Test Report

47 CFR FCC Part 15 subpart C
Intentional Radiators

Report reference no.	:	28110757 001
FCC Designation Number	:	IT0008
FCC Test Firm Registration #	:	804595
Tested by (name + signature)……	:	Andrea Bortolotti \ Tester
Approved by (name + signature)……	:	Giovanni Molteni \ TM
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Testing Laboratory	:	TÜV Rheinland Italia S.r.l.
Address	:	Via Mattei 3 - 20010 - Pogliano Milanese (MI) – Italy
Applicant's name	:	Tecniplast S.p.A.
Address	:	Via I Maggio, 6 - 21020 Buguggiate (VA) - Italy
Test item description	:	Gateway
Trade Mark	:	TECNIPLAST innovation through passion
Manufacturer	:	Tecniplast S.p.A.
Model/Type reference	:	GA62
Ratings	:	100-240V~ 50/60Hz
Sample	:	
Samples received on	:	03/01/2017
TUV reference samples	:	170003 (sampled by the customer)
Samples tested n.	:	1
Testing	:	
Start Date:	:	07/06/2017
End Date:	:	26/06/2017

The results in this Test Report are exclusively referred to the tested samples. Without the written authorization of TÜV Rheinland Italia S.r.l., this document can be reproduced only integrally

SUMMARY

1. Reference Standards	
Standard	**Description**
FCC Part 15 (Subpart C)	§15.247 Operation within the bands 902-928 MHz, 2400-2483,5 MHz, and 5725-5850 MHz.
FCC Part 15 (Subpart C)	§15.207 Conducted Limits
FCC Part 15 (Subpart C)	§15.209 Radiated emission limits; general requirements
FCC Part 15 (Subpart C)	§15.203 Antenna Requirement
ANSI C63.4:2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2014	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC GUIDE 15.247 (DTS): April 8,2016	Guidance for performing compliance measurements on digital transmission systems (dts) operating under §15.247

2. Summary of testing:

FCC Rule Part	Test Item	Result	Remarks
15.207	AC POWER CONDUCTED EMISSION	PASS	Meet the requirement of limit
15.205 15.209 15.247(d)	RADIATED EMISSIONS	PASS	Meet the requirement of limit
15.247(a)(2)	6dB BANDWIDTH	PASS	Meet the requirement of limit
15.247(b)(3)(4)	OUTPUT POWER_1 (external antenna)	PASS	EIRP calculated is based on an antenna gain of 5dBi
15.247(d)	CONDUCTED ANTENNA PORT SPURIOUS EMISSIONS (external antenna)	PASS	Meet the requirement of limit
15.247(d)	RADIATED SPURIOUS EMISSIONS (external antenna)	PASS	Meet the requirement of limit
15.247(e)	POWER SPECTRAL DENSITY	PASS	Meet the requirement of limit
15.203	ANTENNA REQUIREMENT	PASS	Professional equipment (RP SMA)
15.247(b)	RF EXPOSURE REQUIREMENTS	PASS	Meet the requirement of limit

Possible test case verdicts:	
- test case does not apply to the test object ....:	N/A
- test object does meet the requirement .....:	PASS
- test object does not meet the requirement ....:	FAIL

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

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"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a comma (point) is used as the decimal separator.

3. General product information

Gateway for remote control and alarm monitoring

4. General Chipset information

Manufacturer Shenzhen Ogemray Technology Co., Ltd.

Model GWF-3M08-3.3V

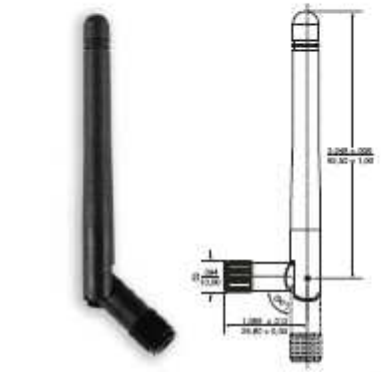
EUT Type ..... : USB Wireless Module
Adaptive Techniques ..... : Load Based Equipment
Hardware Version ..... : 1.3
Software Version ..... : 2.0
Modulation technology..... : DSSS, OFDM
Modulation Type ..... : Please see section 1.3
Frequency Range ..... : 802.11b/g/n-20:2.412GHz - 2.472GHz (at interval of 5MHz)
802.11n-40: 2.422GHz - 2.462GHz (at interval of 5MHz)
Antenna Gain ..... : 2dBi

FCC id: QR4WF5370M08

5. General Antennas information

Manufacturer Pulse

Model W1030



Features

- Shortest antennas in product line
- For WLAN devices using WiFi (802.11b/g), Bluetooth® and ZigBee™
- Omni-directional radiation pattern provides broad 360° coverage
- One-quarter wavelength dipole configuration
- Connection options easily integrate with OEM designs

Connector Options

- Reverse SMA (Male)*
- SMA (Male)

** Default Configuration – Please contact Pulse Applications Engineering for assistance in ordering connectors*

Weight ..... 6.3 grams
Carton 20/bag; 500/carton

Dimensions: Inches / mm

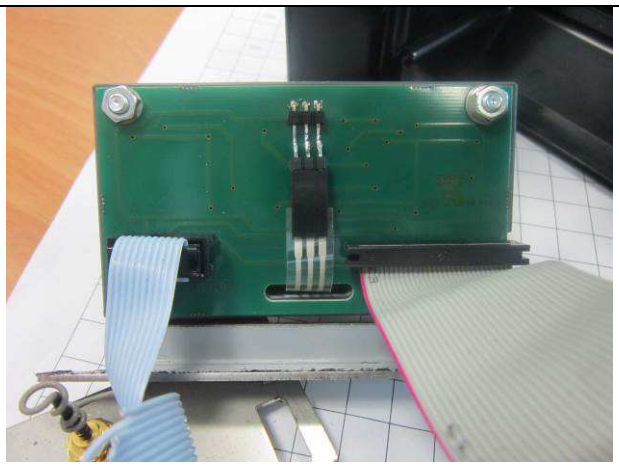
Unless otherwise specified, all tolerances are ± .010 / 0.25

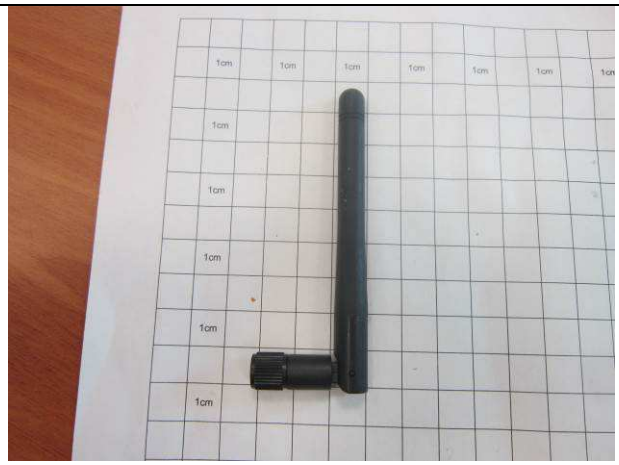
Electrical Specifications @ 25 °C

Note: This part number is lead-free and RoHS compliant. No additional suffix or identifier is required.

Antenna Part No.	Frequency [GHz]	Gain [dBi]	Impedance [Nom]	VSWR	Polarization	Electrical Length	Radiation
W1030	2.4 – 2.5	2.0	50 Ω	≤ 2.0	Vertical	1/4, dipole	Omni

6. Photographic documentation





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7. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Gateway	Tecniplast S.r.l.	GA62	---
AE	PC	Lenovo	T430	Used to set the WiFi Module

Note:

* Use :

EUT - Equipment Under Test,
AE - Auxiliary/Associated Equipment, or
SIM - Simulator (Not Subjected to Test)

No other Auxiliary/Associated Equipment was connected/installed on the EUT

8. Input/Output Ports:

CONNECTIONS

Port		Description	Connection	Cable lenght
1	Enclosure	Plastic	---	---
2	AC Power Port	AC	115Vac ~ 60 Hz	<3m
3	DC Power Port	DC	12Vdc (powered by dedicated AC/DC adaptor, supplied by the customer)	---
4	LAN	TP	RJ45 connector	>3m
5	USB	I/O	Local use (x2)	<3mt
6	HDMI	I/O	Not used	<3mt
7	MICRO USB	I/O	Not used	<3mt
8	Audio IN	I/O	Not used	<3mt
9	Audio OUT	I/O	Not used	<3mt
10	Data Line	I/O	RJ45	>3mt

*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

9. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	115	1.8	---	60Hz	1	---

10. EUT Operation Modes

Operation mode	Description
#1	EUT turn on with Wi-Fi Module in transmission mode

11. EUT Configuration Modes:

Mode #	Description
---	---

12. EUT Configuration Modes:

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

1. Test Conditions and Results – AC POWER CONDUCTED EMISSION

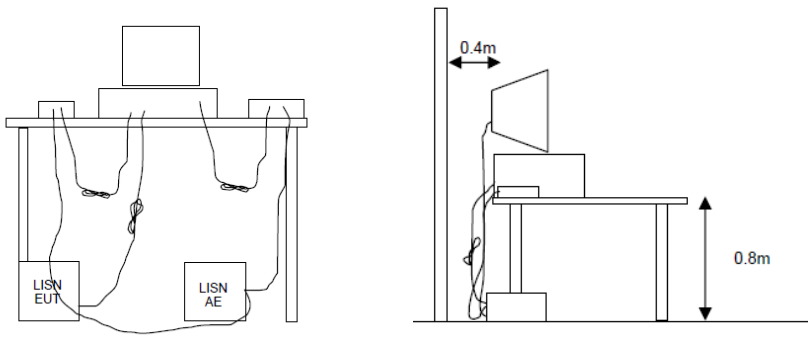
12	TEST: AC Power Conducted Emission		PASS
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C	
	Relative Humidity (%)	30 to 60 %	
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	21°C	
	Relative Humidity (%)	56%	
	Air pressure (hPa)	1020	
—	Frequency	Application Point	
Fully configured sample tested at the power line frequency	115V ~ 60Hz	AC Mains	
Equipment mode:	Operation mode	#1	
FCC Standard	§15.207		

Frequency (MHz)	Quasi-peak (dBuV)	Average (dBuV)	Result
0.15-0.5	66 to 56	56 to 46	PASS
0.5-5	56	46	PASS
5-30	60	50	PASS

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Further information to test setup

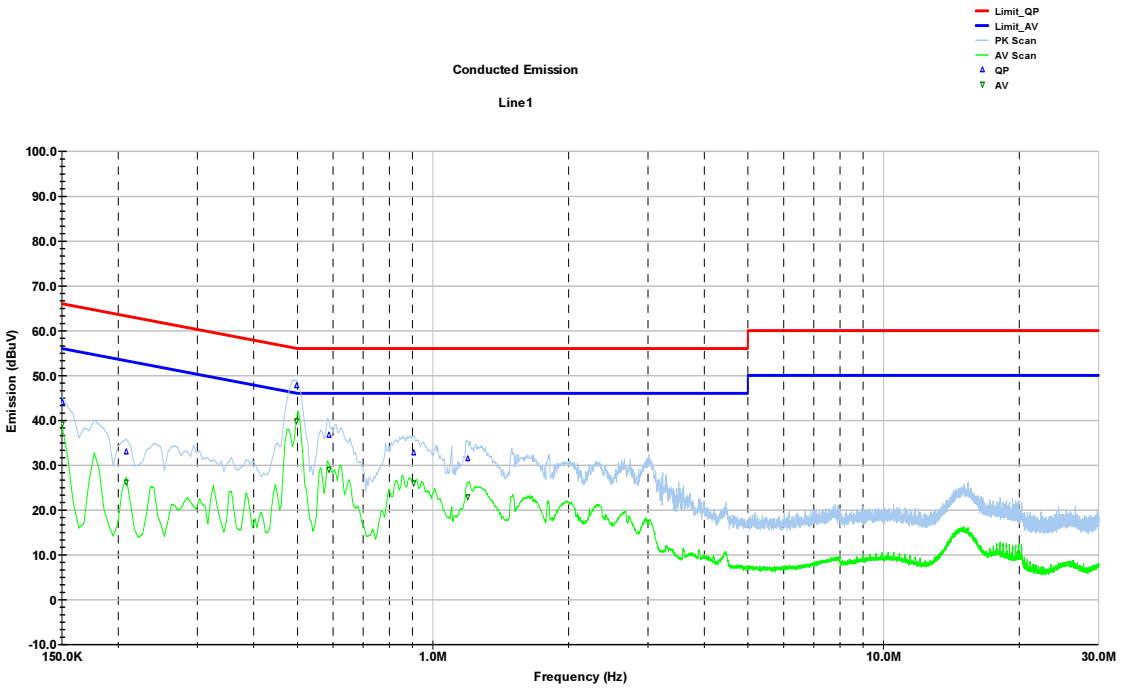


Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU40	87020455	04/2017	04/2018
LISN	PMM	PMM L3-64	87020466	09/2016	09/2017
Stabilized Power Supply	Elettrotest	TPS T 30K60S	87020490	09/2015	09/2018

Graphical representation of Mains Terminal Disturbance Voltage Measurement

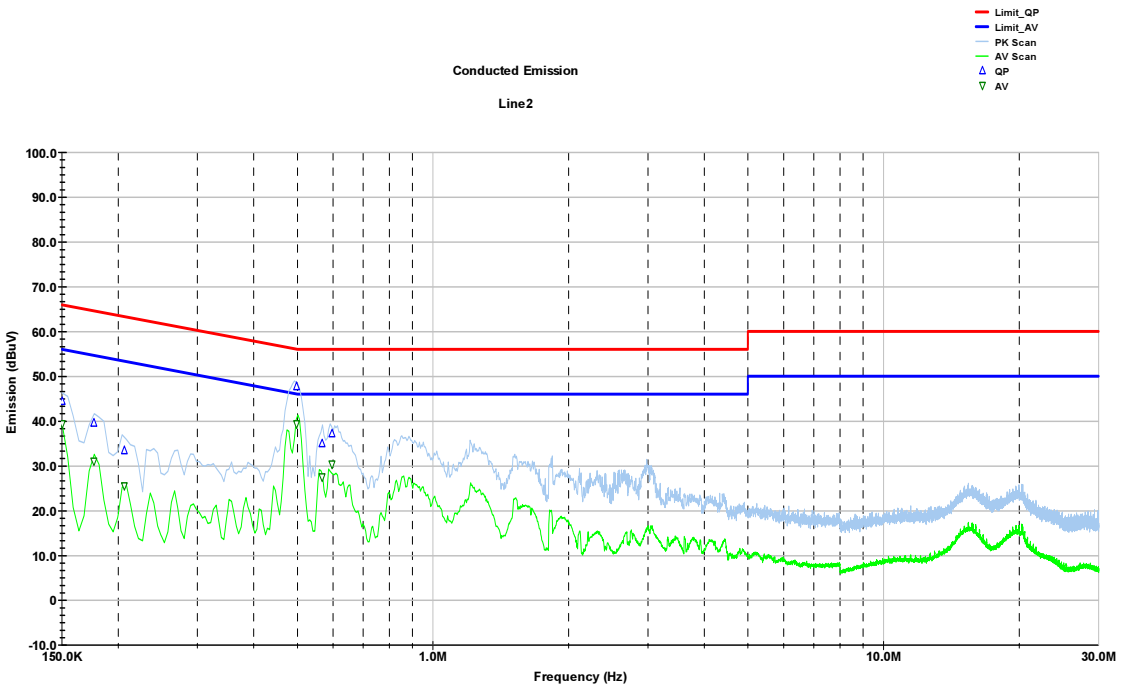
Operation Mode: #1

Line 1



Frequency (MHz)	QP (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV (dBuV)	AV Limit (dBuV)	AV Margin (dB)	factor_total_L1 ()
1.197 MHz	31.45	56.00	-24.55	22.81	46.00	-23.19	-10.972
905.918 KHz	32.83	56.00	-23.17	25.88	46.00	-20.12	-10.965
586.485 KHz	36.69	56.00	-19.31	29.05	46.00	-16.95	-10.904
496.488 KHz	47.66	56.06	-8.40	39.86	46.06	-6.20	-10.890
208.495 KHz	33.04	63.27	-30.23	26.19	53.27	-27.08	-10.923
150.000 KHz	43.93	66.00	-22.07	39.07	56.00	-16.93	-10.960
150.000 KHz	43.93	66.00	-22.07	39.07	56.00	-16.93	-10.960

Graphical representation of Mains Terminal Disturbance Voltage Measurement
Operation Mode: #1
Line 2



Frequency (MHz)	QP (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV (dBuV)	AV LImit (dBuV)	AV Margin (dB)
150.750 KHz	44.32	65.96	-21.63	39.40	55.96	-16.56
176.996 KHz	39.57	64.63	-25.06	31.08	54.63	-23.54
206.045 KHz	33.46	63.36	-29.91	25.56	53.36	-27.80
496.510 KHz	47.67	56.06	-8.39	39.34	46.06	-6.72
568.486 KHz	35.09	56.00	-20.91	27.63	46.00	-18.37
595.485 KHz	37.27	56.00	-18.73	30.40	46.00	-15.60

2. Test Conditions and Results – RADIATED EMISSION

13	TEST: Radiated Emission		PASS
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C	
	Relative Humidity (%)	30 to 60 %	
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	22°C	
	Relative Humidity (%)	54%	
	Air pressure (hPa)	1020	
—	Frequency	Application Point	
Fully configured sample tested at the power line frequency	115V ~ 60Hz	Enclosure	
Equipment mode:	Operation mode	#1	
FCC Standard	§15.205; §15.209; §15.247		

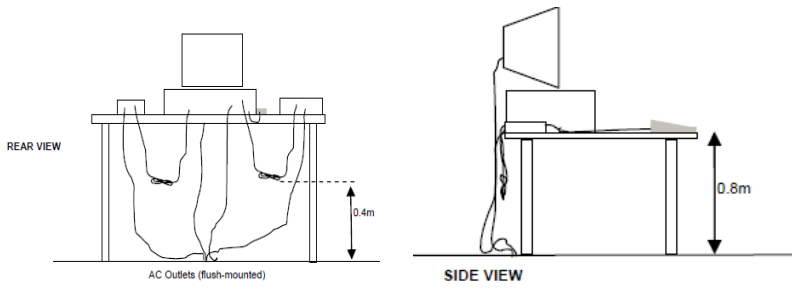
Frequency (MHz)	Quasi-peak (dBuV)	Average (dBuV)	Result
0.15-0.5	66 to 56	56 to 46	PASS
0.5-5	56	46	PASS
5-30	60	50	PASS

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

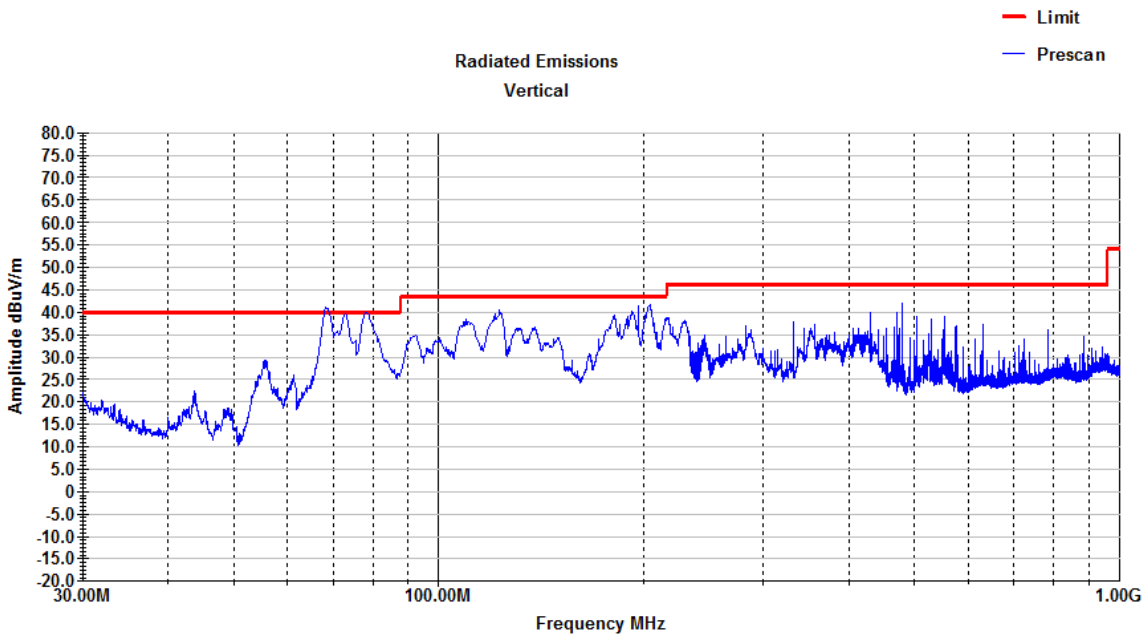
**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

Further information to test setup

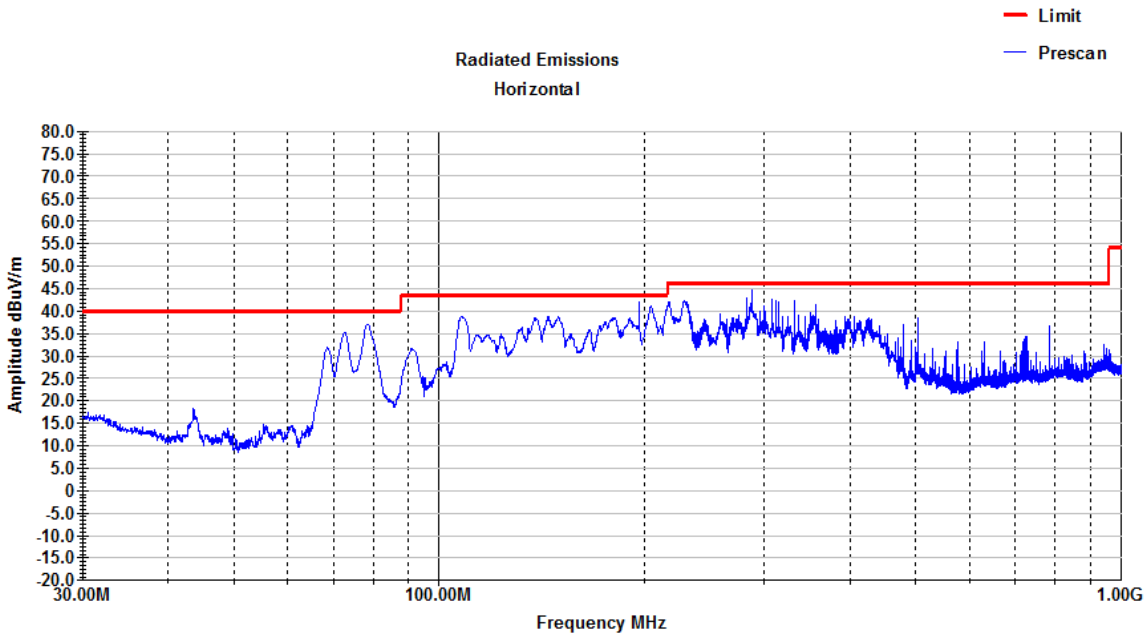


Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
CSSA	ETS Lindgren	FACT3	87020484	10/2016	10/2017
EMI Test Receiver	R&S	ESU40	87020455	04/2017	04/2018
Antenna BiConiLog	ETS Lindgren	3124E-PA	87020457	04/2017	04/2020
Antenna Horn with Preamplifier	ETS Lindgren	3117-PA	87020458	04/2017	04/2020
Antenna Horn with Preamplifier	ETS Lindgren	114514	87020459	04/2017	04/2020
Antenna Horn with Preamplifier	ETS Lindgren	120722	87020460	04/2017	04/2020

Graphical representation of Radiated Emission Measurement
Operation Mode: #1
Frequency: 30MHz – 1GHz
Antenna Polarization: Vertical
Channel: Low / Standard: IEE 802.11g (worst case)



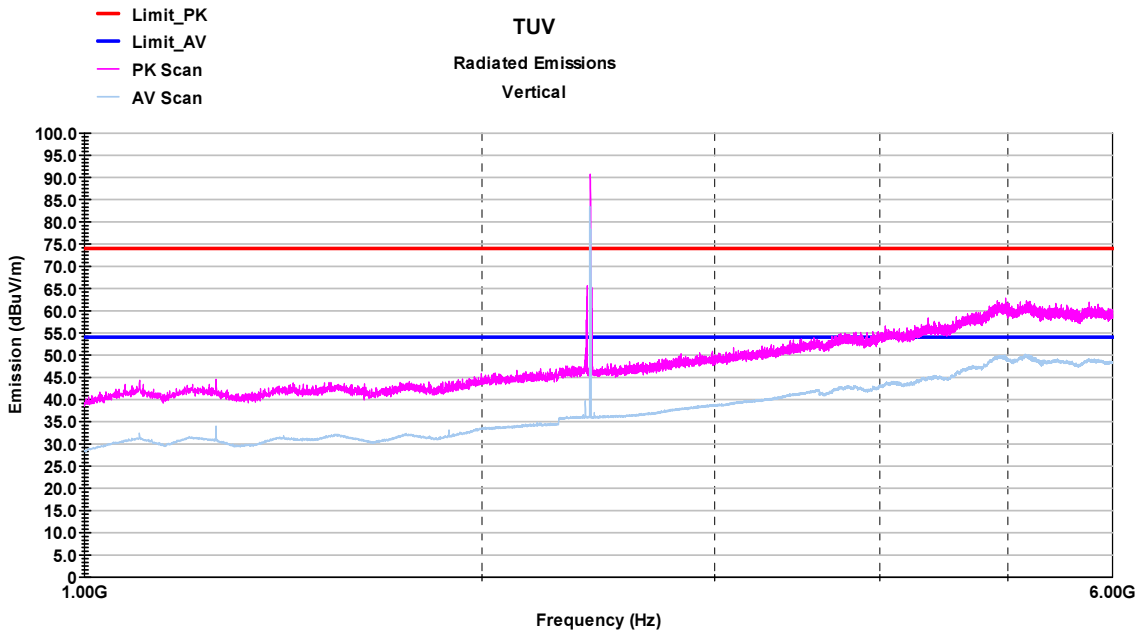
Graphical representation of Radiated Emission Measurement
Operation Mode: #1
Frequency: 30MHz – 1GHz
Antenna Polarization: Horizontal
Channel: Low / Standard: IEE 802.11g (worst case)



