

Test Report for FCC

FCC ID :ZKE-ICAMM300

Report Number		ESTRFC1810-005		
Applicant	Company name	Iris ID, Inc.		
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	Contact person	Mr Dae-Sung Noh		
Product	Product name	Portable Data Collection Terminal		
	Model No.	iCAM M300	Manufacturer	Iris ID, Inc.
	Serial No.	None	Country of origin	KOREA
Test date	2018-08-29 ~ 2018-09-27		Date of issue	17-Oct-18
Testing location	347-69, Jungbu-daero 147beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do 467-811, R. O. Korea			
Standard	FCC PART 15 Subpart C (15.247) , ANSI C 63.10 , KDB 558074 D01			
Measurement facility registration number		659627		
Tested by	Senior Engineer H.K. Lee		(Signature)	
Reviewed by	Engineering Manager I.K. Hong		(Signature)	
Abbreviation	OK, Pass = Passed, Fail = Failed, N/A = not applicable			
* Note - This test report is not permitted to copy partly without our permission - This test result is dependent on only equipment to be used - This test result based on a single evaluation of one sample of the above mentioned - Marketing Model name : RP1600				

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Appendix 1. Special diagram

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1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.

ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Suite 1015 World Meridian II, 123 Gasan Digital 2-ro, Geumcheon-gu, Seoul 153-759, R. O. Korea

EMC/Telecom/Safety Test Lab : 347-69, Jungbu-daero 147beon-gil, Majang-myeon, Icheon-si,
Gyeonggi-do 467-811, R. O. Korea

1.3 Official Qualification(s)

MSIP : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC requirements

FCC : Conformity Assessment Body(CAB) with registration number 659627 under APEC TEL MRA between the RRA and the FCC

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

2. Description of EUT

2.1 Summary of Equipment Under Test

Modulation Type	: CCK, OFDM
Transfer Rate	: 11 Mbps , 54 Mbps, MCS 7
Number of Channel	: 11 ch
PEAK Output Power	: 16.38 dBm
Rating	: DC 3.7 V Battery
Receipt Date	: 2-Apr-18
Testing Voltage	DC 3.7 V

2.2 General descriptions of EUT

Performance Characteristics		Battery(4000mA) Performance	
CPU	Samsung CPU 1.8GHz (Octa core) Exynos5430	Standby time	220 hours
OS	Android 4.4 KitKat	Talk time	10 hours
Memory	3G SDRAM 16G ROM	User profiles	Outdoor WAN+GPS, 15min/hour voice communication, 10kB transmission every 10 min, and GPS on all time, 10.5 hours of operation.
Communication Interface	USB HOST 2.0 HIGH SPEED USB Client 2.0 HIGH SPEED		Outdoor Voice, 15 min/hour voice communication, 10.5 hours of operation and 150 hours standby time.
Physical Characteristics		User Environment	
Dimensions	139mm H X 73mm W X 21mm D	Sealing	
Weight	315 gram with 4000mAH battery	Drop Spec.	
Display	4.3inch. WVGA	Operating Temp.	Main
Input	Touch Panel, 4 side keys, power key, Alphanumeric Keypad		Storage
Battery	4000mA/h, 3.7V, Li-ion Build-in backup battery : 200mA/h, 3.7V (polymer)	AC Power	
Expansion Slot	High capacity micro SD Card	Relative Humidity	
Audio	Speaker / Receiver / MIC		
Wireless (WWAN)	HSPA+(Five-band) 800/850/900/1900/2100MHz Quad-band EDGE GPRS GSM 850/900/1800/1900 MHz		
Bluetooth	Class 2 (2402MHz~2480MHz) Bluetooth V4.0+HS		
Wireless LAN	2.4GHz/ 5GHz 802.11 a/b/g/n	Peripherals and Accessories	
GPS	Embedded A-GPS	Communication	USB Client 2.0 HIGH SPEED
Notification	Vibration and Charging LED	Battery Chargers:	1-slot battery charger Cradle
Scanner	1D Laser Type 2D Imager (SE-4750SR)		
Camera			
Resolution:	13 megapixel		
Illumination:	User controllable flash		
Lens:	Auto Focus		

3. Test Standards

Test Standard : FCC PART 15 Subpart C (15.247)

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.10 & KDB558074 D01

This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

Summary of Test Results

Applied Standard : 47 CFR Part 15 Subpart C				remark
Standard	Test Type	Result	Remark	Limit
15.207	AC Power Conducted Emission	Pass	Meet the requirement	
15.205 & 15.209	Restricted band / Intentional Radiated Emission	Pass	Meet the requirement	
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement	Min. 500 kHz
	99 % Bandwidth			
15.247(b)(3)	Maximum Peak/average output power	Pass	Meet the requirement	Max. 30 dBm
15.247(c)	Transmitter Radiated Emission	Pass	Meet the requirement	Table 15.209
15.247(e)	Power Spectral Density	Pass	Meet the requirement	Max. 8 dBm
15.247(d)	Band Edge Measurement	Pass	Meet the requirement	20 dB less

4. Measurement Condition

4.1 EUT Operation

a. Channel

Ch.	Frequency	Ch.	Frequency
1	2 412 MHz	7	2 442 MHz
2	2 417 MHz	8	2 447 MHz
3	2 422 MHz	9	2 452 MHz
4	2 427 MHz	10	2 457 MHz
5	2 432 MHz	11	2 462 MHz
6	2 437 MHz		

b. Measurement Channel : WLAN : Low(2 412 MHz), Middle(2 437 MHz), High(2 462 MHz)

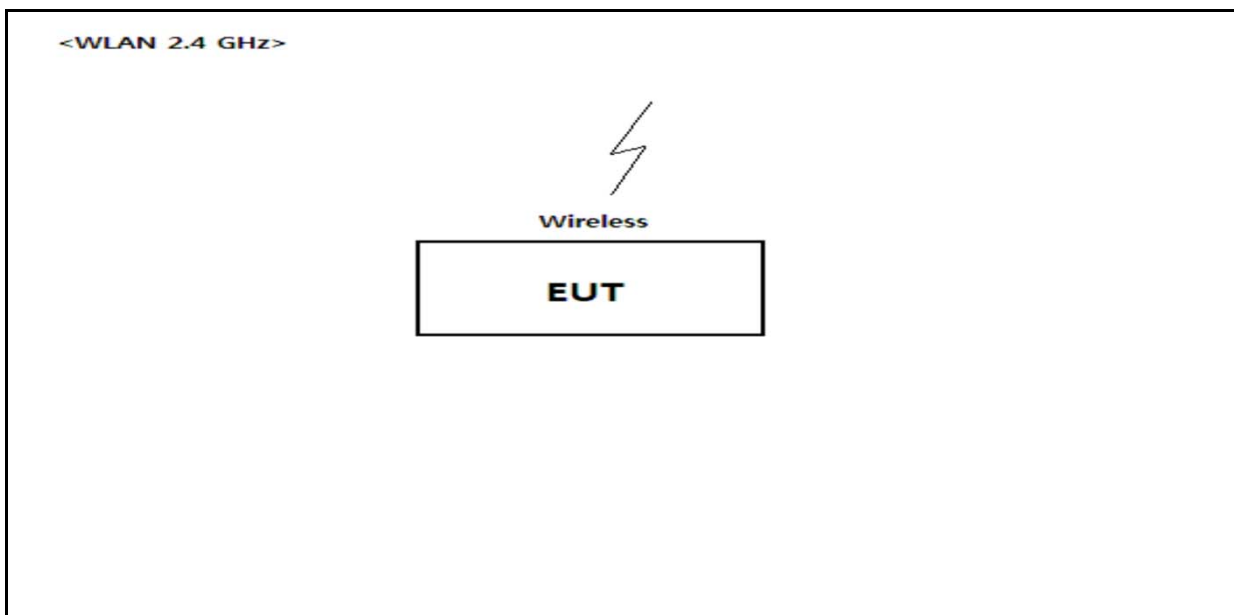
c. Test Mode : Continuous Output, CCK, OFDM

d. Test rate : 11 Mbps, 54 Mbps, MCS 7

4.2 EUT Operation

- The EUT was in the following operation mode during all testing
 - * Wireless LAN 2.4 GHz operation check
 - * Transmit mode were measured each channels(802.11.b, 802.11.g, 802.11.n20)

4.3 Configuration and Peripherals



4.4 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
Portable Data Collection Terminal	iCAM M300	NONE	Iris ID, Inc.	EUT
Cradle	iCAM M300-CRST	NONE	Iris ID, Inc.	

4.5 Cable Connecting

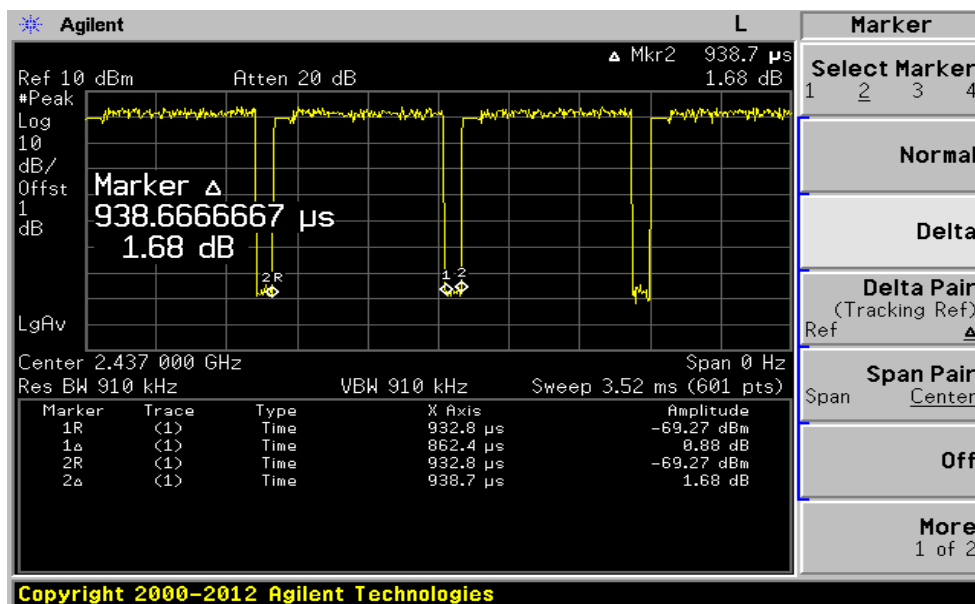
Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
Portable Data Collection Terminal	Power	Adapter	-	2	Unshielded	

4.6 DUTY CYCLE OF TEST SIGNAL

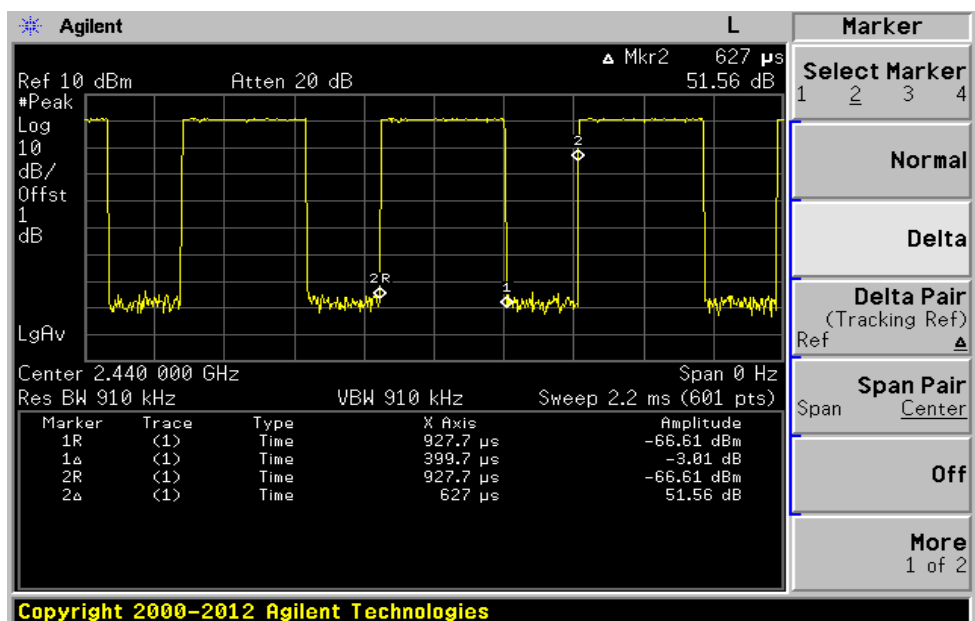
Duty cycle is > 98 %, duty factor shall be considered.

duty cycle = 88% , duty factor = $10 \cdot \log(1/0.88) = 0.555$

802.11b



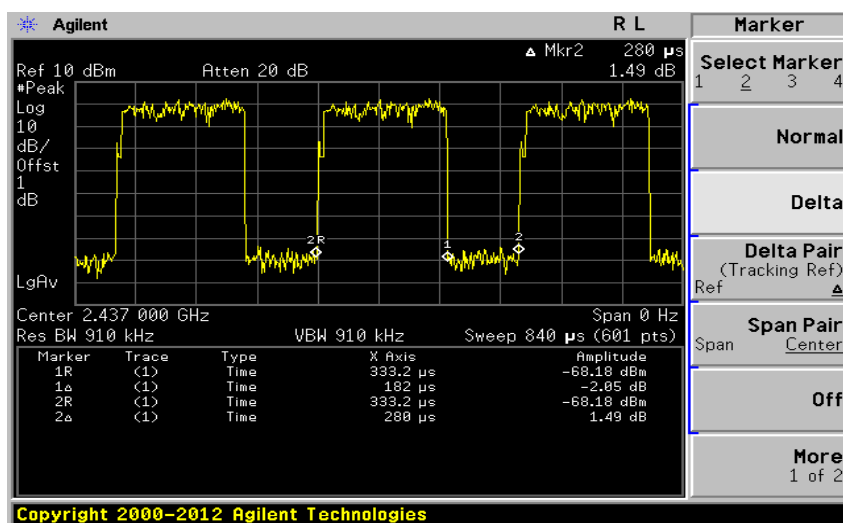
duty cycle = 58% , duty factor = $10 \cdot \log(1/0.58) = 2.365$



4.6 DUTY CYCLE OF TEST SIGNAL

duty cycle = 59% , duty factor = $10 \cdot \log(1/0.59) = 2.291$

802.11n20



5. DTS bandwidth

5.1 Test procedure

Acordding to 558074 D01 DTS Meas Guidance

5.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 30 KHz . VBW $\geq$ 300 kHz
- . Span= 50 MHz . Sweep= suitable duration based on the EUT specification.
- Limits : FCC § 15.247(a)(2)

6dB Bandwidth Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	27-Dec-18
RF Cable	Length: 30 cm	–	
–Spectrum Analyzer $\Leftrightarrow$ EUT	Loss: 1 dB	–	

5.3 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	b, g, n20	ENVIRONMENTAL CONDITION	24.0 °C, 44.0 % R.H.
INPUT POWER	3.7 Vd.c.		

