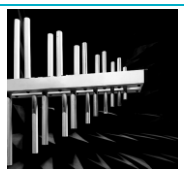
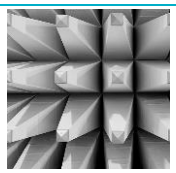

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-6872/18-01-02-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
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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 starting with the registration number: D-PL-12076-01.

Applicant

Trackman
Stubbeled 2
2950 Vedbæk / DENMARK
Phone: +45 4557 0850
Contact: Soeren Carlsen
e-mail: scr@trackman.com
Phone: -/-

Manufacturer

Trackman
Stubbeled 2
2950 Vedbæk / DENMARK

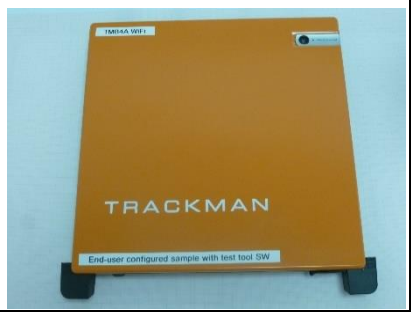
Test standard/s

FCC - Title 47 CFR Part 15	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 5	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

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

Test Item

Kind of test item:	**TrackMan Baseball Practice dual radar**
Model name:	**B1**
FCC ID:	**SFX-TMB4A**
IC:	**10140A-TMB4A**
Frequency:	2400 MHz to 2483.5 MHz DTS band
Technology tested:	WLAN
Antenna:	two integrated chip antennas
Power supply:	19.0 DC via external AC/ DC adaptor (FSP065-RECN2)
Temperature range:	0°C to +40°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.

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David Lang
Lab Manager
Radio Communications

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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.
The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.
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In no case this test report can be considered as a Letter of Approval.

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.

2.2 Application details

Date of receipt of order:	2019-07-04
Date of receipt of test item:	2019-07-04
Start of test:	2019-07-09
End of test:	2019-08-16
Person(s) present during the test:	-/-

2.3 Test laboratories sub-contracted

None

3 Test standard/s and references

Test standard	Date	Description
FCC - Title 47 CFR Part 15	-/-	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 5	April 2018	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
DTS: KDB 558074 D01	v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
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
KDB 662911 D01	v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

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

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+20 °C during room temperature tests No testing under extreme temperature conditions required! No testing under extreme temperature conditions required!
Relative humidity content	:		46 %
Barometric pressure	:		1018 hpa
Power supply	:	V_{nom} V_{max} V_{min}	19.0 V DC via external AC/ DC adaptor (FSP065-RECN2) No testing under extreme voltage conditions required! No testing under extreme voltage conditions required!

5 Test item

5.1 General description

Kind of test item	:	TrackMan Baseball Practice dual radar
Type identification	:	TrackMan™ Radar unit
HMN	:	-/-
PMN	:	B1
HVIN	:	TMB4A
FVIN	:	-/-
S/N serial number	:	Rad. 19040016 Cond. 18480004
Hardware status	:	A3
Software status	:	1.2.0
Frequency band	:	2400 MHz to 2483.5 MHz DTS band
Type of radio transmission Use of frequency spectrum	: :	DSSS, OFDM
Type of modulation	:	BPSK, QPSK
Number of channels	:	11
Antenna	:	two integrated chip antennas
Power supply	:	19.0 DC via external AC/ DC adaptor (FSP065-RECN2)
Temperature range	:	0°C to +40°C

5.2 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: 1-6872/18-01-01_AnnexA
1-6872/18-01-01_AnnexD

6 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).

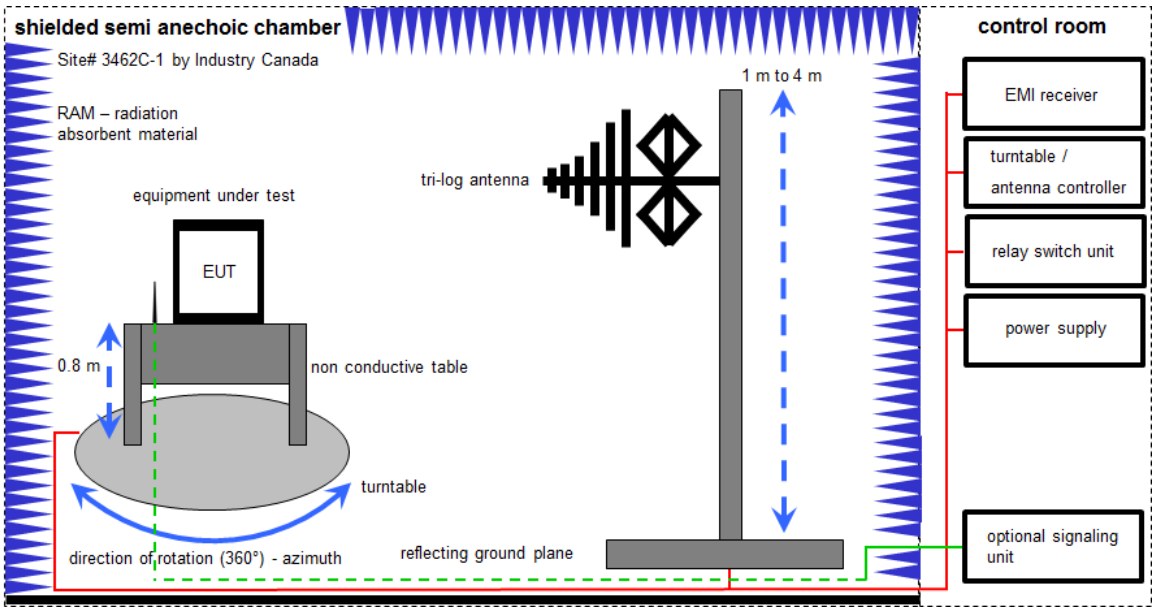
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

6.1 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
EMC32 software version: 10.30.0

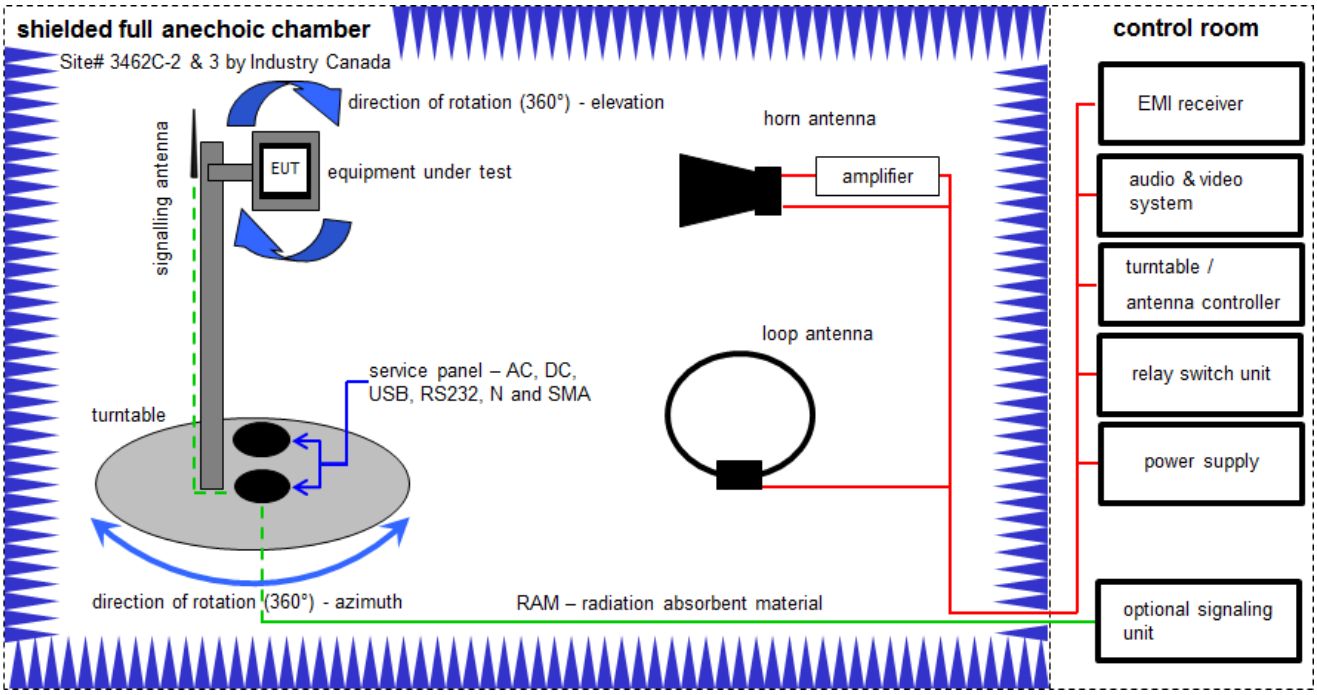
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
2	A	Meßkabine 1	HF-Absorberhalle	MWB AG 300023		300000551	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	12.12.2018	11.12.2019
4	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	vlKl!	15.01.2018	14.01.2020
5	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
6	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
7	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
8	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	371	300003854	vlKl!	24.11.2017	23.11.2020

6.2 Shielded fully anechoic chamber



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

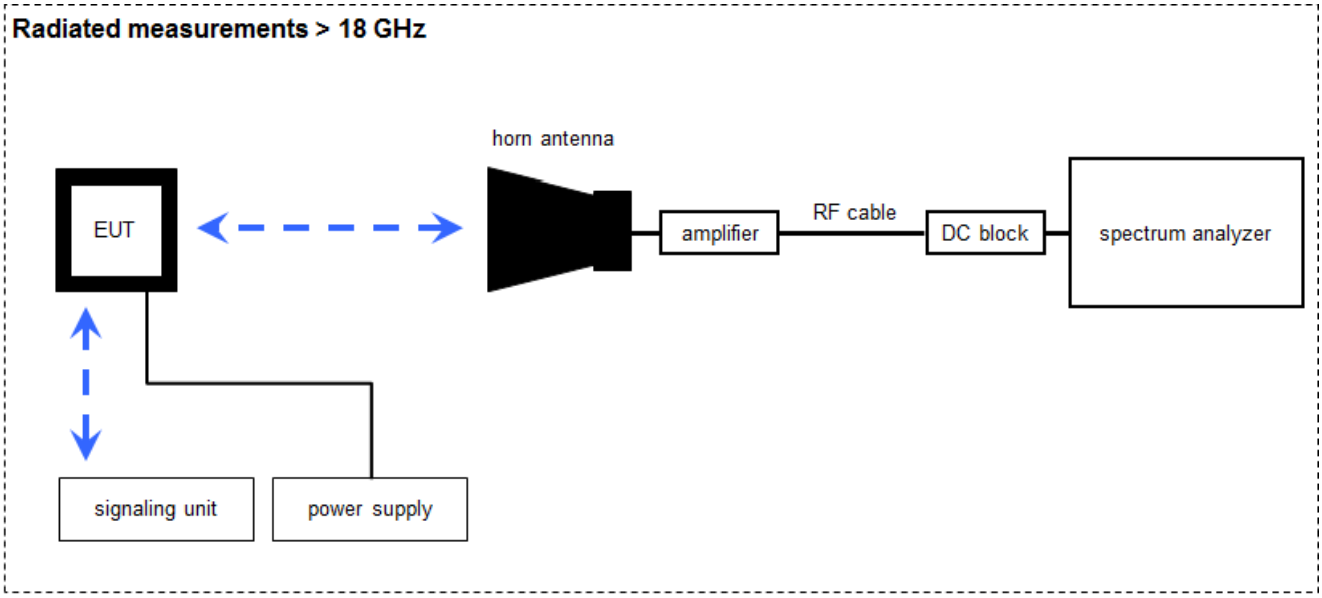
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A+B	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vlKl!	13.06.2019	12.06.2021
2	A+B+C	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A+C	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vlKl!	27.02.2019	26.02.2021
4	A+B+C	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
5	A+C	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev	-/-	-/-
6	A+B+C	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	14.09.2018	13.12.2019
7	A+C	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
8	A+C	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
9	A+C	High Pass Filter	VHF-3500+	Mini Circuits	-/-	400000193	ne	-/-	-/-
10	A+C	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 V3.19.1.8	EMCO	-/-	300004682	ne	-/-	-/-
13	A+B+C	PC	ExOne	F+W	-/-	300004703	ne	-/-	-/-
14	A+C	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-

6.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

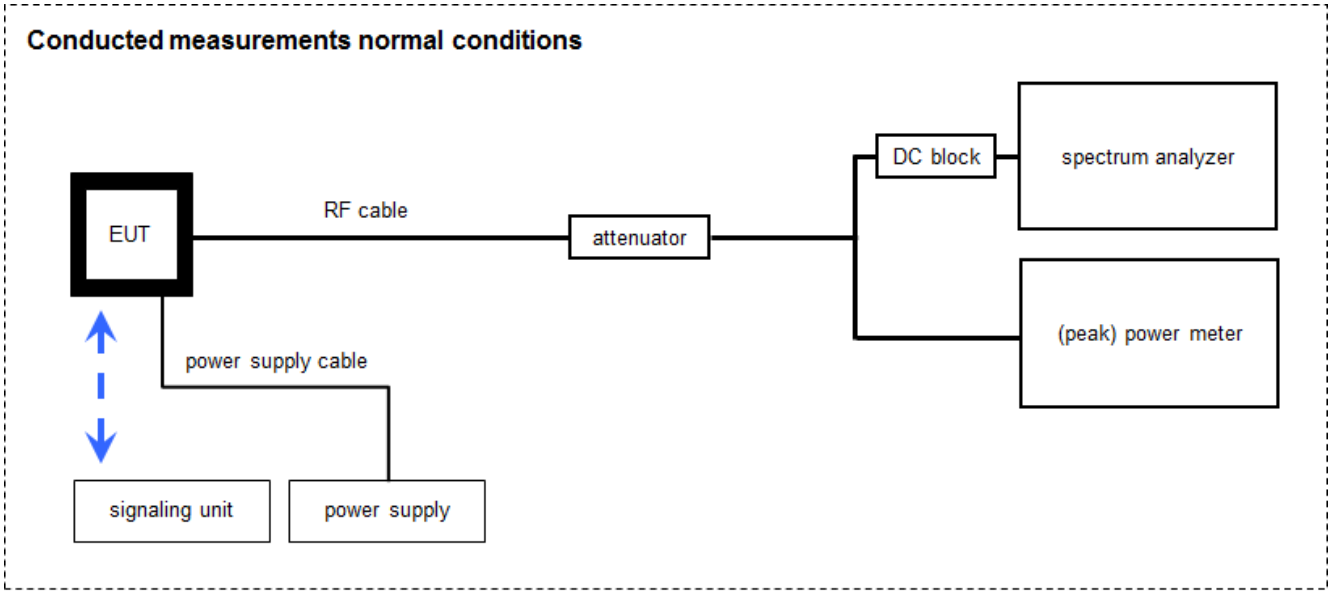
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda	01096	300000486	vlKl!	13.12.2017	12.12.2019
2	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101353	300004819	vlKl!	12.12.2017	11.12.2019
4	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-

6.4 Conducted measurements with peak power meter & spectrum analyzer



WLAN tester version: 1.1.13; LabView2015

OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	17.12.2018	16.12.2019
2	A+B	PC Tester R005	Intel Core i3 3220/3,3 GHz, Prozessor	-/-	2V2403033A4523	300004589	ne	-/-	-/-
3	A+B	Teststand	Teststand Custom Sequence Editor	National Instruments GmbH	-/-	300004590	ne	-/-	-/-
4	B	Power Sensor	NRP-Z81	R&S	100010	300003780	vlKl!	11.12.2018	10.12.2020
5	A+B	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
6	A+B	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
7	A+B	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	-/-	400001186	ev	-/-	-/-
8	A+B	Synchron Power Meter	SPM-4	CTC	1	300005580	ev	-/-	-/-

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, 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.

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 ± 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.

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 Measurement uncertainty

Measurement uncertainty		
Test case	**Uncertainty**	
Antenna gain	± 3 dB	
Power spectral density	± 1.15 dB	
DTS bandwidth	± 100 kHz (depends on the used RBW)	
Occupied bandwidth	± 100 kHz (depends on the used RBW)	
Maximum output power conducted	± 1.15 dB	
Detailed spurious emissions @ the band edge - conducted	± 1.15 dB	
Band edge compliance radiated	± 3 dB	
Spurious emissions conducted	> 3.6 GHz	± 1.15 dB
	> 7 GHz	± 1.15 dB
	> 18 GHz	± 1.89 dB
	≥ 40 GHz	± 3.12 dB
Spurious emissions radiated below 30 MHz	± 3 dB	
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB	
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB	
Spurious emissions radiated above 12.75 GHz	± 4.5 dB	
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB	

9 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	CFR Part 15 RSS - 247, Issue 2	See table!	2020-03-30	-/-

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	C	NC	NA	NP	Remark
§15.247(b)(4) RSS - 247 / 5.4 (f)(ii)	Antenna gain	-/-	Nominal	Nominal	DSSS	-/-				-/-
§15.35	Duty cycle	-/-	Nominal	Nominal	DSSS OFDM	-/-				-/-
§15.247(e) RSS - 247 / 5.2 (b)	Power spectral density	KDB 558074 DTS clause: 8.4	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.247(a)(2) RSS - 247 / 5.2 (a)	DTS bandwidth	KDB 558074 DTS clause: 8.2	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.247(b)(3) RSS - 247 / 5.4 (d)	Maximum output power	KDB 558074 DTS clause: 8.3.1.3	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.247(d) RSS - 247 / 5.5	Detailed spurious emissions @ the band edge – cond.	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance cond. & rad.	KDB 558074 DTS clause: 8.7.3	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.247(d) RSS - 247 / 5.5	TX spurious emissions cond.	KDB 558074 DTS clause: 8.5	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.209(a) RSS-Gen	TX spurious emissions rad. below 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions rad. 30 MHz to 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions rad. above 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-
§15.109 RSS-Gen	RX spurious emissions rad. 30 MHz to 1 GHz	-/-	Nominal	Nominal	RX / idle	☒	☐	☐	☐	-/-
§15.109 RSS-Gen	RX spurious emissions rad. above 1 GHz	-/-	Nominal	Nominal	RX / idle	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	-/-

Notes:

C	Compliant	**NC**	Not compliant	**NA**	Not applicable	**NP**	Not performed

10 Additional comments

Reference documents: Customer Questionnaire
Antenna specification: AH104N2450D1_Char.pdf, Date Sep/01/2011

Special test descriptions: None

Configuration descriptions: Only b-mode & g-mode modulations supported by the DUT as declared by manufacturer.
Test mode vs. Power setting vs. Data rate:

Test mode:	Power setting	Data rate
b-mode	12 (Ch 1) 17 (Ch 6) 11(Ch11)	1 Mbit/s
g-mode	12 (Ch 1) 17 (Ch 6) 11(Ch11)	54 Mbit/s

Note: To represent worst case scenario the output power was increased during Band Edge measurements as reported in section 12.9.
Test mode vs. Power setting vs. Data rate (Band Edge measurements):

Test mode:	Power setting	Data rate
b-mode	20 (Ch1 & Ch 11)	1 Mbit/s
g-mode	14 (Ch1 & Ch 11)	54 Mbit/s

Provided channels:

Channels with 20 MHz channel bandwidth:

channel number & center frequency													
channel	**1**	2	3	4	5	**6**	7	8	9	10	**11**	12	13
f_c / MHz	**2412**	2417	2422	2427	2432	**2437**	2442	2447	2452	2457	**2462**	2467	2472

11 Additional EUT parameter

Test mode:	☐	No test mode available Iperf was used to ping another device with the largest support packet size
	☒	Test mode available Special software is used. EUT is transmitting pseudo random data by itself
Modulation types:	☒	Wide Band Modulation (None Hopping – e.g. DSSS, OFDM)
	☐	Frequency Hopping Spread Spectrum (FHSS)
Antennas and transmit operating modes:	☐	Operating mode 1 (single antenna) - *Equipment with 1 antenna,* - *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,* - *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*
	☒	Operating mode 2 (multiple antennas, no beamforming) - *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*
	☐	Operating mode 3 (multiple antennas, with beamforming) - *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.* *In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.*

12 Measurement results

12.1 Antenna gain

Description:

The DUT contains two identical antennas. As per antenna specification the gain is:

Results:

	2400 MHz	2450 MHz	2500 MHz
Gain [dBi]	1.7	2.1*	1.4

* The maximum antenna gain of 2.1dBi was considered for all e.i.r.p. calculations.

Limits:

FCC	IC
6 dBi / > 6 dBi output power and power density reduction required	

12.2 Identify worst case data rate

Worst case data rate or modulation scheme declared by the manufacturer.

Modulation scheme / bandwidth	
DSSS / b – mode	1 Mbit/s
OFDM / g – mode	54 Mbit/s

12.3 Maximum output power

Description:

Measurement of the maximum conducted peak output power. The measurements are performed using the data rate identified in the previous chapter.

Measurement:

Measurement parameter	
According to DTS clause: 8.3.1.3	
Peak power meter	
Test setup	See chapter 6.4 B
Measurement uncertainty	See chapter 8

Limits:

FCC	IC
Conducted 1.0 W / 30 dBm with an antenna gain of max. 6 dBi	

Results:

antenna port 1	maximum output power / dBm		
	lowest channel	middle channel	highest channel
Output power conducted DSSS / b – mode	13.3	18.5	11.8
Output power conducted OFDM / g – mode	20.2	24.0	18.4

antenna port 2	maximum output power / dBm		
	lowest channel	middle channel	highest channel
Output power conducted DSSS / b – mode	10.4	9.6	9.3
Output power conducted OFDM / g – mode	14.4	13.6	13.3

12.4 Duty cycle

Description:

Measurement of the timing behavior.

Measurement:

Measurement parameter	
Detector	Peak
Sweep time	Depends on the signal see plot
Resolution bandwidth	10 MHz
Video bandwidth	10 MHz
Trace mode	Max hold
Test setup	See chapter 6.4 - A
Measurement uncertainty	See chapter 8

Limits:

FCC	IC
No limitation!	

Results:

T_{nom}	V_{nom}	lowest channel	middle channel	highest channel
DSSS / b – mode		100 % / 0 dB	100 % / 0 dB	100 % / 0 dB
OFDM / g – mode		100 % / 0 dB	100 % / 0 dB	100 % / 0 dB

12.5 Peak power spectral density

Description:

Measurement of the peak power spectral density of a digital modulated system. The PSD shows the strength of the variations as a function of the frequency. The measurement is repeated for both modulations at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
According to DTS clause: 8.4	
Detector	Positive Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Span	30 MHz
Trace mode	Max. hold (allow trace to fully stabilize)
Test setup	See chapter 6.4 A
Measurement uncertainty	See chapter 8

Limits:

FCC	IC
8 dBm / 3 kHz (conducted)	

Results: antenna port 1

measured	peak power spectral density / dBm @ 100 kHz		
	Lowest channel	Middle channel	Highest channel
DSSS / b – mode	-0.2	5.4	-1.3
OFDM / g – mode	-1.3	2.0	-4.7

Formula for PKPSD calculation: $PKPSD_{calculated}=PKPSD_{measured}+10*\log(3kHz/RBW_{measured}[kHz])$

calculated	peak power spectral density / dBm @ 3 kHz		
	Lowest channel	Middle channel	Highest channel
DSSS / b – mode	-15.4	-9.8	-16.5
OFDM / g – mode	-16.5	-13.2	-19.9

Results: antenna port 2

measured	peak power spectral density / dBm @ 100 kHz		
	Lowest channel	Middle channel	Highest channel
DSSS / b – mode	-2.5	-3.5	-3.9
OFDM / g – mode	-9.5	-10.2	-10.4

Formula for PKPSD calculation: $PKPSD_{calculated}=PKPSD_{measured}+10*\log(3kHz/RBW_{measured}[kHz])$

calculated	peak power spectral density / dBm @ 3 kHz		
	Lowest channel	Middle channel	Highest channel
DSSS / b – mode	-17.7	-18.7	-19.1
OFDM / g – mode	-24.7	-25.4	-25.6

Results: antenna port 1 + 2

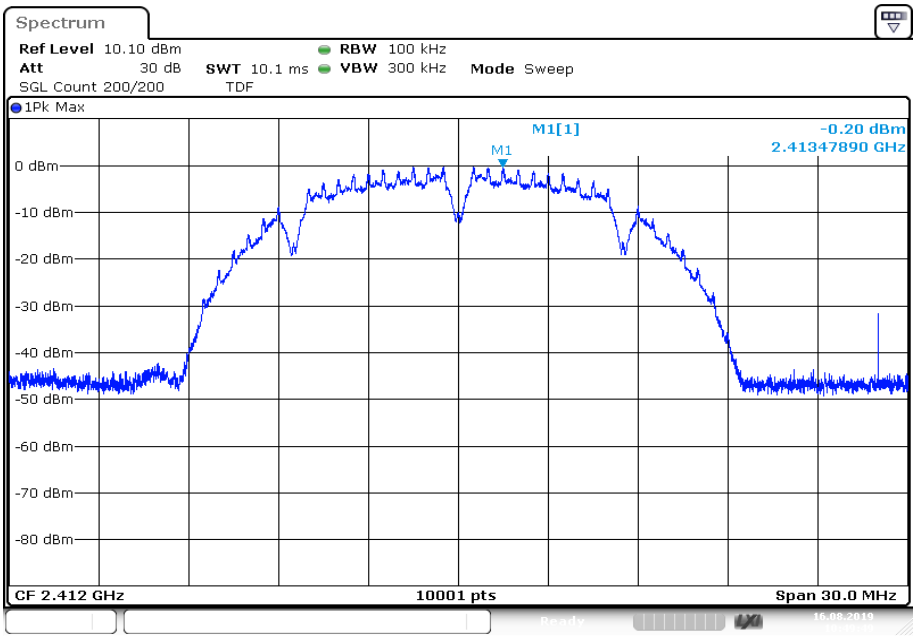
measured	peak power spectral density / dBm @ 100 kHz		
	Lowest channel	Middle channel	Highest channel
DSSS / b – mode	1.8	5.9	0.6
OFDM / g – mode	-0.7	2.3	-3.7

Formula for PKPSD calculation: $PKPSD_{calculated}=PKPSD_{measured}+10*\log(3kHz/RBW_{measured}[kHz])$

calculated	peak power spectral density / dBm @ 3 kHz		
	Lowest channel	Middle channel	Highest channel
DSSS / b – mode	-13.4	-9.3	-14.6
OFDM / g – mode	-15.9	-12.9	-18.9

