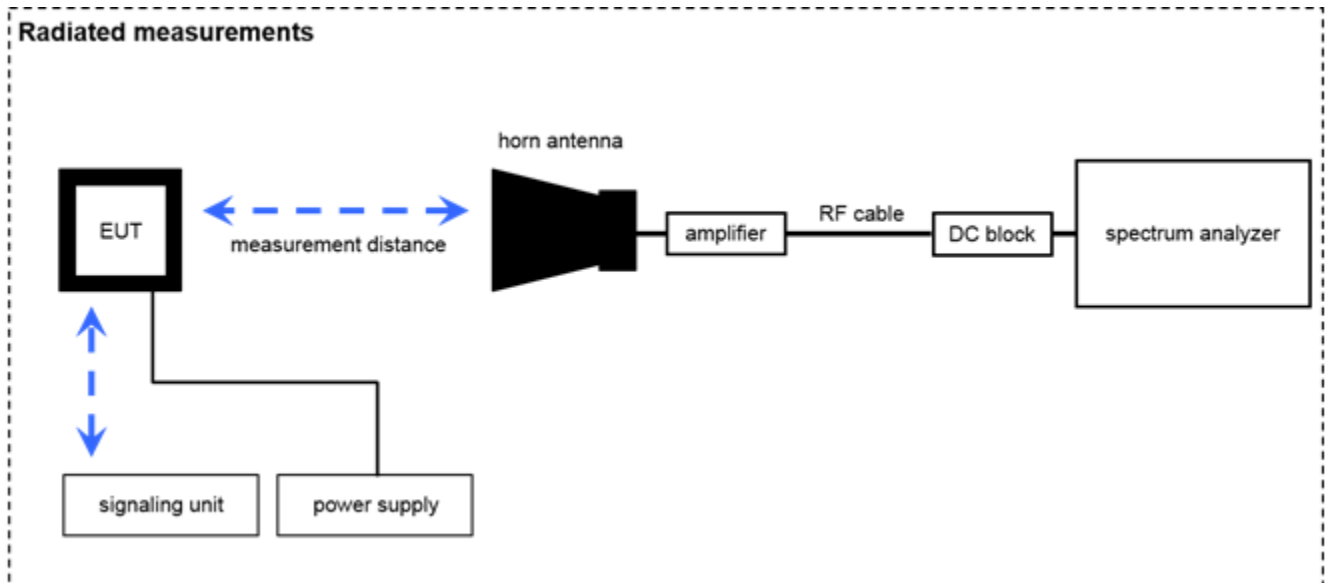
Example calculation:

$$OP \text{ [dBm]} = -65.0 \text{ [dBm]} + 50 \text{ [dB]} - 20 \text{ [dBi]} + 5 \text{ [dB]} = -30 \text{ [dBm]} (1 \mu\text{W})$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No CTC	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO	2210	300001015	k	20.05.2015	20.05.2017
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	13.08.2015	13.08.2017
3	n. a.	Signal- and Spectrum Analyzer	FSW26	R&S	101455	300004528	k	14.03.2016	14.03.2017
4	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	318	300003696	k	22.04.2014	22.04.2017
5	n. a.	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22050	300004482	ev		
6	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne		
7	n. a.	NEXIO EMV-Software	BAT EMC	EMCO		300004682	ne		
8	n. a.	Anechoic chamber		TDK		300003726	ne		
9	n. a.	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	vIKI!	13.09.2016	13.03.2018

8.3 Radiated measurements > 18 GHz



$$FS = UR + CA + AF$$

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

Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB\mu V/m] (6.79 \mu V/m)$$

$$OP = AV + D - G + CA$$

(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:

$$OP [dBm] = -59.0 [dBm] + 44.0 [dB] - 20.0 [dBi] + 5.0 [dB] = -30 [dBm] (1 \mu W)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No CTC	Kind of Calibration	Last Calibration	Next Calibration
1	CR 79	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ne		
2		Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	NK!	19.07.2013	
3		Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	Ve	28.10.2016	28.10.2018
4		Broadband LNA 18-50 GHz	CBL18503070PN	CERNEX	25240	300004948	ev	-/-	-/-

9 Measurement uncertainty

Test case	Uncertainty
Antenna gain	± 3 dB or declared
Equivalent isotropically radiated power (e.i.r.p.)	Conducted value ± 0.5 dB Radiated value ± 3 dB
Permitted range of operating frequencies	± 100 kHz
Unwanted emissions in the spurious domain (conducted)	± 1 dB
Unwanted emissions in the spurious domain (radiated)	± 3 dB
Duty cycle	-/-
Additional requirements for FHSS equipment	-/-
Adjacent channel selectivity (Class 1 only)	± 1 dB
Blocking or desensitization (Class 1 and 2 only)	± 1 dB
Receiver spurious emissions (conducted)	± 1 dB
Receiver spurious emissions (radiated)	± 3 dB
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 (1) RSS-210 Issue 9 (2)	see table	2018-12-03	-/-

Test specification clause	Test case	Temperature conditions	Power source	Pass	Fail	NA	NP	Remark
§15.250(b) (1) K.2.1 (2)	10 dB Bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.250 (d) (1) K.2.2 (2) §15.209 (1) RSS-Gen	TX Radiated Emissions	Nominal	Nominal	☒	☐	☐	☐	complies
§15.250 (a) (1) §2.1055 (1) RSS-Gen (2)	Frequency stability	Nominal	Nominal	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

11 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☐ No test mode available.