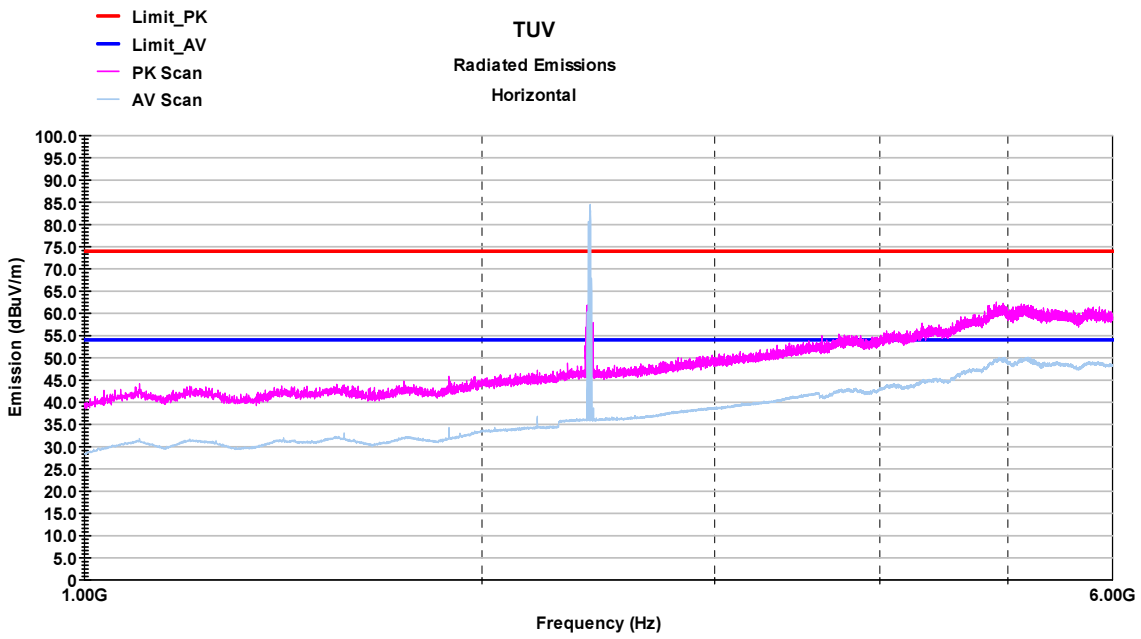
Tabulated results of Radiated Emission Measurement
Operation Mode: #1
Frequency: 30MHz – 1GHz

Frequency (MHz)	QP (dBuV/m)	Margin (dB)	TT (deg)	Tower (cm)	Polarization (H or V)	Correction (dB)
68.470 MHz	36.057	-3.943	90.000	108.000	V	6.897
72.910 MHz	38.756	-1.244	21.000	116.000	V	6.983
78.370 MHz	38.718	-1.282	164.000	104.000	V	7.027
287.980 MHz	33.105	-12.915	360.000	120.000	H	13.132

Graphical representation of Radiated Emission Measurement
Operation Mode: #1
Frequency: 1GHz – 6GHz
Antenna Polarization: Vertical
Channel: Low / Standard: IEE 802.11g (worst case)

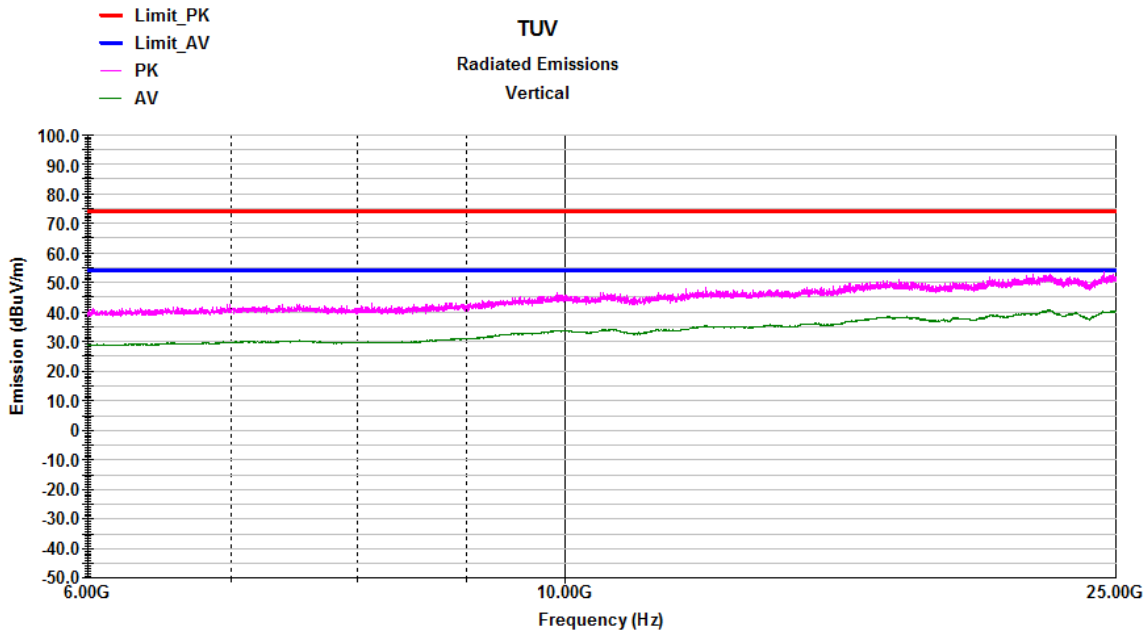


Graphical representation of Radiated Emission Measurement
Operation Mode: #1
Frequency: 1GHz – 6GHz
Antenna Polarization: Horizontal
Channel: Low / Standard: IEE 802.11g (worst case)

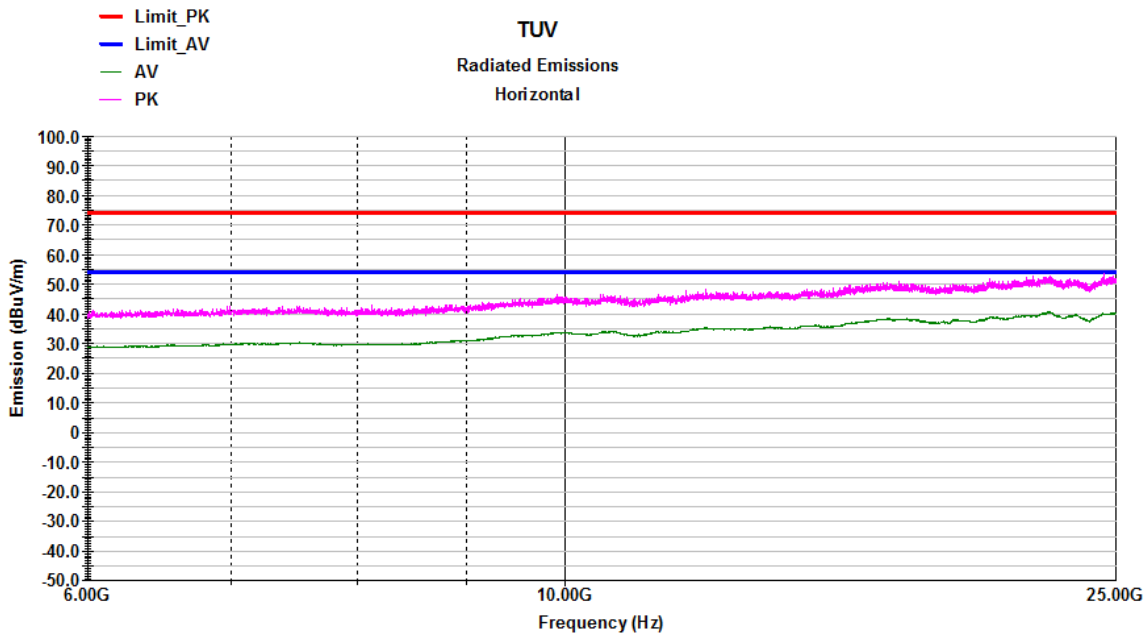


Tabulated results of Radiated Emission Measurement
Operation Mode: #1
Frequency: 1GHz - 6GHz

Graphical representation of Radiated Emission Measurement
Operation Mode: #1
Frequency: 6GHz – 25GHz
Antenna Polarization: Vertical
Channel: Low / Standard: IEE 802.11g (worst case)

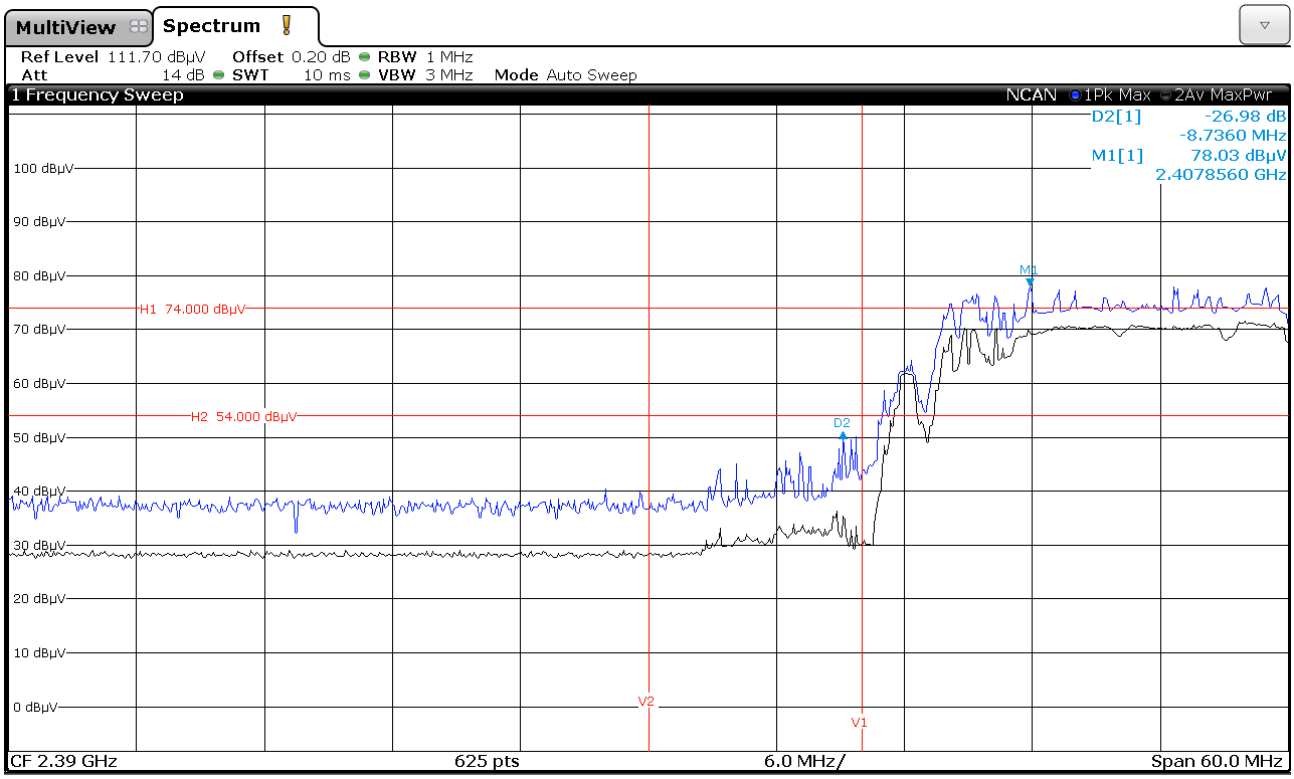


Graphical representation of Radiated Emission Measurement
Operation Mode: #1
Frequency: 6GHz – 25GHz
Antenna Polarization: Horizontal
Channel: Low / Standard: IEE 802.11g (worst case)

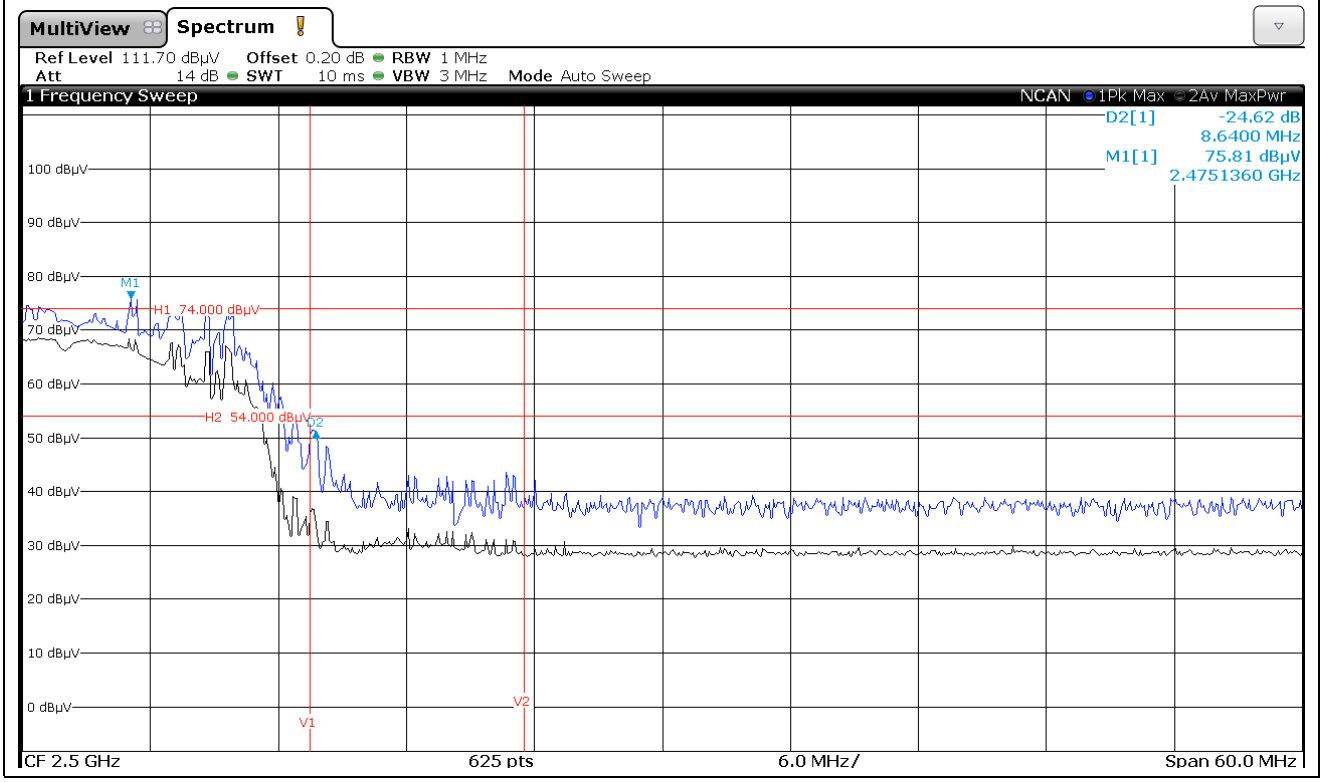


Tabulated results of Radiated Emission Measurement
Operation Mode: #1
Frequency: 6GHz - 25GHz

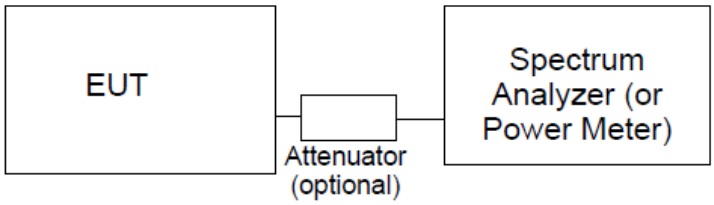
Graphical representation of Antenna Port Spurious Emission - Radiated
Operation Mode: #1
Standard: IEE 802.11g (worst case)
Channel: Low
BAND EDGE



Graphical representation of Antenna Port Spurious Emission - Radiated
Operation Mode: #1
Standard: IEE 802.11g (worst case)
Channel: High
BAND EDGE

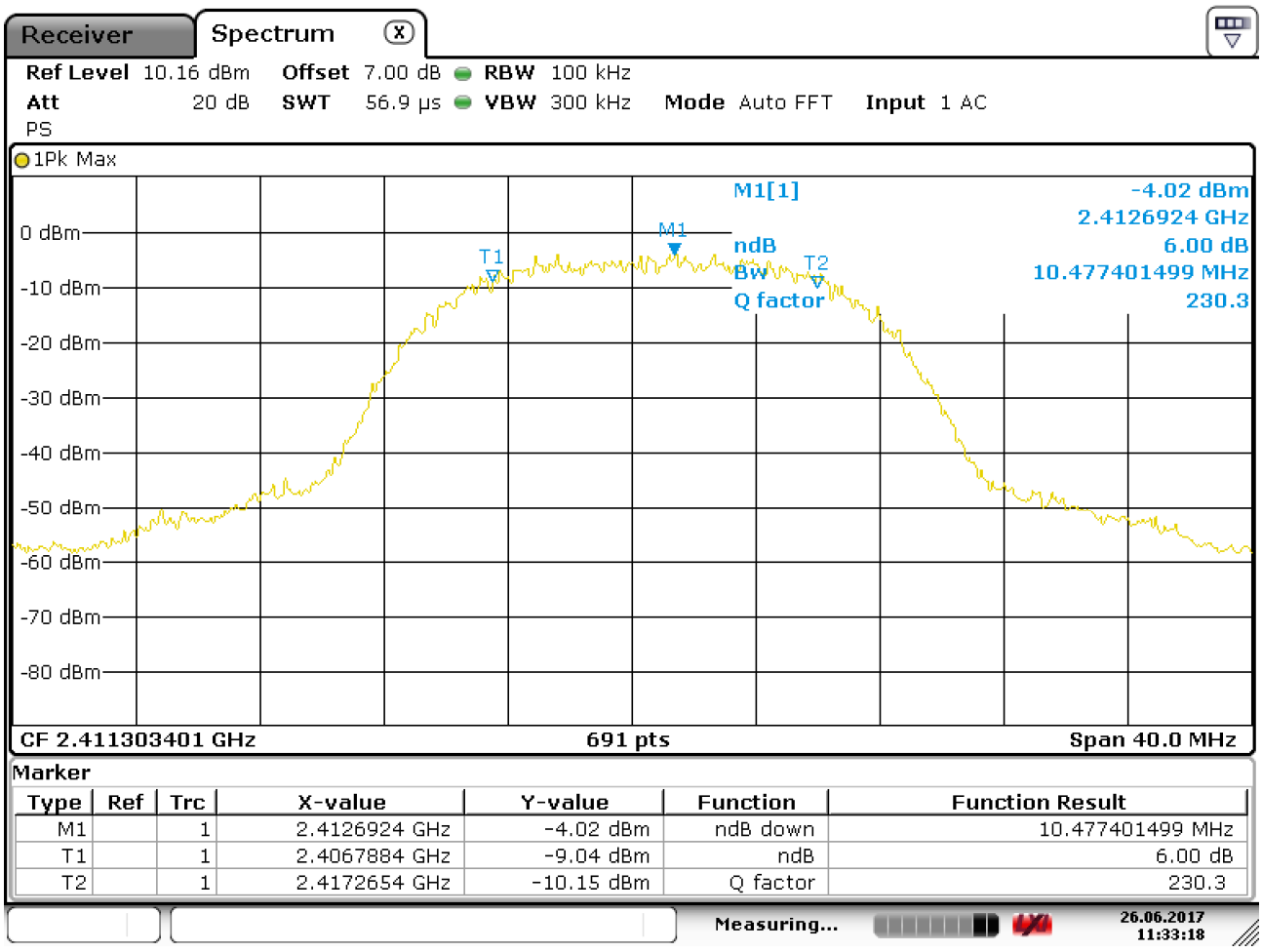


3. Test Conditions and Results – 6dB BANDWIDTH

14	TEST: Radiated Emission		PASS
Parameters required prior to the test		Laboratory Ambient Temperature (°C)	15 to 35 °C
		Relative Humidity (%)	30 to 60 %
Parameters recorded during the test		Laboratory Ambient Temperature (°C)	24°C
		Relative Humidity (%)	48%
		Air pressure (hPa)	1020
—		Frequency	Application Point
Fully configured sample tested at the power line frequency		115V ~ 60Hz	SMA Connector
Equipment mode:		Operation mode	#1
FCC Standard		§15.247	
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.			
Further information to test setup			

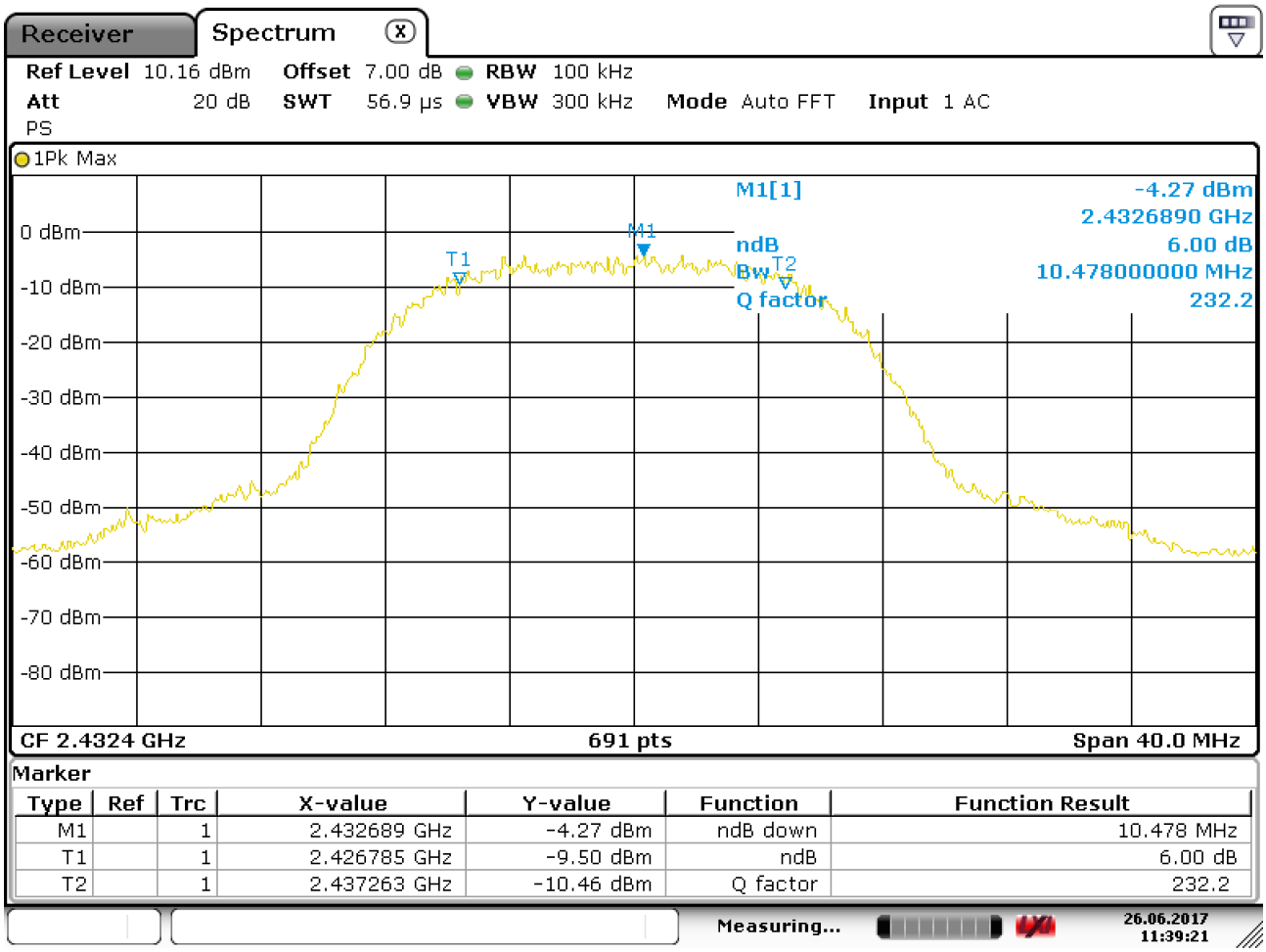
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU40	87020455	04/2017	04/2018
20dB Attenuator	RS Components	Huber & Suhner	87020534	10/2016	10/2017