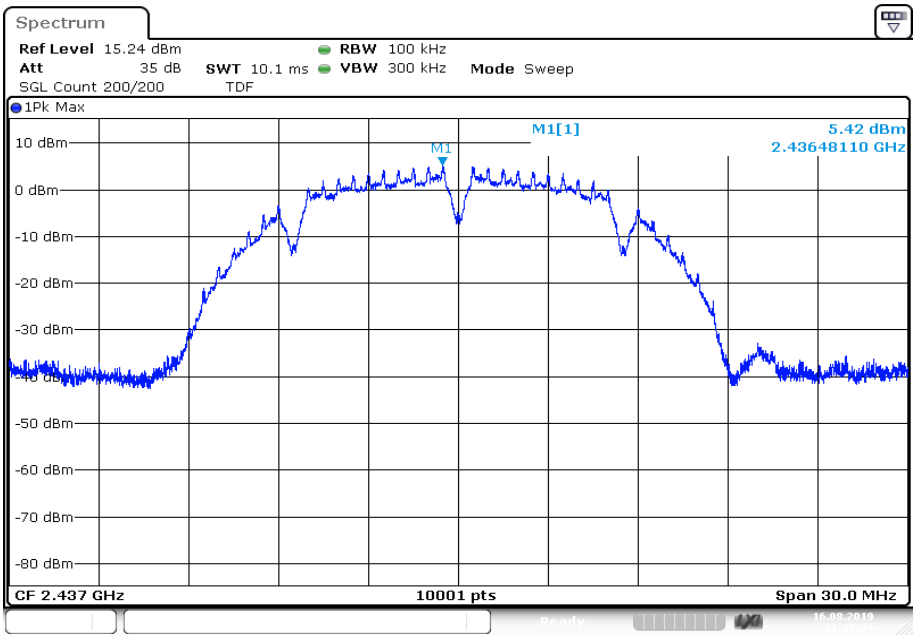
Plots: DSSS / b – mode; antenna port 1

Plot 1: Lowest channel



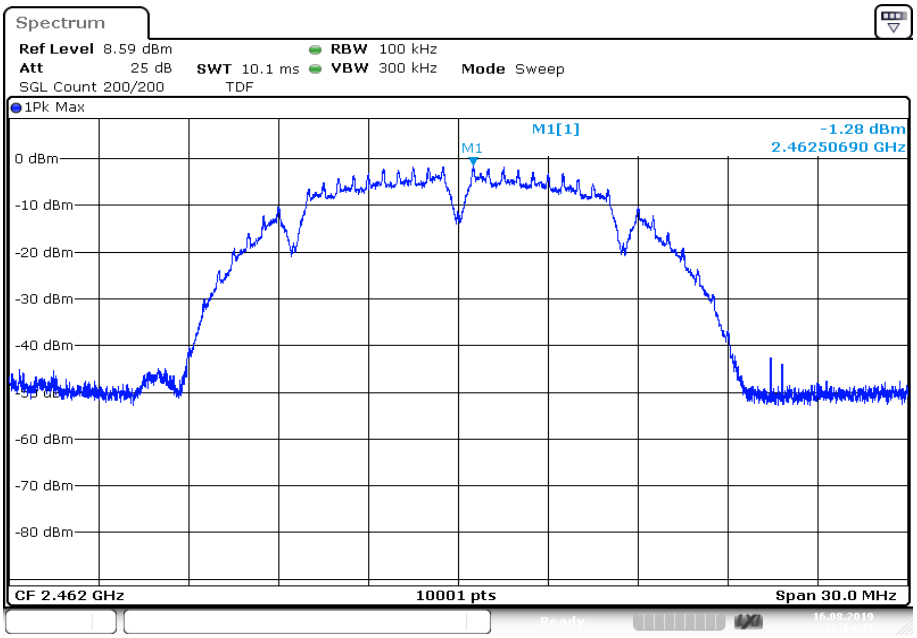
Date: 16.AUG.2019 10:49:49

Plot 2: Middle channel



Date: 16.AUG.2019 11:37:30

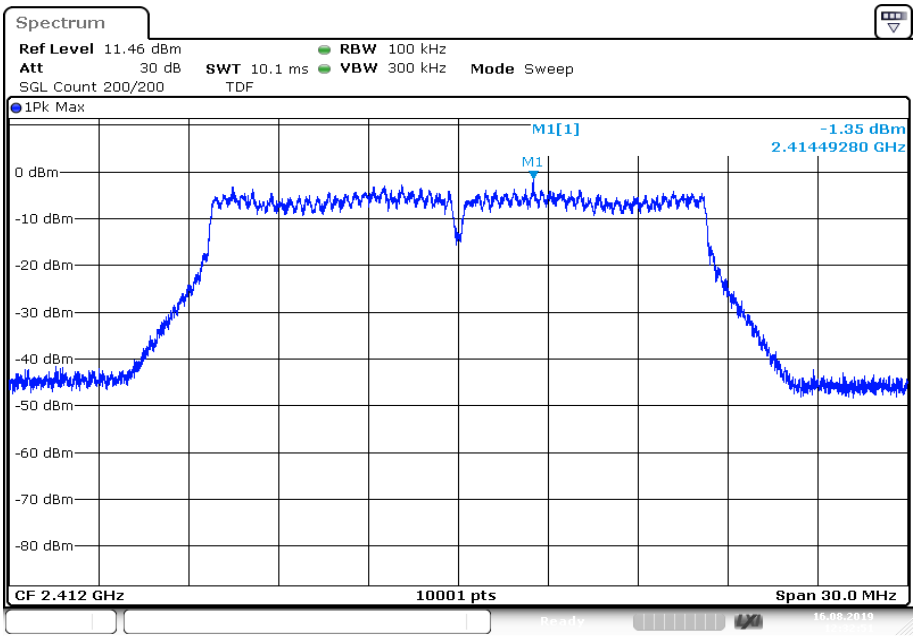
Plot 3: Highest channel



Date: 16.AUG.2019 12:14:37

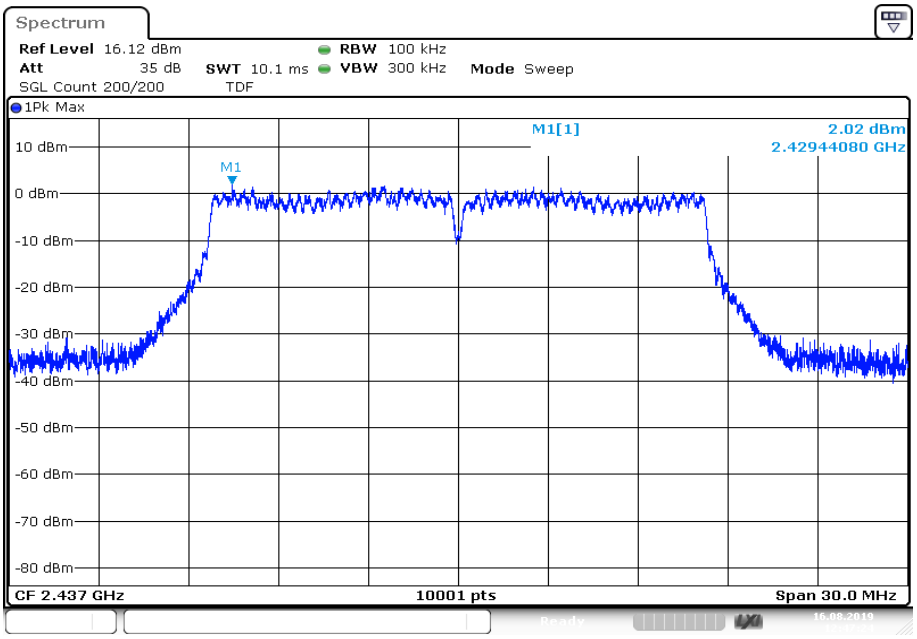
Plots: OFDM / g – mode; antenna port 1

Plot 1: Lowest channel



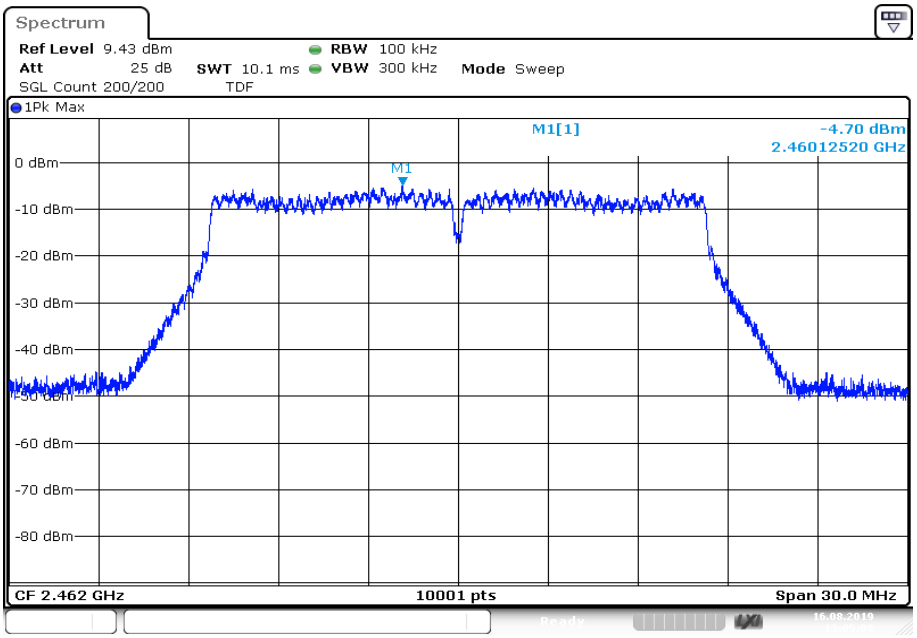
Date: 16.AUG.2019 12:32:51

Plot 2: Middle channel



Date: 16.AUG.2019 12:47:24

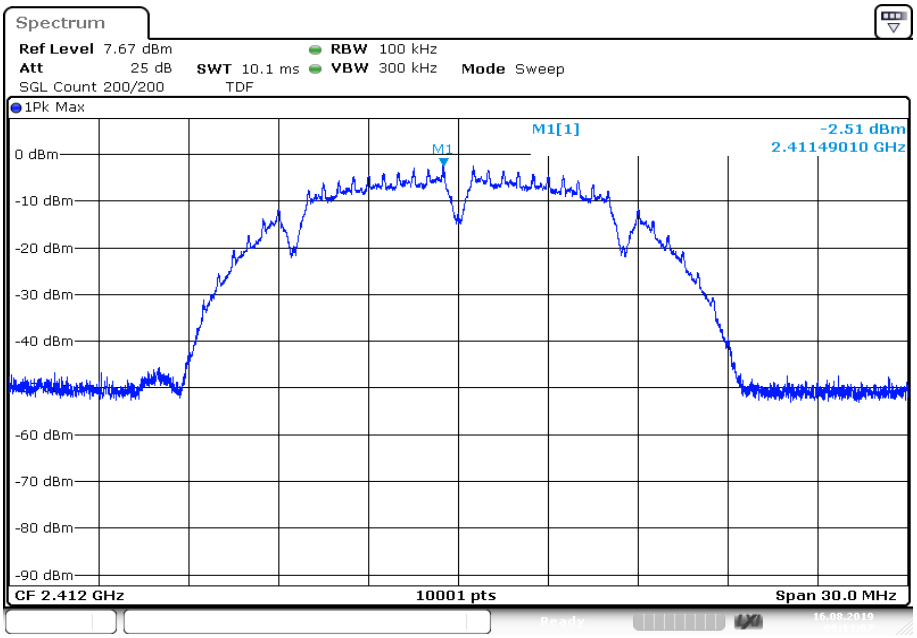
Plot 3: Highest channel



Date: 16.AUG.2019 13:05:08

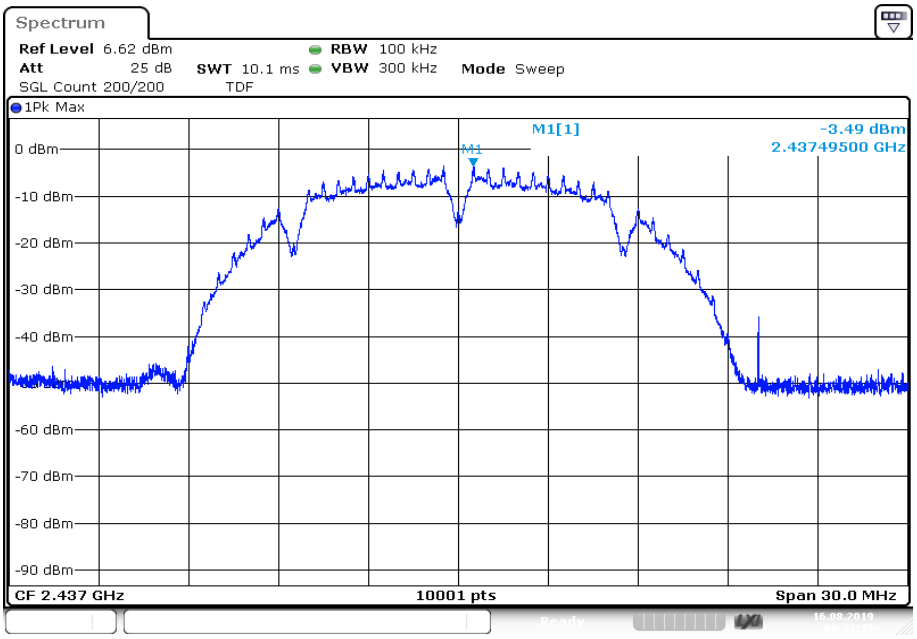
Plots: DSSS / b – mode; antenna port 2

Plot 1: Lowest channel



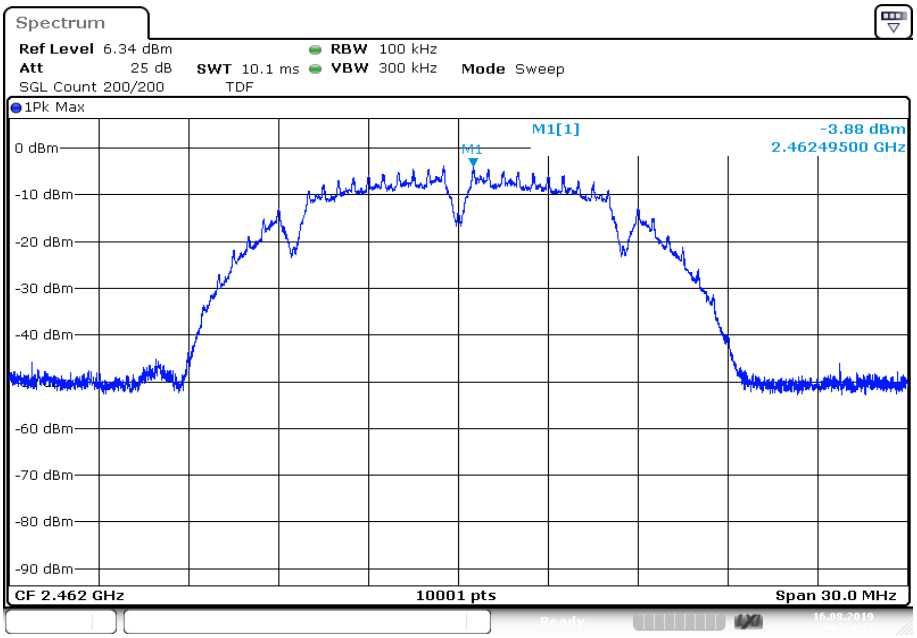
Date: 16.AUG.2019 09:13:07

Plot 2: Middle channel



Date: 16.AUG.2019 09:31:15

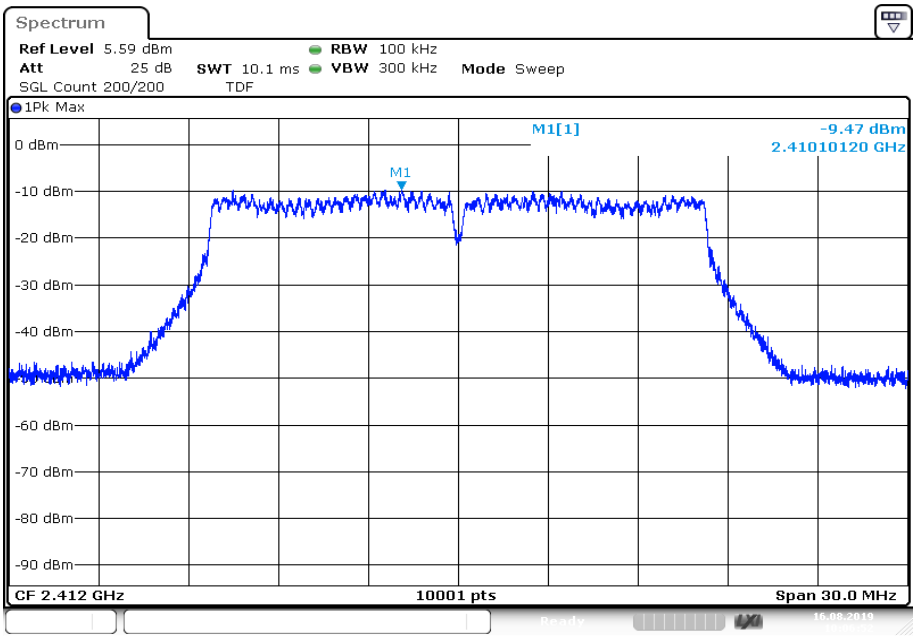
Plot 3: Highest channel



Date: 16.AUG.2019 09:54:52

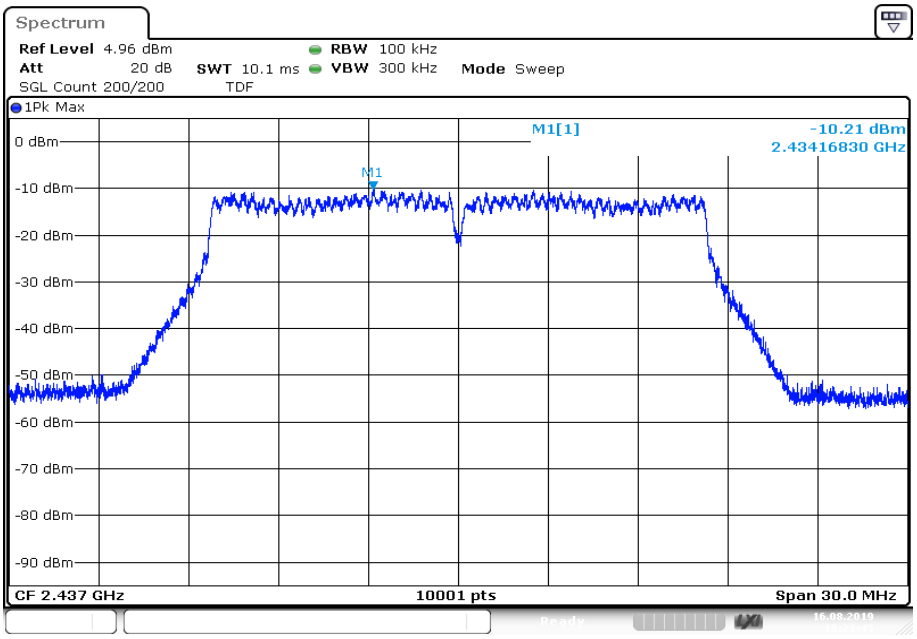
Plots: OFDM / g – mode; antenna port 2

Plot 1: Lowest channel



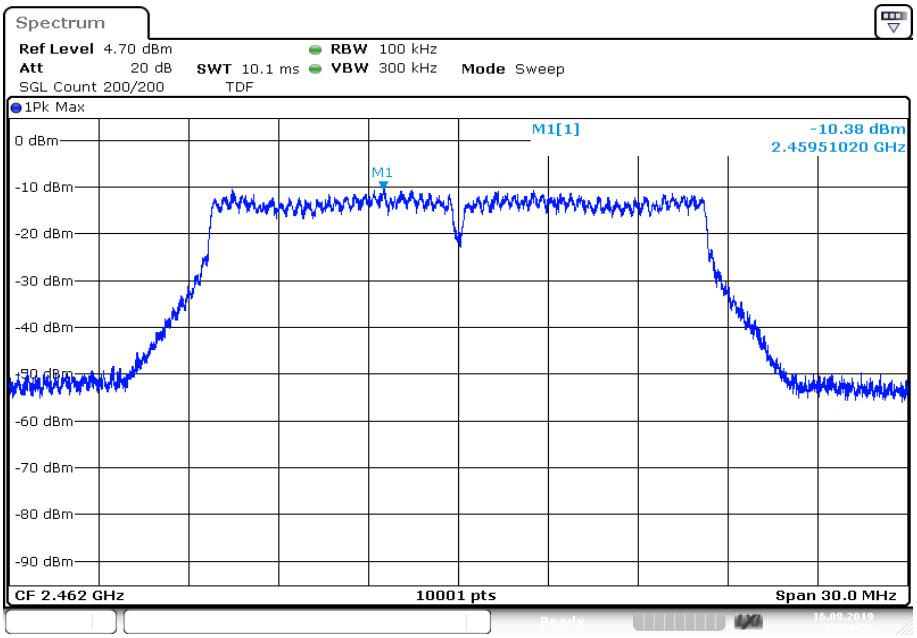
Date: 16.AUG.2019 10:06:52

Plot 2: Middle channel



Date: 16.AUG.2019 10:23:45

Plot 3: Highest channel



Date: 16.AUG.2019 10:38:56

12.6 6 dB DTS bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to DTS clause: 8.2	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	500 kHz
Span	30 MHz / 50 MHz
Trace mode	Single count with 200 counts
Test setup	See chapter 6.4.A
Measurement uncertainty	See chapter 8

Limits:

FCC	IC
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

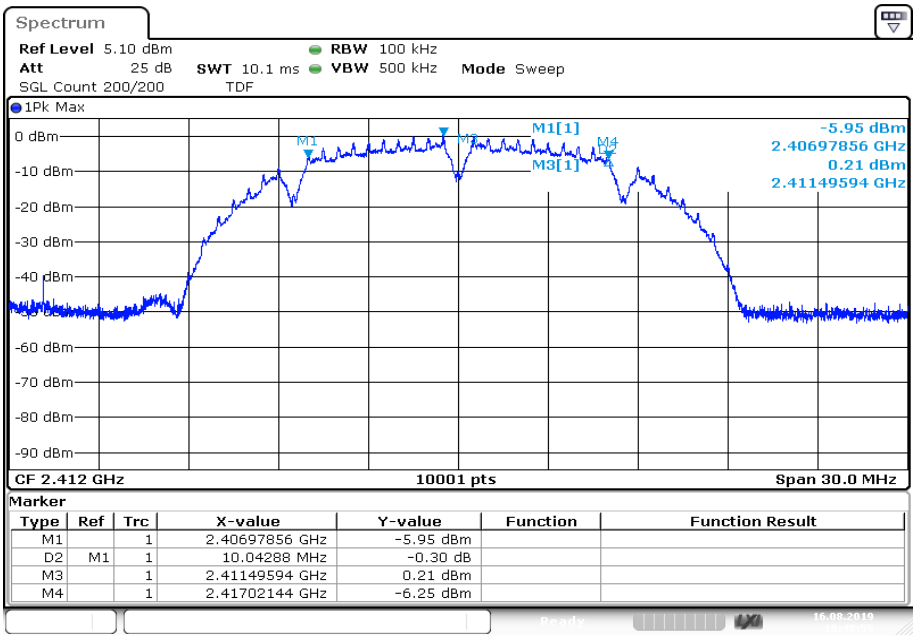
Results:

antenna port 1	6 dB DTS bandwidth / kHz		
	lowest channel	middle channel	highest channel
DSSS / b – mode	10043	10010	10064
OFDM / g – mode	16519	16531	16525

antenna port 2	6 dB DTS bandwidth / kHz		
	lowest channel	middle channel	highest channel
DSSS / b – mode	10064	10061	10061
OFDM / g – mode	16525	16510	16519

Plots: DSSS / b – mode; antenna port 1

Plot 1: Lowest channel

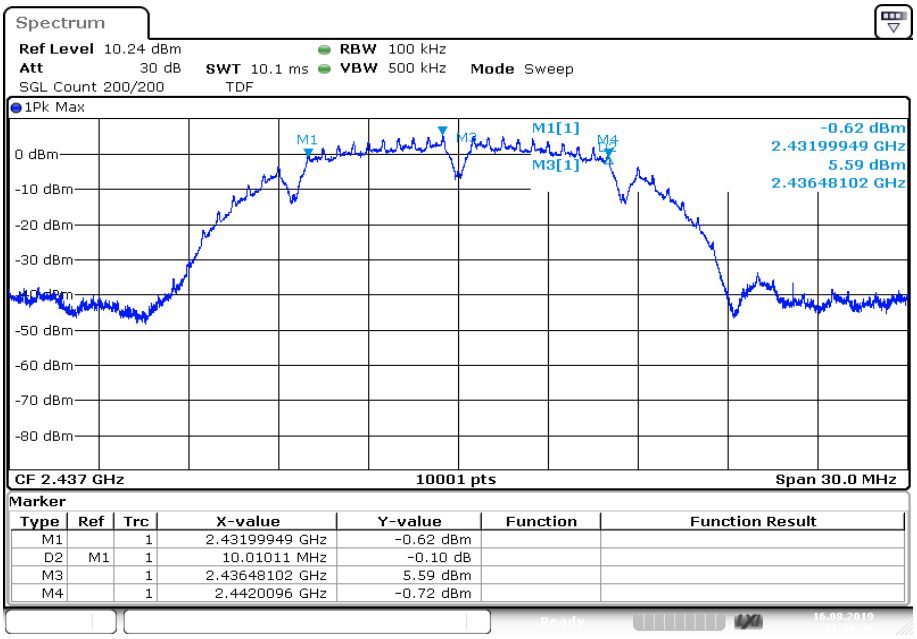


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40697856 GHz	-5.95 dBm		
D2	M1	1	10.04288 MHz	-0.30 dB		
M3		1	2.41149594 GHz	0.21 dBm		
M4		1	2.41702144 GHz	-6.25 dBm		

Date: 16.AUG.2019 10:48:56

Plot 2: Middle channel

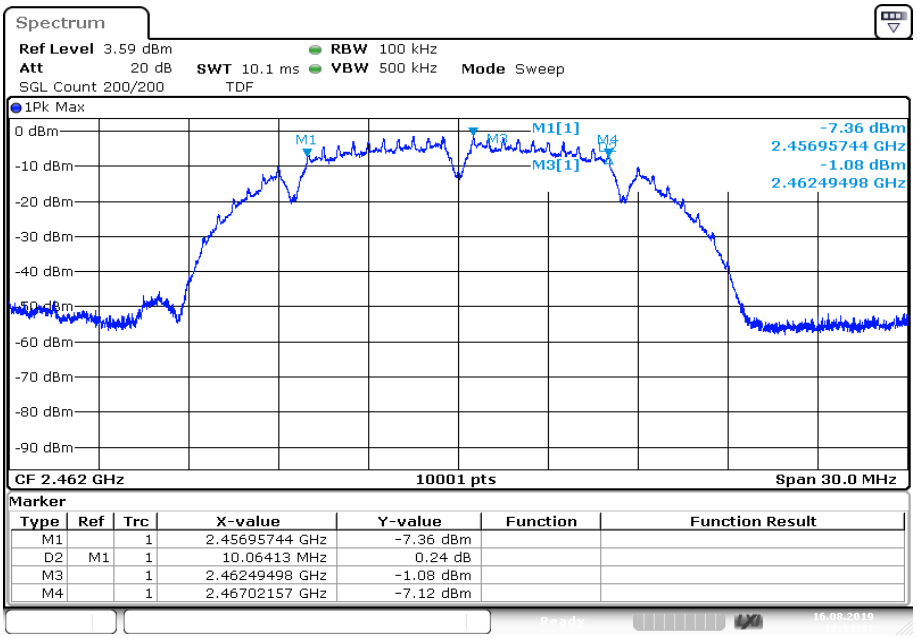


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43199949 GHz	-0.62 dBm		
D2	M1	1	10.01011 MHz	-0.10 dB		
M3		1	2.43648102 GHz	5.59 dBm		
M4		1	2.4420096 GHz	-0.72 dBm		

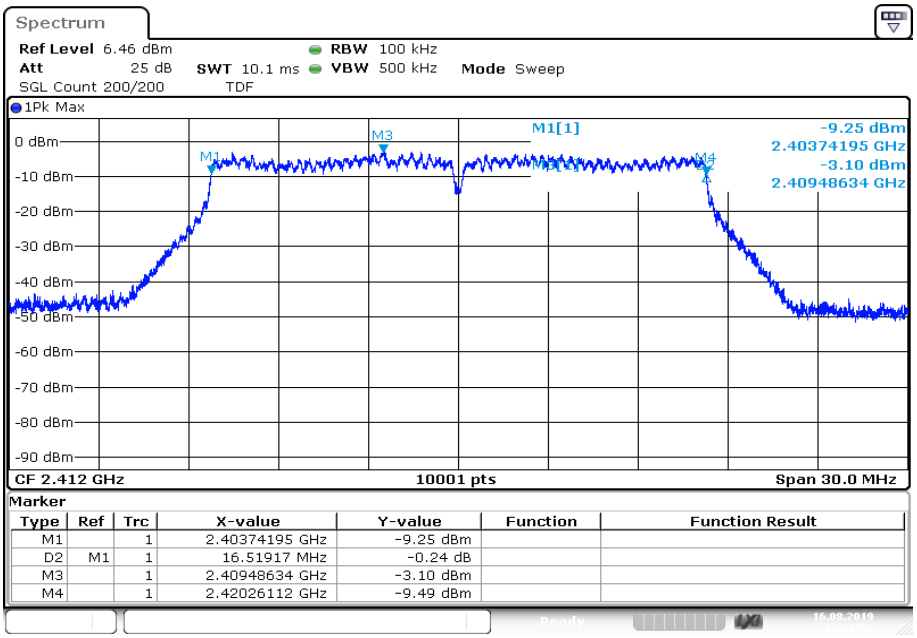
Date: 16.AUG.2019 11:36:36

Plot 3: Highest channel

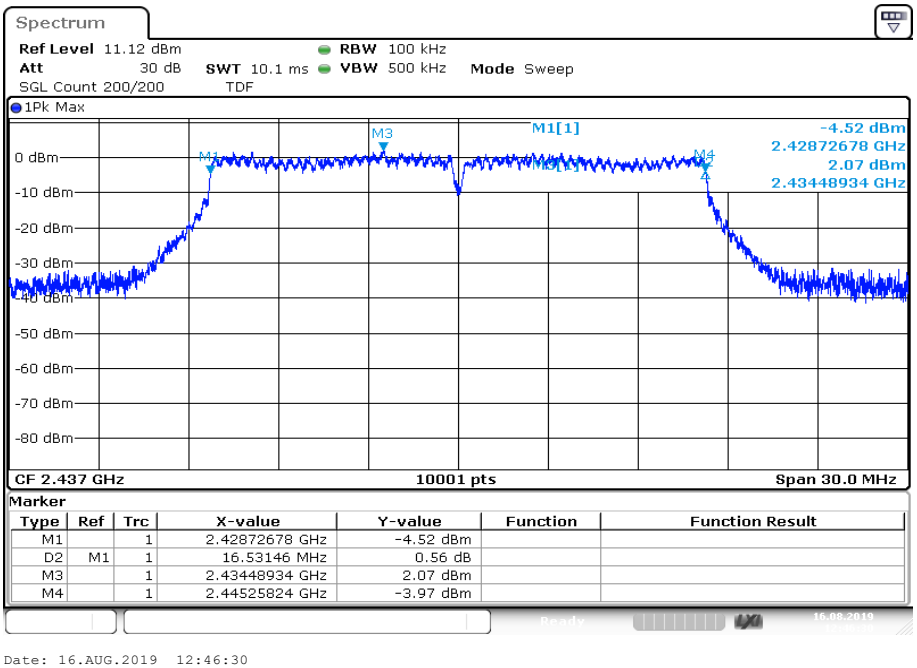


Plots: OFDM / g – mode; antenna port 1

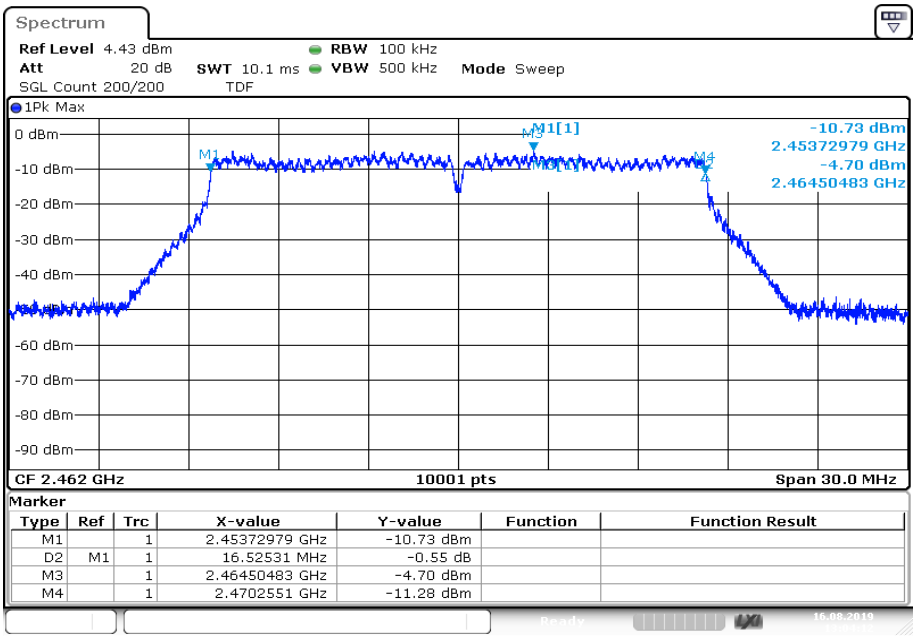
Plot 1: Lowest channel



Plot 2: Middle channel



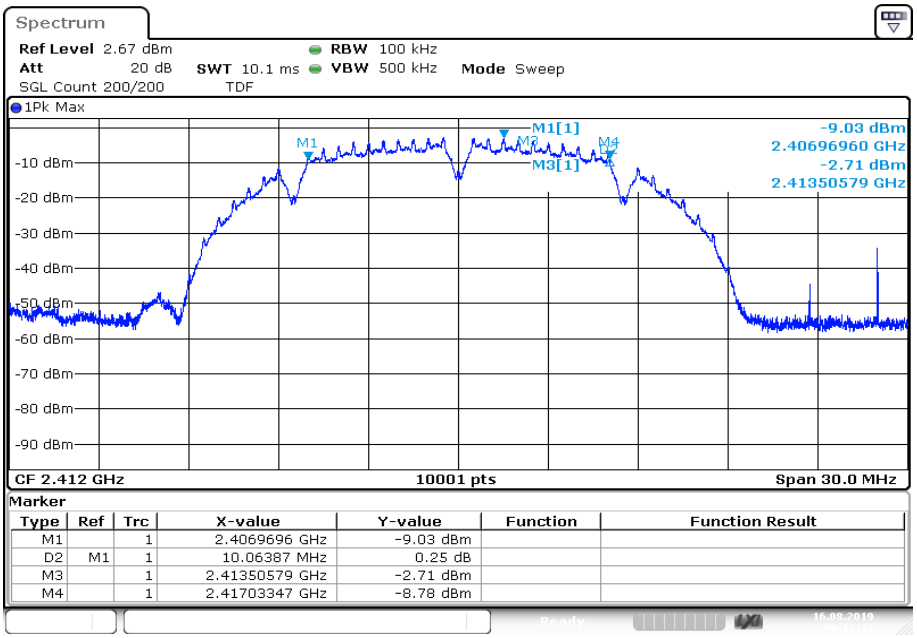
Plot 3: Highest channel



Date: 16.AUG.2019 13:04:12

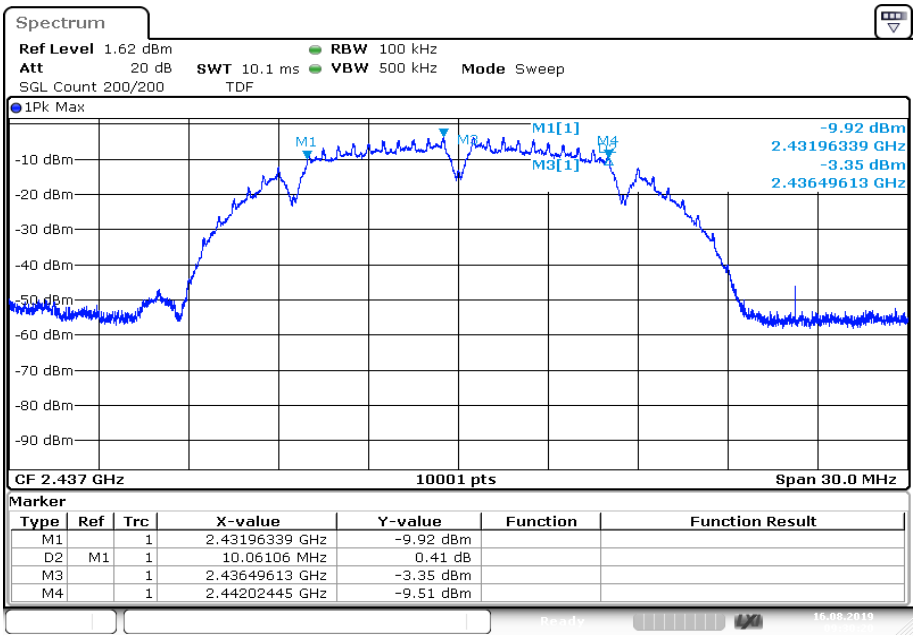
Plots: DSSS / b – mode; antenna port 2

Plot 1: Lowest channel



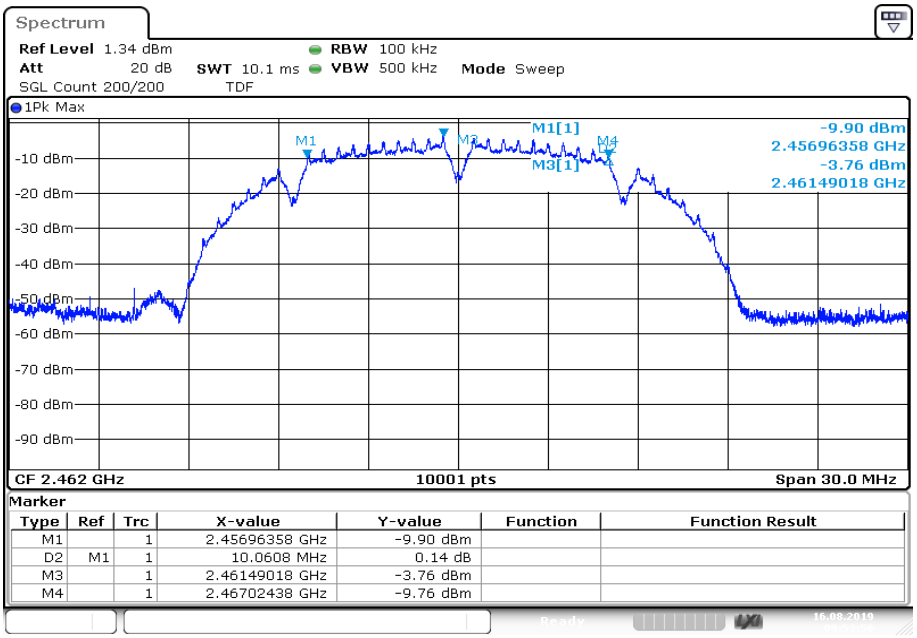
Date: 16.AUG.2019 09:12:11

Plot 2: Middle channel



Date: 16.AUG.2019 09:30:20

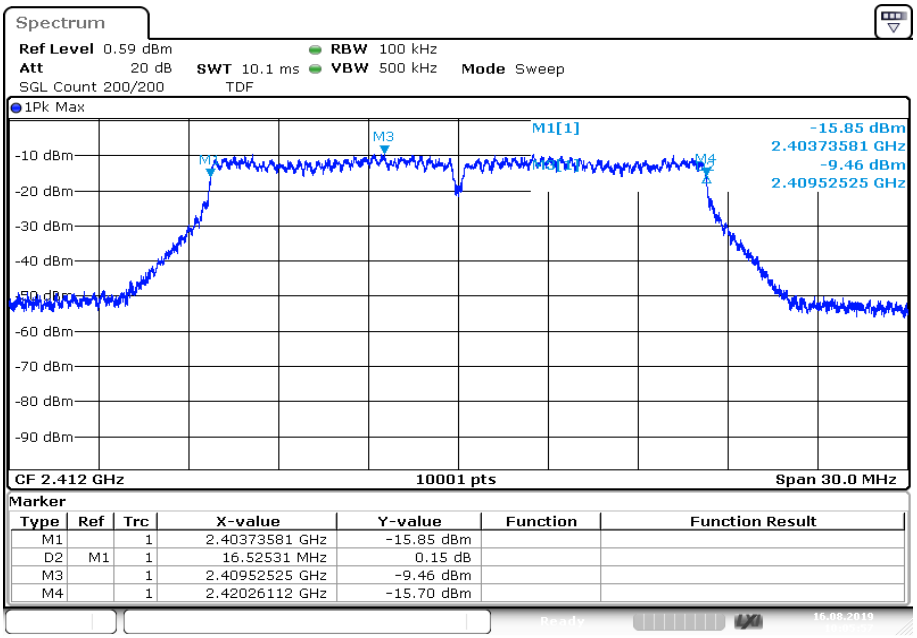
Plot 3: Highest channel



Date: 16.AUG.2019 09:53:56

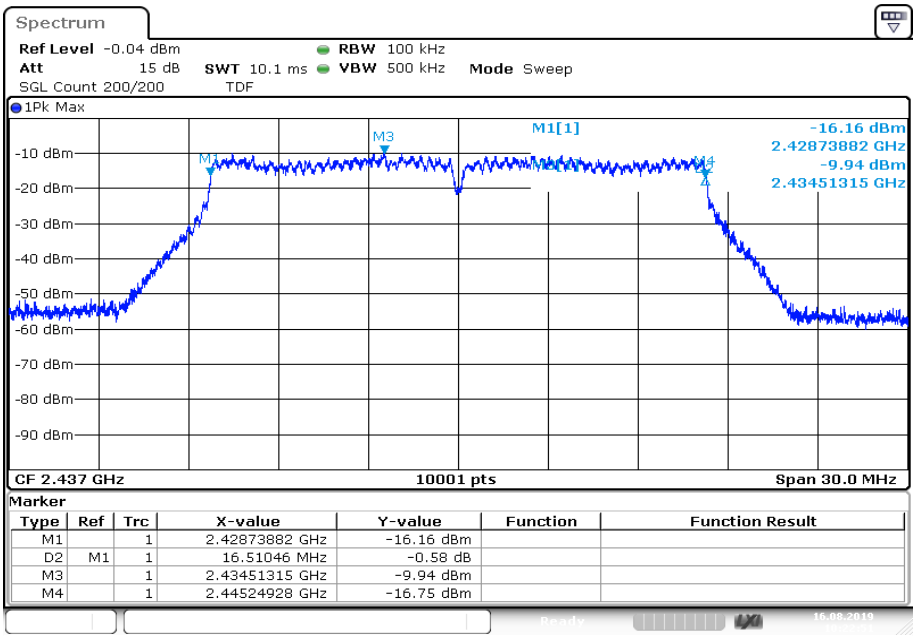
Plots: OFDM / g – mode; antenna port 2

Plot 1: Lowest channel



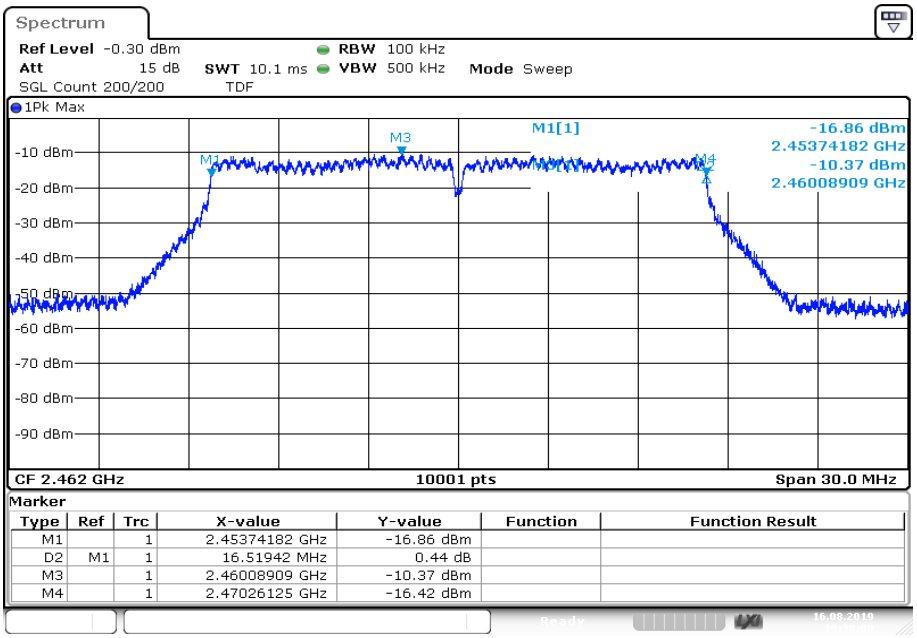
Date: 16.AUG.2019 10:05:58

Plot 2: Middle channel



Date: 16.AUG.2019 10:22:51

Plot 3: Highest channel



12.7 Occupied bandwidth – 99% emission bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

Measurement:

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	300 kHz
Video bandwidth	1 MHz
Span	30 MHz / 50 MHz
Measurement procedure	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace mode	Single count with 200 counts
Test setup	See chapter 6.4 A
Measurement uncertainty	See chapter 8

Usage:

-/-	IC
OBW is necessary for Emission Designator	

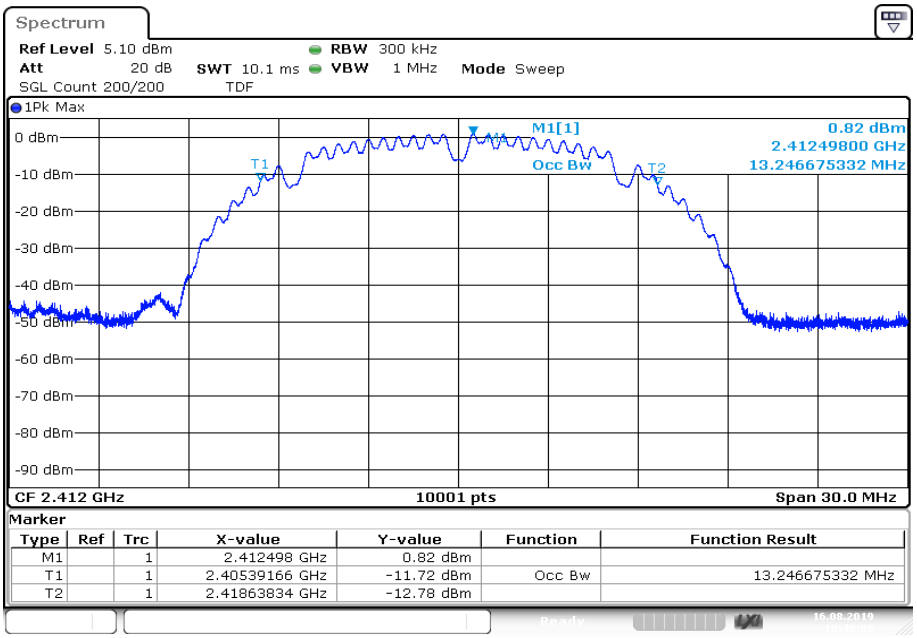
Results:

antenna port 1	99% emission bandwidth / kHz		
	lowest channel	middle channel	highest channel
DSSS / b – mode	13247	13247	13268
OFDM / g – mode	16663	16672	16660

antenna port 2	99% emission bandwidth / kHz		
	lowest channel	middle channel	highest channel
DSSS / b – mode	13235	13253	13253
OFDM / g – mode	16669	16672	16666

