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

TEST REPORT

Test report no.: 1-6965/13-13-18

Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH

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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-12076-01-01

Area of Testing:

Radio Communications & EMC (RCE)

Applicant

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

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e-mail: Micke.nilsson@sonymobile.com

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Manufacturer

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

Test standard/s

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: Tablet PC WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS**Type name:** TS-0020-BV**Model name:** SGP511**IC:** 4170B-TS0020**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 – mode and n HT20 – mode)**Antenna:** Integrated antenna**Power supply:** 3.7 V DC by Li - polymer battery**Temperature range:** -20°C to +55°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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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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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2013-12-19
Date of receipt of test item:	2014-01-27
Start of test:	2014-01-27
End of test:	2014-01-28
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
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	2013-04	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}	+55 °C during high temperature tests
	T_{min}	-20 °C during low temperature tests
Relative humidity content:		39 %
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	:	Tablet PC WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS
Type name	:	TS-0020-BV
Model name	:	SGP511
S/N serial number	:	Conducted unit: CB51268F4Y Radiated unit: CB51268FN3
HW hardware status	:	AP1
SW software status	:	RF test software
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	:	-20°C to +55°C

5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-6965/13-13-01_AnnexA
 1-6965/13-13-01_AnnexB
 1-6965/13-13-01_AnnexD

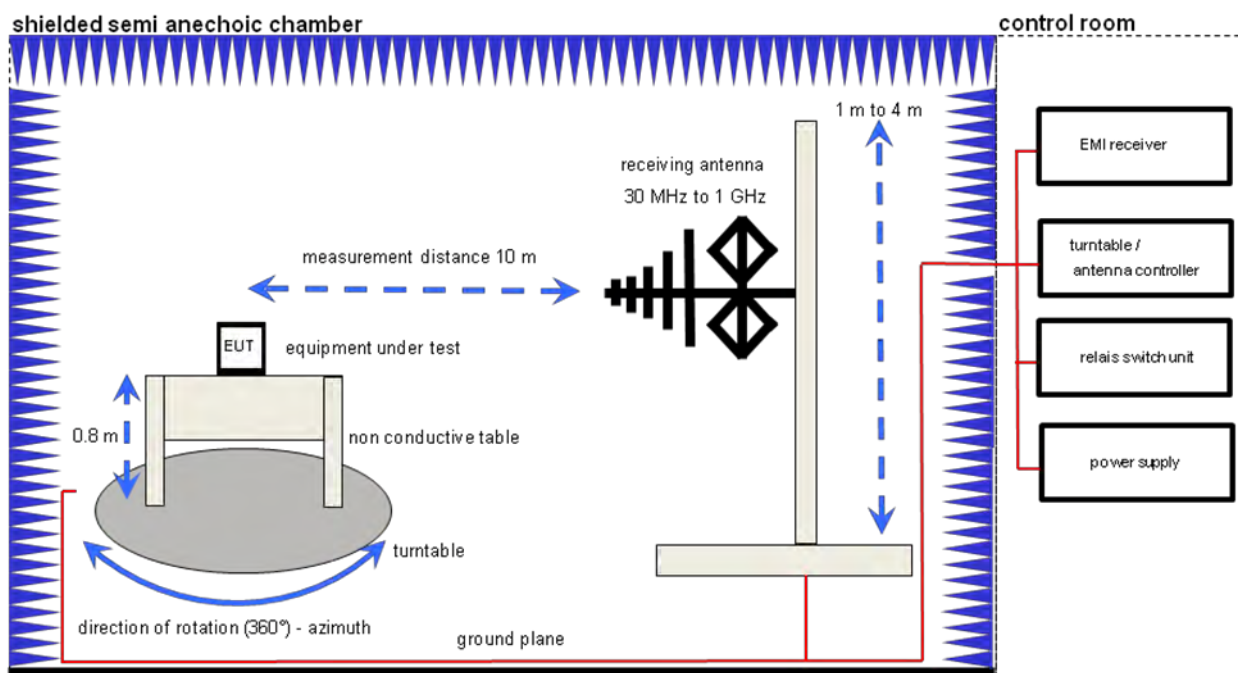
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

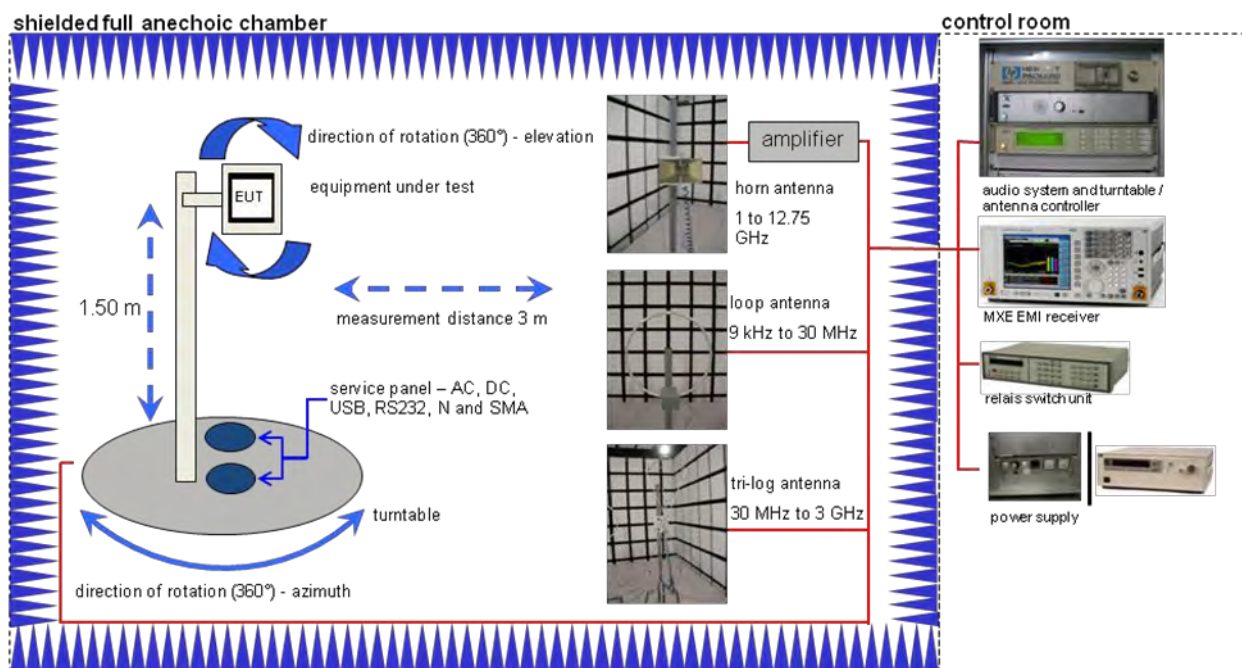
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas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

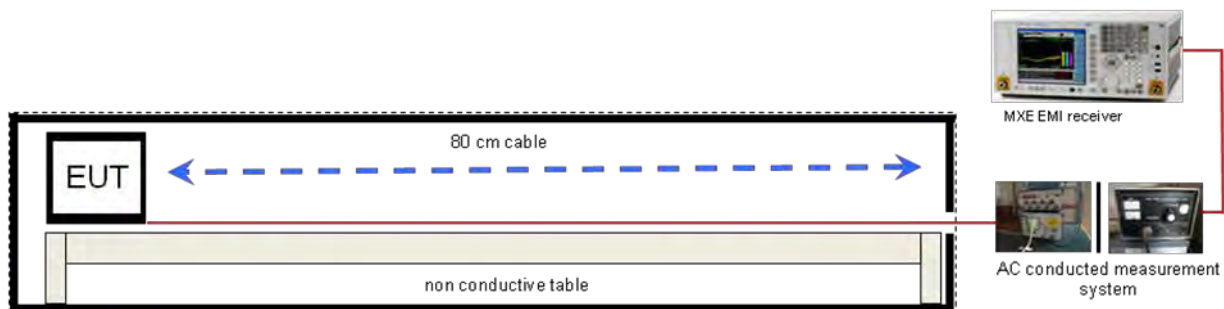
7.3 Radiated measurements 12.75 GHz to 26 GHz



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
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

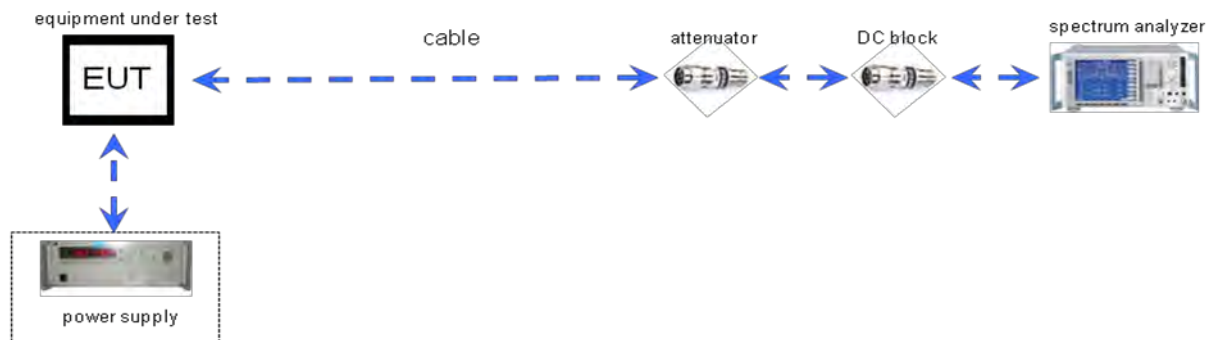
7.4 AC conducted



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	RSS 210, Issue 8	Passed	2014-02-05	-/-

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
RSS 210 / A8.4(2)	Antenna gain	-/-	Nominal	Nominal	DSSS	☒	☐	☐	☐	complies
RSS 210 / A8.2(b)	Power spectral density	KDB 558074 DTS clause: 10.2	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS 210 / A8.2(a)	Spectrum bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.2	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS Gen. clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS-210 / A8.4(4)	Maximum output power	KDB 558074 DTS clause: 9.1.2	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS-210 / A8.5	Band edge compliance conducted	KDB 558074 DTS clause: 13.2.1	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS-210 / A8.5	Band edge compliance radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS-210 / A8.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS-210 / A8.5	TX spurious emissions radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
RSS-Gen.	RX spurious emissions radiated	-/-	Nominal	Nominal	-/-	☒	☐	☐	☐	complies
RSS-Gen.	TX spurious emissions radiated < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
-/-	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 RSP100 test report cover sheet / performance test data

Test report number	:	1-6965/13-13-18				
Equipment model number:		SGP511				
Certification number	:	4170B-TS0020				
Manufacturer (complete address)	:	Sony Mobile Communications AB Nya Vattentorget 22188 Lund / SWEDEN				
Tested to radio standards specification no.	:	RSS 210, Issue 8				
Open area test site IC No.	:	IC 3462C-1				
Frequency range	:	DTS band 2400 MHz to 2483.5 MHz				
RF-power (max.)	:	Conducted values:				
		Band	b – mode	g – mode	n HT20 – mode	n HT40 – mode
		2412 – 2462 MHz	19.77 mW	52.36 mW	63.97 mW	
		2422 – 2462 MHz				-/-
		Radiated values:				
		Band	b – mode	g – mode	n HT20 – mode	n HT40 – mode
		2412 – 2462 MHz	22.44 mW	59.02 mW	72.61 mW	
		2422 – 2462 MHz				-/-
Occupied bandwidth (99%-BW)	:	Band	b – mode	g – mode	n HT20 – mode	n HT40 – mode
		2412 – 2462 MHz	11.21 MHz	17.79 MHz	18.43 MHz	
		2422 – 2462 MHz				-/-
Necessary bandwidth (calculated)	:	Band	b – mode	g – mode	n HT20 – mode	n HT40 – mode
		2412 – 2462 MHz	12.80 MHz	16.88 MHz	16.88 MHz	
		2422 – 2462 MHz				-/-
Emission classification	:	(according TRC-43)	G1D	G7D	G7D	-/-
Type of modulation	:	DSSS & OFDM technology with BPSK, QPSK, 16 – and 64 – QAM modulation.				
Antenna information	:	Integrated antenna				
Transmitter spurious IdBuV/m @ 3m	:	60 @ 2390 MHz (peak); 39.5 @ 2390 MHz (AVG)				

ATTESTATION:

DECLARATION OF COMPLIANCE:

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory manager:

2014-02-05
Date

Marco Bertolino
Name


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 2014.02.05 16:25:51 +01'00'

Signature

11 Measurement results**11.1 Antenna gain****Limits:**

FCC	IC
Antenna Gain	
6 dBi	

Results:

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Gain [dBi] Declared by the manufacturer		0.9	0.8	0.3
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

Result: **Passed**

11.2 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	2Mbit/s	2Mbit/s	2Mbit/s
OFDM / g – mode	9Mbit/s	6Mbit/s	6Mbit/s
OFDM / n – mode	MCS0	MCS0	MCS0

11.3 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	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	40 MHz
Integration bandwidth:	75 % power - bandwidth (DTS BW)
Trace-Mode:	Max hold (allow trace to fully stabilize)
Measurement function:	Channel power with DTS BW

Limits:

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

Results: DSSS / b – mode

DSSS / b – mode Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Peak output power conducted Worst case data rate	12.31	12.71	12.96
Output Power Radiated – EIRP*) Worst case data rate	13.21	13.51	13.26
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*) calculated with Antenna gain

Result: Passed

Results: OFDM / g – mode

OFDM / g – mode Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Peak output power conducted Worst case data rate	16.74	16.91	17.19
Output Power Radiated – EIRP*) Worst case data rate	17.64	17.71	17.49
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*) calculated with Antenna gain

Result: Passed**Results: OFDM / n – mode HT 20**

OFDM / n – mode HT20 Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Peak output power conducted Worst case data rate	17.71	17.79	18.06
Output Power Radiated – EIRP*) Worst case data rate	18.61	18.59	18.36
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*) calculated with Antenna gain

Result: Passed

11.4 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: 10.2	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Span:	40 MHz
Trace-Mode:	Max hold (allow trace to fully stabilize)

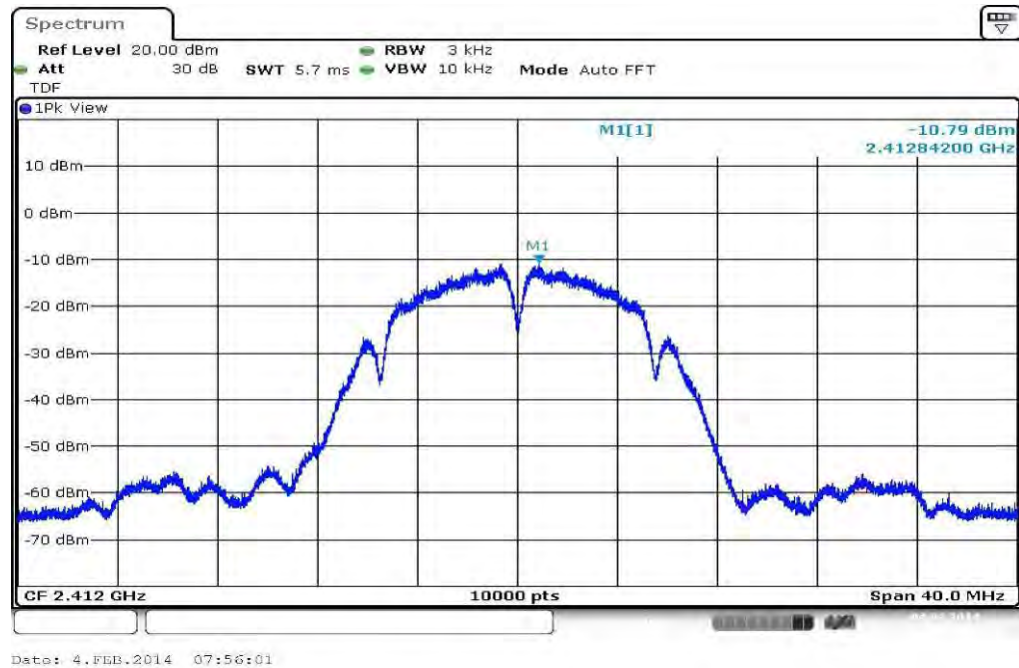
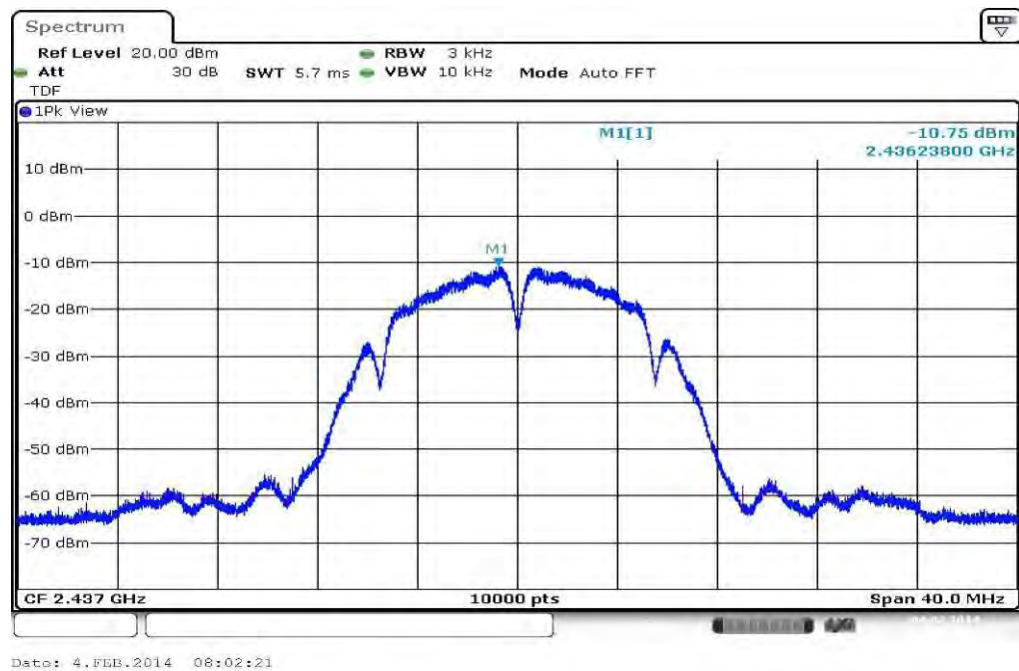
Limits:

FCC	IC
Power Spectral Density	
8 dBm (conducted)	

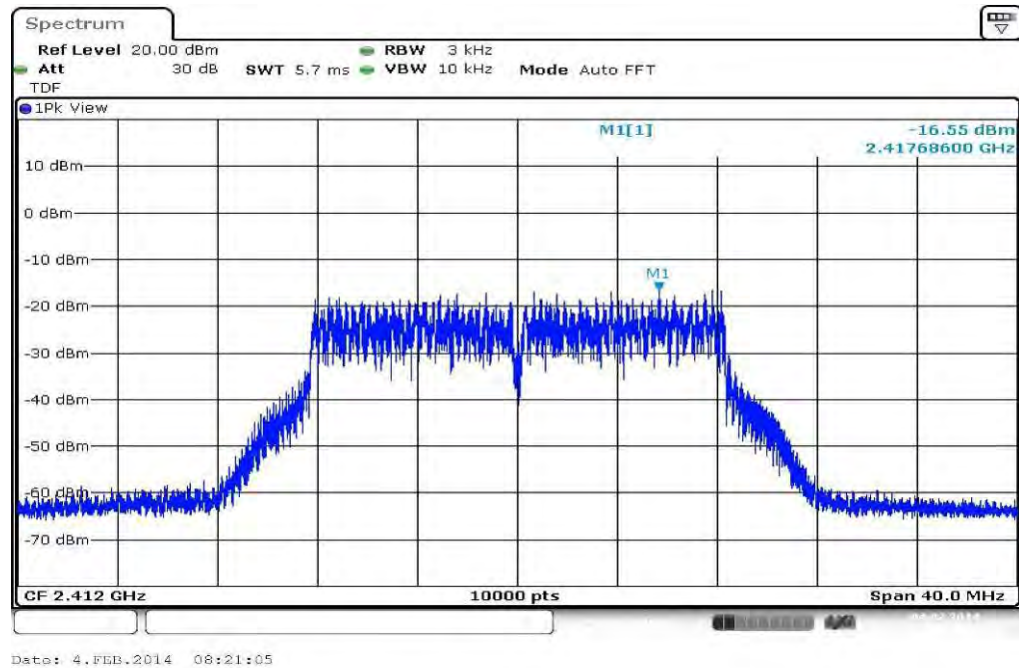
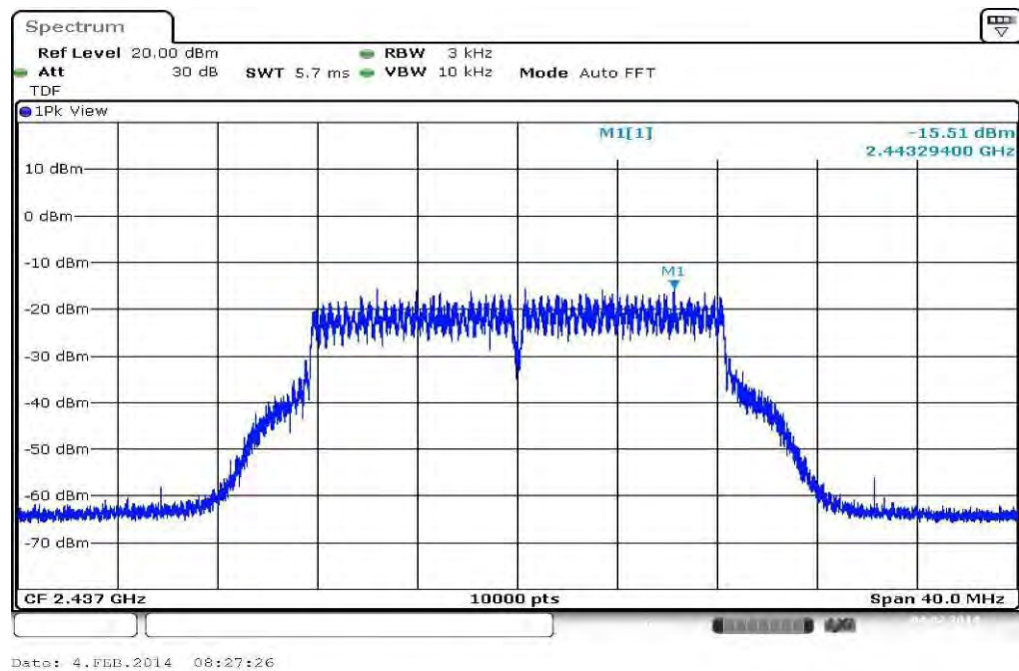
Results:

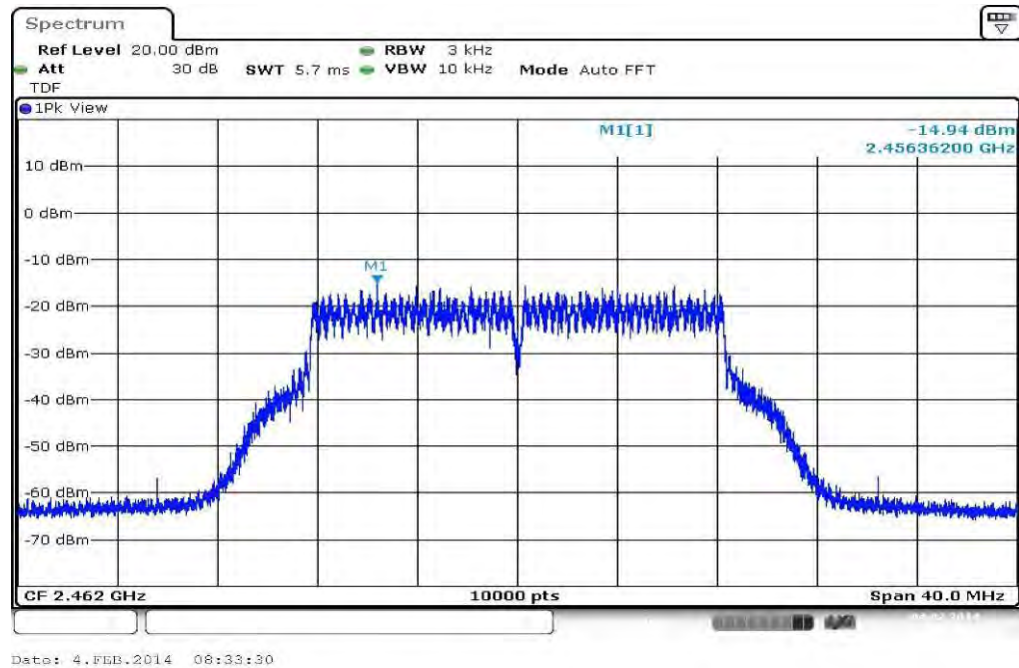
Modulation Frequency	Power Spectral density [dBm]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	-10.79	-10.75	-9.46
OFDM / g – mode	-16.55	-15.51	-14.94
OFDM / n – mode	-15.43	-15.00	-14.76
Measurement uncertainty	± 1.5 dB		

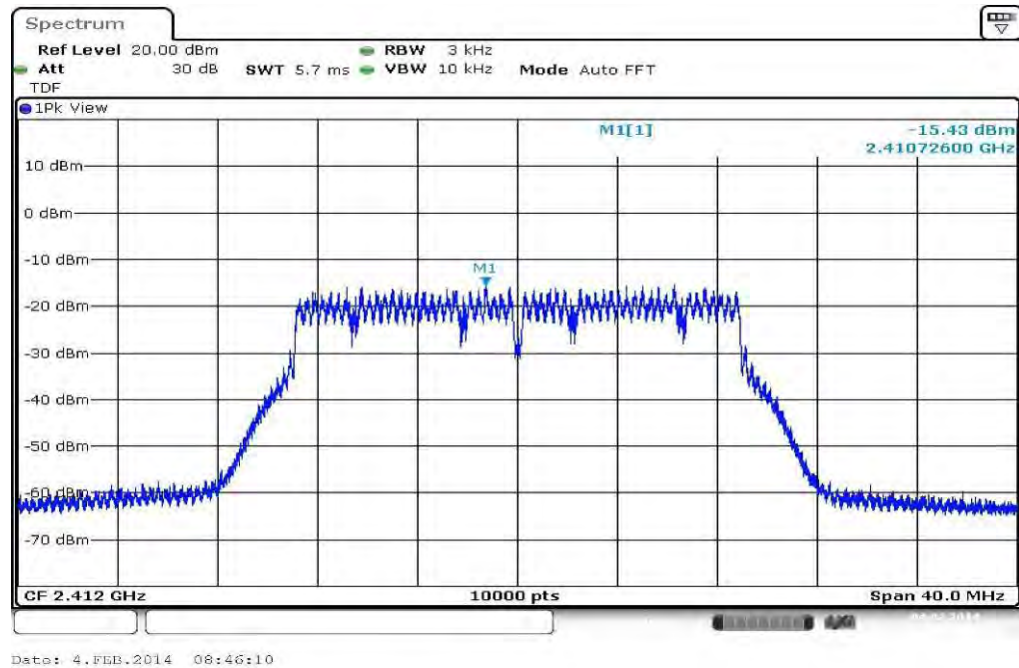
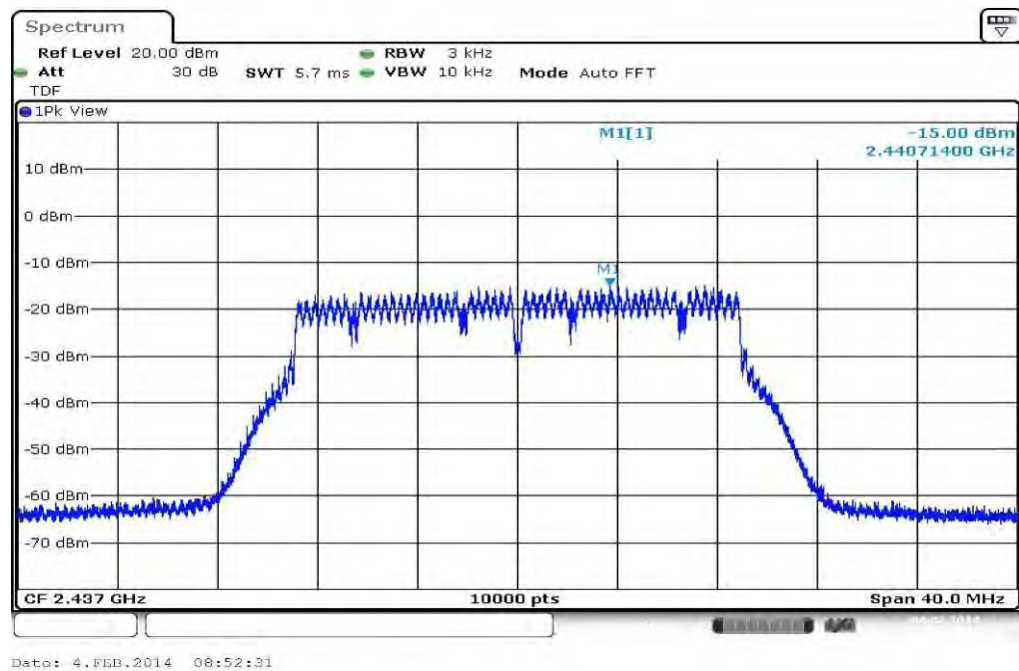
Result: **Passed**

