**CETECOM™****CETECOM ICT Services**
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-7443/14-04-09-B

Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH

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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

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Manufacturer

Sony Mobile Communications Inc.

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Test standard/s

47 CFR Part 15

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

RSS - 210 Issue 8

Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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

Test Item

Kind of test item: BT Smart Watch**Model name:** SWR50**Commercial name:** SWR50**Type number:** RD-0090**FCC ID:** PY7-RD0090**IC:** 4170B-RD0090**Frequency:** DTS band 2400 MHz to 2483.5 MHz
(lowest channel 01 – 2412 MHz; highest channel 11 – 2462 MHz)**Technology tested:** WLAN (DSSS/b – mode; OFDM/ g & n HT20 – mode)**Antenna:** Integrated antenna**Power supply:** 3.7 V DC by Li - polymer battery**Temperature range:** -30°C to +50°C

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

Test report authorised:

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Test performed:

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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:	2014-07-08
Date of receipt of test item:	2014-07-21
Start of test:	2014-07-21
End of test:	2014-07-31
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 - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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}	+50 °C during high temperature tests
	T_{min}	-30 °C during low temperature tests
Relative humidity content:		52 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.7 V DC by Li - polymer battery
	V_{max}	4.2 V
	V_{min}	3.3 V

5 Test item

Kind of test item	:	BT Smart Watch
Model name	:	SWR50
Commercial name	:	SWR50
Type number	:	RD-0090
S/N serial number	Conducted unit:	14271D1AA37269C
	Radiated unit:	14271D11A371D4A
		14271D1BA371ED0
HW hardware status	:	AP
SW software status	:	Cond.: RF test software java_sony_brooks.020-eng ANDROID-201410704.154857KOT49H 20test-keys
Frequency band [MHz]	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 01 – 2412 MHz; highest channel 11 – 2462 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 antenna
Power supply	:	3.7 V DC by Li - polymer battery
Temperature range	:	-30°C to +50 °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: 1-7443/14-04-01_AnnexA
1-7443/14-04-01_AnnexB
1-7443/14-04-01_AnnexD

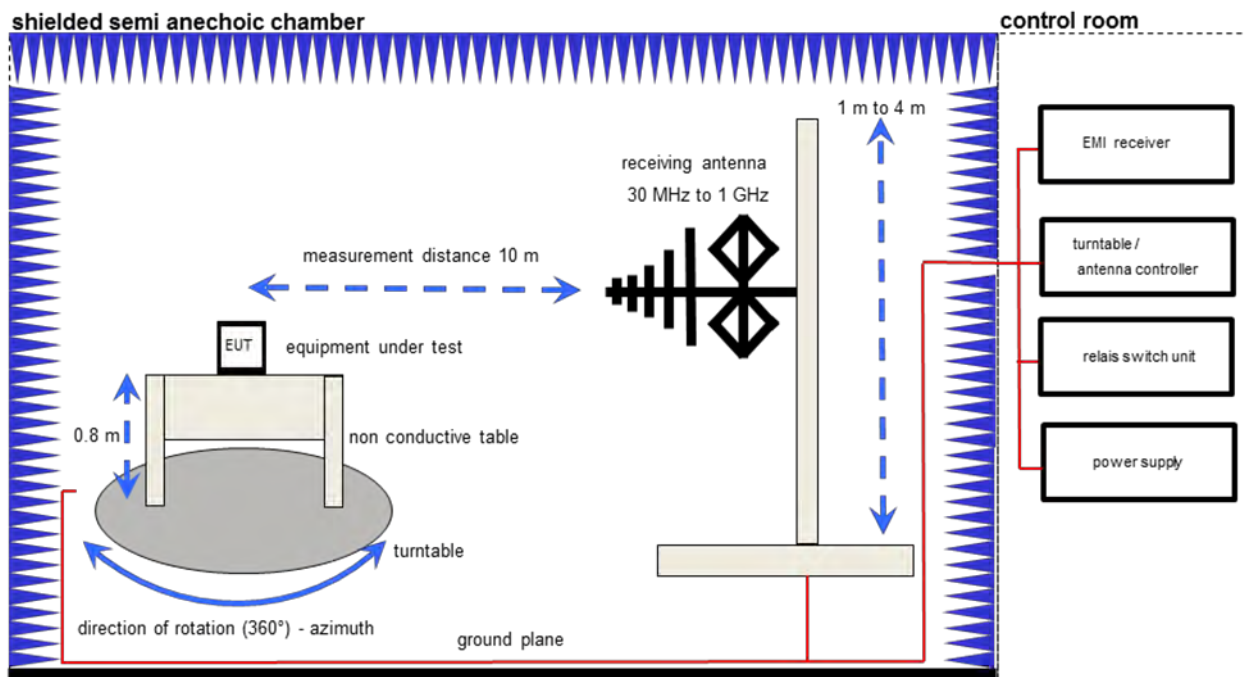
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

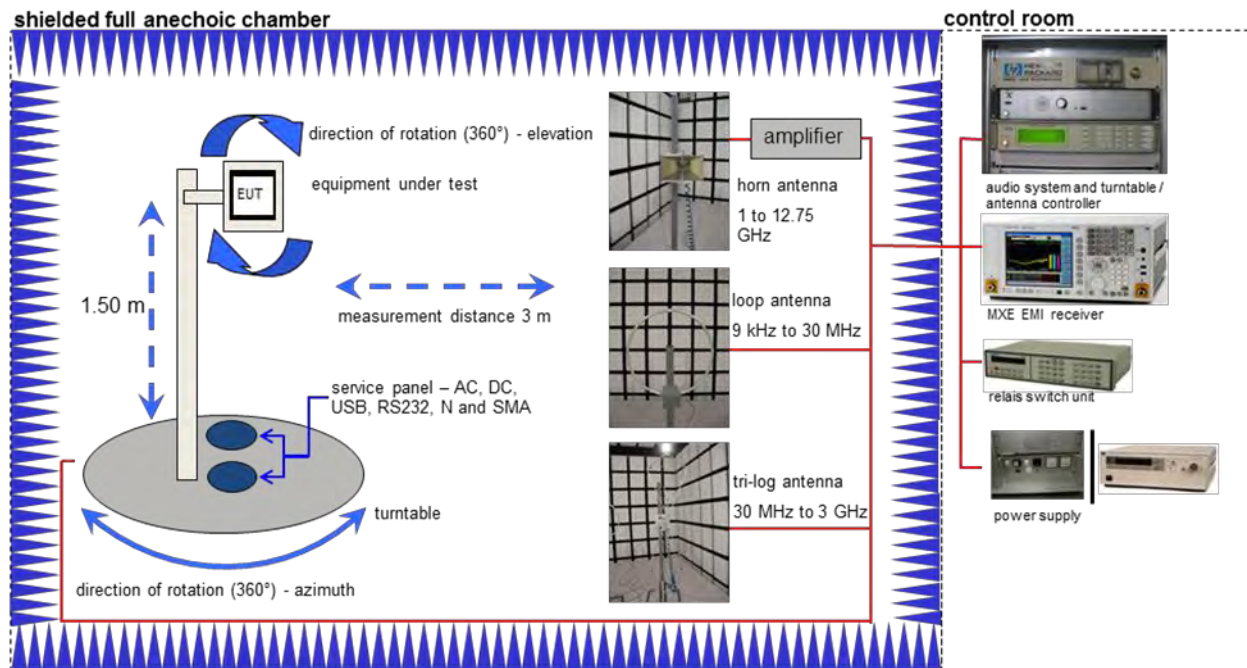
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas 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:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Software	EMC32 V. 9.12.05	R&S	-/-	-/-
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787

7.2 Radiated measurements chamber C



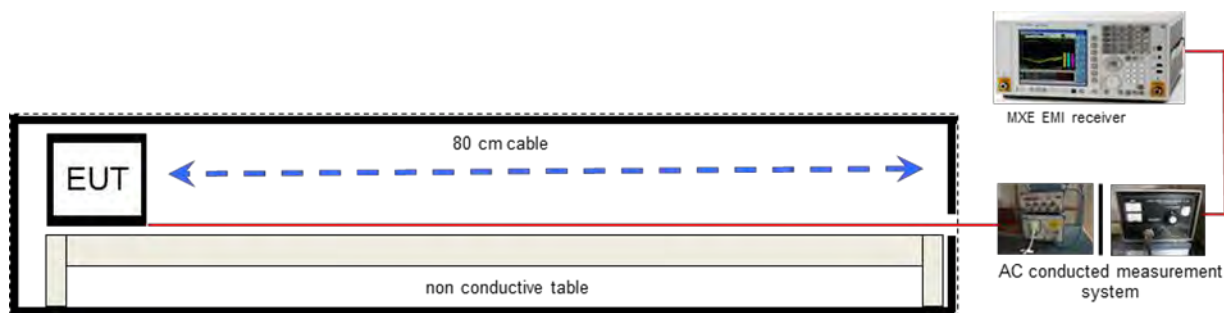
Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854
Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351
Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
Active Loop Antenna	6502	EMCO	8905-2342	300000256
Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	ErFi	91350	300001155
Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997
Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143

7.3 Radiated measurements 12.75 GHz to 26 GHz**Equipment table:**

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

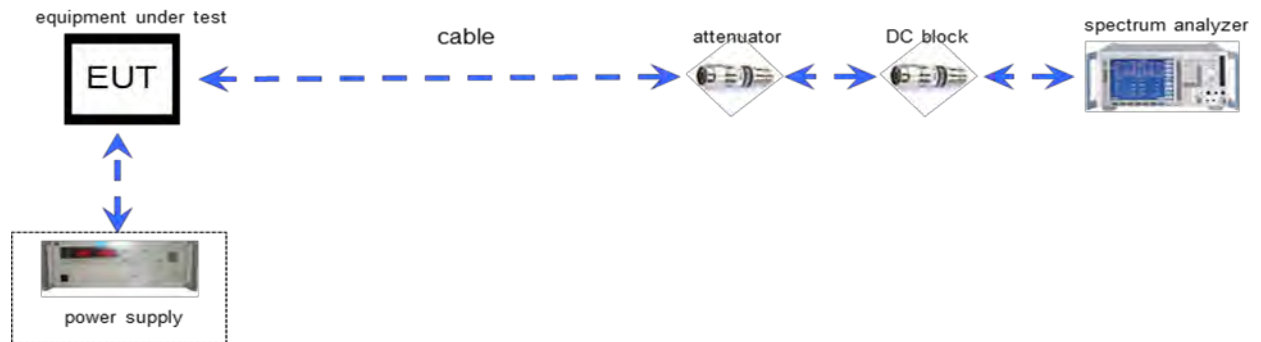
7.4 AC conducted



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erft	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210

7.5 Conducted measurements



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

8 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8	Passed	2014-10-01	-/-

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	-/-	Nominal	Nominal	DSSS	☒	☐	☐	☐	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	KDB 558074 DTS clause: 10.6	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	KDB 558074 DTS clause: 9.2.2.5	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	Detailed spurious emissions @ the band edges - conducted	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	KDB 558074 DTS clause: 13.3.2	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.109 RSS-Gen	RX spurious emissions radiated	-/-	Nominal	Nominal	-/-	☒	☐	☐	☐	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies

Note: NA = Not Applicable; NP = Not Performed

9 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

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

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

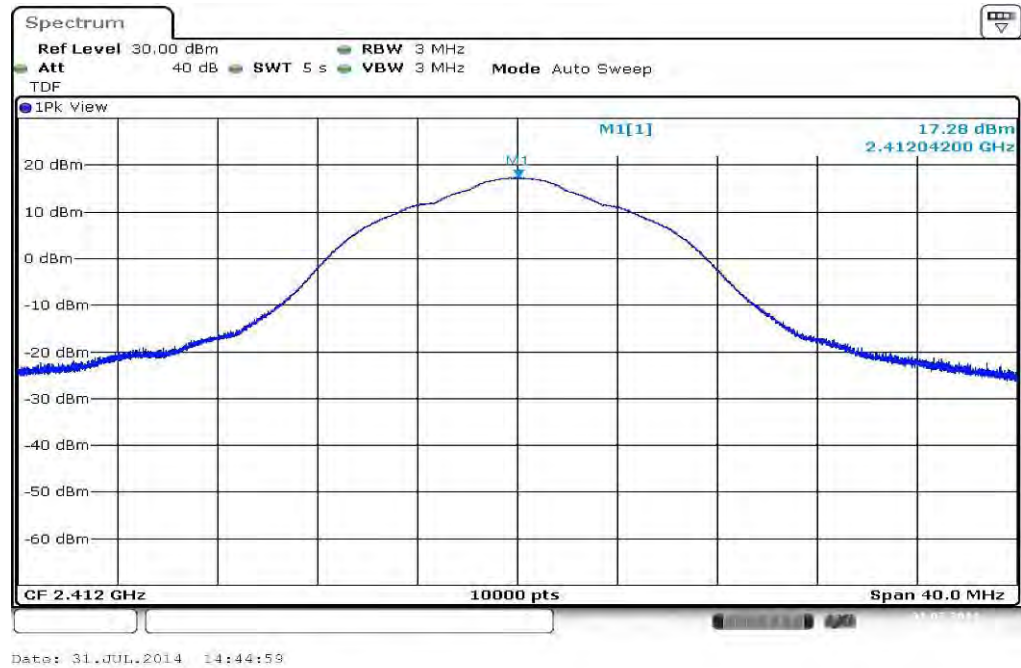
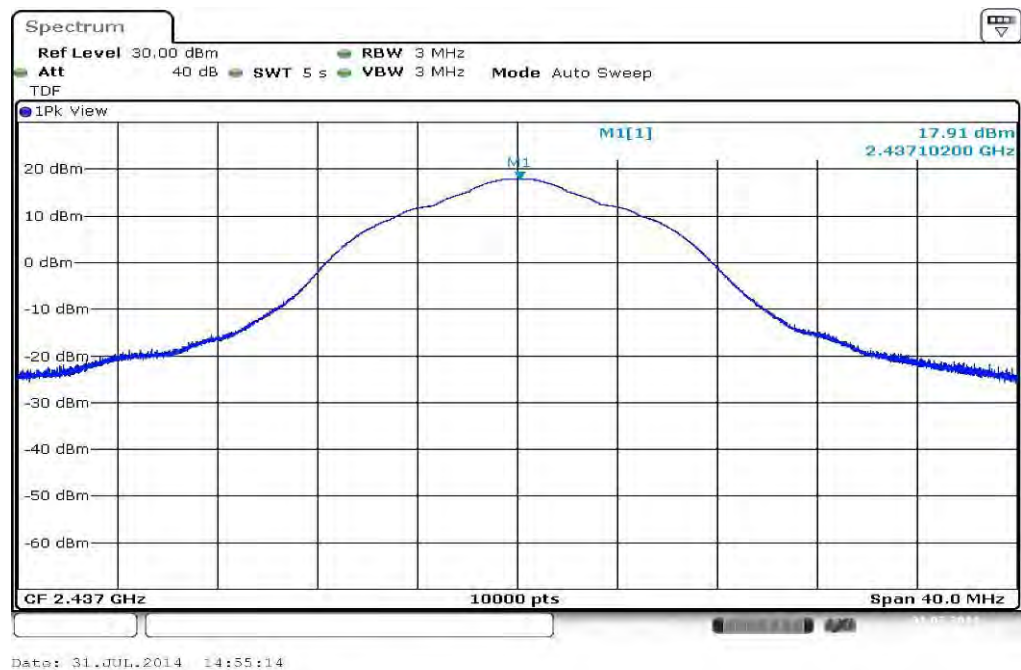
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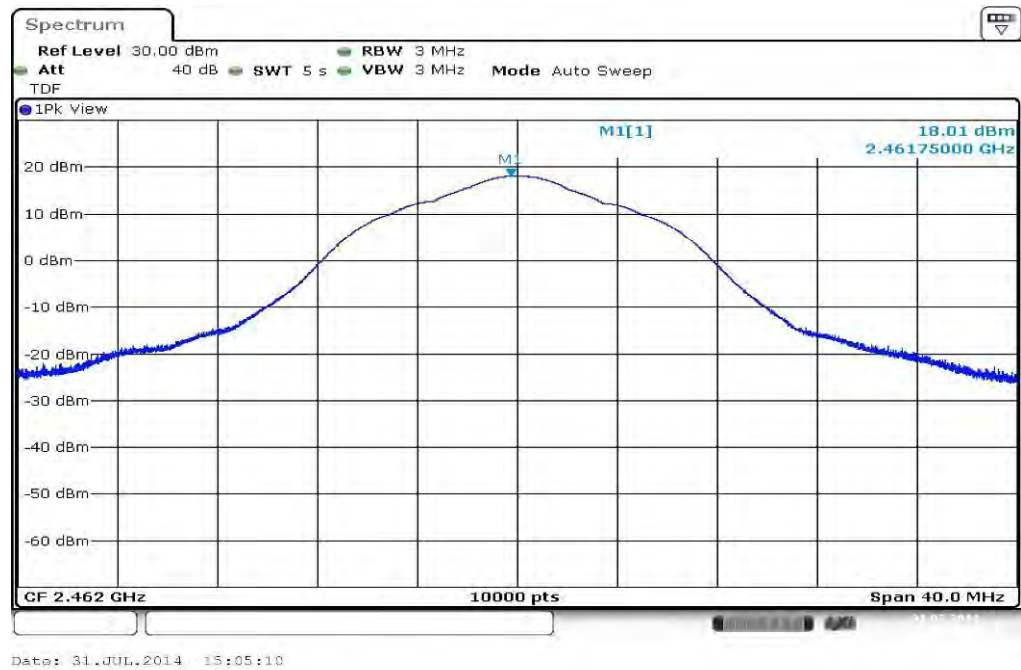
FCC	IC
Antenna Gain	
6 dBi	

Results:

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		17.28	17.91	18.01
Radiated power [dBm] Measured with DSSS modulation		16.50	17.80	18.40
Gain [dBi] Calculated		-0.78	-0.11	0.39
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

Result: **Passed**

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

Plot 3: TX mode, highest channel

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. Additional the band edge compliance test will be performed in the lowest and highest modulation scheme.

Measurement parameters:

Average Power Meter

Results:

Modulation Frequency	Modulation scheme / bandwidth		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	1 Mbit/s	1 Mbit/s	1 Mbit/s
OFDM / g – mode	6 Mbit/s	6 Mbit/s	6 Mbit/s
OFDM / n HT20 – mode	MCS0	MCS0	MCS0

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. The duty cycle is measured before and the resulting correction factor is added to every measurement as offset value. You can see the offset values in the plots.

Measurement:

Measurement parameter	
According to DTS clause: 9.2.2.5	
Detector:	RMS
Sweep time:	See Plots.
Resolution bandwidth:	500 kHz
Video bandwidth:	3 MHz
Span:	40 MHz
Integration bandwidth:	99% power - bandwidth (OBW)
Trace-Mode:	Max hold (allow trace to fully stabilize)
Measurement function:	Channel power with OBW

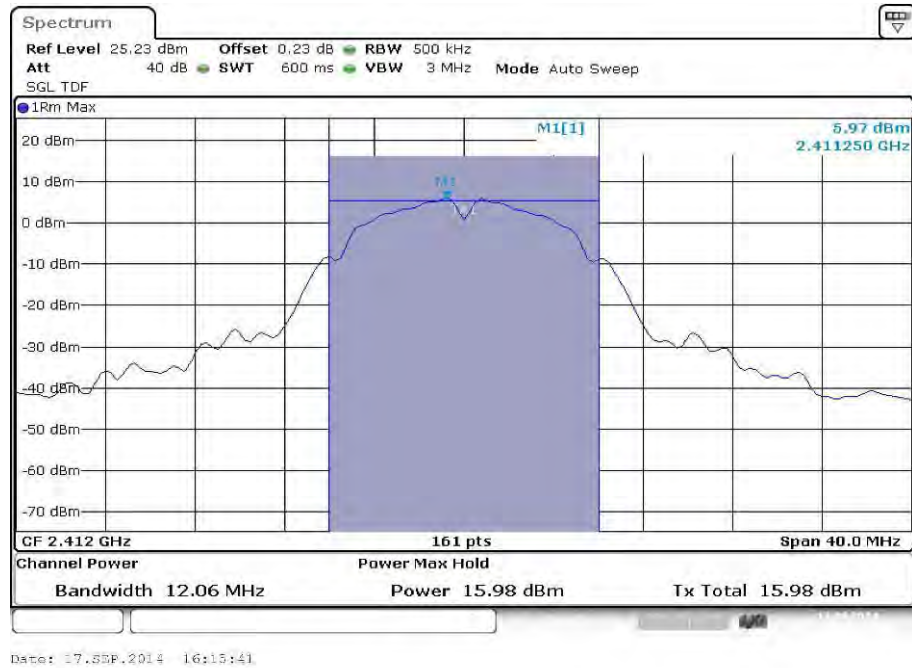
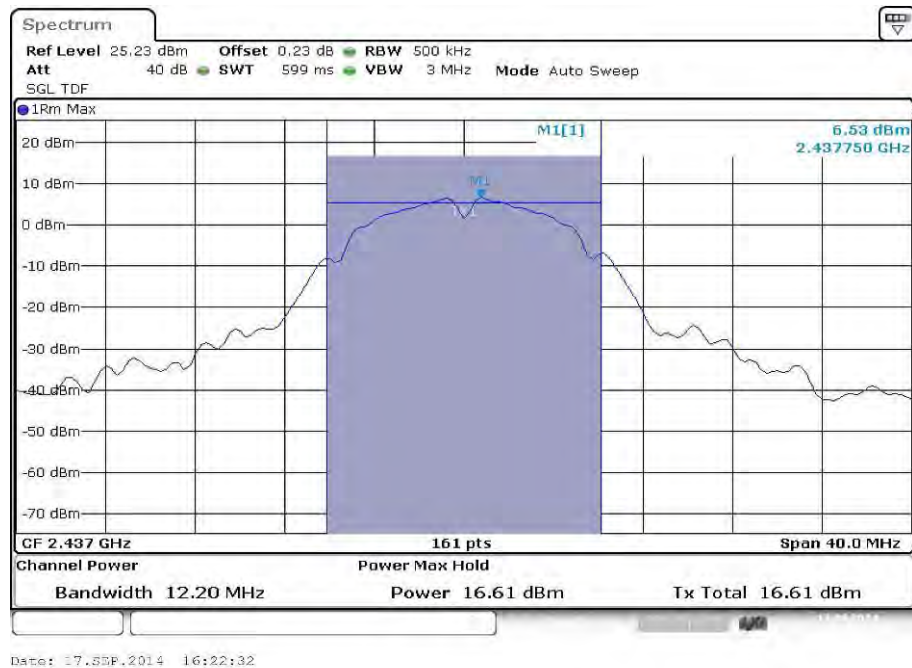
Limits:

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

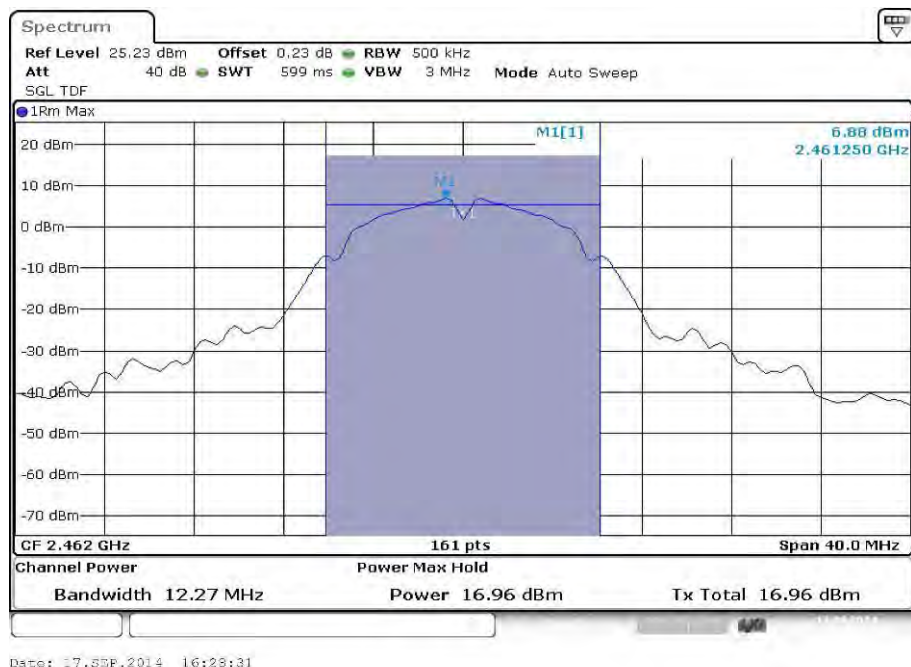
Results:

DSSS / b – mode	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Frequency			
Output power conducted including DC corr. Worst case data rate	15.98	16.61	16.96
OFDM / g – mode	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Frequency			
Output power conducted including DC corr. Worst case data rate	14.79	15.33	15.69
OFDM / n HT20 – mode	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Frequency			
Output power conducted including DC corr. Worst case data rate	14.80	15.31	15.77
Measurement uncertainty	± 1.5 dB (cond.)		

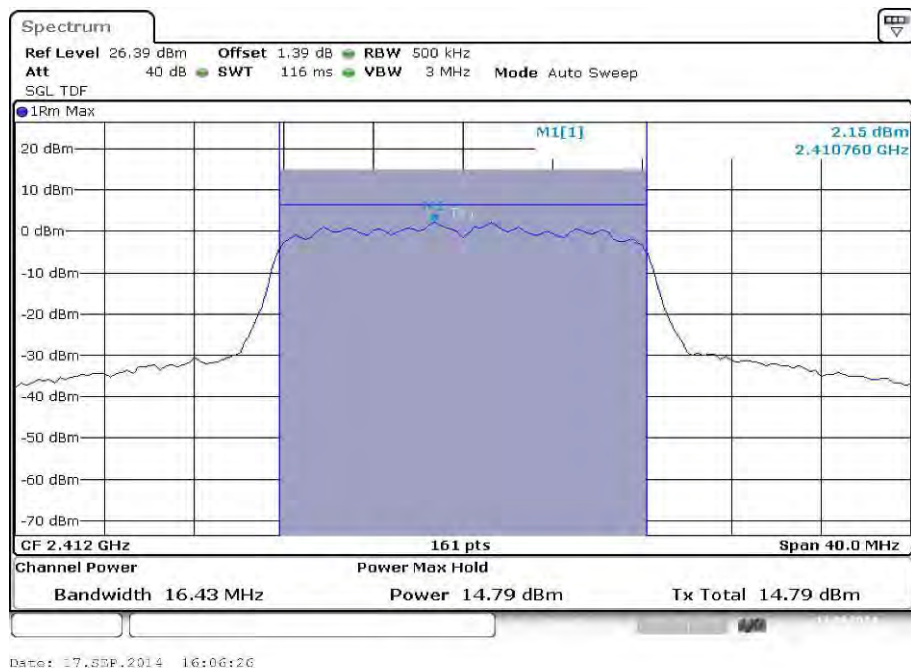
Result: Passed

Plots:**Plot 1: b-mode, CH 1****Plot 2: b-mode, CH 6**

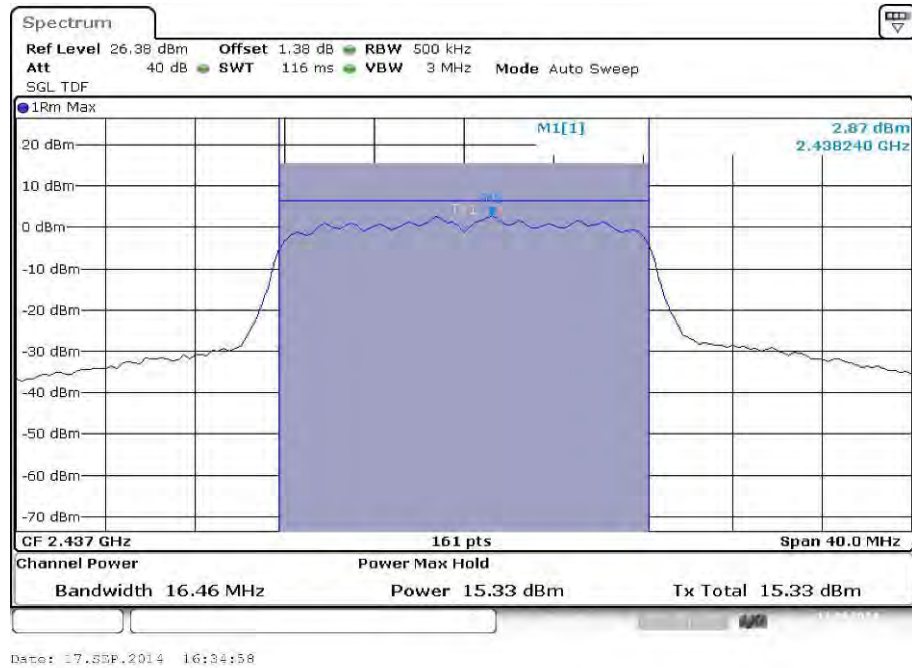
Plot 3: b-mode, CH 11



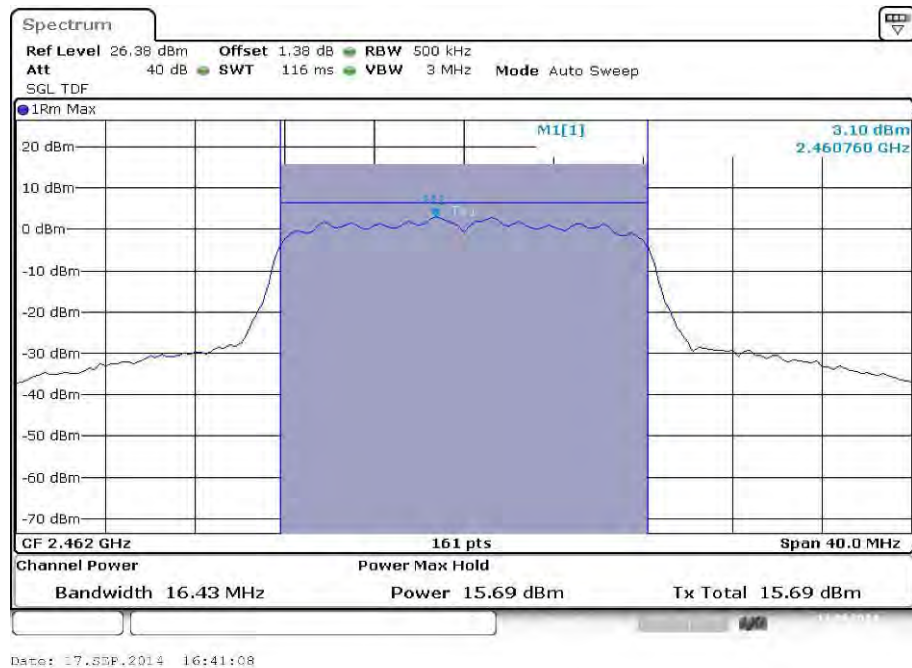
Plot 4: g-mode, CH 1



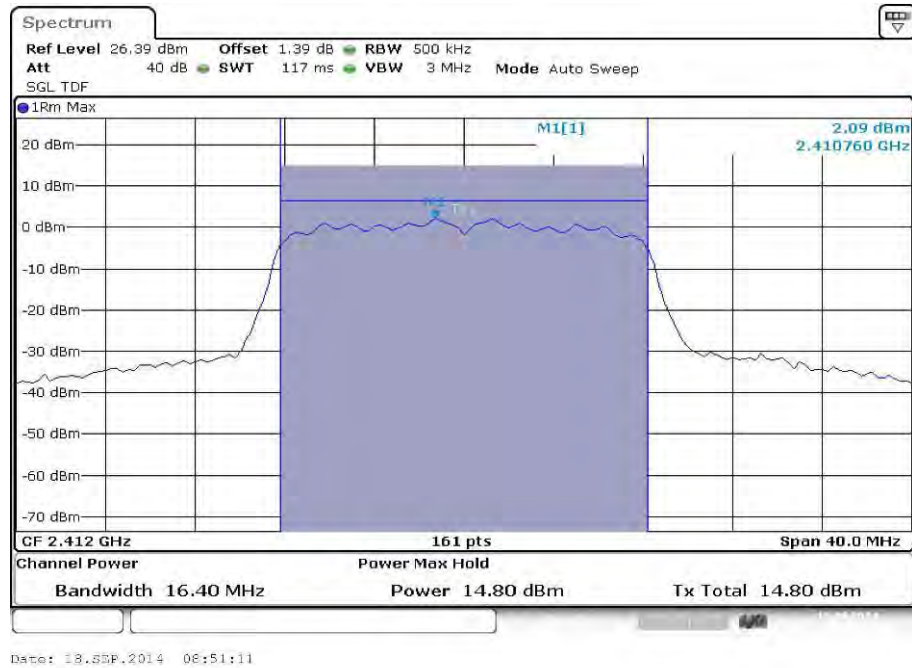
Plot 5: g-mode, CH 6



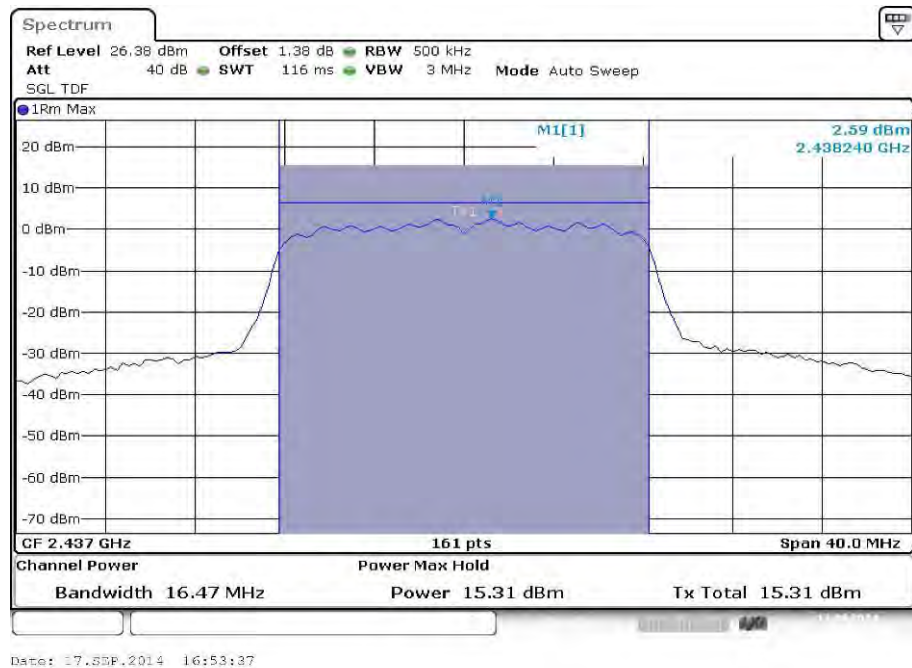
Plot 6: g-mode, CH 11

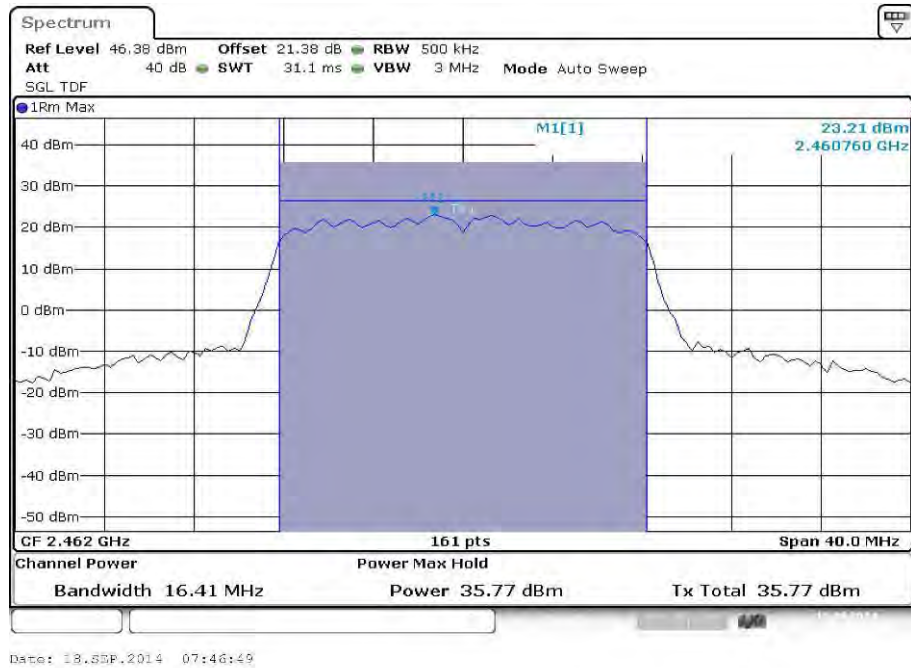


Plot 7: n-mode, CH 1



Plot 8: n-mode, CH 6



Plot 9: n-mode, CH 11

Wrong offset assumed in this plot. Real offset is 1.38dB. So result is 15.77dBm.