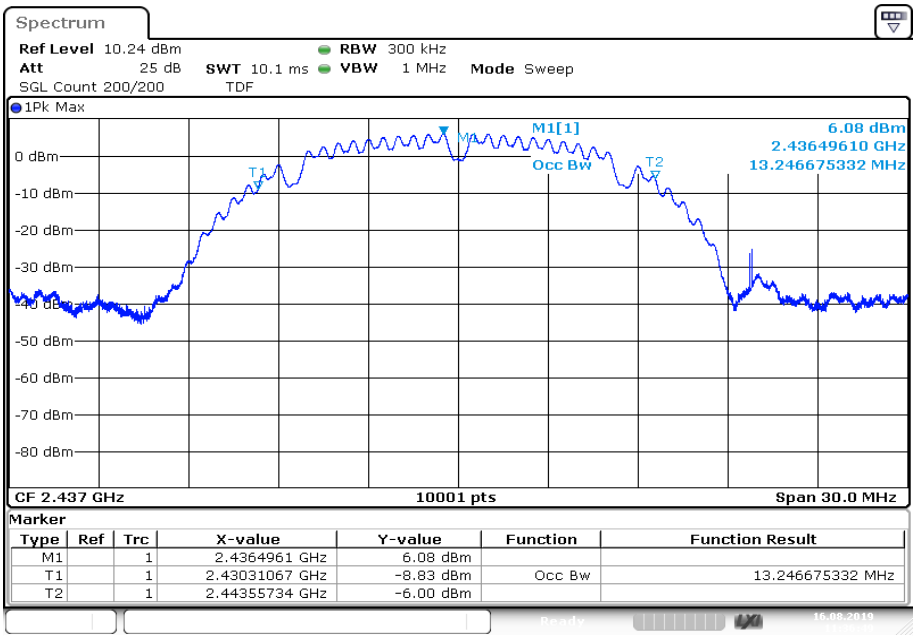
Plots: DSSS / b – mode; antenna port 1

Plot 1: Lowest channel



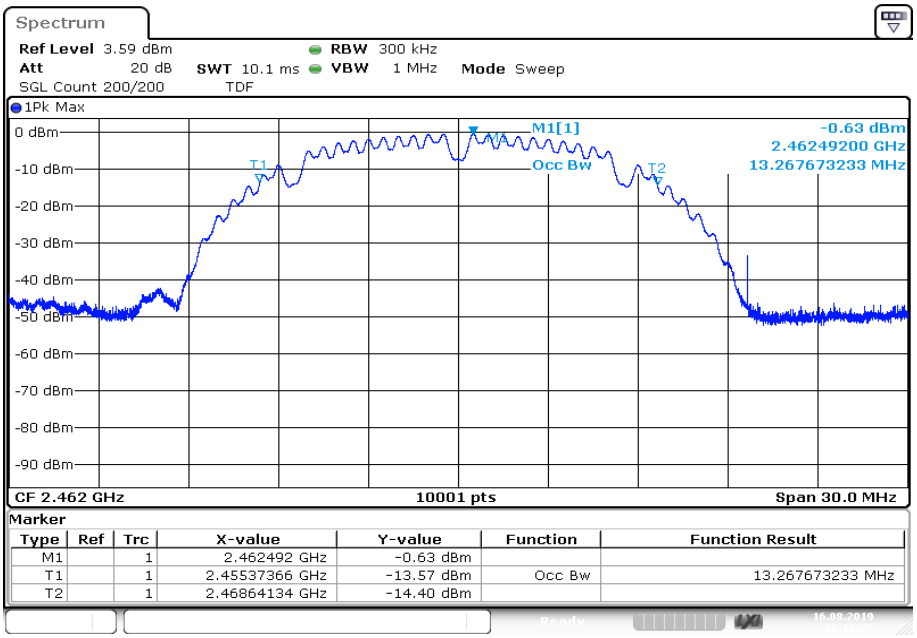
Date: 16.AUG.2019 10:49:09

Plot 2: Middle channel



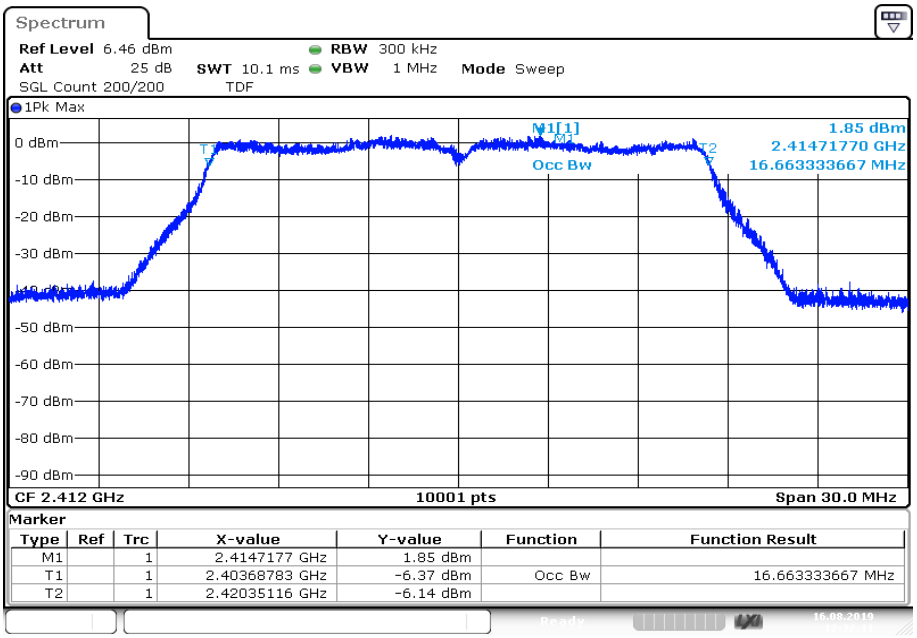
Date: 16.AUG.2019 11:36:49

Plot 3: Highest channel

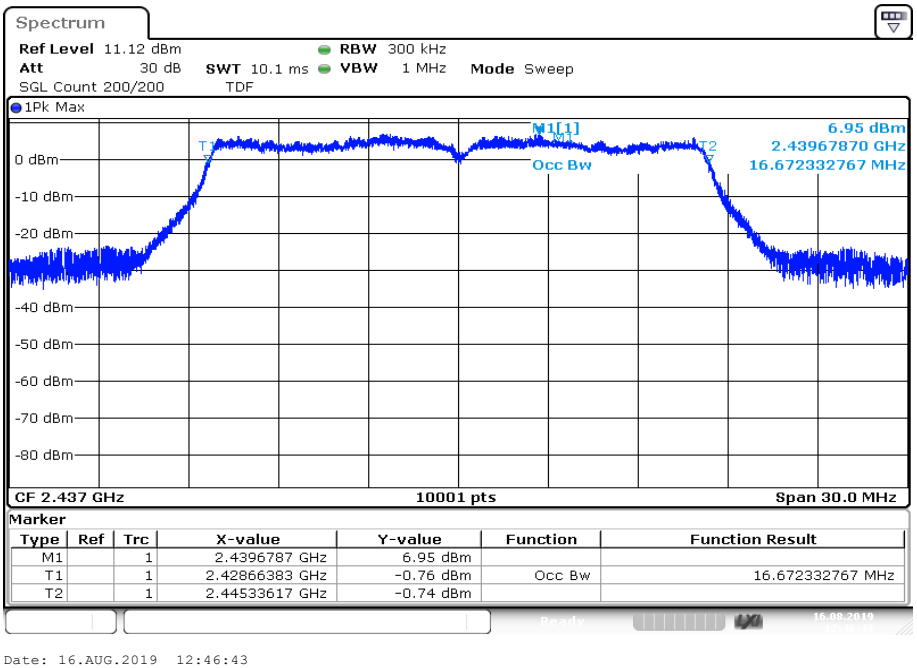


Plots: OFDM / g – mode; antenna port 1

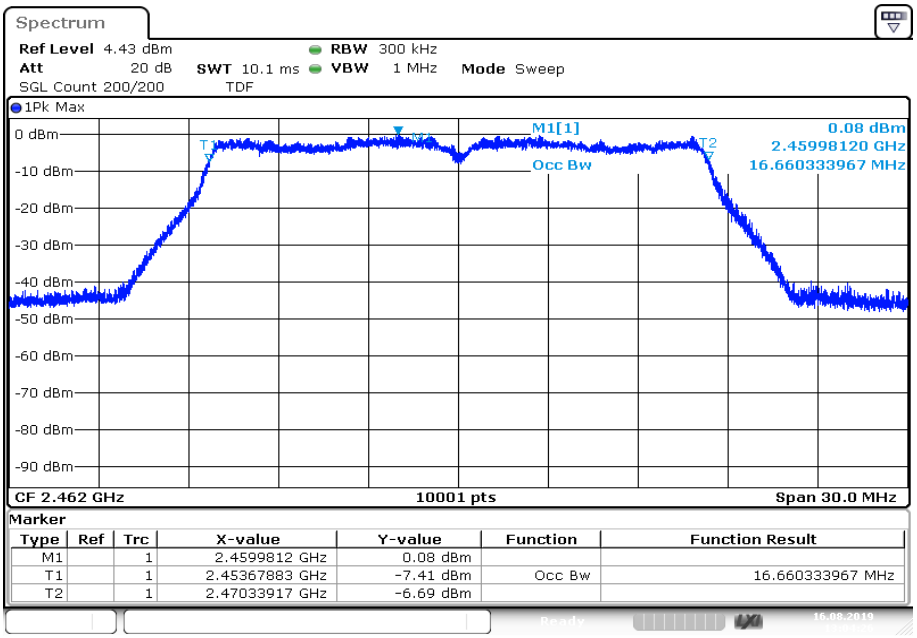
Plot 1: Lowest channel



Plot 2: Middle channel

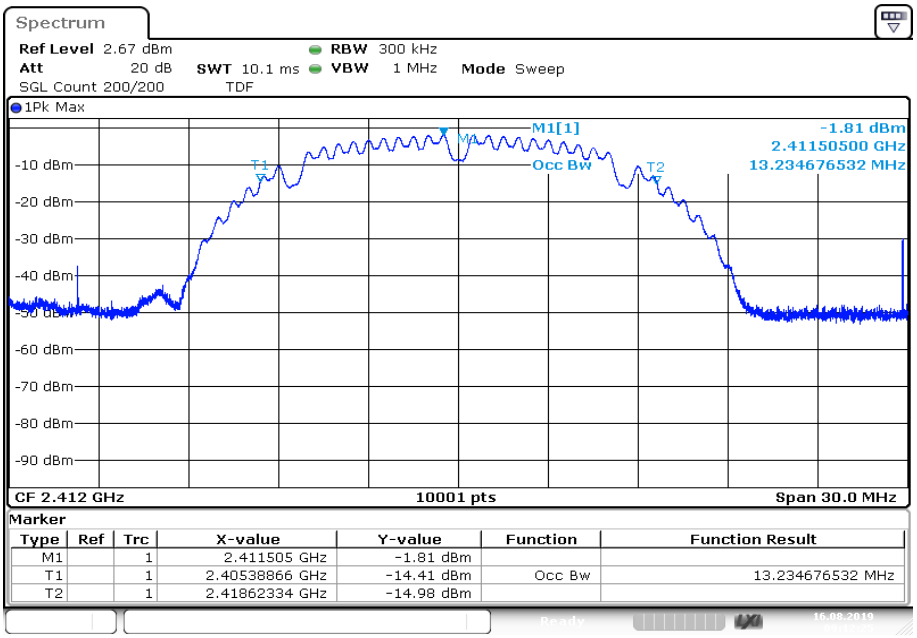


Plot 3: Highest channel



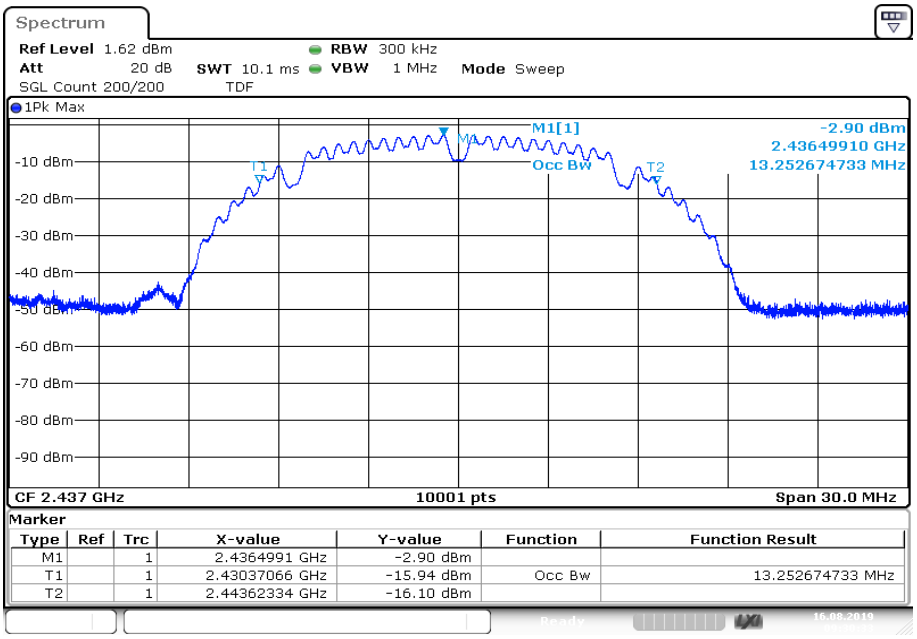
Plots: DSSS / b – mode; antenna port 2

Plot 1: Lowest channel



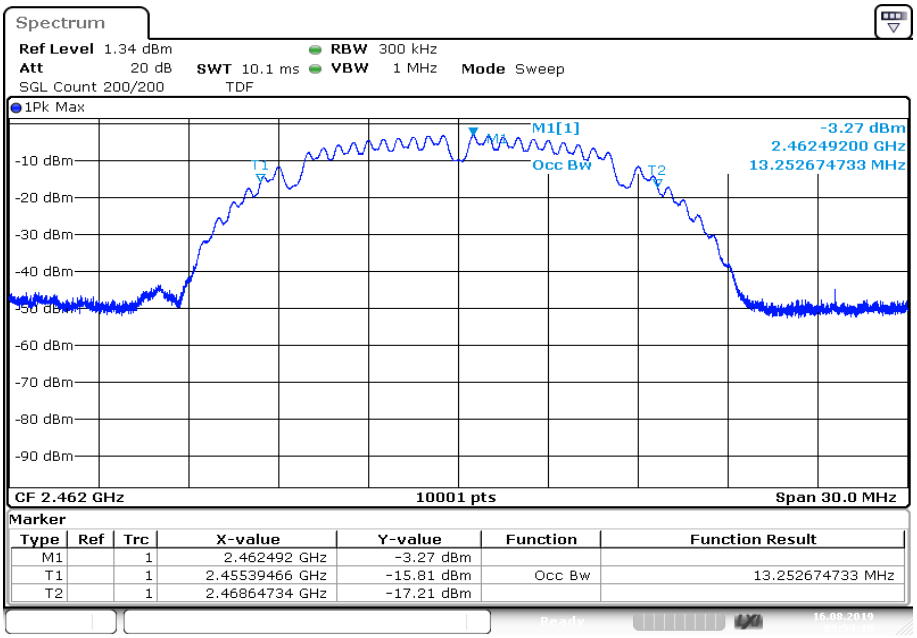
Date: 16.AUG.2019 09:12:25

Plot 2: Middle channel



Date: 16.AUG.2019 09:30:33

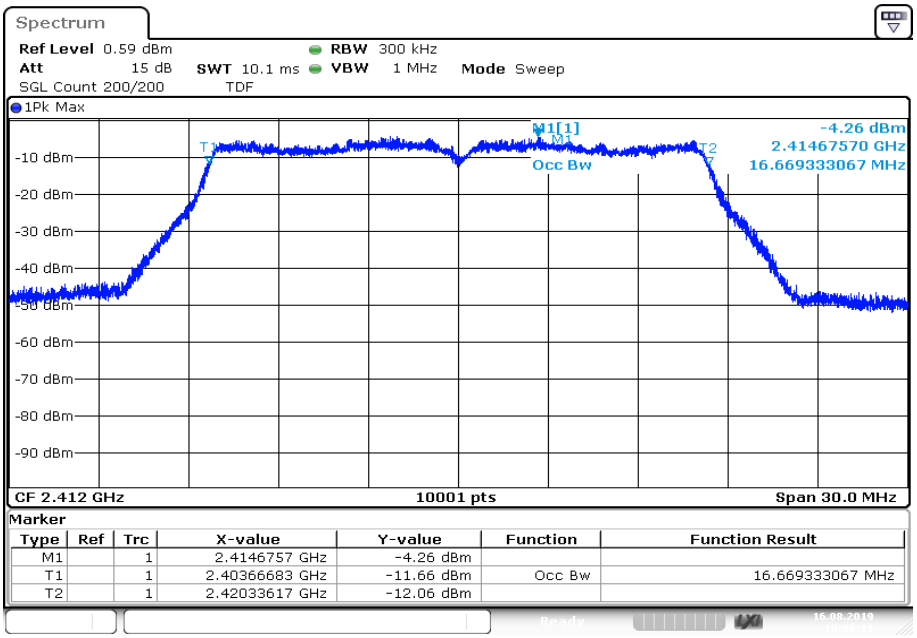
Plot 3: Highest channel



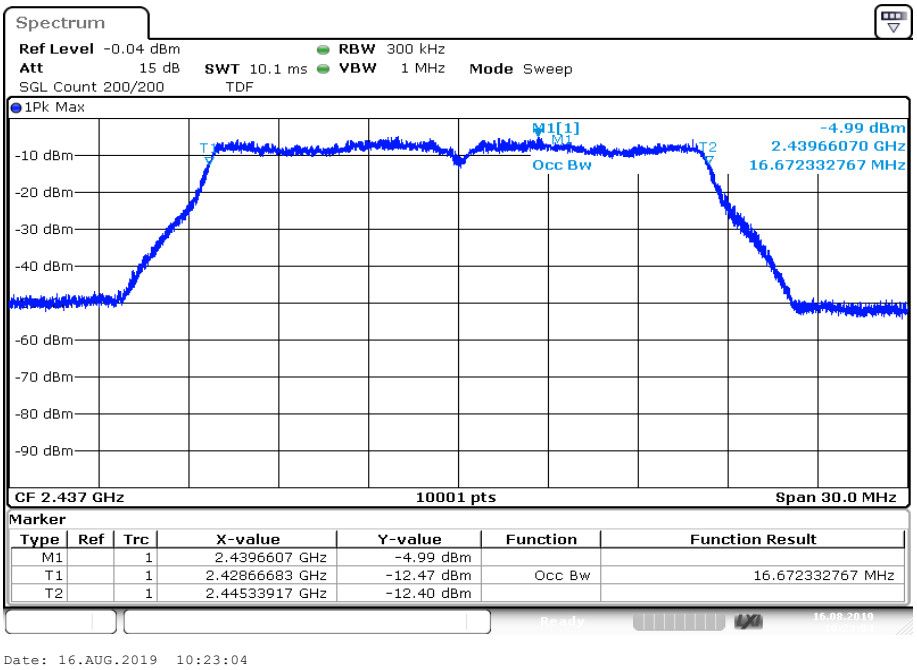
Date: 16.AUG.2019 09:54:11

Plots: OFDM / g – mode; antenna port 2

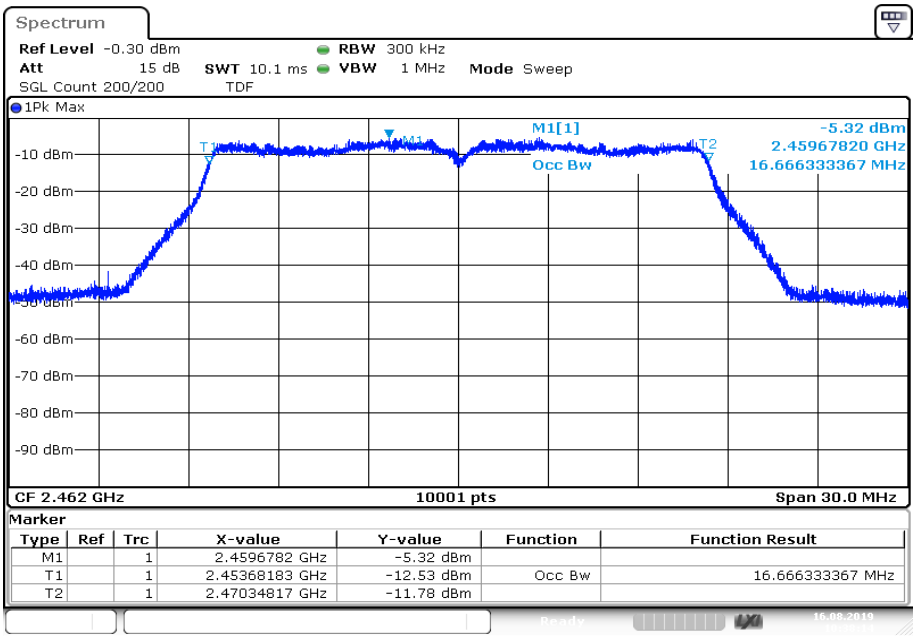
Plot 1: Lowest channel



Plot 2: Middle channel



Plot 3: Highest channel



12.8 Occupied bandwidth – 20 dB bandwidth

Description:

Measurement of the 20 dB bandwidth of the modulated carrier.

Measurement:

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	500 kHz
Span	30 MHz / 50 MHz
Trace mode	Single count with min. 200 counts
Test setup	See chapter 6.4 A
Measurement uncertainty	See chapter 8

Usage:

-/-	IC
Within the used band!	

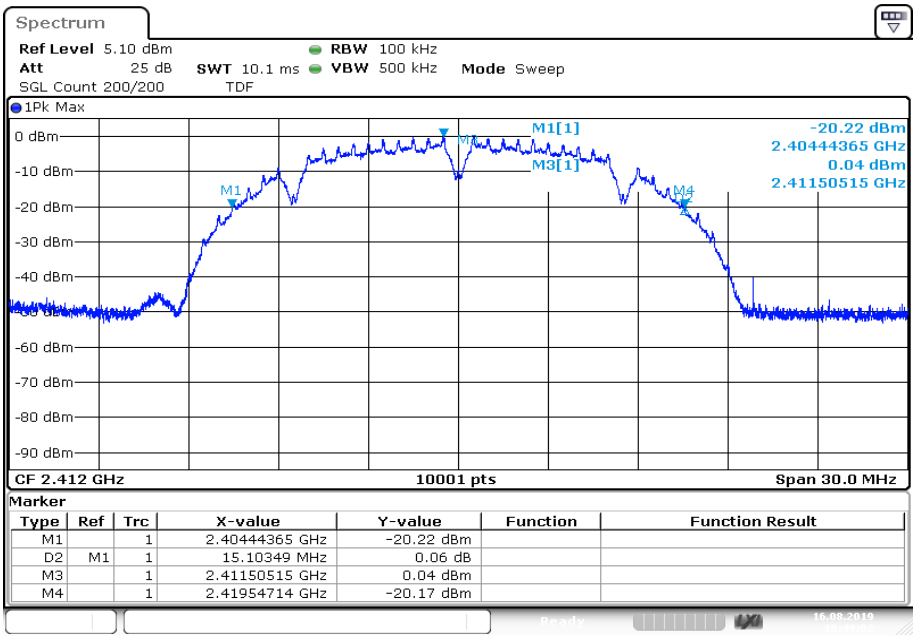
Results:

antenna port 1	20 dB bandwidth / MHz		
	lowest channel	middle channel	highest channel
DSSS / b – mode	15.10	15.10	15.09
OFDM / g – mode	17.70	17.72	17.76

antenna port 2	20 dB bandwidth / MHz		
	lowest channel	middle channel	highest channel
DSSS / b – mode	15.07	15.10	15.11
OFDM / g – mode	17.73	17.76	17.75

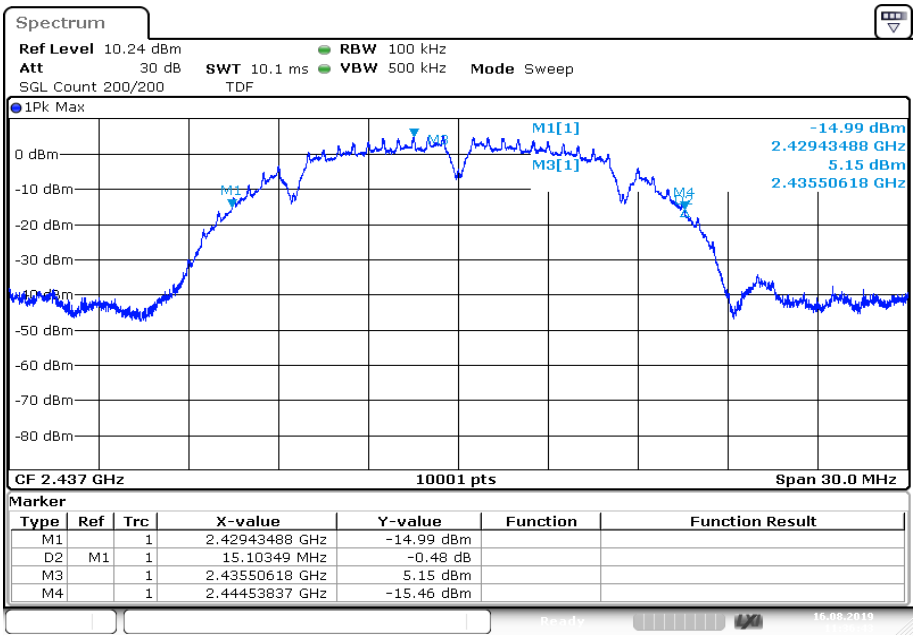
Plots: DSSS / b – mode; antenna port 1

Plot 1: Lowest channel



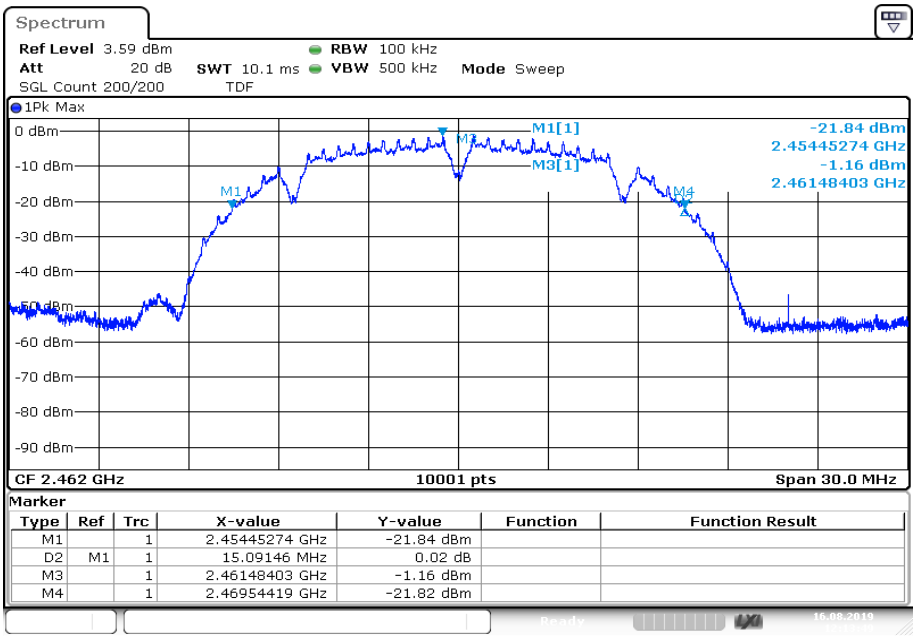
Date: 16.AUG.2019 10:49:02

Plot 2: Middle channel



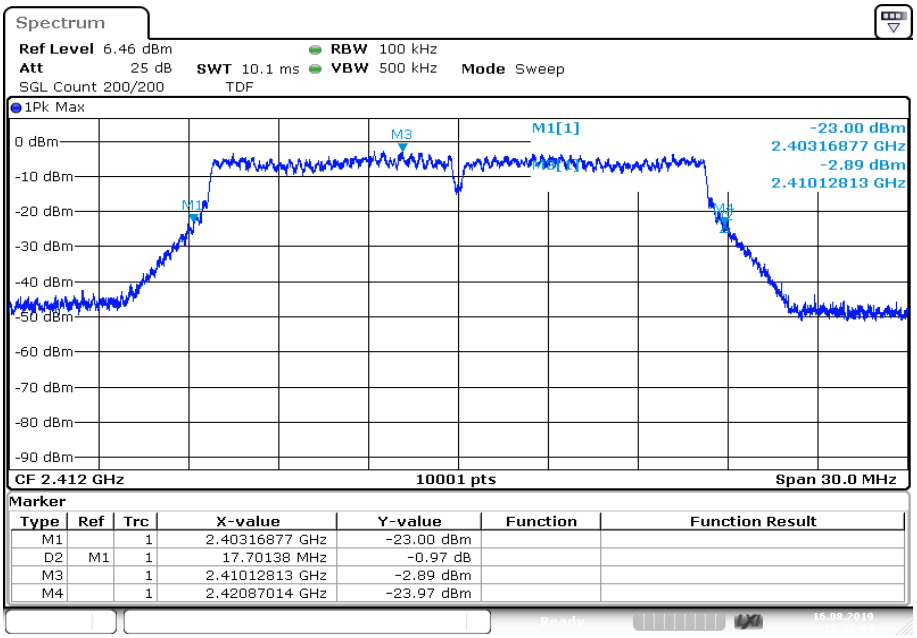
Date: 16.AUG.2019 11:36:43

Plot 3: Highest channel

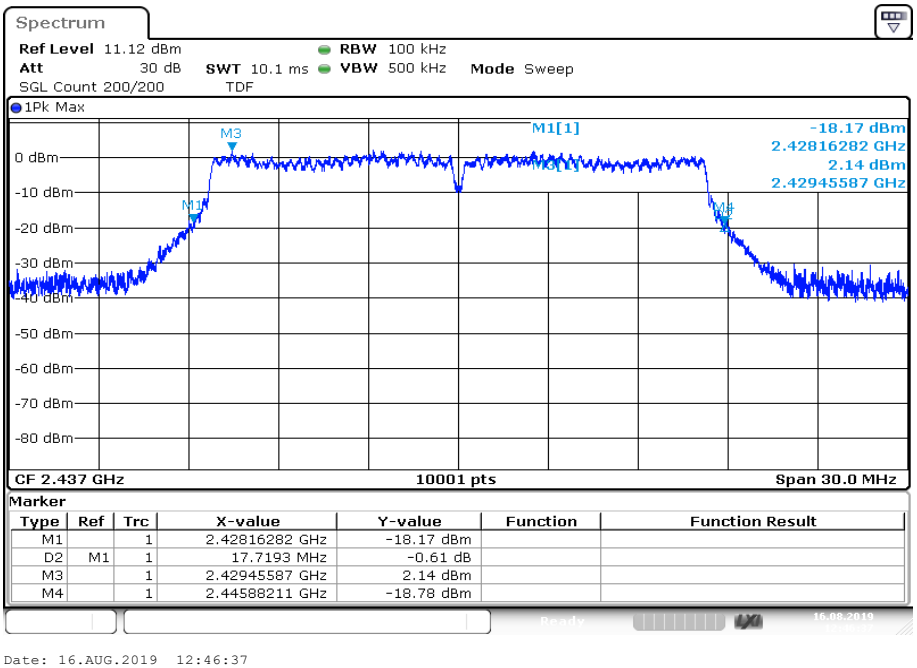


Plots: OFDM / g – mode; antenna port 1

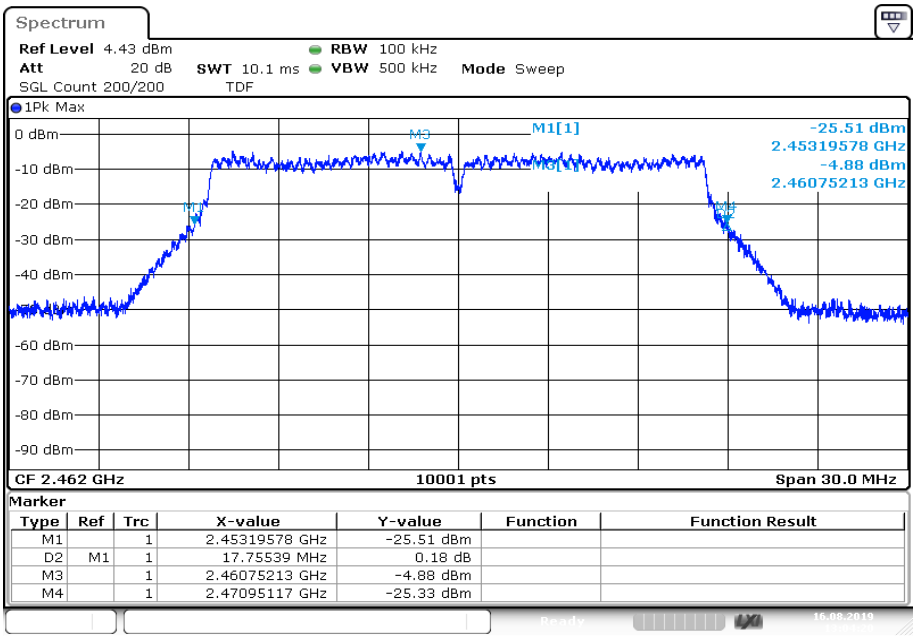
Plot 1: Lowest channel



Plot 2: Middle channel



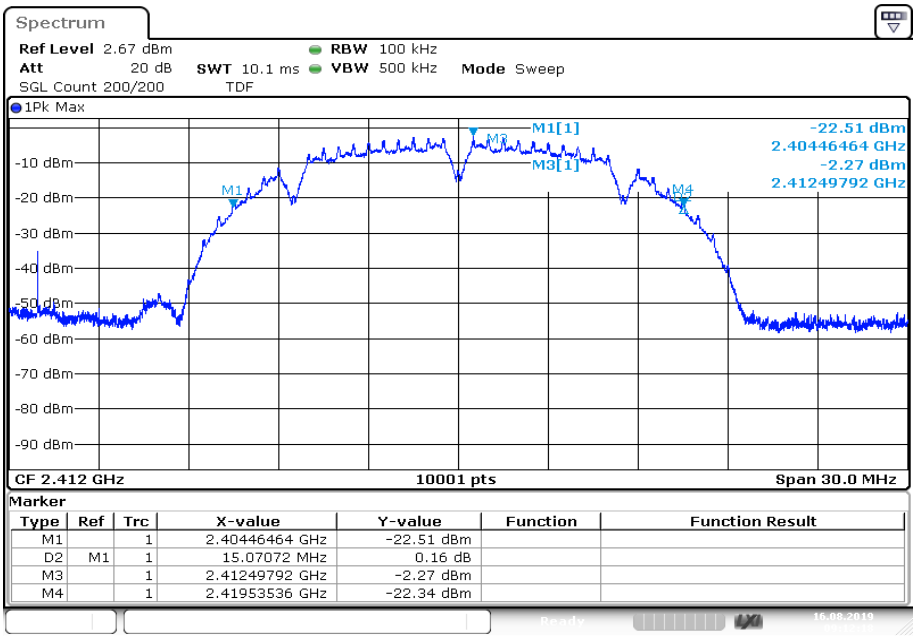
Plot 3: Highest channel



Date: 16.AUG.2019 13:04:20

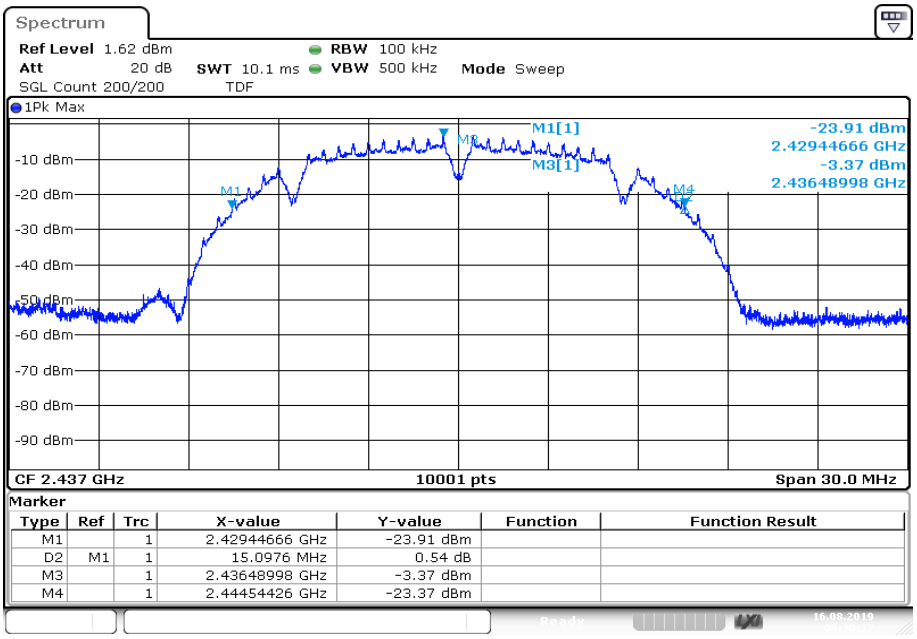
Plots: DSSS / b – mode; antenna port 2

Plot 1: Lowest channel



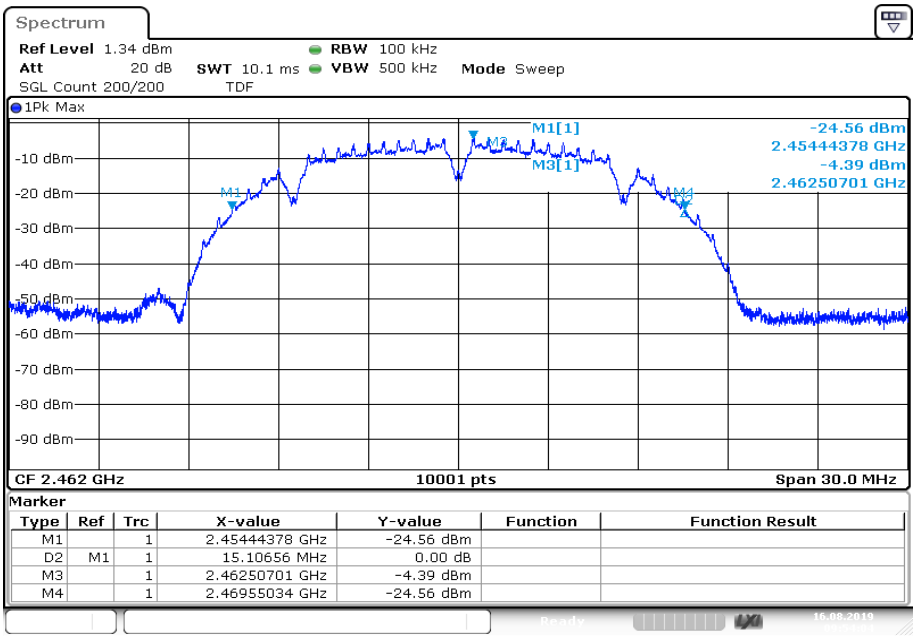
Date: 16.AUG.2019 09:12:18

Plot 2: Middle channel



Date: 16.AUG.2019 09:30:27

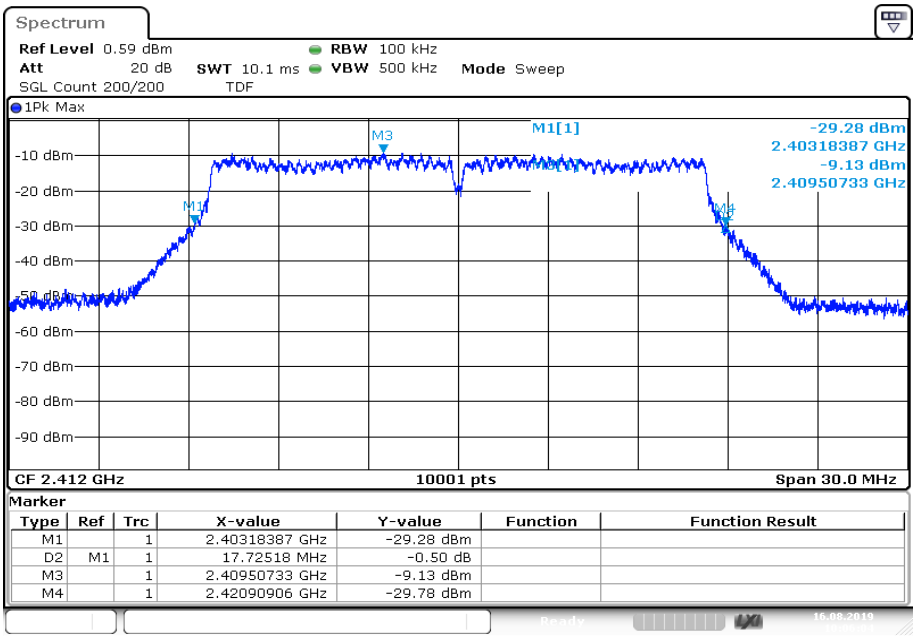
Plot 3: Highest channel



Date: 16.AUG.2019 09:54:04

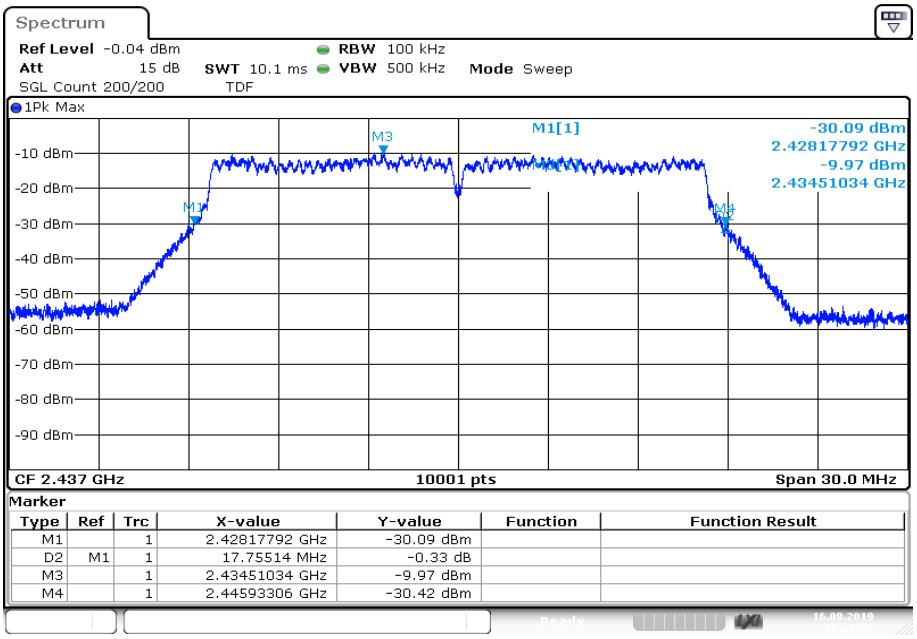
Plots: OFDM / g – mode; antenna port 2

Plot 1: Lowest channel



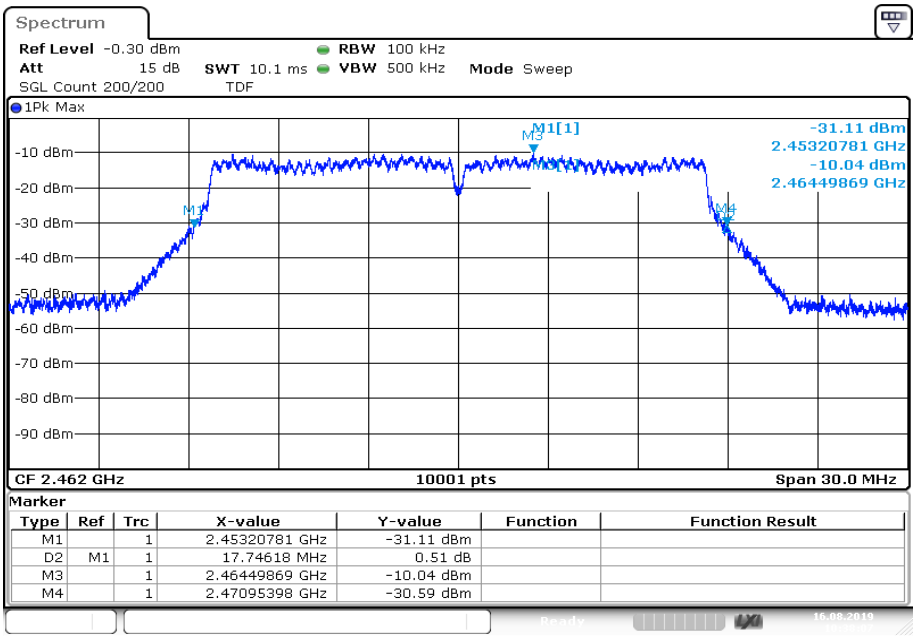
Date: 16.AUG.2019 10:06:04

Plot 2: Middle channel



Date: 16.AUG.2019 10:22:58

Plot 3: Highest channel



Date: 16.AUG.2019 10:38:08

12.9 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to the lowest channel for the lower restricted band and to the highest channel for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3 meter.