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

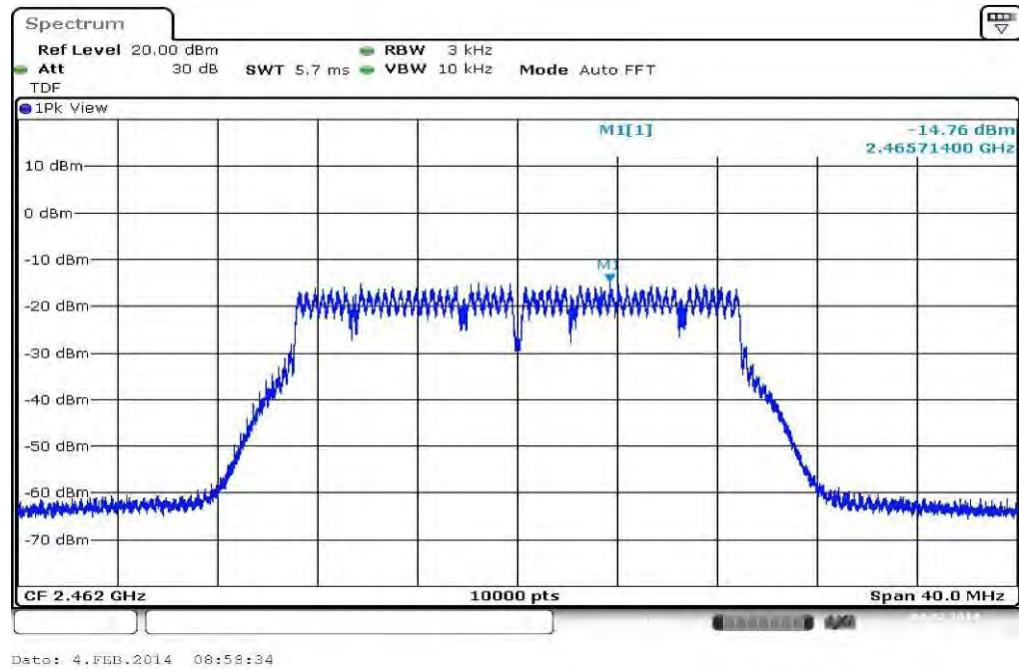
Plot 3: TX mode, highest channel

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 – mode**Plot 1: TX mode, lowest channel****Plot 2: TX mode, middle channel**

Plot 3: TX mode, highest channel



11.5 Spectrum bandwidth – 6 dB

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to DTS clause: 8.2	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	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
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: DSSS / b – mode

Modulation Frequency	6 dB bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	5.74	5.70	5.74
Measurement uncertainty	± RBW		

Result: **Passed**

Results: OFDM / g – mode

Modulation Frequency	6 dB bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
OFDM / g – mode	12.50	12.08	12.44
Measurement uncertainty	± RBW		

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

Modulation Frequency	6 dB bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
OFDM / n – mode HT20	13.32	12.98	13.30
Measurement uncertainty	± RBW		

Result: Passed

11.6 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:	500 kHz
Video bandwidth:	3 MHz
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:

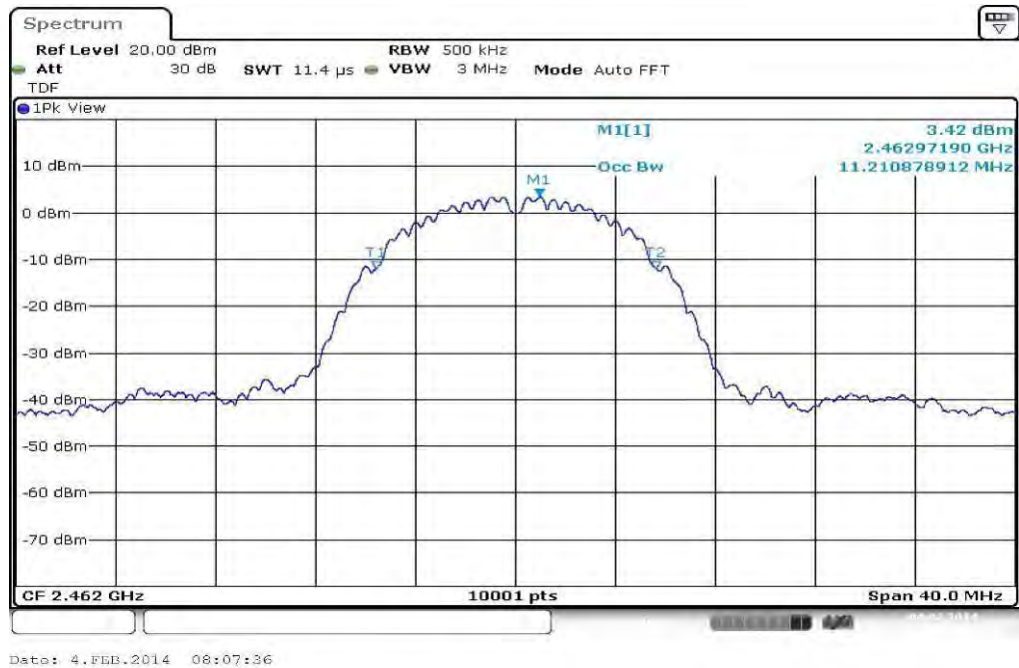
-/-	IC
Occupied Bandwidth – 99% emission bandwidth	
OBW is necessary for Emission Designator	

Results:

Modulation Frequency	99 % bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	11.21	11.05	11.21
OFDM / g – mode	17.38	17.69	17.79
OFDM / n – mode	18.34	18.43	18.34
Measurement uncertainty	± RBW		

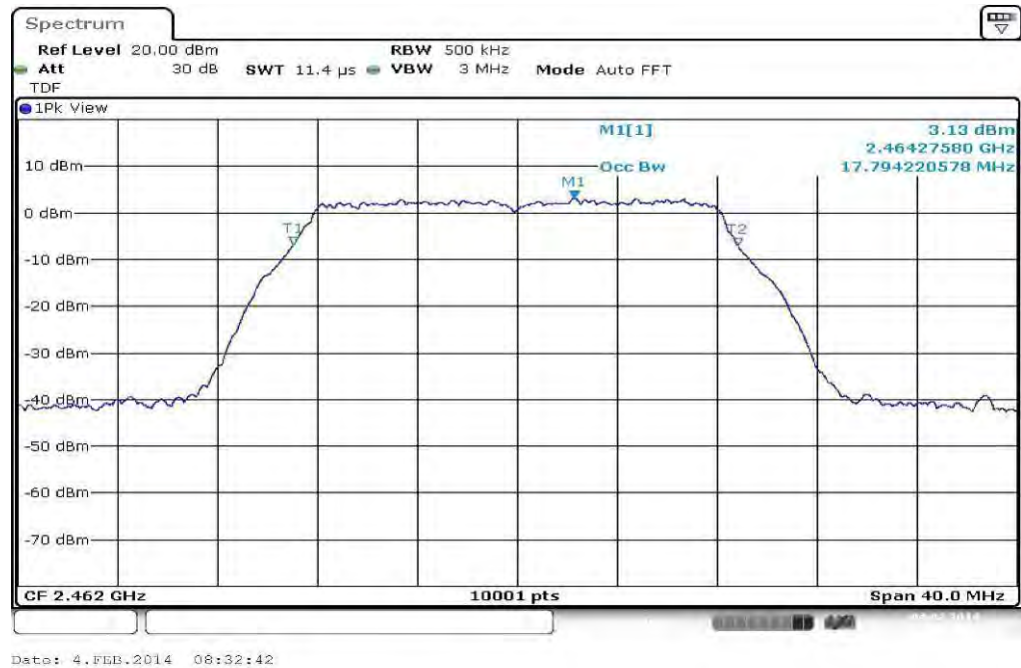
Result: **Passed**

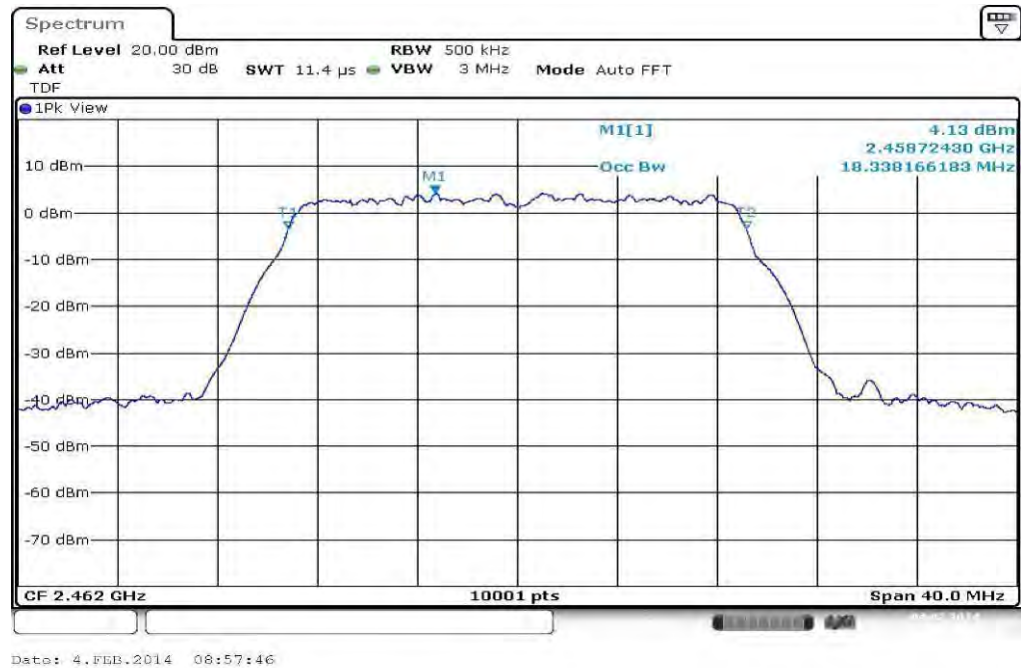
Plots: DSSS / b – mode**Plot 1: TX mode, lowest channel****Plot 2: TX mode, middle channel**

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



Plot 3: TX mode, highest channel

11.7 Band edge compliance 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	
According to DTS clause: 13.2.1	
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

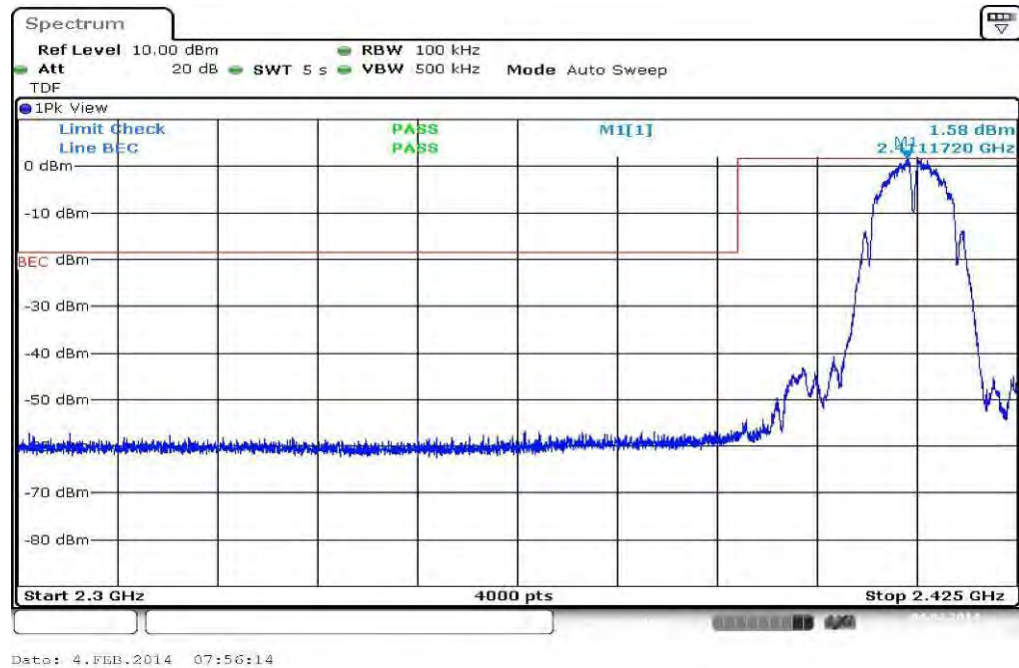
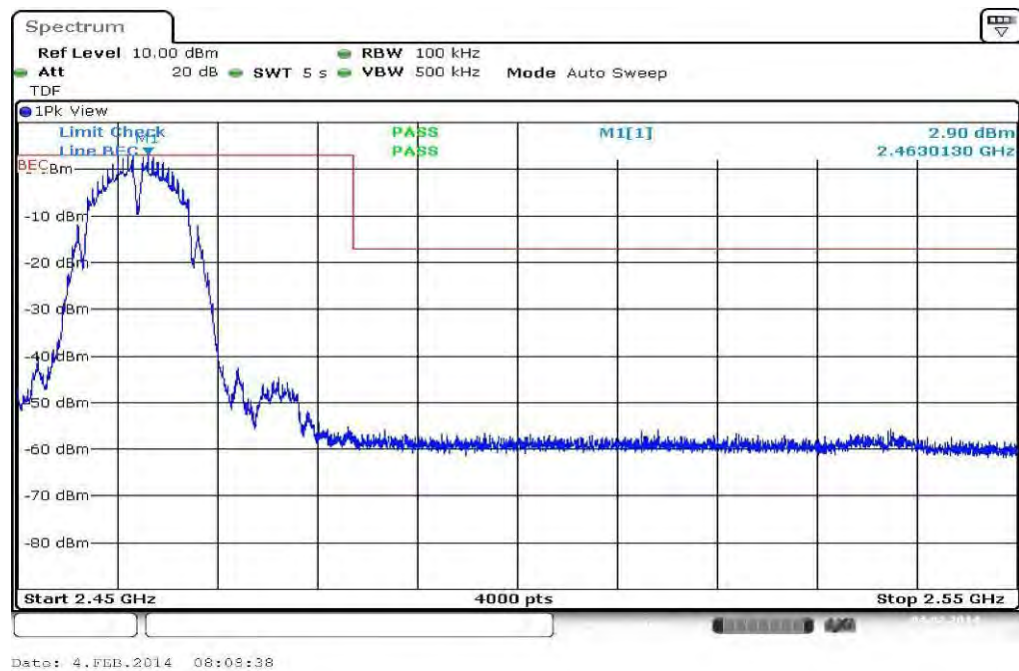
Limits:

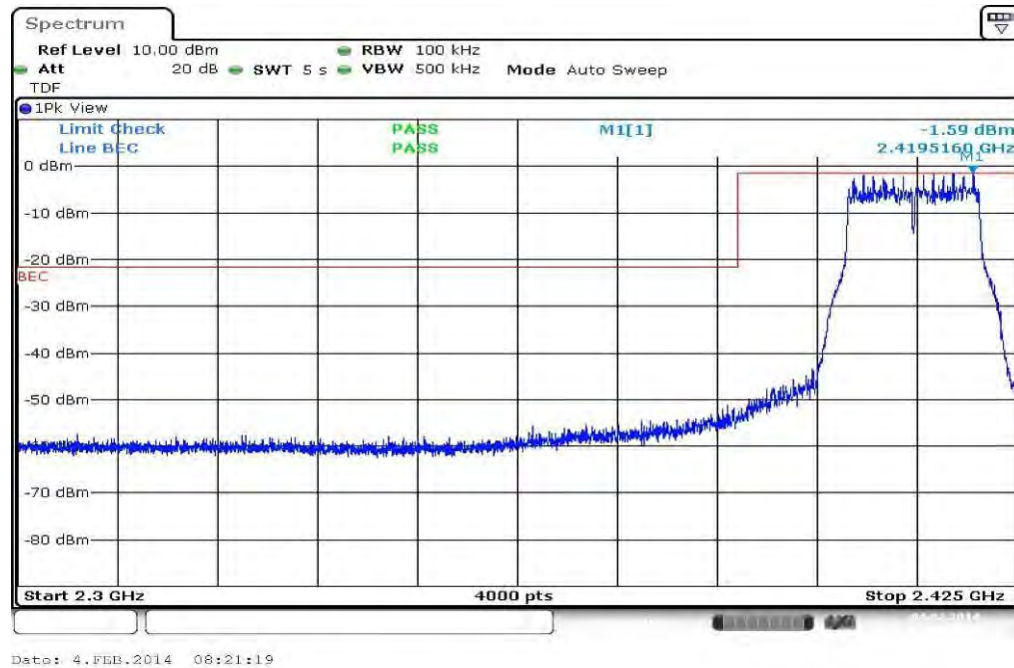
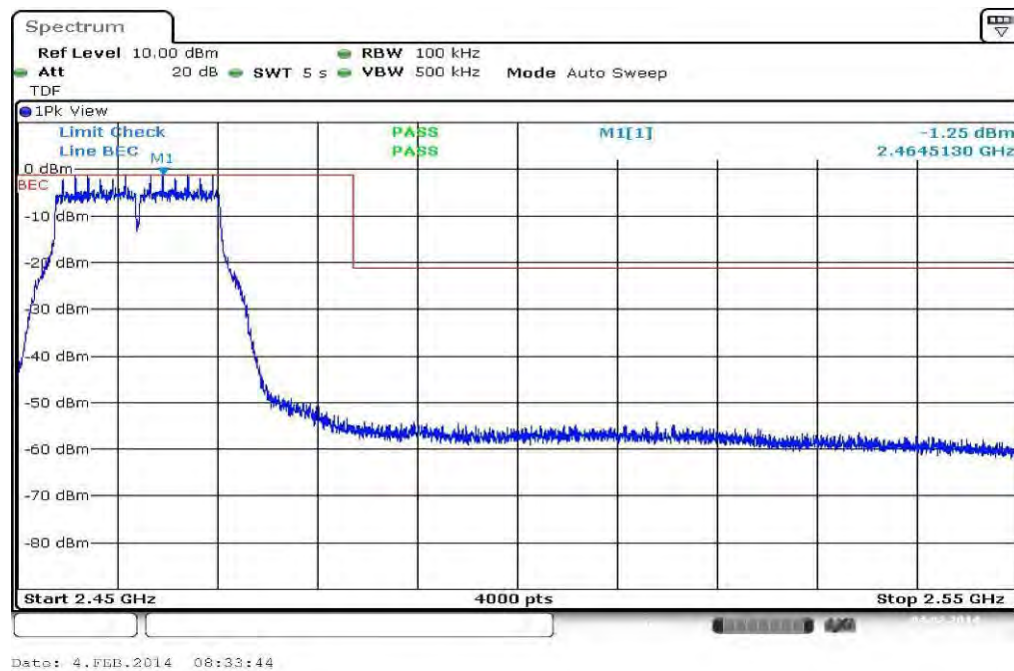
FCC	IC
Band Edge Compliance Conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.	

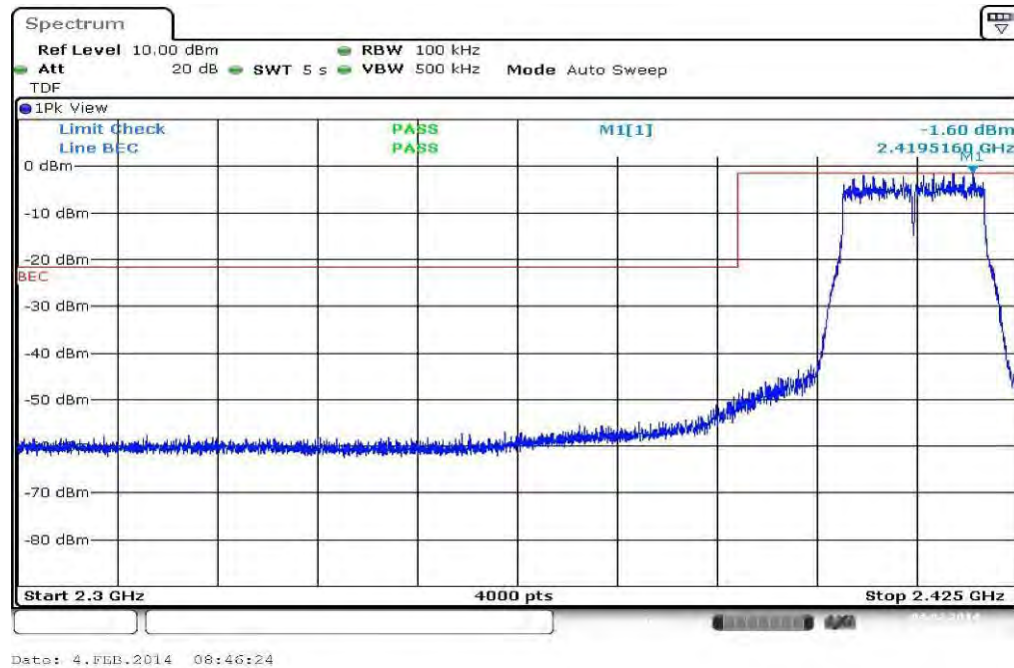
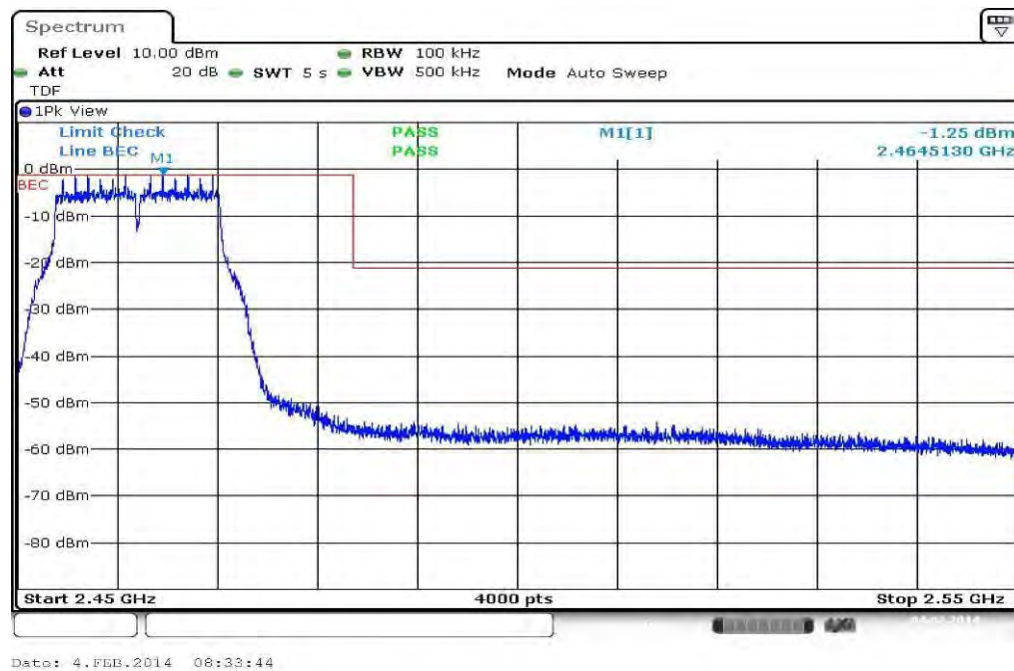
Results:

Scenario Modulation	Band Edge Compliance Conducted [dB]		
	DSSS / b – mode	OFDM / g – mode	OFDM / n – mode
Lower Band Edge – Channel 1	> 20 dB	> 20 dB	> 20 dB
Upper Band Edge – Channel 11	> 20 dB	> 20 dB	> 20 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 – mode**Plot 1: TX mode, lower band edge****Plot 2: TX mode, upper band edge**

11.8 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	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz / 1 MHz
Video bandwidth:	1 MHz / 10 Hz
Span:	See plot!
Trace-Mode:	Max Hold

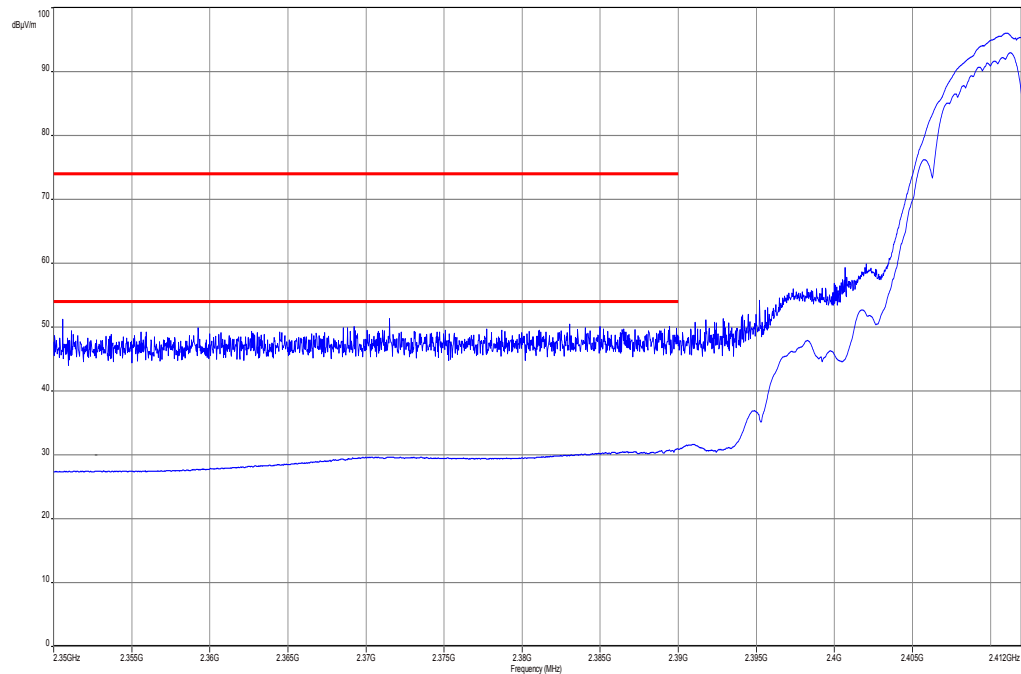
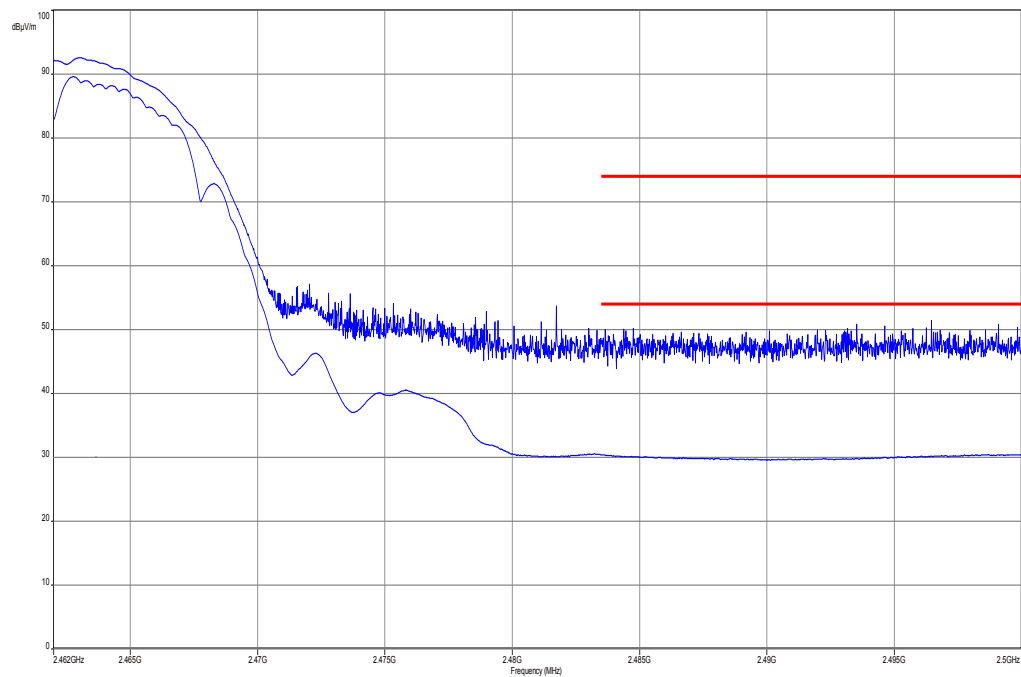
Limits:

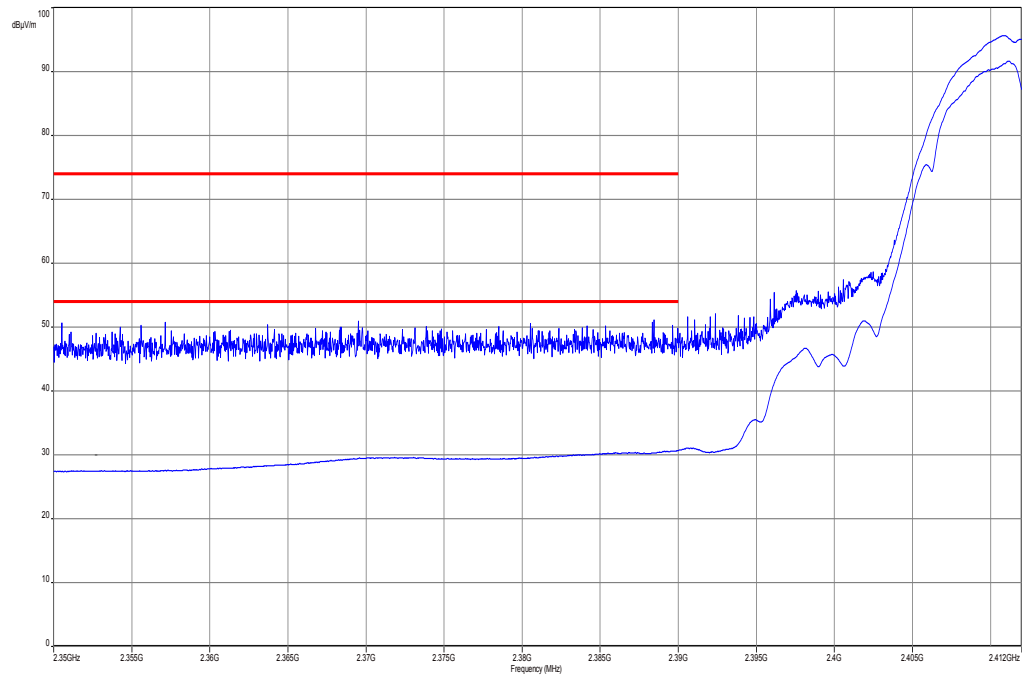
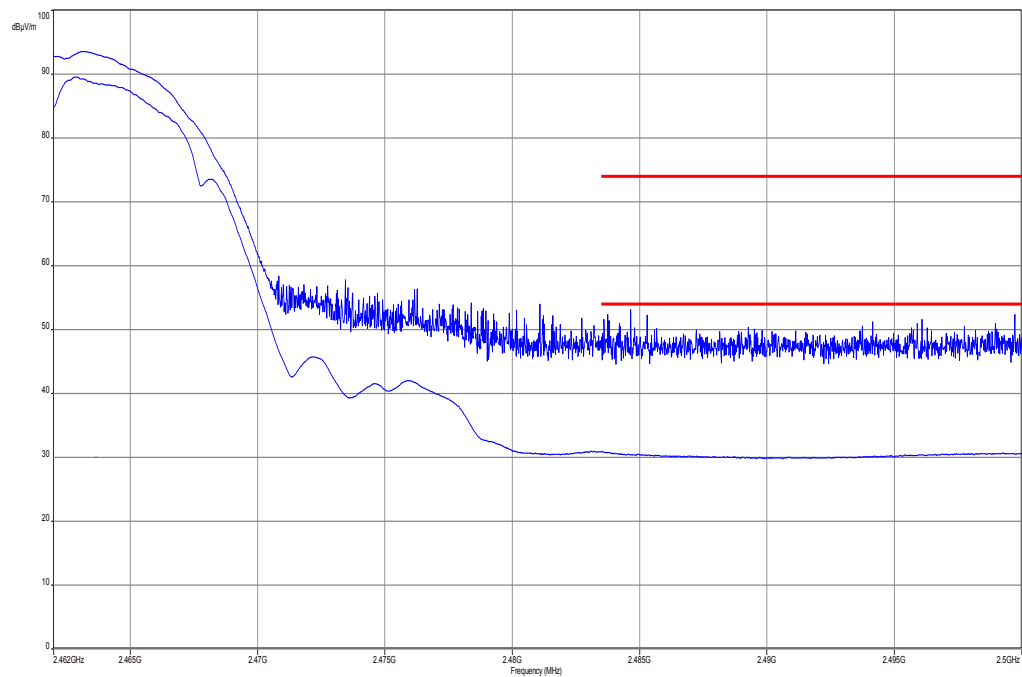
FCC	IC
Band Edge Compliance Radiated	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth 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)).	
54 dB μ V/m AVG	

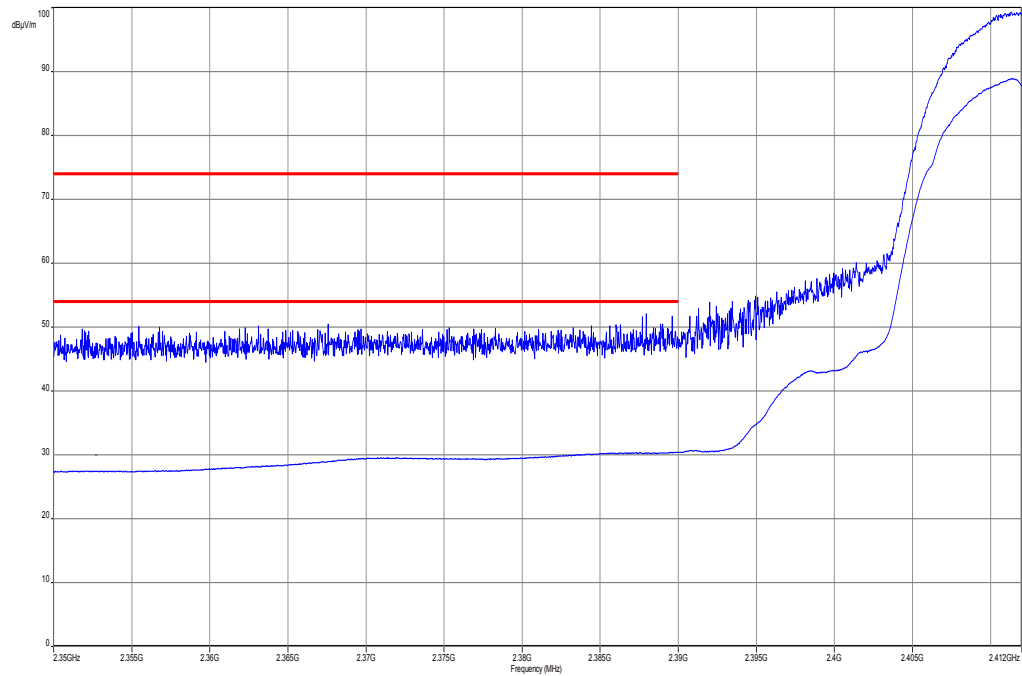
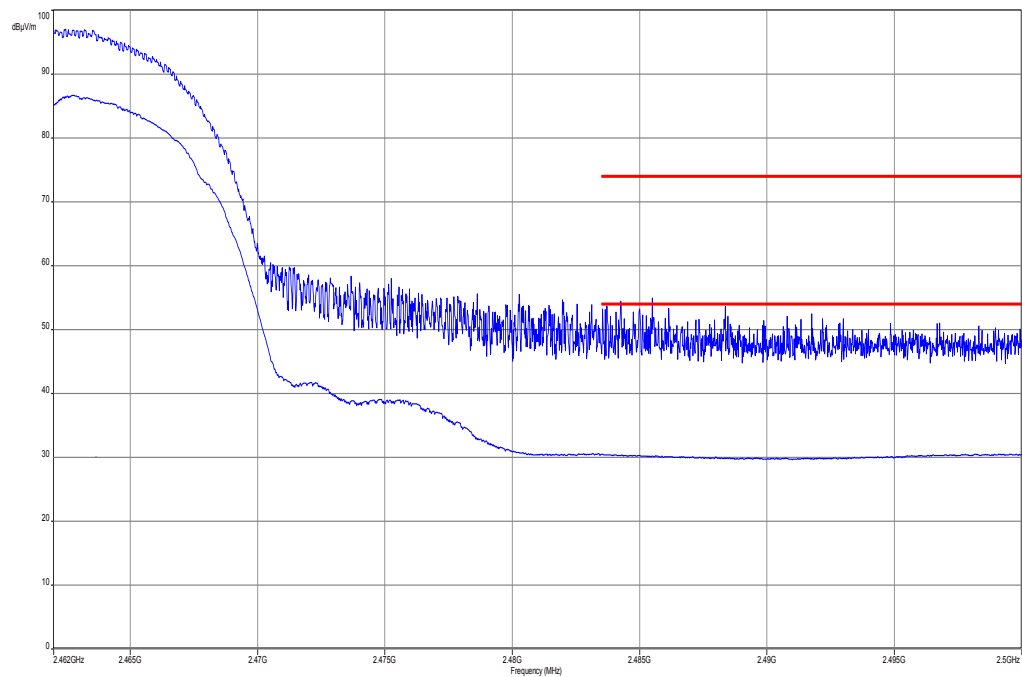
Results:

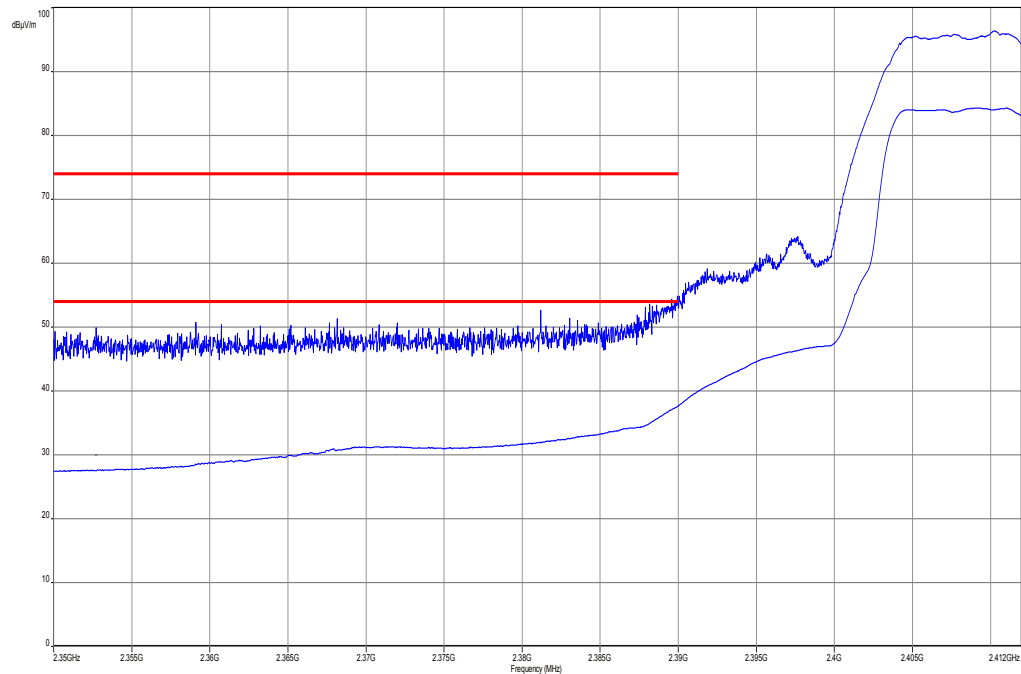
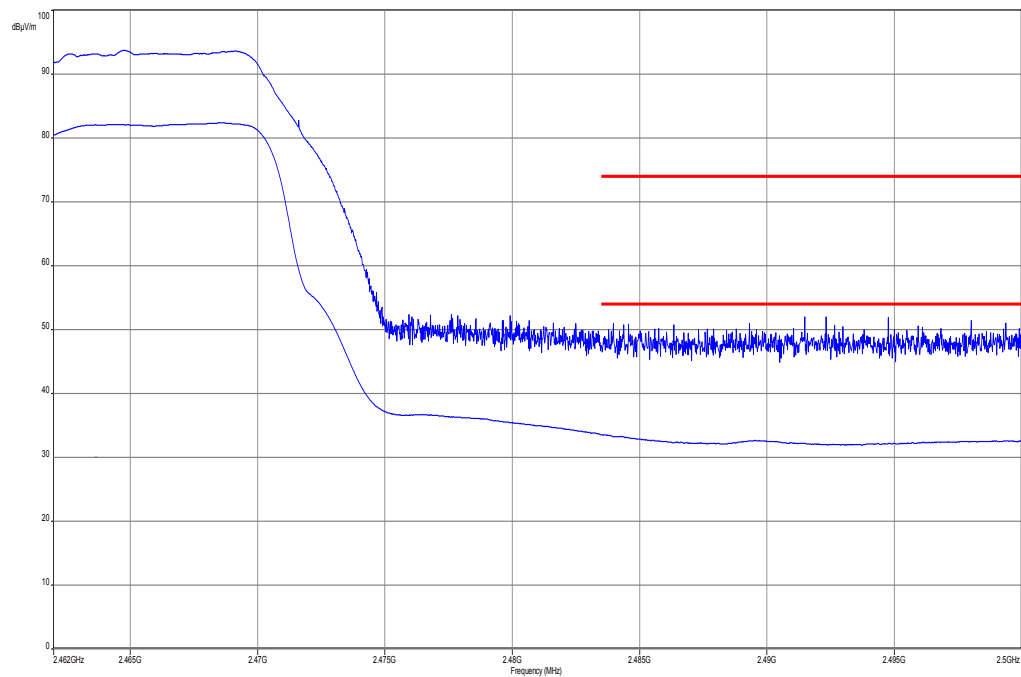
Scenario Modulation	Band Edge Compliance Conducted [dB]		
	DSSS / b – mode	OFDM / g – mode	OFDM / n – mode
Lower Band Edge – Channel 1	> 20 dB (Peak) > 20 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)
Upper Band Edge – Channel 11	> 20 dB (Peak) > 20 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)
Measurement uncertainty	± 3 dB		

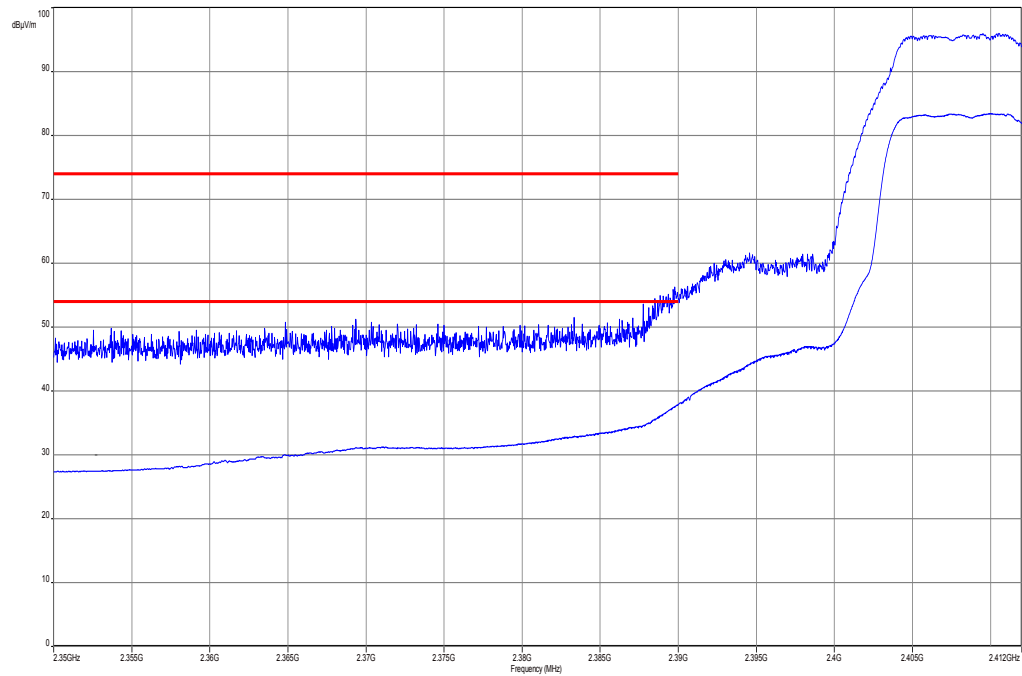
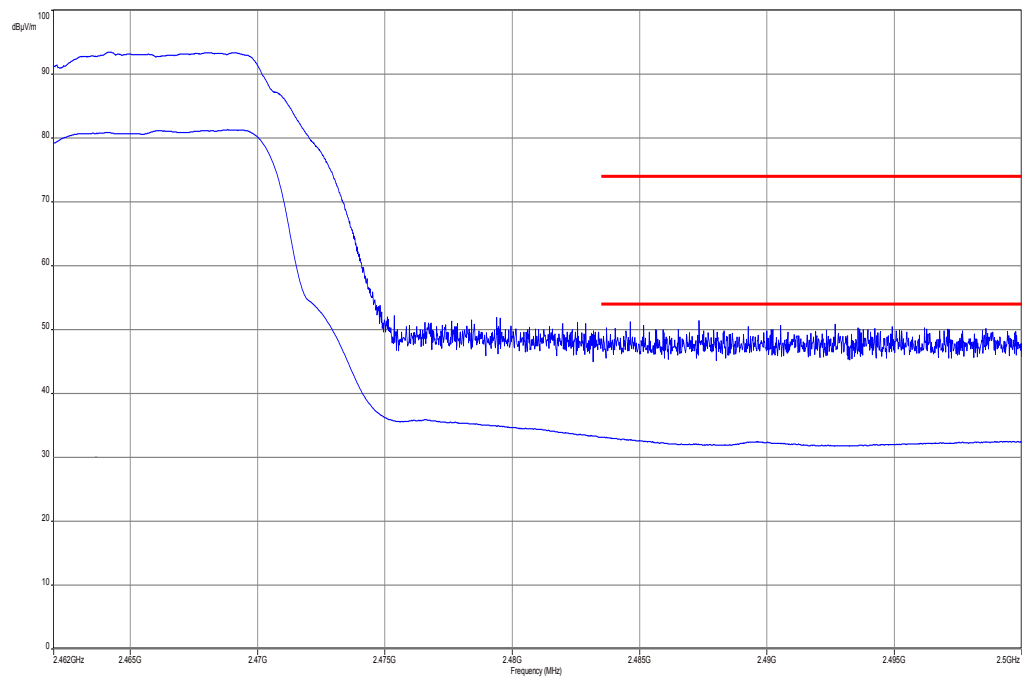
Result: Passed

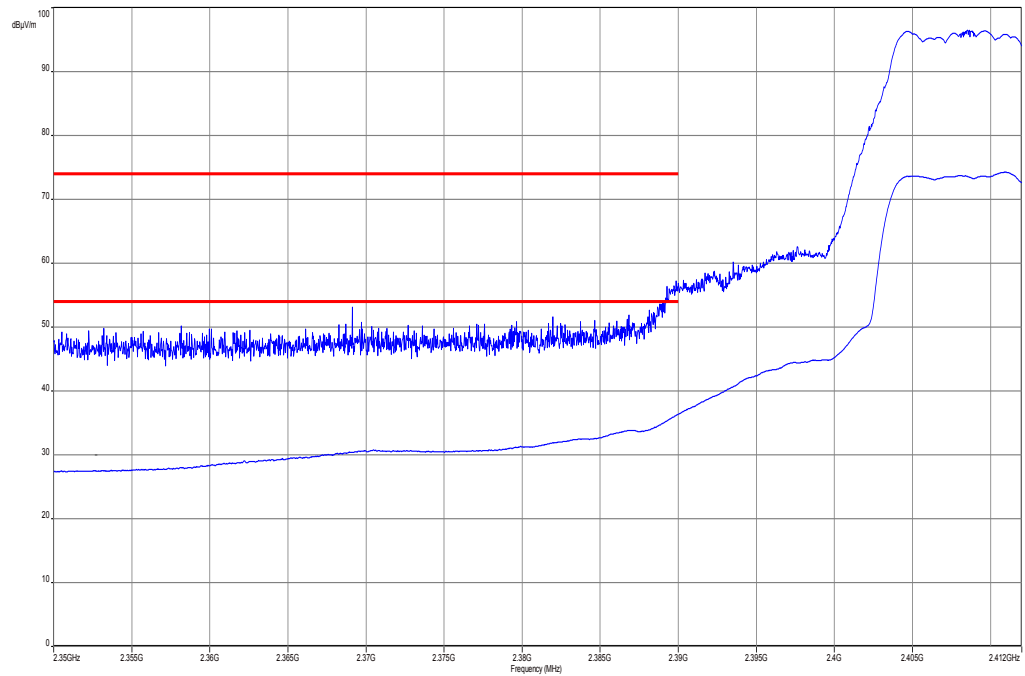
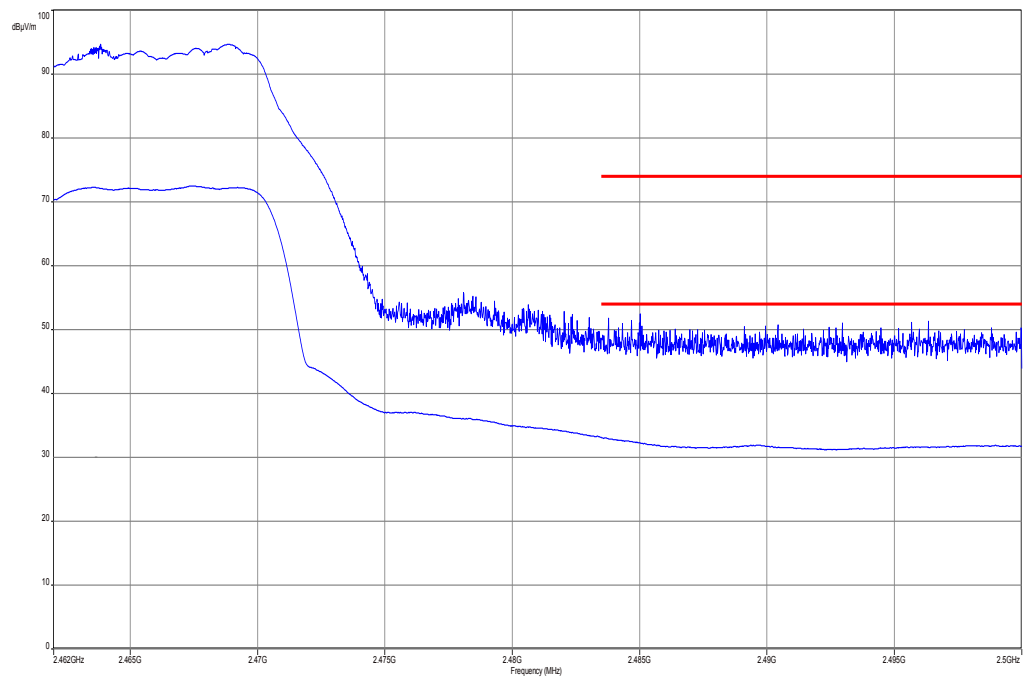
Plots: DSSS/ b – mode peak / average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization, low data rate****Plot 2: TX mode, upper band edge, vertical & horizontal polarization, low data rate**

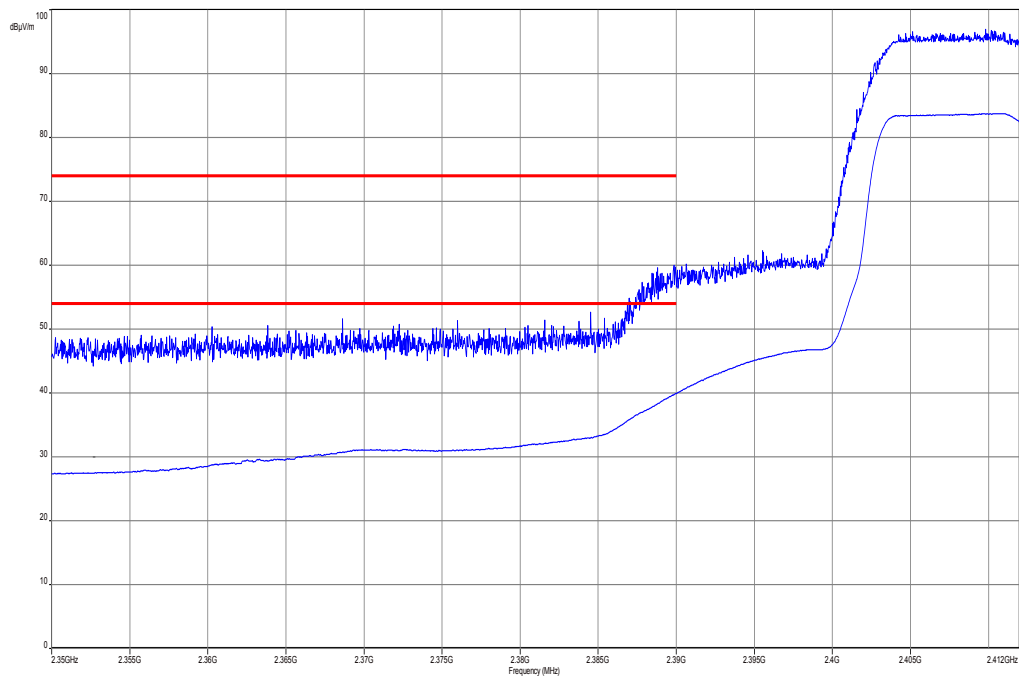
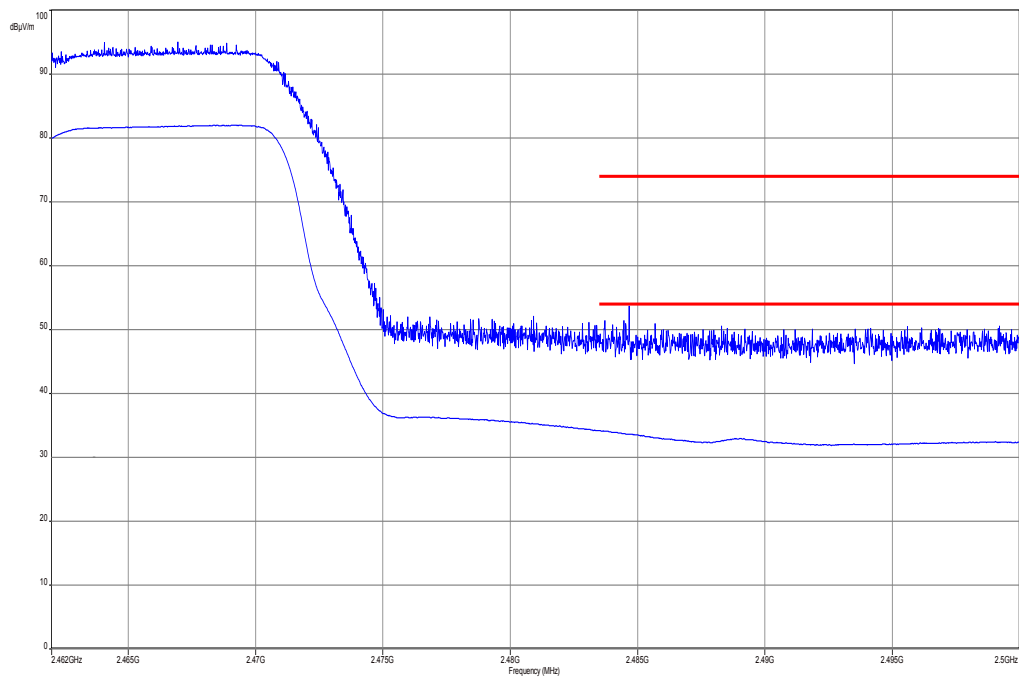
Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high power data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization, high power data rate