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11b
Channel: #1



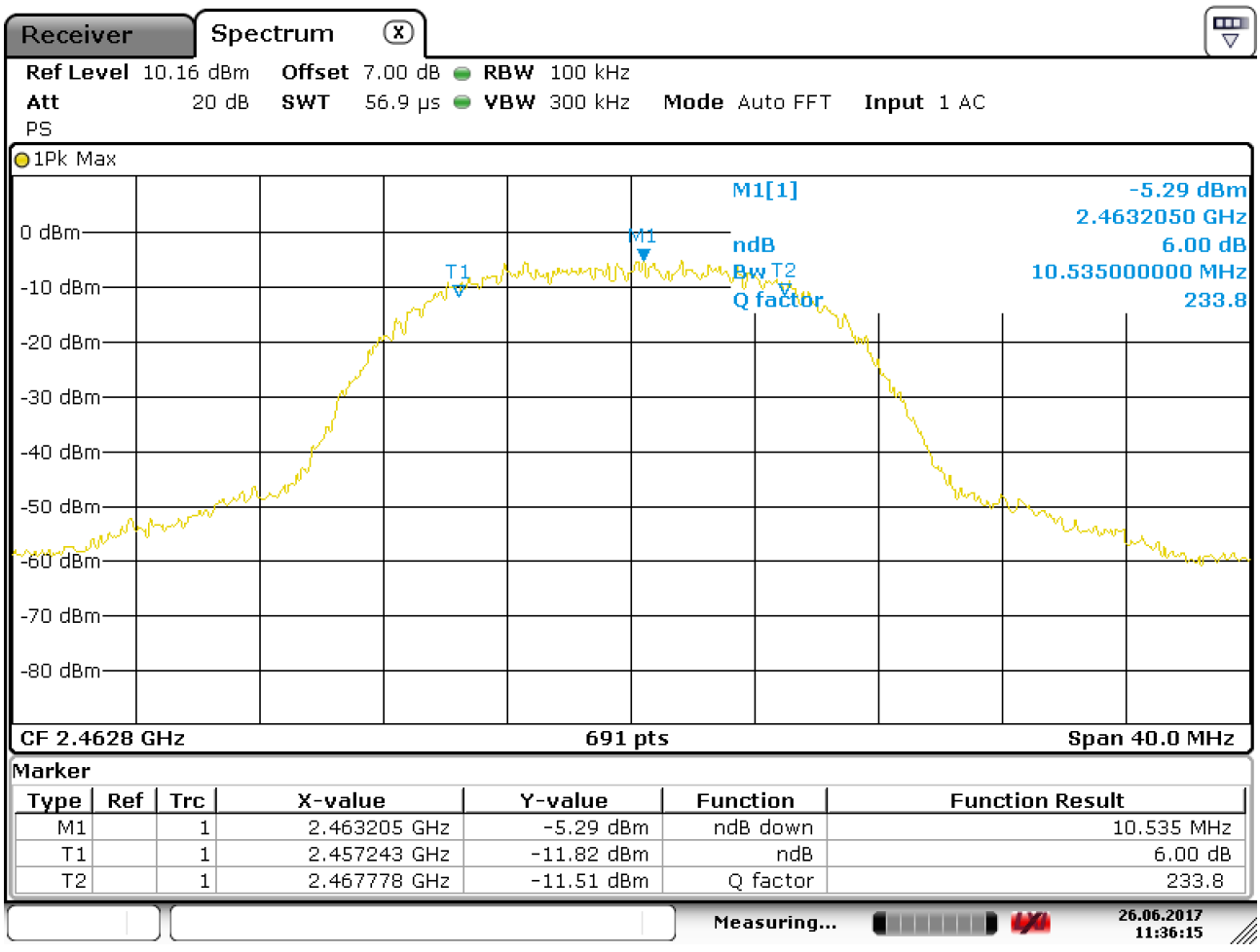
Date: 26.JUN.2017 11:33:18

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11b
Channel: #5



Date: 26.JUN.2017 11:39:20

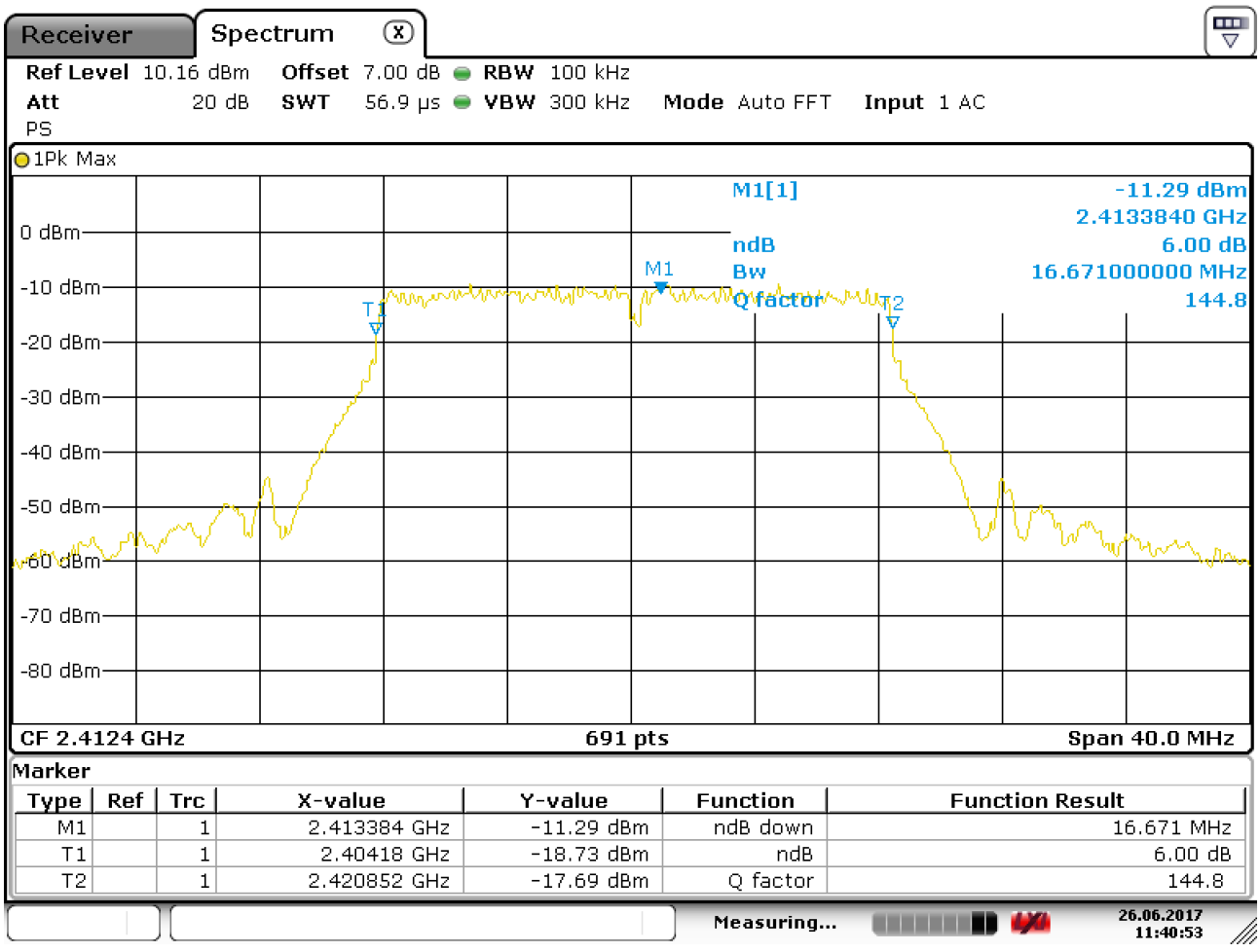
Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11b
Channel: #11



Date: 26.JUN.2017 11:36:15

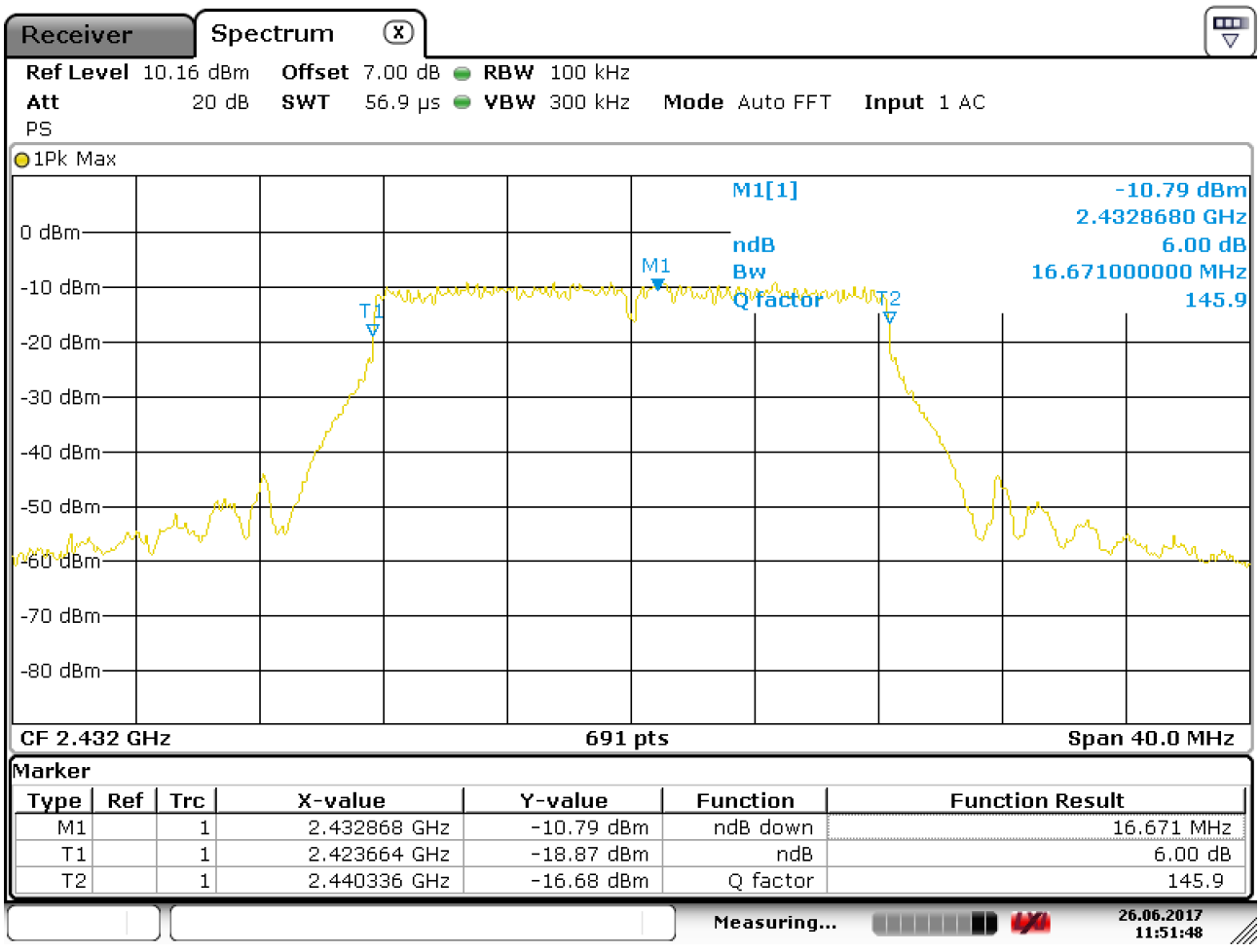
Test Results			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2412	10.47	0,5
5	2432	10.47	0,5
11	2463	10.53	0,5

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11g
Channel: #1



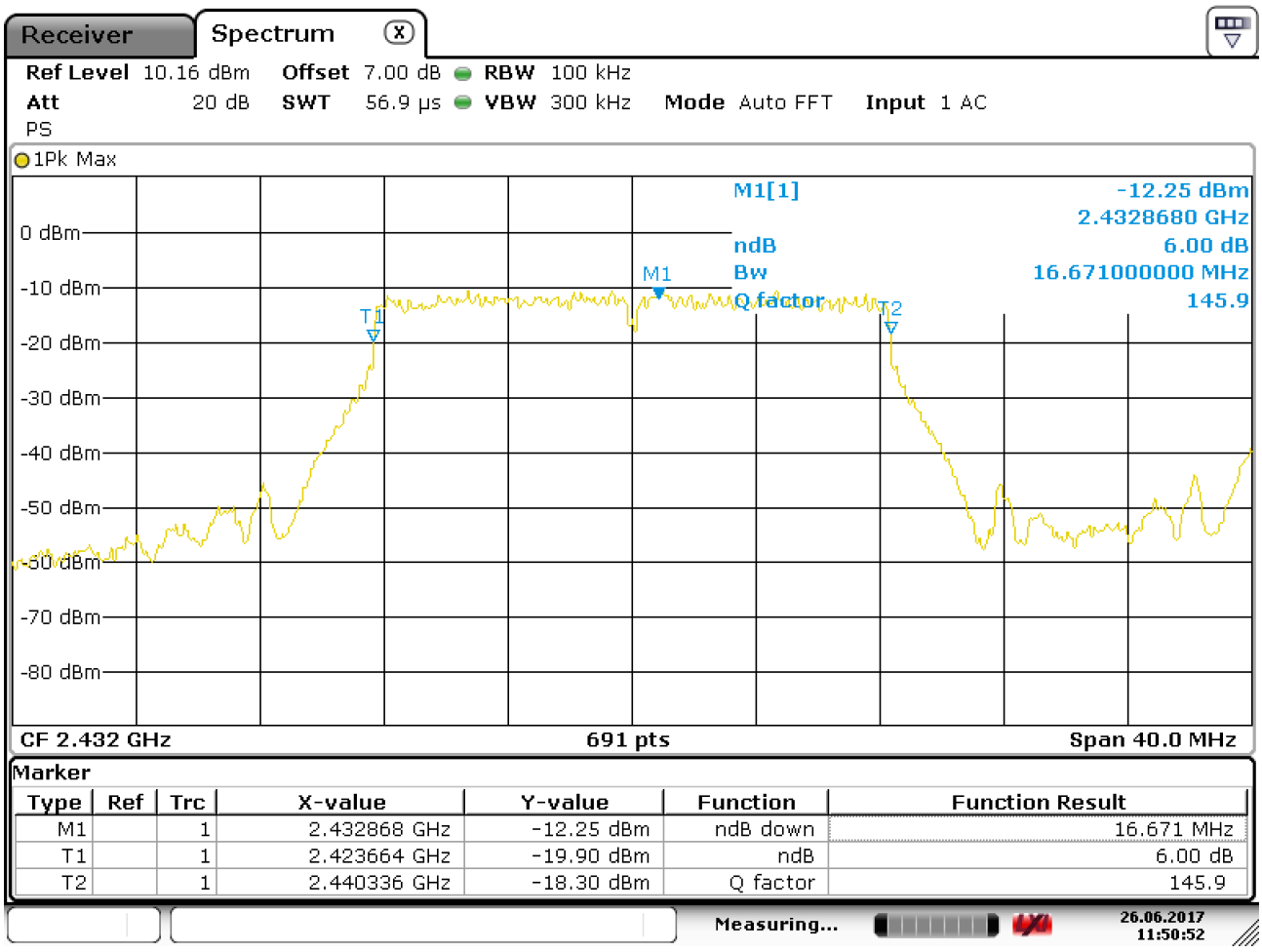
Date: 26.JUN.2017 11:40:53

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11g
Channel: #5



Date: 26.JUN.2017 11:51:48

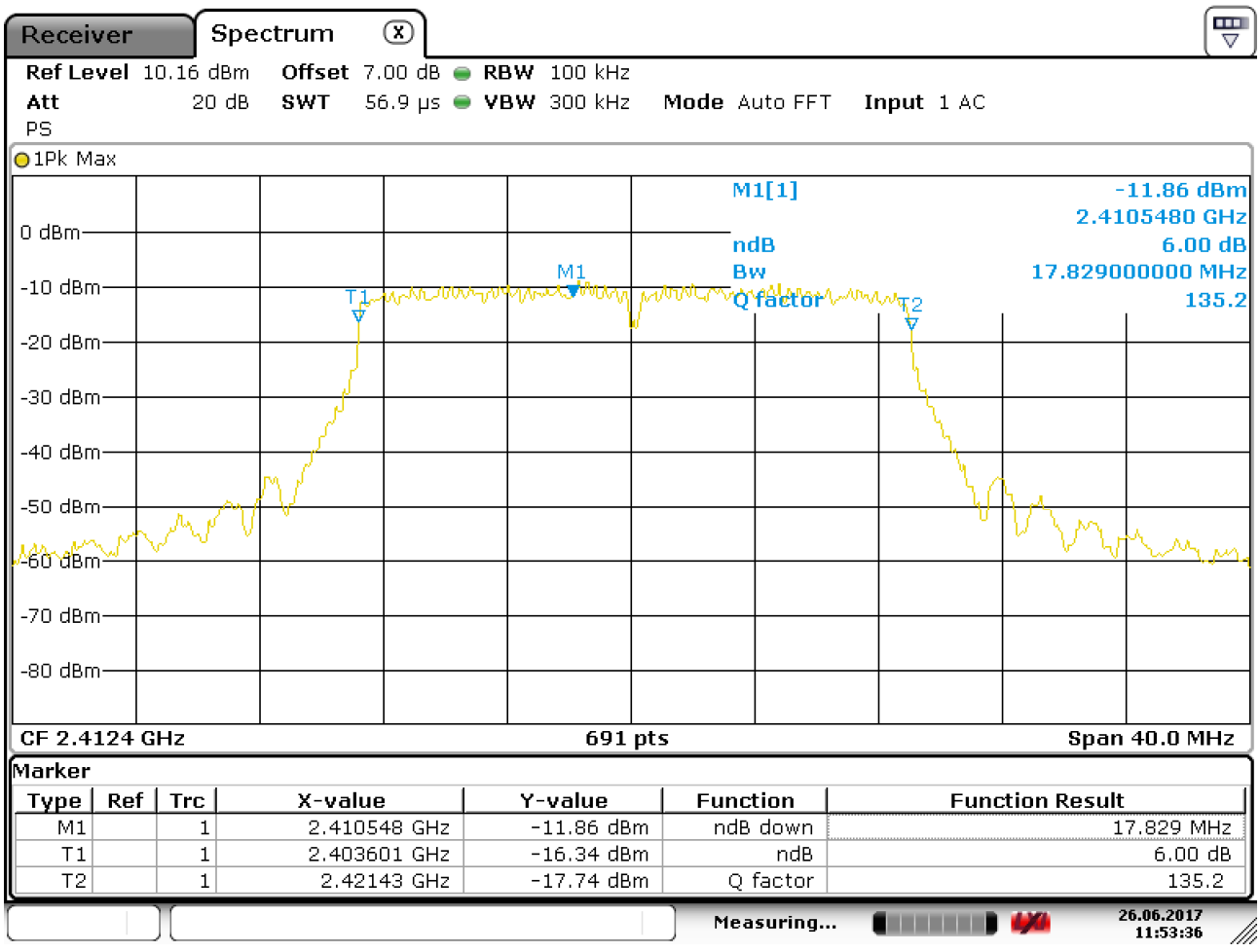
Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11g
Channel: #11



Date: 26.JUN.2017 11:50:52

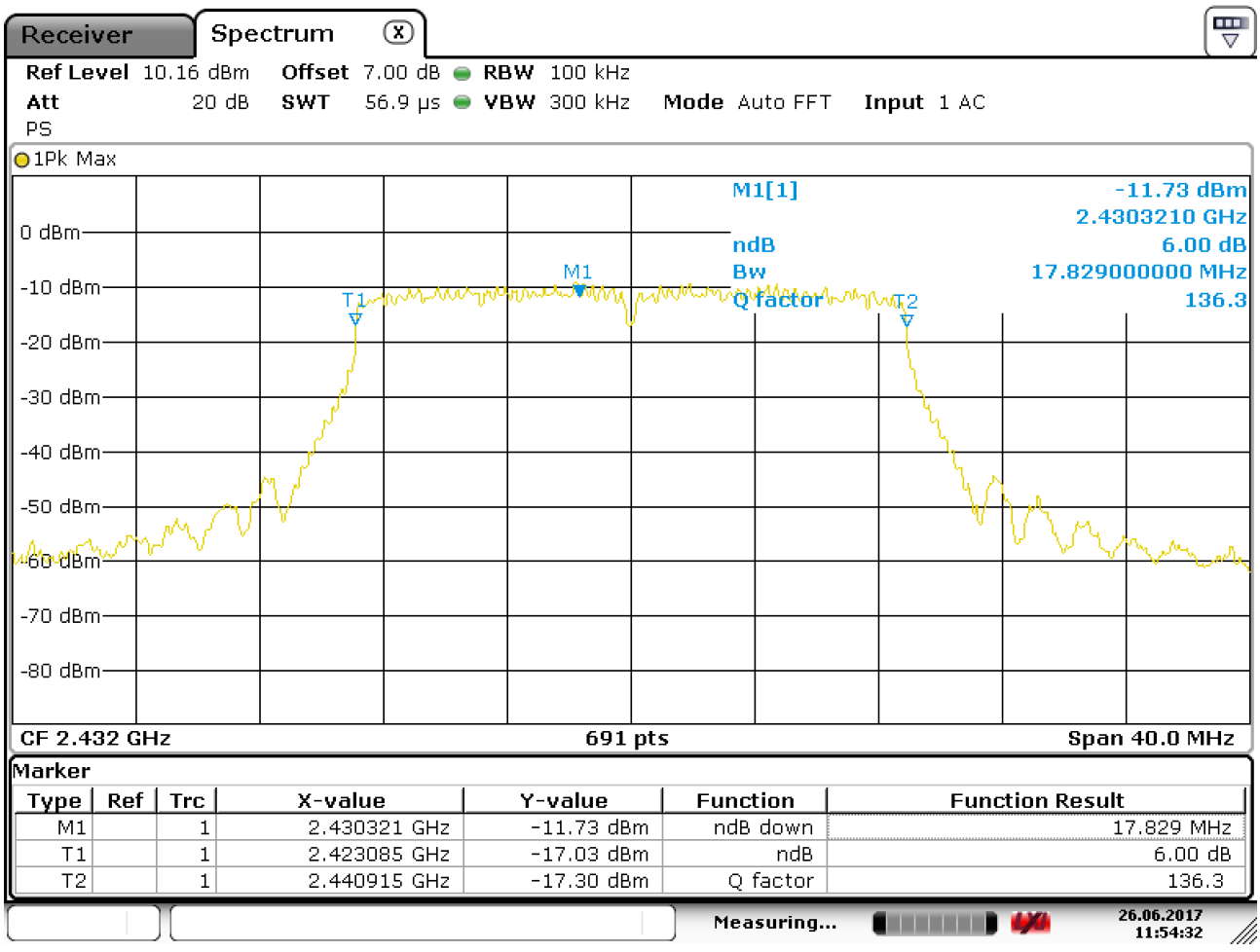
Test Results			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2413	16.67	0,5
6	2432	16.67	0,5
11	2463	16.68	0,5

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11n 20MHz
Channel: #1



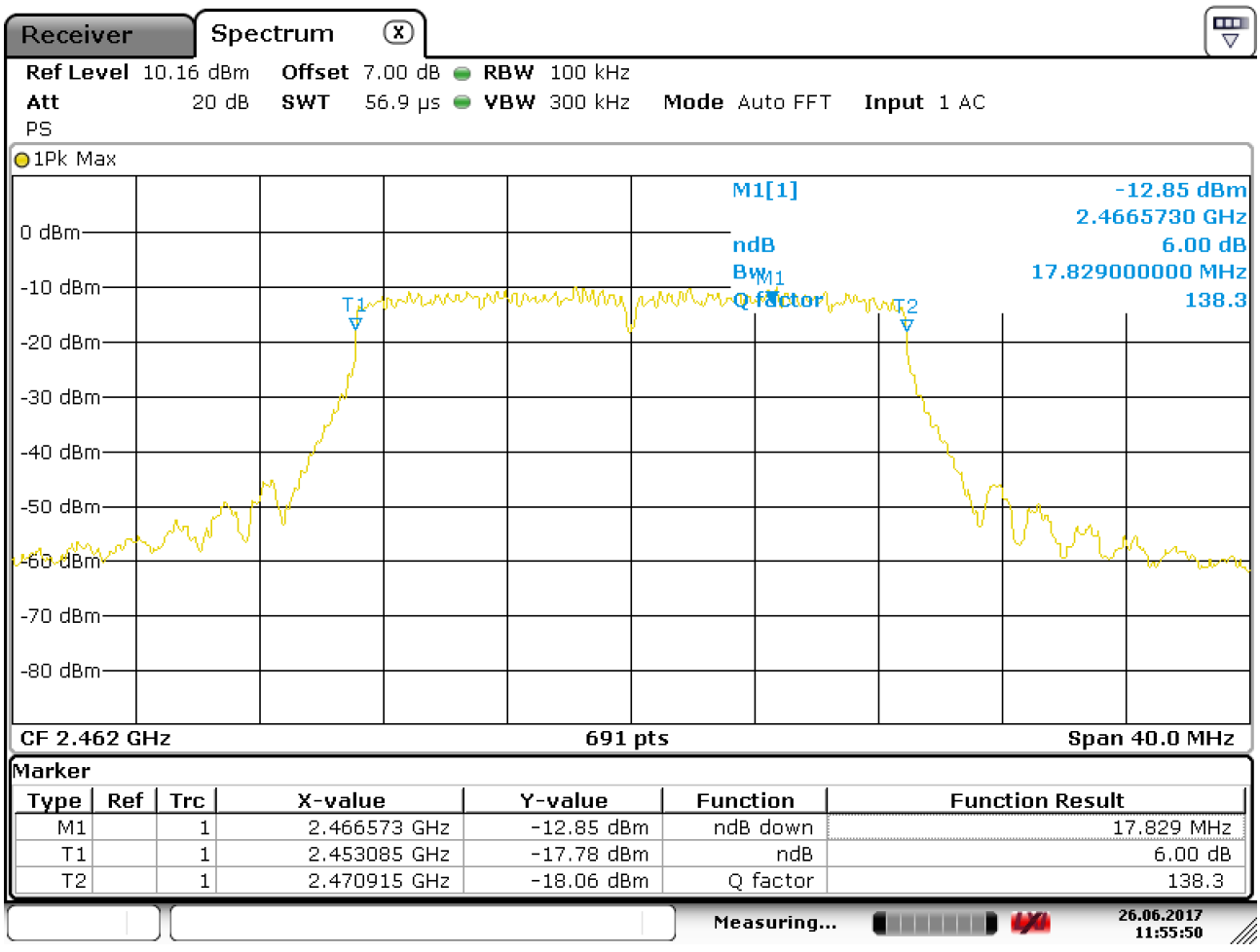
Date: 26.JUN.2017 11:53:36

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11n 20MHz
Channel: #5



Date: 26.JUN.2017 11:54:32

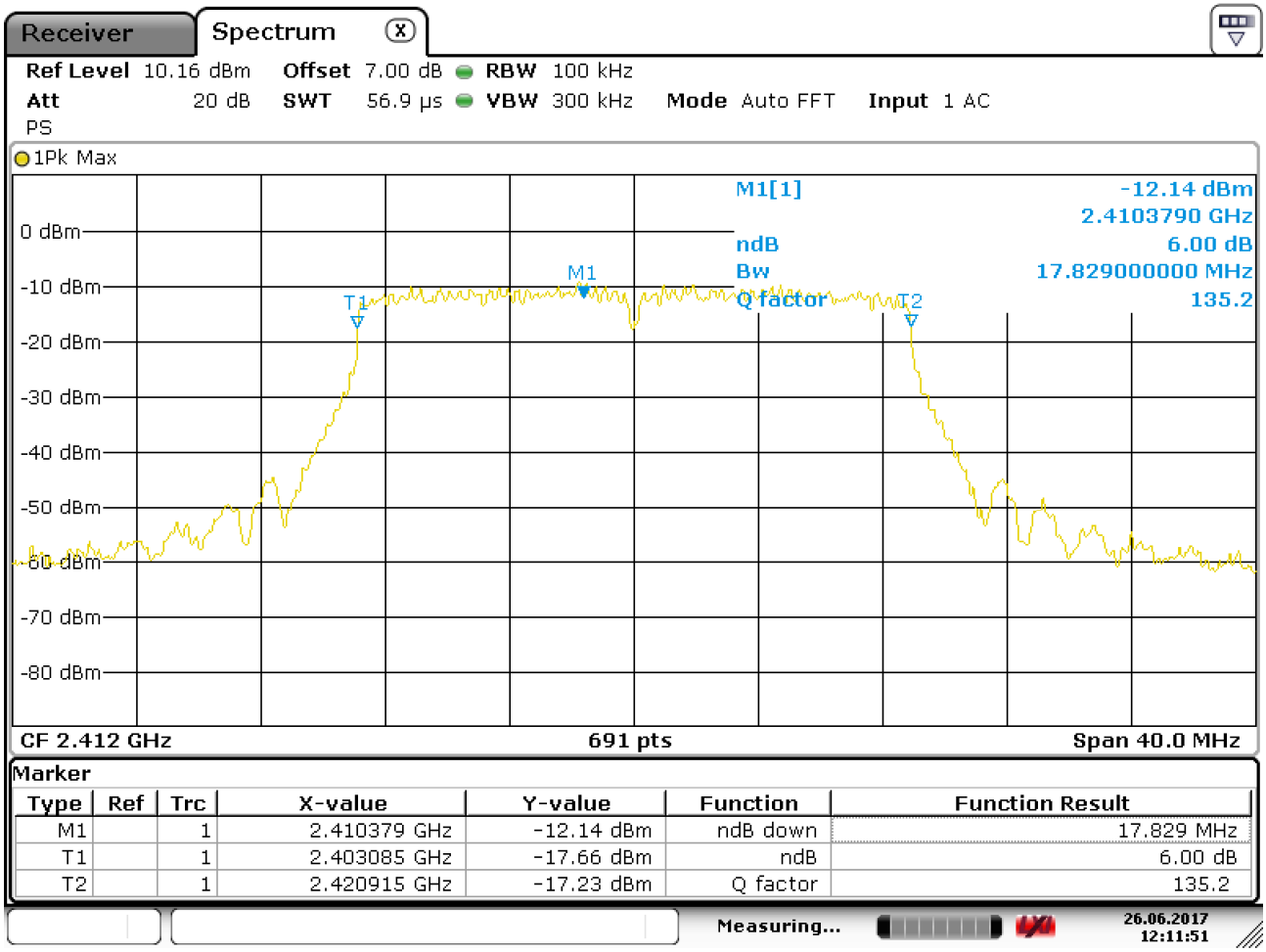
Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11n 20MHz
Channel: #11