Measurement:

	Measurement parameter for peak measurements	Measurement parameter for average measurements
		According to DTS clause: 8.7.3
Detector	Peak	RMS
Sweep time	Auto	Auto
Resolution bandwidth	1 MHz	100 kHz
Video bandwidth	1 MHz	300 kHz
Span	See plot	2 MHz
Trace mode	Max. hold	RMS Average over 101 sweeps
Analyzer function	-/-	Band power function (Compute the power by integrating the spectrum over 1 MHz)
Test setup	See chapter 6:2 – A + C	
Measurement uncertainty	See chapter 8	

Limits:

FCC	IC
74 dBµV/m @ 3 m (Peak) 54 dBµV/m @ 3 m (AVG)	

Results: Antenna 1

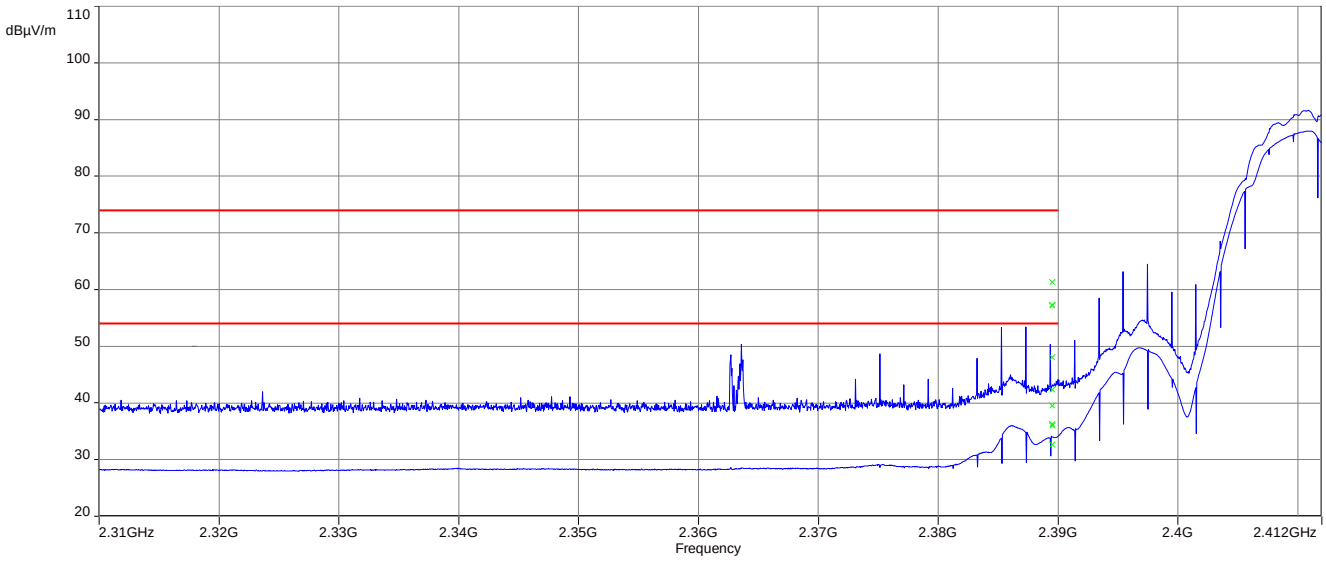
band edge compliance radiated / (dBµV / m) @ 3 m		
	DSSS	OFDM (20 MHz nominal channel bandwidth)
Lower band edge	61.3 (Peak) / 39.6 (AVG)	65.7 (Peak) / 49.4 (AVG)
Upper band edge	63.2 (Peak) / 53.4 (AVG)	65.8 (Peak) / 51.9 (AVG)

Results: Antenna 2

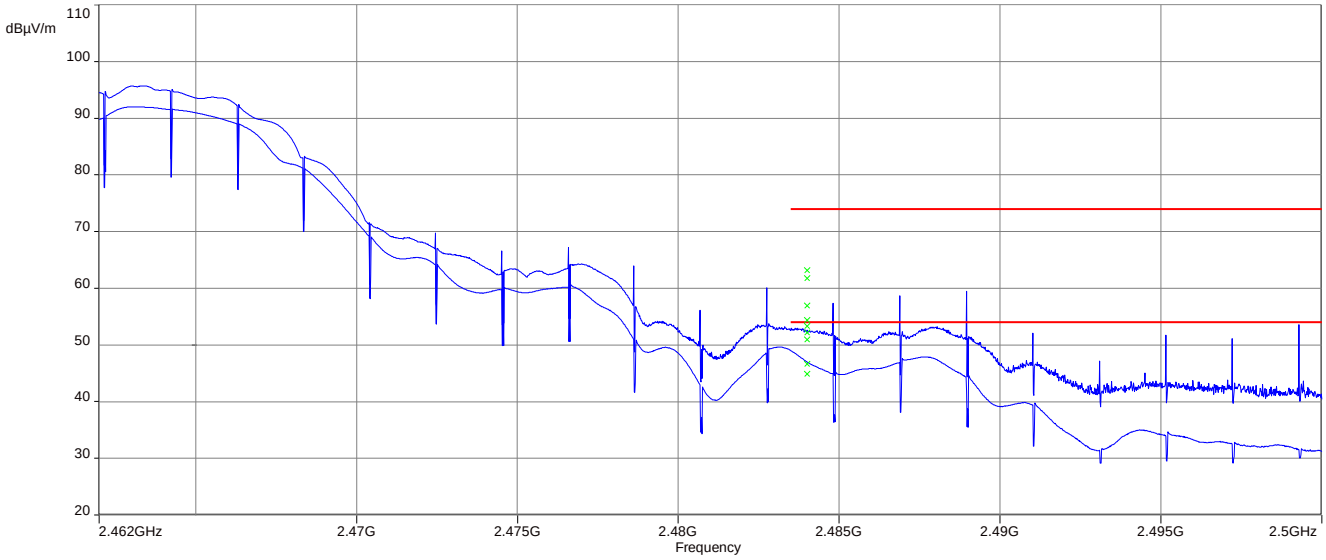
band edge compliance radiated / (dBµV / m) @ 3 m		
	DSSS	OFDM (20 MHz nominal channel bandwidth)
Lower band edge	59.1 (Peak) / 44.8 (AVG)	70.9 (Peak) / 51.8 (AVG)
Upper band edge	59.8 (Peak) / 39.3 (AVG)	62.7 (Peak) / 50.1 (AVG)

Plots: DSSS - peak / average – Antenna 1

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

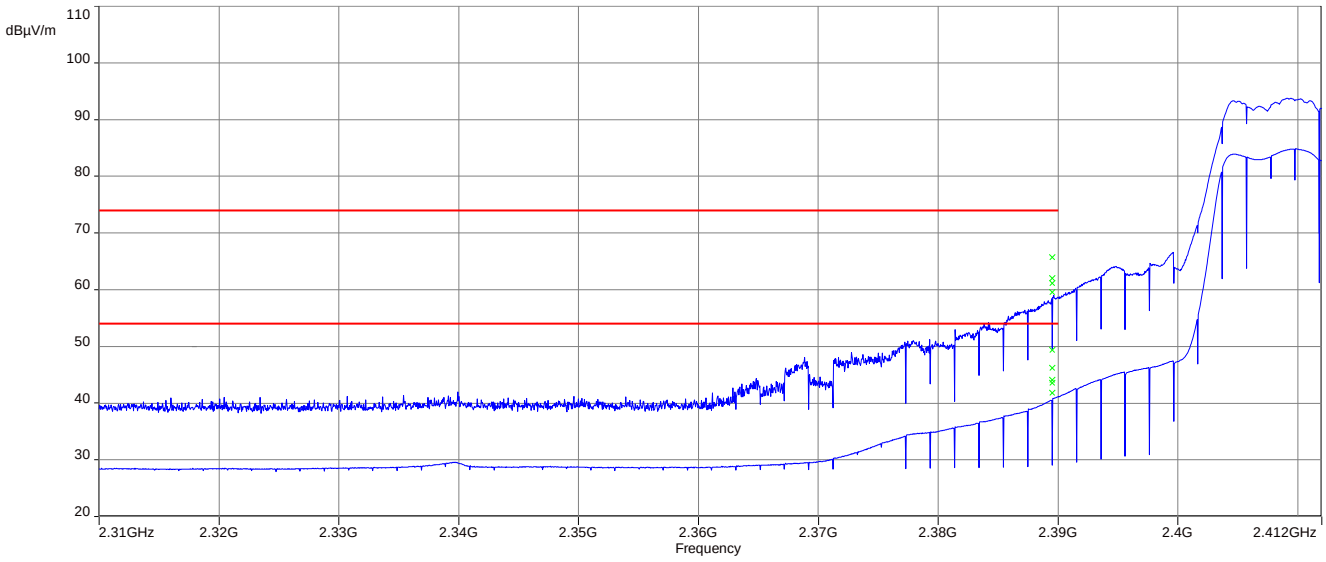


Plot 2: TX mode, upper band edge, vertical & horizontal polarization, antenna 1

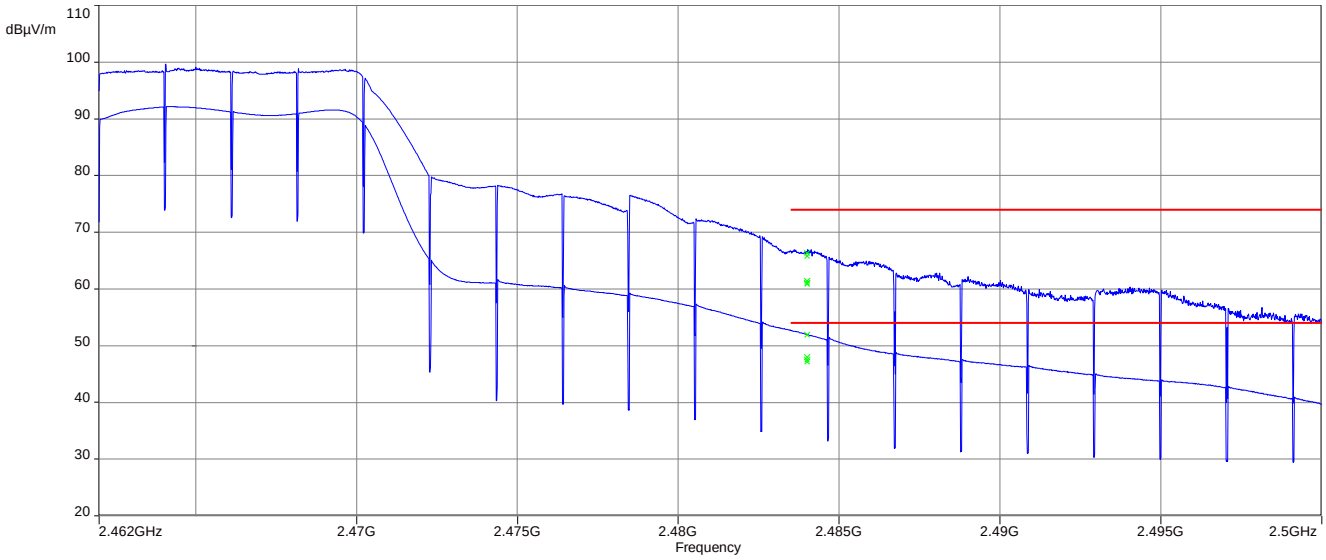


Plots: OFDM (20 MHz bandwidth) - peak / average – Antenna 1

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

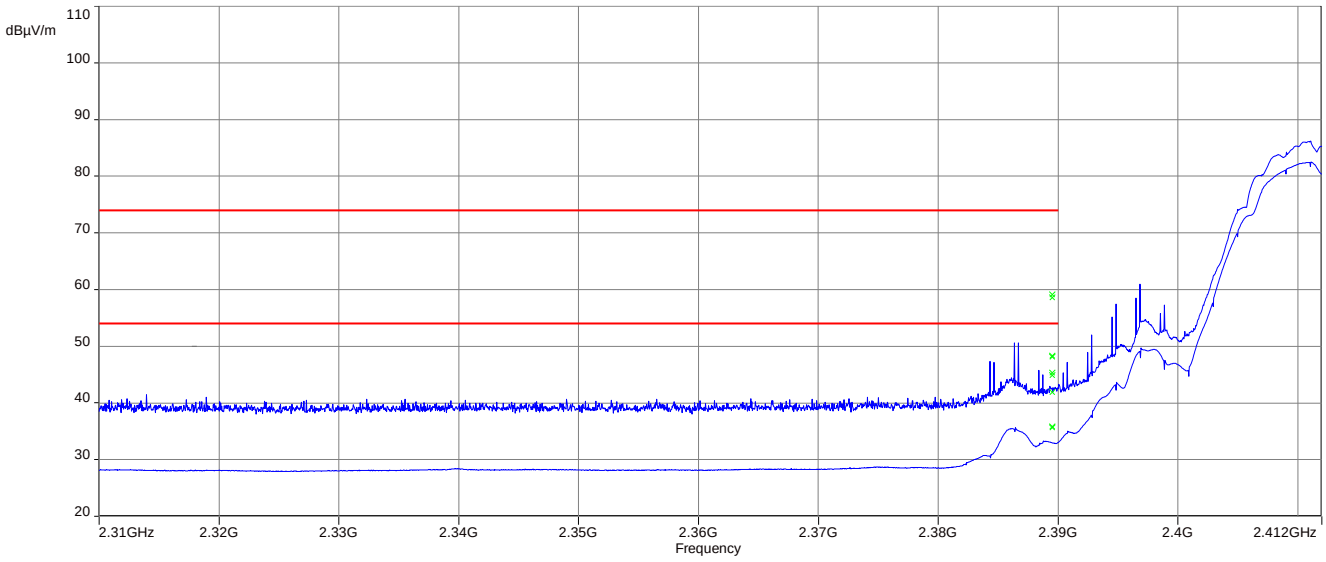


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

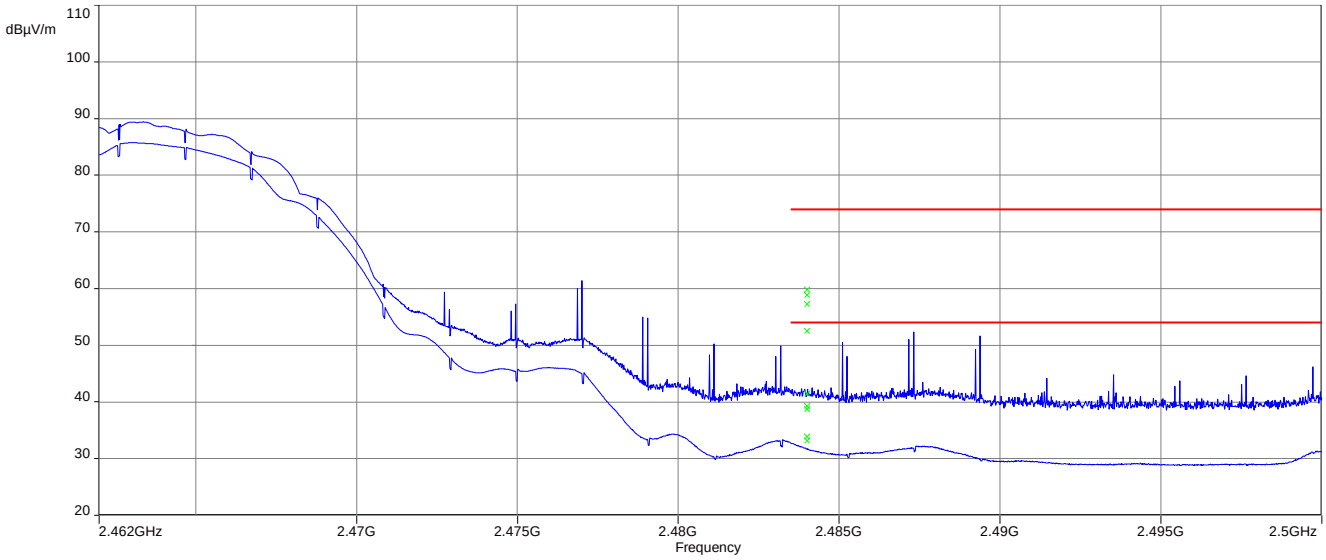


Plots: DSSS - peak / average – Antenna 2

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

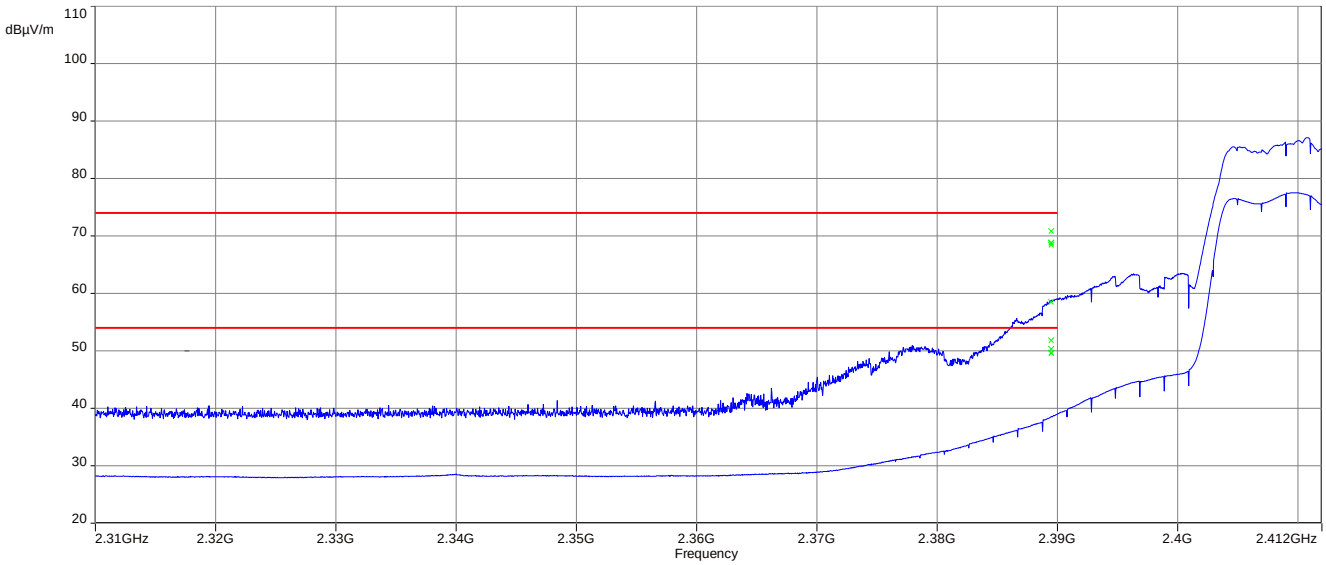


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

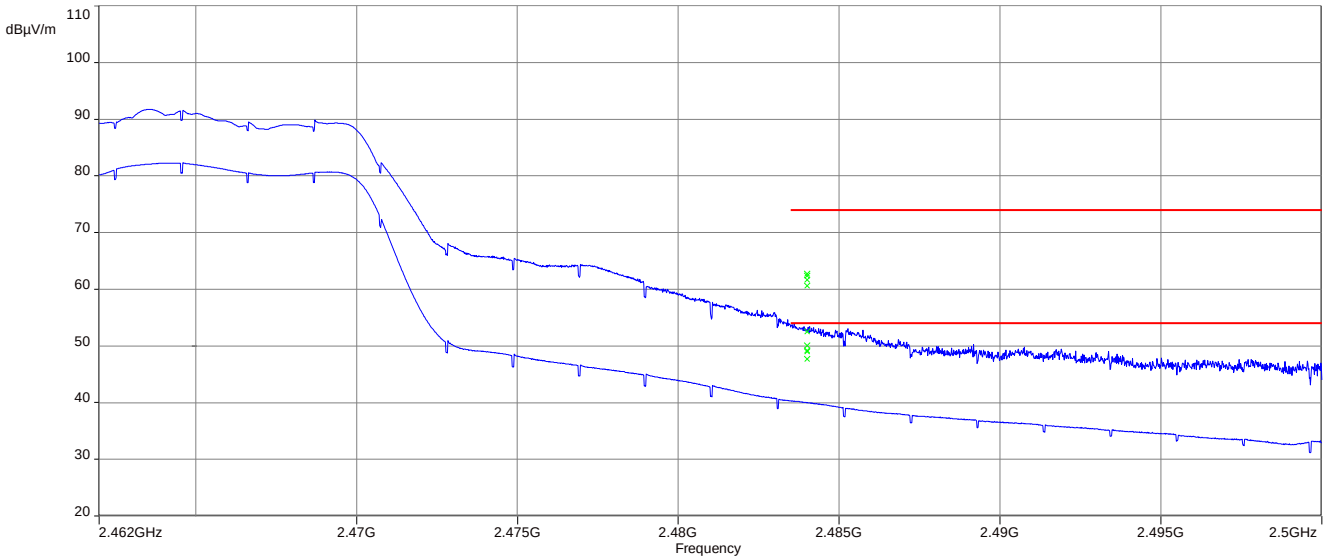


Plots: OFDM (20 MHz bandwidth) - peak / average – Antenna 2

Plot 1: TX mode, lower band edge, vertical & horizontal polarization



Plot 2: TX mode, upper band edge, vertical & horizontal polarization



12.10 Spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at the lowest; the middle and the highest channel. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	500 kHz
Span	9 kHz to 25 GHz
Trace mode	Max Hold
Test setup	See chapter 6.4 A
Measurement uncertainty	See chapter 8

Limits:

FCC	IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required	

Results: DSSS / b – mode; antenna port 1

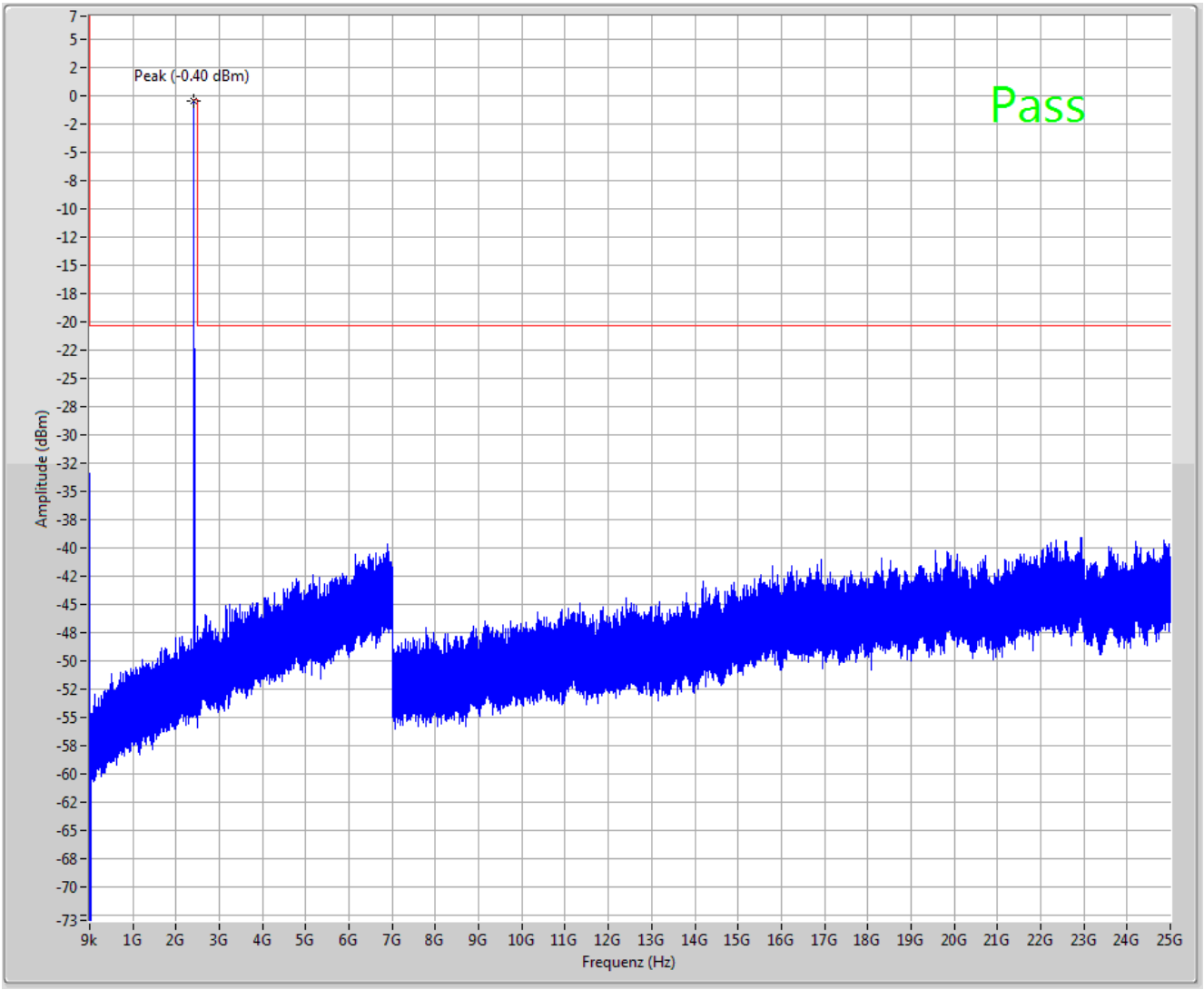
TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Lowest channel		-0.4	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Middle channel		5.04	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Highest channel		-1.84	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant

Results: OFDM / g – mode; antenna port 1

TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Lowest channel		-3.25	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Middle channel		1.88	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Highest channel		-5.48	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant

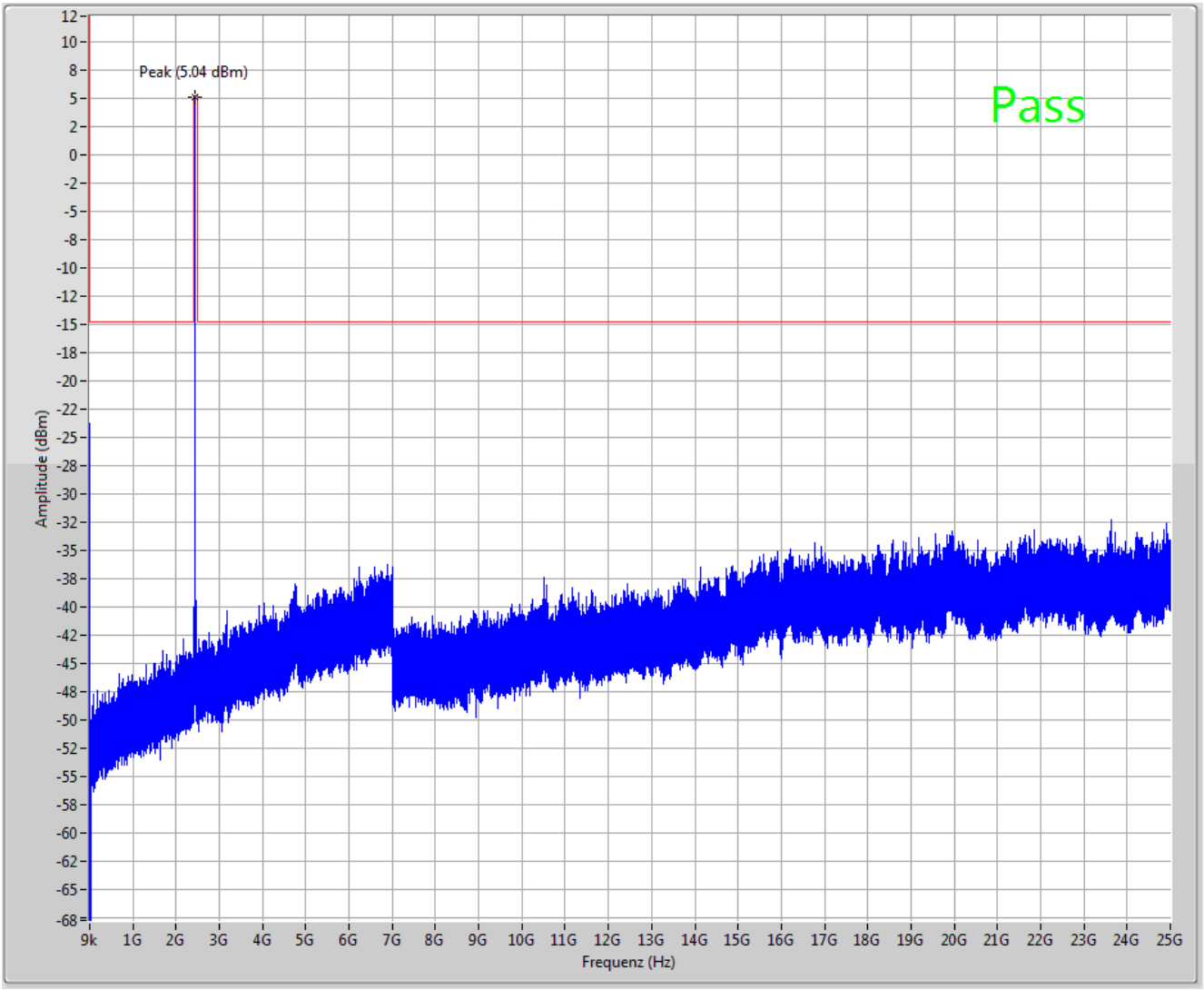
Plots: DSSS / b – mode; antenna port 1

Plot 1: Lowest channel, up to 25 GHz



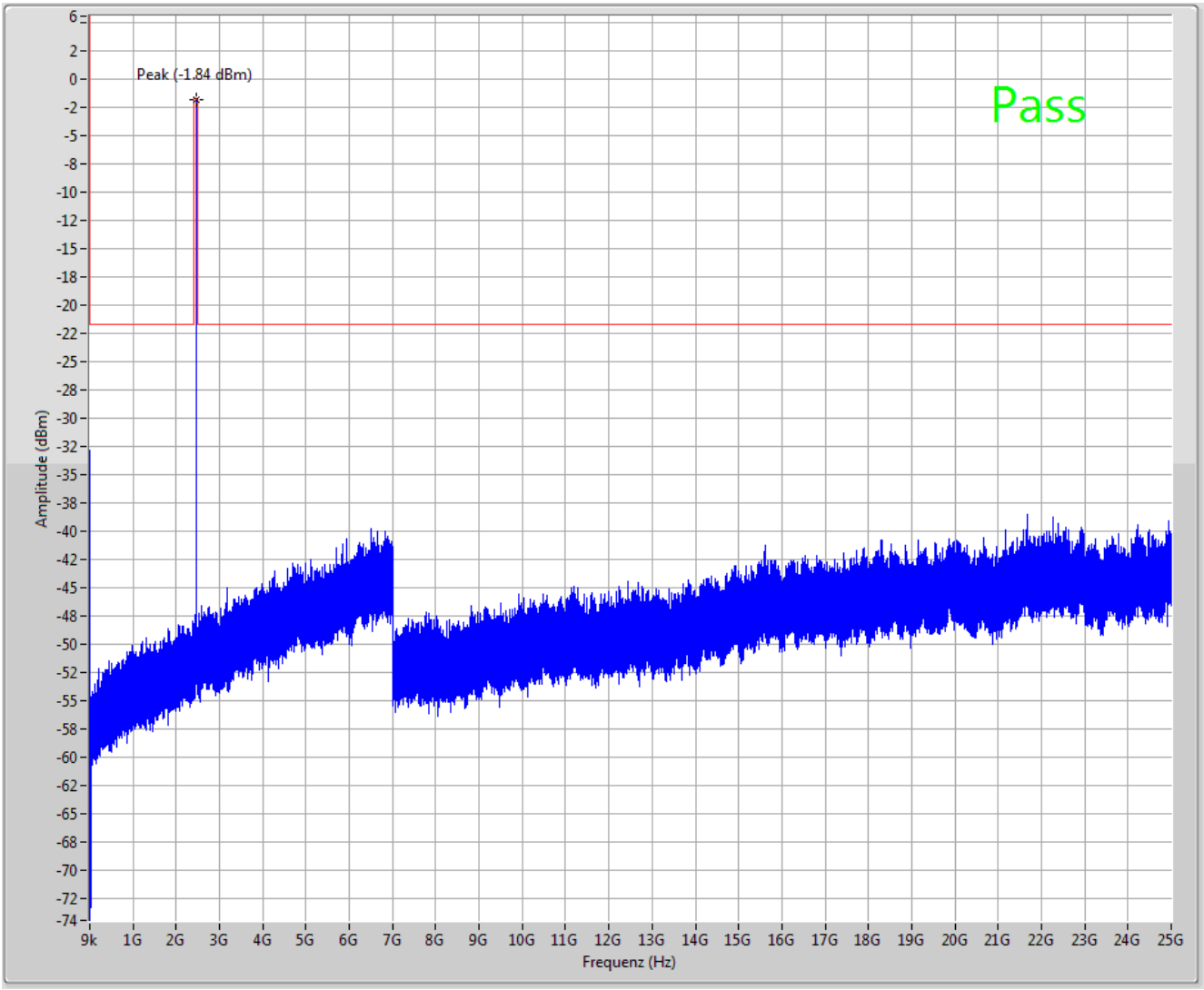
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

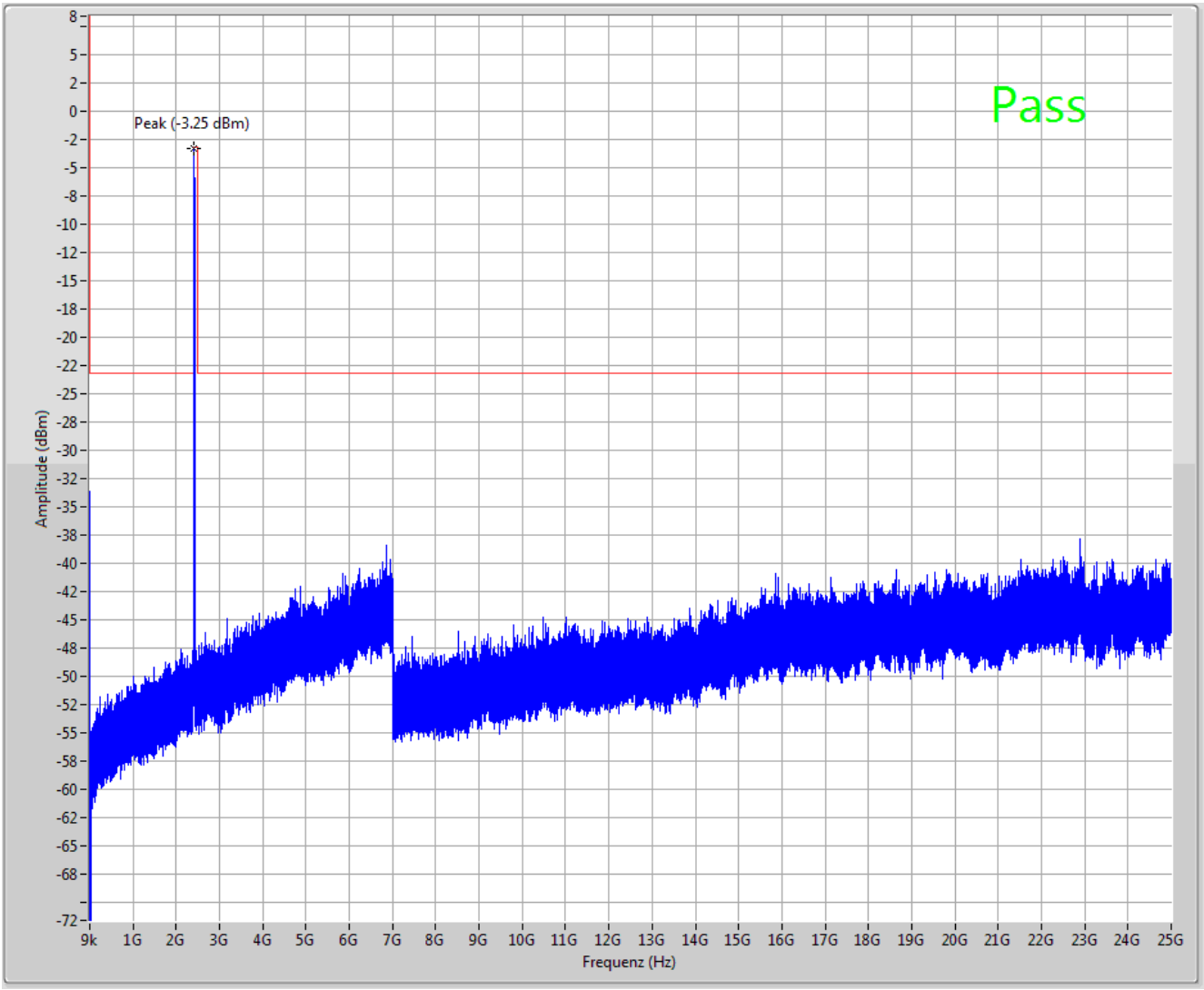
Plot 3: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