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. The duty cycle is measured before and the resulting correction factor is added to every measurement as offset value. You can see the offset values in the plots.

Measurement:

Measurement parameter	
According to DTS clause: 10.6	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	40 MHz
Trace-Mode:	Max hold – single sweep

Limits:

FCC	IC
Power Spectral Density	
8 dBm (conducted)	

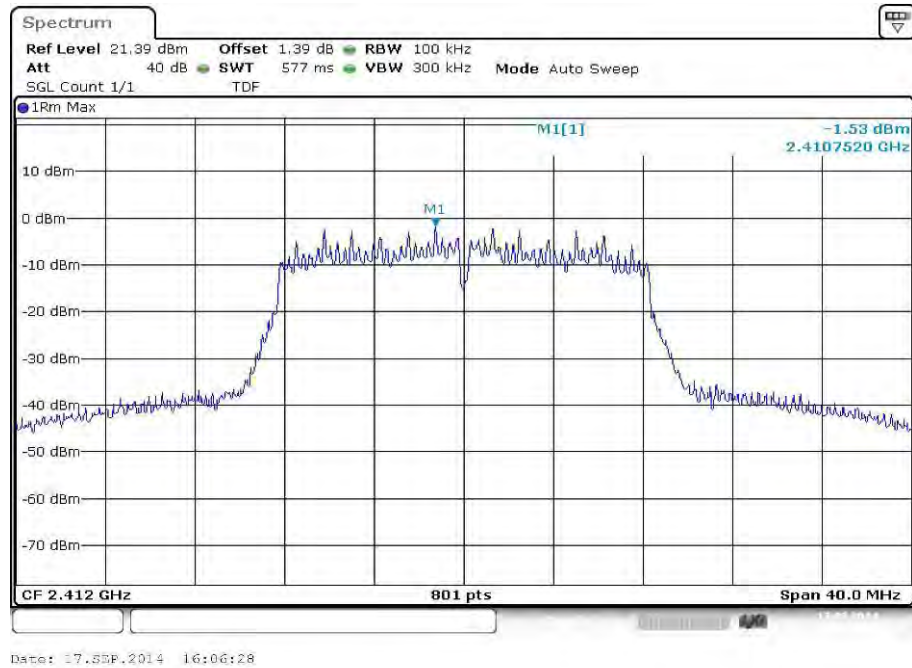
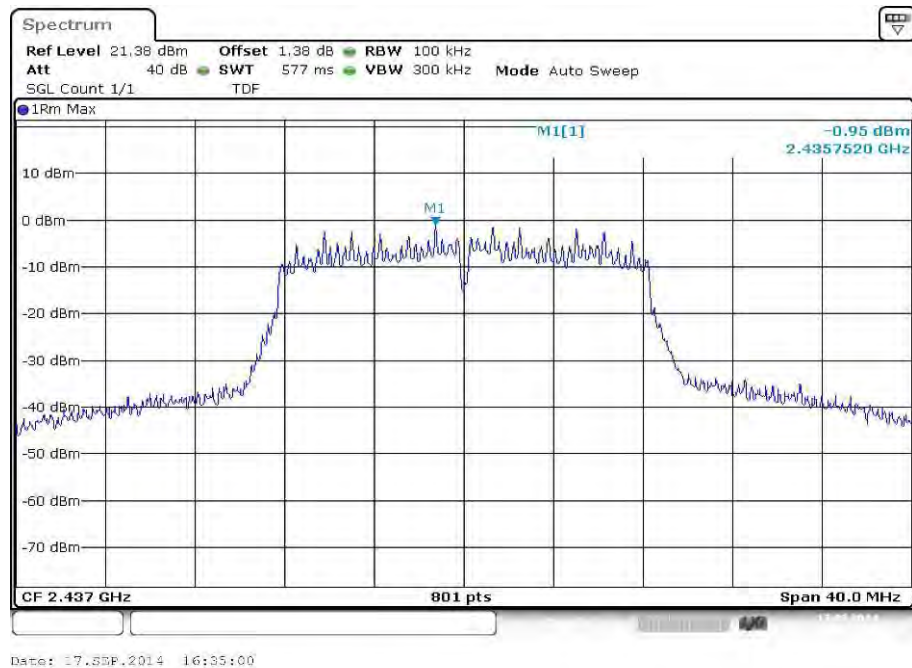
Results:

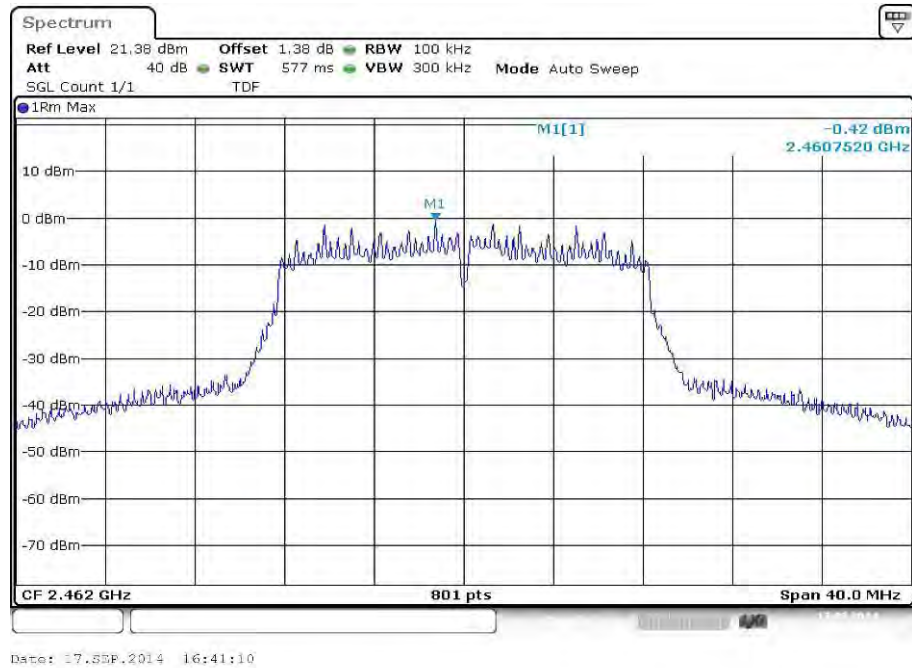
Modulation Frequency	Power Spectral density [dBm] incl. DC correction		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	0.04	0.58	0.87
OFDM / g – mode	-1.53	-0.95	-0.42
OFDM / n HT20 – mode	-1.30	-0.98	-0.73
Measurement uncertainty	± 1.5 dB (cond.)		

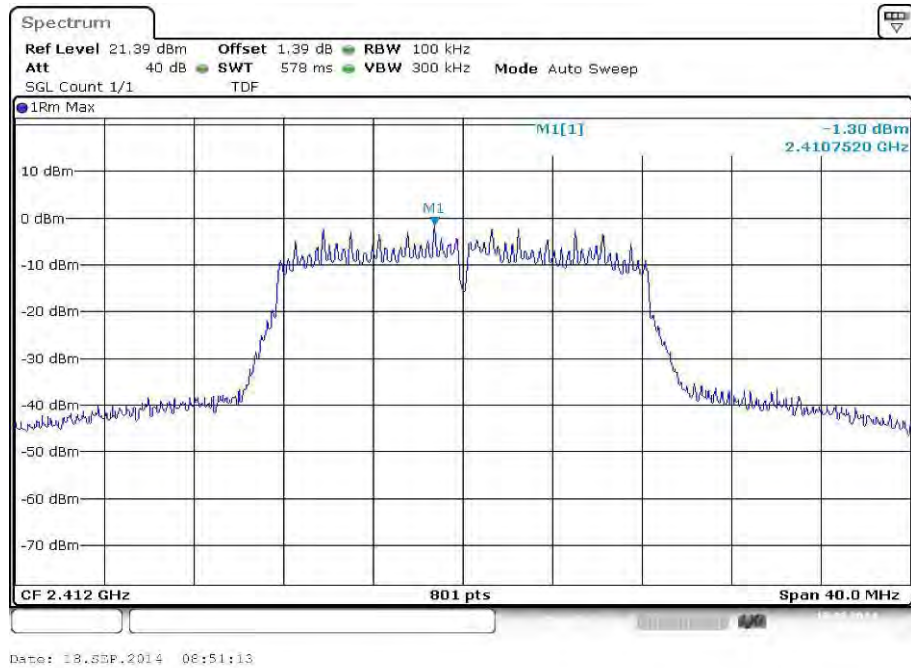
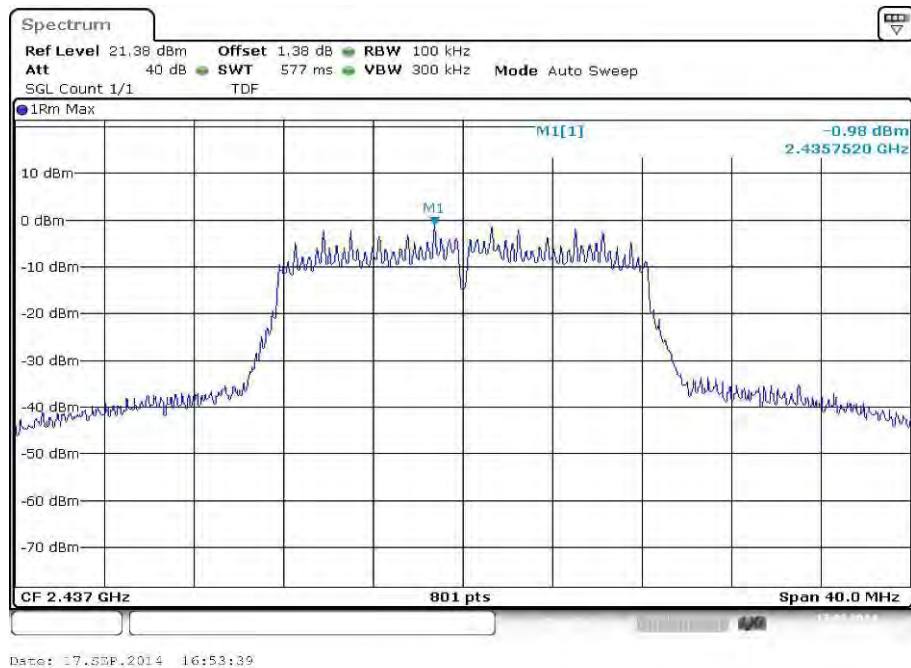
Result: **Passed**

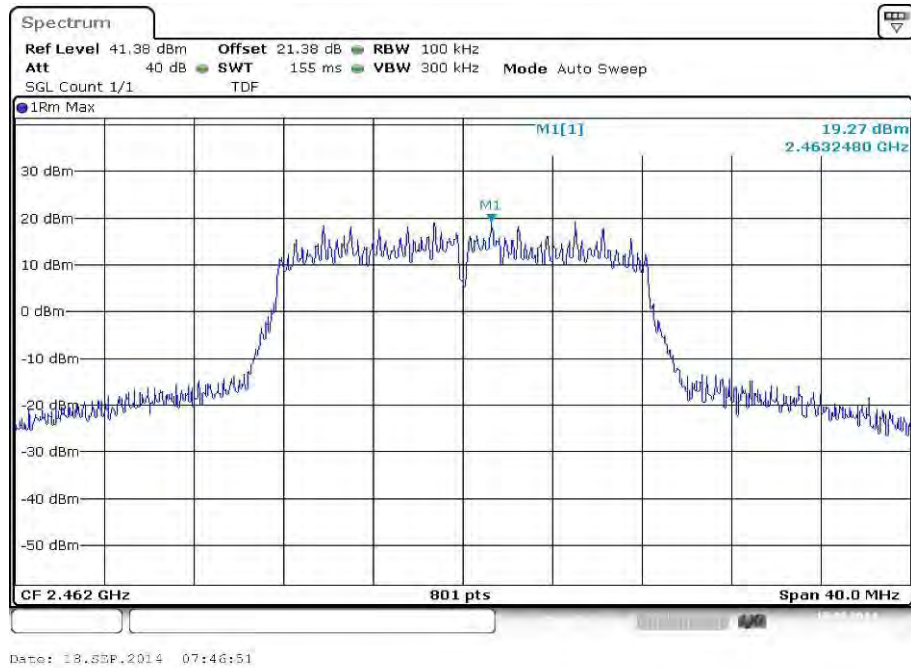
Plots: DSSS / b – mode**Plot 1: TX mode, lowest channel****Plot 2: TX mode, middle channel**

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

Wrong offset in this plot. Real offset 1.38 dB. PSD value -0.73 dBm

10.5 Spectrum 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:	Using two marker to measure 6 dB below the maximum fundamental emission.
Trace-Mode:	Max hold (allow trace to stabilize)

Limits:

FCC	IC
Spectrum 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 [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	8.07	8.09	8.06
OFDM / g – mode	15.1	15.1	15.1
OFDM / n HT20 – mode	16.1	15.1	15.1
Measurement uncertainty	± RBW		

Result: Passed

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:	100 kHz
Video bandwidth:	3 kHz
Span:	40 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

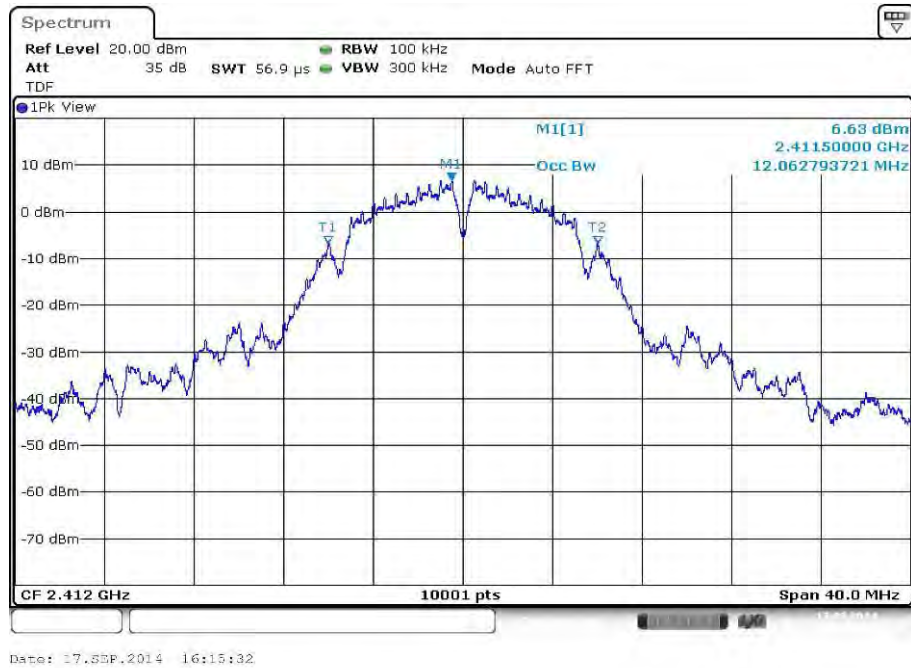
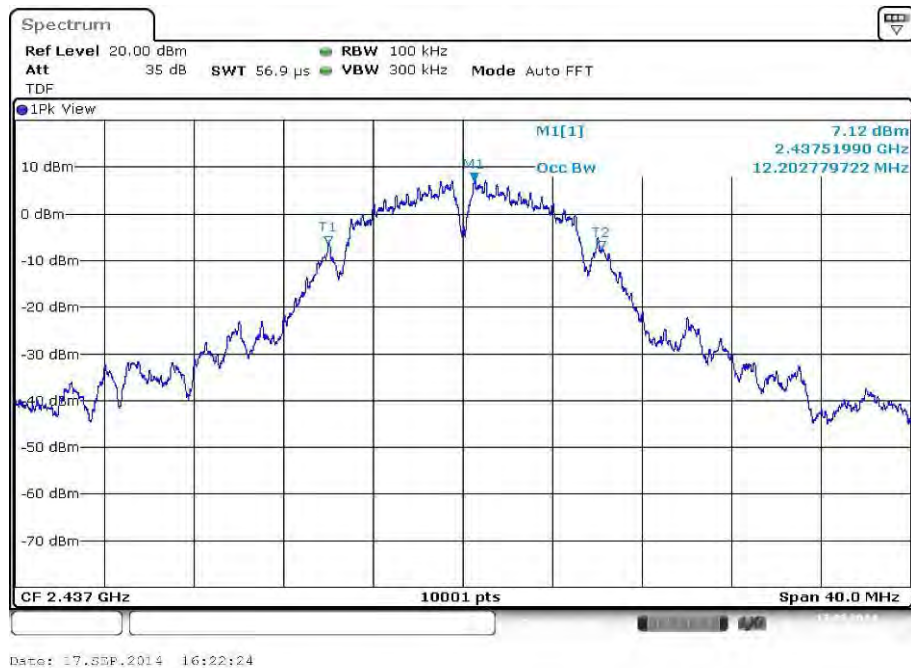
Usage:

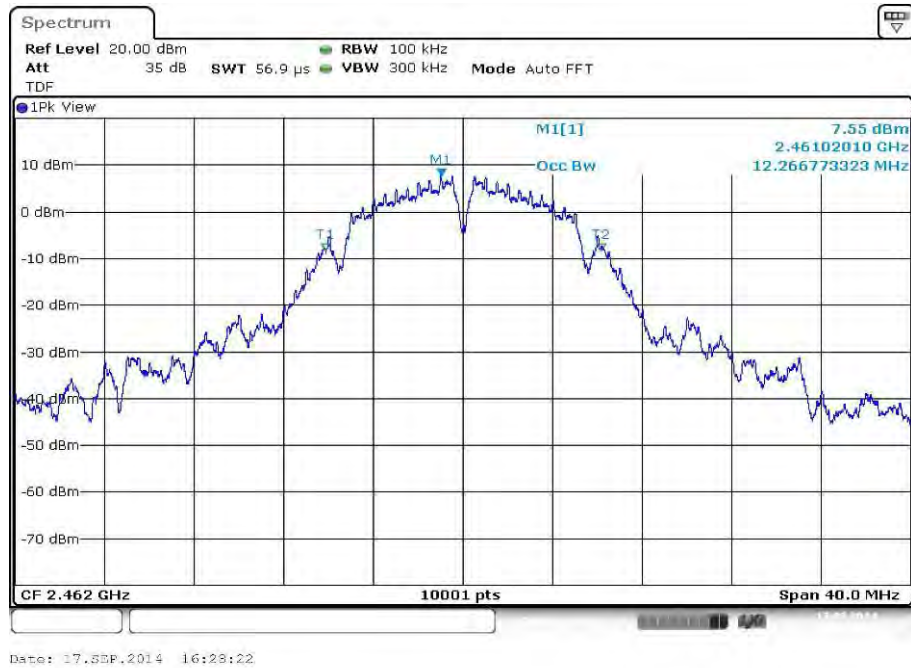
-/-	IC
Occupied Bandwidth – 99% emission bandwidth	
OBW is necessary for Emission Designator	

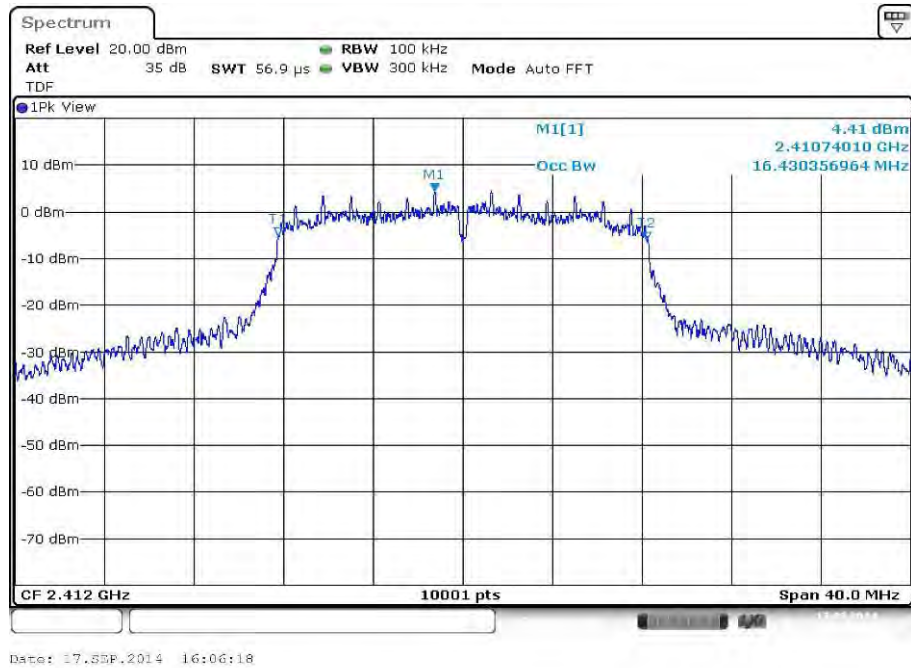
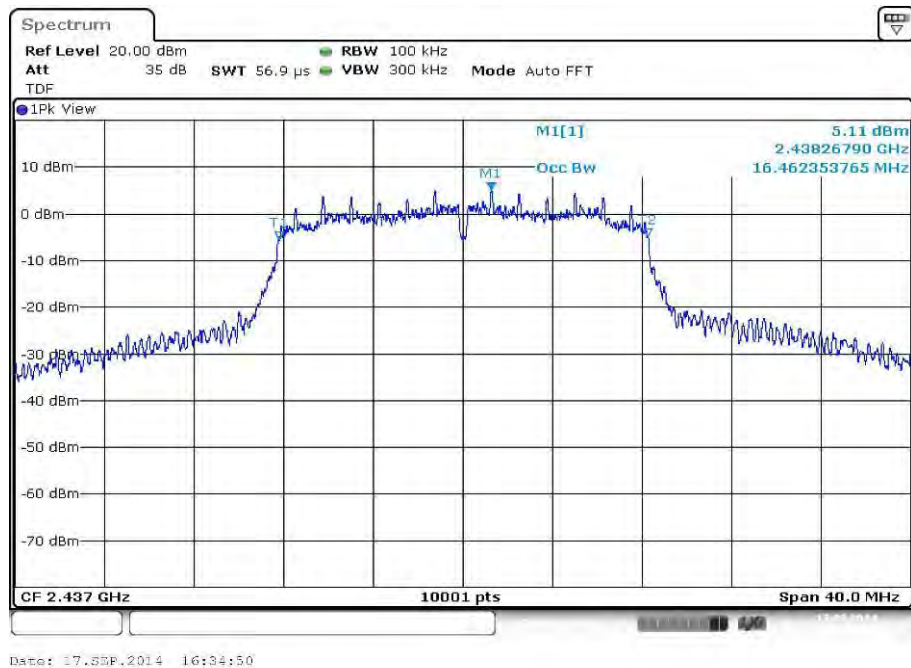
Results:

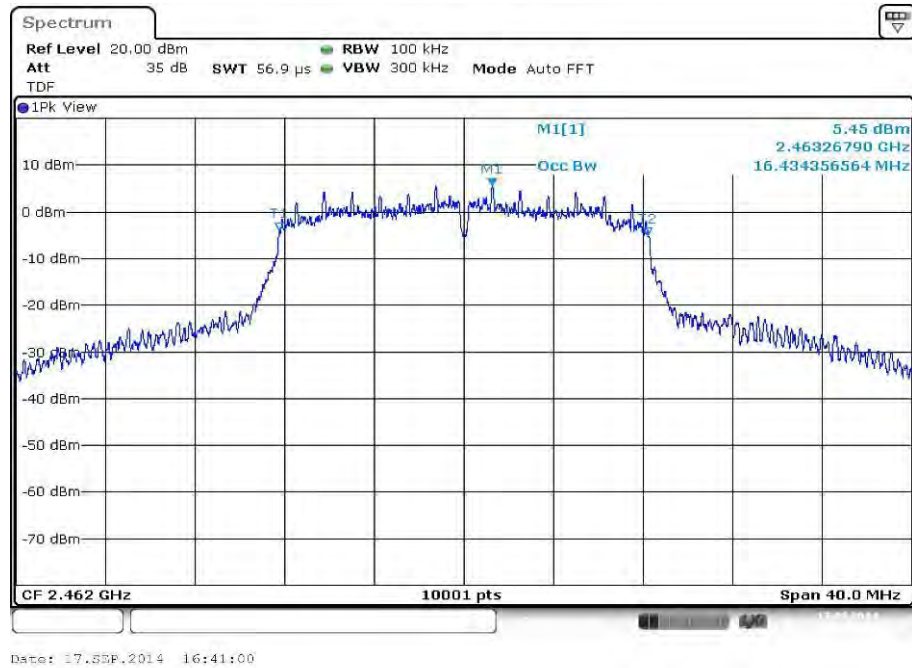
Modulation Frequency	99% bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	12.06	12.20	12.27
OFDM / g – mode	16.43	16.46	16.43
OFDM / n HT20 – mode	16.40	16.47	16.41
Measurement uncertainty	± RBW		

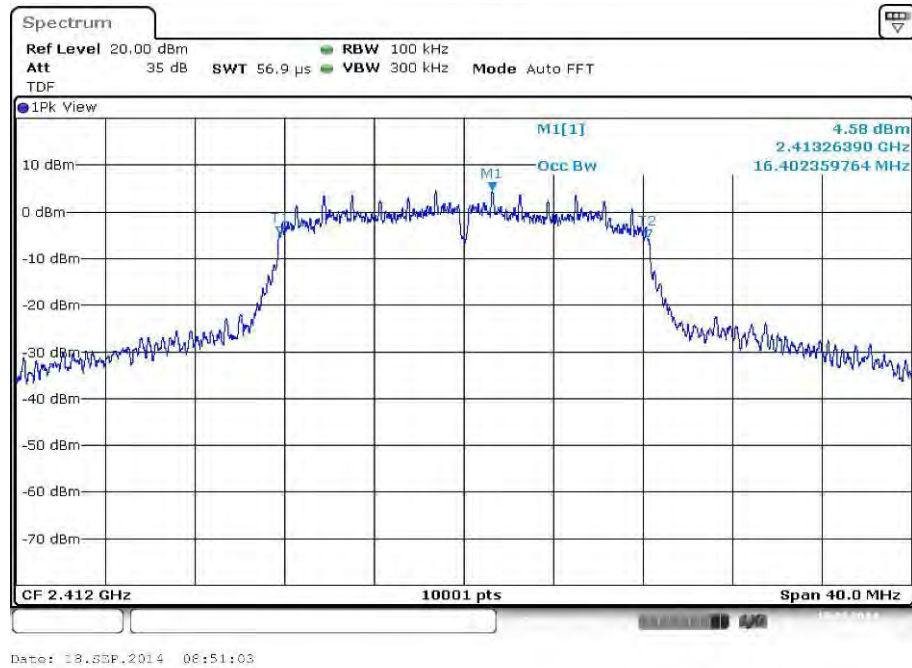
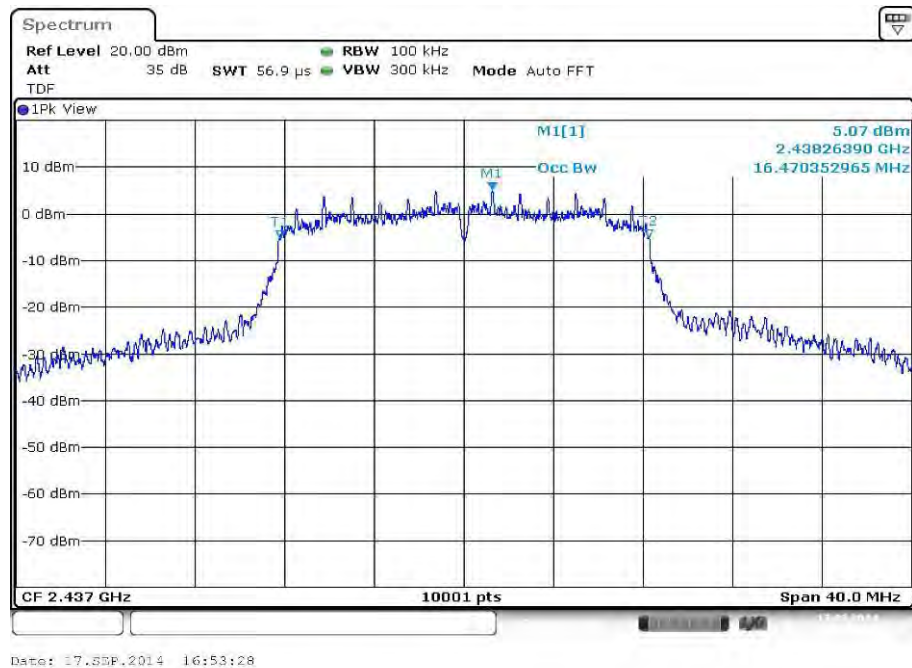
Result: **Passed**

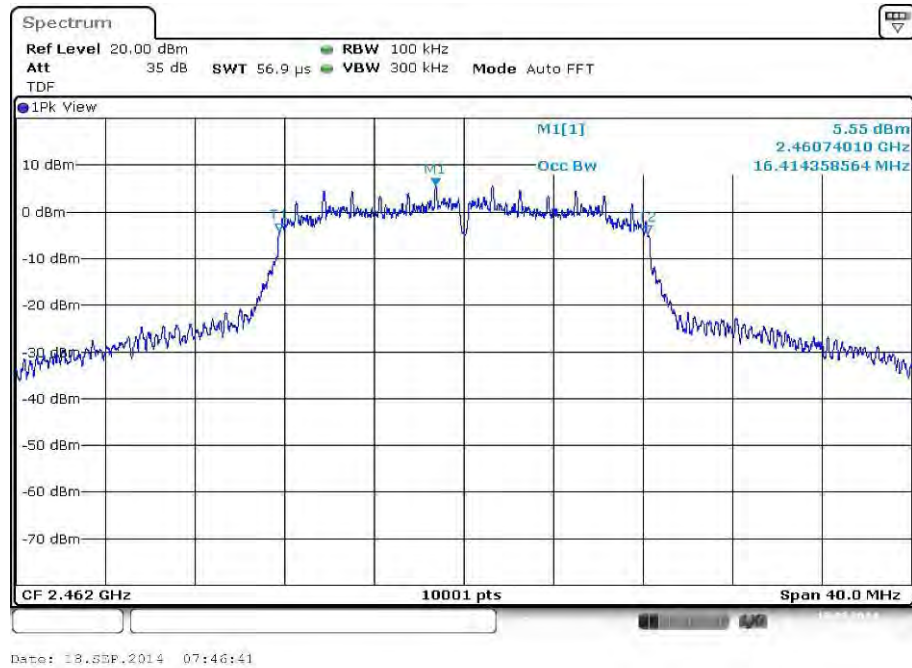
Plots: DSSS / b – mode**Plot 1: TX mode, lowest channel****Plot 2: TX mode, middle channel**

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

10.7 Detailed spurious emissions @ the band edges - conducted

Description:

Measurement of the spurious @ the band edges. EUT is measured at the lower and upper band edge in all three modes. The full spurious emissions conducted can be found in a separate chapter.

