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consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-7962/14-15-03

Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH

Untertuerkheimer Strasse 6 – 10

66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

Internet: <http://www.cetecom.com>e-mail: ict@cetecom.com**Accredited Testing Laboratory:**

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

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal / Deutschland

Phone: +49 561 9522-2218

Fax: +49 561 9522-2280

Contact: Pablo de Castillo-Elejabeytia Bürger

e-mail: Pablo.deCastillo@SMA.de

Manufacturer

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal / Deutschland

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - 247 Issue 1

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence - Exempt Local Area Network (LE-LAN) Devices

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

Test Item

Kind of test item: Communication main board**Model name:** PC-KP20**FCC ID:** SVF-KP20**IC:** 9440A-KP20Frequency: 2400.0 MHz to 2483.5 MHz ISM Band,
Lowest channel: 2412.0 MHz,
Highest channel: 2462.0 MHz

Technology tested: WLAN

Antenna: Integrated and external antenna

Power supply: 14.0 V DC

Temperature range: -40°C to +75°C



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

Test report authorised:

cn=Stefan Boes, o=CETECOM ICT Services
GmbH, ou=BOE-111011,
email=Stefan.Boes@cetecom.com, c=DE
2015.06.16 13:21:12 +02'00'Stefan Böse
Lab Manager
Radio Communications & EMC

Test performed:

David Lang
cn=David Lang, o=CETECOM ICT Services
GmbH, ou=LNG-141031,
email=david.lang@cetecom.com, c=DE
2015.06.16 11:09:35 +02'00'David Lang
Lab Manager
Radio Communications & EMC

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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2.2 Application details

Date of receipt of order:	2015-02-09
Date of receipt of test item:	2015-04-28
Start of test:	2015-04-28
End of test:	2015-05-19
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	01.05.2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

3.1 Measurement guidance

DTS : KDB 558074	2014-06	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+75 °C during high temperature tests
	T_{min}	-40 °C during low temperature tests
Relative humidity content:		51 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	14.0 V DC
	V_{max}	15.0 V
	V_{min}	13.0 V

5 Test item

Kind of test item	:	Communication main board
Type identification	:	PC-KP20
HMN	:	-/-
PMN	:	PC-KP20
HVIN	:	PC-KP20.BG1
FVIN	:	-/-
S/N serial number	:	Rad. Sample #4 Cond. Sample #1
HW hardware status	:	No information available
SW software status	:	No information available
Frequency band	:	2400.0 MHz to 2483.5 MHz ISM Band, Lowest ch.: 2412.0 MHz, Highest ch.: 2462.0 MHz
Type of radio transmission	:	DSSS, OFDM
Use of frequency spectrum	:	
Type of modulation	:	BPSK, QPSK, 16 – QAM, 64 – QAM
Number of channels	:	11
Antenna	:	Integrated and external antenna
Power supply	:	14.0 V DC
Temperature range	:	-40°C to +75°C

5.1 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: 1-7962/14-15-01_AnnexA
1-7962/14-15-01_AnnexB
1-7962/14-15-01_AnnexD

6 Test laboratories sub-contracted

None

7 Description of the test setup

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

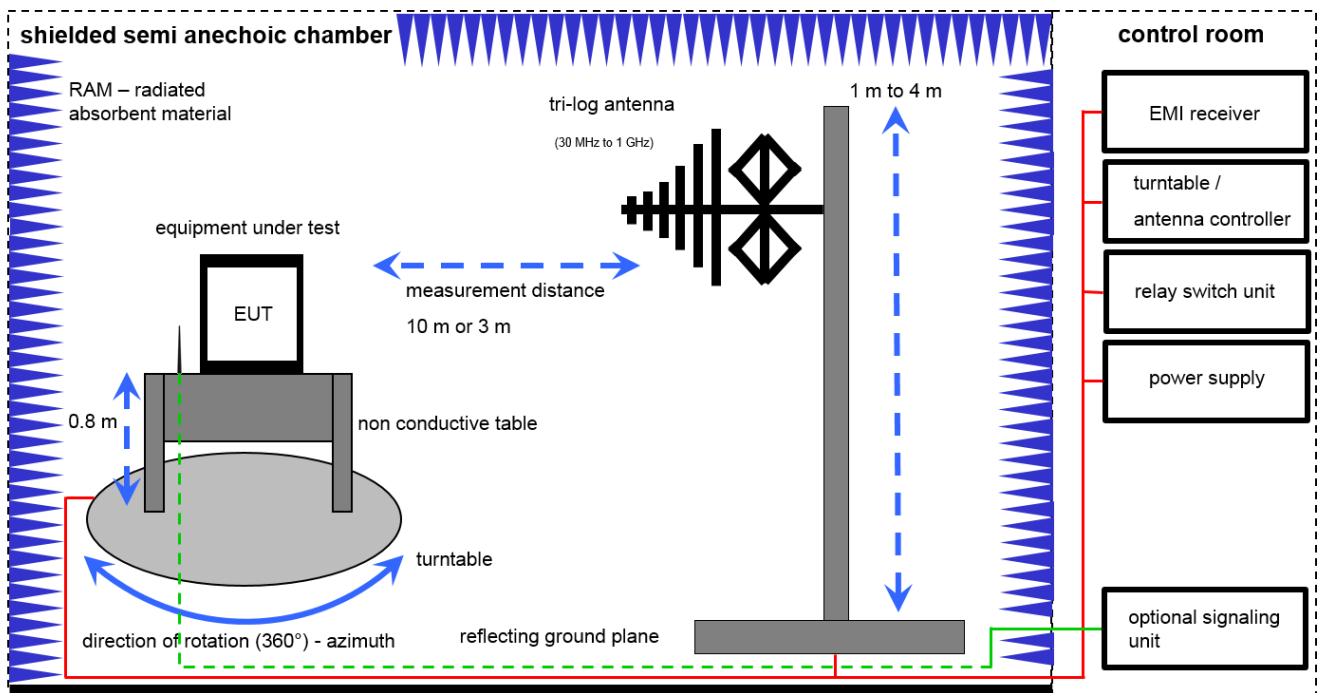
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

7.1 Shielded semi anechoic chamber

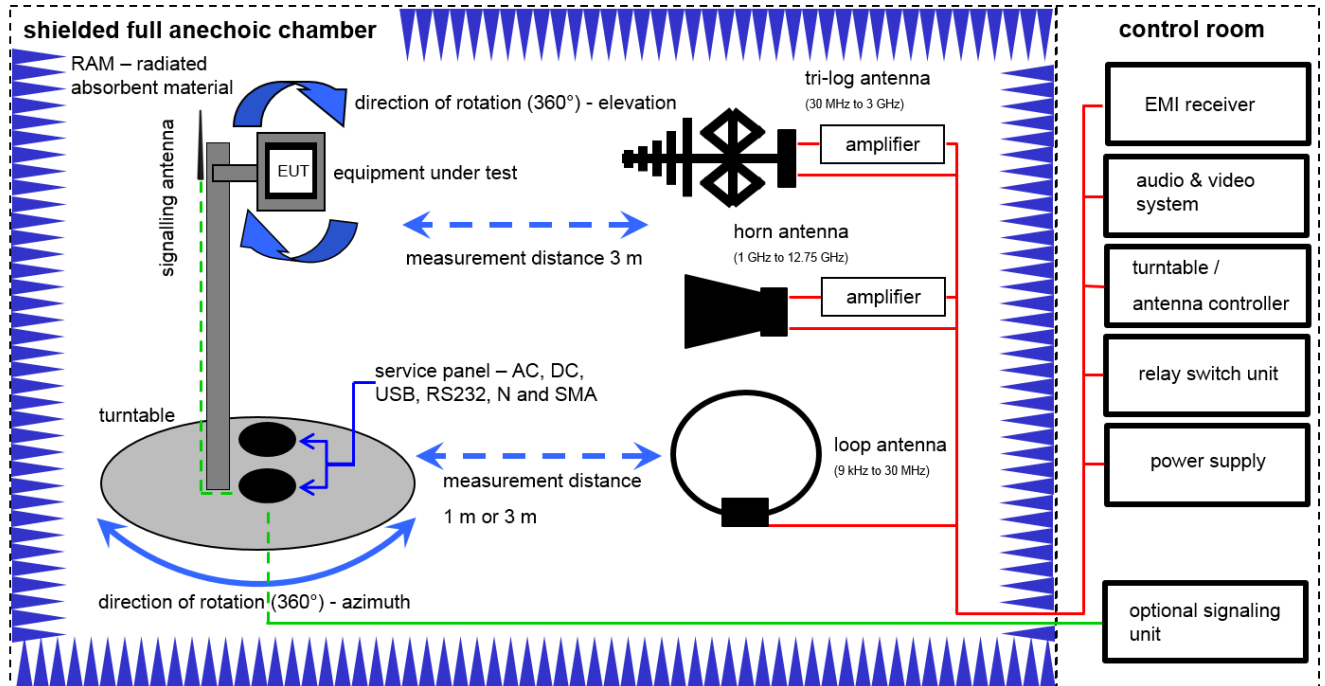
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. 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 analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Equipment table:

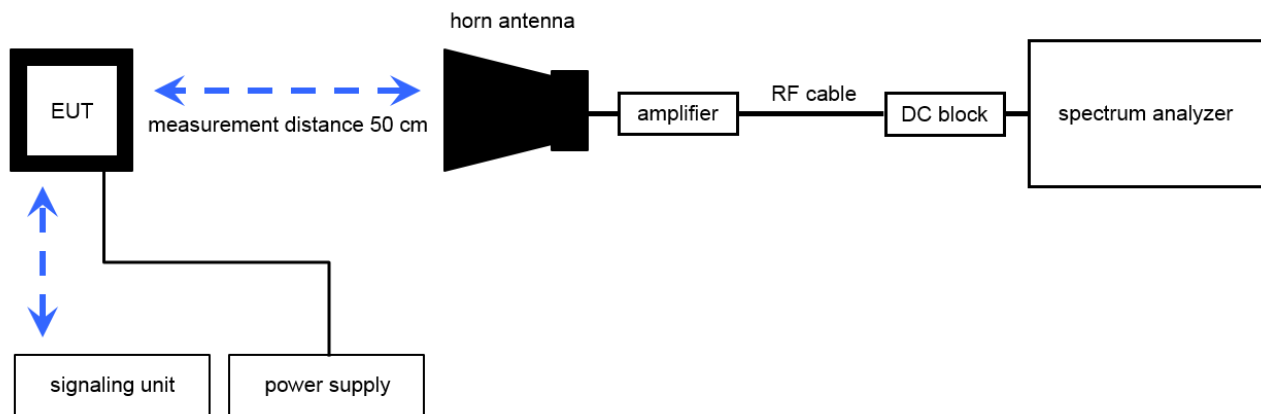
No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP	2719A14505	300000368	g		
2	45	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
3	45	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
4	45	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
5	45	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
6	45	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016

7.2 Shielded fully anechoic chamber

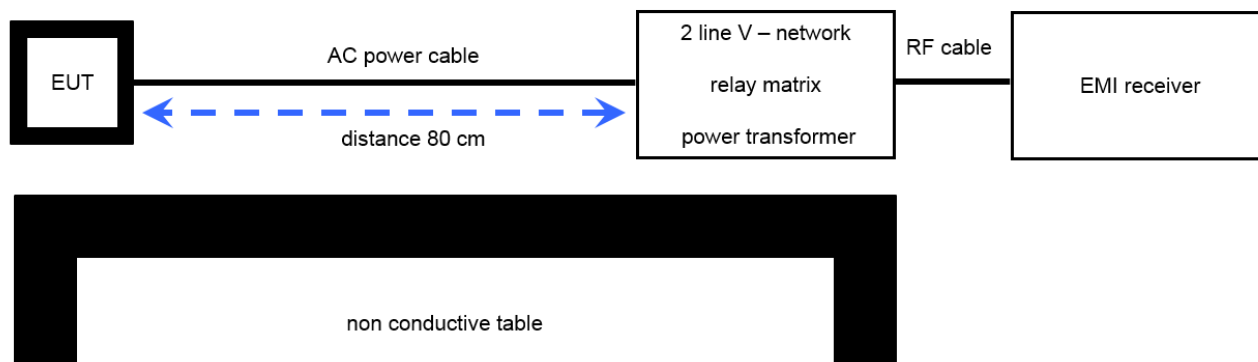


Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	ev		
3	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
4	n. a.	Switch / Control Unit	3488A	HP	*	300000199	ne		
5	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
6	90	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
7	90	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
8	90	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
9	90	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		

7.3 Radiated measurements > 12.75 GHz**Radiated measurements > 12.75 GHz****Equipment table:**

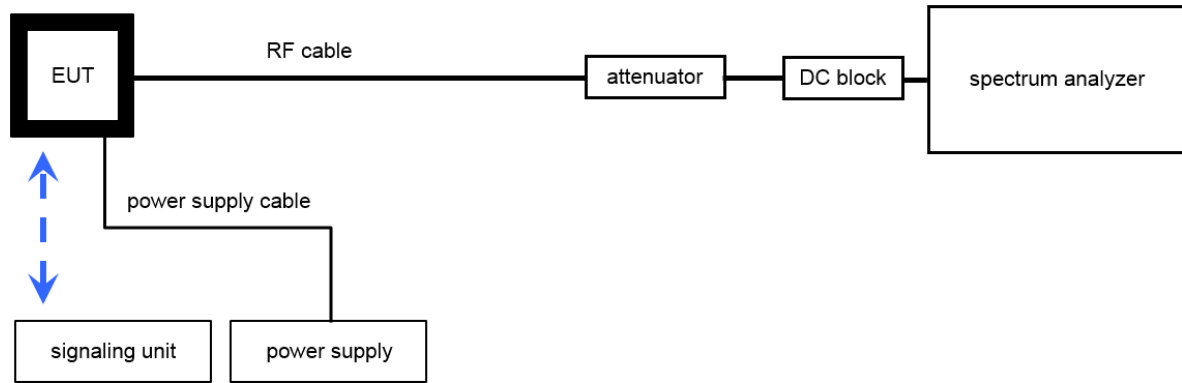
No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
2	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
3	A029	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
4	A029	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev		

7.4 AC conducted**AC conducted****Equipment table:**

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	30.01.2014	30.01.2016
2	9	Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155	ne		

7.5 Conducted measurements

Conducted measurements normal conditions



Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016

8 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 1	See table!	2015-06-16	-/-

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS - 247 / 5.4 (4)	System gain	-/-	Nominal	Nominal	DSSS	☒	☐	☐	☐	complies
§15.247(e) RSS - 247 / 5.2 (2)	Power spectral density	KDB 558074 DTS clause: 10.6	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.247(a)(2) RSS - 247 / 5.2 (1)	DTS bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.247(b)(3) RSS - 247 / 5.4 (4)	Maximum output power	KDB 558074 DTS clause: 9.1.2	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS - 247 / 5.5	Detailed spurious emissions @ the band edge - conducted	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance radiated	KDB 558074 DTS clause: 13.3.2	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS - 247 / 5.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2 11.3	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated below 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	complies
§15.109 RSS-Gen	RX spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	RX / idle	☒	☐	☐	☐	complies
§15.109 RSS-Gen	RX spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	RX / idle	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	Complies ^{*1}

Note:

NA = Not Applicable; NP = Not Performed;

*1For the purpose of testing this test was performed with an AC/DC adaptor which will not be supplied by the manufacturer (for reference see section 8 of this report).

9 Additional comments

Reference documents:	Datasheet for external outdoor antenna for 2.4GHz applications version 1.0 (03/10) by Pulse.
Special test descriptions:	AC conducted emission test performed with an Amigo power supply (Model No: AMS63-1501660FV-VP).
Configuration descriptions:	All tests performed with the EUT set to transmit with the highest possible output power
Test mode:	☐ No test mode available. Iperf was used to ping another device with the largest support packet size ☒ Special software is used. EUT is transmitting pseudo random data by itself
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.

10 Measurement results

10.1 Antenna gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the DSSS mode is used.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Antenna Gain	
6 dBi	

Results (internal antenna):

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		18.5	18.3	18.0
Radiated power [dBm] Measured with DSSS modulation		18.7	16.6	16.5
Gain [dBi] Calculated		0.2	1.7	1.5
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

Verdict: **complies**

Results (external antenna):

Maximum Antenna Gain as declared by the manufacturer is **1.5 dBi** (for reference see section 9 of this report).

Verdict: **complies**

10.2 Identify worst case data rate

Measurement:

All modes of the module will be measured with an average power meter to identify the maximum transmission power on low, mid and high channel. In the case that only one or two channels are available, only these will be measured.

In further tests only the identified worst case modulation scheme or bandwidth will be measured.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max hold

Results:

Modulation Frequency	Modulation scheme / bandwidth		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	-/-	11 Mbit/s	-/-
OFDM / g – mode	-/-	6 Mbit/s	-/-
OFDM / n HT20 – mode	-/-	MCS 0	-/-

10.3 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. The measurements are performed using the data rate producing the highest conducted output power.

Measurement:

Measurement parameter	
According to DTS clause: 9.1.2 (PKPM1 Peak power meter method)	
Detector:	Peak
Sweep time:	-/-
Resolution bandwidth:	-/-
Video bandwidth:	≥ DTS bandwidth

Limits:

FCC	IC
Maximum Output Power	
Conducted: 1.0 W – Antenna Gain max. 6 dBi	

Results:

Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Output power conducted DSSS / b – mode	18.0	18.0	17.7
Output power conducted DSSS / g – mode	20.1	20.2	19.9
Output power conducted DSSS / n HT20 – mode	20.1	20.2	19.8
Measurement uncertainty	± 1.5 dB (cond.)		

Verdict: [complies](#)

10.4 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated for both modulations at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
According to DTS clause: 10.6	
Detector:	Peak
Sweep time:	10.1s
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	30 MHz
Trace-Mode:	Max hold (allow trace to fully stabilize)

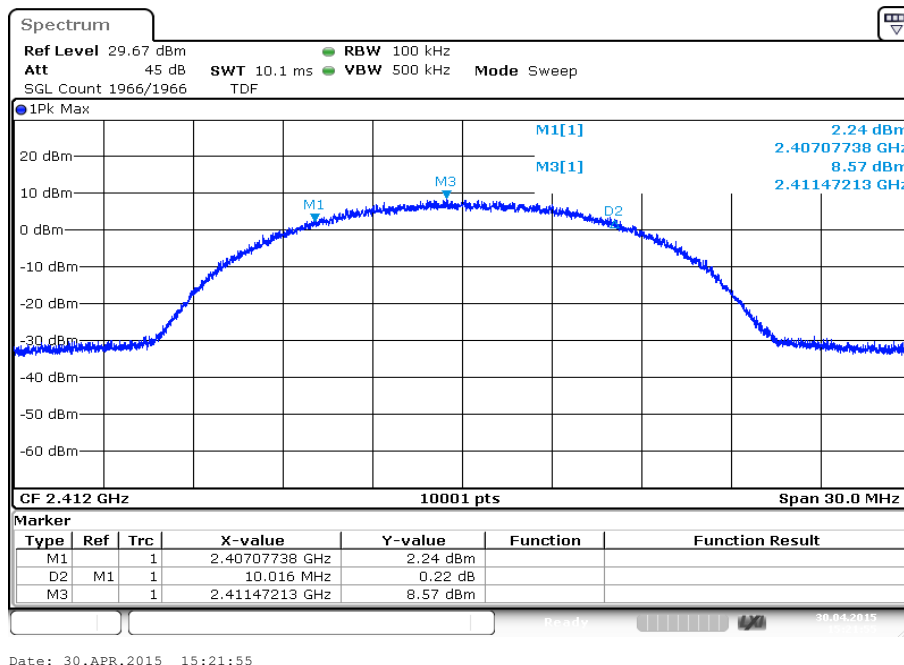
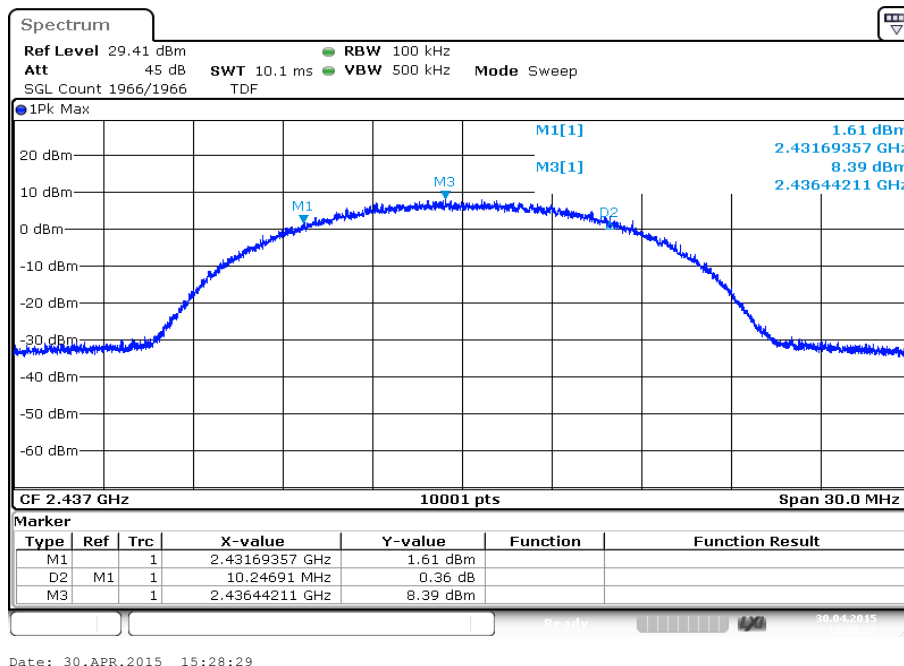
Limits:

FCC	IC
Power Spectral Density	
8 dBm / 3kHz (conducted)	

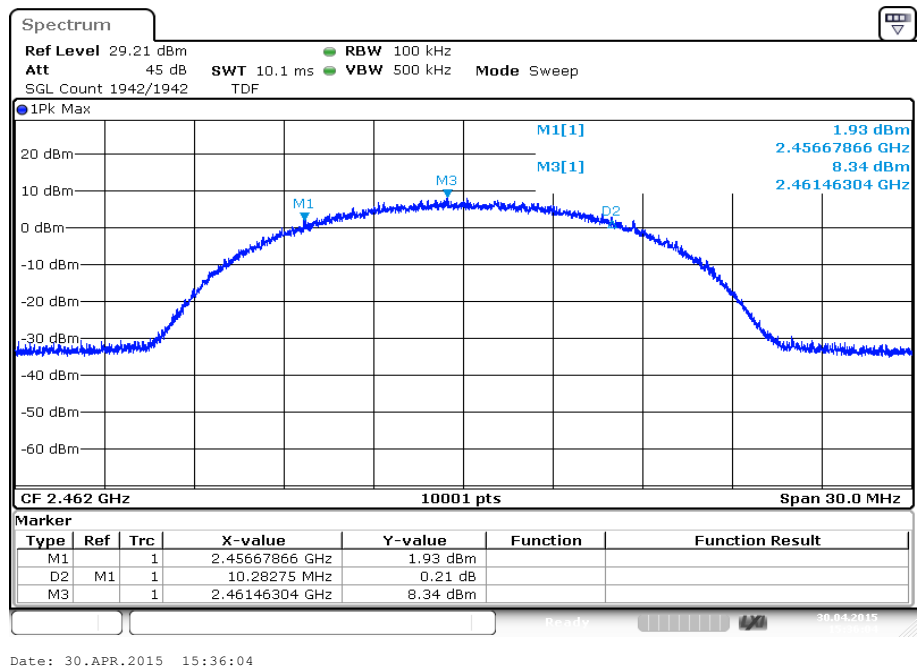
Results:

Modulation Frequency	Power Spectral density [dBm]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	-16.7	-16.9	-17.2
OFDM / g – mode	-20.5	-18.2	-21.2
OFDM / n HT20 – mode	-20.5	-18.9	-21.1
Measurement uncertainty	± 1.5 dB (cond.)		

Verdict: [complies](#)

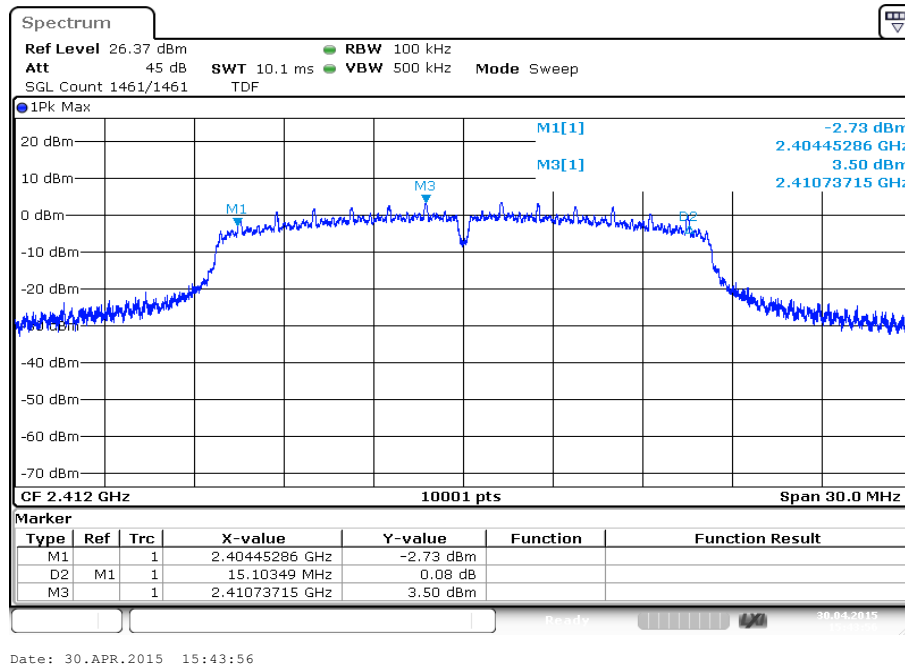
Plots: DSSS / b – mode**Plot 1:** TX mode, lowest channel**Plot 2:** TX mode, middle channel

Plot 3: TX mode, highest channel

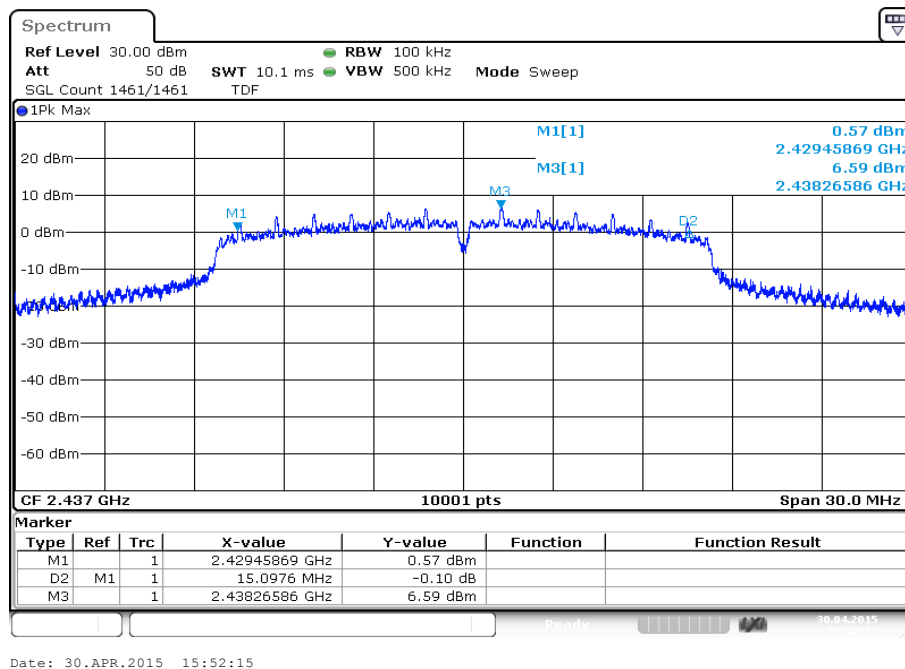


Plots: OFDM / g – mode

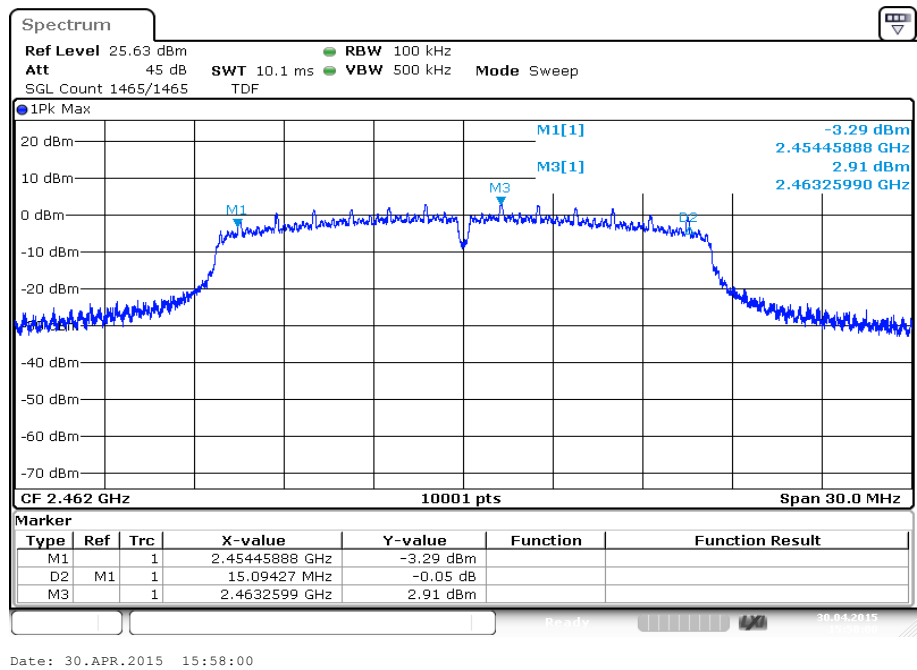
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

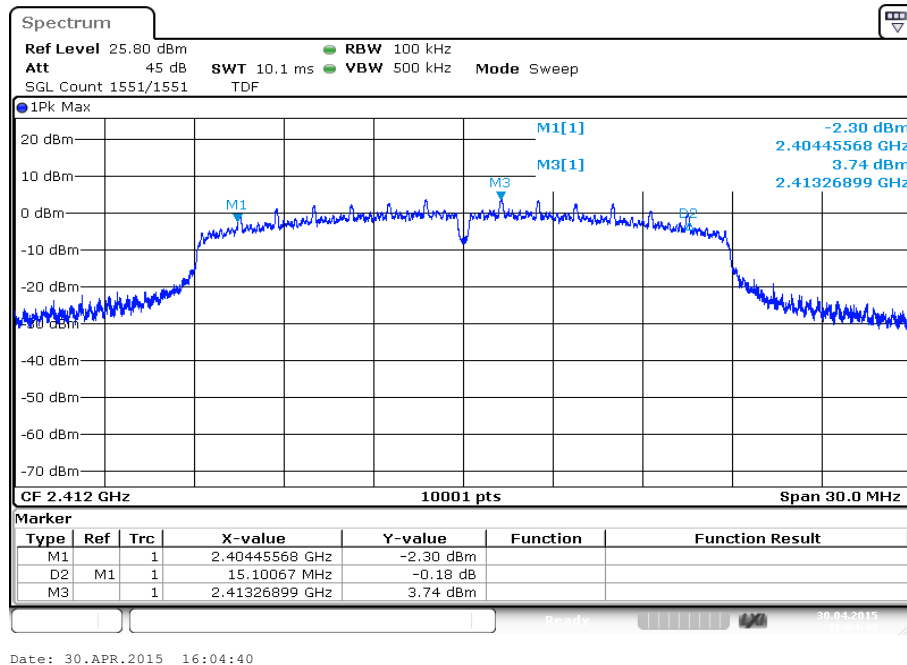


Plot 3: TX mode, highest channel

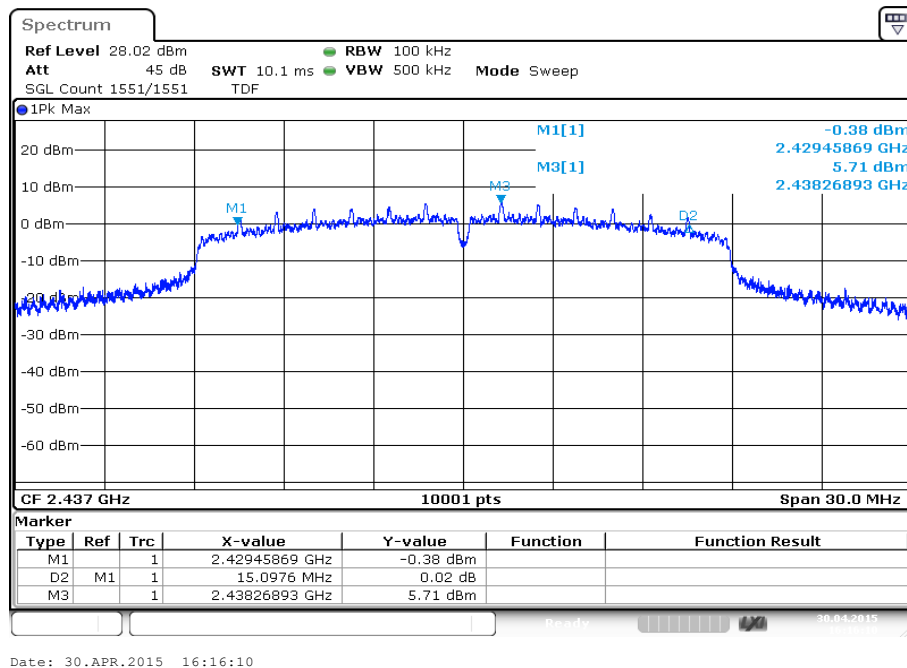


Plots: OFDM / n HT20 – mode

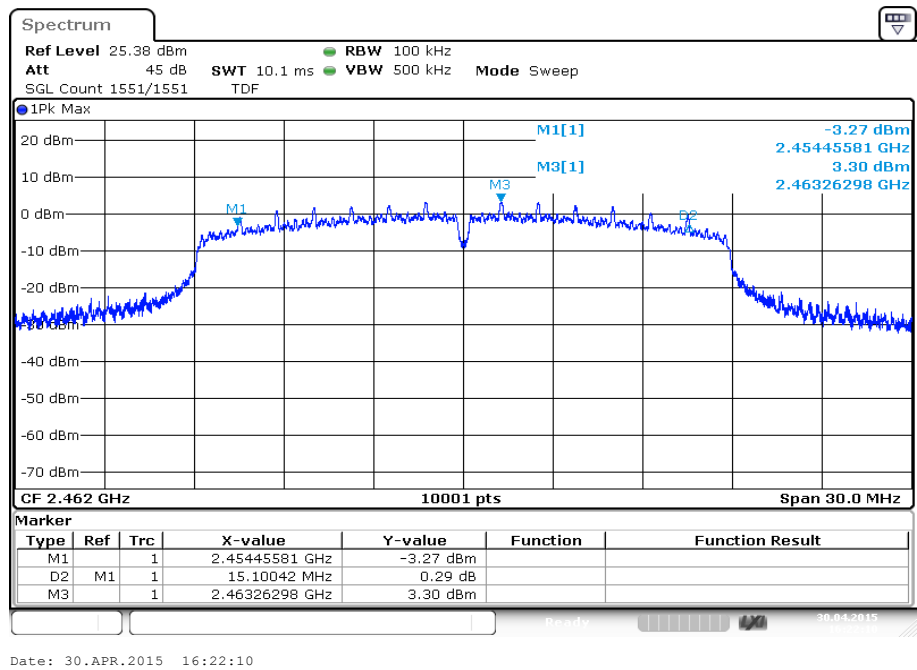
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel



Plot 3: TX mode, highest channel



10.5 DTS bandwidth – 6 dB

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to DTS clause: 8.1	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	40 MHz
Measurement procedure:	Measurement of the 75% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

Limits:

FCC	IC
DTS Bandwidth – 6 dB	
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:

Frequency	6 dB bandwidth [kHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	10020	10250	10280
OFDM / g – mode	15100	15100	15090
OFDM / n HT20 – mode	15100	15100	15100
Measurement uncertainty	± RBW		

Verdict: **complies**

10.6 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:	1000 kHz
Span:	30 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

Usage:

-/-	IC
Occupied Bandwidth – 99% emission bandwidth	
OBW is necessary for Emission Designator	

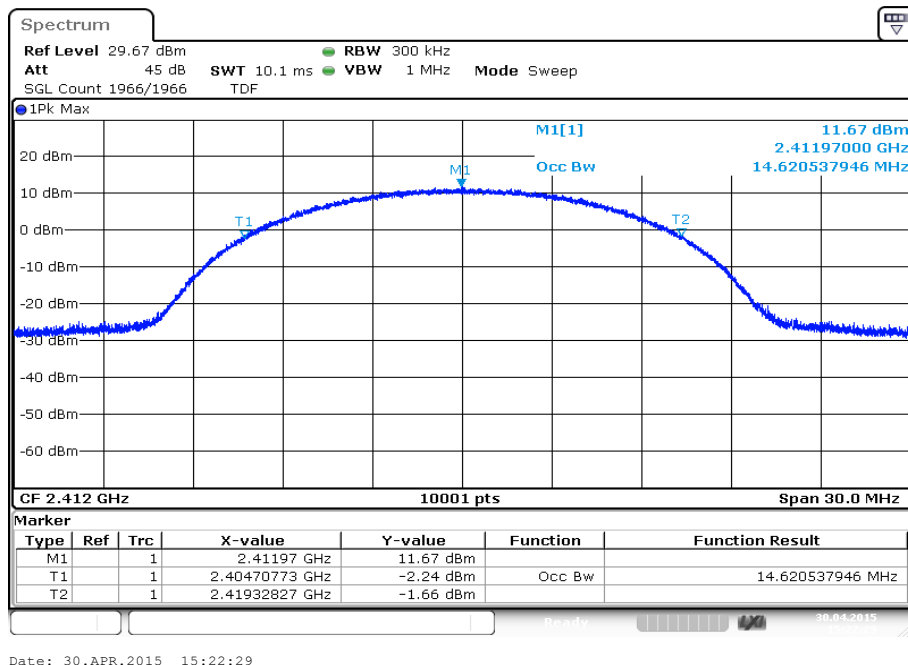
Results:

Modulation Frequency	99% bandwidth [kHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	14620	14612	14600
OFDM / g – mode	16510	18637	16480
OFDM / n HT20 – mode	17629	18397	17617
Measurement uncertainty	± RBW		

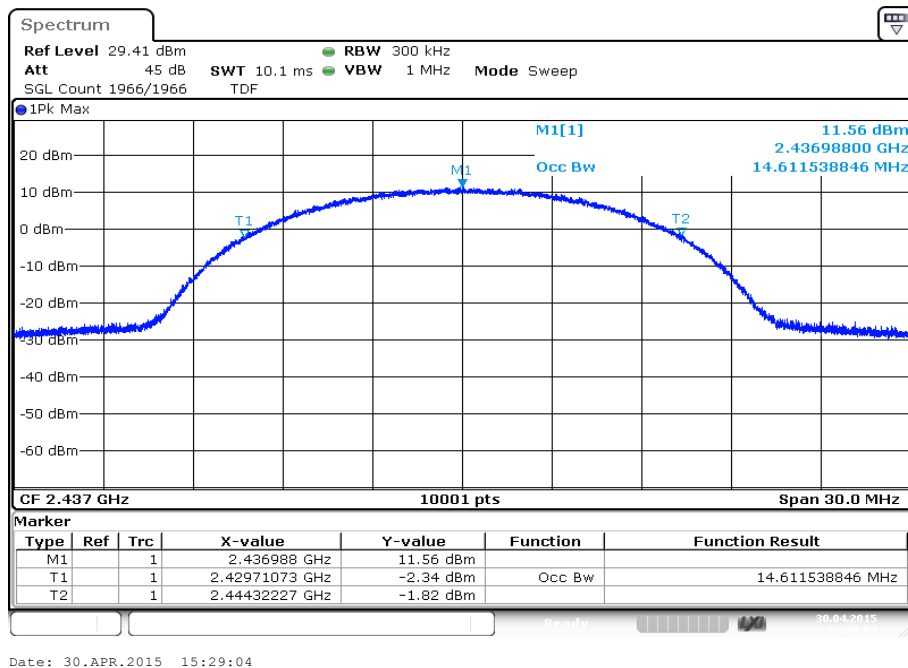
Verdict: [complies](#)

Plots: DSSS / b – mode

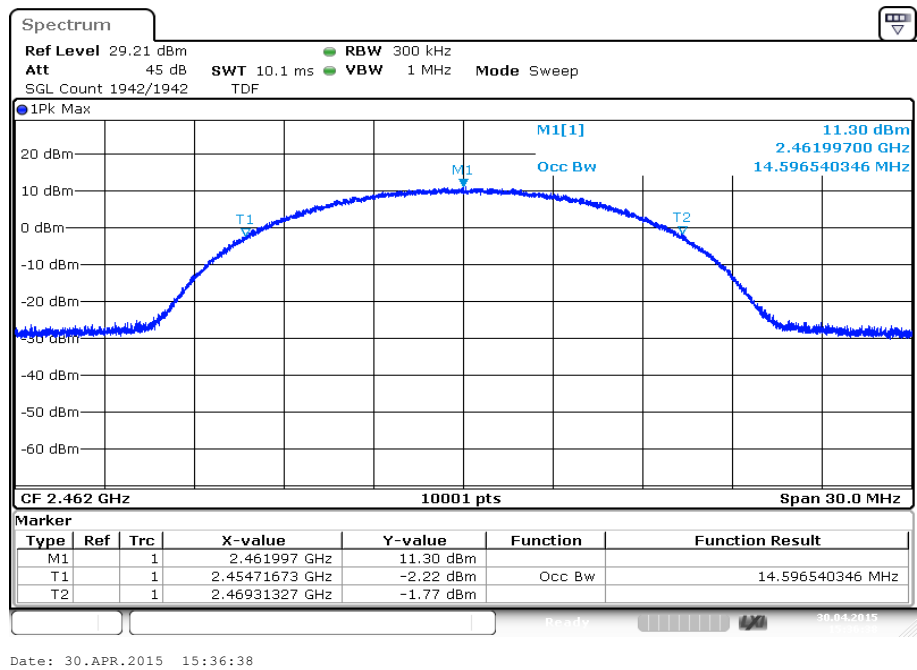
Plot 1: TX mode, lowest channel

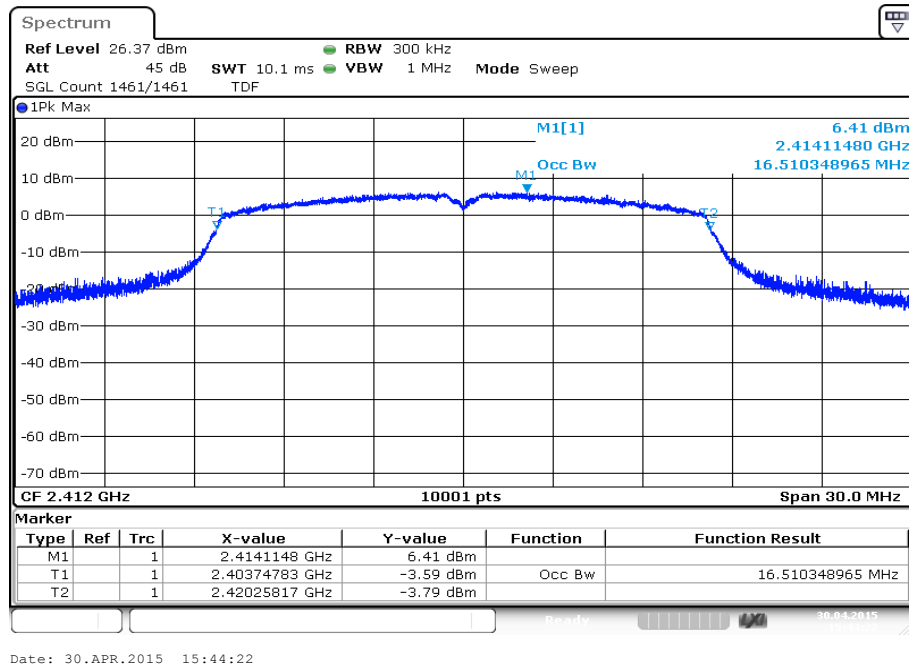
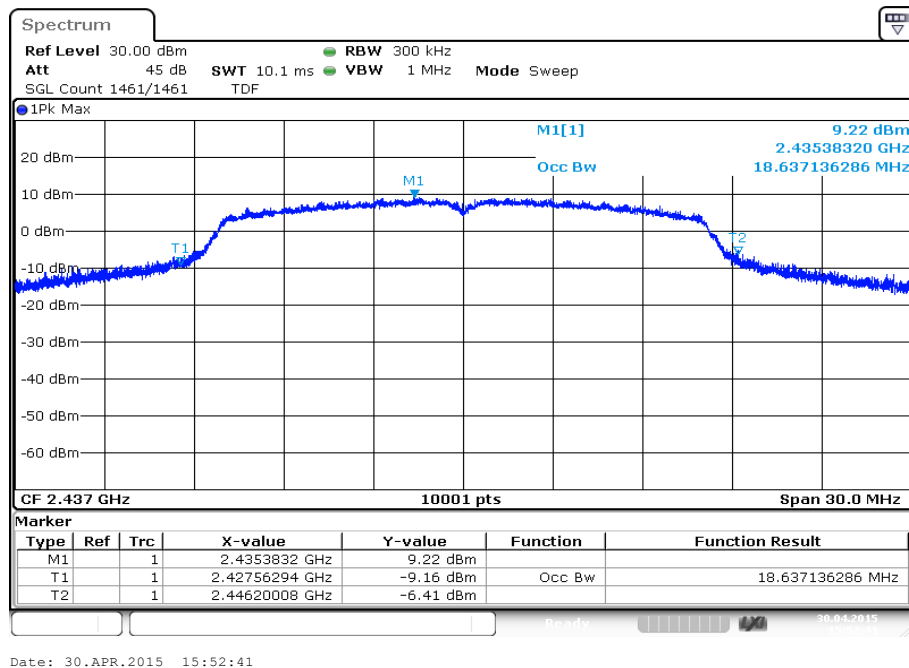


Plot 2: TX mode, middle channel

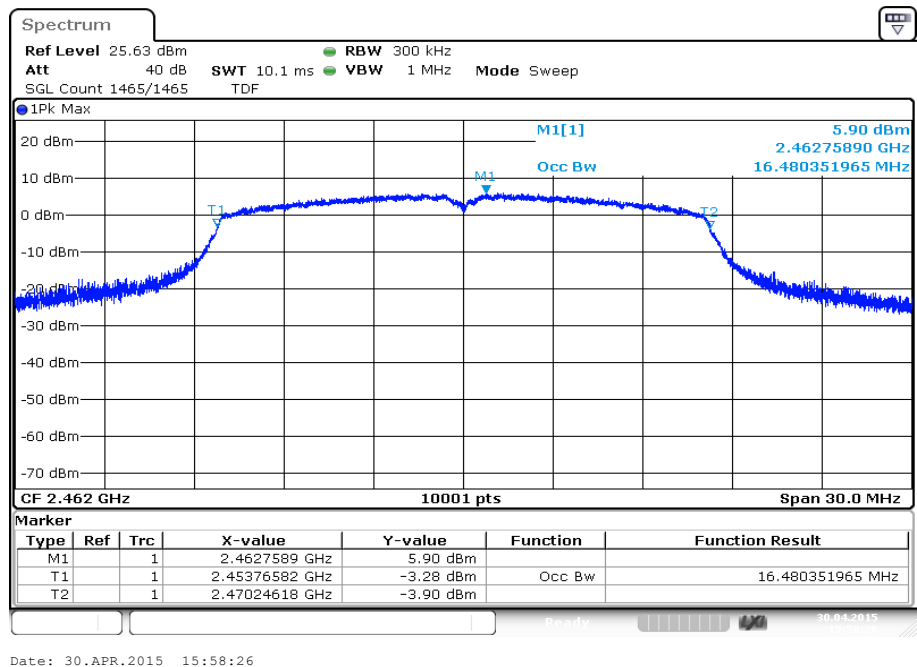


Plot 3: TX mode, highest channel



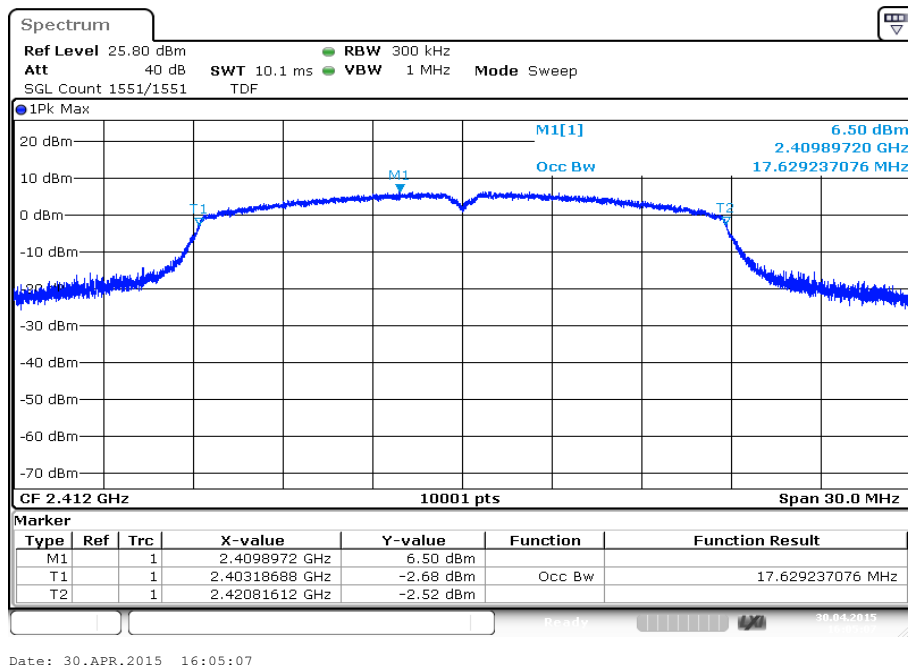
Plots: OFDM / g – mode**Plot 1:** TX mode, lowest channel**Plot 2:** TX mode, middle channel

Plot 3: TX mode, highest channel

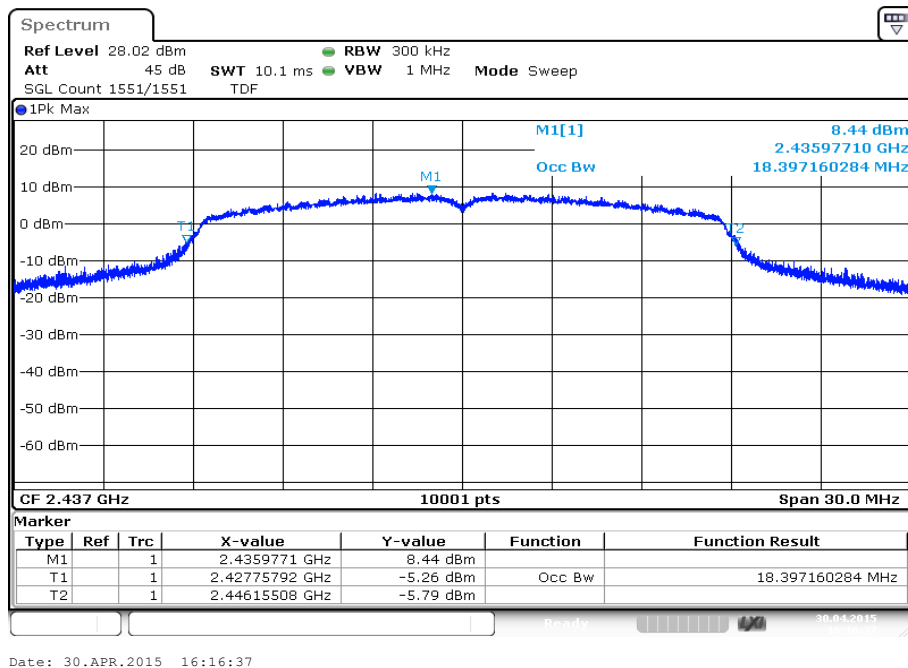


Plots: OFDM / n HT20 – mode

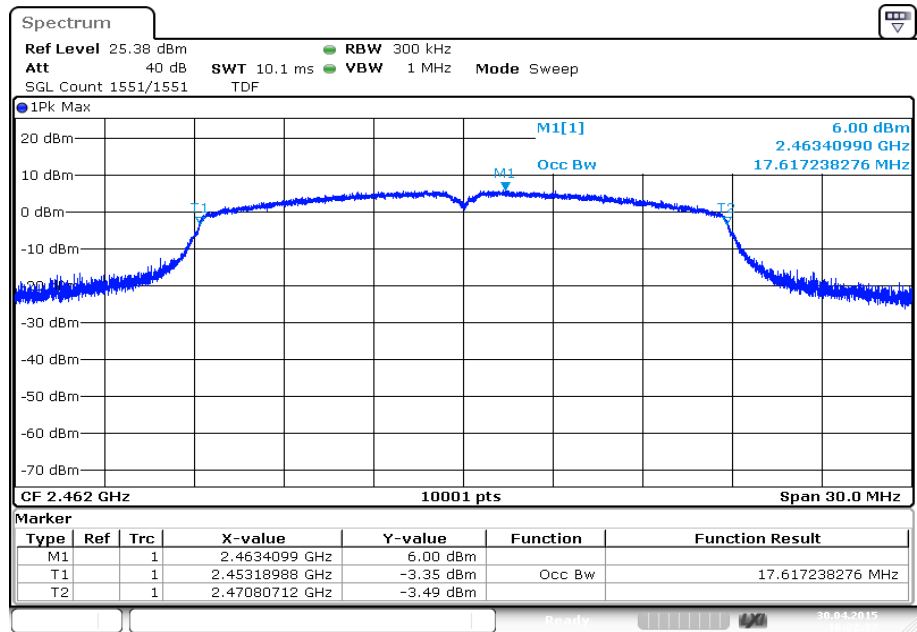
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel



Plot 3: TX mode, highest channel



Date: 30.APR.2015 16:22:37

10.7 Detailed spurious emissions @ the band edge - conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in both modes.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	Lower Band Edge: 2300 – 2425 MHz Upper Band Edge: 2450 – 2550 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Band Edge Compliance Conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.	
The output power in this test report is measured with a Peak power meter, so the limit is -20 dBc.	

Results:

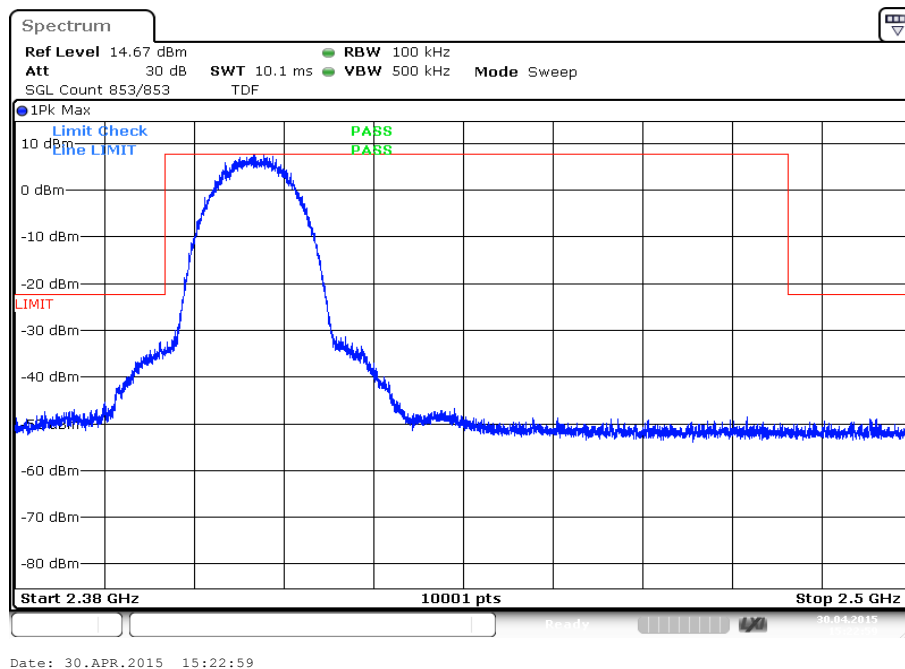
Scenario Modulation	Compliance Conducted [dB]			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	-/-
Lower band edge	> 20 dB	> 20 dB	> 20 dB	-/-
Upper band edge	> 20 dB	> 20 dB	> 20 dB	-/-
Measurement uncertainty	± 1.5 dB			

Verdict: [complies](#)

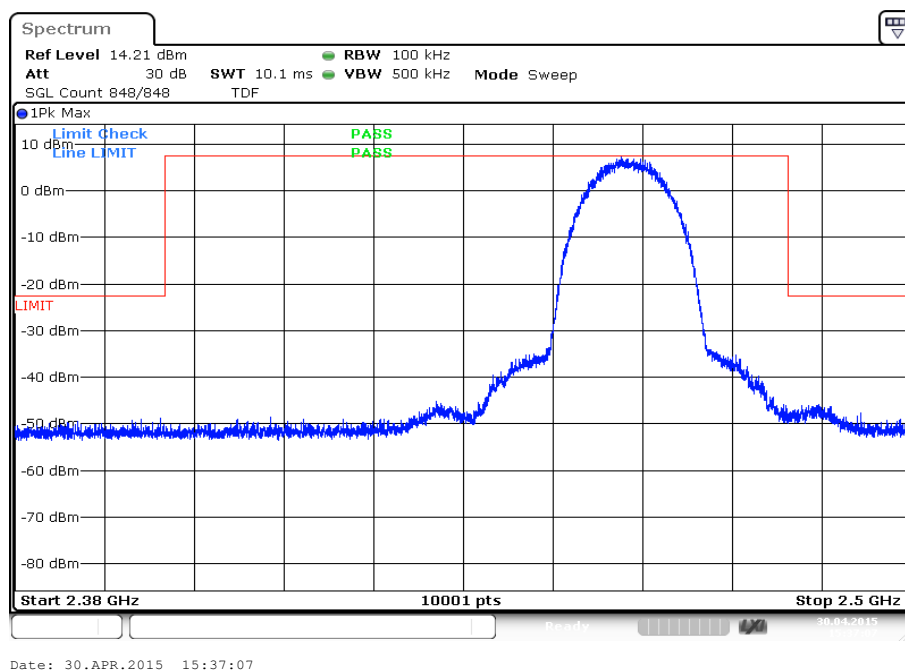
Note: Some of the following plots contain the more stringent -30dBc limit line. All plots are valid to show compliance.

Plots: DSSS / b – mode

Plot 1: TX mode, lower band edge

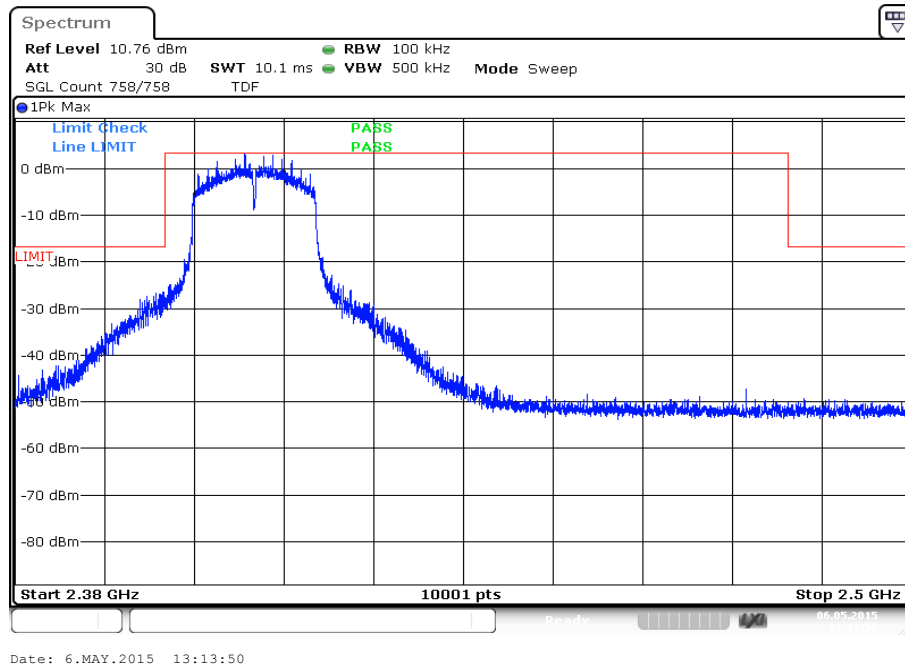


Plot 2: TX mode, upper band edge

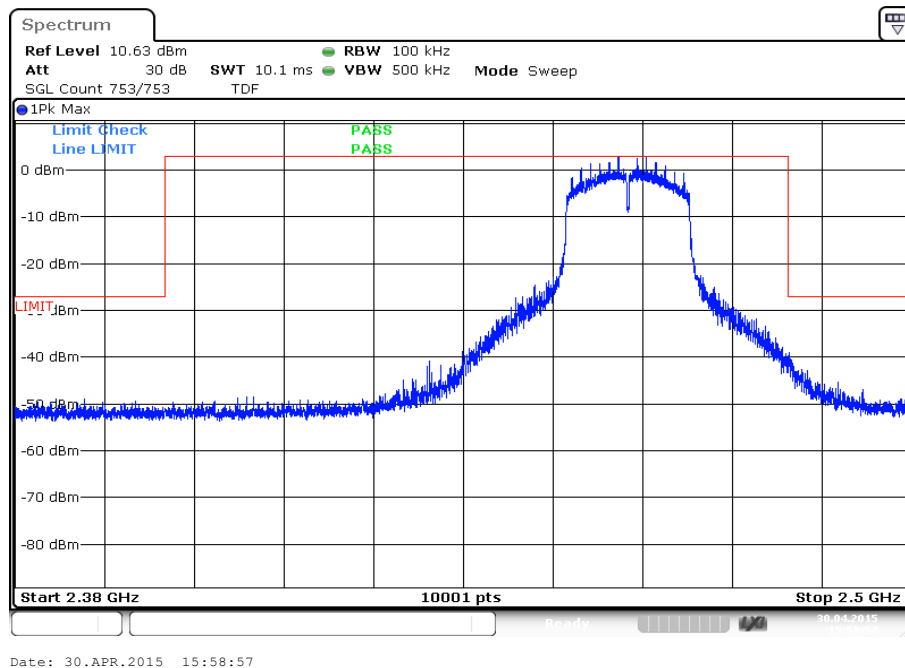


Plots: OFDM / g – mode

Plot 1: TX mode, lower band edge

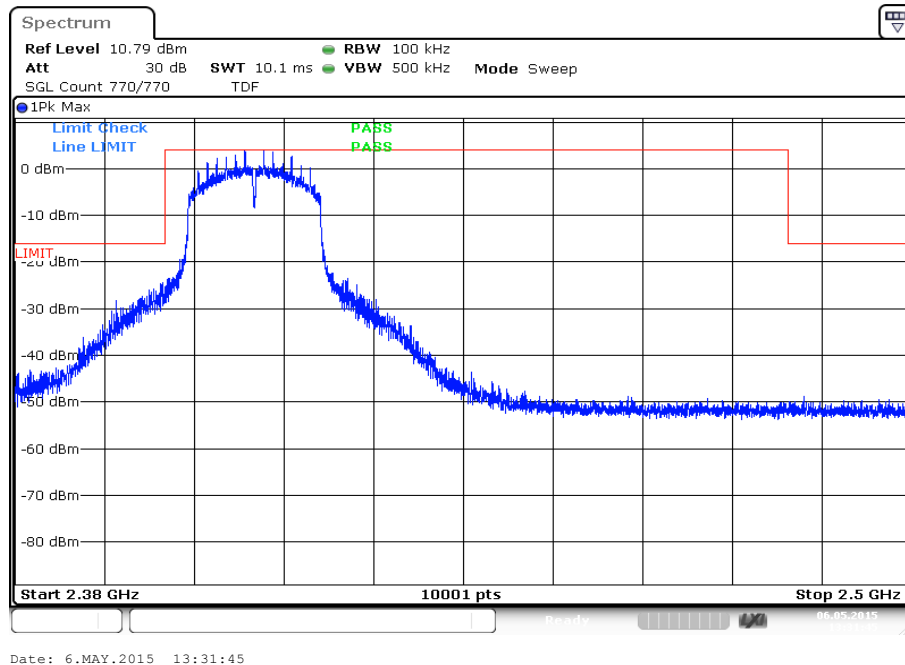


Plot 2: TX mode, upper band edge

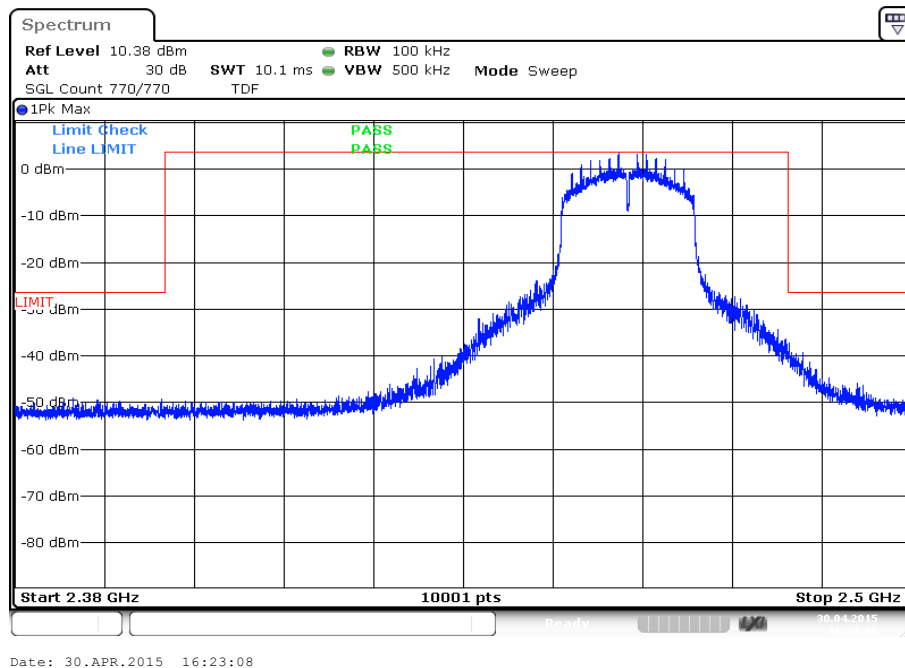


Plots: OFDM / n HT20 – mode

Plot 1: TX mode, lower band edge



Plot 2: TX mode, upper band edge



10.8 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 channel 1 for the lower restricted band and to channel 11 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter for peak measurements	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	See plot!
Trace-Mode:	Max Hold

Measurement parameter for average measurements	
According to DTS clause: 13.3.2	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	2 MHz
Trace-Mode:	RMS Average over 101 sweeps

Limits:

FCC	IC
Band Edge Compliance Radiated	
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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).	
74 dBμV/m Peak 54 dBμV/m AVG	

10.8.1 Results Setup A – internal Antenna

Results (according §15.209):

Scenario Modulation	Band Edge Compliance Conducted [dB]			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	-/-
Lower band edge	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	-/-
Upper band edge	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	-/-
Measurement uncertainty	± 3 dB			

Verdict: [complies](#)

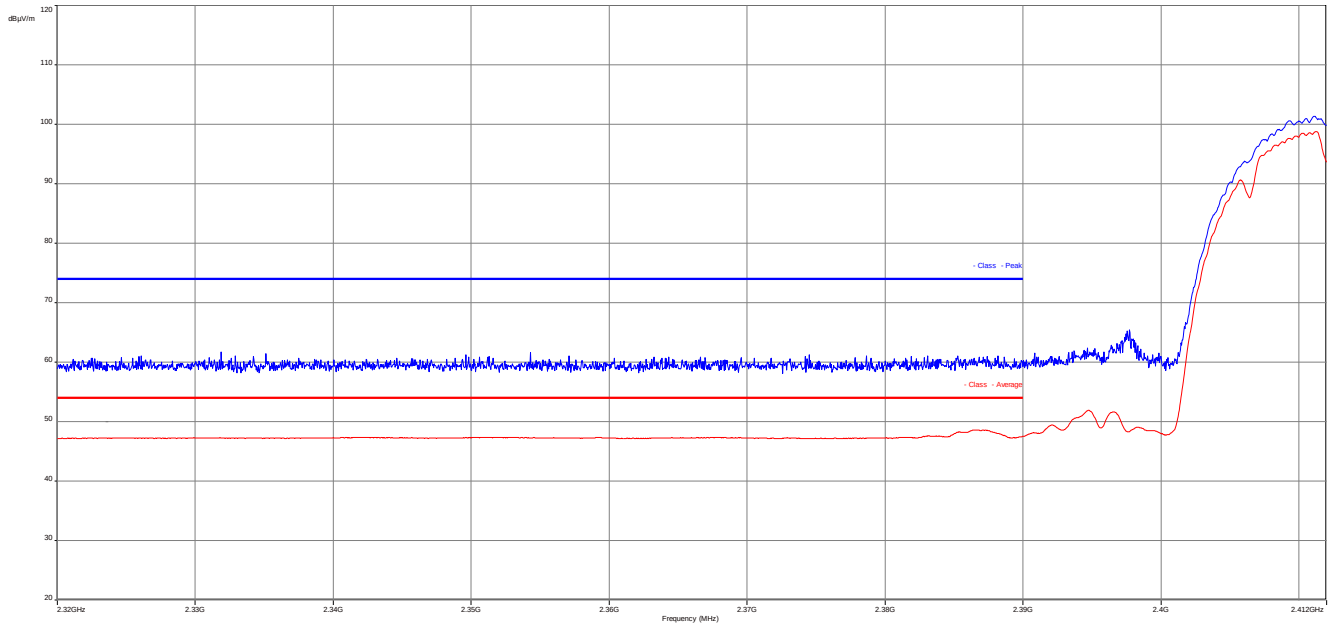
Results (according DTS clause 13.3.2):

Scenario Modulation	Band Edge Compliance Conducted [dB]			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	-/-
Lower band edge	< 54 dBμV/m	< 54 dBμV/m	< 54 dBμV/m	-/-
Upper band edge	< 54 dBμV/m	< 54 dBμV/m	< 54 dBμV/m	-/-
Measurement uncertainty	± 3 dB			