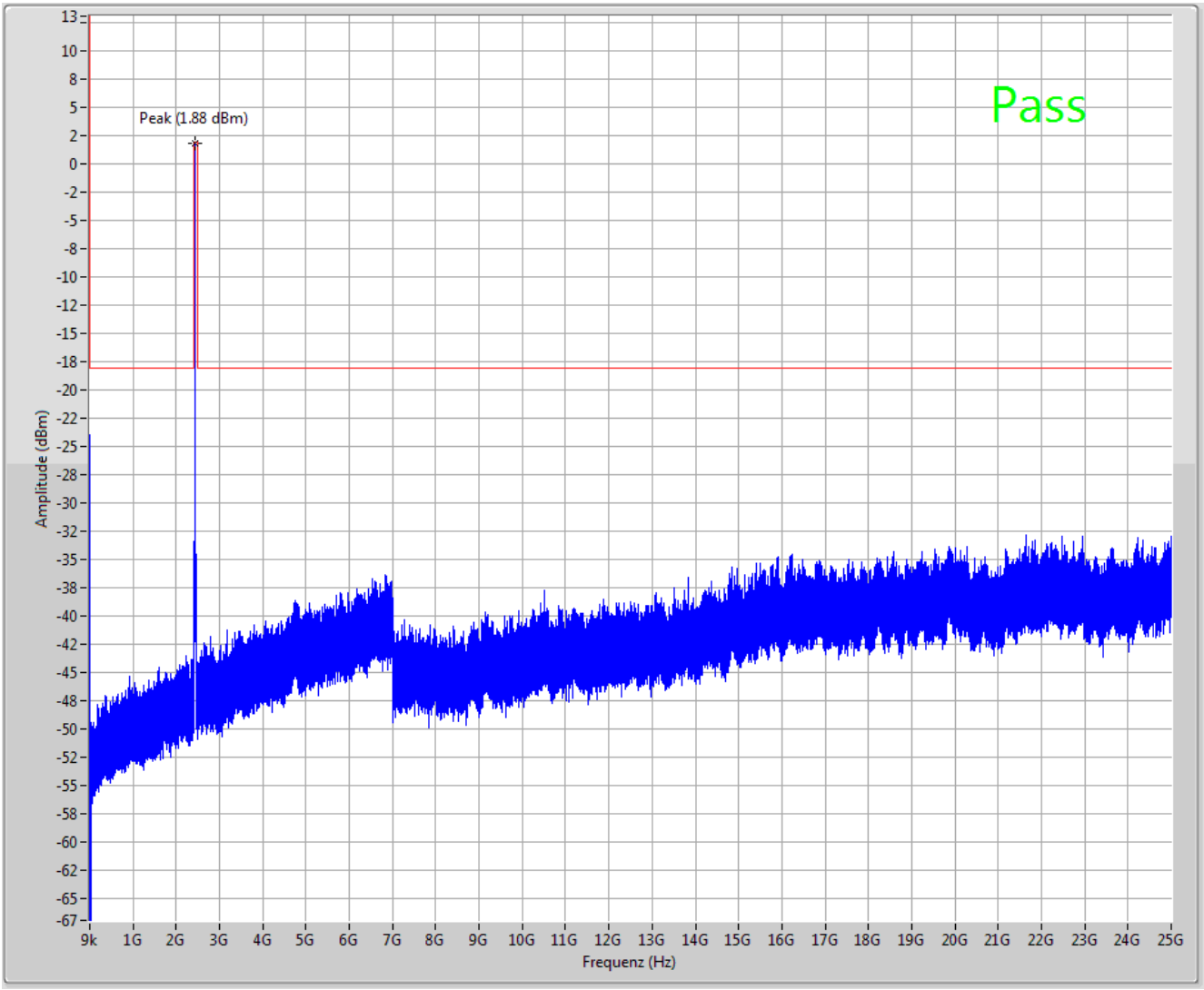
Plots: OFDM / g – mode; antenna port 1

Plot 1: Lowest channel, up to 25 GHz



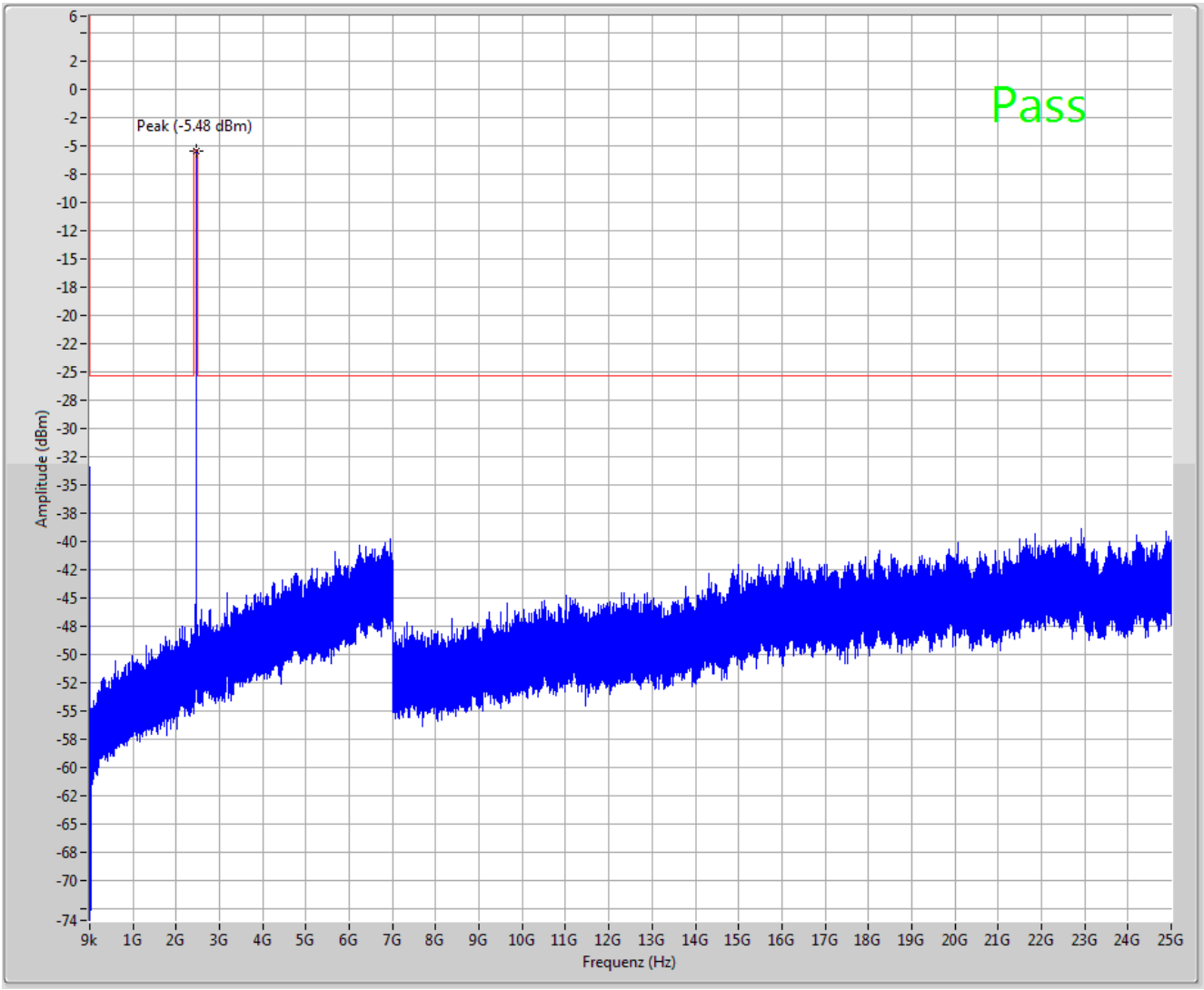
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

Plot 3: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

Results: DSSS / b – mode; antenna port 2

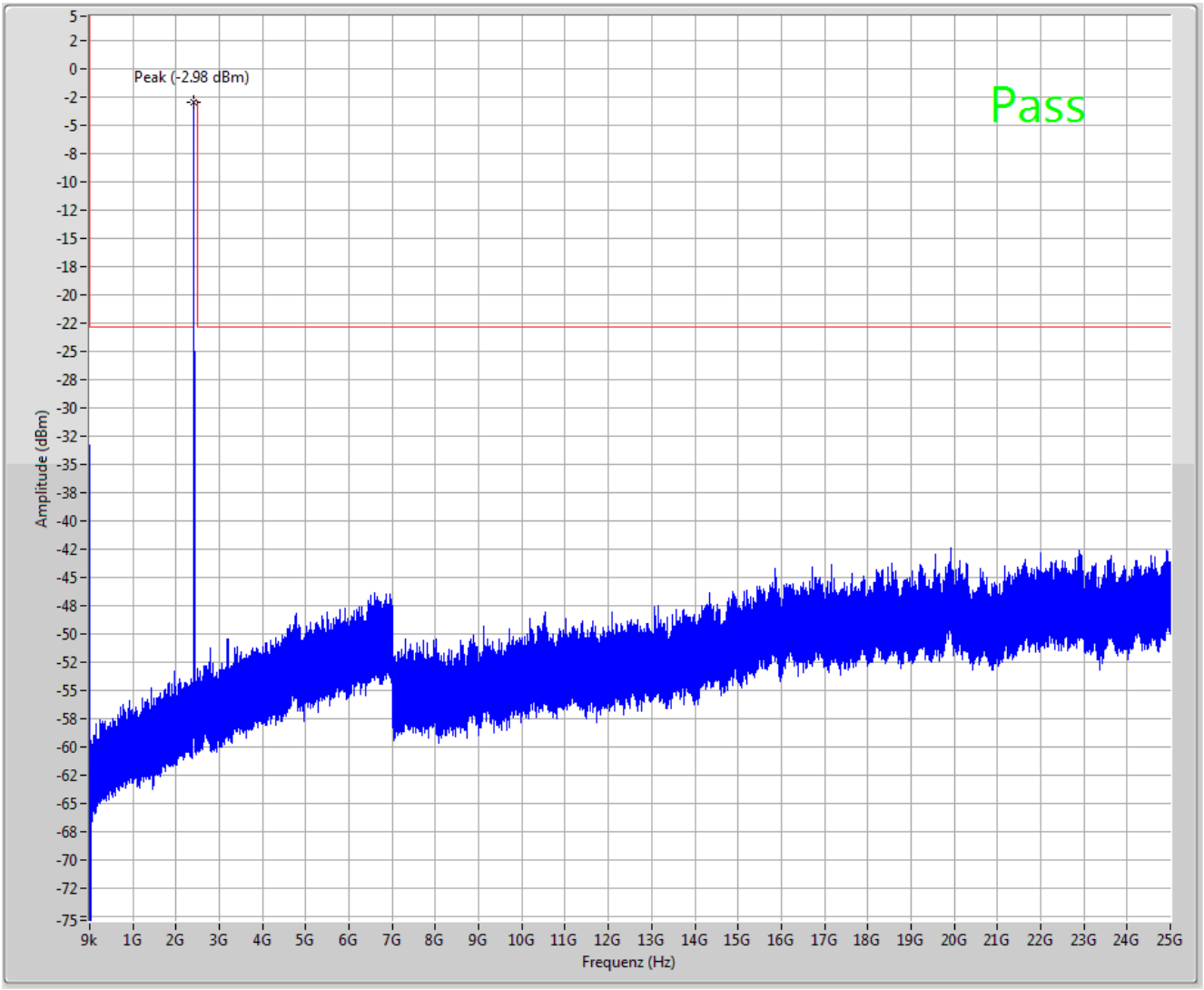
TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Lowest channel		-2.98	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Middle channel		-4.45	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Highest channel		-4.56	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant

Results: OFDM / g – mode; antenna port 2

TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Lowest channel		-9.71	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Middle channel		-11.10	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant
Highest channel		-10.78	30 dBm	-/-	Operating frequency
All detected emissions are below the -20 dBc.			-20 dBc (peak) -30 dBc (average)	-/-	compliant

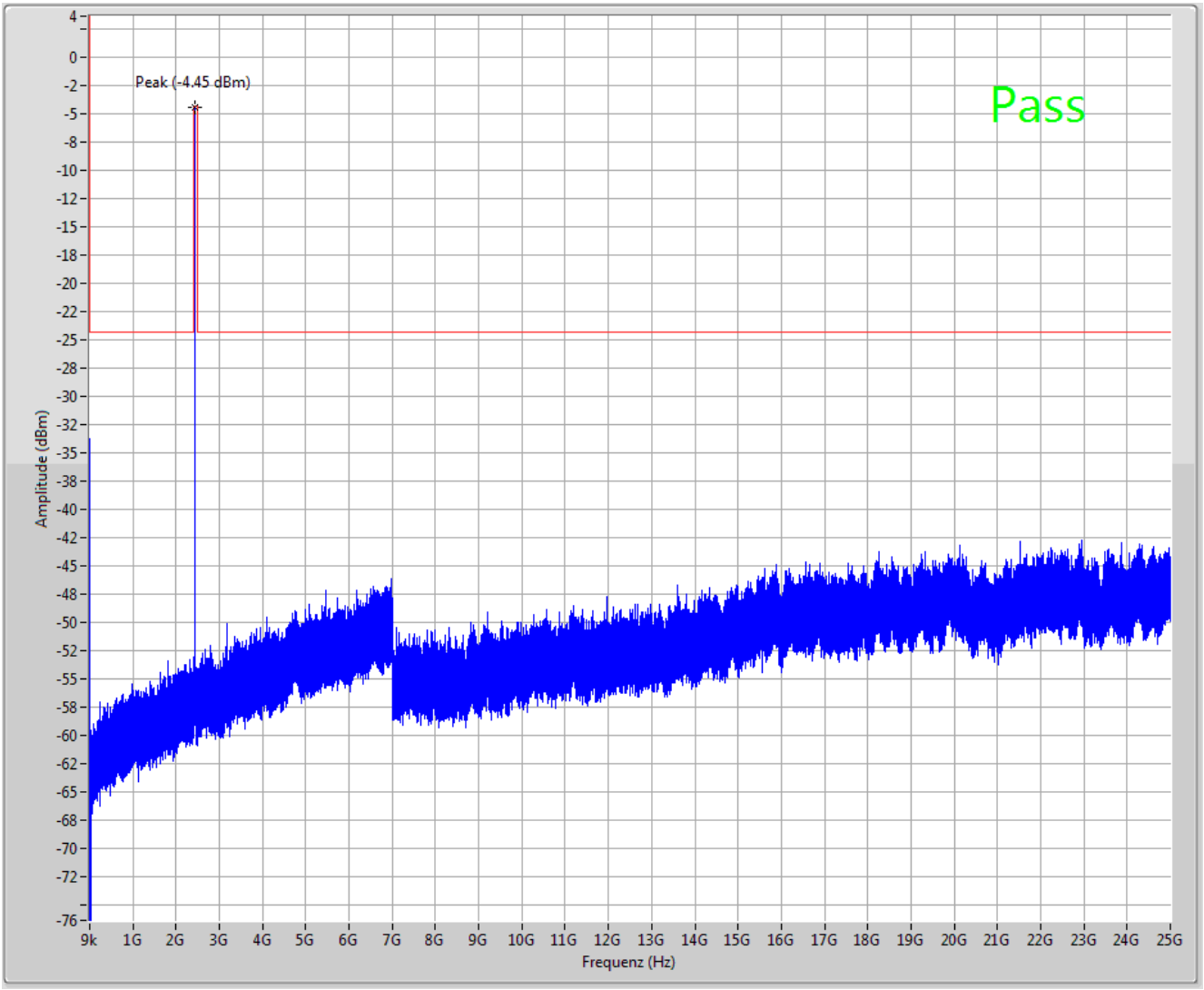
Plots: DSSS / b – mode; antenna port 2

Plot 1: Lowest channel, up to 25 GHz



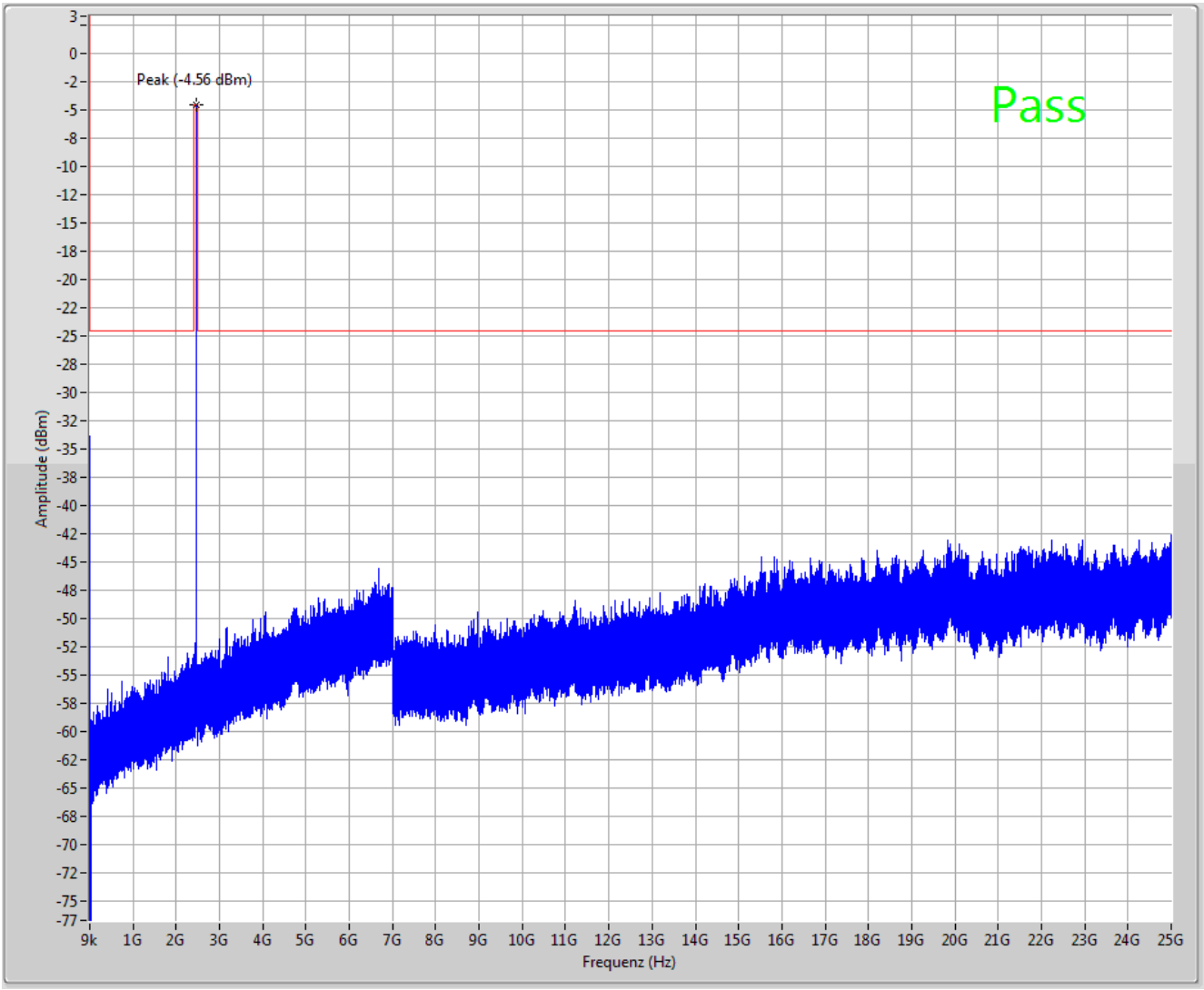
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

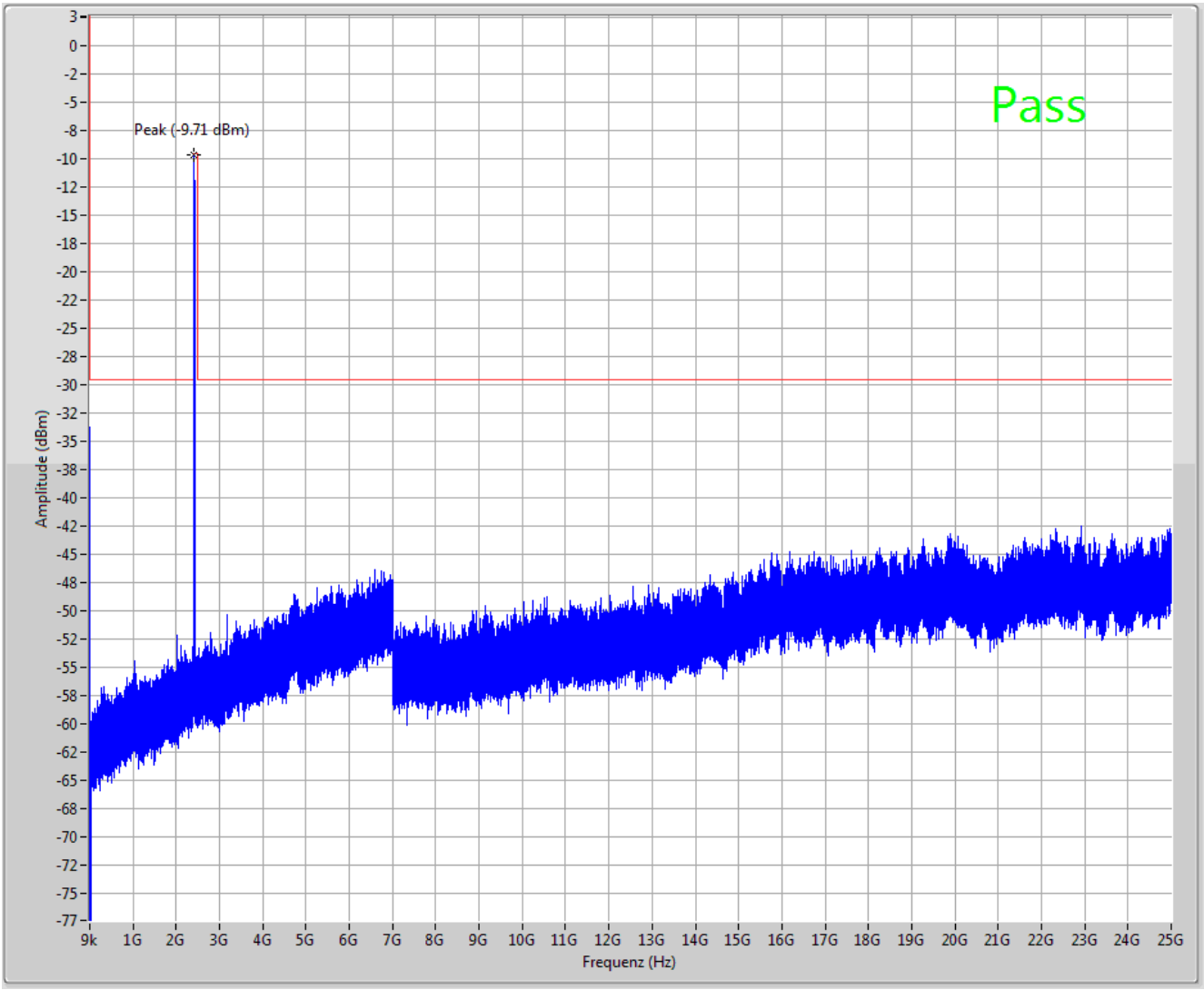
Plot 3: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

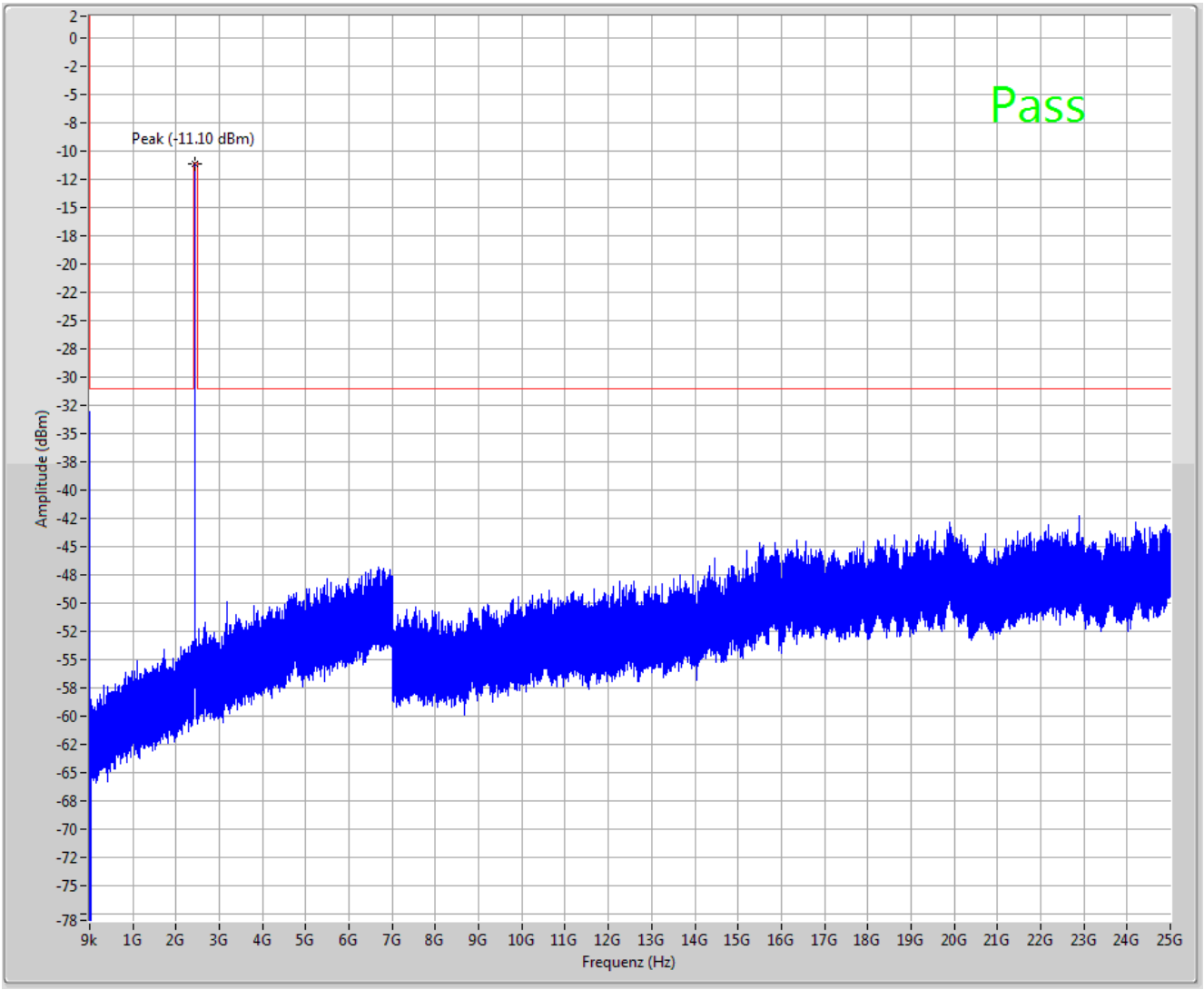
Plots: OFDM / g – mode; antenna port 2

Plot 1: Lowest channel, up to 25 GHz



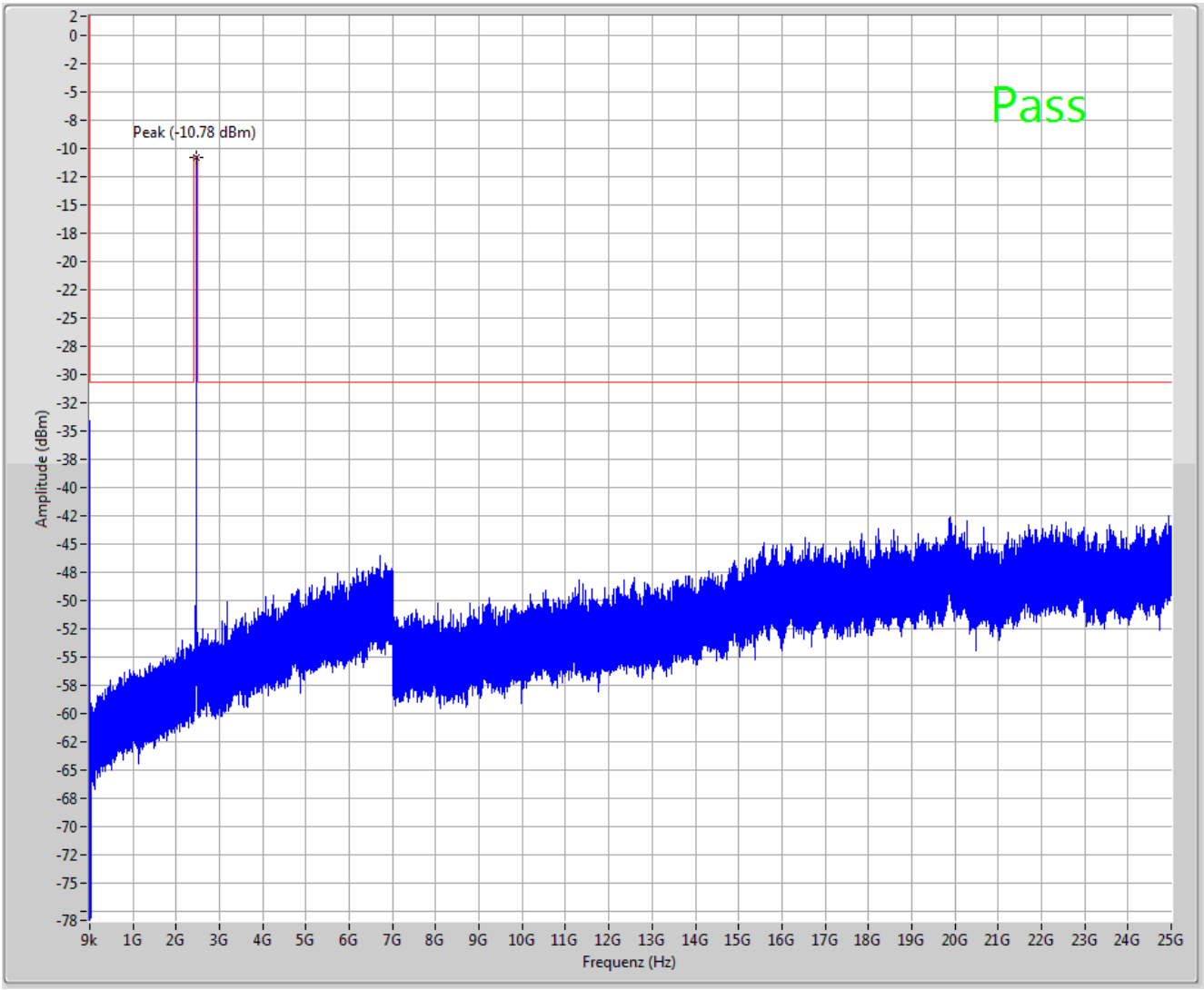
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Middle channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

Plot 3: Highest channel, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

12.11 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector	Peak / Quasi Peak
Sweep time	Auto
Resolution bandwidth	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span	9 kHz to 30 MHz
Trace mode	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☐ OFDM n HT20 – mode ☐ OFDM n HT40 – mode
Test setup	See chapter 6.2 – A + B
Measurement uncertainty	See chapter 8

Limits:

FCC		IC
Frequency / MHz	Field Strength / (dBµV / m)	Measurement distance / m
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results: Antenna 1

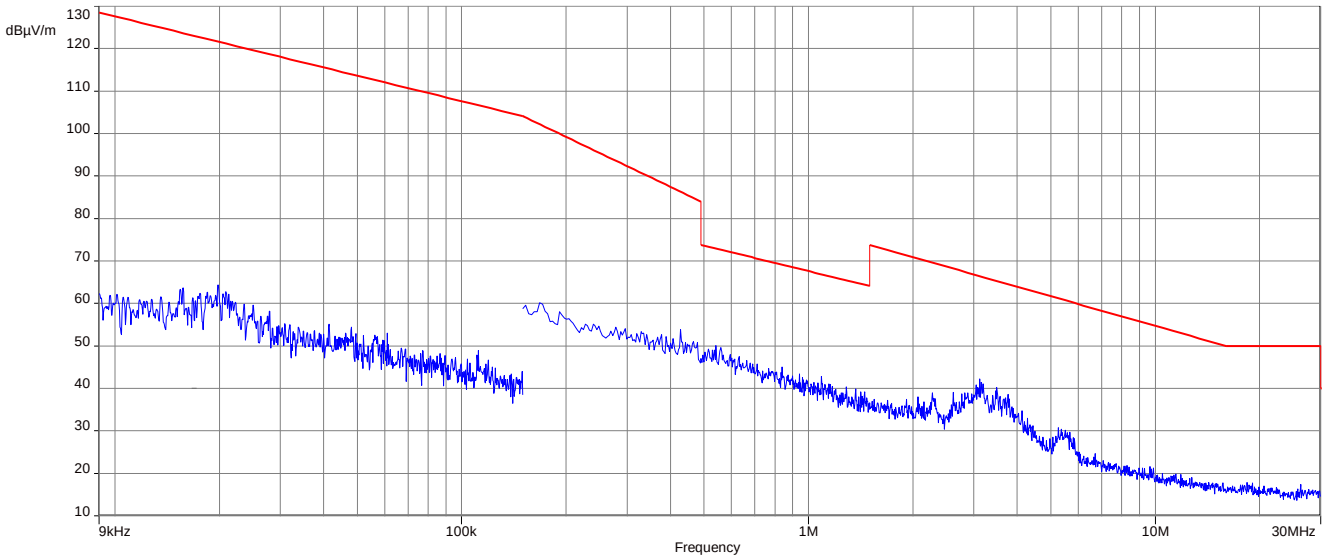
TX spurious emissions radiated < 30 MHz / (dBµV / m) @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.		

Results: Antenna 2

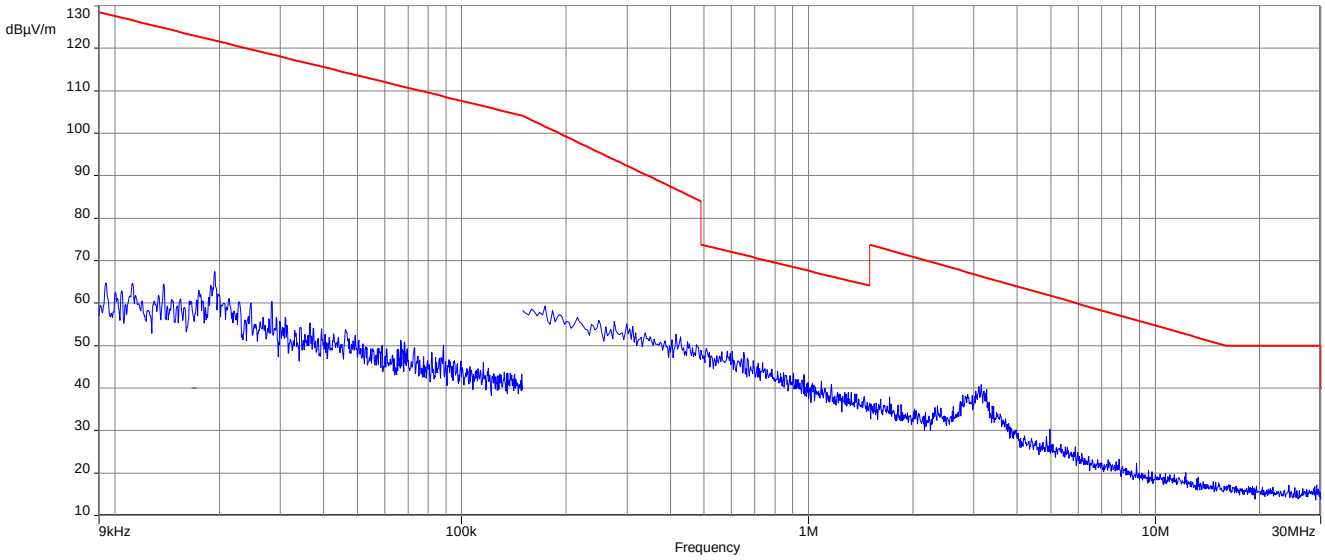
TX spurious emissions radiated < 30 MHz / (dBµV / m) @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.		