Measurement:

Measurement parameter	
Detector:	RMS
Sweep time:	5s
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

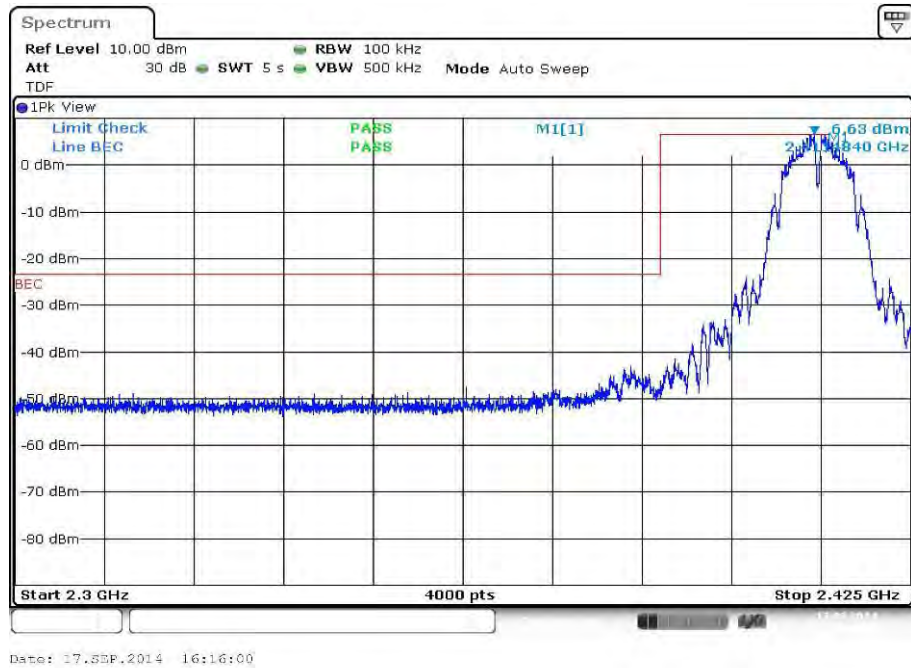
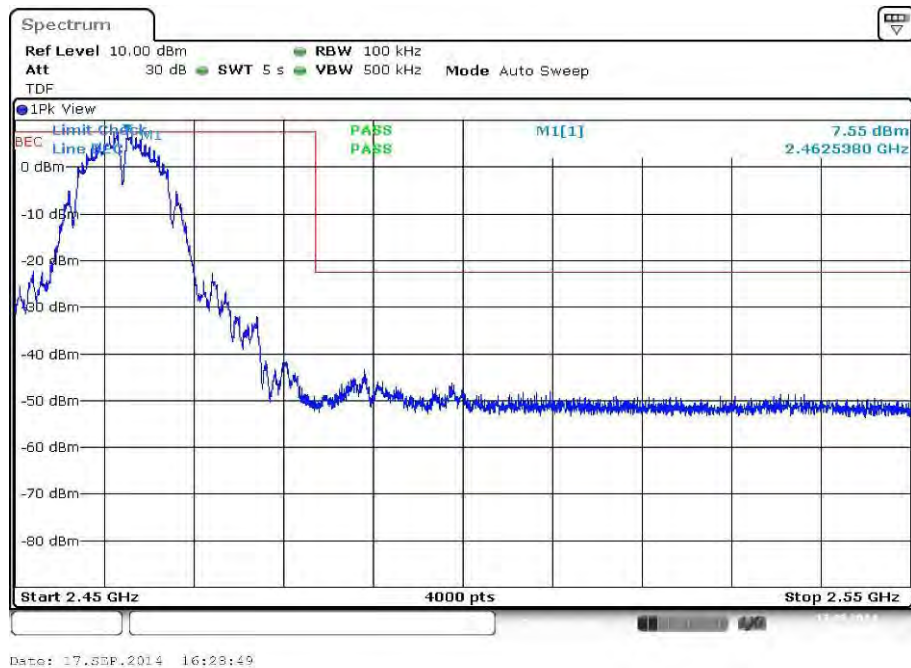
Limits:

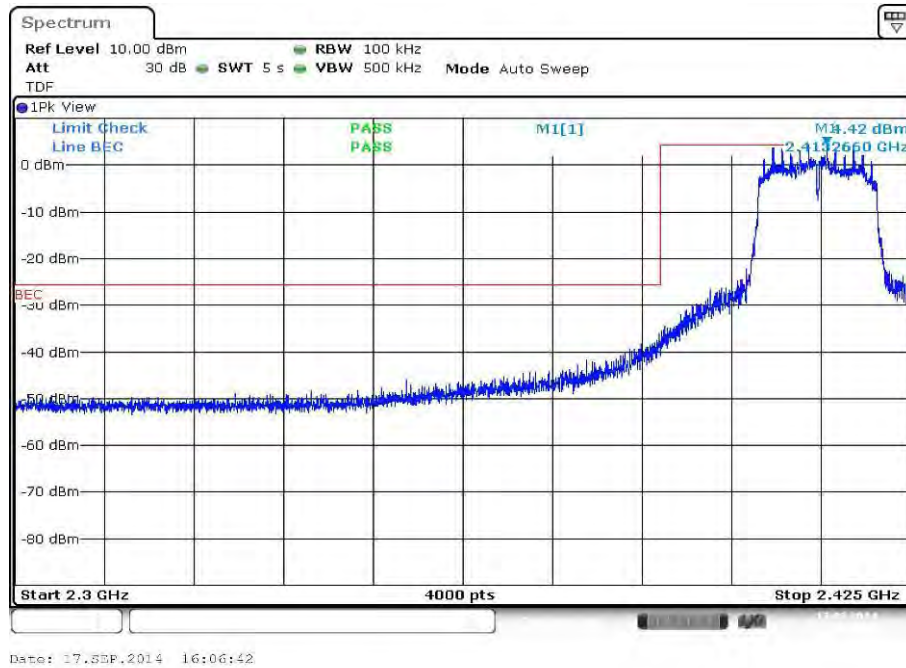
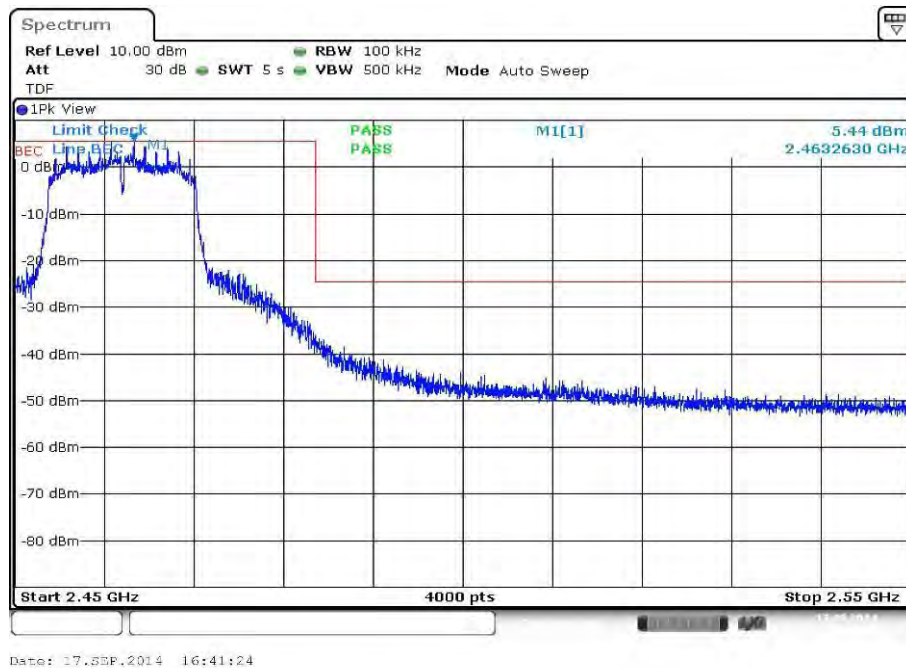
FCC	IC
Conducted spurious emissions	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest avg. 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.	

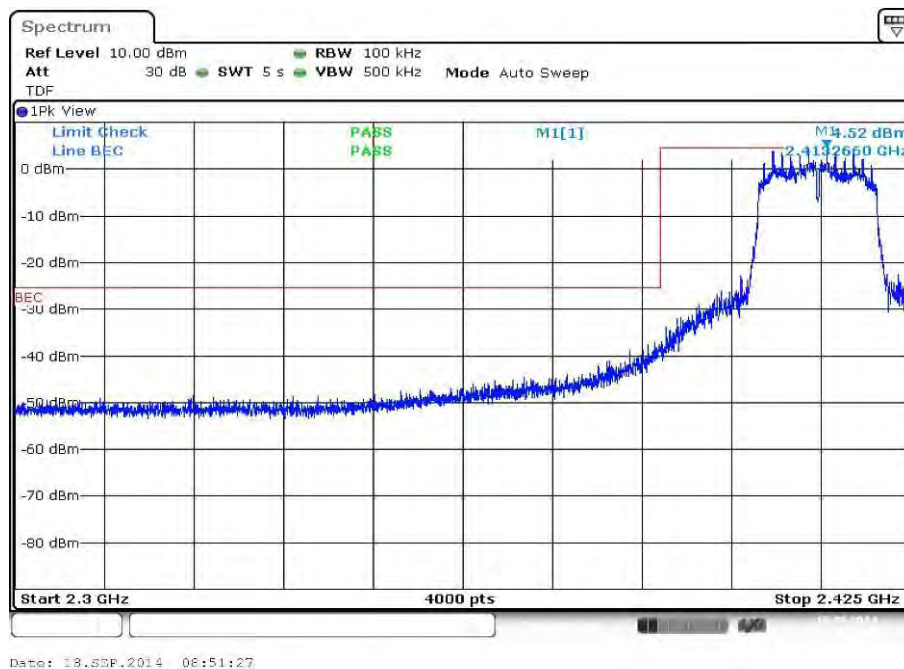
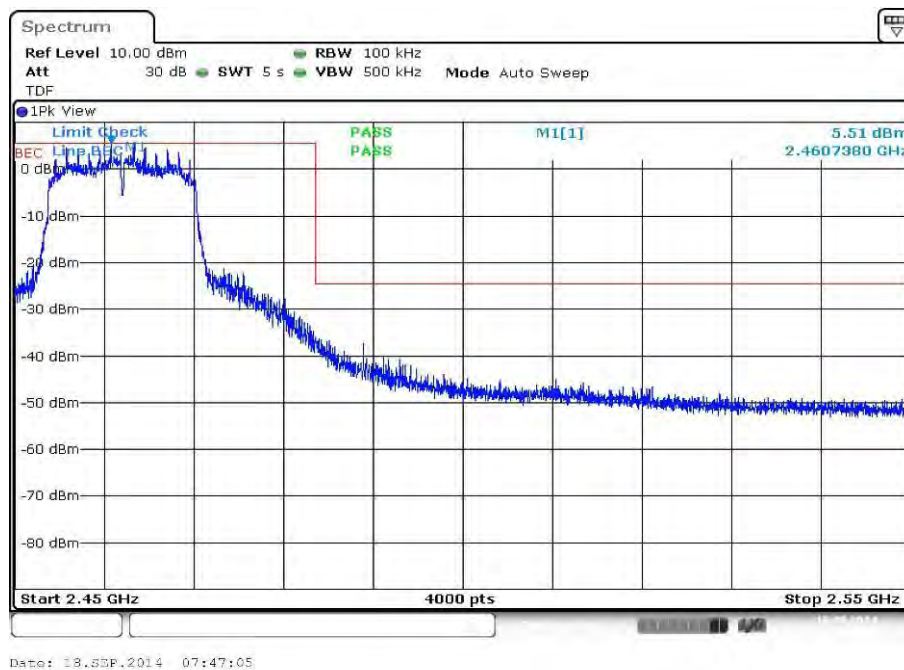
Results:

Scenario Modulation	Band Edge Compliance Conducted [dB]		
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode
Lower Band Edge – Channel 1	> 30 dB	> 30 dB	> 30 dB
Upper Band Edge – Channel 11	> 30 dB	> 30 dB	> 30 dB
Measurement uncertainty	± 1.5 dB		

Result: **Passed**

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 value	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	See plot!
Trace-Mode:	Max Hold

Measurement parameter for AVG value	
According to DTS clause: 13.3.2	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	See plot!
Trace-Mode:	Max Hold

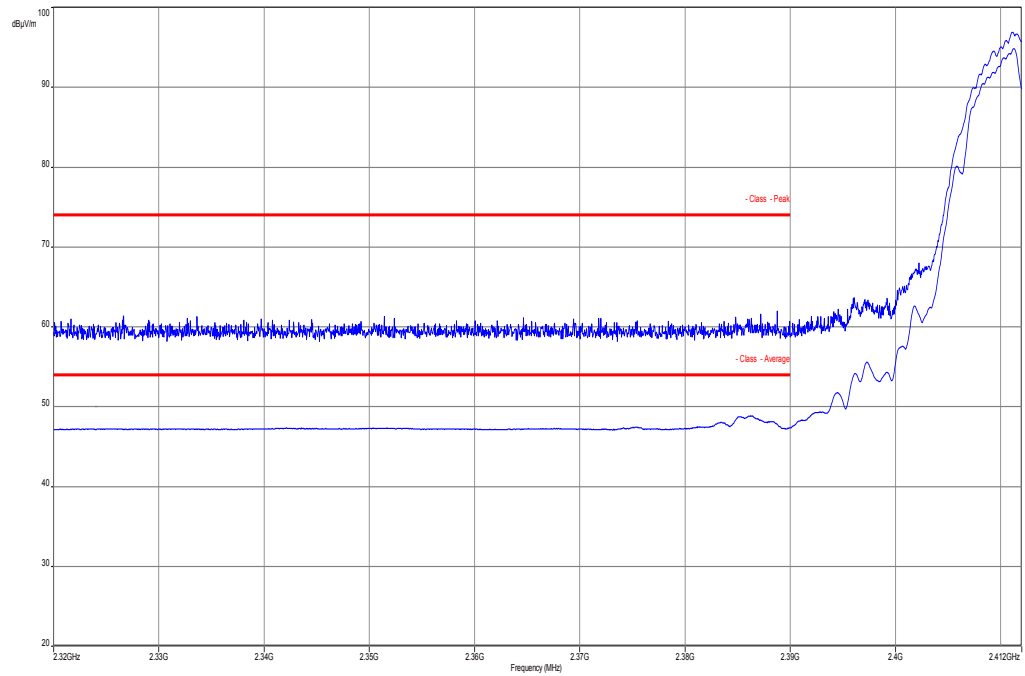
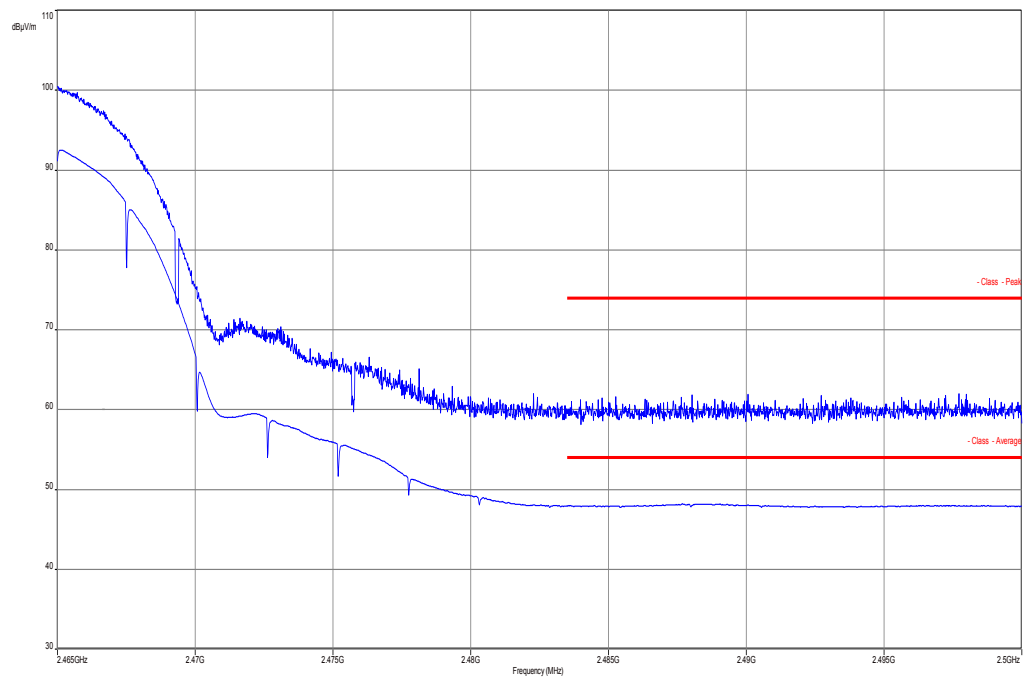
Limits:

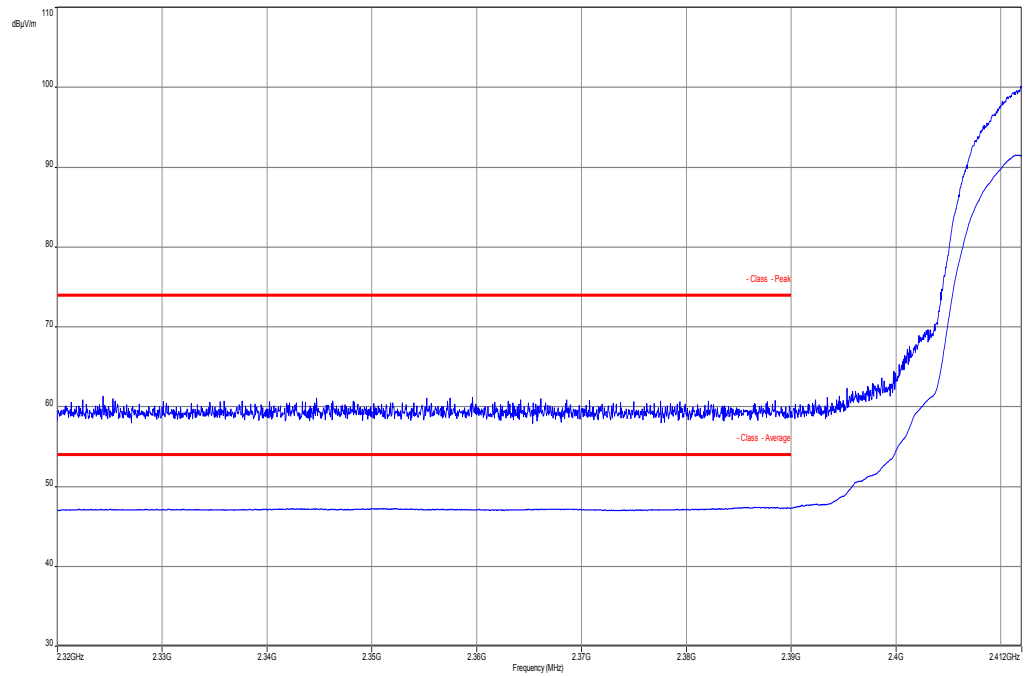
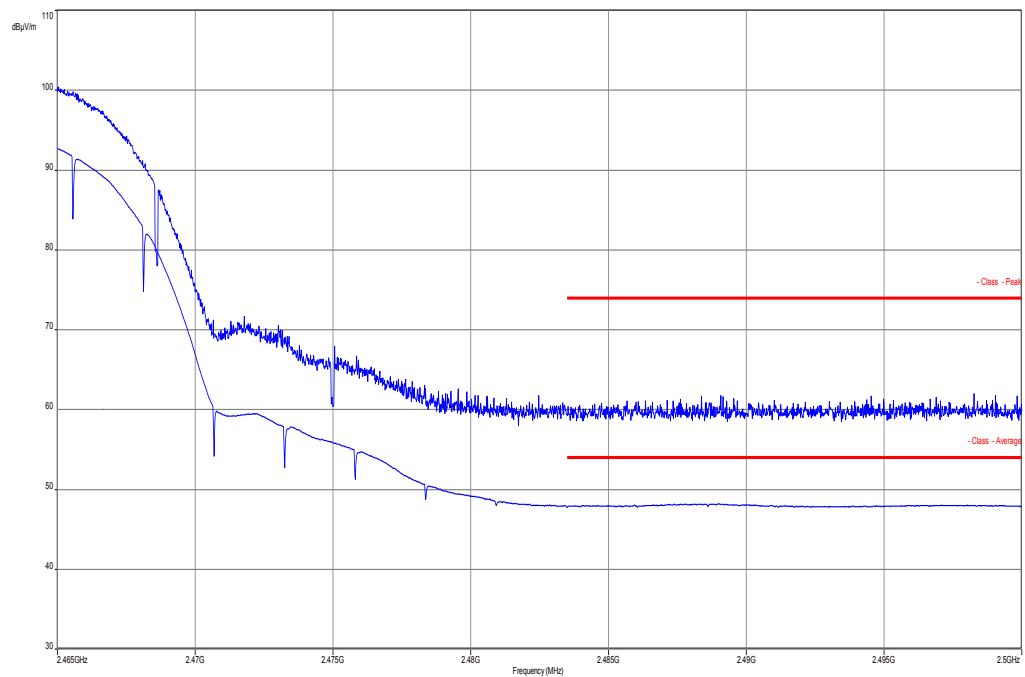
FCC	IC
Band Edge Compliance Radiated	
74 dB μ V/m Peak	
54 dB μ V/m AVG	

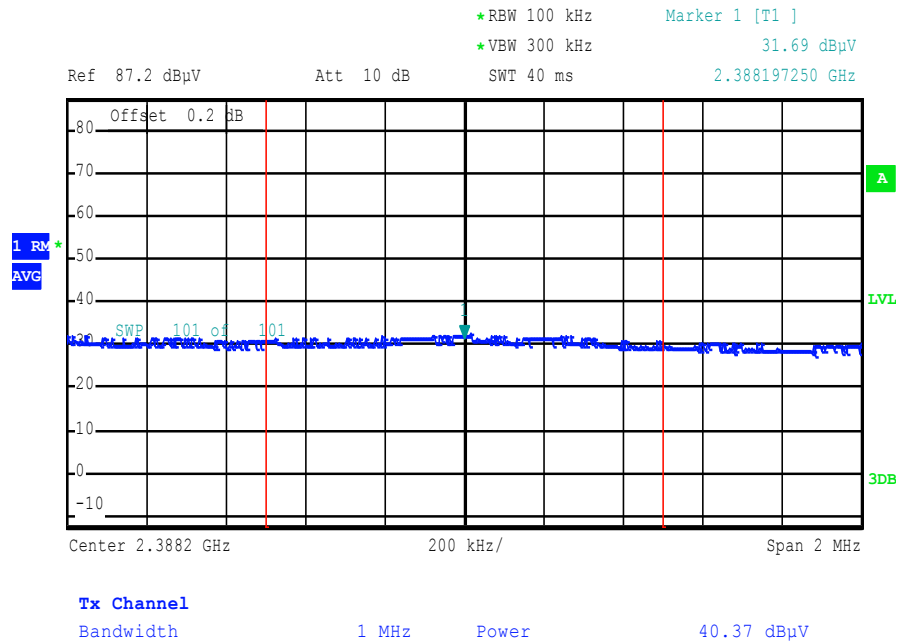
Results:

Scenario Modulation	Band Edge Compliance radiated [dB μ V/m @ 3m]		
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode
Lower Band Edge – Channel 1	62.0 (Peak) 40.4 (AVG)	61.5 (Peak) 40.8 (AVG)	61.4 (Peak) 40.7 (AVG)
Upper Band Edge – Channel 11	61.8 (Peak) 38.8 (AVG)	64.1 (Peak) 45.8 (AVG)	64.6 (Peak) 45.4 (AVG)
Measurement uncertainty	± 3 dB		

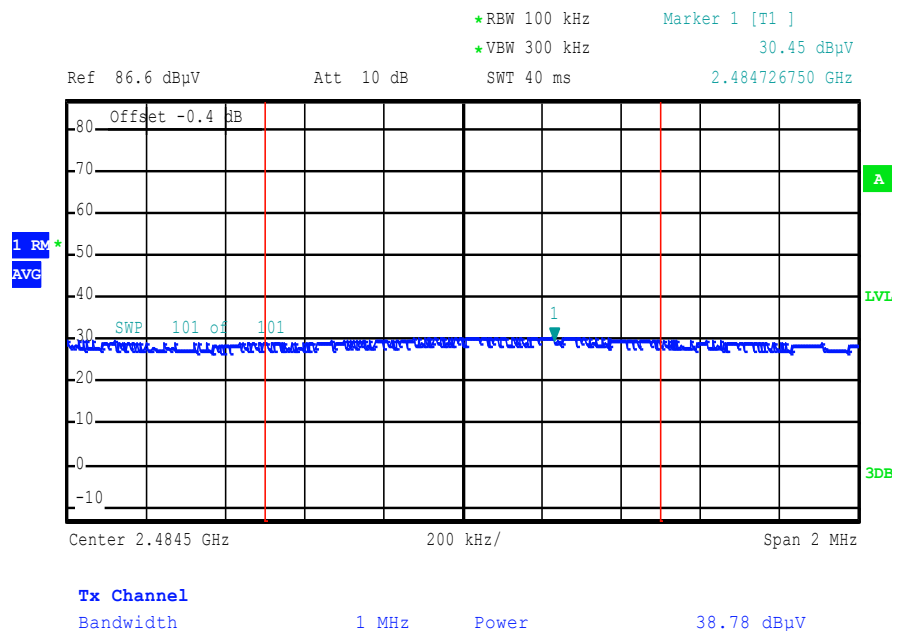
Result: Passed

Plots: DSSS/ b – mode peak + prescan for average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization, low data rate****Plot 2: TX mode, upper band edge, vertical & horizontal polarization, low data rate**

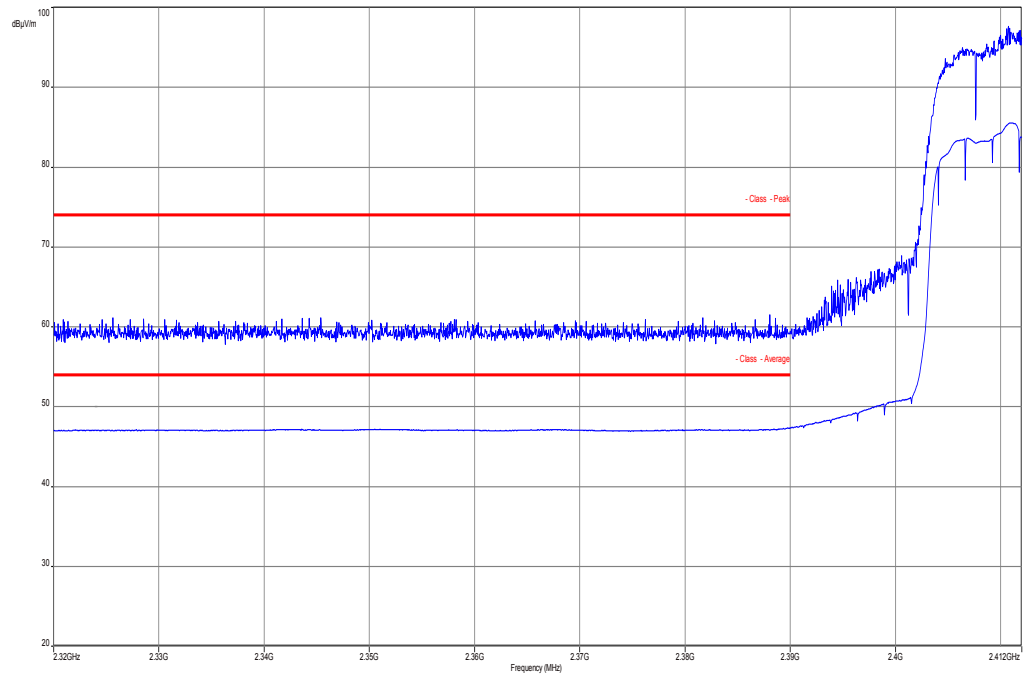
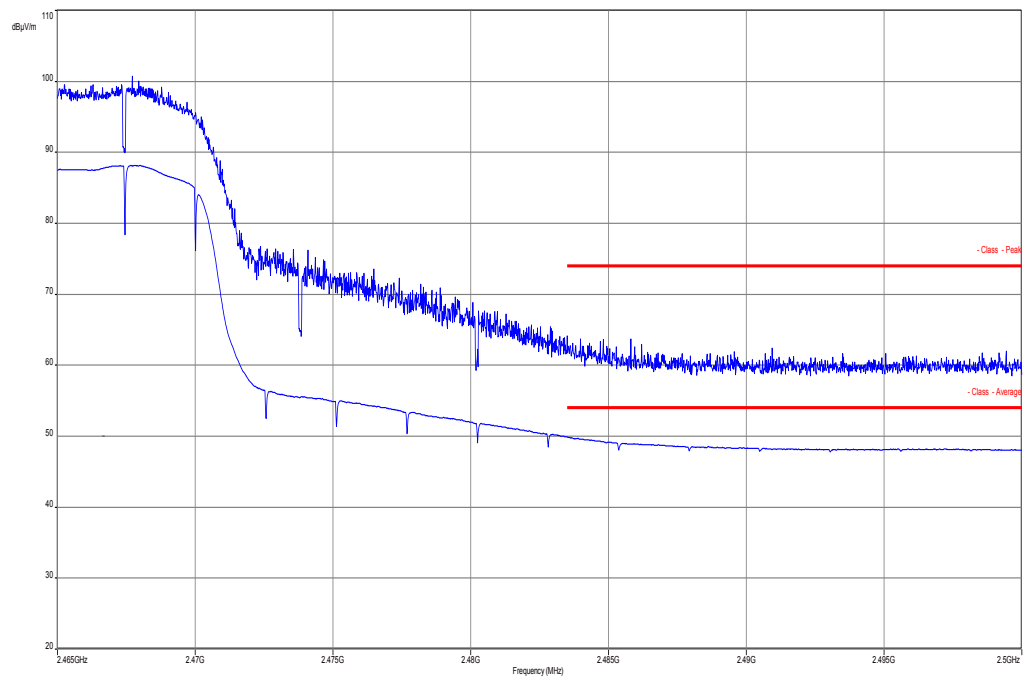
Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

