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LAB N° 0121

TEST REPORT

No. ARSQ00039-01a

performed in accordance with

FCC Rules: Code of Federal Regulations (CFR) no. 47
Part 15 Subpart C Section 15.247

PRODUCT	WiFi module
MODEL(s) TESTED	SPWF04SA SPWF04SC
FCC ID	S9NSPWFS04
TRADE MARK(s)	STMicroelectronics

APPLICANT	STMicroelectronics S.r.l. ~ Centro Direzionale Colleoni - Palazzo Andromeda 3 I-20864 Agrate Brianza (MB)
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Tested by	Roberto Radice	
Approved by	Giovanni Di Turi <i>[Laboratory manager]</i>	

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2016-05-13	First edition Digital signed - ARSQ00039-01a_TR_FCC 15.247_STMICELECTRONICS_Modulo SPWFS04

The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself.
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1. GENERAL DATA

SAMPLE		
Samples received on	2016-04-04	(item sent and sampling by applicant)
IMQ reference samples	BEM	81291
Samples tested No.	1	
Object under analysis recognition	Not carried out Except where stated, characteristics of products were taken from client description and were not verified by the laboratory	
TEST LOCATION		
Testing dates	2016-04-04 ÷ 2016-05-11	
Testing laboratory	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
ENVIRONMENTAL CONDITIONING		
<i>Parameter</i>	<i>Measured</i>	
Ambient Temperature	20 ÷ 25 °C	
Relative Humidity	50 ÷ 60 %	
Atmospheric Pressure	900 ÷ 1000 mbar	
REMARKS		
Throughout this report a point (coma) is used as the decimal separator. The ability or reliability of this product to perform its intended function in a particular application has not been investigated. IMQ declines any responsibility derived from missing or wrong information provided aside by the applicant.		

2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
<input checked="" type="checkbox"/>	47 CFR Part 15	2015	Radio Frequency Device
<input checked="" type="checkbox"/>	ANSI C63.4	2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<input checked="" type="checkbox"/>	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices

3. EQUIPMENT UNDER TEST (EUT) DETAILS

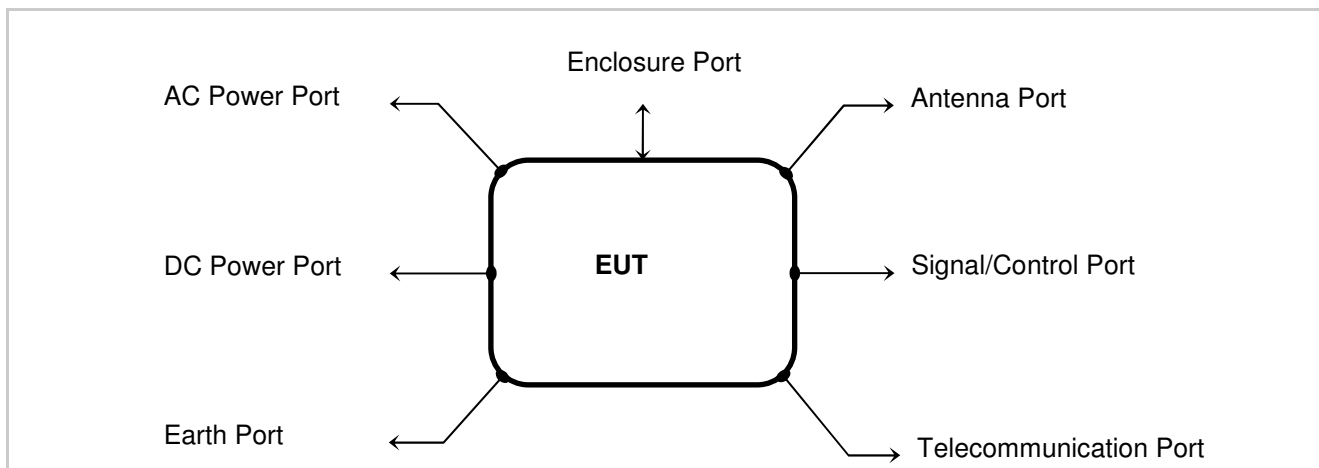
GENERAL DATA

MODEL (basic)	Description
SPWFS04SA	WiFi module with integrated antenna
SPWFS04SC	WiFi module with Integrated u.fl connector and dedicated external antenna
FCC ID	S9NSPWFS04
Manufacturer	STMicroelectronics S.r.l. ~ Centro Direzionale Colleoni - Palazzo Andromeda 3 I-20864 Agrate Brianza (MB)
Equipment classification	According to the definition 15.3 (o) EUT is a Intentional Radiator operating within the bands 2400 ÷ 2483.5 MHz so it shall fulfill provisions of 47CFR Part 15 Subpart C – Intentional radiators – and Section 15.247
Type of equipment	Radio module
Operating frequency	2412 ÷ 2462 MHz
Equipment Class	DTS
Max radiated power	114,34 dB μ V/m (at 3m. distance)
Modulation	DSSS; OFDM
Channel Spacing	20MHz
Channel bandwidth (at -6db)	802.11b: 12MHz 802.11g: 16.4MHz 802.11n: 17.5MHz
Antenna	Rufa 2.4GHz smd Antenna P/N A5839 - Peak gain: 2.1 dBi Titanis 2.4 GHz Swivel SMA Antenna (Antenova) - Peak gain: 4.4 dBi
Number of channels	11

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462		

4. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

EUT PORTS



Port	Description	Max length
Enclosure	Open frame board	/
AC power	Not present	/
DC power	DC power supply 3.3 V DC	/
Signal/ Control	I/O pin (see also schematics data sheet)	/
Antenna	Integrated on PCB Integrated u.fl connector and dedicated external antenna	/

STATE OF THE EUT DURING TESTS

SPWF04SA: WiFi module with integrated antenna

#1	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11b standard with DSSS modulation (1Mbit/s; 2Mbit/s; 5.5Mbit/s & 11Mbit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with max. RF power setting (18dBm) on all channels.</p>
#2	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11g with OFDM modulation (6Mbit/s; 9Mbit/s; 12Mbit/s; 18Mbit/s; 24Mbit/s; 36Mbit/s; 48Mbit/s & 56Mbit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with these max. RF power settings: 15dBm on 2412MHz channel 18dBm on 2437MHz channel 11dBm on 2462MHz channel</p>
#3	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11n with OFDM modulation (6.5Mbit/s; 13Mbit/s; 19.5Mbit/s; 26Mbit/s; 39Mbit/s; 52Mbit/s; 58.5Mbit/s & 65Mbit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with these max. RF power settings: 15dBm on 2412MHz channel 18dBm on 2437MHz channel 11dBm on 2462MHz channel</p>

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

#4	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11b standard with DSSS modulation (1Mbit/s; 2Mbit/s; 5.5Mbit/s & 11MBit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with max. RF power setting (18dBm) on all channels.</p>
#5	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11g with OFDM modulation (6Mbit/s; 9Mbit/s; 12Mbit/s; 18Mbit/s; 24Mbit/s; 36Mbit/s; 48Mbit/s & 56MBit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with these max. RF power settings: 15dBm on 2412MHz channel 18dBm on 2437MHz channel 11dBm on 2462MHz channel</p>
#6	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11n with OFDM modulation (6.5Mbit/s; 13Mbit/s; 19.5Mbit/s; 26Mbit/s; 39Mbit/s; 52Mbit/s; 58.5Mbit/s & 65MBit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with these max.RF power settings: 14dBm on 2412MHz channel 18dBm on 2437MHz channel 10dBm on 2462MHz channel</p>

SPWF04SC: WiFi module with Integrated u.fl connector (conducted test)

#7	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11b standard with DSSS modulation (1Mbit/s; 2Mbit/s; 5.5Mbit/s & 11MBit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with max. RF power setting (18dBm) on all channels.</p>
#8	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11g with OFDM modulation (6Mbit/s; 9Mbit/s; 12Mbit/s; 18Mbit/s; 24Mbit/s; 36Mbit/s; 48Mbit/s & 56MBit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with these max. RF power settings: 15dBm on 2412MHz channel 18dBm on 2437MHz channel 11dBm on 2462MHz channel</p>
#9	Operating	<p>Continuous transmission (single channel transmission 2412MHz, 2437MHz, 2462MHz) 802.11n with OFDM modulation (6.5Mbit/s; 13Mbit/s; 19.5Mbit/s; 26Mbit/s; 39Mbit/s; 52Mbit/s; 58.5Mbit/s & 65MBit/s).</p> <p>The EUT is installed on module device board (dongle). The dongle is powered from the USB cable port.</p> <p>The EUT is in continuously transmitting with these max.RF power settings: 14dBm on 2412MHz channel 18dBm on 2437MHz channel 10dBm on 2462MHz channel</p>

SUPPORT EQUIPMENT

Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

Equipment	Manufacturer	Model
Dongle furnished by manufacturer for supply and management of radio module	ST Microelectronics	NUCLEO (PC26B V01)
<p>Software used for testing: EFT (Engineering Test Functions) CW1100/CW1200 (ST-Ericsson)</p> <p>This software was running on PC connected via USB to the Dongle. It was used to enable the test operation mode #1, #2 and #3</p>		

ELECTROMAGNETICALLY RELEVANT COMPONENTS

Component	No.	Manufacturer	Model
Microcontroller (U11)	1	STM	STM32F439ZI
RF transceiver (U2)	1	STM	CW1100
Band Pass filter 2.450GHz (FL1)	1	MURATA	p/n LFB182G45SG9B740
Quartz (X1)	1	NDK	XTAL 38.400MHz +/-10PPM 9PF

RFI SUPPRESSION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EMI PROTECTION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EUT TECHNICAL DOCUMENTATION

Document	Reference
Datasheet – Preliminary data	SPWF04SA – January 2016
Schematic diagram	Drawing n° DM00280916-V1
Components Layout	Doc. Ref. DM00280942
Bill of Materials	Doc. Ref. DM00280934

5. METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2014, ANSI C63.10-2013 and Section 15.31 of CFR47 Part 15 (2015) – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the § 6 of this test report.

FREQUENCY RANGE INVESTIGATED

Conducted emission tests: from 150 kHz to 30MHz

Radiated emission tests: from 9 kHz to tenth harmonic of fundamental.

6. SUMMARY OF TEST RESULTS

POSSIBLE TEST CASE VERDICTS	
Test object does meet the requirement	PASS
Test object does not meet the requirement	FAIL
Test case does not apply to the test object	N.A.
Test not performed	N.P.

CFR47 Part 15	TITLE	RESULT
§ 15.203	Antenna Requirements	PASS
§ 15.247 (b)(4)(i)		
§ 15.207 (a)	Power Line Conducted Emission	PASS
§ 15.209 (a) (f)	Radiated Emission	PASS
§ 15.247 (d)	Out-of-band emissions	PASS
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edges	PASS
§ 15.247 (a)	Frequency Hopping Spread Spectrum Specifications	
§ 15.247(a)	20 dB Bandwidth	N.A.
§ 15.247(a)(1)	Carrier frequency (Hopping Channel) Separation	N.A.
§ 15.247(a)(1)(iii)	Number of Hopping Channels Used	N.A.
§ 15.247(a)(1)(iii)	Time occupancy (Dwell Time) of Each Ch. within a 0,4 x Nch (sec) Period	N.A.
§ 15.247(a)(2)	6dB Minimum Bandwidth	PASS
§ 15.247(b)	Maximum Peak Output Power	
§ 15.247(b) (1)	Peak Output Power, radiated (EIRP)	PASS
§ 15.247(b) (3)	RF power output, radiated (EIRP)	N.A.
§ 15.247(b) (4)	Antenna gain	N.A.
§ 15.247(c)	Operation with directional antenna gains greater than 6 dBi	N.A.
§ 15.247 (e)	Power Spectral Density	PASS
§ 15.247 (f)	Hybrid systems	N.A.
§ 15.247 (g)	FHSS Transmission characteristics	N.A.
§ 15.247 (h)	Recognition of occupied channel and multiple transmission system	N.A.
§ 15.247(i) (§ 47CFR 1.1307(b)(1))	RF humane exposure	PASS

7. TEST RESULTS

7.1 ANTENNA REQUIREMENTS

TEST REQUIREMENT

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Antenna specifications

N° of authorized antenna types	2
Antenna type	Rufa 2.4GHz smd Antenna P/N A5839 Titanis 2.4 GHz Swivel SMA Antenna (Antenova)
Maximum total gain	+4.4 dBi
External power amplifiers	Not present

TEST RESULT

The EUT meets the requirements of section 15.203 and 15.204

7.2 POWER LINE CONDUCTED EMISSION

TEST REQUIREMENT

Test setup	ANSI C63.4
Test facility	Shielded chamber
Frequency range	150 kHz – 30 MHz
IF bandwidth	9 kHz
EMC class	B
EUT operating condition	#4 #5 #6 (worst condition: max antenna gain)

LIMITS

Band of operations	Quasi-Peak (dB μ V)	Average Limit (dB μ V)
0.15 ÷ 0.5	66 ÷ 56	56 ÷ 46
0.5 ÷ 5	56	46
5 ÷ 30	60	50

TEST RESULT

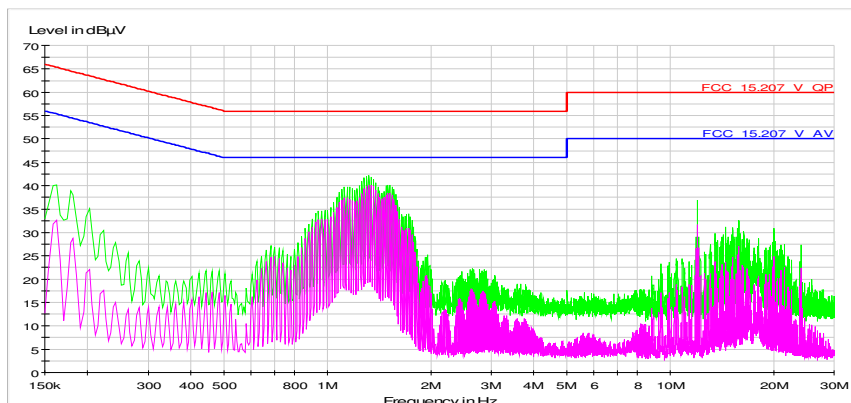
The EUT meets the requirements of sections 15.207 (a).

TEST PROCEDURE

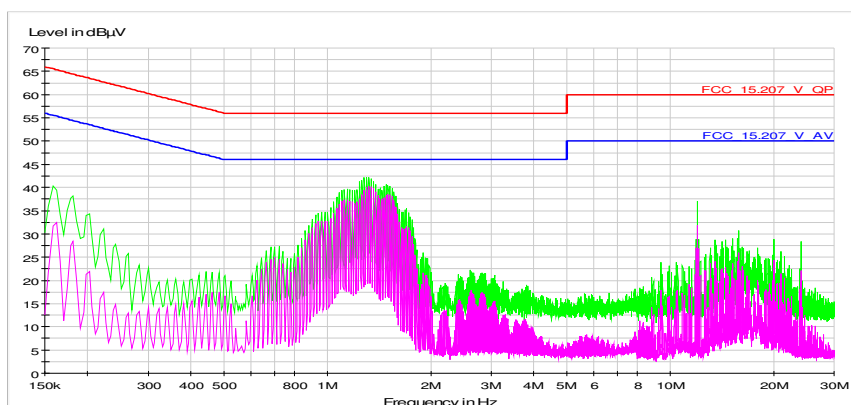
- 1) The EUT was placed on a wooden table of size, 80 cm by 80 cm, raised 80 cm in which is located 40 cm away from the vertical wall the shielded room.
- 2) Each EUT power cord input cord was individually connected through a 50 Ω /50 μ H LISN to the input power source.
- 3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
- 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
- 5) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 9 kHz during the measurements.
- 6) The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).

MEASUREMENTS RESULT: Conducted disturbance on Ac power supply of Personal Computer where the dongle is connected.

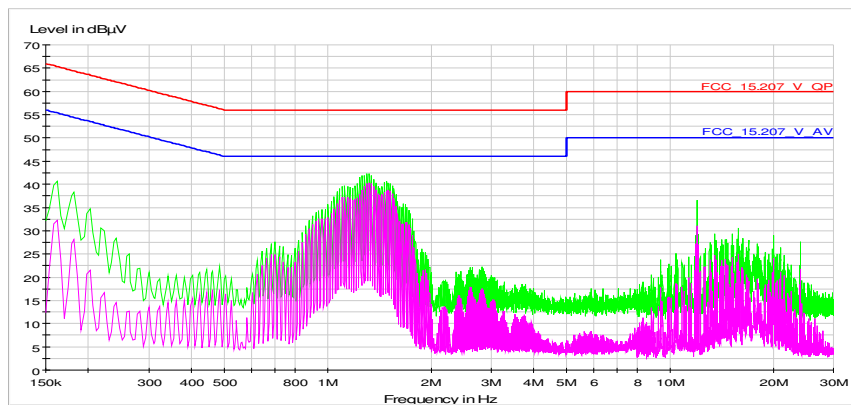
Test condition: Lower channel (2412MHz) 802.11b Modulation DSSS



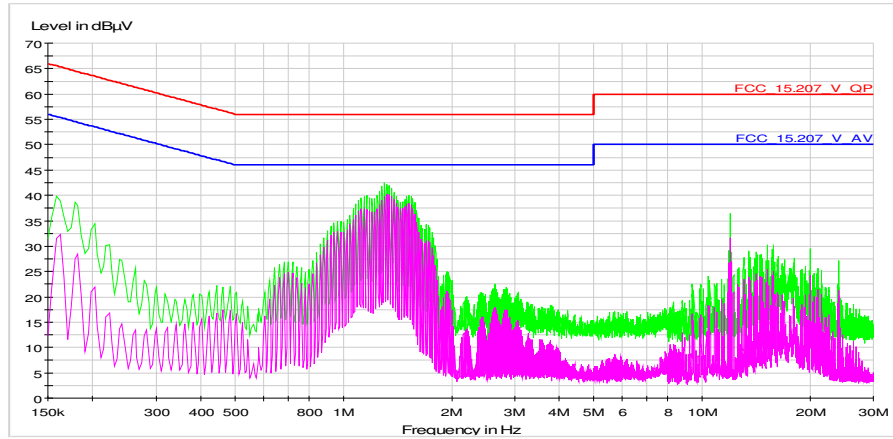
Test condition: Middle channel (2437MHz) 802.11b Modulation DSSS



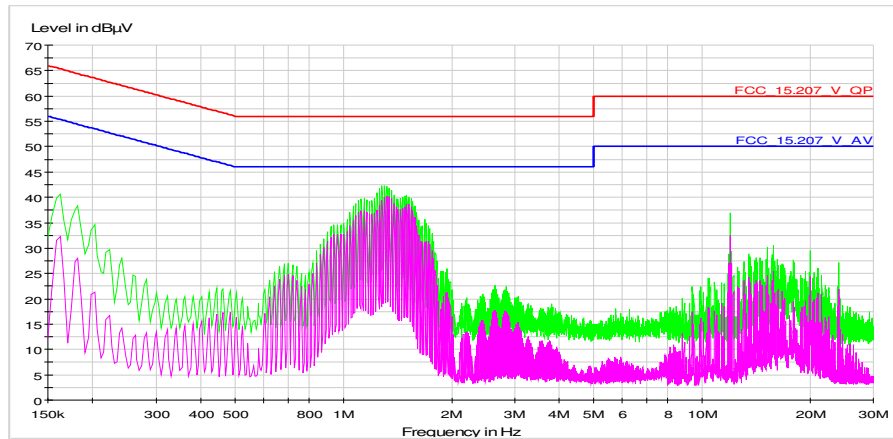
Test condition: Higher channel (2462MHz) 802.11b Modulation DSSS



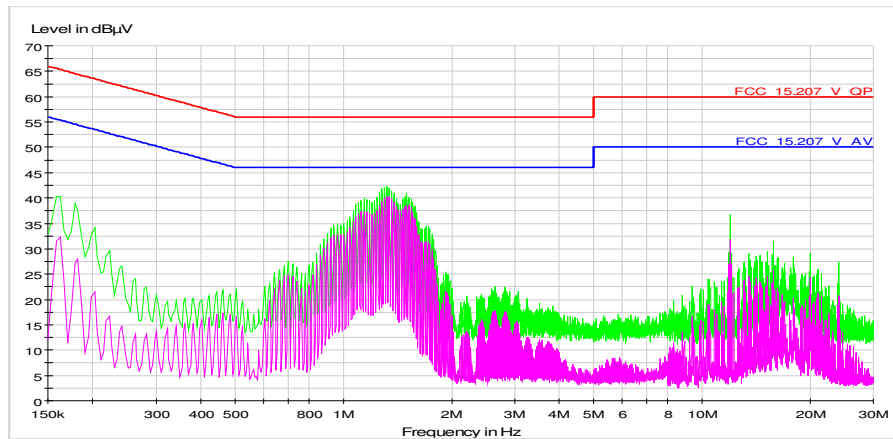
Test condition: Lower channel (2412MHz) 802.11g Modulation OFDM



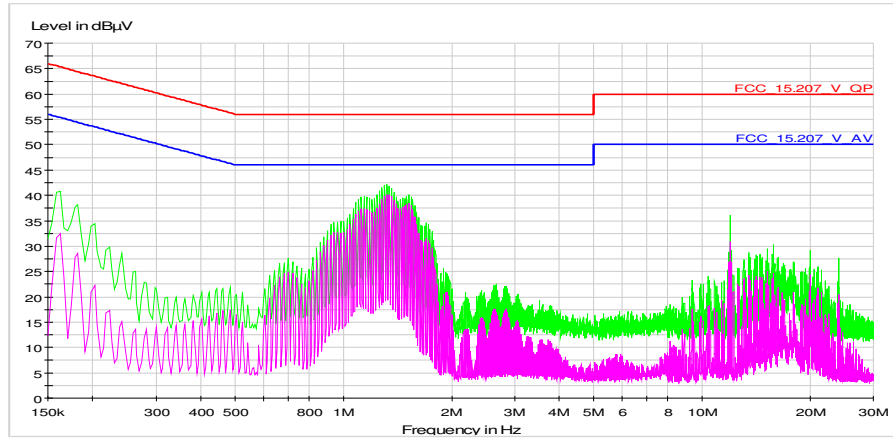
Test condition: Middle channel (2437MHz) 802.11g Modulation OFDM



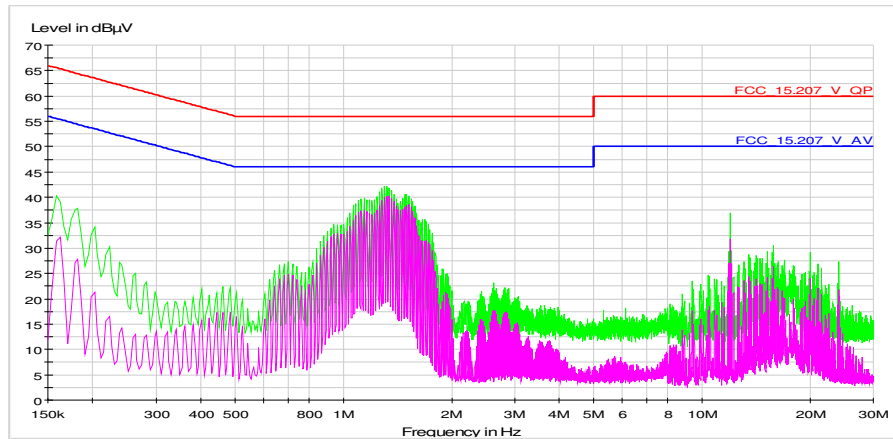
Test condition: Higher channel (2462MHz) 802.11g Modulation OFDM



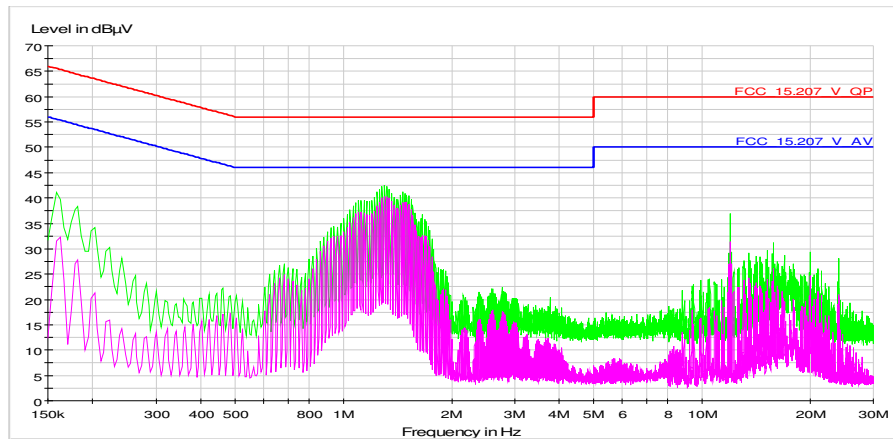
Test condition: Lower channel (2412MHz) 802.11n Modulation OFDM



Test condition: Middle channel (2437MHz) 802.11n Modulation OFDM



Test condition: Higher channel (2462MHz) 802.11n Modulation OFDM



7.3 RADIATED DISTURBANCES

TEST REQUIREMENT	
Test setup	ANSI C63.4
Test facility	Semi-anechoic chamber
Test distance	3 meters
Frequency range	9 kHz to tenth harmonic of fundamental
IF bandwidth (below 30 MHz)	9 kHz
IF bandwidth (below 1,000 MHz)	120 kHz
IF bandwidth (above 1,000 MHz)	1 MHz
EMC class	B
EUT operating condition	#1 #2 #3 #4 #5 #6
<p>Remark: In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40 \log (300 \text{ meter} / 3 \text{ meter}) = +80 \text{ db}$ Extrapolation (dB) = $40 \log (30 \text{ meter} / 3 \text{ meter}) = +40 \text{ db}$</p>	

LIMITS		
Band of operations	Peak (dB μ V/m)	Average Limit (dB μ V/m)
Restricted bands (§ 15.205)	74	54
Other bands	According to 15.209 or fundamental -20dB (which is greater)	

TEST RESULT
<p>The EUT has been tested in 3 orthogonal axes at the frequencies lowest, middle and highest. The results reported are worst case. The measurement of spurious emission of EUT in receiver mode is deemed to be fulfilled as no limits are exceeded in transmitter mode (condition considered more burdensome). The EUT meets the requirements of sections 15.205 (b), 15.209 and 15.247.</p>

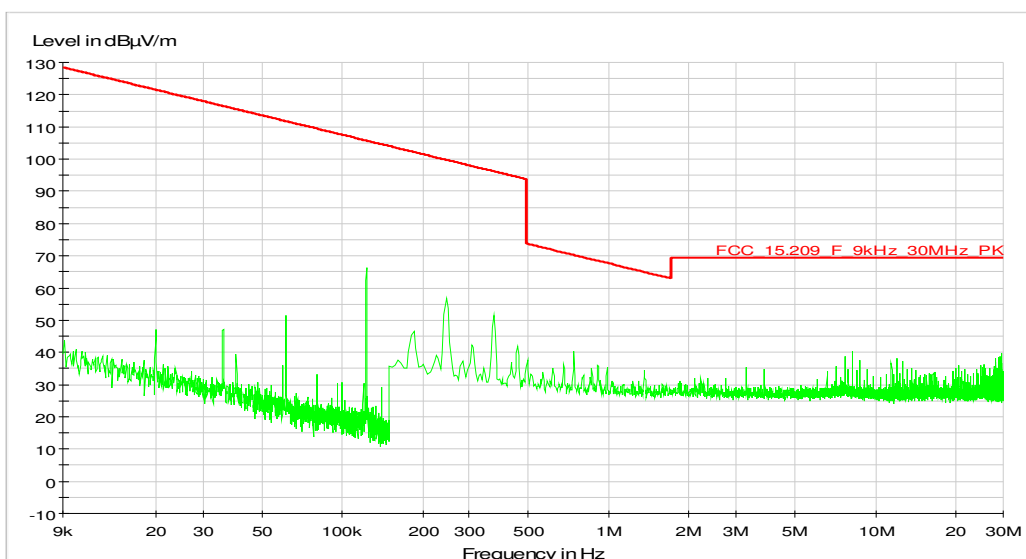
TEST PROCEDURE
<ol style="list-style-type: none"> 1) The EUT was placed on turntable which is 0.8 m above the ground plane 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level. 3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission. 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz. 5) The receiving antenna was positioned in both horizontal and vertical polarization. 6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).

MEASUREMENTS RESULTS - RADIATED

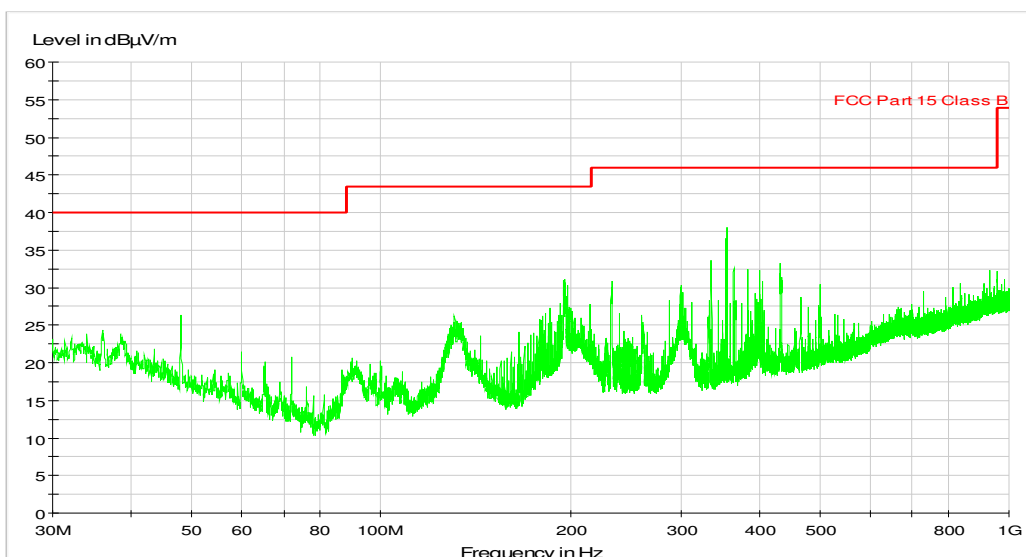
TEST CONDITION: LOWER CHANNEL (2412MHz) 802.11B MODULATION DSSS

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	115.08	27.30	5.18	-37.57	109.99	-----	-----	-----
4824	52.64	31.30	7.31	-36.98	54.27	5000	74.00	>19
7236	47.97	36.00	9.09	-37.00	56.06	5000	74.00	>17
9648	42.39	38.10	10.71	-37.17	54.03	5000	74.00	>19
12060	35.32	39.50	12.01	-36.71	50.21	5000	74.00	>23
14472	36.89	42.20	12.93	-34.90	57.12	5000	74.00	>16
16884	38.92	40.50	13.69	-34.50	58.61	5000	74.00	>15
f>16884	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

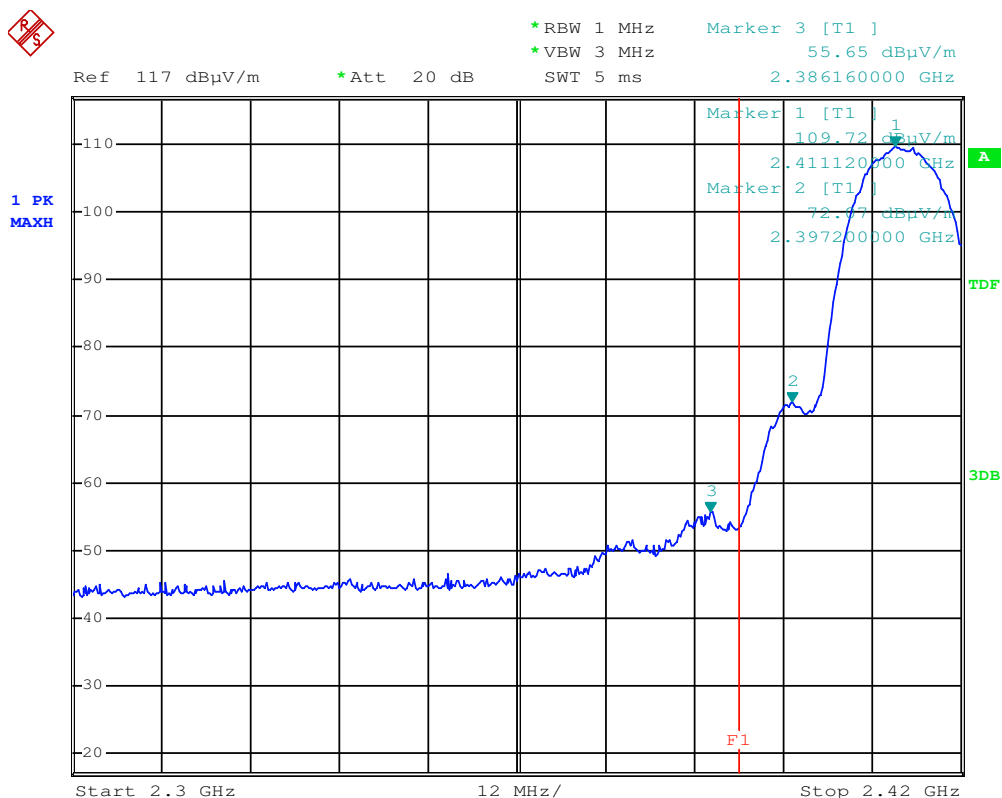
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	106.04	27.30	5.18	-37.57	100.95	-----	-----	-----
4824	46.64	31.30	7.31	-36.98	48.27	500	54.00	>5
7236	35,38	36.00	9.09	-37.00	43.47	500	54.00	>10
9648	31,44	38.10	10.71	-37.17	43.08	500	54.00	>10
12060	26,23	39.50	12.01	-36.71	41.12	500	54.00	>12
14472	26.90	42.20	12.93	-34.90	47.13	500	54.00	>7
16884	27.65	40.50	13.69	-34.50	47.34	500	54.00	>7
f>16884	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Lower band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