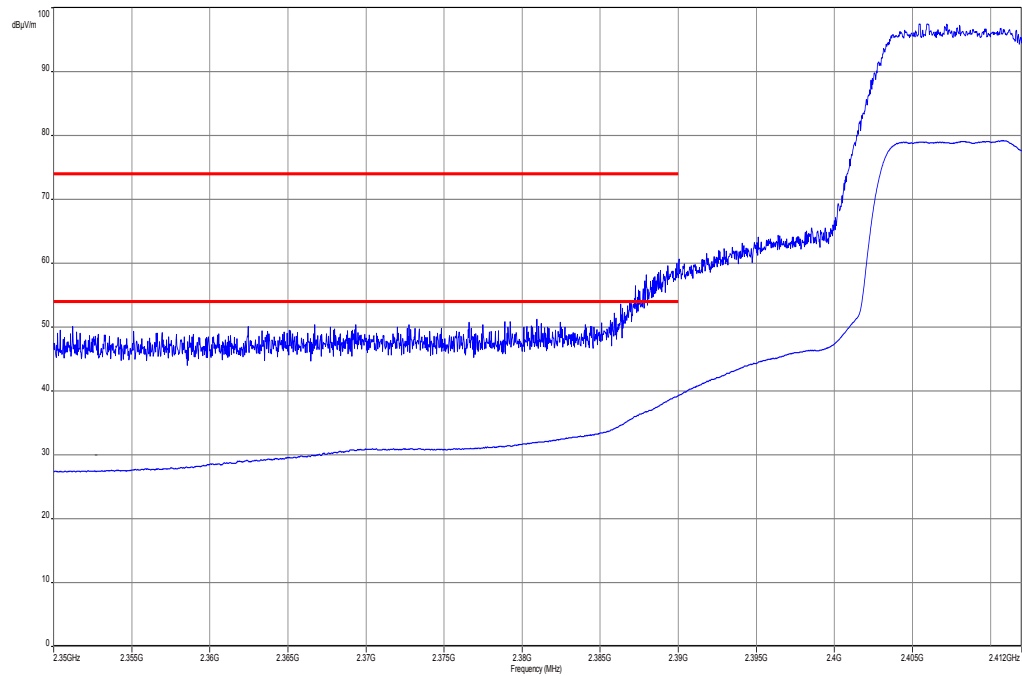
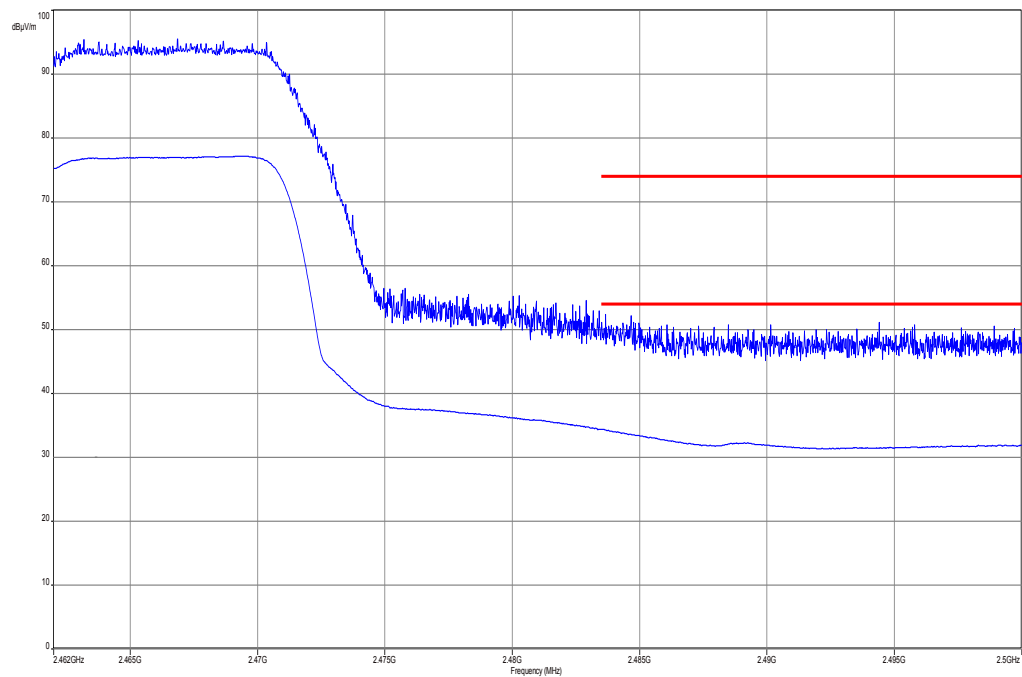
Plot 5: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 6:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

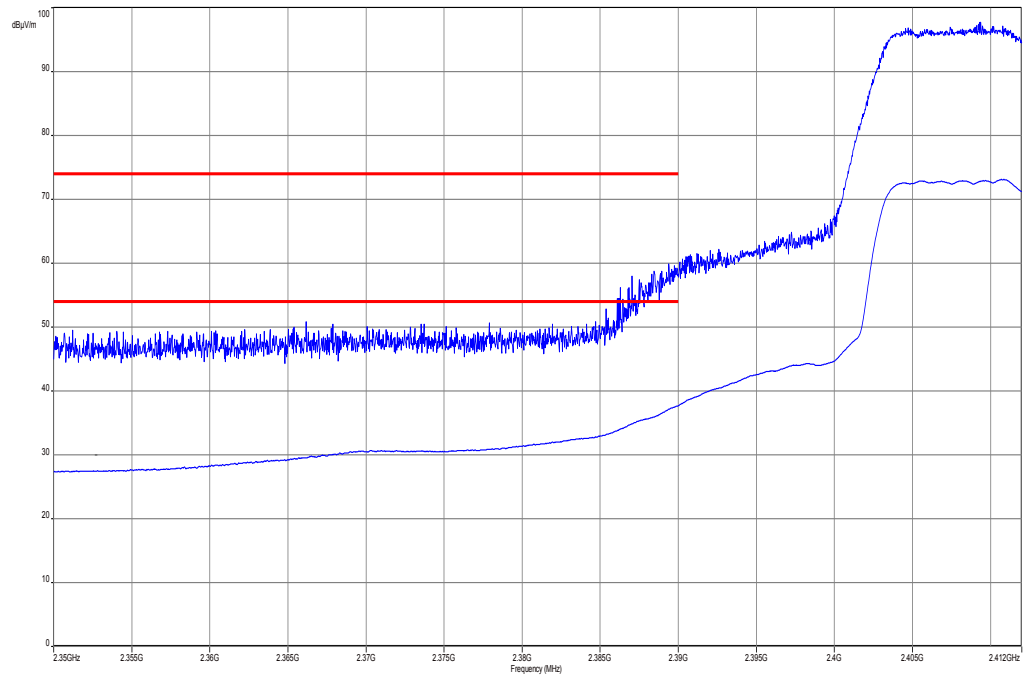
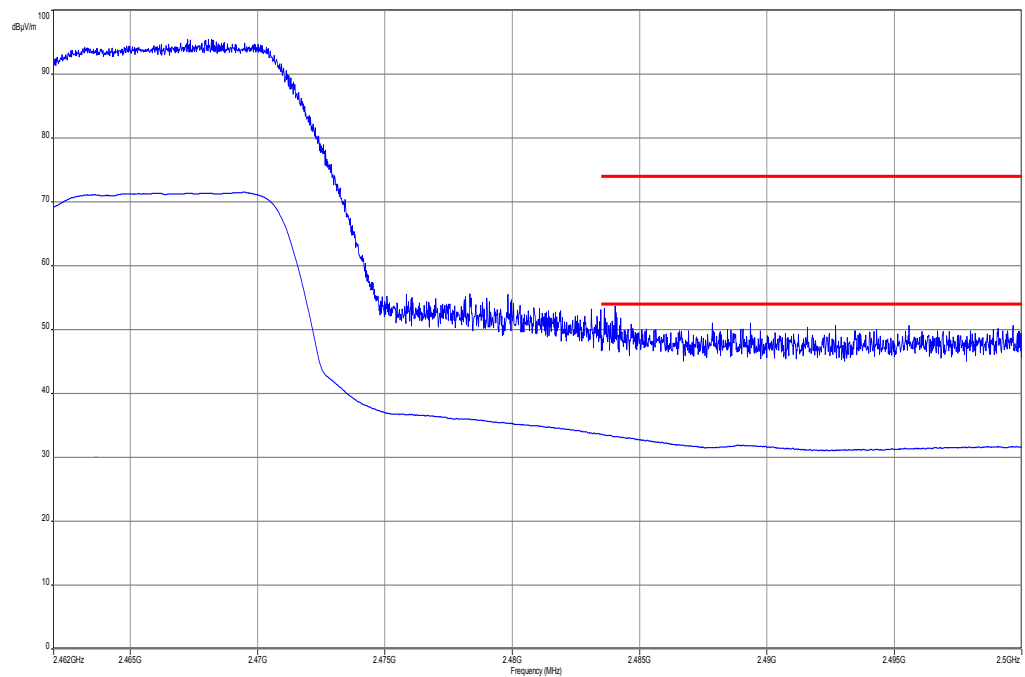
Plots: OFDM / g – mode peak / average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization, low data rate****Plot 2: TX mode, upper band edge, vertical & horizontal polarization, low data rate**

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

Plot 5: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 6:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

Plots: OFDM / n – mode peak / 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 power data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization, high power data rate

Plot 5: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 6:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

11.9 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	
According to:	
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		1.87	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2437		2.43	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2462		3.13	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
Measurement uncertainty		± 3 dB			

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

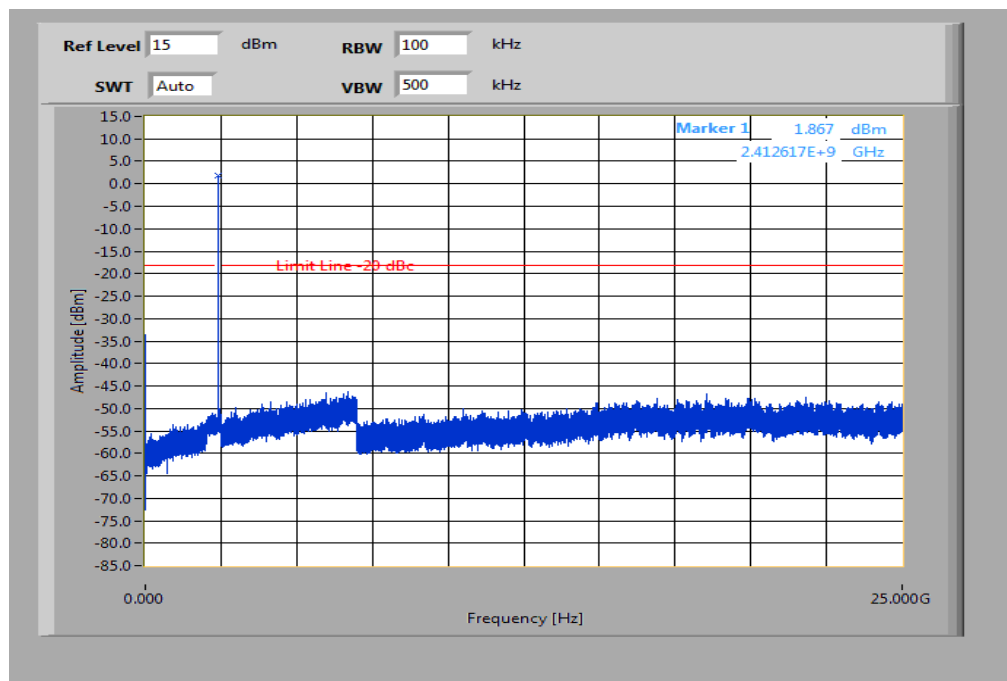
TX Spurious Emissions Conducted					
OFDM / g – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-1.48	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2437		-1.15	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
2462		-1.31	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak)		complies
			-30 dBc (average)		
Measurement uncertainty		± 3 dB			

Result: Passed

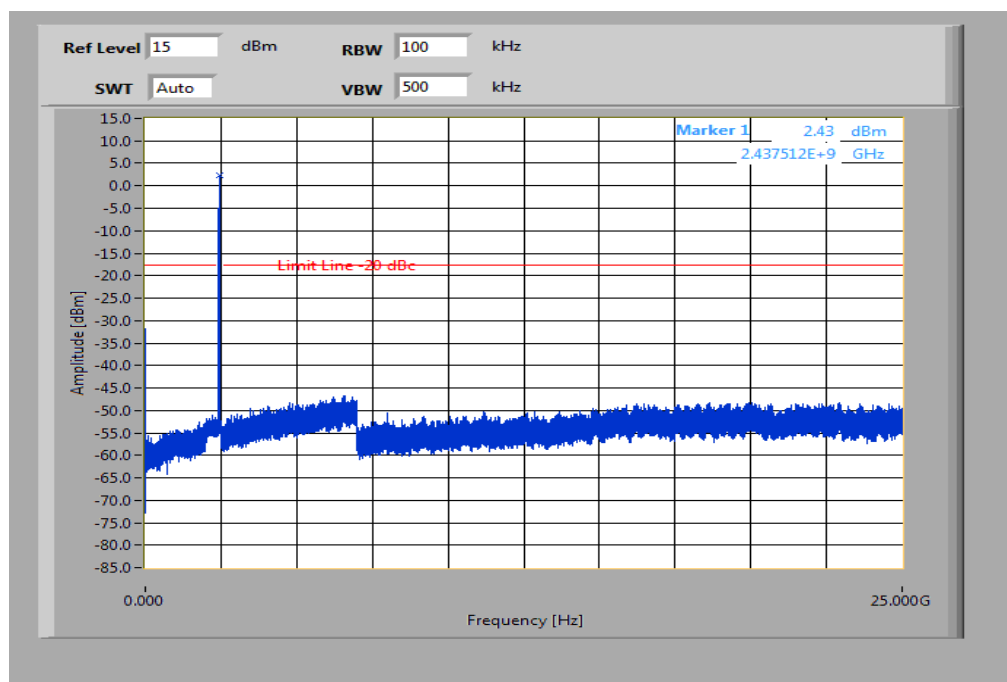
Results: OFDM / n – mode

TX Spurious Emissions Conducted					
OFDM / n – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-1.46	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2437		-1.26	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
2462		-1.53	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			

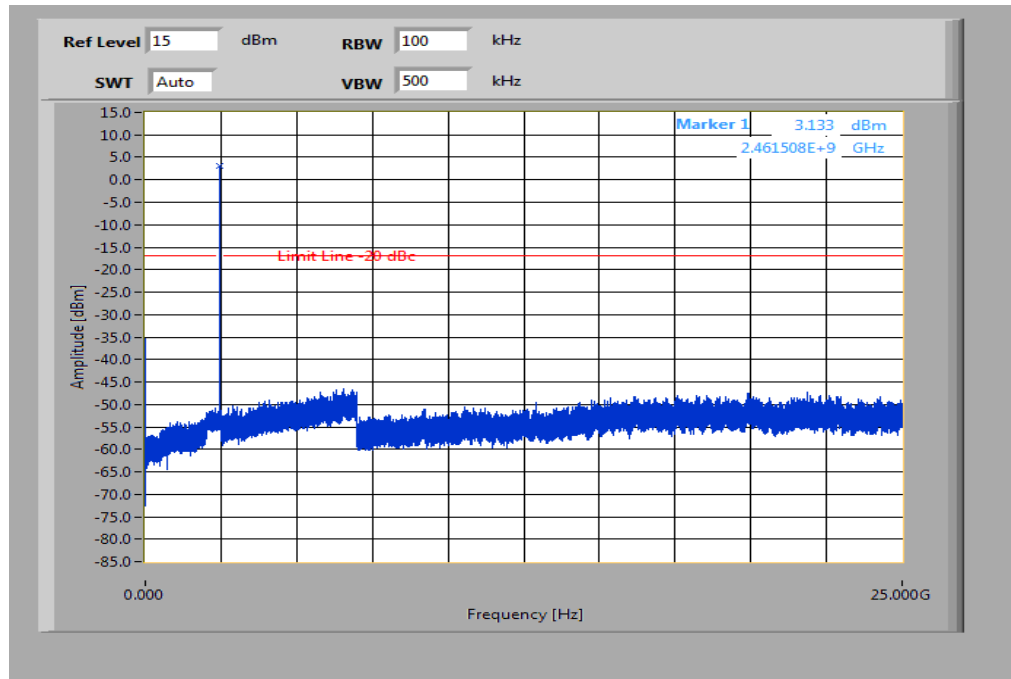
Result: Passed

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

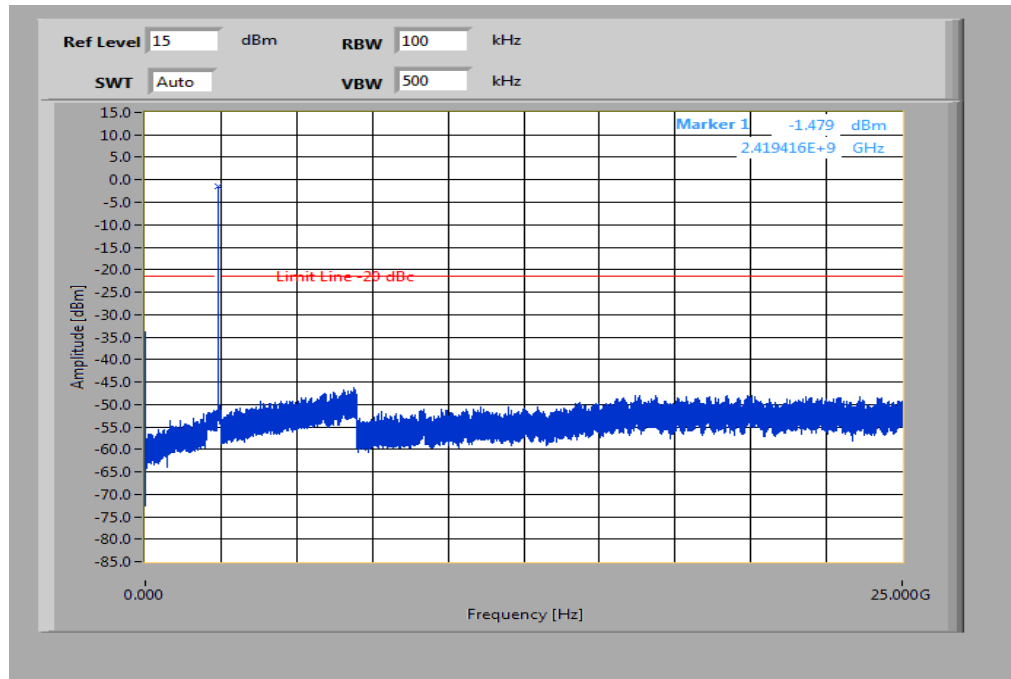
The peak at the beginning of the plot is the LO from the SA.

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

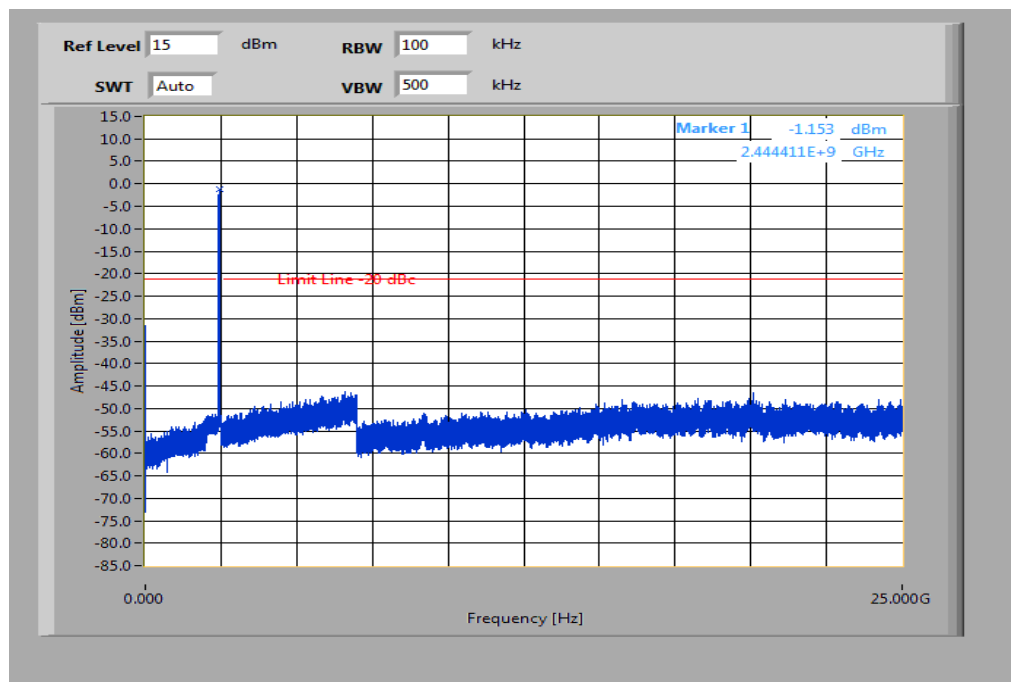
The peak at the beginning of the plot is the LO from the SA.

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

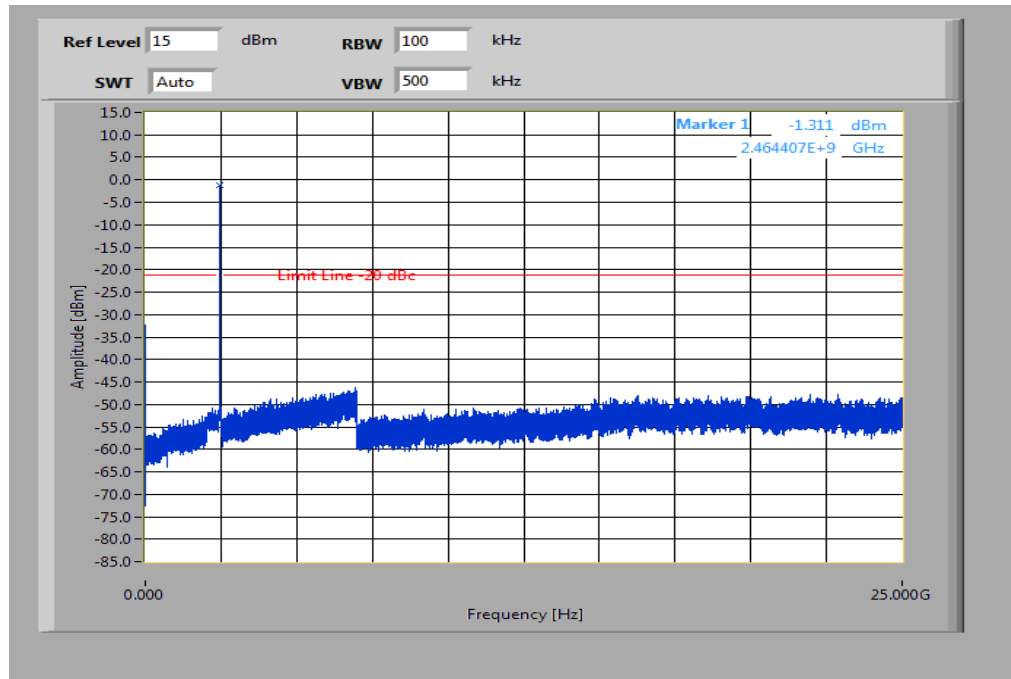
The peak at the beginning of the plot is the LO from the SA.

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

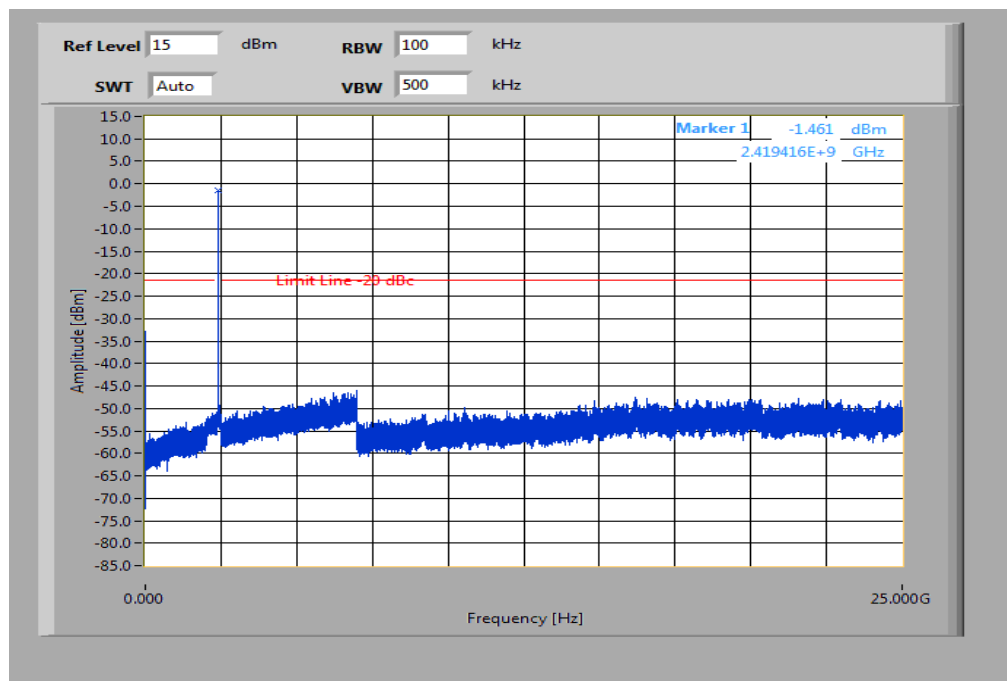
The peak at the beginning of the plot is the LO from the SA.

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

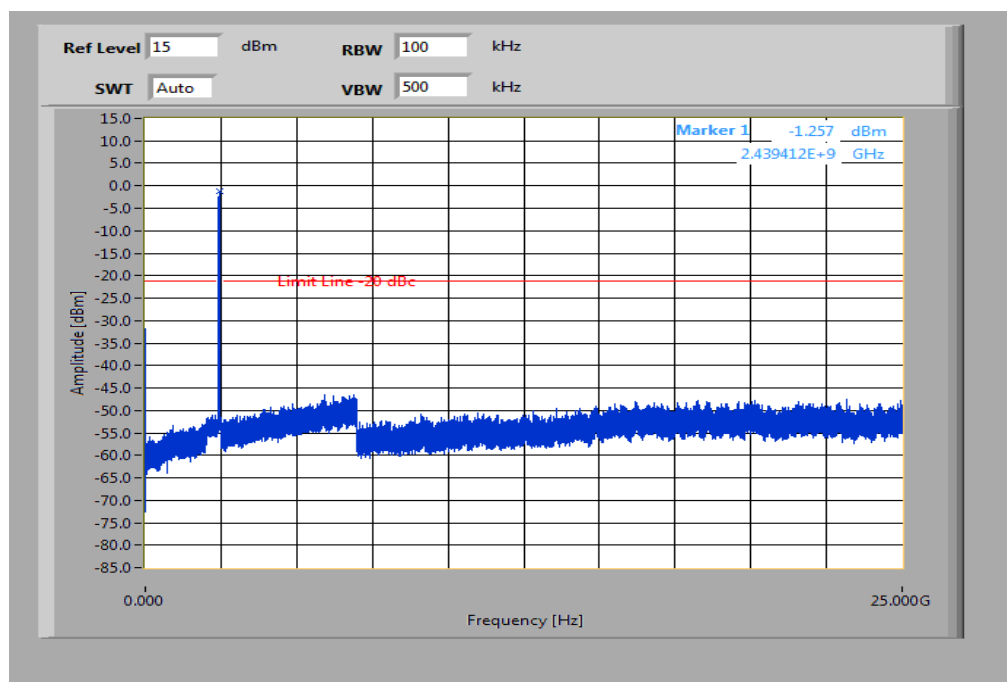
The peak at the beginning of the plot is the LO from the SA.

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

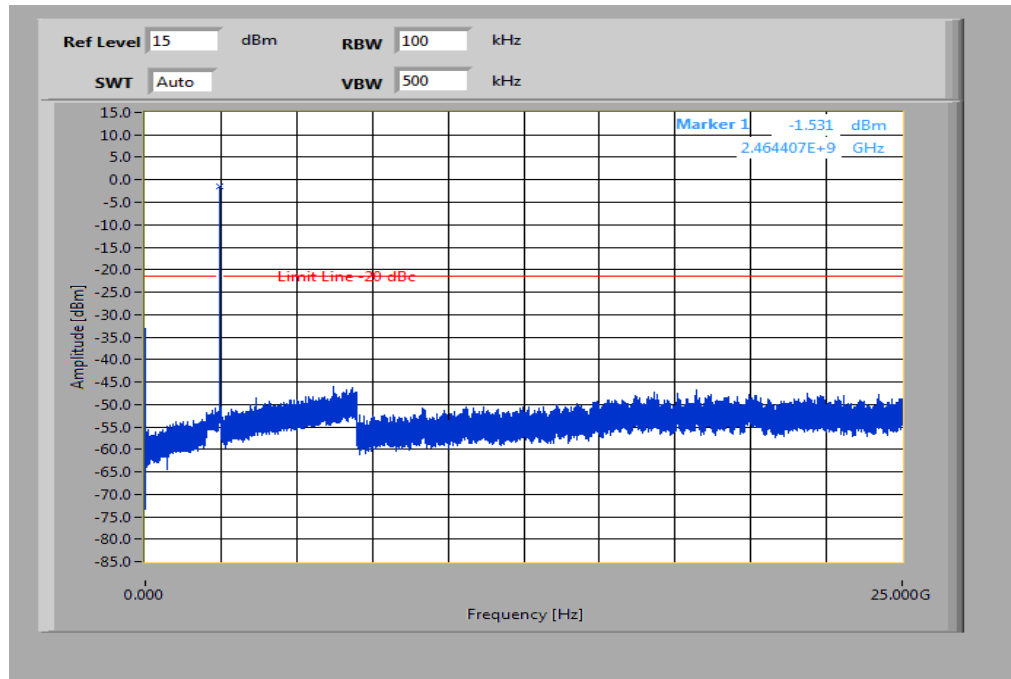
The peak at the beginning of the plot is the LO from the SA.

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.