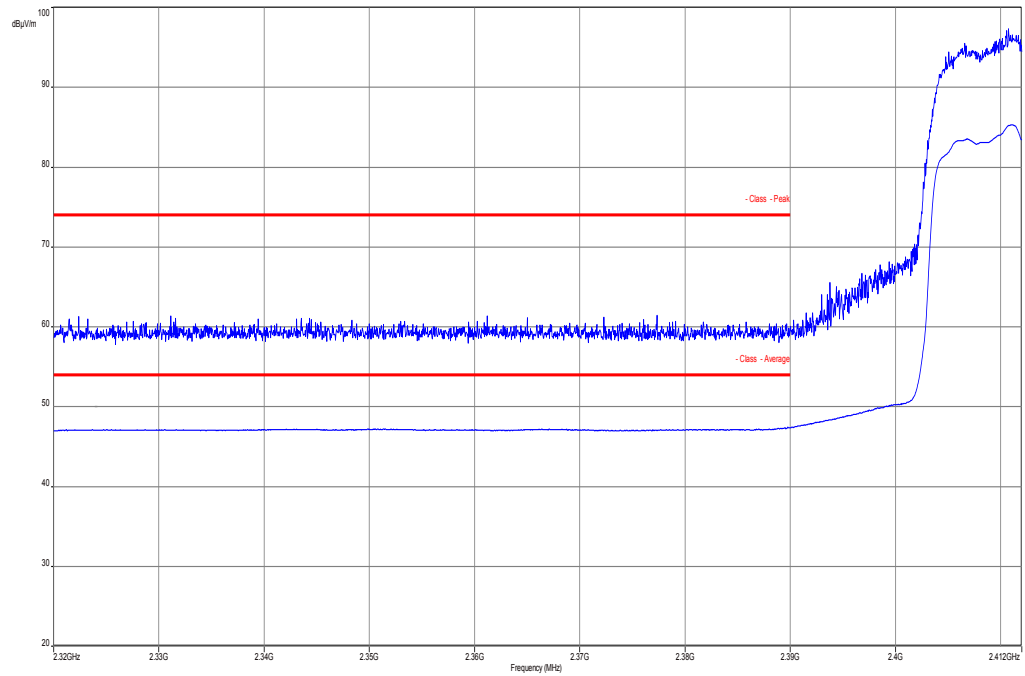
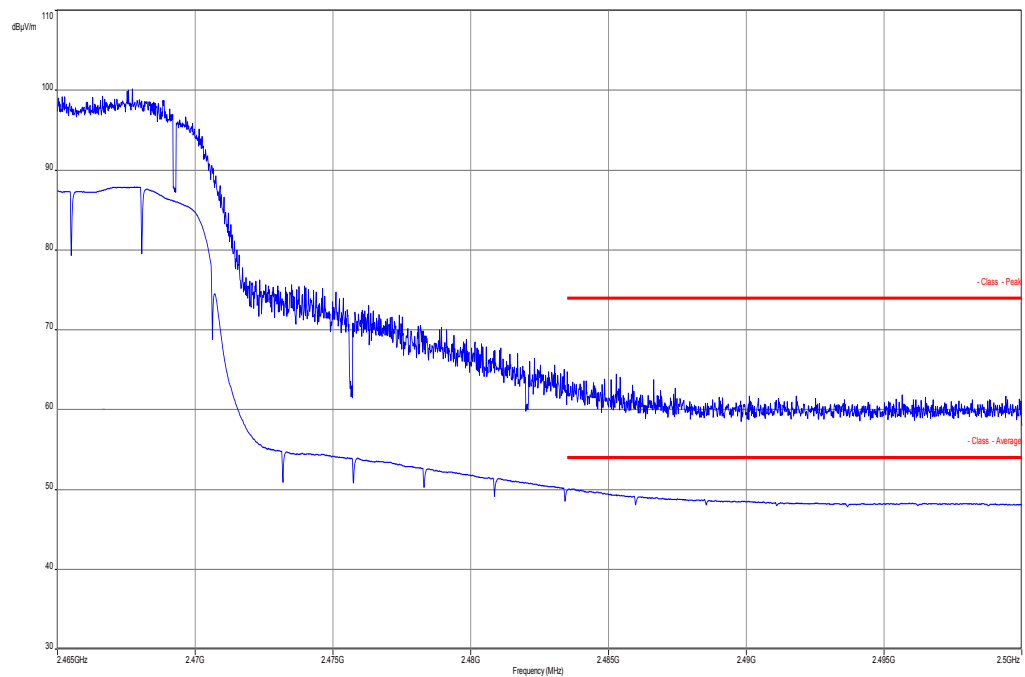
Plots: DSSS/ b – mode average**Plot 1: TX mode, lower band edge, worst case position and datarate**

Value including DC correction, antenna factor, gain and cable loss.

Plot 2: TX mode, upper band edge, worst case position and datarate

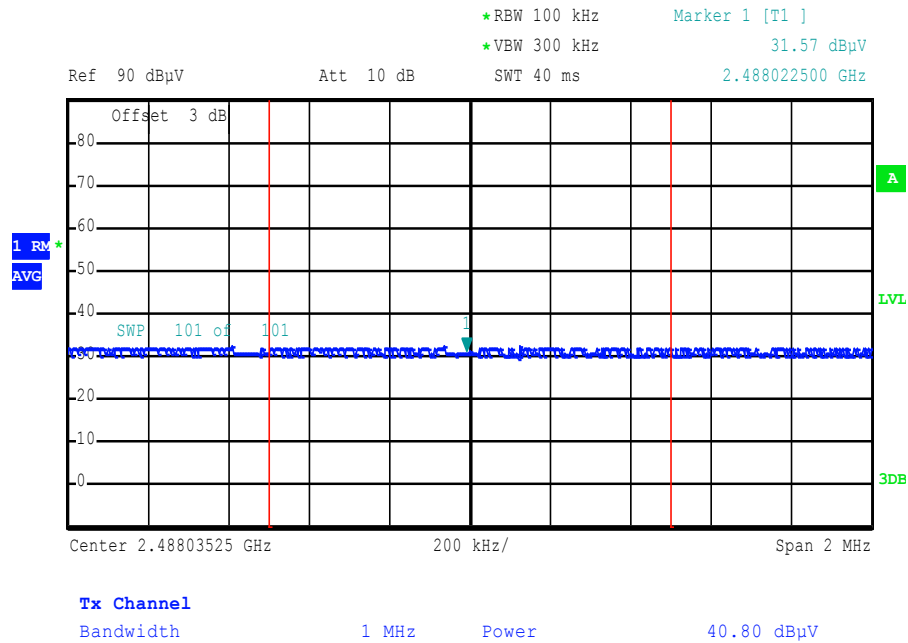
Value including DC correction, antenna factor, gain and cable loss.

Plots: OFDM / g – mode peak + prescan for average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization, low data rate****Plot 2: TX mode, upper band edge, vertical & horizontal polarization, low data rate**

Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

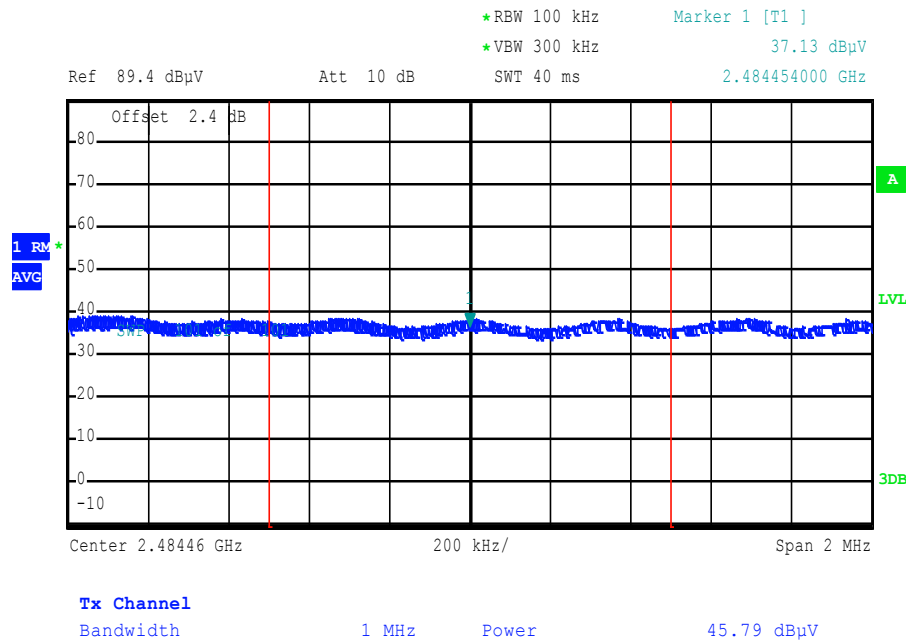
Plots: DSSS/ g – mode average

Plot 1: TX mode, lower band edge, worst case position and datarate

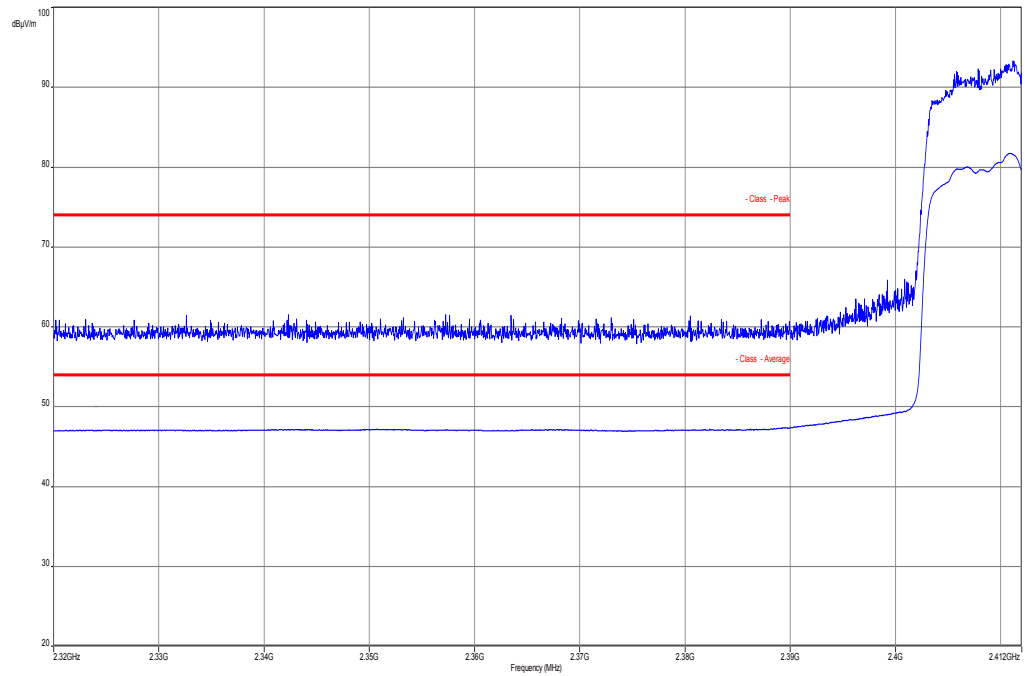
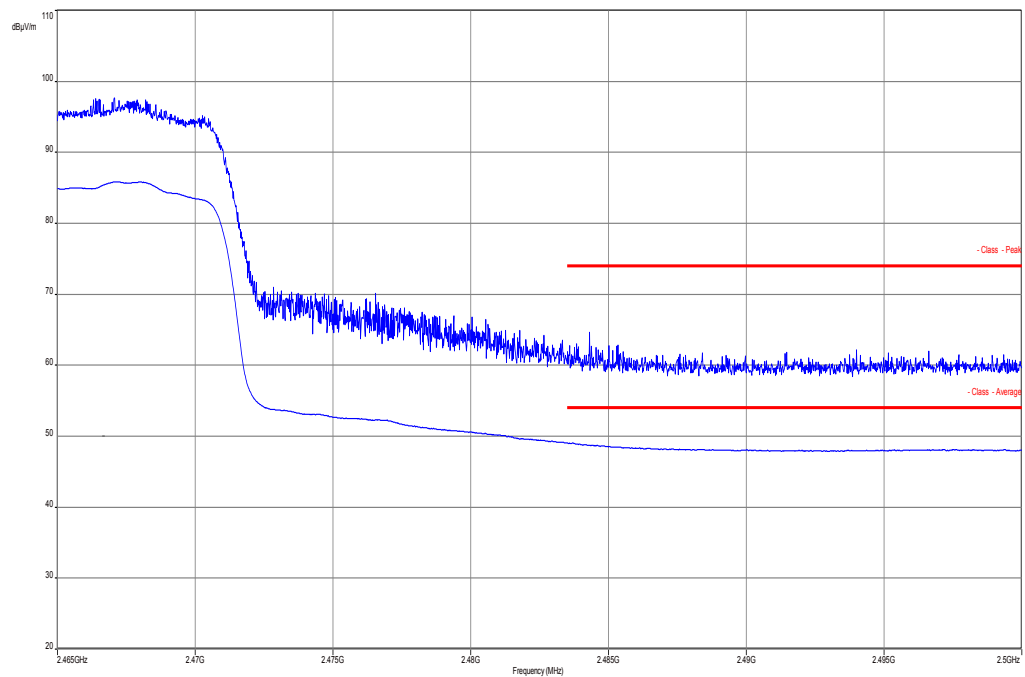


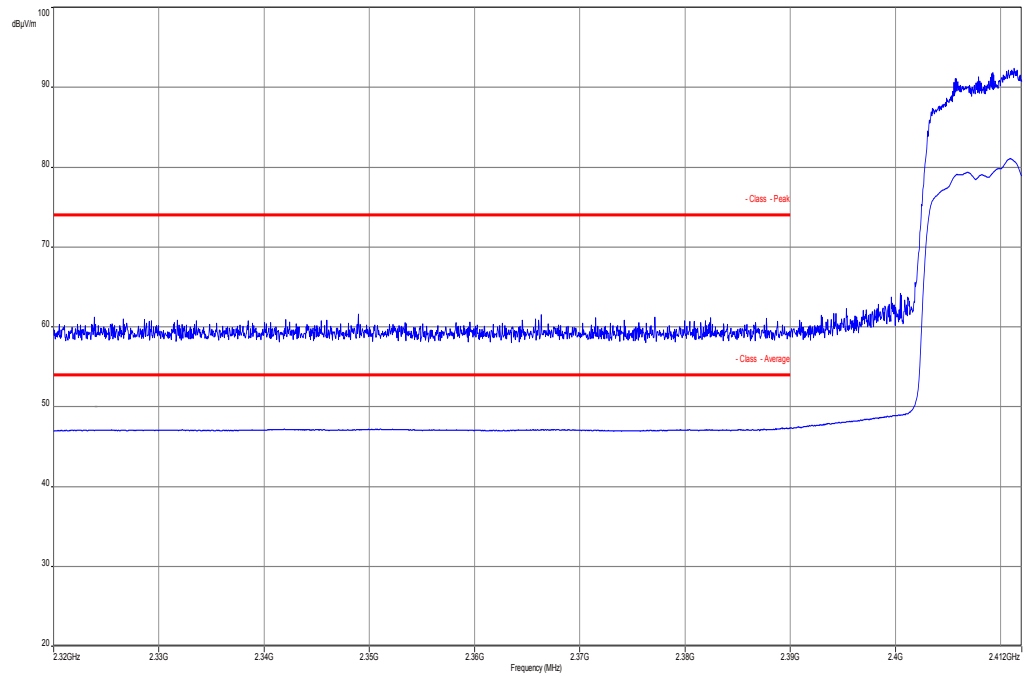
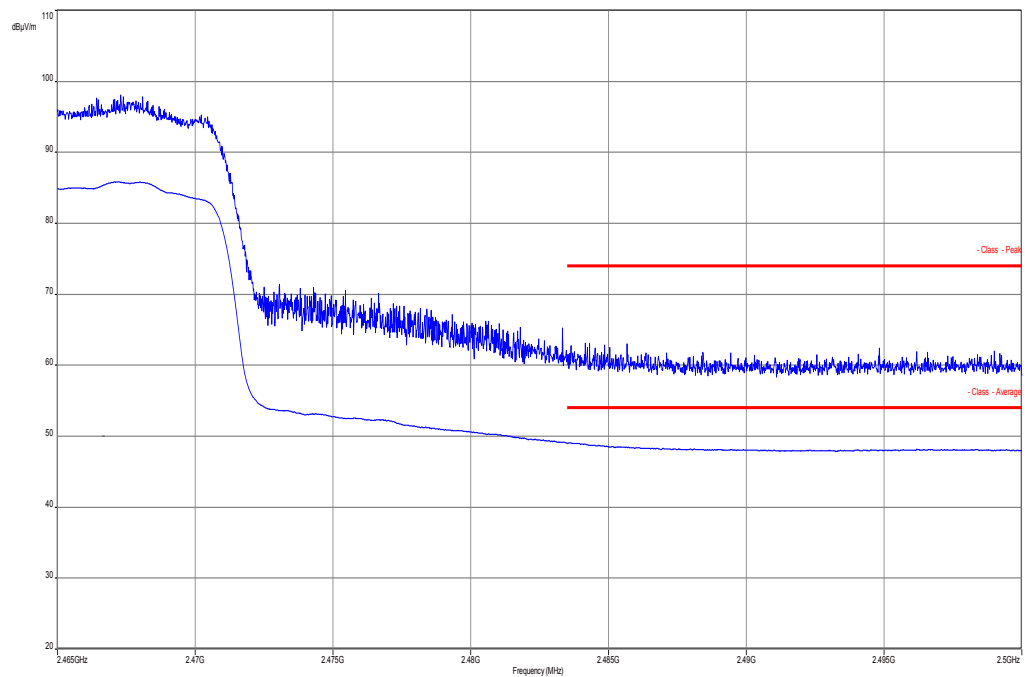
Value including DC correction, antenna factor, gain and cable loss.

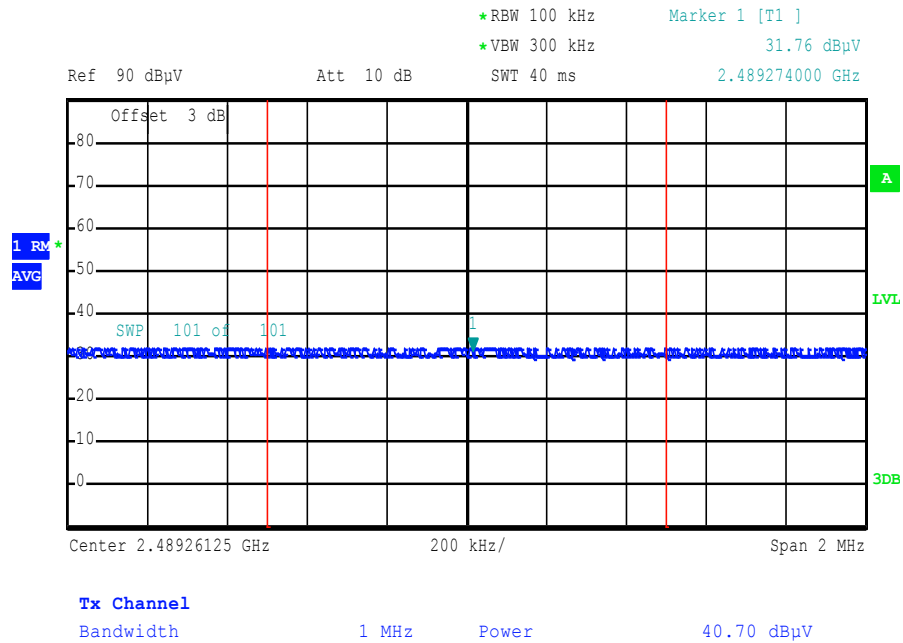
Plot 2: TX mode, upper band edge, worst case position and datarate



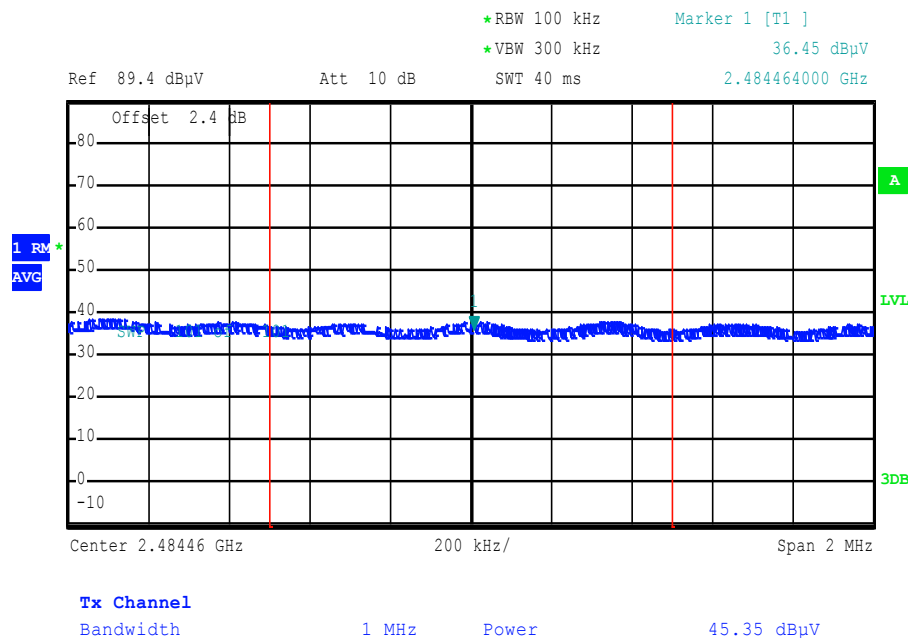
Value including DC correction, antenna factor, gain and cable loss.

Plots: OFDM / n HT20 – mode peak + prescan for average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization, low data rate****Plot 2: TX mode, upper band edge, vertical & horizontal polarization, low data rate**

Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

Plots: DSSS/ n – mode average**Plot 1: TX mode, lower band edge, worst case position and datarate**

Value including DC correction, antenna factor, gain and cable loss.

Plot 2: TX mode, upper band edge, worst case position and datarate

Value including DC correction, antenna factor, gain and cable loss.

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. Attenuation below the general limits specified in Section 15.209(a) is not required	

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]	results
2412		9.06	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2437		9.19	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2462		9.47	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
Measurement uncertainty		± 3 dB			

Result: Passed**Results: OFDM / g – mode**

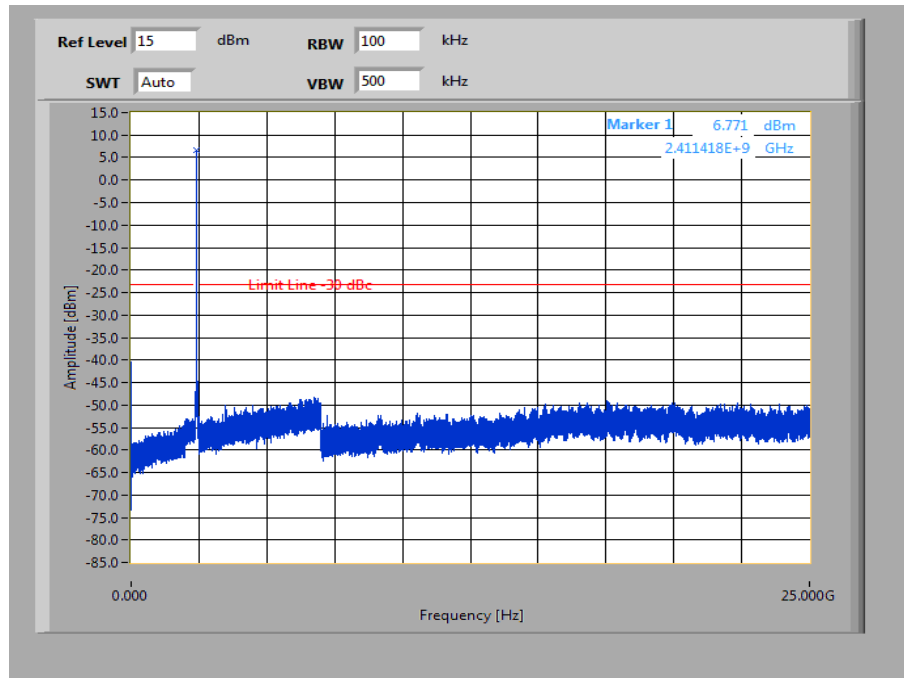
TX Spurious Emissions Conducted					
OFDM / g – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		4.01	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2437		3.92	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2462		5.67	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
Measurement uncertainty		± 3 dB			

Result: Passed

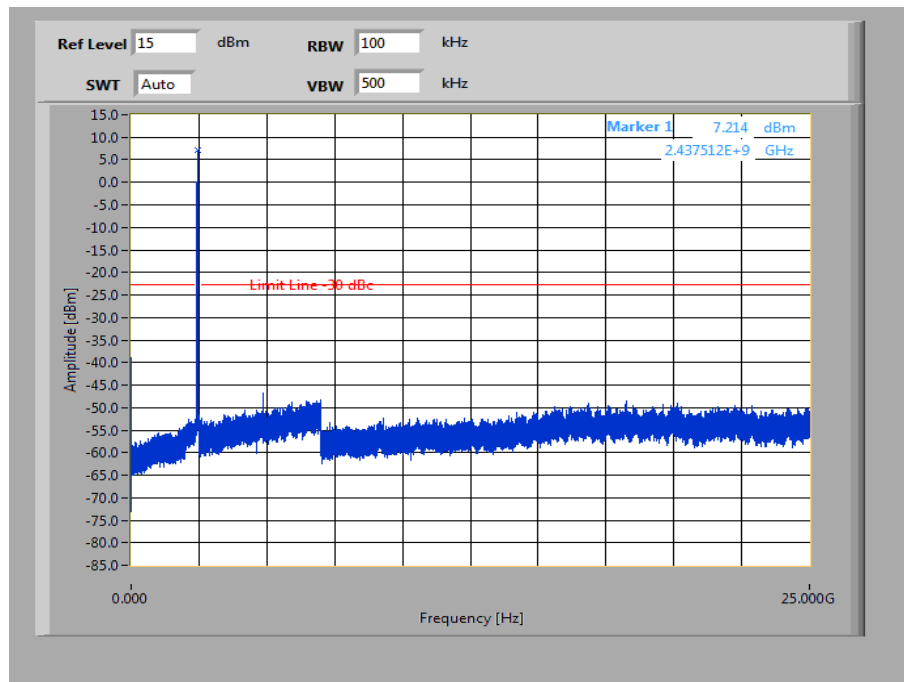
Results: OFDM / n HT20 – mode

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		4.62	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2437		5.31	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2462		5.76	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -30 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
Measurement uncertainty		± 3 dB			

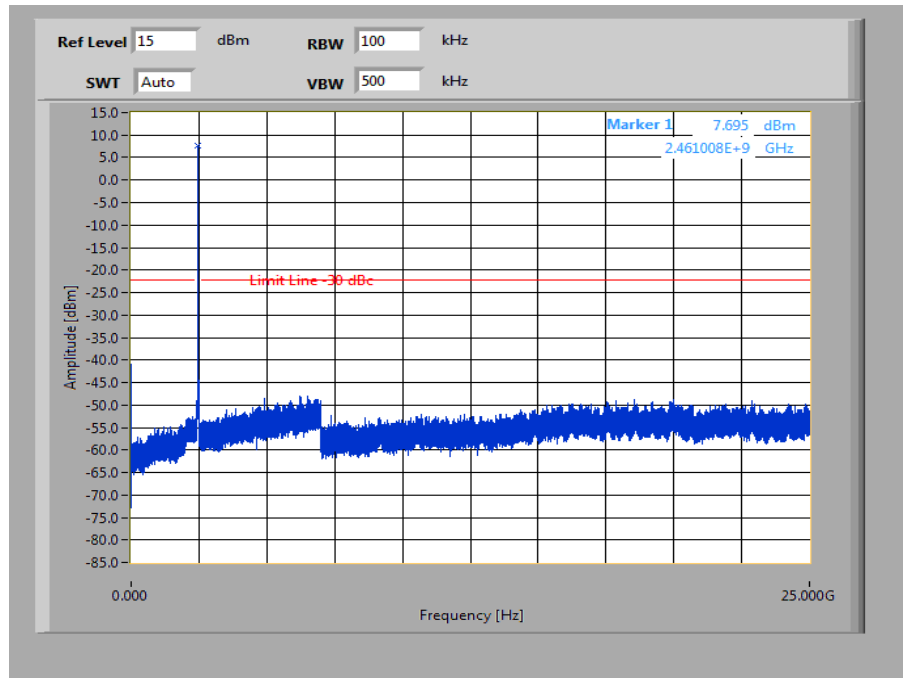
Result: Passed

Plots: DSSS / b – mode**Plot 1: TX mode, lowest channel, up to 25 GHz**

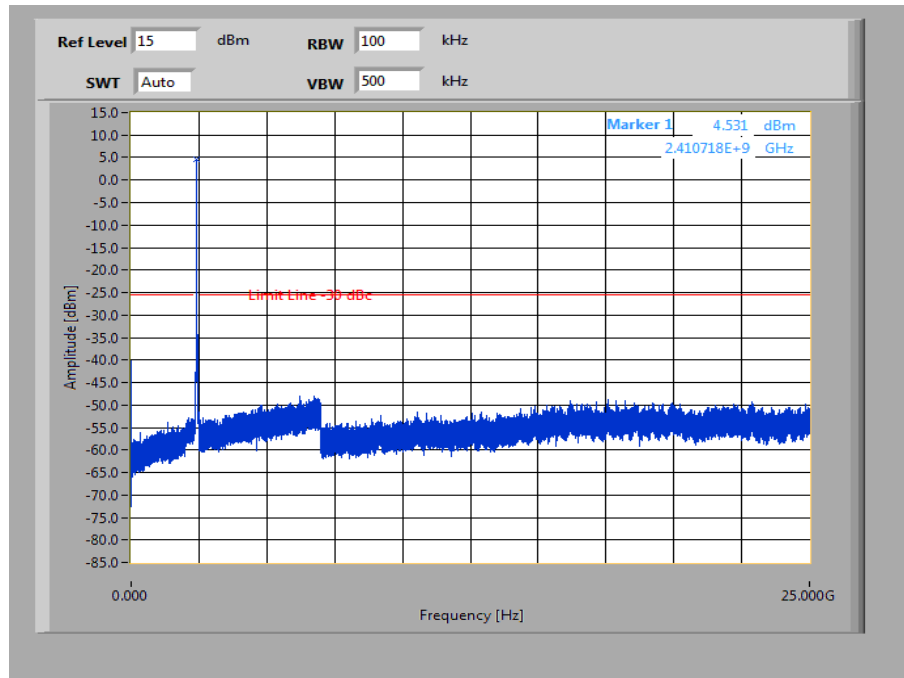
The peak at the beginning of the plot is the LO from the SA.