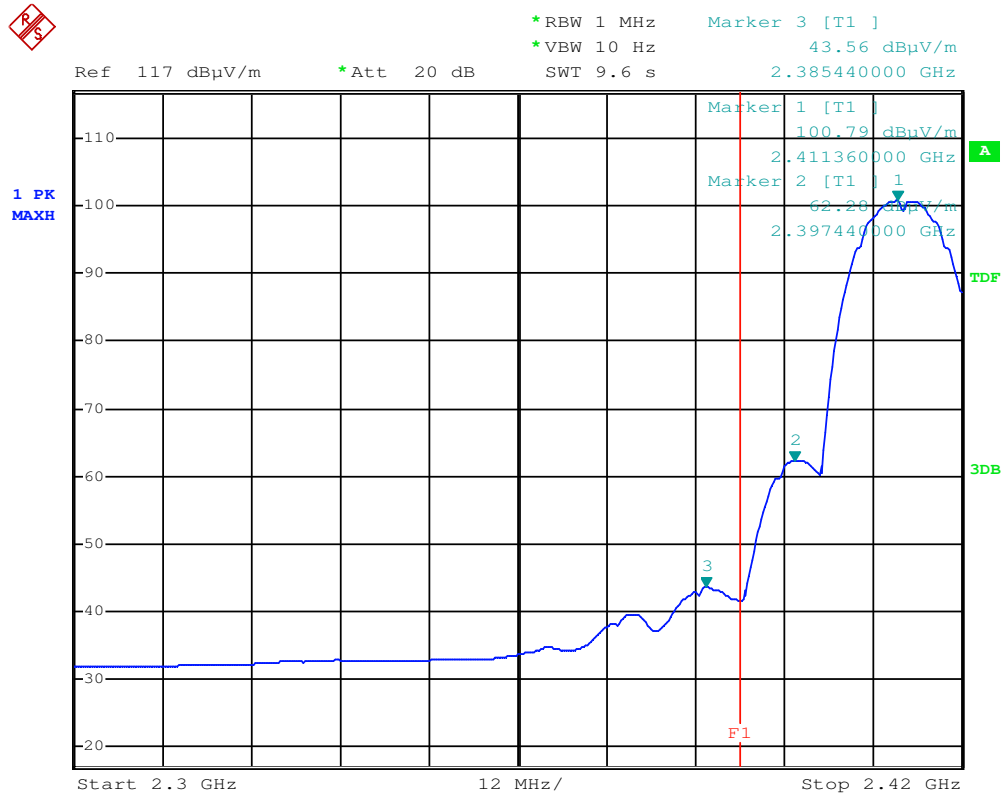
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	PK Limit (μV/m)	PK Limit (dBμV/m)	Margin (dB)
2386.16	60.74	27.30	5.18	-37.57	55.65	5000	74.00	18.35

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Lower band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2385.44	48.65	27.30	5.18	-37.57	43.56	500	54.00	10.44

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	117.69	27.30	5.18	-37.57	112.60	-----	-----	-----
4824	54.86	31.30	7.31	-36.98	56.49	5000	74.00	>17
7236	48.46	36.00	9.09	-37.00	56.55	5000	74.00	>17
9648	45.38	38.10	10.71	-37.17	57.02	5000	74.00	>16
12060	45.26	39.50	12.01	-36.71	60.15	5000	74.00	>13
14472	40.63	42.20	12.93	-34.90	60.86	5000	74.00	>13
16884	40.90	40.50	13.69	-34.50	60.59	5000	74.00	>13
f>16884	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

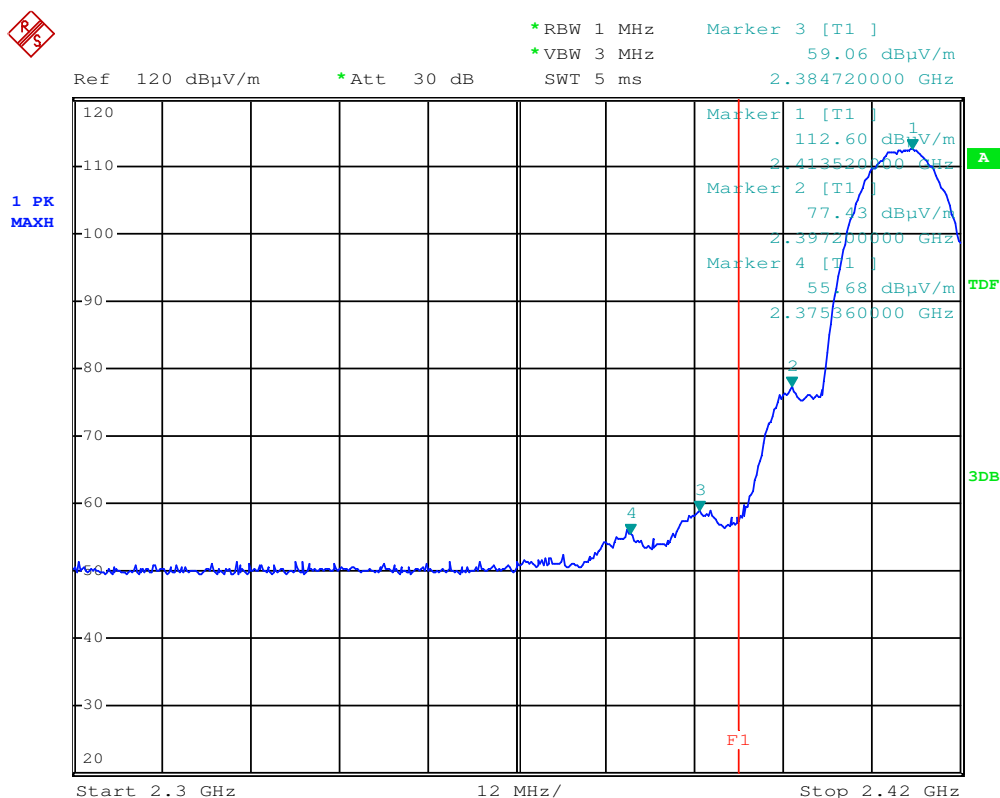
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	109.20	27.30	5.18	-37.57	104.11	-----	-----	-----
4824	51.65	31.30	7.31	-36.98	53.28	500	54.00	0.72
7236	37.62	36.00	9.09	-37.00	45.71	500	54.00	>8
9648	32.65	38.10	10.71	-37.17	44.29	500	54.00	>9
12060	32.48	39.50	12.01	-36.71	47.37	500	54.00	>7
14472	28.53	42.20	12.93	-34.90	48.76	500	54.00	>6
16884	28.83	40.50	13.69	-34.50	48.52	500	54.00	>6
f>16884	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Lower band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

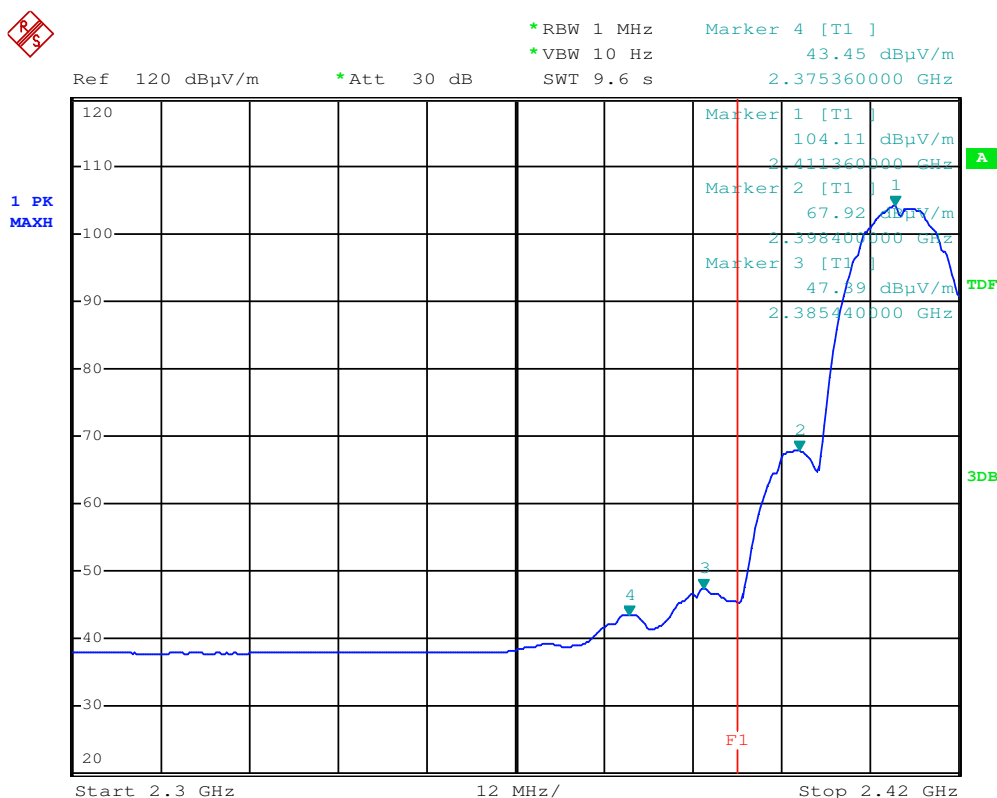
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	PK Limit (μV/m)	PK Limit (dBμV/m)	Margin (dB)
2384.72	64.15	27.30	5.18	-37.57	59.06	5000	74.00	14.94
2375.36	60.77	27.30	5.18	-37.57	55.68	5000	74.00	18.32

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Lower band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

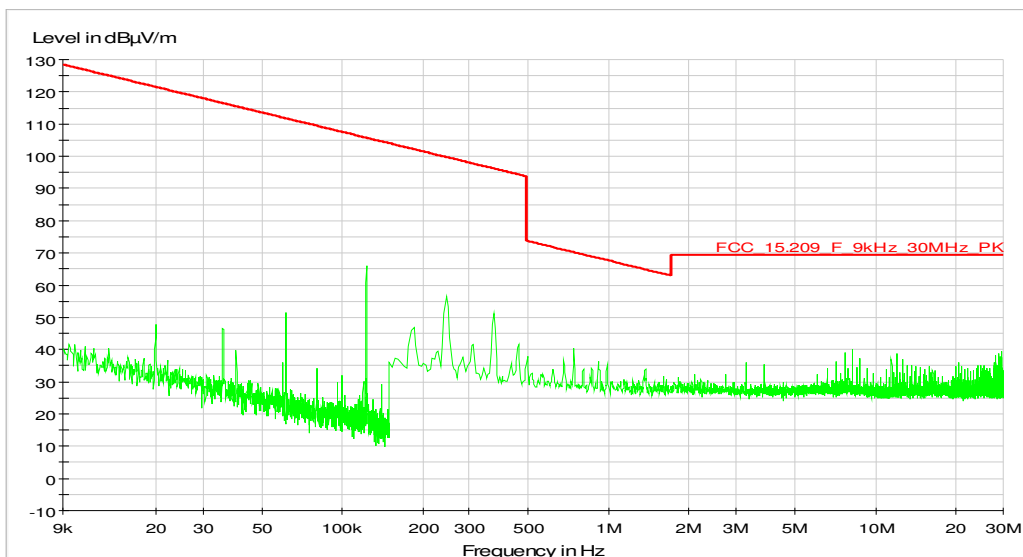
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2385.44	52.48	27.30	5.18	-37.57	47.39	500	54.00	6.61
2375.36	48.54	27.30	5.18	-37.57	43.45	500	54.00	10.55

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

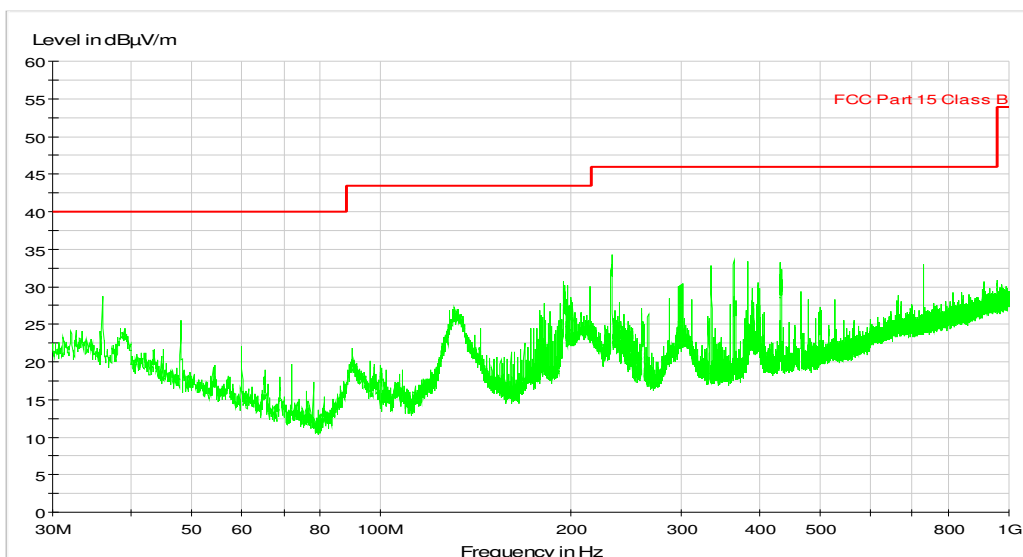
TEST CONDITION: MIDDLE CHANNEL (2437MHZ) 802.11B MODULATION DSSS

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2437 (fundamental)	117.67	27.30	5.18	-37.57	112.58	-----	-----	-----
4874	55.14	31.45	7.34	-36.90	57.03	5000	74.00	>16
7311	47.95	36.15	9.15	-37.00	56.25	5000	74.00	>17
9748	42.38	38.20	10.61	-37.15	54.04	5000	74.00	>19
12185	35.85	39.10	12.17	-36.00	51.12	5000	74.00	>22
14622	37.69	41.4	13.04	-35.30	56.83	5000	74.00	>17
17059	38.20	41.0	13.60	-34.46	58.34	5000	74.00	>15
f>17059	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
24437 (fundamental)	108.80	27.30	5.18	-37.57	103.71	-----	-----	-----
4874	47.06	31.45	7.34	-36.90	48.95	500	54.00	>5
7311	38.21	36.15	9.15	-37.00	46.51	500	54.00	>7
9748	31.27	38.20	10.61	-37.15	42.93	500	54.00	>11
12185	26.56	39.10	12.17	-36.00	41.83	500	54.00	>12
14622	28.17	41.4	13.04	-35.30	47.31	500	54.00	>6
17059	27.50	41.0	13.60	-34.46	47.64	500	54.00	>6
f>17059	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2437 (fundamental)	119.27	27.30	5.18	-37.57	114.18	-----	-----	-----
4874	55.04	31.45	7.34	-36.90	56.93	5000	74.00	>17
7311	49.37	36.15	9.15	-37.00	57.67	5000	74.00	>16
9748	44.65	38.20	10.61	-37.15	56.31	5000	74.00	>17
12185	44.73	39.10	12.17	-36.00	60.00	5000	74.00	14
14622	41.51	41.4	13.04	-35.30	60.65	5000	74.00	>13
17059	40.82	41.0	13.60	-34.46	60.96	5000	74.00	>13
f>17059	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

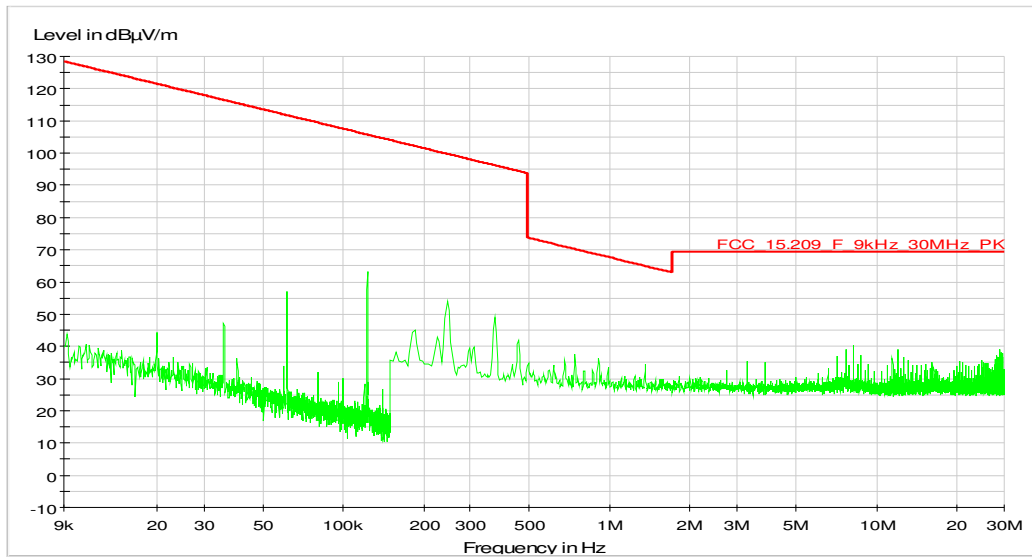
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
24437 (fundamental)	110.53	27.30	5.18	-37.57	105.44	-----	-----	-----
4874	51.91	31.45	7.34	-36.90	53.80	500	54.00	0.20
7311	38.7	36.15	9.15	-37.00	47.00	500	54.00	7
9748	33.16	38.20	10.61	-37.15	44.82	500	54.00	>9
12185	32.12	39.10	12.17	-36.00	47.39	500	54.00	>6
14622	29.68	41.4	13.04	-35.30	48.82	500	54.00	>5
17059	29.65	41.0	13.60	-34.46	49.79	500	54.00	>4
f>17059	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

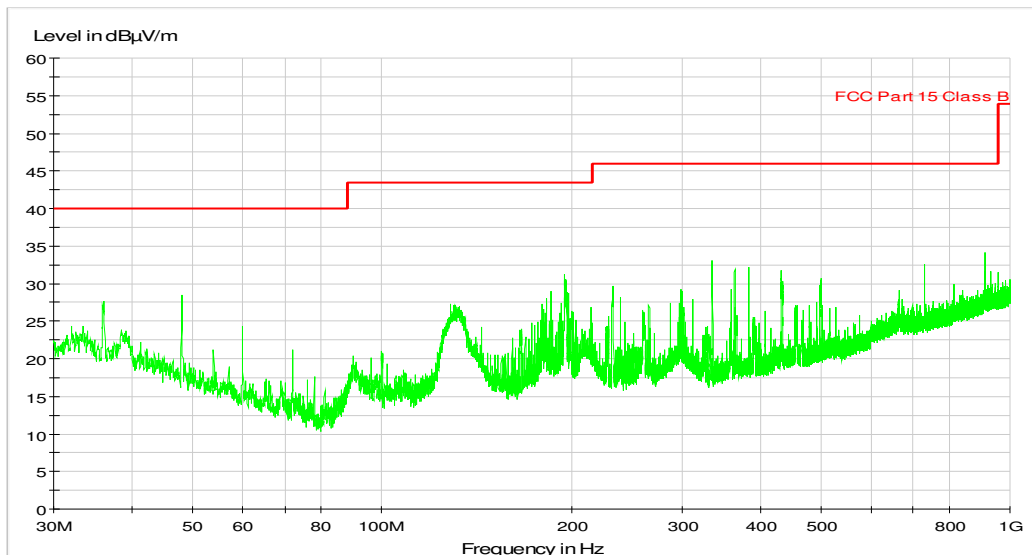
TEST CONDITION: HIGHER CHANNEL (2462MHz) 802.11B MODULATION DSSS

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	118.49	27.40	5.18	-37.57	113.50	-----	-----	-----
4924	50.73	31.50	7.34	-36.90	52.67	5000	74.00	>21
7386	44.13	36.40	9.42	-36.90	53.05	5000	74.00	>20
9848	43.35	38.40	10.69	-37.10	55.34	5000	74.00	>18
12310	35.49	38.90	12.32	-35.70	51.01	5000	74.00	>22
14772	39.09	39.90	12.97	-36.00	55.94	5000	74.00	>18
17234	35.18	43.20	14.10	-34.46	58.02	5000	74.00	>15
f>17234	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

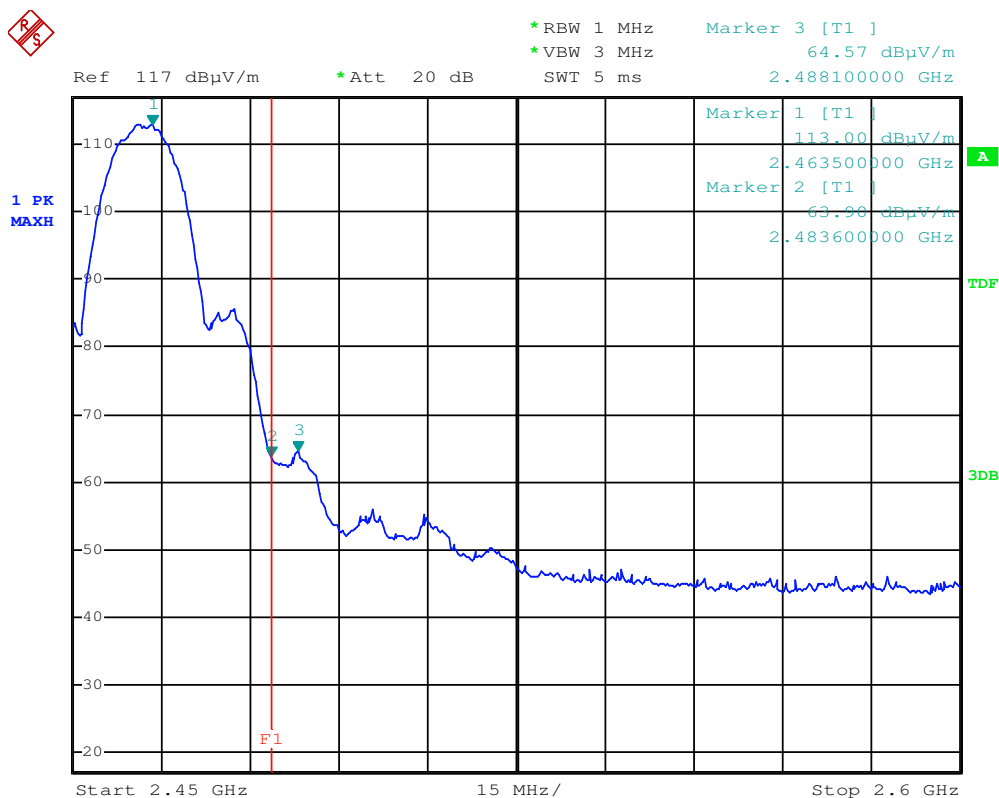
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	108.26	27.40	5.18	-37.57	103.27	-----	-----	-----
4924	43.38	31.50	7.34	-36.90	45.32	500	54.00	>8
7386	30.42	36.40	9.42	-36.90	39.34	500	54.00	>14
9848	31.93	38.40	10.69	-37.10	43.92	500	54.00	>10
12310	25.75	38.90	12.32	-35.70	41.27	500	54.00	>12
14772	30.11	39.90	12.97	-36.00	46.98	500	54.00	>7
17234	24.52	43.20	14.10	-34.46	47.36	500	54.00	>6
f>17234	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Higher band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

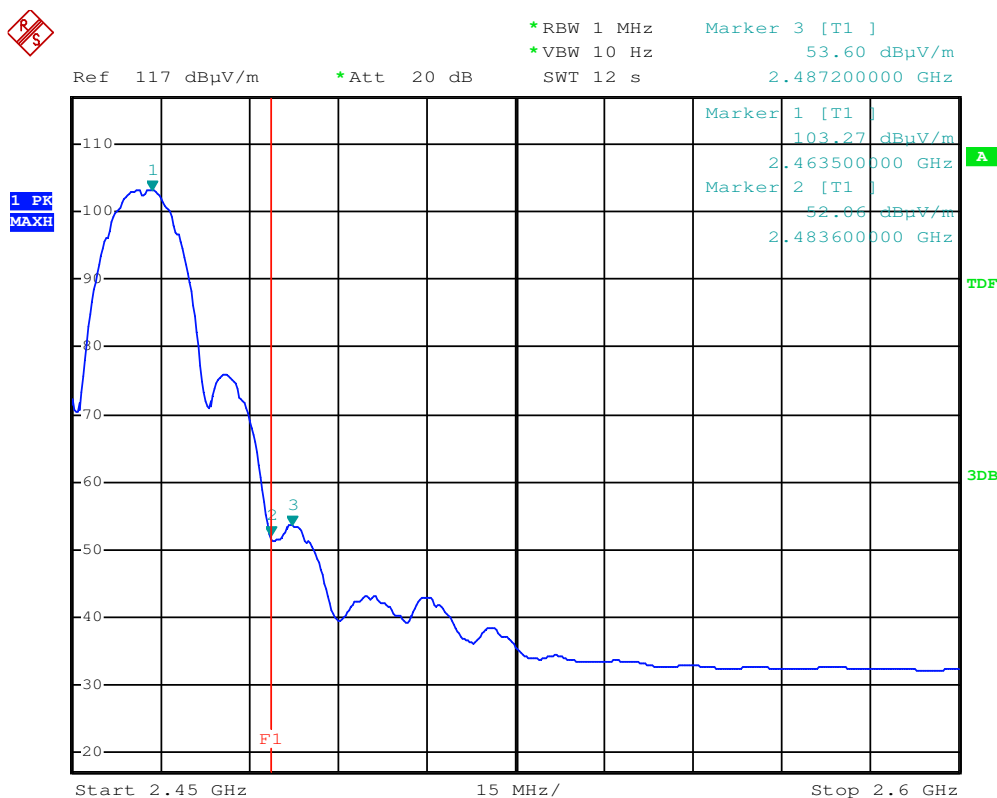
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	PK Limit (μV/m)	PK Limit (dBμV/m)	Margin (dB)
2483.60	68.89	27.40	5.18	-37.57	63.90	5000	74.00	10.10
2488.10	69.56	27.40	5.18	-37.57	64.57	5000	74.00	9.43

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Higher band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2483.60	57.05	27.40	5.18	-37.57	52.06	500	54.00	1.94
2487.20	58.59	27.40	5.18	-37.57	53.60	500	54.00	0.40

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	119.33	27.40	5.18	-37.57	114.34	-----	-----	-----
4924	55.06	31.50	7.34	-36.90	57.00	5000	74.00	17
7386	49.67	36.40	9.42	-36.90	58.59	5000	74.00	>15
9848	44.81	38.40	10.69	-37.10	56.80	5000	74.00	>17
12310	45.33	38.90	12.32	-35.70	60.85	5000	74.00	>13
14772	42.34	39.90	12.97	-36.00	59.21	5000	74.00	>14
17234	38.58	43.20	14.10	-34.46	61.42	5000	74.00	>12
f>17234	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

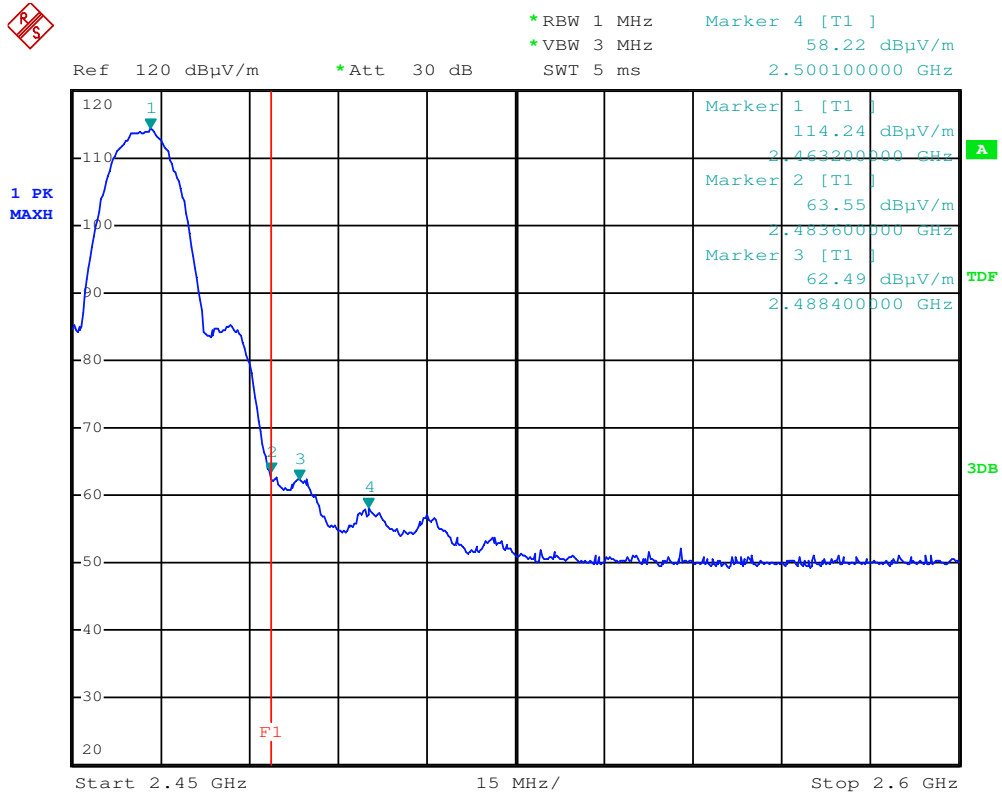
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	110.61	27.40	5.18	-37.57	105.62	-----	-----	-----
4924	51.96	31.50	7.34	-36.90	53.90	500	54.00	0.10
7386	40.27	36.40	9.42	-36.90	49.19	500	54.00	>4
9848	32.69	38.40	10.69	-37.10	44.68	500	54.00	>9
12310	31.98	38.90	12.32	-35.70	47.50	500	54.00	>7
14772	30.72	39.90	12.97	-36.00	47.59	500	54.00	>7
17234	27.43	43.20	14.10	-34.46	50.27	500	54.00	>3
f>17234	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Higher band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

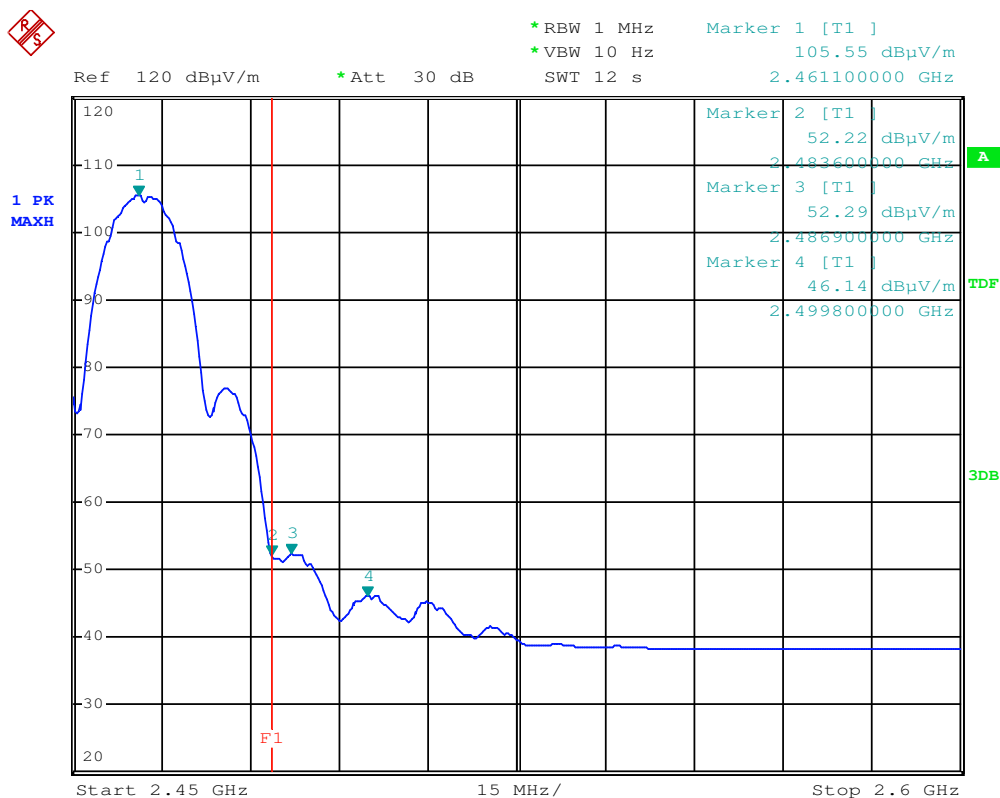
Frequency (MHz)	Reading value (dBµV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBµV/m)	PK Limit (µV/m)	PK Limit (dBµV/m)	Margin (dB)
2483.60	68.54	27.40	5.18	-37.57	63.55	5000	74.00	10.45
2488.10	67.48	27.40	5.18	-37.57	62.49	5000	74.00	11.51
2500.00	63.21	27.40	5.18	-37.57	58.22	5000	74.00	15.78

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Higher band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

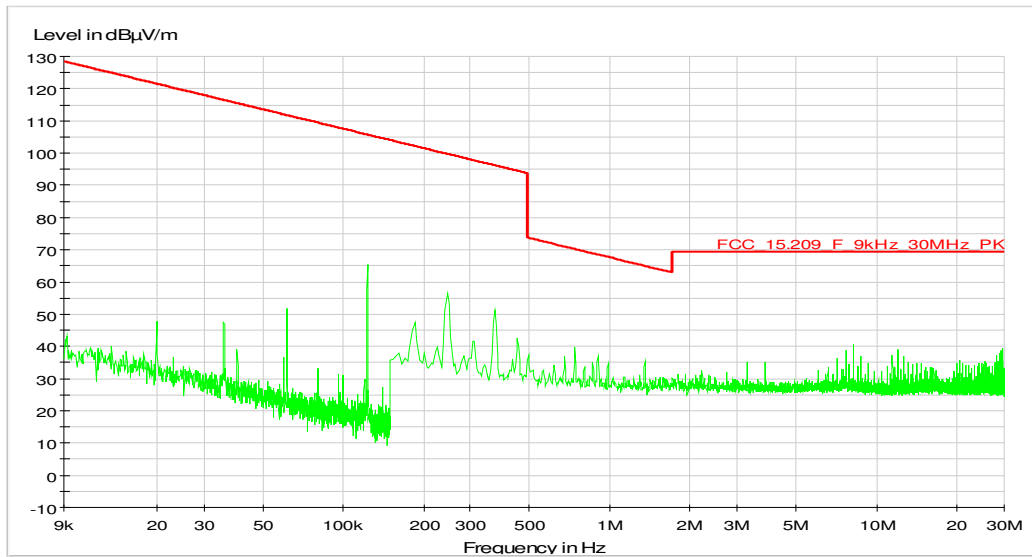
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2483.60	57.21	27.40	5.18	-37.57	52.22	500	54.00	1.78
2486.90	57.28	27.40	5.18	-37.57	52.29	500	54.00	1.71
2499.80	51.13	27.40	5.18	-37.57	46.14	500	54.00	7.86