Plots: DSSS – Antenna 1

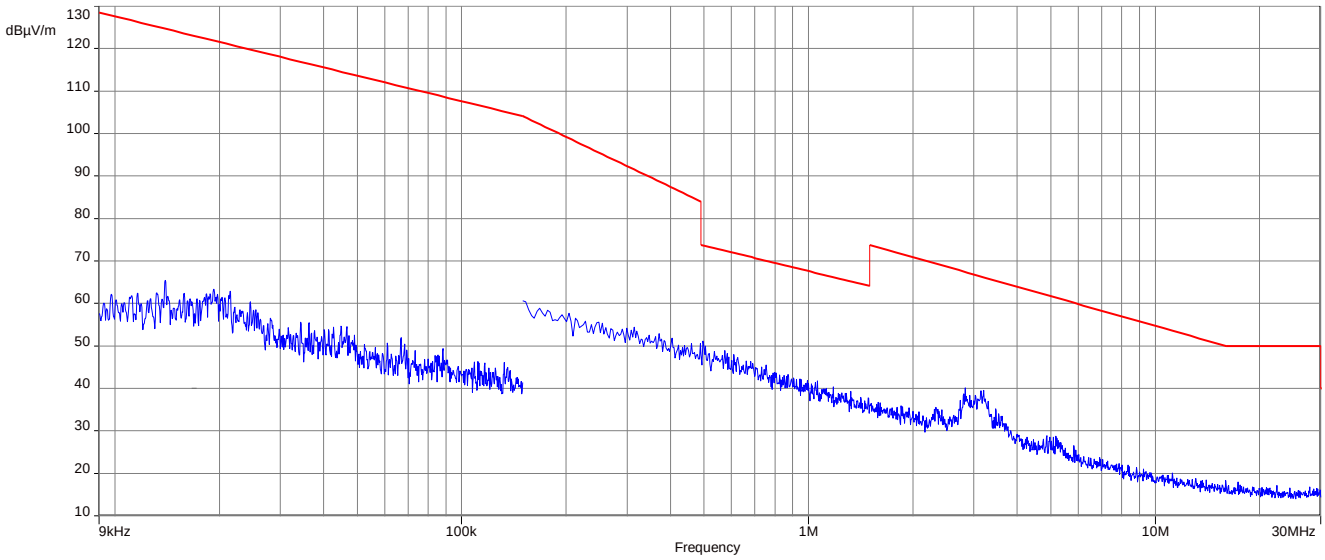
Plot 1: 9 kHz to 30 MHz, lowest channel



Plot 2: 9 kHz to 30 MHz, middle channel

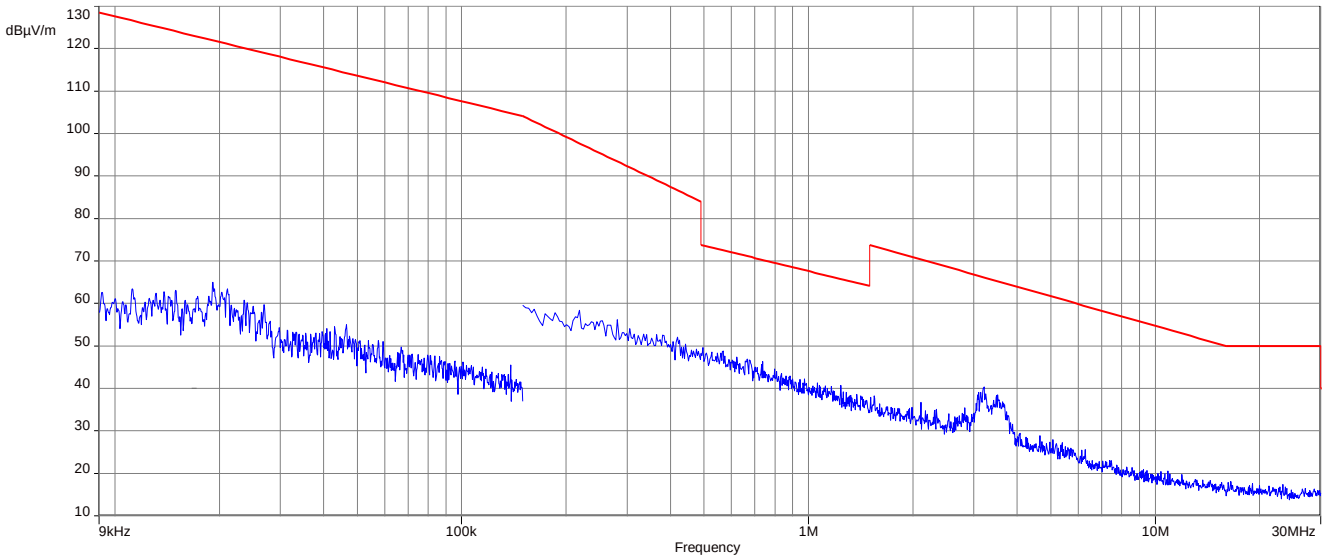


Plot 3: 9 kHz to 30 MHz, highest channel

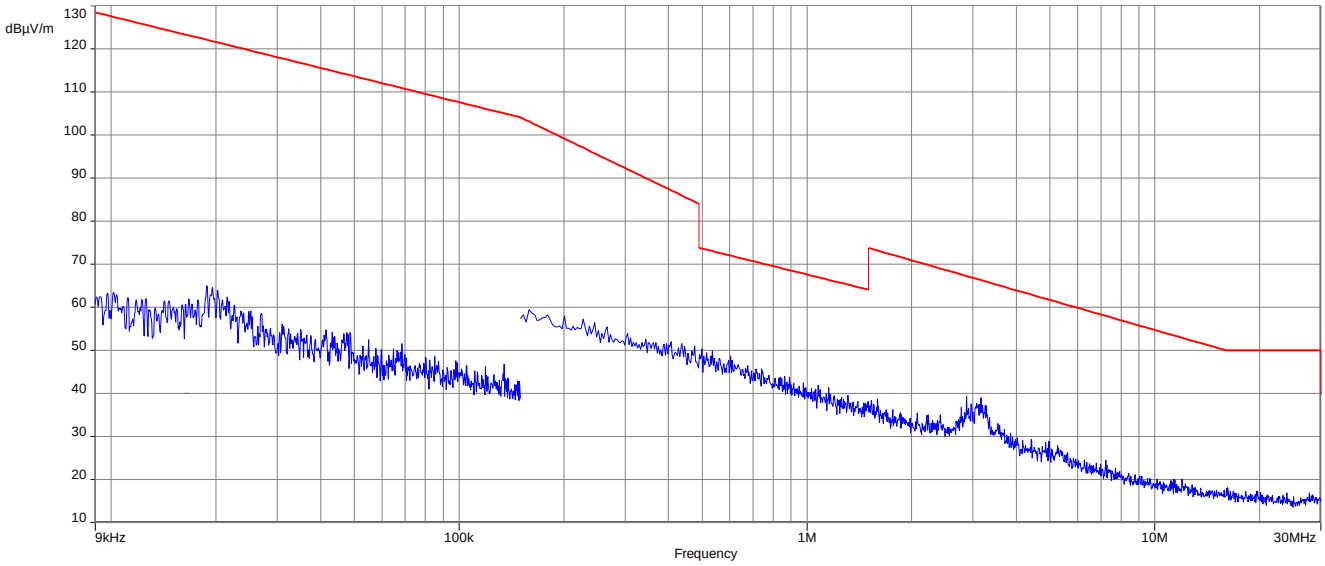


Plots: OFDM (20 MHz nominal channel bandwidth) – Antenna 1

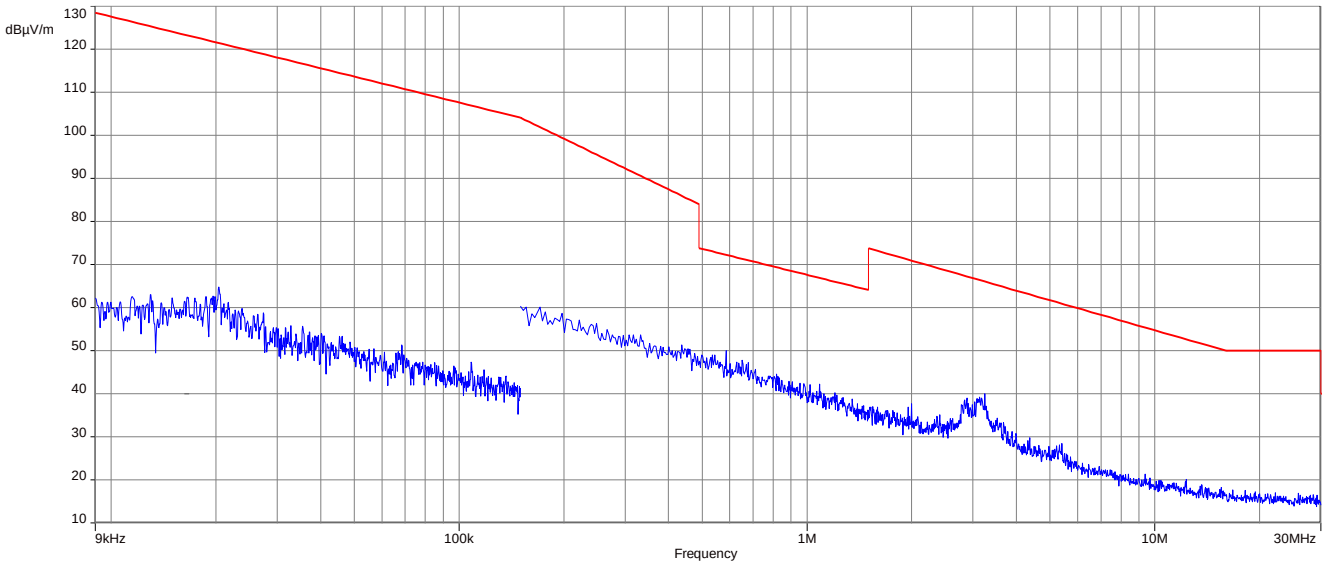
Plot 1: 9 kHz to 30 MHz, lowest channel



Plot 2: 9 kHz to 30 MHz, middle channel

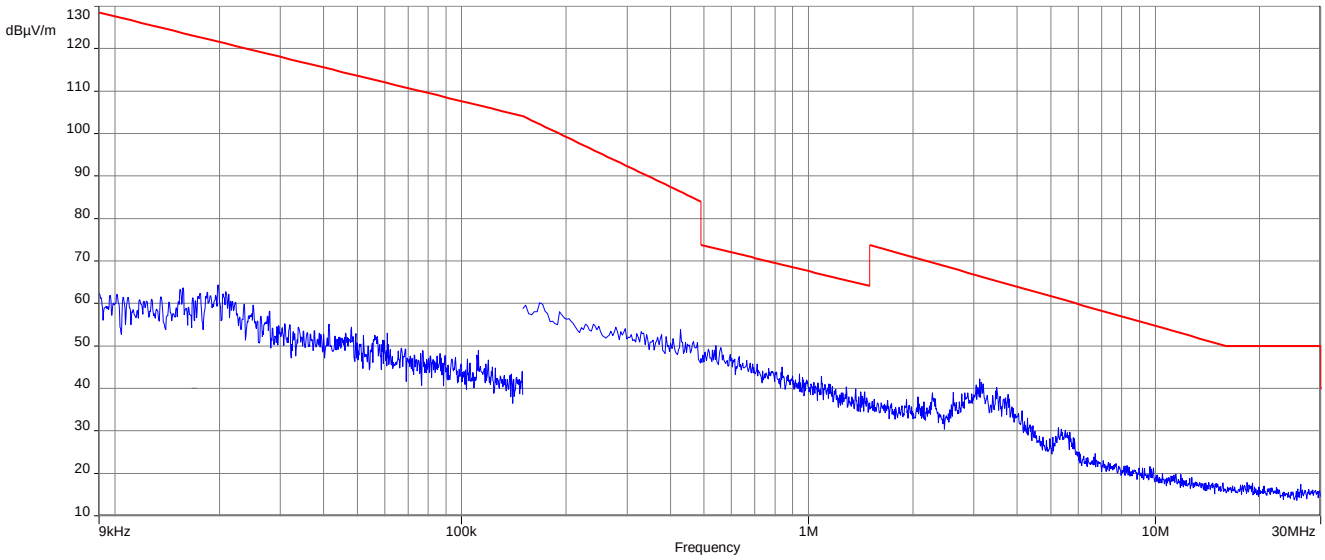


Plot 3: 9 kHz to 30 MHz, highest channel

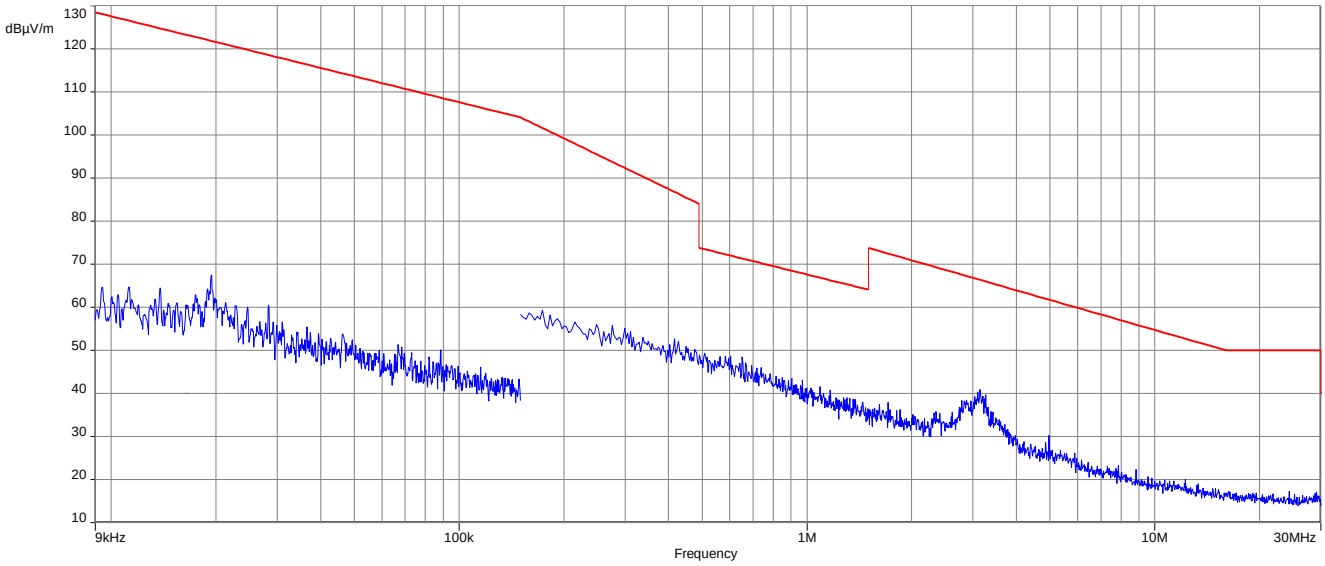


Plots: DSSS – Antenna 2

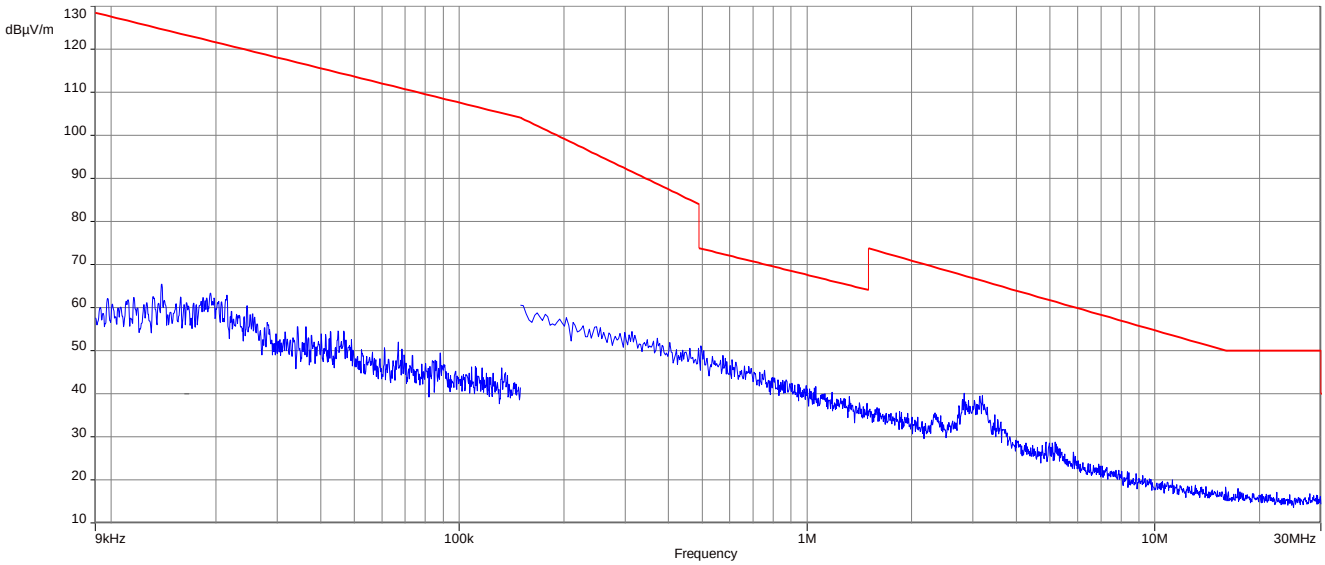
Plot 1: 9 kHz to 30 MHz, lowest channel



Plot 2: 9 kHz to 30 MHz, middle channel

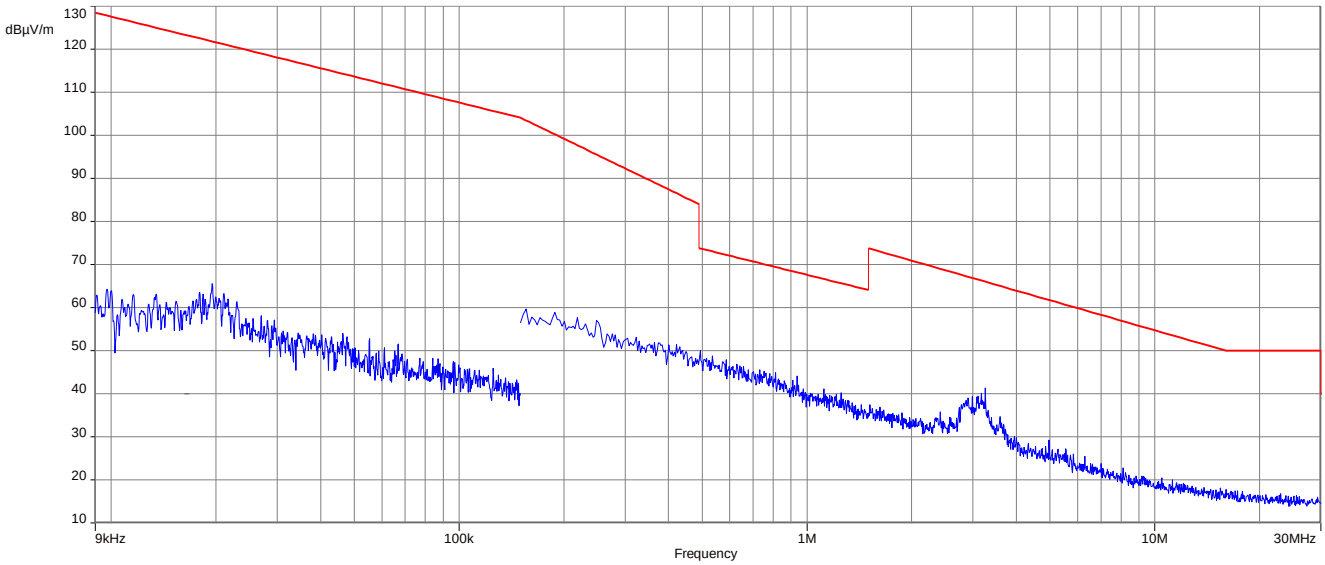


Plot 3: 9 kHz to 30 MHz, highest channel

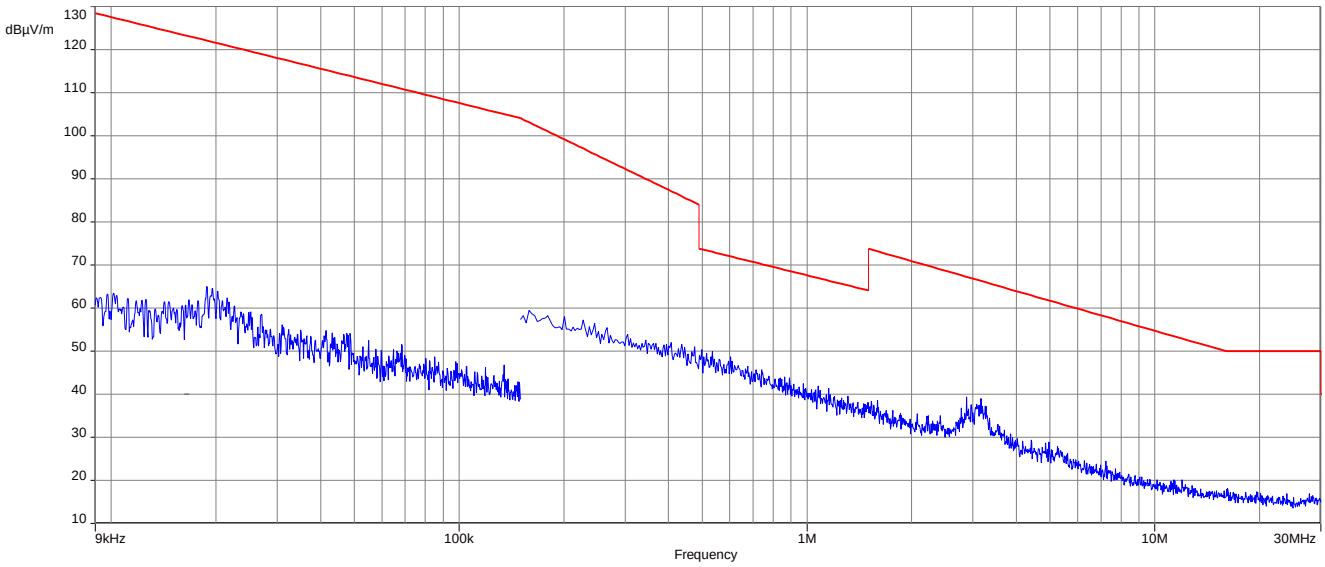


Plots: OFDM (20 MHz nominal channel bandwidth) – Antenna 2

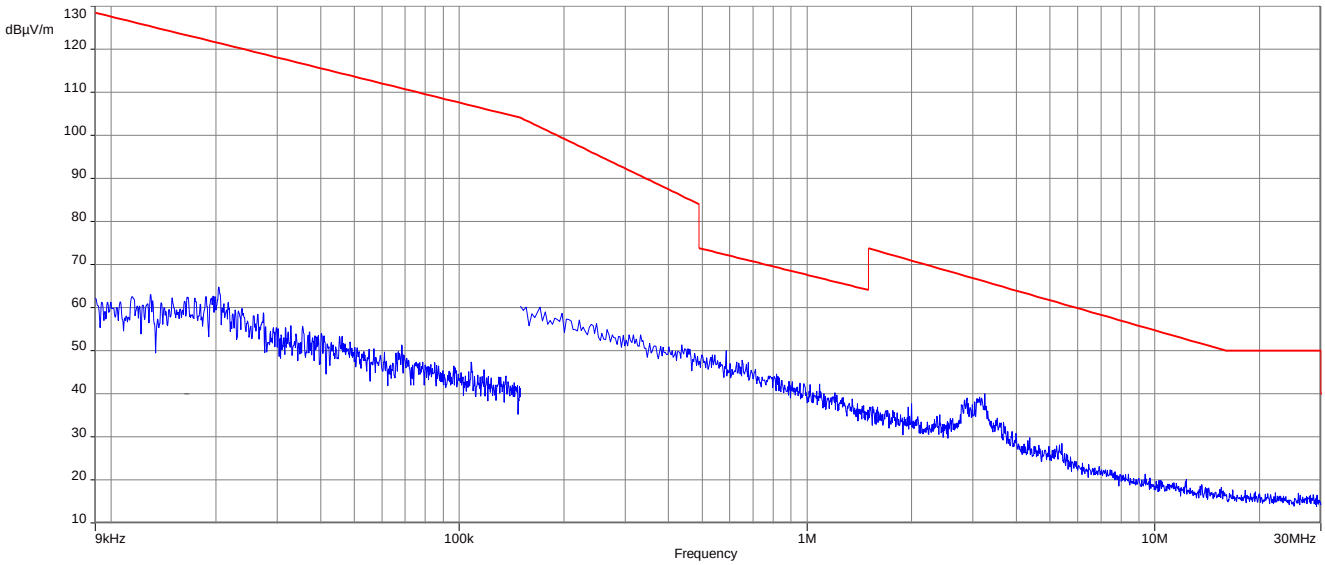
Plot 1: 9 kHz to 30 MHz, lowest channel



Plot 2: 9 kHz to 30 MHz, middle channel



Plot 3: 9 kHz to 30 MHz, highest channel



12.12 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

Measurement:

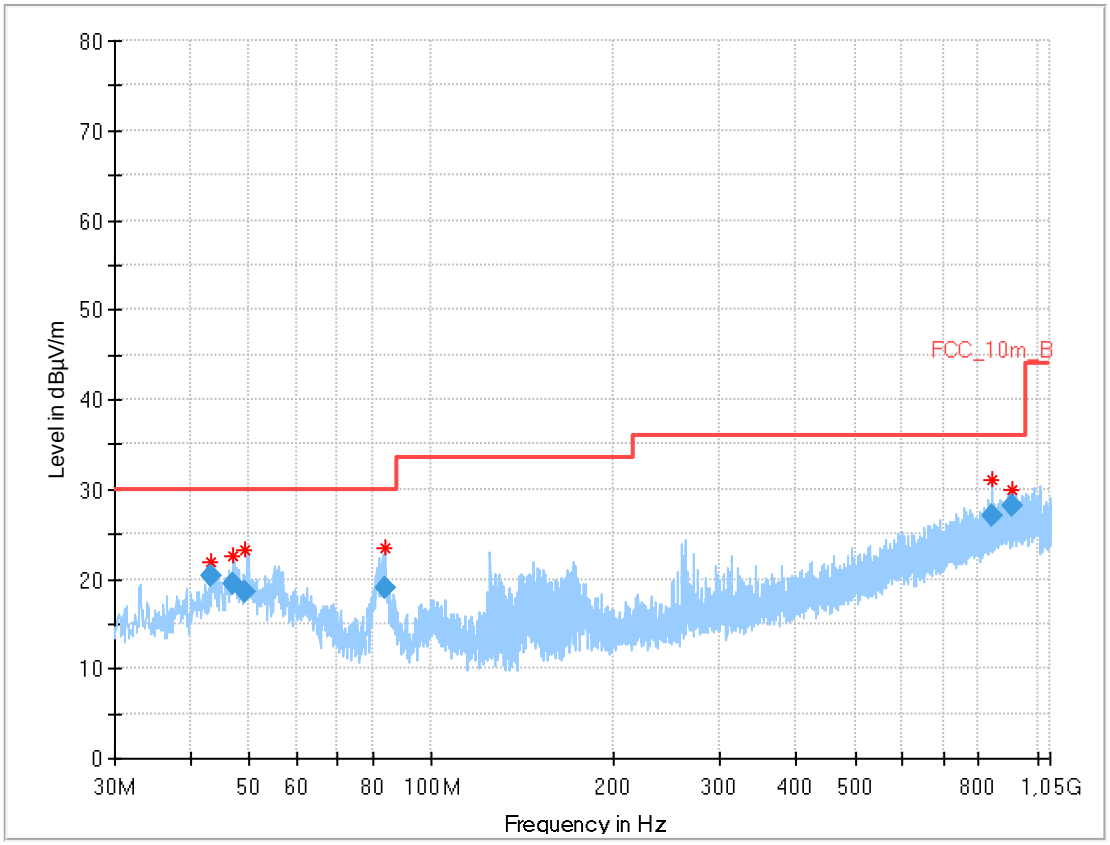
Measurement parameter	
Detector	Peak / Quasi Peak
Sweep time	Auto
Resolution bandwidth	120 kHz
Video bandwidth	3 x RBW
Span	30 MHz to 1 GHz
Trace mode	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☐ OFDM n HT20 – mode ☐ OFDM n HT40 – mode ☐ RX / Idle – mode
Test setup	See chapter 6.1 - A
Measurement uncertainty	See chapter 8

Limits:

FCC		IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency / MHz	Field Strength / (dBµV / m)	Measurement distance / m
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10

Plot: DSSS – Antenna 1

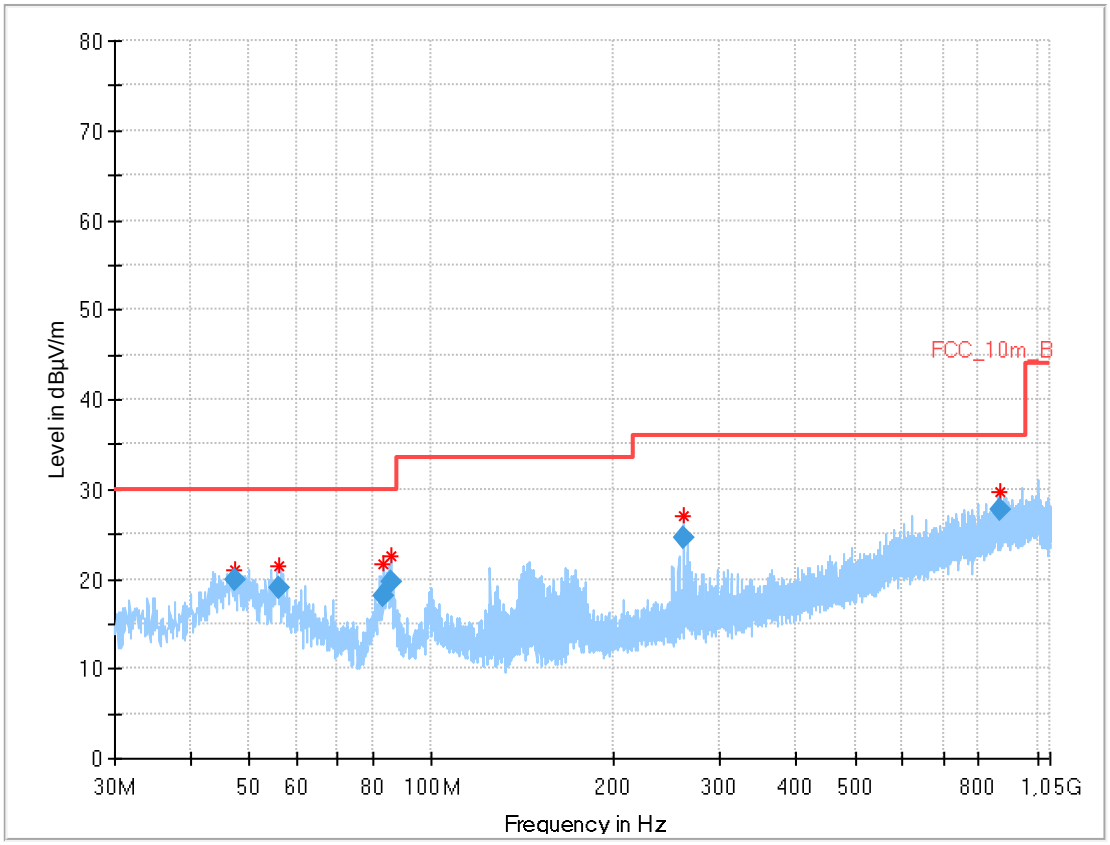
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, lowest channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.213	20.31	30.0	9.69	1000	120	101.0	V	292.0	15
46.848	19.55	30.0	10.45	1000	120	101.0	V	260.0	15
49.320	18.55	30.0	11.45	1000	120	101.0	V	68.0	15
83.591	19.05	30.0	10.95	1000	120	147.0	V	79.0	11
841.880	27.09	36.0	8.91	1000	120	170.0	H	22.0	23
909.134	28.11	36.0	7.89	1000	120	170.0	H	169.0	24

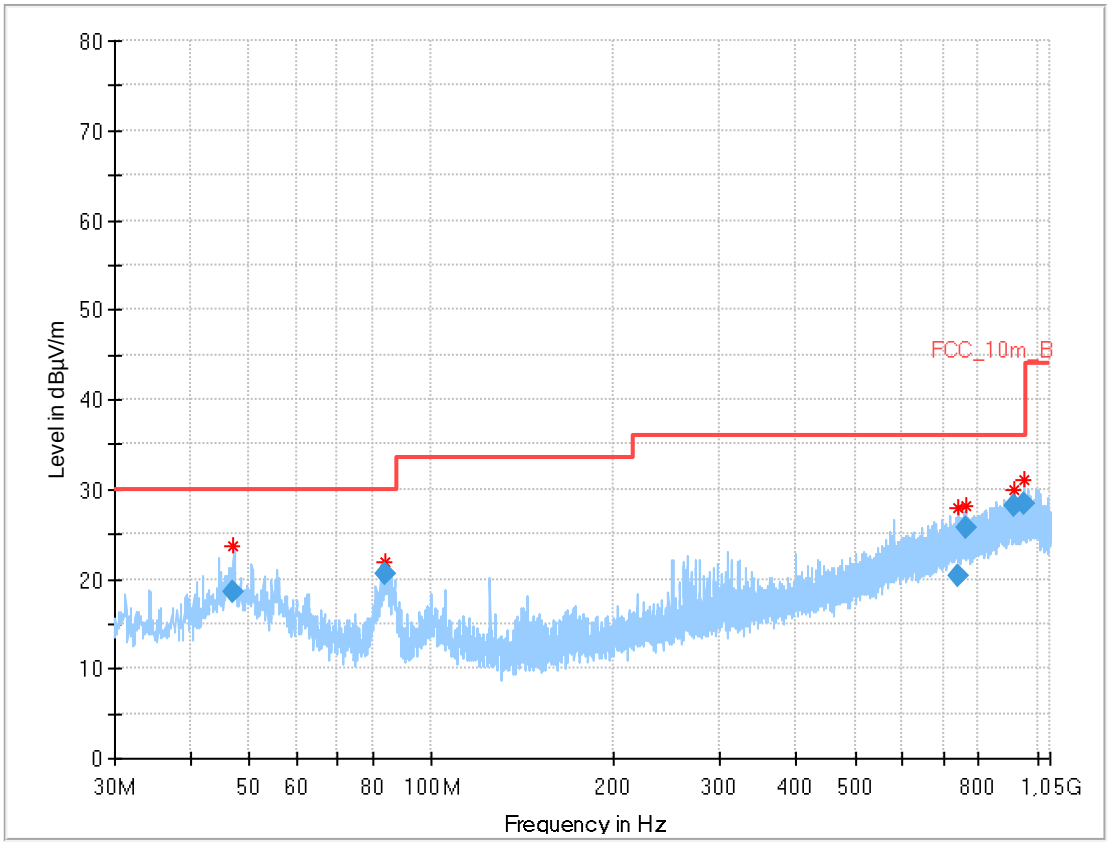
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, middle channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
47.499	19.93	30.0	10.07	1000	120	101.0	V	-10.0	15
55.878	18.99	30.0	11.01	1000	120	170.0	V	112.0	14
83.465	18.08	30.0	11.92	1000	120	147.0	V	68.0	11
85.793	19.72	30.0	10.28	1000	120	170.0	V	72.0	11
259.993	24.64	36.0	11.36	1000	120	101.0	V	202.0	14
865.302	27.64	36.0	8.36	1000	120	145.0	V	202.0	23

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, highest channel

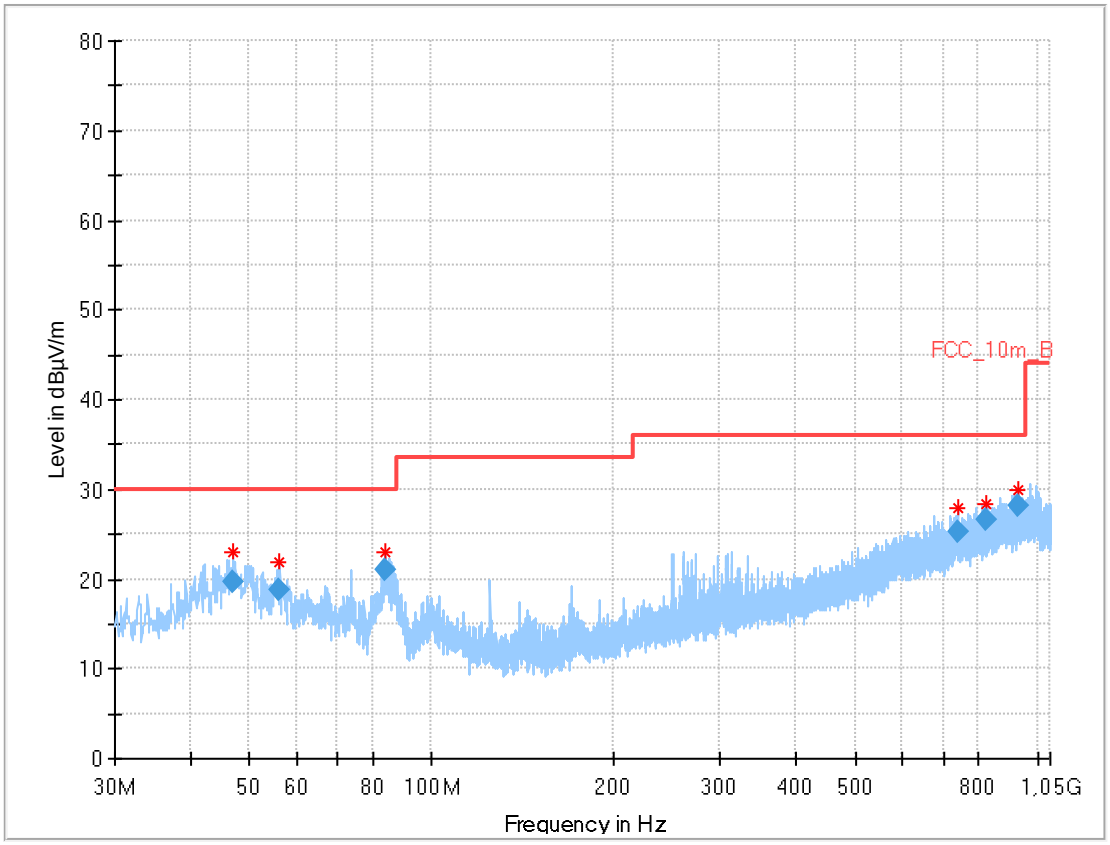


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
46.858	18.62	30.0	11.38	1000	120	101.0	V	71.0	15
83.635	20.57	30.0	9.43	1000	120	145.0	V	100.0	11
737.332	20.39	36.0	15.61	1000	120	147.0	H	67.0	22
761.504	25.78	36.0	10.22	1000	120	145.0	V	112.0	22
916.629	28.12	36.0	7.88	1000	120	170.0	V	157.0	24
951.133	28.40	36.0	7.60	1000	120	170.0	H	180.0	24

Plot: OFDM (20 MHz nominal channel bandwidth) – Antenna 1

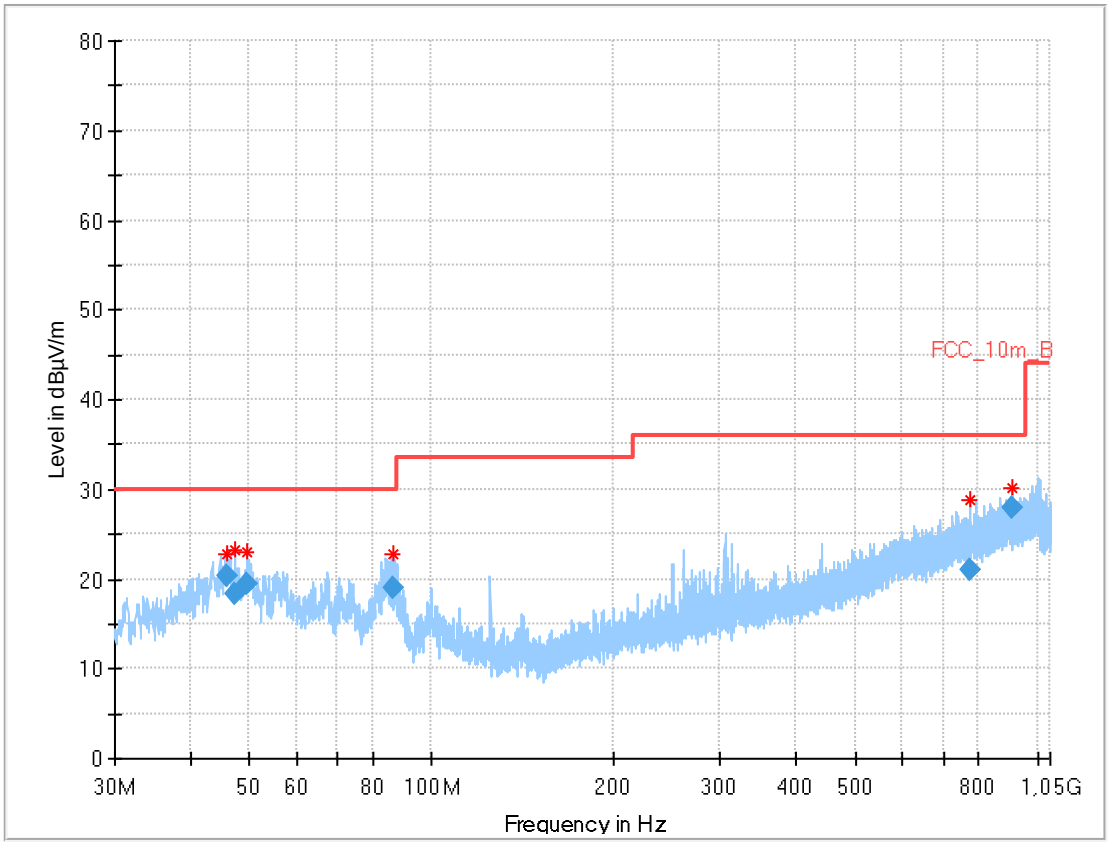
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, lowest channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
47.057	19.75	30.0	10.25	1000	120	101.0	V	292.0	15
55.867	18.70	30.0	11.30	1000	120	101.0	V	112.0	14
84.013	20.96	30.0	9.04	1000	120	170.0	V	101.0	11
739.935	25.35	36.0	10.65	1000	120	170.0	H	292.0	22
821.700	26.52	36.0	9.48	1000	120	170.0	H	71.0	23
927.435	28.20	36.0	7.80	1000	120	170.0	H	-22.0	24

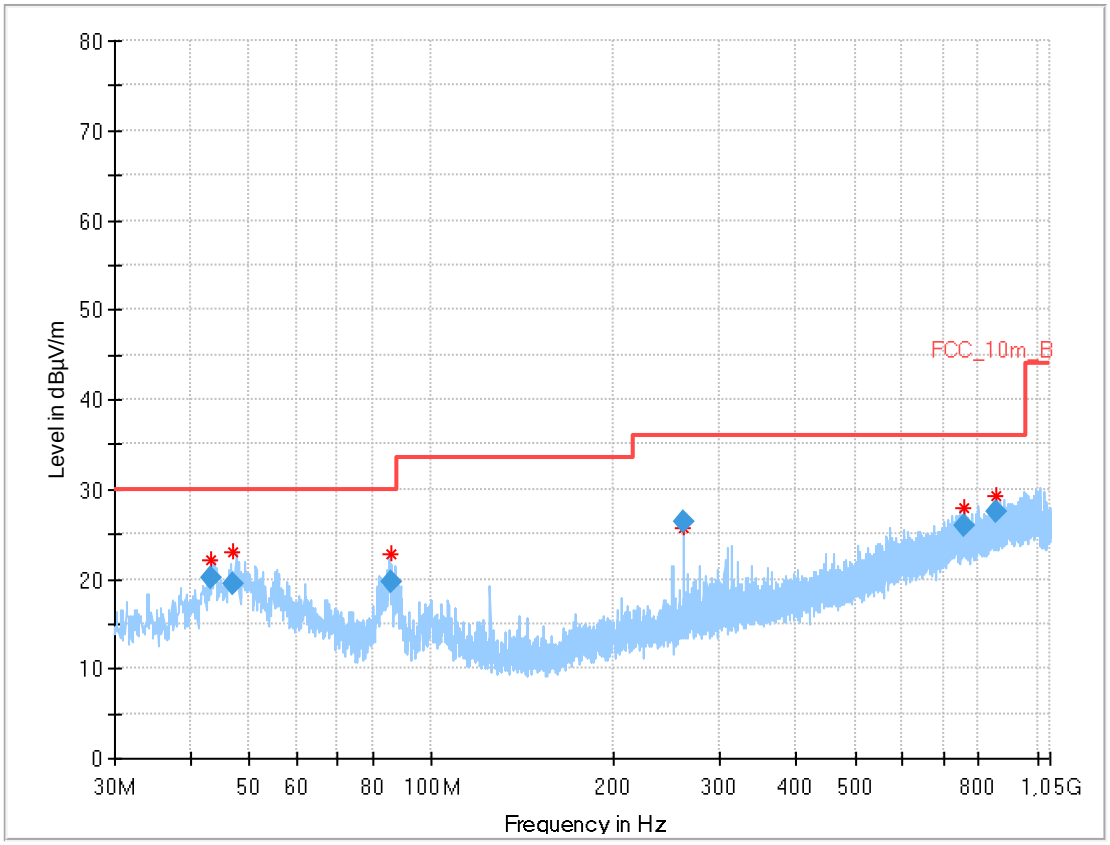
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, middle channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.955	20.26	30.0	9.74	1000	120	101.0	V	247.0	15
47.521	18.28	30.0	11.72	1000	120	101.0	V	91.0	15
49.409	19.37	30.0	10.63	1000	120	98.0	V	259.0	15
86.225	18.99	30.0	11.01	1000	120	170.0	V	90.0	11
775.988	20.90	36.0	15.10	1000	120	101.0	H	292.0	22
911.751	28.04	36.0	7.96	1000	120	170.0	V	281.0	24