Date: 26.JUN.2017 11:55:51

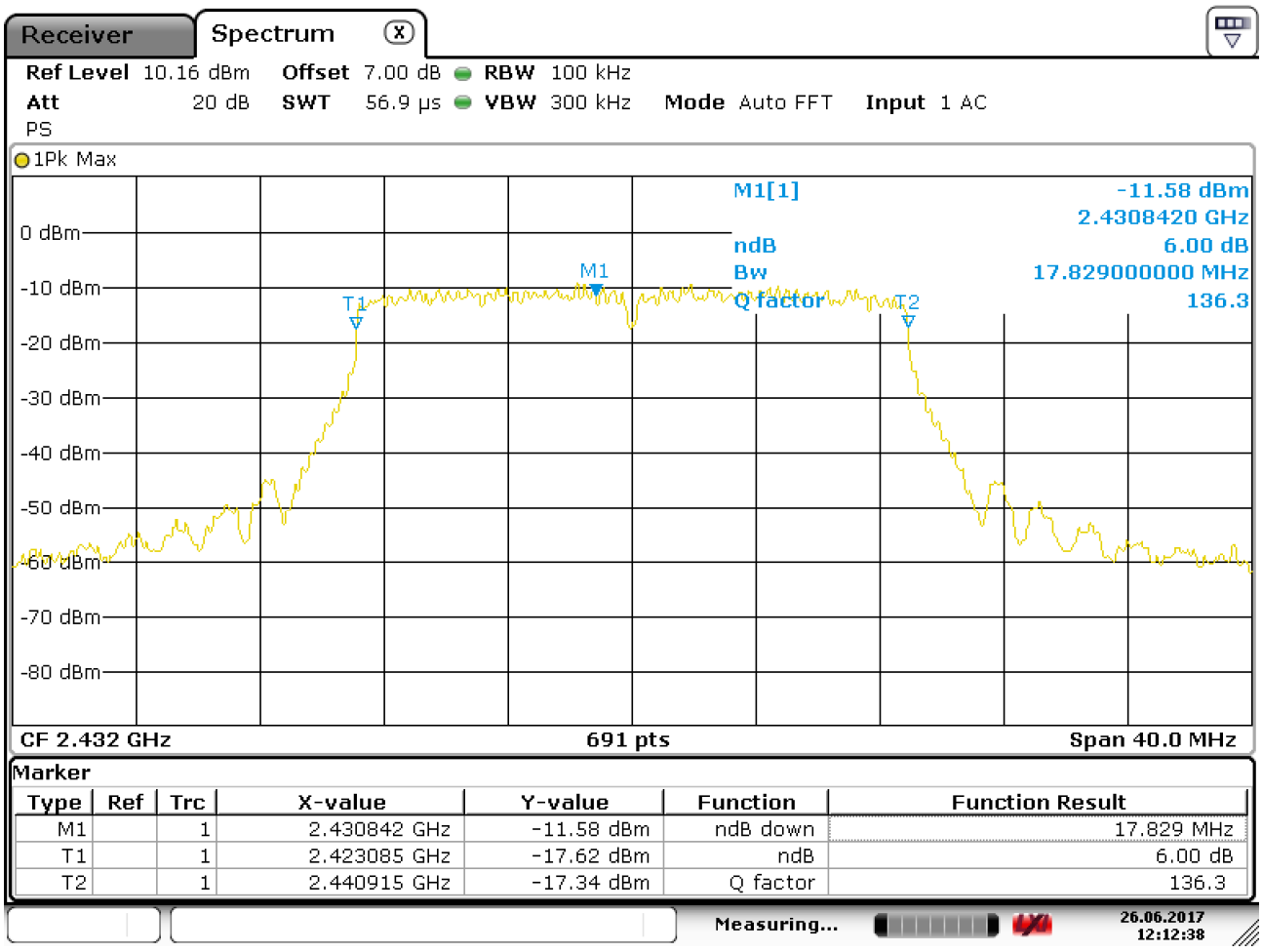
Test Results			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2410	17.83	0,5
6	2430	17.83	0,5
11	2466	17.83	0,5

Operation Mode: #1
Standard: IEE 802.11n 40MHz
Channel: #1

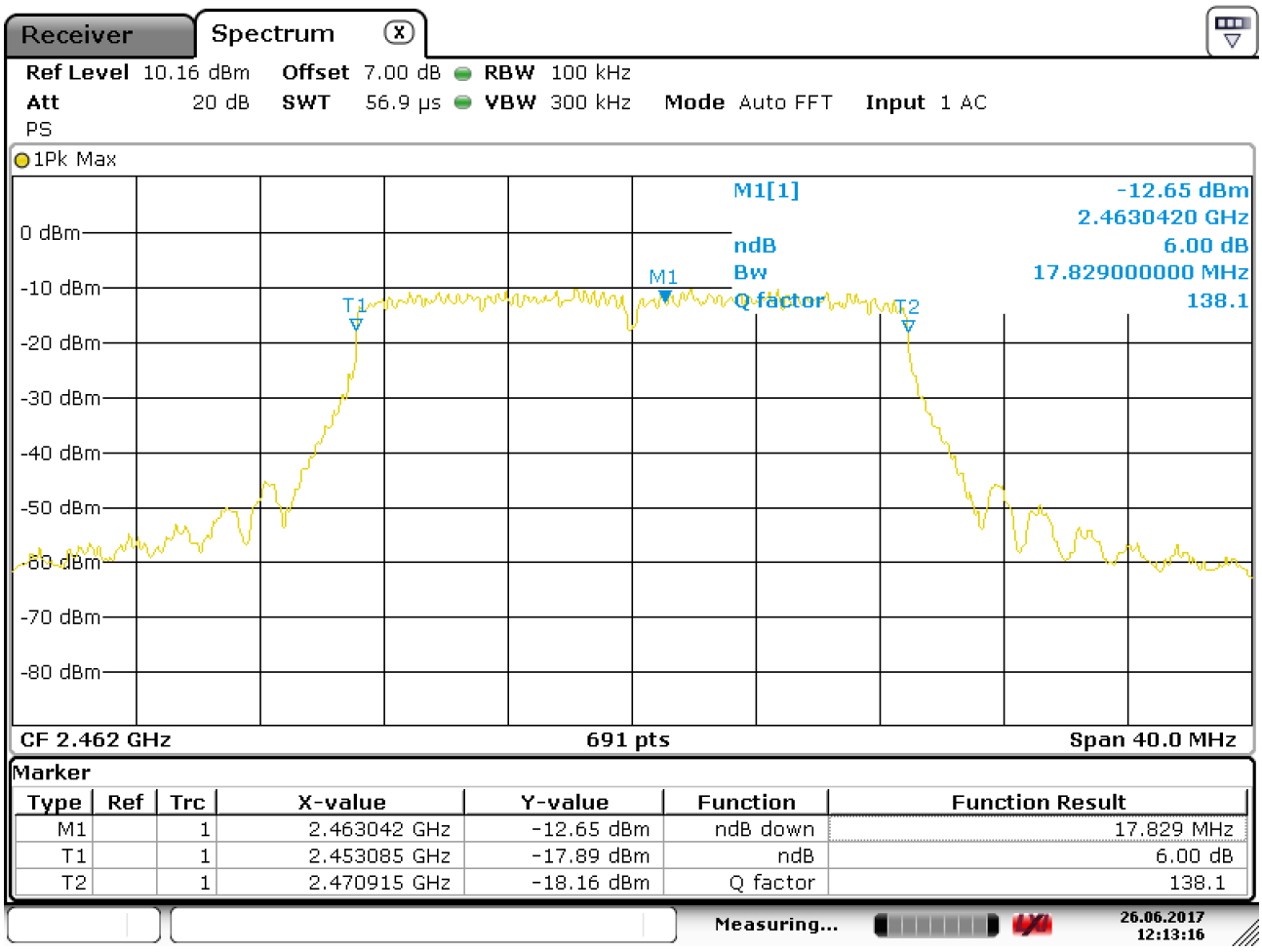


Date: 26.JUN.2017 12:11:52

Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11n 40MHz
Channel: #5



Graphical representation of 6dB Bandwidth
Operation Mode: #1
Standard: IEE 802.11n 40MHz
Channel: #11



Date: 26.JUN.2017 12:13:16

Test Results			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2410	17.83	0,5
6	2430	17.83	0,5
11	2463	17.83	0,5

4. Test Conditions and Results – OUTPUT POWER_1 (external antenna)

15	**TEST: Output Power 1** (external antenna)		**PASS**
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C	
	Relative Humidity (%)	30 to 60 %	
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	22,5°C	
	Relative Humidity (%)	51%	
	Air pressure (hPa)	1020	
—	Frequency	Application Point	
Fully configured sample tested at the power line frequency	115V ~ 60Hz	SMA Connector	
Equipment mode:	Operation mode	#1	
FCC Standard	§15.247		

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

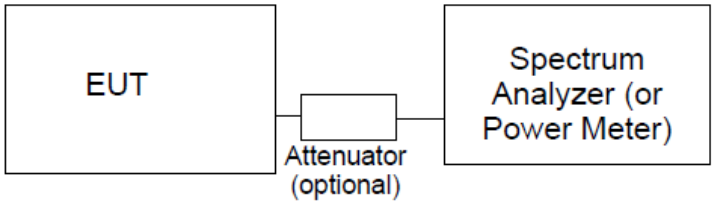
(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Further information to test setup



Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
Fast Power Sensor	R&S	NRP-Z81	87020796	08/2015	08/2017
20dB Attenuator	RS Components	Huber & Suhner	87020534	10/2016	10/2017

Test result of Peak Output Power (802.11b)

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2412	12,20	0,017	1
Middle Channel	2437	12,44	0,017	1
High Channel	2462	12,44	0,017	1

Test result of Peak Output Power (802.11g)

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2412	17,31	0,054	1
Middle Channel	2437	17,56	0,057	1
High Channel	2462	17,81	0,060	1

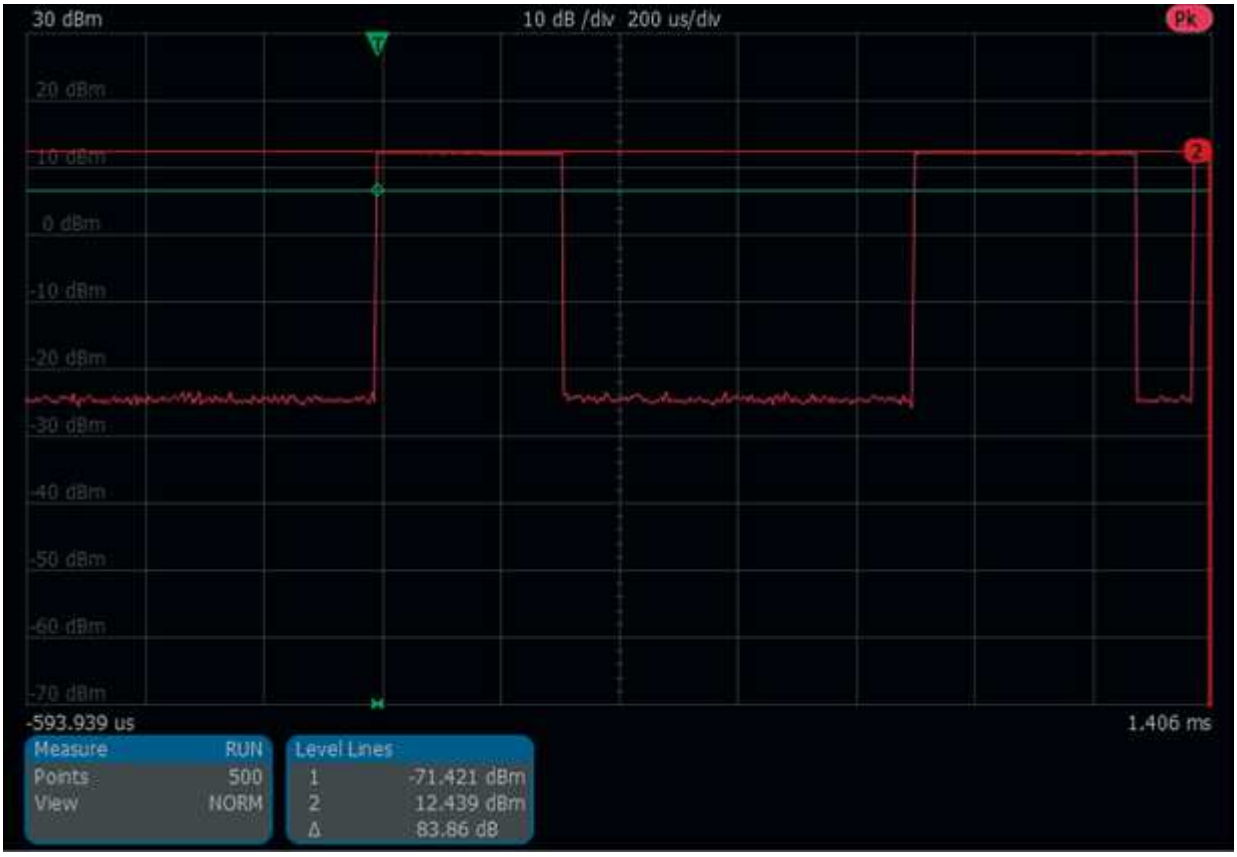
Test result of Peak Output Power (802.11n)

Channel	Channel Frequency (MHz)	Output Power		Limit
		(dBm)	(W)	(W)
Low Channel	2412	14,63	0,029	1
Middle Channel	2437	14,63	0,029	1
High Channel	2462	14,39	0,027	1

Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #1

Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #6

Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #11

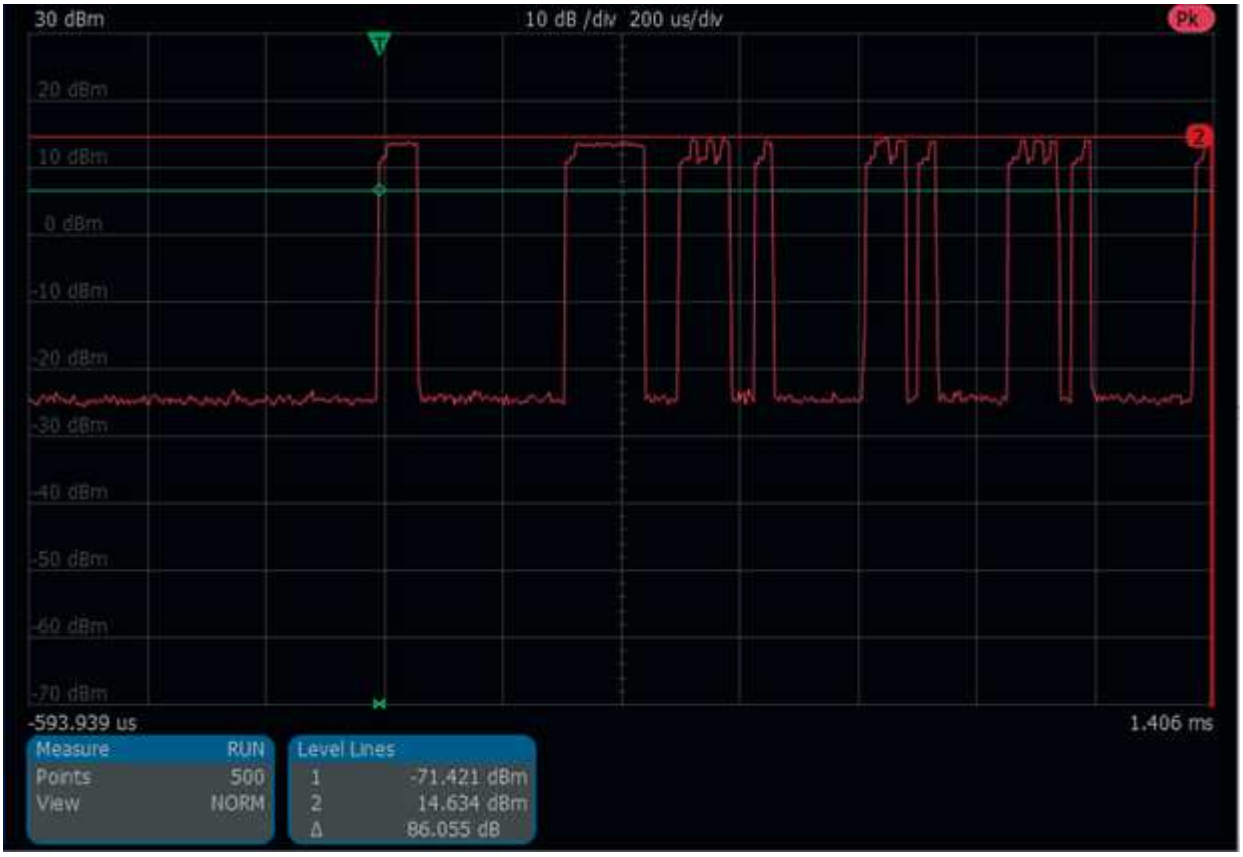


Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #1

Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #6

Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #11

Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11n
Channel: #1



Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11n
Channel: #6

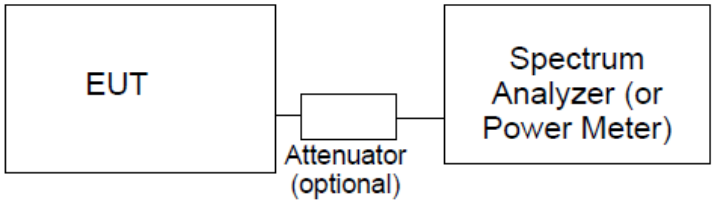
Graphical representation of RF Output Power - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #11

5. Test Conditions and Results – CONDUCTED ANTENNA PORT SPURIOUS EMISSIONS (external antenna)

17	TEST: Conducted Antenna Port Spurious Emission (external antenna)		PASS
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C	
	Relative Humidity (%)	30 to 60 %	
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	22°C	
	Relative Humidity (%)	50%	
	Air pressure (hPa)	1020	
—	Frequency	Application Point	
Fully configured sample tested at the power line frequency	115V ~ 60Hz	SMA Connector	
Equipment mode:	Operation mode	#1	
FCC Standard	§15.247		

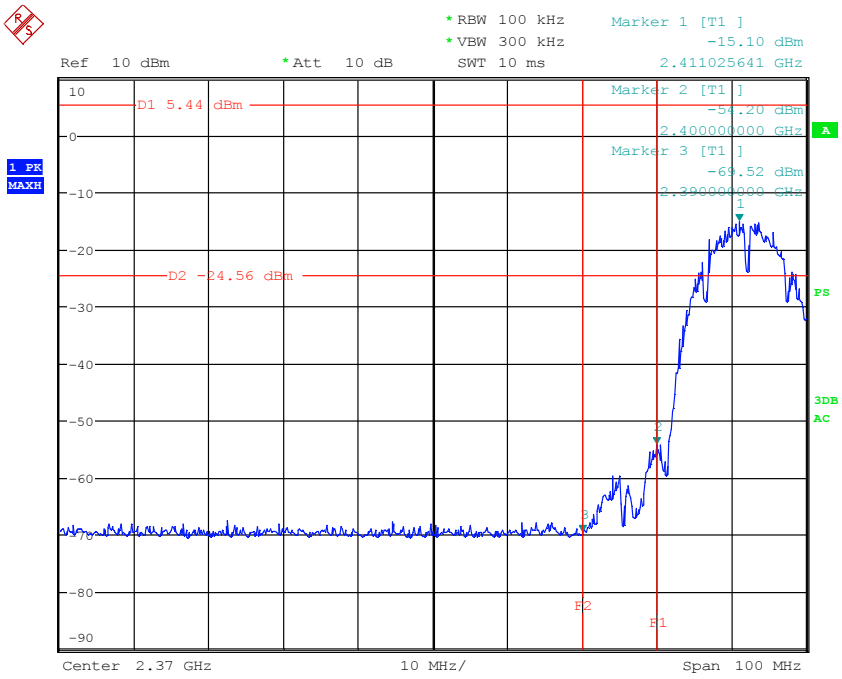
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Further information to test setup

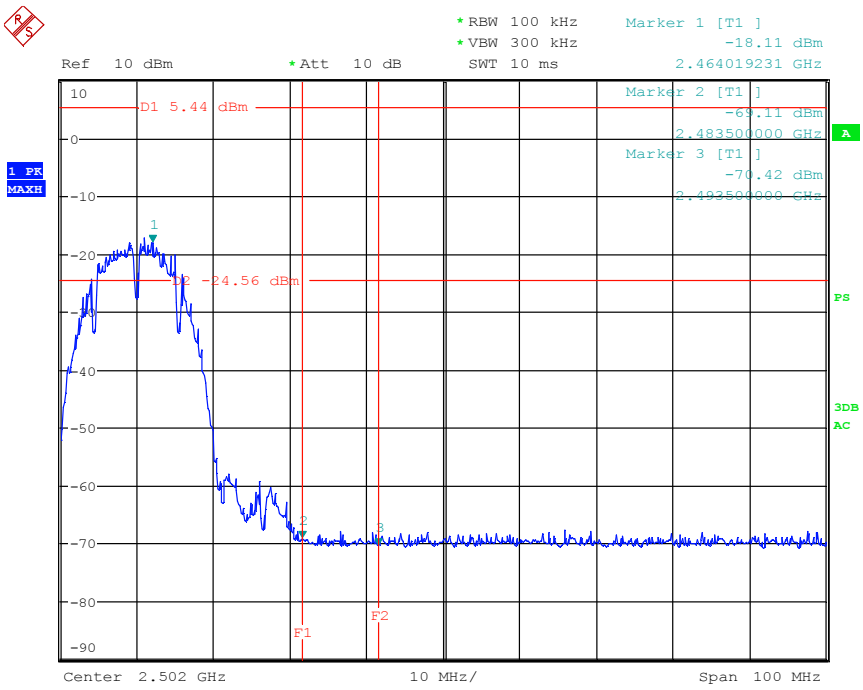


Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU40	87020455	04/2017	04/2018
20dB Attenuator	RS Components	Huber & Suhner	87020534	10/2016	10/2017

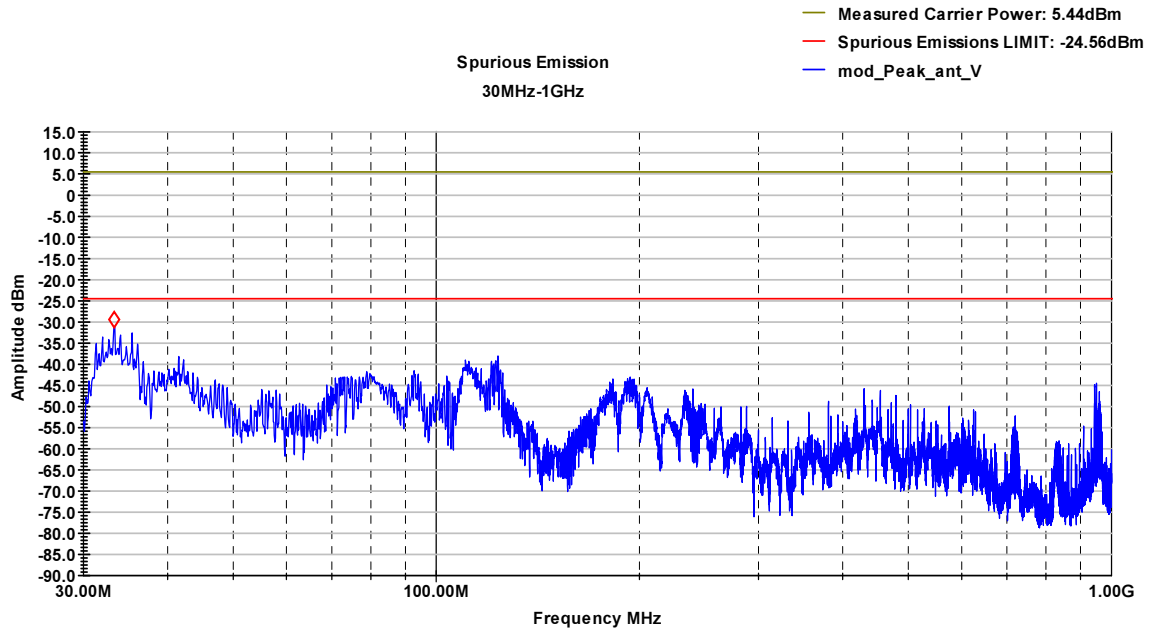
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #1
BAND EDGE