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

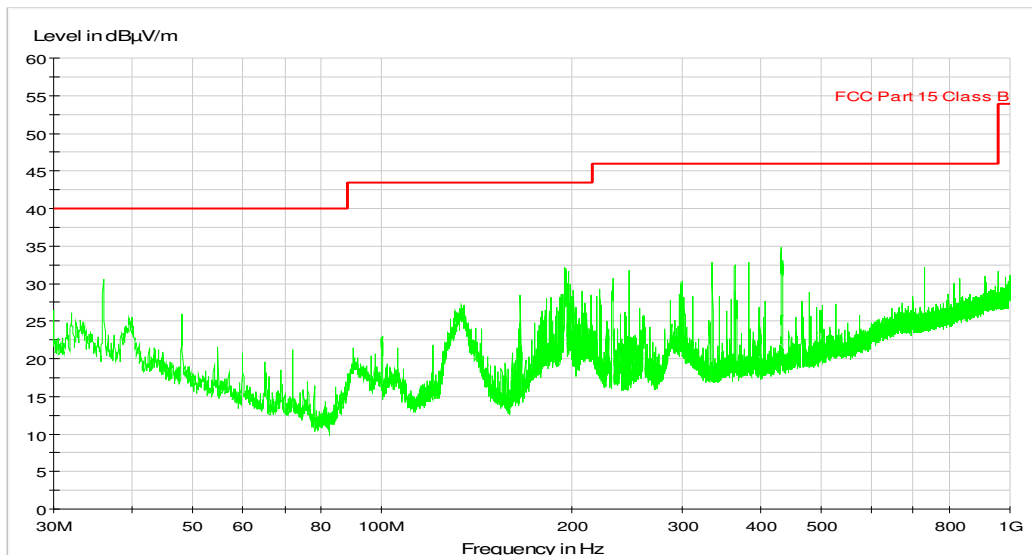
TEST CONDITION: LOWER CHANNEL (2412MHZ) 802.11G MODULATION OFDM

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	110.62	27.30	5.18	-37.57	105.53	-----	-----	-----
4824	47.09	31.30	7.31	-36.98	48.72	5000	74.00	>25
7236	45.99	36.00	9.09	-37.00	54.08	5000	74.00	>19
9648	41.07	38.10	10.71	-37.17	52.71	5000	74.00	>21
12060	34.13	39.50	12.01	-36.71	49.02	5000	74.00	>24
14472	36.07	42.20	12.93	-34.90	56.30	5000	74.00	>17
16884	37.83	40.50	13.69	-34.50	57.52	5000	74.00	>16
f>16884	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

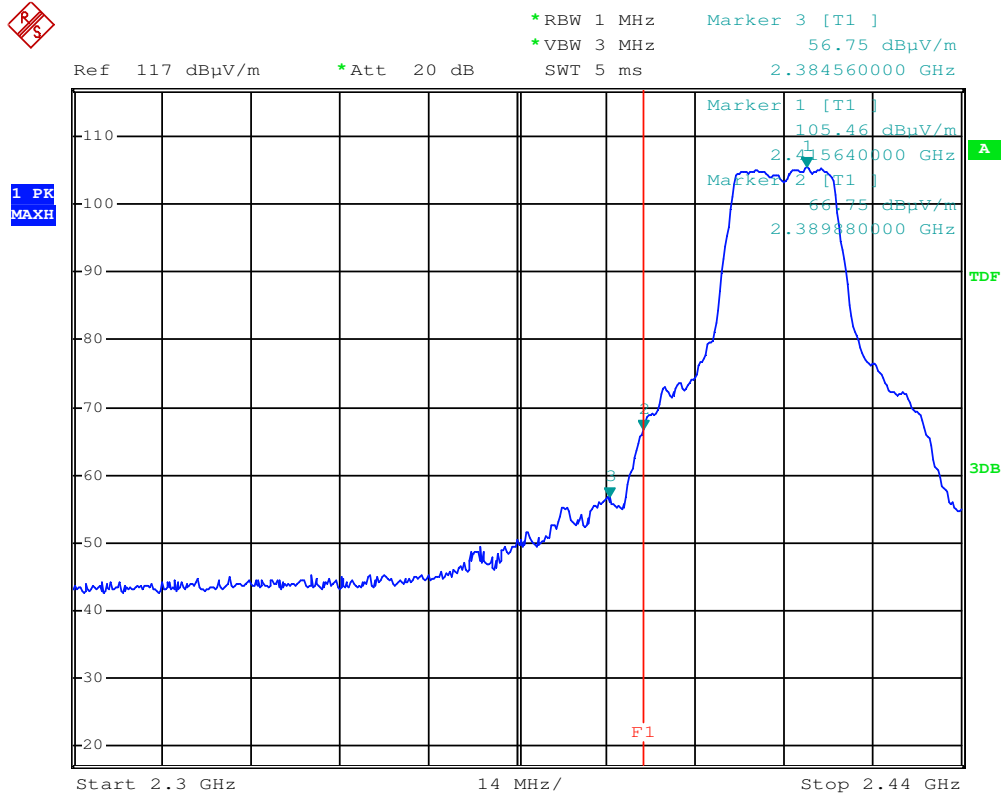
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	99.44	27.30	5.18	-37.57	94.35	-----	-----	-----
4824	31.53	31.30	7.31	-36.98	33.16	500	54.00	>20
7236	29.62	36.00	9.09	-37.00	37.71	500	54.00	>16
9648	23.39	38.10	10.71	-37.17	35.03	500	54.00	>18
12060	25.89	39.50	12.01	-36.71	40.78	500	54.00	>13
14472	26.79	42.20	12.93	-34.90	47.02	500	54.00	>6
16884	27.99	40.50	13.69	-34.50	47.68	500	54.00	>6
f>16884	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Lower band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

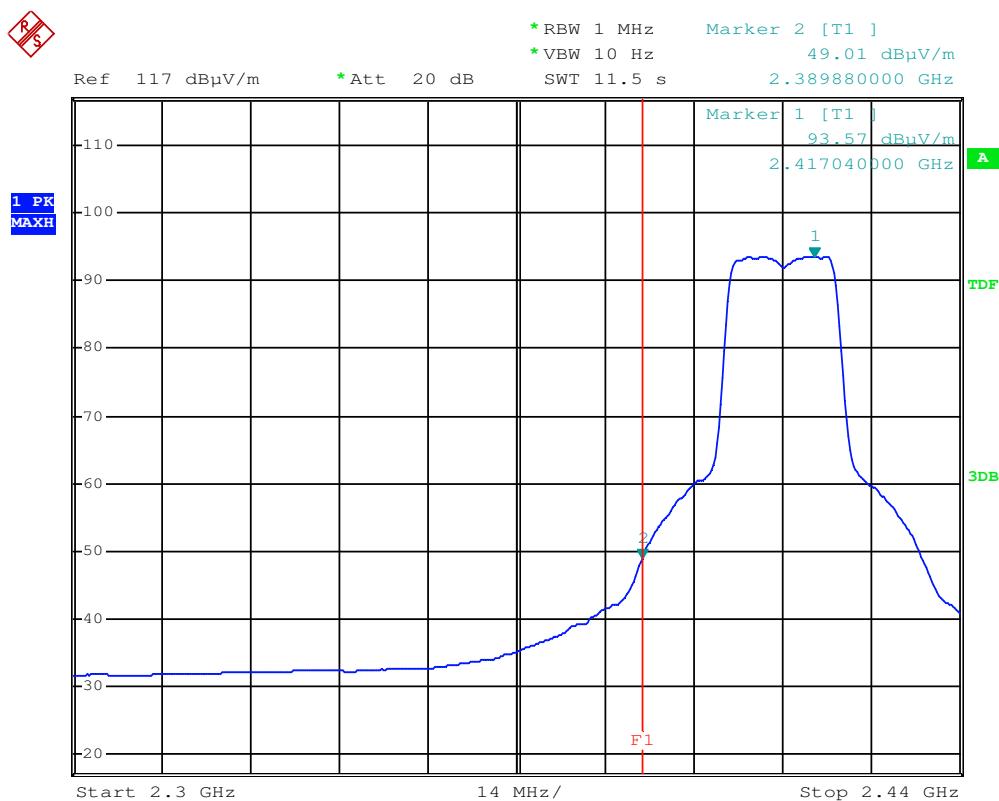
Frequency (MHz)	Reading value (dBµV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBµV/m)	PK Limit (µV/m)	PK Limit (dBµV/m)	Margin (dB)
2389.88	71.84	27.30	5.18	-37.57	66.75	5000	74.00	7.25
2384.56	61.84	27.30	5.18	-37.57	56.75	5000	74.00	17.25

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Lower band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dB μ V)	(dB3/m)	(dB)	(dB)	(dB μ V/m)	(μ V/m)	(dB μ V/m)	(dB)
2389.88	54.10	27.30	5.18	-37.57	49.01	500	54.00	4.99

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2412 (fundamental)	114.09	27.30	5.18	-37.57	109.00	-----	-----	-----
4824	50.09	31.30	7.31	-36.98	51.72	5000	74.00	>22
7236	44.85	36.00	9.09	-37.00	52.94	5000	74.00	>21
9648	44.64	38.10	10.71	-37.17	56.28	5000	74.00	>17
12060	44.48	39.50	12.01	-36.71	59.37	5000	74.00	>14
14472	39.69	42.20	12.93	-34.90	59.92	5000	74.00	>14
16884	41.15	40.50	13.69	-34.50	60.84	5000	74.00	>13
f>16884	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

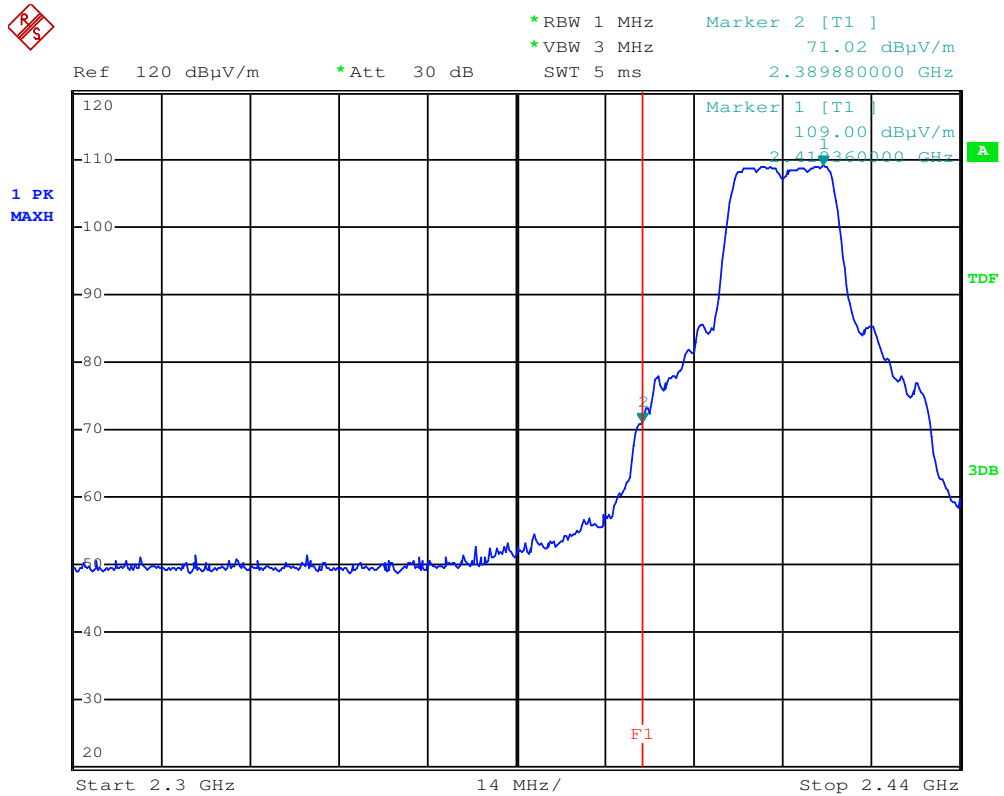
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2412 (fundamental)	102.75	27.30	5.18	-37.57	97.66	-----	-----	-----
4824	36.33	31.30	7.31	-36.98	37.96	500	54.00	>16
7236	32.1	36.00	9.09	-37.00	40.19	500	54.00	>13
9648	32.81	38.10	10.71	-37.17	44.45	500	54.00	>9
12060	32.5	39.50	12.01	-36.71	47.39	500	54.00	>6
14472	28.99	42.20	12.93	-34.90	49.22	500	54.00	>4
16884	29.63	40.50	13.69	-34.50	49.32	500	54.00	>4
f>16884	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Lower band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

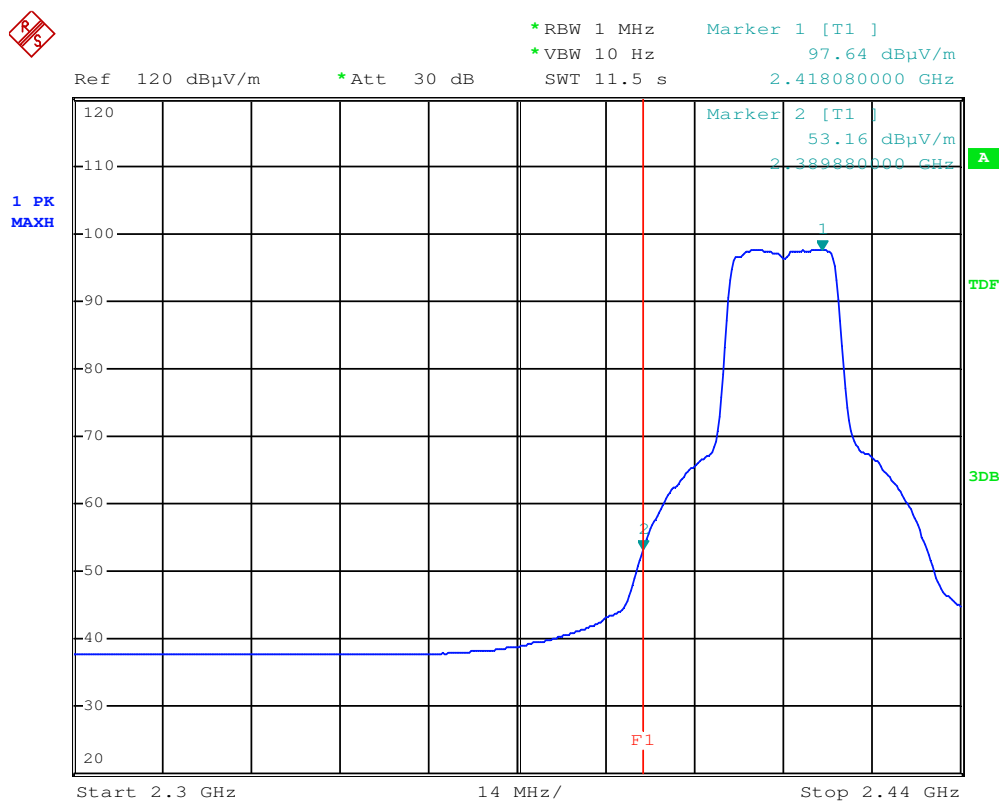
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit	PK Limit	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2389.88	76.11	27.30	5.18	-37.57	71.02	5000	74.00	2.98

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Lower band edge

Average



Date: 10.MAY.2016 11:56:57

Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

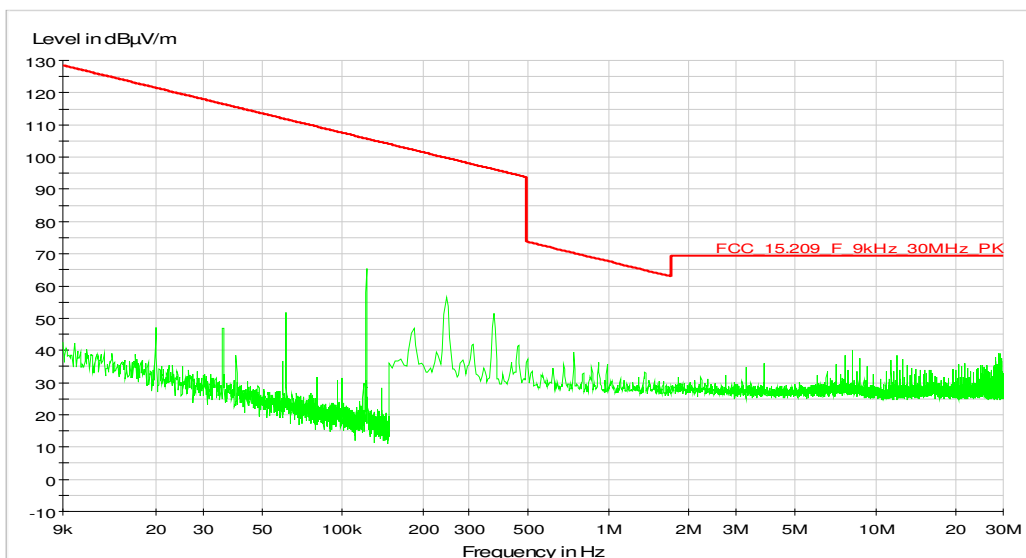
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2389.88	58.25	27.30	5.18	-37.57	53.16	500	54.00	0.84

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

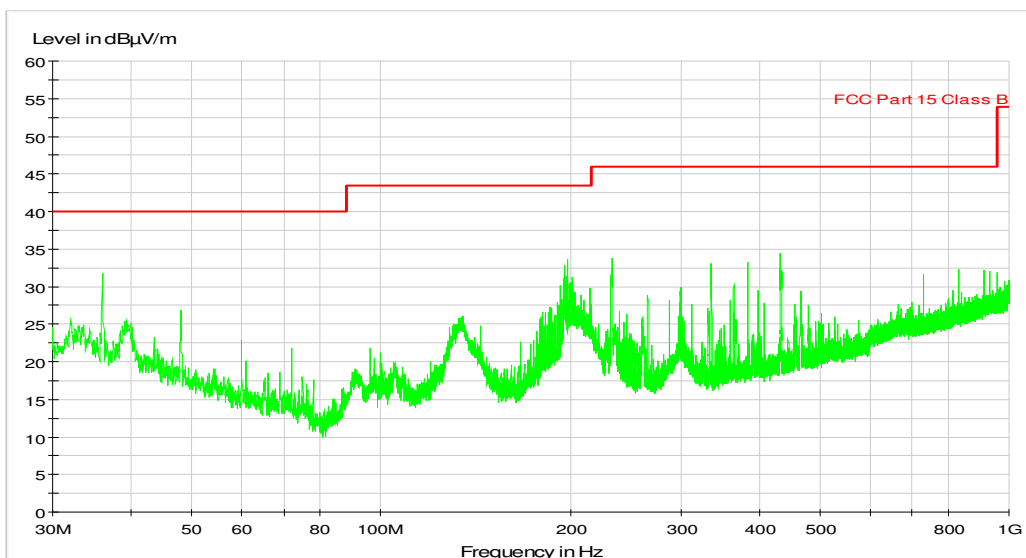
TEST CONDITION: MIDDLE CHANNEL (2437MHZ) 802.11G MODULATION OFDM

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2437 (fundamental)	116.80	27.30	5.18	-37.57	111.71	-----	-----	-----
4874	46.90	31.45	7.34	-36.90	48.79	5000	74.00	>25
7311	50.27	36.15	9.15	-37.00	58.57	5000	74.00	>15
9748	41.76	38.20	10.61	-37.15	53.42	5000	74.00	>20
12185	37.07	39.10	12.17	-36.00	52.31	5000	74.00	>21
14622	39.02	41.4	13.04	-35.30	58.16	5000	74.00	>15
17059	38.68	41.0	13.60	-34.46	58.82	5000	74.00	>15
f>17059	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2437 (fundamental)	105.10	27.30	5.18	-37.57	100.01	-----	-----	-----
4874	31.74	31.45	7.34	-36.90	33.63	500	54.00	>20
7311	33.71	36.15	9.15	-37.00	41.01	500	54.00	>12
9748	30.54	38.20	10.61	-37.15	42.20	500	54.00	>11
12185	26.80	39.10	12.17	-36.00	42.07	500	54.00	>11
14622	28.44	41.4	13.04	-35.30	47.58	500	54.00	>6
17059	27.78	41.0	13.60	-34.46	47.92	500	54.00	>6
f>17059	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2437 (fundamental)	117.93	27.30	5.18	-37.57	112.84	-----	-----	-----
4874	51.11	31.45	7.34	-36.90	53.00	5000	74.00	21
7311	48.55	36.15	9.15	-37.00	56.85	5000	74.00	>17
9748	44.66	38.20	10.61	-37.15	56.32	5000	74.00	>17
12185	44.42	39.10	12.17	-36.00	59.69	5000	74.00	>14
14622	40.53	41.4	13.04	-35.30	59.67	5000	74.00	>14
17059	41.53	41.0	13.60	-34.46	61.67	5000	74.00	>12
f>17059	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

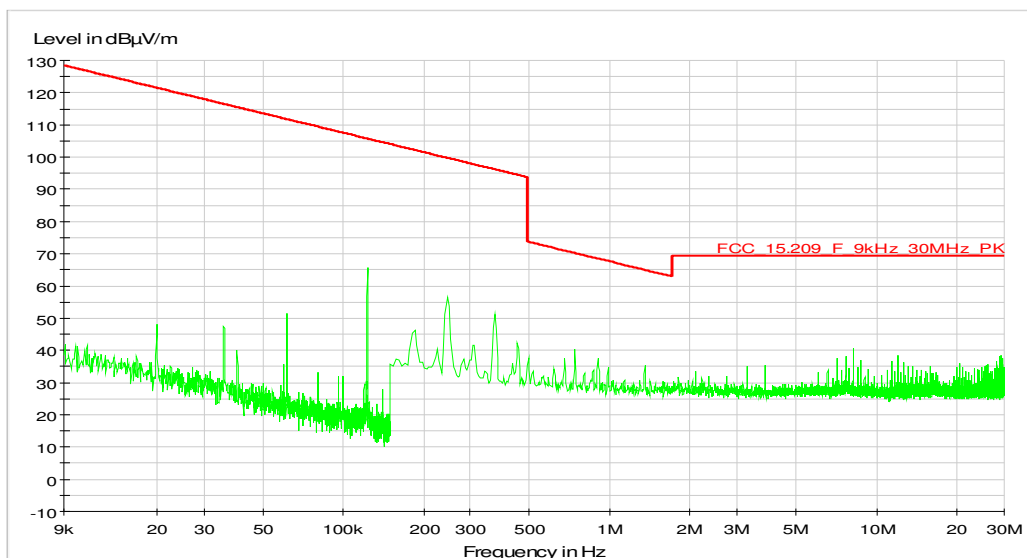
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2437 (fundamental)	106.26	27.30	5.18	-37.57	101.17	-----	-----	-----
4874	37.85	31.45	7.34	-36.90	39.74	500	54.00	>14
7311	34.43	36.15	9.15	-37.00	42.73	500	54.00	>11
9748	32.77	38.20	10.61	-37.15	44.43	500	54.00	>9
12185	32.22	39.10	12.17	-36.00	47.49	500	54.00	>6
14622	29.09	41.4	13.04	-35.30	48.23	500	54.00	>5
17059	29.67	41.0	13.60	-34.46	49.81	500	54.00	>4
f>17059	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

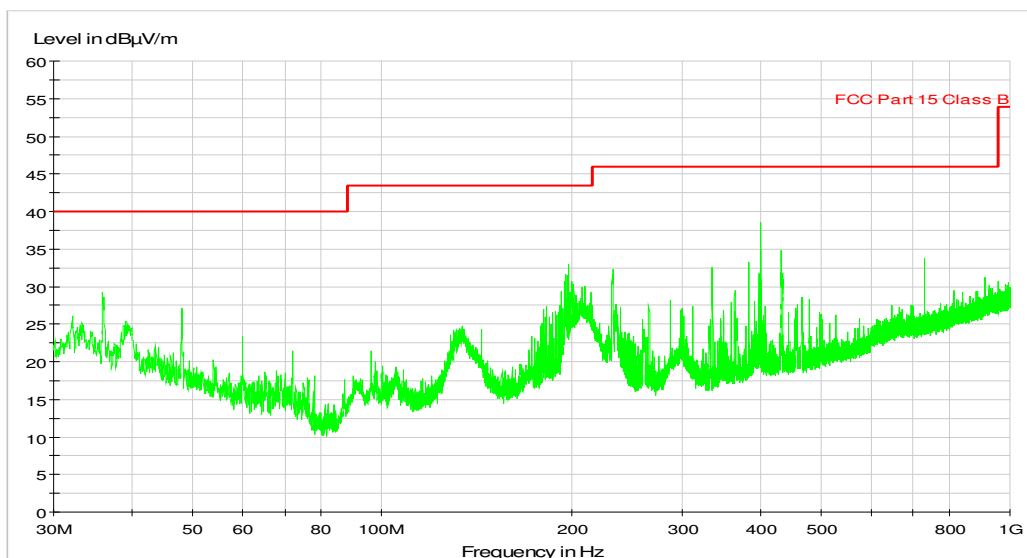
TEST CONDITION: HIGHER CHANNEL (2462MHZ) 802.11G MODULATION OFDM

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2462 (fundamental)	111.69	27.40	5.18	-37.57	106.70	-----	-----	-----
4924	45.28	31.50	7.34	-36.90	47.22	5000	74.00	>26
7386	43.44	36.40	9.42	-36.90	52.36	5000	74.00	>21
9848	41.43	38.40	10.69	-37.10	53.42	5000	74.00	>20
12310	37.24	38.90	12.32	-35.70	52.76	5000	74.00	>21
14772	39.29	39.90	12.97	-36.00	56.16	5000	74.00	>17
17234	35.00	43.20	14.10	-34.46	57.84	5000	74.00	>16
f>17234	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

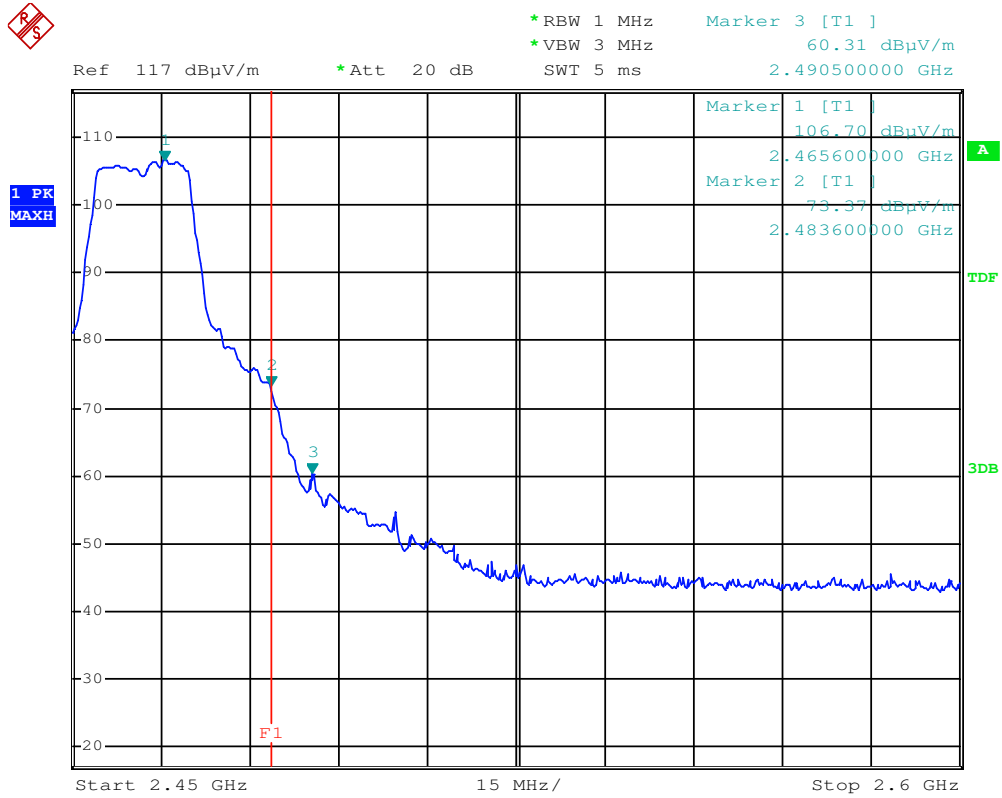
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2462 (fundamental)	99.99	27.40	5.18	-37.57	95.00	-----	-----	-----
4924	29.83	31.50	7.34	-36.90	31.77	500	54.00	>22
7386	27.98	36.40	9.42	-36.90	36.90	500	54.00	>17
9848	30.21	38.40	10.69	-37.10	42.20	500	54.00	>11
12310	26.04	38.90	12.32	-35.70	41.56	500	54.00	>12
14772	29.74	39.90	12.97	-36.00	46.61	500	54.00	>7
17234	24.40	43.20	14.10	-34.46	47.24	500	54.00	>6
f>17234	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Higher band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

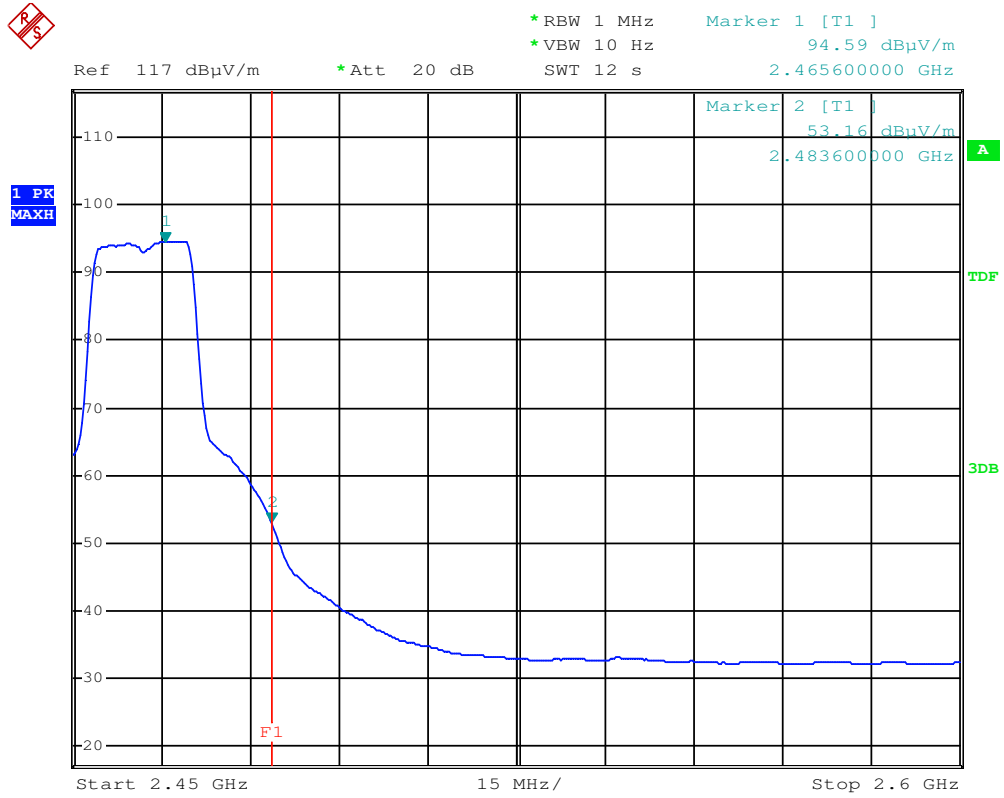
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	PK Limit (μV/m)	PK Limit (dBμV/m)	Margin (dB)
2483.60	78.36	27.40	5.18	-37.57	73.37	5000	74.00	0.63
2490.05	65.30	27.40	5.18	-37.57	60.31	5000	74.00	13.69

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Higher band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2483.60	58.15	27.40	5.18	-37.57	53.16	500	54.00	0.84

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	113.24	27.40	5.18	-37.57	108.25	-----	-----	-----
4924	49.47	31.50	7.34	-36.90	51.41	5000	74.00	>22
7386	45.74	36.40	9.42	-36.90	54.66	5000	74.00	>19
9848	45.4	38.40	10.69	-37.10	57.39	5000	74.00	>16
12310	44.34	38.90	12.32	-35.70	59.86	5000	74.00	>14
14772	41.60	39.90	12.97	-36.00	58.47	5000	74.00	>15
17234	38.39	43.20	14.10	-34.46	61.23	5000	74.00	>12
f>17234	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