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, highest channel

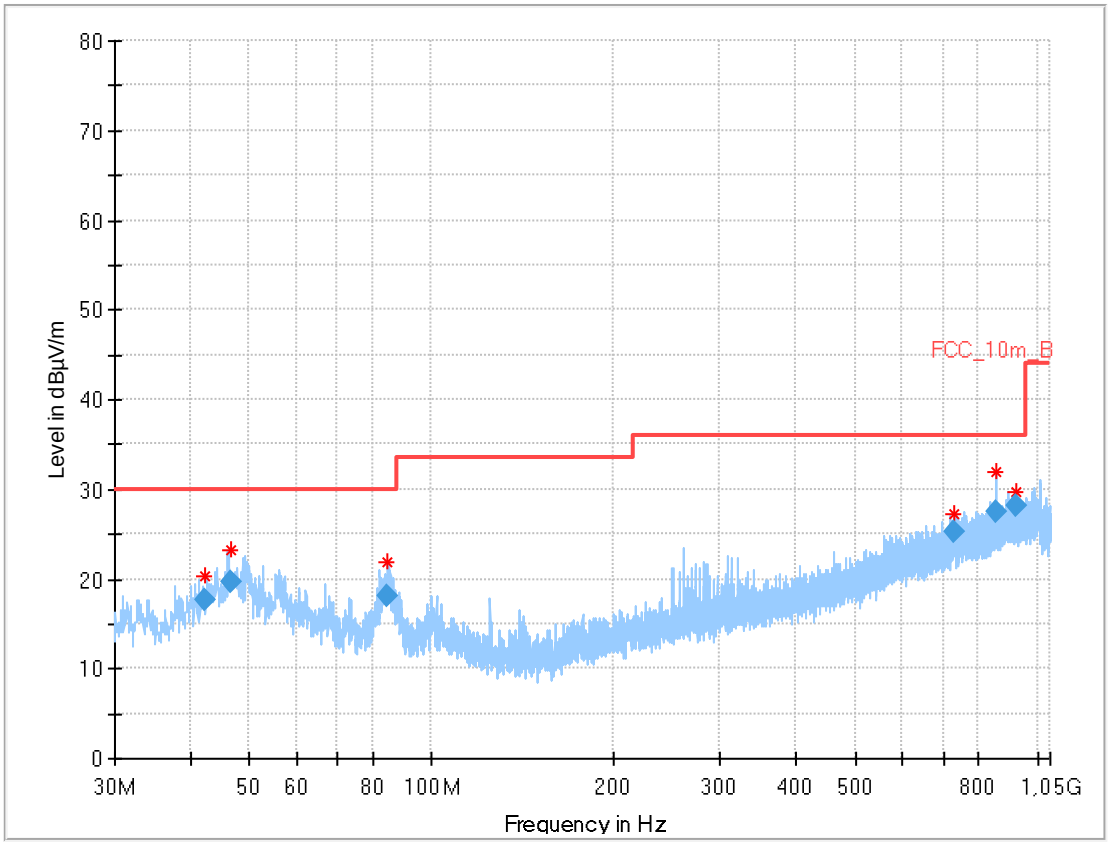


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.327	20.17	30.0	9.83	1000	120	98.0	V	12.0	15
47.012	19.36	30.0	10.64	1000	120	101.0	V	22.0	15
85.467	19.63	30.0	10.37	1000	120	152.0	V	112.0	11
260.002	26.29	36.0	9.71	1000	120	98.0	V	202.0	14
756.828	25.82	36.0	10.18	1000	120	98.0	V	259.0	22
856.708	27.39	36.0	8.61	1000	120	170.0	V	22.0	23

Plot: DSSS – Antenna 2

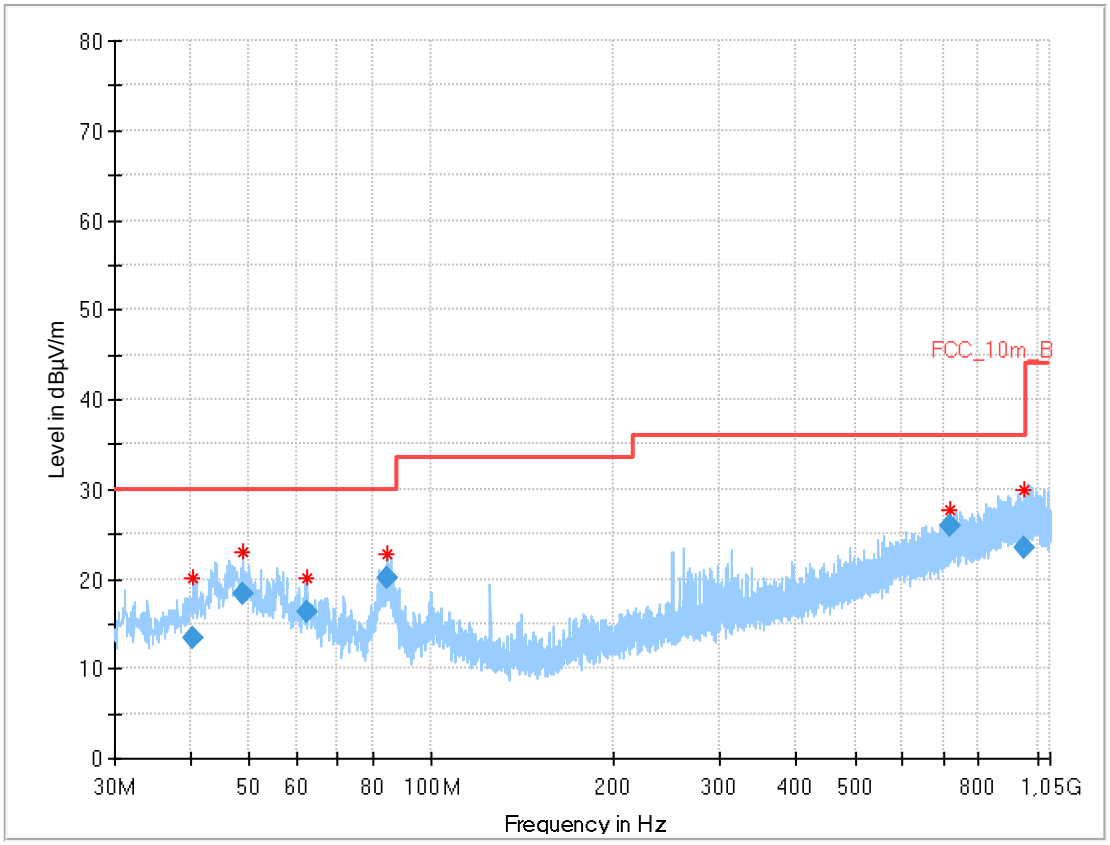
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, lowest channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
42.288	17.59	30.0	12.41	1000	120	98.0	V	292.0	15
46.759	19.65	30.0	10.35	1000	120	101.0	V	248.0	15
84.477	18.18	30.0	11.82	1000	120	170.0	V	157.0	11
731.292	25.22	36.0	10.78	1000	120	147.0	H	281.0	22
856.596	27.45	36.0	8.55	1000	120	170.0	H	22.0	23
921.925	28.09	36.0	7.91	1000	120	101.0	H	80.0	24

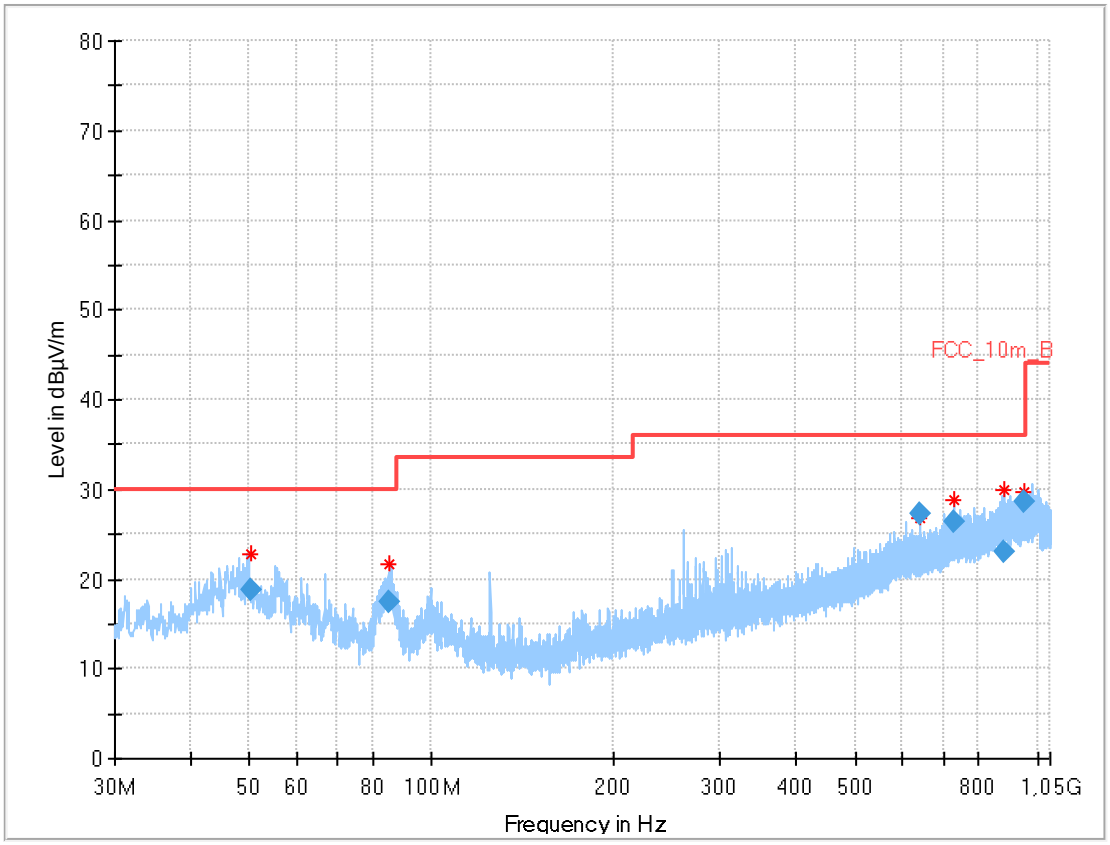
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, middle channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.276	13.39	30.0	16.61	1000	120	101.0	H	3.0	14
48.909	18.30	30.0	11.70	1000	120	101.0	V	158.0	15
62.502	16.29	30.0	13.71	1000	120	101.0	V	71.0	12
84.580	20.06	30.0	9.94	1000	120	147.0	V	112.0	11
715.975	25.94	36.0	10.06	1000	120	170.0	V	72.0	22
947.913	23.50	36.0	12.50	1000	120	170.0	V	247.0	24

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, highest channel

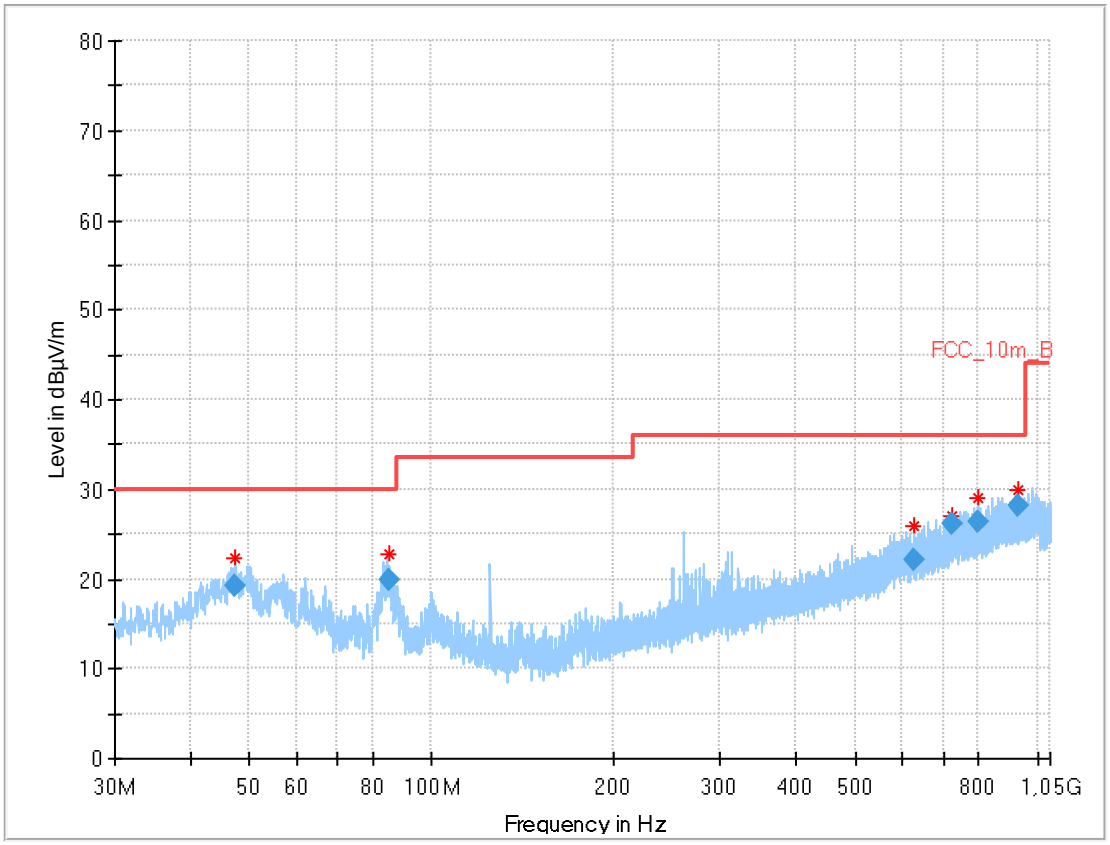


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
50.389	18.74	30.0	11.26	1000	120	101.0	V	252.0	15
85.302	17.51	30.0	12.49	1000	120	170.0	V	157.0	11
639.119	27.19	36.0	8.81	1000	120	98.0	H	202.0	21
729.028	26.48	36.0	9.52	1000	120	151.0	H	162.0	22
881.223	23.05	36.0	12.95	1000	120	101.0	H	292.0	24
953.456	28.57	36.0	7.43	1000	120	101.0	V	-10.0	24

Plot: OFDM (20 MHz nominal channel bandwidth) – Antenna 2

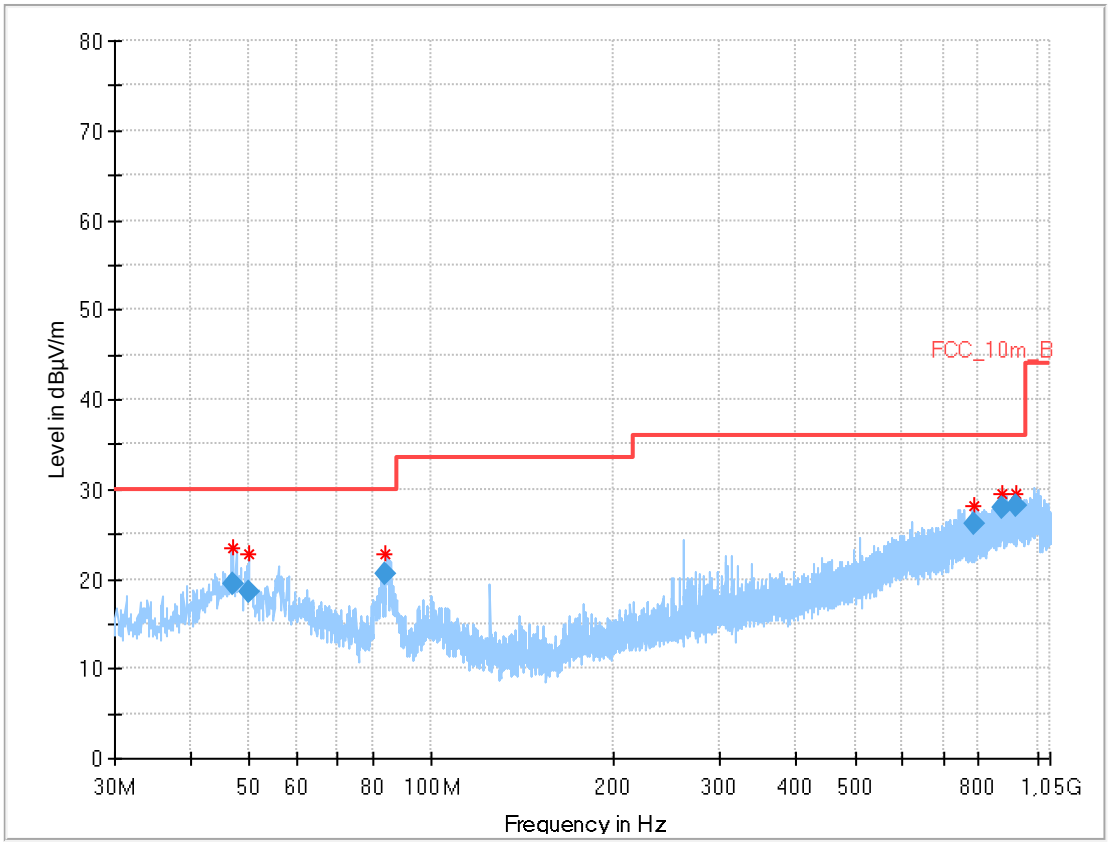
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, lowest channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
47.201	19.17	30.0	10.83	1000	120	101.0	V	12.0	15
84.899	19.92	30.0	10.08	1000	120	170.0	V	112.0	11
625.368	22.05	36.0	13.95	1000	120	170.0	V	2.0	21
721.206	26.17	36.0	9.83	1000	120	147.0	H	202.0	22
798.323	26.33	36.0	9.67	1000	120	104.0	H	-17.0	22
928.205	28.24	36.0	7.76	1000	120	170.0	H	252.0	24

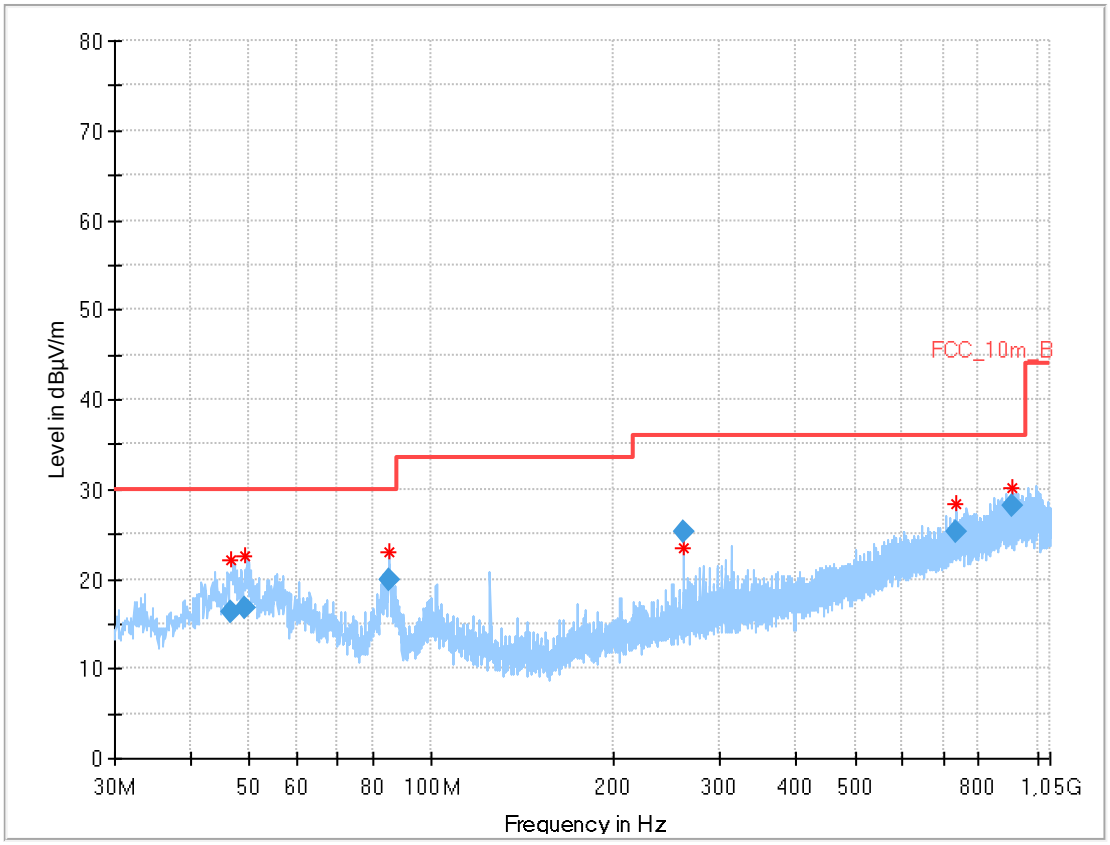
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, middle channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
46.957	19.49	30.0	10.51	1000	120	101.0	V	247.0	15
50.113	18.53	30.0	11.47	1000	120	101.0	V	191.0	15
84.079	20.59	30.0	9.41	1000	120	170.0	V	112.0	11
789.028	26.14	36.0	9.86	1000	120	170.0	V	72.0	22
873.962	27.88	36.0	8.12	1000	120	170.0	H	158.0	24
920.849	28.13	36.0	7.87	1000	120	170.0	V	158.0	24

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, highest channel



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
46.754	16.25	30.0	13.75	1000	120	101.0	V	112.0	15
49.266	16.80	30.0	13.20	1000	120	101.0	V	202.0	15
84.942	19.82	30.0	10.18	1000	120	170.0	V	112.0	11
260.012	25.15	36.0	10.85	1000	120	98.0	V	202.0	14
733.693	25.26	36.0	10.74	1000	120	146.0	H	259.0	22
910.694	28.10	36.0	7.90	1000	120	170.0	V	191.0	24

12.13 Spurious emissions radiated above 1 GHz

Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode and receiver / idle mode.

Measurement:

Measurement parameter	
Detector	Peak / RMS
Sweep time	Auto
Resolution bandwidth	1 MHz
Video bandwidth	3 x RBW
Span	1 GHz to 26 GHz
Trace mode	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☐ OFDM n HT20 – mode ☐ OFDM n HT40 – mode ☐ RX / Idle – mode
Test setup	See chapter 6.2 – A+C & 6.3 - A
Measurement uncertainty	See chapter 8

Limits:

FCC		IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency / MHz	Field Strength / (dBµV / m)	Measurement distance / m
Above 960	54.0 (AVG)	3
	74.0 (peak)	

Results: DSSS – Antenna 1

TX spurious emissions radiated / dBµV/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
4823.8	Peak	51.4	4873.9	Peak	51.3	4924	Peak	51
	AVG	44.3		AVG	44.1		AVG	43

Results: OFDM (20 MHz nominal channel bandwidth) – Antenna 1

TX spurious emissions radiated / dBµV/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
All detected emissions are more than 6 dB below the limit.			All detected emissions are more than 6 dB below the limit.			22206	Peak	50.1

Results: DSSS – Antenna 2

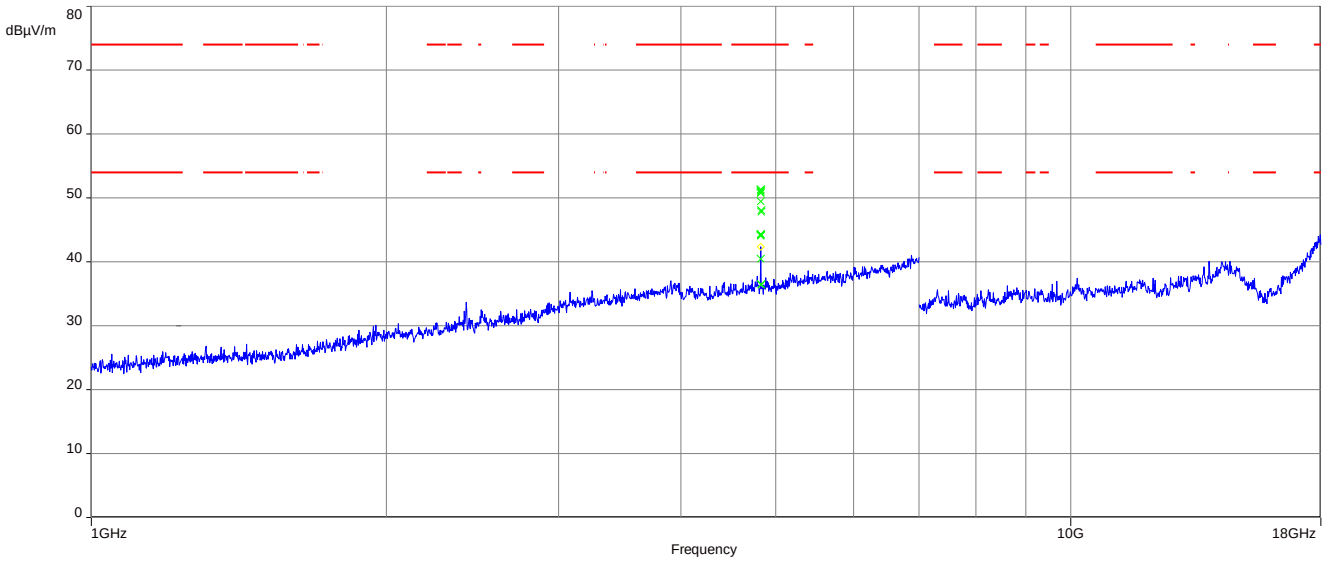
TX spurious emissions radiated / dBµV/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
20506	Peak	49.9	4873.9	Peak	52.1	4924	Peak	52.5
				AVG	45.0		AVG	46
-/-	Peak	-/-	-/-	Peak	-/-	7386.1	Peak	51.5
	AVG	-/-		AVG	-/-		AVG	39.6
-/-	-/-	-/-	-/-	-/-	-/-	22712	Peak	50.6
	-/-	-/-		-/-	-/-			

Results: OFDM (20 MHz nominal channel bandwidth) – Antenna 2

TX spurious emissions radiated / dBµV/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
21740	Peak	47.1	7310.2	Peak	55.8	7381.7	Peak	53.4
				AVG	43.1		AVG	40.9
-/-	-/-	-/-	-/-	-/-	-/-	22731	Peak	47.8
	-/-	-/-		-/-	-/-			

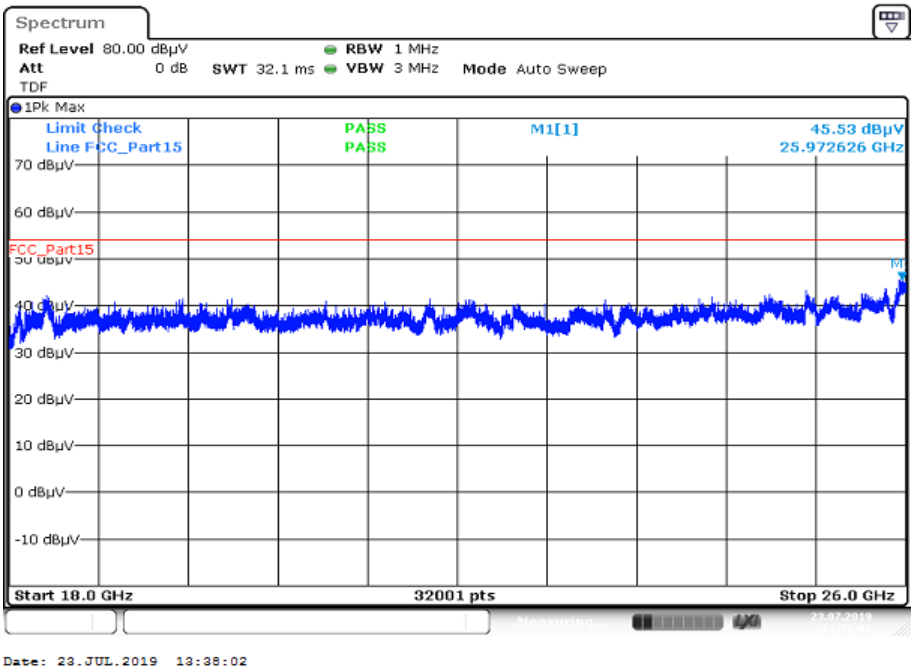
Plots: DSSS – Antenna 1

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

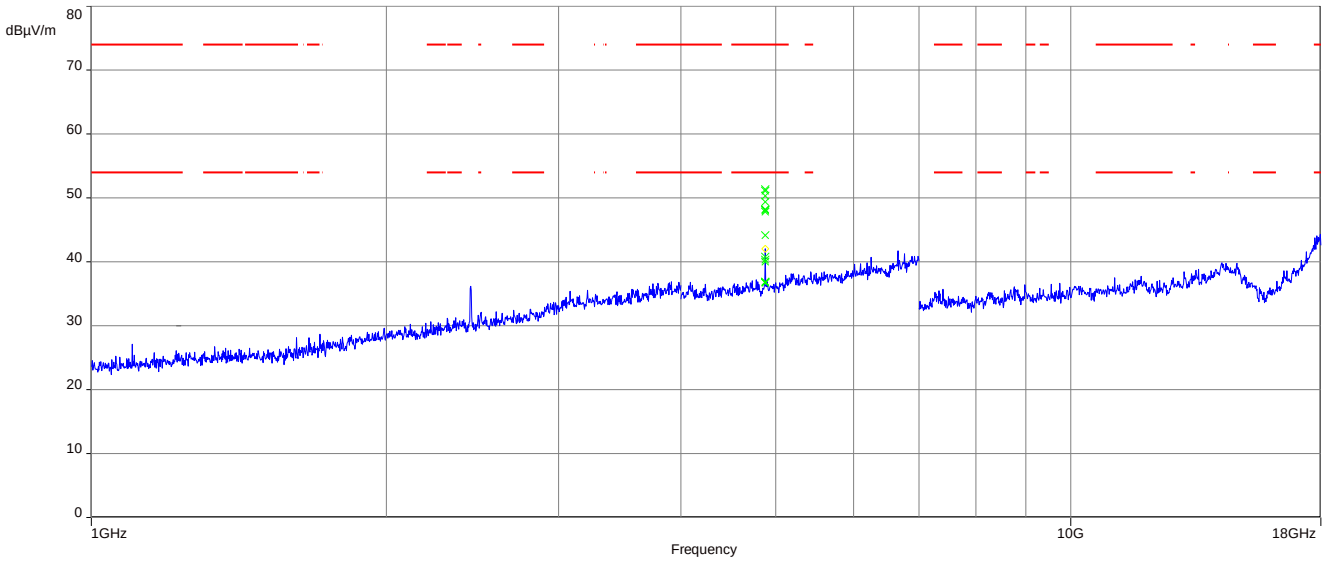


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

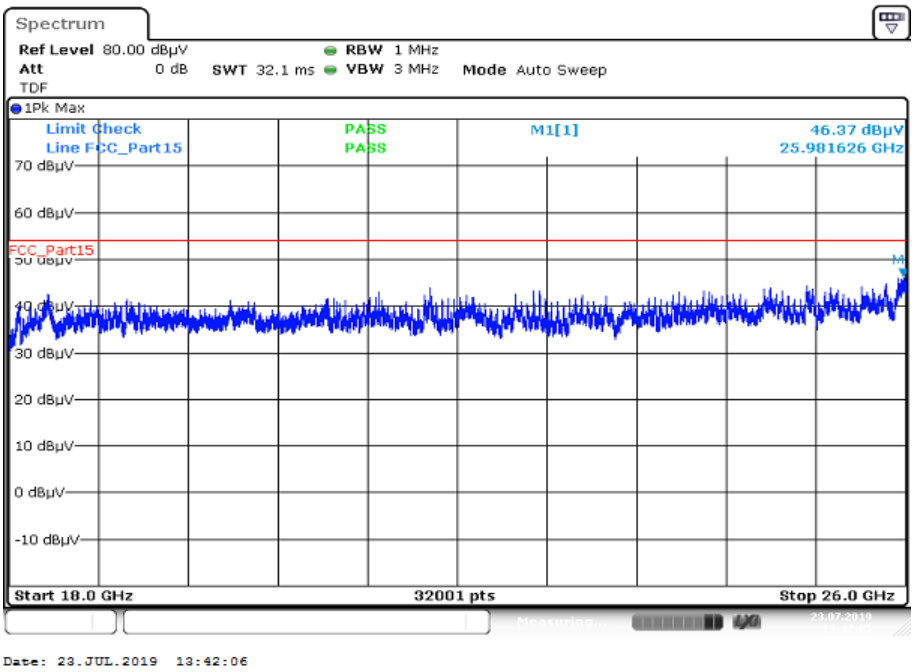


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

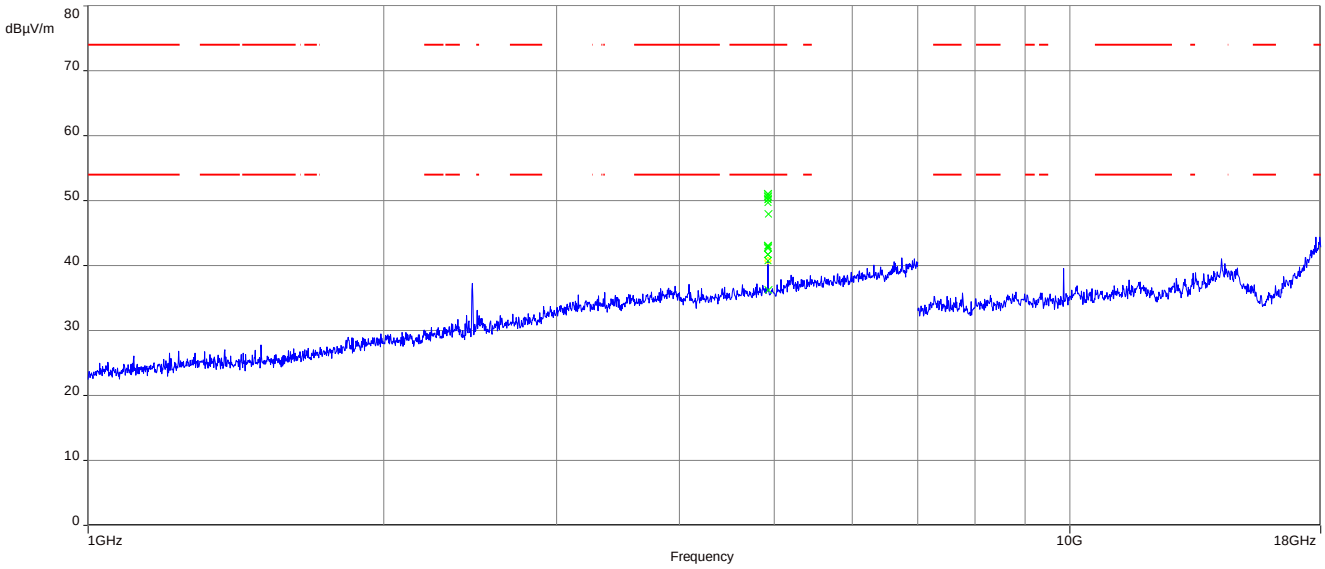


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

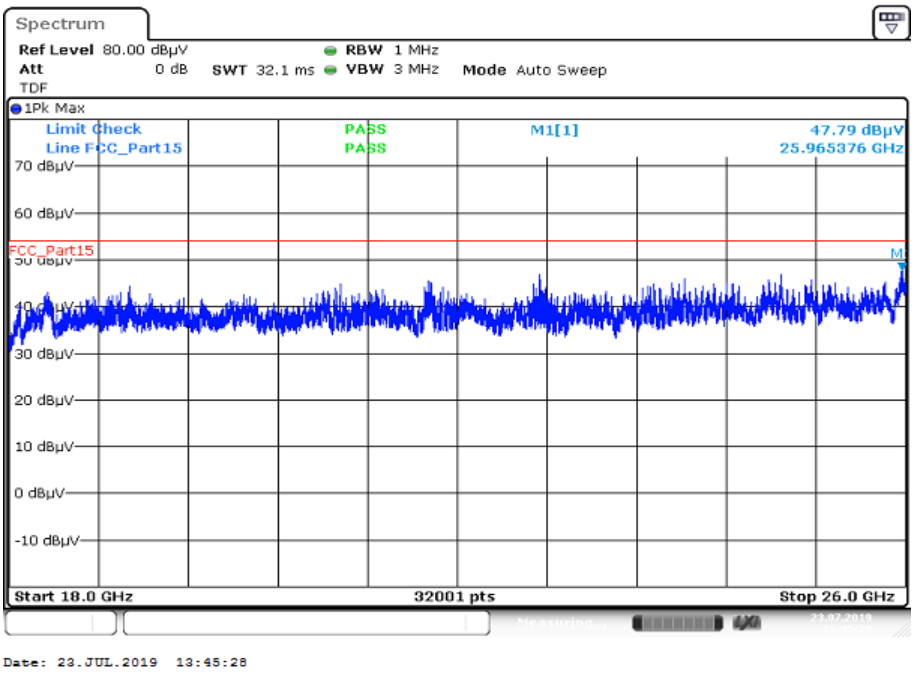


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



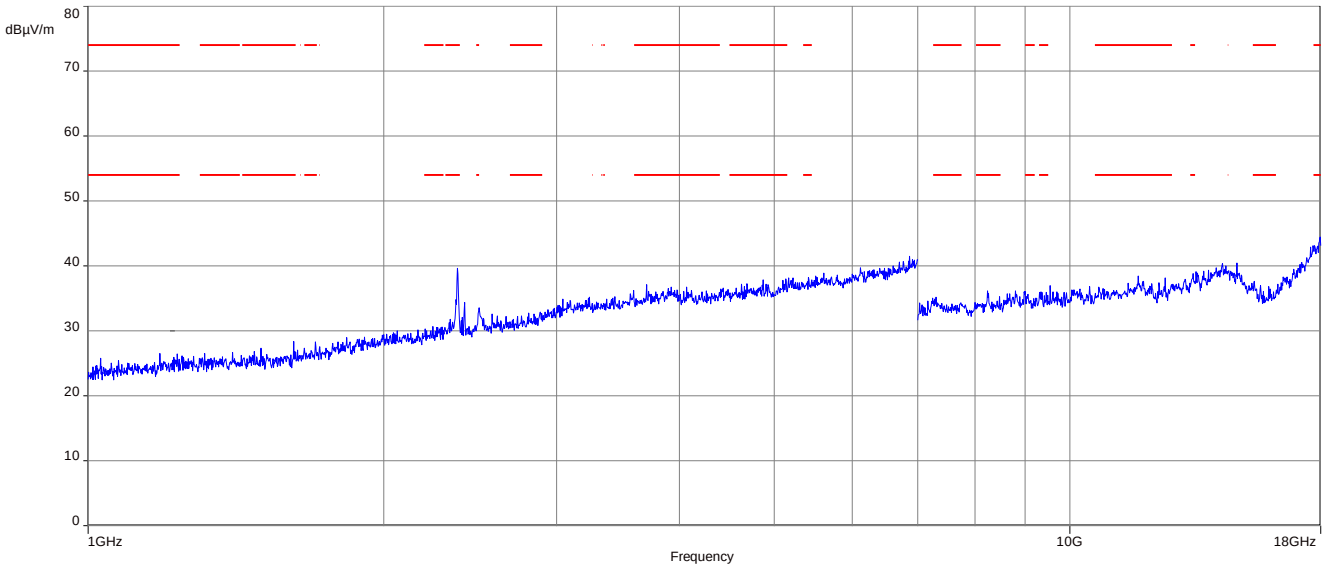
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