MODE – 802.11b

Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 412	11.09	8.64	0.5	PASS
2 437	11.17	8.05	0.5	PASS
2 462	11.22	8.12	0.5	PASS

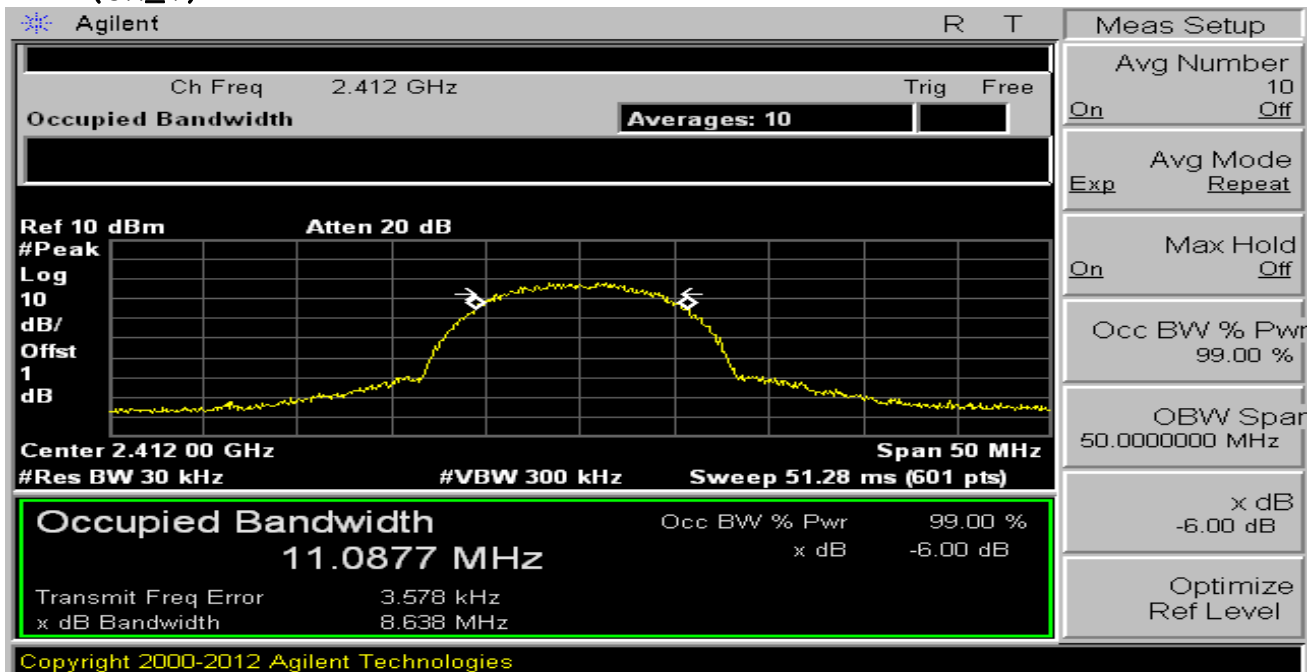
MODE – 802.11g

Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 412	16.33	15.78	0.5	PASS
2 437	16.33	16.09	0.5	PASS
2 462	16.32	15.77	0.5	PASS

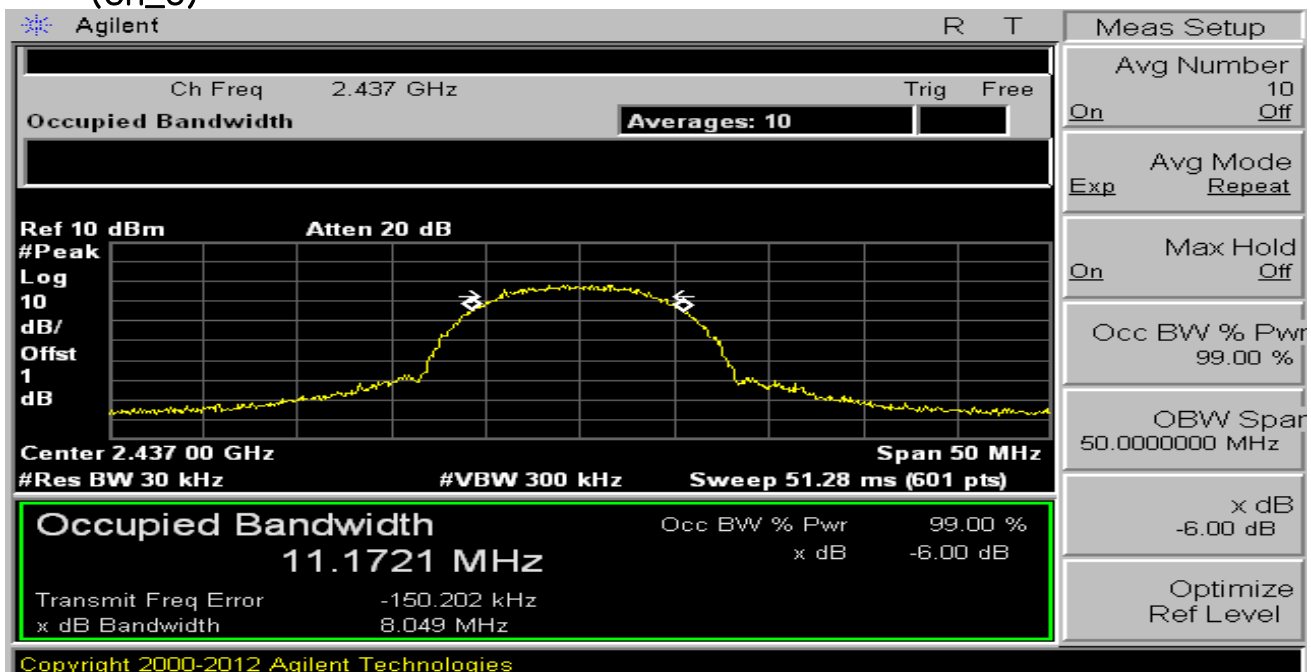
MODE – 802.11n20

Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 412	17.57	17.45	0.5	PASS
2 437	17.60	17.59	0.5	PASS
2 462	17.57	15.99	0.5	PASS

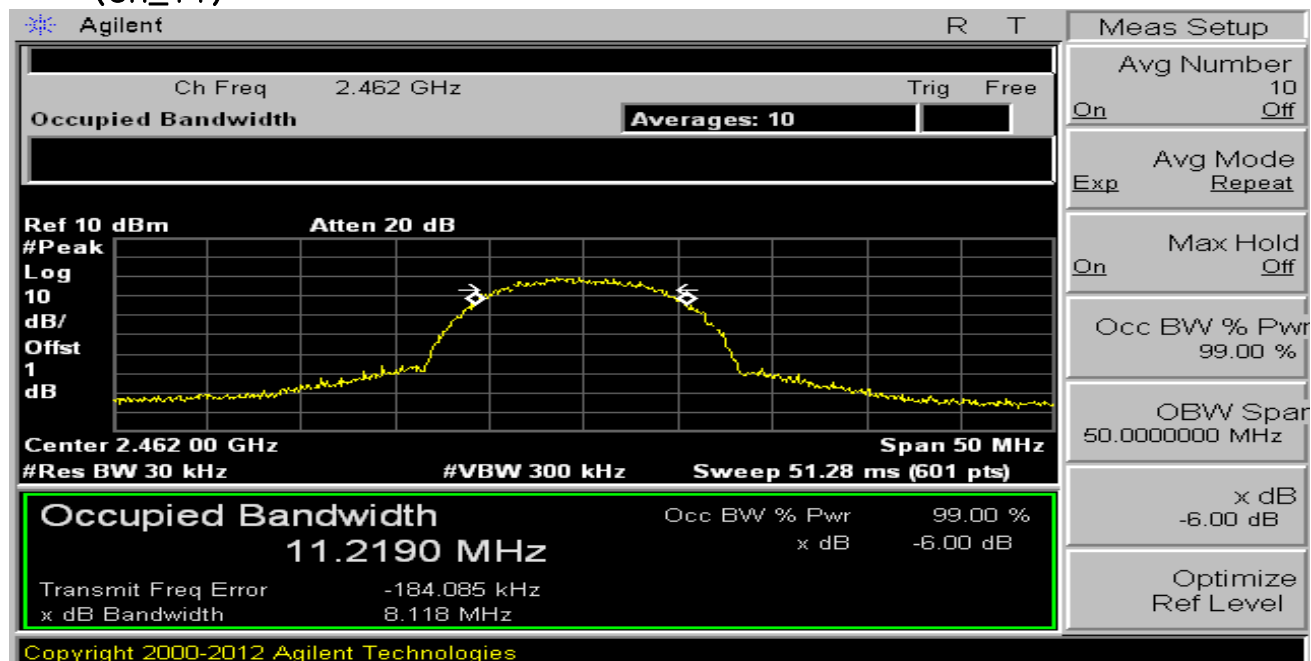
5.4 Trace data – 802.11b (ch_1)



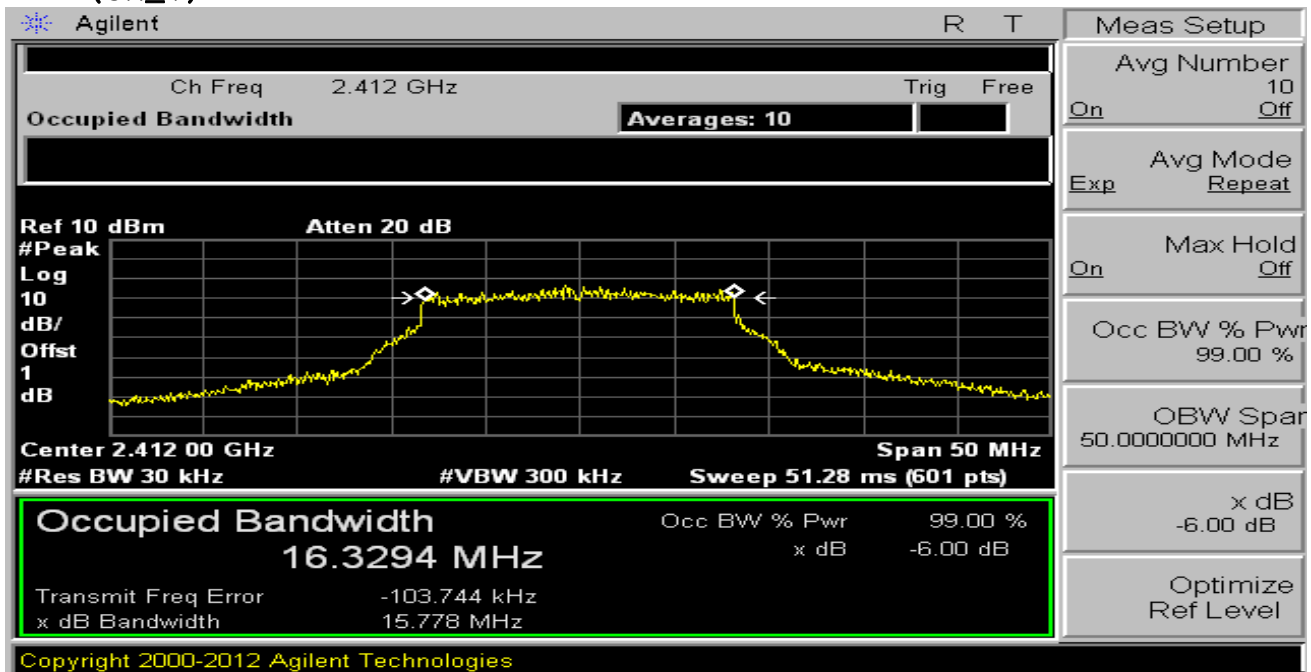
(ch_6)



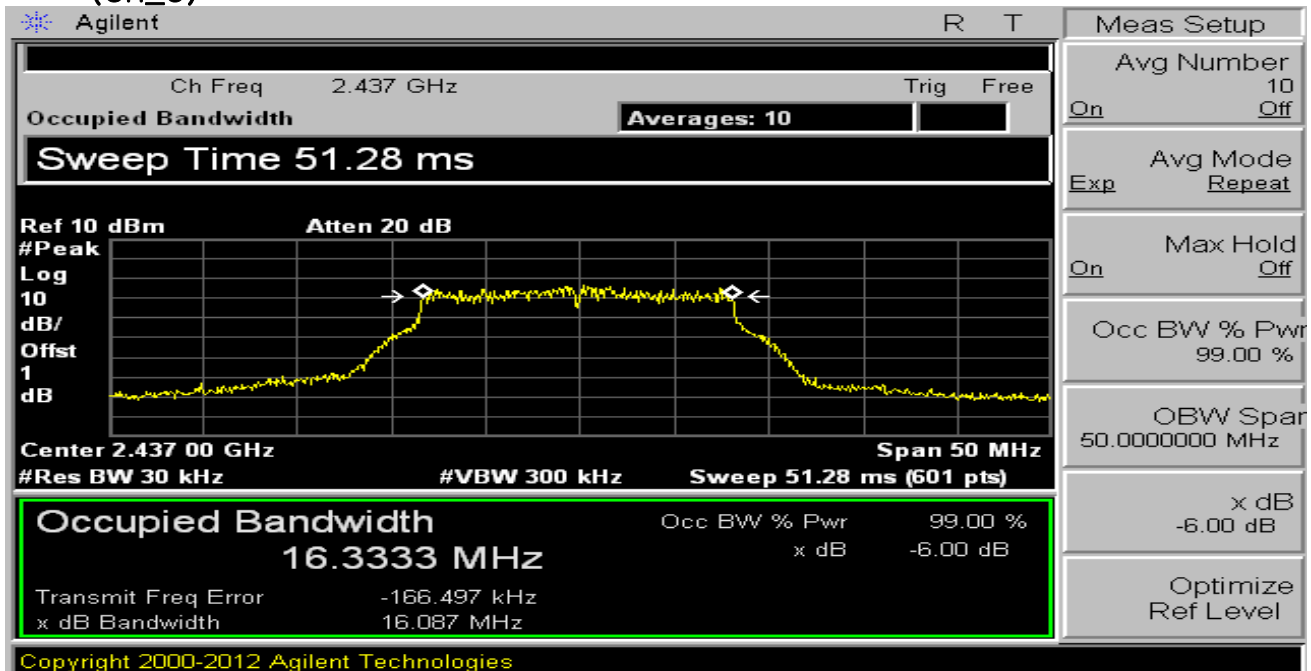
(ch_11)



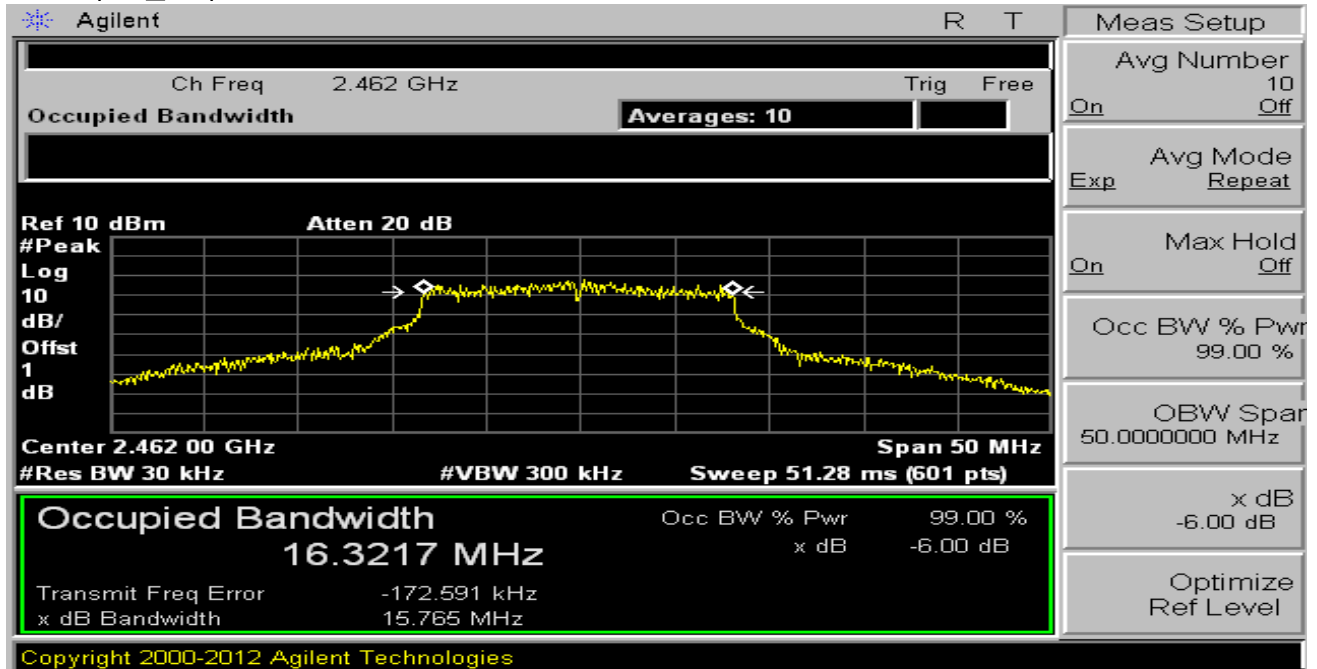
5.4 Trace data – 802.11g (ch_1)



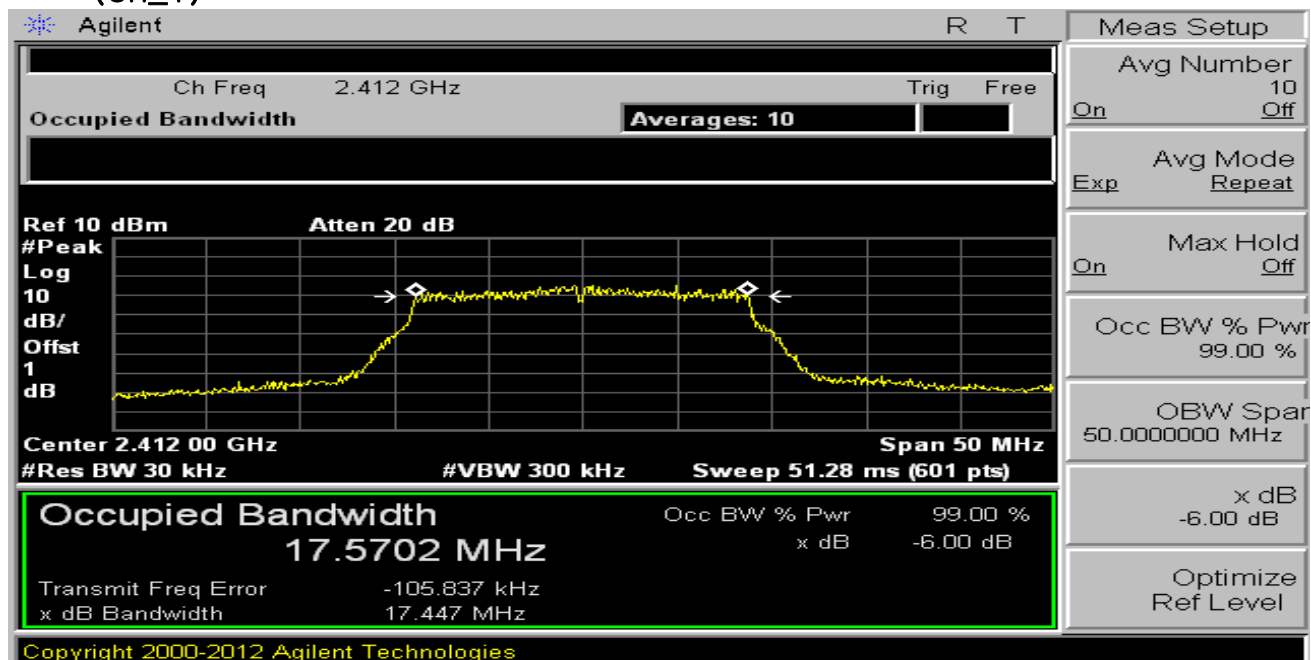
(ch_6)