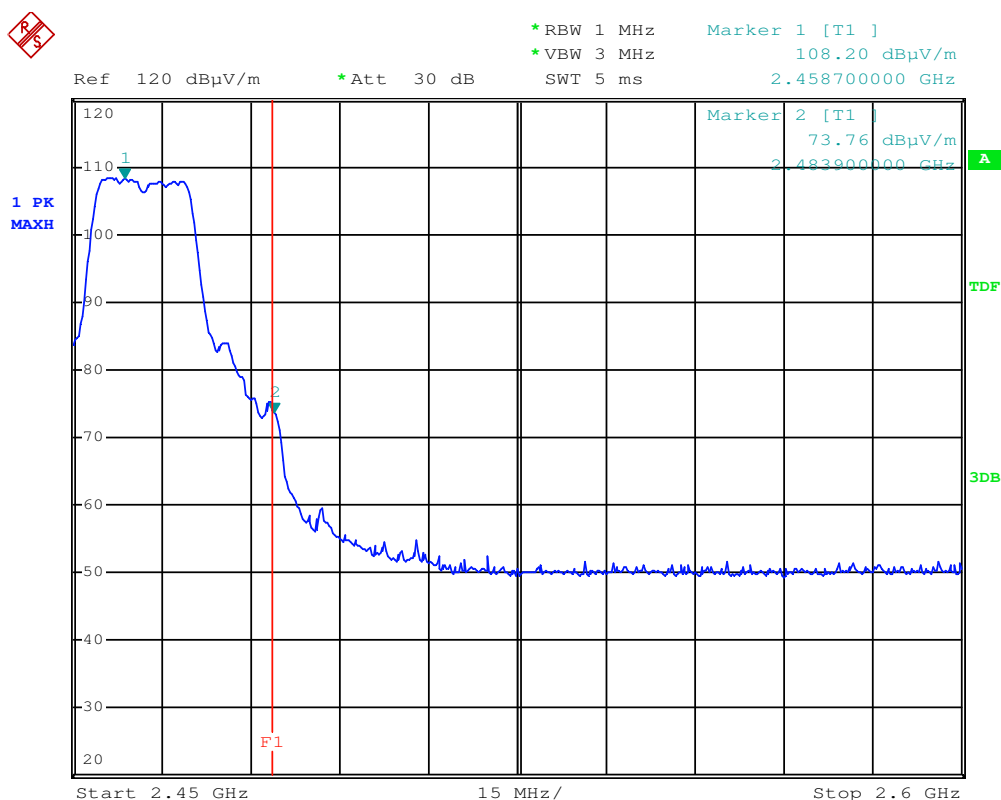
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	101.99	27.40	5.18	-37.57	97.00	-----	-----	-----
4924	37.27	31.50	7.34	-36.90	39.21	500	54.00	>14
7386	32.3	36.40	9.42	-36.90	41.22	500	54.00	>12
9848	33.09	38.40	10.69	-37.10	45.08	500	54.00	>8
12310	32.04	38.90	12.32	-35.70	47.56	500	54.00	>6
14772	30.53	39.90	12.97	-36.00	47.40	500	54.00	>6
17234	26.36	43.20	14.10	-34.46	49.20	500	54.00	>4
f>17234	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Higher band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

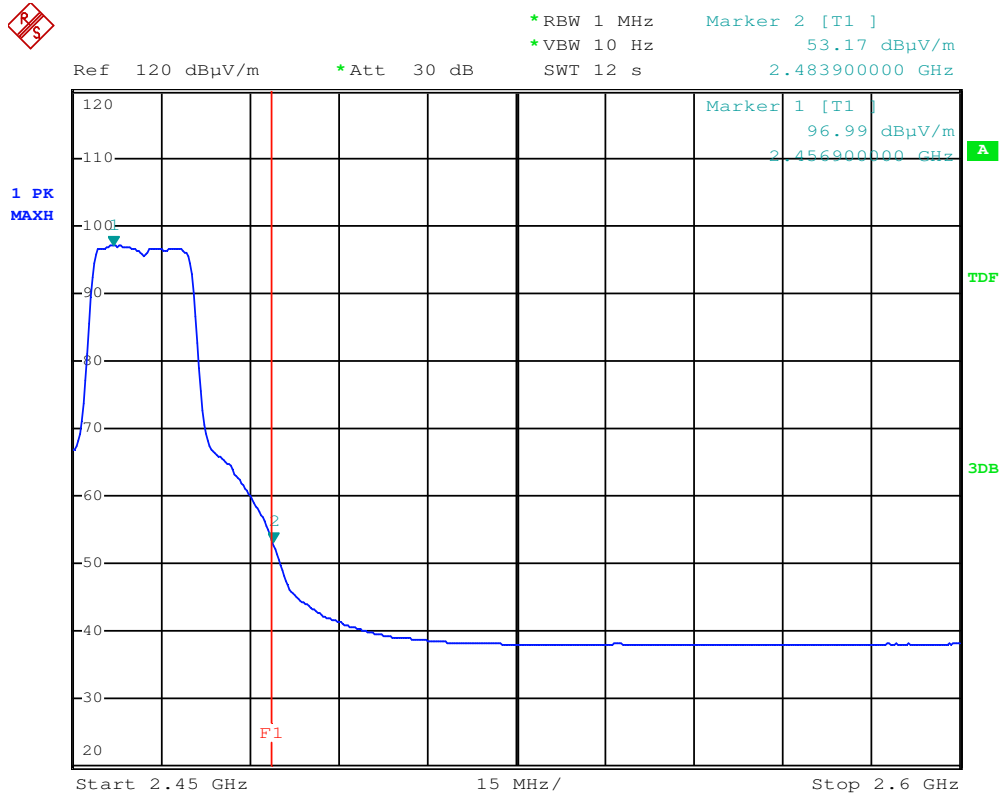
Frequency (MHz)	Reading value (dBµV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBµV/m)	PK Limit (µV/m)	PK Limit (dBµV/m)	Margin (dB)
2483.90	78.75	27.40	5.18	-37.57	73.76	5000	74.00	0.24

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Higher band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

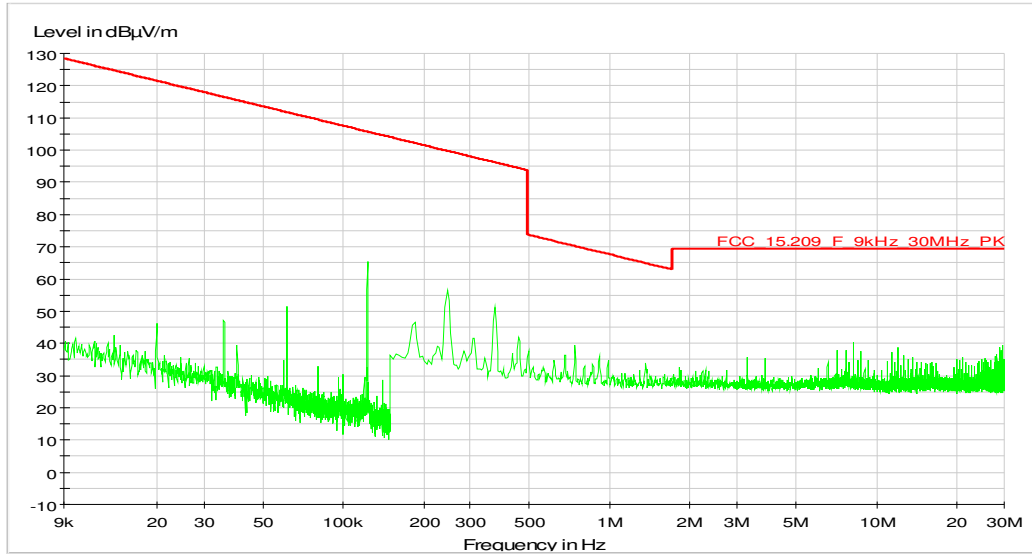
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2483.90	58.16	27.40	5.18	-37.57	53.17	500	54.00	0.83

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

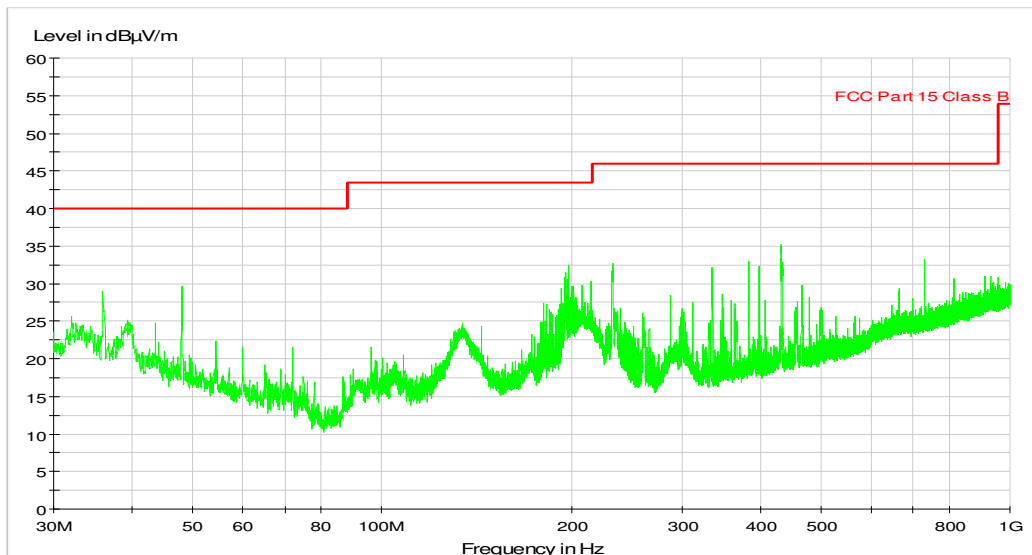
TEST CONDITION: LOWER CHANNEL (2412MHZ) 802.11N MODULATION OFDM

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	110.18	27.30	5.18	-37.57	105.09	-----	-----	-----
4824	47.35	31.30	7.31	-36.98	48.98	5000	74.00	>25
7236	46.61	36.00	9.09	-37.00	54.70	5000	74.00	>19
9648	41.2	38.10	10.71	-37.17	52.84	5000	74.00	>21
12060	34.42	39.50	12.01	-36.71	49.31	5000	74.00	>24
14472	36.22	42.20	12.93	-34.90	56.45	5000	74.00	>17
16884	37.94	40.50	13.69	-34.50	57.63	5000	74.00	>16
f>16884	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

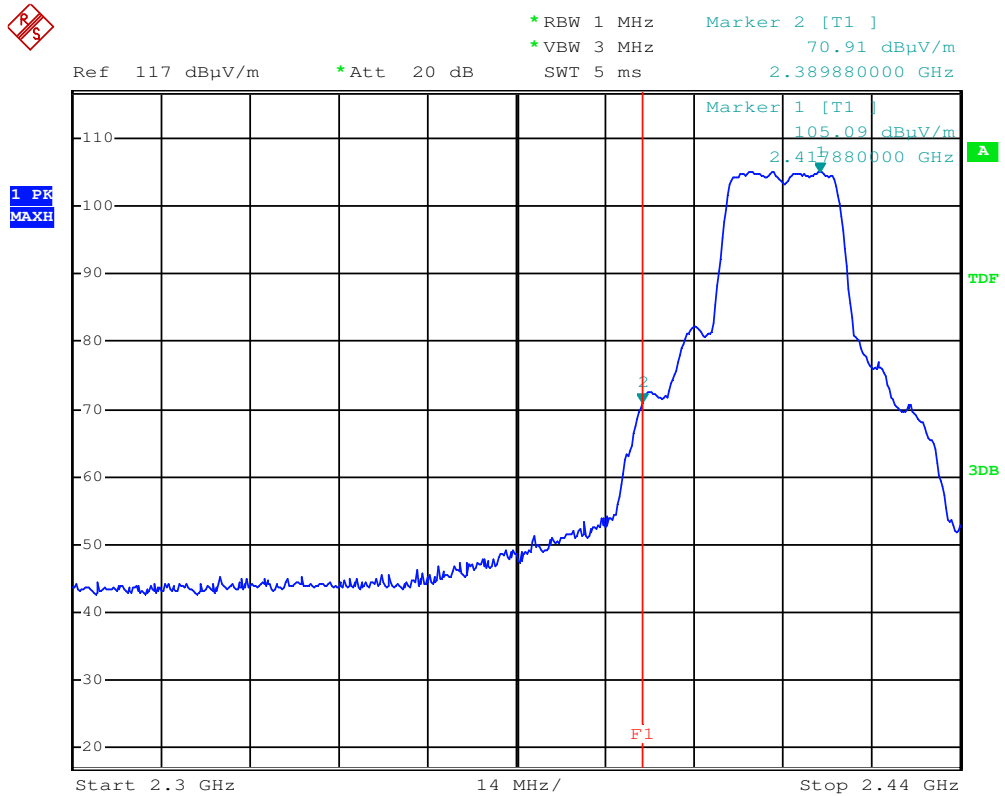
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	99.06	27.30	5.18	-37.57	93.97	-----	-----	-----
4824	31.39	31.30	7.31	-36.98	33.02	500	54.00	>20
7236	29.45	36.00	9.09	-37.00	37.54	500	54.00	>16
9648	31.48	38.10	10.71	-37.17	43.12	500	54.00	>10
12060	25.66	39.50	12.01	-36.71	40.55	500	54.00	>13
14472	27.08	42.20	12.93	-34.90	47.31	500	54.00	>6
16884	28.03	40.50	13.69	-34.50	47.72	500	54.00	>6
f>16884	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Lower band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

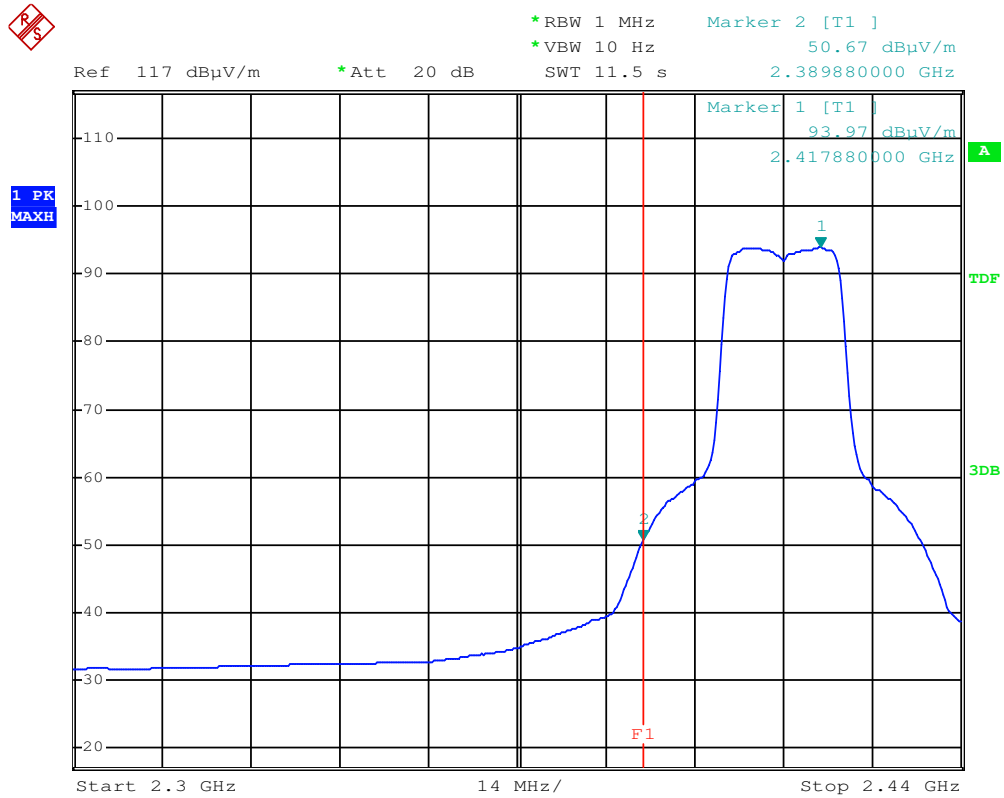
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit	PK Limit	Margin
(MHz)	(dBuV)	(dB3/m)	(dB)	(dB)	(dBuV/m)	(uV/m)	(dBuV/m)	(dB)
2389.88	76.00	27.30	5.18	-37.57	70.91	5000	74.00	3.09

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Lower band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2389.88	55.76	27.30	5.18	-37.57	50.67	500	54.00	3.33

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	113.01	27.30	5.18	-37.57	107.92	-----	-----	-----
4824	48.61	31.30	7.31	-36.98	50.24	5000	74.00	>23
7236	44.93	36.00	9.09	-37.00	53.02	5000	74.00	>20
9648	44.86	38.10	10.71	-37.17	56.50	5000	74.00	>17
12060	44.64	39.50	12.01	-36.71	59.53	5000	74.00	>14
14472	39.47	42.20	12.93	-34.90	59.70	5000	74.00	>14
16884	40.92	40.50	13.69	-34.50	60.61	5000	74.00	>13
f>16884	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

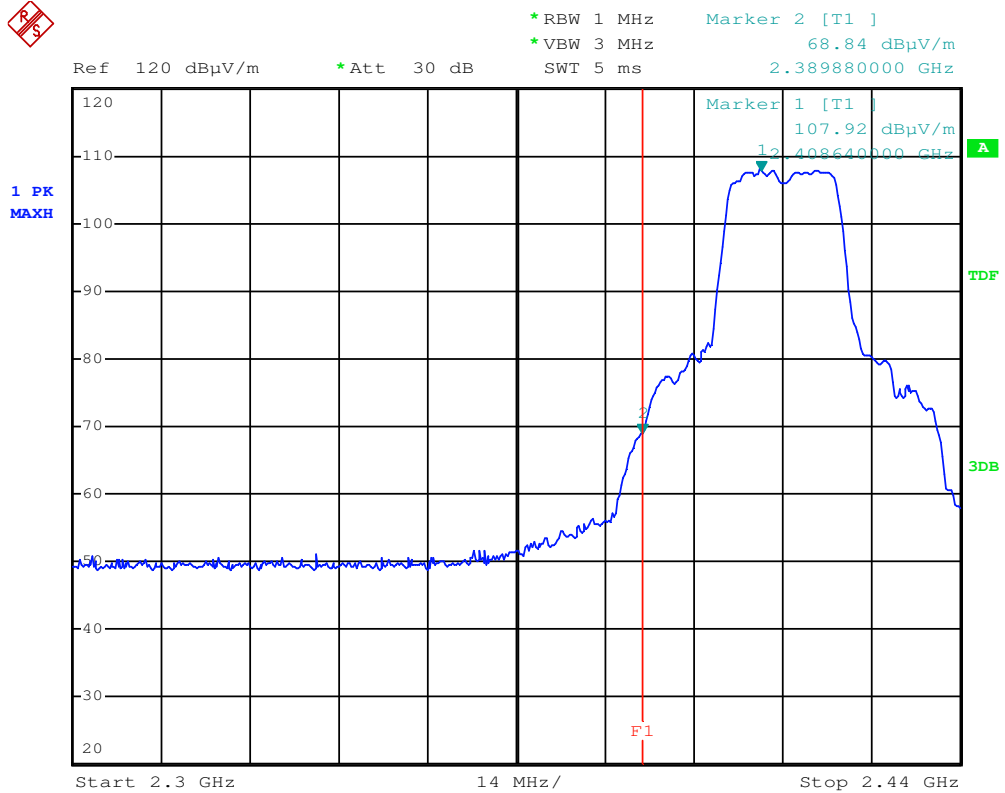
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2412 (fundamental)	101.11	27.30	5.18	-37.57	96.02	-----	-----	-----
4824	35.25	31.30	7.31	-36.98	36.88	500	54.00	>17
7236	32.69	36.00	9.09	-37.00	40.78	500	54.00	>13
9648	32.87	38.10	10.71	-37.17	44.51	500	54.00	>9
12060	32.72	39.50	12.01	-36.71	47.61	500	54.00	>6
14472	28.68	42.20	12.93	-34.90	48.91	500	54.00	>5
16884	29.40	40.50	13.69	-34.50	49.09	500	54.00	>4
f>16884	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Lower band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

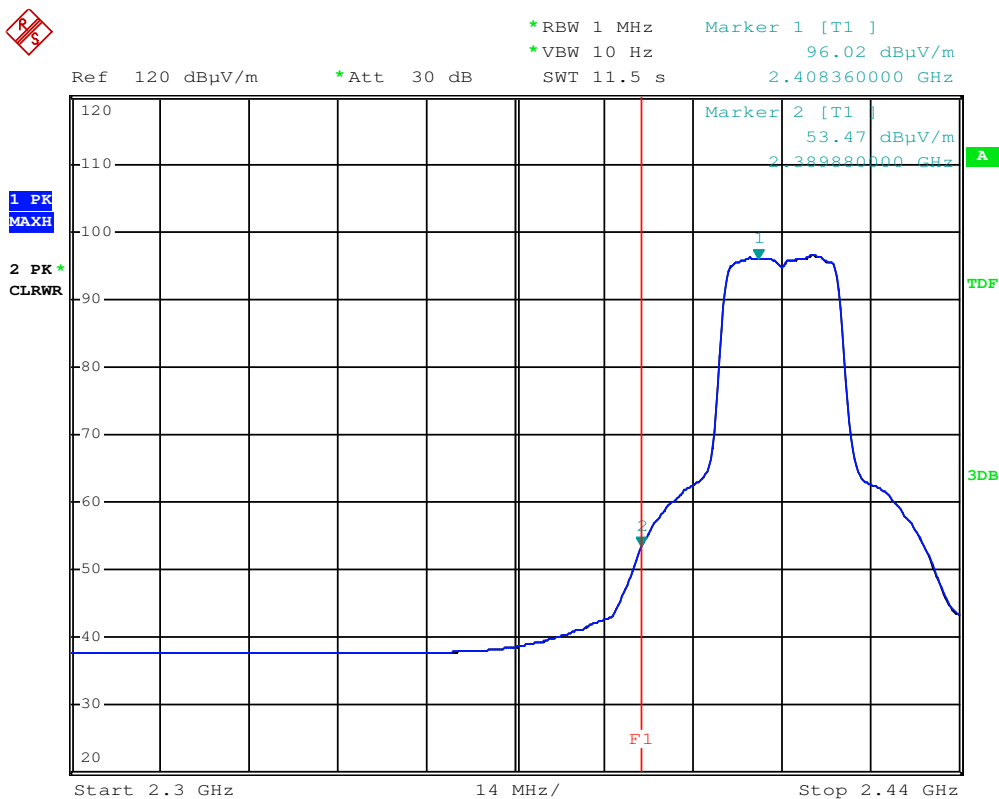
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit	PK Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2389.88	73.93	27.30	5.18	-37.57	68.84	5000	74.00	5.16

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Lower band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

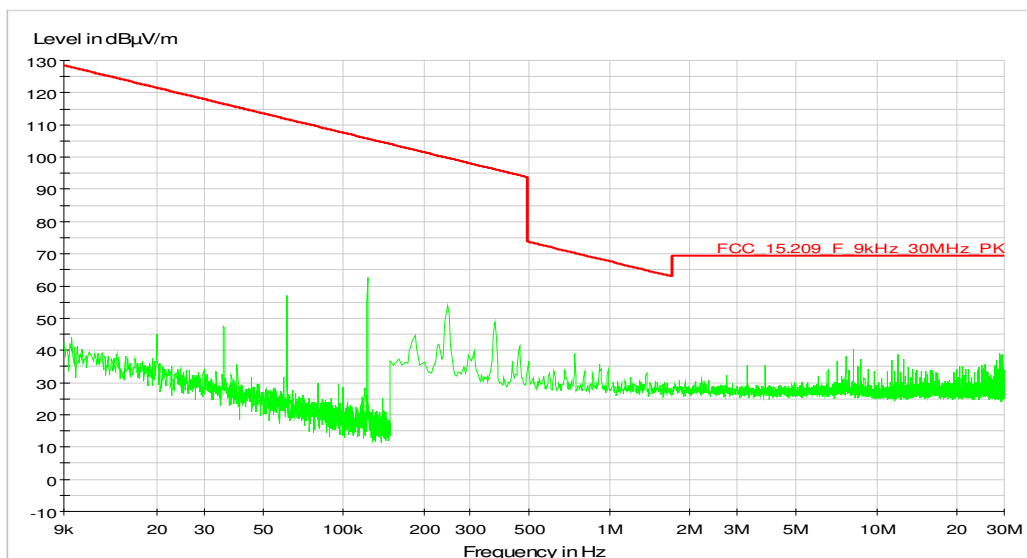
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2389.88	58.56	27.30	5.18	-37.57	53.47	500	54.00	0.53

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

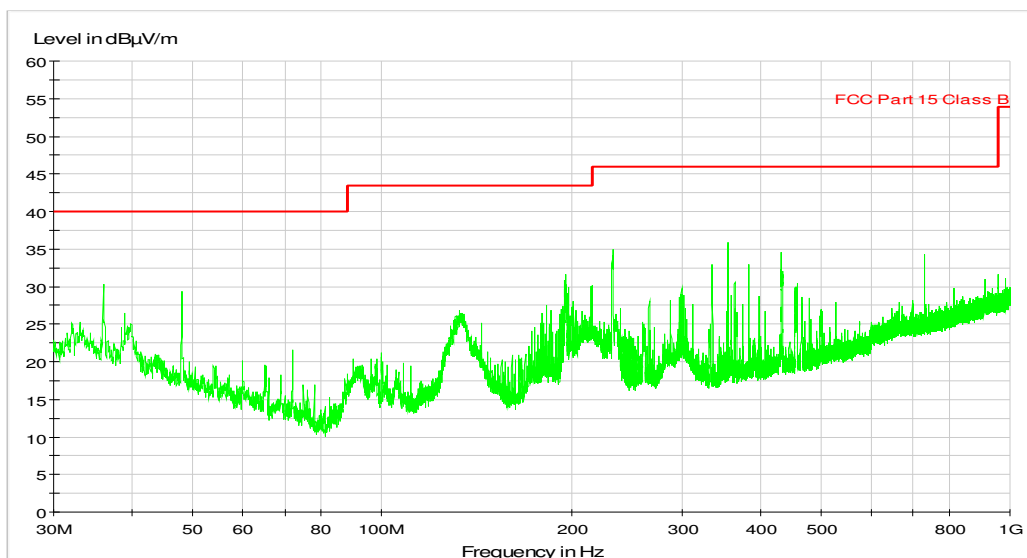
TEST CONDITION: MIDDLE CHANNEL (2437MHZ) 802.11N MODULATION OFDM

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz÷30 MHz



30÷1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2437 (fundamental)	116.73	27.30	5.18	-37.57	111.64	-----	-----	-----
4874	46.96	31.45	7.34	-36.90	48.85	5000	74.00	>25
7311	49.70	36.15	9.15	-37.00	58.00	5000	74.00	>15
9748	41.71	38.20	10.61	-37.15	53.37	5000	74.00	>20
12185	36.90	39.10	12.17	-36.00	52.17	5000	74.00	>21
14622	39.48	41.4	13.04	-35.30	58.62	5000	74.00	>15
17059	39.01	41.0	13.60	-34.46	59.15	5000	74.00	>14
f>17059	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
24437 (fundamental)	104.55	27.30	5.18	-37.57	99.46	-----	-----	-----
4874	31.82	31.45	7.34	-36.90	33.71	500	54.00	>20
7311	32.33	36.15	9.15	-37.00	40.63	500	54.00	>13
9748	30.44	38.20	10.61	-37.15	42.10	500	54.00	>11
12185	26.57	39.10	12.17	-36.00	41.84	500	54.00	>12
14622	28.76	41.4	13.04	-35.30	47.90	500	54.00	>6
17059	27.91	41.0	13.60	-34.46	48.05	500	54.00	>5
f>17059	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2437 (fundamental)	118.02	27.30	5.18	-37.57	112.93	-----	-----	-----
4874	52.06	31.45	7.34	-36.90	53.95	5000	74.00	>20
7311	49.3	36.15	9.15	-37.00	57.60	5000	74.00	>16
9748	44.95	38.20	10.61	-37.15	56.61	5000	74.00	>17
12185	44.74	39.10	12.17	-36.00	60.01	5000	74.00	>13
14622	40.36	41.4	13.04	-35.30	59.50	5000	74.00	>14
17059	41.28	41.0	13.60	-34.46	61.42	5000	74.00	>12
f>17059	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

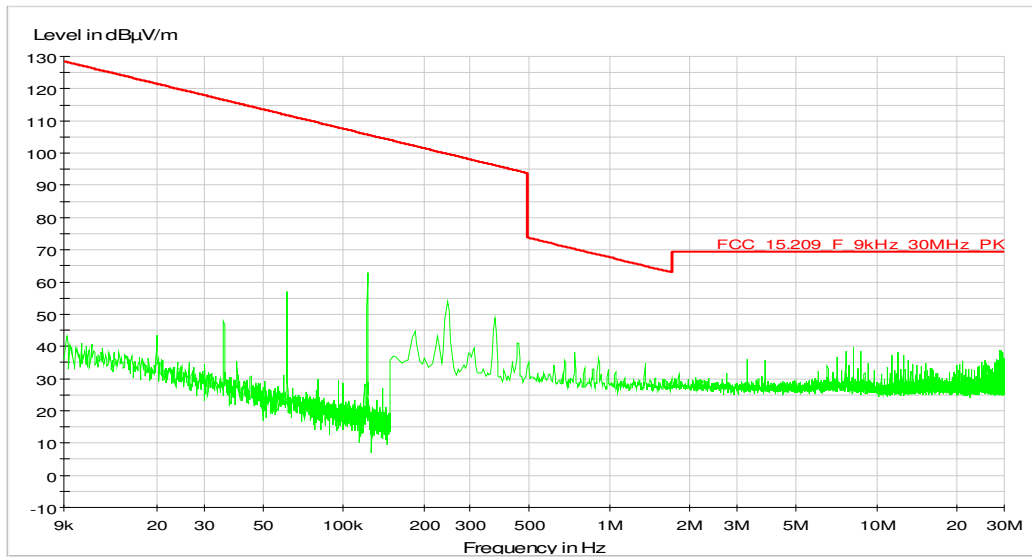
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
24437 (fundamental)	106.12	27.30	5.18	-37.57	101.03	-----	-----	-----
4874	37.73	31.45	7.34	-36.90	39.62	500	54.00	>14
7311	34.7	36.15	9.15	-37.00	43.00	500	54.00	>10
9748	32.93	38.20	10.61	-37.15	44.59	500	54.00	>9
12185	32.29	39.10	12.17	-36.00	47.56	500	54.00	>6
14622	28.97	41.4	13.04	-35.30	48.11	500	54.00	>5
17059	29.78	41.0	13.60	-34.46	49.92	500	54.00	>4
f>17059	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

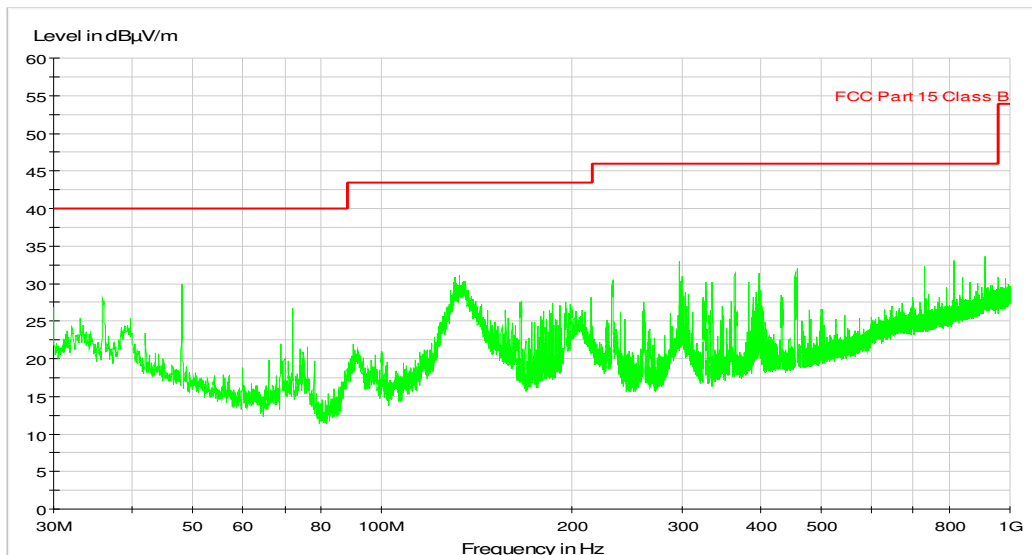
TEST CONDITION: HIGHER CHANNEL (2462MHz) 802.11n MODULATION OFDM

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna (worst condition)

9 kHz ÷ 30 MHz



30 ÷ 1,000 MHz



SPWF04SA: WiFi module with integrated antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	111.29	27.40	5.18	-37.57	106.30	-----	-----	-----
4924	46.38	31.50	7.34	-36.90	48.32	5000	74.00	>25
7386	42.16	36.40	9.42	-36.90	51.08	5000	74.00	>22
9848	41.35	38.40	10.69	-37.10	53.34	5000	74.00	>20
12310	36.78	38.90	12.32	-35.70	52.30	5000	74.00	>21
14772	39.21	39.90	12.97	-36.00	56.08	5000	74.00	>17
17234	34.73	43.20	14.10	-34.46	57.57	5000	74.00	>16
f>17234	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

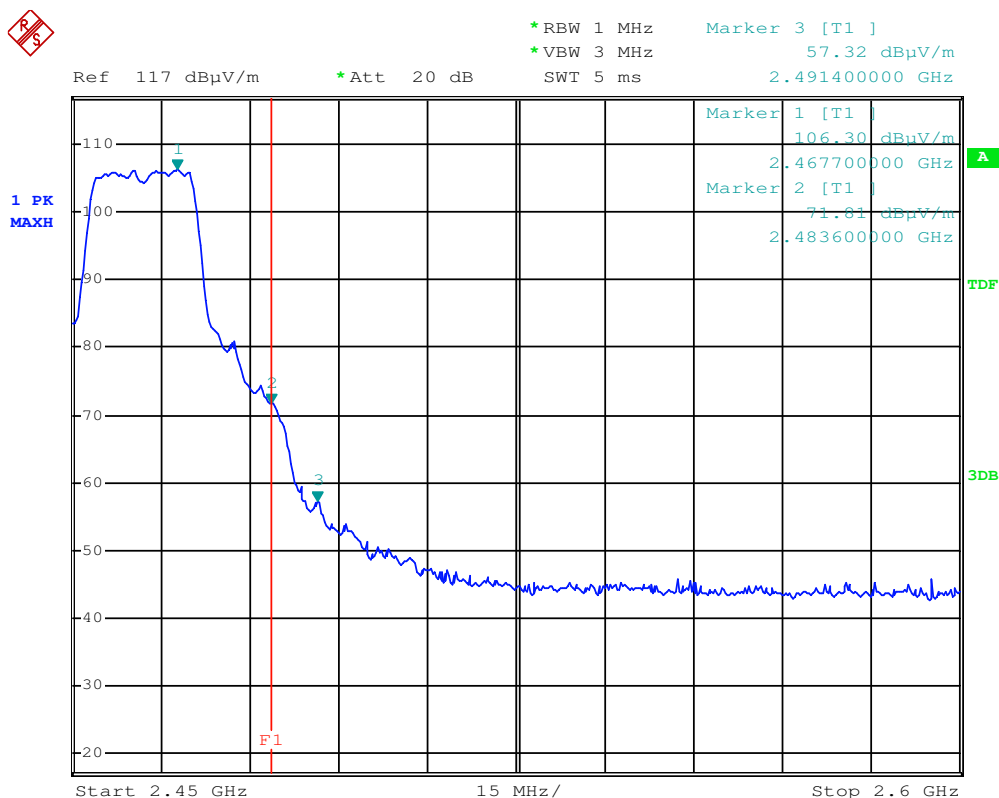
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBμV)	(dB3/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2462 (fundamental)	99.32	27.40	5.18	-37.57	94.33	-----	-----	-----
4924	29.85	31.50	7.34	-36.90	31.79	500	54.00	>22
7386	27.48	36.40	9.42	-36.90	36.40	500	54.00	>17
9848	29.91	38.40	10.69	-37.10	41.90	500	54.00	>12
12310	25.88	38.90	12.32	-35.70	41.40	500	54.00	>12
14772	29.18	39.90	12.97	-36.00	46.05	500	54.00	>7
17234	24.28	43.20	14.10	-34.46	47.12	500	54.00	>6
f>17234	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Higher band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