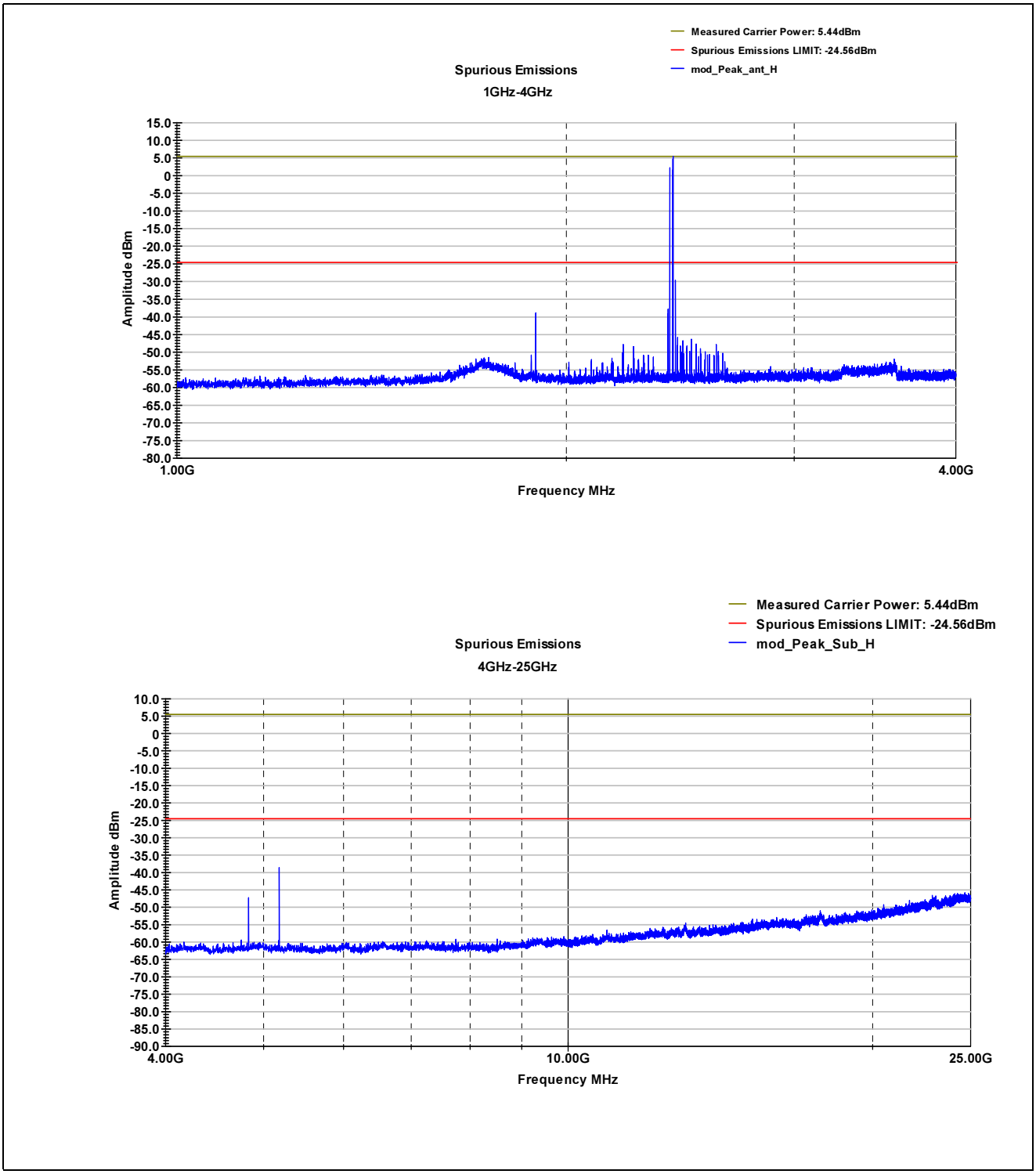
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #11
BAND EDGE



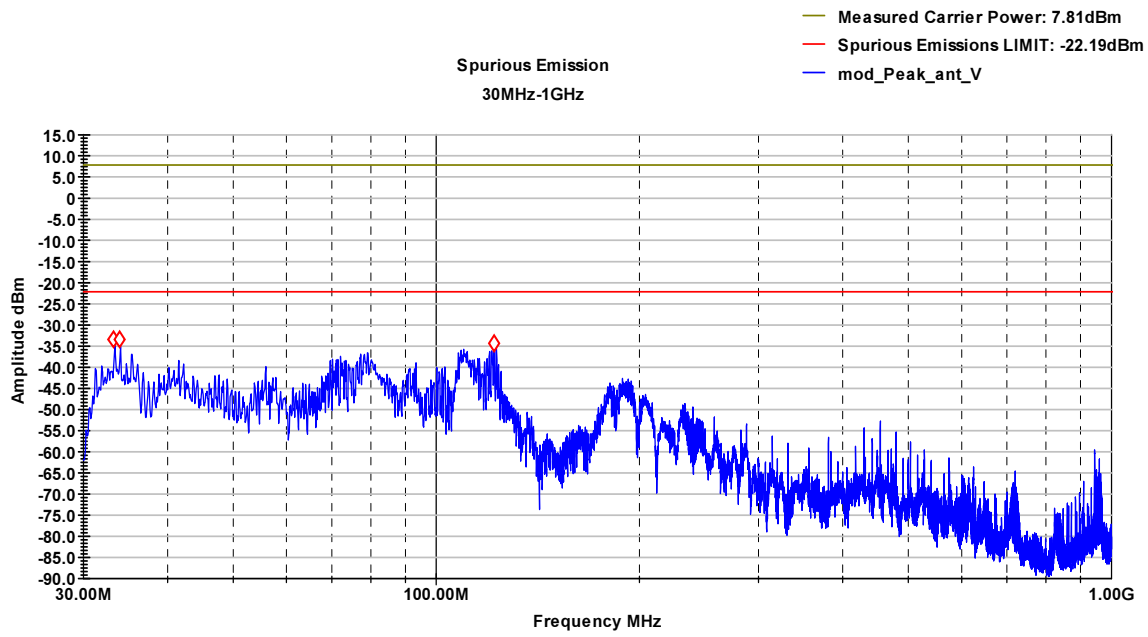
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #1



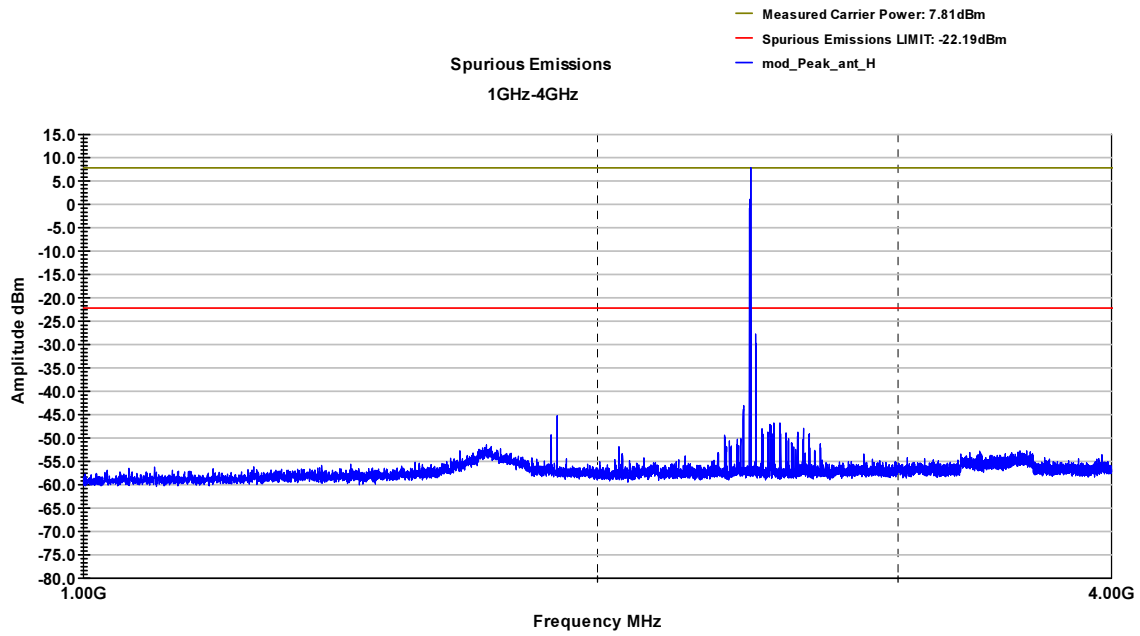
Frequency	QP	Margin
MHz	dBm	dB
35.47 MHz	-29.454	4.894

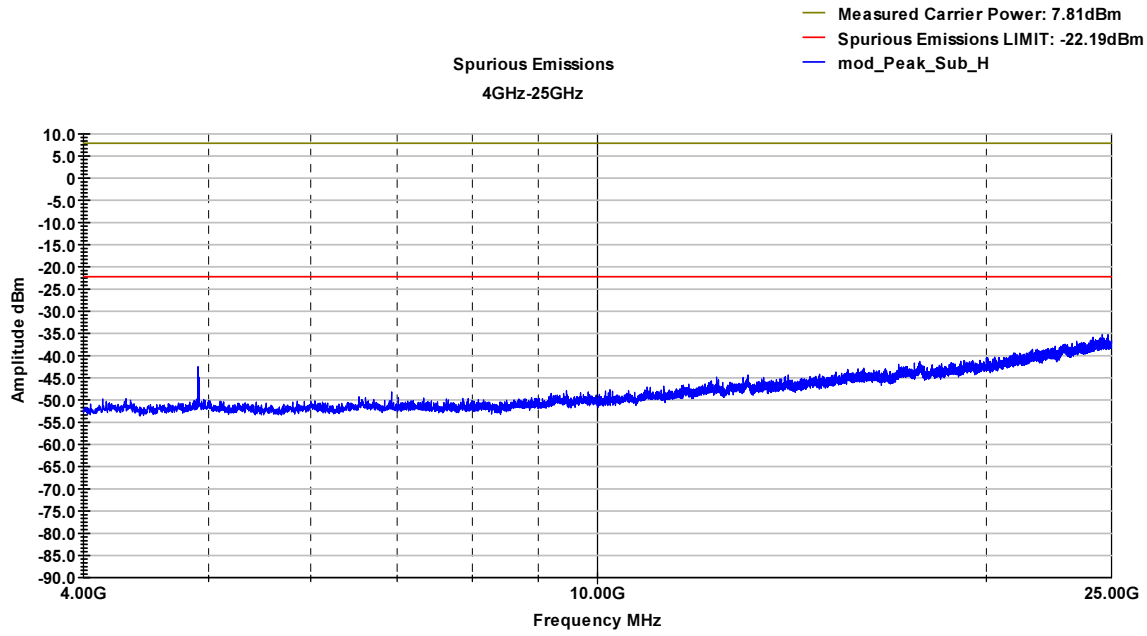

Measured Carrier Power: 5.44dBm
Spurious Emissions LIMIT: -24.56dBm
mod_Peak_ant_H
Spurious Emissions
1GHz-4GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
1.00G
4.00G
Frequency MHz
Measured Carrier Power: 5.44dBm
Spurious Emissions LIMIT: -24.56dBm
mod_Peak_Sub_H
Spurious Emissions
4GHz-25GHz
Amplitude dBm
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
-85.0
-90.0
4.00G
10.00G
25.00G
Frequency MHz

Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11b
Channel: #11

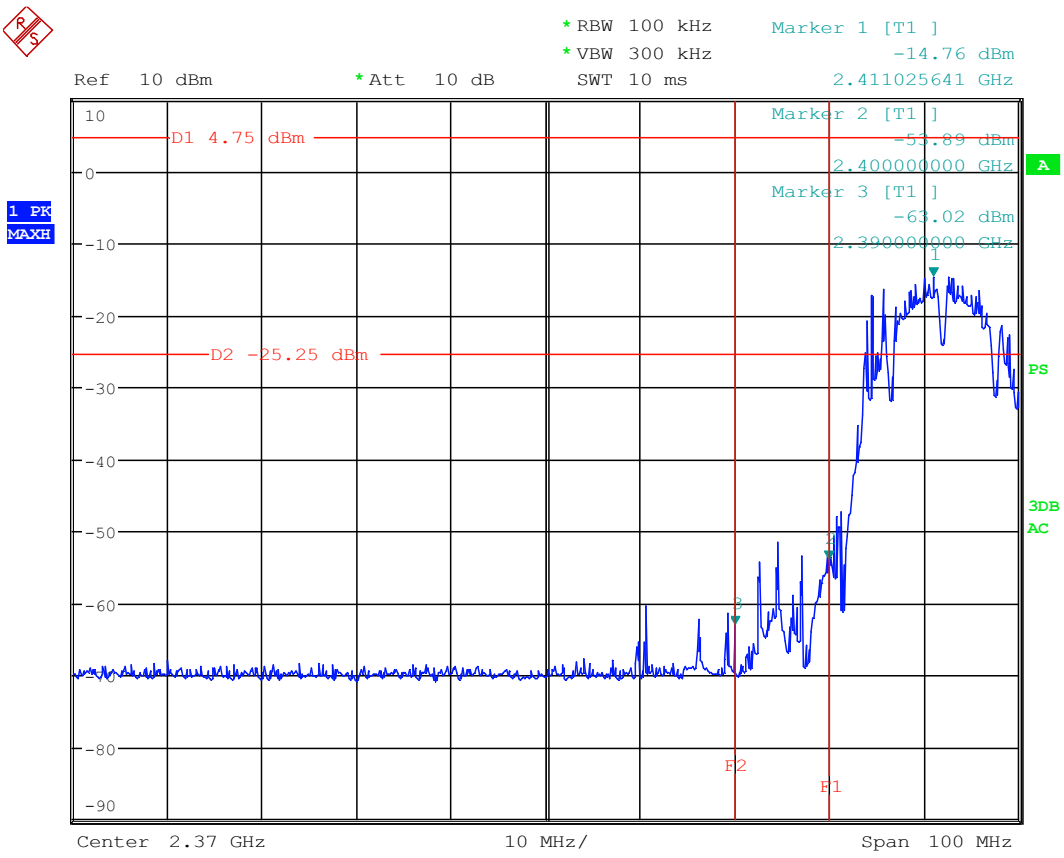


Frequency	QP	Margin
MHz	dBm	dB
33.54 MHz	-35.454	13.264
37.12 MHz	-35.239	13.049
115.24 MHz	-36.469	14.279

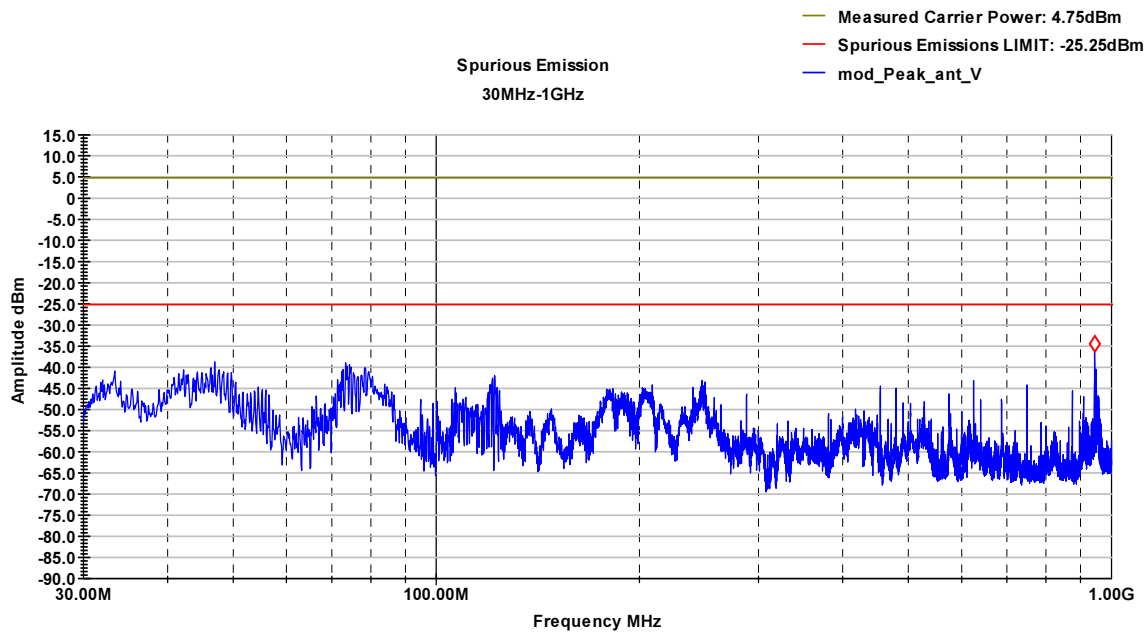

Measured Carrier Power: 7.81dBm
Spurious Emissions LIMIT: -22.19dBm
mod_Peak_ant_H
Spurious Emissions
1GHz-4GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
1.00G
4.00G
Frequency MHz


Measured Carrier Power: 7.81dBm
Spurious Emissions LIMIT: -22.19dBm
mod_Peak_Sub_H
Spurious Emissions
4GHz-25GHz
Amplitude dBm
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
-85.0
-90.0
4.00G
10.00G
25.00G
Frequency MHz

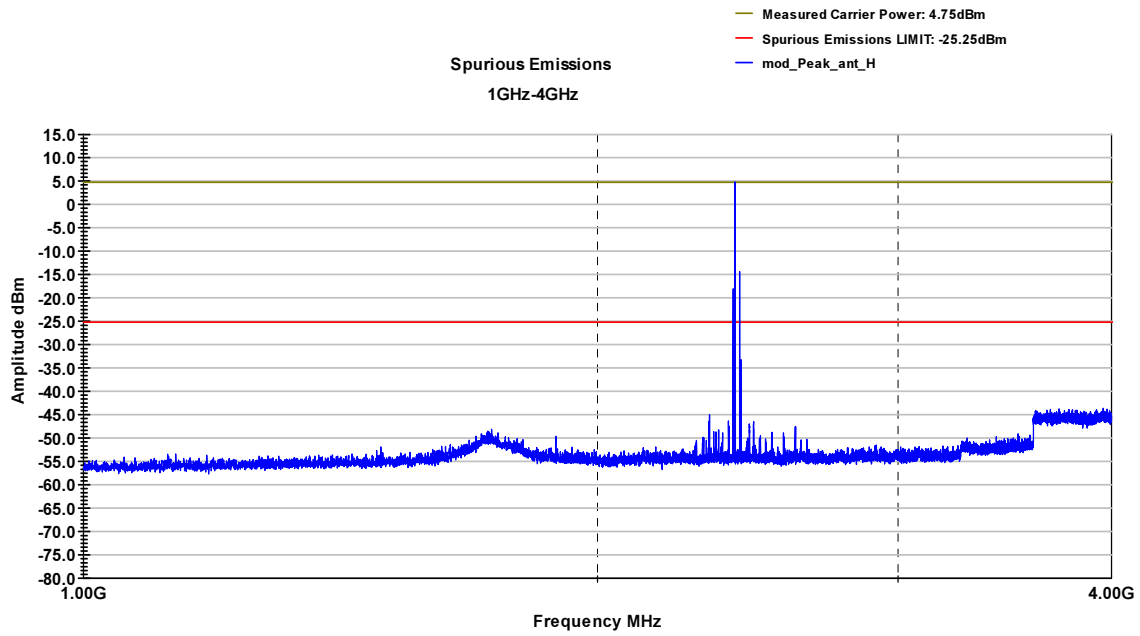
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #1
BAND EDGE

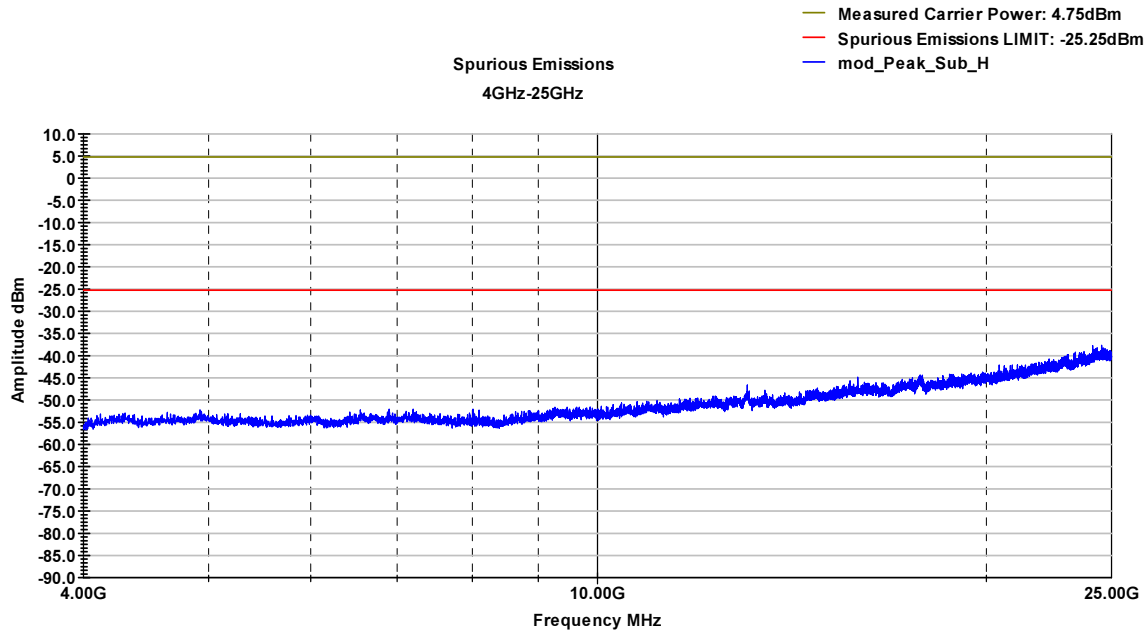


Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #1

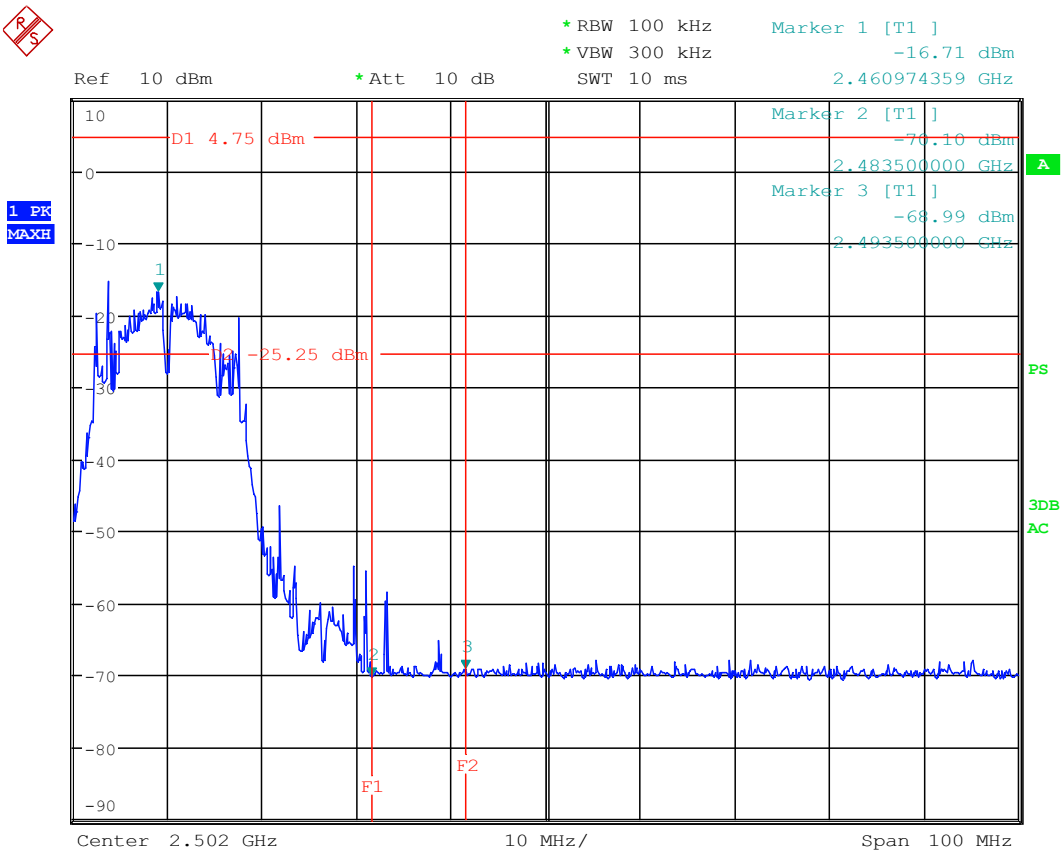


Frequency	QP	Margin
MHz	dBm	dB
910.54 MHz	-35.297	10.047

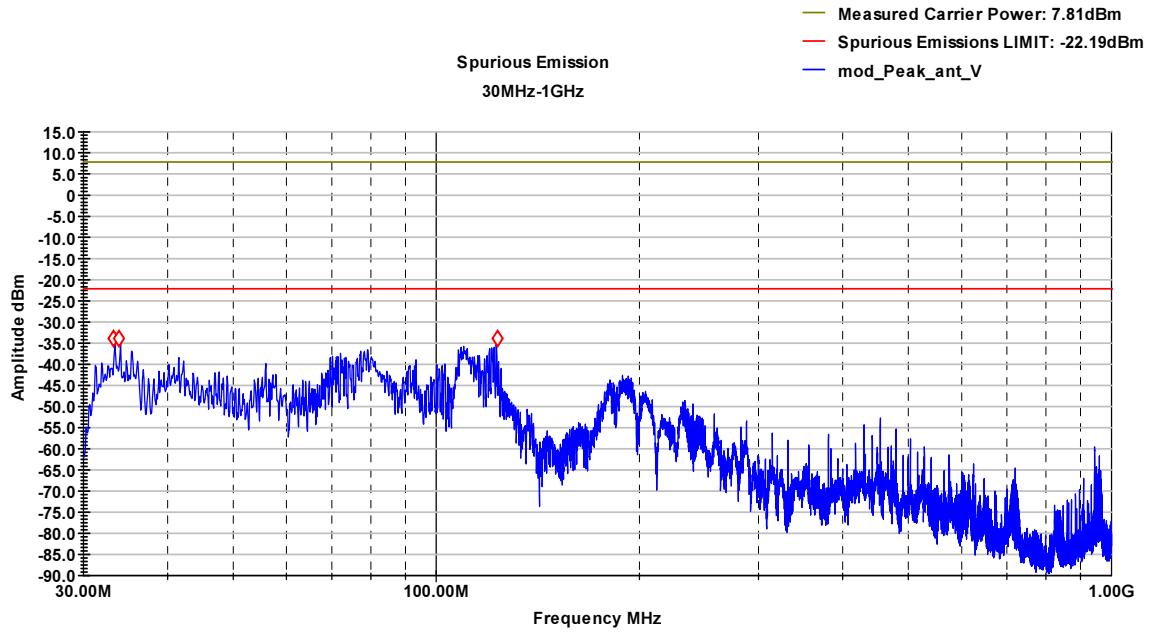

Measured Carrier Power: 4.75dBm
Spurious Emissions LIMIT: -25.25dBm
mod_Peak_ant_H
Spurious Emissions
1GHz-4GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
1.00G
4.00G
Frequency MHz