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

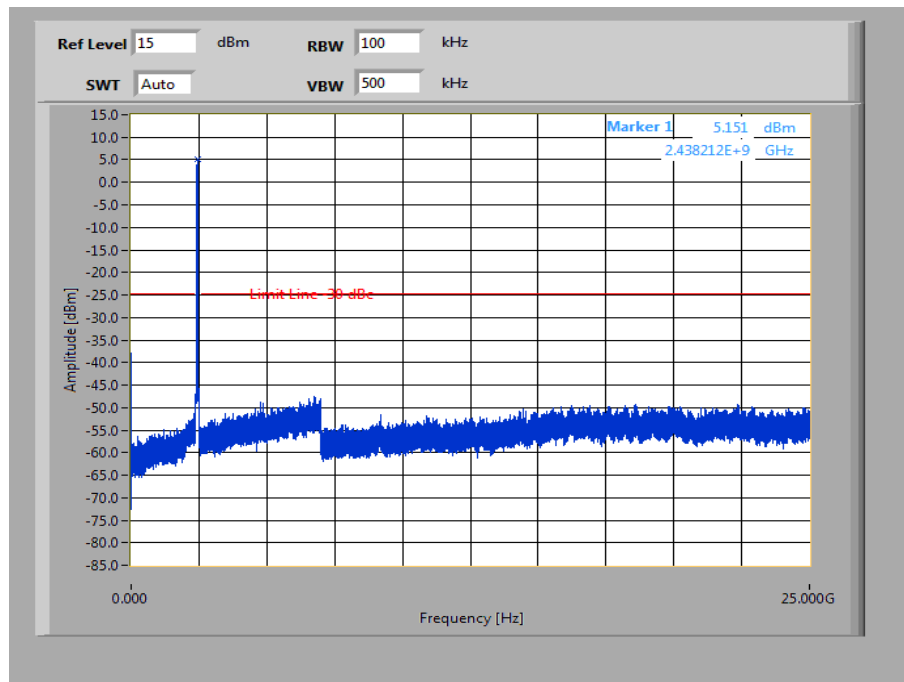
The peak at the beginning of the plot is the LO from the SA.

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

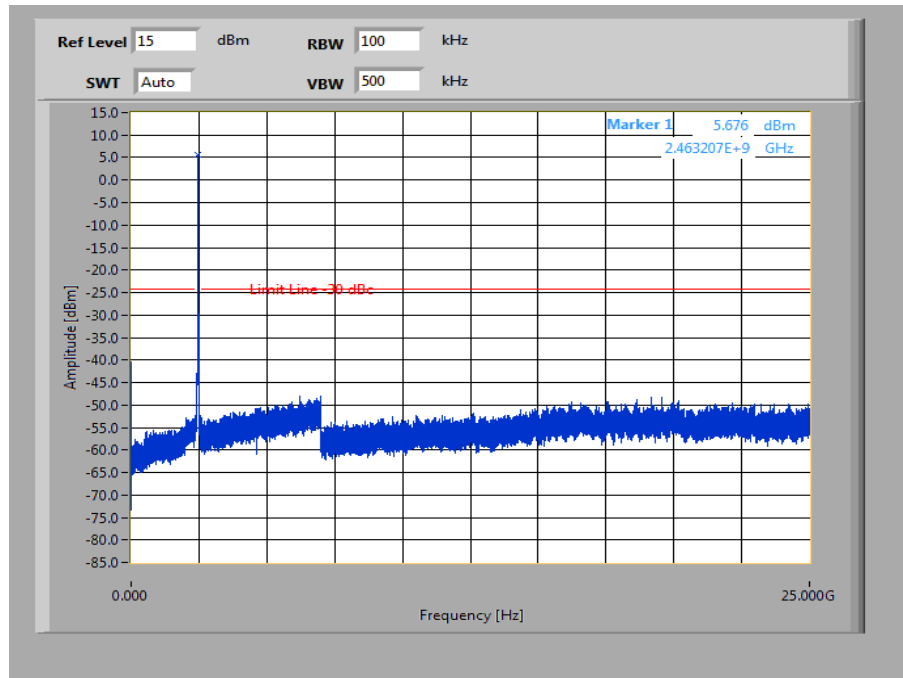
The peak at the beginning of the plot is the LO from the SA.

Plots: OFDM / g – mode**Plot 1: TX mode, lowest channel, up to 25 GHz**

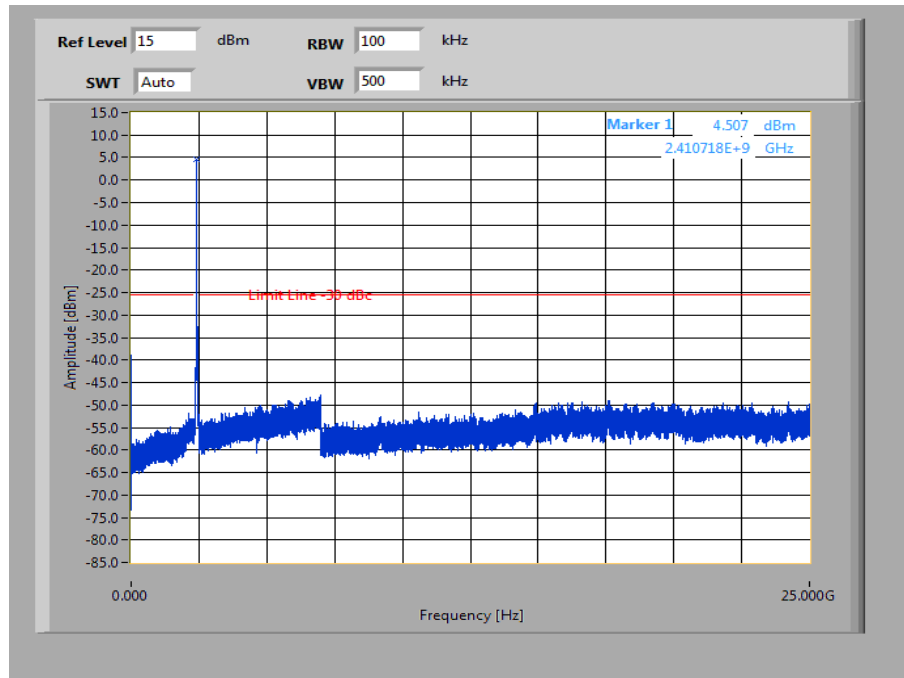
The peak at the beginning of the plot is the LO from the SA.

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

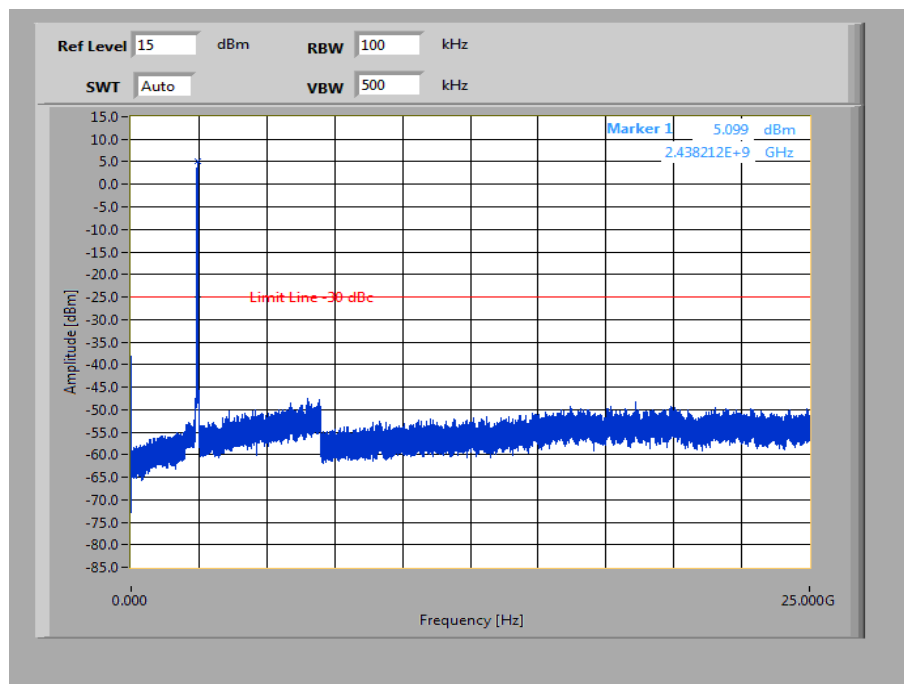
The peak at the beginning of the plot is the LO from the SA.

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

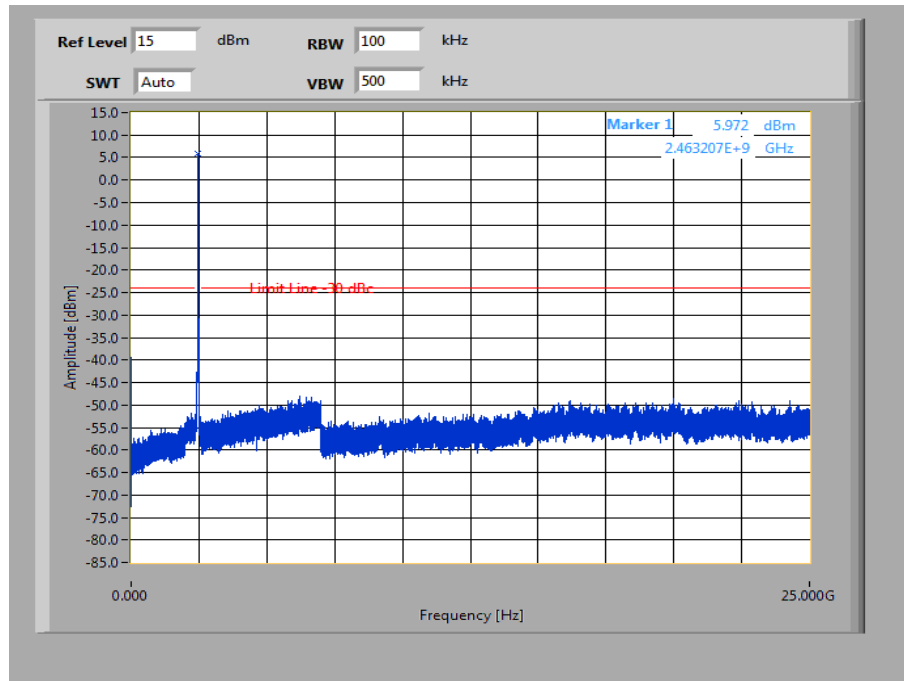
The peak at the beginning of the plot is the LO from the SA.

Plots: OFDM / n – 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

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 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
Measured Modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n – mode

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

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

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 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit.			All detected peak emissions above 1 GHz are below the average limit.			All detected peak emissions above 1 GHz are below the average limit.		
Measurement uncertainty			± 3 dB					

Result: Passed**Results: OFDM / g – mode**

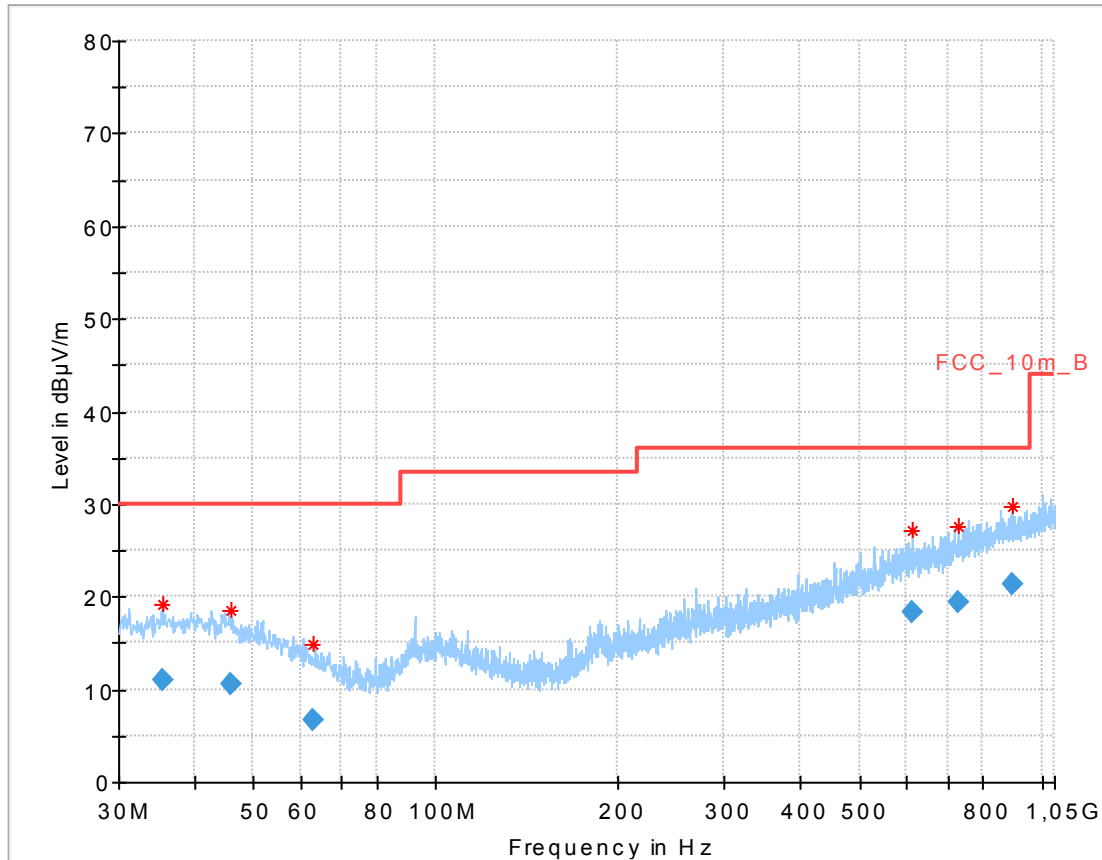
TX Spurious Emissions Radiated [dB μ V/m]								
OFDM / g – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit.			All detected peak emissions above 1 GHz are below the average limit.			All detected peak emissions above 1 GHz are below the average limit.		
Measurement uncertainty			± 3 dB					

Result: Passed**Results: OFDM / n HT20 – mode**

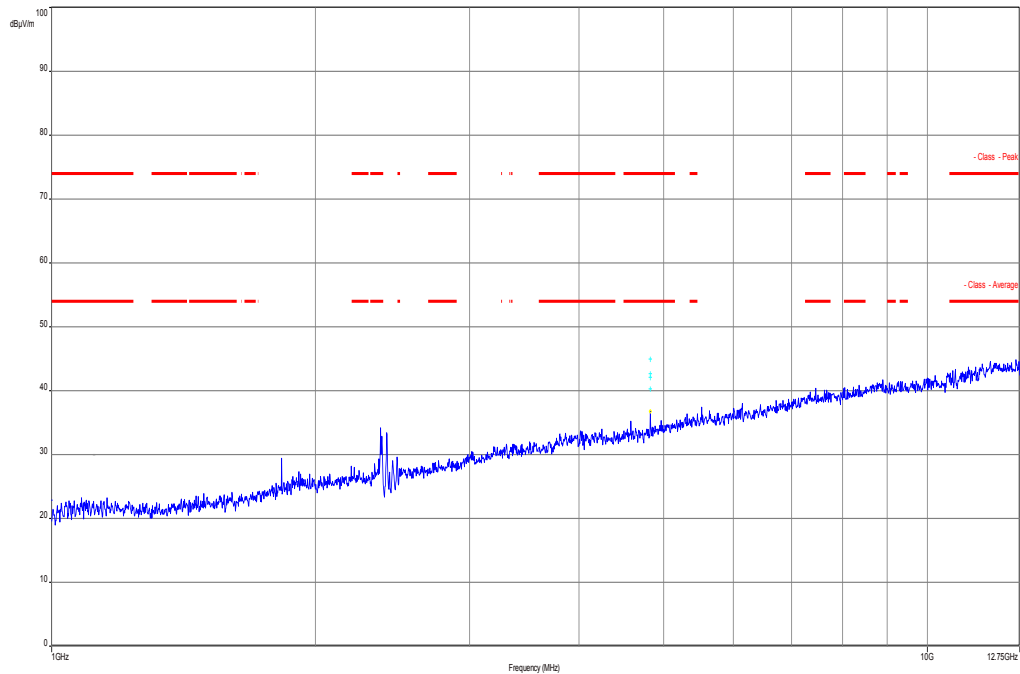
TX Spurious Emissions Radiated [dB μ V/m]								
OFDM / n – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit.			All detected peak emissions above 1 GHz are below the average limit.			All detected peak emissions above 1 GHz are below the average limit.		
Measurement uncertainty			± 3 dB					

Result: Passed

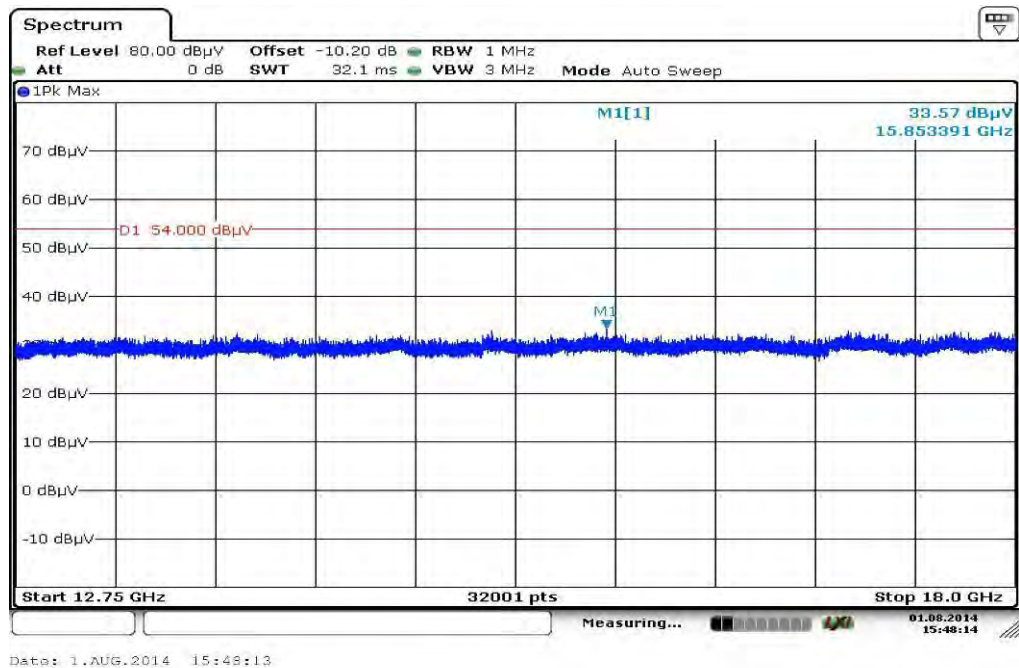
Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

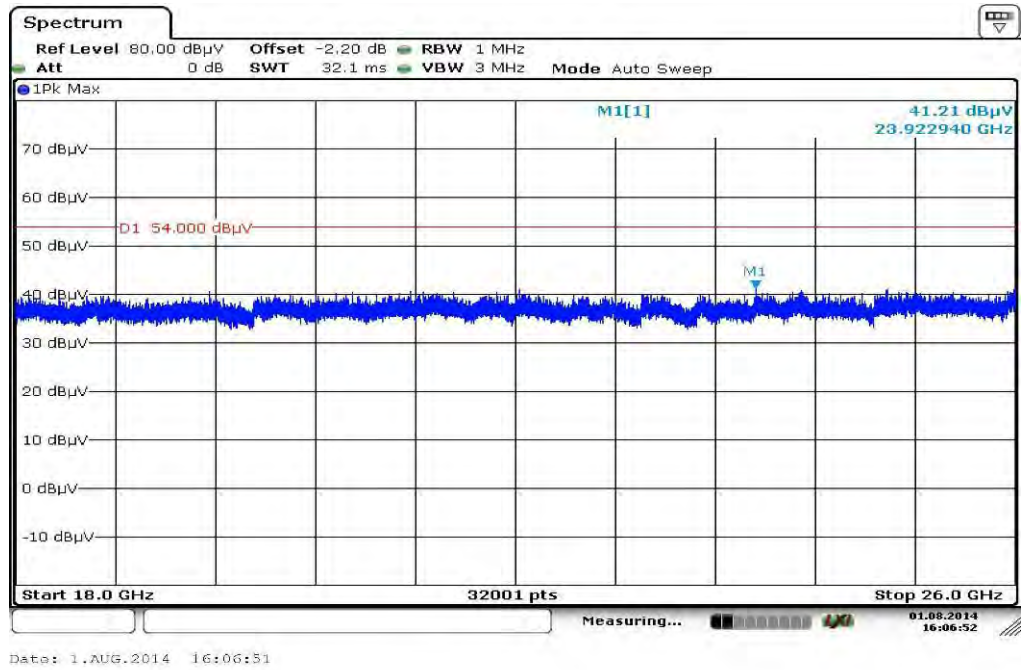
Plots: DSSS / b – mode
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Final_Result:

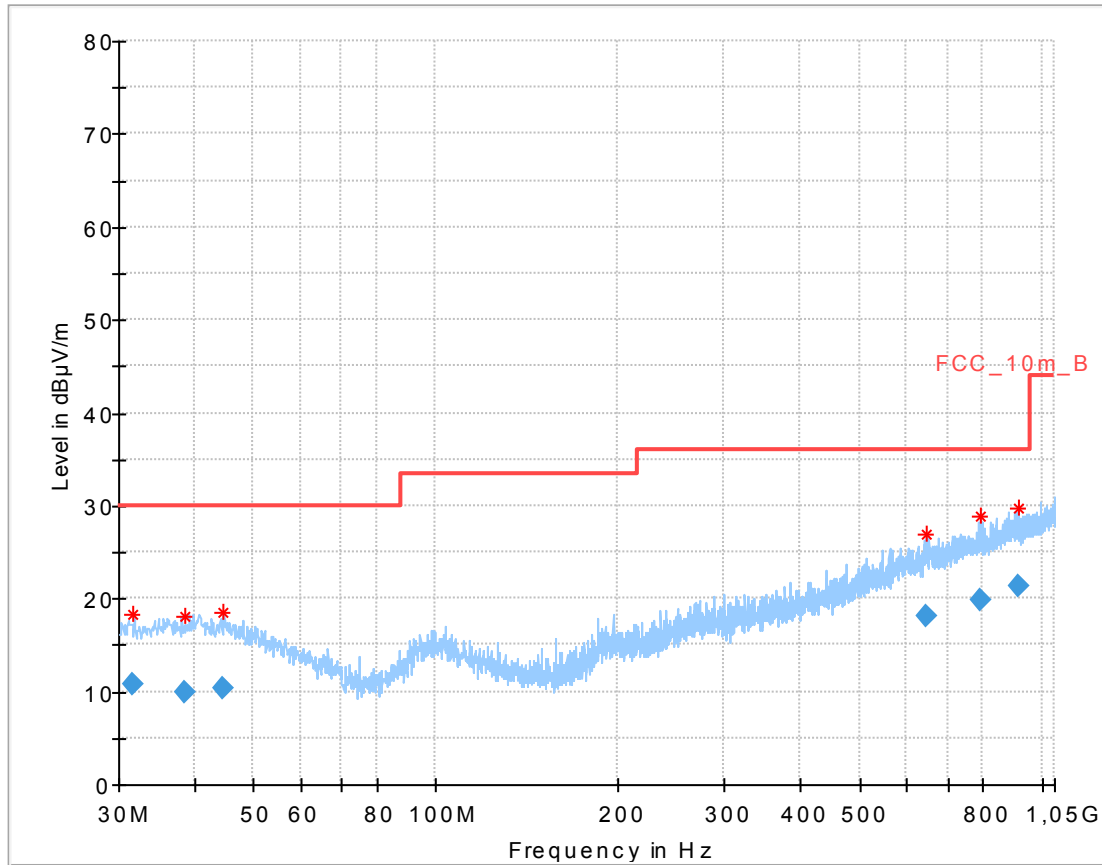
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.391450	11.02	30.00	18.98	1000.0	120.000	101.0	H	115	13.8
45.854850	10.64	30.00	19.36	1000.0	120.000	98.0	V	179	13.6
62.879700	6.76	30.00	23.24	1000.0	120.000	166.0	V	155	9.9
613.127250	18.30	36.00	17.70	1000.0	120.000	98.0	H	89	20.8
730.317150	19.48	36.00	16.52	1000.0	120.000	170.0	H	91	22.2
892.319250	21.31	36.00	14.69	1000.0	120.000	170.0	V	155	24.0

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

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

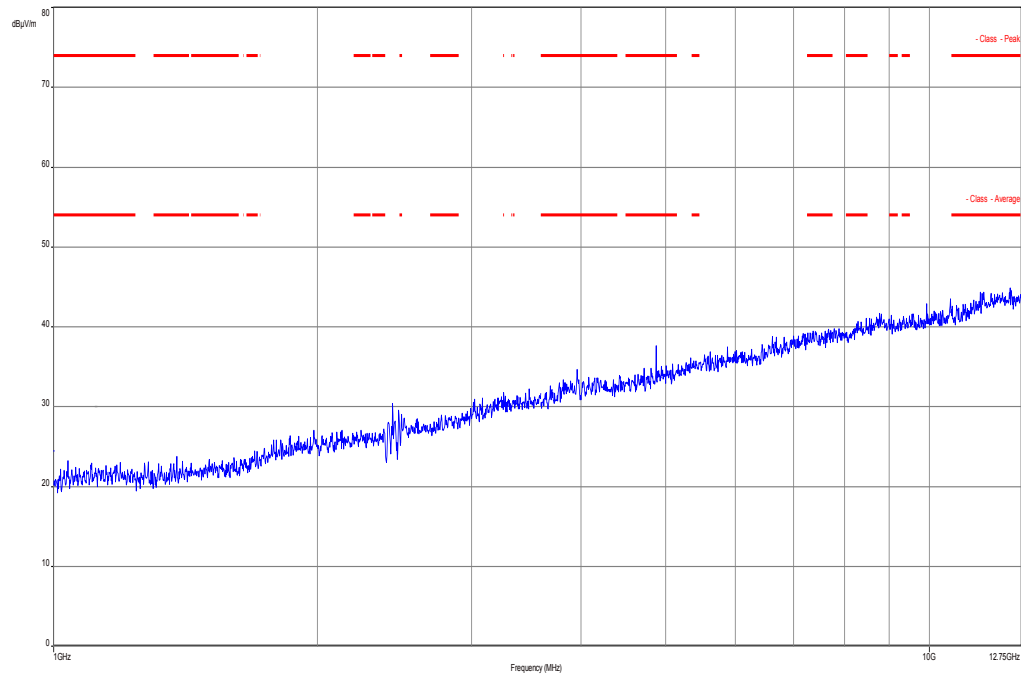
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

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

Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

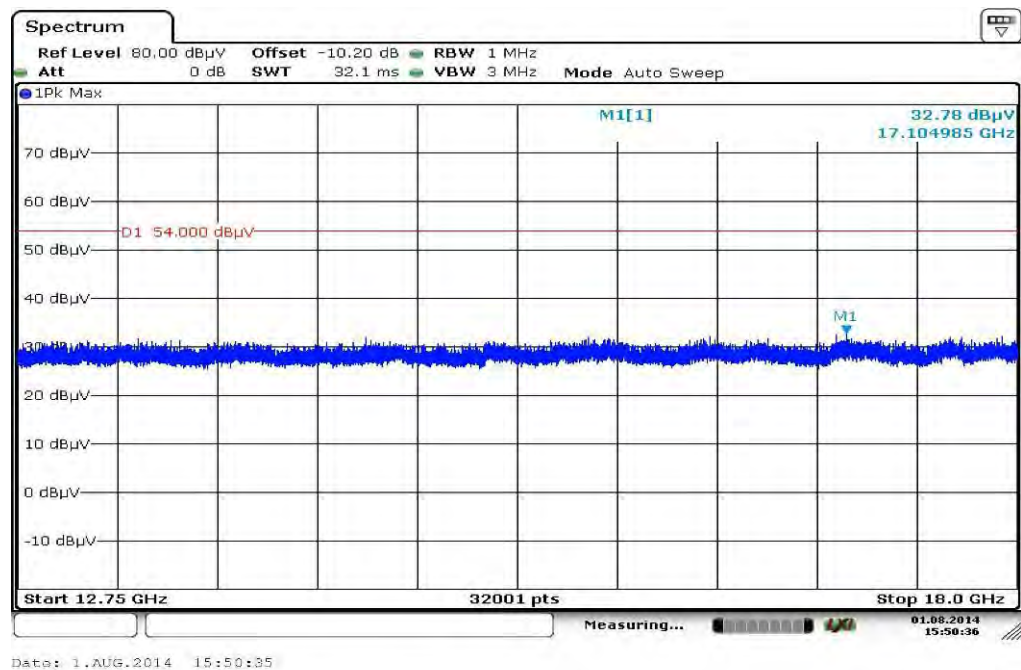
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.611000	10.80	30.00	19.20	1000.0	120.000	101.0	H	25	13.5
38.572650	9.93	30.00	20.07	1000.0	120.000	101.0	V	269	14.0
44.456550	10.32	30.00	19.68	1000.0	120.000	101.0	H	90	13.9
643.794000	18.18	36.00	17.82	1000.0	120.000	98.0	H	-25	21.1
791.237550	19.77	36.00	16.23	1000.0	120.000	170.0	V	25	22.7
913.523850	21.26	36.00	14.74	1000.0	120.000	170.0	H	269	24.2

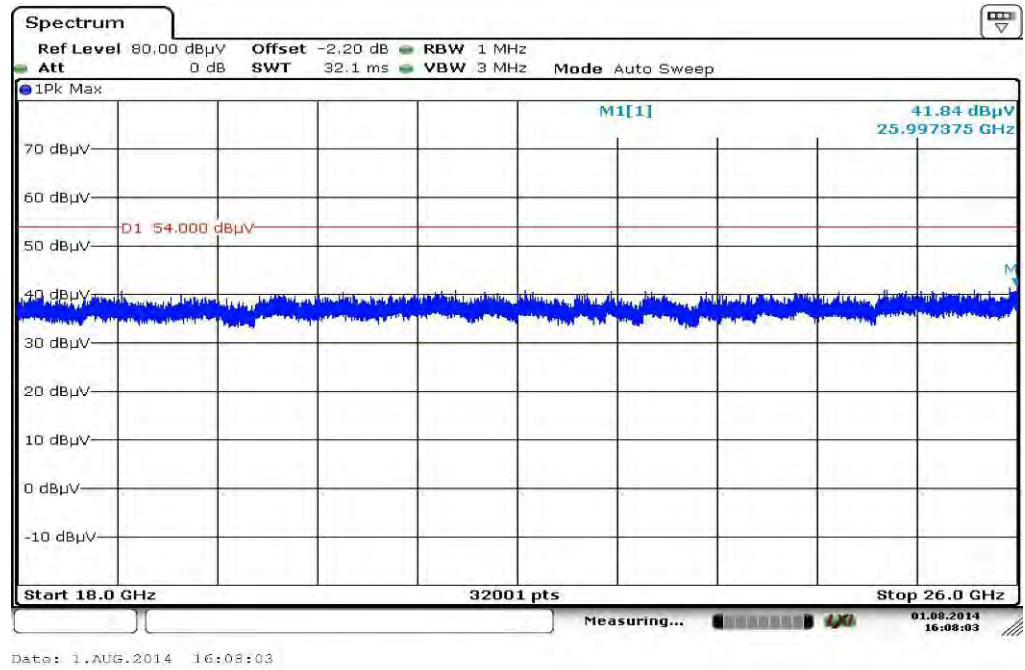
Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

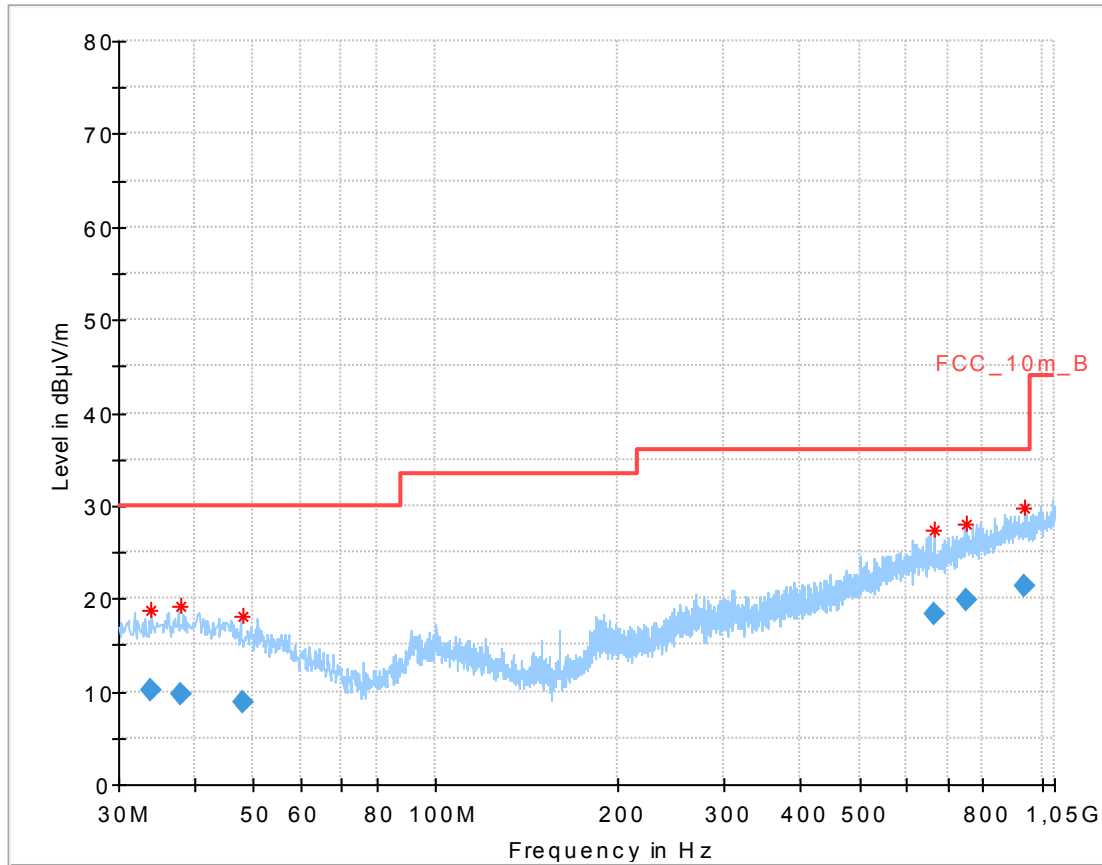


The carrier signal is notched with a 2.4 GHz band rejection filter.