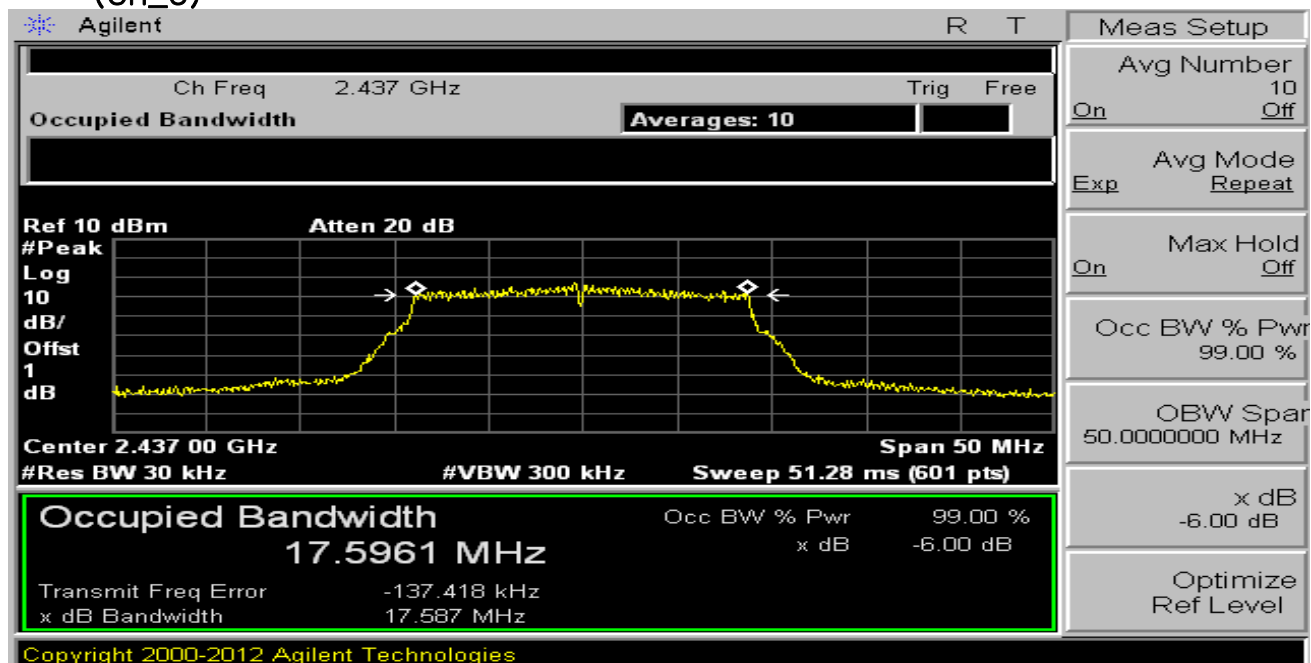
(ch_11)



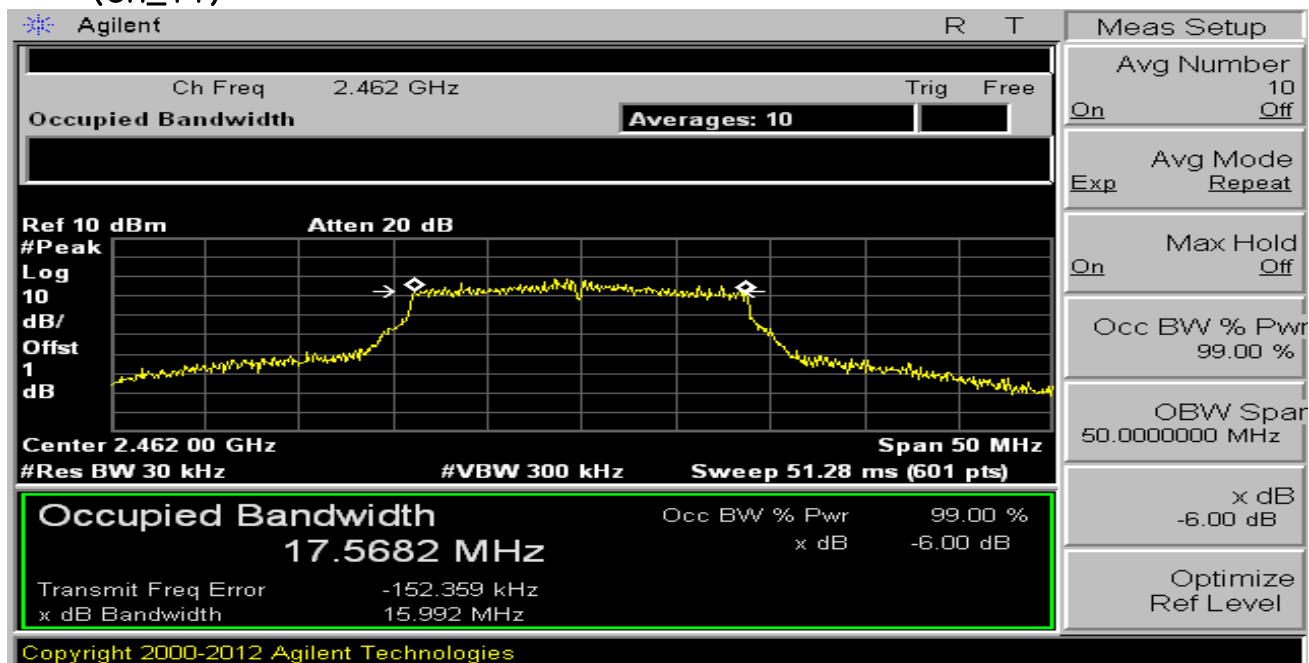
5.4 Trace data – 802.11n20 (ch_1)



(ch_6)



(ch_11)



6. Maximum peak conducted output power

6.1 Test procedure

Acordding to 558074 D01 DTS Meas Guidance

6.2 Test instruments and measurement setup

The transmitter antenna terminal is connected to the input of a wide-band Power Sensor.

Maximum Peak Output Power Test Instruments

Description	Model	Serial Number	Cal. Due Date
Power Meter	N1912A	MY45100570	2018-12-26
Power Sensor	N1912A	MY45240427	2018-12-26
-Power Meter <=> EUT	Loss: 1 dB	-	

6.3 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	b, g, n20, n40	ENVIRONMENTAL CONDITION	22.0 °C, 48.0 % R.H.
INPUT POWER	12.0 Vd.c.		

MODE – 802.11b

CHANNEL	Channel frequency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
1	2 412	PEAK	7.65	0.0058	30.0	PASS
6	2 437	PEAK	8.65	0.0073	30.0	PASS
11	2 462	PEAK	9.49	0.0089	30.0	PASS

MODE – 802.11g

CHANNEL	Channel frequency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
1	2 412	PEAK	14.14	0.0259	30.0	PASS
6	2 437	PEAK	14.94	0.0312	30.0	PASS
11	2 462	PEAK	15.55	0.0359	30.0	PASS

MODE – 802.11n20

CHANNEL	Channel frequency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
1	2 412	PEAK	15.03	0.0318	30.0	PASS
6	2 437	PEAK	15.33	0.0341	30.0	PASS
11	2 462	PEAK	16.38	0.0435	30.0	PASS

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	b, g, n20	ENVIRONMENTAL CONDITION	22.0 °C, 48.0 % R.H.
INPUT POWER	3.7 Vd.c.		

MODE – 802.11b

CHANNEL	Channel frequency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
1	2 412	AVG	3.86	0.56	4.4	0.0028
6	2 437	AVG	4.60	0.56	5.2	0.0033
11	2 462	AVG	9.49	0.56	10.0	0.0101

MODE – 802.11g

CHANNEL	Channel frequency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
1	2 412	AVG	2.23	2.37	4.6	0.0029
6	2 437	AVG	3.35	2.37	5.7	0.0037
11	2 462	AVG	4.72	2.37	7.1	0.0051

MODE – 802.11n20

CHANNEL	Channel frequency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
1	2 412	AVG	3.46	2.29	5.8	0.0038
6	2 437	AVG	4.51	2.29	6.8	0.0048
11	2 462	AVG	5.70	2.29	8.0	0.0063

7. Maximum power spectral density level in the fundamental emission

7.1 Test procedure

Acordding to 558074 D01 DTS Meas Guidance

7.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Limits FCC § 15.247

The peak power density Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E440A	US42041291	2018-12-27
Gignal Analyzer	FSV40	100939	2018-12-27
-Spectrum Analyzer <=> EUT	Loss: 1 dB	-	

7.3 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	b, g, n20	ENVIRONMENTAL CONDITION	22.0 °C, 45.0 % R.H.
INPUT POWER	3.7 Vd.c.		

MODE – 802.11b

CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
1	2 412	-12.98	8.0	20.98
6	2 437	-12.21	8.0	20.21
11	2 462	-11.60	8.0	19.60

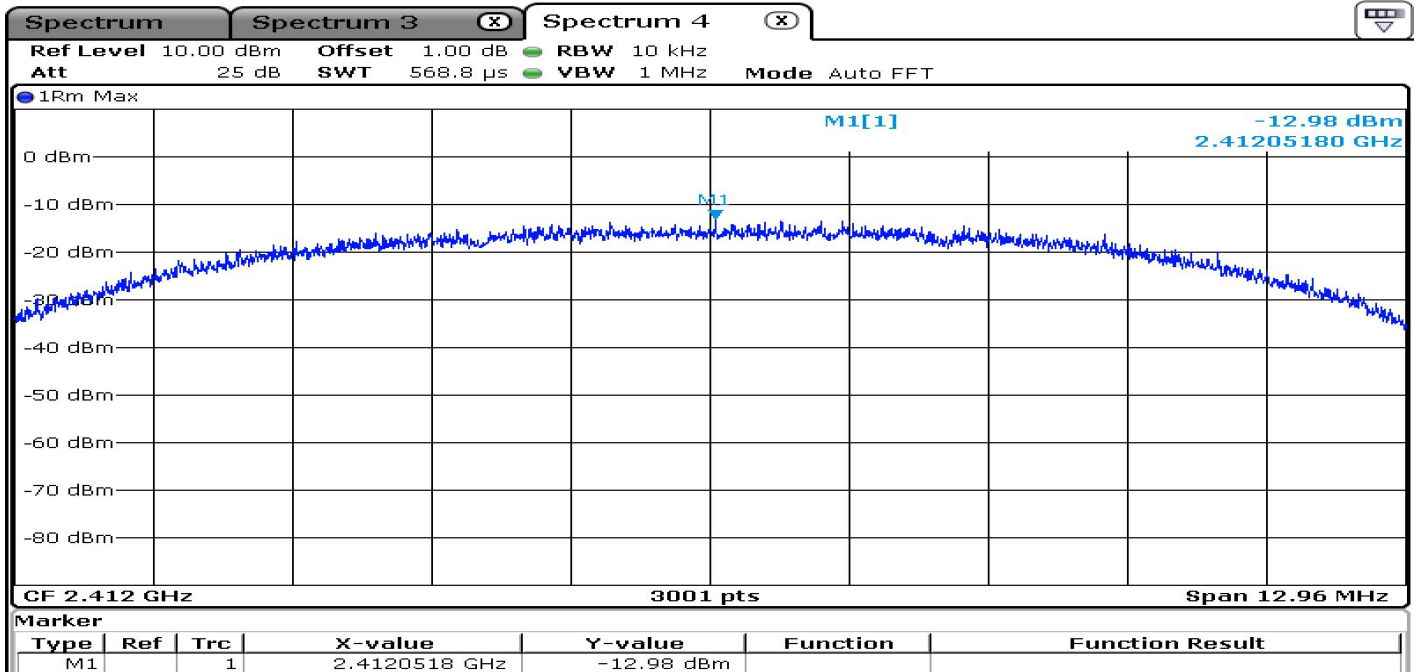
MODE – 802.11g

CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
1	2 412	-15.49	8.0	23.49
6	2 437	-14.72	8.0	22.72
11	2 462	-12.99	8.0	20.99

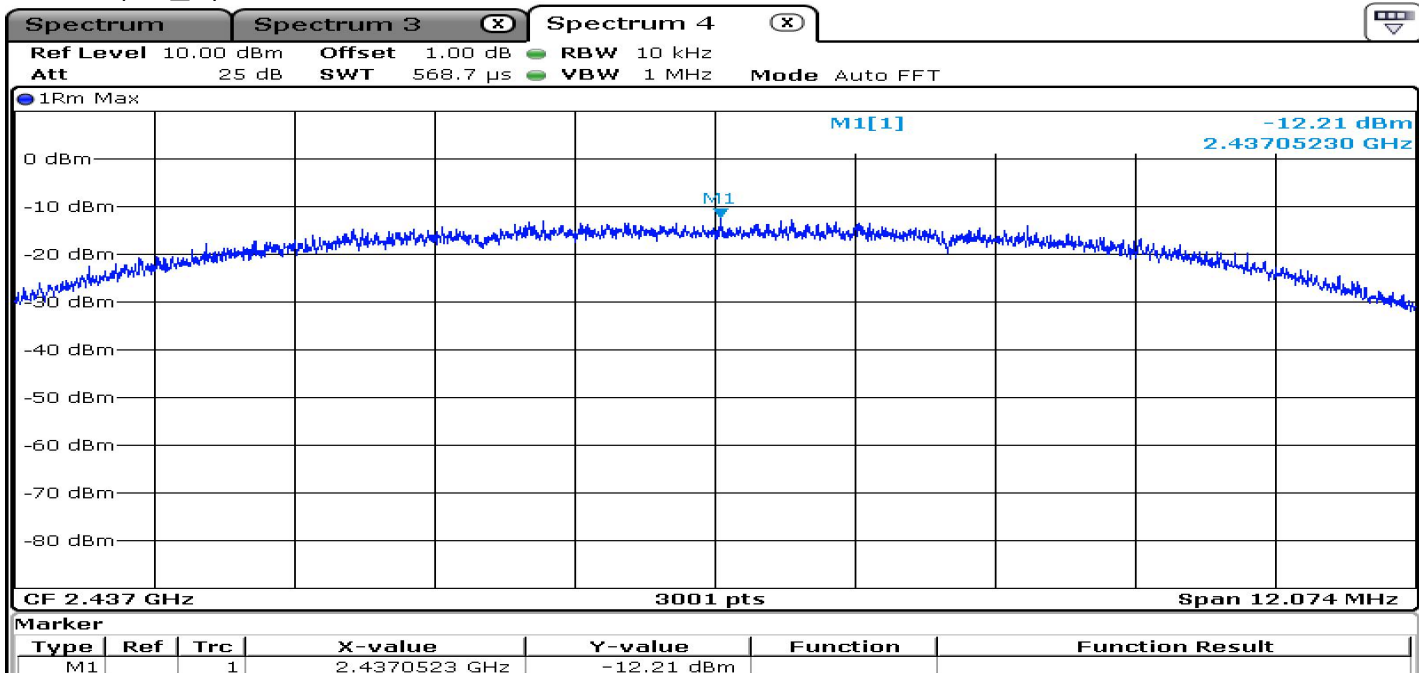
MODE – 802.11n20

CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
1	2 412	-15.58	8.0	23.58
6	2 437	-12.77	8.0	20.77
11	2 462	-12.49	8.0	20.49