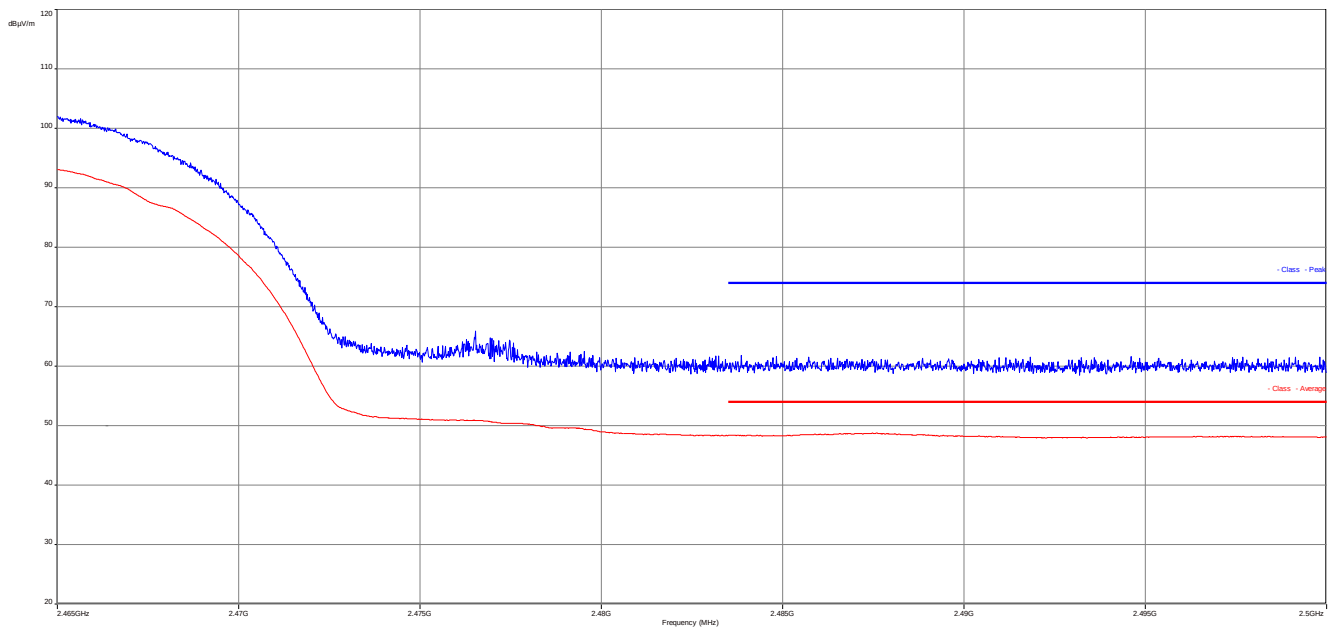
Verdict: [complies](#)

Plots (internal antenna): DSSS/ b – mode peak / average

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

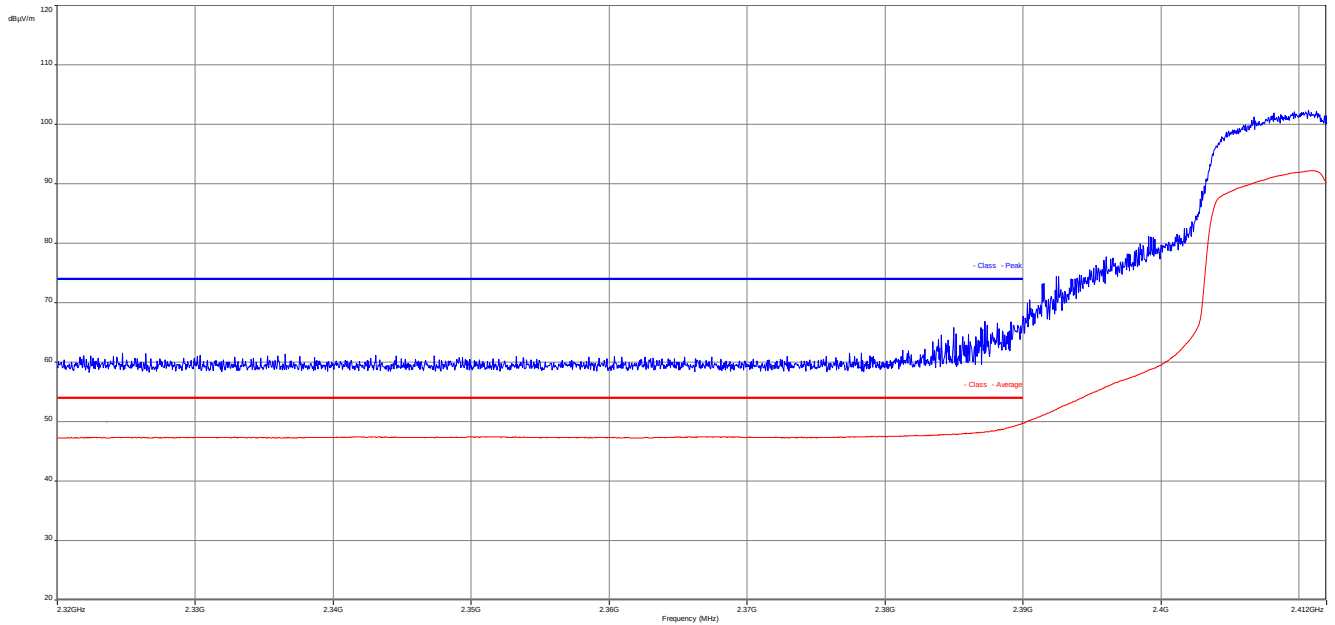


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

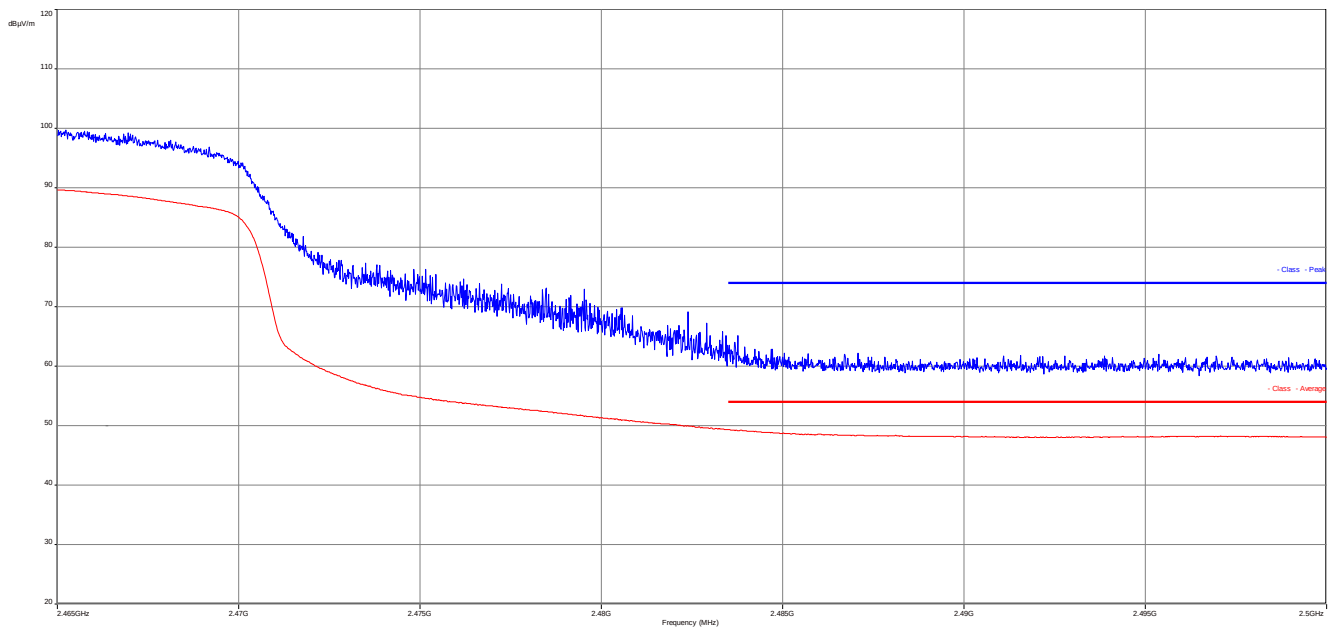


Plots (internal antenna): OFDM / g – mode peak / average

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

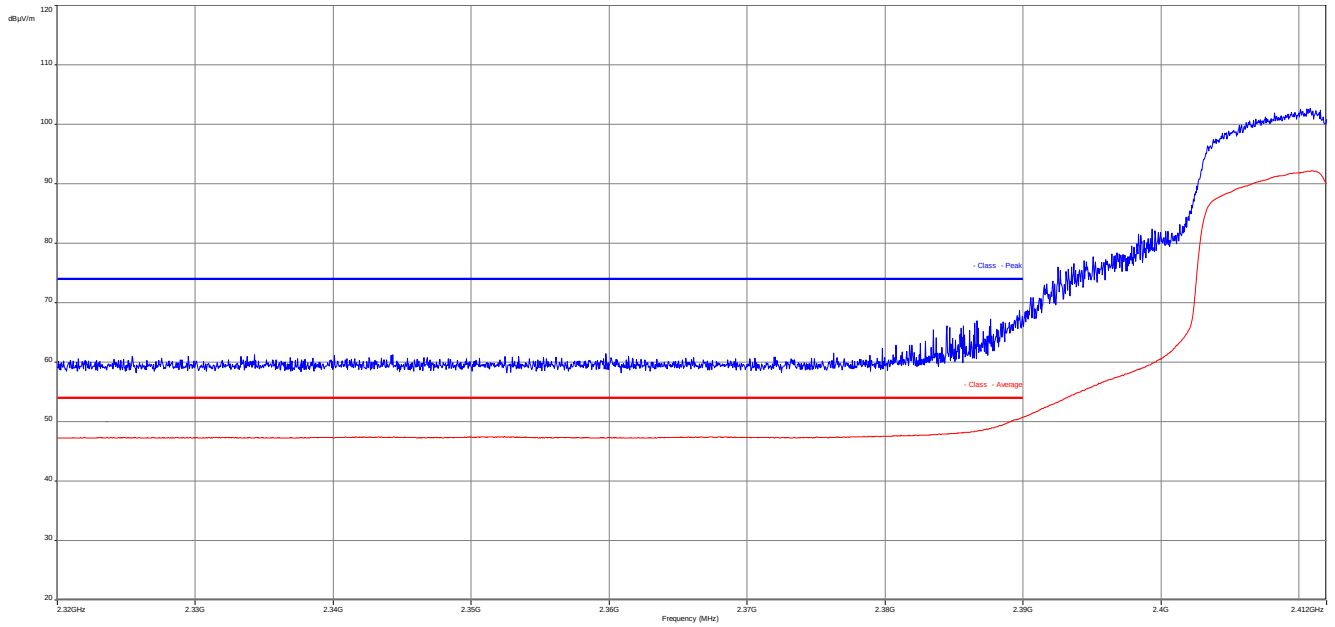


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

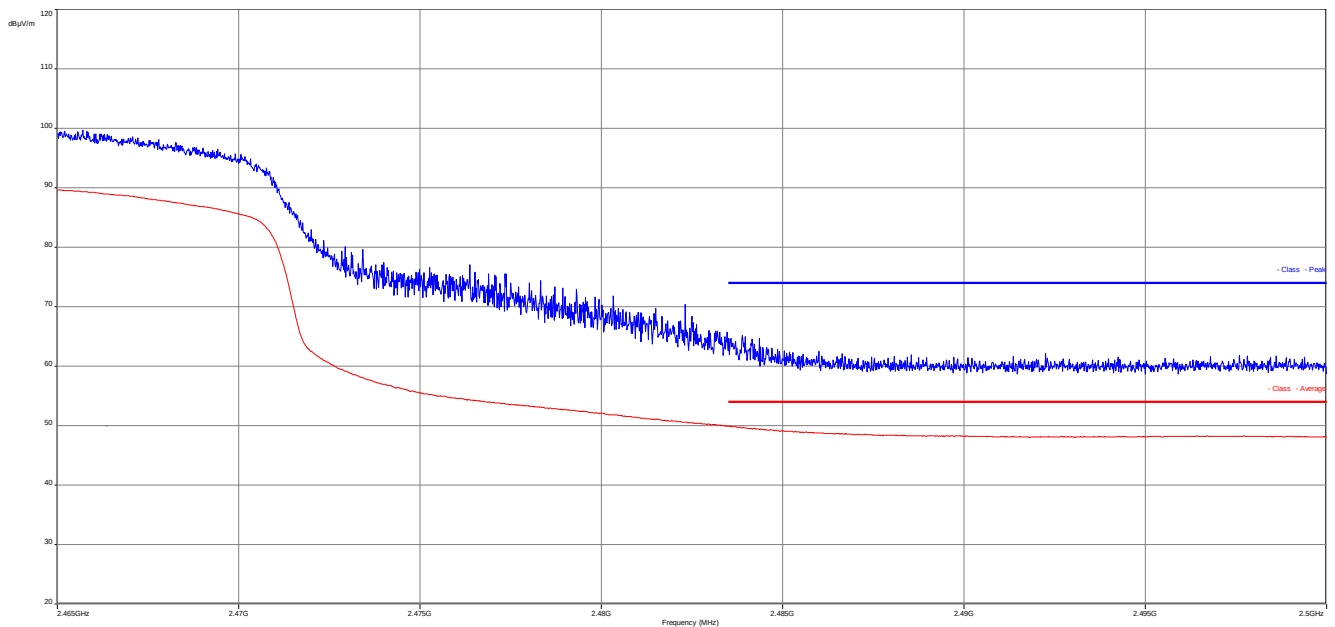


Plots (internal antenna): OFDM / n HT20 – mode peak / average

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



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



10.8.2 Results Setup B – external Antenna

Results (according §15.209):

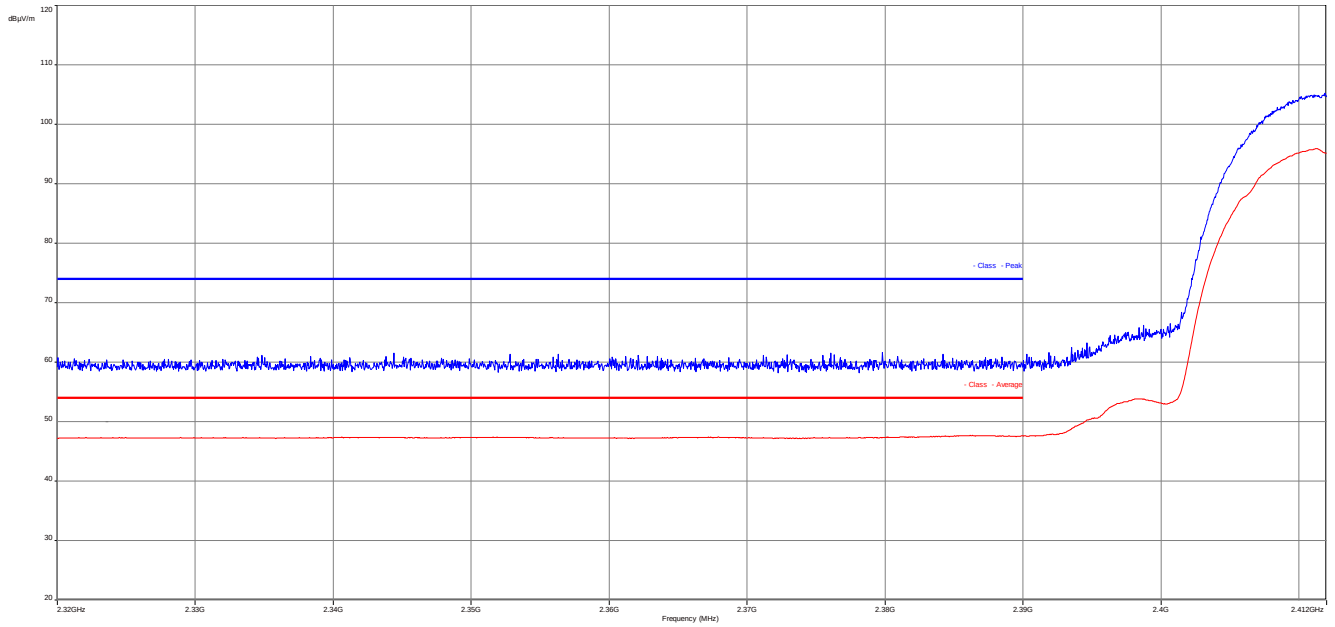
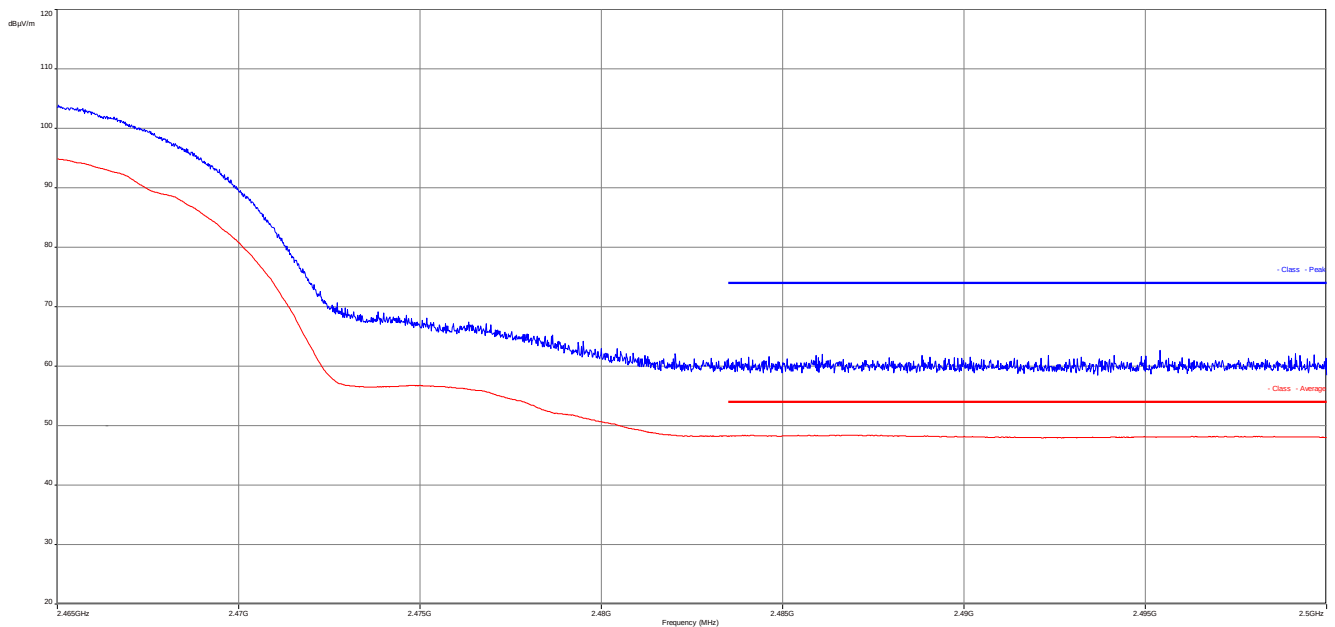
Scenario Modulation	Band Edge Compliance Conducted [dB]			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	-/-
Lower band edge	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	-/-
Upper band edge	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	> 20 dB (Peak) > 20 dB (AVG)	-/-
Measurement uncertainty	± 3 dB			

Verdict: [complies](#)

Results (according DTS clause 13.3.2):

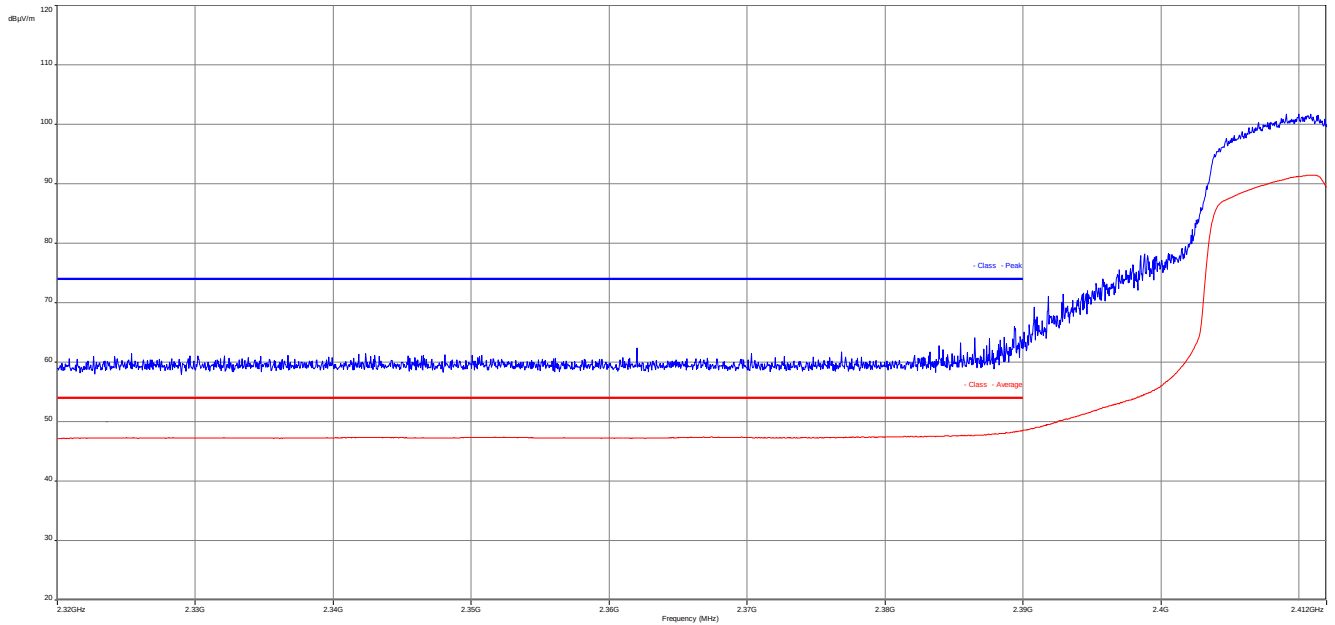
Scenario Modulation	Band Edge Compliance Conducted [dB]			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	-/-
Lower band edge	< 54 dBμV/m	< 54 dBμV/m	< 54 dBμV/m	-/-
Upper band edge	< 54 dBμV/m	< 54 dBμV/m	< 54 dBμV/m	-/-
Measurement uncertainty	± 3 dB			

Verdict: [complies](#)

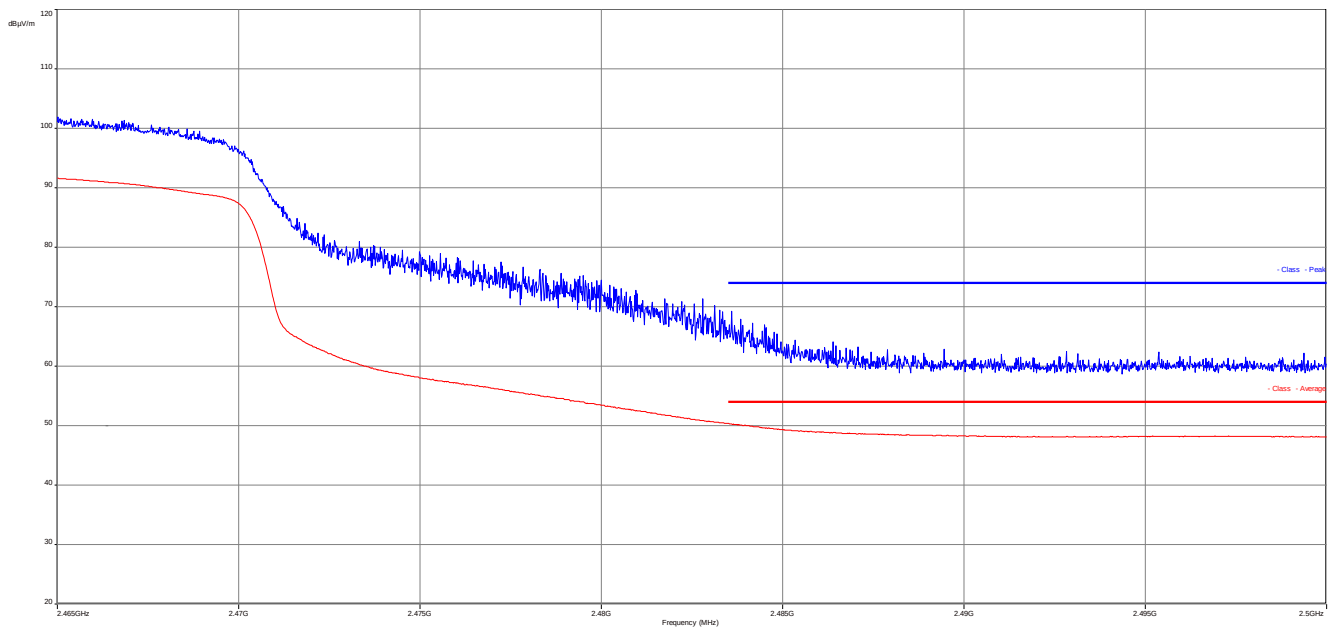
Plots (external antenna): DSSS/ b – mode peak / average**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization

Plots (external antenna): OFDM / g – mode peak / average

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

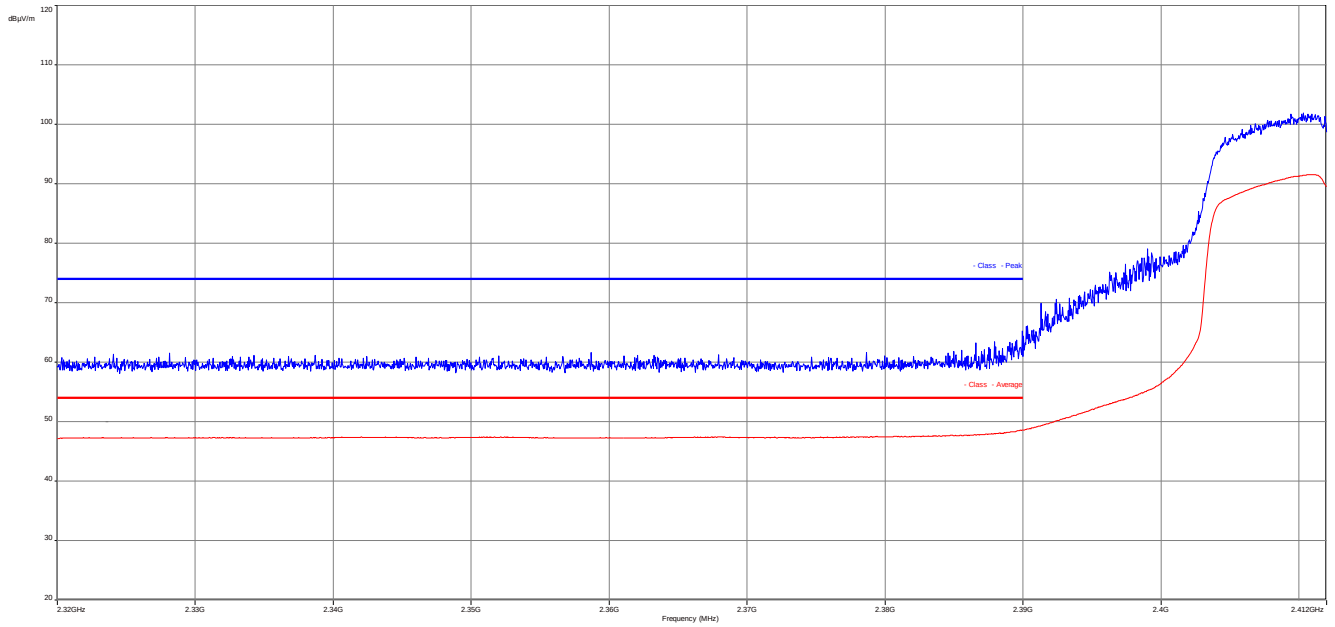


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

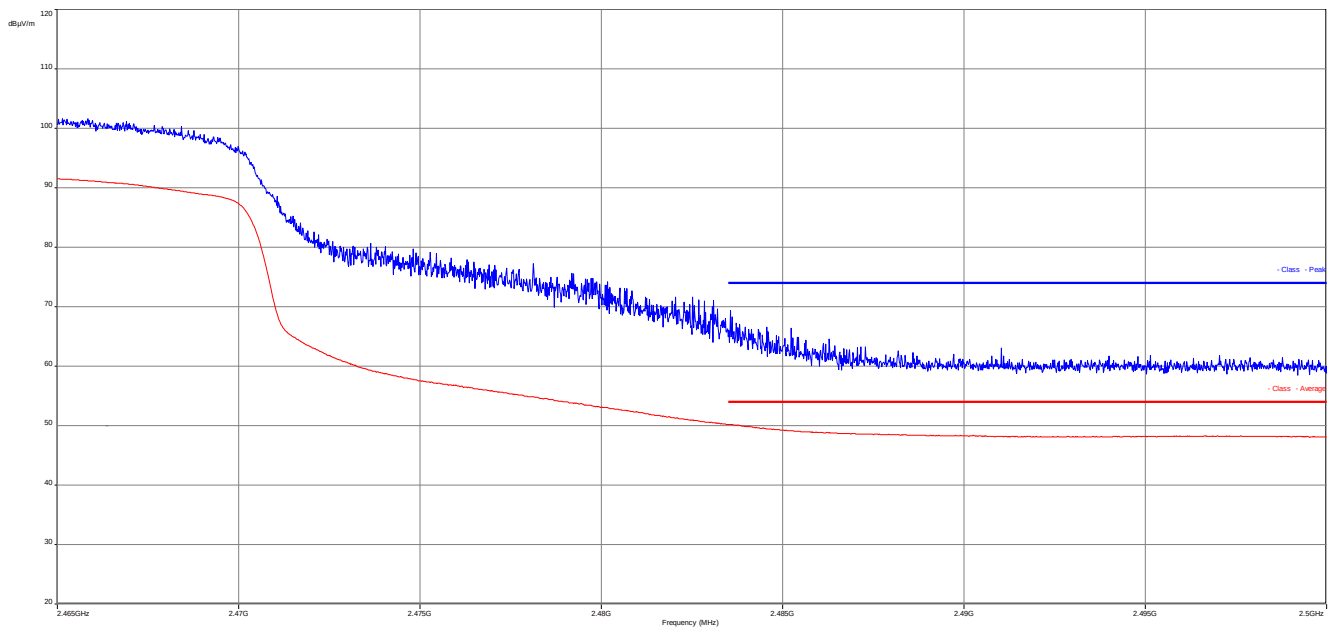


Plots (external antenna): OFDM / n HT20 – mode peak / average

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



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



10.9 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. 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

Limits:

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

Results: DSSS / b – mode

TX Spurious Emissions Conducted					
DSSS / b – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	Verdict
2412		7.0	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2437		6.0	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2462		5.6	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Verdict: **complies****Results:** OFDM / g – mode

TX Spurious Emissions Conducted					
OFDM / g – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		2.5	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2437			30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
		5.1			
2462			30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
		1.4			
Measurement uncertainty		± 3 dB			

Verdict: **complies**

Results: OFDM / n HT20 – mode

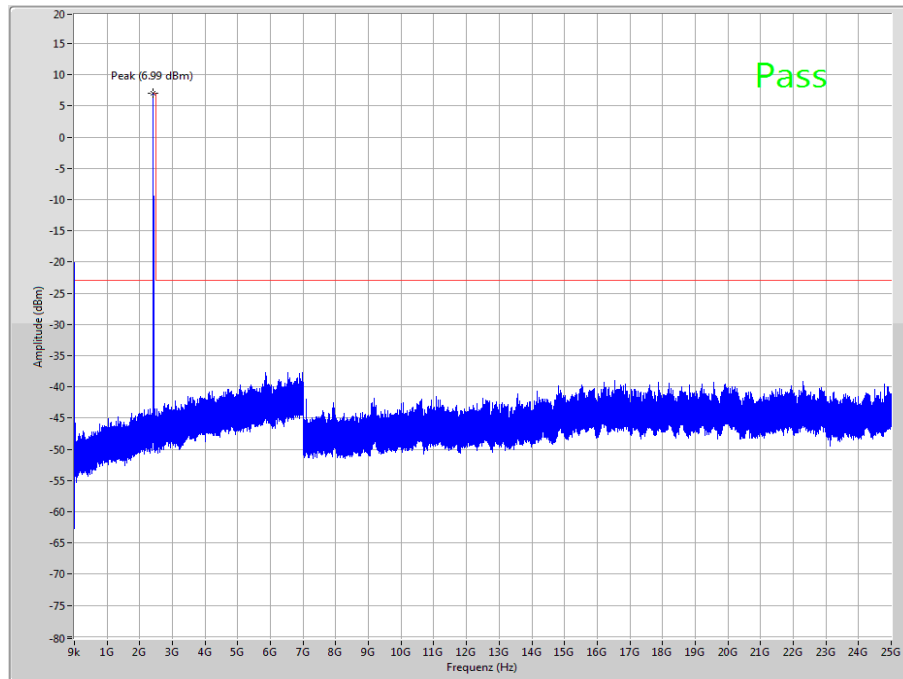
TX Spurious Emissions Conducted					
OFDM / n HT20 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		3.0	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2437		5.7	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2462		0.6	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Verdict: [complies](#)

Note: Some of the following plots contain the more stringent -30dBc limit line. All plots are valid to show compliance.

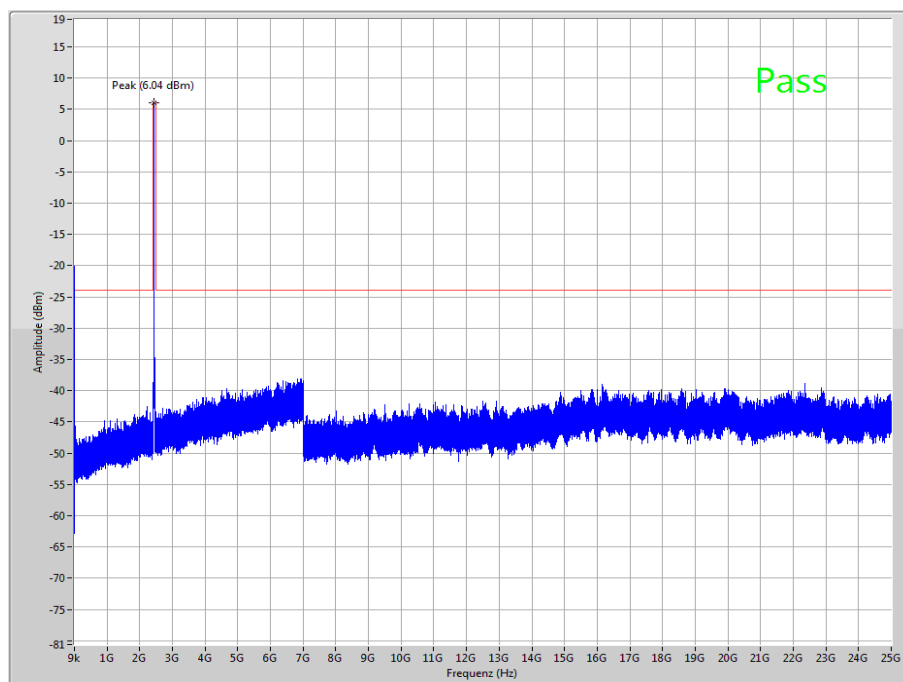
Plots: DSSS / b – mode

Plot 1: TX mode, lowest channel, up to 25 GHz

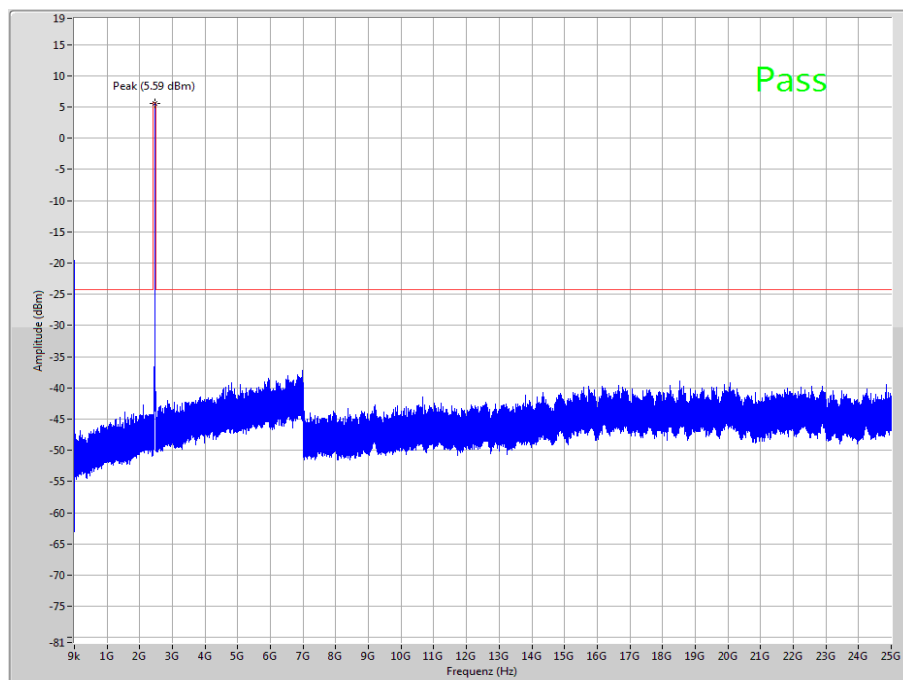


The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



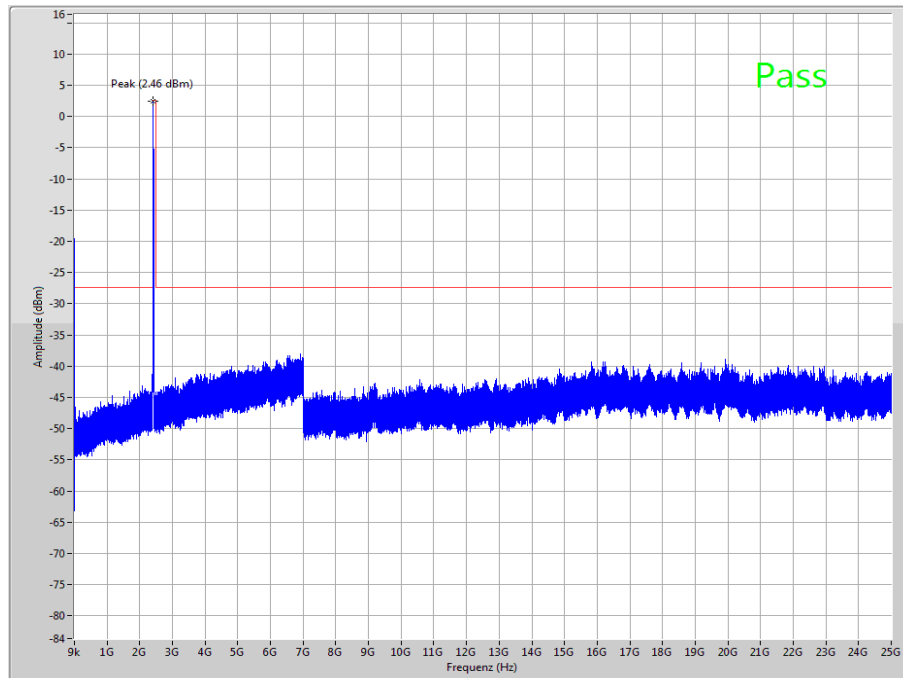
The peak at the beginning of the plot is the LO from the SA.