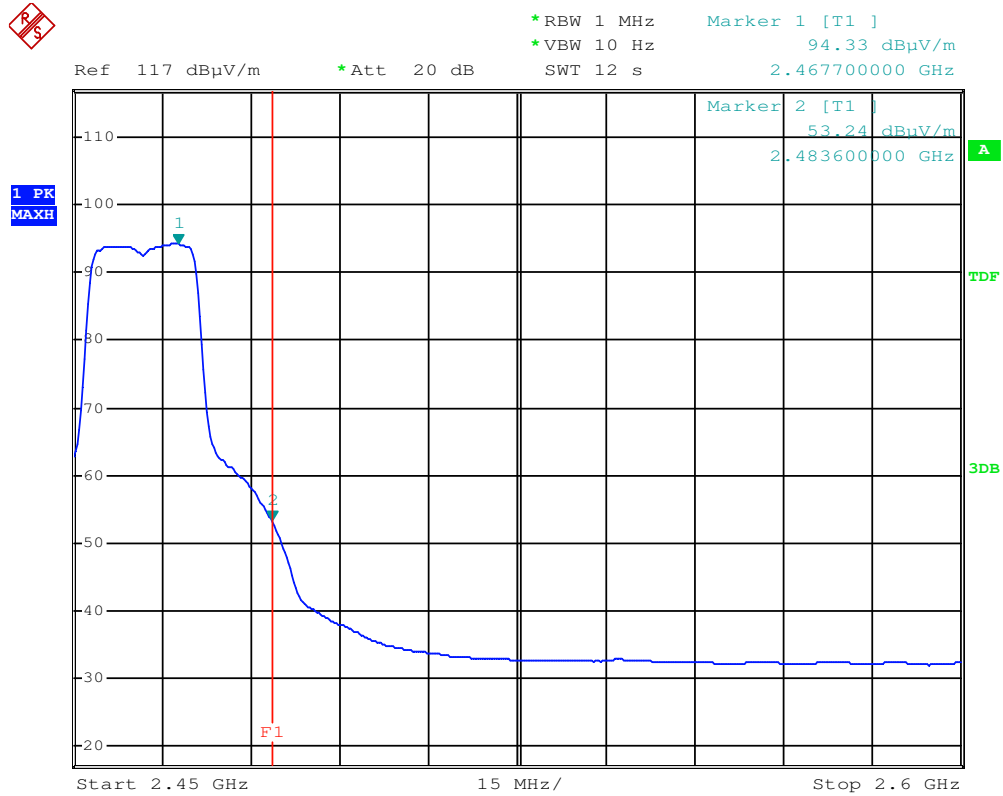
Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	PK Limit (μV/m)	PK Limit (dBμV/m)	Margin (dB)
2483.60	76.29	27.40	5.18	-37.57	71.01	5000	74.00	2.99
2491.40	62.31	27.40	5.18	-37.57	57.32	5000	74.00	16.68

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SA: WiFi module with integrated antenna

Radiated Band-edge compliance - Higher band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2483.60	58.23	27.40	5.18	-37.57	53.24	500	54.00	0.76

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

1÷26 GHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	PK Limit (AV + 20dB)	PK Limit (AV + 20dB)	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2462 (fundamental)	112.49	27.40	5.18	-37.57	107.50	-----	-----	-----
4924	50.86	31.50	7.34	-36.90	52.80	5000	74.00	>21
7386	45.5	36.40	9.42	-36.90	54.42	5000	74.00	>19
9848	45.11	38.40	10.69	-37.10	57.10	5000	74.00	>16
12310	44.56	38.90	12.32	-35.70	60.08	5000	74.00	>13
14772	43.04	39.90	12.97	-36.00	59.91	5000	74.00	>14
17234	38.47	43.20	14.10	-34.46	61.31	5000	74.00	>12
f>17234	not significant	---	---	---	---	5000	74.00	---

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

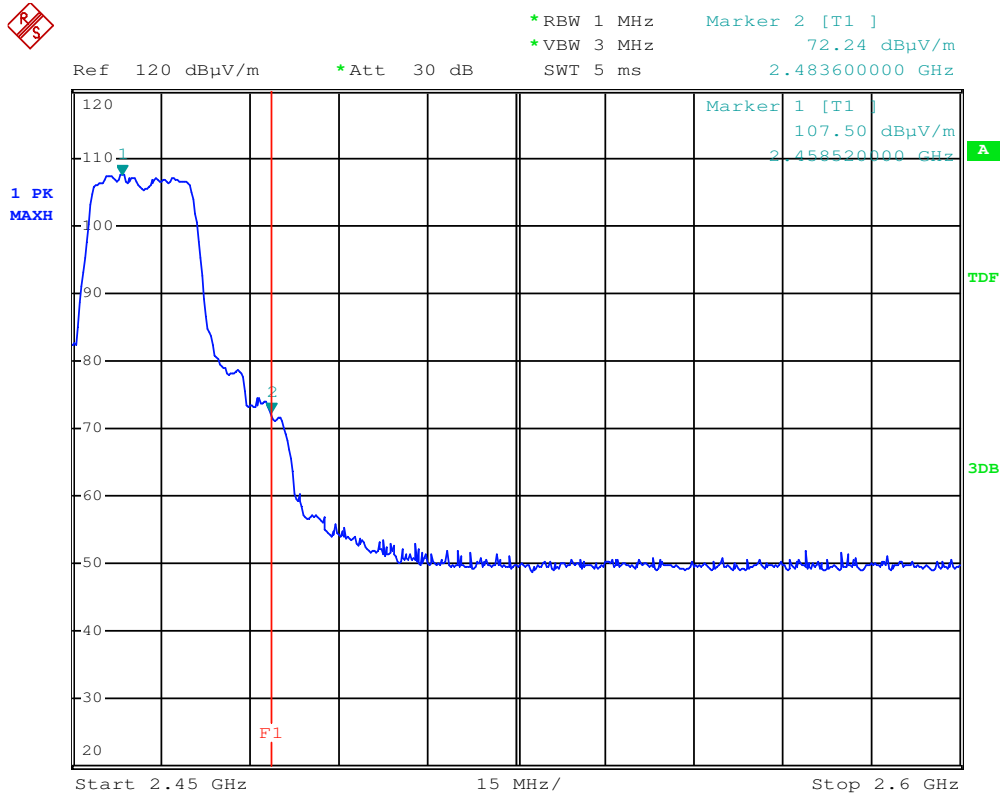
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	AV Limit	AV Limit	Margin
(MHz)	(dBµV)	(dB3/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2462 (fundamental)	100.88	27.40	5.18	-37.57	95.89	-----	-----	-----
4924	38.01	31.50	7.34	-36.90	39.95	500	54.00	>14
7386	33.21	36.40	9.42	-36.90	42.13	500	54.00	>11
9848	33.33	38.40	10.69	-37.10	45.32	500	54.00	>8
12310	32.4	38.90	12.32	-35.70	47.92	500	54.00	>6
14772	31.23	39.90	12.97	-36.00	48.10	500	54.00	>5
17234	27.46	43.20	14.10	-34.46	50.30	500	54.00	>3
f>17234	not significant	---	---	---	---	500	54.00	---

NOTE: The measures above are the worst case on 3 axes X Y and Z in both polarization, with all data rate

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Higher band edge

Peak



Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK RESULT (RBW=1MHz; VBW=3MHz)

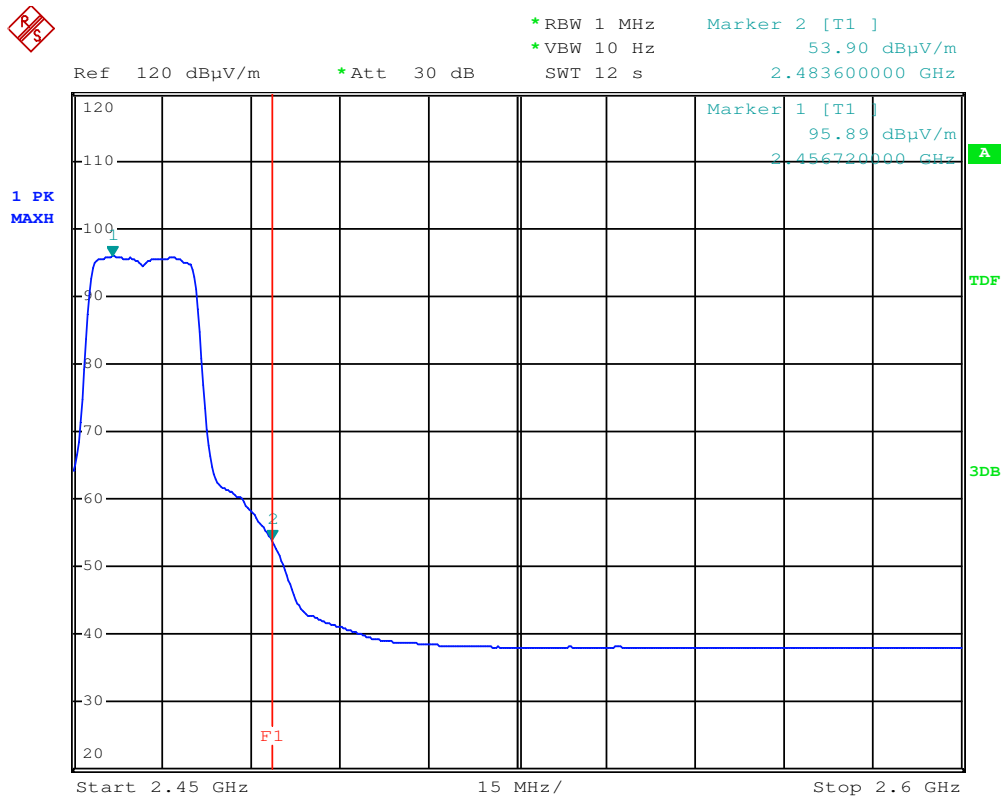
Frequency (MHz)	Reading value (dBµV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBµV/m)	PK Limit (µV/m)	PK Limit (dBµV/m)	Margin (dB)
2483.60	77.23	27.40	5.18	-37.57	72.24	5000	74.00	1.76

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

SPWF04SC: WiFi module with Integrated u.fl connector and dedicated external antenna

Radiated Band-edge compliance - Higher band edge

Average



Spurious Emission in restricted band near 2400-2483.5 MHz

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB3/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2483.60	58.89	27.40	5.18	-37.57	53.90	500	54.00	0.10

NOTE: The measures above are the worst case on 3 axes X Y and Z and both polarization.

7.4 OUT-OF-BAND EMISSIONS

TEST REQUIREMENT	
Spectrum analyzer settings	
Span	/
Resolution bandwidth (RBW)	100 kHz
Video bandwidth (VBW)	300 kHz
Sweep time (SWT)	as necessary to capture the entire dwell time
Detector function	Peak
Trace	Max hold
Attenuator	/
Deviation to test procedure	None
EUT operating condition	#7 #8 #9
Remark	None

TEST PROCEDURE
<p>A spectrum analyzer is connected to the antenna port of the transmitter. The measure has been executed with the lowest transmit channel, the highest transmit channel and one located somewhere in the middle of the band. The measurement takes into account the loss generated by the used cable.</p>

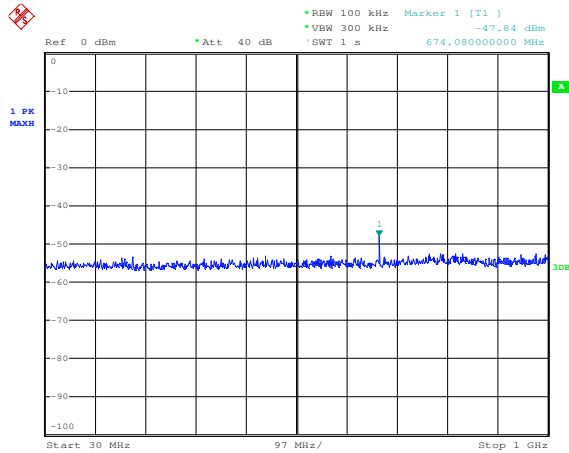
LIMITS
-20 dB below peak output power

TEST RESULT
<p>The EUT meets the requirements of sections 15.247 (d) All out of band spurious emissions are more 20 dB below the in band power of the fundamental.</p>

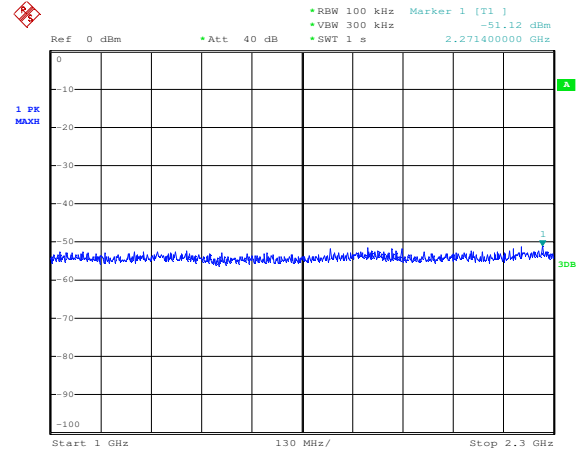
MEASUREMENTS RESULTS - CONDUCTED

TEST CONDITION: LOWER CHANNEL (2412MHZ) 802.11B MODULATION DSSS

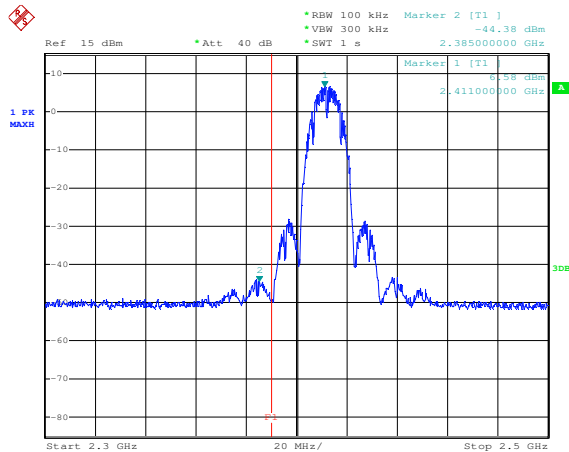
Plot 1 (30÷1000MHz)



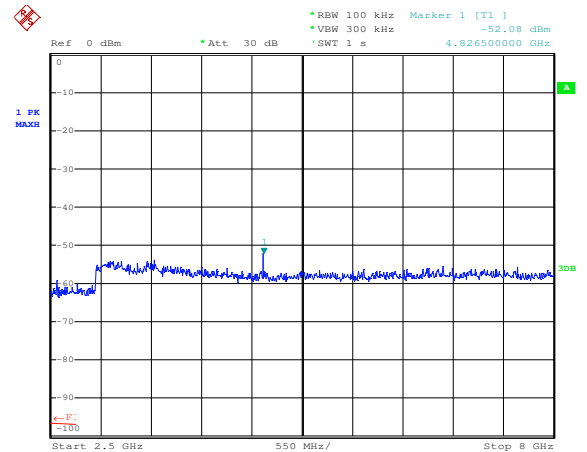
Plot 2 (1÷2.3GHz)



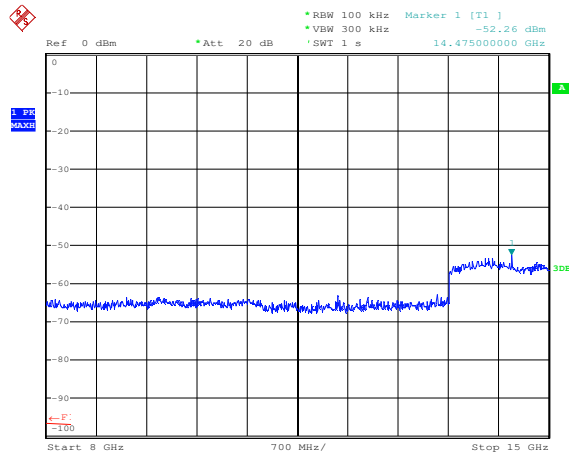
Plot 3 (2.3÷2.5GHz)



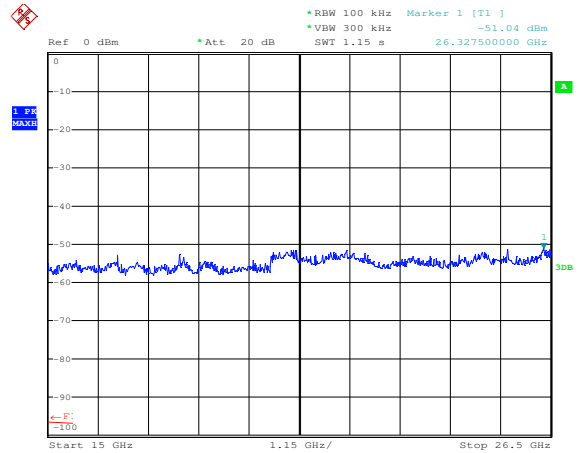
Plot 4 (2.5÷8GHz)



Plot 5 (8÷15GHz)

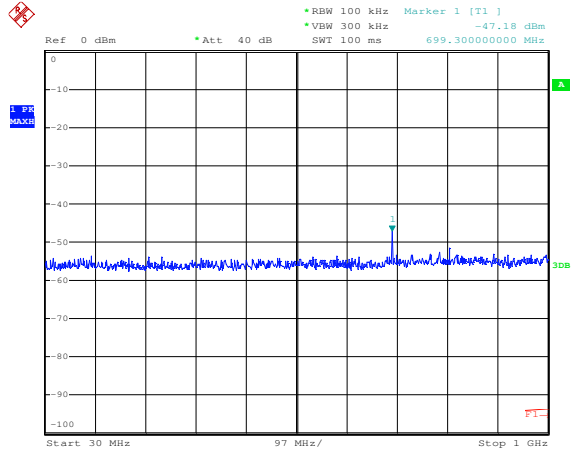


Plot 6 (15÷26.5GHz)

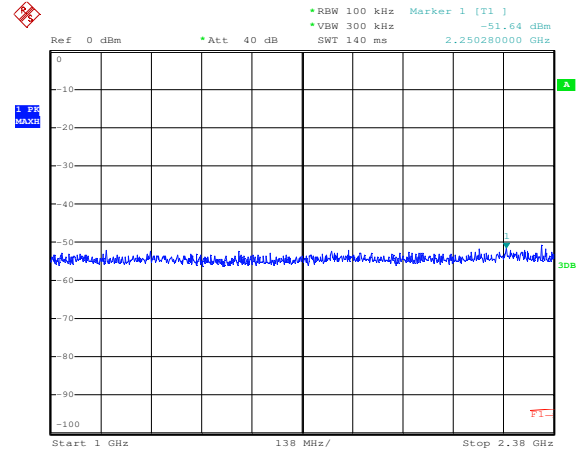


TEST CONDITION: MIDDLE CHANNEL (2437MHZ) 802.11B MODULATION DSSS

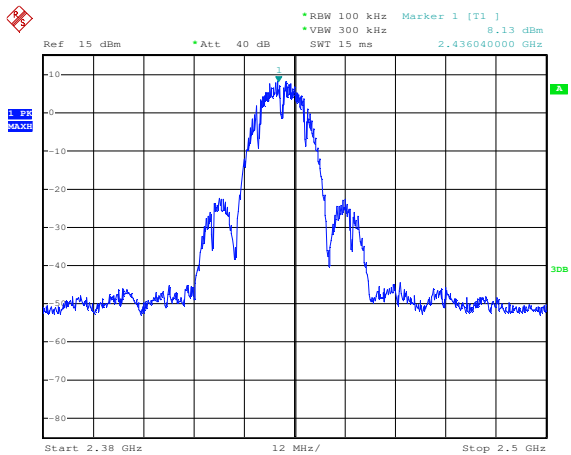
Plot 1 (30÷1000MHz)



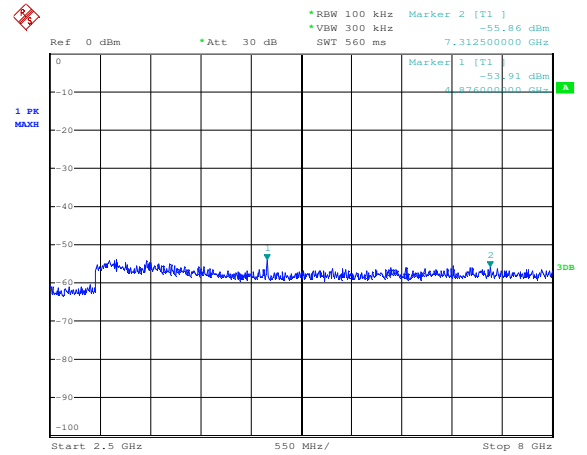
Plot 2 (1÷2.38GHz)



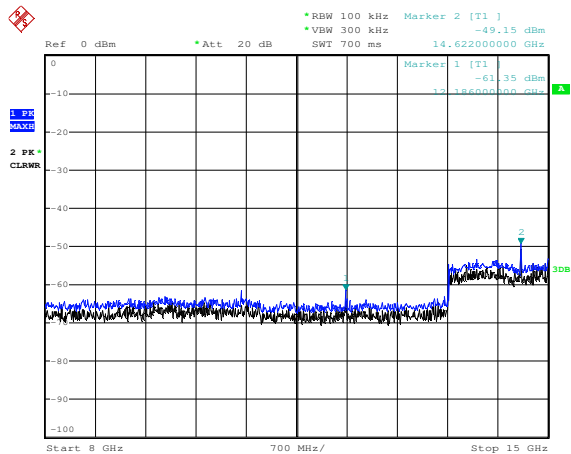
Plot 3 (2.38÷2.5GHz)



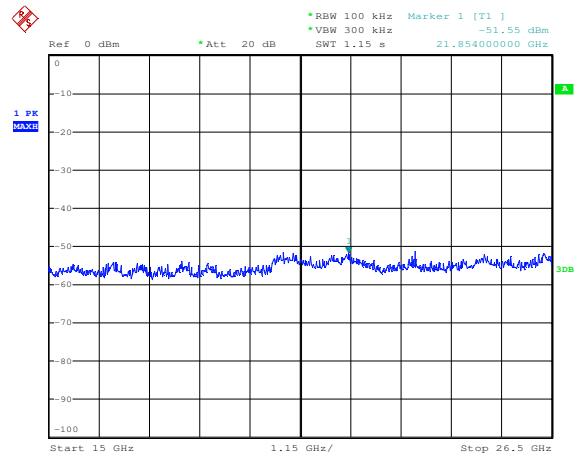
Plot 4 (2.5÷8GHz)



Plot 5 (8÷15GHz)

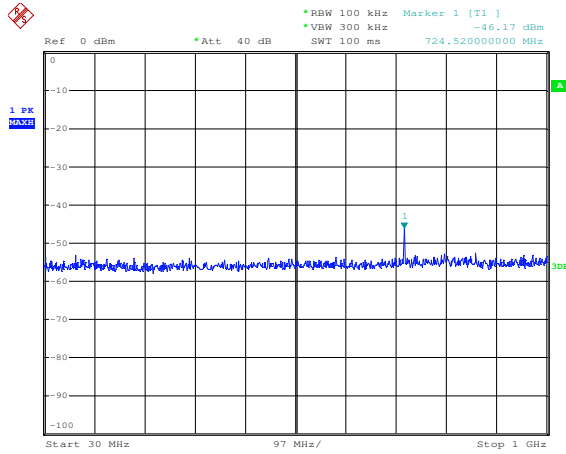


Plot 6 (15÷26.5GHz)

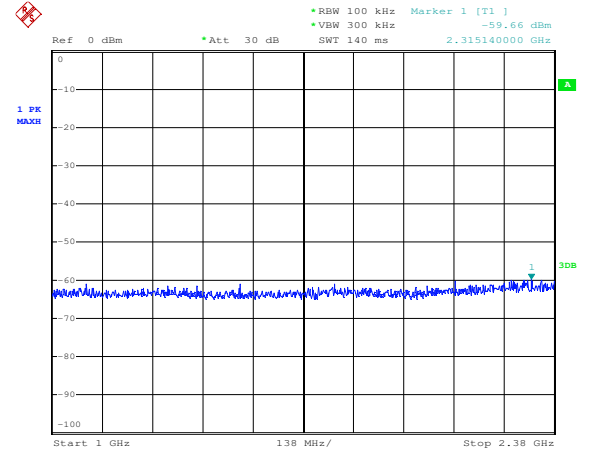


TEST CONDITION: HIGHER CHANNEL (2462MHz) 802.11B MODULATION DSSS

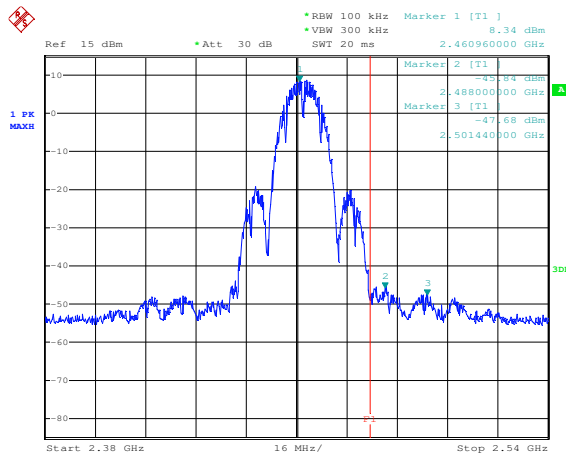
Plot 1 (30÷1000MHz)



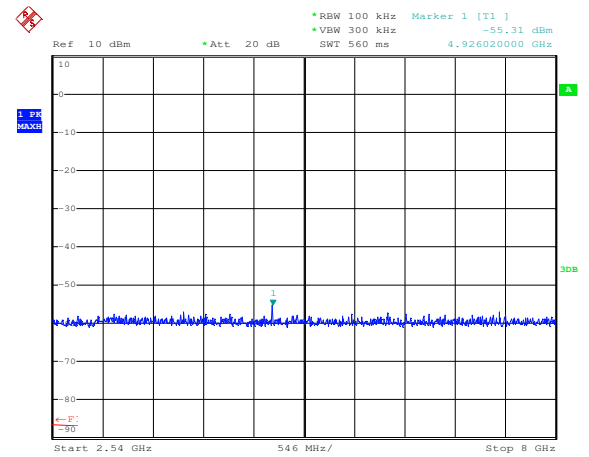
Plot 2 (1÷2.38GHz)



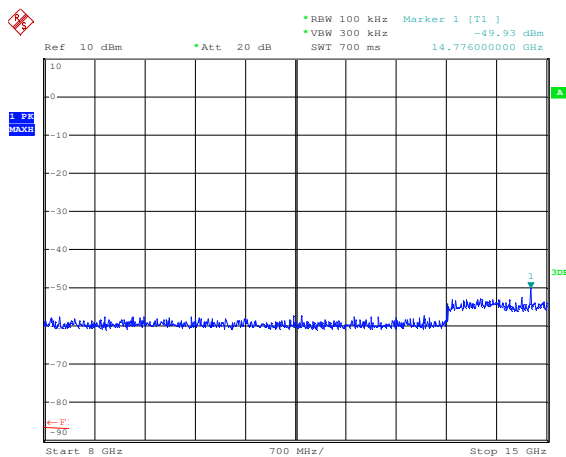
Plot 3 (2.38÷2.54GHz)



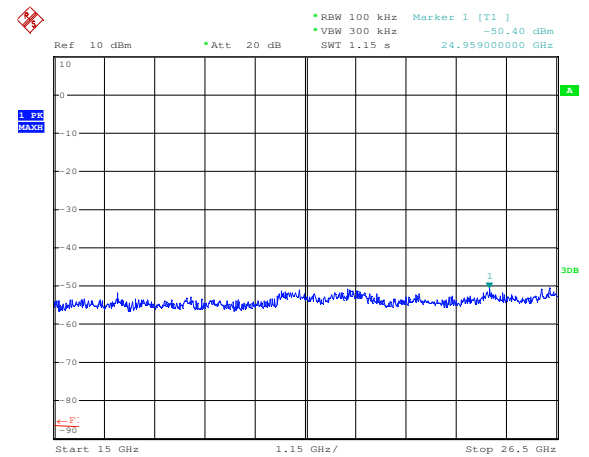
Plot 4 (2.54÷8GHz)



Plot 5 (8÷15GHz)

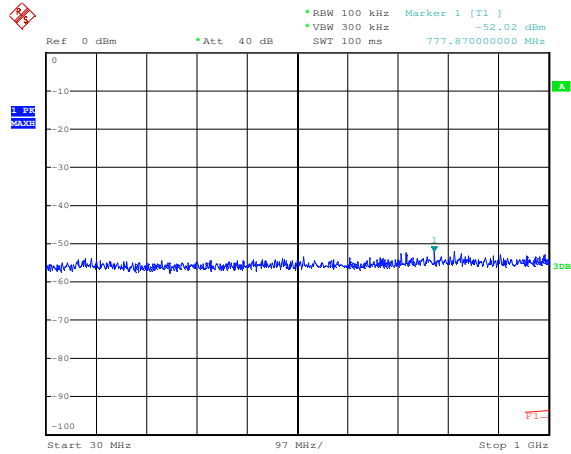


Plot 6 (15÷26.5GHz)

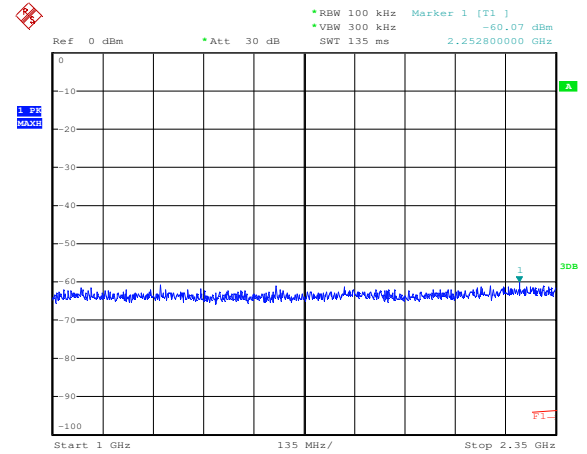


TEST CONDITION: LOWER CHANNEL (2412MHz) 802.11G MODULATION OFDM

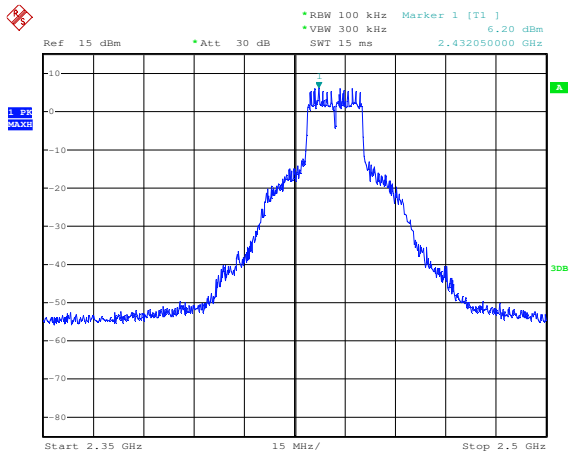
Plot 1 (30÷1000MHz)



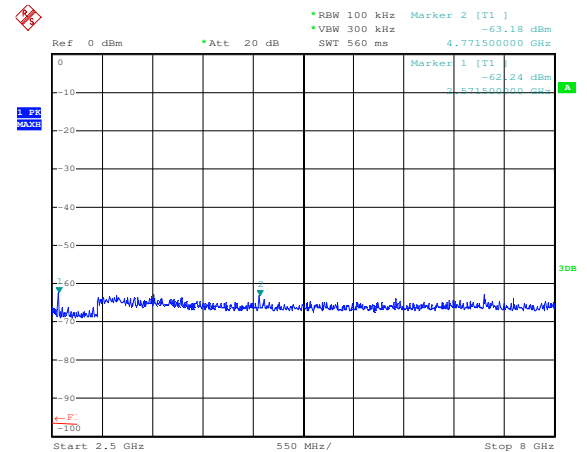
Plot 2 (1÷2.35GHz)



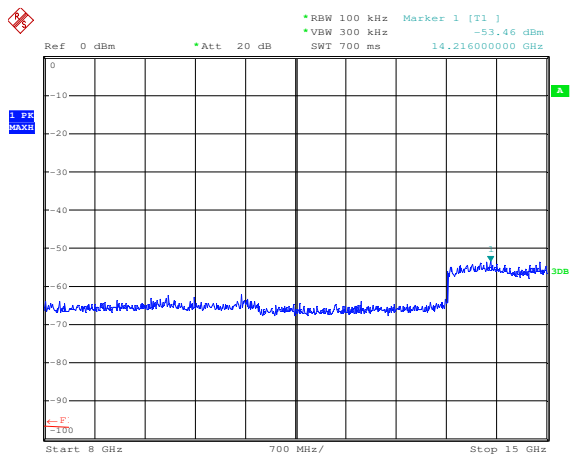
Plot 3 (2.35÷2.5GHz)