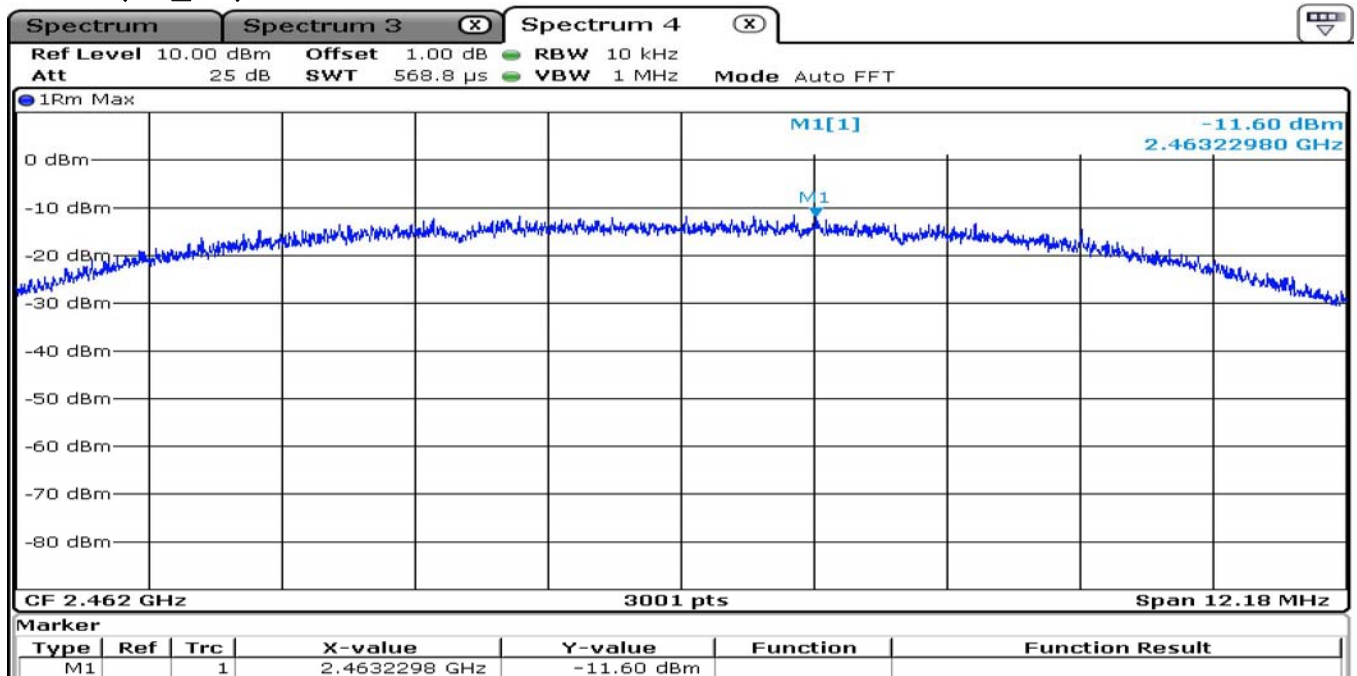
7.4 Trace data – 802.11b mode (ch_1)



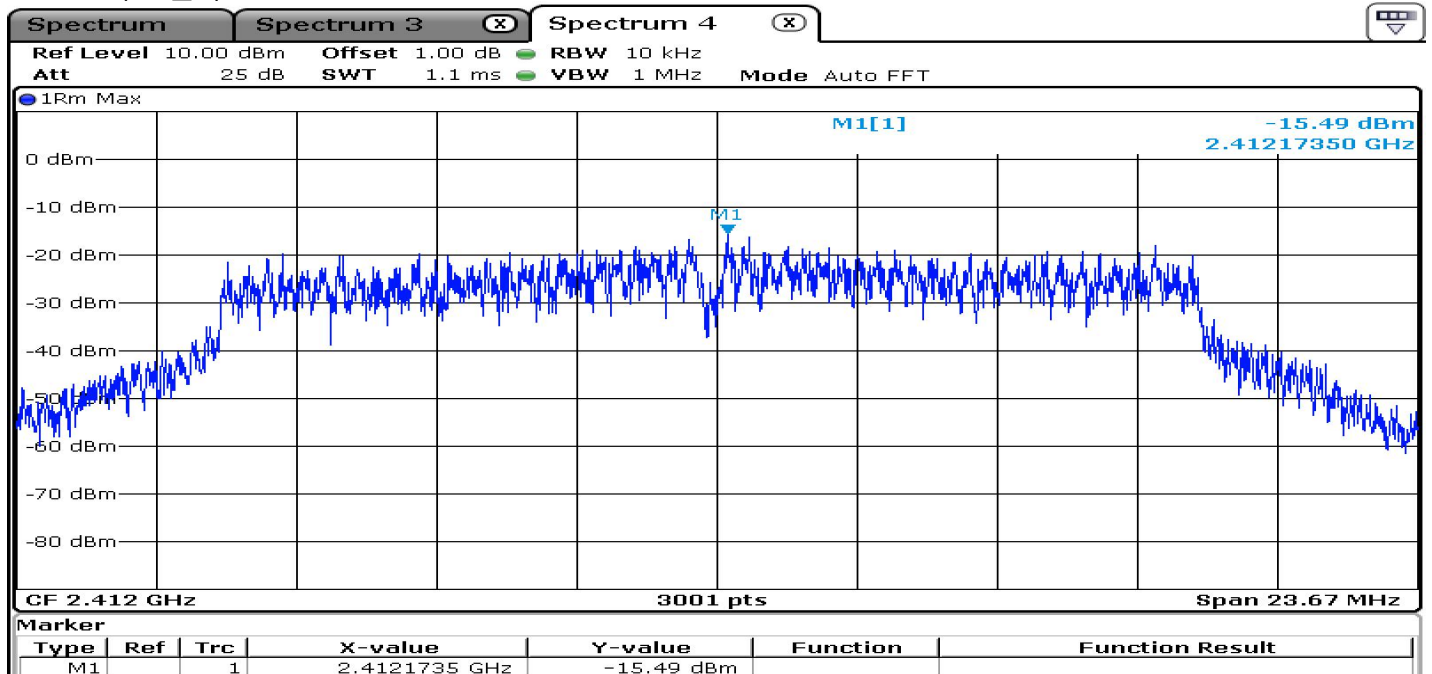
(ch_6)



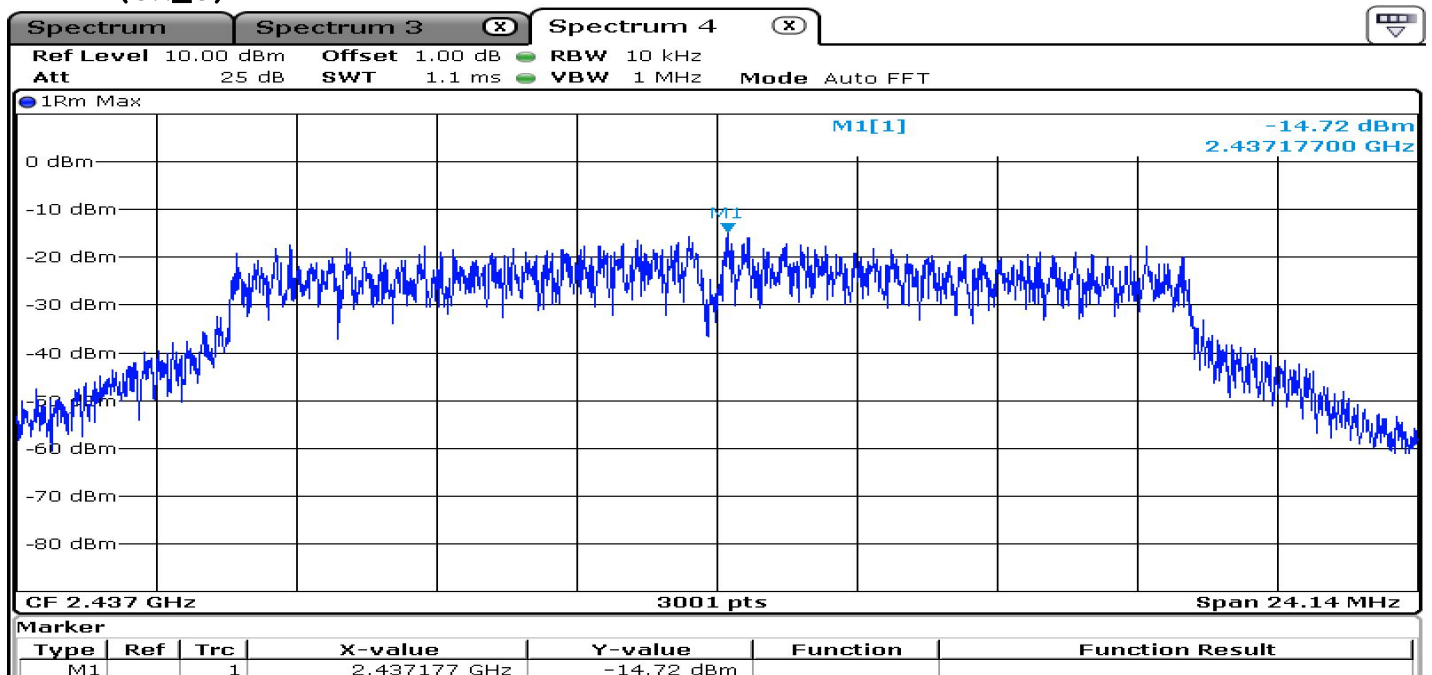
(ch_11)



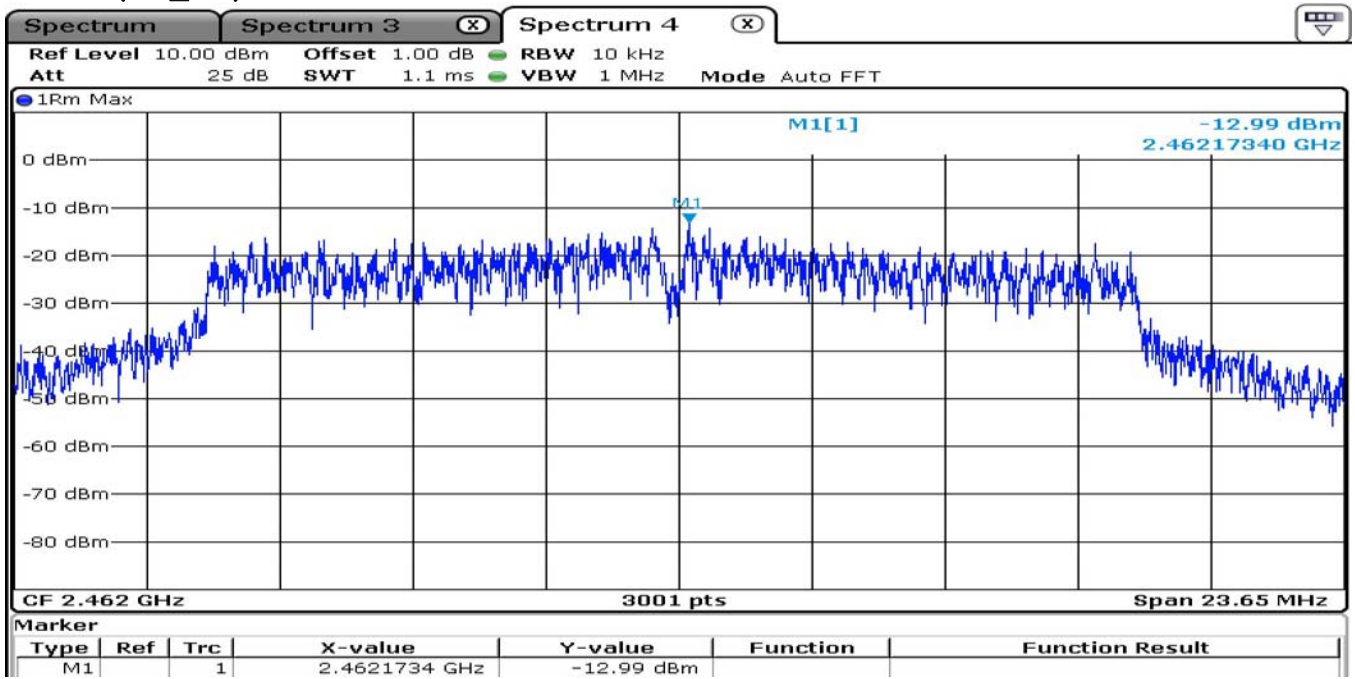
Trace data – 802.11g mode
(ch_1)



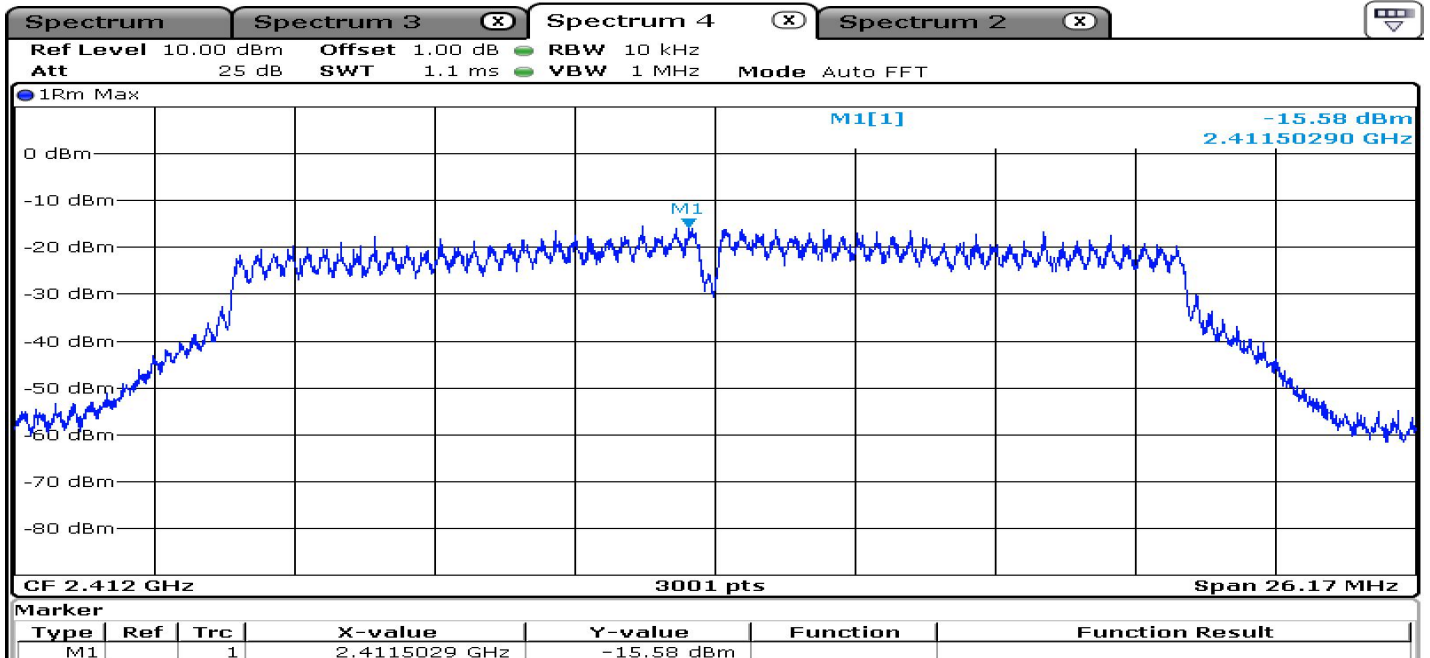
(ch_6)



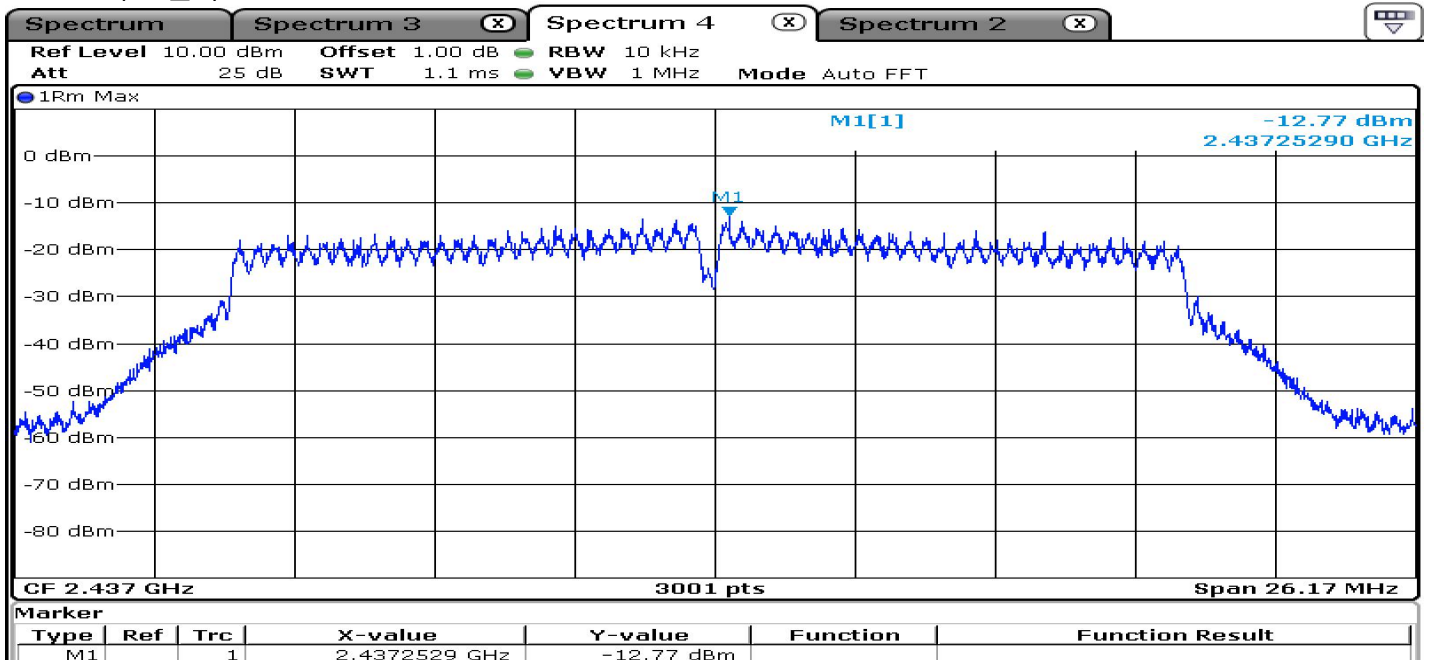
(ch_11)