11.10 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 [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]
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.		
No emissions detected above 1 GHz.			No emissions detected above 1 GHz.			No emissions detected above 1 GHz.		
Measurement uncertainty			± 3 dB					

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

TX Spurious Emissions Radiated [dBμV/m]								
OFDM / 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]
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.		
No emissions detected above 1 GHz.			No emissions detected above 1 GHz.			No emissions detected above 1 GHz.		
Measurement uncertainty			± 3 dB					

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

TX Spurious Emissions Radiated [dBμV/m]								
OFDM / n – 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]
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.		
No emissions detected above 1 GHz.			No emissions detected above 1 GHz.			No emissions detected above 1 GHz.		
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)

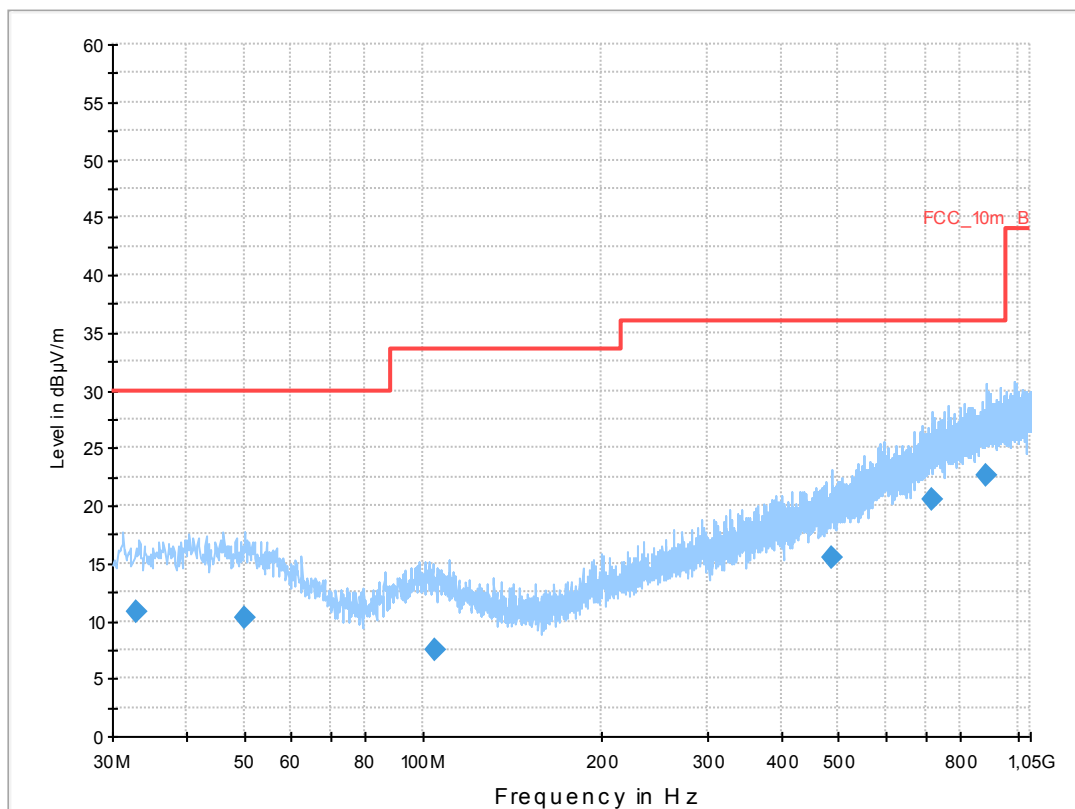
Plots: DSSS / b – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan b-mode tx ch1
 Operator Name: Wolsdorfer
 Comment: battery powered

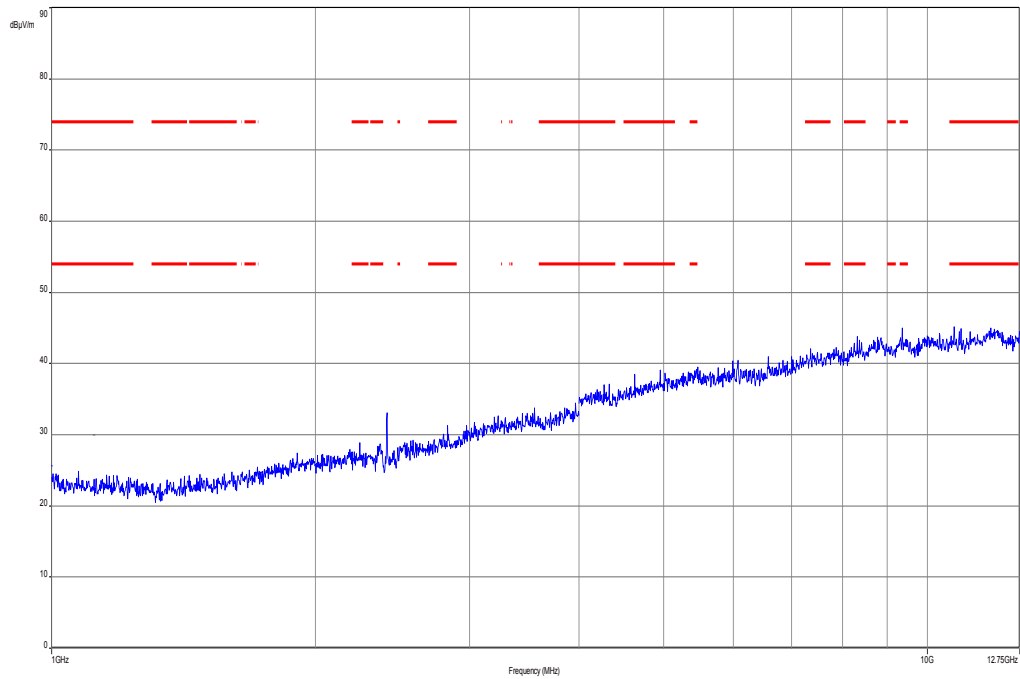
Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dBµV/m

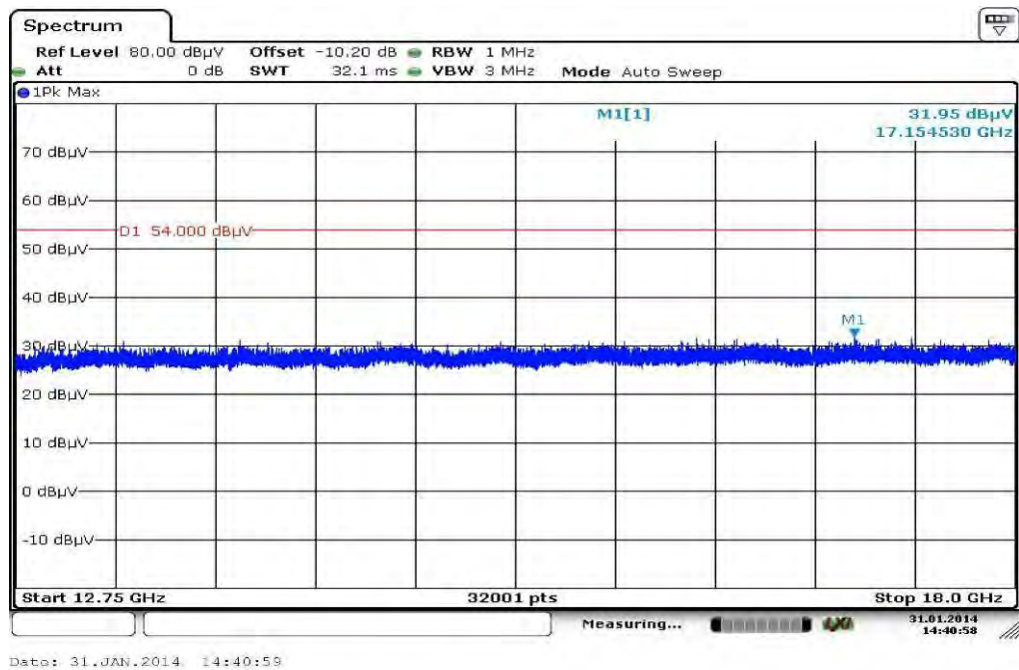
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

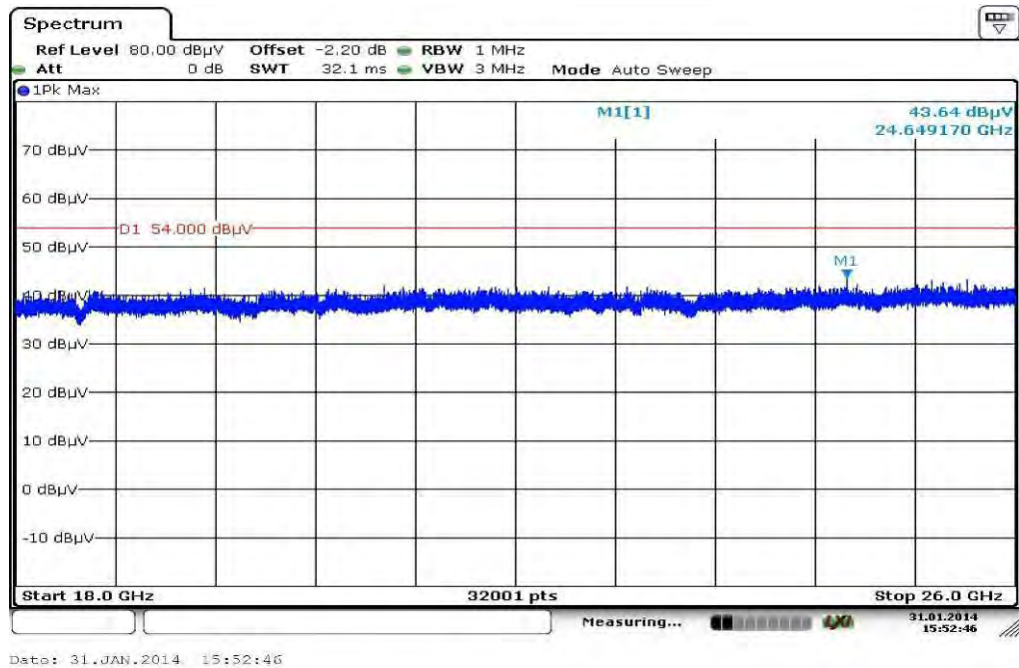
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
32.870400	10.8	1000.0	120.000	164.0	V	182.0	12.8	19.2	30.0	
49.912950	10.2	1000.0	120.000	170.0	V	85.0	13.4	19.8	30.0	
104.769900	7.5	1000.0	120.000	98.0	V	170.0	11.5	26.0	33.5	
488.310300	15.4	1000.0	120.000	170.0	V	268.0	18.5	20.6	36.0	
716.878350	20.5	1000.0	120.000	113.0	V	280.0	22.9	15.5	36.0	
882.341700	22.6	1000.0	120.000	170.0	H	280.0	25.0	13.4	36.0	

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

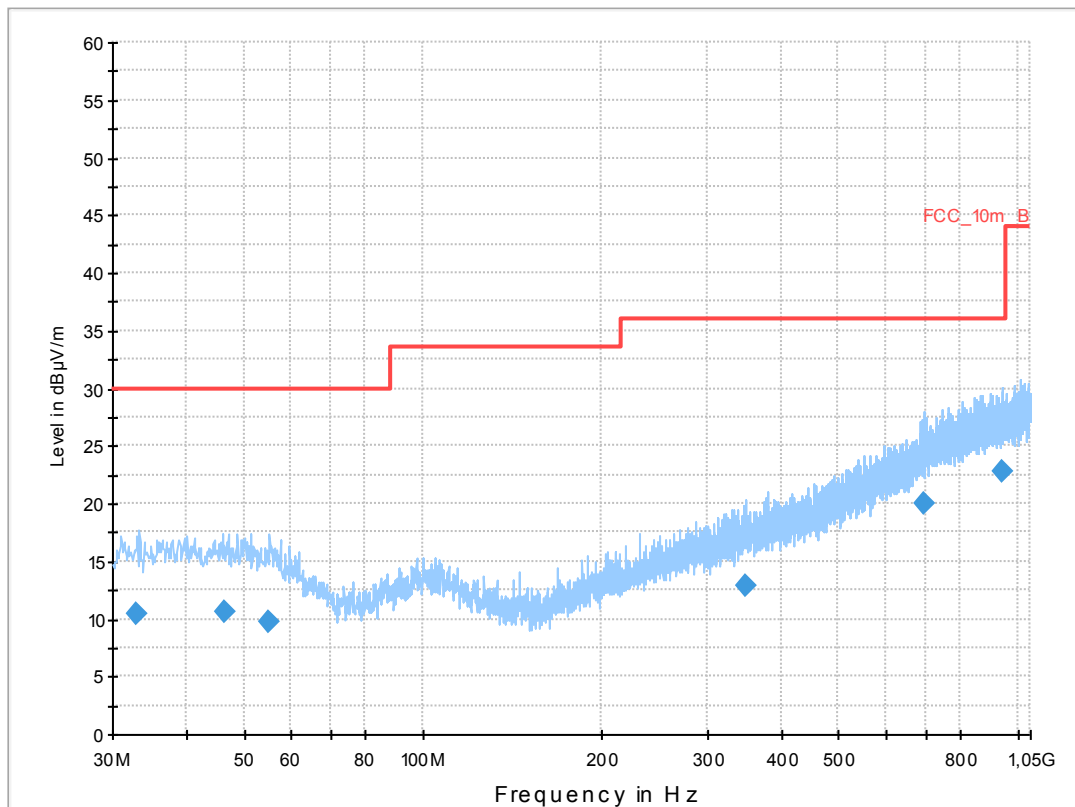
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan b-mode tx ch6
 Operator Name: Wolsdorfer
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

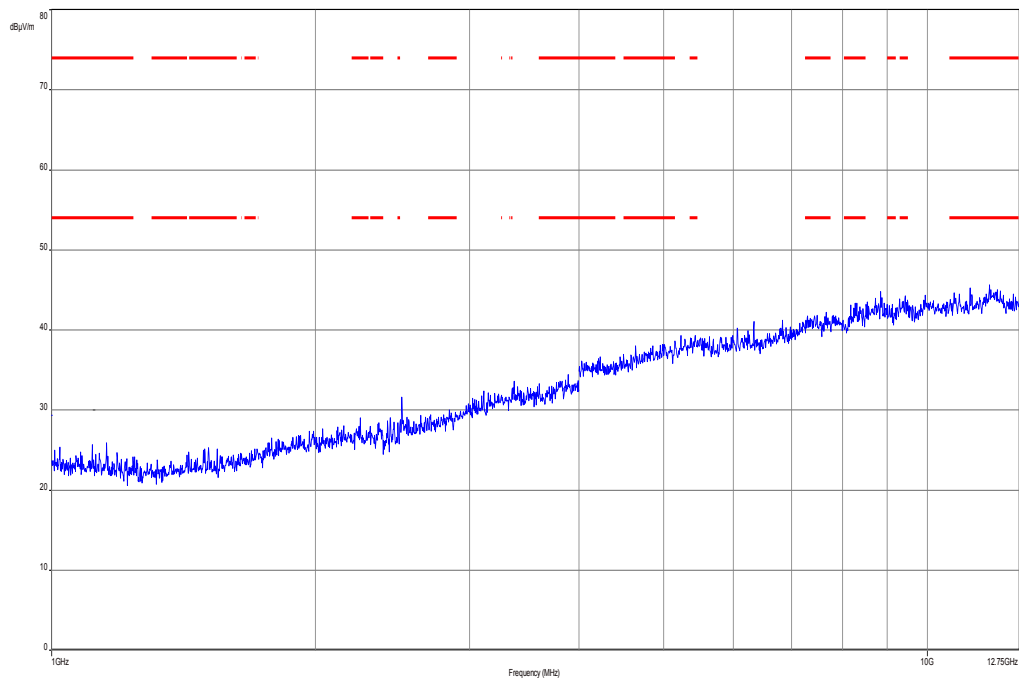
Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

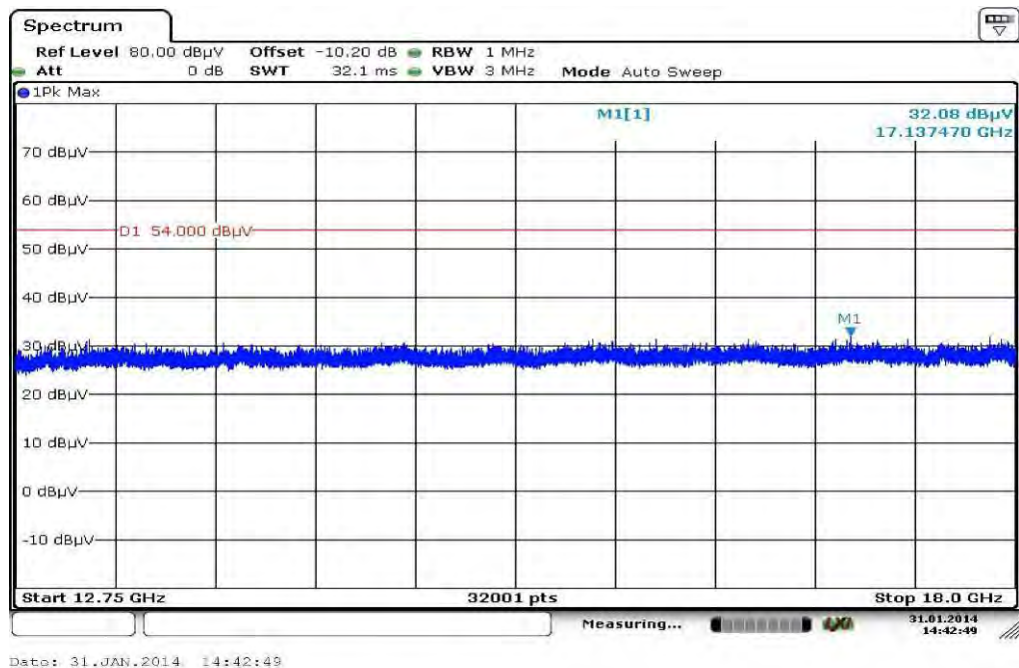


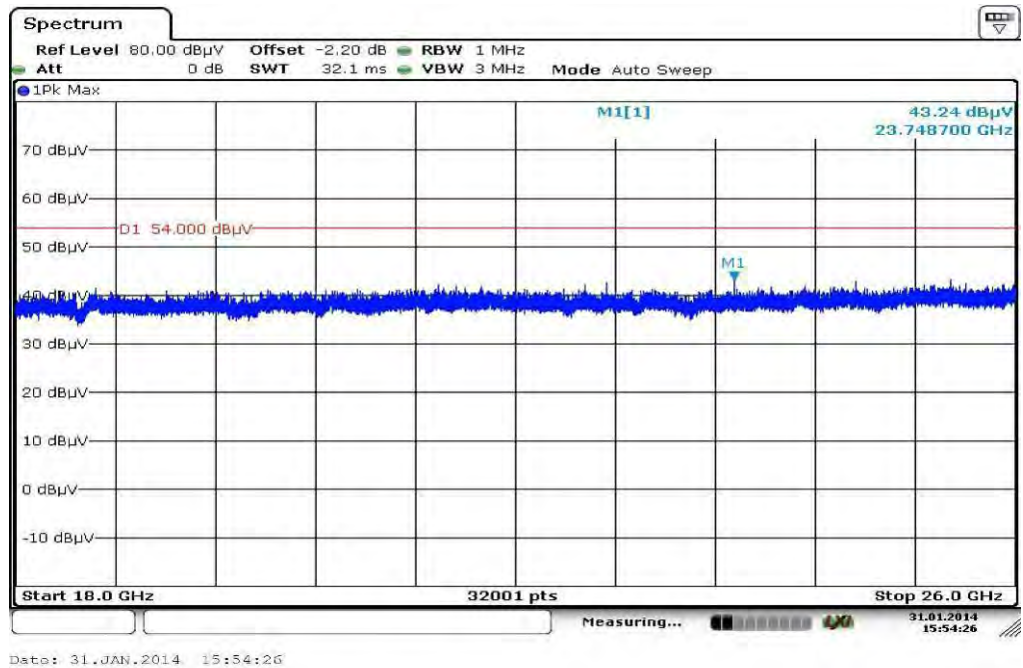
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
32.865300	10.5	1000.0	120.000	160.0	V	280.0	12.8	19.5	30.0	
46.205400	10.6	1000.0	120.000	132.0	H	190.0	13.3	19.4	30.0	
55.101300	9.7	1000.0	120.000	163.0	V	273.0	12.9	20.3	30.0	
349.498500	12.9	1000.0	120.000	98.0	V	182.0	16.0	23.1	36.0	
695.800200	20.0	1000.0	120.000	132.0	H	100.0	22.4	16.0	36.0	
941.289750	22.7	1000.0	120.000	170.0	V	-5.0	25.3	13.3	36.0	

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

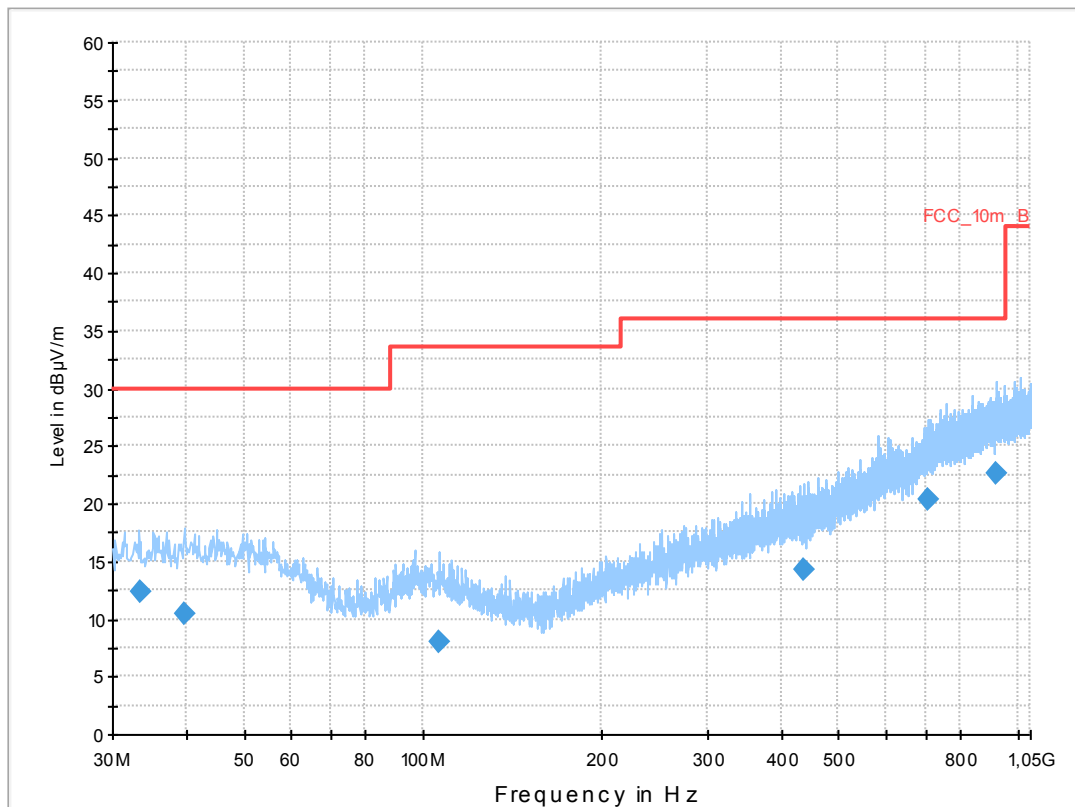
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan b-mode tx ch11
 Operator Name: Wolsdorfer
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

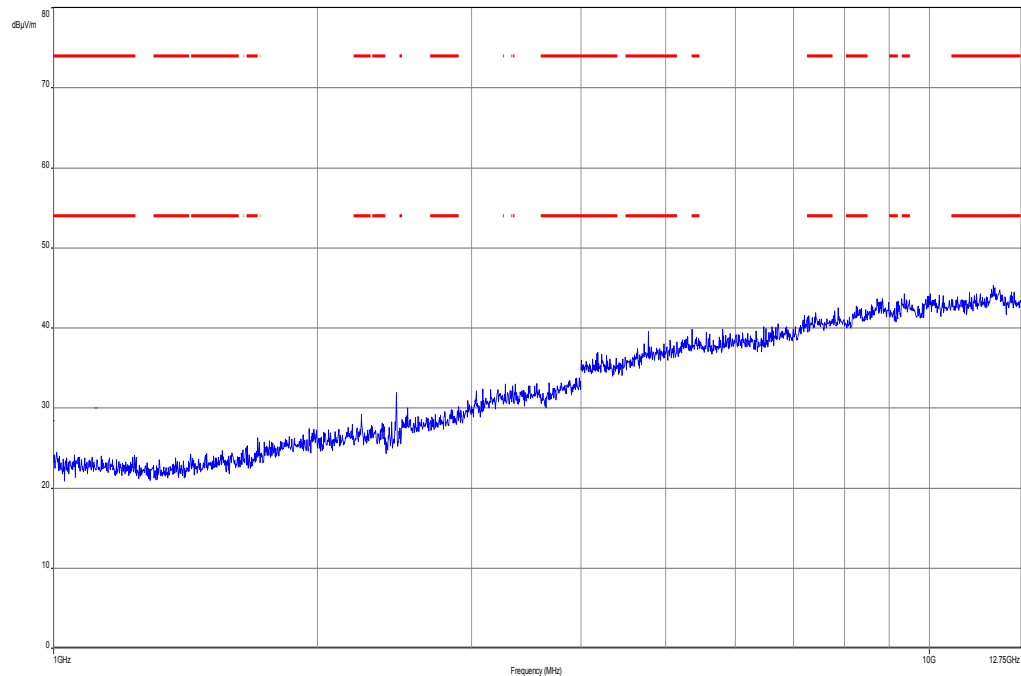
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

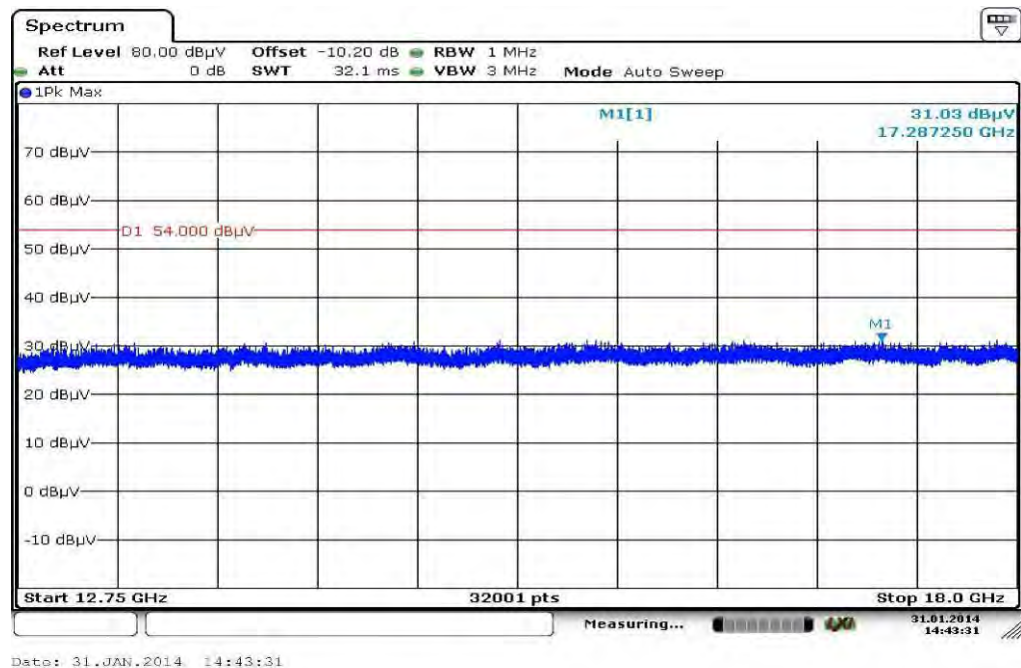


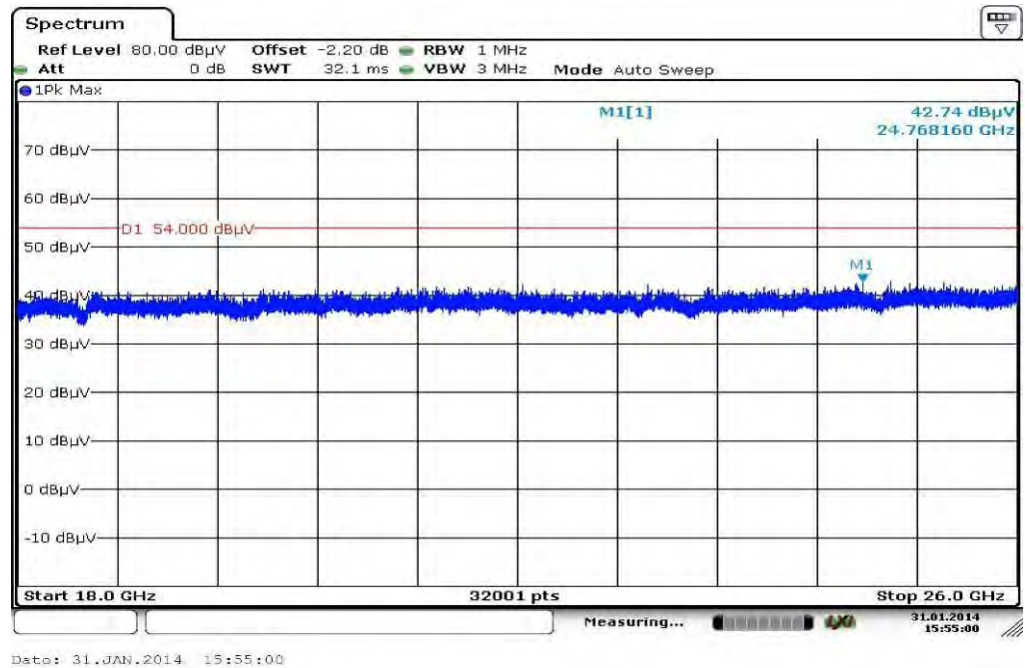
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
33.384750	12.4	1000.0	120.000	111.0	V	190.0	12.9	17.6	30.0	
39.675900	10.5	1000.0	120.000	170.0	V	88.0	13.4	19.5	30.0	
106.119600	8.0	1000.0	120.000	132.0	H	182.0	11.4	25.5	33.5	
437.767950	14.2	1000.0	120.000	111.0	H	-10.0	17.5	21.8	36.0	
707.151300	20.3	1000.0	120.000	170.0	H	270.0	22.7	15.7	36.0	
922.812900	22.6	1000.0	120.000	170.0	V	100.0	25.3	13.4	36.0	