Measured Carrier Power: 4.75dBm
Spurious Emissions LIMIT: -25.25dBm
mod_Peak_Sub_H
Spurious Emissions
4GHz-25GHz
Amplitude dBm
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
-85.0
-90.0
4.00G
10.00G
25.00G
Frequency MHz

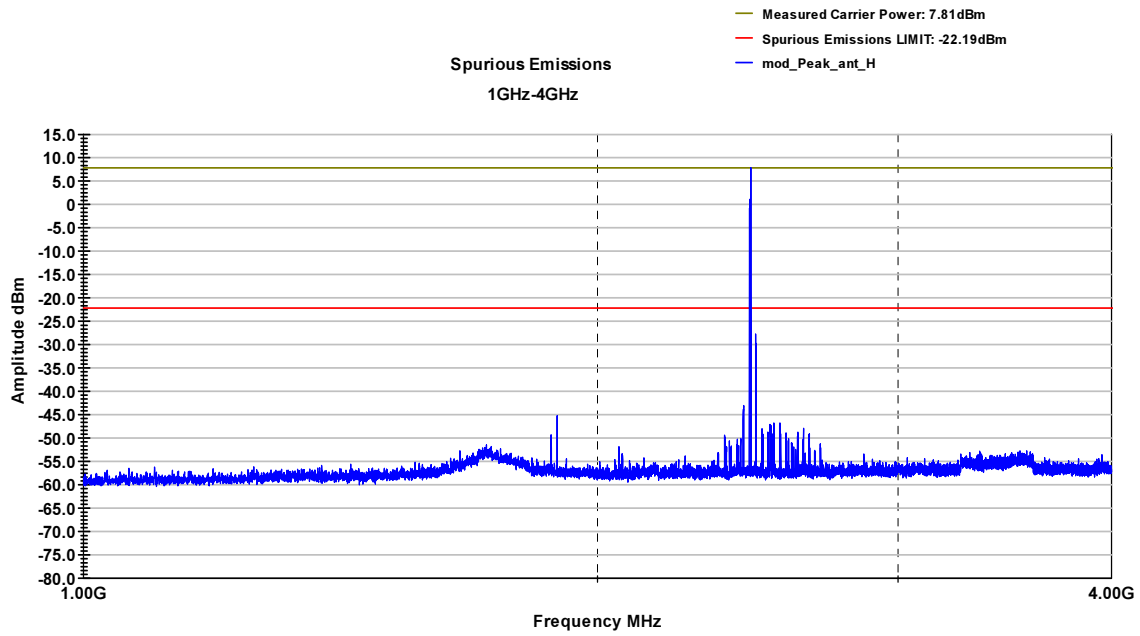
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #11
BAND EDGE

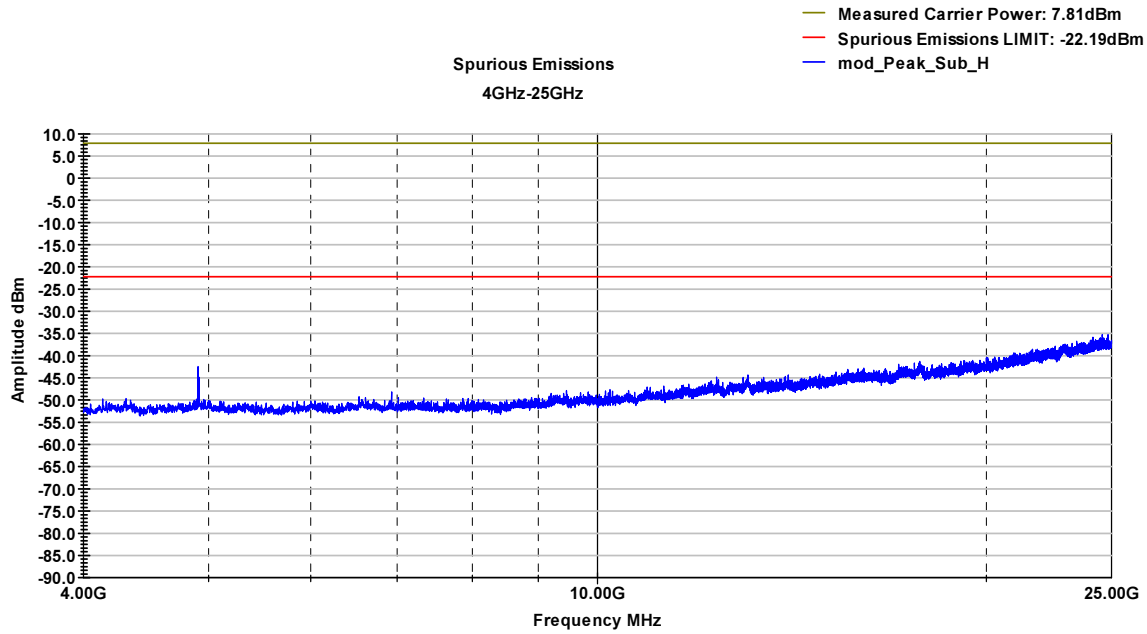


Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11g
Channel: #11

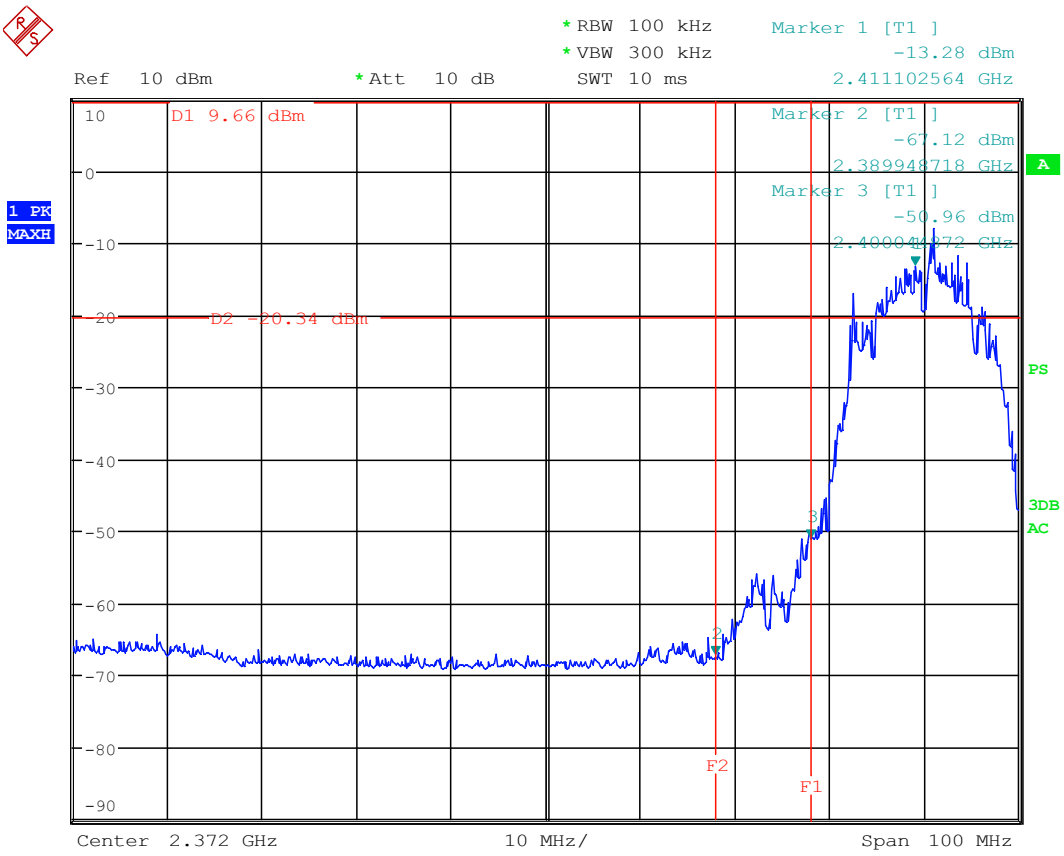


Frequency	QP	Margin
MHz	dBm	dB
33.54 MHz	-35.448	13.258
37.12 MHz	-35.257	13.067
115.24 MHz	-36.467	14.277

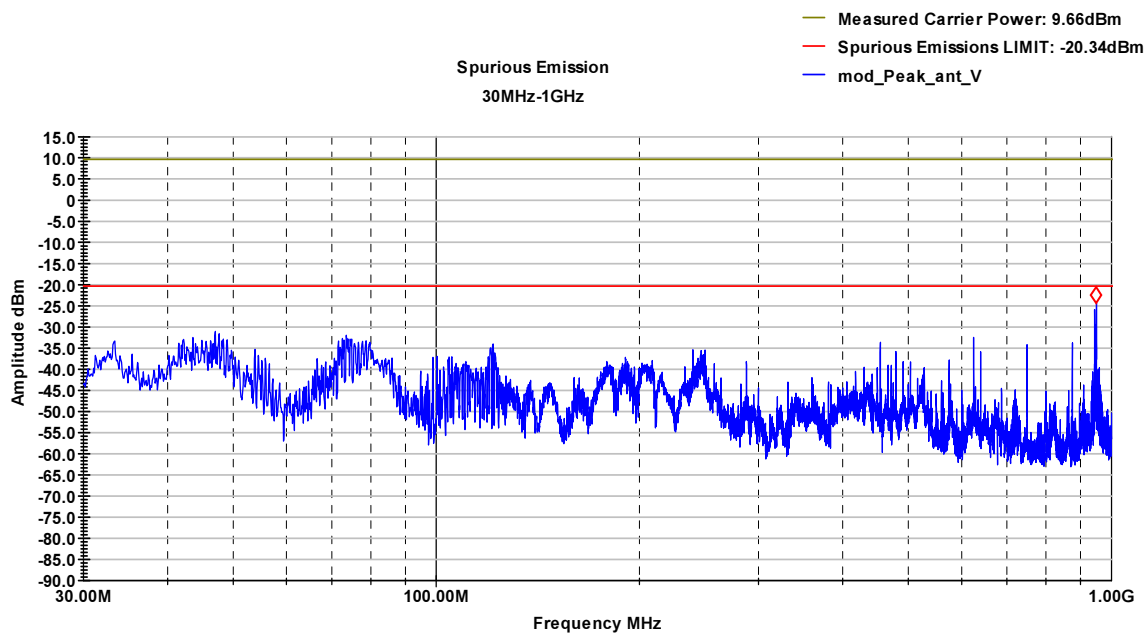

Measured Carrier Power: 7.81dBm
Spurious Emissions LIMIT: -22.19dBm
mod_Peak_ant_H
Spurious Emissions
1GHz-4GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
1.00G
4.00G
Frequency MHz


Measured Carrier Power: 7.81dBm
Spurious Emissions LIMIT: -22.19dBm
mod_Peak_Sub_H
Spurious Emissions
4GHz-25GHz
Amplitude dBm
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
-85.0
-90.0
4.00G
10.00G
25.00G
Frequency MHz

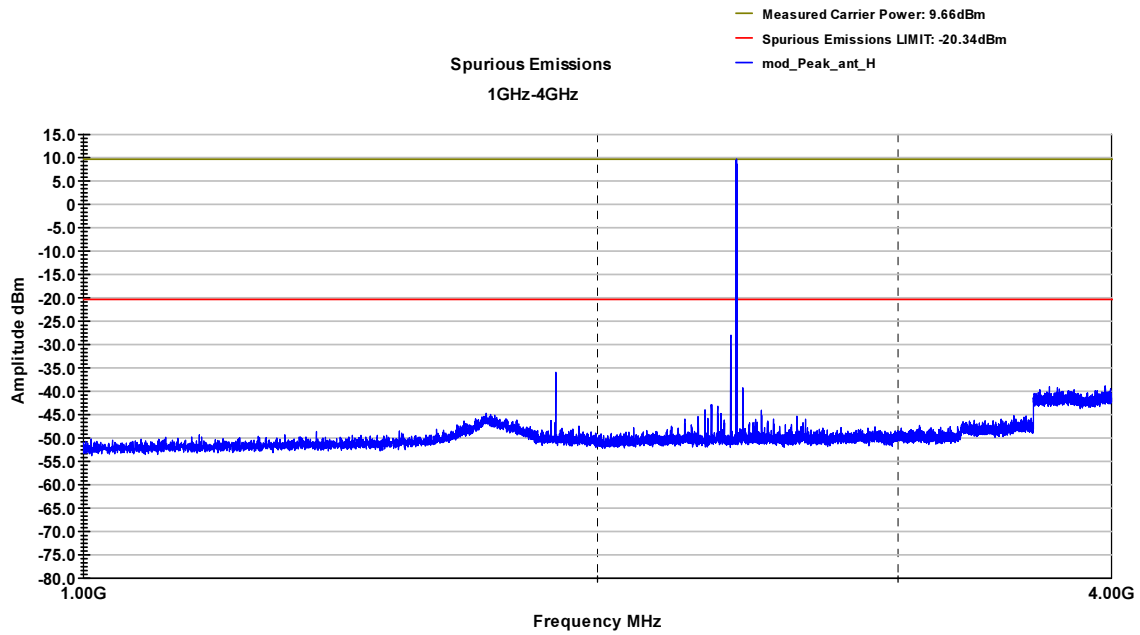
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11n
Channel: #1
BAND EDGE

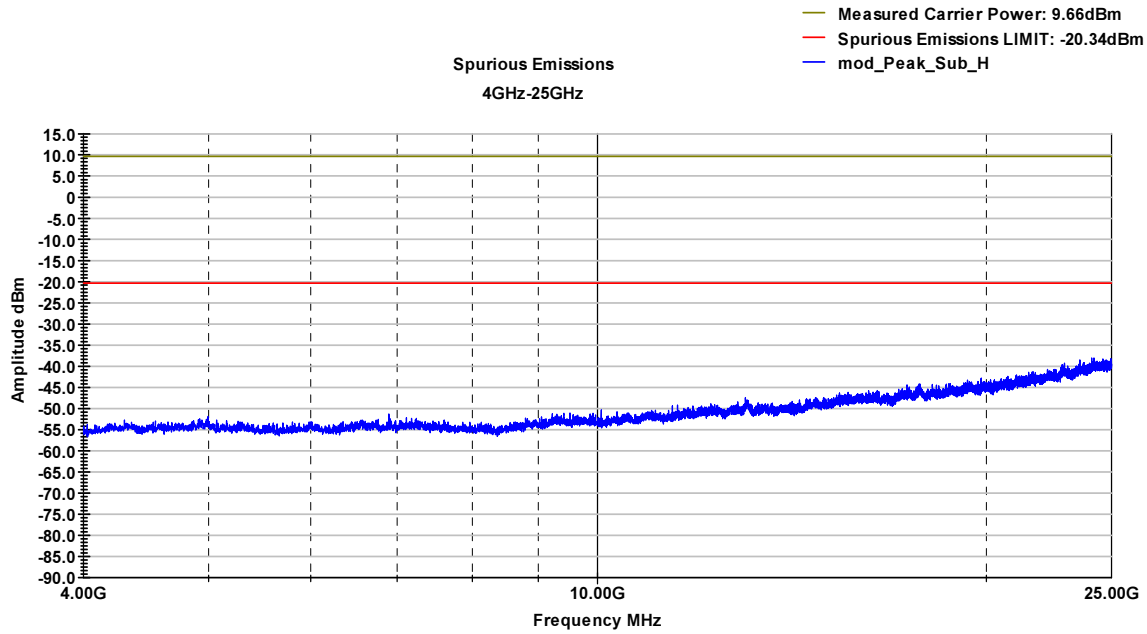


Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11n
Channel: #1

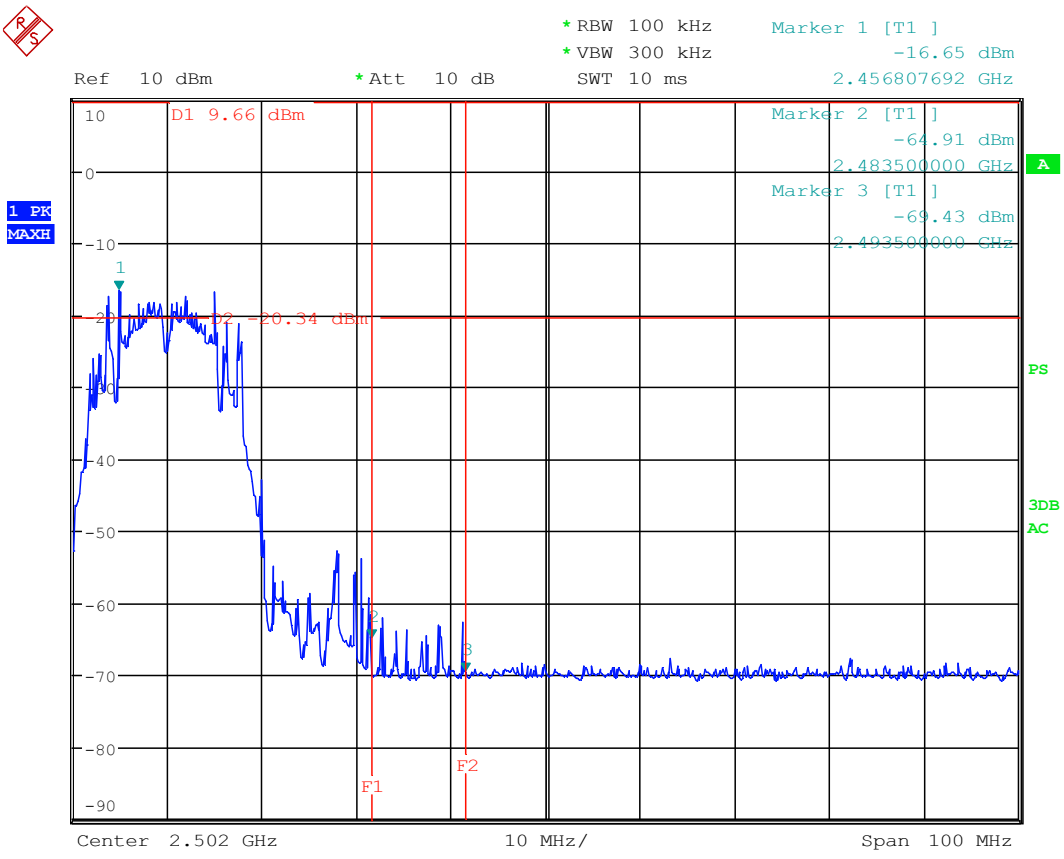


Frequency	QP	Margin
MHz	dBm	dB
910.54 MHz	-24.257	3.917

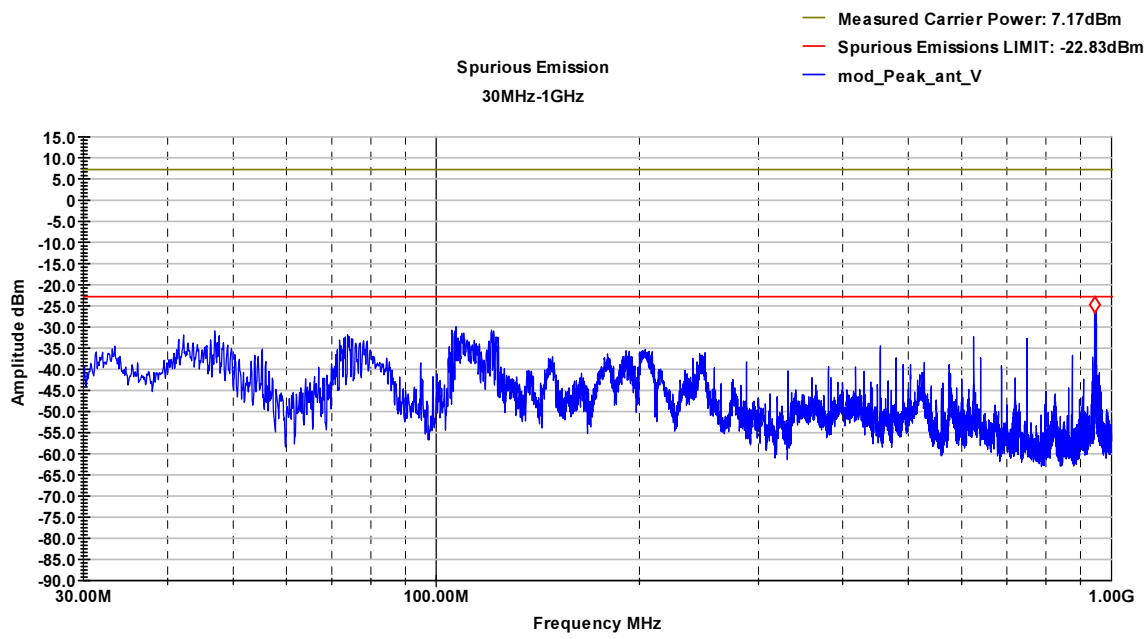

Measured Carrier Power: 9.66dBm
Spurious Emissions LIMIT: -20.34dBm
mod_Peak_ant_H
Spurious Emissions
1GHz-4GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
1.00G
4.00G
Frequency MHz


Measured Carrier Power: 9.66dBm
Spurious Emissions LIMIT: -20.34dBm
mod_Peak_Sub_H
Spurious Emissions
4GHz-25GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
-85.0
-90.0
4.00G
10.00G
25.00G
Frequency MHz

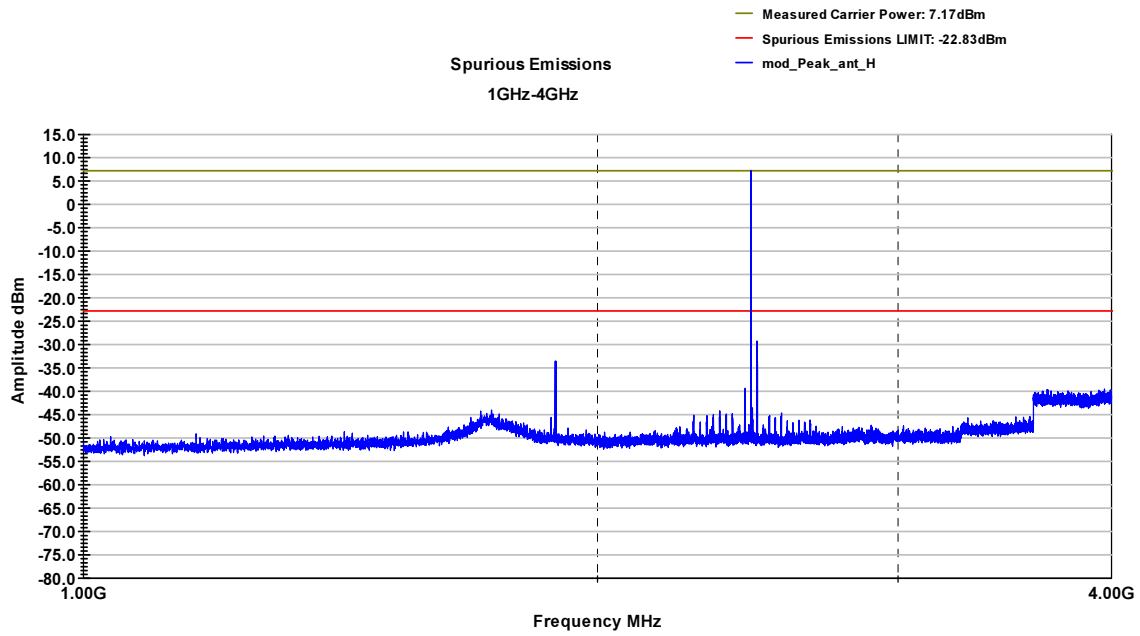
Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11n
Channel: #11
BAND EDGE

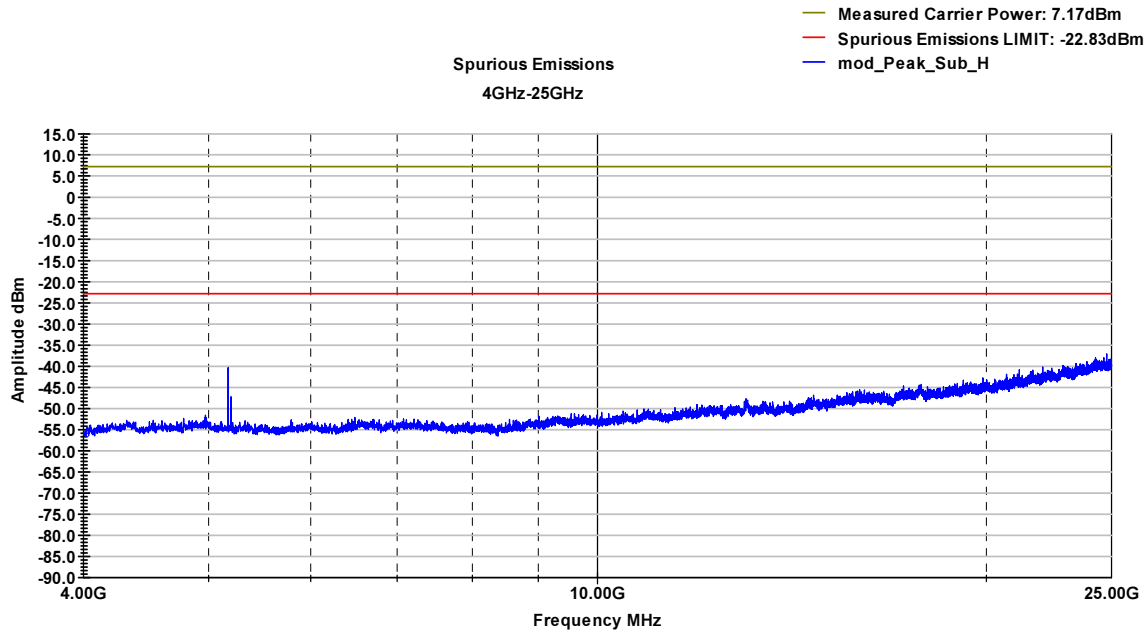


Graphical representation of Antenna Port Spurious Emission - Conducted
Operation Mode: #1
Standard: IEE 802.11n
Channel: #11