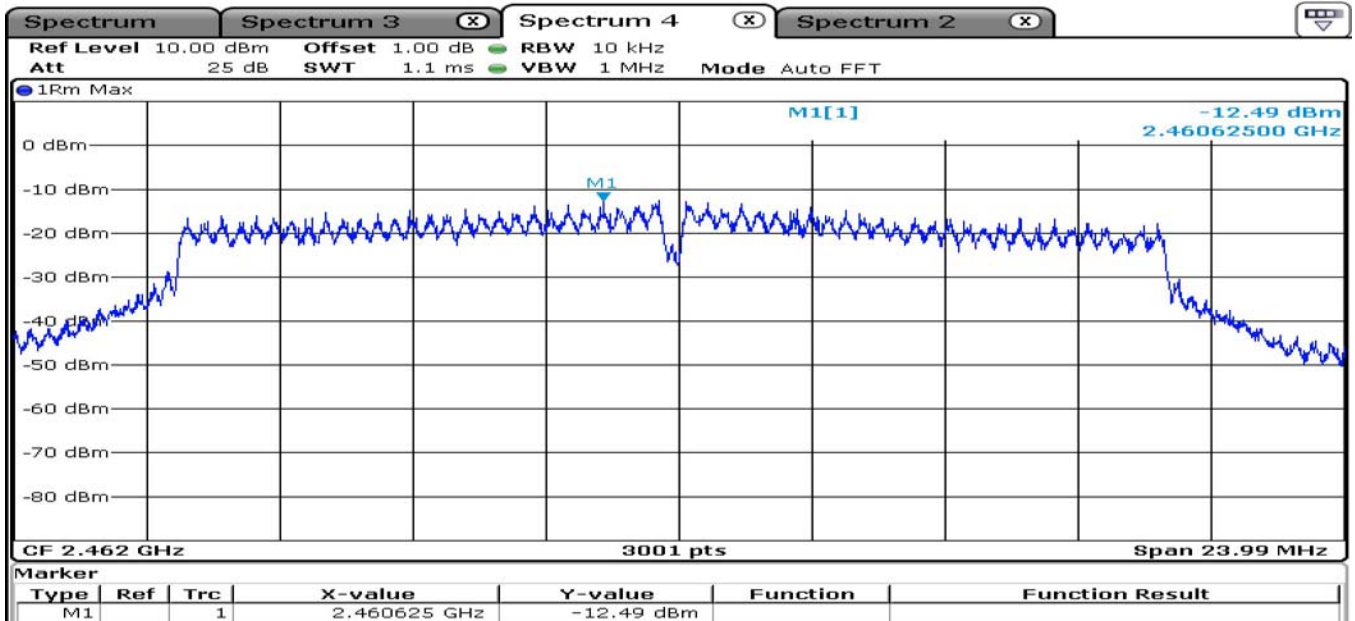
Trace data – 802.11n20 mode
(ch_1)



(ch_6)



(ch_11)



8. Emissions in non-restricted frequency bands

8.1 Test procedure

According to 558074 D01 DTS Meas Guidance

8.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to ≥ 1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW $\geq 3 \times$ RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Limits FCC § 15.247

Band Edge&Out of Emission Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	2018-12-27
Spectrum Analyzer	FSV40	100939	2018-12-27
-Spectrum Analyzer <=> EUT	Loss: 1 dB		-

8.3 Measurement results of band-edge & out of emission

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	b, g, n20, n40	ENVIRONMENTAL CONDITION	23.0 °C, 43.0 % R.H.
INPUT POWER	12.0 Vd.c.		

MODE -802.11b

CHANNEL	Channel Frequency (MHz)	limit	PASS/FAIL
1	2 412	20dBc	PASS
11	2 462	20dBc	PASS

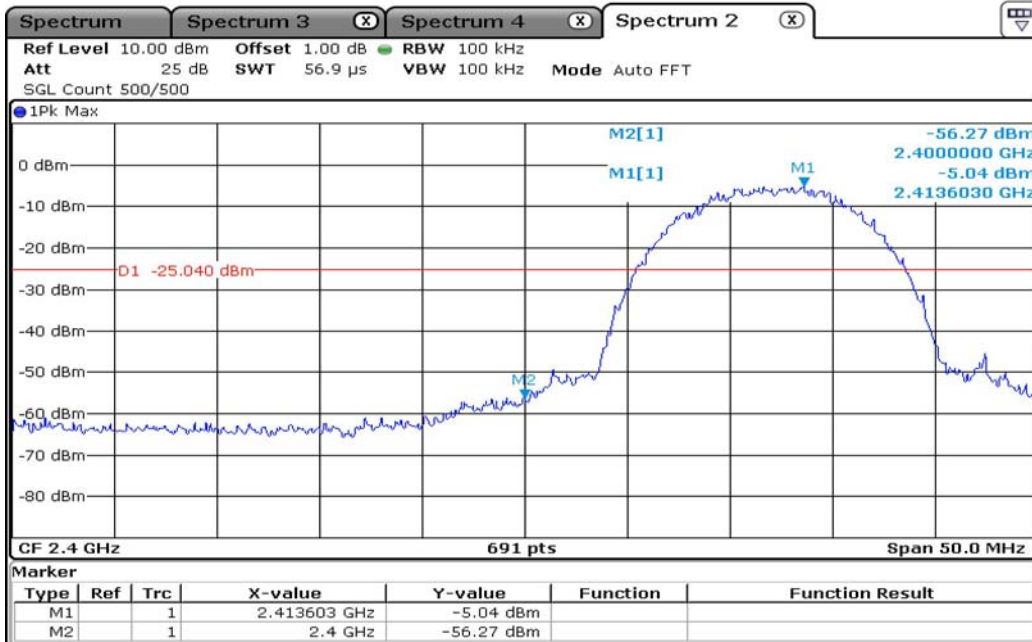
MODE -802.11g

CHANNEL	Channel Frequency (MHz)	limit	PASS/FAIL
1	2 412	20dBc	PASS
11	2 462	20dBc	PASS

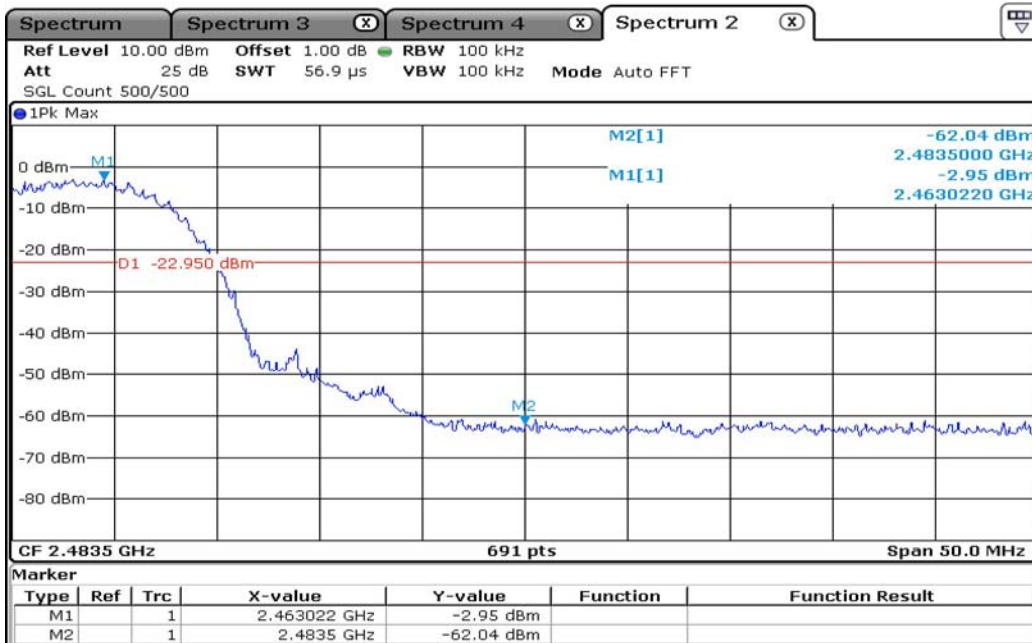
MODE -802.11n20

CHANNEL	Channel Frequency (MHz)	limit	PASS/FAIL
1	2 412	20dBc	PASS
11	2 462	20dBc	PASS

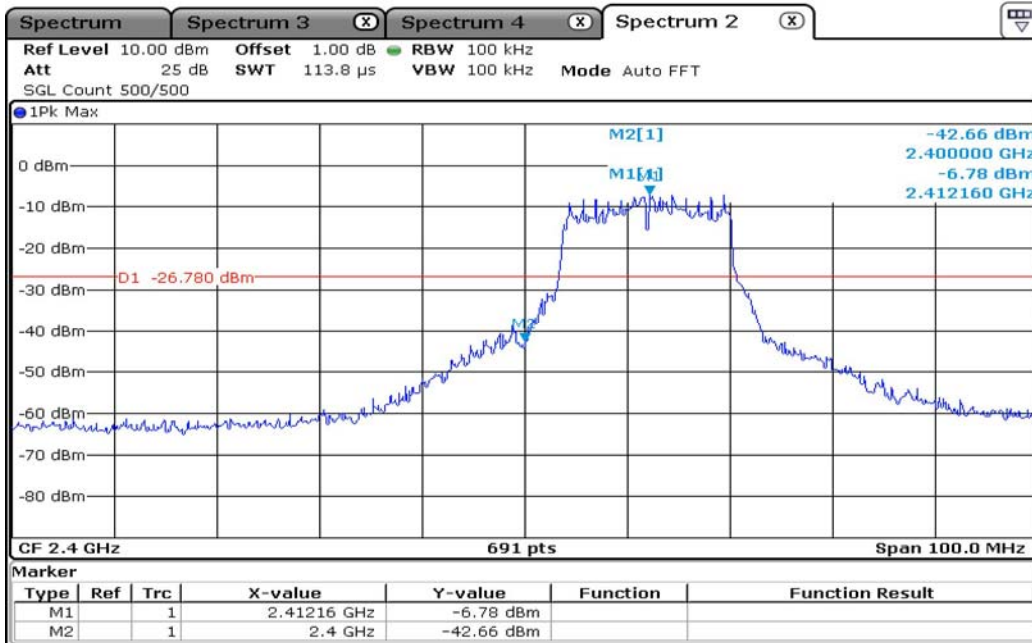
8.4 Trace data of band-edge & Out of Emission – 802.11b (ch_1)



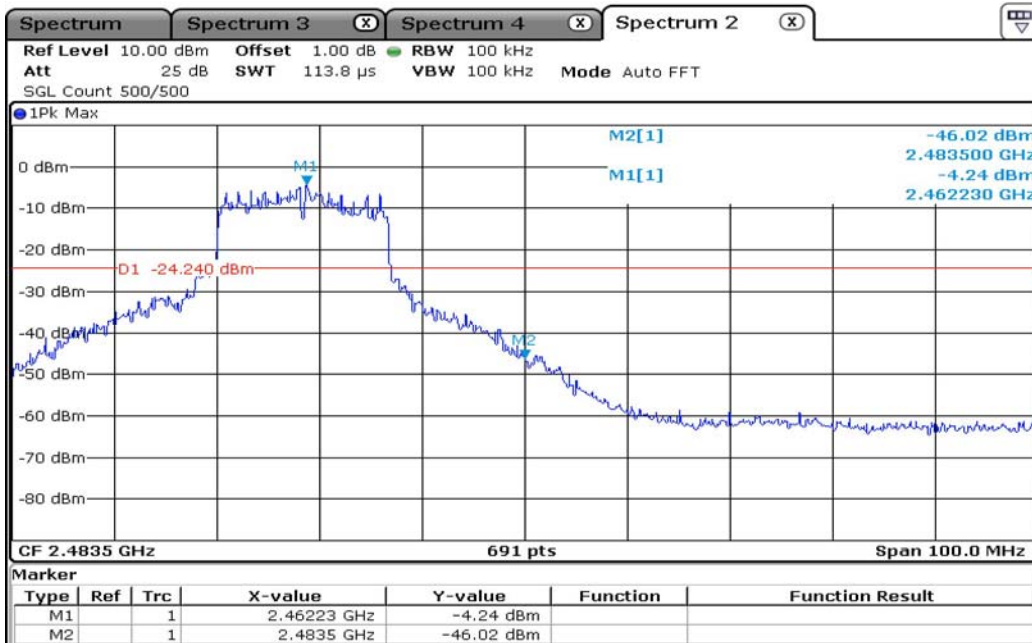
(ch_11)



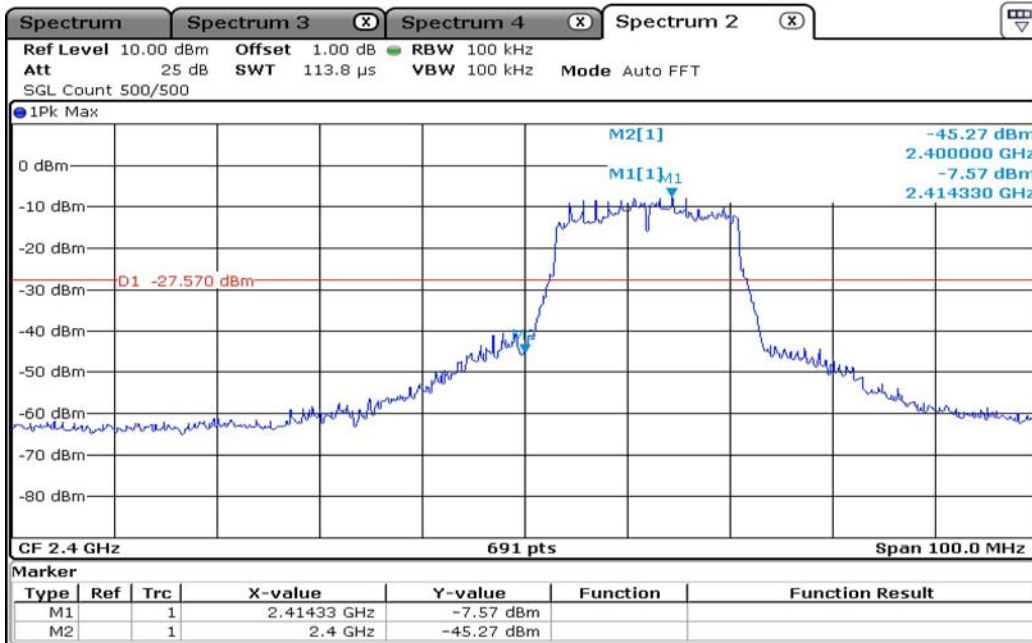
Trace data of band-edge & Out of Emission – 802.11g (ch_1)



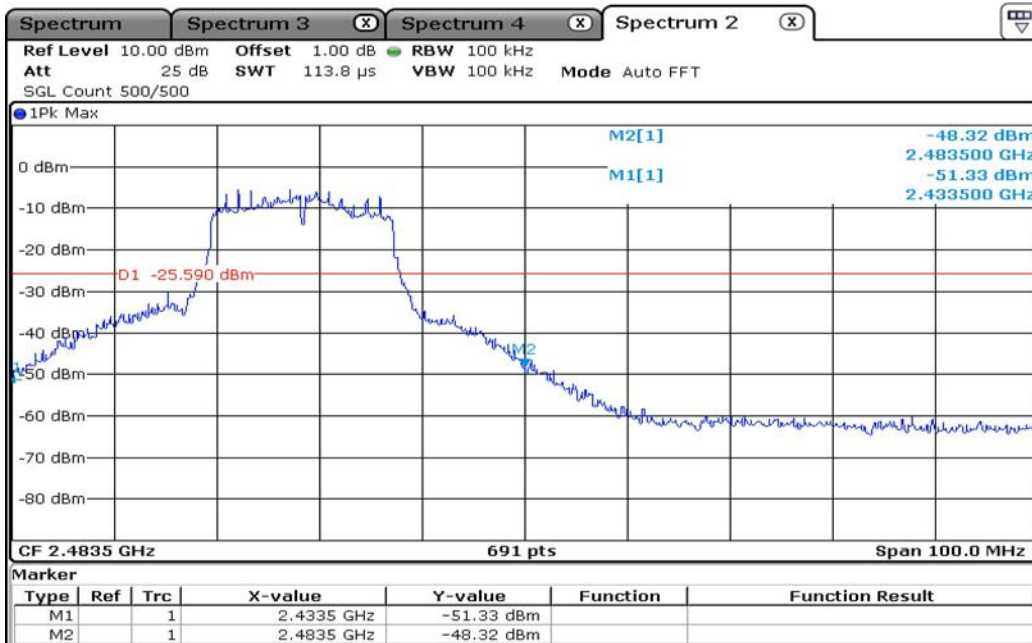
(ch_11)