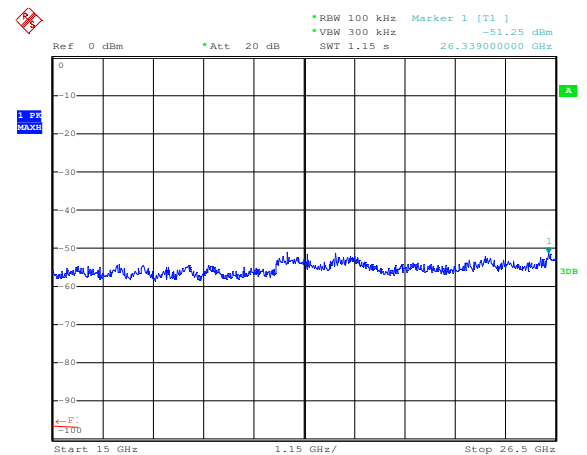
Plot 4 (2.5÷8GHz)



Plot 5 (8÷15GHz)

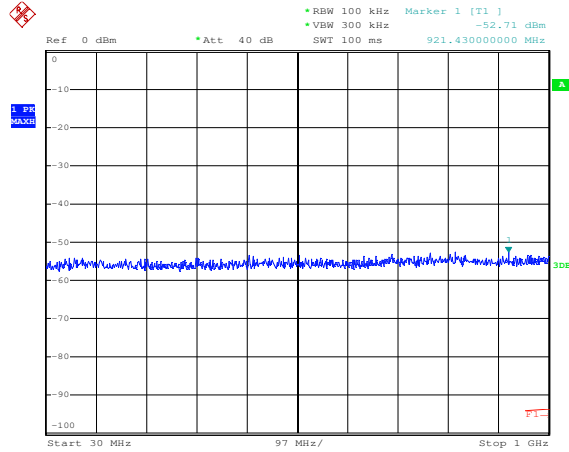


Plot 6 (15÷26.5GHz)

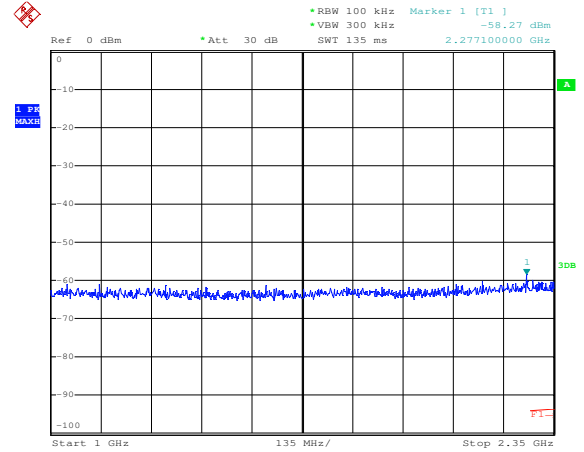


TEST CONDITION: MIDDLE CHANNEL (2437MHz) 802.11G MODULATION OFDM

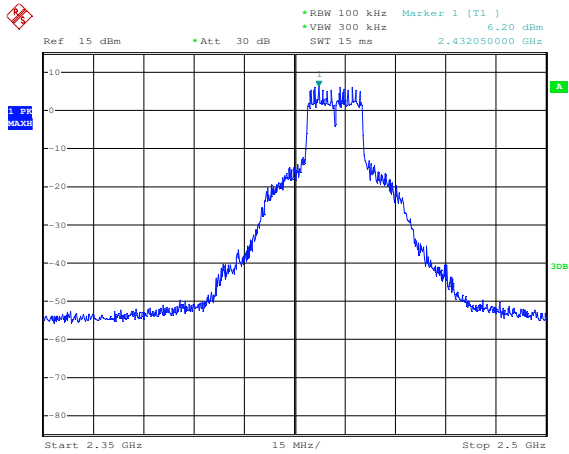
Plot 1 (30÷1000MHz)



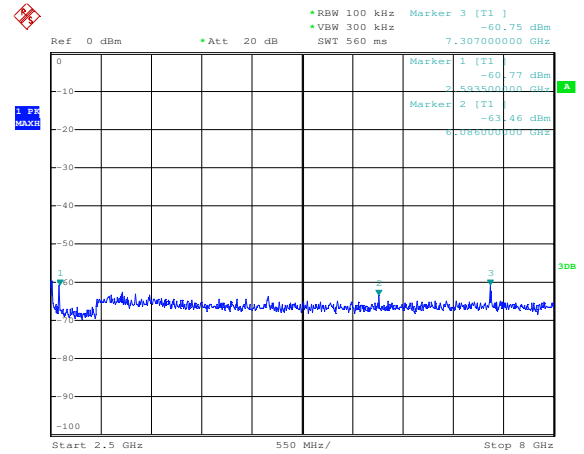
Plot 2 (1÷2.35GHz)



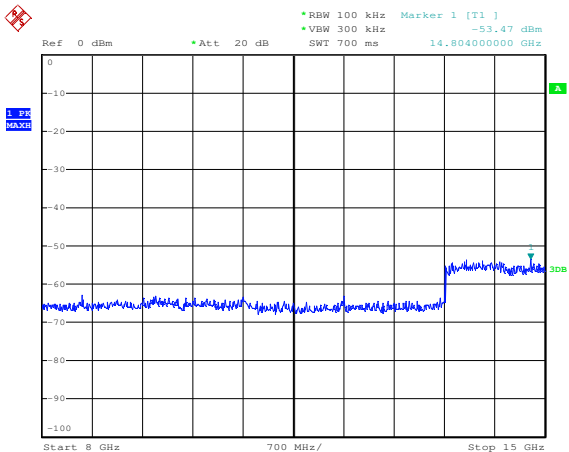
Plot 3 (2.35÷2.5GHz)



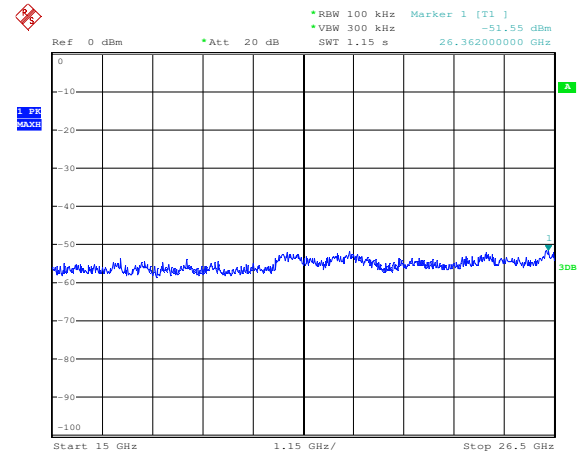
Plot 4 (2.5÷8GHz)



Plot 5 (8÷15GHz)

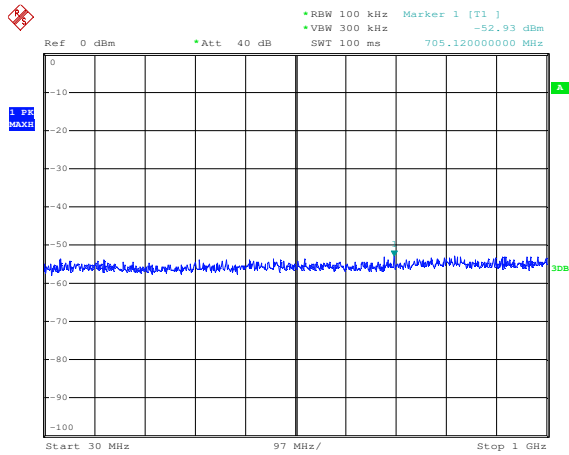


Plot 6 (15÷26.5GHz)

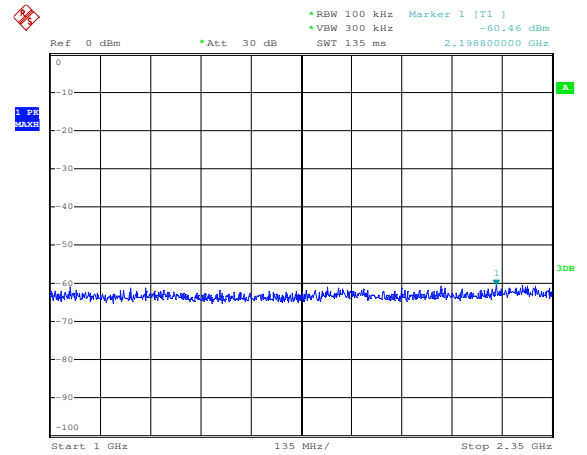


TEST CONDITION: HIGHER CHANNEL (2462MHZ) 802.11G MODULATION DSSS

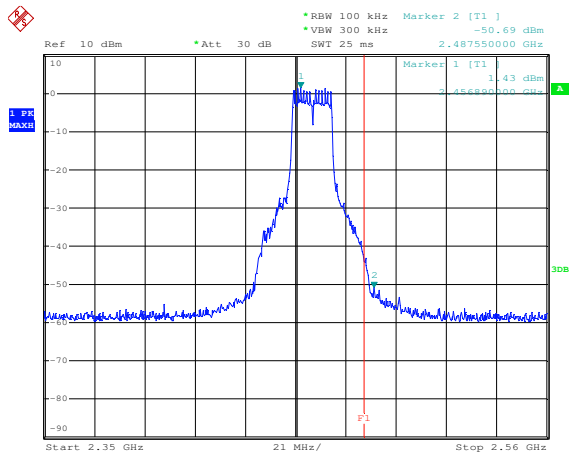
Plot 1 (30÷1000MHz)



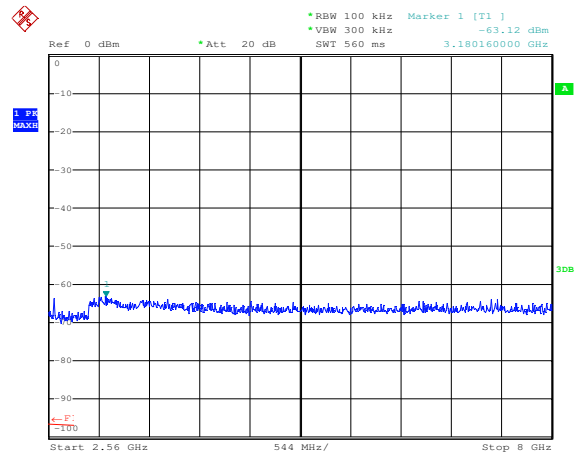
Plot 2 (1÷2.35GHz)



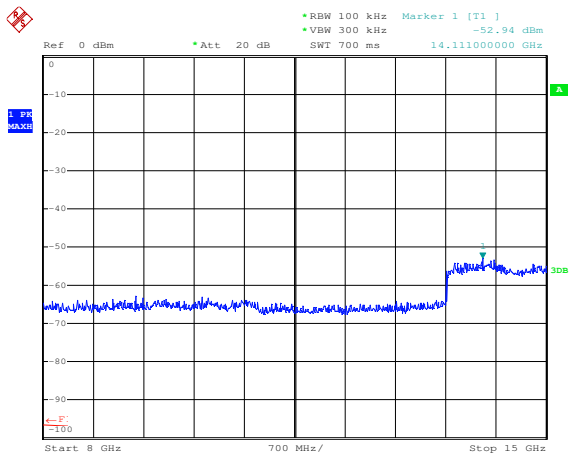
Plot 3 (2.35÷2.56GHz)



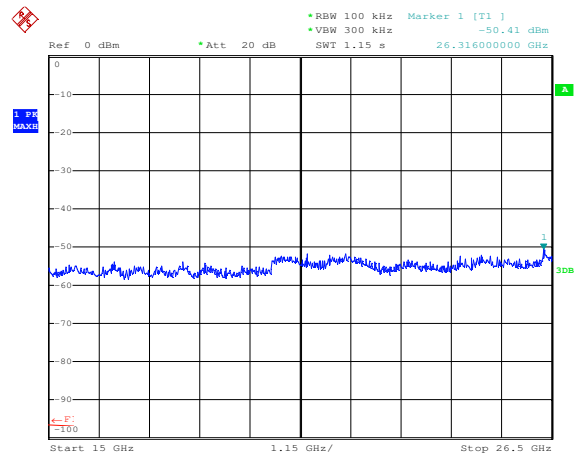
Plot 4 (2.56÷8GHz)



Plot 5 (8÷15GHz)

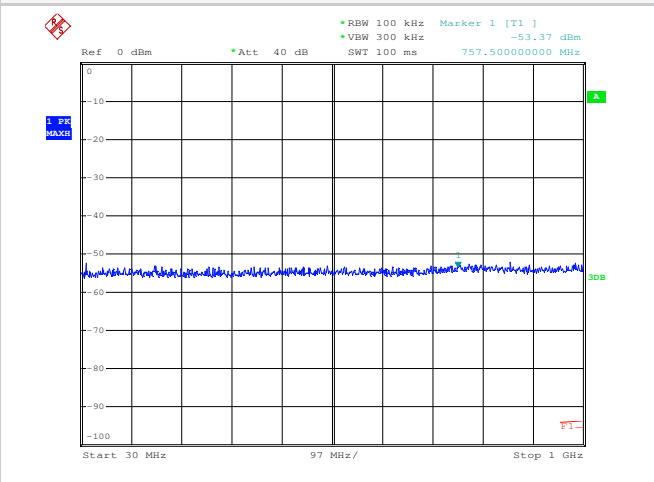


Plot 6 (15÷26.5GHz)

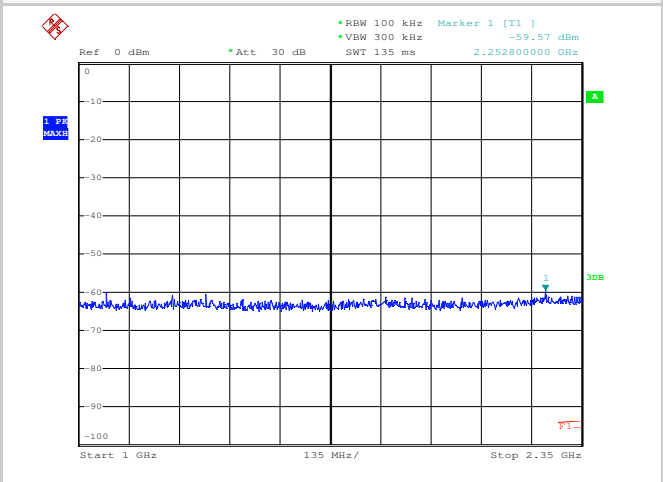


TEST CONDITION: LOWER CHANNEL (2412MHz) 802.11N MODULATION OFDM

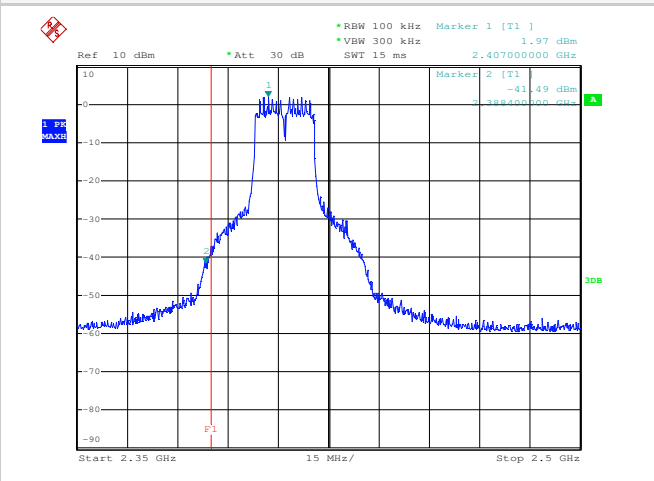
Plot 1 (30÷1000MHz)



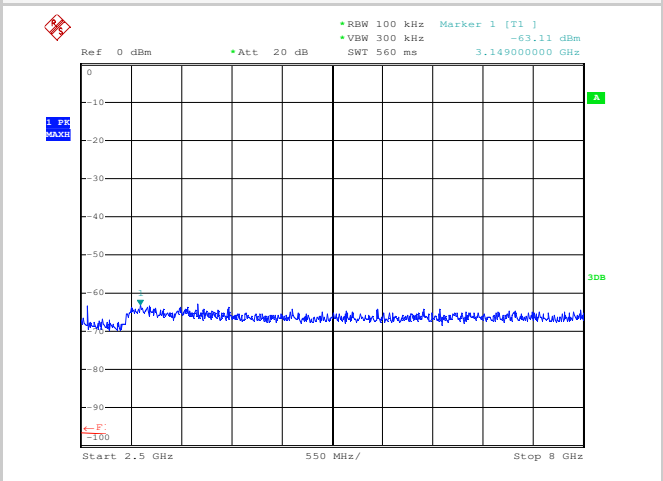
Plot 2 (1÷2.35GHz)



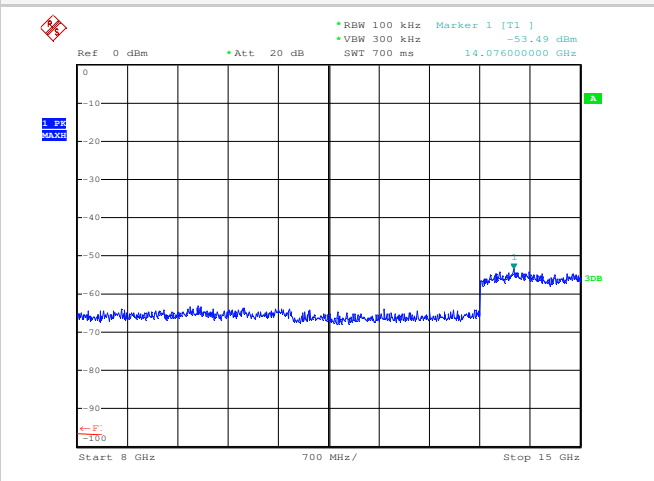
Plot 3 (2.35÷2.5GHz)



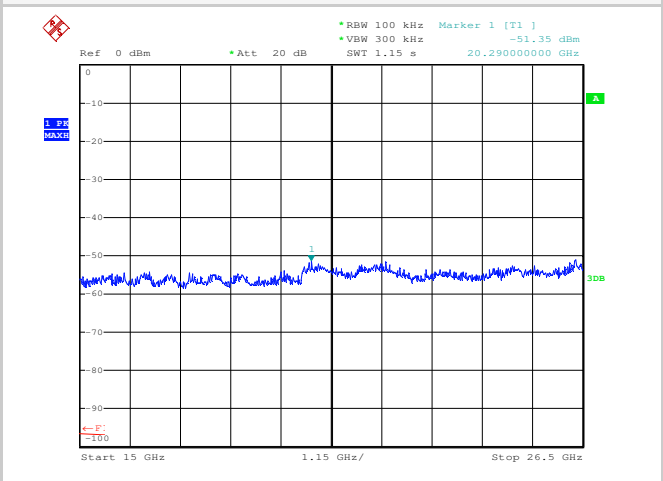
Plot 4 (2.5÷8GHz)



Plot 5 (8÷15GHz)

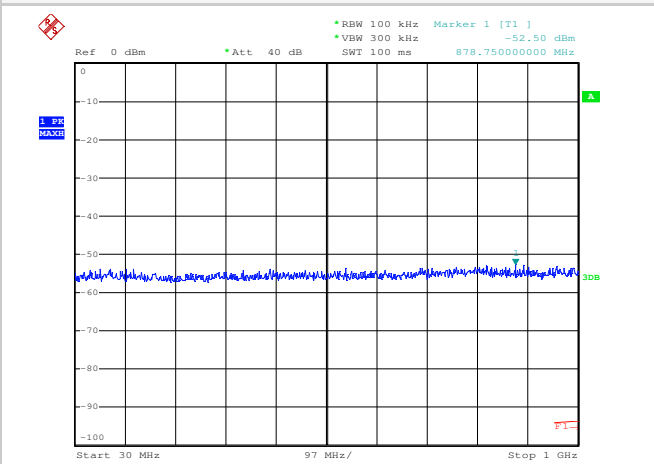


Plot 6 (15÷26.5GHz)

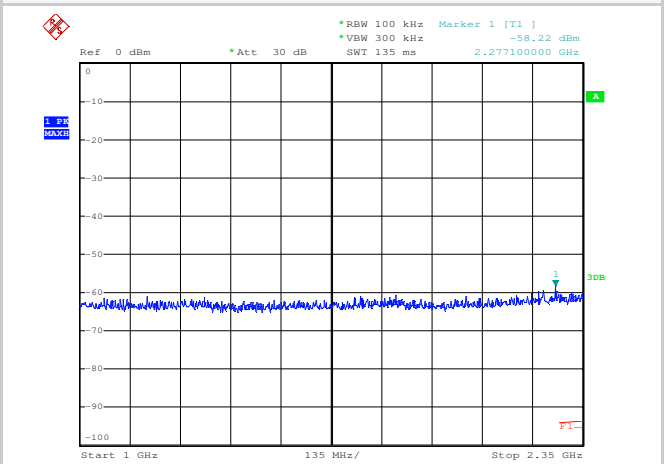


TEST CONDITION: MIDDLE CHANNEL (2437MHz) 802.11N MODULATION OFDM

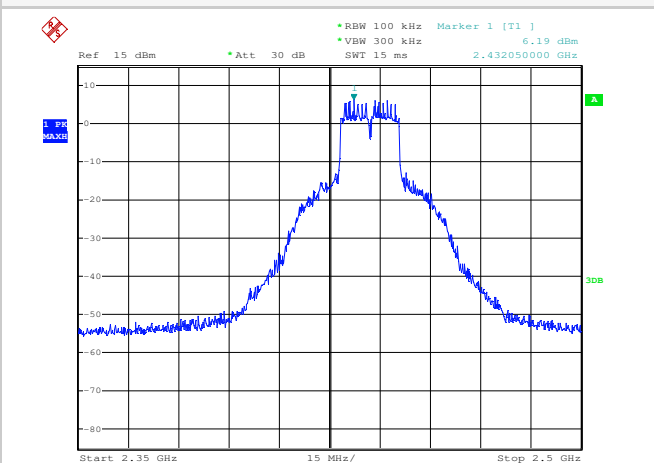
Plot 1 (30÷1000MHz)



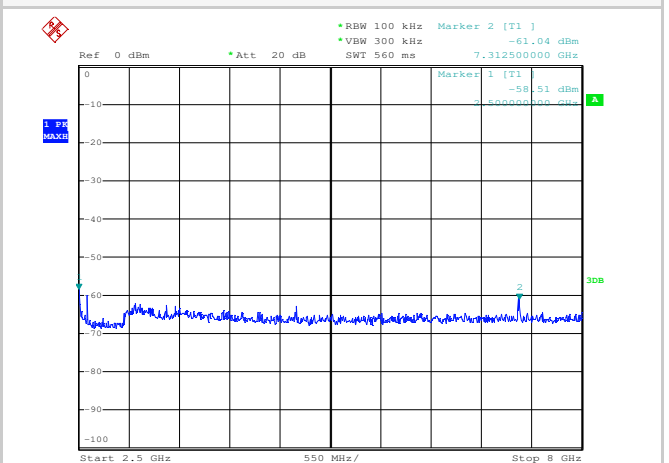
Plot 2 (1÷2.35GHz)



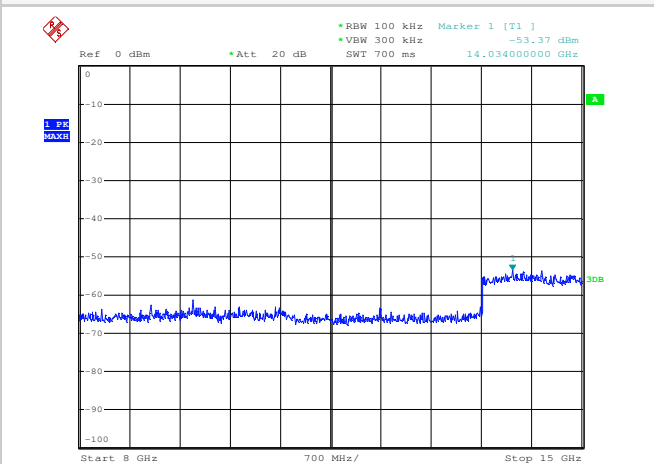
Plot 3 (2.35÷2.5GHz)



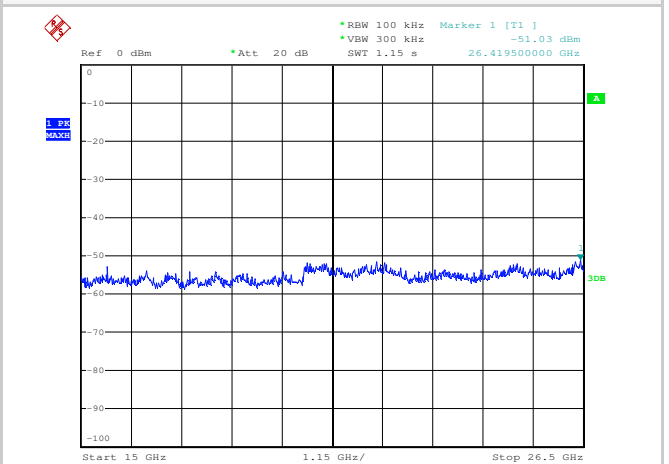
Plot 4 (2.5÷8GHz)



Plot 5 (8÷15GHz)

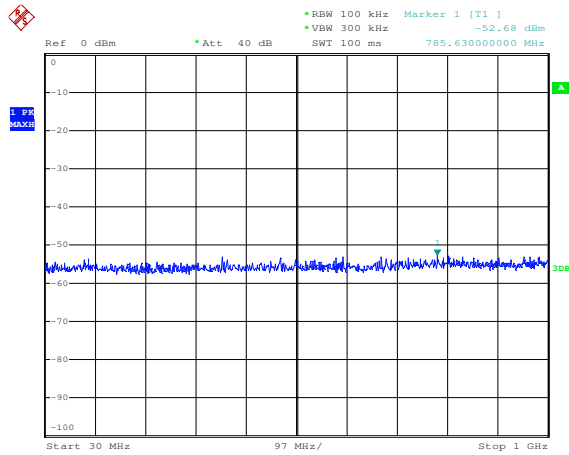


Plot 6 (15÷26.5GHz)

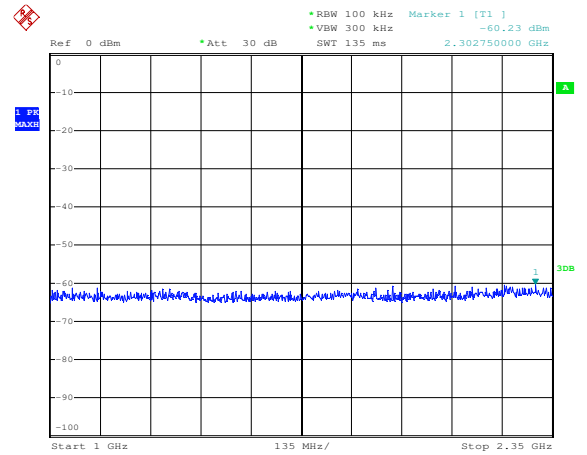


TEST CONDITION: HIGHER CHANNEL (2462MHZ) 802.11N MODULATION DSSS

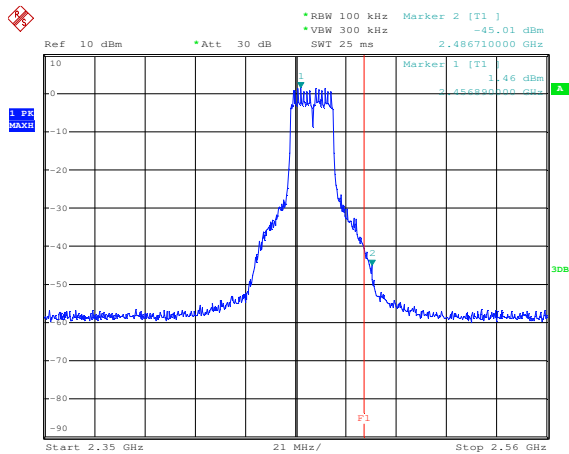
Plot 1 (30÷1000MHz)



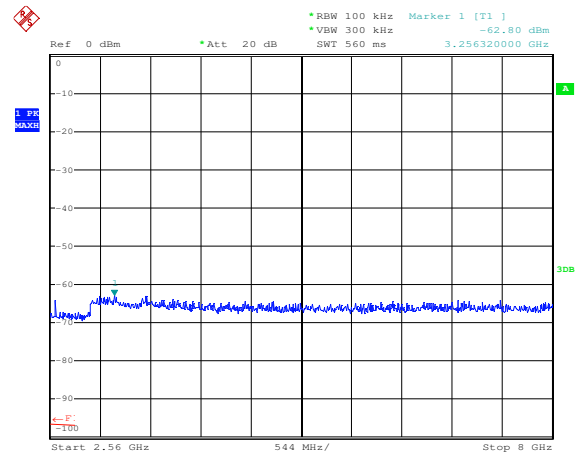
Plot 2 (1÷2.35GHz)



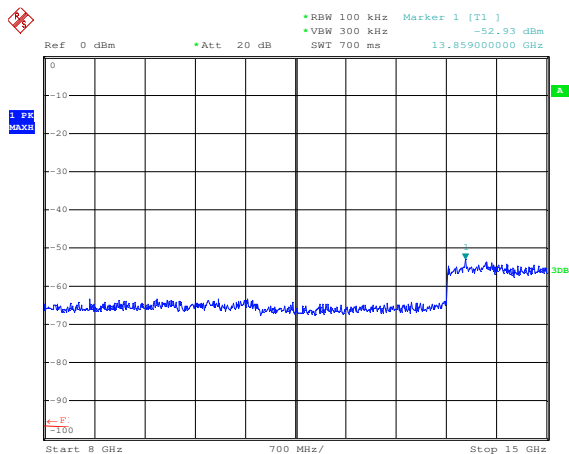
Plot 3 (2.35÷2.56GHz)



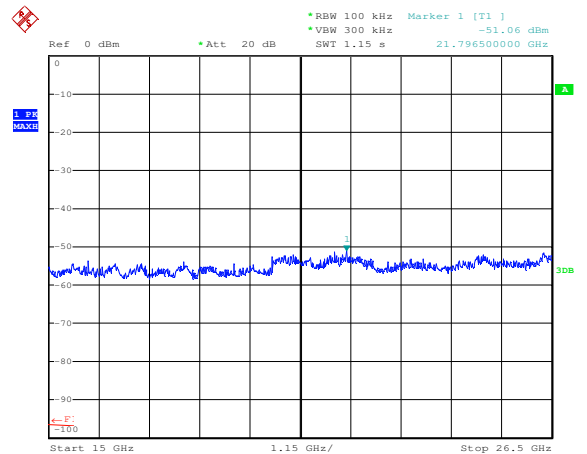
Plot 4 (2.56÷8GHz)



Plot 5 (8÷15GHz)



Plot 6 (15÷26.5GHz)



7.5 6dB BANDWIDTH

TEST REQUIREMENT

Spectrum analyzer settings

Span	40 MHz
Resolution bandwidth (RBW)	100 kHz
Video bandwidth (VBW)	300 kHz
Sweep time (SWT)	15 ms
Detector function	Peak
Trace	Max hold
Attenuator	30dB
Deviation to test procedure	None
EUT operating condition	#7 #8 #9
Remark	None

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through a temporary RF 50Ω connector. The Channel bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

LIMITS

At least 500kHz

TEST RESULT

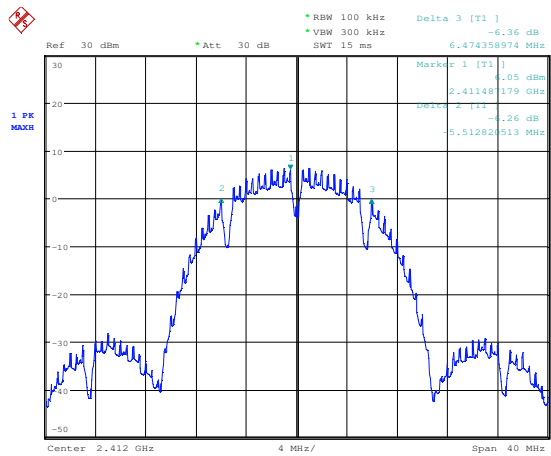
The EUT meets the requirements of sections 15.247 (a) (2)

MEASUREMENTS RESULTS

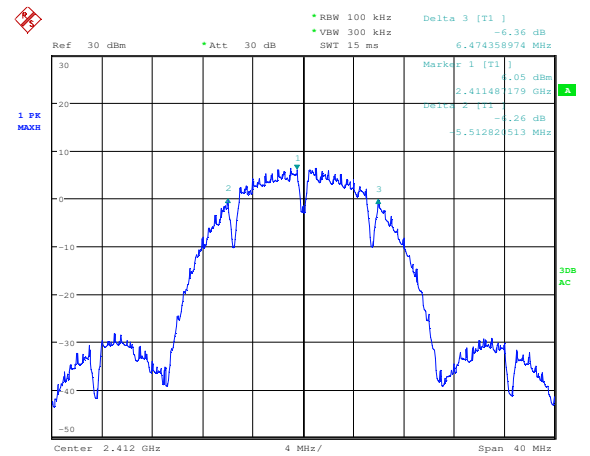
TEST CONDITION: 802.11B MODULATION DSSS

Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
Low	1Mbit/s	11.98	1
Low	2Mbit/s	11.98	2
Low	5.5Mbit/s	11.98	3
Low	11Mbit/s	11.98	4