Plot 3: TX mode, highest channel, up to 25 GHz

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

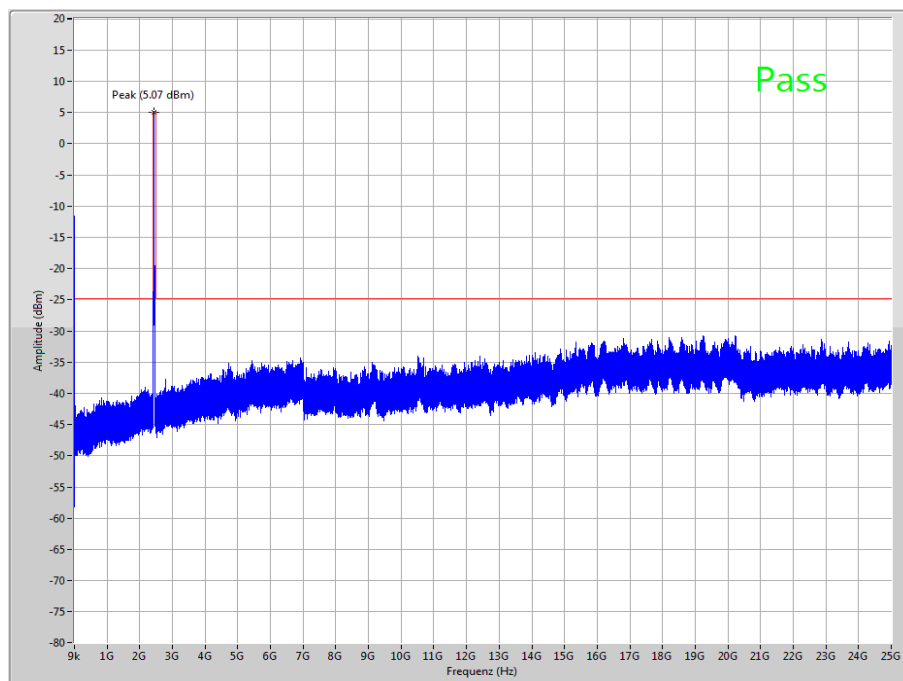
Plots: OFDM / g – mode

Plot 1: TX mode, lowest channel, up to 25 GHz

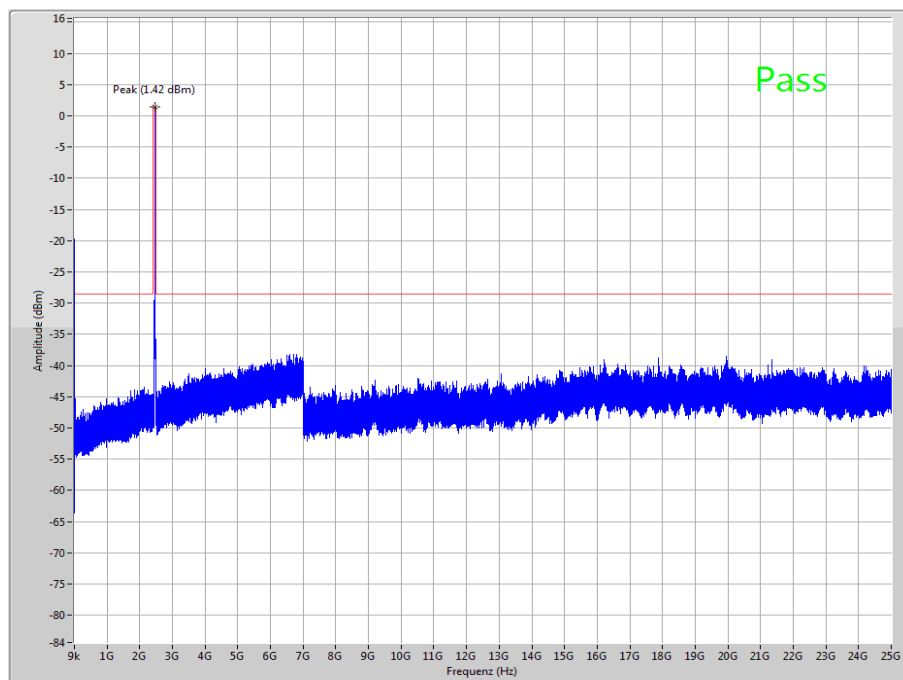


The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



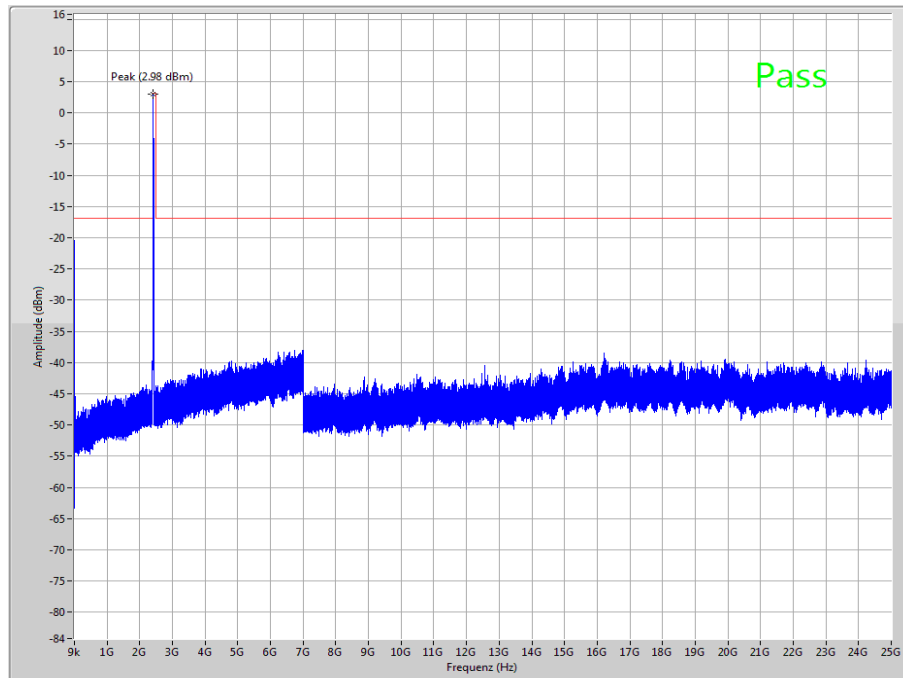
The peak at the beginning of the plot is the LO from the SA.

Plot 3: TX mode, highest channel, up to 25 GHz

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

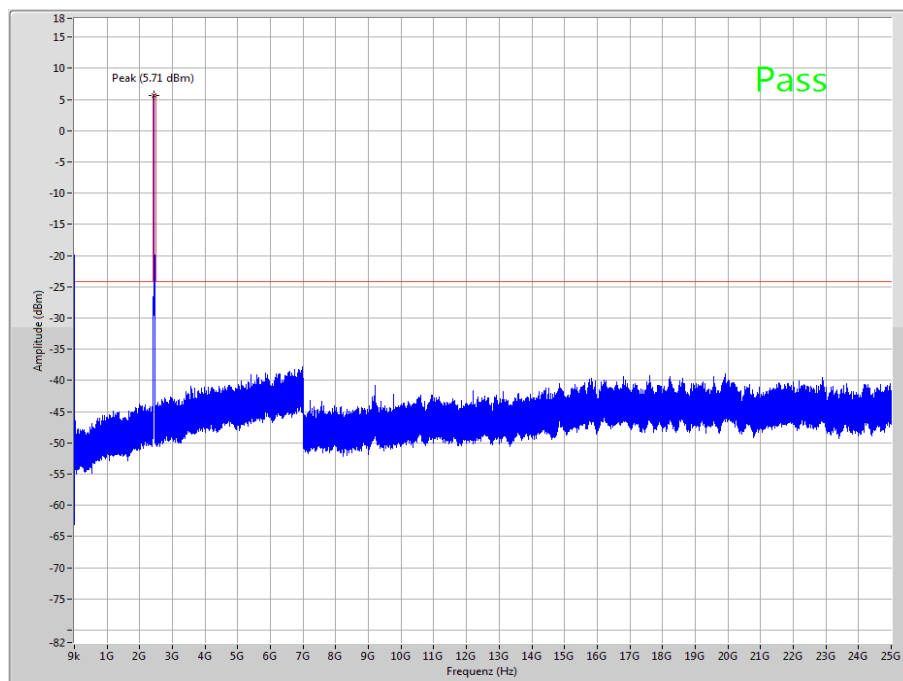
Plots: OFDM / n HT 20 – mode

Plot 1: TX mode, lowest channel, up to 25 GHz

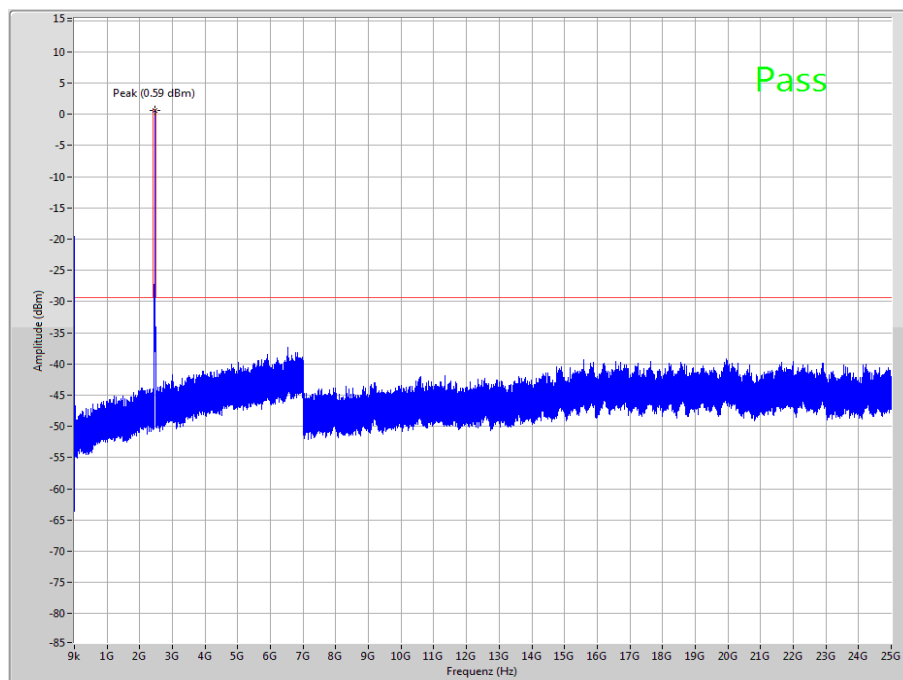


The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 25 GHz



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

Plot 3: TX mode, highest channel, up to 25 GHz

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

10.10 TX spurious emissions radiated < 1 GHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 1 GHz the EUT is set to channel 6. This measurement is representative for all channels. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power.

The limit was recalculated with 20 dB/decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz F < 1 GHz: 100 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz 3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	9 kHz to 30 MHz 30 MHz to 1 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ DSSS b – mode ☒ OFDM g – mode

Limits:

FCC		IC
TX Spurious Emissions Radiated		
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
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

10.10.1 Results Setup A – internal Antenna

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 30 MHz all detected peaks are more than 20dB below the limit.								
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.								
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

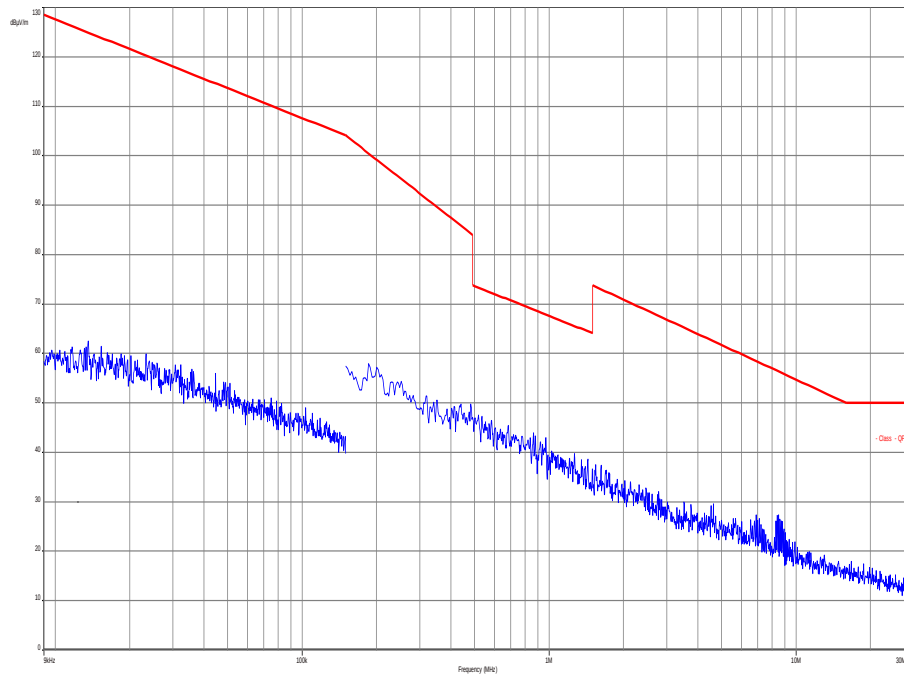
Results: OFDM / g – mode

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / g – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 30 MHz all detected peaks are more than 20dB below the limit.								
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.								
Measurement uncertainty			± 3 dB					

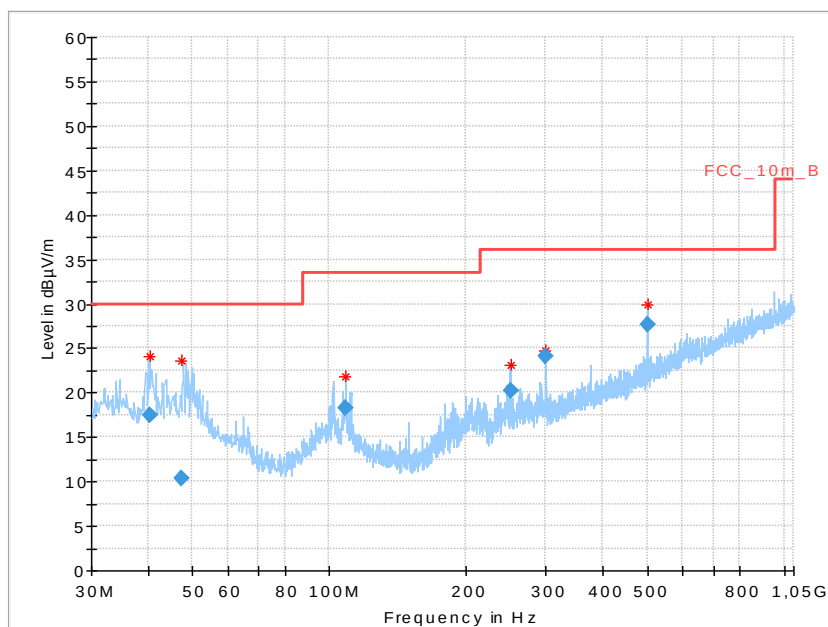
Verdict: [complies](#)

Plots: DSSS / b – mode

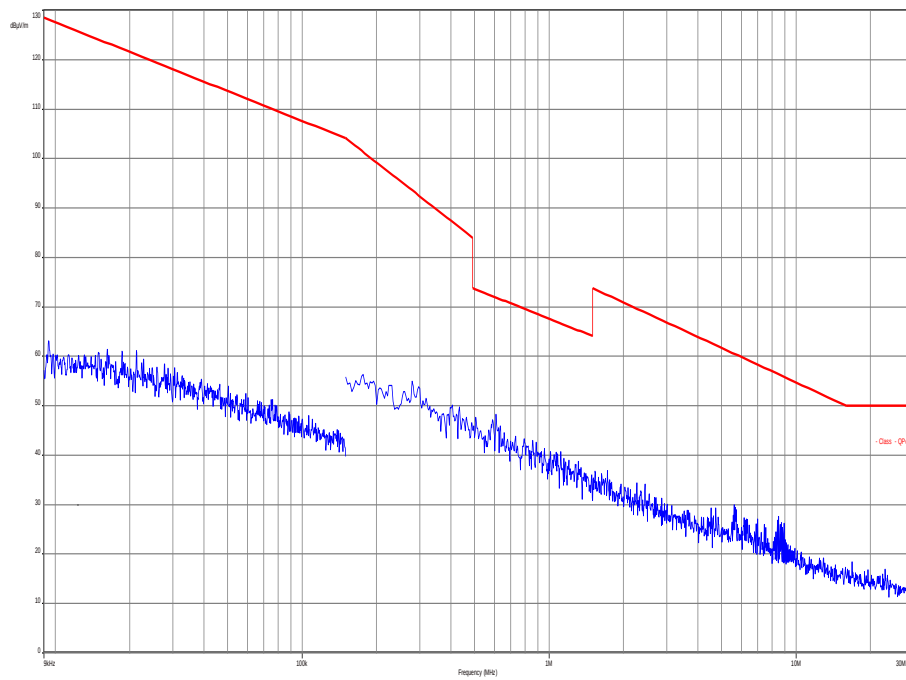
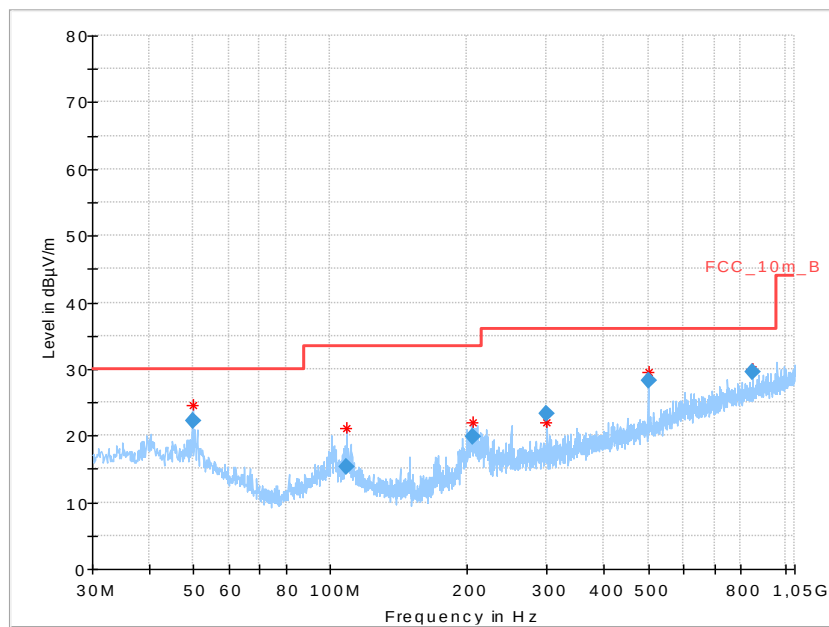
Plot 1: Low channel, 9 kHz to 30 MHz



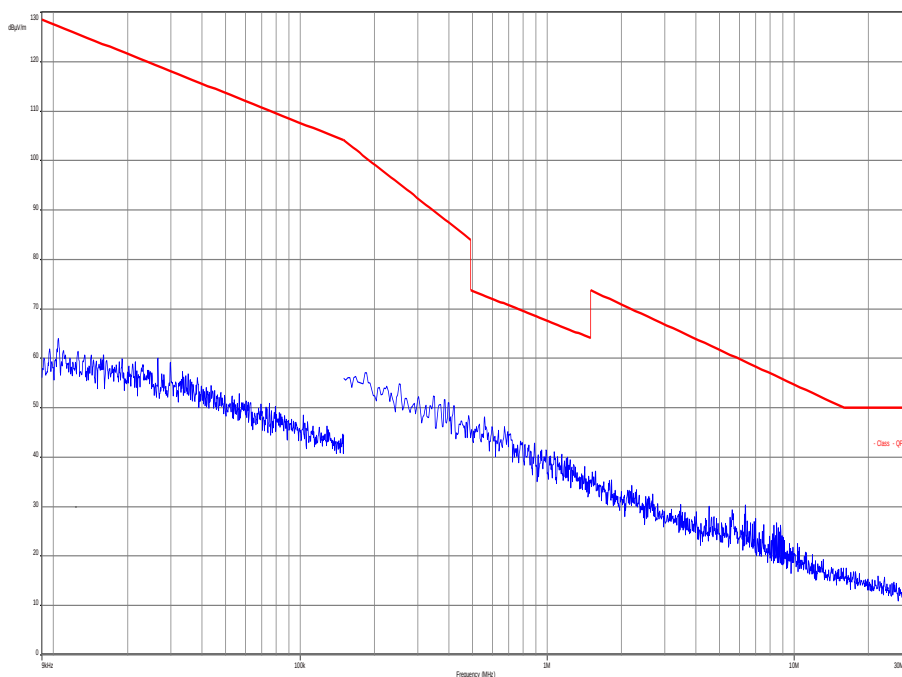
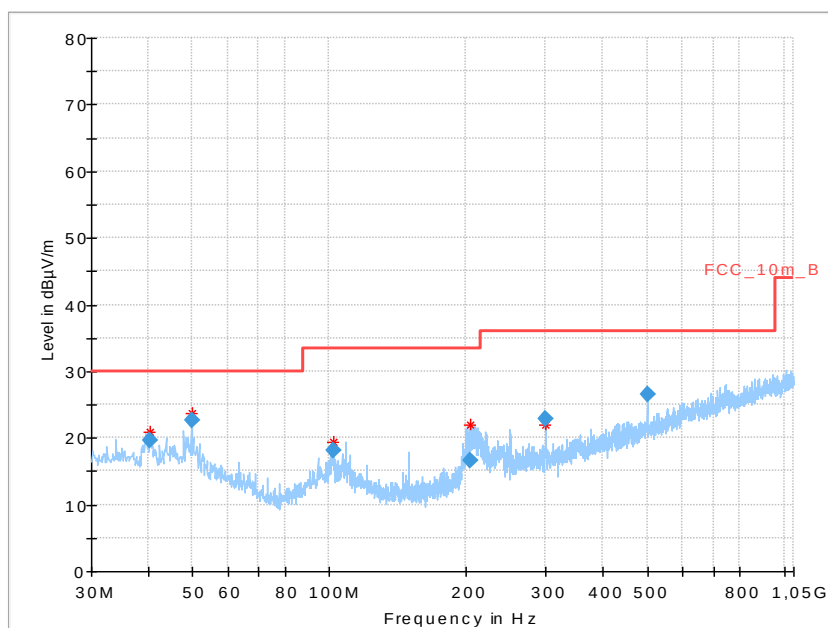
Plot 2: Low channel, 30 MHz to 1 GHz



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.378950	17.43	30.00	12.57	1000.0	120.000	101.0	V	2	14.0
47.395350	10.41	30.00	19.59	1000.0	120.000	103.0	V	297	13.3
108.785850	18.27	33.50	15.23	1000.0	120.000	172.0	V	28	11.2
250.006350	20.19	36.00	15.81	1000.0	120.000	100.0	V	257	13.4
299.986950	24.08	36.00	11.92	1000.0	120.000	100.0	V	-50	14.4
499.985700	27.62	36.00	8.38	1000.0	120.000	100.0	V	277	18.7

Plot 3: Middle channel, 9 kHz to 30 MHz**Plot 4:** Middle channel, 30 MHz to 1 GHz

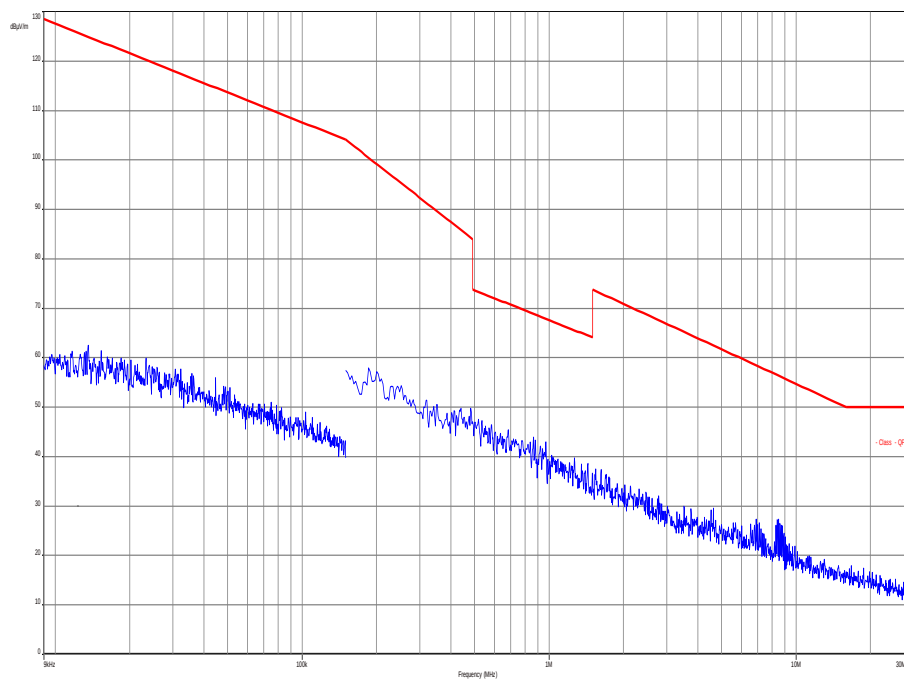
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.970100	22.24	30.00	7.76	1000.0	120.000	98.0	V	280	12.7
108.791550	15.22	33.50	18.28	1000.0	120.000	101.0	V	81	11.2
205.186050	19.86	33.50	13.64	1000.0	120.000	101.0	V	80	11.9
299.990250	23.24	36.00	12.76	1000.0	120.000	98.0	V	280	14.4
500.005500	28.34	36.00	7.66	1000.0	120.000	170.0	H	-9	18.7
850.007700	29.59	36.00	6.41	1000.0	120.000	98.0	H	10	23.5

Plot 5: High channel, 9 kHz to 30 MHz**Plot 6: High channel, 30 MHz to 1 GHz**

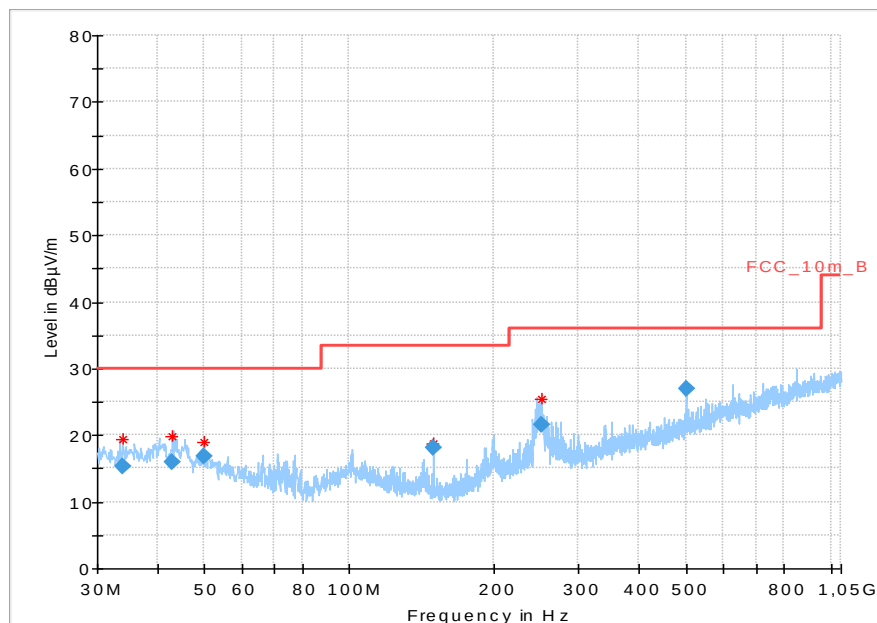
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.379850	19.68	30.00	10.32	1000.0	120.000	101.0	V	-9	14.0
50.010750	22.70	30.00	7.30	1000.0	120.000	98.0	V	100	12.6
101.887800	18.17	33.50	15.33	1000.0	120.000	101.0	V	280	12.0
204.069150	16.59	33.50	16.91	1000.0	120.000	101.0	V	100	11.8
299.993550	22.78	36.00	13.22	1000.0	120.000	98.0	V	280	14.4
499.998900	26.49	36.00	9.51	1000.0	120.000	101.0	H	10	18.7

Plots: OFDM / g – mode

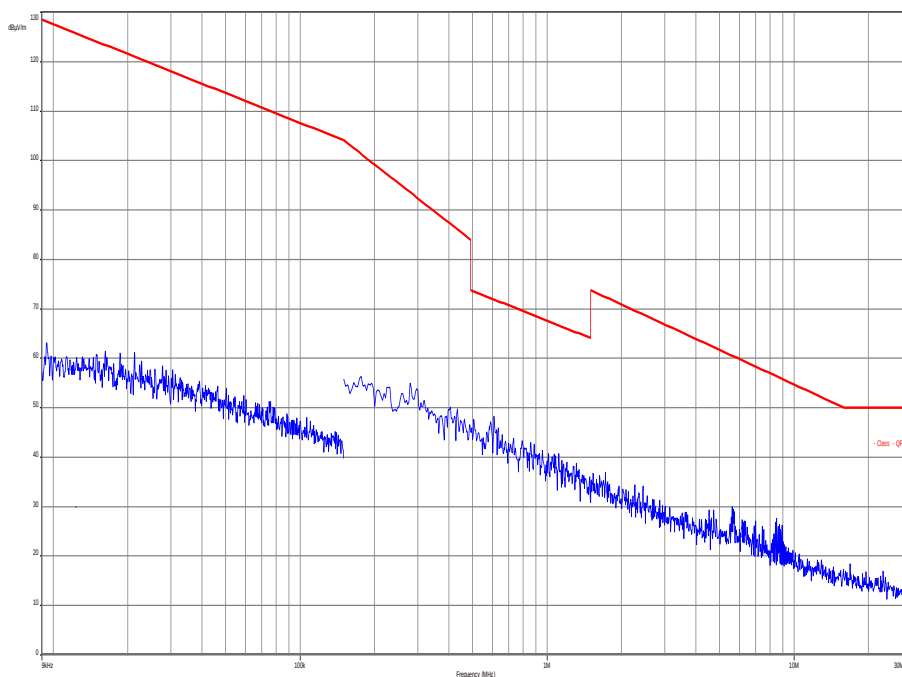
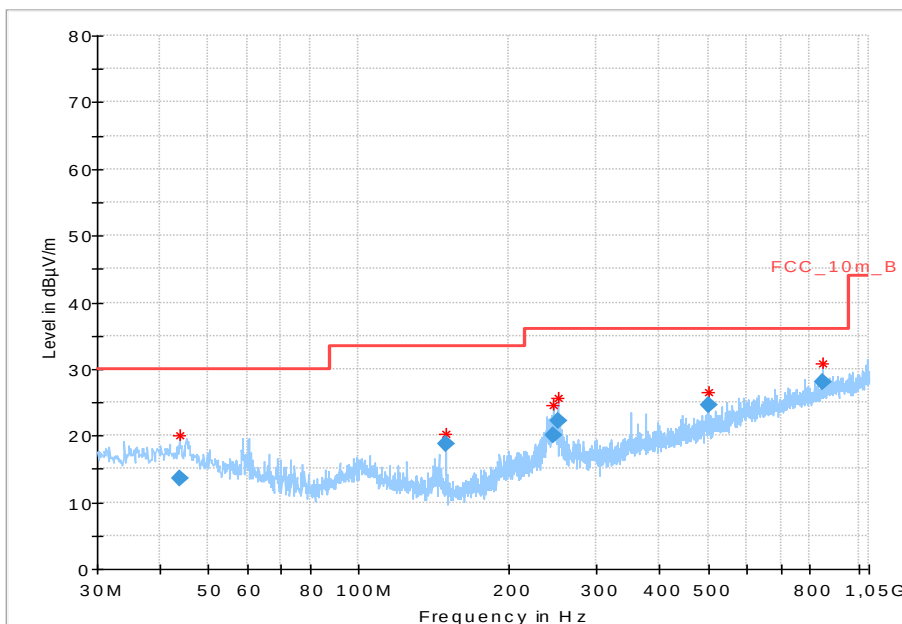
Plot 1: Low channel, 9 kHz to 30 MHz