Trace data of band-edge & Out of Emission –802.11n20 (ch_1)

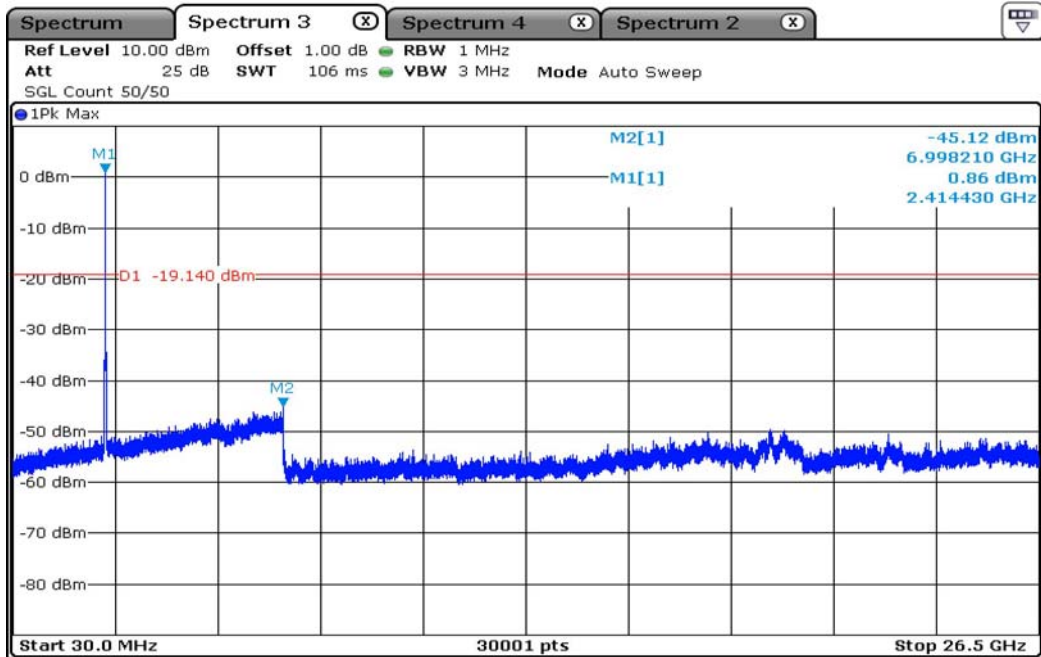


(ch_11)

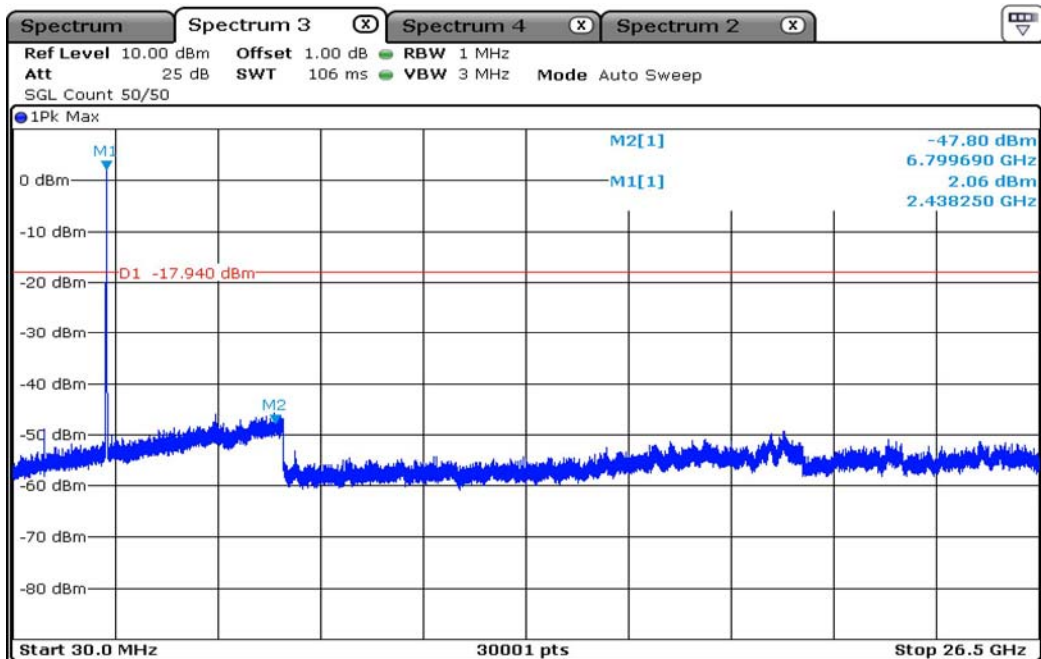


Trace data of Out of Emission – 802.11b

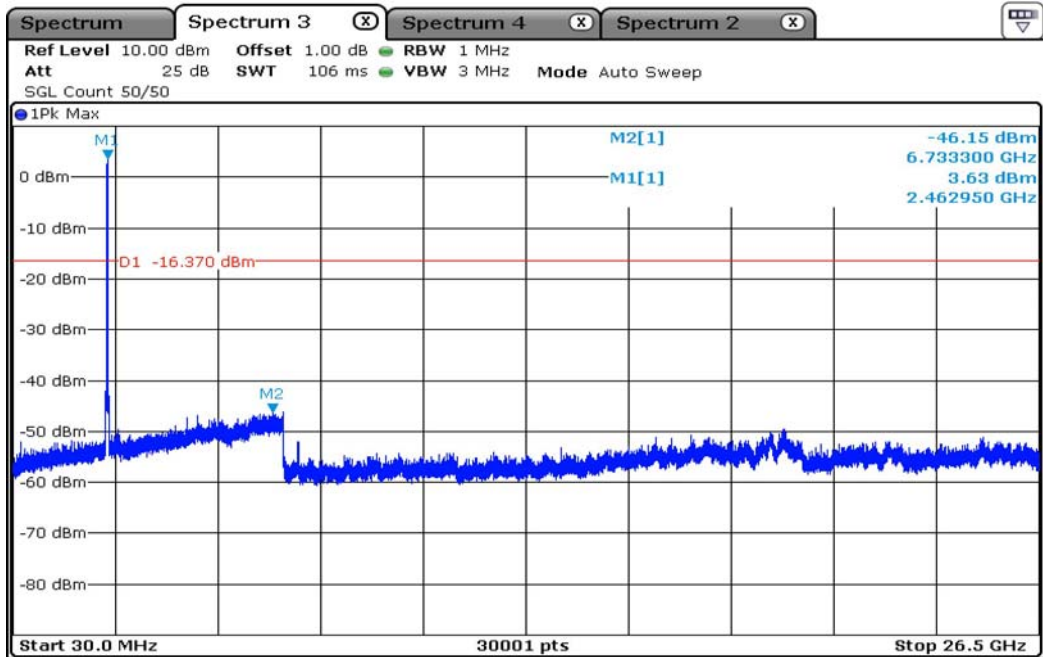
(ch_1)



(ch_6)

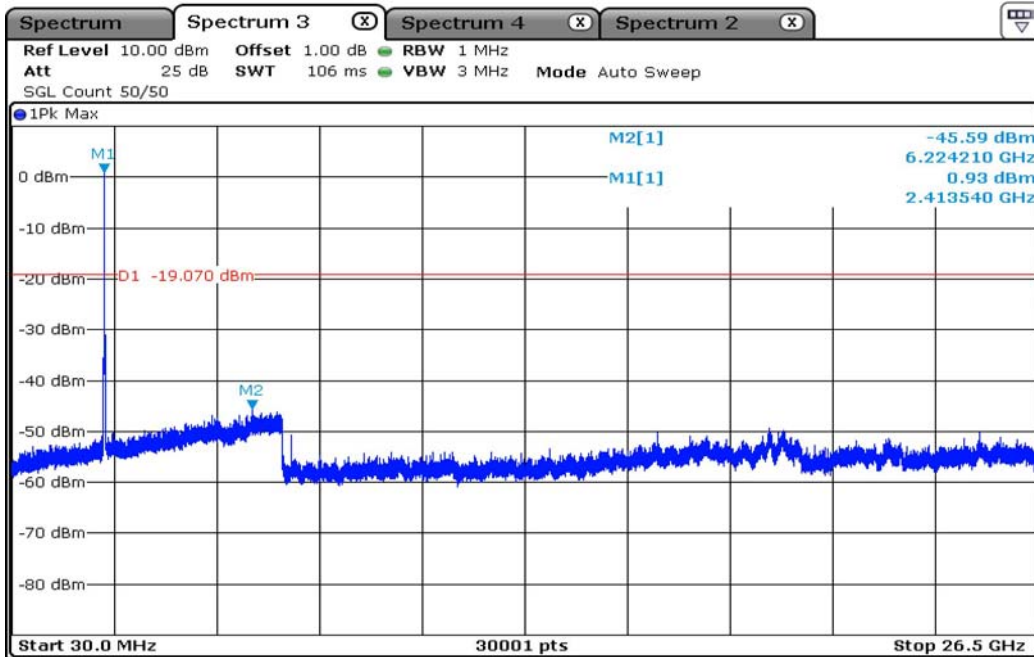


Trace data of Out of Emission – 802.11b
(ch_11)

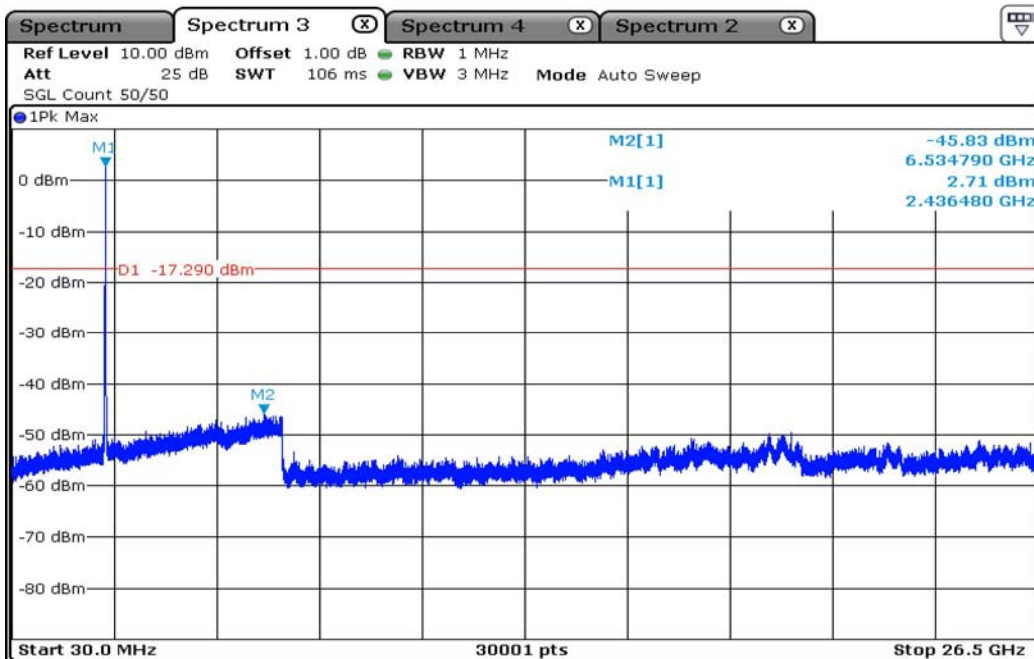


Trace data of Out of Emission – 802.11g

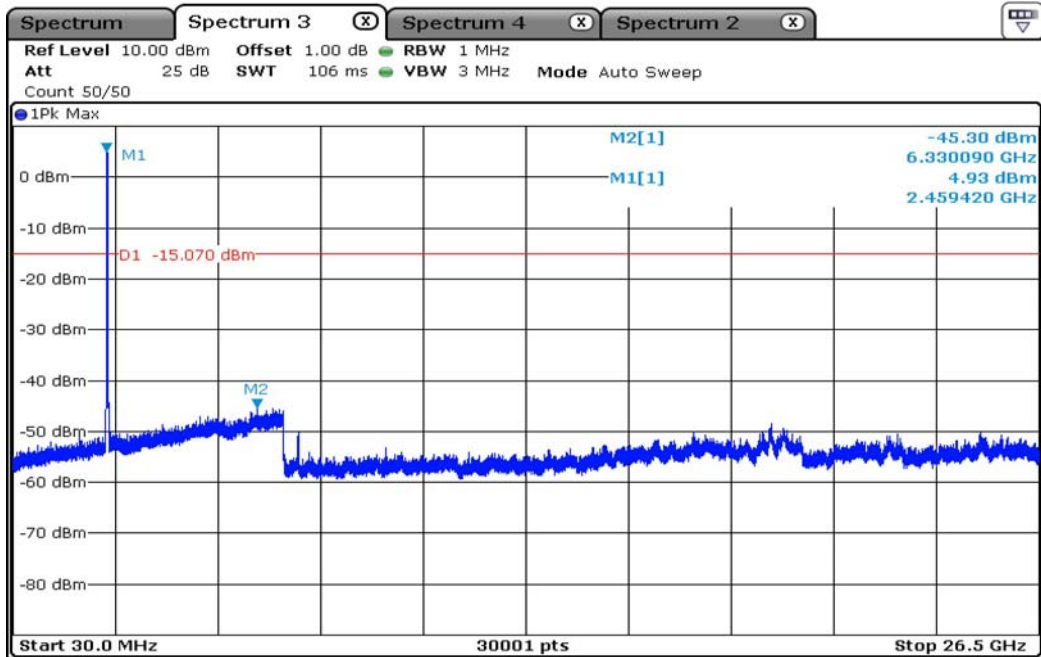
(ch_1)



(ch_6)

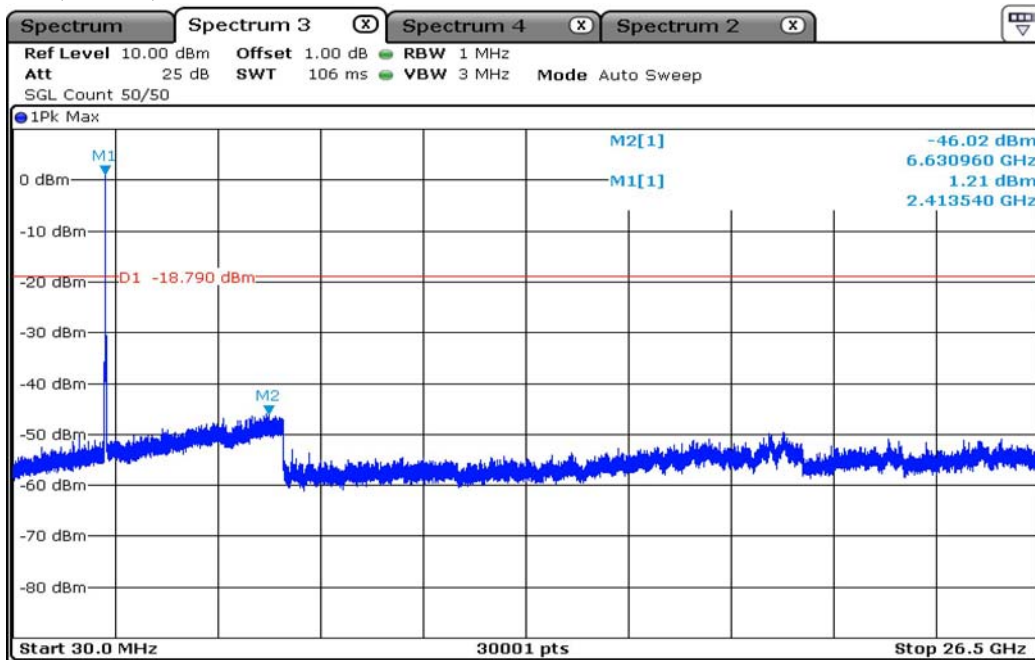


Trace data of Out of Emission – 802.11g
(ch_11)