☒ Special software is used.
 EUT is in a continuous transmission mode

12 Measurement results

12.1 10 dB - Bandwidth

Description:

(b) The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the -10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of §15.31(m).

Measurement:

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

Test Setup: 7.3

Limits:

>50 MHz

Results:

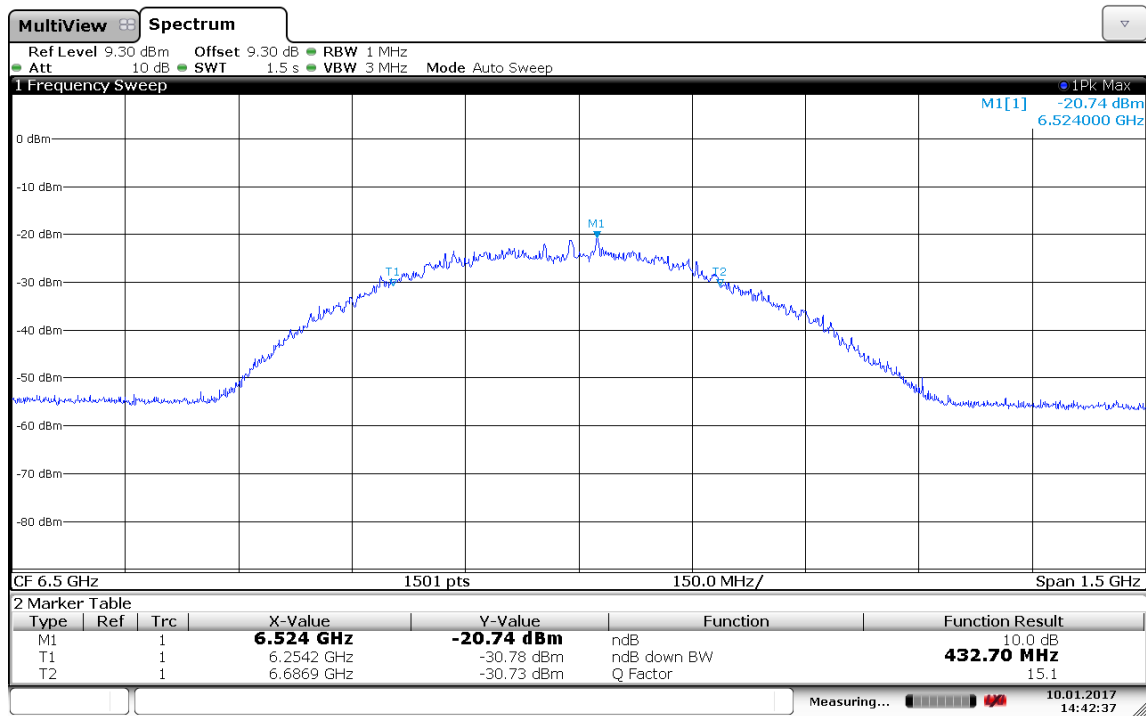
Temperature	EUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]	Plot
22 °C	1	6.2542	6.6869	432.7	1

Time domain measurements:

EUT	Plot
1	2

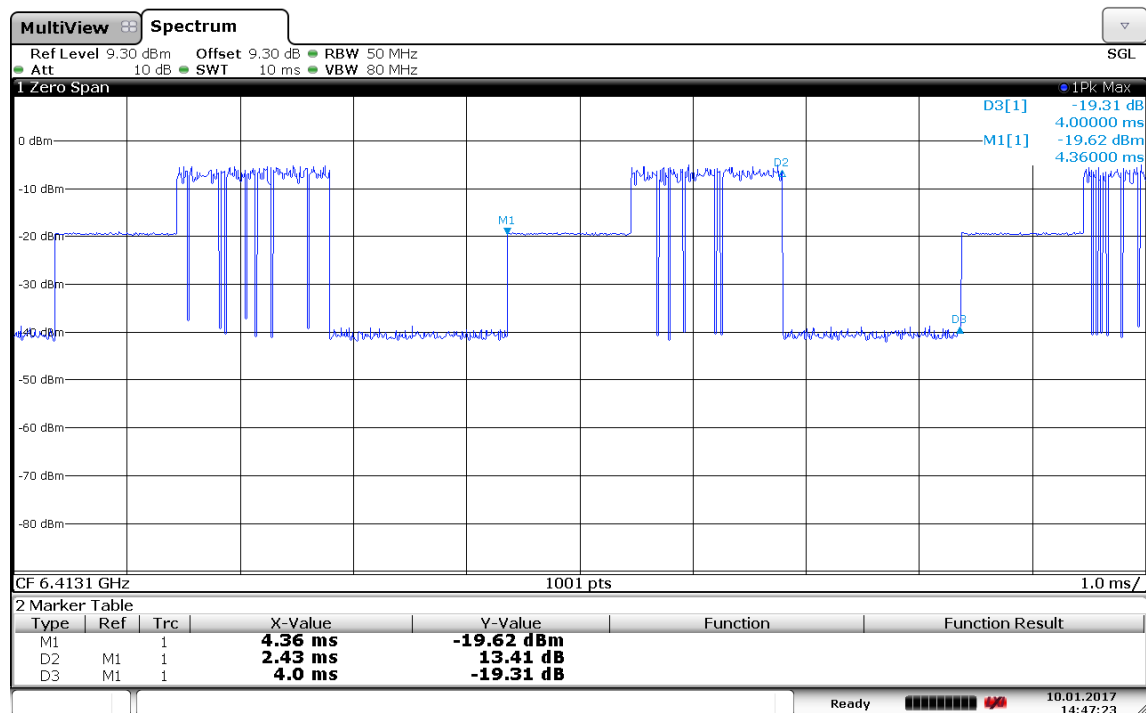
Verdict: Compliant

Plot 1:



14:42:38 10.01.2017

Plot 2:



14:47:23 10.01.2017

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

§15.250 (d) (1):

Average Measurement parameter	
Detector:	RMS
Sweep time:	1 ms/pts
Number of points	1001/10001
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

§15.250 (d) (2):

Average Measurement parameter	
Detector:	RMS
Sweep time:	1 ms/pts
Number of points	10001
Resolution bandwidth:	1 kHz
Video bandwidth:	3 kHz
Trace-Mode:	Max Hold

§15.250 (d) (3):

Peak Measurement parameter	
Detector:	Max Peak
Sweep time:	1 s
Resolution bandwidth:	50 MHz
Video bandwidth:	80 MHz
Span:	Zero span
Trace-Mode:	Max Hold

Limits:

§15.250 (d) (1):

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	-75.3
1610 to 1990	-63.3
1990 to 3100	-61.3
3100 to 5925	-51.3
5925 to 7250	-41.3
7150 to 10600	-51.3
Above 10600	-61.3

§15.250 (d) (2) 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	-85.3
1559 to 1610	-85.3

§15.250 (d) (3) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs and this 50 MHz bandwidth must be contained within the 5925-7250 MHz band. The peak EIRP limit is $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW. If RBW is greater than 3 MHz, the application for certification filed with the Commission shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

Result:

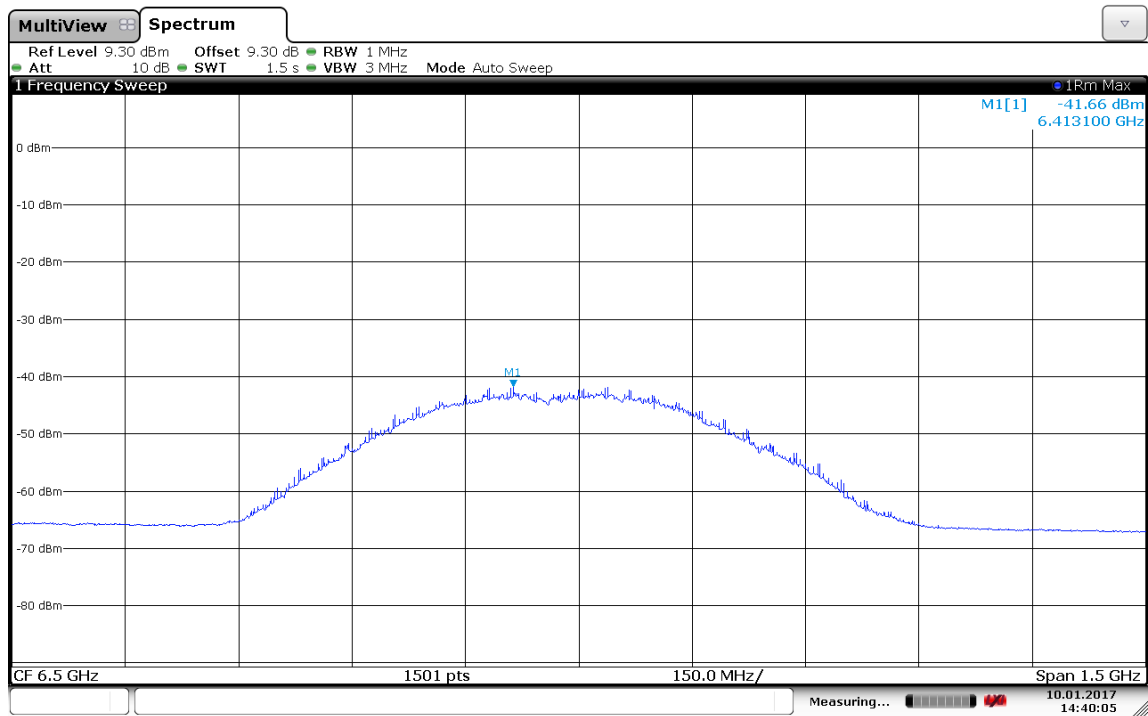
	EUT	Frequency /GHz	Max e.i.r.p. / dBm		Plot
			average value	peak value	
Max E.I.R.P	1	6.4131	-41.7	-4.9	3, 4
Measurement uncertainty				± 3 dB	

Emissions outside the bands (plots 9-15):

Spurious Emission Level (dBm)			
Frequency (MHz)	RBW	Detector	Level (dBm)
no critical emissions detected			
Measurement uncertainty			± 3dB