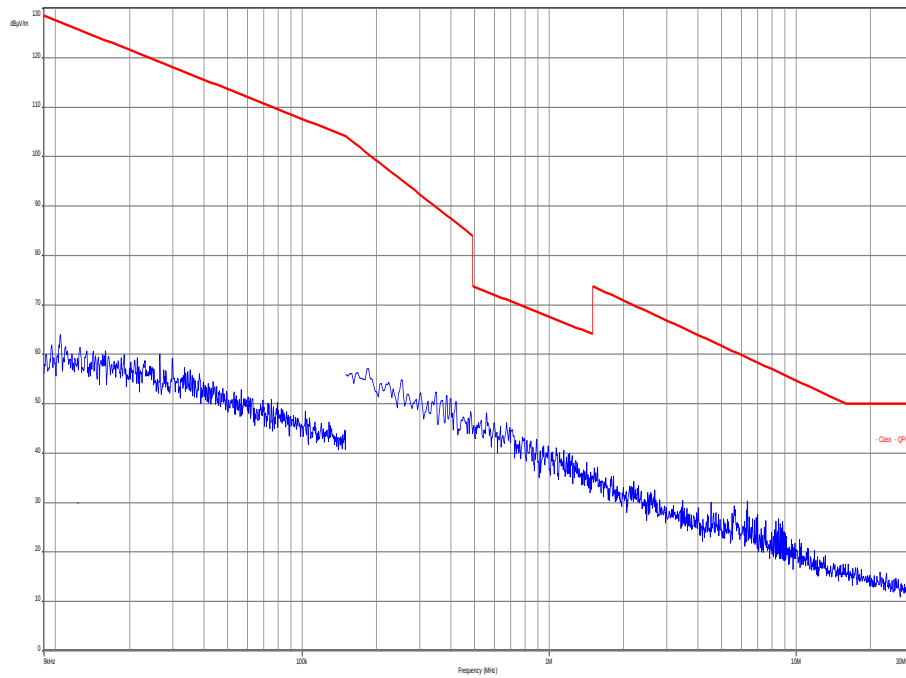
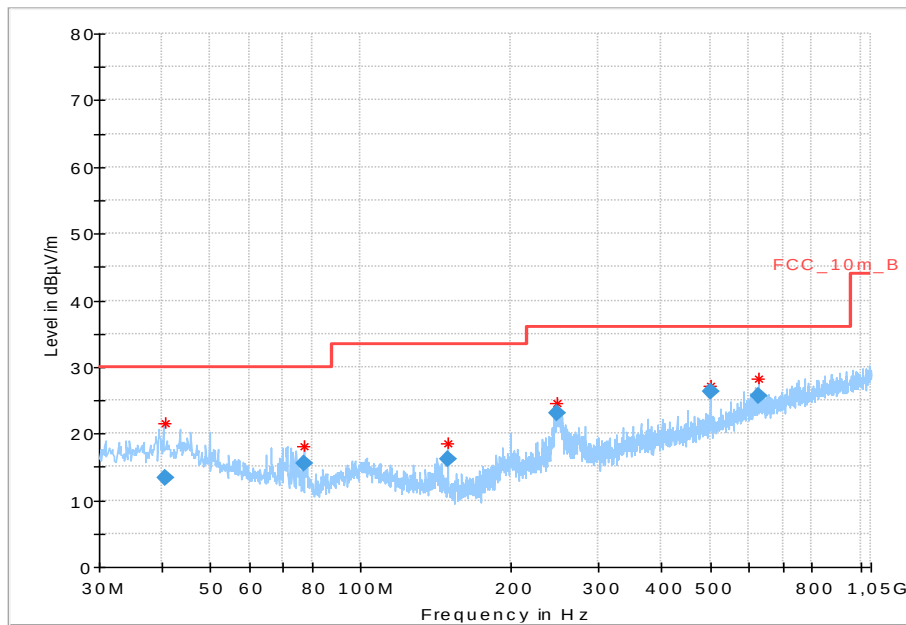
Plot 2: Low channel, 30 MHz to 1 GHz



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.002600	15.25	30.00	14.75	1000.0	120.000	100.0	V	171	13.7
42.930900	15.96	30.00	14.04	1000.0	120.000	101.0	V	80	13.9
49.995450	16.85	30.00	13.15	1000.0	120.000	98.0	V	-10	12.6
150.001800	18.14	33.50	15.36	1000.0	120.000	98.0	V	190	8.9
250.317900	21.56	36.00	14.44	1000.0	120.000	170.0	V	190	13.4
499.980600	26.92	36.00	9.08	1000.0	120.000	113.0	V	260	18.7

Plot 3: Middle channel, 9 kHz to 30 MHz**Plot 4:** Middle channel, 30 MHz to 1 GHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.851750	13.49	30.00	16.51	1000.0	120.000	101.0	V	10	13.9
150.007200	18.78	33.50	14.72	1000.0	120.000	98.0	V	190	8.9
245.044650	20.05	36.00	15.95	1000.0	120.000	170.0	V	190	13.2
250.001850	22.23	36.00	13.77	1000.0	120.000	170.0	V	190	13.4
500.001600	24.59	36.00	11.41	1000.0	120.000	170.0	H	100	18.7
849.977550	27.99	36.00	8.01	1000.0	120.000	98.0	H	171	23.5

Plot 5: High channel, 9 kHz to 30 MHz**Plot 6:** High channel, 30 MHz to 1 GHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.816050	13.37	30.00	16.63	1000.0	120.000	170.0	V	10	14.0
77.184600	15.43	30.00	14.57	1000.0	120.000	101.0	V	100	8.2
150.022500	16.27	33.50	17.23	1000.0	120.000	170.0	V	-9	8.9
246.878100	23.00	36.00	13.00	1000.0	120.000	170.0	V	171	13.3
500.003850	26.22	36.00	9.78	1000.0	120.000	170.0	H	171	18.7
625.021950	25.76	36.00	10.24	1000.0	120.000	101.0	H	10	20.9

10.10.2 Results Setup B – external Antenna

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 30 MHz all detected peaks are more than 20dB below the limit.								
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.								
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

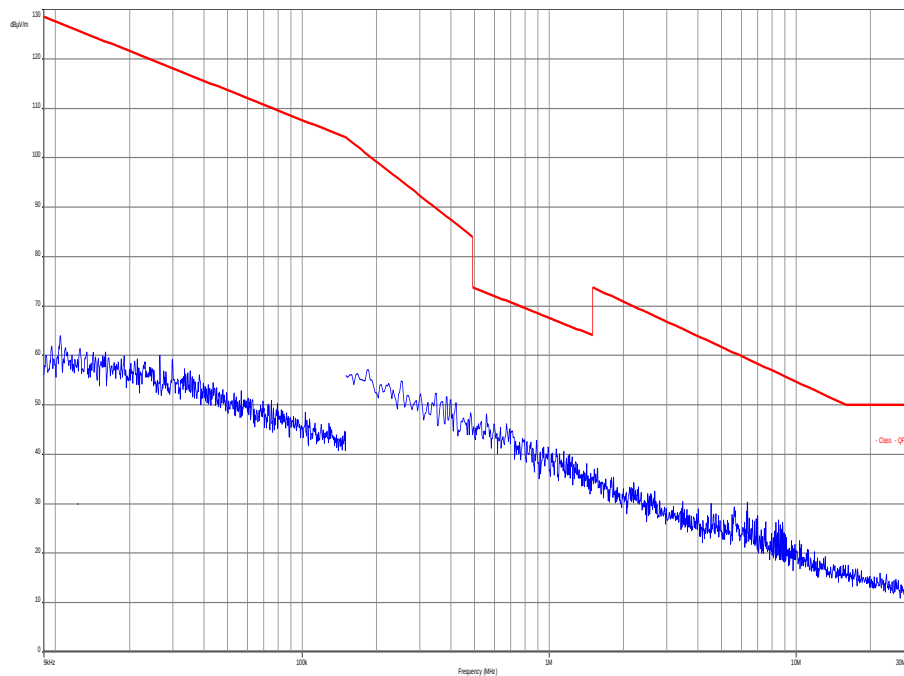
Results: OFDM / g – mode

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / g – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 30 MHz all detected peaks are more than 20dB below the limit.								
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.								
Measurement uncertainty			± 3 dB					

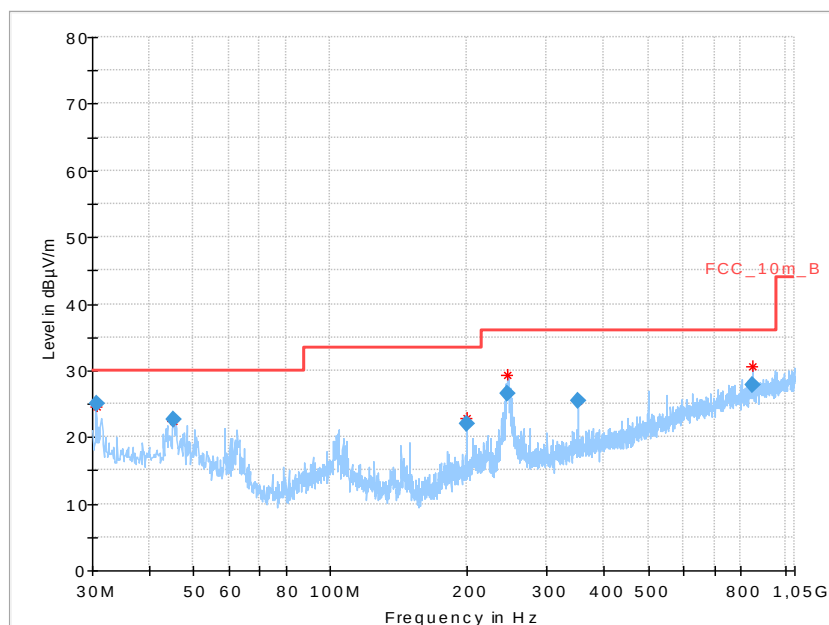
Verdict: [complies](#)

Plots: DSSS / b – mode

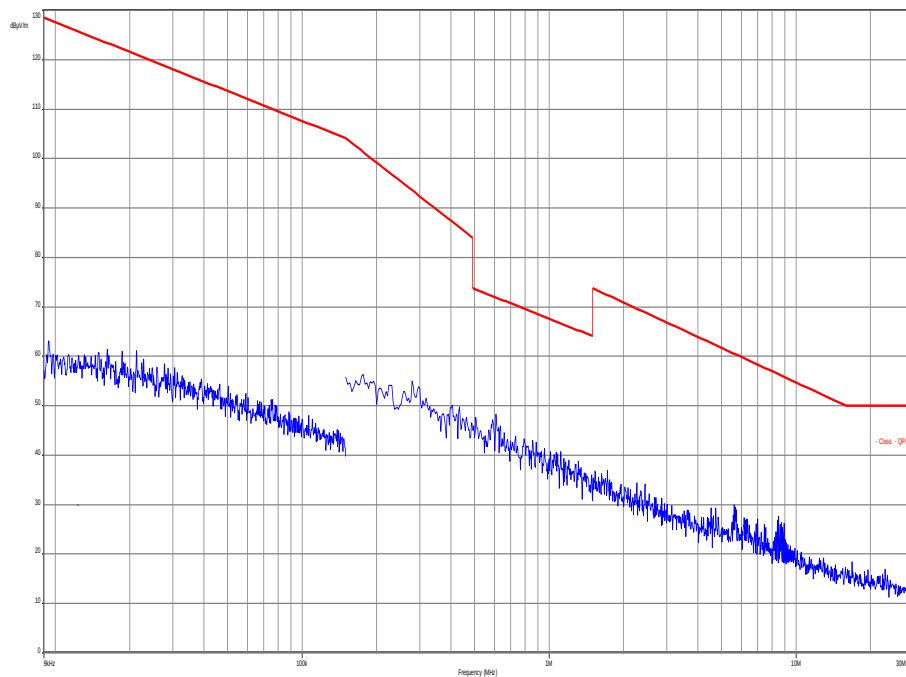
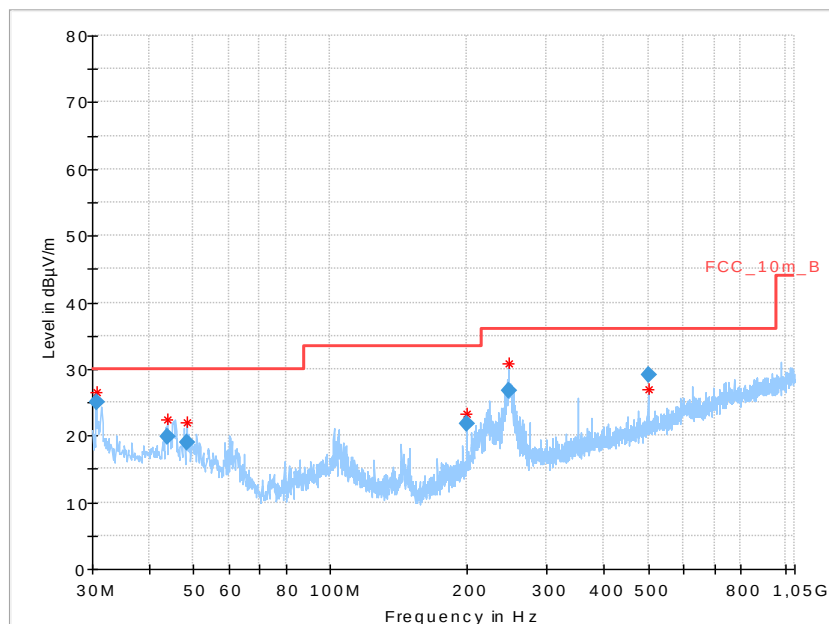
Plot 1: Low channel, 9 kHz to 30 MHz



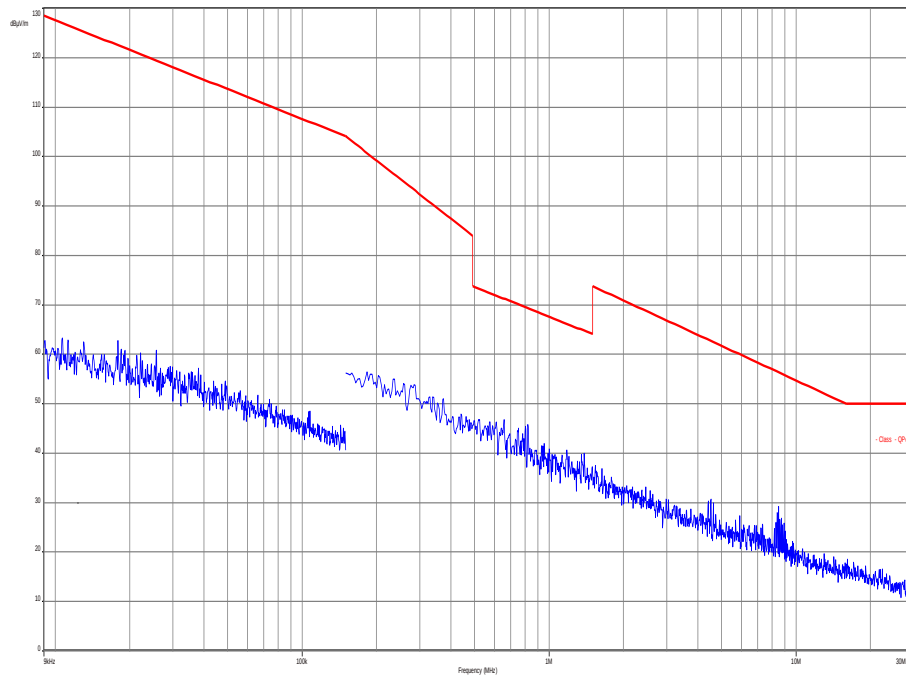
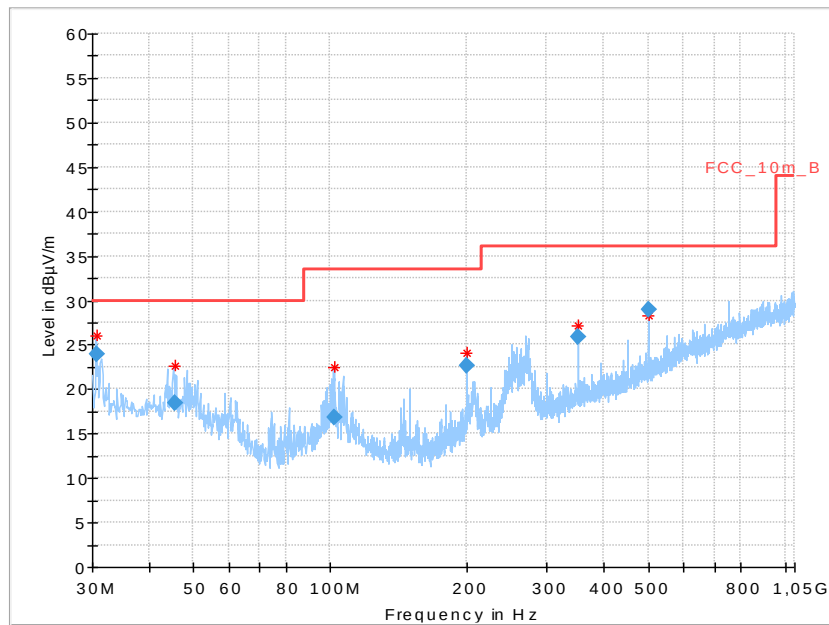
Plot 2: Low channel, 30 MHz to 1 GHz



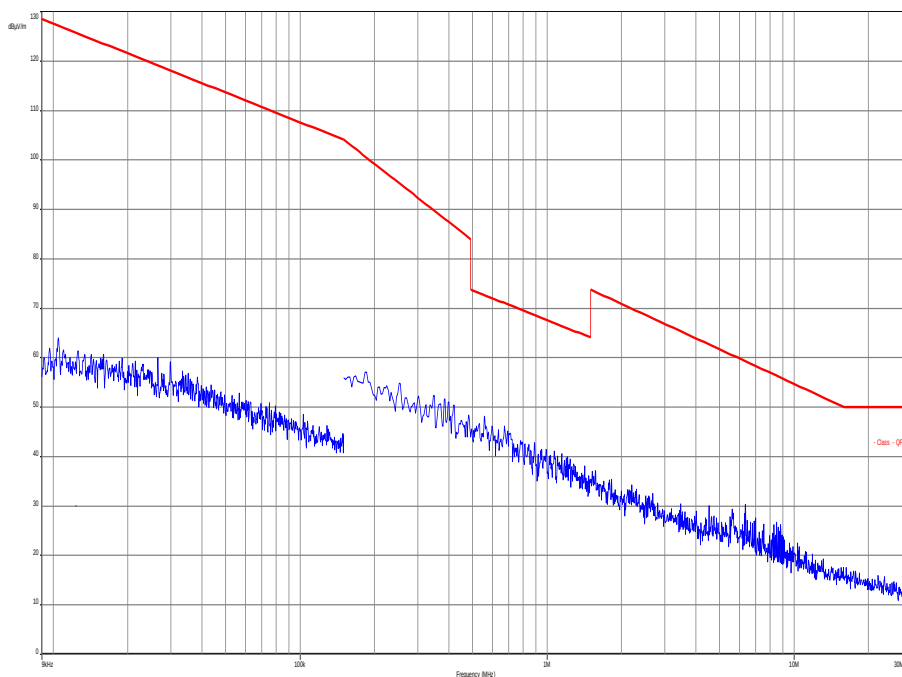
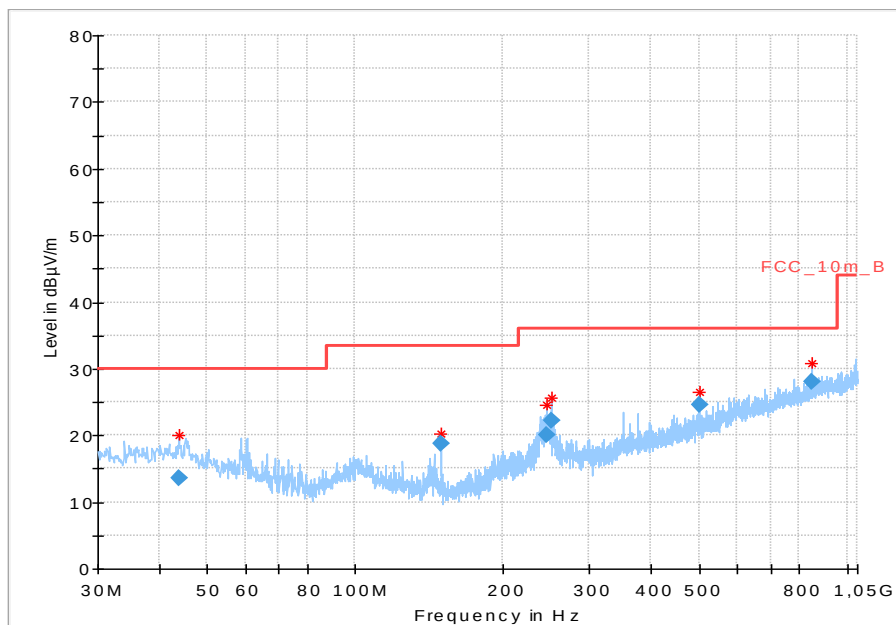
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.638389	24.93	30.00	5.07	1000.0	120.000	101.0	V	190	13.4
45.258150	22.64	30.00	7.36	1000.0	120.000	98.0	V	190	13.8
200.009850	22.03	33.50	11.47	1000.0	120.000	98.0	V	-9	11.7
245.744850	26.48	36.00	9.52	1000.0	120.000	98.0	V	-9	13.2
349.999050	25.55	36.00	10.45	1000.0	120.000	98.0	V	190	16.0
850.032750	27.87	36.00	8.13	1000.0	120.000	98.0	H	10	23.5

Plot 3: Middle channel, 9 kHz to 30 MHz**Plot 4:** Middle channel, 30 MHz to 1 GHz

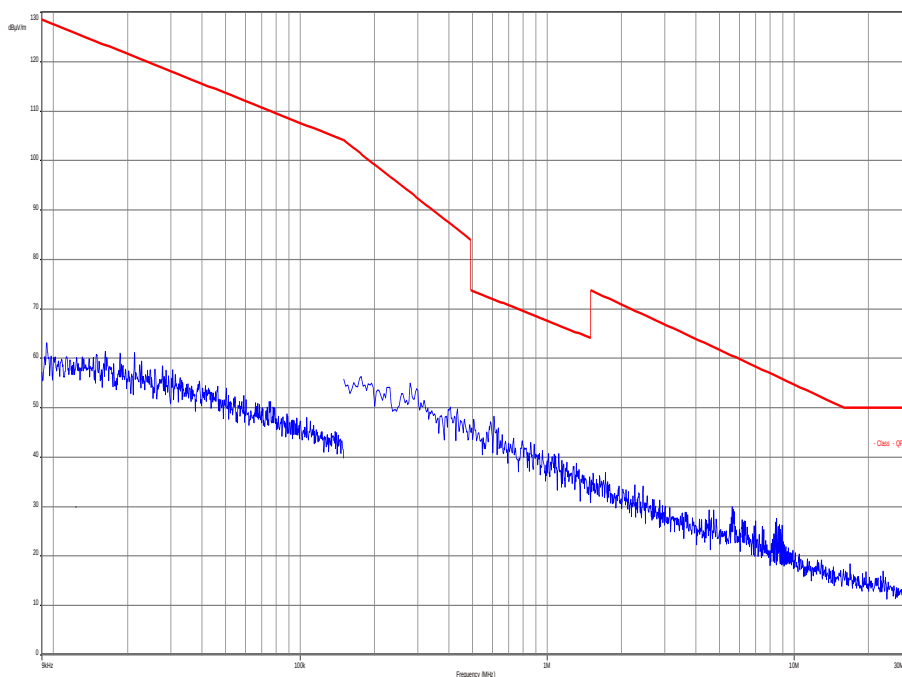
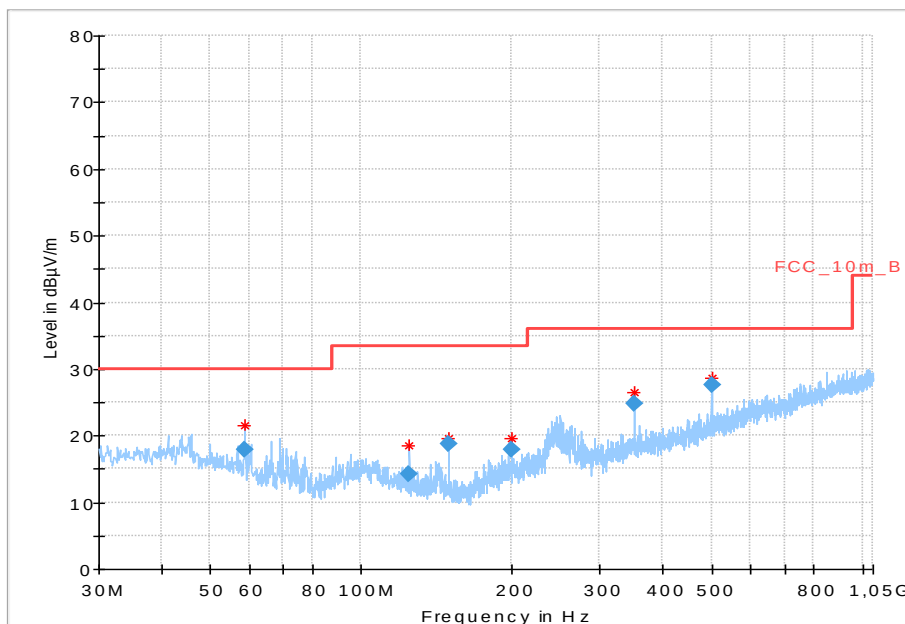
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.596764	24.97	30.00	5.03	1000.0	120.000	101.0	V	171	13.4
43.803450	19.89	30.00	10.11	1000.0	120.000	101.0	V	280	13.9
48.452400	18.99	30.00	11.01	1000.0	120.000	101.0	V	80	13.0
200.008050	21.79	33.50	11.71	1000.0	120.000	170.0	V	-9	11.7
246.553500	26.73	36.00	9.27	1000.0	120.000	98.0	V	-9	13.2
500.013150	29.05	36.00	6.95	1000.0	120.000	98.0	V	80	18.7

Plot 5: High channel, 9 kHz to 30 MHz**Plot 6:** High channel, 30 MHz to 1 GHz

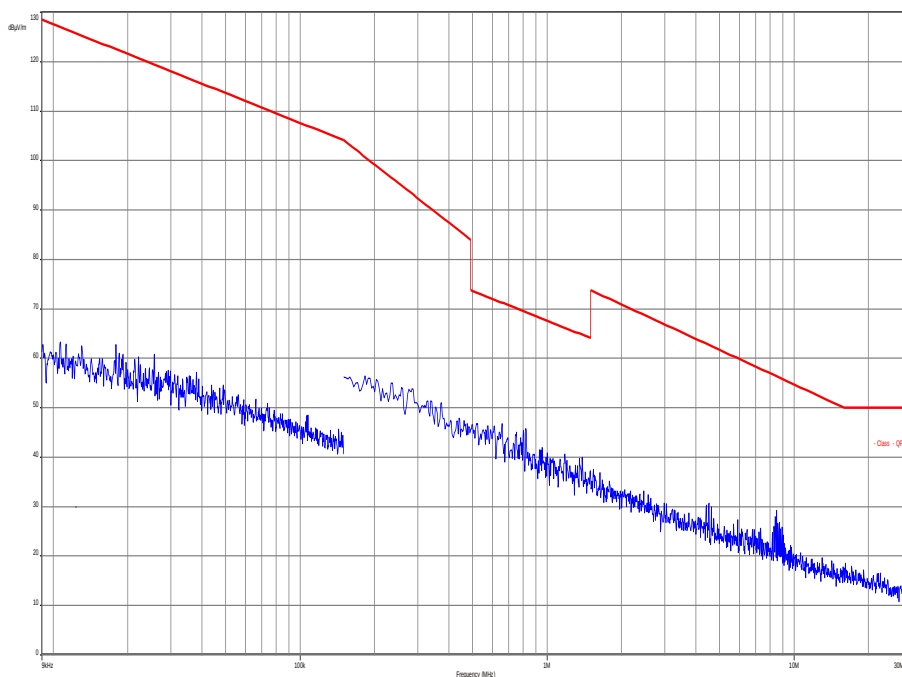
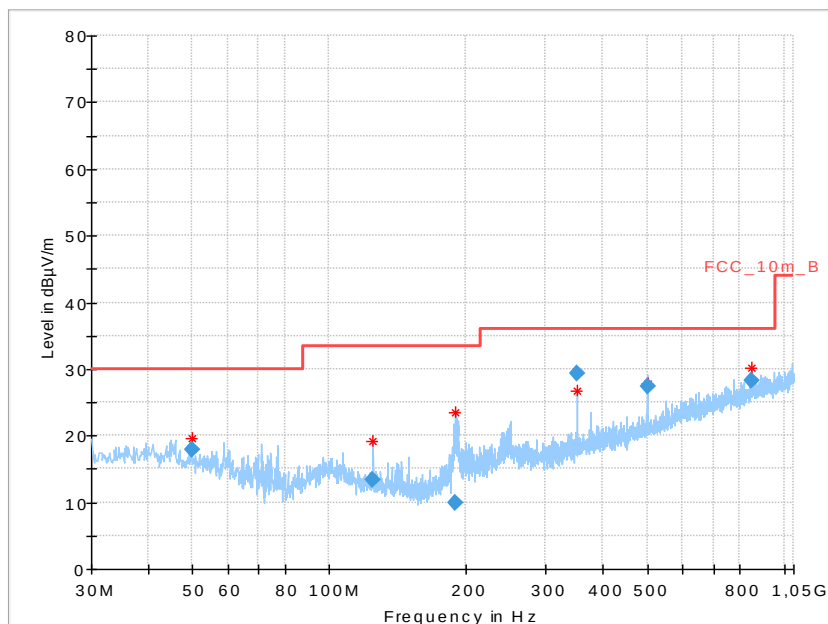
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.617854	24.01	30.00	5.99	1000.0	120.000	103.0	V	140	13.4
45.720750	18.36	30.00	11.64	1000.0	120.000	200.0	V	320	13.7
101.899650	16.75	33.50	16.75	1000.0	120.000	103.0	V	282	12.0
199.998900	22.69	33.50	10.81	1000.0	120.000	101.0	V	232	11.7
349.994250	25.89	36.00	10.11	1000.0	120.000	98.0	V	186	16.0
499.995150	28.96	36.00	7.04	1000.0	120.000	279.0	V	95	18.7

Plots: OFDM / g – mode**Plot 1:** Low channel, 9 kHz to 30 MHz**Plot 2:** Low channel, 30 MHz to 1 GHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.851750	13.49	30.00	16.51	1000.0	120.000	101.0	V	10	13.9
150.007200	18.78	33.50	14.72	1000.0	120.000	98.0	V	190	8.9
245.044650	20.05	36.00	15.95	1000.0	120.000	170.0	V	190	13.2
250.001850	22.23	36.00	13.77	1000.0	120.000	170.0	V	190	13.4
500.001600	24.59	36.00	11.41	1000.0	120.000	170.0	H	100	18.7
849.977550	27.99	36.00	8.01	1000.0	120.000	98.0	H	171	23.5

Plot 3: Middle channel, 9 kHz to 30 MHz**Plot 4:** Middle channel, 30 MHz to 1 GHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
58.712850	17.80	30.00	12.20	1000.0	120.000	101.0	V	81	10.9
124.991400	14.16	33.50	19.34	1000.0	120.000	98.0	V	-10	9.8
150.008100	18.82	33.50	14.68	1000.0	120.000	101.0	V	171	8.9
199.986900	17.89	33.50	15.61	1000.0	120.000	98.0	V	261	11.7
350.008650	24.73	36.00	11.27	1000.0	120.000	98.0	V	80	16.0
499.993200	27.66	36.00	8.34	1000.0	120.000	170.0	V	260	18.7

Plot 5: High channel, 9 kHz to 30 MHz**Plot 6:** High channel, 30 MHz to 1 GHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
50.014500	17.87	30.00	12.13	1000.0	120.000	98.0	V	80	12.6
124.971450	13.30	33.50	20.20	1000.0	120.000	101.0	V	-10	9.8
189.733350	9.94	33.50	23.56	1000.0	120.000	170.0	V	80	11.0
349.992900	29.24	36.00	6.76	1000.0	120.000	170.0	V	10	16.0
500.000700	27.39	36.00	8.61	1000.0	120.000	170.0	H	170	18.7
849.988950	28.23	36.00	7.77	1000.0	120.000	98.0	H	171	23.5

10.11 TX spurious emissions radiated > 1 GHz

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	1 GHz to 26 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ DSSS b – mode ☒ OFDM g – mode

Limits:

FCC		IC
TX Spurious Emissions Radiated		
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
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

10.11.1 Results Setup A – internal Antenna

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
12061	Peak	38.6	14622	Peak	35.1	14772	Peak	36.8
14472	Peak	37.0	17060	Peak	34.2	15770	Peak	33.6
16884	Peak	34.4	19496	Peak	41.8	17235	Peak	35.7
19296	Peak	43.5	24370	Peak	37.4	19696	Peak	42.9
24120	Peak	39.0	-/-	-/-	-/-	24620	Peak	40.0
Measurement uncertainty			± 3 dB					

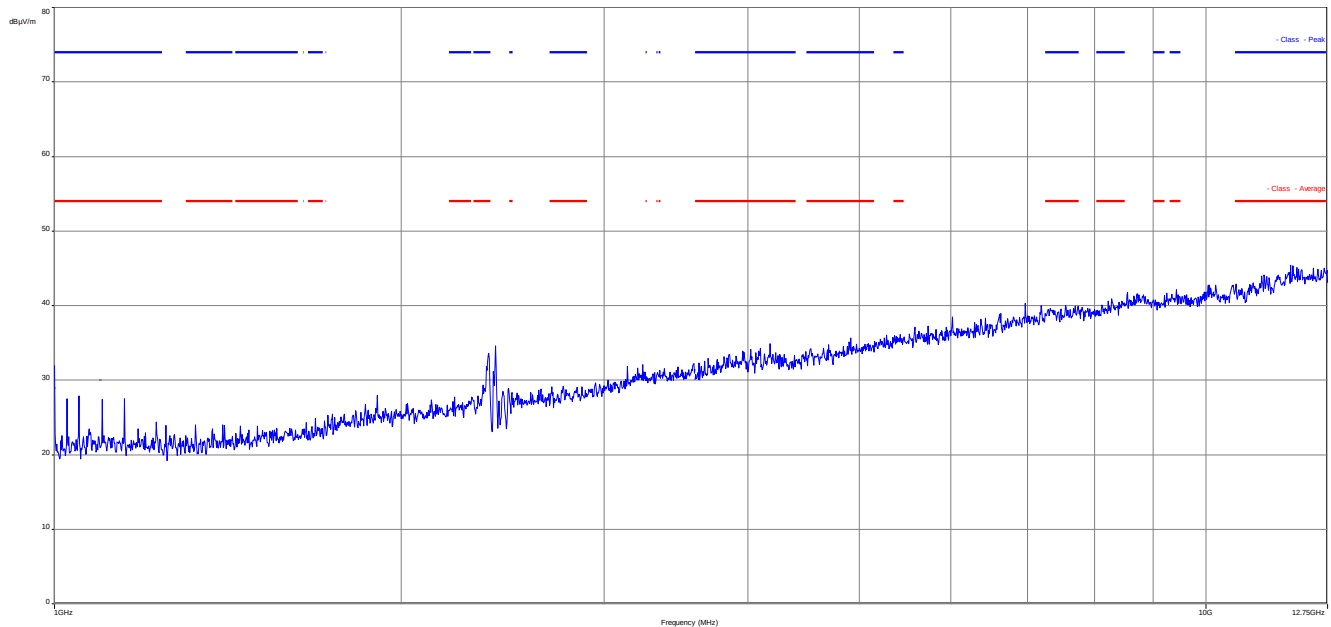
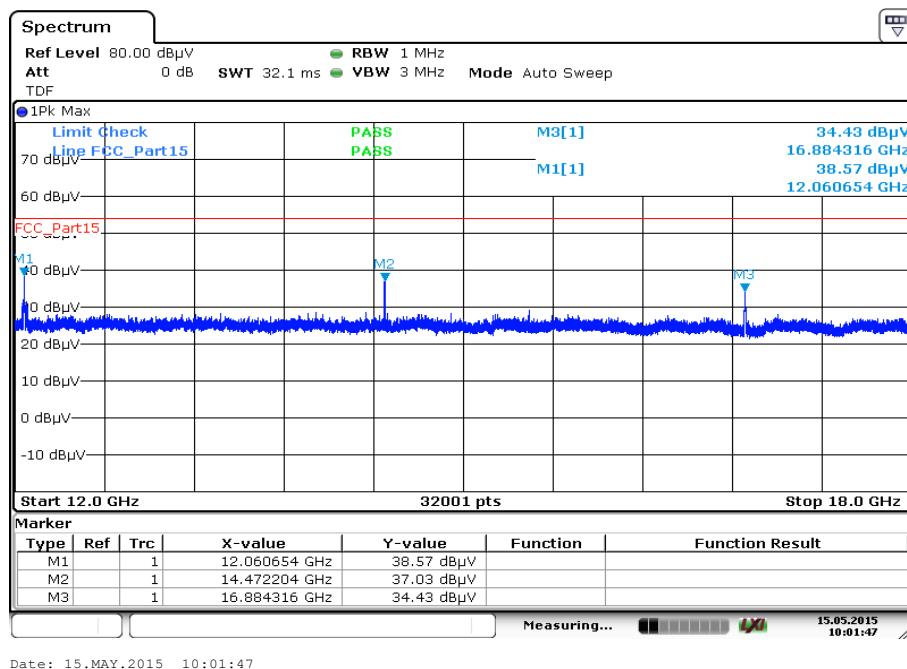
Verdict: [complies](#)