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

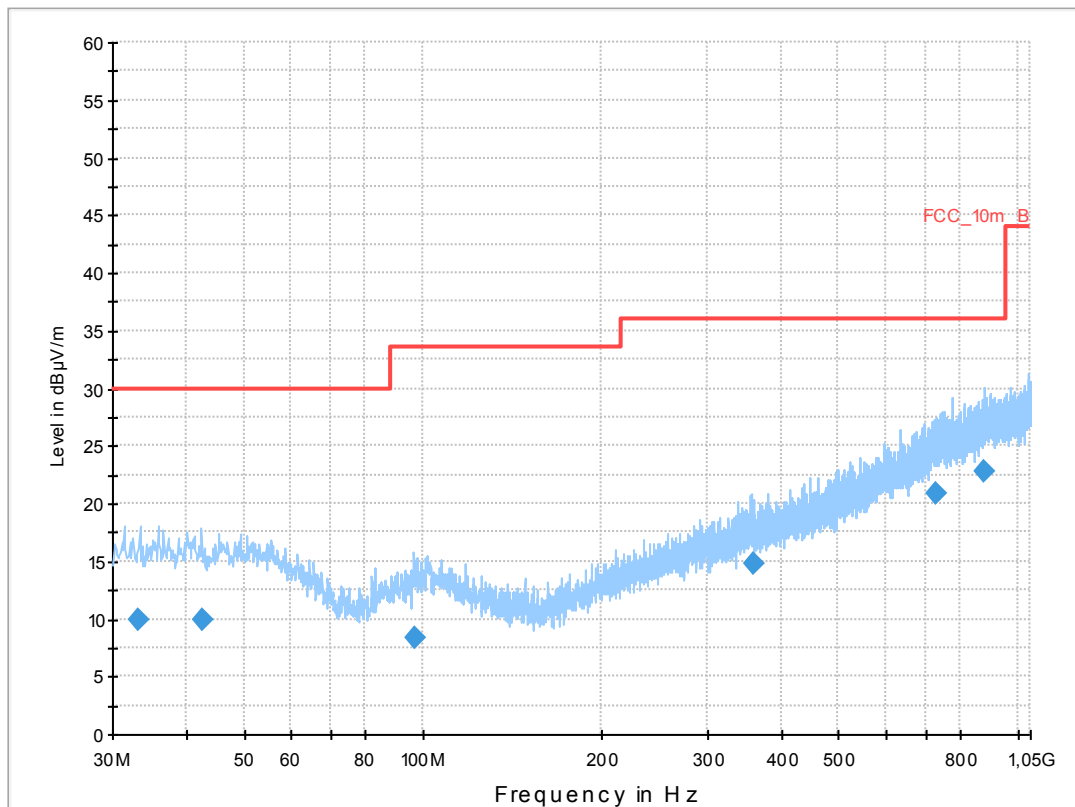
Plots: OFDM / g – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan g-mode tx ch1
 Operator Name: Wolsdorfer
 Comment: battery powered

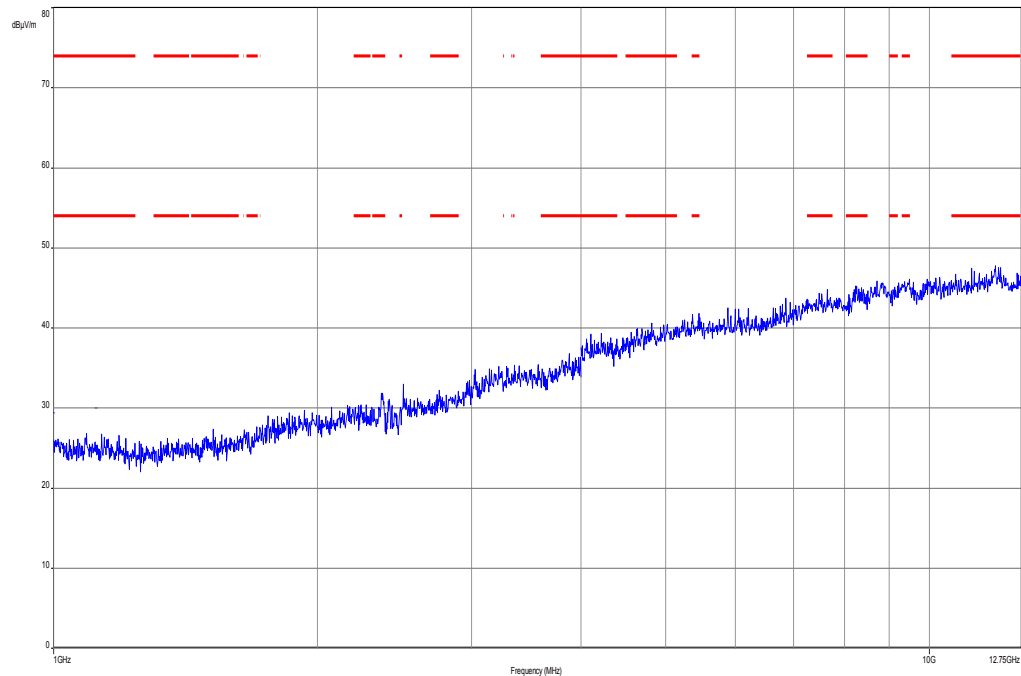
Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dBμV/m

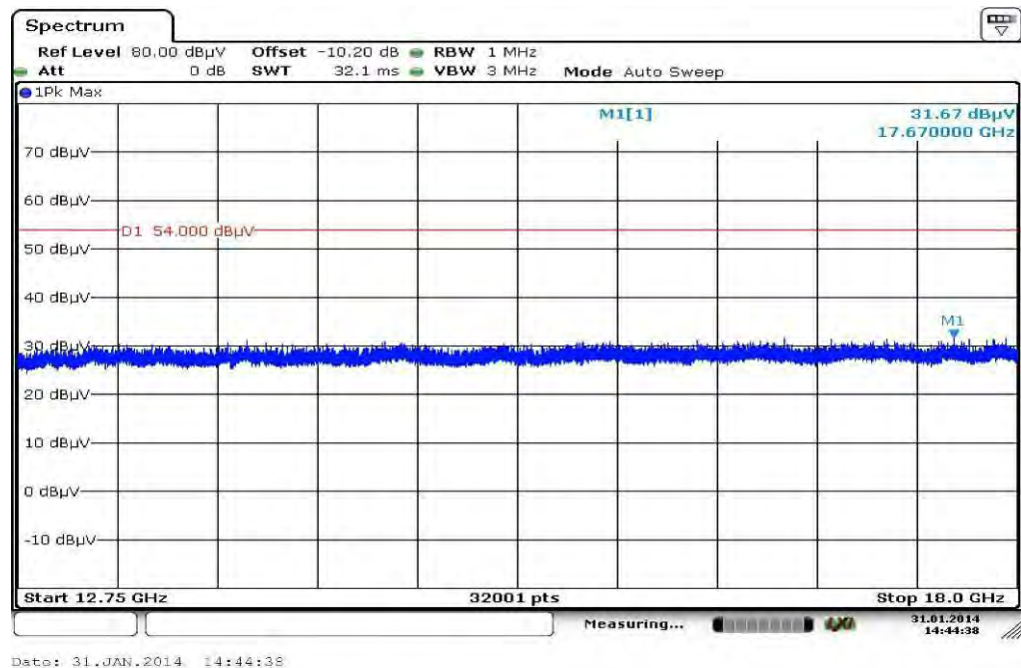
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

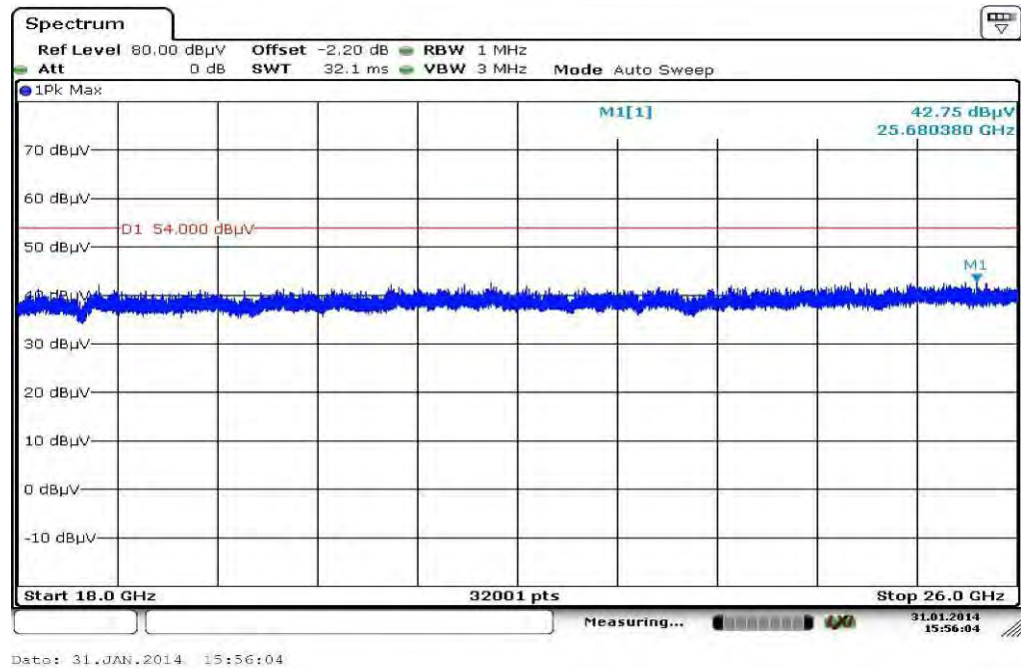
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
33.155400	10.0	1000.0	120.000	170.0	H	268.0	12.8	20.0	30.0	
42.598200	9.9	1000.0	120.000	170.0	V	100.0	13.3	20.1	30.0	
97.208400	8.3	1000.0	120.000	170.0	H	190.0	11.5	25.2	33.5	
359.955300	14.8	1000.0	120.000	105.0	V	3.0	16.2	21.2	36.0	
730.908750	20.8	1000.0	120.000	170.0	V	280.0	23.2	15.2	36.0	
875.368350	22.7	1000.0	120.000	170.0	V	93.0	24.9	13.3	36.0	

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

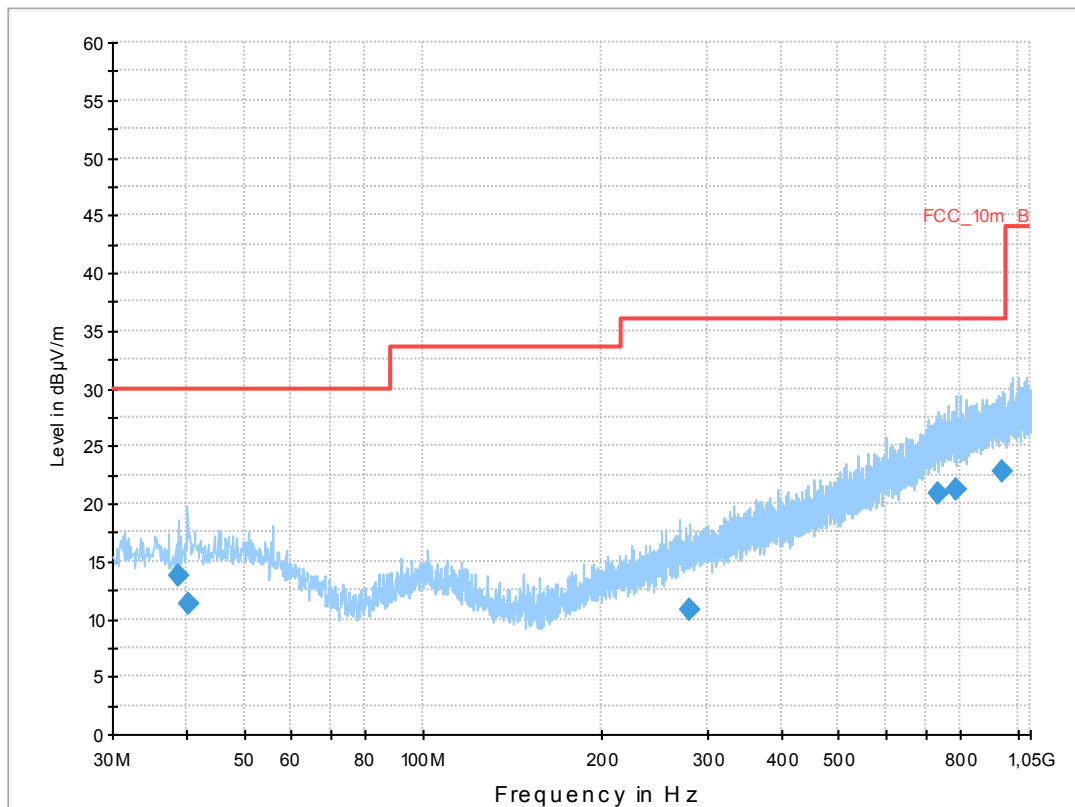
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan g-mode tx ch6
 Operator Name: Wolsdorfer
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

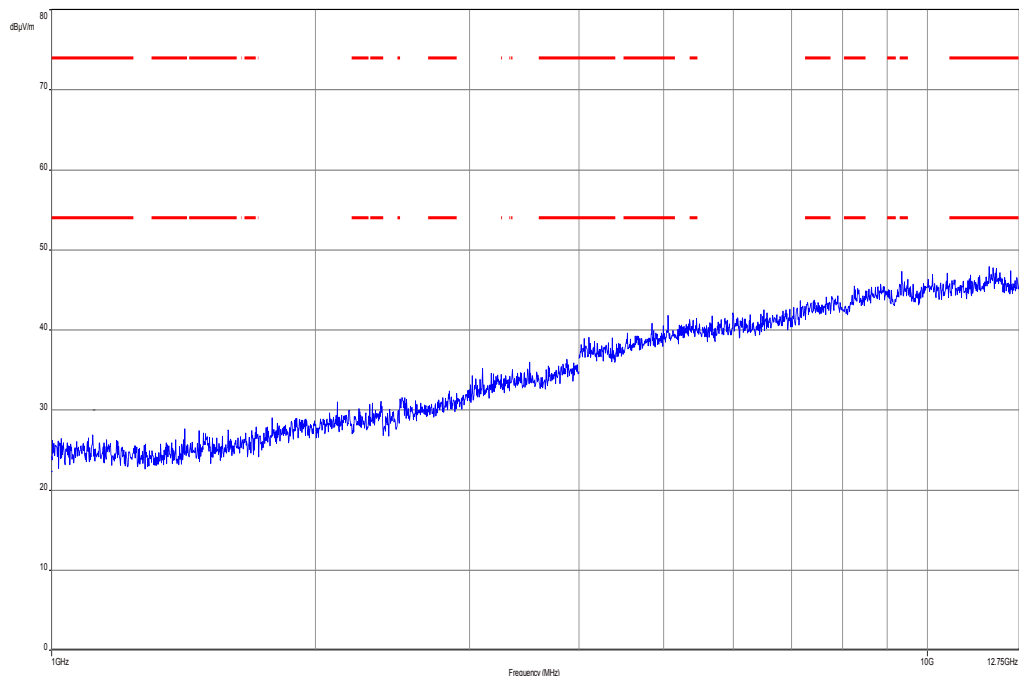
Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

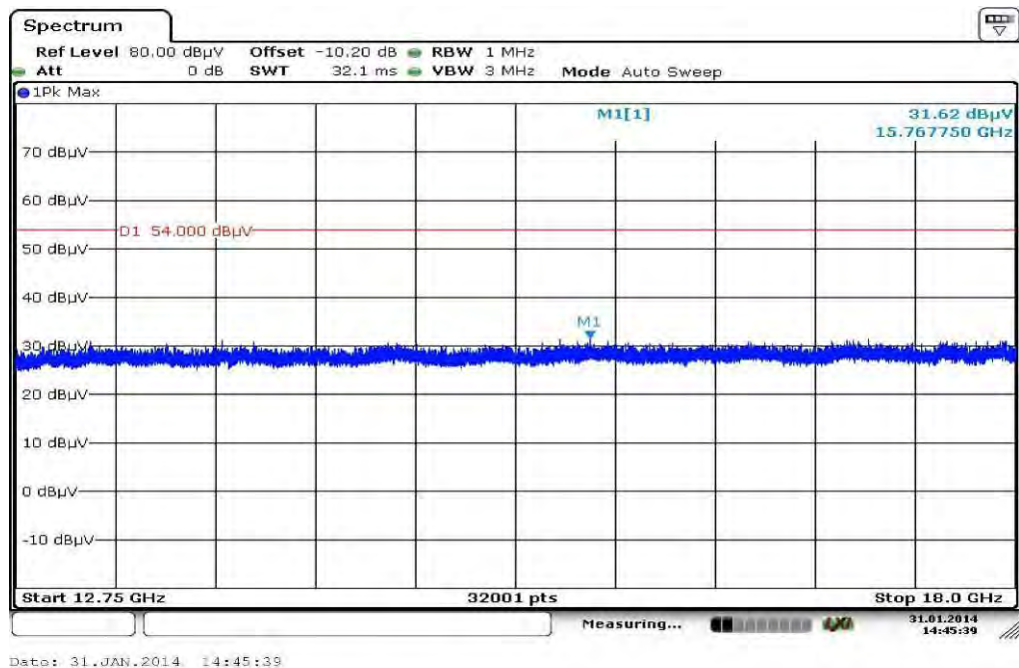


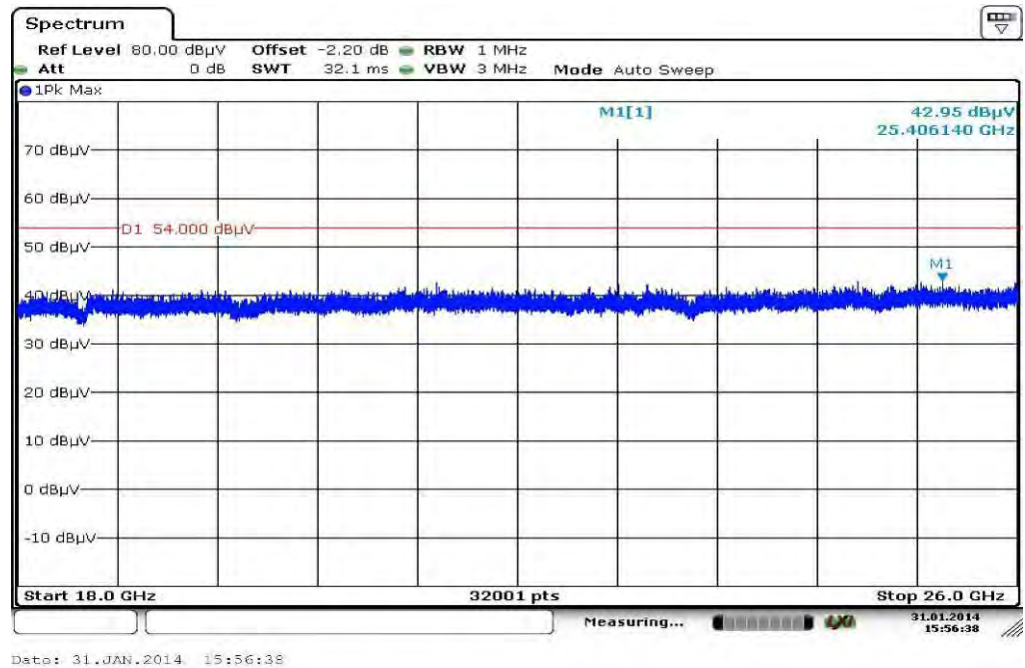
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
38.695800	13.8	1000.0	120.000	98.0	V	80.0	13.3	16.2	30.0	
40.371300	11.3	1000.0	120.000	133.0	V	80.0	13.4	18.7	30.0	
279.878850	10.7	1000.0	120.000	170.0	V	280.0	14.0	25.3	36.0	
735.970050	20.9	1000.0	120.000	170.0	H	100.0	23.3	15.1	36.0	
785.480550	21.2	1000.0	120.000	98.0	H	176.0	23.8	14.8	36.0	
941.319450	22.7	1000.0	120.000	98.0	H	86.0	25.3	13.3	36.0	

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

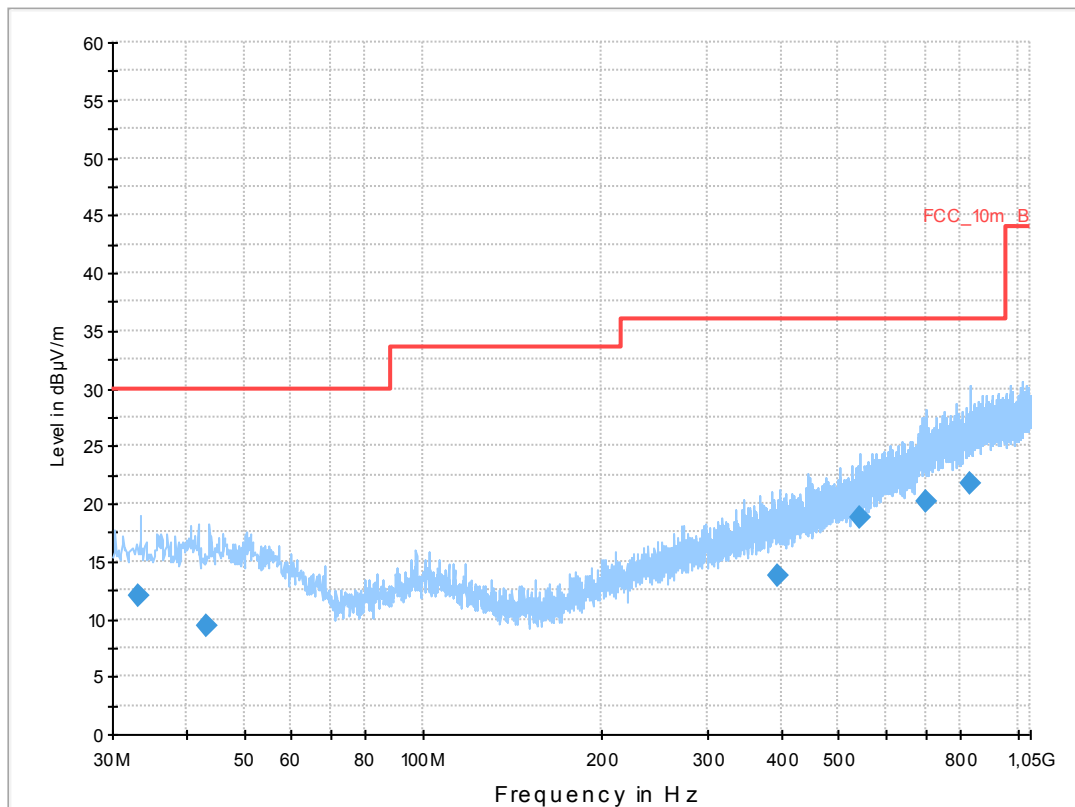
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan g-mode tx ch11
 Operator Name: Wolsdorfer
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

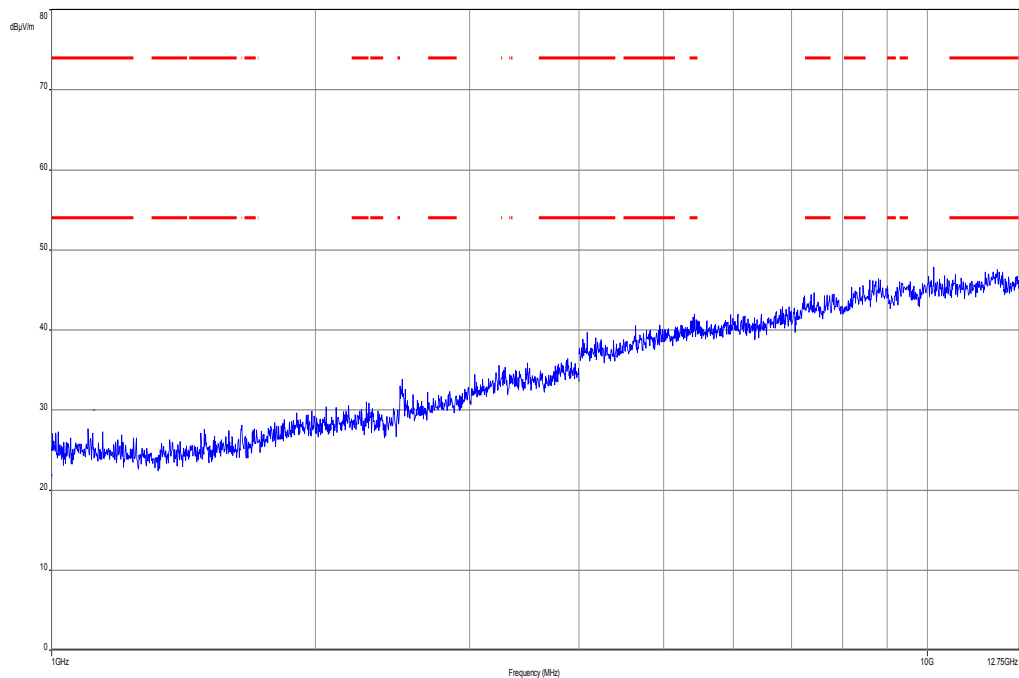
Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