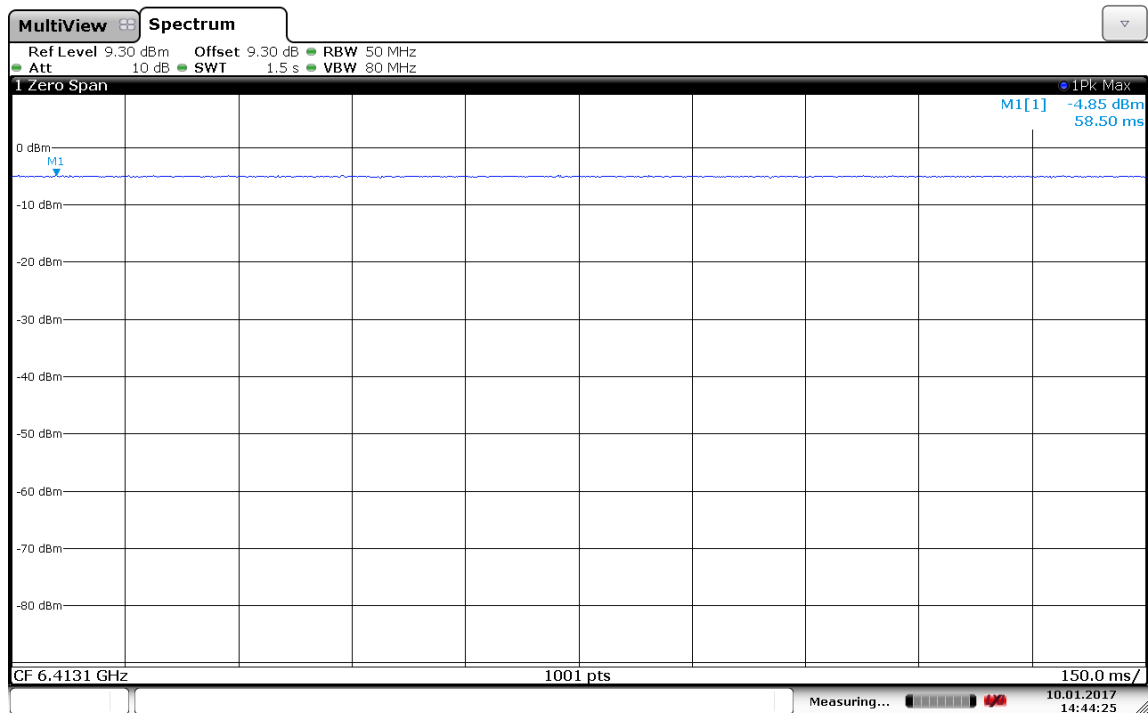
Verdict: [complies](#)

Plot 3:



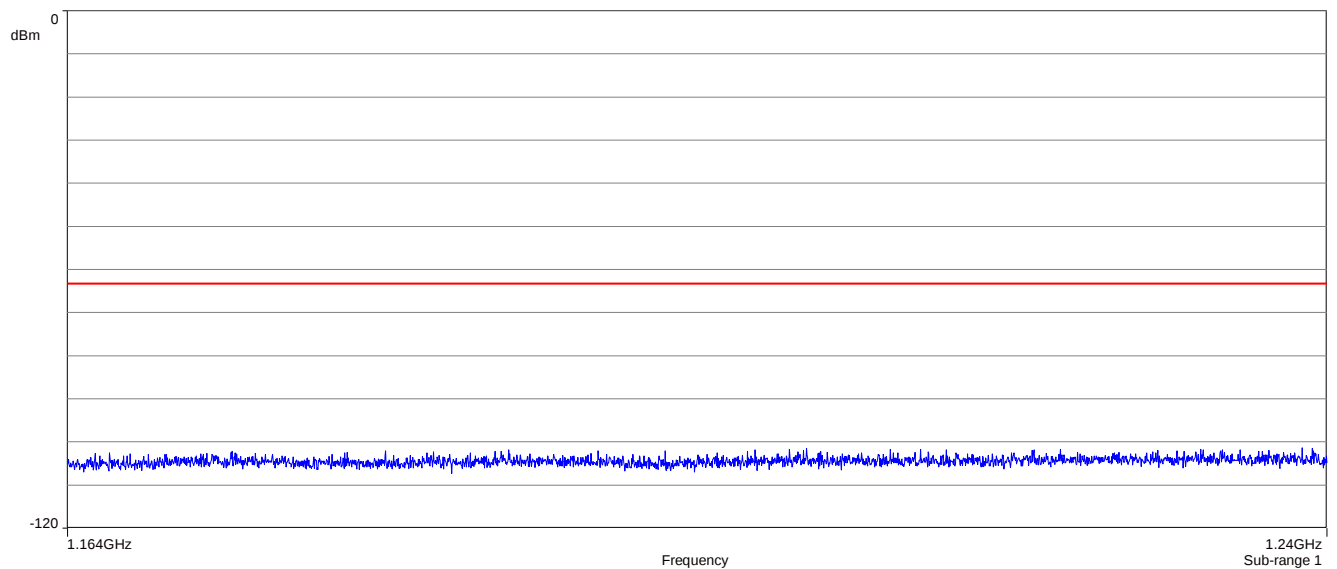
14:40:05 10.01.2017

Plot 4:

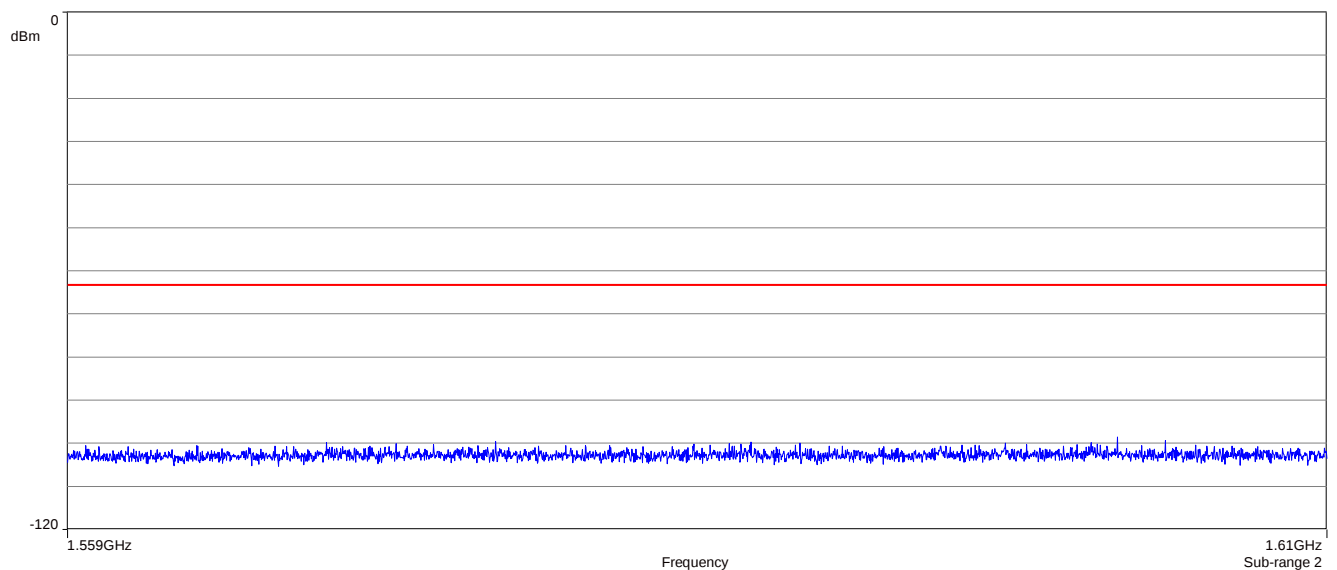


14:44:25 10.01.2017

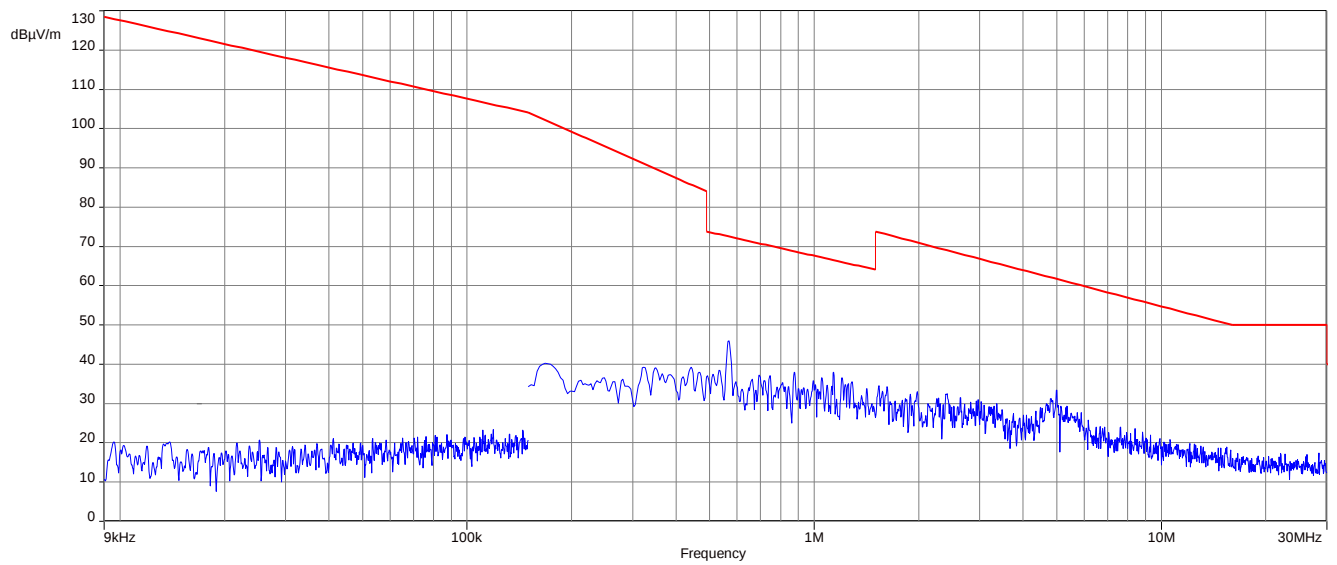
Plot 5: EUT 1, 15.250 (d) (2)