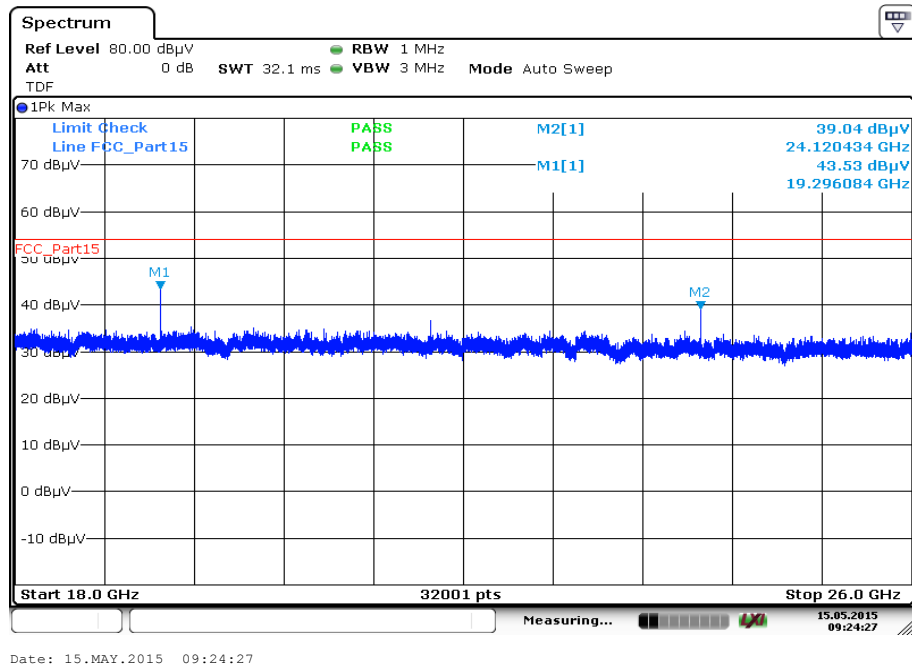
Results: OFDM / g – mode

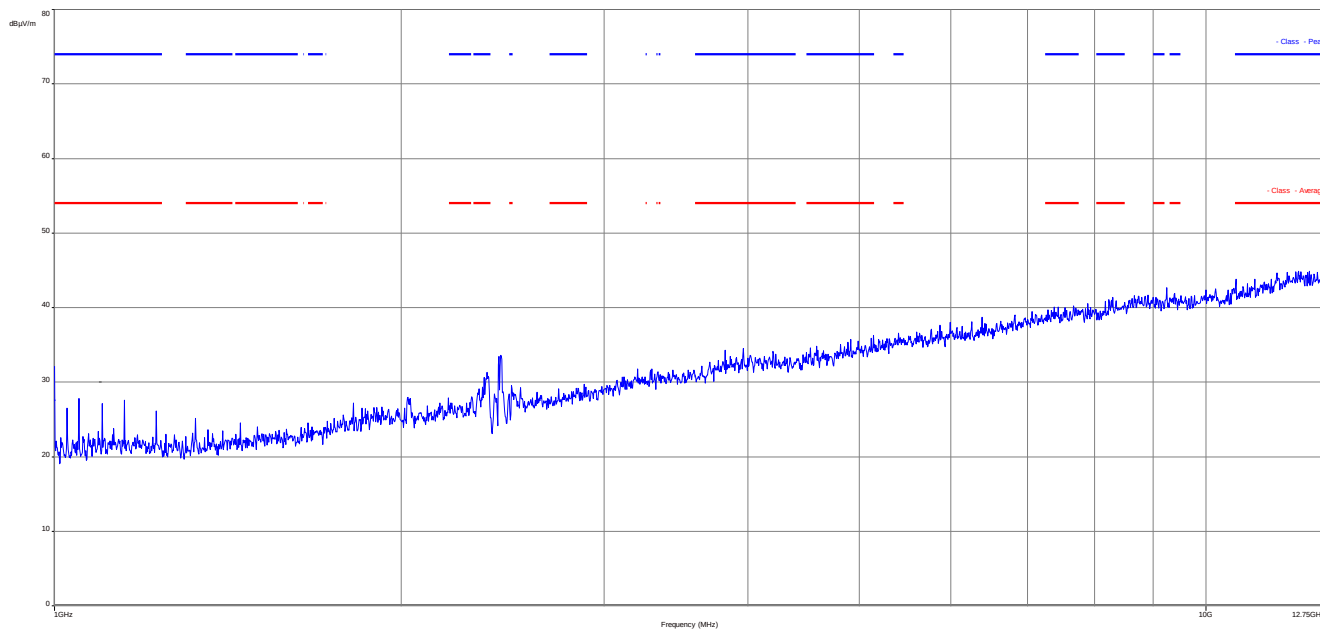
TX Spurious Emissions Radiated [dB μ V/m]								
DSSS / g – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
14772	Peak	36.8	14472	Peak	37.1	12179	Peak	40.4
15757	Peak	35.7	19296	Peak	37.0	14620	Peak	36.2
17234	Peak	33.6	24370	Peak	31.2	19496	Peak	41.1
19696	Peak	42.9	-/-	-/-	-/-	24370	Peak	38.8
24620	Peak	40.1				-/-	-/-	-/-
Measurement uncertainty			± 3 dB					

Verdict: [complies](#)

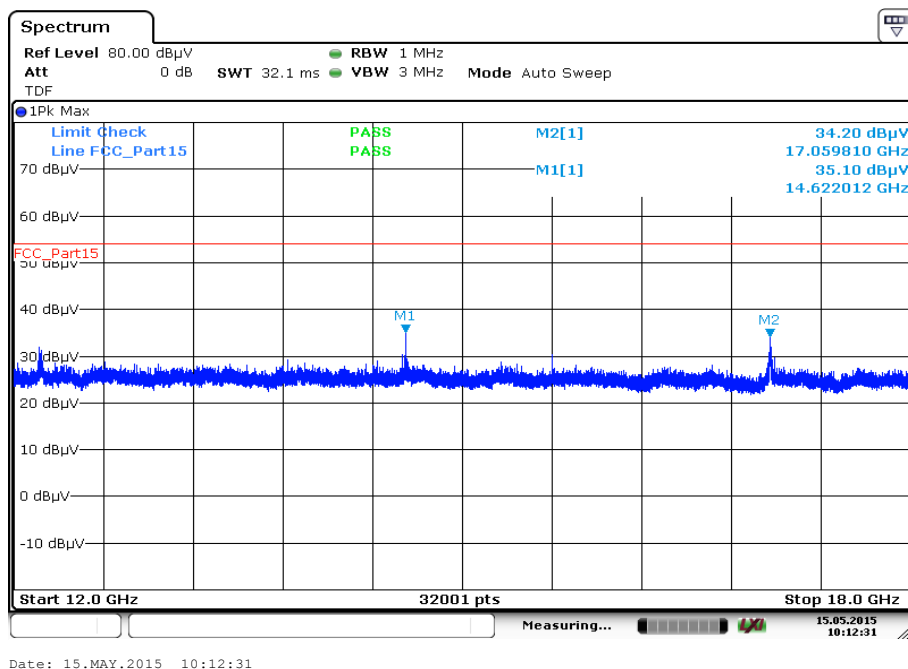
Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance.

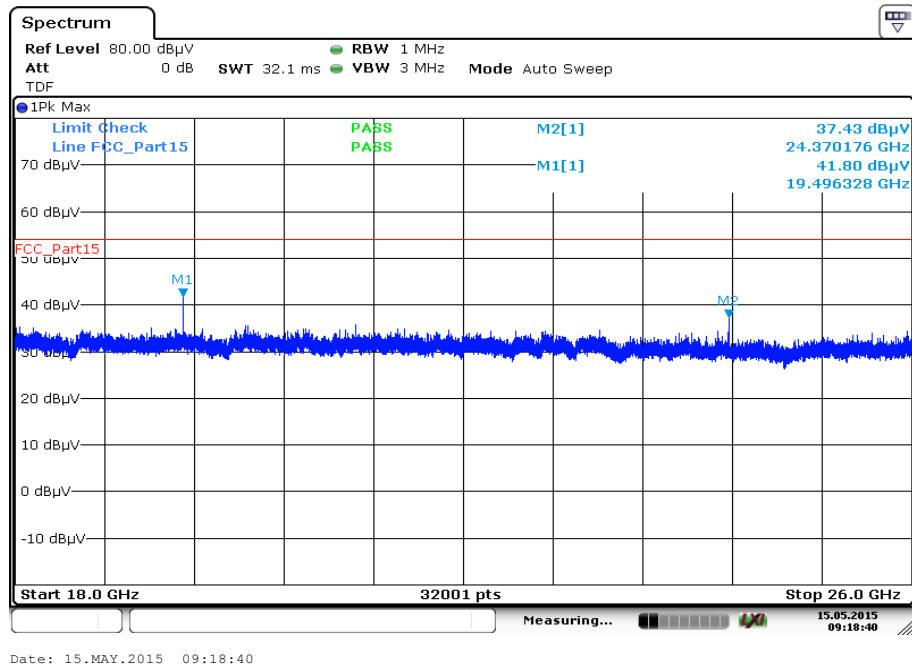
Plots: DSSS / b – mode**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 2:** Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

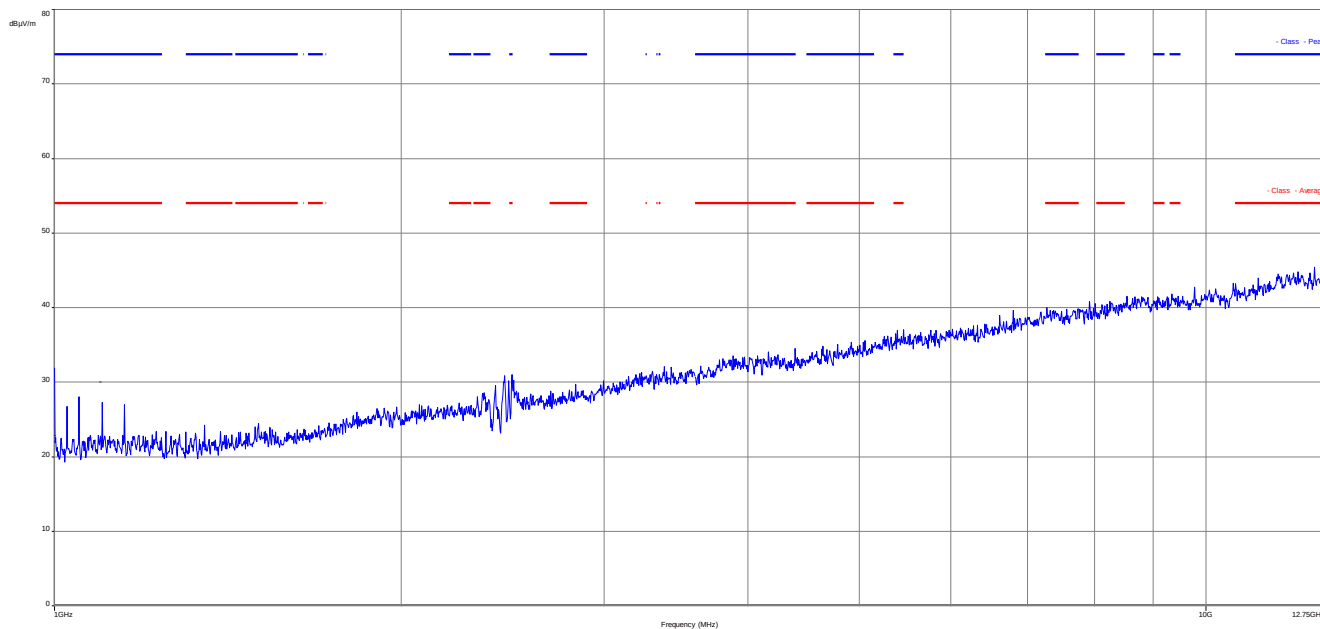
Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

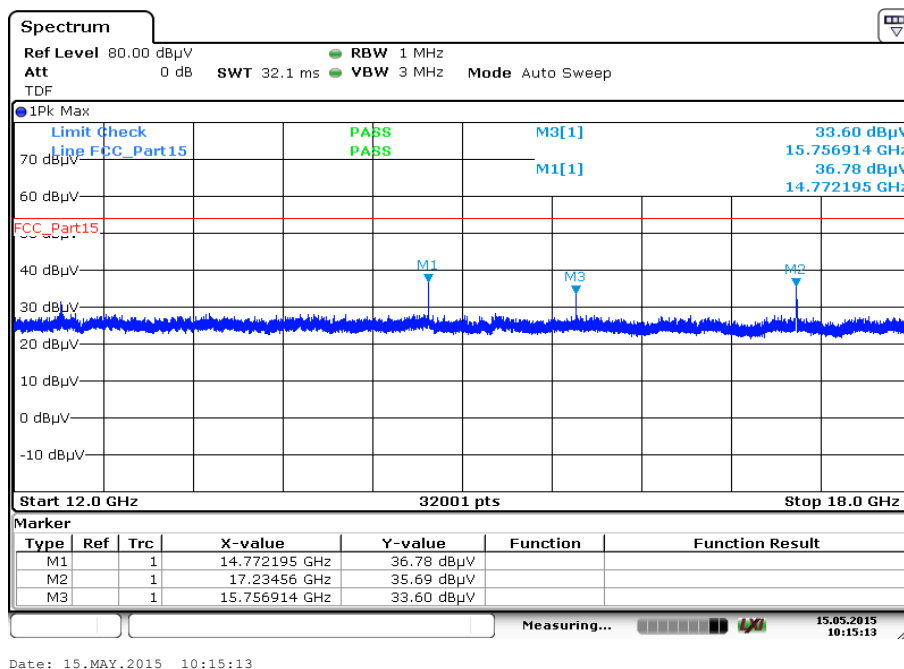
The carrier signal is notched with a 2.4 GHz band rejection filter.

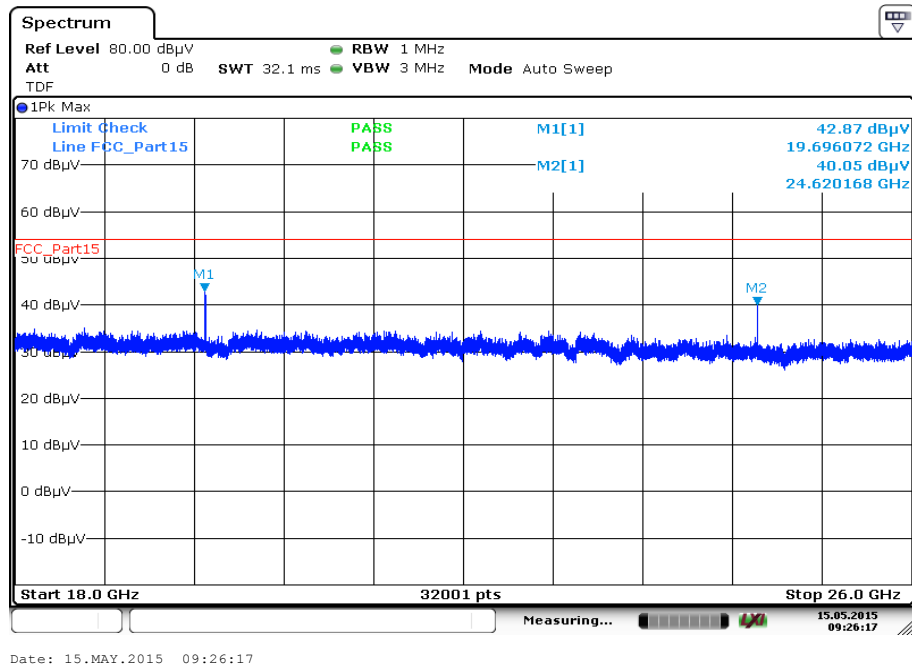
Plot 5: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

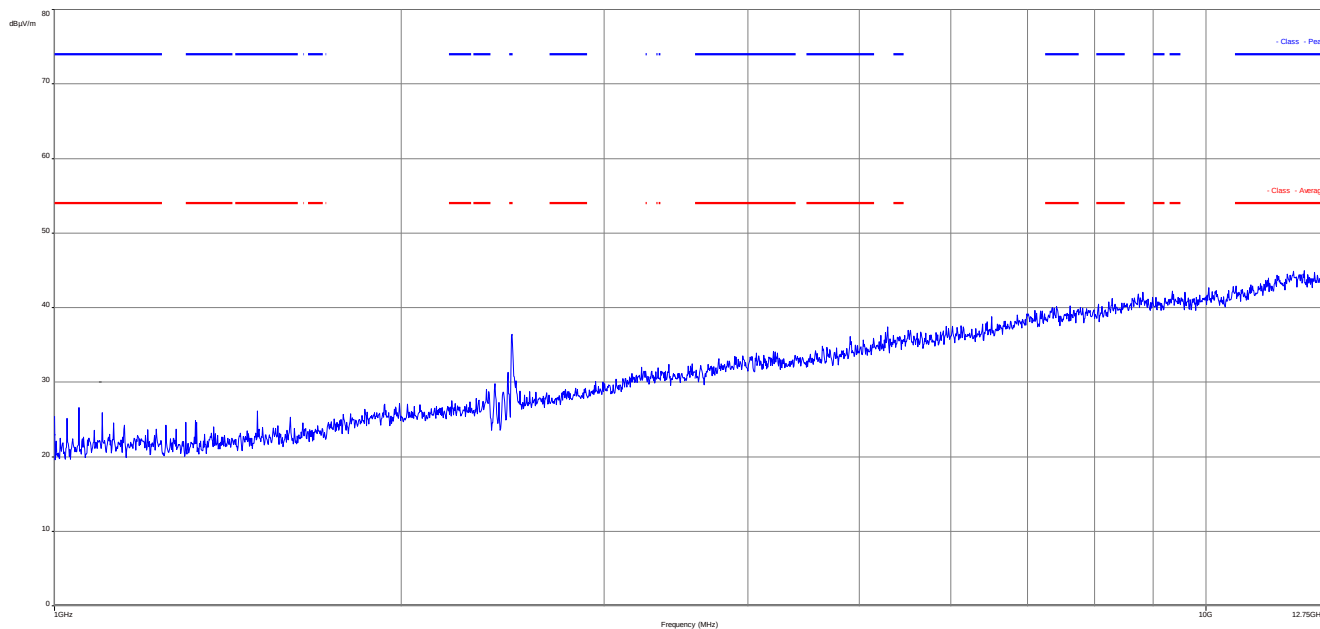
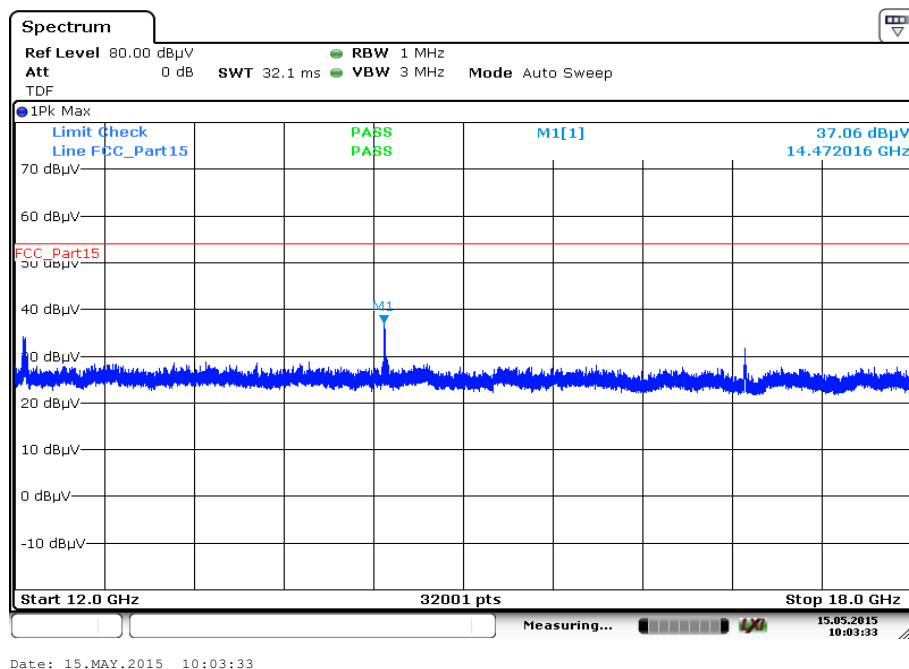
Plot 6: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

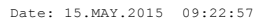
The carrier signal is notched with a 2.4 GHz band rejection filter.

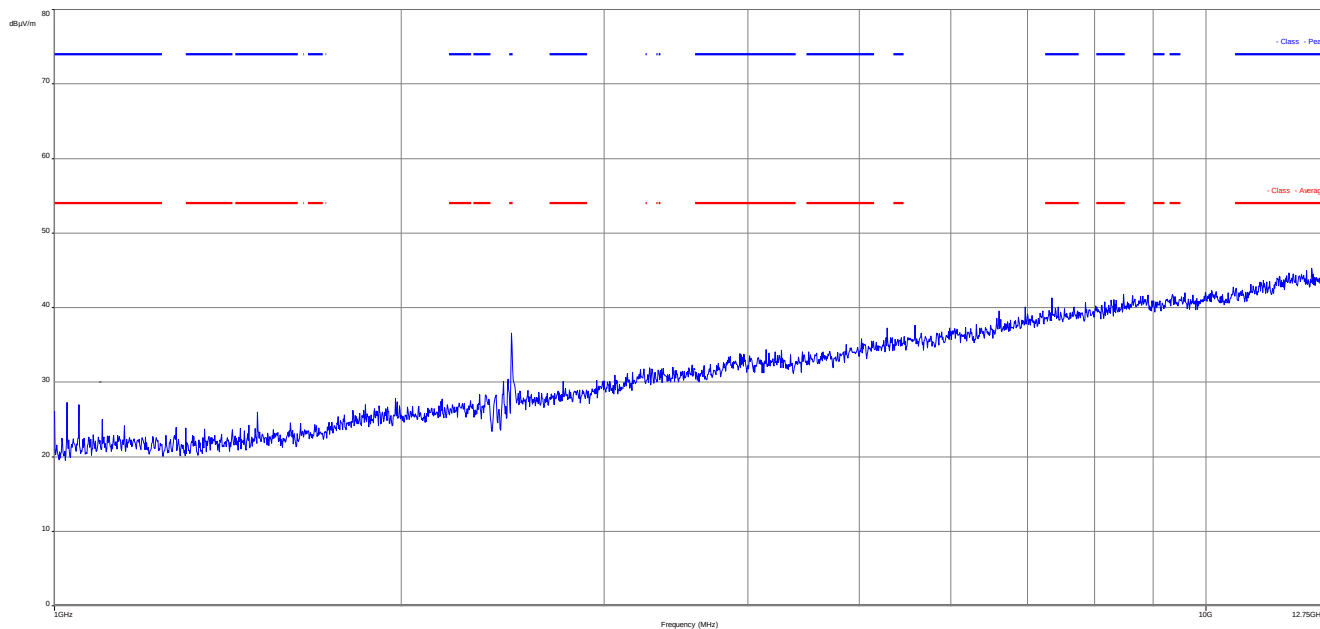
Plot 8: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

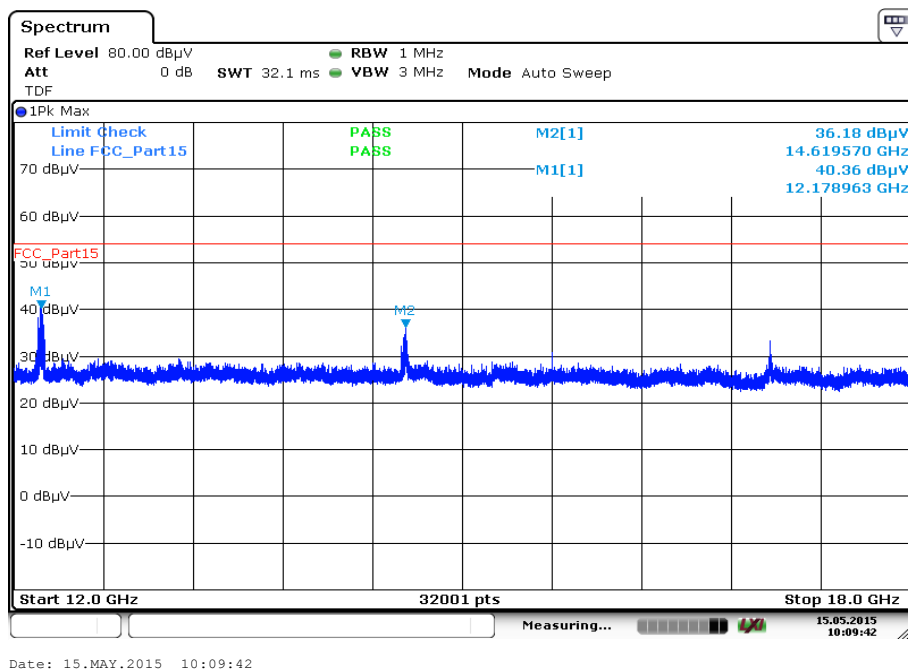
Plots: OFDM / g – mode**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 2:** Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

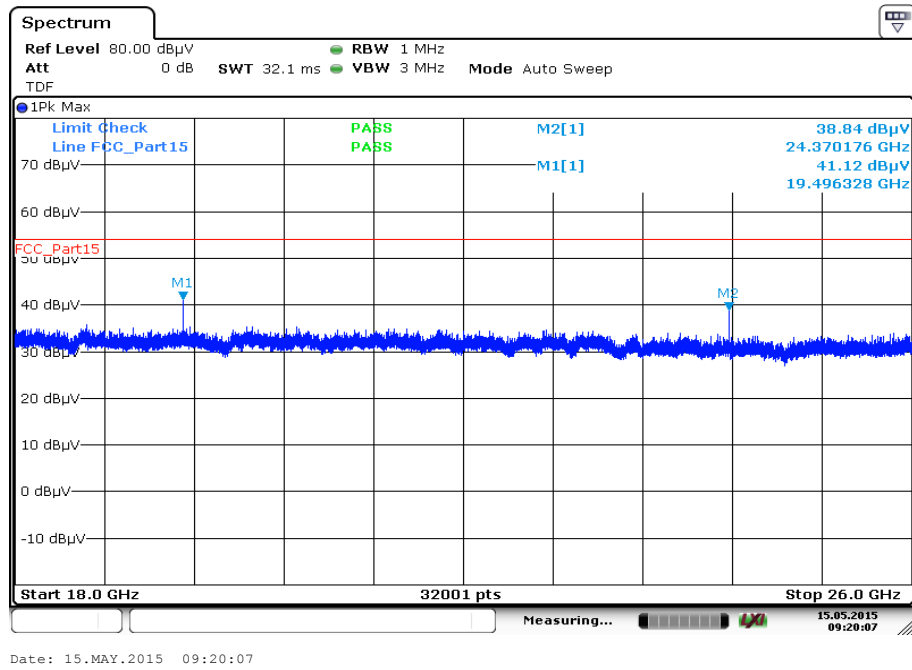


Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

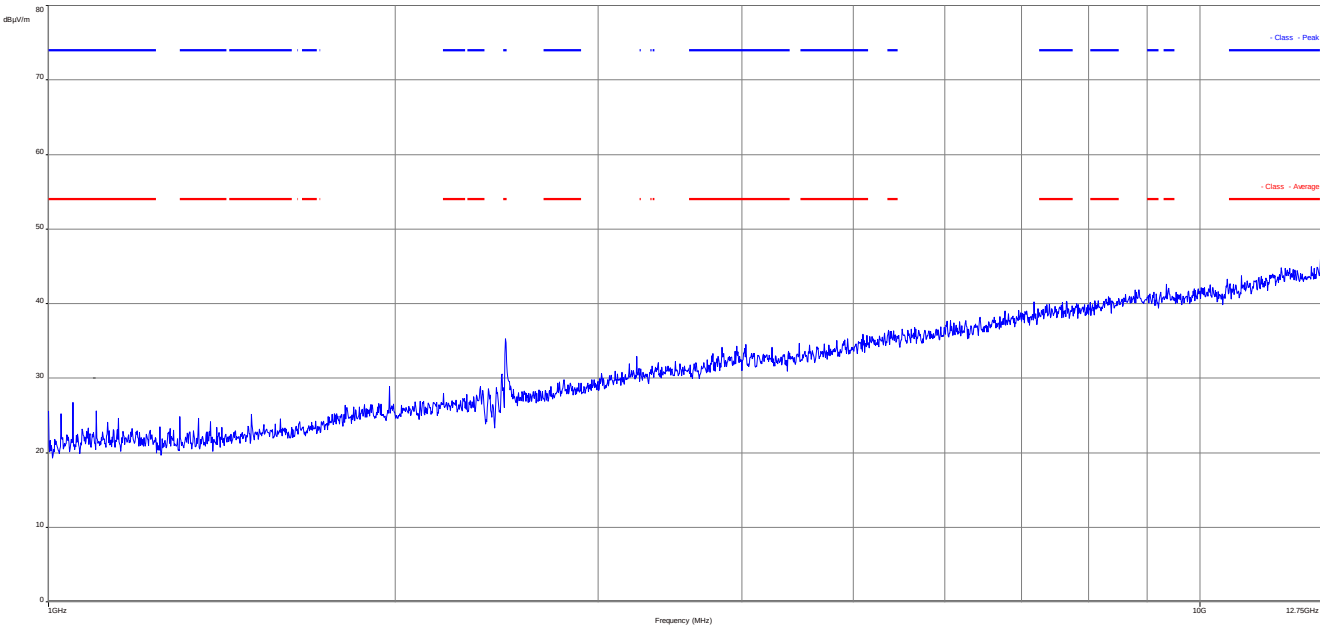
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 5: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

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

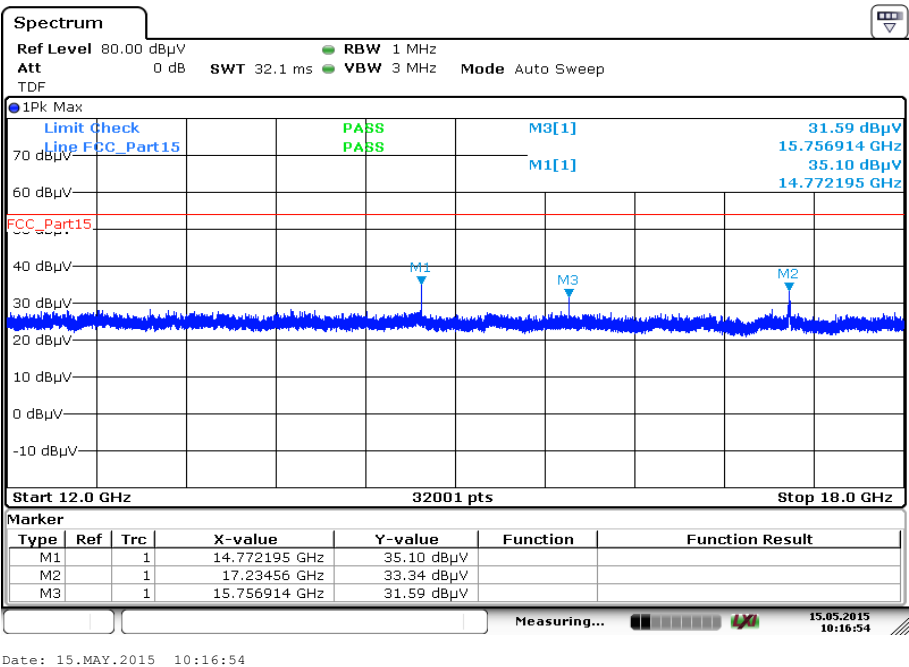


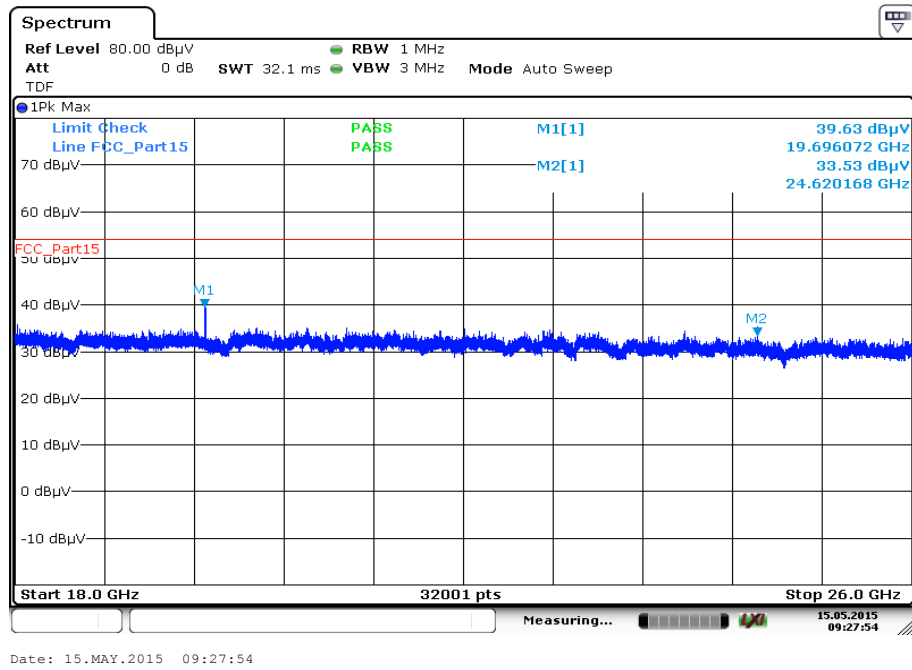
Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



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

Plot 8: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

10.11.2 Results Setup B – external Antenna

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dBμV/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
14472	Peak	36.3	14622	Peak	40.6	14772	Peak	38.8
16884	Peak	32.9	17059	Peak	32.7	17234	Peak	31.7
19260	Peak	38.1	19496	Peak	38.6	19696	Peak	40.5
-/-	-/-	-/-	24370	Peak	36.8	24620	Peak	38.1
			-/-	-/-	-/-	-/-	-/-	-/-
Measurement uncertainty			± 3 dB					

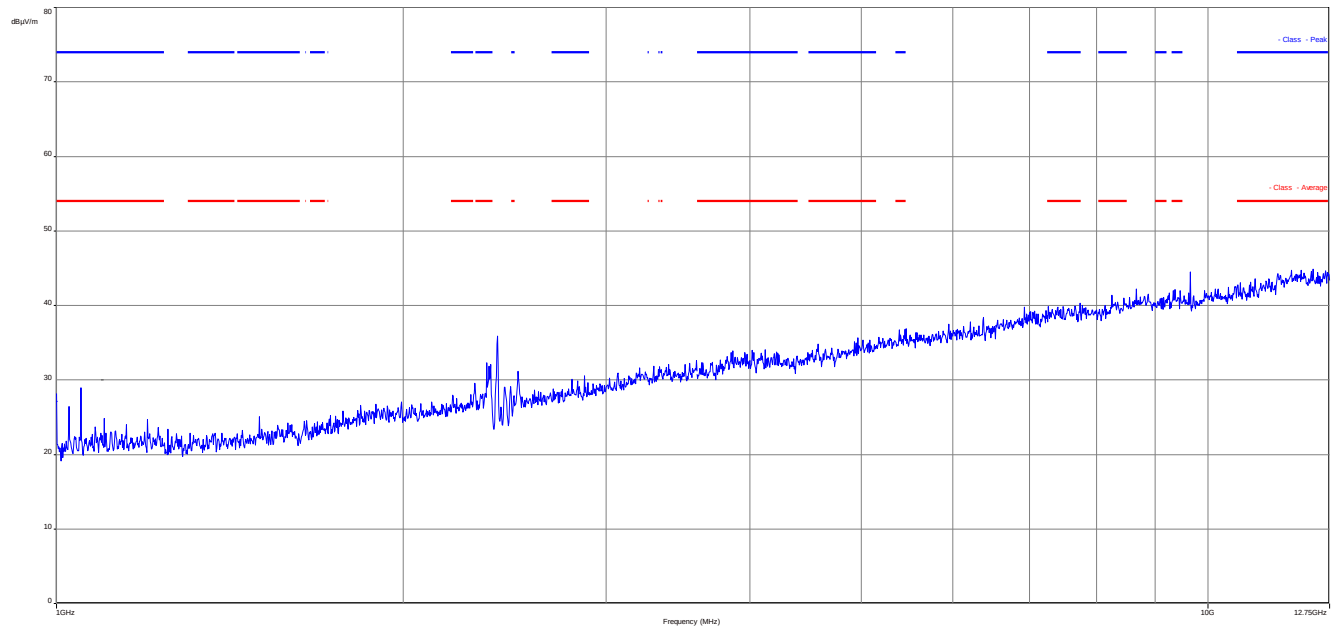
Verdict: [complies](#)