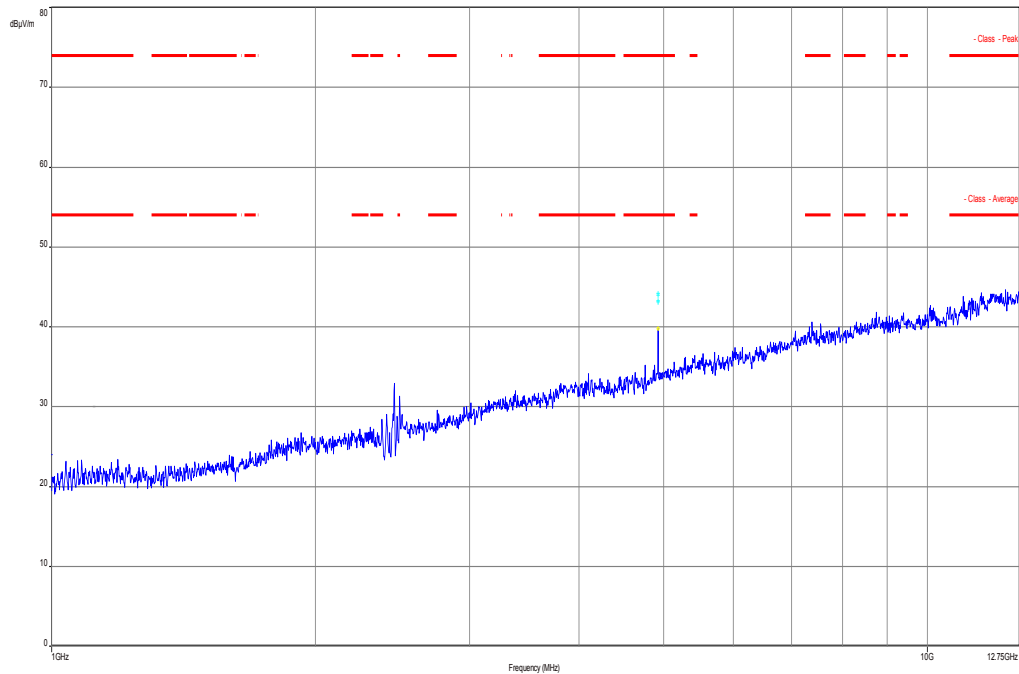
Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



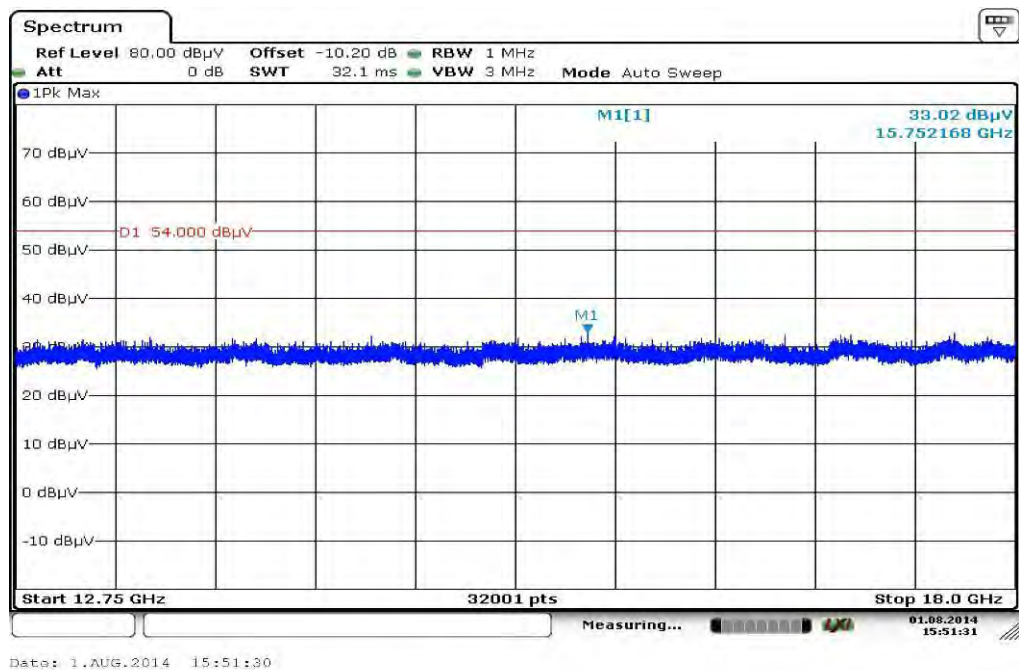
Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

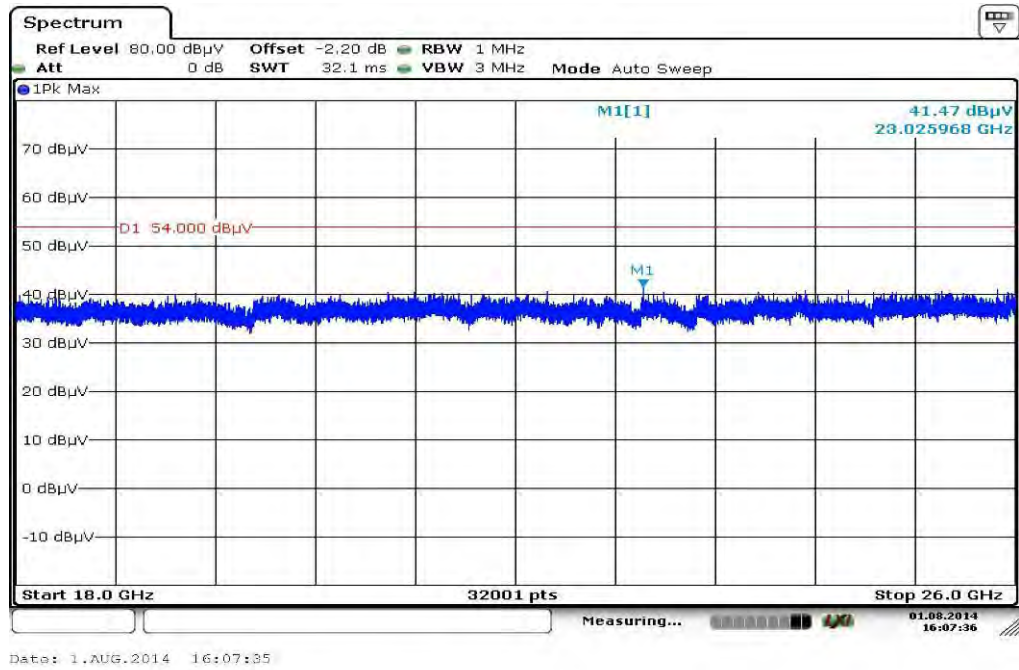
Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

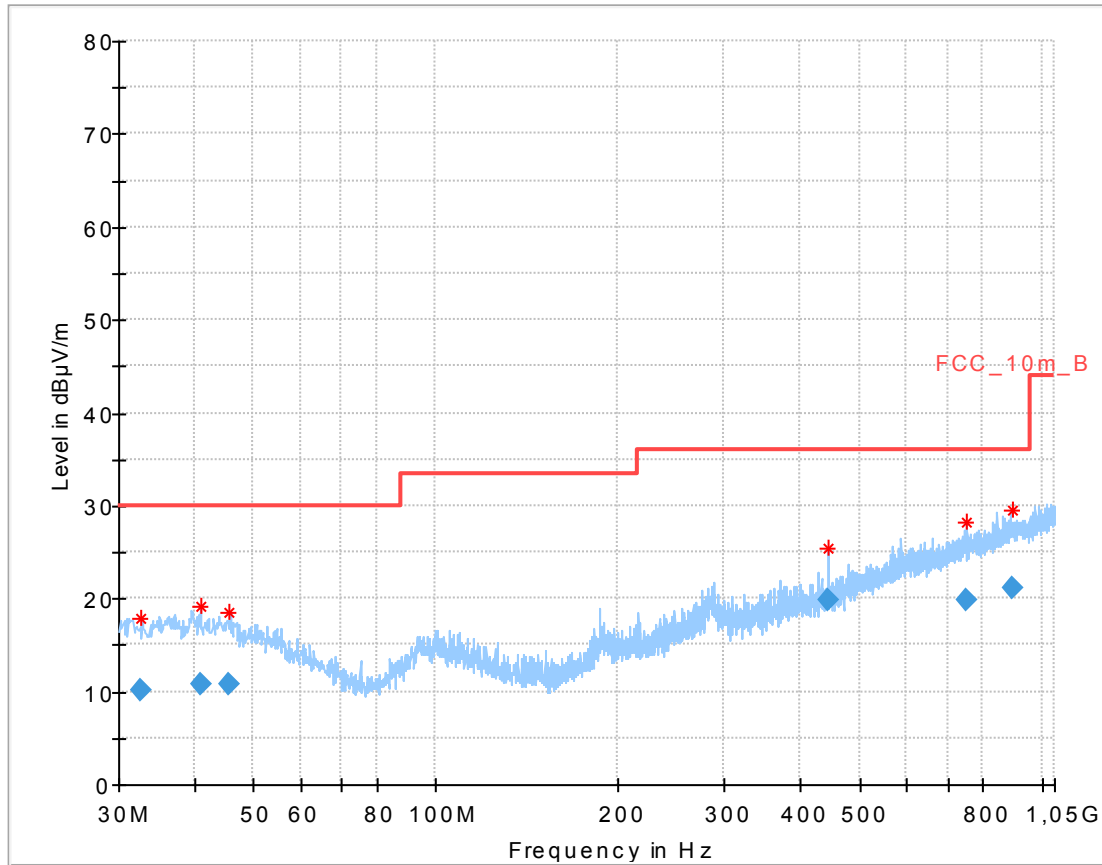
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.945450	10.23	30.00	19.77	1000.0	120.000	170.0	V	65	13.7
37.939350	9.68	30.00	20.32	1000.0	120.000	101.0	H	179	13.9
48.123150	8.86	30.00	21.14	1000.0	120.000	170.0	V	179	13.1
665.523450	18.38	36.00	17.62	1000.0	120.000	170.0	V	0	21.2
752.208150	19.83	36.00	16.17	1000.0	120.000	98.0	H	245	22.7
938.049150	21.34	36.00	14.66	1000.0	120.000	170.0	V	115	24.2

Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

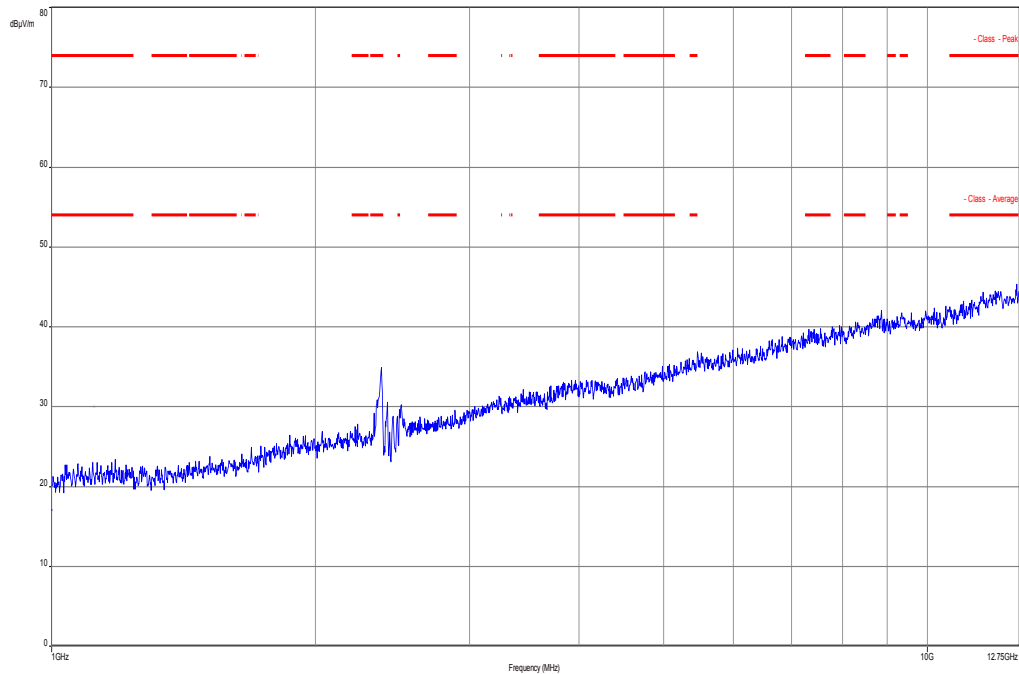
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

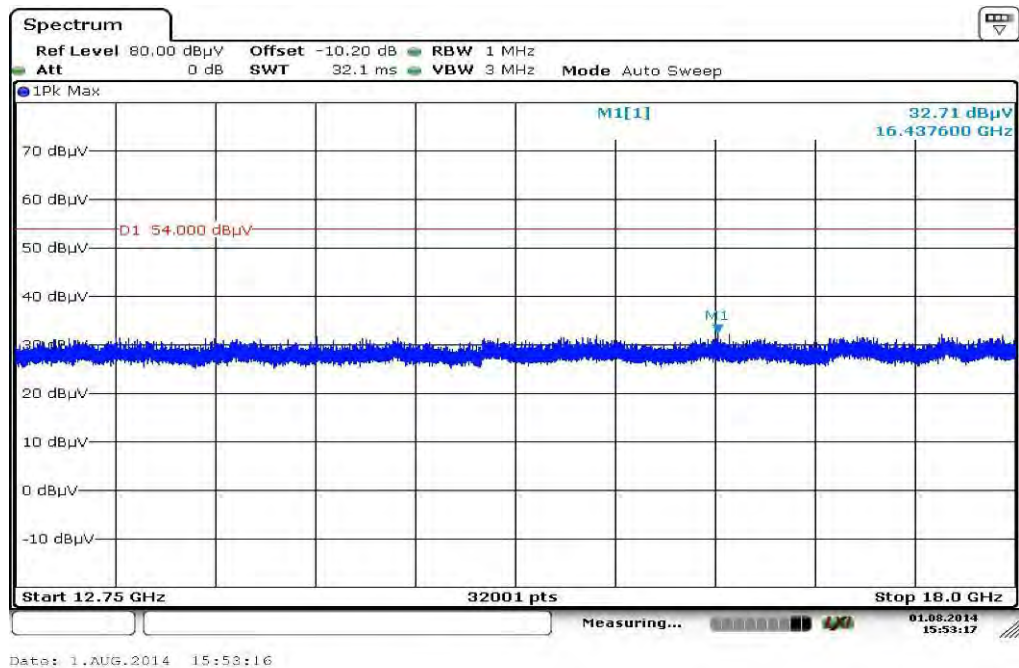
Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

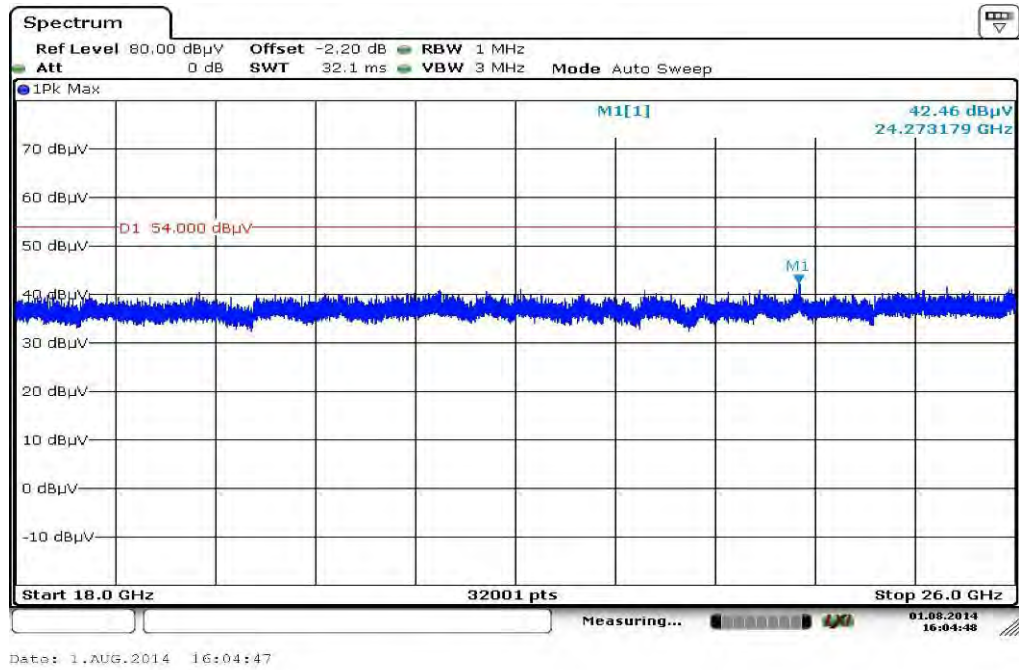
Plots: OFDM / g – mode
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Final_Result:

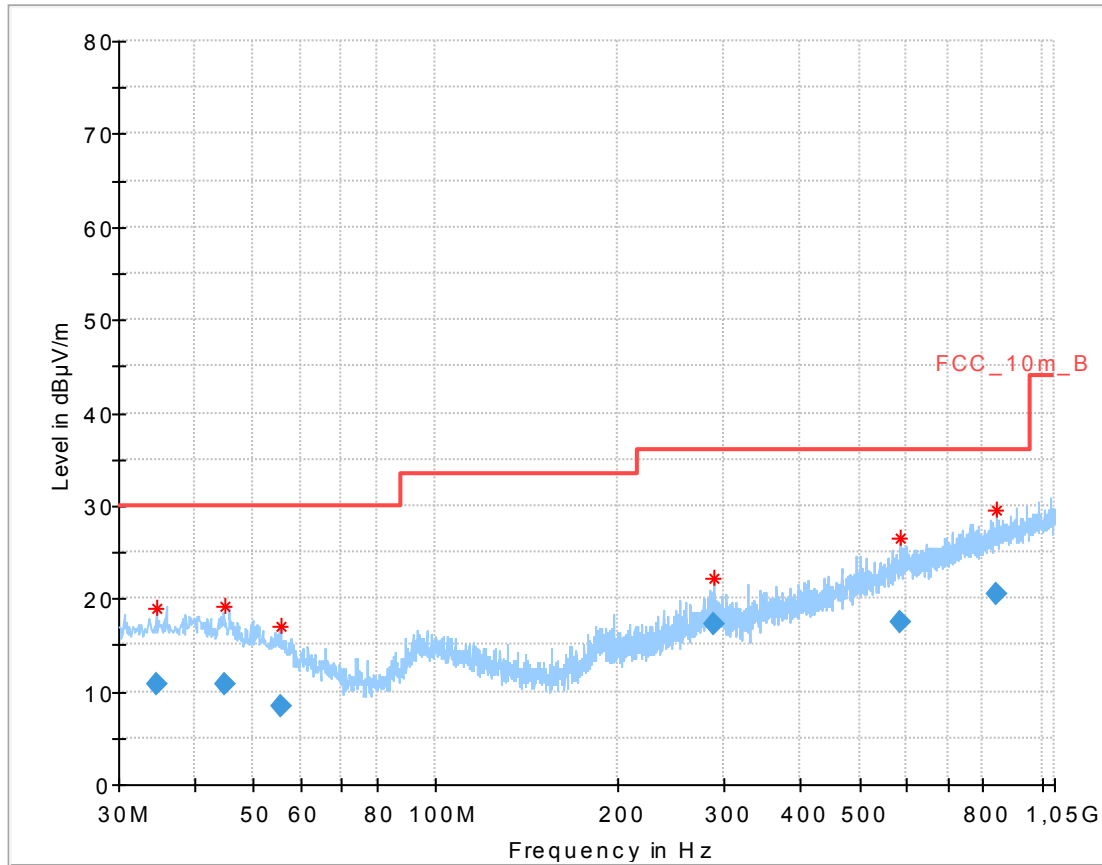
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.613000	10.13	30.00	19.87	1000.0	120.000	170.0	V	179	13.6
40.997400	10.81	30.00	19.19	1000.0	120.000	101.0	H	295	14.0
45.447000	10.73	30.00	19.27	1000.0	120.000	101.0	V	25	13.7
443.848650	19.88	36.00	16.12	1000.0	120.000	101.0	H	-25	17.5
752.329500	19.79	36.00	16.21	1000.0	120.000	98.0	H	205	22.7
891.473400	21.20	36.00	14.80	1000.0	120.000	101.0	H	89	24.0

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

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

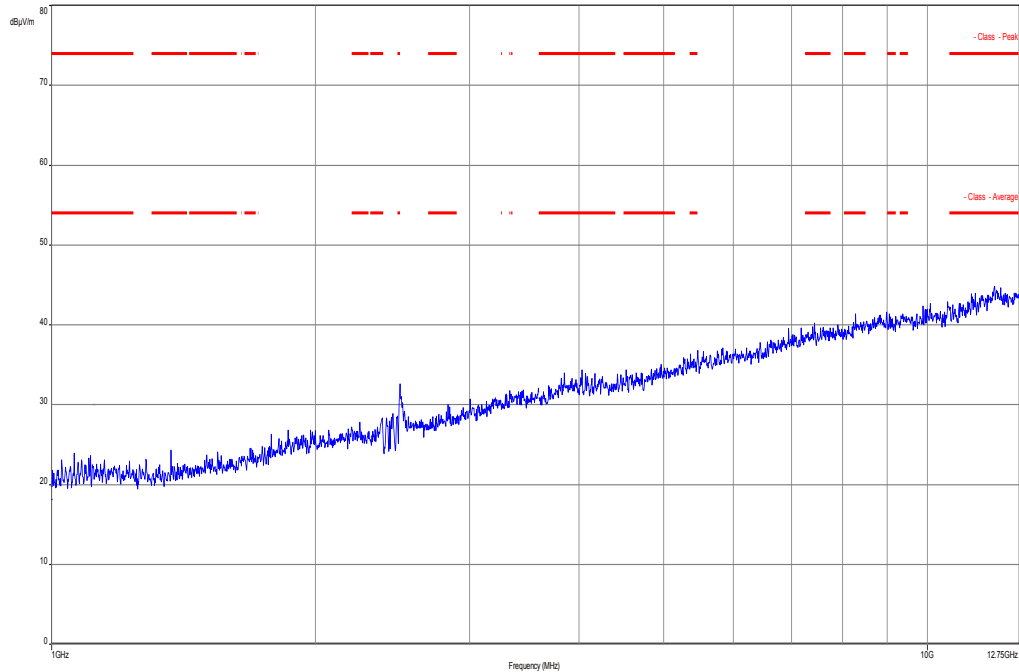
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

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

Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

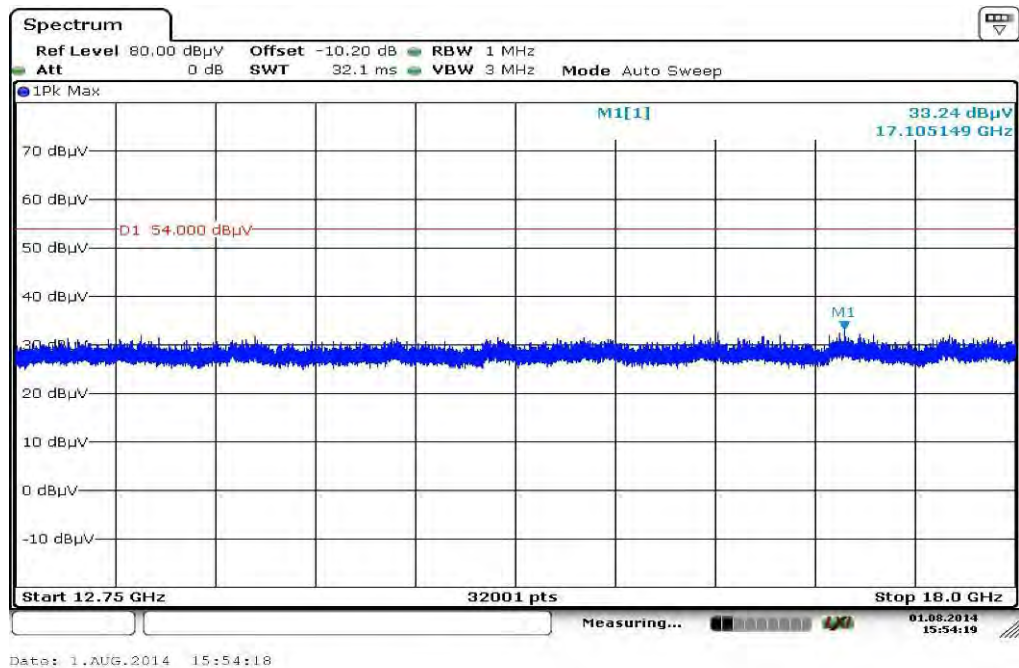
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.755900	10.78	30.00	19.22	1000.0	120.000	100.0	V	-25	13.8
45.022950	10.85	30.00	19.15	1000.0	120.000	101.0	V	115	13.9
55.541400	8.51	30.00	21.49	1000.0	120.000	170.0	V	89	11.7
287.932950	17.28	36.00	18.72	1000.0	120.000	98.0	V	245	14.2
583.781550	17.40	36.00	18.60	1000.0	120.000	170.0	V	-25	20.3
843.914850	20.49	36.00	15.51	1000.0	120.000	170.0	H	25	23.4

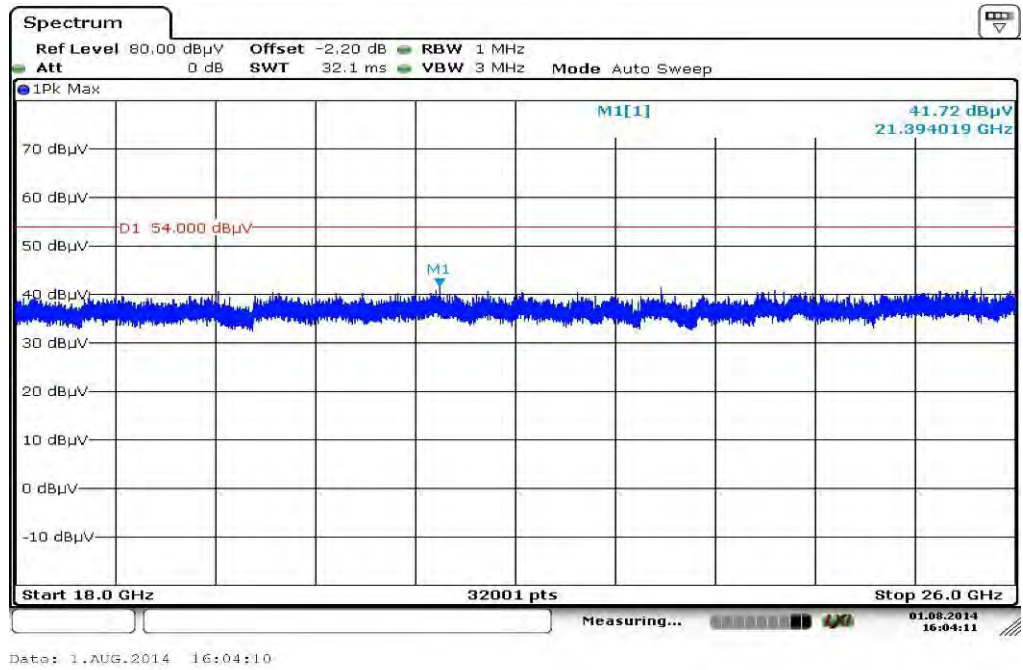
Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