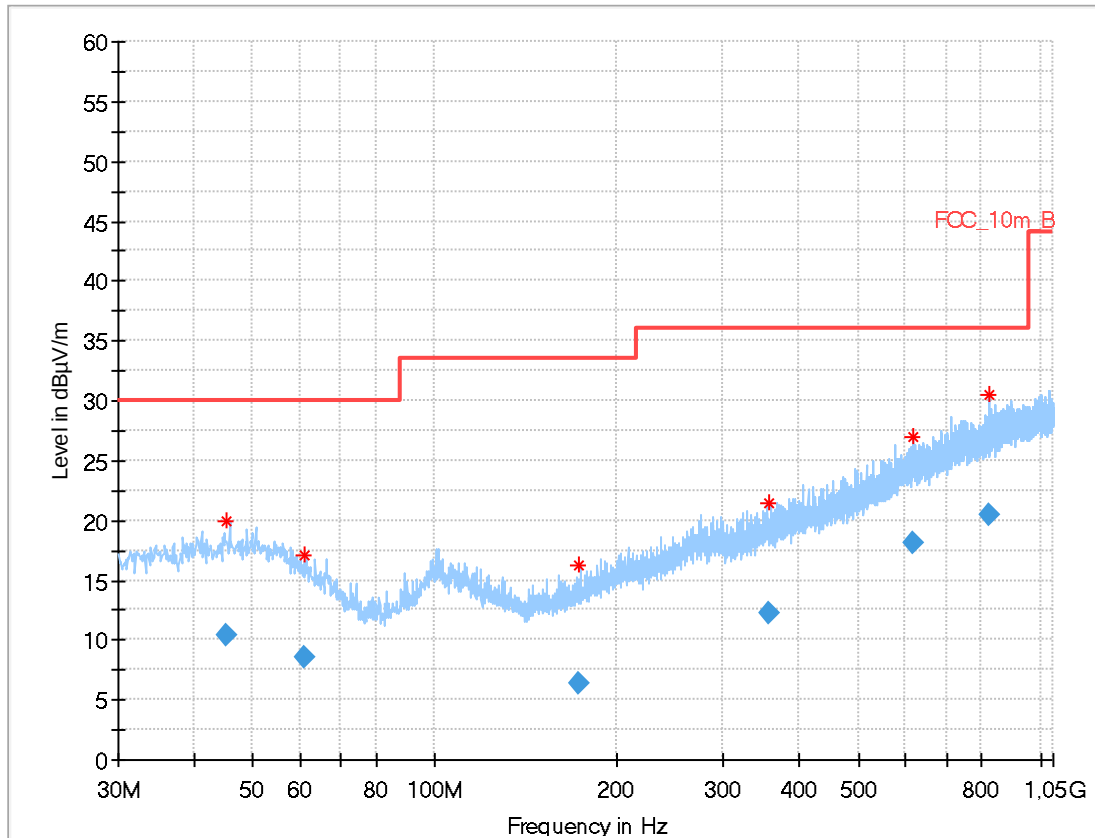
Plot 6: EUT 1, 15.250 (d) (2)