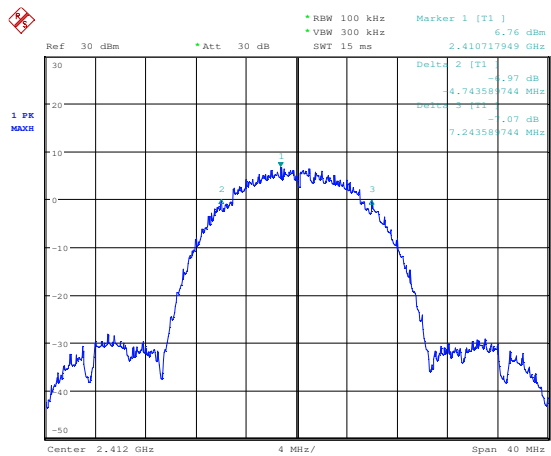
Plot 1



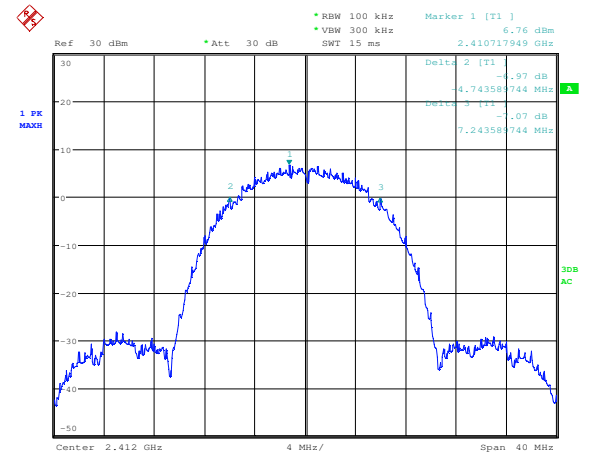
Plot 2



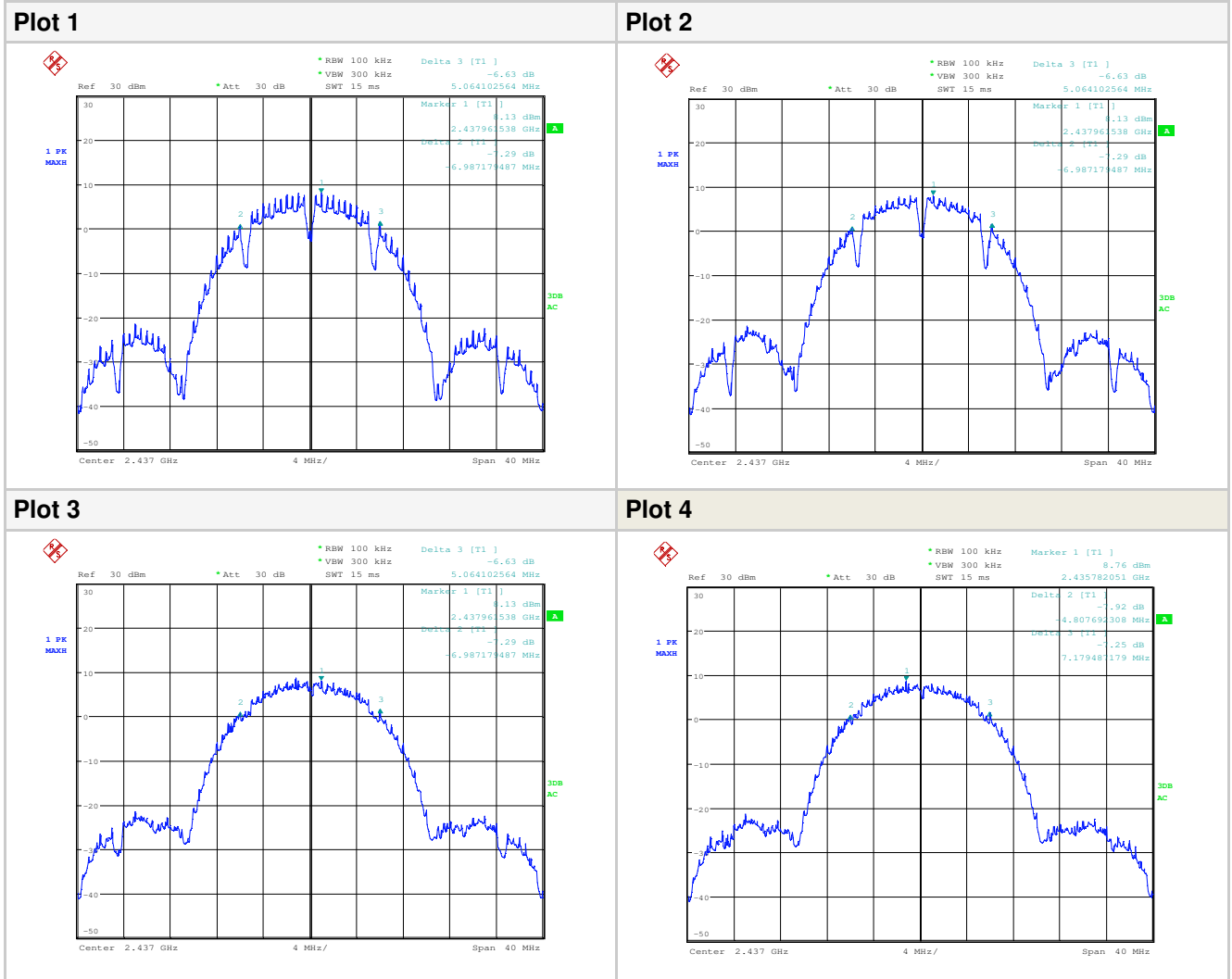
Plot 3



Plot 4

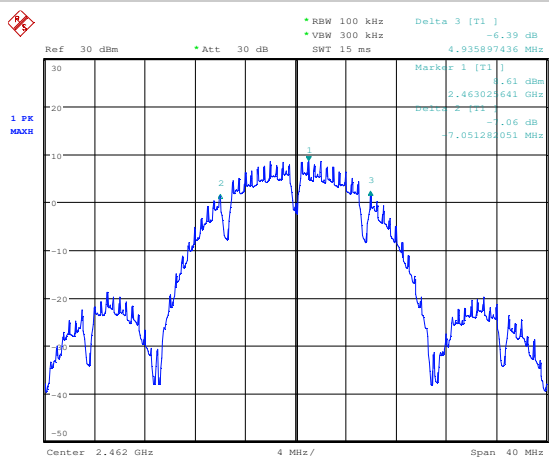


Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
Middle	1Mbit/s	11.95	1
Middle	2Mbit/s	11.95	2
Middle	5.5Mbit/s	11.95	3
Middle	11Mbit/s	11.98	4

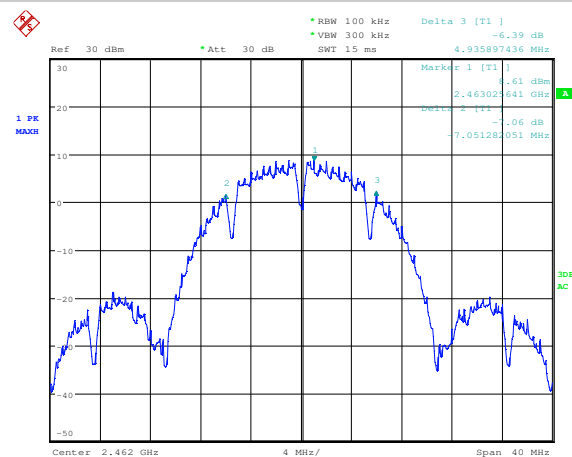


Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
High	1Mbit/s	11.98	1
High	2Mbit/s	11.98	2
High	5.5Mbit/s	11.98	3
High	11Mbit/s	11.98	4

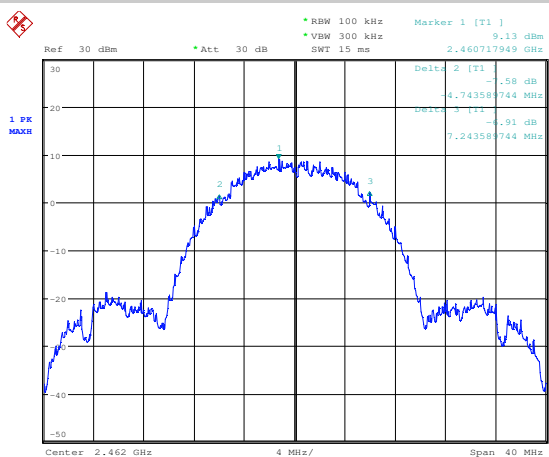
Plot 1



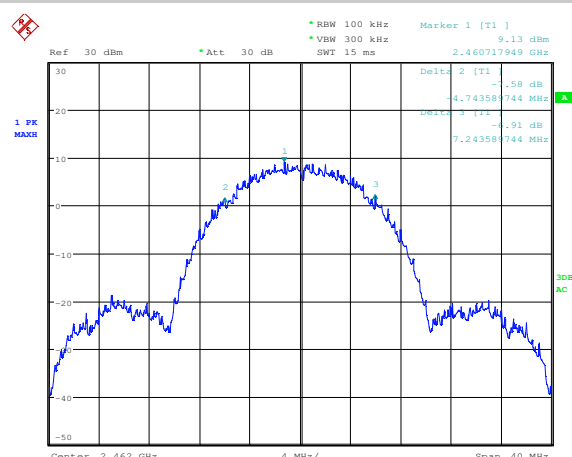
Plot 2



Plot 3



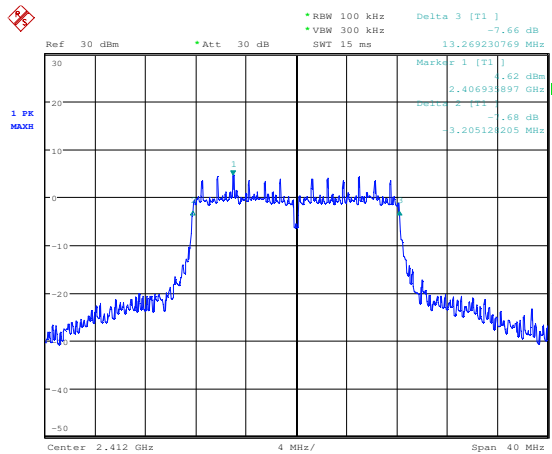
Plot 4



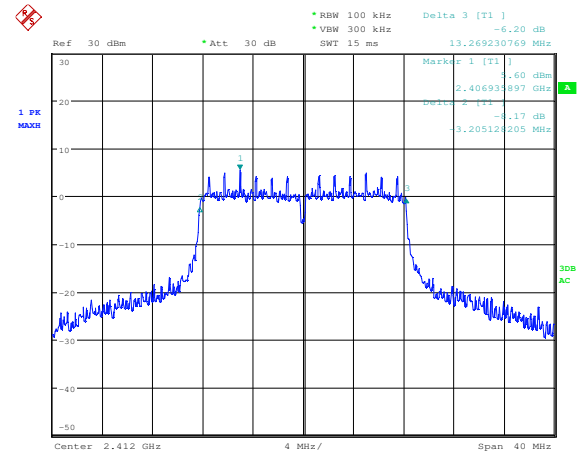
TEST CONDITION: 802.11G MODULATION OFDM

Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
Low	6Mbit/s	16.47	1
Low	18Mbit/s	16.47	2
Low	24Mbit/s	16.47	3
Low	54Mbit/s	16.47	4

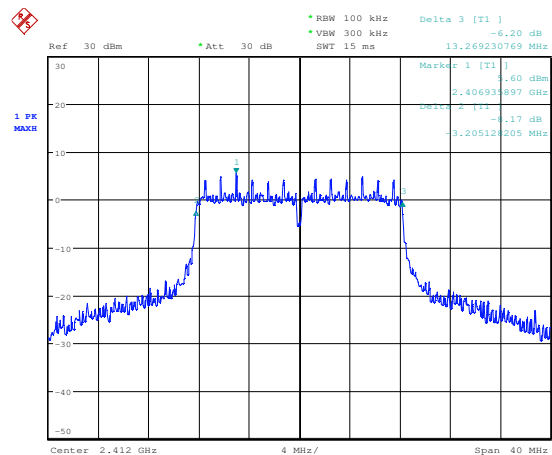
Plot 1



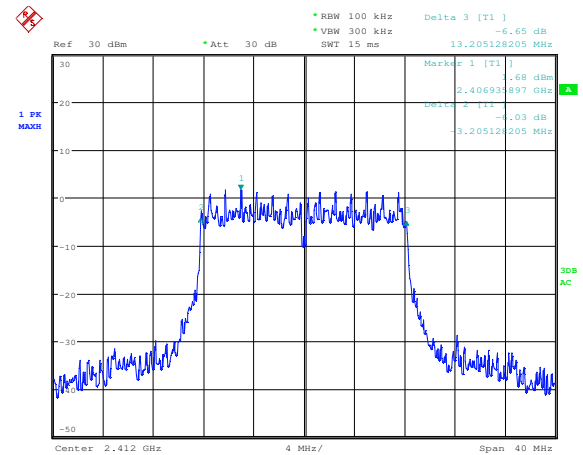
Plot 2



Plot 3

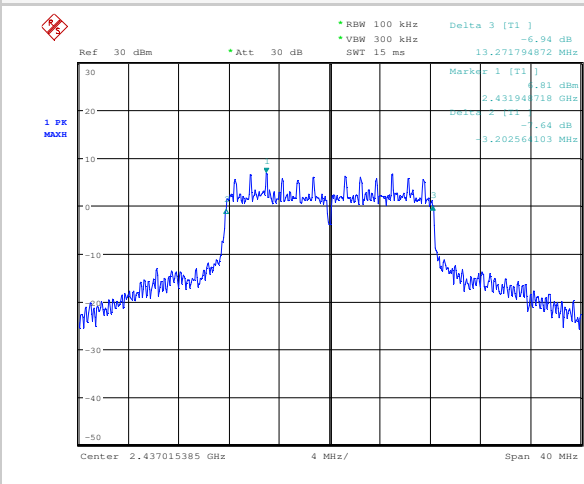


Plot 4

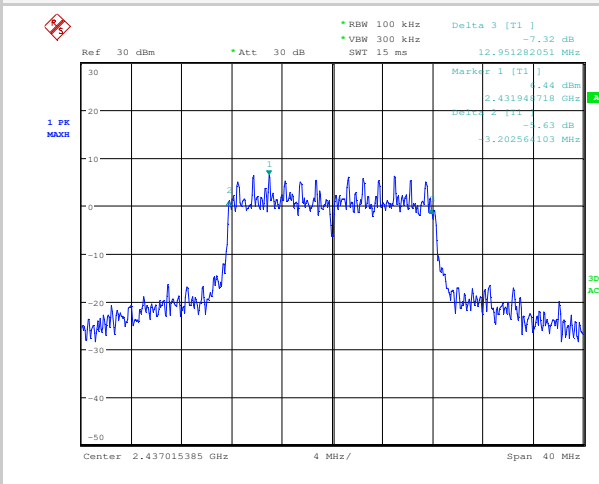


Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
Middle	6Mbit/s	16.47	1
Middle	54Mbit/s	16.15	2

Plot 1

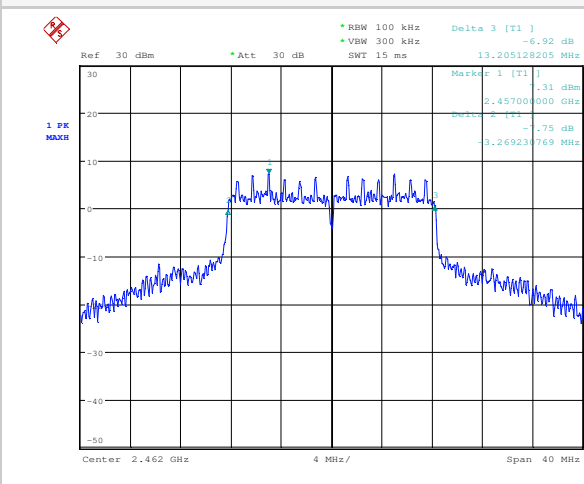


Plot 2

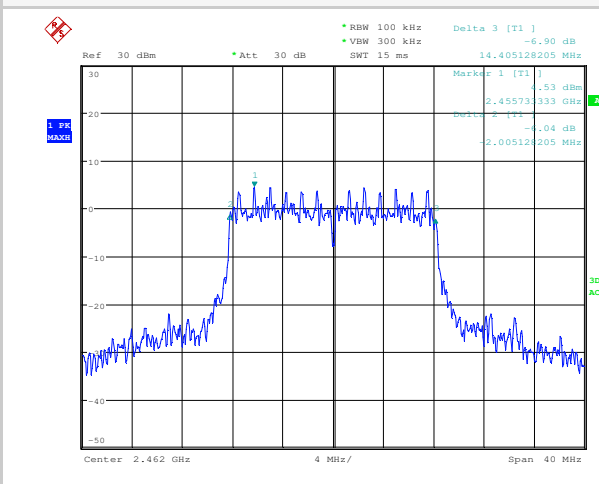


Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
High	6Mbit/s	16.47	1
High	54Mbit/s	16.41	2

Plot 1



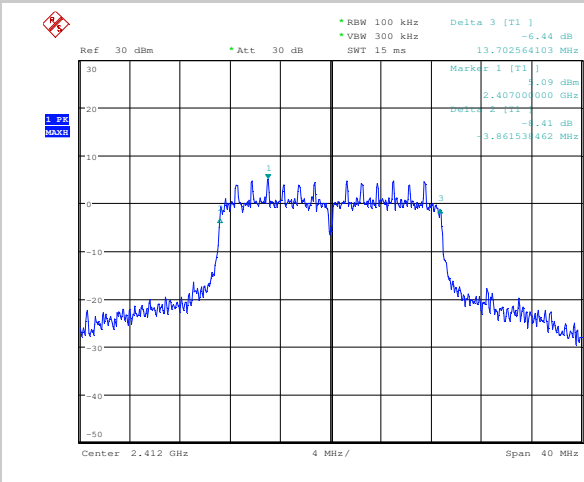
Plot 2



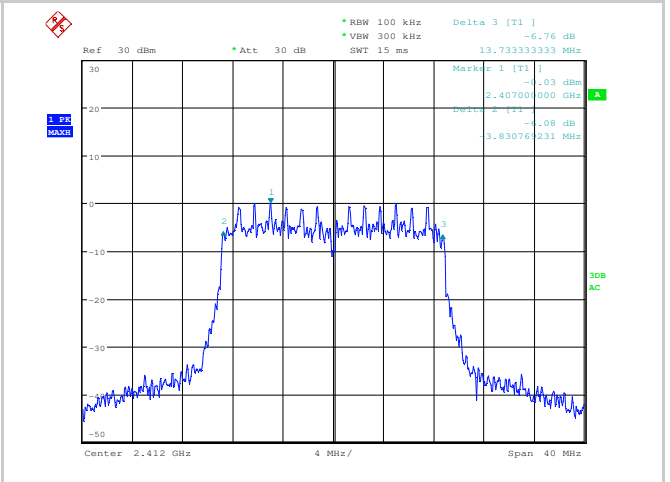
TEST CONDITION: 802.11N MODULATION OFDM

Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
Low	6.5Mbit/s	17.56	1
Low	65Mbit/s	17.56	2

Plot 1

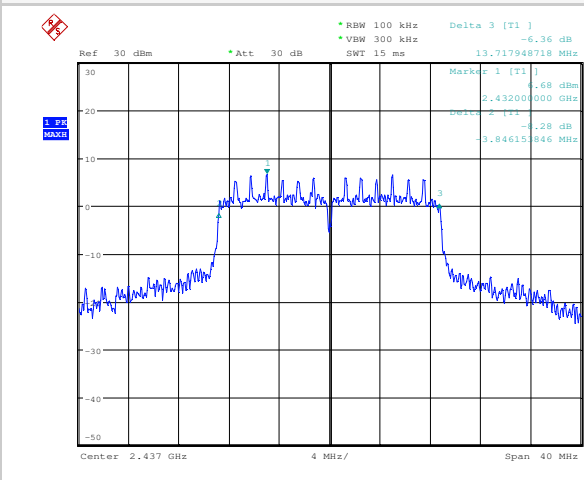


Plot 2

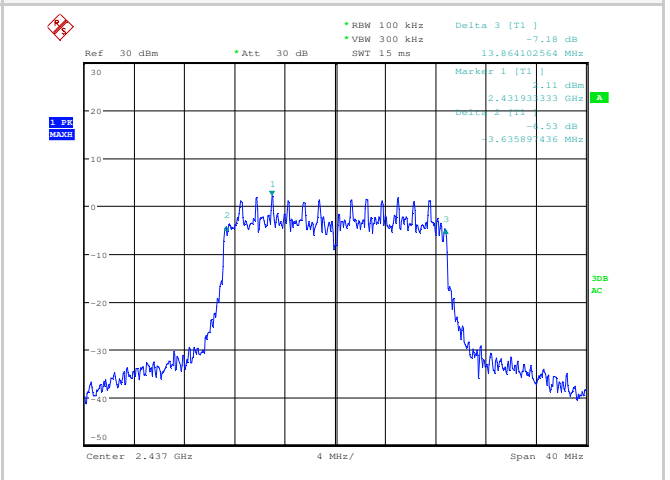


Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
Middle	6.5Mbit/s	17.55	1
Middle	65Mbit/s	17.50	2

Plot 1

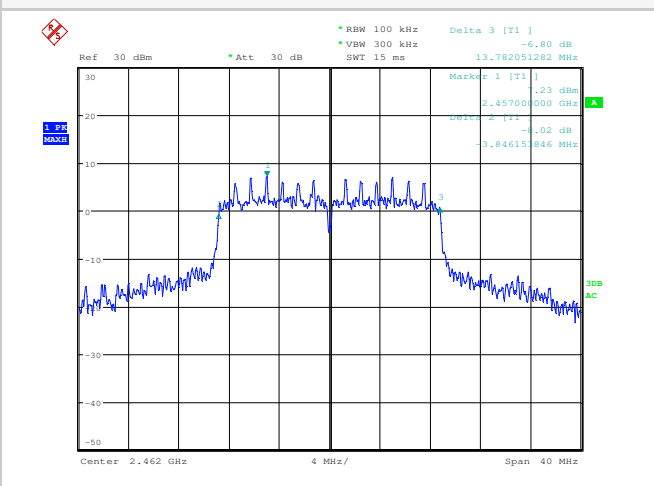


Plot 2

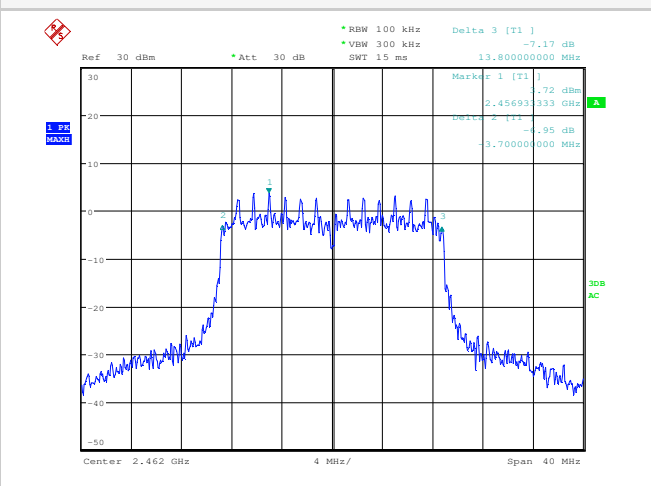


Channel (No.)	Data rate	Channel Bandwidth at -6dB (MHz)	Plot (No.)
High	6.5Mbit/s	17.62	1
High	65Mbit/s	17.50	2

Plot 1



Plot 2



7.6 MAXIMUM PEAK OUTPUT POWER (DE FACTO EIRP)

TEST REQUIREMENT	
Spectrum analyzer settings	
Resolution bandwidth (RBW)	3 MHz
Video bandwidth (VBW)	10 MHz
Sweep time (SWT)	2,5 ms
Detector function	Peak
Trace	max hold
Test distance	/
EUT operating condition	#7 #8 #9
Remark	none

TEST PROCEDURE
Conducted measurements:
The transmitter output was connected to the Wideband Power Sensor through a temporary RF 50Ω connector type SMA.
Radiated measurements:
As the EUT is supplied with a dedicated antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method.
The field strength levels shall be converted to equivalent conducted power levels for comparison to the applicable output power limit refer to KDB 412172.

LIMITS
1 Watt (30dBm)

TEST RESULT
The EUT meets the requirements of sections 15.247 (b) (3)

MEASUREMENTS RESULTS (CONDUCTED)

TEST CONDITION: 802.11B MODULATION DSSS

Channel (No.)	Frequency (MHz)	Data rate	Output Power (dBm)	Limit (dBm)
Low	2412	1Mbit/s	+16.15	+30
Low	2412	2Mbit/s	+15.96	+30
Low	2412	5.5Mbit/s	+16.04	+30
Low	2412	11Mbit/s	+15.90	+30
Middle	2437	1Mbit/s	+17.58	+30
Middle	2437	2Mbit/s	+17.53	+30
Middle	2437	5.5Mbit/s	+17.65	+30
Middle	2437	11Mbit/s	+17.53	+30
High	2462	1Mbit/s	+18.04	+30
High	2462	2Mbit/s	+17.99	+30
High	2462	5.5Mbit/s	+18.13	+30
High	2462	11Mbit/s	+17.96	+30

TEST CONDITION: 802.11G MODULATION OFDM

Channel (No.)	Frequency (MHz)	Data rate	Output Power (dBm)	Limit (dBm)
Low	2412	6Mbit/s	+13.22	+30
Low	2412	9Mbit/s	+13.17	+30
Low	2412	12Mbit/s	+13.21	+30
Low	2412	18Mbit/s	+13.15	+30
Low	2412	24Mbit/s	+13.11	+30
Low	2412	36Mbit/s	+13.03	+30
Low	2412	48Mbit/s	+12.99	+30
Low	2412	54Mbit/s	+11.39	+30
Middle	2437	6Mbit/s	+17.25	+30
Middle	2437	9Mbit/s	+17.10	+30
Middle	2437	12Mbit/s	+17.18	+30
Middle	2437	18Mbit/s	+17.15	+30
Middle	2437	24Mbit/s	+16.72	+30
Middle	2437	36Mbit/s	+15.96	+30
Middle	2437	48Mbit/s	+15.04	+30
Middle	2437	54Mbit/s	+14.14	+30
High	2462	6Mbit/s	+12.80	+30
High	2462	9Mbit/s	+12.84	+30
High	2462	12Mbit/s	+12.95	+30
High	2462	18Mbit/s	+12.86	+30
High	2462	24Mbit/s	+12.86	+30
High	2462	36Mbit/s	+12.85	+30
High	2462	48Mbit/s	+12.75	+30
High	2462	54Mbit/s	+12.80	+30

TEST CONDITION: 802.11N MODULATION OFDM

Channel (No.)	Frequency (MHz)	Data rate	Output Power (dBm)	Limit (dBm)
Low	2412	6.5Mbit/s	+13.18	+30
Low	2412	13Mbit/s	+13.07	+30
Low	2412	19.5Mbit/s	+13.13	+30
Low	2412	26Mbit/s	+13.15	+30
Low	2412	39Mbit/s	+13.14	+30
Low	2412	52Mbit/s	+13.01	+30
Low	2412	58.5Mbit/s	+12.02	+30
Low	2412	65Mbit/s	+11.06	+30
Middle	2437	6.5Mbit/s	+17.32	+30
Middle	2437	13Mbit/s	+17.15	+30
Middle	2437	19.5Mbit/s	+17.17	+30
Middle	2437	26Mbit/s	+16.78	+30
Middle	2437	39Mbit/s	+15.93	+30
Middle	2437	52Mbit/s	+15.11	+30
Middle	2437	58.5Mbit/s	+14.10	+30
Middle	2437	65Mbit/s	+13.10	+30
High	2462	6.5Mbit/s	+12.87	+30
High	2462	13Mbit/s	+12.80	+30
High	2462	19.5Mbit/s	+12.88	+30
High	2462	26Mbit/s	+12.92	+30
High	2462	39Mbit/s	+12.94	+30
High	2462	52Mbit/s	+12.93	+30
High	2462	58.5Mbit/s	+12.79	+30
High	2462	65Mbit/s	+12.75	+30

MEASUREMENTS RESULTS (RADIATED)

802.11b Modulation DSSS (worst case measured with both antenna)

Channel (No.)	Frequency (MHz)	Radiated Output Power (at 3m. distance) (dB μ V/m)	Calculated E.I.R.P (dBm)	Limit (dBm)
Low	2412	112.60	17.32	30
Middle	2437	114.18	18.95	30
High	2462	114.34	19.11	30

802.11g Modulation OFDM (worst case measured with both antenna)

Channel (No.)	Frequency (MHz)	Radiated Output Power (at 3m. distance) (dB μ V/m)	Calculated E.I.R.P (dBm)	Limit (dBm)
Low	2412	109.00	13.77	30
Middle	2437	112.84	17.61	30
High	2462	108.25	13.02	30

802.11n Modulation OFDM (worst case measured with both antenna)

Channel (No.)	Frequency (MHz)	Radiated Output Power (at 3m. distance) (dB μ V/m)	Calculated E.I.R.P (dBm)	Limit (dBm)
Low	2412	107.92	12.69	30
Middle	2437	112.93	17.70	30
High	2462	107.50	12.27	30

7.7 TRANSMITTER POWER SPECTRAL DENSITY

TEST REQUIREMENT	
Spectrum analyzer settings	
Span	40 MHz
Resolution bandwidth (RBW)	3 kHz
Video bandwidth (VBW)	10 kHz
Sweep time (SWT)	Auto
Detector function	Peak
Trace	Max hold
Attenuator	25dB
Deviation to test procedure	None
EUT operating condition	#7 #8 #9
Remark	None

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through a temporary RF 50Ω connector. After trace stabilisation the marker shall be set on the signal peak. The indicated level is the power spectral density.

LIMITS

8 dBm in 3 kHz bandwidth.

TEST RESULT

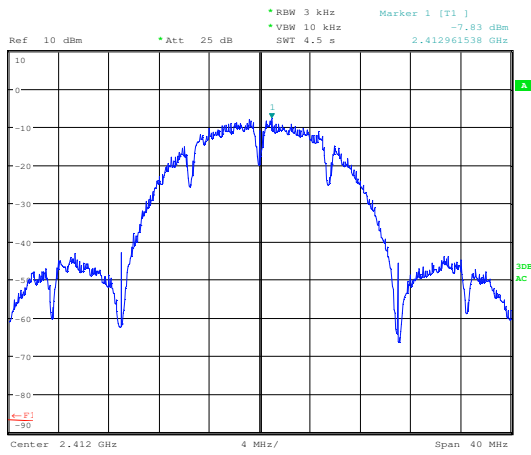
The EUT meets the requirements of sections 15.247 (e)

MEASUREMENTS RESULTS

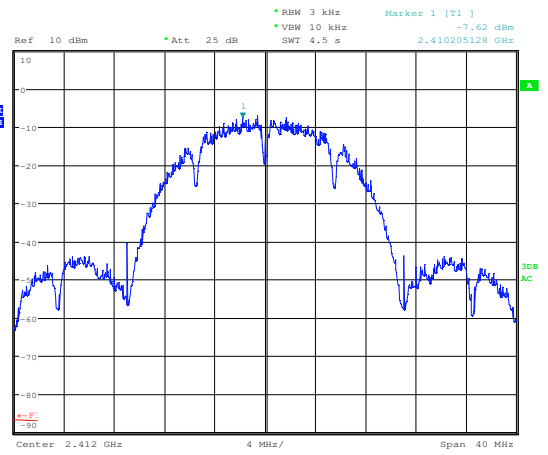
TEST CONDITION: 802.11B MODULATION DSSS

Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
Low	1Mbit/s	-7.83	+8	1
Low	2Mbit/s	-7.62	+8	2
Low	5.5Mbit/s	-7.74	+8	3
Low	11Mbit/s	-8.15	+8	4

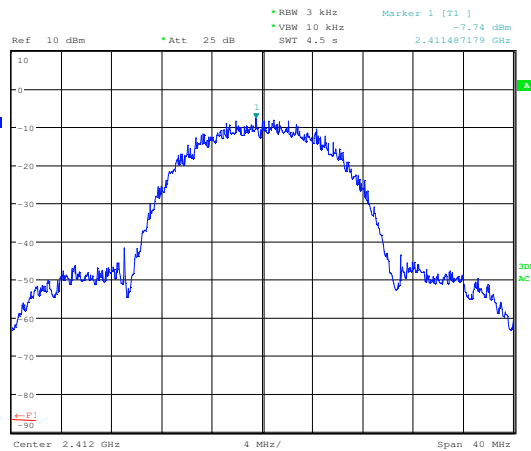
Plot 1



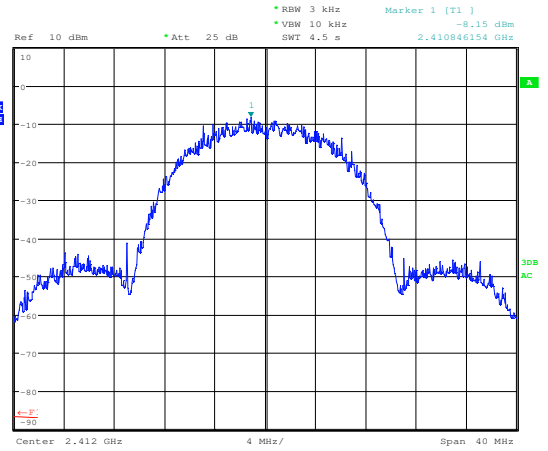
Plot 2



Plot 3

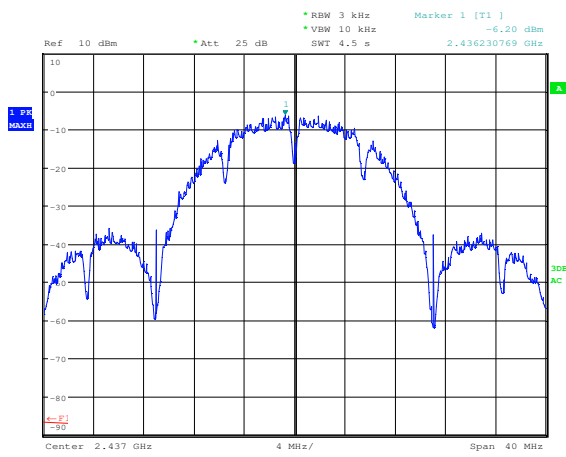


Plot 4

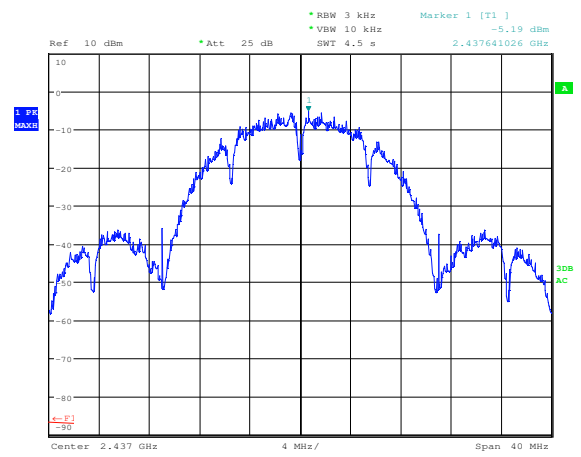


Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
Middle	1Mbit/s	-6.20	+8	1
Middle	2Mbit/s	-5.19	+8	2
Middle	5.5Mbit/s	-5.72	+8	3
Middle	11Mbit/s	-6.42	+8	4