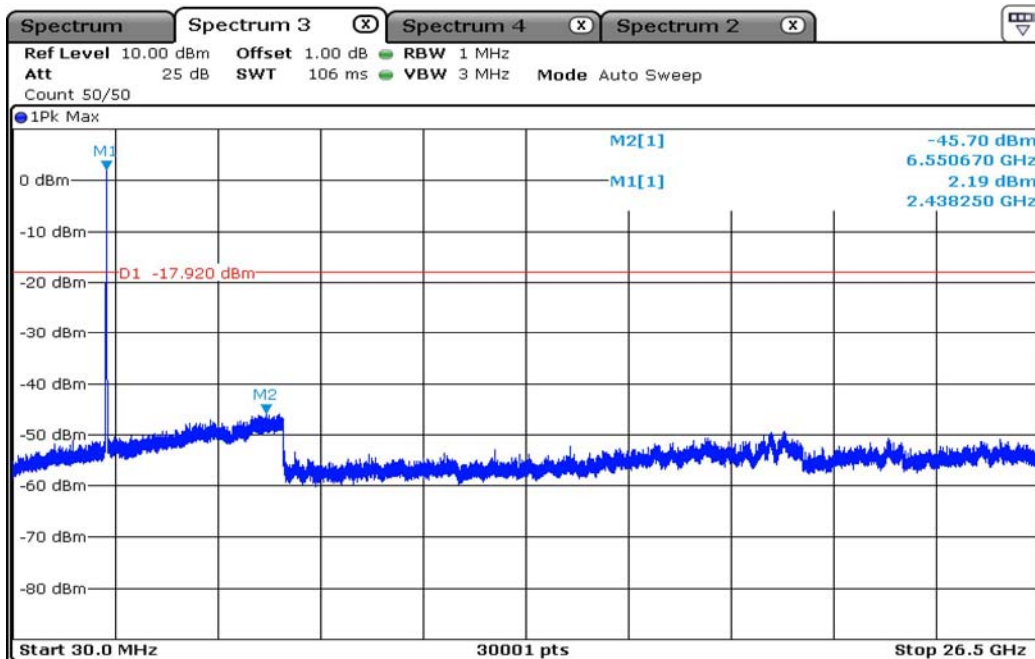


Trace data of Out of Emission – 802.11n20

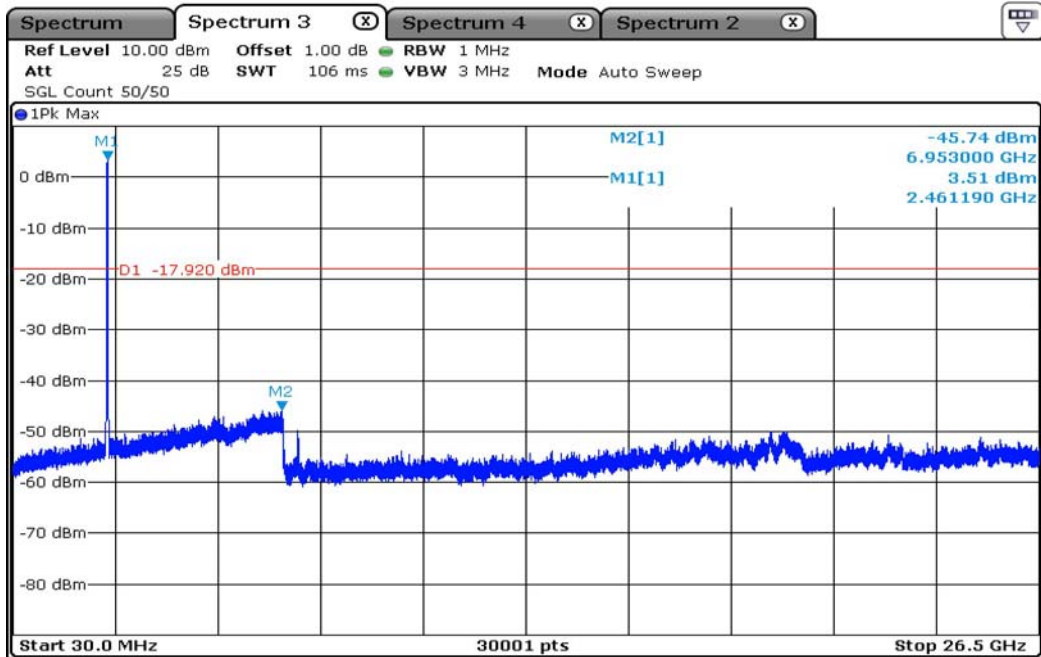
(ch_1)



(ch_6)



Trace data of Out of Emission – 802.11n20
(ch_11)



9. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC PART 15.205, 15.209 . The test setup was made according to ANSI C 63.10 (2009) & KDB 558074 D01 Semi-anechoic chamber, which allows a 3 m distance measurement. The EUT was placed in the center of styrofoam. turntable. The height of this table was 0.8 m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

9.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	100916	31-Oct-18
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	12-Oct-18
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
PREAMPLIFIER	8449B	AGILENT	3008A00581	31-Oct-18
Horn Antenna	BBHA9120D	SCHWARZBECK	469	25-Aug-18
Test Receiver	ESPI7	ROHDE & SCHWARZ	100185	31-Oct-18
Spectrum Analyzer	R3273	ADVANTEST	121200664	10-Oct-18
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Pyramidal Horn Antenna	3160-09-01	EST-L INDGREN	102642	25-Aug-18
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/642 /28051111/L	-

9.2 Environmental Condition

Below 1 GHz –Test Place : 10 m Semi-anechoic chamber

WLAN Mode

Temperature (°C) : 21.4 °C

Humidity (% R.H.) : 55.7 % R.H.

Above 1 GHz–Test Place : 3 m Semi-anechoic chamber

WLAN 802.11 b,g,n20 Mode

Temperature (°C) : 22.1 °C

Humidity (% R.H.) : 53.5 % R.H.

9.3 Measurement Instrument setting for Radiated Emission

9.3.1 Frequency range below 1 GHz

Detector : Quasi-Peak

9.3.2 Frequency range above 1 GHz

- a. RBW : 1 MHz , VBW : 3 MHz
- b. Trace mode = max hold
- c. Detector : Peak
- d. Sweep time = auto

- a. Set analyzer center frequency to the frequency associated with the emission
- b. RBW : 1 MHz , VBW : 3 MHz
- c. Detector : RMS
- d. Sweep time = auto

* Note

Band	Duty cycle(%)	Ton (ms)	Ton + Toff (ms)	DCF=10*log(1/Duty) (dB)
802.11b	88.0	0.940	1.068	0.56
802.11g	58.0	0.168	0.287	2.37
802.11n20	59.0	0.152	0.272	2.29

* This was not applied of duty cycle factor for average value because of measured with the EUT transmitting continuously more than 98 % duty cycle at its maximum power control level.

9.4.1 Test Data (802.11 b)

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
41.90	14.19	V	1.3	13.26	0.96	40.00	28.41	11.59
81.50	20.29	V	1.5	9.18	1.34	40.00	30.81	9.19
122.30	19.30	V	1.7	11.24	1.66	43.50	32.21	11.29
335.40	14.81	H	1.9	14.26	2.86	46.00	31.93	14.07
480.00	13.35	H	1.8	17.40	3.45	46.00	34.20	11.80
Remark	H : Horizontal, V : Vertical *Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position) *CL = Cable Loss(In case of below 1 000 MHz) *Result Value = Reading + Ant Factor + Cable loss *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz.							

9.4.2 Test Data (802.11 g)

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
41.90	15.49	V	1.5	13.26	0.96	40.00	29.71	10.29
80.40	19.32	V	1.2	9.36	1.33	40.00	30.01	9.99
122.30	19.40	V	1.3	11.24	1.66	43.50	32.31	11.19
332.60	15.63	H	1.5	14.20	2.85	46.00	32.68	13.32
480.00	13.30	H	1.7	17.40	3.45	46.00	34.15	11.85
Remark	H : Horizontal, V : Vertical *Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position) *CL = Cable Loss(In case of below 1 000 MHz) *Result Value = Reading + Ant Factor + Cable loss *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz.							

9.4.3 Test Data (802.11 n20)

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
41.90	14.26	V	1.6	13.26	0.96	40.00	28.48	11.52
81.50	16.96	V	1.7	9.18	1.34	40.00	27.48	12.52
117.90	21.71	V	1.5	10.82	1.63	43.50	34.16	9.34
335.50	14.80	H	1.4	14.26	2.86	46.00	31.93	14.07
480.00	13.40	H	1.5	17.40	3.45	46.00	34.25	11.75
Remark	H : Horizontal, V : Vertical *Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position) *CL = Cable Loss(In case of below 1 000 MHz) *Result Value = Reading + Ant Factor + Cable loss *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz.							

9.4-5 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	36.73	H	1.8	26.11	-30.08	0.56	74.00	33.31	40.69
2390.00	49.89	V	1.5	26.11	-30.08	0.56	74.00	46.47	27.53
4824.00	51.90	H	1.6	30.99	-26.98	0.56	74.00	56.46	17.54
4824.00	51.60	V	1.7	30.99	-26.98	0.56	74.00	56.16	17.84
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	36.73	H	1.8	26.11	-30.08	0.56	54.00	33.31	20.69
2390.00	36.63	V	1.5	26.11	-30.08	0.56	54.00	33.21	20.79
4824.00	40.03	H	1.6	30.99	-26.98	0.56	54.00	44.59	9.41
4824.00	39.98	V	1.7	30.99	-26.98	0.56	54.00	44.54	9.46
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 b – CH 1(2 412 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-6 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
4874.00	52.45	H	1.7	31.13	-26.84	0.56	74.00	57.30	16.70
4874.00	52.11	V	1.6	31.13	-26.84	0.56	74.00	56.96	17.04
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	39.89	H	1.7	31.13	-26.84	0.56	54.00	44.74	9.26
4874.00	40.33	V	1.6	31.13	-26.84	0.56	54.00	45.18	8.82
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 b – CH 6(2 437 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-7 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	48.39	H	1.5	26.30	-29.93	0.56	74.00	45.32	28.68
2483.50	48.12	V	1.5	26.30	-29.93	0.56	74.00	45.05	28.95
4924.00	52.33	H	1.5	31.27	-26.74	0.56	74.00	57.43	16.57
4924.00	52.54	V	1.5	31.27	-26.74	0.56	74.00	57.64	16.36
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	36.47	H	1.5	26.30	-29.93	0.56	54.00	33.40	20.60
2483.50	36.46	V	1.5	26.30	-29.93	0.56	54.00	33.39	20.61
4924.00	40.32	H	1.5	31.27	-26.74	0.56	54.00	45.42	8.58
4924.00	40.47	V	1.5	31.27	-26.74	0.56	54.00	45.57	8.43
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 b – CH 11(2 462 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-8 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	54.89	H	1.5	26.11	-30.08	2.37	74.00	53.28	20.72
2390.00	55.35	V	1.6	26.11	-30.08	2.37	74.00	53.74	20.26
4824.00	51.50	H	1.6	30.99	-26.98	2.37	74.00	57.88	16.12
4824.00	51.35	V	1.6	30.99	-26.98	2.37	74.00	57.73	16.27
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	37.24	H	1.6	26.11	-30.08	2.37	54.00	35.63	18.37
2390.00	40.15	V	1.6	26.11	-30.08	2.37	54.00	38.54	15.46
4824.00	40.06	H	1.5	30.99	-26.98	2.37	54.00	46.44	7.56
4824.00	39.97	V	1.5	30.99	-26.98	2.37	54.00	46.35	7.65
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 g – CH 1(2 412 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-9 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
4874.00	51.81	H	1.6	31.13	-26.84	2.37	74.00	58.47	15.53
4874.00	52.27	V	1.7	31.13	-26.84	2.37	74.00	58.93	15.07
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	40.34	H	1.6	31.13	-26.84	2.37	54.00	47.00	7.00
4874.00	40.32	V	1.7	31.13	-26.84	2.37	54.00	46.98	7.02
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 g – CH 6(2 437 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-10 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	55.65	H	1.6	26.30	-29.93	2.37	74.00	54.39	19.61
2483.50	55.68	V	1.5	26.30	-29.93	2.37	74.00	54.42	19.58
4924.00	52.94	H	1.6	31.27	-26.74	2.37	74.00	59.85	14.15
4924.00	52.82	V	1.5	31.27	-26.74	2.37	74.00	59.73	14.27
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	37.80	H	1.6	26.30	-29.93	2.37	54.00	36.54	17.46
2483.50	37.86	V	1.6	26.30	-29.93	2.37	54.00	36.60	17.40
4924.00	40.53	H	1.6	31.27	-26.74	2.37	54.00	47.44	6.56
4924.00	40.31	V	1.5	31.27	-26.74	2.37	54.00	47.22	6.78
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11g – CH 11(2 462 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-11 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	54.19	H	1.6	26.11	-30.08	2.29	74.00	52.50	21.50
2390.00	62.25	V	1.5	26.11	-30.08	2.29	74.00	60.56	13.44
4824.00	51.96	H	1.5	30.99	-26.98	2.29	74.00	58.26	15.74
4824.00	51.96	V	1.5	30.99	-26.98	2.29	74.00	58.26	15.74
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	36.88	H	1.7	26.11	-30.08	2.29	54.00	35.19	18.81
2390.00	37.50	V	1.5	26.11	-30.08	2.29	54.00	35.81	18.19
4824.00	39.98	H	1.6	30.99	-26.98	2.29	54.00	46.28	7.72
4824.00	40.00	V	1.7	30.99	-26.98	2.29	54.00	46.30	7.70
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 n20 – CH 1(2 412 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-12 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
4874.00	52.27	H	1.7	31.13	-26.84	2.29	74.00	58.85	15.15
4874.00	51.81	V	1.6	31.13	-26.84	2.29	74.00	58.39	15.61
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	40.34	H	1.5	31.13	-26.84	2.29	54.00	46.92	7.08
4874.00	40.34	V	1.6	31.13	-26.84	2.29	54.00	46.92	7.08
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 n20 – CH 6(2 437 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

9.4-13 Test Data

Test Date : 7-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	58.83	H	1.7	26.30	-29.93	2.29	74.00	57.49	16.51
2483.50	58.40	V	1.5	26.30	-29.93	2.29	74.00	57.06	16.94
4924.00	52.60	H	1.7	31.27	-26.74	2.29	74.00	59.43	14.57
4924.00	52.60	V	1.5	31.27	-26.74	2.29	74.00	59.43	14.57
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	38.28	H	1.6	26.30	-29.93	2.29	54.00	36.94	17.06
2483.50	38.36	V	1.5	26.30	-29.93	2.29	54.00	37.02	16.98
4924.00	40.31	H	1.6	31.27	-26.74	2.29	54.00	47.14	6.86
4924.00	32.67	V	1.6	31.27	-26.74	2.29	54.00	39.50	14.50
Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 n20 – CH 11(2 462 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss – Amp Gain + Duty Cycle Correction								

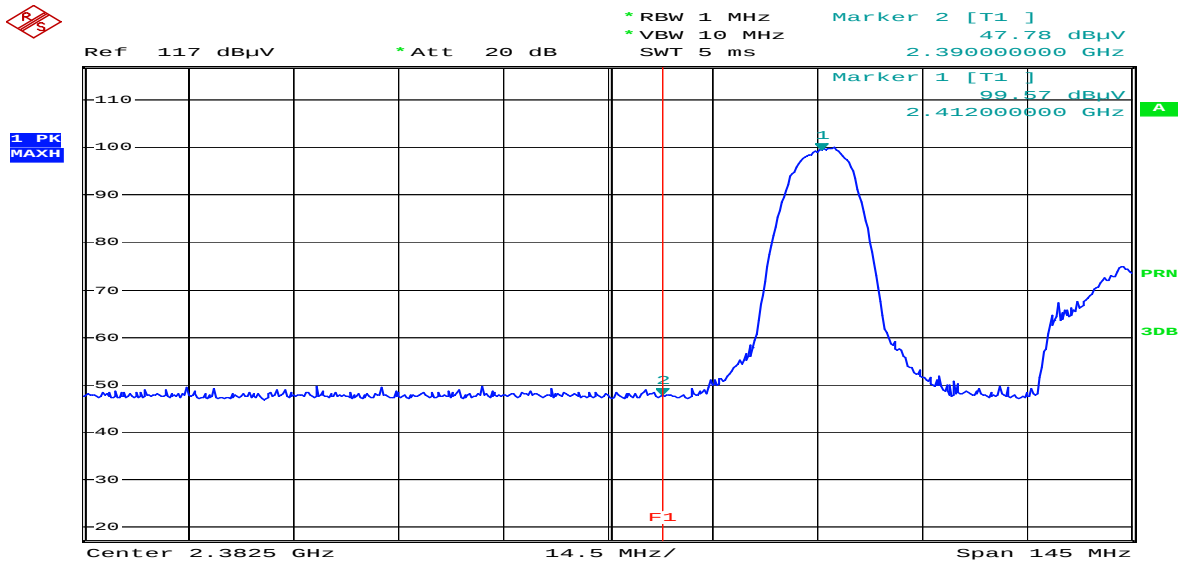
9.5 Restricted Band Edges

*802.11b Mode

Band Edges(CH Low)