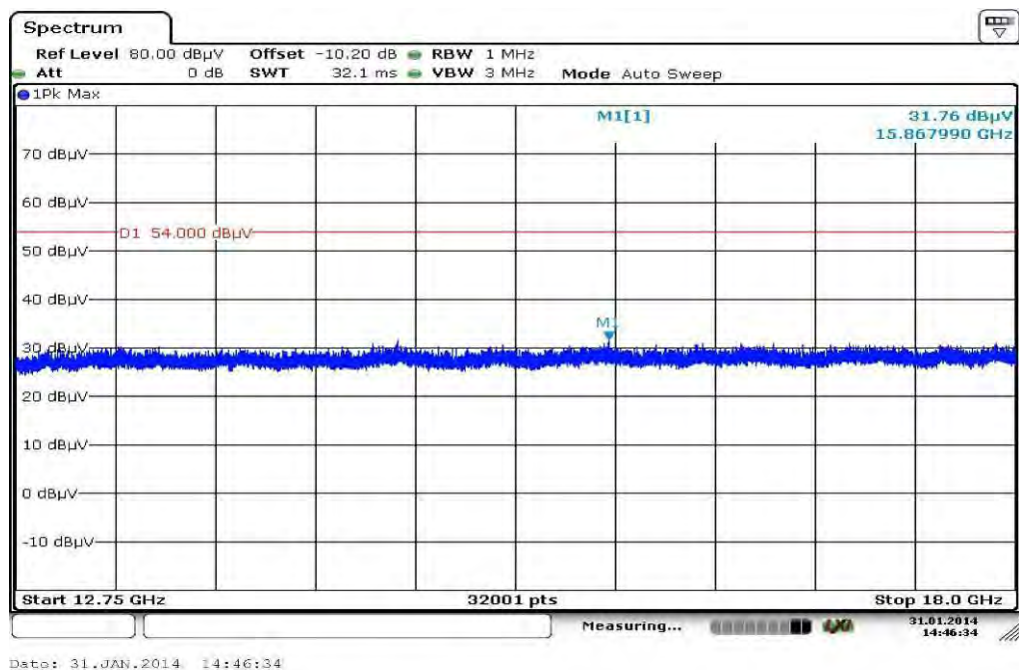


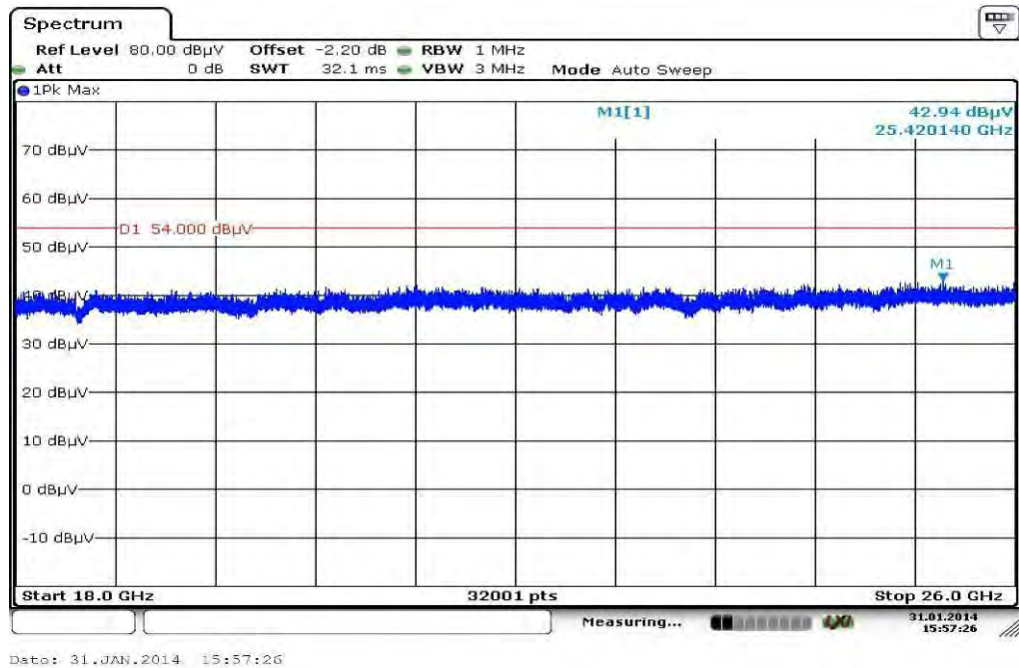
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
33.241950	12.0	1000.0	120.000	98.0	V	88.0	12.8	18.0	30.0	
43.327950	9.3	1000.0	120.000	170.0	H	88.0	13.3	20.7	30.0	
396.009750	13.7	1000.0	120.000	155.0	V	81.0	16.8	22.3	36.0	
543.985950	18.7	1000.0	120.000	170.0	H	260.0	19.3	17.3	36.0	
702.492750	20.1	1000.0	120.000	170.0	H	280.0	22.6	15.9	36.0	
830.303550	21.8	1000.0	120.000	170.0	H	260.0	24.3	14.2	36.0	

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

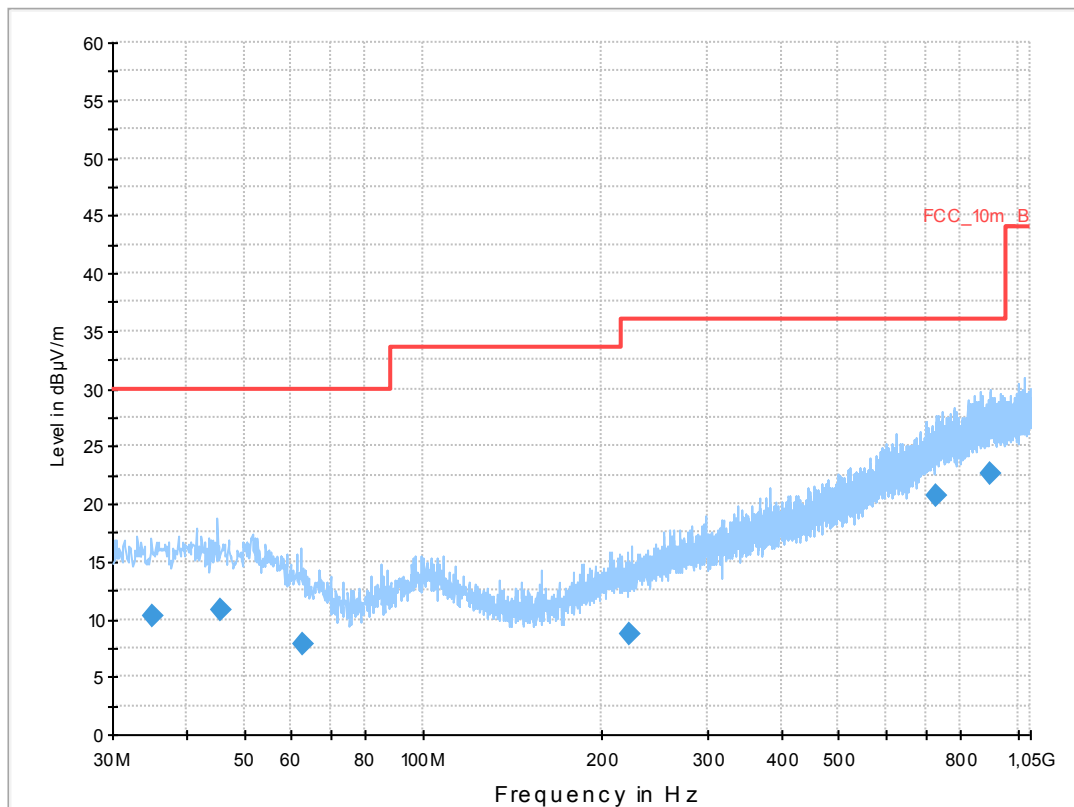
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan n-mode tx ch1
 Operator Name: Wolsdorfer
 Comment: battery powered

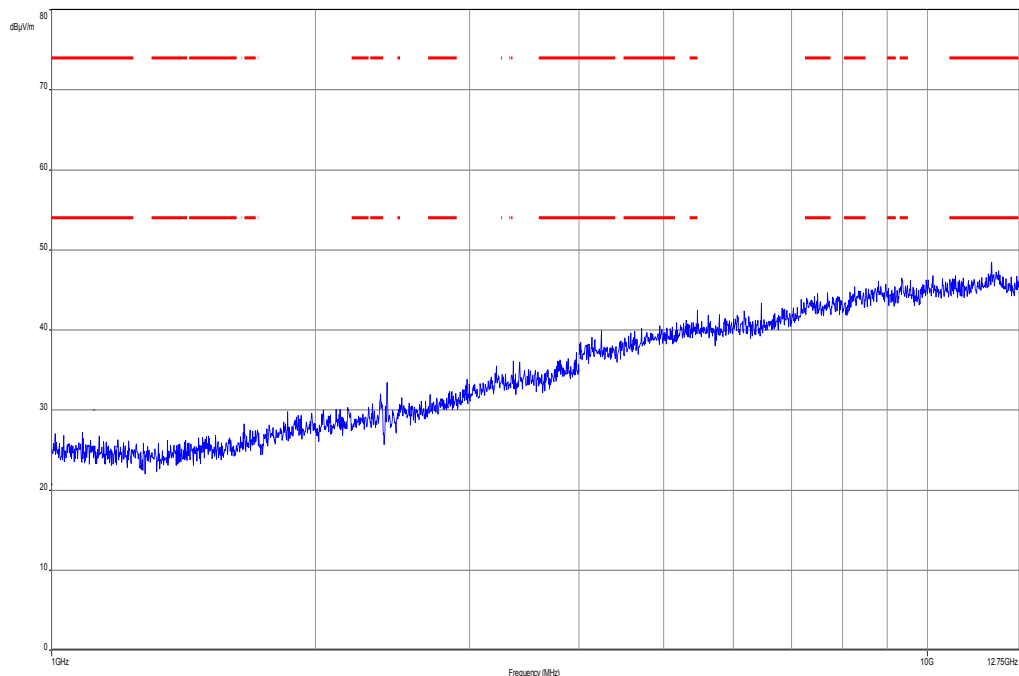
Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dBμV/m

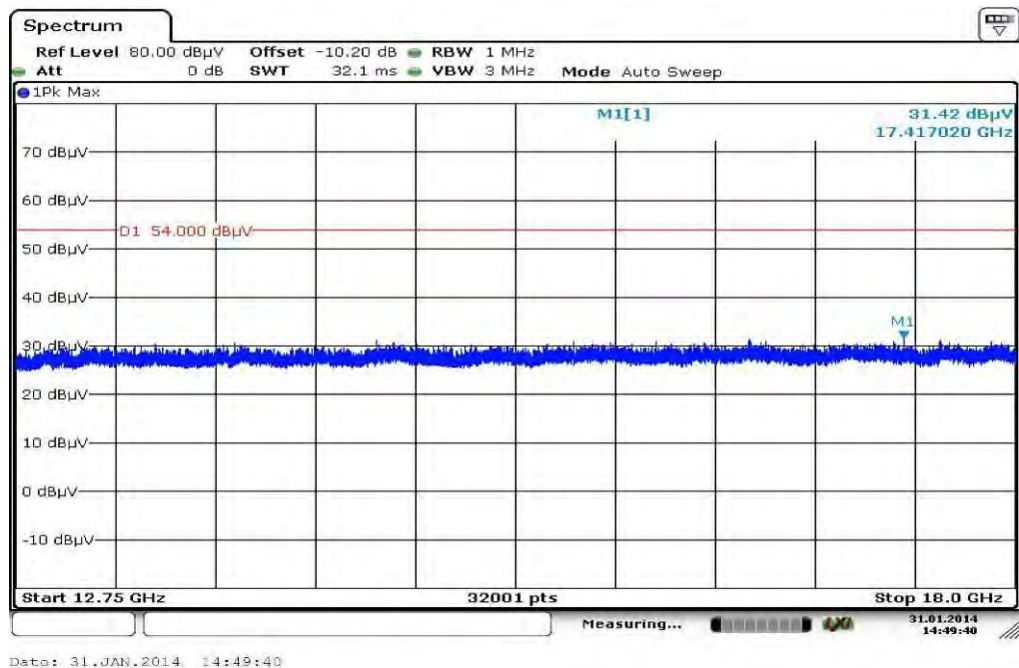
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

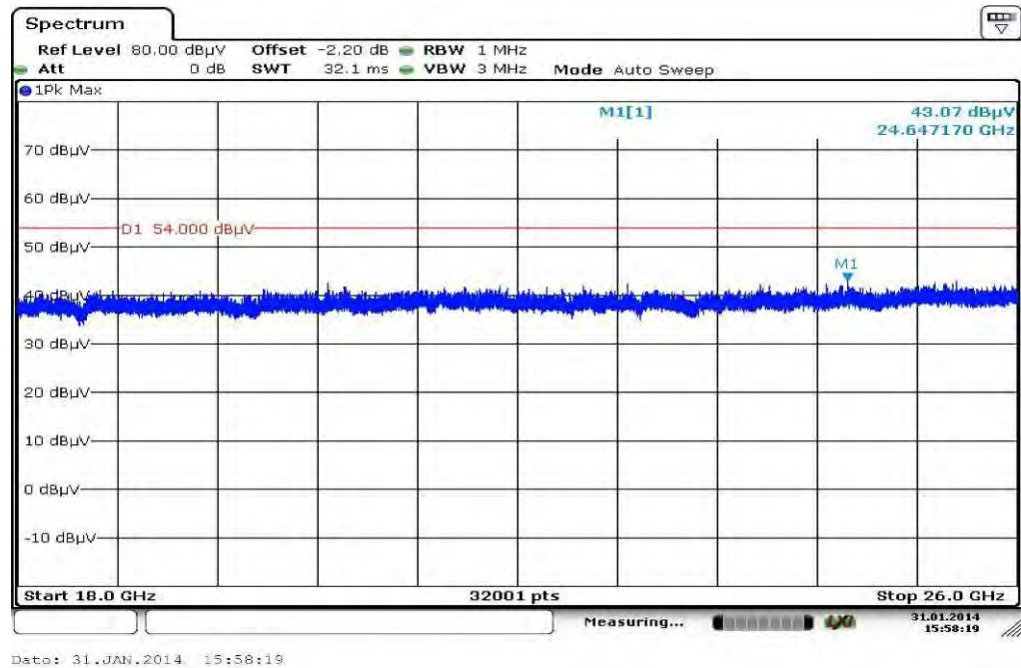
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
35.034600	10.3	1000.0	120.000	170.0	H	93.0	13.0	19.7	30.0	
45.623850	10.7	1000.0	120.000	170.0	V	190.0	13.3	19.3	30.0	
62.772900	7.9	1000.0	120.000	170.0	H	2.0	10.9	22.1	30.0	
223.137300	8.8	1000.0	120.000	170.0	V	280.0	12.5	27.2	36.0	
729.173850	20.7	1000.0	120.000	170.0	V	100.0	23.2	15.3	36.0	
897.451650	22.7	1000.0	120.000	98.0	H	265.0	25.2	13.3	36.0	

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

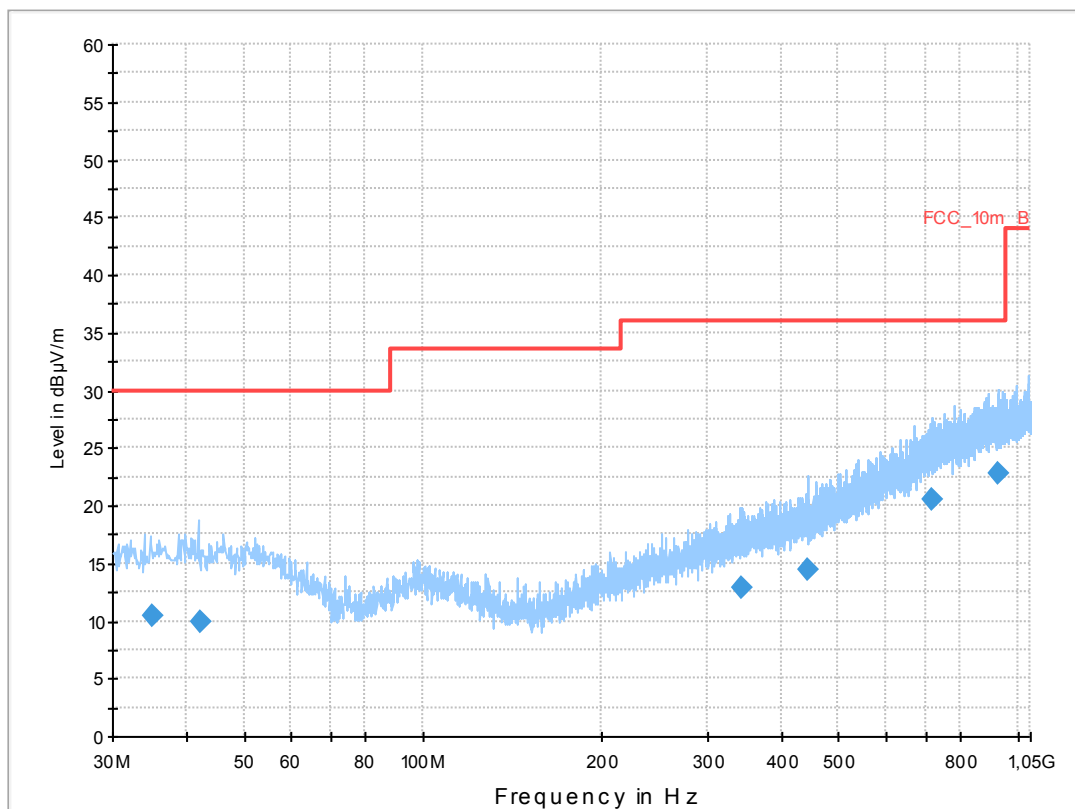
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan n-mode tx ch6
 Operator Name: Wolsdorfer
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

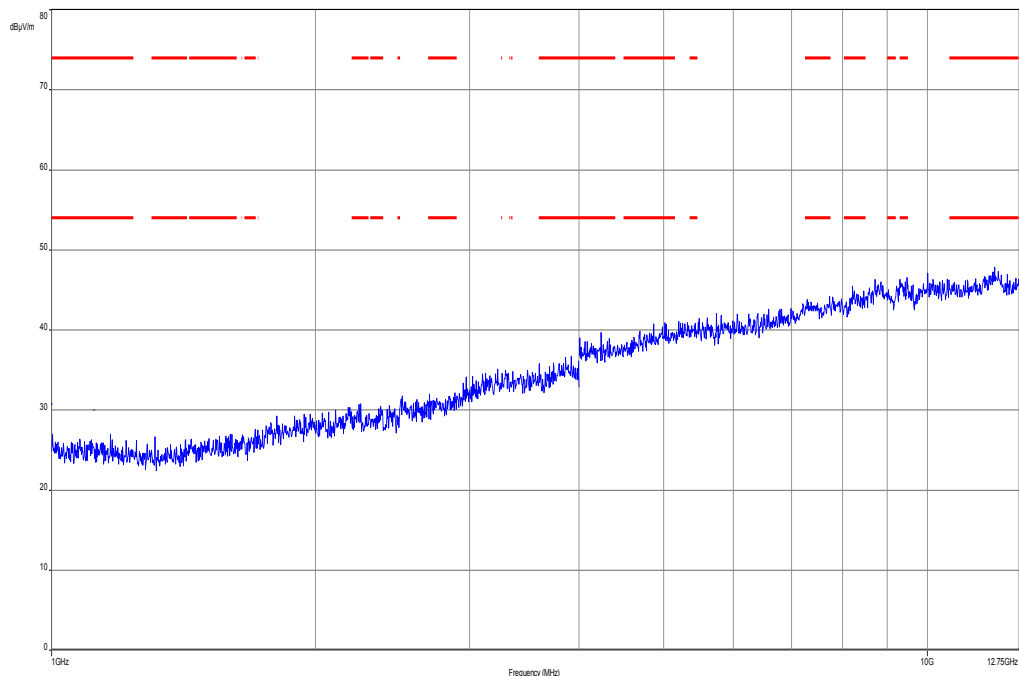
Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

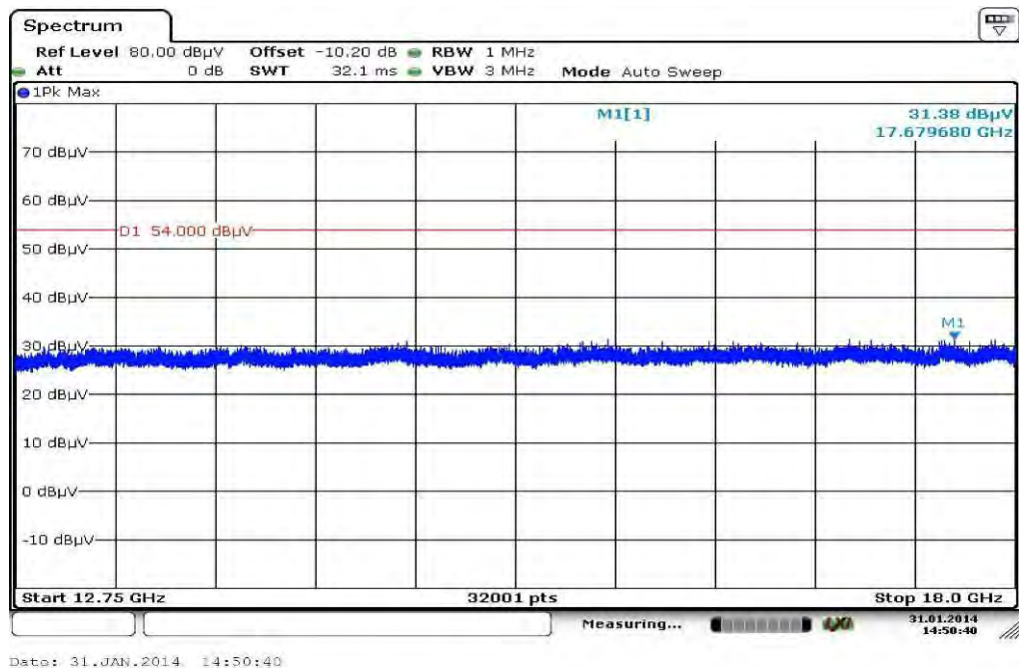


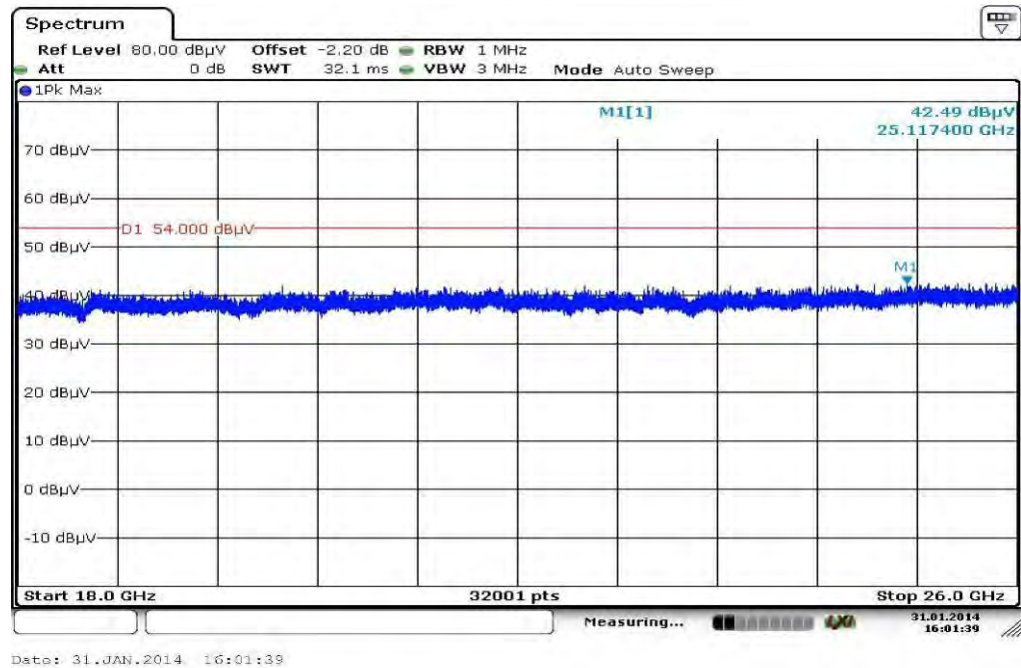
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
35.119350	10.4	1000.0	120.000	132.0	V	81.0	13.0	19.6	30.0	
42.124200	9.9	1000.0	120.000	145.0	H	10.0	13.4	20.1	30.0	
343.184550	12.8	1000.0	120.000	170.0	V	-9.0	15.9	23.2	36.0	
445.126950	14.4	1000.0	120.000	98.0	H	261.0	17.6	21.6	36.0	
716.260200	20.4	1000.0	120.000	170.0	V	-2.0	22.9	15.6	36.0	
925.148100	22.7	1000.0	120.000	170.0	H	10.0	25.3	13.3	36.0	

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

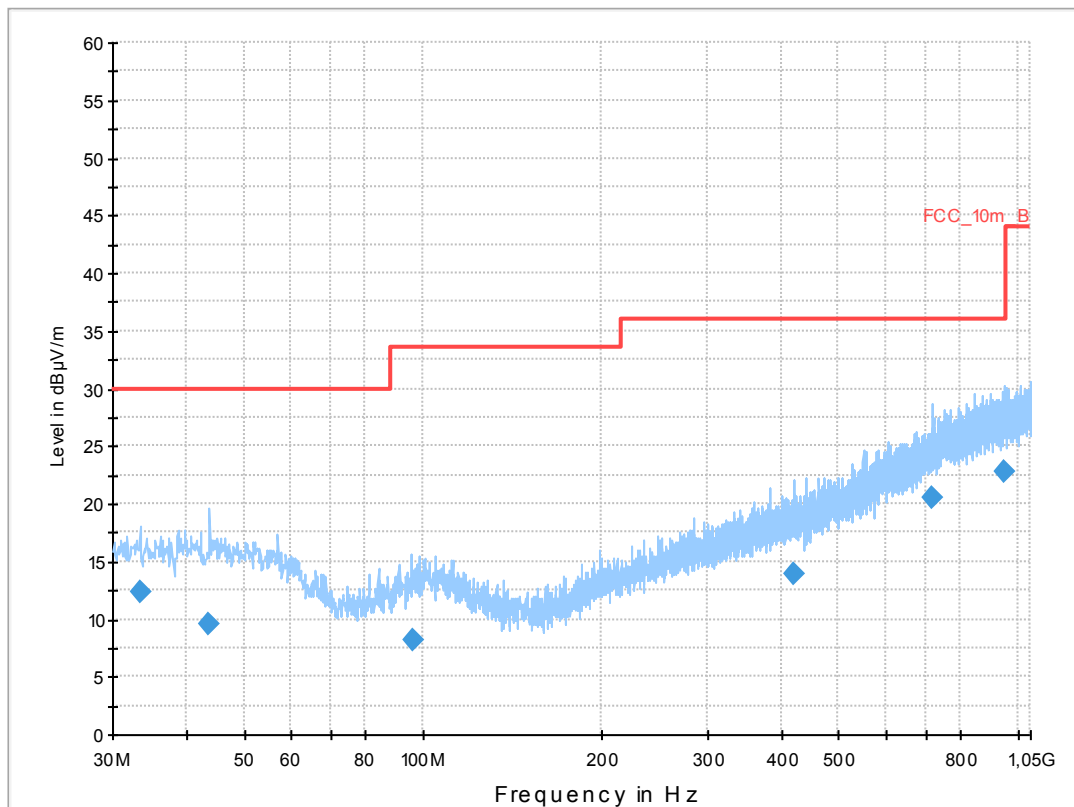
Common Information

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: wlan n-mode tx ch11
 Operator Name: Wolsdorfer
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

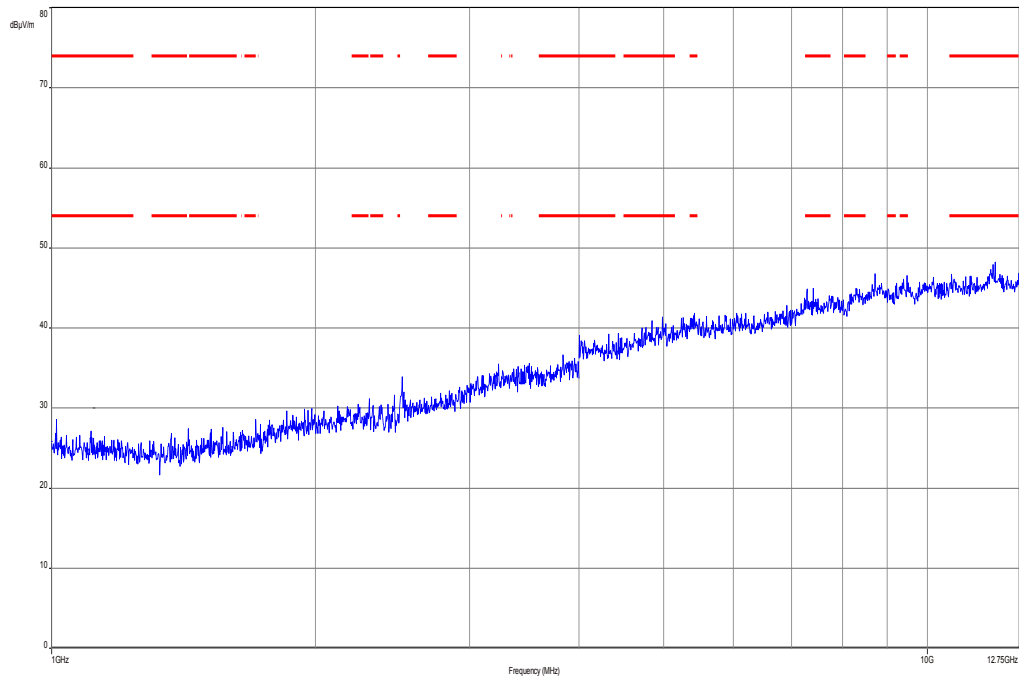
Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