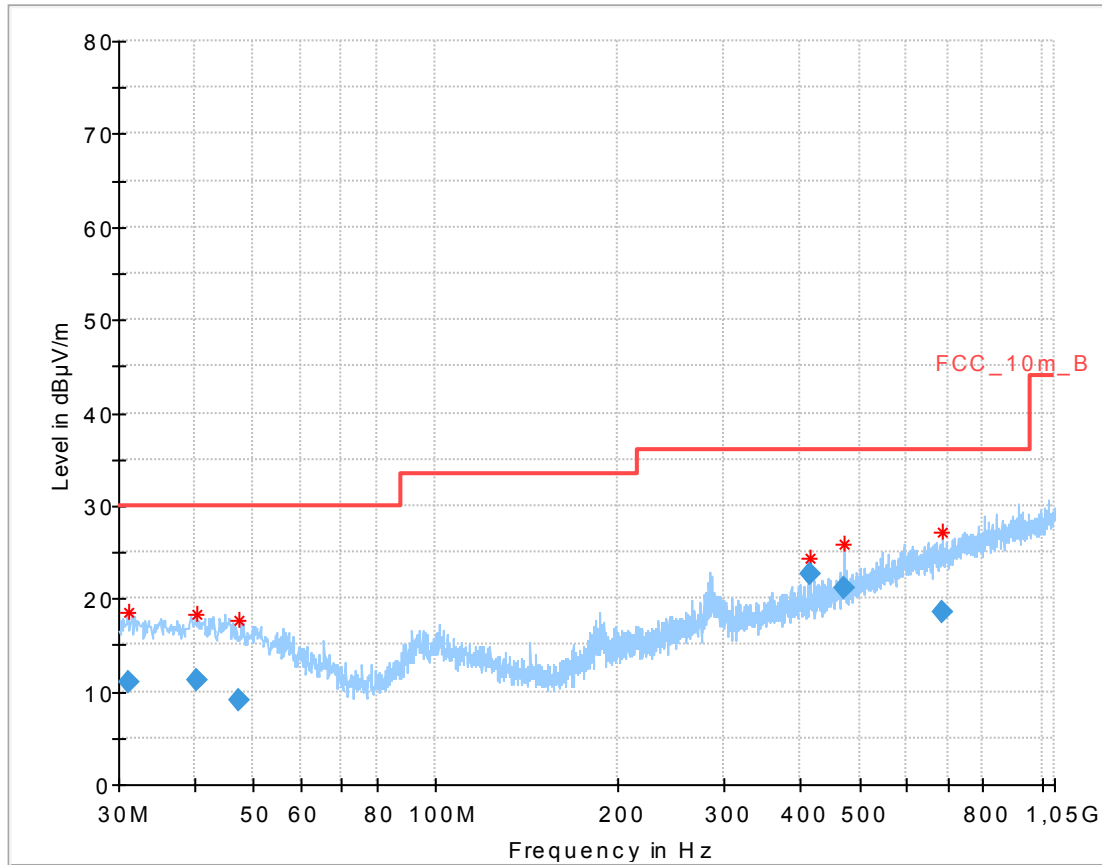


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

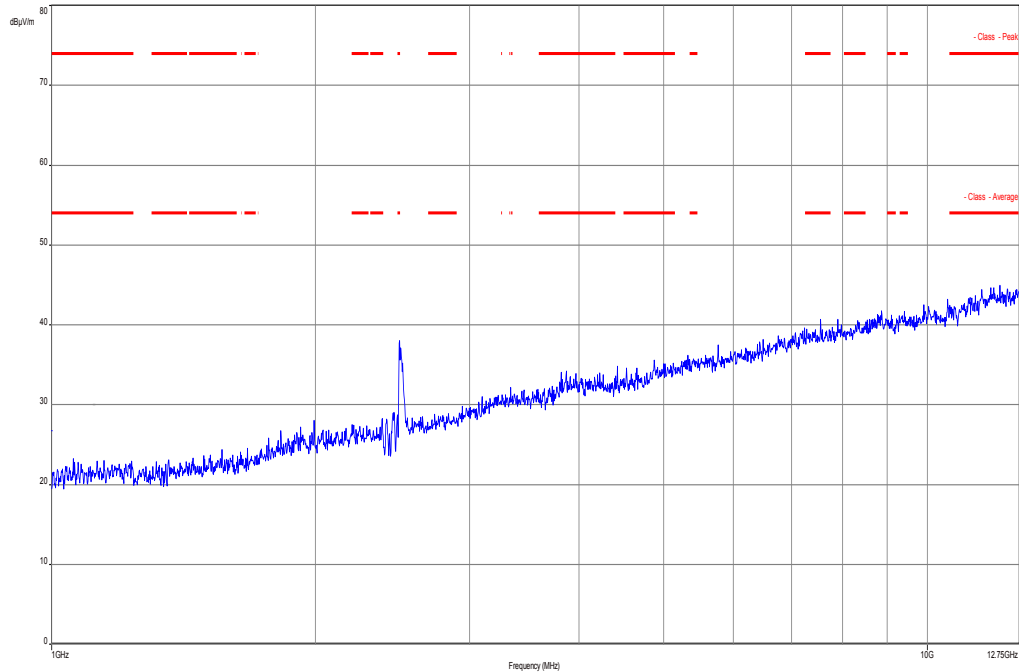


Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

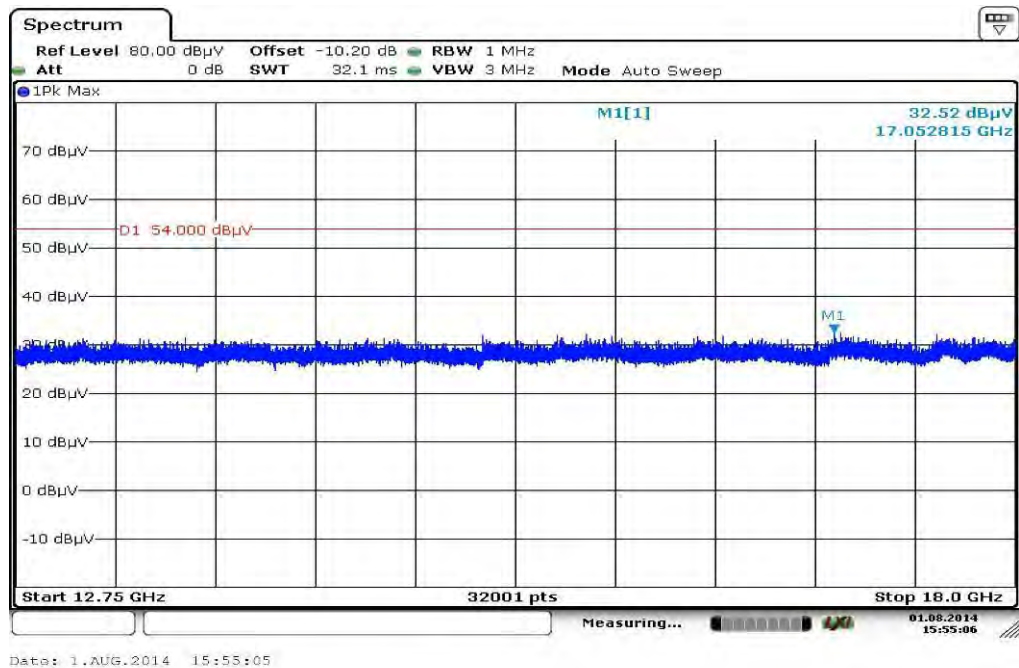
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.232400	11.02	30.00	18.98	1000.0	120.000	98.0	H	295	13.5
40.286400	11.12	30.00	18.88	1000.0	120.000	101.0	V	295	14.0
47.313300	9.16	30.00	20.84	1000.0	120.000	170.0	H	205	13.3
415.228350	22.58	36.00	13.42	1000.0	120.000	170.0	H	25	17.1
472.517550	21.09	36.00	14.91	1000.0	120.000	170.0	H	25	18.1
687.433950	18.51	36.00	17.49	1000.0	120.000	101.0	H	205	21.4

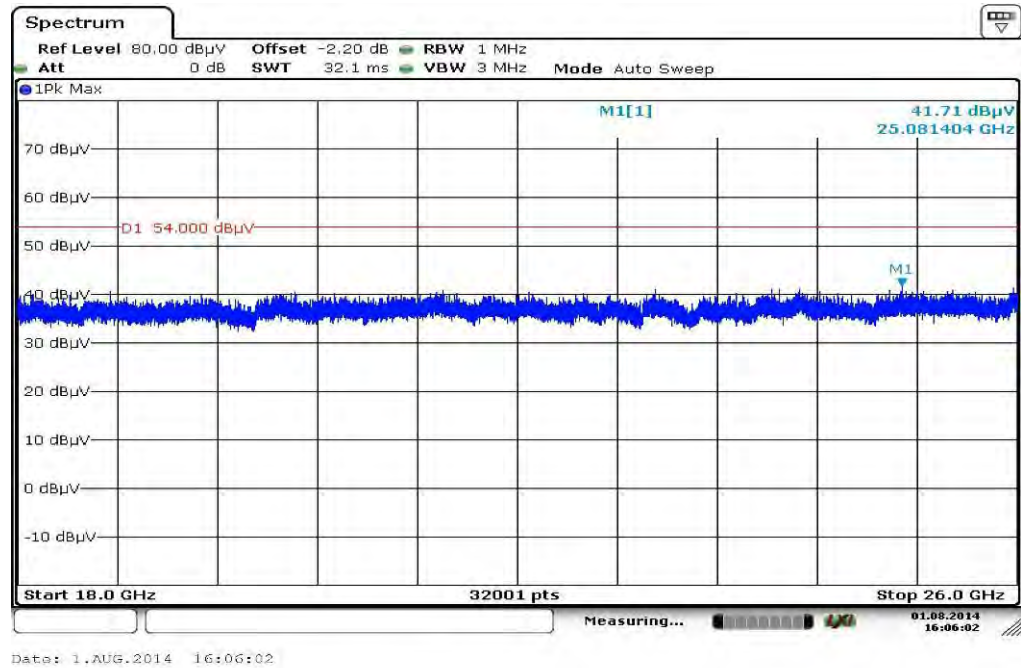
Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

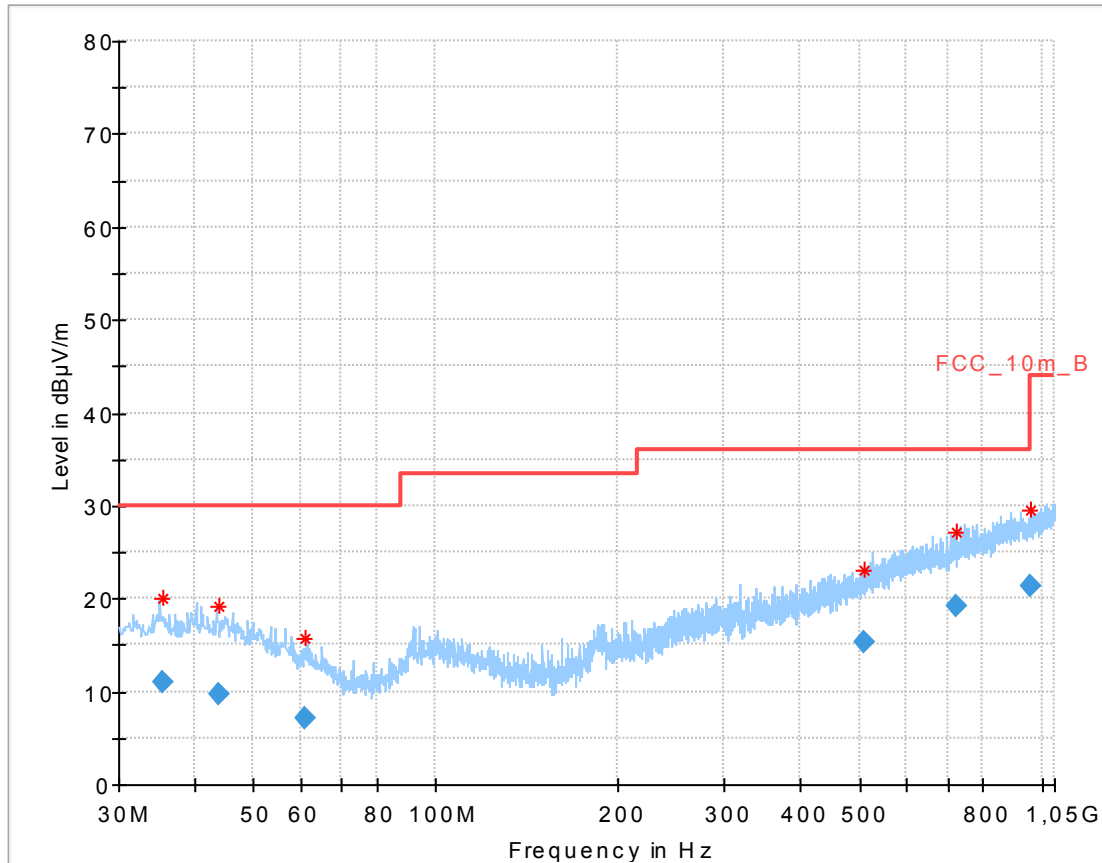


The carrier signal is notched with a 2.4 GHz band rejection filter.

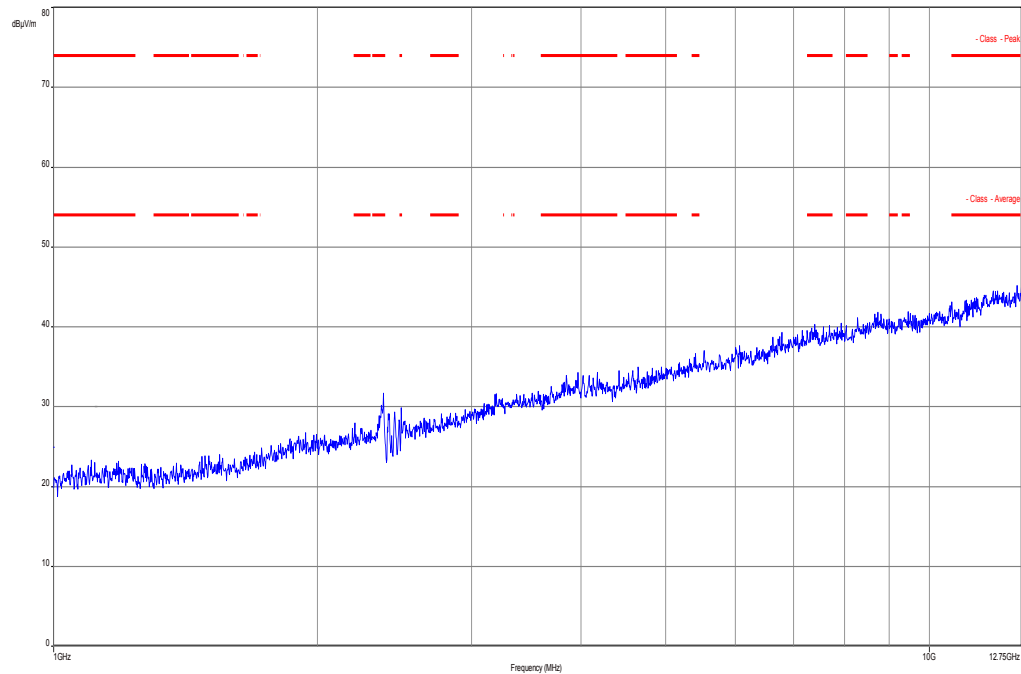
Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



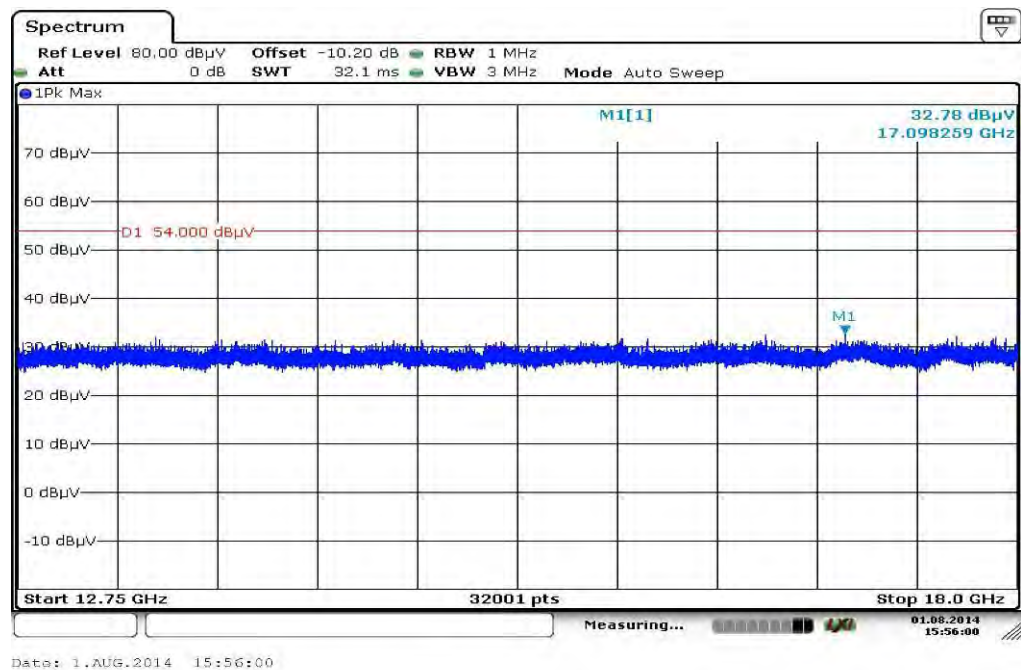
Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

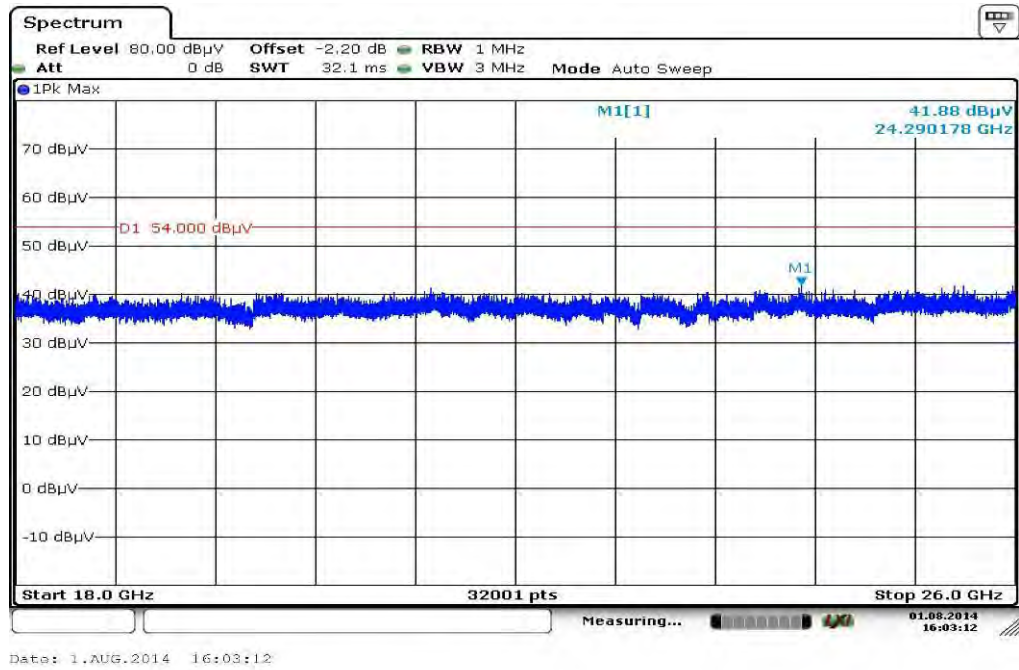
Plots: OFDM / n – mode
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Final_Result:

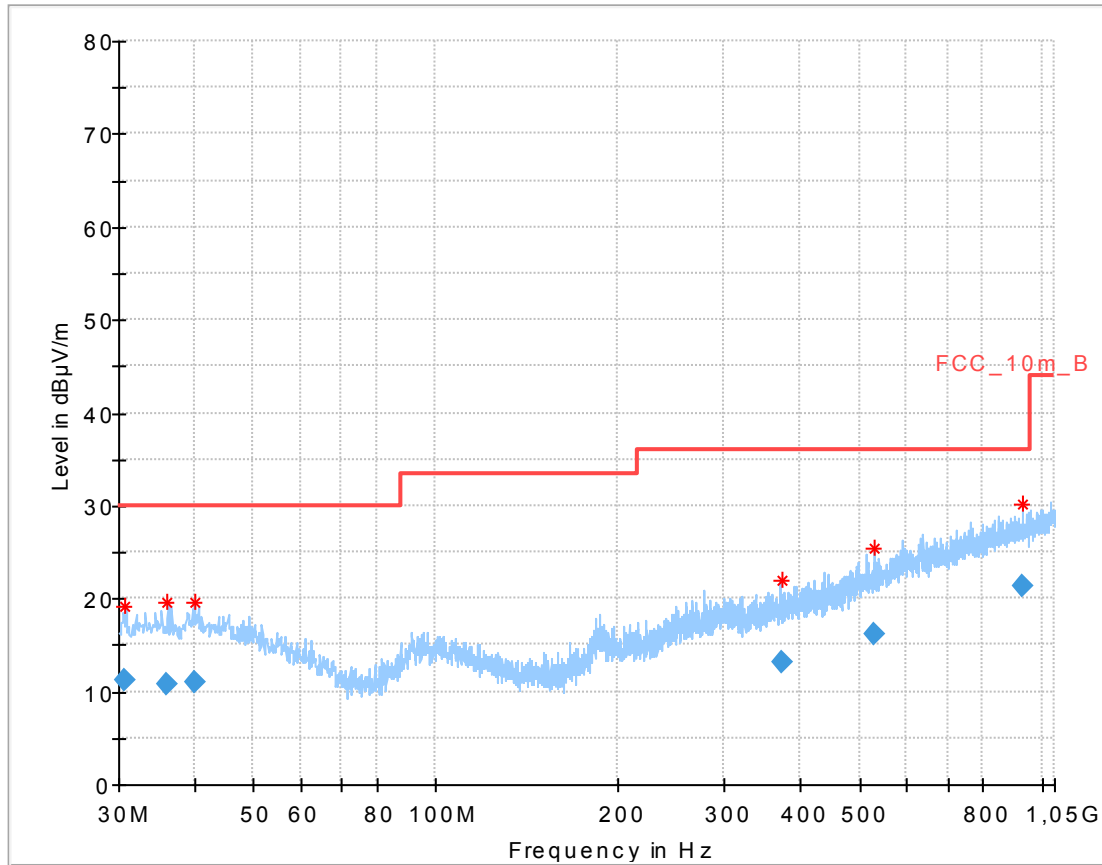
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.447550	11.07	30.00	18.93	1000.0	120.000	101.0	H	269	13.8
43.800600	9.79	30.00	20.21	1000.0	120.000	98.0	H	295	13.9
60.738900	7.18	30.00	22.82	1000.0	120.000	170.0	H	25	10.4
509.250600	15.26	36.00	20.74	1000.0	120.000	170.0	V	25	18.8
722.033250	19.12	36.00	16.88	1000.0	120.000	170.0	H	89	22.0
956.152200	21.42	36.00	14.58	1000.0	120.000	170.0	H	115	24.3

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

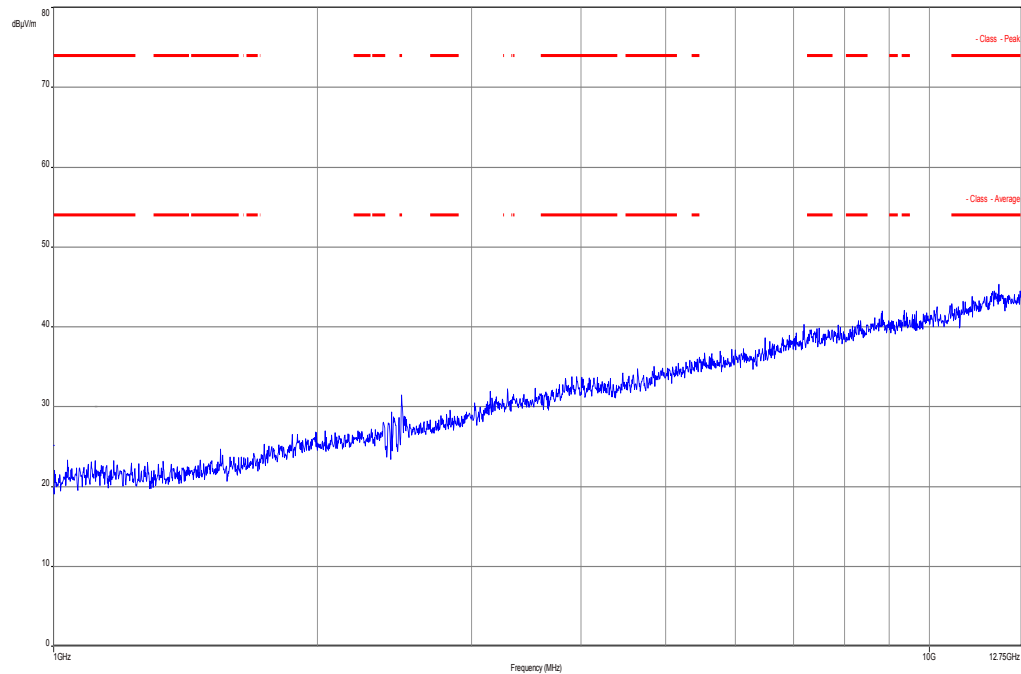
The carrier signal is notched with a 2.4 GHz band rejection filter.

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

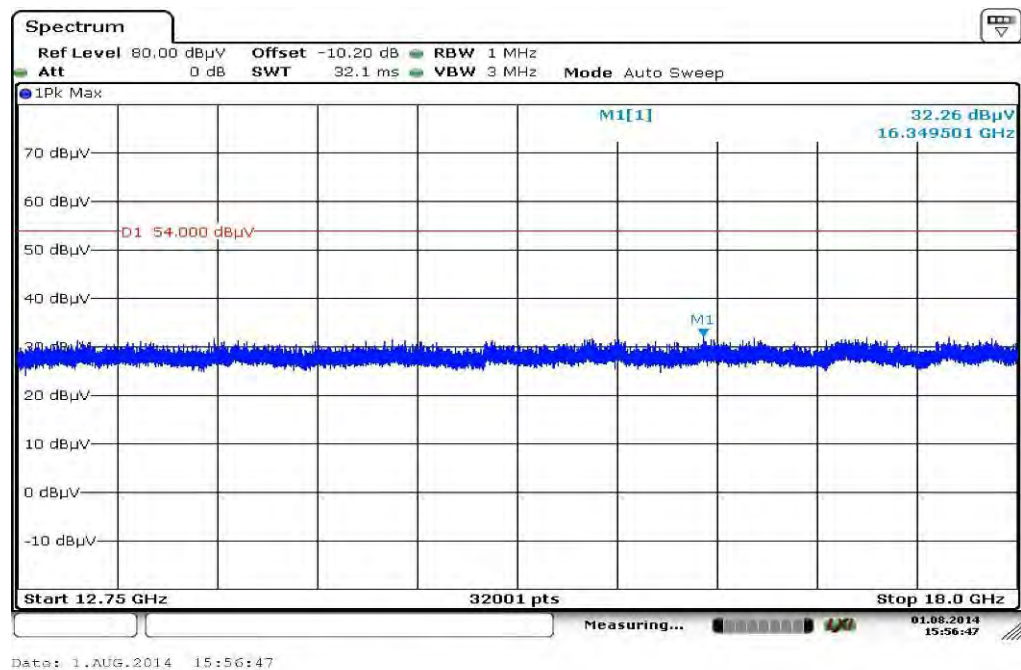
Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

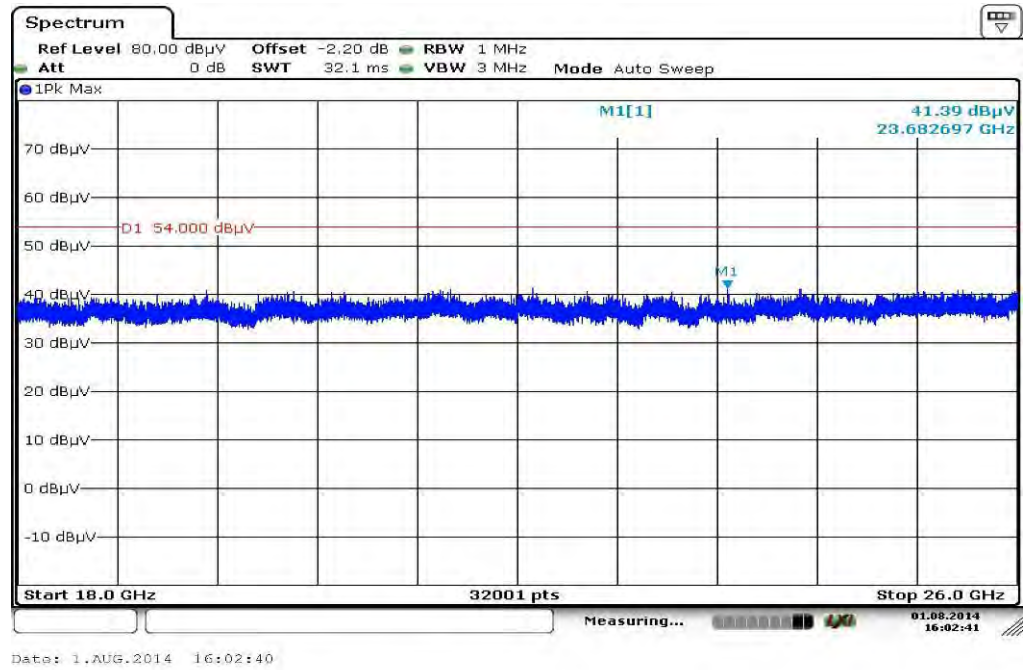
Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

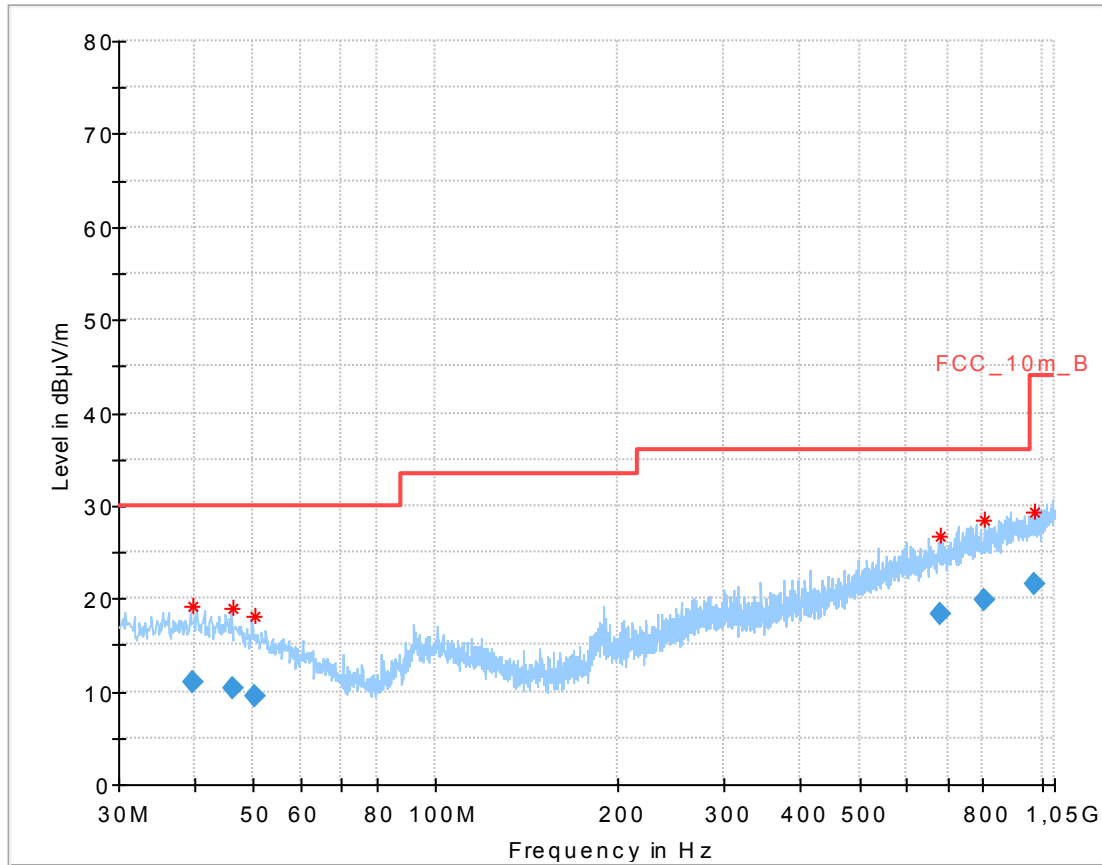
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.728850	11.11	30.00	18.89	1000.0	120.000	101.0	V	179	13.4
36.087000	10.85	30.00	19.15	1000.0	120.000	170.0	H	65	13.8
39.951300	11.03	30.00	18.97	1000.0	120.000	98.0	V	205	14.0
371.481750	13.12	36.00	22.88	1000.0	120.000	170.0	H	179	16.4
529.023450	16.09	36.00	19.91	1000.0	120.000	98.0	V	179	19.1
931.594650	21.31	36.00	14.69	1000.0	120.000	170.0	V	155	24.2

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

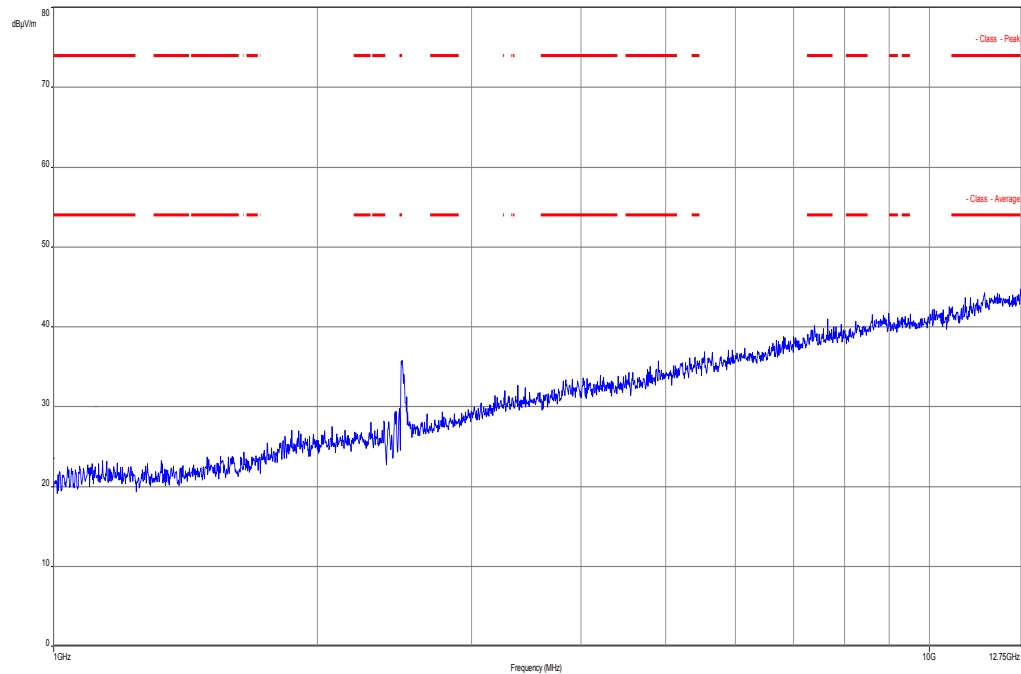
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