Results: OFDM / g – mode

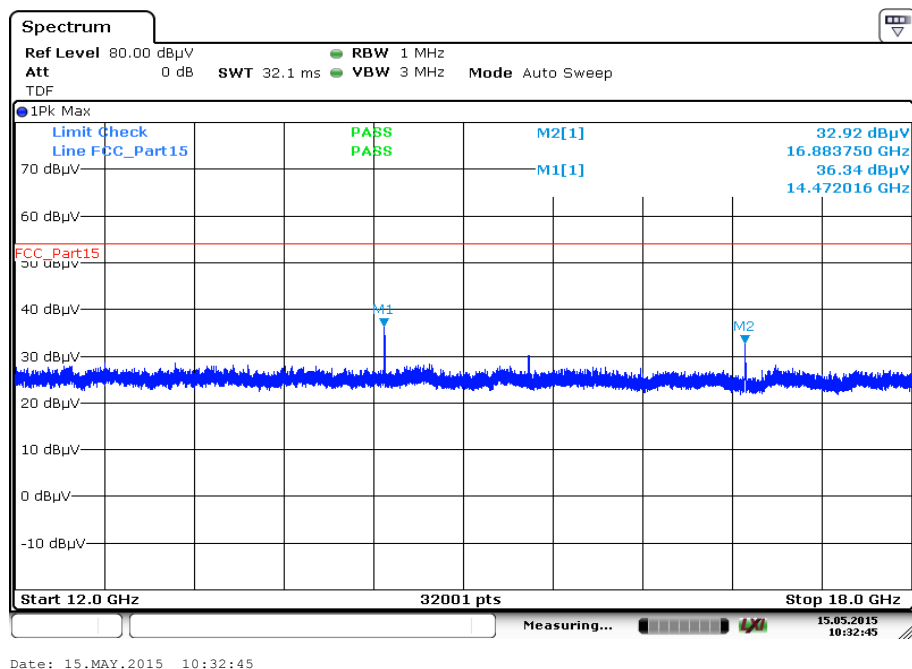
TX Spurious Emissions Radiated [dBμV/m]								
DSSS / g – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
14047	Peak	35.4	12186	Peak	36.3	14772	Peak	33.9
14472	Peak	29.1	17072	Peak	35.5	19696	Peak	41.6
19296	Peak	41.5	19496	Peak	35.8	24620	Peak	37.0
-/-	-/-	-/-	24370	Peak	33.1	-/-	-/-	-/-
Measurement uncertainty			± 3 dB					

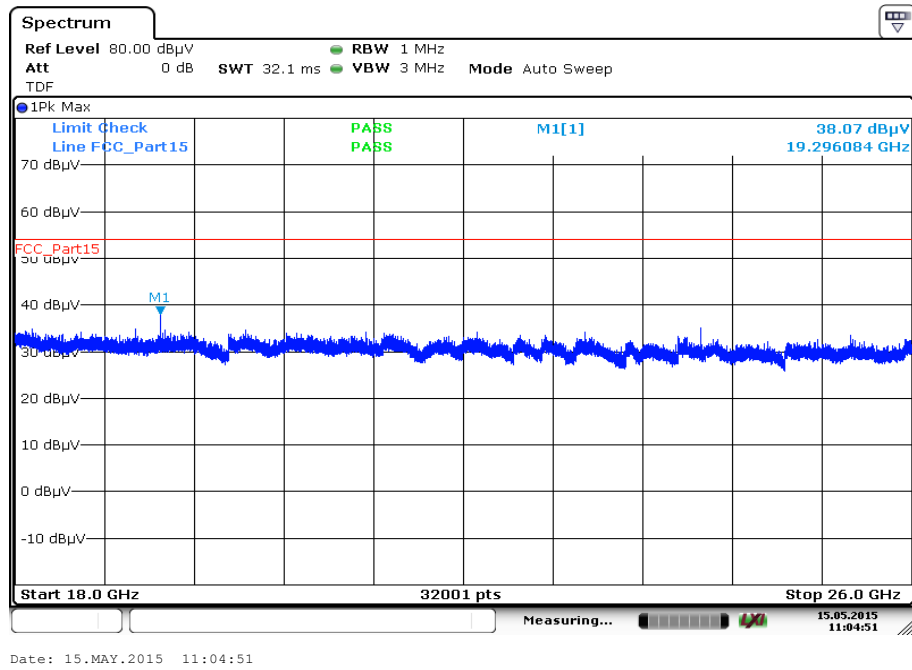
Verdict: [complies](#)

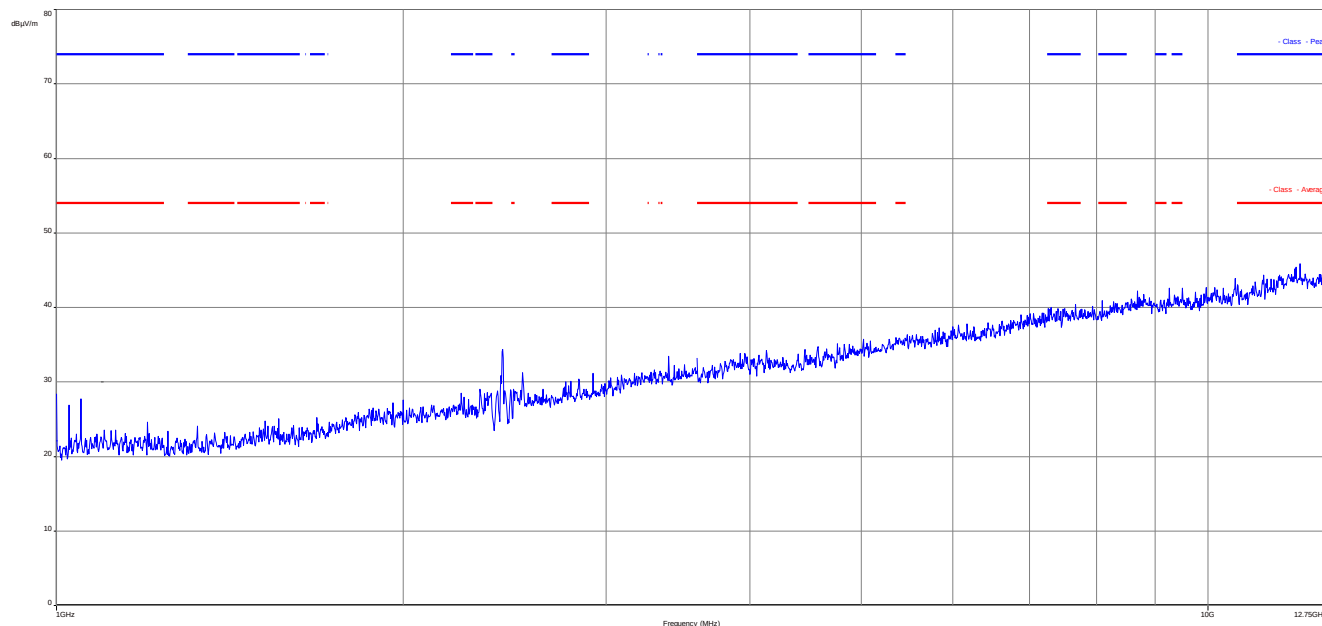
Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance.

Plots: DSSS / b – mode**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

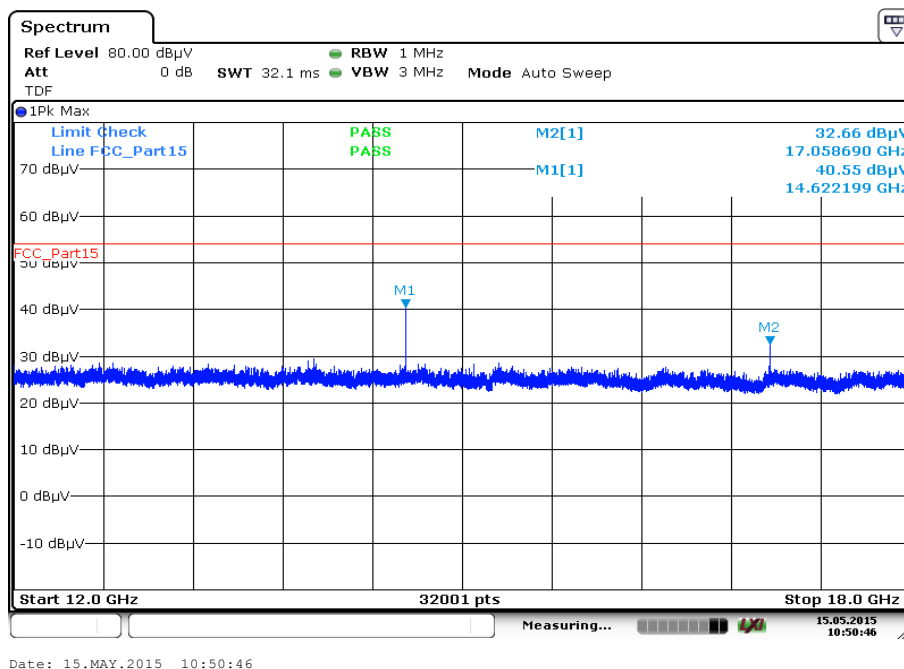
The carrier signal is notched with a 2.4 GHz band rejection filter.

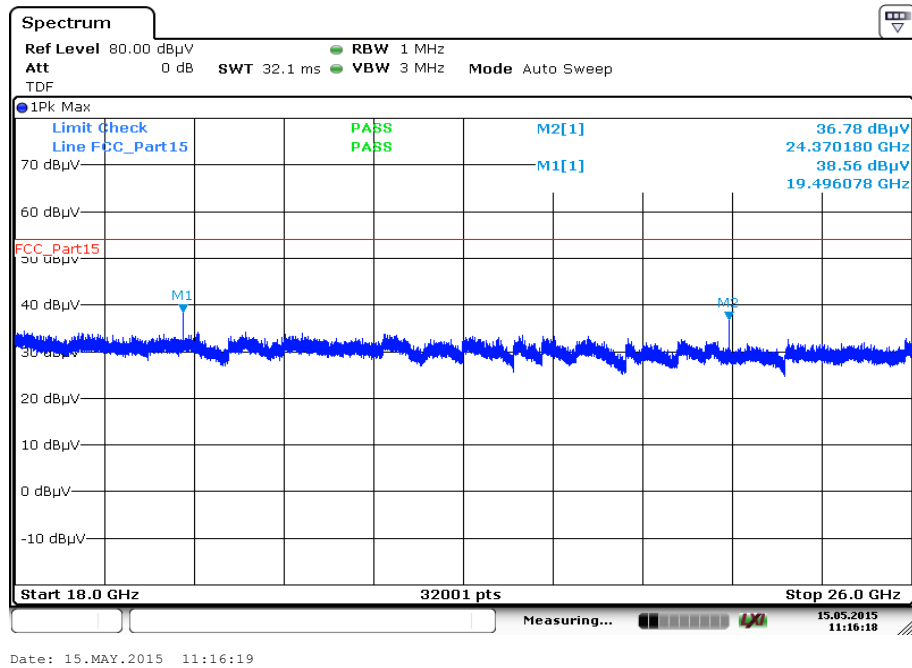
Plot 2: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

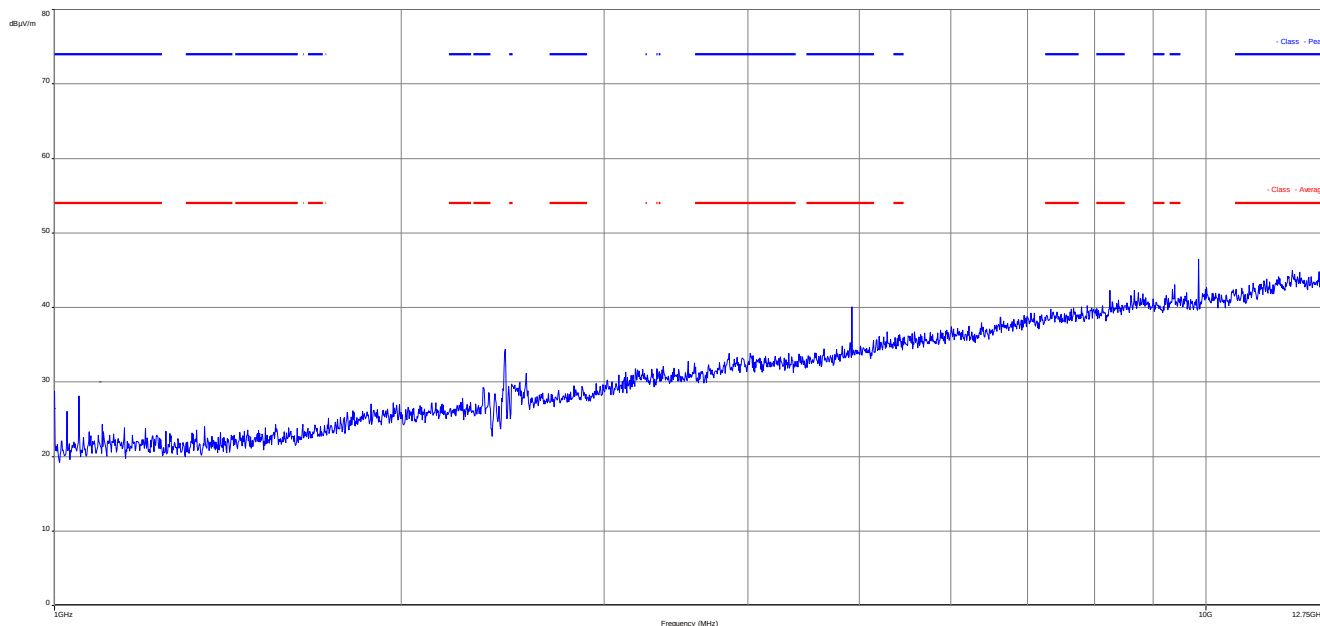
Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

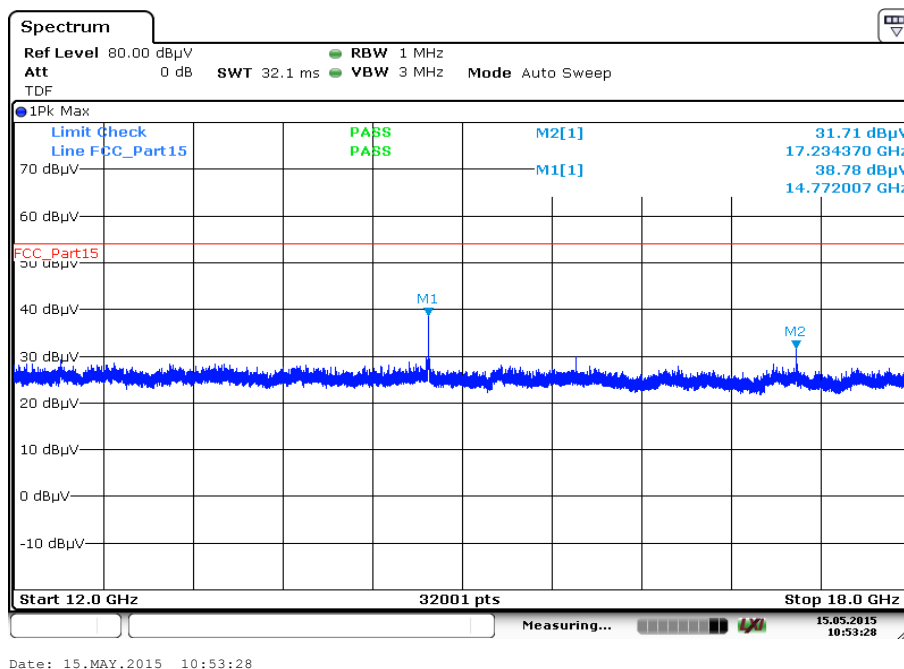
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 5: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

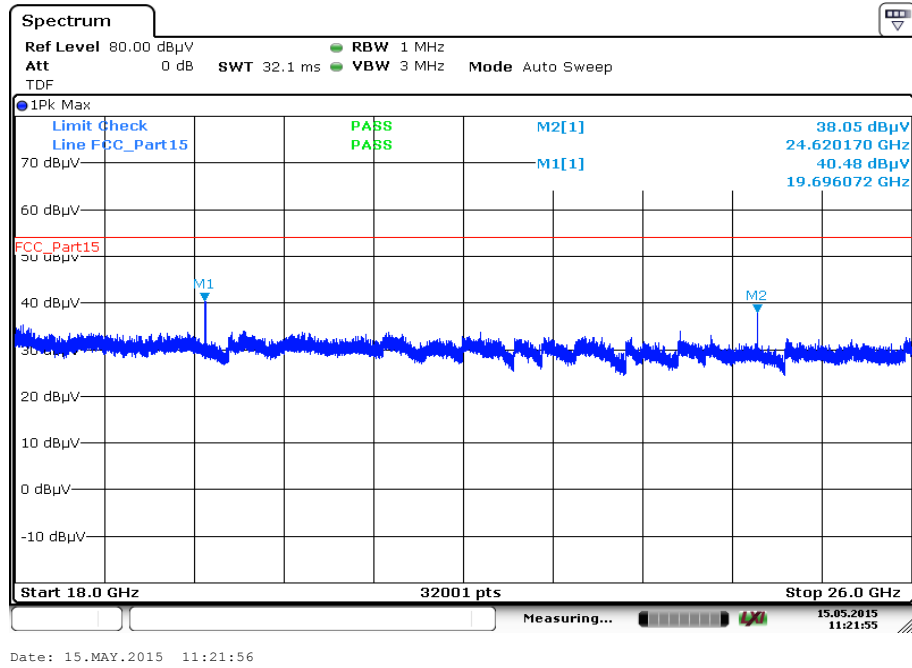
Plot 6: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

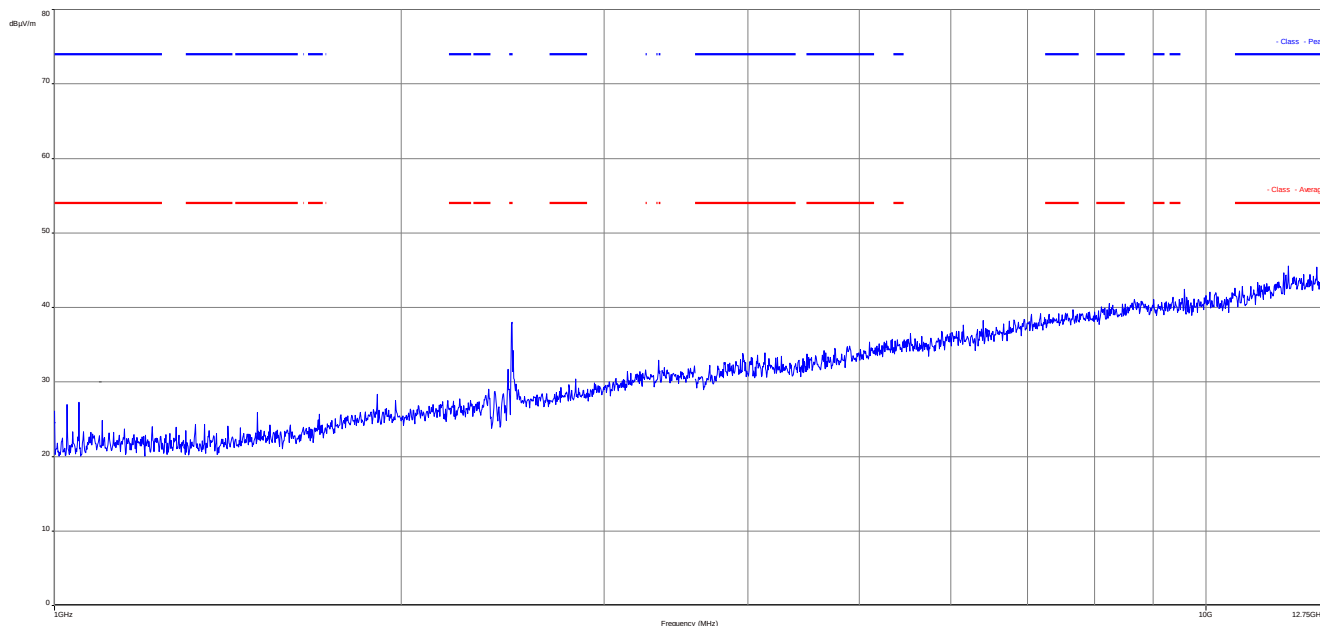
Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

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

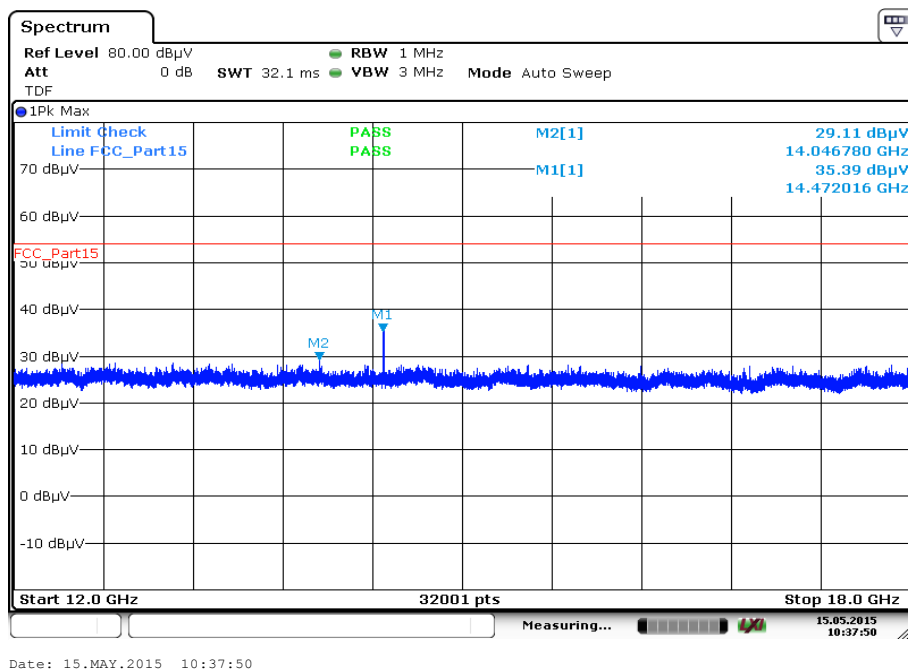
Plot 8: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

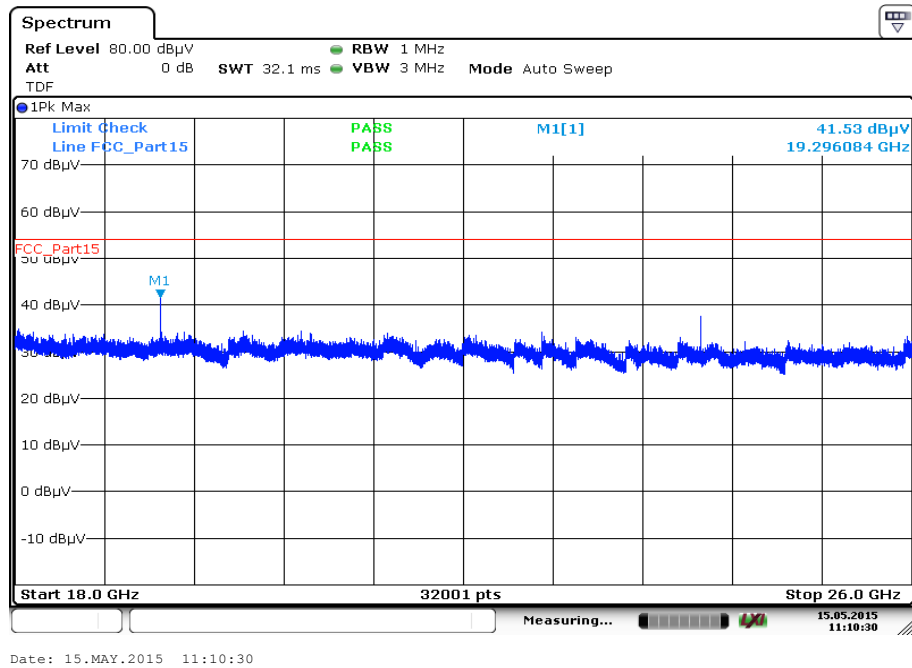
Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

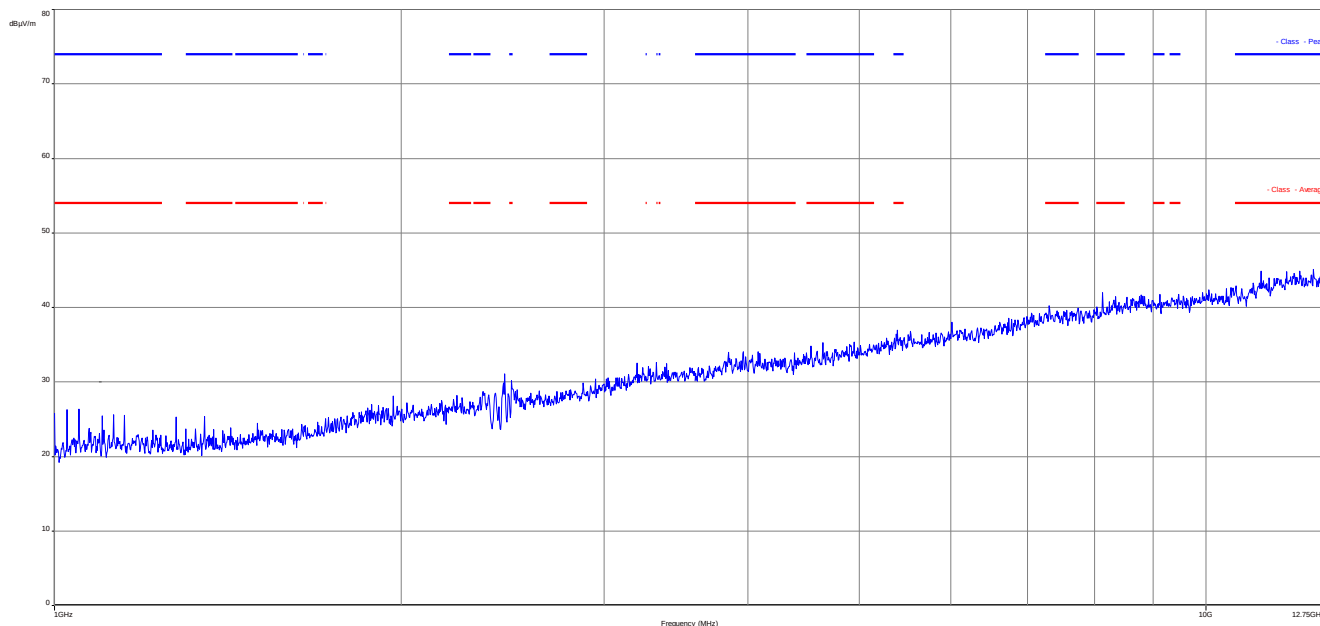


Plots: OFDM / g – mode**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

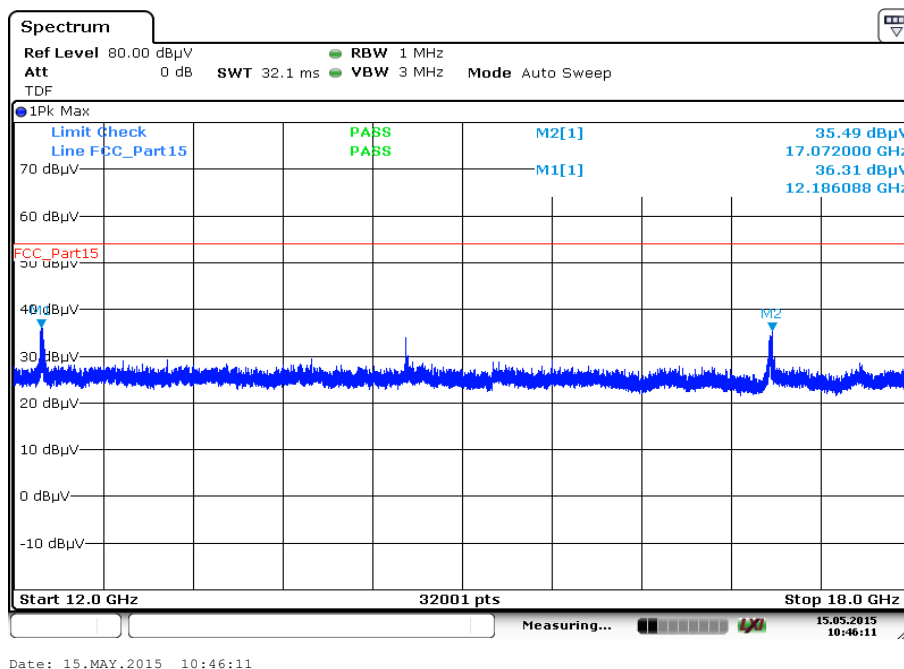
The carrier signal is notched with a 2.4 GHz band rejection filter.

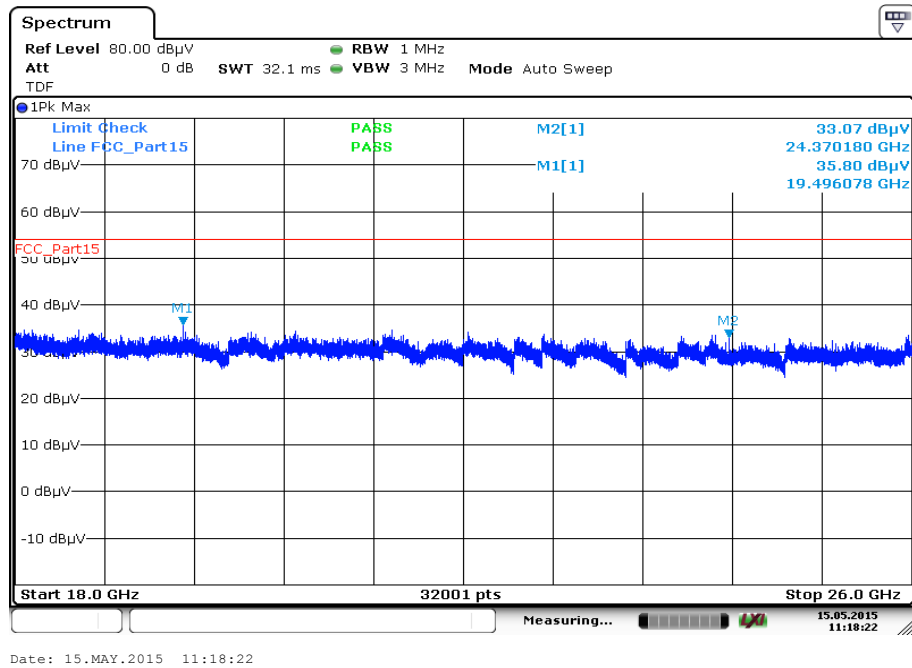
Plot 2: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

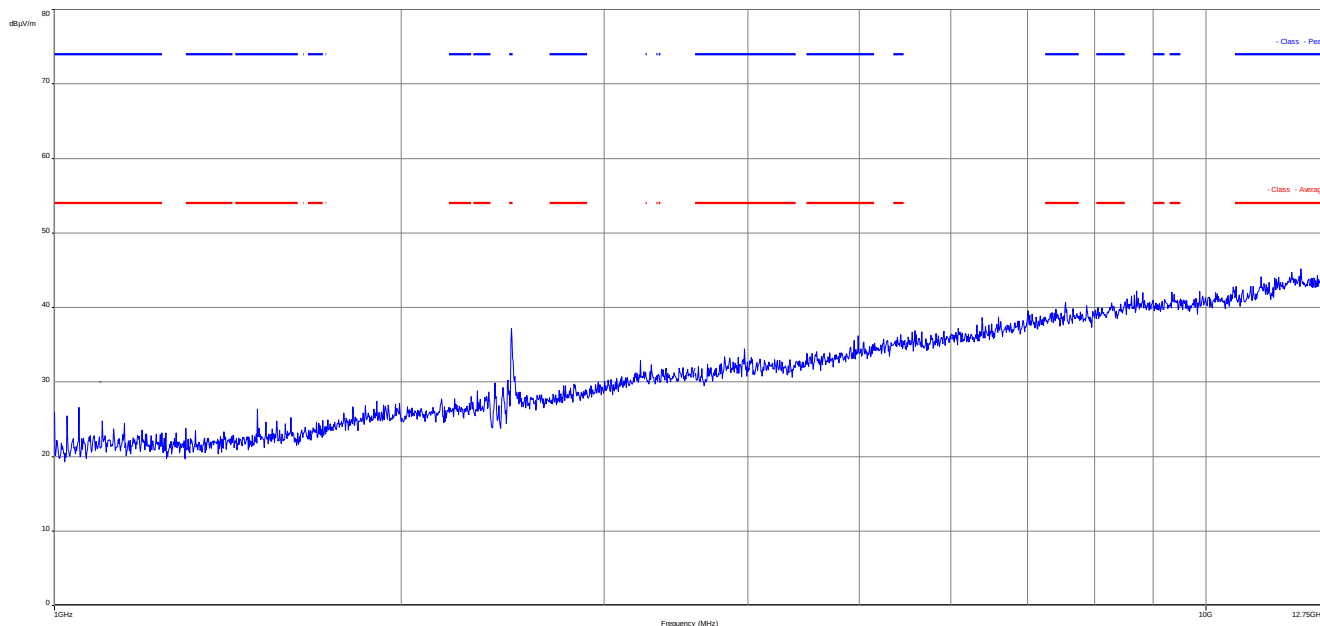
Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

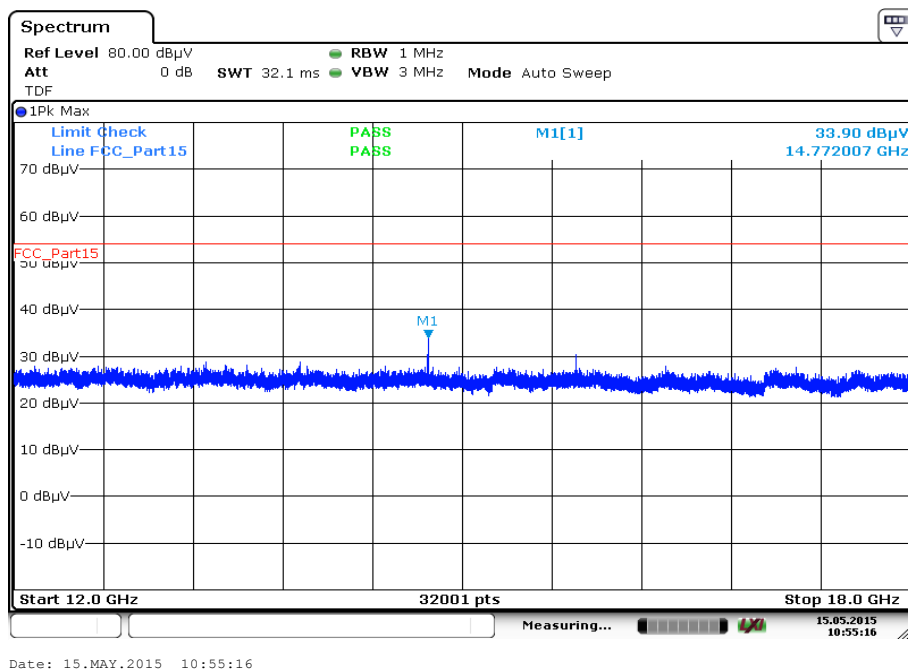
The carrier signal is notched with a 2.4 GHz band rejection filter.