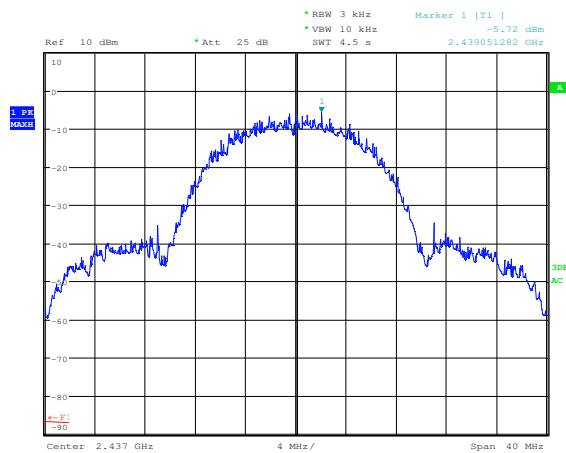
Plot 1



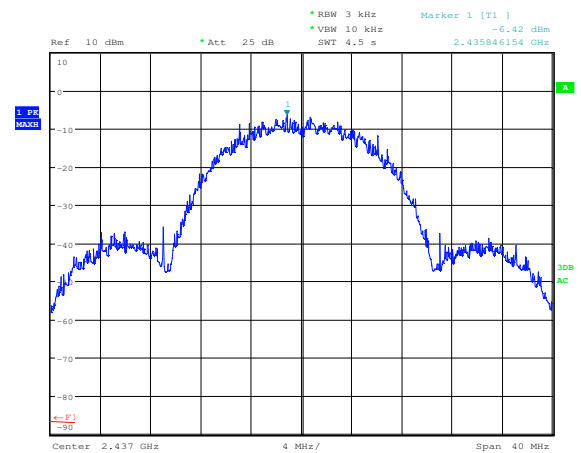
Plot 2



Plot 3

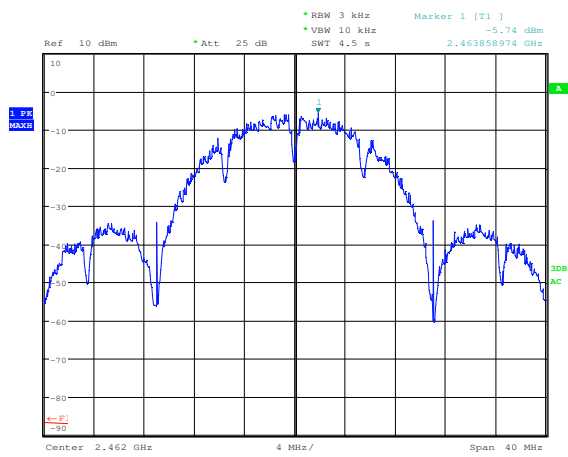


Plot 4

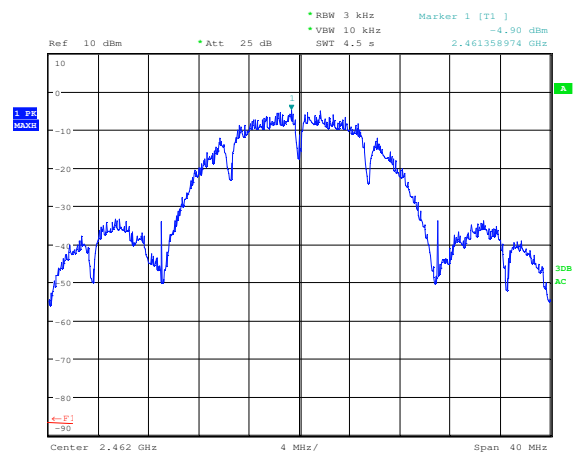


Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
High	1Mbit/s	-5.74	+8	1
High	2Mbit/s	-4.90	+8	2
High	5.5Mbit/s	-5.17	+8	3
High	11Mbit/s	-5.77	+8	4

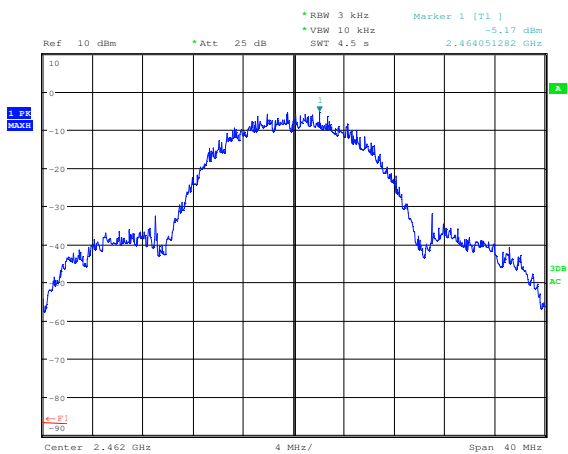
Plot 1



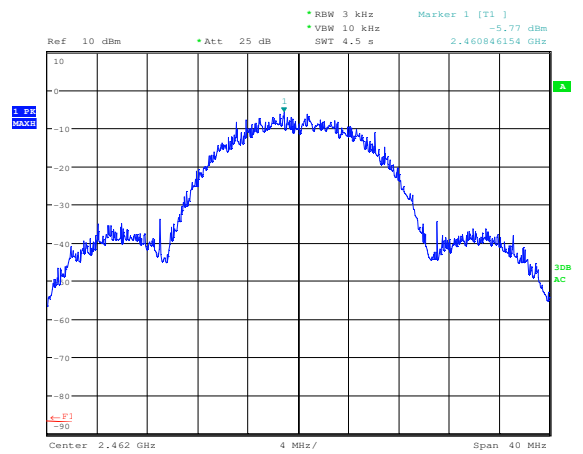
Plot 2



Plot 3



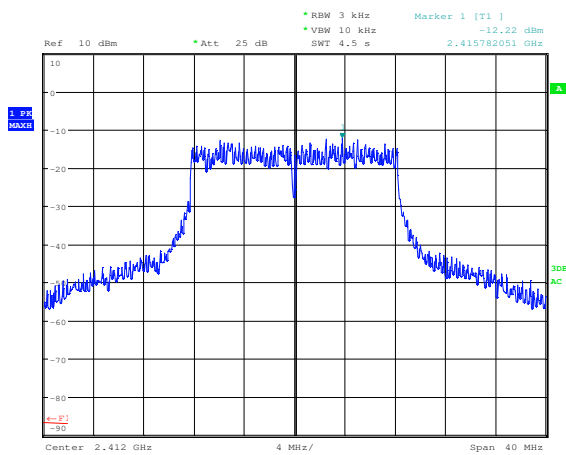
Plot 4



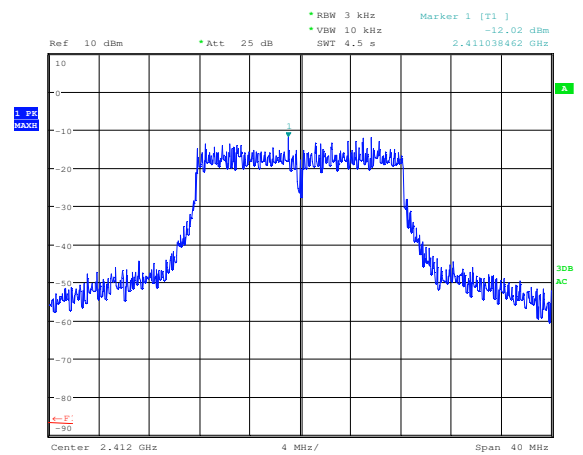
TEST CONDITION: 802.11G MODULATION OFDM

Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
Low	6Mbit/s	-12.22	+8	1
Low	18Mbit/s	-12.02	+8	2
Low	36Mbit/s	-9.38	+8	3
Low	54Mbit/s	-9.54	+8	4

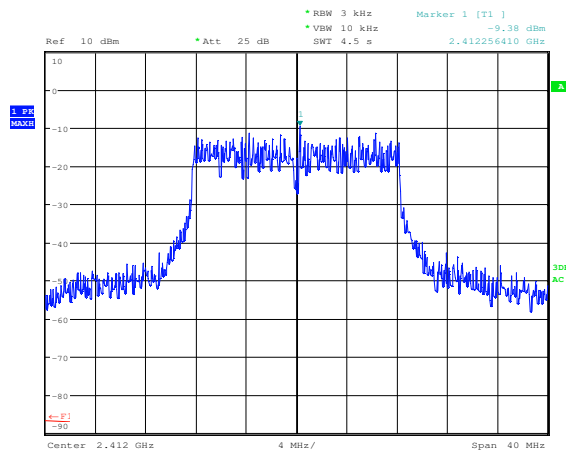
Plot 1



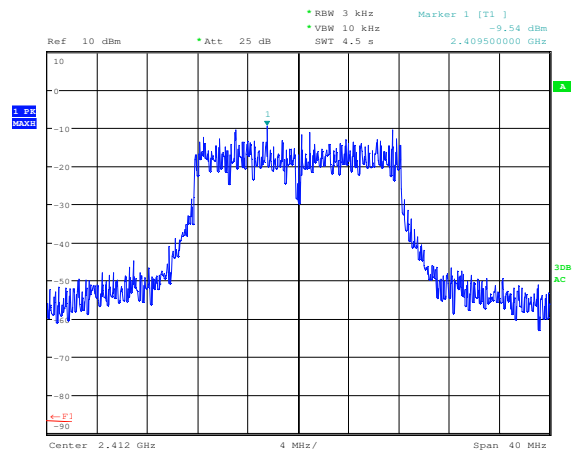
Plot 2



Plot 3

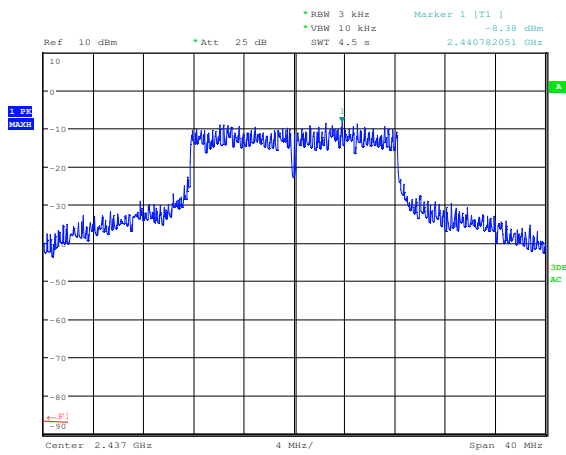


Plot 4

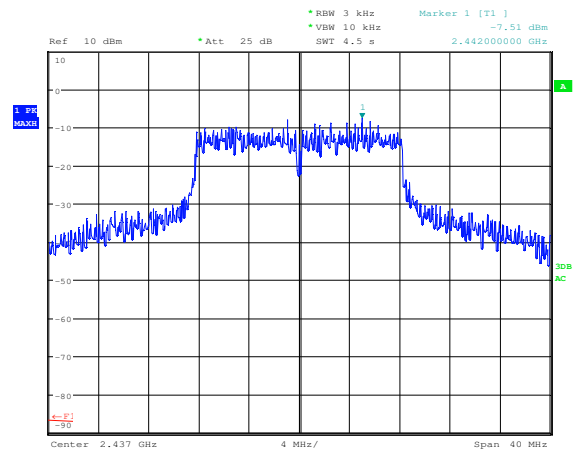


Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
Middle	6Mbit/s	-8.38	+8	1
Middle	18Mbit/s	-7.51	+8	2
Middle	36Mbit/s	-6.03	+8	3
Middle	54Mbit/s	-8.40	+8	4

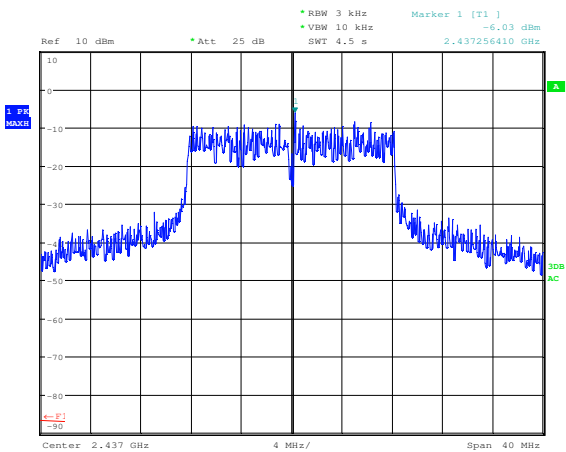
Plot 1



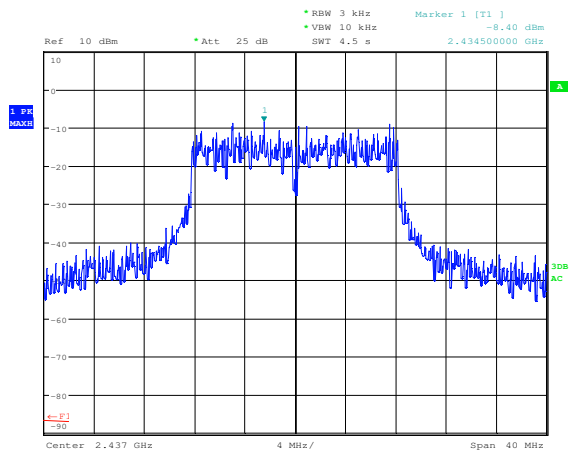
Plot 2



Plot 3

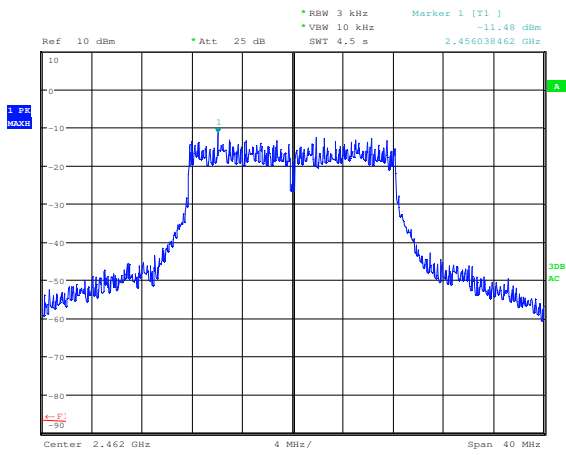


Plot 4

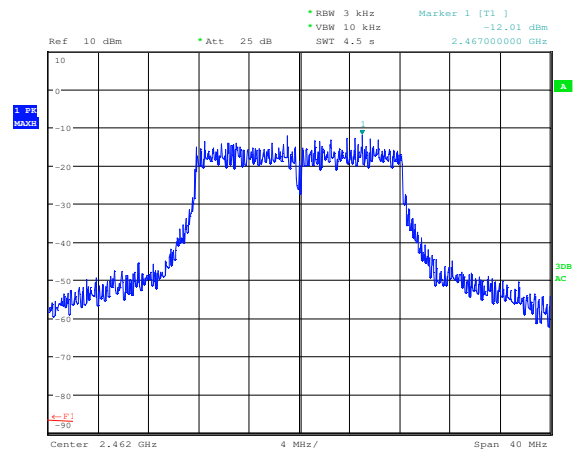


Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
High	6Mbit/s	-11.48	+8	1
High	18Mbit/s	-12.01	+8	2
High	36Mbit/s	-9.17	+8	3
High	54Mbit/s	-8.59	+8	4

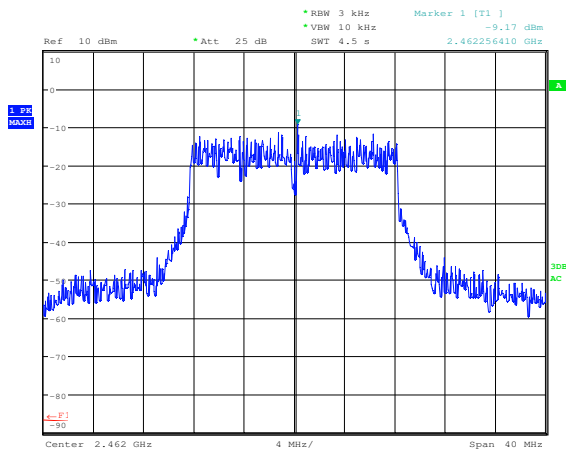
Plot 1



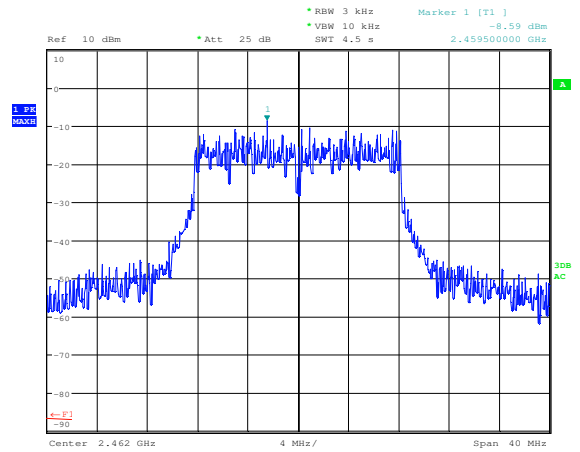
Plot 2



Plot 3



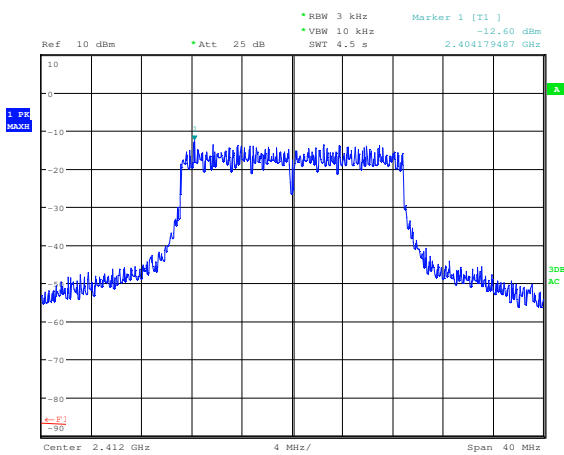
Plot 4



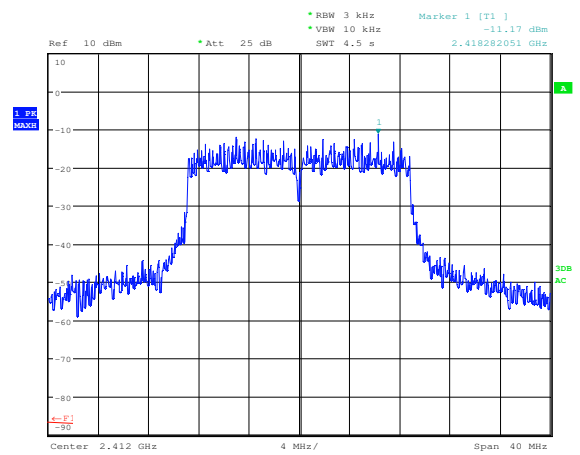
TEST CONDITION: 802.11N MODULATION OFDM

Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
Low	6.5Mbit/s	-12.22	+8	1
Low	26Mbit/s	-11.17	+8	2
Low	39Mbit/s	-8.90	+8	3
Low	65Mbit/s	-10.76	+8	4

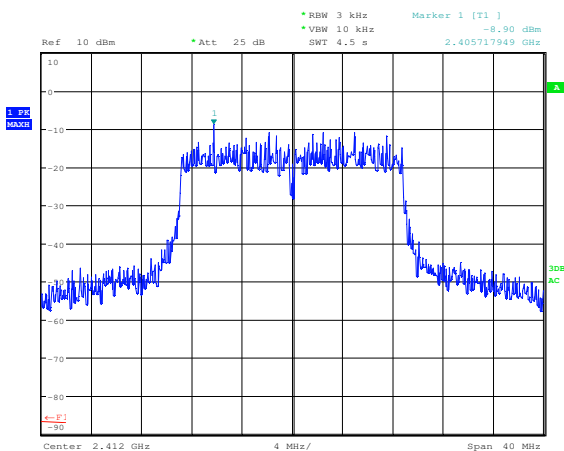
Plot 1



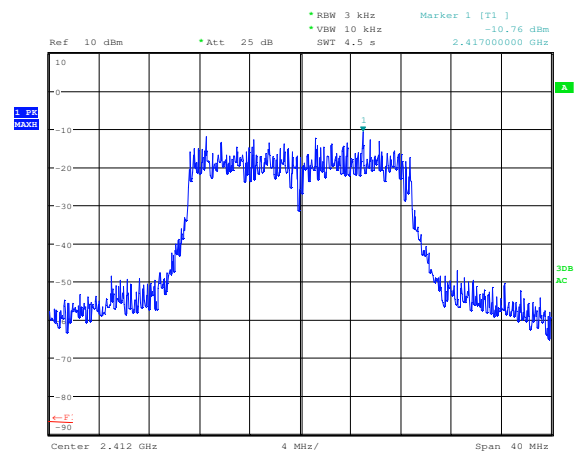
Plot 2



Plot 3

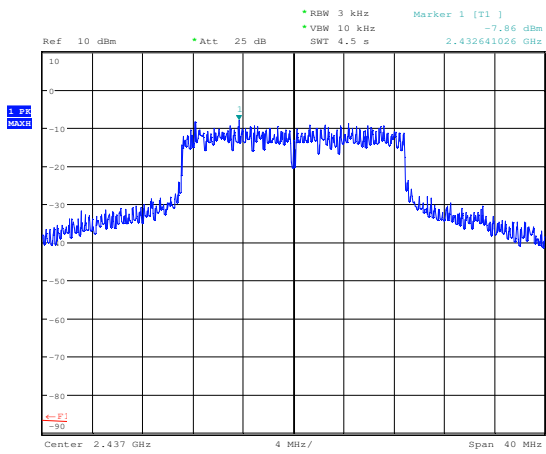


Plot 4

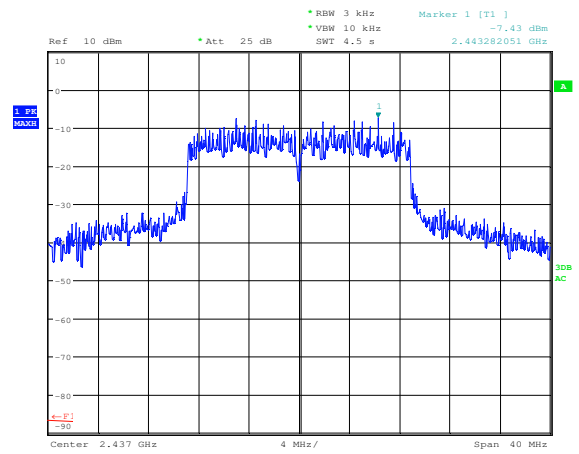


Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
Middle	6.5Mbit/s	-7.86	+8	1
Middle	26Mbit/s	-7.43	+8	2
Middle	39Mbit/s	-5.49	+8	3
Middle	65Mbit/s	-9.33	+8	4

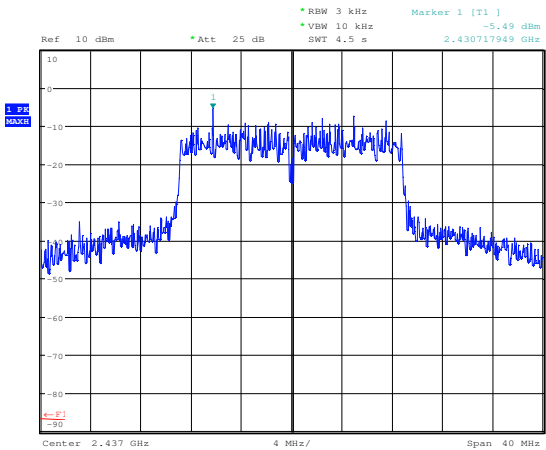
Plot 1



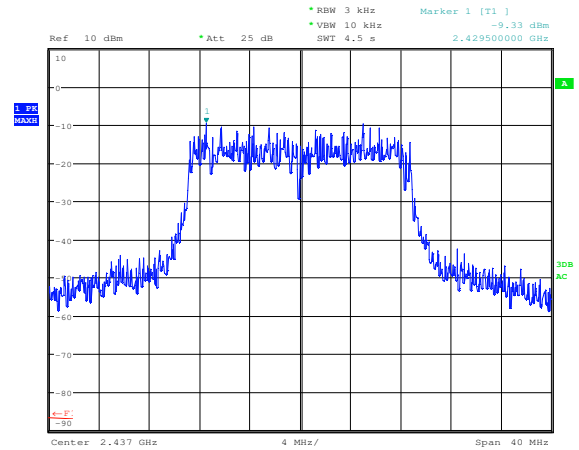
Plot 2



Plot 3

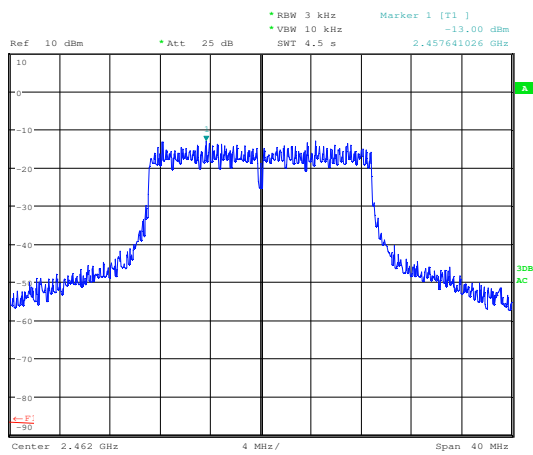


Plot 4

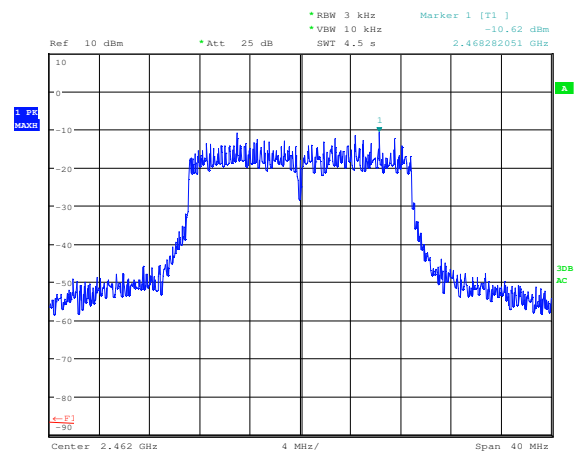


Channel (No.)	Data rate	Transmitter power on 3 kHz band (dBm)	Limit (dBm)	Plot (No.)
High	6.5Mbit/s	-13.00	+8	1
High	26Mbit/s	-10.62	+8	2
High	39Mbit/s	-8.58	+8	3
High	65Mbit/s	-8.88	+8	4

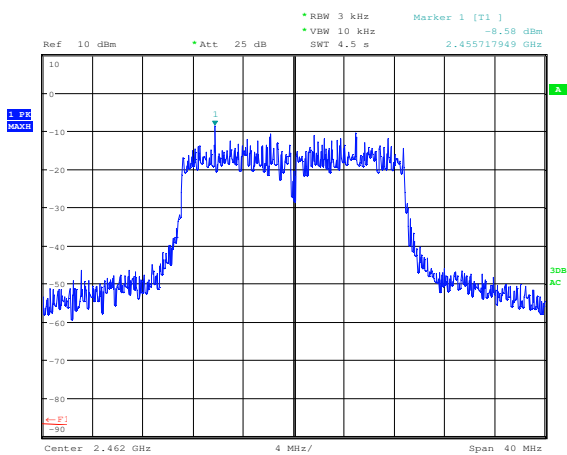
Plot 1



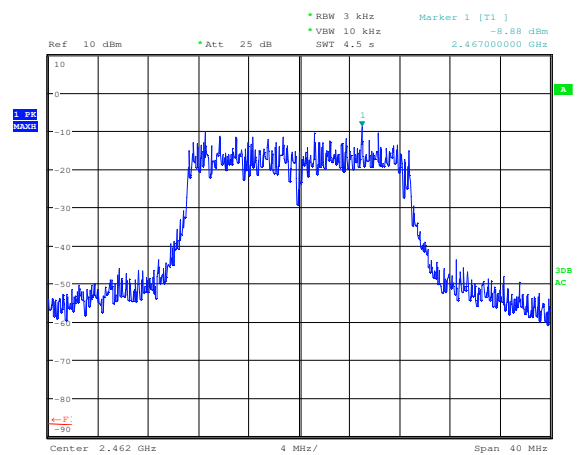
Plot 2



Plot 3



Plot 4



7.8 RF EXPOSURE EVALUATION

TEST REQUIREMENT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines § 1.1307(b)(1).

EUT classification (fixed, mobile or portable devices)

Portable according to § 2.1093(b) of this Chapter

LIMITS

According to § 2.1093 of this Chapter, by means of the following guidelines: OET Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies (447498 D01 General RF Exposure Guidance v06)

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≥ 50 mm

447498 D01 General RF Exposure Guidance v06 – Appendix A

MHz	50	60	70	80	90	mm
100	474	481	487	494	501	SAR Test Exclusion Threshold (mW)
150	387	397	407	417	427	
300	274	294	314	334	354	
450	224	254	284	314	344	
835	164	220	275	331	387	
900	158	218	278	338	398	
1500	122	222	322	422	522	
1900	108	209	309	409	509	
2450	96	196	296	396	496	
3600	79	179	279	379	479	
5200	66	166	266	366	466	
5400	65	165	265	365	465	
5800	62	162	262	362	462	

The test separation distances ≥ 50 mm is applied to determine SAR test exclusion.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≥ 50 mm

447498 D01 General RF Exposure Guidance v06 – Appendix A

Channel No.	Frequency (MHz)	Measured Radiated power (at 3 m distance)	E.I.R.P.	Distance	[[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]] mW, for > 1500 MHz and ≤ 6 GHz	Limits
		(dBuV/m)	(mW)	(mm)		
Lowest	2412	112.60	53.95	50	96mW	96mW

Max level measured in this test condition: 802.11b DSSS with external Antenna

Channel No.	Frequency (MHz)	Measured Radiated power (at 3 m distance)	E.I.R.P.	Distance	[[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]] mW, for > 1500 MHz and ≤ 6 GHz	Limits
		(dBuV/m)	(mW)	(mm)		
Middle	2437	114.18	78.52	50	96mW	96mW

Max level measured in this test condition: 802.11b DSSS with external Antenna

Channel No.	Frequency (MHz)	Measured Radiated power (at 3 m distance)	E.I.R.P.	Distance	[[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]] mW, for > 1500 MHz and ≤ 6 GHz	Limits
		(dBuV/m)	(mW)	(mm)		
Highest	2462	114.34	81.47	50	96mW	96mW

Max level measured in this test condition: 802.11b DSSS with external Antenna

TEST RESULT

This value is less than the low threshold limit with a distance ≥ 50 mm. No SAR test is required.

8. MEASUREMENTS AND TESTS UNCERTAINTY

Unless otherwise stated the uncertainties for the tests and measurements are evaluated in according to IMQ Operational Instruction IO-LAB-001 and IO-LAB-004. and requirement of NIST Technical Note 1297 and NIS 81: 1994 “The Treatment of Uncertainty in EMC Measurements”

The expanded uncertainty was calculated for all measurements and tests listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainty in EMC Measurements“, with UKAS document LAB 34 and is documented in the quality system accordance to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device

Internal Procedure PI-037 ensures that the requirements for traceability of calibrations, of all test equipment requiring calibration, and calibration intervals are met.

Methods/Standard	Parameter	Expanded Uncertainty	Unit	Confidence level	Coverage Factor	Degree of freedom
Continuous disturbance	QP detector 9 – 150 kHz	2,47	dB	95%	2,00	25
	QP detector 150 k – 30 MHz	2,61	dB	95%	2,00	26
	QP detector using Voltage Probe	2,45	dB	95%	2,00	26
	QP detector using ISN	3,15	dB	95%	2,00	> 60
	QP detector using Current Probe	2,15	dB	95%	2,00	35
Radiated disturbance	QP detector (30 MHz - 100 MHz) H polarization	4,33	dB	95%	2,00	> 60
	QP detector (30 MHz - 100 MHz) V polarization	4,22	dB	95%	2,00	> 60
	QP detector (100 MHz - 200 MHz) H polarization	3,40	dB	95%	2,00	> 60
	QP detector (100 MHz - 200 MHz) V polarization	4,76	dB	95%	2,00	> 60
	QP detector (200 MHz - 1000 MHz) H polarization	3,91	dB	95%	2,00	> 60
	QP detector (200 MHz - 1000 MHz) V polarization	3,82	dB	95%	2,00	> 60
	P detector 1-6 GHz	4,77	dB	95%	2,00	> 60
	P detector 6 – 18 GHz	5,14	dB	95%	2,00	> 60

9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

IMQ Serial Number	Instrument	Manufacturer	Type	Last Cal.	Cal. Period.	Calibration Company
P01709	Shielded semi-anechoic chamber	SIDT	/	03-15	24	IMQ
P02486	Turntable controller unit	FRANKONIA	FCTAM01	/	/	/
P02488	Mast antenna	FRANKONIA	FAM4	/	/	/
S05562	EMI Receiver	ROHDE & SCHWARZ	ESU 8	05-15	12	Rohde & Schwarz
S03631	LISN 1 PHASE	ROHDE & SCHWARZ	ENV216	03-16	12	I.N.R.I.M.
S02508	Loop Antenna	ROHDE & SCHWARZ	HFH2-Z2	01-15	24	SEIBERSDORF
S06463	Log antenna	ARA	VULB9160	04-16	36	SEIBERSDORF
S04272	Horn antenna	SCHWARZBECK	BBHA 9120D	07-14	36	NPL
S03668	Horn antenna	SCHWARZBECK	BBHA 9170	08-13	36	Liberty Labs
S03629	Spectrum Analyzer	Rohde & Schwarz	FSP40	04-16	12	Rohde & Schwarz
S03542	Preamplifier	Hewlett Packard	HP 8449B	04-16	24	IMQ
W-00199/E	Software	ROHDE & SCHWARZ	EMC32 Ver. 6.30	/	/	/
H-00165	PC	/	/	/	/	/

END OF TEST REPORT