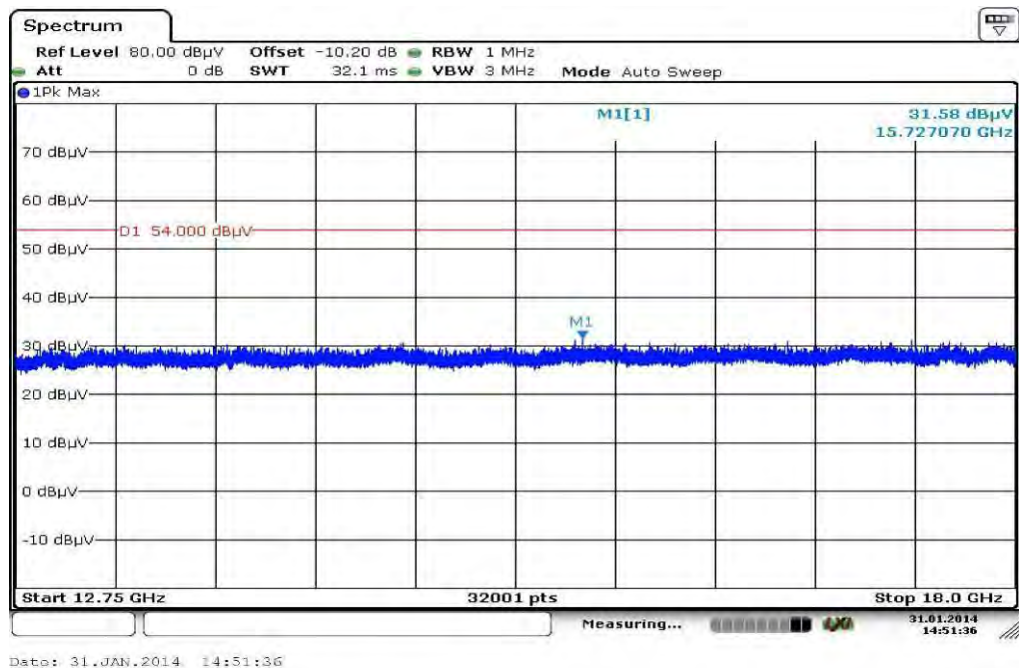


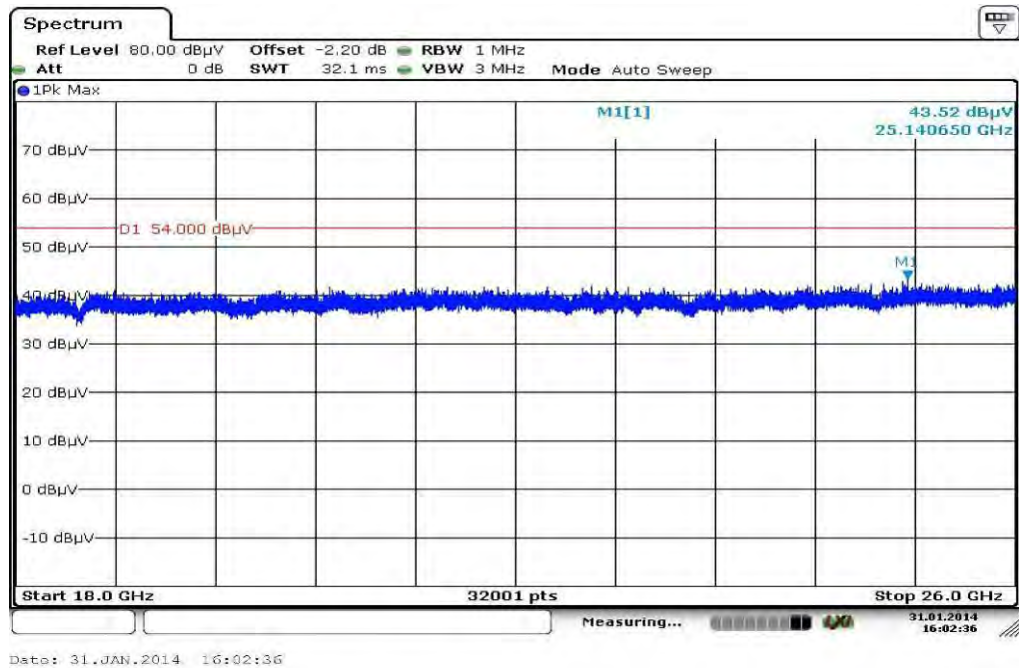
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
33.338550	12.3	1000.0	120.000	98.0	V	268.0	12.9	17.7	30.0	
43.473900	9.5	1000.0	120.000	170.0	V	85.0	13.3	20.5	30.0	
95.791200	8.1	1000.0	120.000	132.0	H	100.0	11.3	25.4	33.5	
420.765750	13.9	1000.0	120.000	170.0	H	85.0	17.2	22.1	36.0	
717.442650	20.5	1000.0	120.000	170.0	H	100.0	22.9	15.5	36.0	
949.426650	22.7	1000.0	120.000	170.0	H	90.0	25.3	13.3	36.0	

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

11.11 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 emissions detected above 1 GHz.		
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)

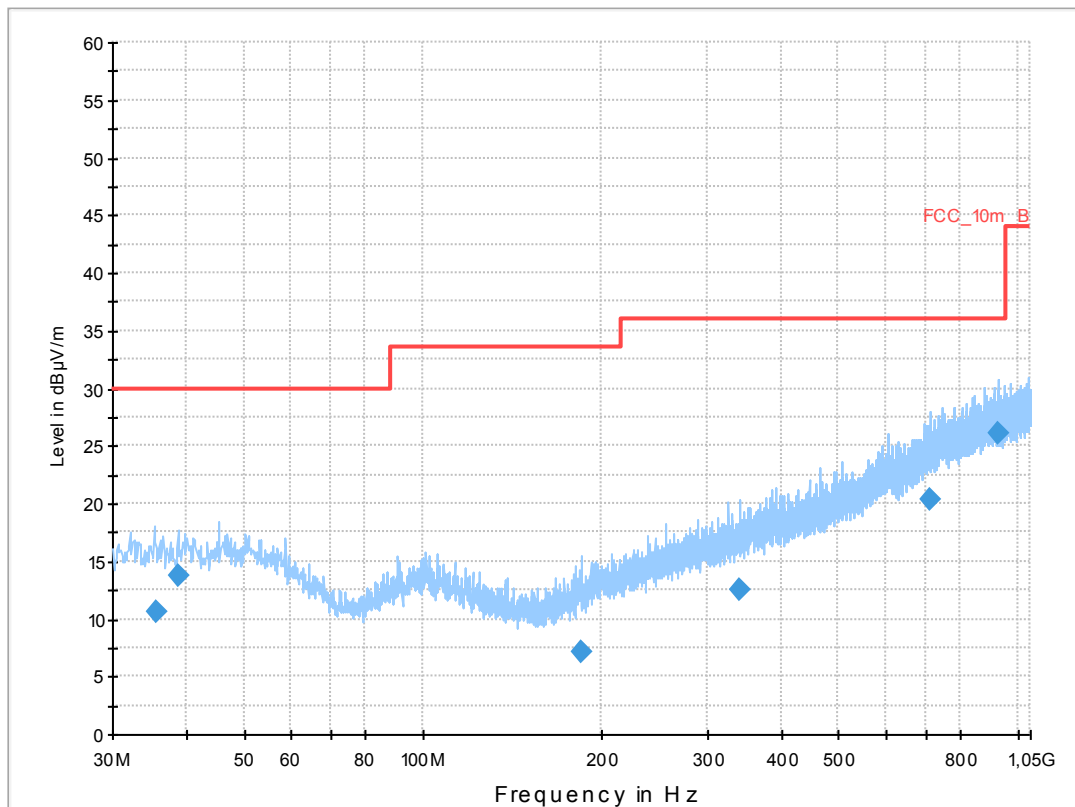
Plots: RX / Idle – mode**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: TS-0020-BV
 Serial Number: CB51268FN3
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: WLAN Idle
 Operator Name: Wolsdorfer
 Comment: battery powered

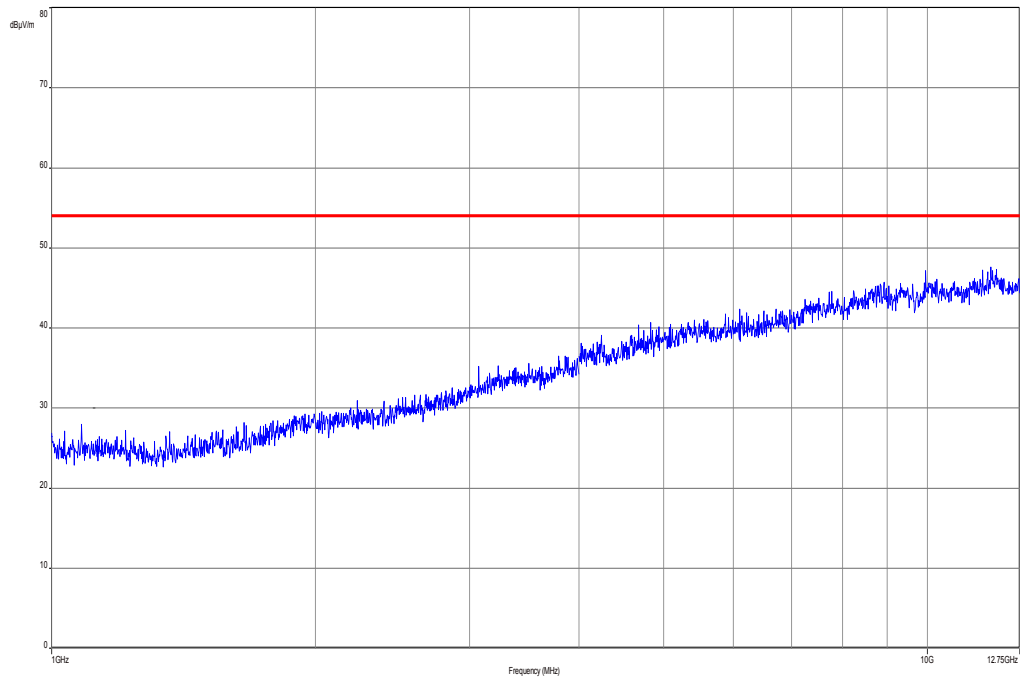
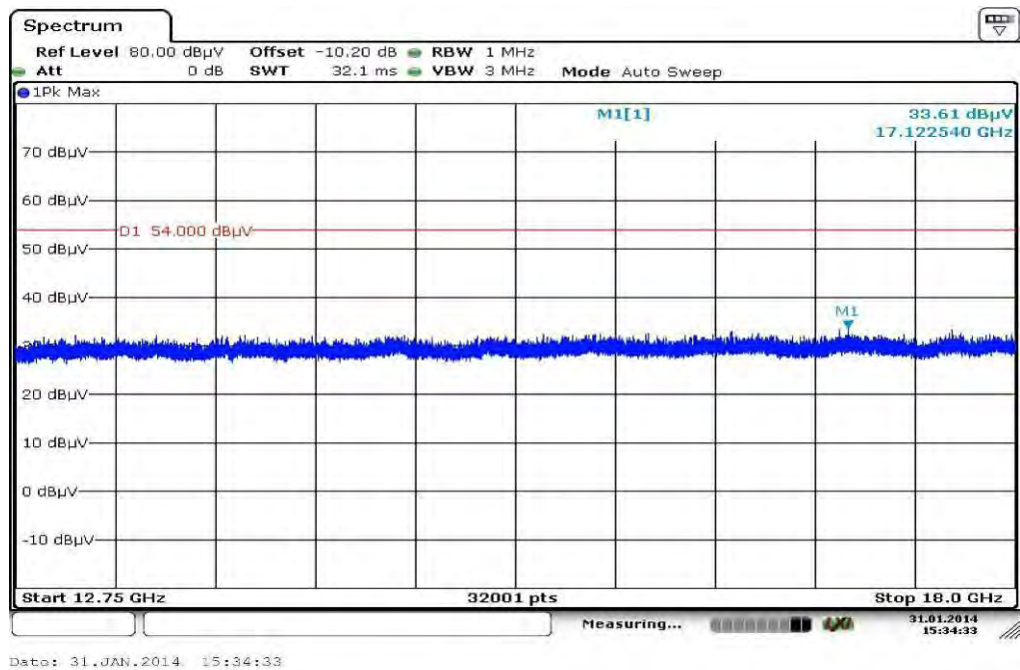
Scan Setup: STAN_Fin [EMI radiated]

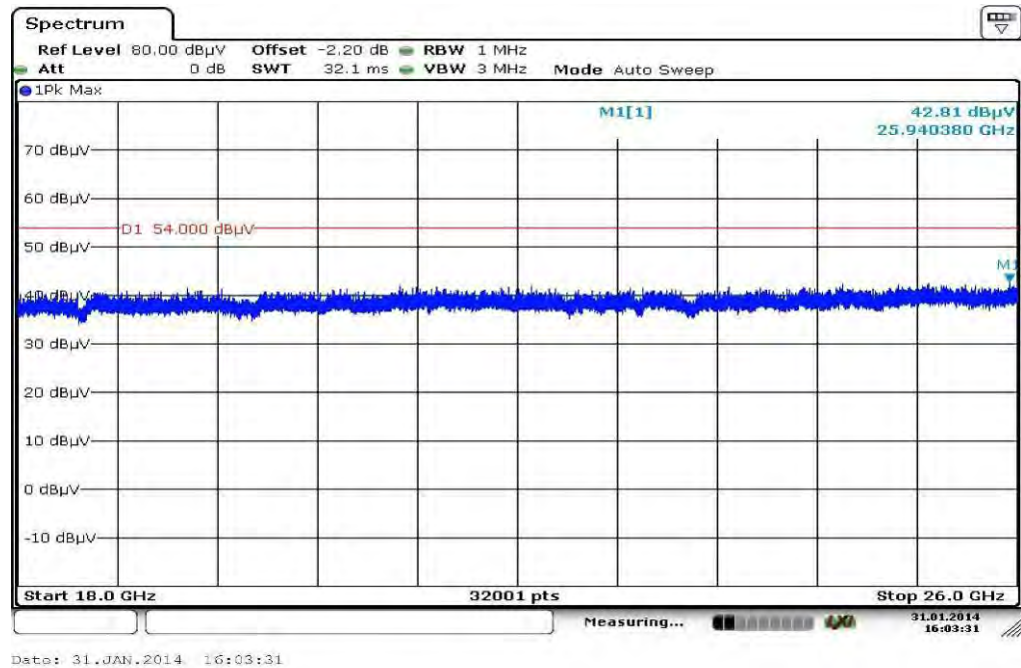
Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
35.511750	10.6	1000.0	120.000	132.0	H	190.0	13.1	19.4	30.0	
38.696250	13.7	1000.0	120.000	98.0	V	268.0	13.3	16.3	30.0	
183.855600	7.2	1000.0	120.000	170.0	H	190.0	10.7	26.3	33.5	
340.353600	12.6	1000.0	120.000	98.0	V	180.0	15.8	23.4	36.0	
714.690600	20.4	1000.0	120.000	121.0	H	0.0	22.8	15.6	36.0	
927.418500	26.0	1000.0	120.000	98.0	V	260.0	25.3	10.0	36.0	

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

11.12 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

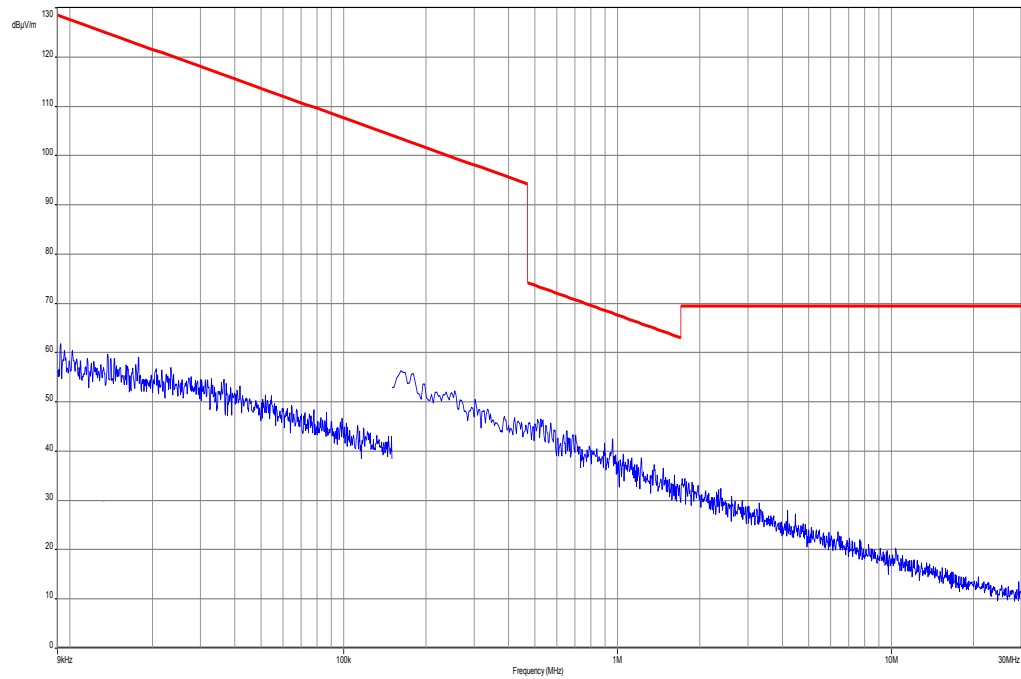
Results:

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

Result: Passed

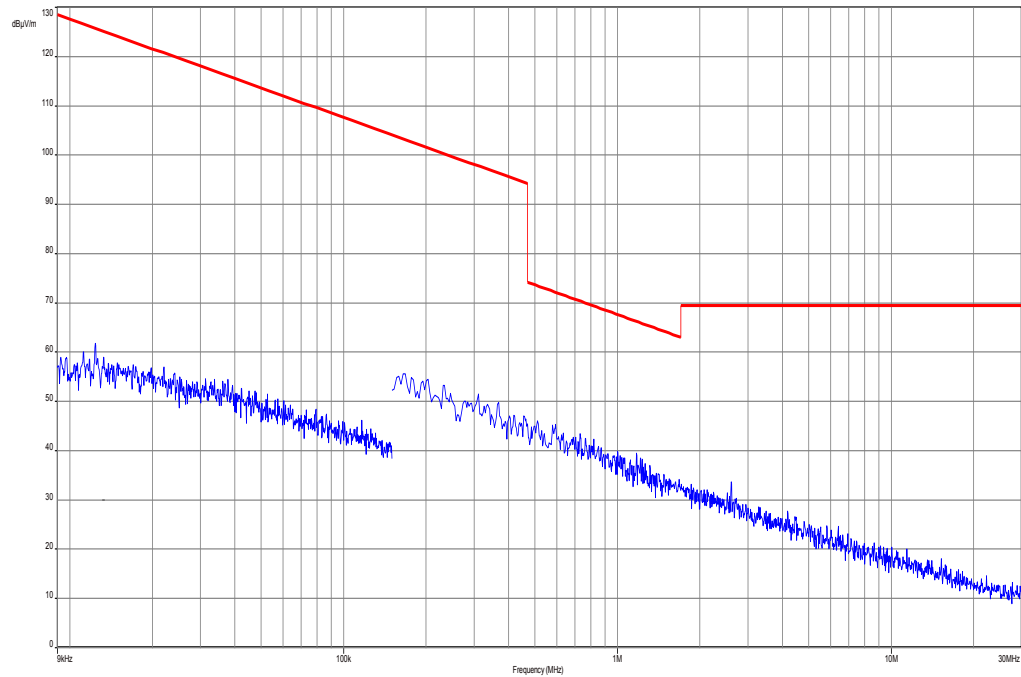
Plots: TX mode

Plot 1: 9 kHz to 30 MHz



Plots: RX / Idle – mode

Plot 1: 9 kHz to 30 MHz



11.13 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:

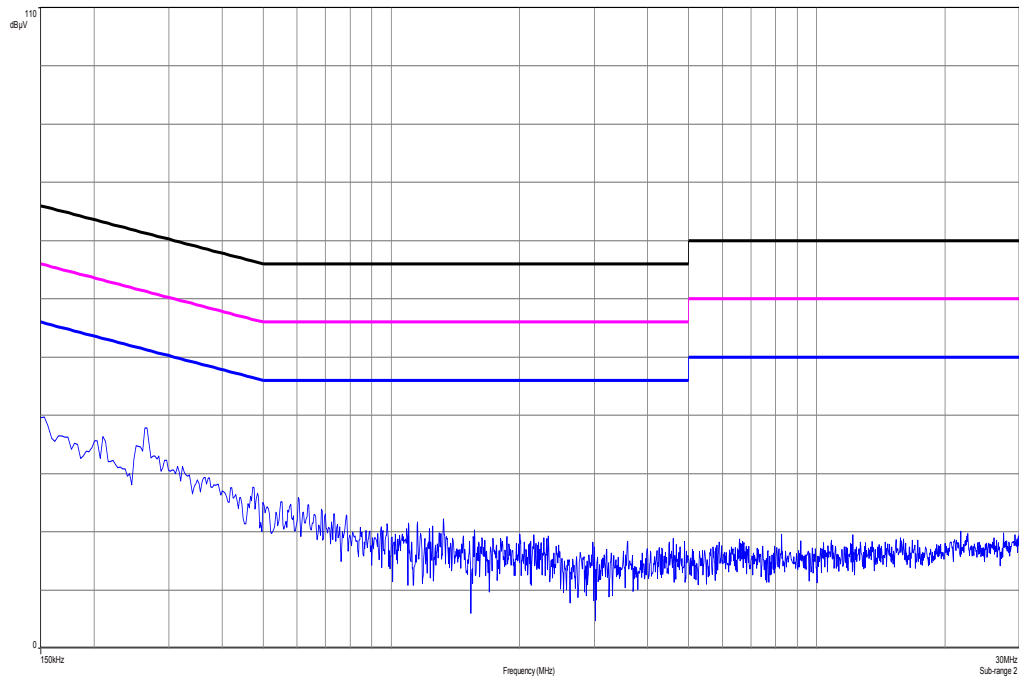
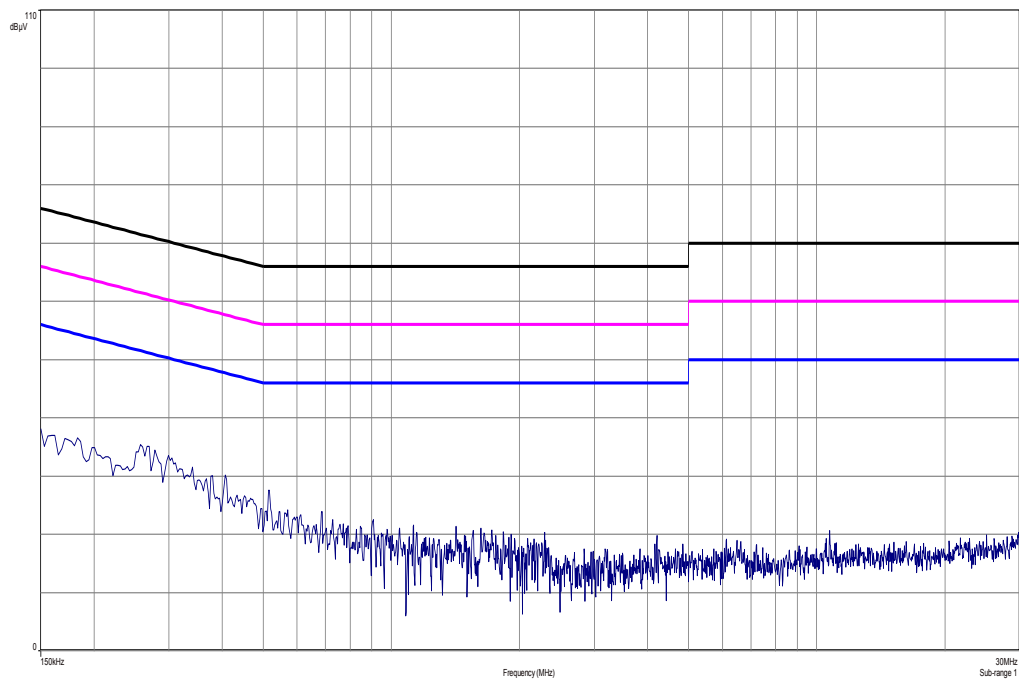
FCC		IC
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Average (dB μ V/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

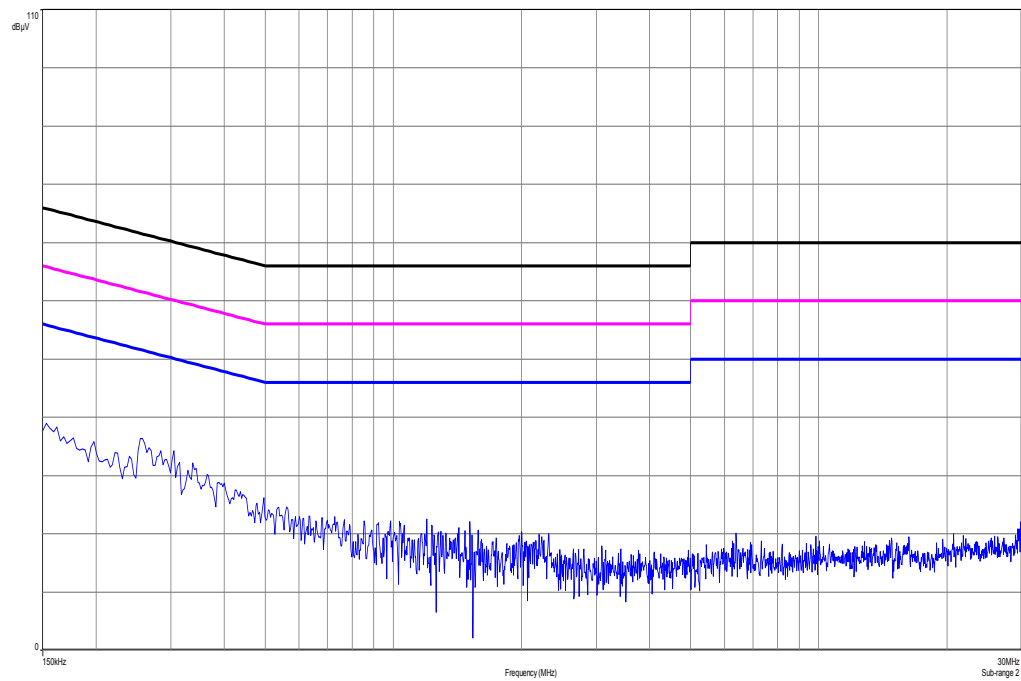
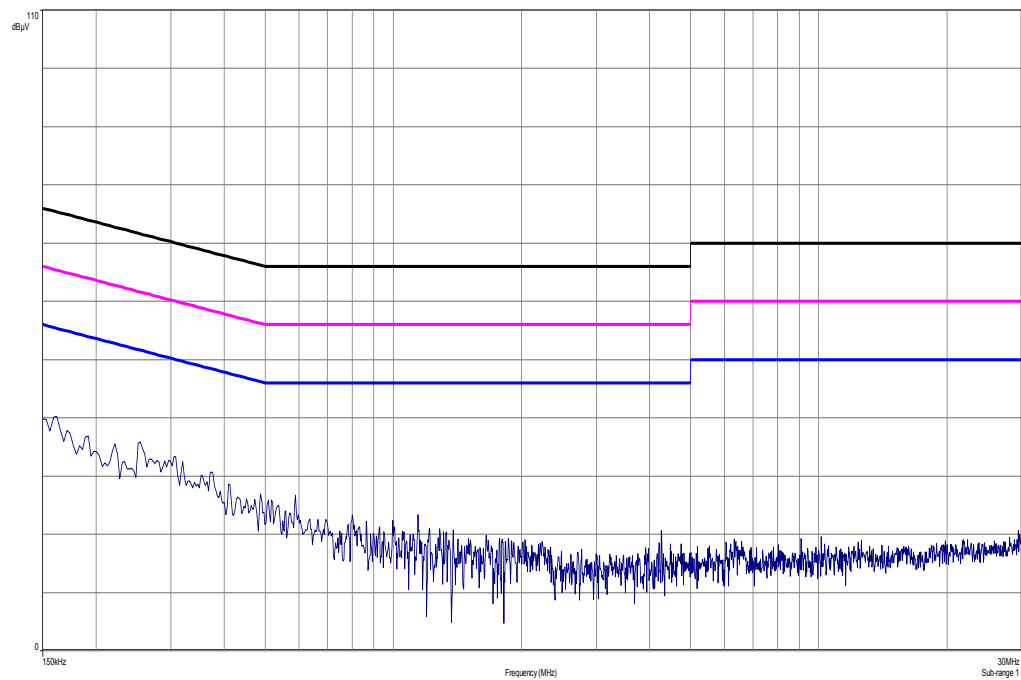
*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
No peaks 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

12 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 (Labor/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.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
4	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
5	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
6	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbe ck	295	300003787	k	12.04.2012	12.04.2014
7	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	08.05.2013	08.05.2015
8	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
9	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
10	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
11	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
12	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	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	WRCG240 0/2483- 2375/2505- 50/10SS	Wainwright	11	300003351	ev		
16	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbe ck	371	300003854	vIKI!	14.10.2011	14.10.2014
17	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologi es	MY51210197	300004405	k	21.02.2013	21.02.2014
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	6632B	Agilent	GB42110541	400000562	vIKI!	10.01.2013	10.01.2016

		0-20V, 0-5A		Technologies					
23	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015

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

13 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2014-02-05

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



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>