Frequency	QP	Margin
MHz	dBm	dB
910.45 MHz	-25.297	2.467


Measured Carrier Power: 7.17dBm
Spurious Emissions LIMIT: -22.83dBm
mod_Peak_ant_H
Spurious Emissions
1GHz-4GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
1.00G
4.00G
Frequency MHz

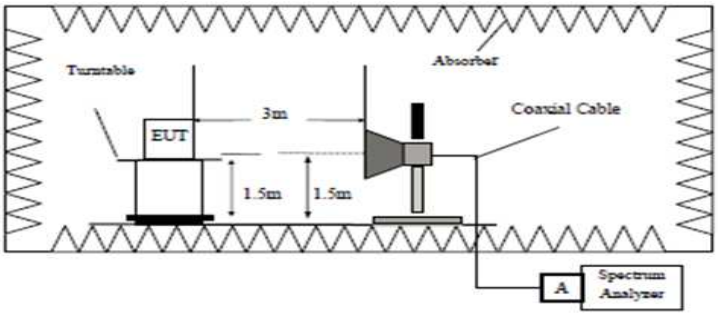

Measured Carrier Power: 7.17dBm
Spurious Emissions LIMIT: -22.83dBm
mod_Peak_Sub_H
Spurious Emissions
4GHz-25GHz
Amplitude dBm
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
-85.0
-90.0
4.00G
10.00G
25.00G
Frequency MHz

6. Test Conditions and Results – RADIATED ANTENNA PORT SPURIOUS EMISSION (external antenna)

18	TEST: Radiated Antenna Port Spurious Emission (external antenna)	PASS
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	21°C
	Relative Humidity (%)	52%
	Air pressure (hPa)	1020
—	Frequency	Application Point
Fully configured sample tested at the power line frequency	115V ~ 60Hz	SMA Connector
Equipment mode:	Operation mode	#1
FCC Standard	§15.247	

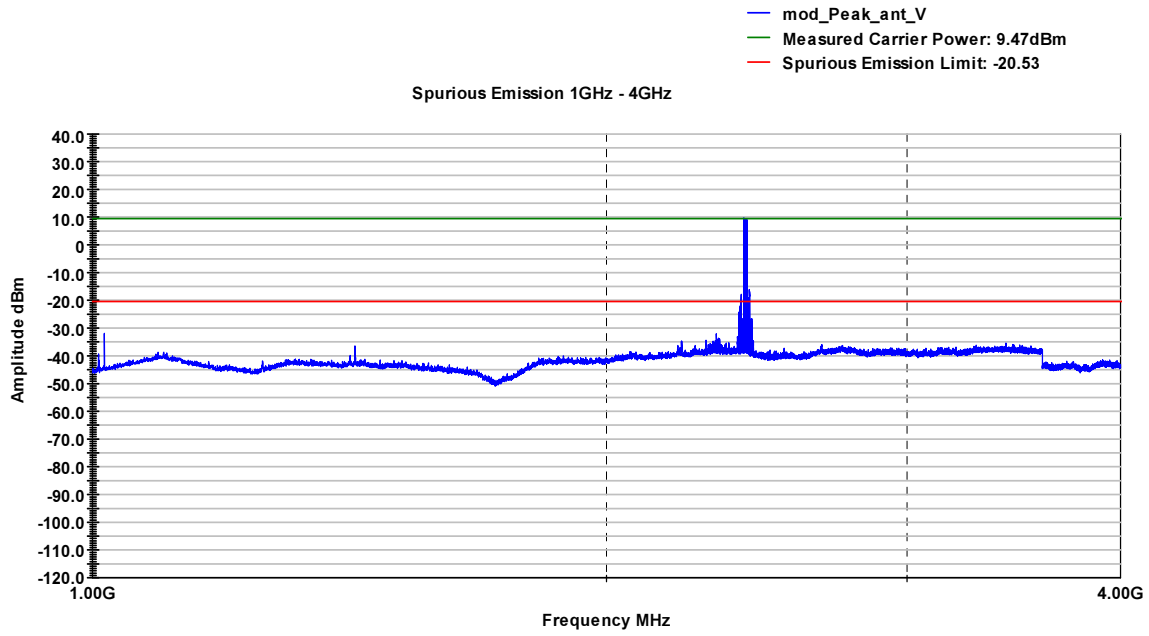
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

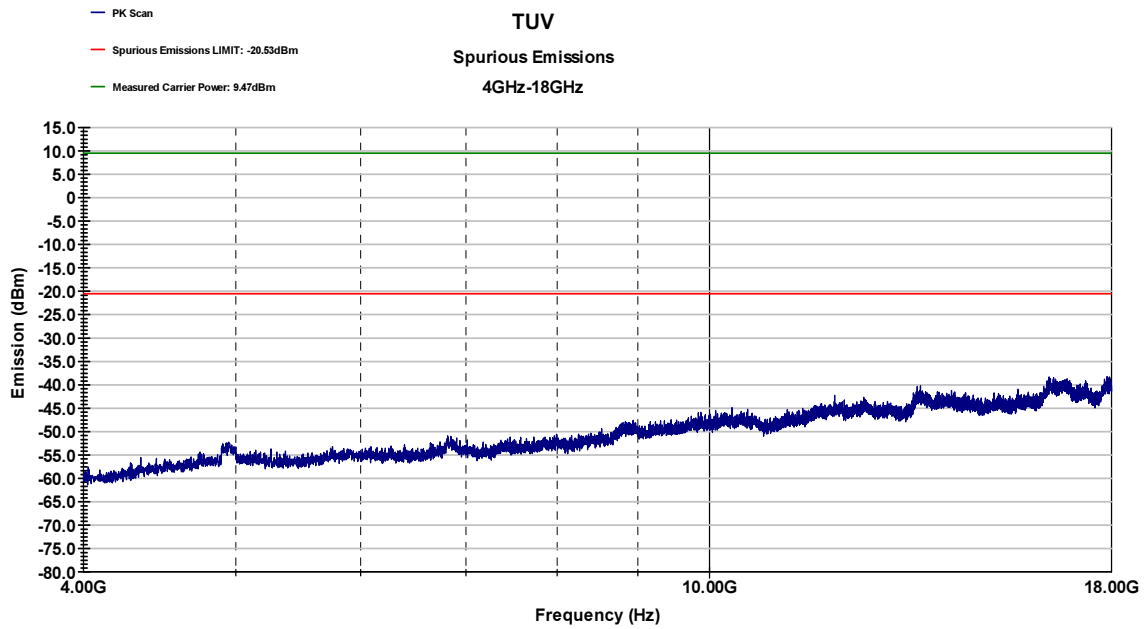
Further information to test setup

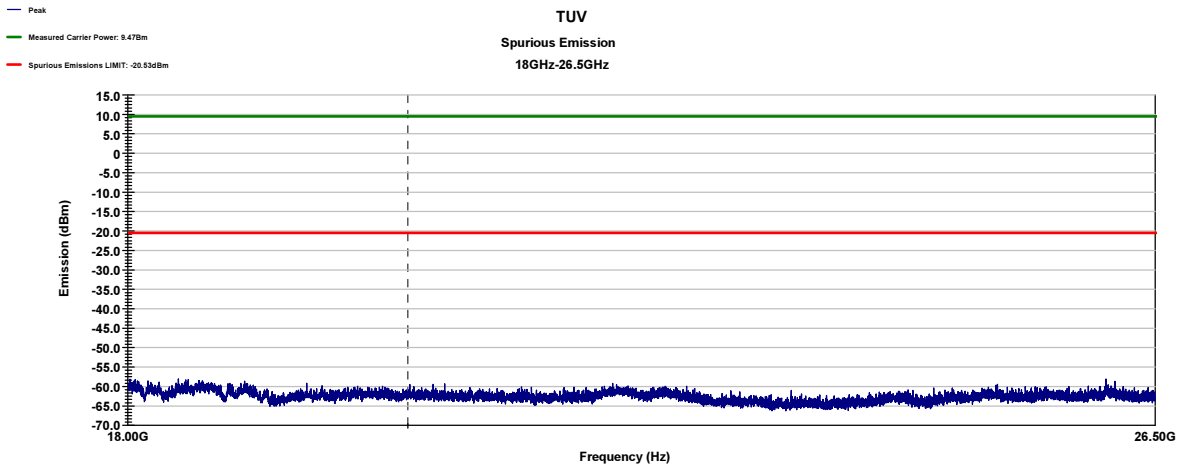


Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
CSSA	ETS Lindgren	FACT3	87020484	10/2016	10/2017
EMI Test Receiver	R&S	ESU40	87020455	04/2017	04/2018
Antenna BiConiLog	ETS Lindgren	3124E-PA	87020457	04/2017	04/2020
Antenna Horn with Preamplifier	ETS Lindgren	3117-PA	87020458	04/2017	04/2020
2xAntenna Horn with Preamplifier	ETS Lindgren	114514 120722	87020459 87020460	04/2017	04/2020

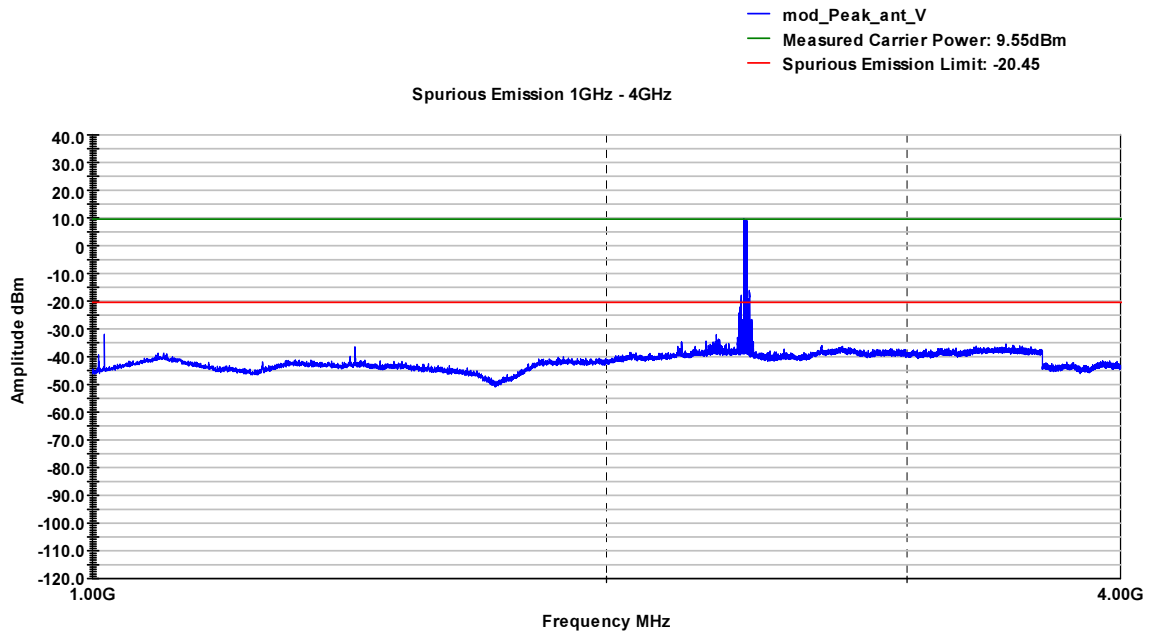
Graphical representation of Antenna Port Spurious Emission - Radiated
Operation Mode: #1
Standard: IEE 802.11b
Channel: #1 (worst condition)

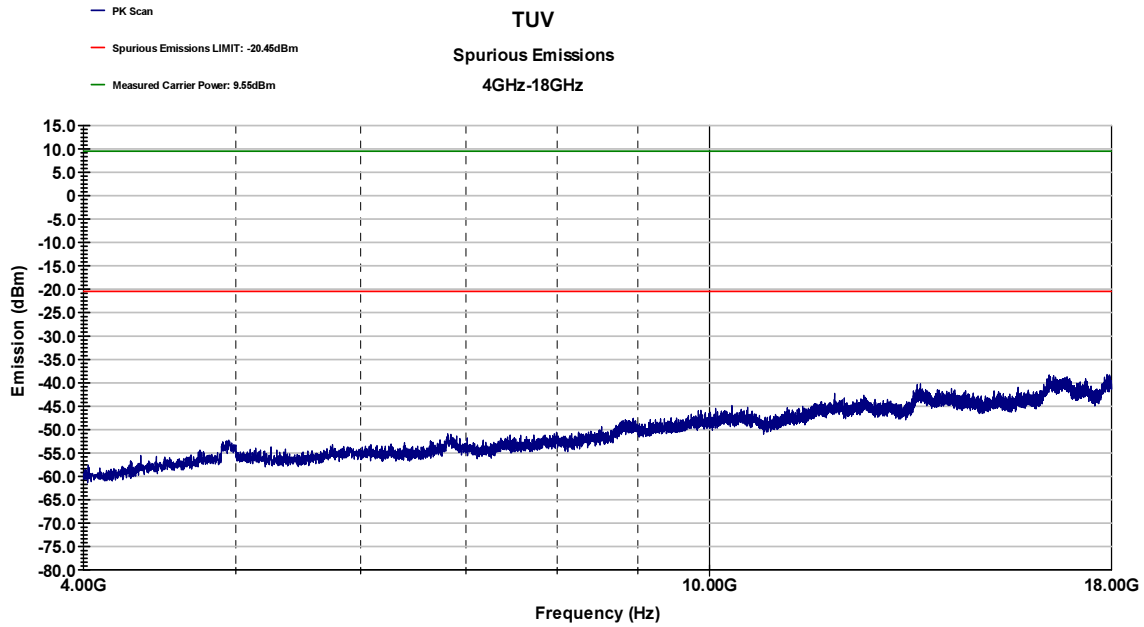


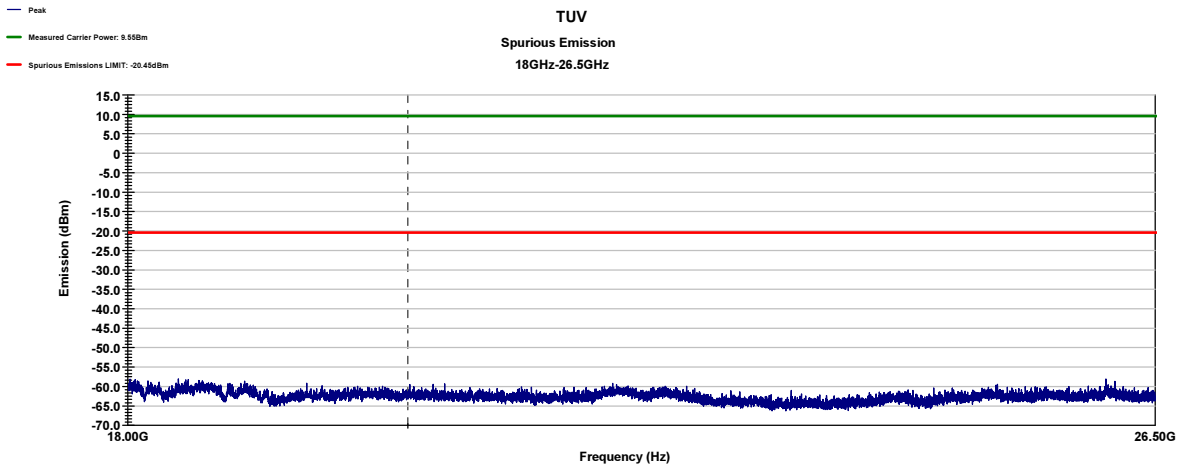

PK Scan
Spurious Emissions LIMIT: -20.53dBm
Measured Carrier Power: 9.47dBm
TUV
Spurious Emissions
4GHz-18GHz
Emission (dBm)
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
4.00G
10.00G
18.00G
Frequency (Hz)


Peak
Measured Carrier Power: 9.47Bm
Spurious Emissions LIMIT: -20.53dBm
TUV
Spurious Emission
18GHz-26.5GHz
Emission (dBm)
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
18.00G
26.50G
Frequency (Hz)

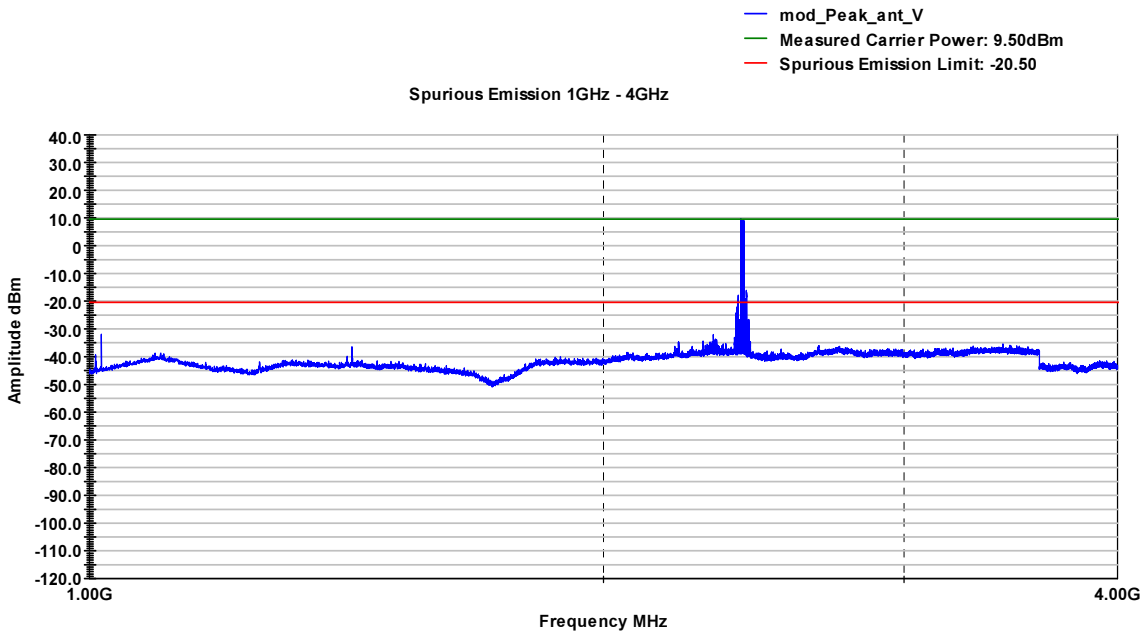
Graphical representation of Antenna Port Spurious Emission - Radiated
Operation Mode: #1
Standard: IEE 802.11g
Channel: #1 (worst condition)

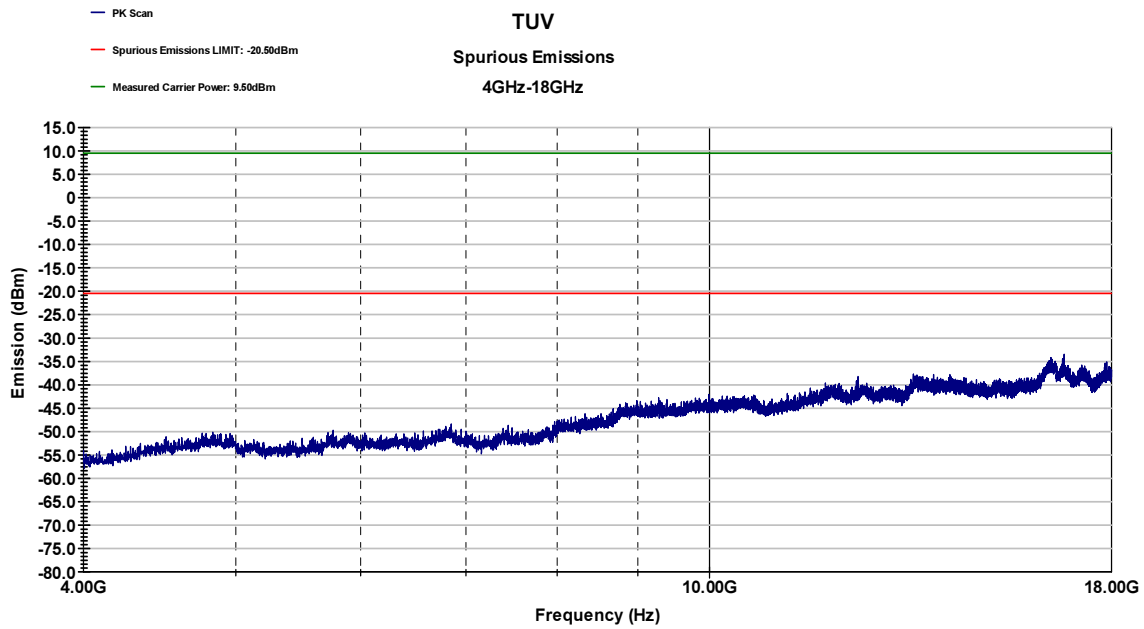


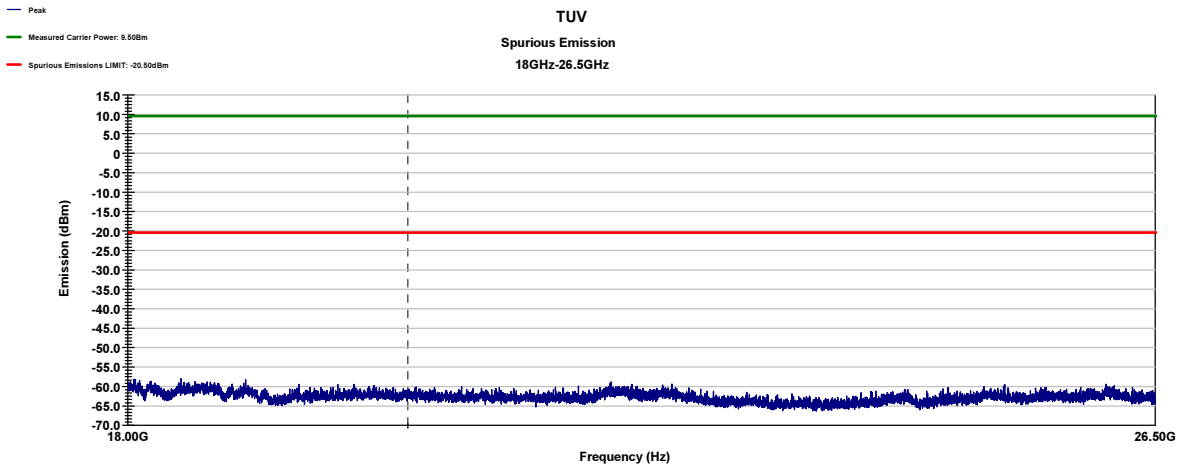

PK Scan
Spurious Emissions LIMIT: -20.45dBm
Measured Carrier Power: 9.55dBm
TUV
Spurious Emissions
4GHz-18GHz
Emission (dBm)
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
4.00G
10.00G
18.00G
Frequency (Hz)


Peak
Measured Carrier Power: 9.55Bm
Spurious Emissions LIMIT: -20.45dBm
TUV
Spurious Emission
18GHz-26.5GHz
Emission (dBm)
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
18.00G
26.50G
Frequency (Hz)

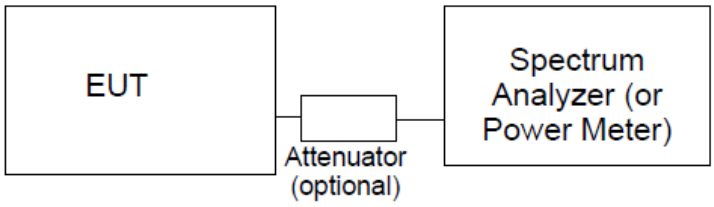
Graphical representation of Antenna Port Spurious Emission - Radiated
Operation Mode: #1
Standard: IEE 802.11n
Channel: #1 (worst condition)




PK Scan
Spurious Emissions LIMIT: -20.50dBm
Measured Carrier Power: 9.50dBm
TUV
Spurious Emissions
4GHz-18GHz
Emission (dBm)
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
-75.0
-80.0
4.00G
10.00G
18.00G
Frequency (Hz)


Peak
Measured Carrier Power: 9.50Bm
Spurious Emissions LIMIT: -20.50dBm
TUV
Spurious Emission
18GHz-26.5GHz
Emission (dBm)
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
-55.0
-60.0
-65.0
-70.0
18.00G
26.50G
Frequency (Hz)

7. Test Conditions and Results – POWER SPECTRAL DENSITY

20	TEST: Power Spectral Density		PASS
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C	
	Relative Humidity (%)	30 to 60 %	
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	24°C	
	Relative Humidity (%)	37%	
	Air pressure (hPa)	1020	
—	Frequency	Application Point	
Fully configured sample tested at the power line frequency	115V ~ 60Hz	SMA Connector	
Equipment mode:	Operation mode	#1	
FCC Standard	§15.247		
(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.			
Further information to test setup			

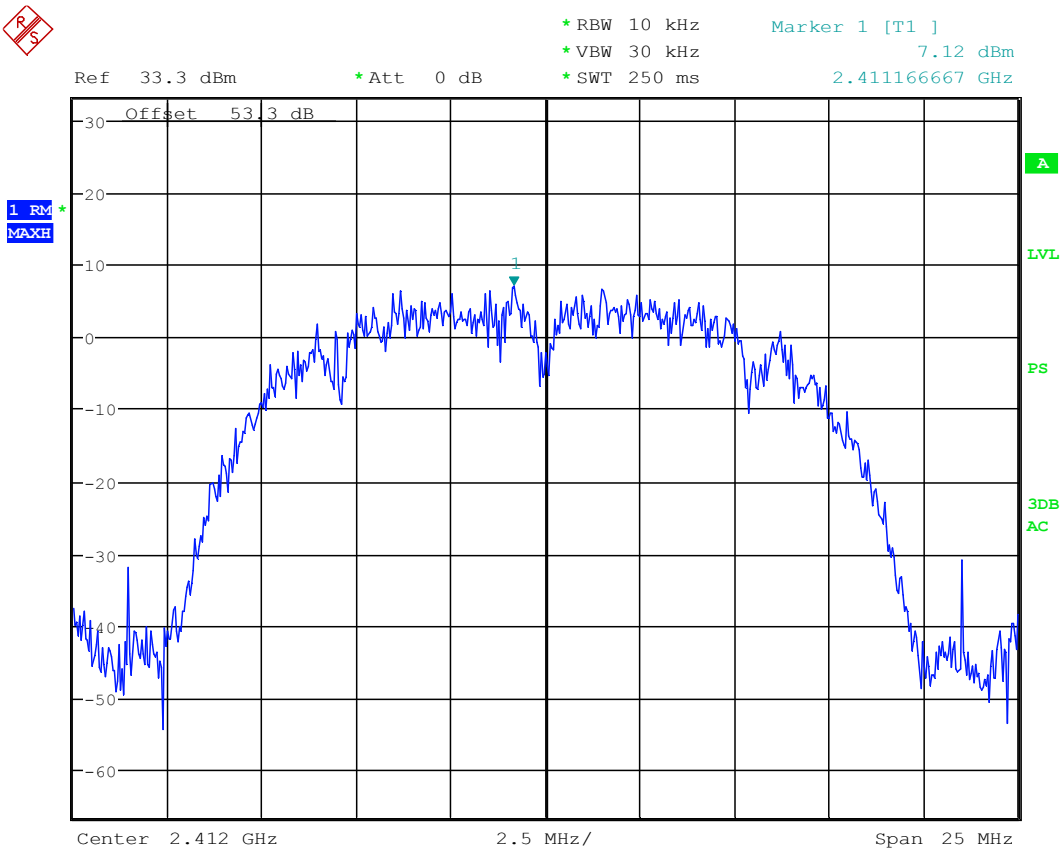
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU40	87020455	04/2016	04/2017
20dB Attenuator	RS Components	Huber & Suhner	87020534	10/2016	10/2017