Plot 7: EUT1, 15.209, TX Magnetic

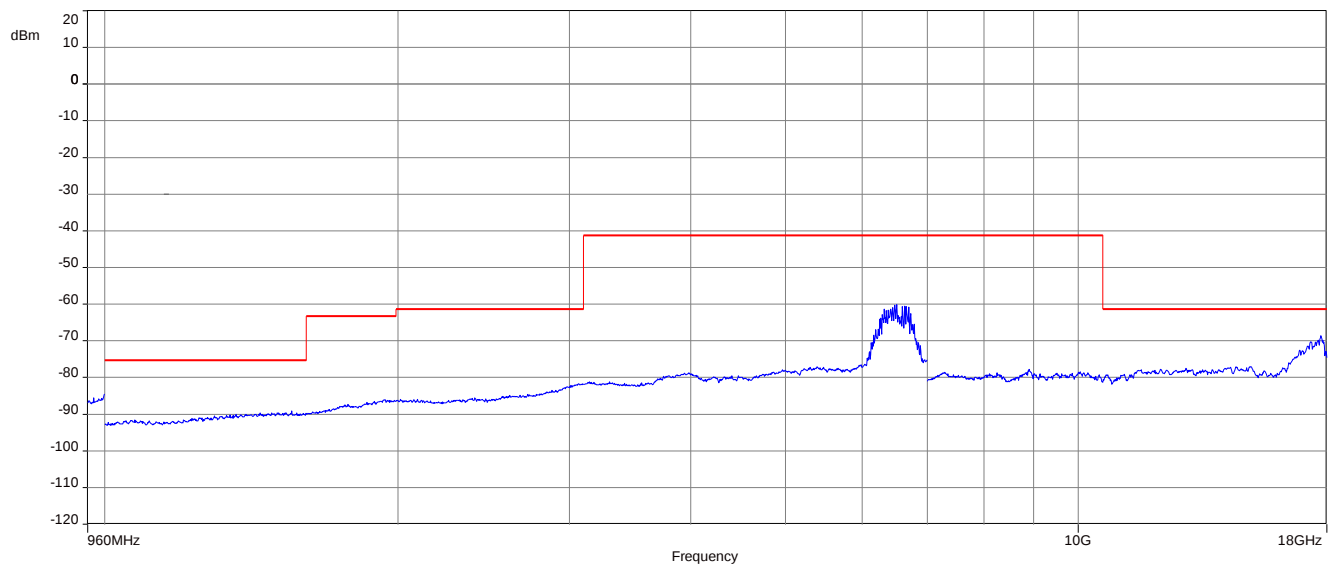


Plot 8: EUT1, 15.209, 30 MHz – 1 GHz

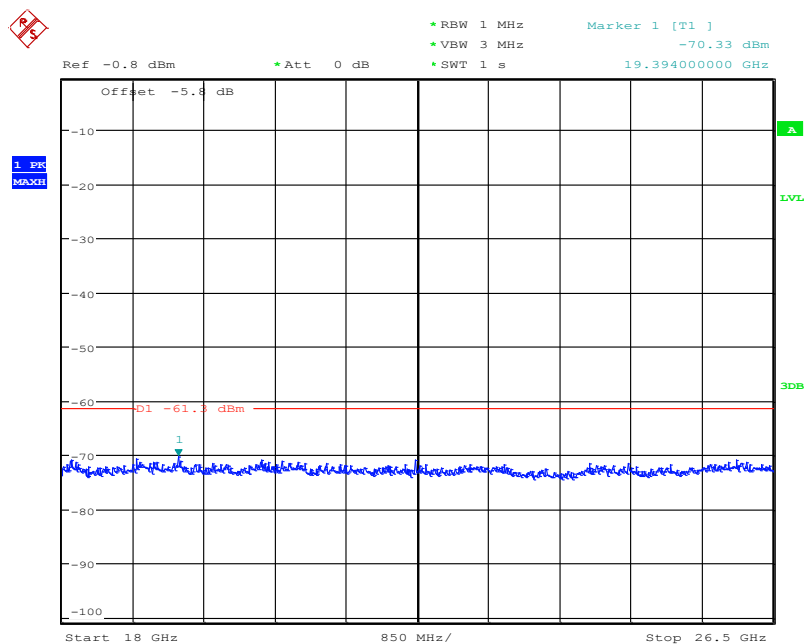
**Final Result**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.343800	10.35	30.00	19.65	1000.	120.000	203.0	H	223.0	13.6
60.871650	8.47	30.00	21.53	1000.	120.000	203.0	V	177.0	11.7
173.302800	6.44	33.50	27.06	1000.	120.000	200.0	H	320.0	10.5
357.398700	12.16	36.00	23.84	1000.	120.000	400.0	V	265.0	16.1
616.137900	18.09	36.00	17.91	1000.	120.000	350.0	H	289.0	20.9
826.016700	20.43	36.00	15.57	1000.	120.000	400.0	H	275.0	23.2

Plot 9: EUT1, 15.250 (d) (1), 960 MHz – 18 GHz

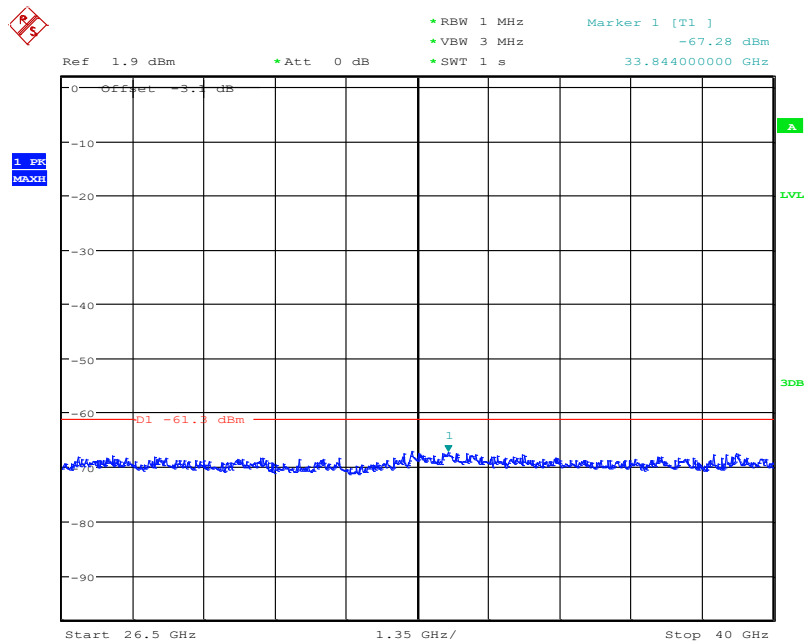


Plot 10: EUT1, 15.250 (d) (1), 18 GHz – 26.5 GHz



Date: 16.JAN.2017 15:34:36

Plot 11: EUT1, 15.250 (d) (1), 26.5 GHz – 40 GHz



Date: 16.JAN.2017 15:37:34

12.3 Frequency stability

Description:

\$15.250 (a) The -10 dB bandwidth of a device operating under the provisions of this section must be contained within the 5925-7250 MHz band under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

Measurement:

Peak Measurement parameter	
Detector:	Max Peak
Sweep time:	60 s
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	2800 MHz
Trace-Mode:	Max Hold

Limits:

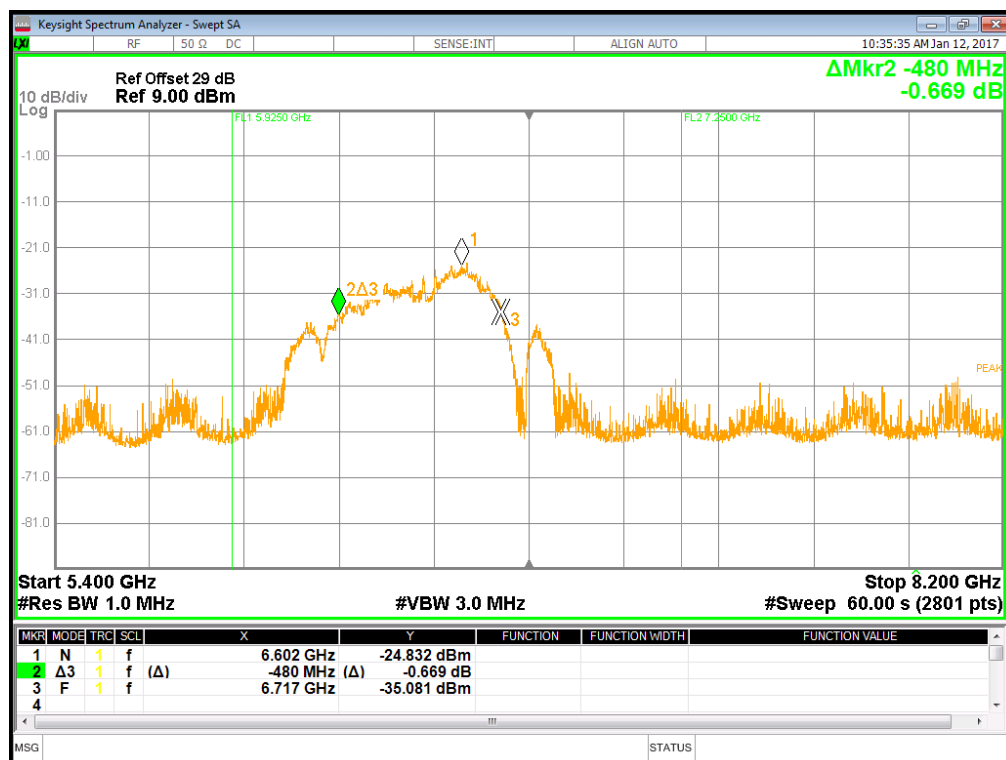
fmin > 5925 MHz fmax > 7250 MHz

Results:

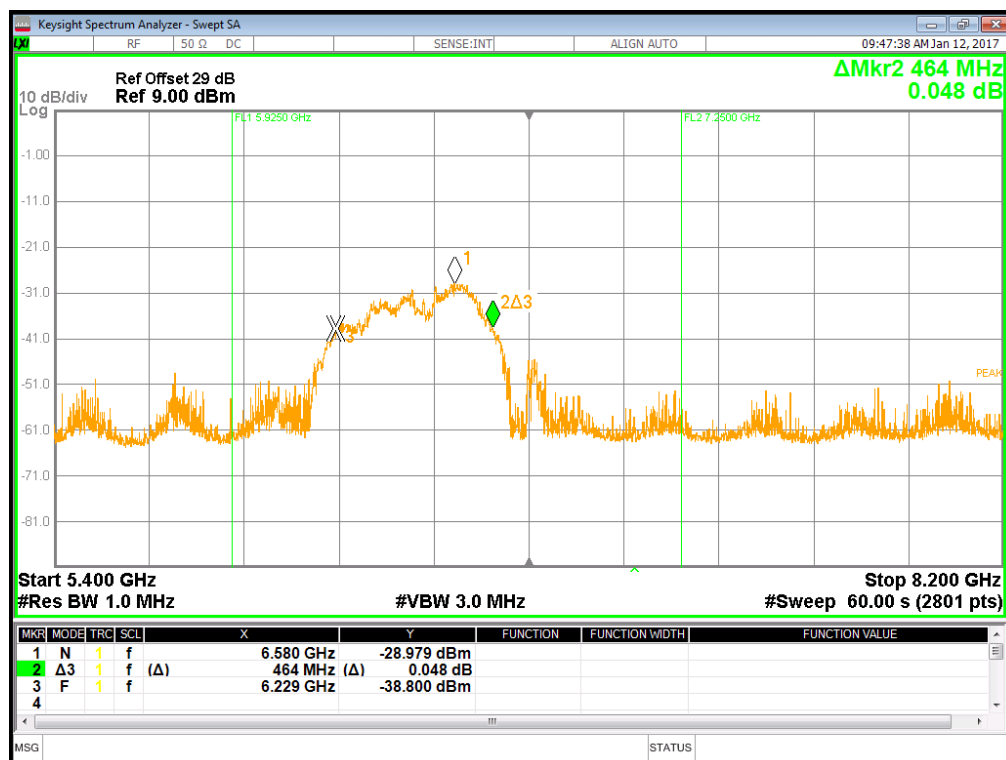
Temperature	EUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]	Plot
22 °C	1	6.2542	6.6869	432.7	1
-30 °C	1	6.2370	6.7170	480.0	12
+55 °C	1	6.2290	6.6930	464.0	13

Verdict: **complies**

Plot 12:



Plot 13:



Annex A Document history

Version	Applied changes	Date of release
-	Initial release	2018-06-12
-A	EUT information changed (page one and chapter 5.1) Result table corrected in chapter 12.3	2018-12-03

Annex B Further information

Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software
PMN		Product marketing name
HMN		Host marketing name
HVIN		Hardware version identification number
FVIN		Firmware version identification number

Annex C Accreditation Certificate

first page	last page		
 Deutsche Akkreditierungsstelle Deutsche Akkreditierungsstelle GmbH Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition Accreditation  The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory CTC advanced GmbH Untertürkheimer Straße 6-10, 66117 Saarbrücken is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields: Telecommunication The accreditation certificate shall only apply in connection with the notice of accreditation of 02.06.2017 with the accreditation number D-PL-12076-01 and is valid until 21.04.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 43 pages. Registration number of the certificate: D-PL-12076-01-03  Dipl.-Ing. (FH) Ralf Sauer Head of Division Frankfurt, 02.06.2017 See notes on back of cover sheet. Deutsche Akkreditierungsstelle GmbH <table><tr><td>Office Berlin Spittelmarkt 10 10117 Berlin</td><td>Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main</td><td>Office Braunschweig Bundesallee 100 38116 Braunschweig</td></tr></table> The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf. No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkKS. The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations. The up-to-date state of membership can be retrieved from the following websites: EA: www.european-accreditation.org ILAC: www.ilac.org IAF: www.iaf.nu	Office Berlin Spittelmarkt 10 10117 Berlin	Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main	Office Braunschweig Bundesallee 100 38116 Braunschweig
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