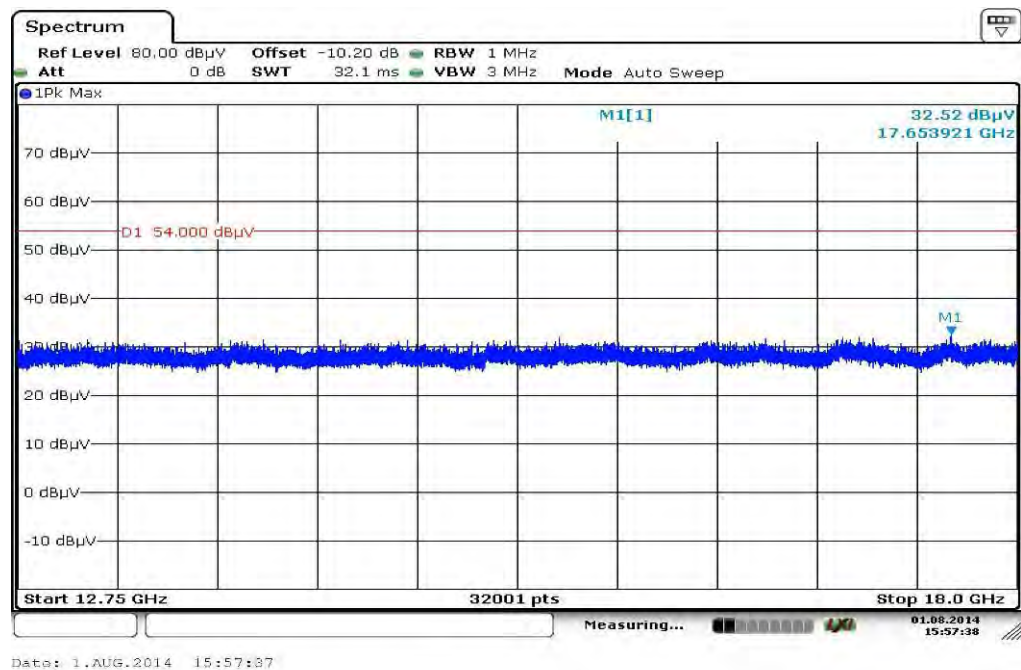
Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

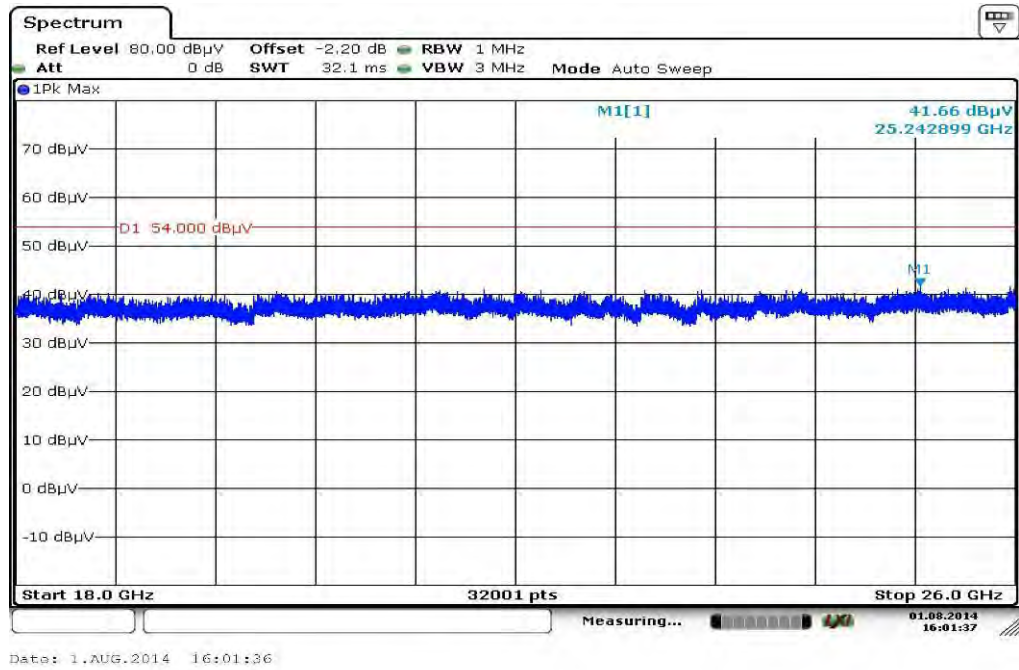
Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.780750	10.93	30.00	19.07	1000.0	120.000	98.0	V	295	14.0
46.193400	10.29	30.00	19.71	1000.0	120.000	170.0	H	-25	13.6
50.336700	9.43	30.00	20.57	1000.0	120.000	101.0	V	179	12.6
680.326650	18.40	36.00	17.60	1000.0	120.000	101.0	H	-1	21.4
803.731500	19.74	36.00	16.26	1000.0	120.000	170.0	V	65	22.8
972.092400	21.53	44.00	22.47	1000.0	120.000	170.0	H	115	24.5

Plot 10: 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 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

10.11 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:

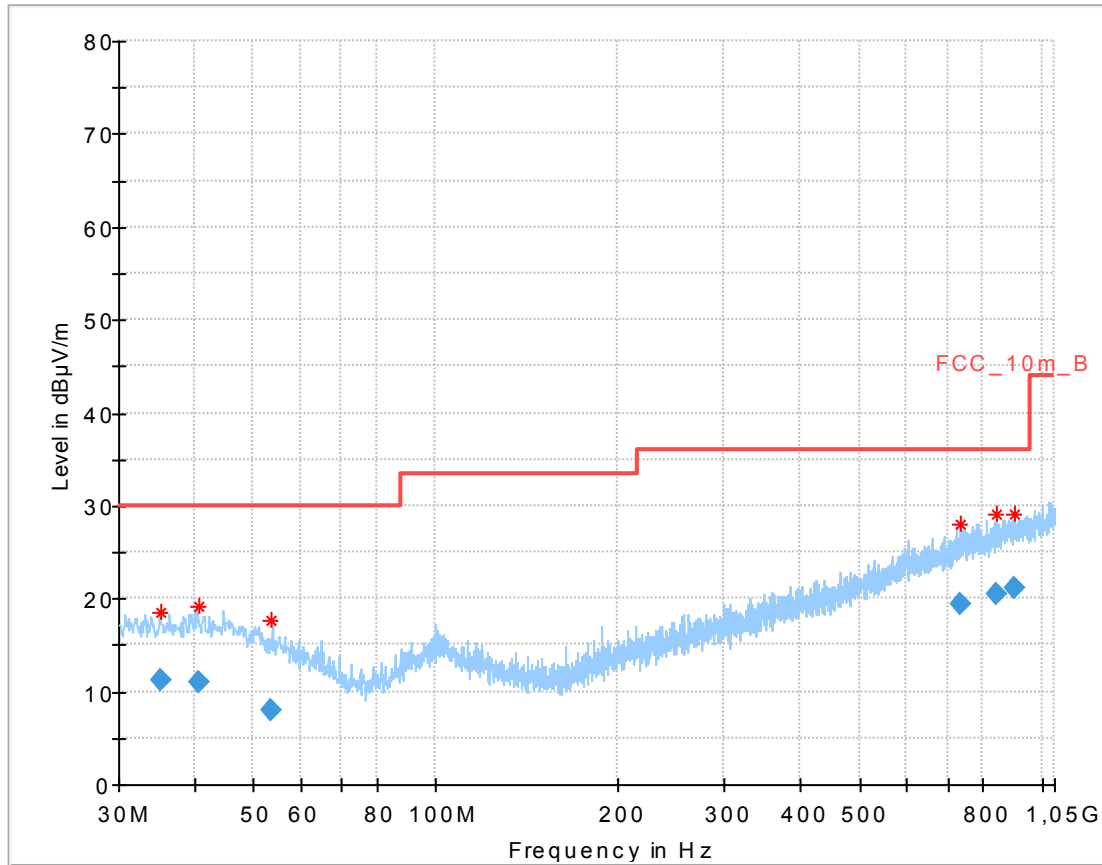
FCC		IC
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
Above 960	54.0	3

Results:

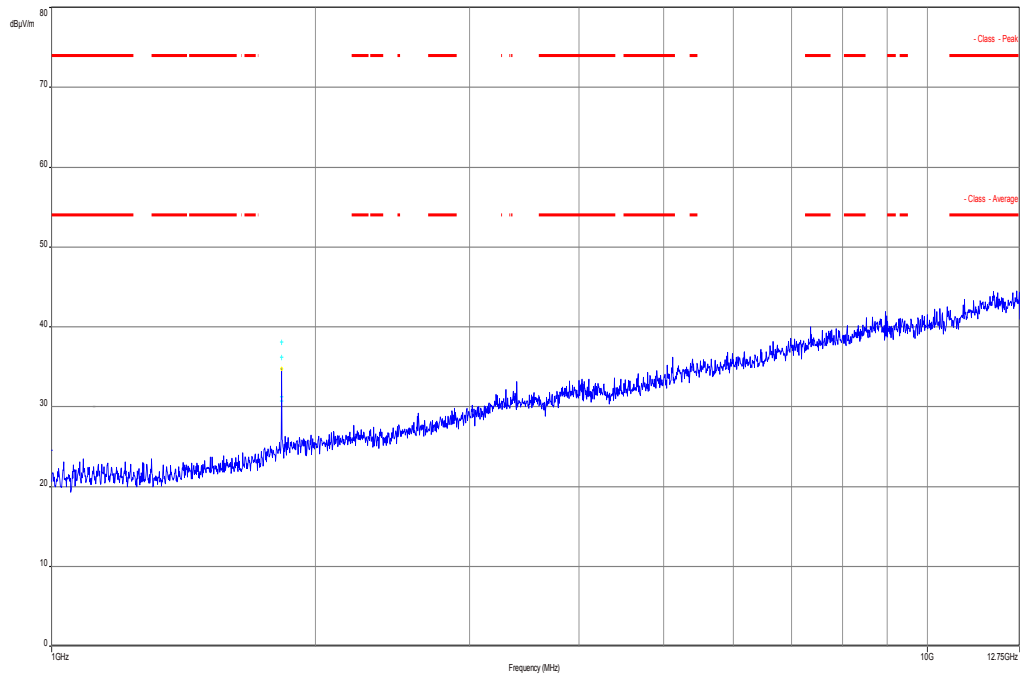
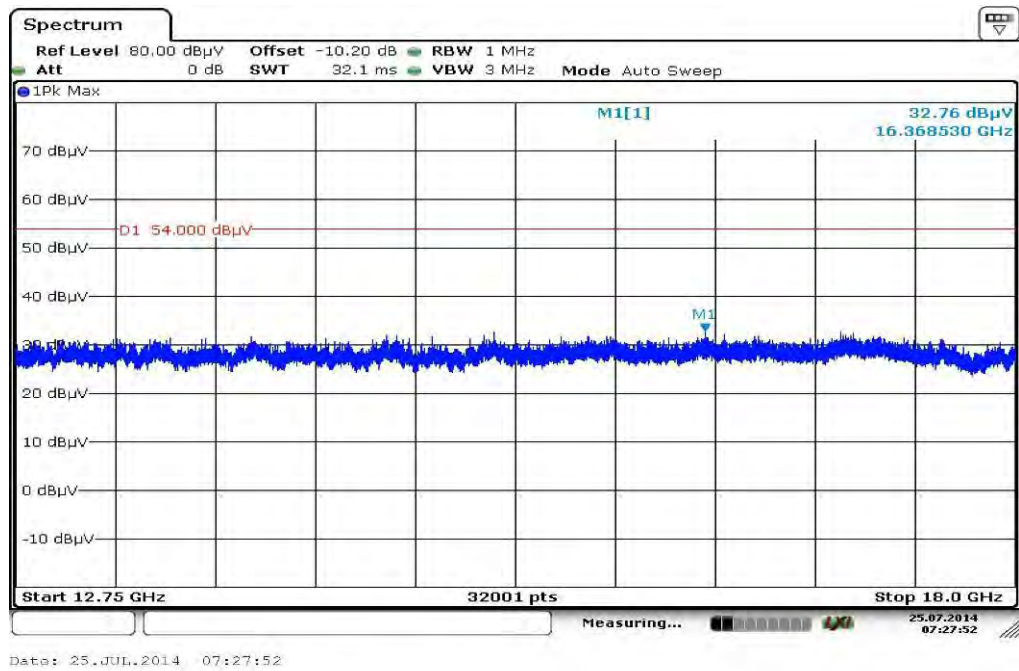
RX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
No spurious emissions above 1 GHz detected.		
Measurement uncertainty	± 3 dB	

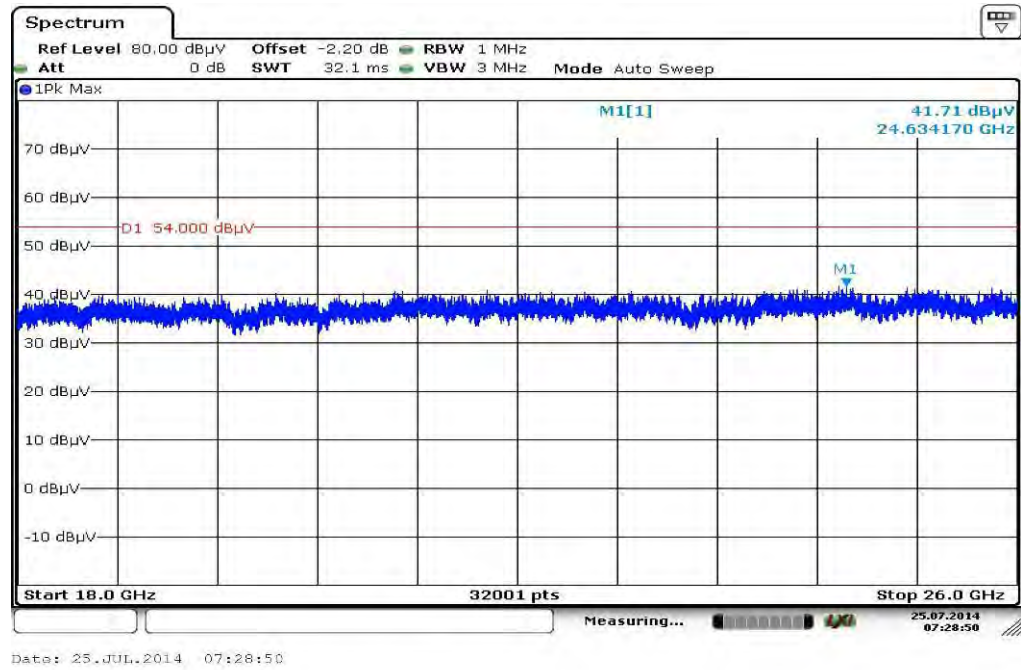
Result: **Passed.**

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)

Plots: RX / Idle – mode
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization

Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.207400	11.23	30.00	18.77	1000.0	120.000	101.0	V	269	13.8
40.651350	10.99	30.00	19.01	1000.0	120.000	170.0	H	269	14.0
53.597550	8.07	30.00	21.93	1000.0	120.000	98.0	V	246	12.1
736.532400	19.50	36.00	16.50	1000.0	120.000	170.0	H	115	22.4
841.996350	20.51	36.00	15.49	1000.0	120.000	166.0	H	179	23.3
904.650600	21.23	36.00	14.77	1000.0	120.000	98.0	V	295	24.1

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

10.12 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is representative for all channels and modes. 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 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
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

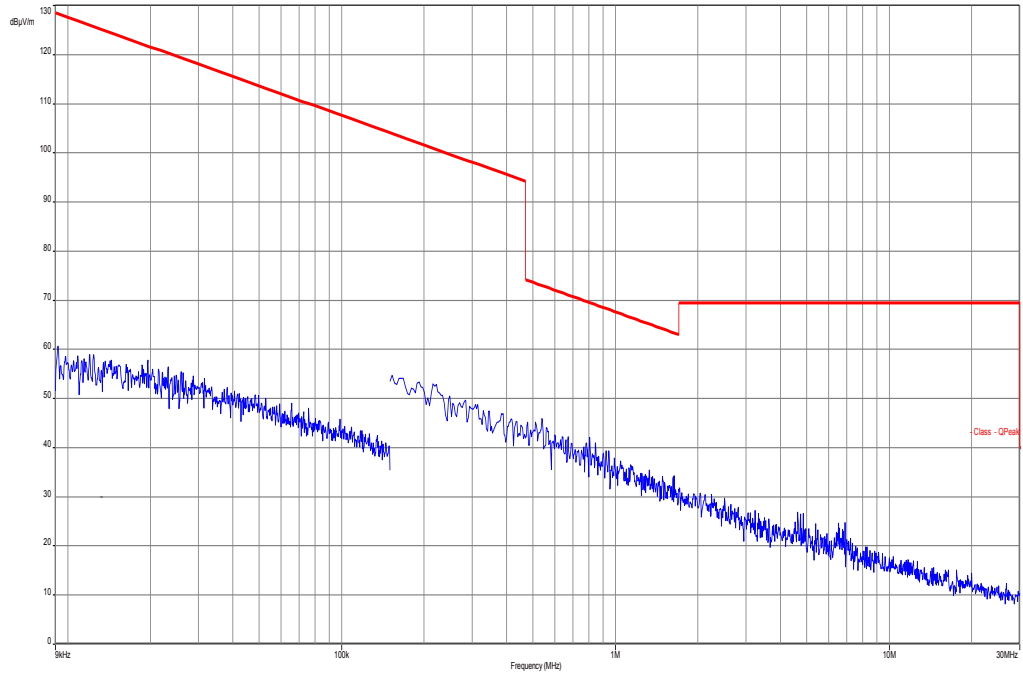
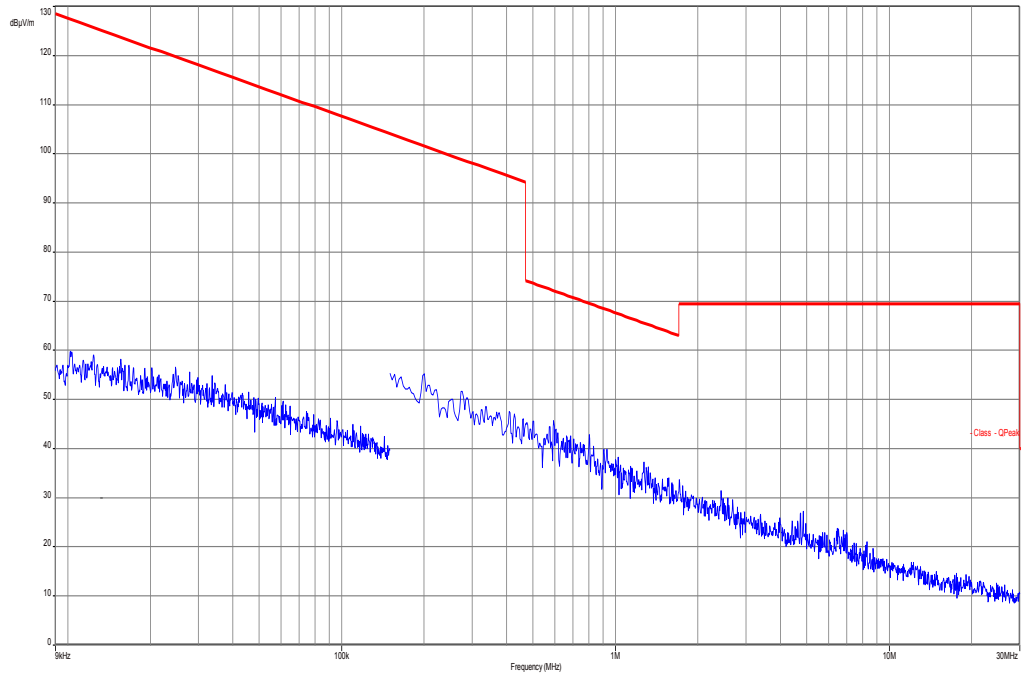
Limits:

FCC		IC
TX Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

TX Spurious Emissions Radiated < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
No emissions detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

Plots: TX mode**Plot 1: 9 kHz to 30 MHz****Plots: RX / Idle – mode****Plot 1: 9 kHz to 30 MHz**

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:

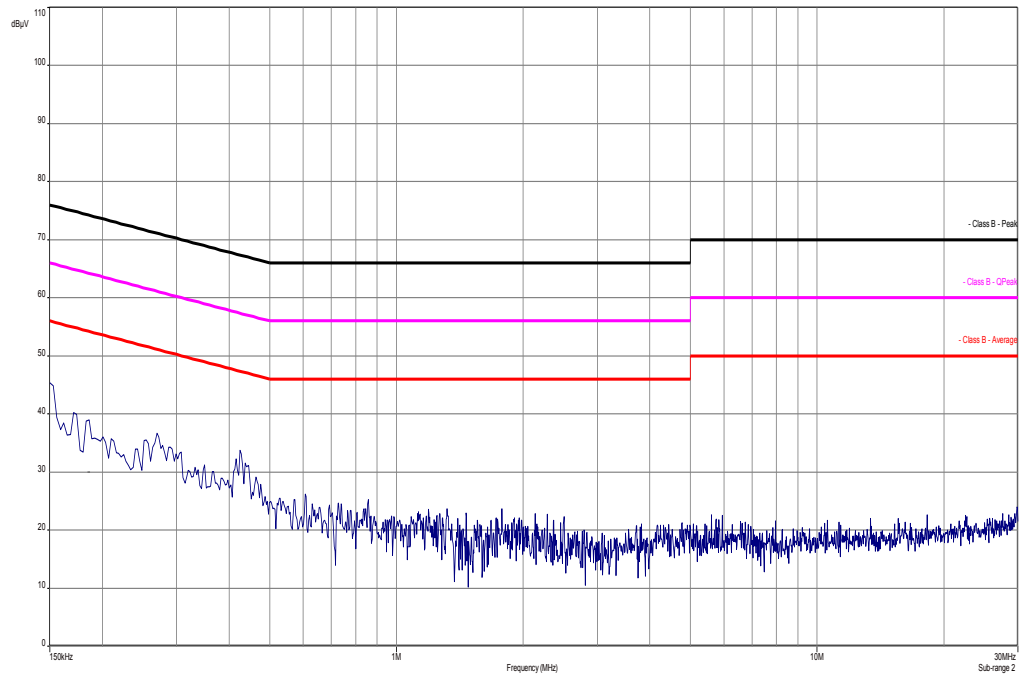
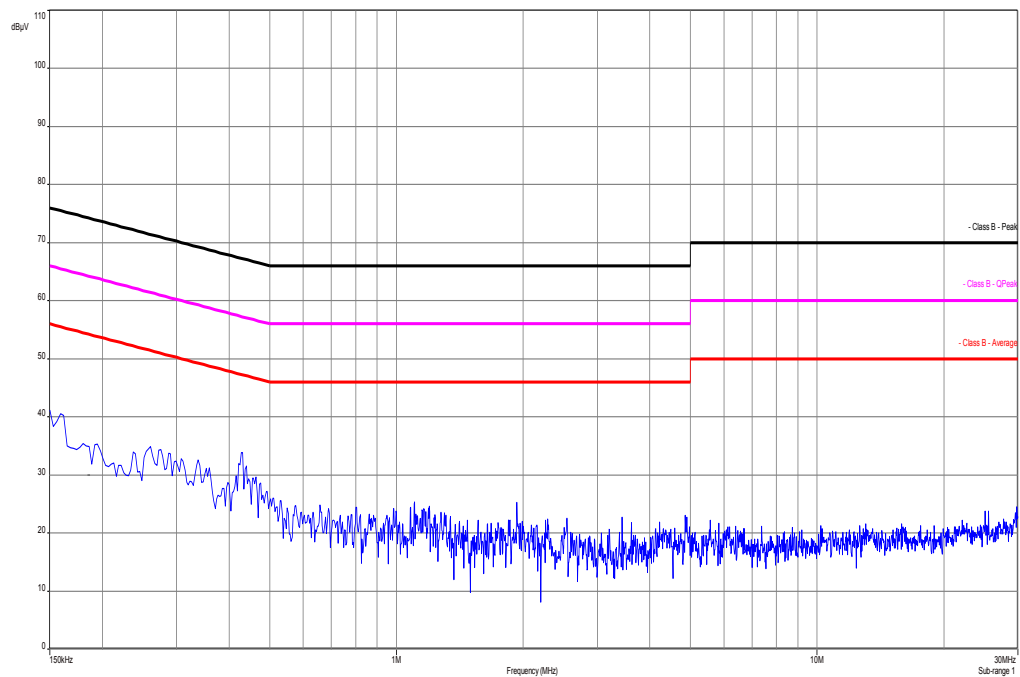
FCC		IC
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Average (dB μ V/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

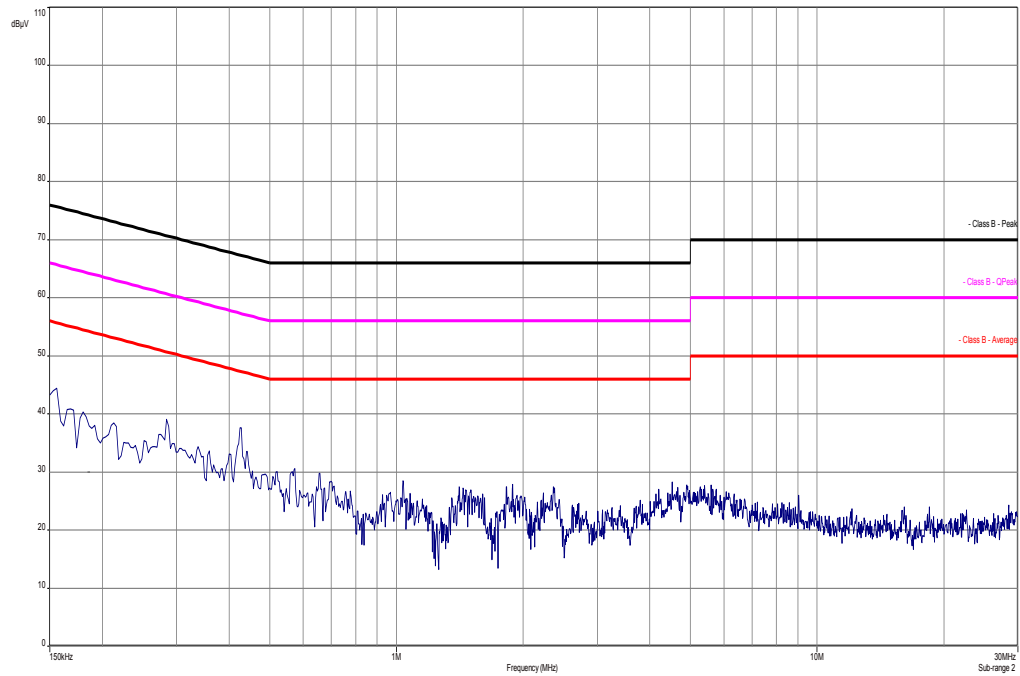
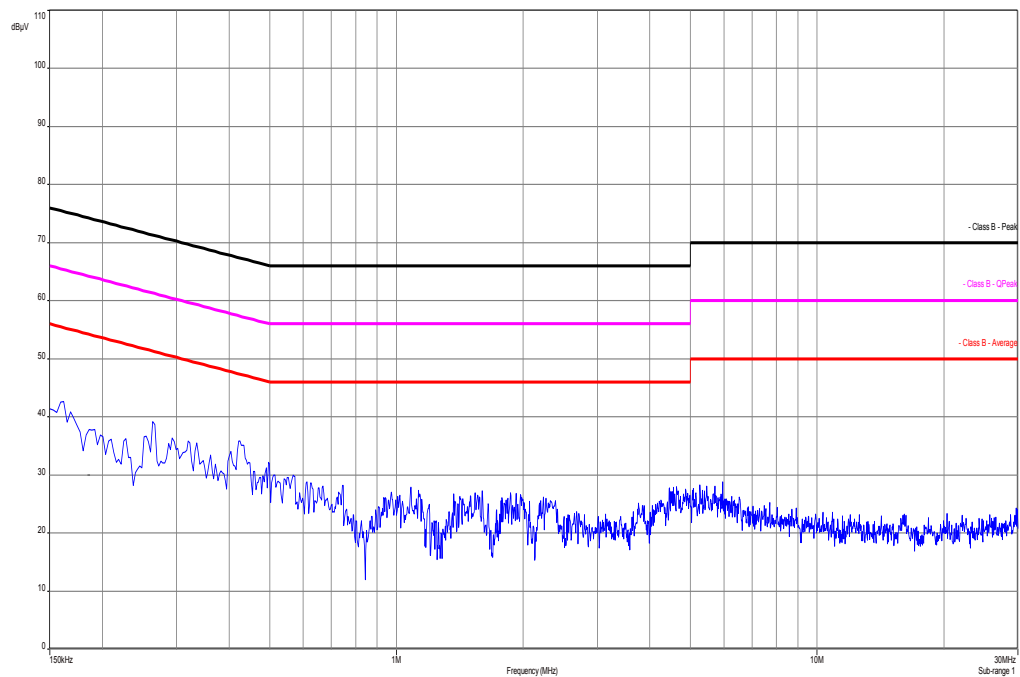
*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
No emissions detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

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

Plot 3: RX / Idle – mode, 150 kHz to 30 MHz, phase line**Plot 4: RX / Idle – mode, 150 kHz to 30 MHz, neutral line**

11 Test equipment and ancillaries used for tests

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 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).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
4	n. a.	Funkstörmessempfänger 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	28.02.2014	28.02.2015
5	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
6	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
7	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
9	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKII	08.05.2013	08.05.2015
10	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
11	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
12	9	Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155	ne		
13	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
14	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
15	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
16	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKII	14.10.2011	14.10.2014
17	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	13.03.2014	13.03.2015
18	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
19	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
20	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
21	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2014	21.01.2015
22	n. a.	Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562	vIKII	10.01.2013	10.01.2016
23	n. a.	PC-WLAN Tester	Intel Core i3 3220/3,3 GHz, Prozessor		2V2403033A4523	300004589	ne		

Agenda: Kind of Calibration

k calibration / calibrated
 ne not required (k, ev, izw, zw not required)
 ev periodic self verification
 Ve long-term stability recognized
 vIKII Attention: extended calibration interval
 NKI Attention: not calibrated

EK limited calibration
 zw cyclical maintenance (external cyclical maintenance)
 izw internal cyclical maintenance
 g blocked for accredited testing
 *) next calibration ordered / currently in progress

12 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	2014-08-07
-A	Measurement procedure change	2014-09-22
-B	Add radiated BEC measurement plots & editorial changes	2014-10-01

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

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
 WiMax und Richtfunk
 Mobilfunk (GSM / GPRS, Over the Air (OTA) 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 Beschluss vom 07.03.2014 mit der
 Akkreditierungsnummer D-PL-12076-01 und ist gültig 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

Gefahrlos nach der Bescheinigung

Dr. Ingrid Hoffmann
 Akkreditierungsstellenleiter

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 38115 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde basiert auf 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 erfolgt gemäß des Gesetzes über die Akkreditierungsstellen (AkkStelleG) vom
 31. Juli 2009 (BGBl. I S. 2075) 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 (Abg. L 218 vom 9. Juli 2008, S. 30).
 Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der
 Kompetenzen (ILAC), der Internationalen Akkreditierungsstelle (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.eurasian-accreditation.org
 ILAC: www.ilac.org
 IAF: www.iaf.eu

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>