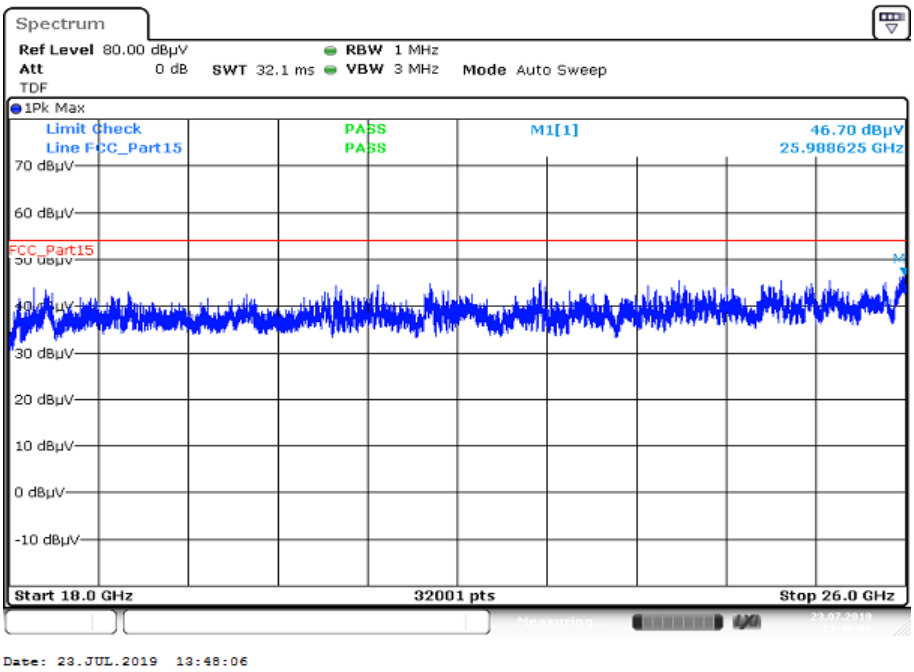
Plots: OFDM (20 MHz bandwidth) – Antenna 1

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

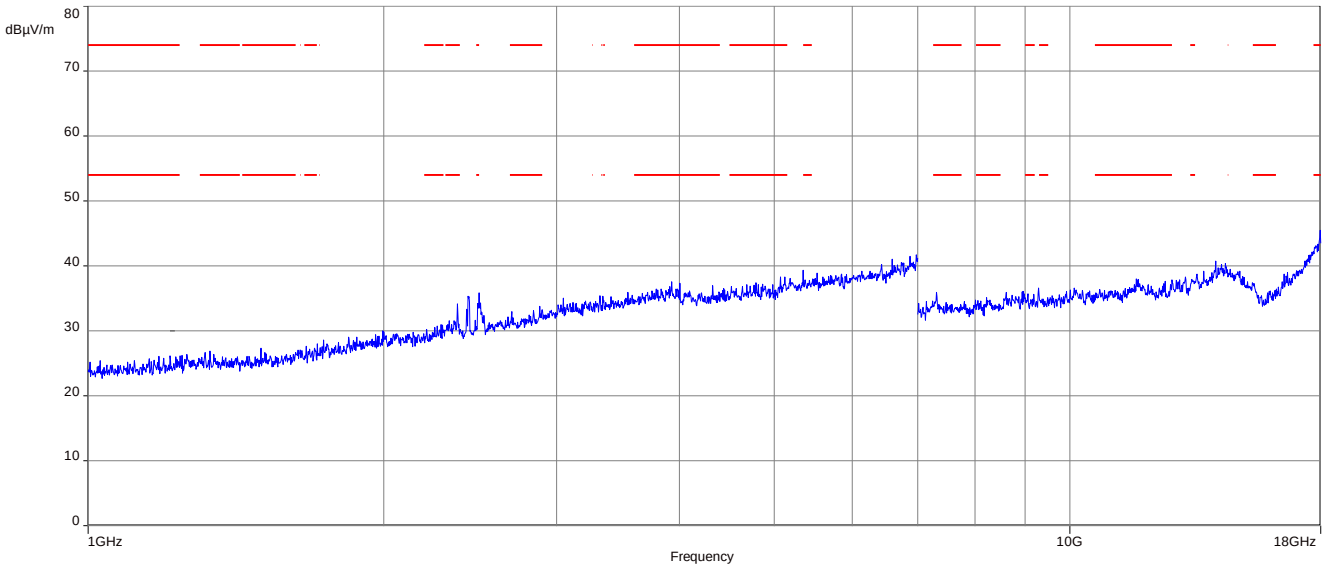


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

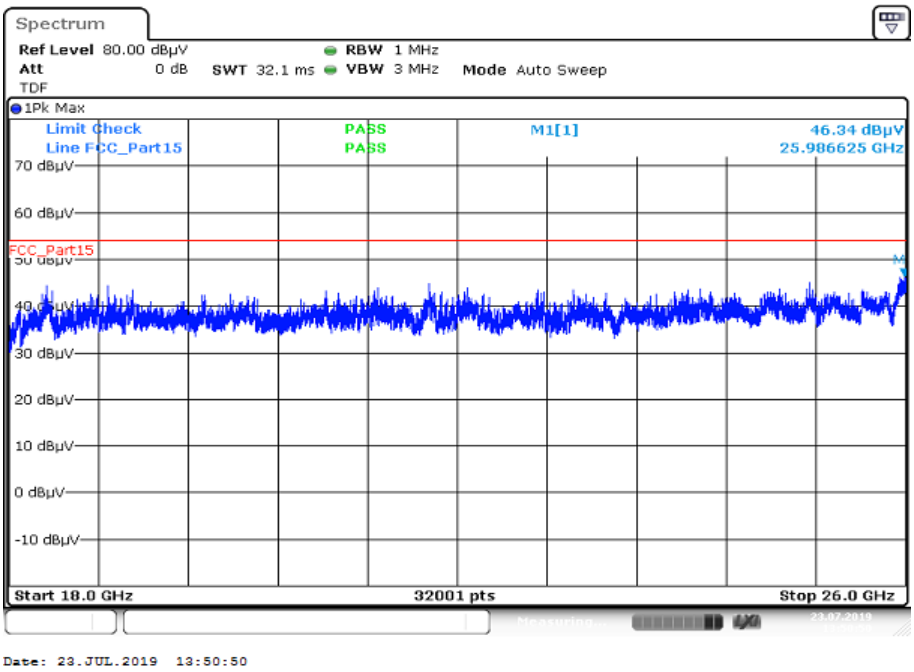


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

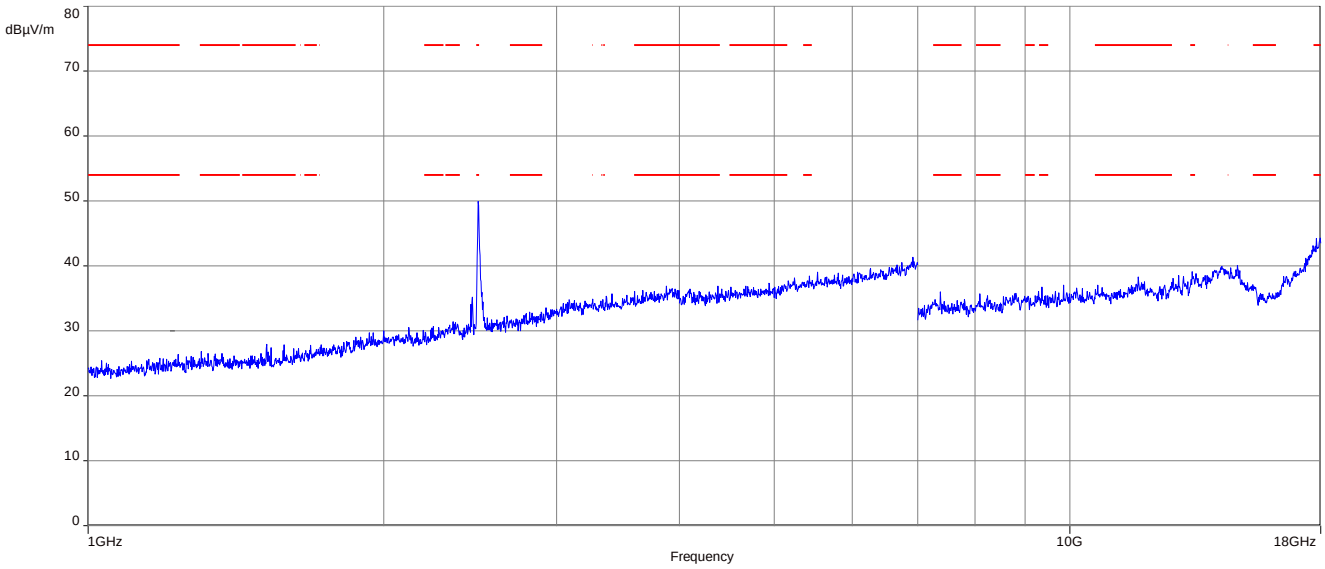


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

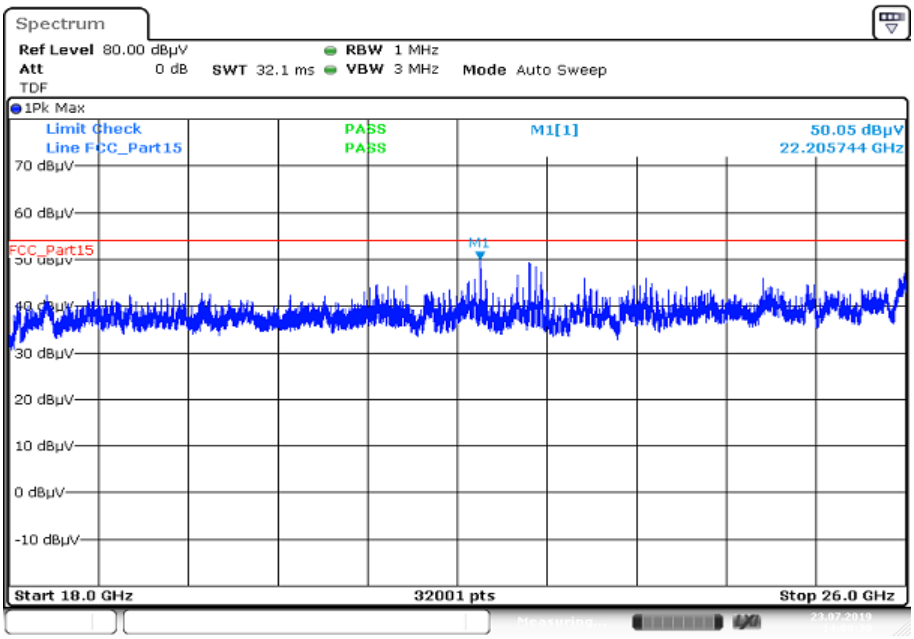


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



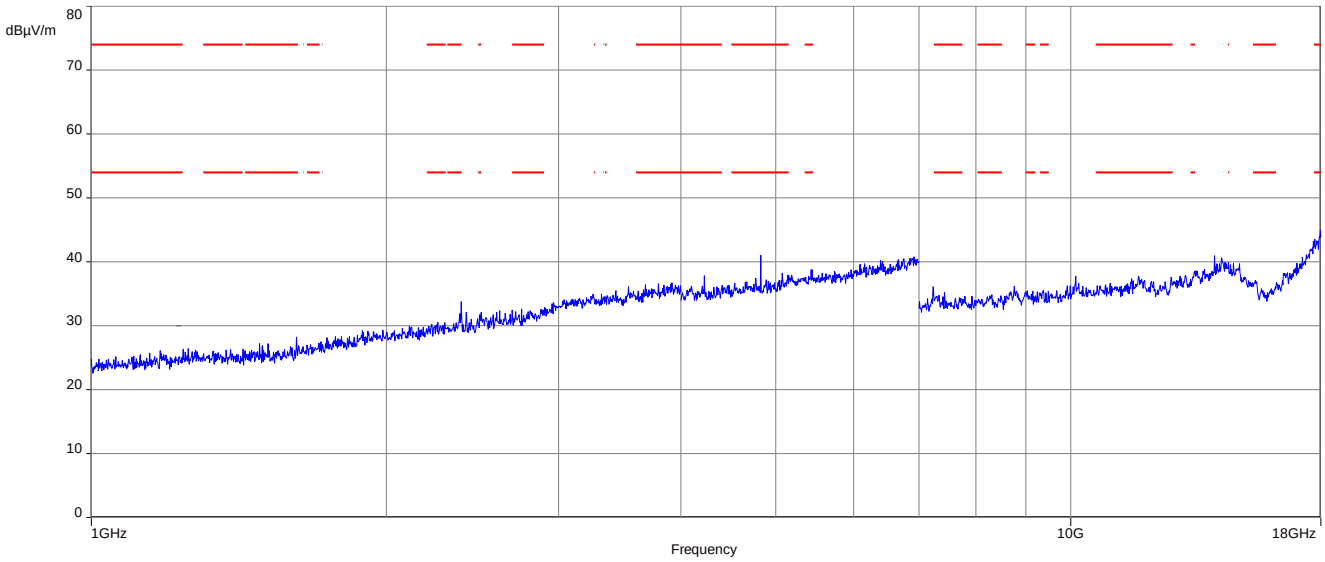
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



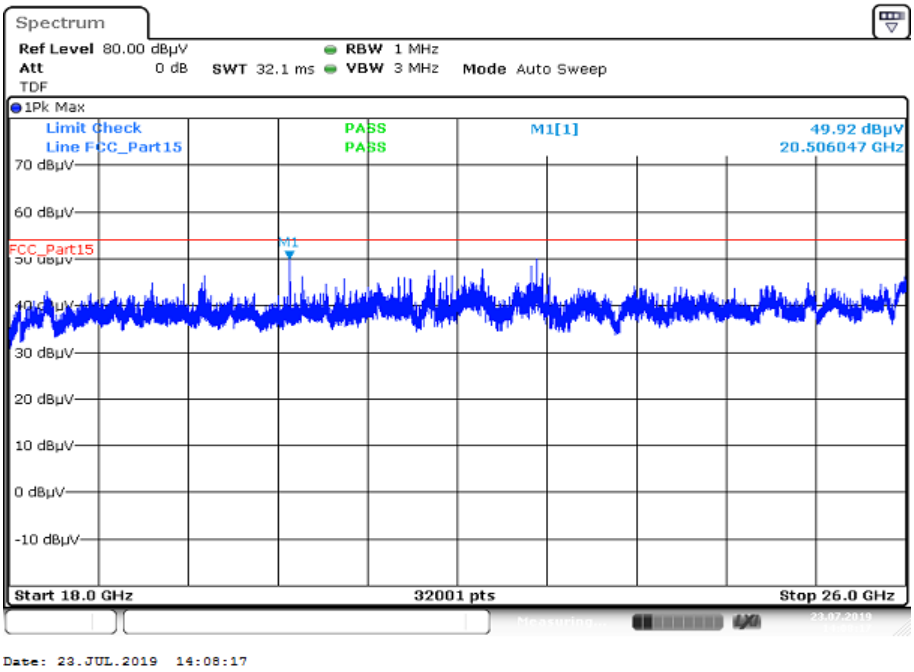
Plots: DSSS – Antenna 2

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

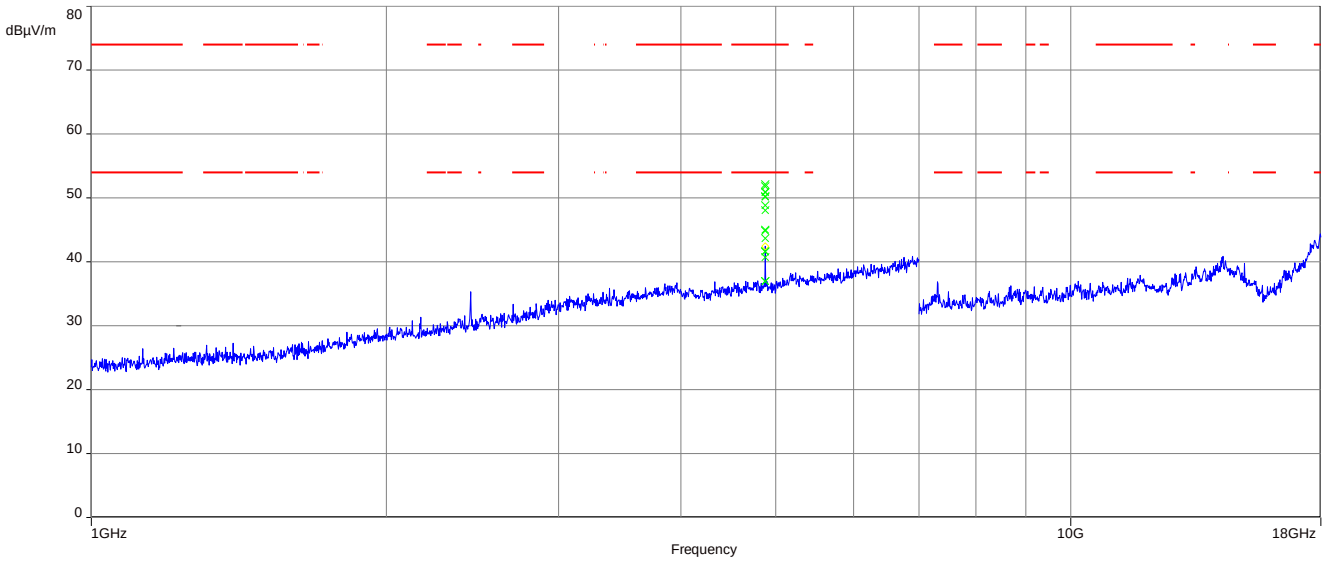


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

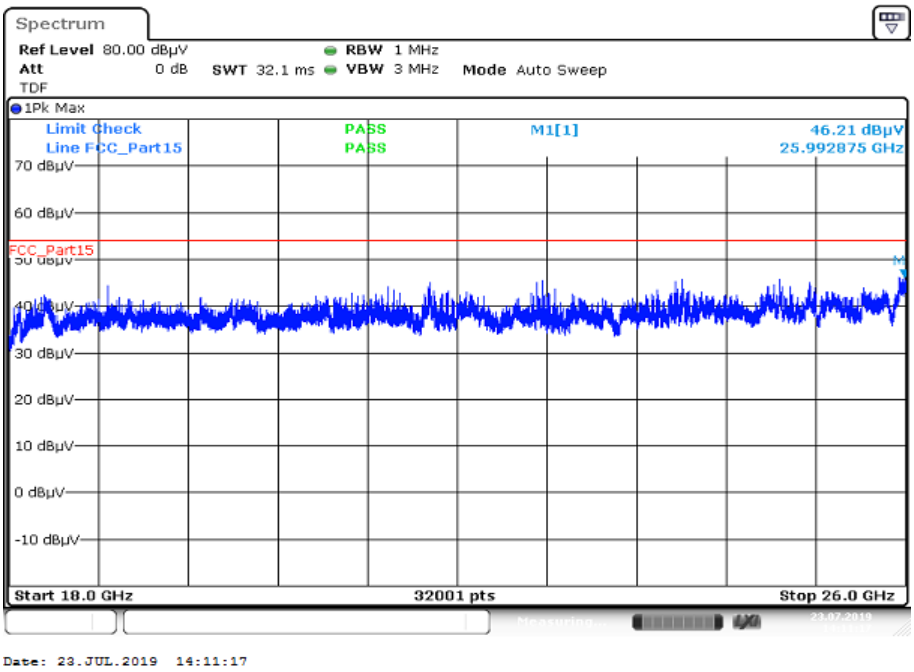


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

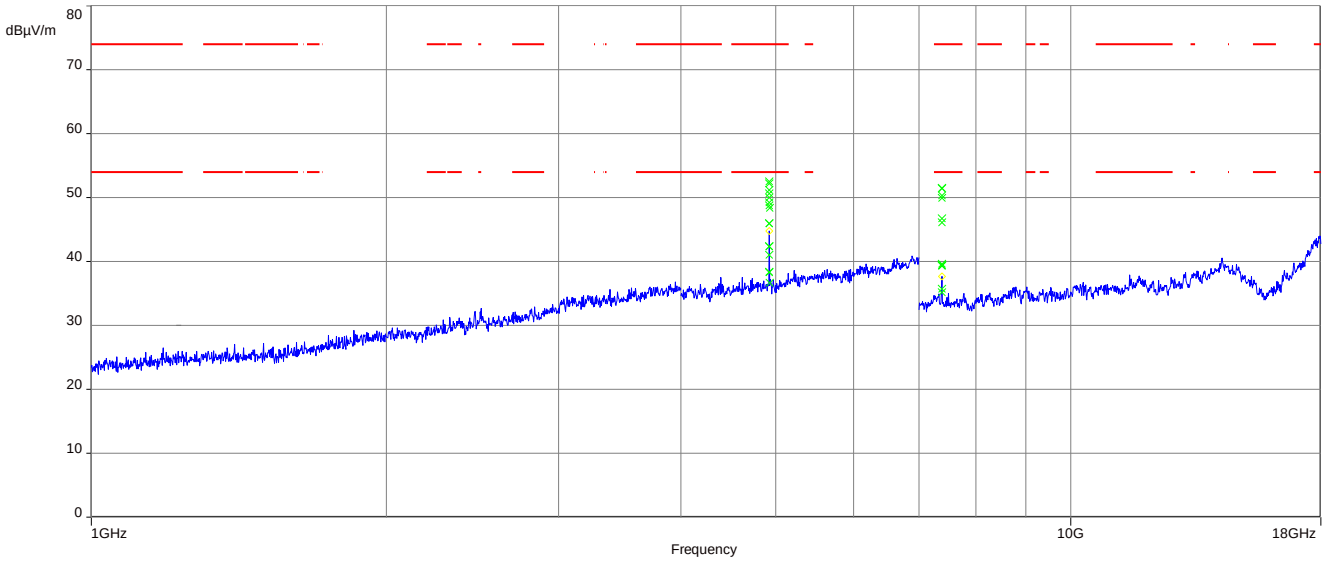


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

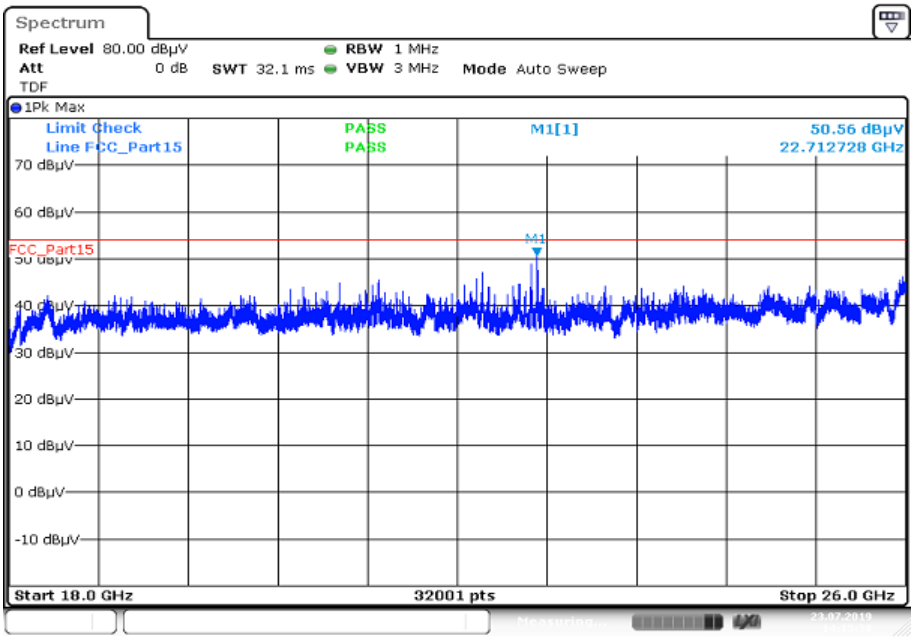


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



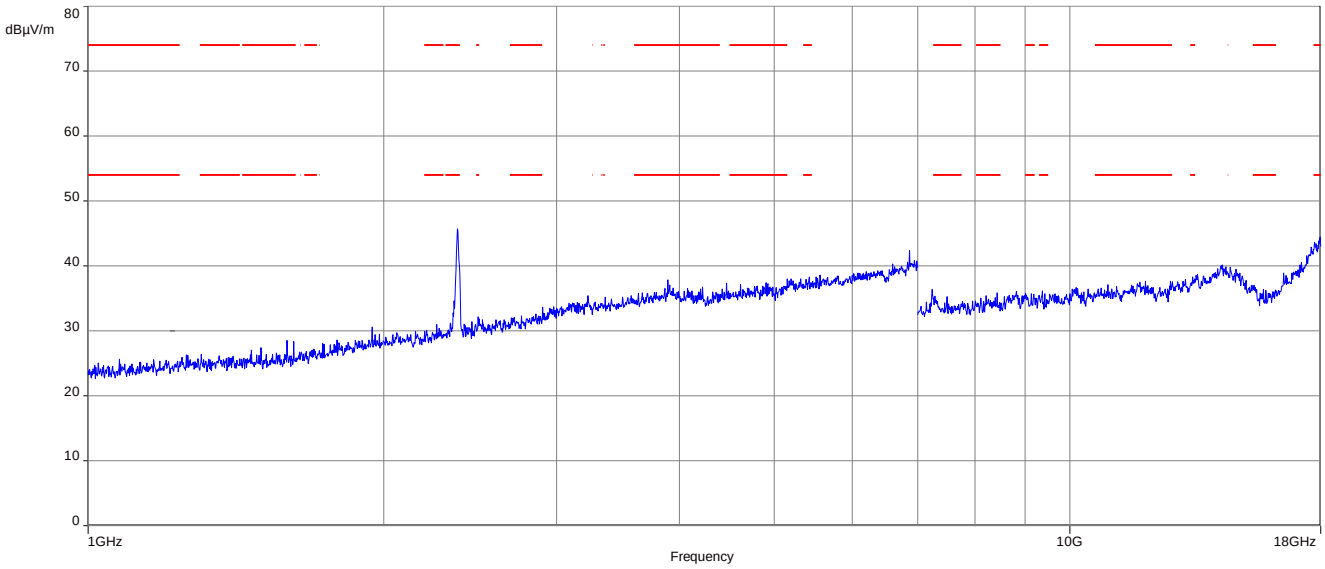
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



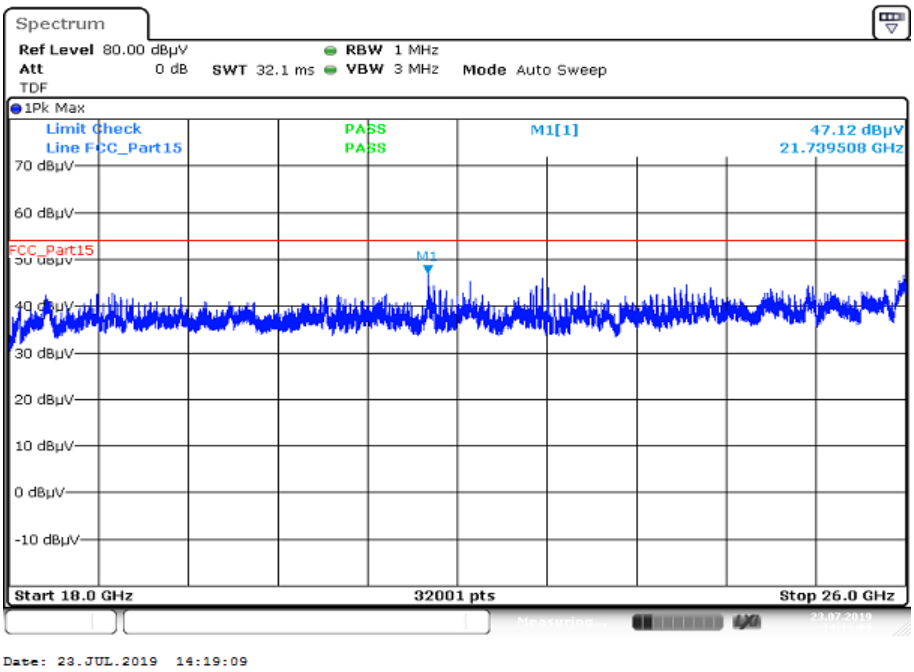
Plots: OFDM (20 MHz bandwidth) – Antenna 2

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

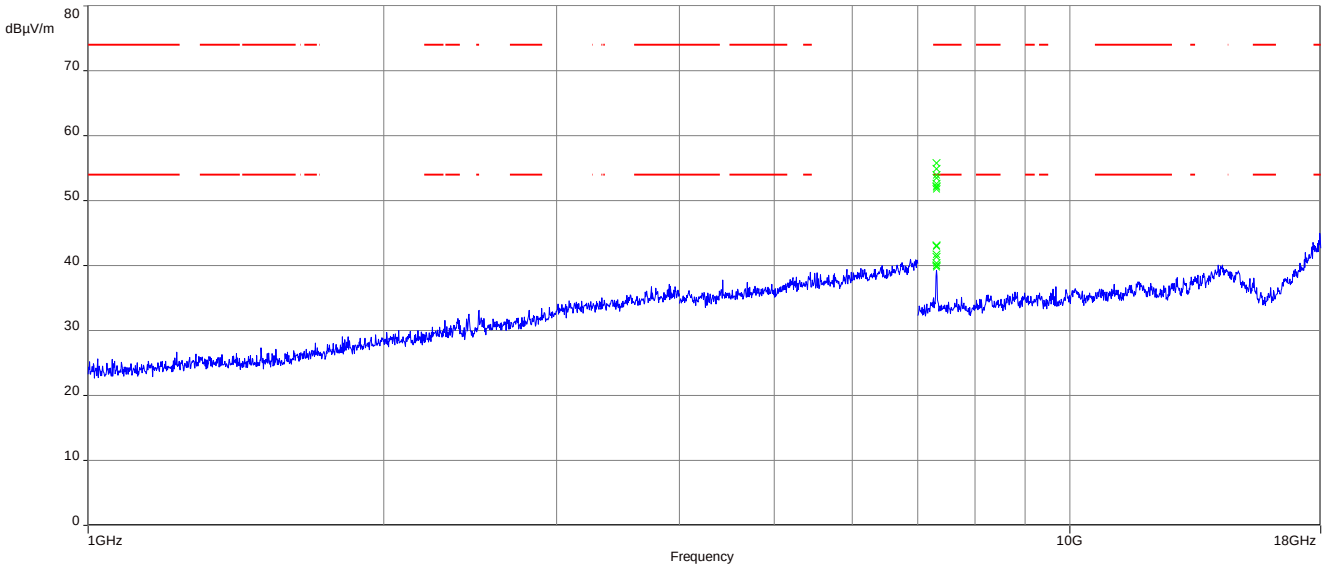


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

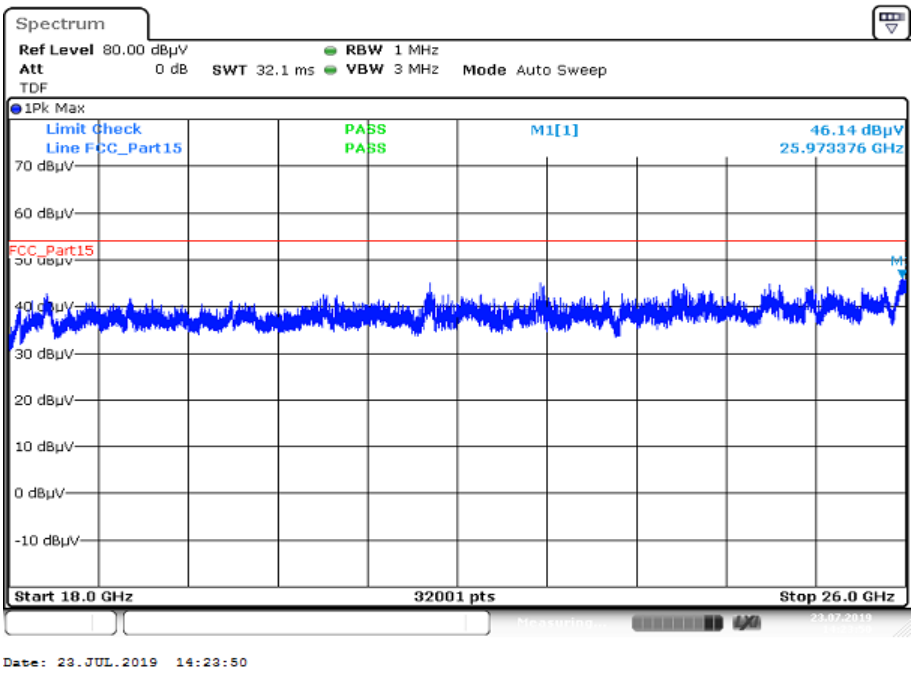


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

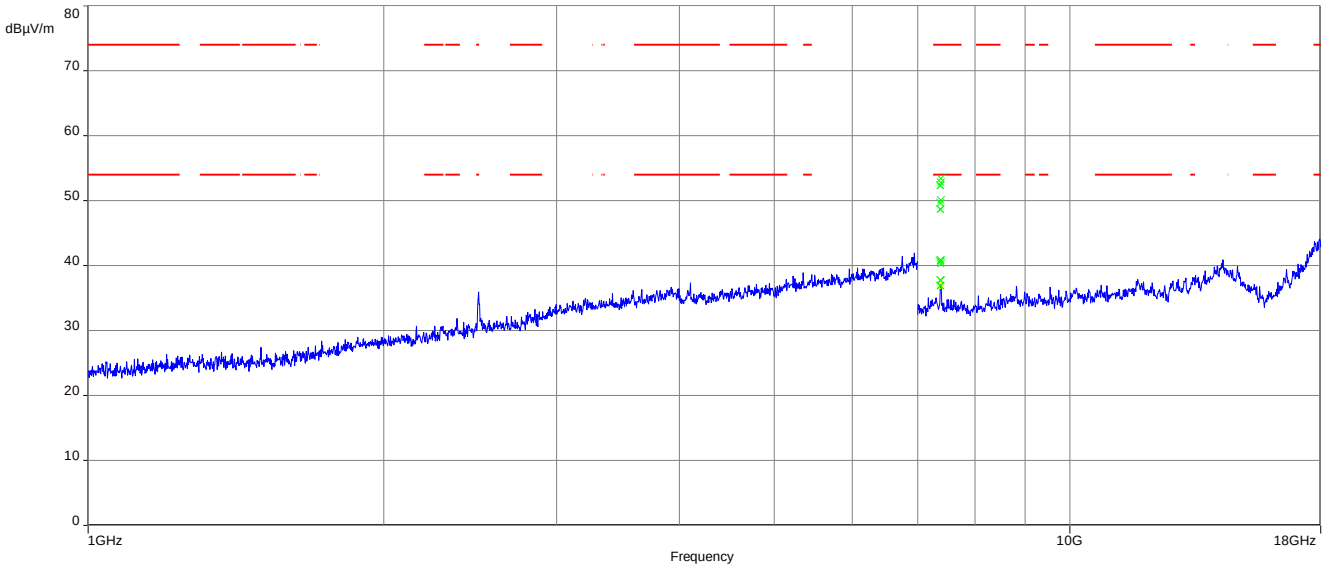


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

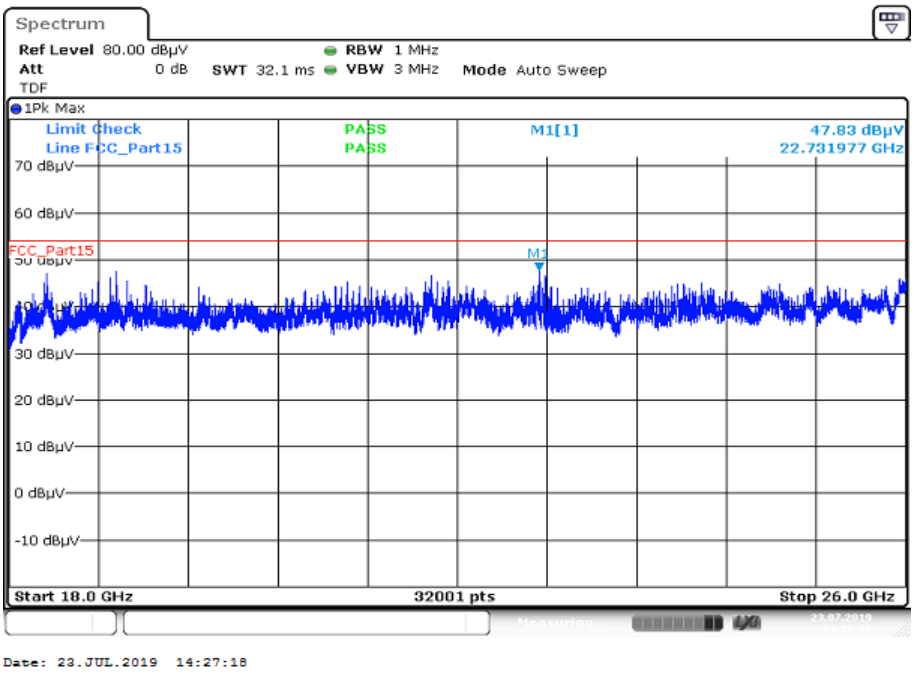


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



13 Observations

No observations except those reported with the single test cases have been made.

Annex A Glossary

EUT	Equipment under test
DUT	Device under test
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
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
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2019-08-23
-A	Model name and PMN changed from “Dual Radar” to “B1”	2019-10-08
-B	ISED number changed	2020-03-30

Annex C Accreditation Certificate – D-PL-12076-01-04

first page	last page
DAkkS 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 (TC) and Electromagnetic Compatibility (EMC) for Canadian Standards** The accreditation certificate shall only apply in connection with the notice of accreditation of 11.01.2019 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 7 pages. Registration number of the certificate: **D-PL-12076-01-04** Frankfurt am Main, 11.01.2019 Dipl.-Biol. Uwe Zimmermann Head of Division See notes overleaf.	Deutsche Akkreditierungsstelle GmbH Office Berlin Spittelmarkt 10 10117 Berlin Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main Office Braunschweig Bundesallee 100 38116 Braunschweig 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

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-12076-01-04.pdf

Annex D Accreditation Certificate – D-PL-12076-01-05

first page	last page
DAkkS 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 (FCC Requirements)** The accreditation certificate shall only apply in connection with the notice of accreditation of 11.01.2019 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 5 pages. Registration number of the certificate: **D-PL-12076-01-05** Frankfurt am Main, 11.01.2019 Dipl.-Biol. Uwe Zimmermann Head of Division See notes overleaf.	Deutsche Akkreditierungsstelle GmbH Office Berlin Spittelmarkt 10 10117 Berlin Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main Office Braunschweig Bundesallee 100 38116 Braunschweig 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

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-12076-01-05.pdf

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