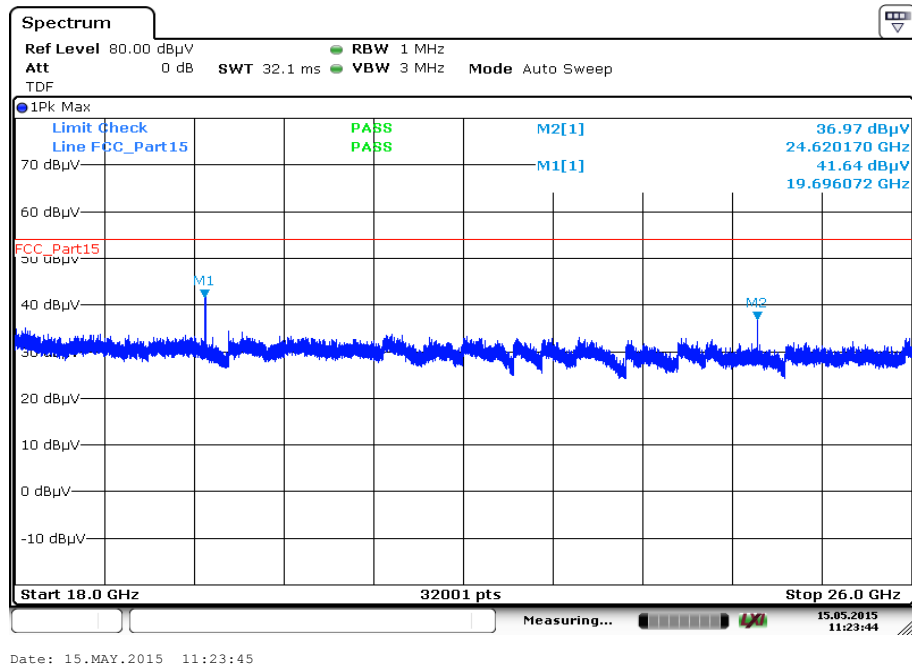
Plot 5: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

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

Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

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

Plot 8: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

10.12 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The results are valid for both modes.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

RX Spurious Emissions Radiated [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
No spurious emissions above 1 GHz detected.		
Measurement uncertainty	± 3 dB	

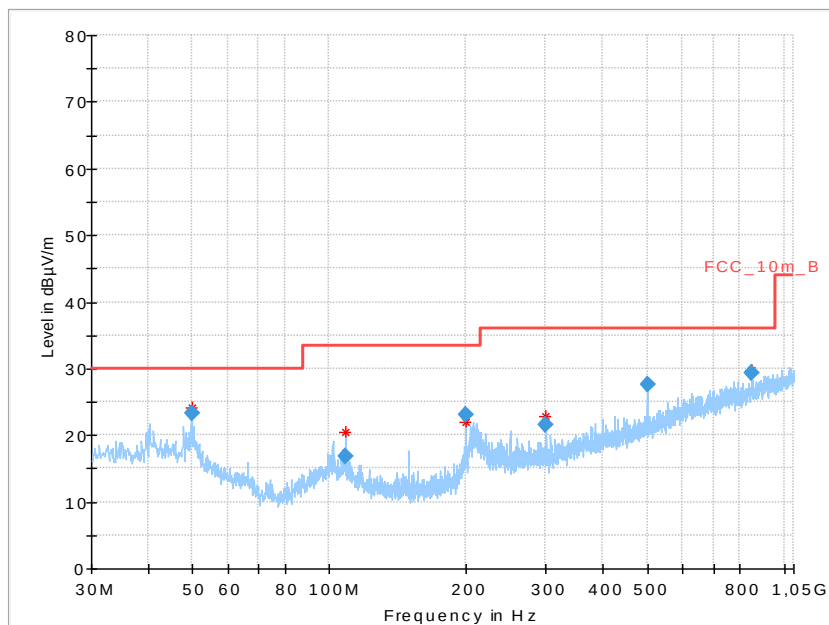
Verdict: **complies**

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

10.12.1 Results Setup A – internal Antenna

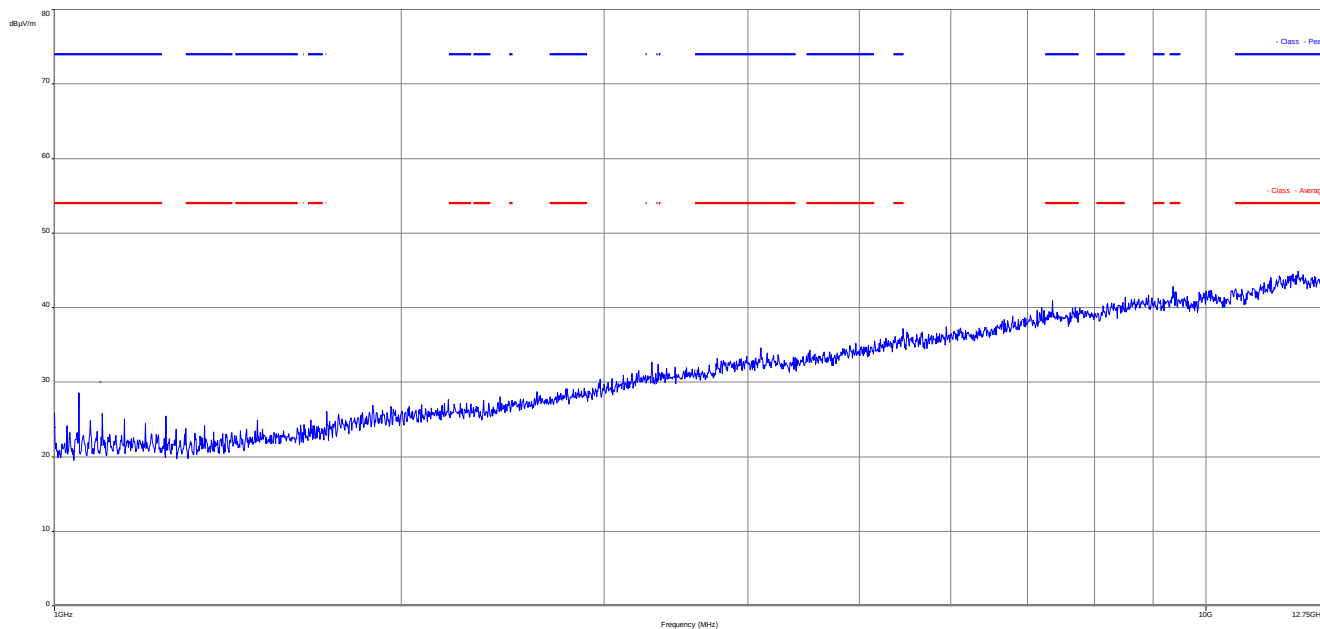
Plots: RX / Idle – mode

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

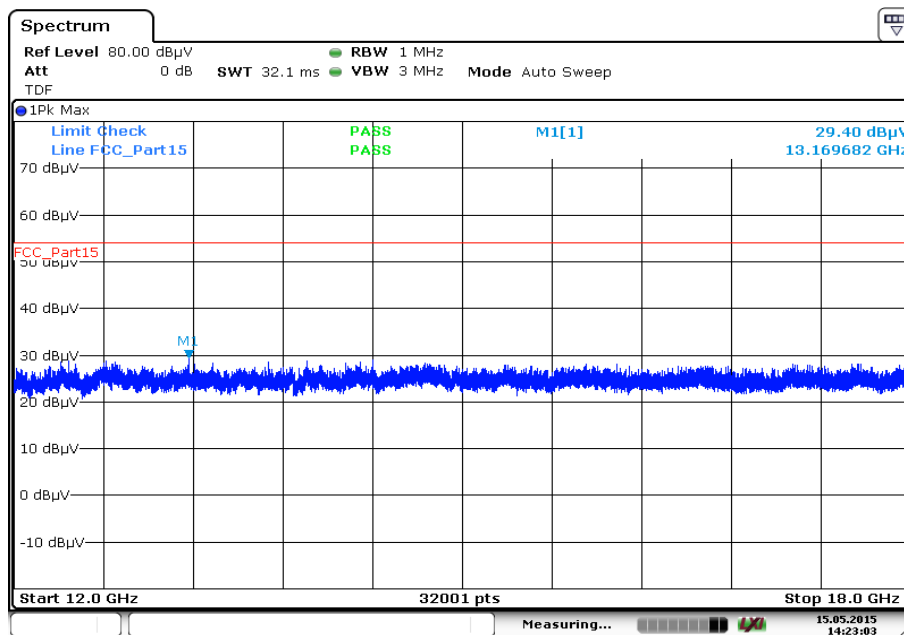


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
50.011350	23.26	30.00	6.74	1000.0	120.000	98.0	V	171	12.6
108.807750	16.77	33.50	16.73	1000.0	120.000	101.0	V	10	11.2
199.992750	23.16	33.50	10.34	1000.0	120.000	98.0	V	-10	11.7
299.986500	21.52	36.00	14.48	1000.0	120.000	98.0	V	261	14.4
500.010000	27.65	36.00	8.35	1000.0	120.000	170.0	H	10	18.7
850.004250	29.41	36.00	6.59	1000.0	120.000	98.0	H	10	23.5

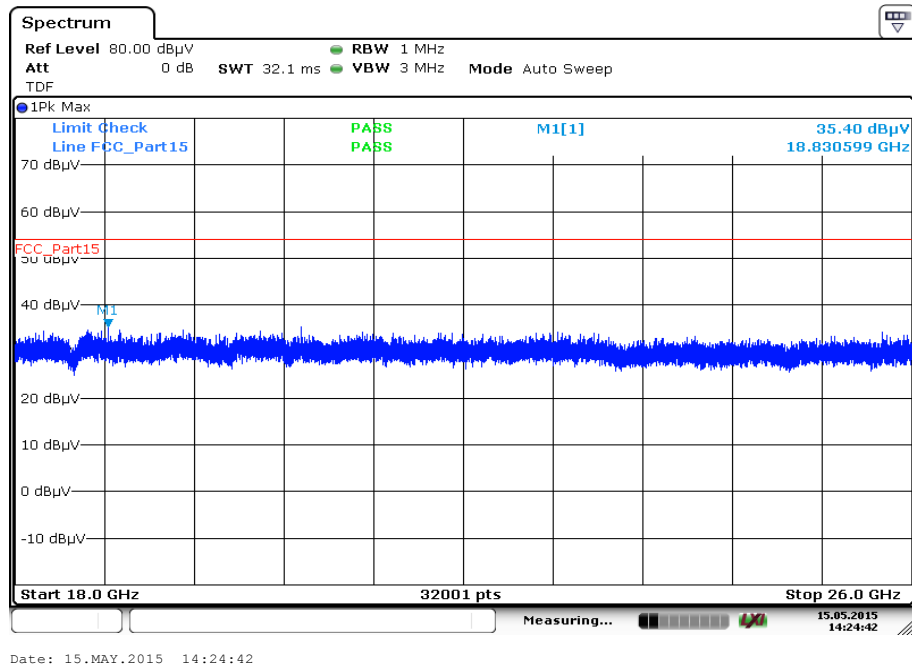
Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization



Plot 3: 12.75 GHz to 18 GHz, vertical & horizontal polarization



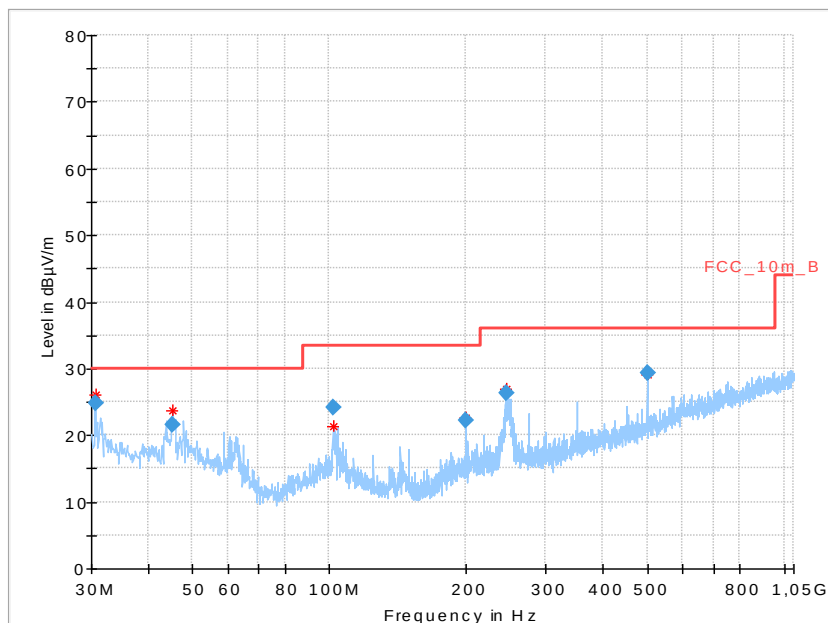
Date: 15.MAY.2015 14:23:03

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

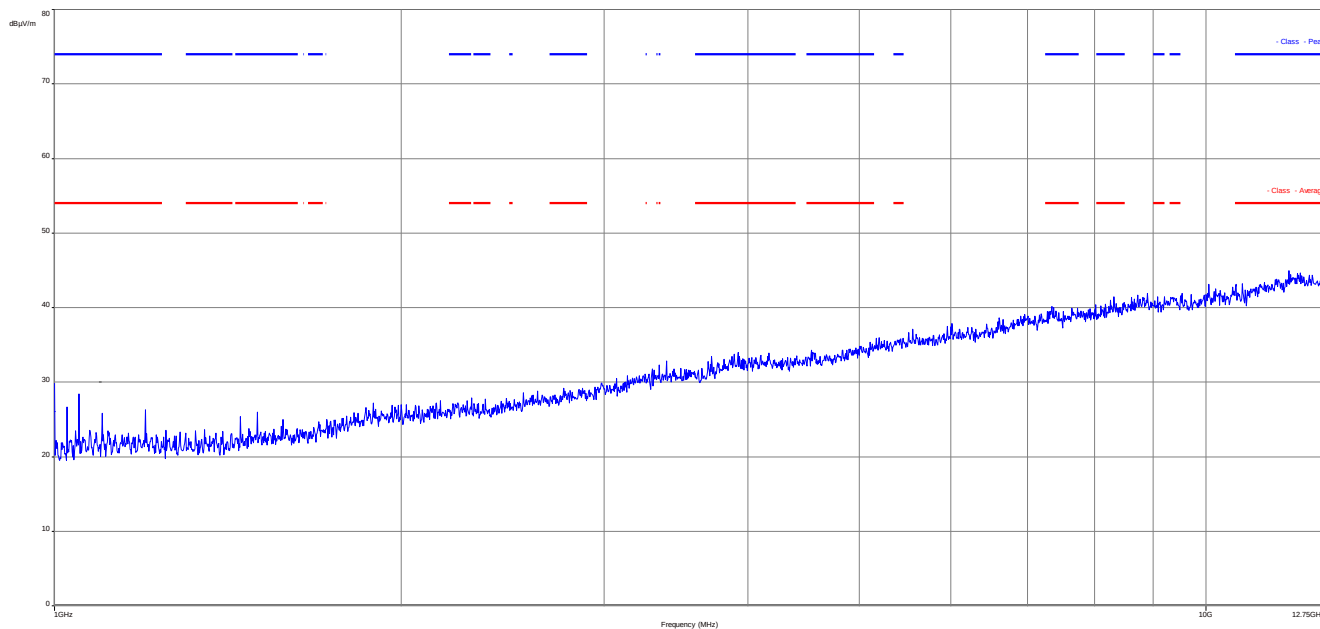
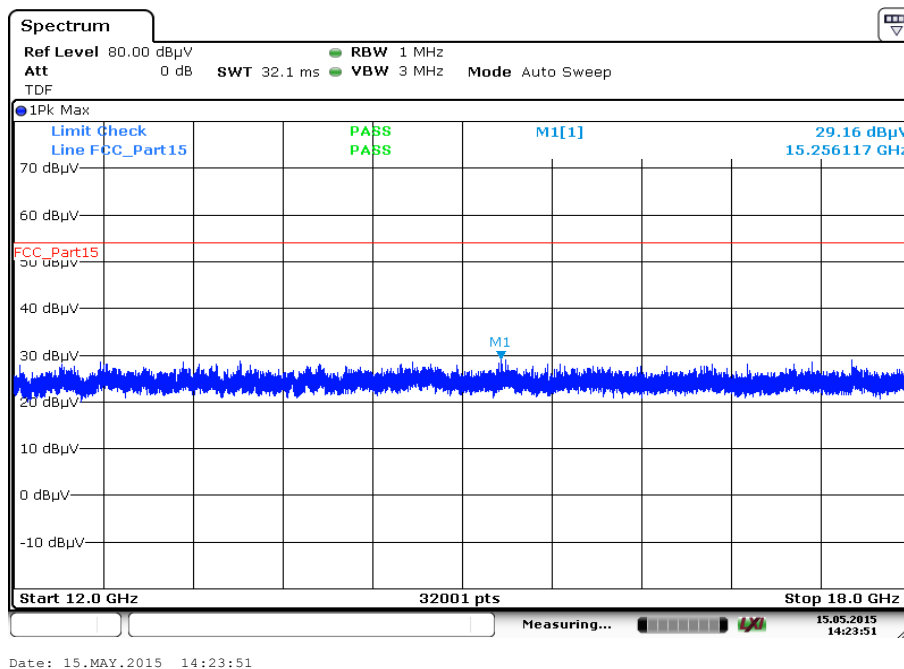
10.12.2 Results Setup B – external Antenna

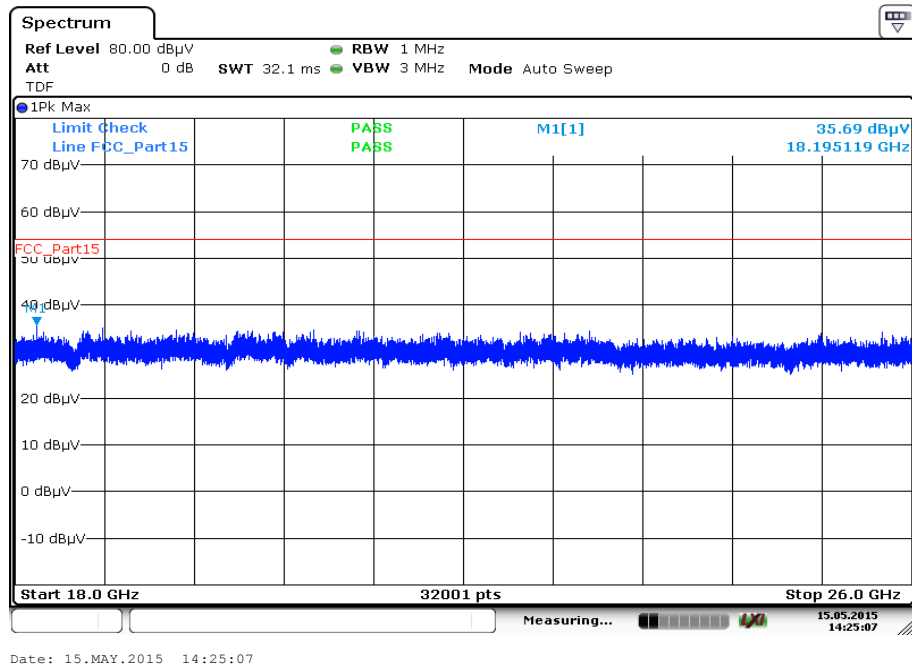
Plots: RX / Idle – mode

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



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.595376	24.81	30.00	5.19	1000.0	120.000	101.0	V	170	13.4
45.252150	21.53	30.00	8.47	1000.0	120.000	101.0	V	100	13.8
101.871300	24.21	33.50	9.29	1000.0	120.000	98.0	V	280	12.0
200.002800	22.17	33.50	11.33	1000.0	120.000	170.0	V	260	11.7
245.927850	26.34	36.00	9.66	1000.0	120.000	98.0	V	-9	13.2
499.998450	29.24	36.00	6.76	1000.0	120.000	98.0	V	80	18.7

Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3:** 12.75 GHz to 18 GHz, vertical & horizontal polarization

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

10.13 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is repeated for DSSS and OFDM modulation. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBμV/m)	Average (dBμV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

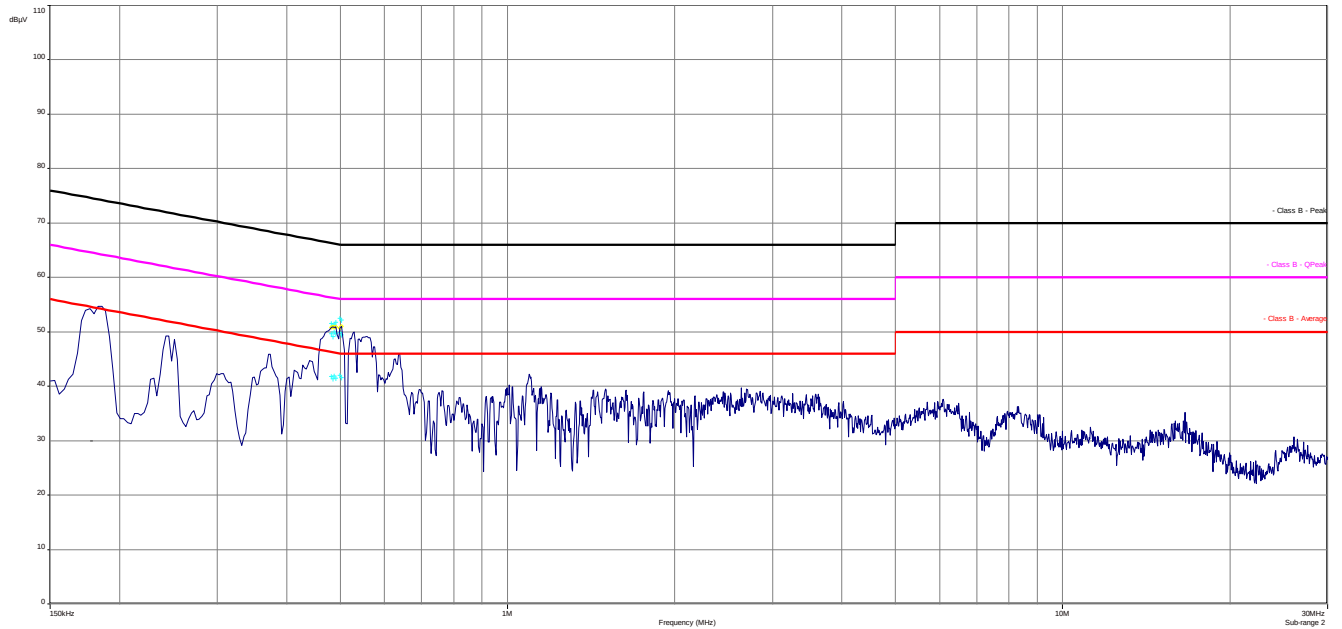
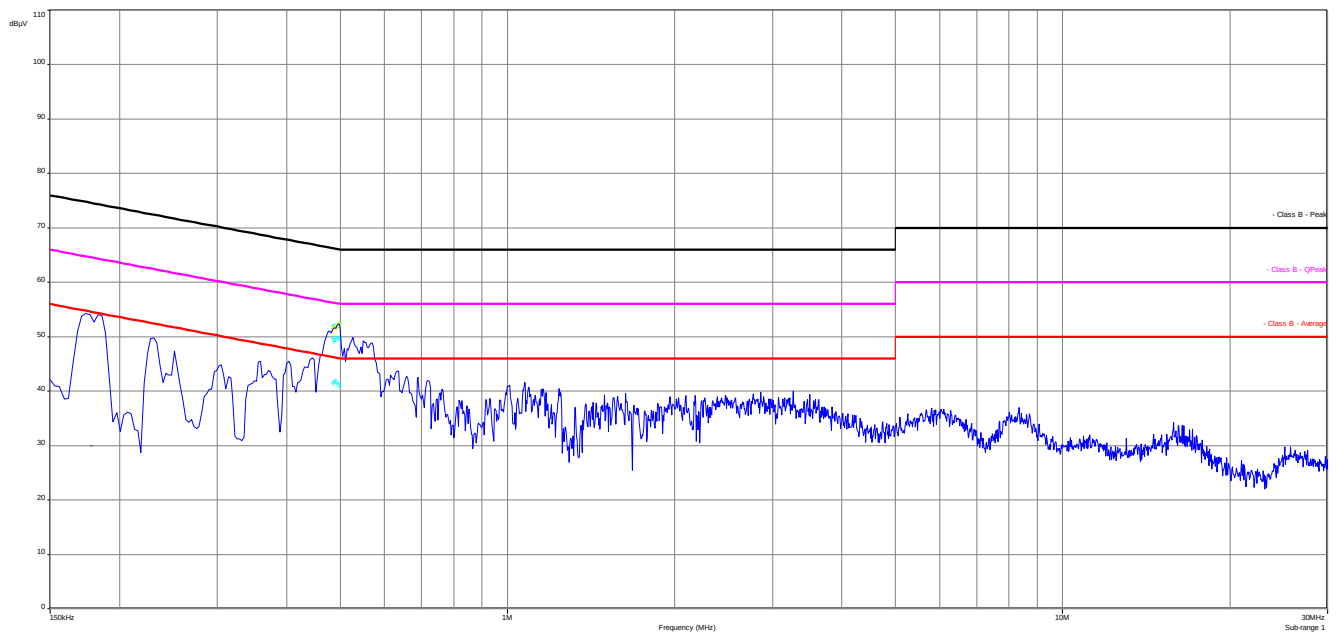
*Decreases with the logarithm of the frequency

10.13.1 Results Setup A – internal Antenna

Results:

TX Spurious Emissions Conducted < 30 MHz [dBμV/m]							
F [MHz]	Peak (dBμV)	Margin PK	QuasiPeak (dBμV)	Margin QP	Average (dBμV)	Margin AV	Line
0.481335	51.5	14.7	49.7	6.6	41.8	4.5	Phase
0.48432	51.1	15.1	49.1	7.1	41.3	4.8	Phase
0.48432	52.0	14.2	49.6	6.6	41.4	4.8	Neutral
0.487305	51.4	14.7	50.0	6.2	41.8	4.3	Phase
0.487305	52.0	14.1	49.1	7.1	41.8	4.3	Neutral
0.49029	52.0	14.1	49.6	6.5	41.9	4.2	Neutral
0.49029	51.7	14.4	49.6	6.5	41.4	4.7	Phase
0.493275	51.9	14.1	49.7	6.3	41.3	4.7	Neutral
0.49626	52.1	13.8	49.6	6.4	41.4	4.6	Neutral
0.499245	52.5	13.4	49.9	6.1	42.0	3.9	Phase
0.499245	52.5	13.5	49.8	6.1	40.8	5.1	Neutral
0.50223	52.1	13.8	49.4	6.5	41.5	4.4	Phase
Measurement uncertainty	± 3 dB						

Verdict: [complies](#)

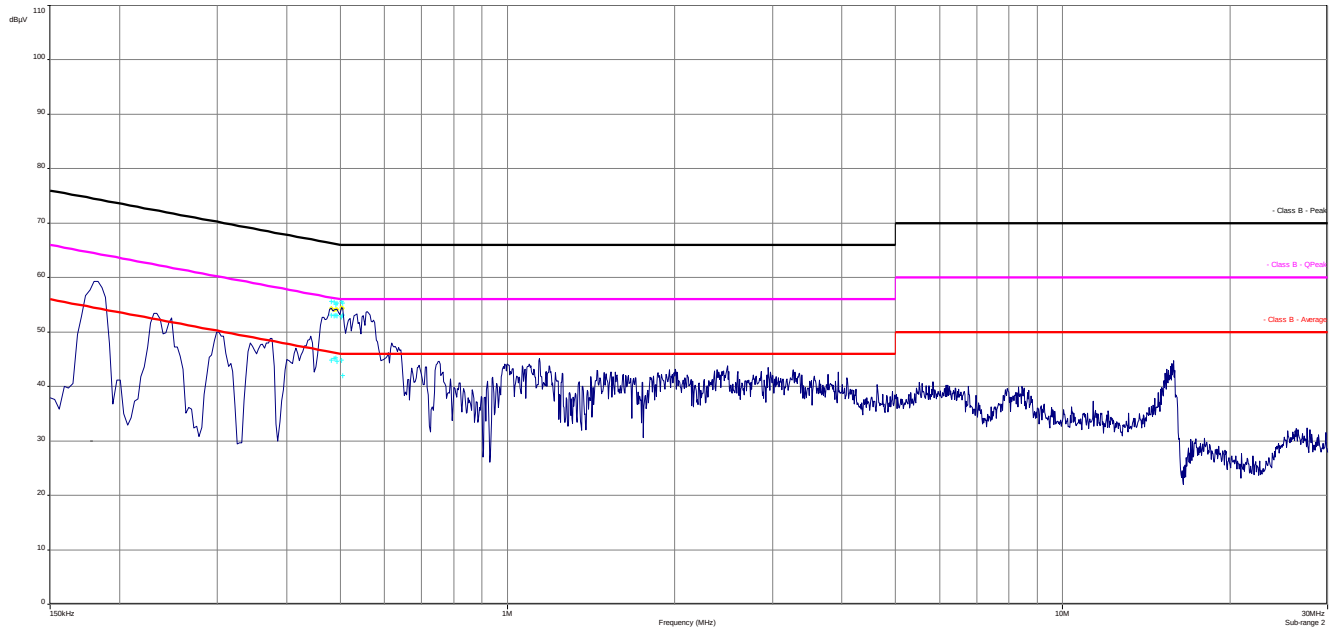
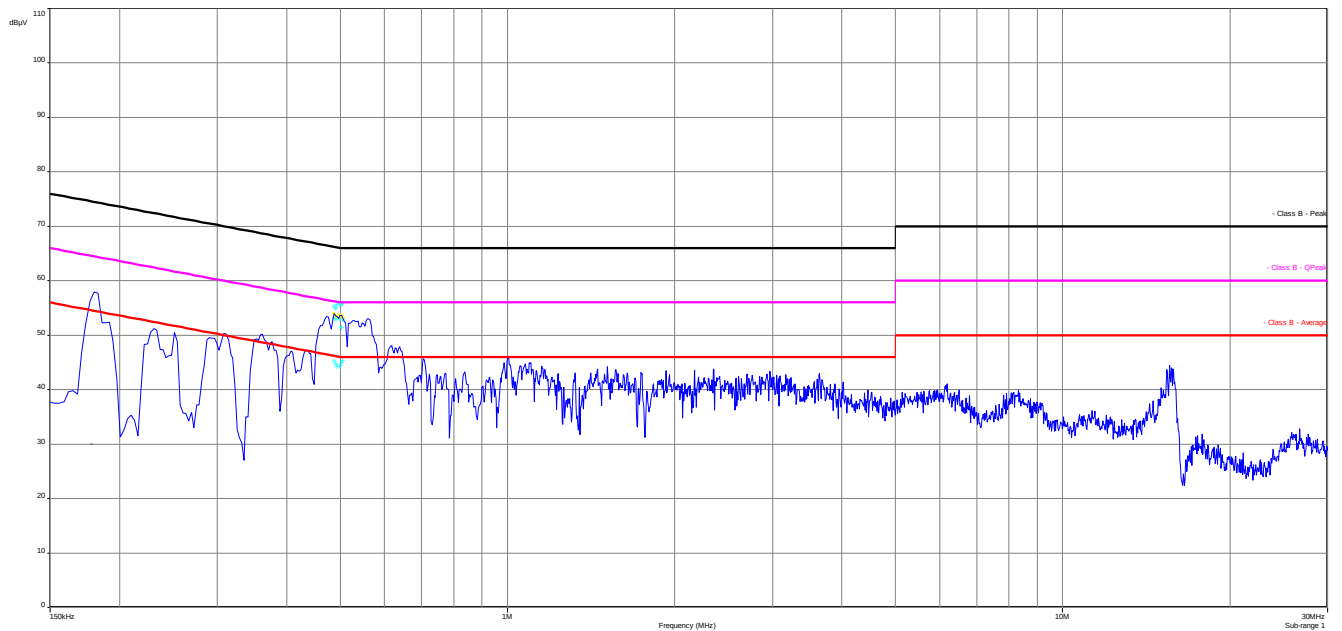
Plots:**Plot 1: 150 kHz to 30 MHz, phase line****Plot 2: 150 kHz to 30 MHz, neutral line**

10.13.2 Results Setup B – external Antenna

Results:

TX Spurious Emissions Conducted < 30 MHz [dBμV/m]							
F [MHz]	Peak (dBμV)	Margin PK	QuasiPeak (dBμV)	Margin QP	Average (dBμV)	Margin AV	Line
0.481335	55.6	10.7	53.1	3.1	44.8	1.4	Phase
0.487305	55.5	10.7	53.0	3.1	45.2	1.0	Phase
0.487305	55.2	10.9	53.2	3.0	45.2	1.0	Neutral
0.49029	55.0	11.0	53.0	3.1	45.2	1.0	Phase
0.49029	54.9	11.1	53.0	3.1	44.7	1.3	Neutral
0.493275	55.6	10.4	53.2	2.8	44.3	1.8	Neutral
0.493275	55.3	10.7	53.0	3.1	44.6	1.4	Phase
0.499245	55.8	10.1	52.9	3.0	44.3	1.6	Neutral
0.50223	55.7	10.2	51.4	4.5	44.9	1.0	Neutral
0.50223	55.6	10.3	52.8	3.1	44.7	1.2	Phase
0.505215	55.2	10.7	53.1	2.8	42.0	3.9	Phase
0.505215	55.9	10.0	52.9	3.0	45.3	0.8	Neutral
Measurement uncertainty	± 3 dB						

Verdict: [complies](#)

Plots:**Plot 1: 150 kHz to 30 MHz, phase line****Plot 2: 150 kHz to 30 MHz, neutral line**

11 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-06-16

Annex B Further information**Glossary**

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

Annex C Accreditation Certificate

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Befähigung gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
 Unterzeichnerin der Multilateralen Abkommen
 von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
 Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL
 VoIP und DECT
 Akustik
 Funk einschließlich WLAN
 Short Range Devices (SRD)
 RFID
 WLAN und Richtfunk
 Mobilfunk (GSM / GPRS / UMTS / LTE Performance)
 Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
 Produktsicherheit
 SAR und Hearing Aid Compatibility (HAC)
 Umweltsimulation
 Smart Card Terminals
 Bluetooth
 Wi-Fi Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der
 Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der
 Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-00

Frankfurt am Main, 07.03.2014

Date of issue of the certificate

Dr. Ingrid Dittmann
 Akkreditierungsstellenleiterin

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
 Spittelmarkt 10
 10117 Berlin

Standort Frankfurt am Main
 Gartenstraße 6
 60594 Frankfurt am Main

Standort Braunschweig
 Bundesallee 100
 38115 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen
 Zustimmung der Deutschen Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate
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 unveränderter Form.

Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt,
 die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom
 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments
 und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung
 im Zusammenhang mit der Vermarktung von Produkten (Abt. L 218 vom 9. Juli 2008, S. 30).
 Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der
 European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und
 der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen
 erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:

EA: www.european-accreditation.orgIAF: www.iaf.or.jpILAC: www.ilac.or.jp

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>