Graphical representation of Power Spectral Density

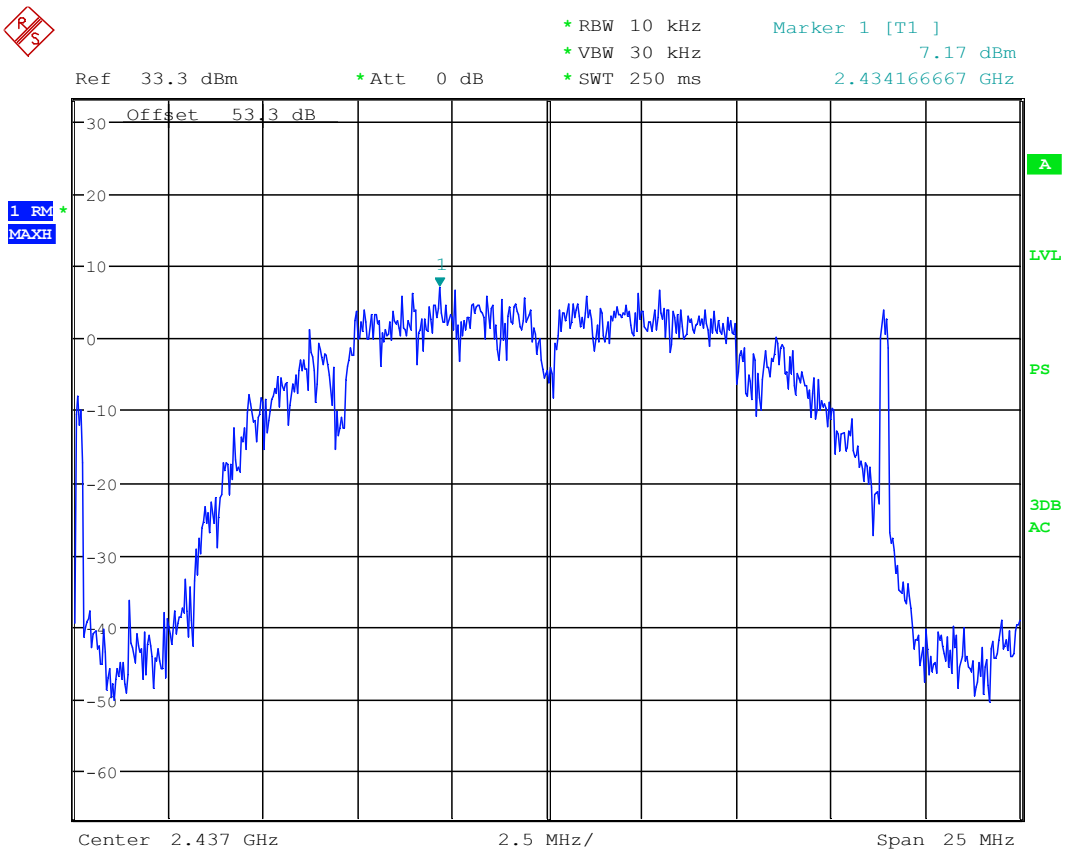
Operation Mode: #1

Standard: IEE 802.11b

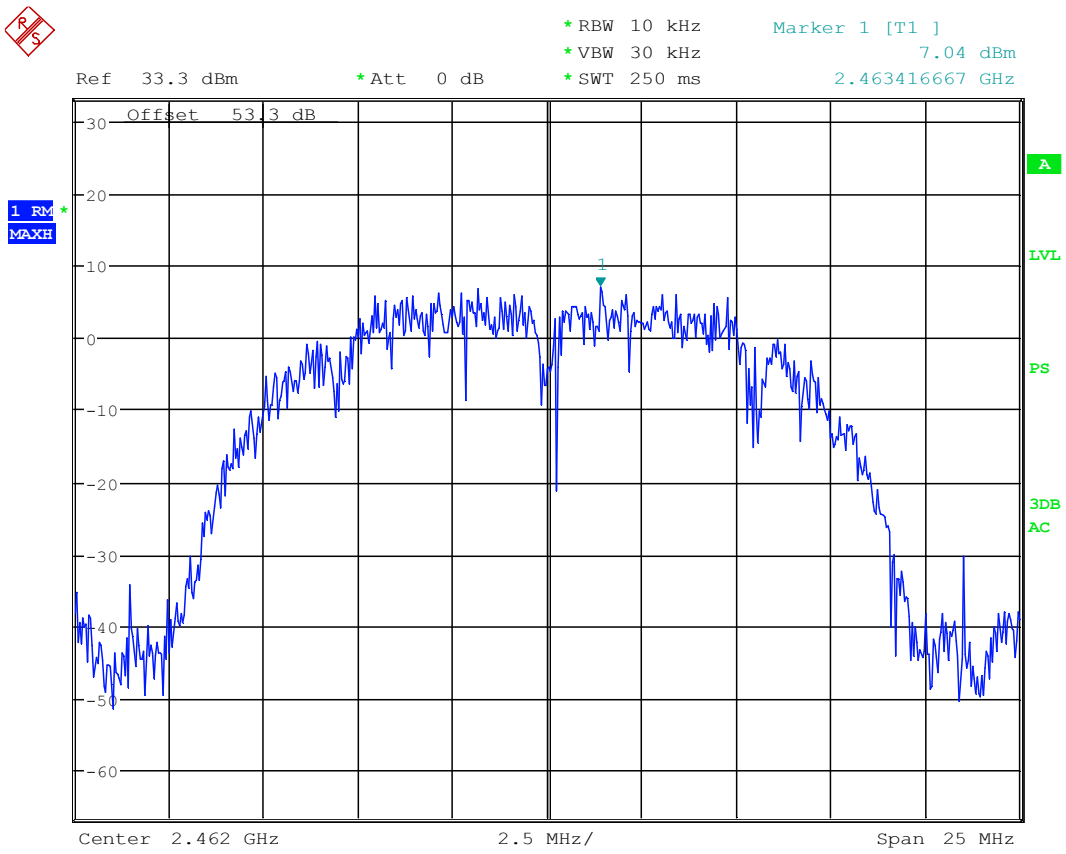
Channel: #1



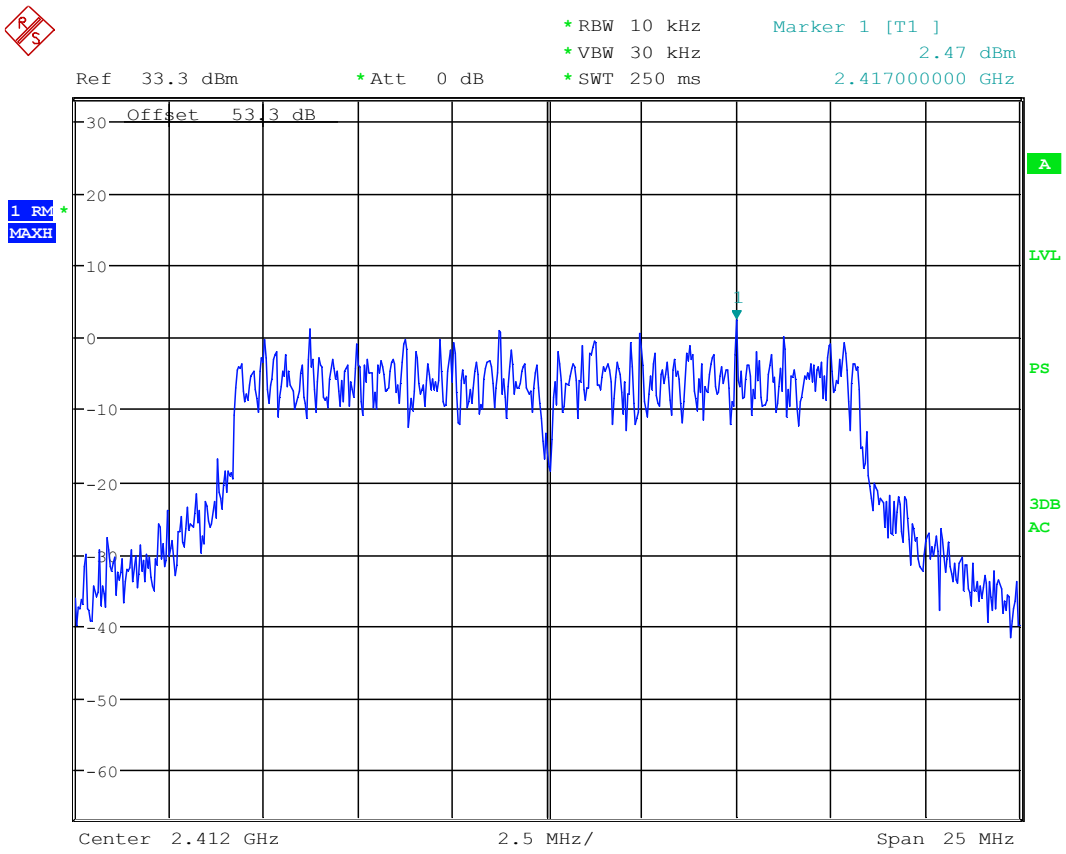
Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11b
Channel: #6



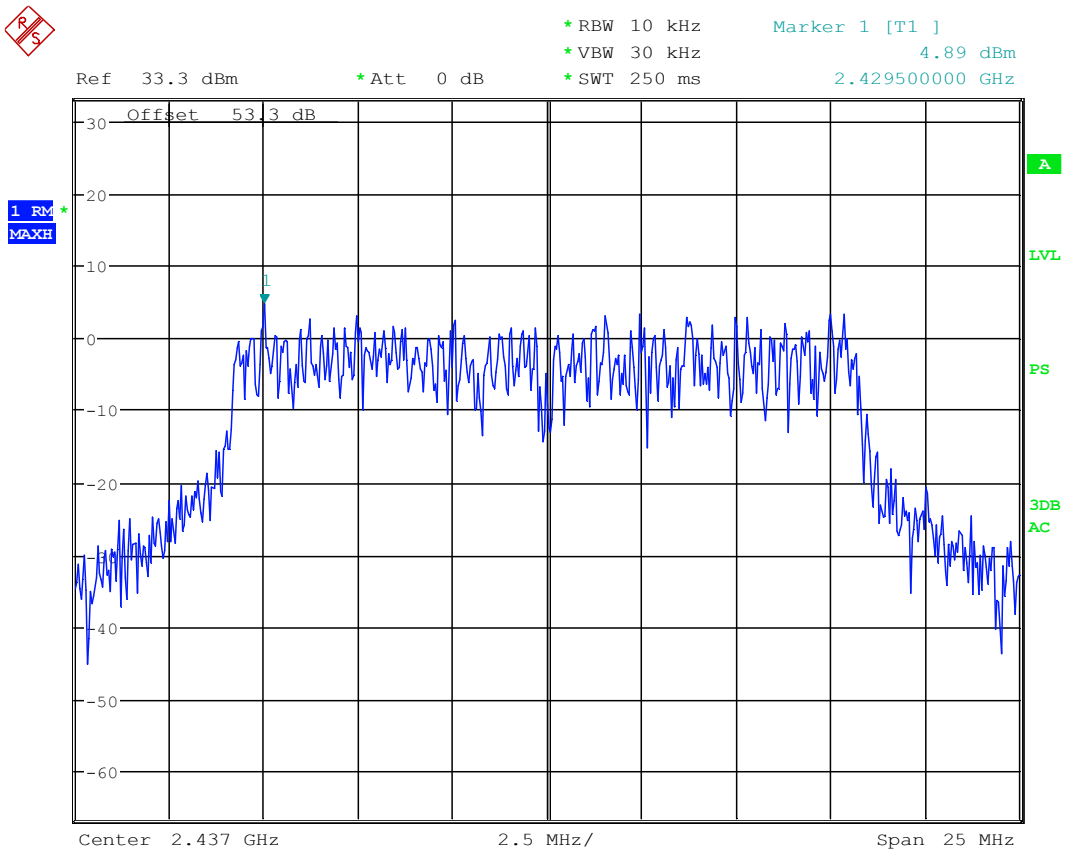
Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11b
Channel: #11



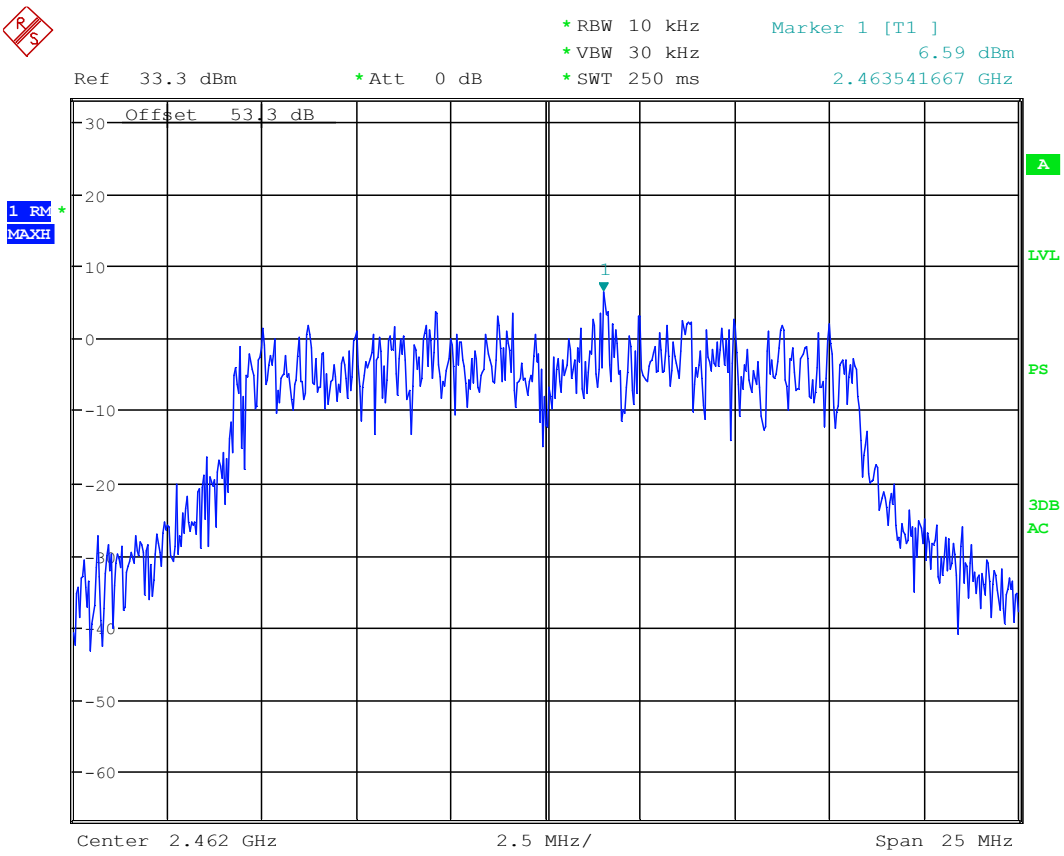
Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11g
Channel: #1



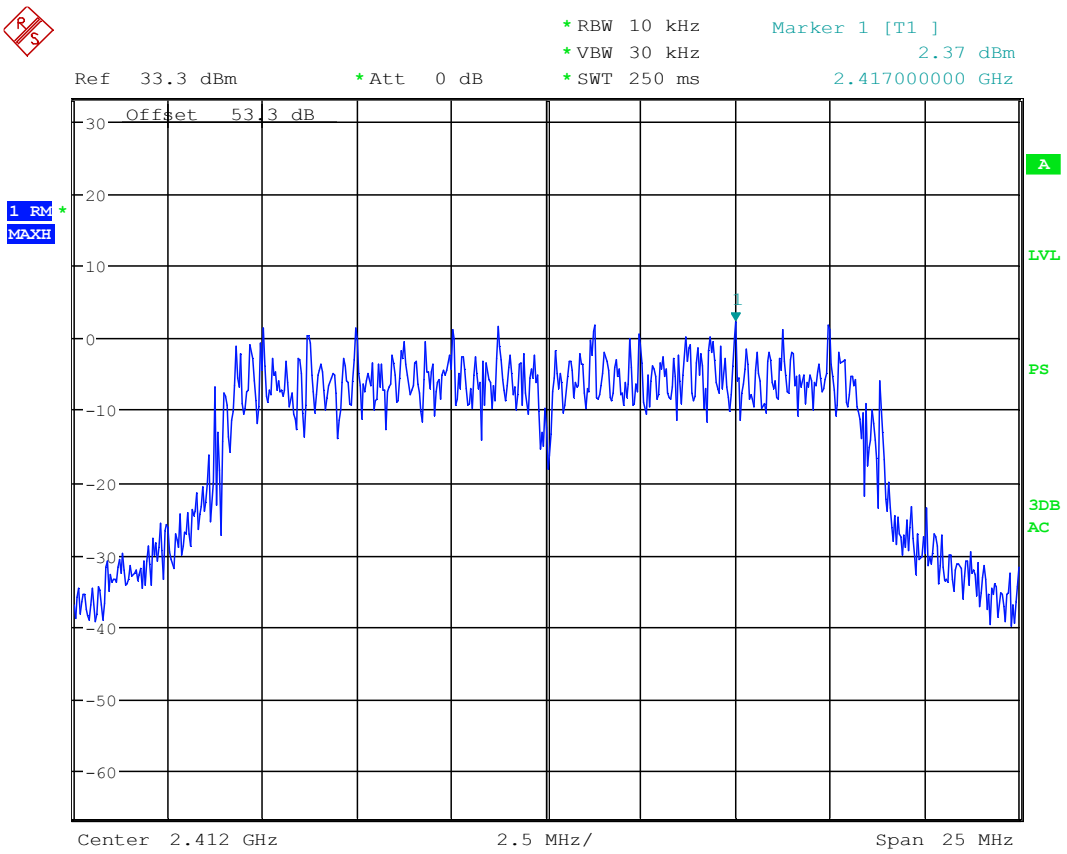
Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11g
Channel: #6



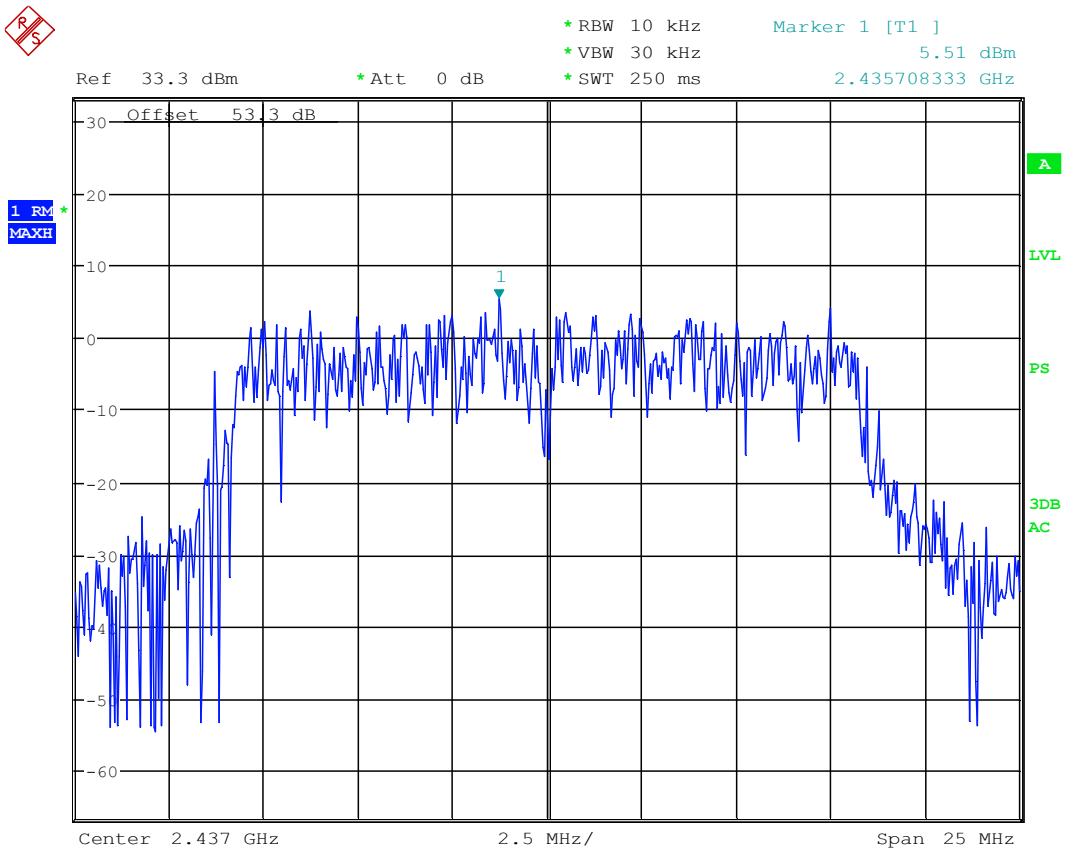
Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11g
Channel: #11



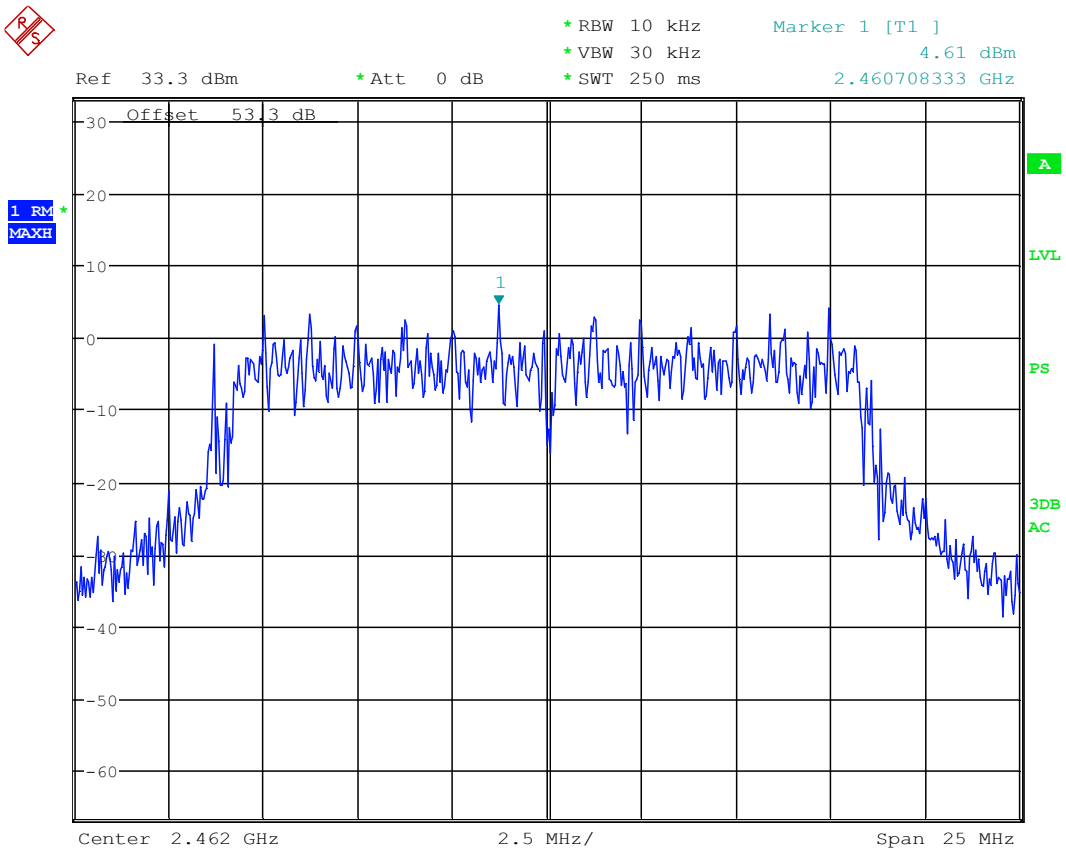
Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11n
Channel: #1



Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11g
Channel: #6



Graphical representation of Power Spectral Density
Operation Mode: #1
Standard: IEE 802.11g
Channel: #11



1. Test Conditions and Results – RF EXPOSURE REQUIREMENTS

21	TEST: RF Exposure Requirements		PASS
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C	
	Relative Humidity (%)	30 to 60 %	
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	---	
	Relative Humidity (%)	---	
	Air pressure (hPa)	1020	
—	Frequency	Application Point	
Fully configured sample tested at the power line frequency	115V ~ 60Hz	SMA Connector	
Equipment mode:	Operation mode	#1	
FCC Standard	§15.247		

General Test Configuration

Calculation uses the free space transmission formula:

$$S = \frac{PG}{4\pi r^2}$$ or equivalent $$S = \frac{EIRP}{4\pi r^2}$$

where
P = input power of the antenna
G = antenna gain relative to an isotropic antenna
r = distance from the antenna to the point of investigation.
EIRP = Effective Isotropic Radiated Power

Summary of Results

Device COMPLIES with Power Density requirements at 20cm separation

Calculation

Antenna: 5dBi (see pag.11)

RESULTS			
CH	**TX Frequency (MHz)**	**Measured Power at Antenna Connector (dBm)**	**Antenna Gain (dBi)**
11	2462	17,805	5
MAXIMUM PERMISSIBLE EXPOSURE (MPE)			
Evaluation Distance (m)		0,2 (1)	
Power density at evaluation distance (W/m²)		---	
Power density Limit (W/m²)		10	
VERDICT			
The EUT Radiated Power density at evaluation distance is WHITIN THE LIMIT			
MIN Safety Distance			
3,8cm			

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