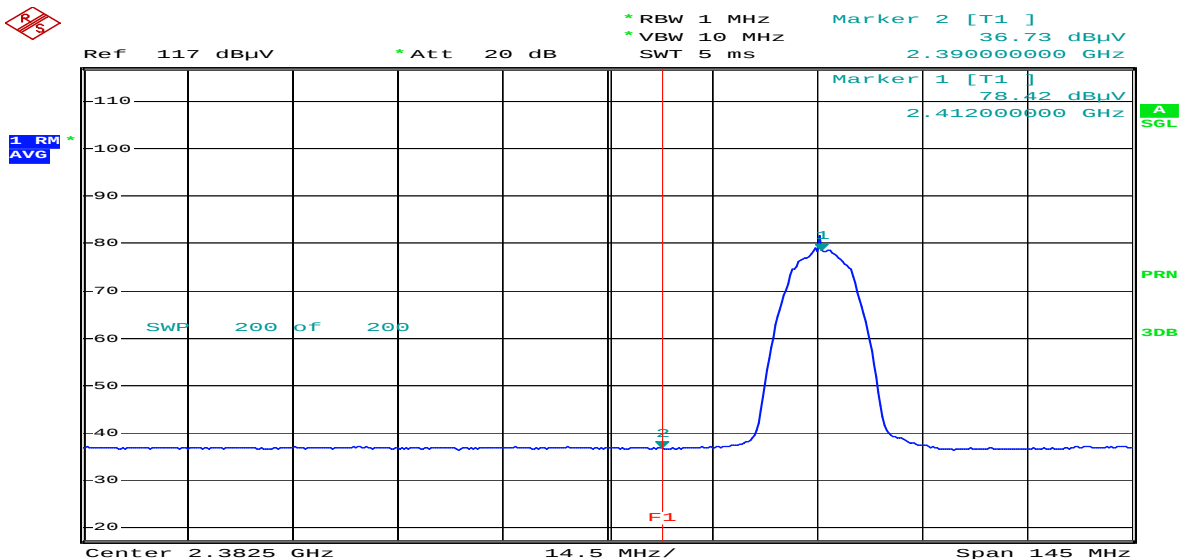
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

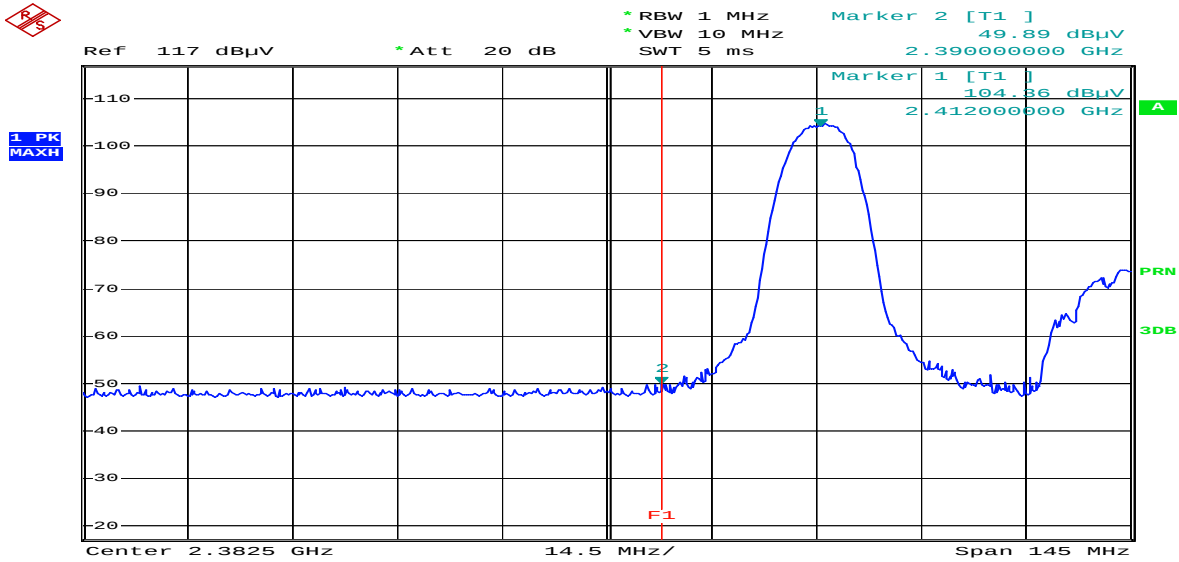
Polarity:Horizontal



Band Edges(CH Low)

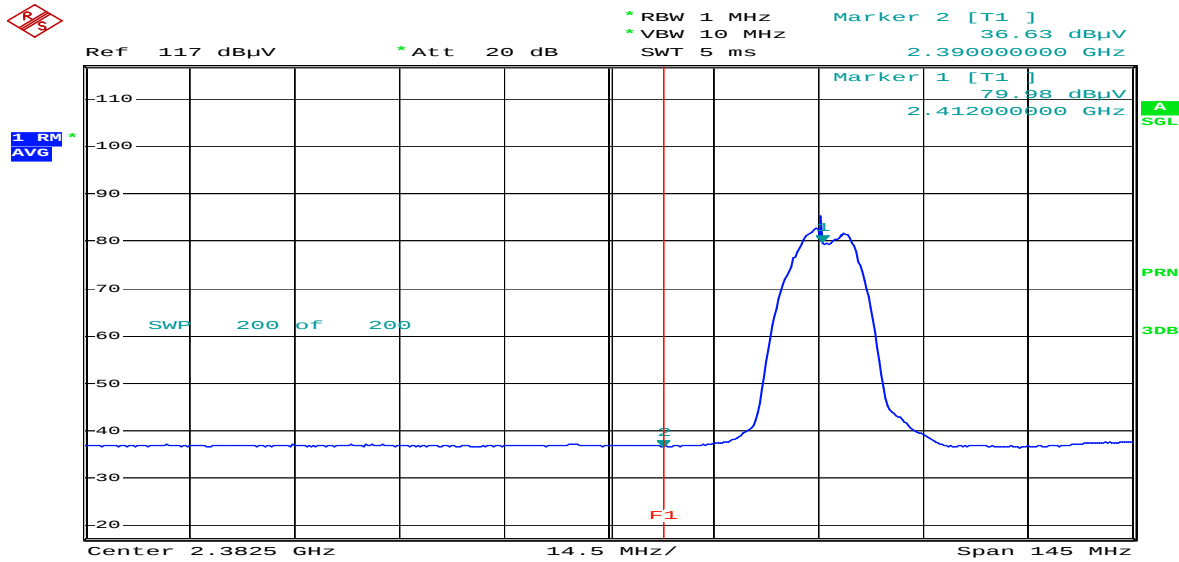
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

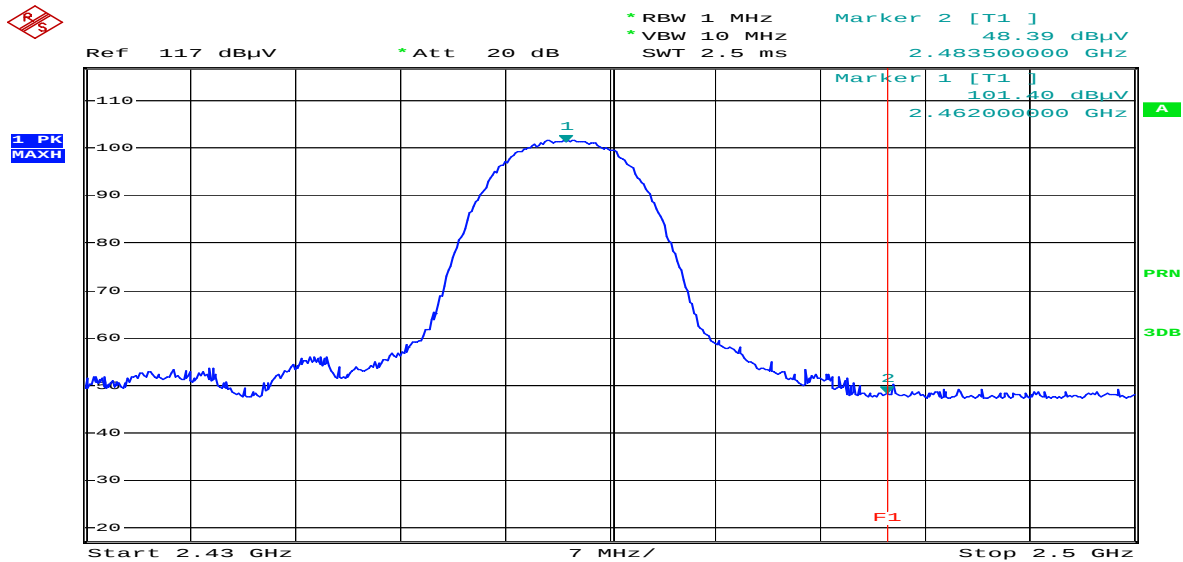
Polarity:Vertical



Band Edges(CH High)

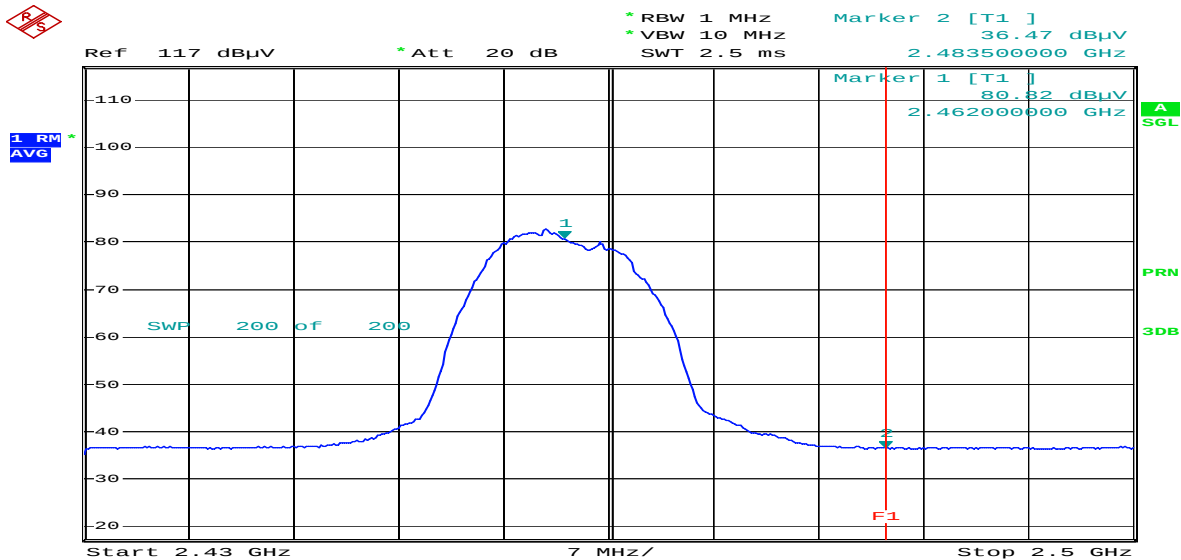
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

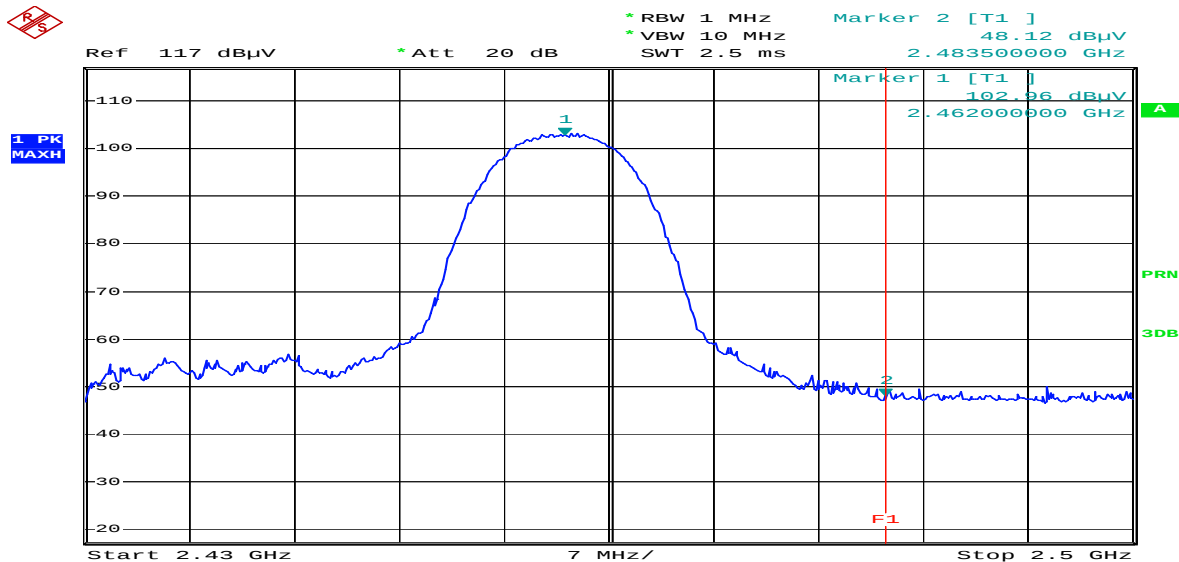
Polarity:Horizontal



Band Edges(CH High)

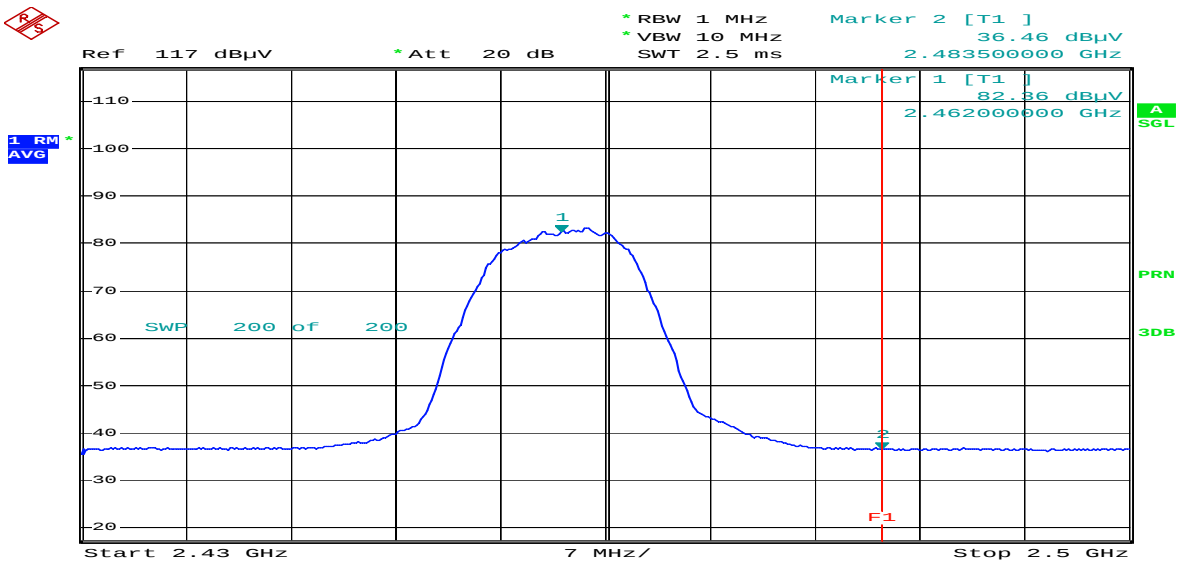
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

Polarity:Vertical

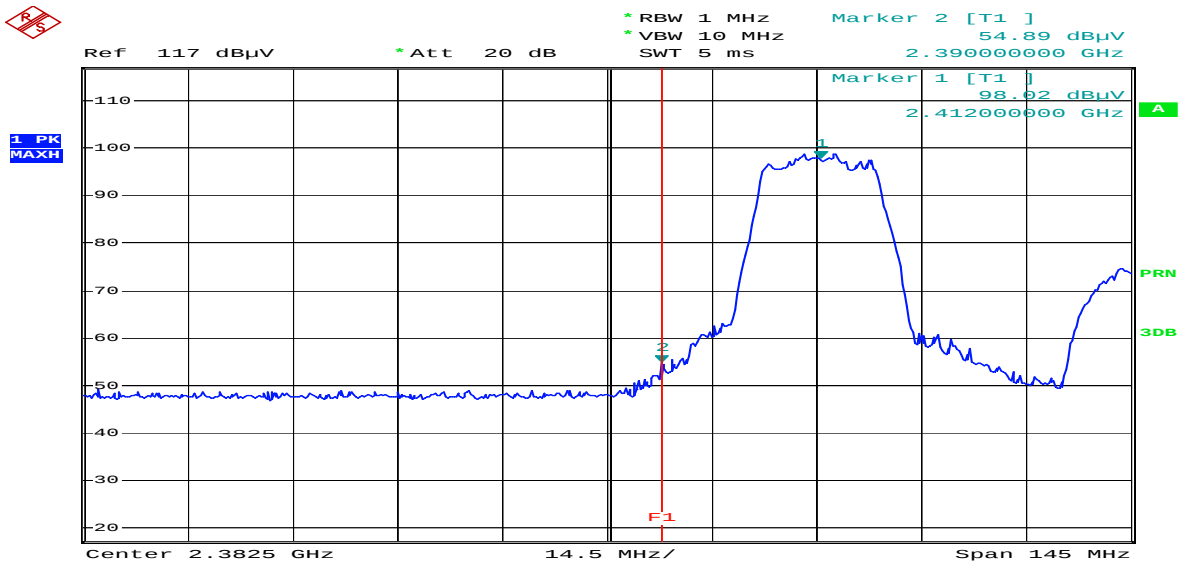


*802.11g Mode

Band Edges(CH Low)

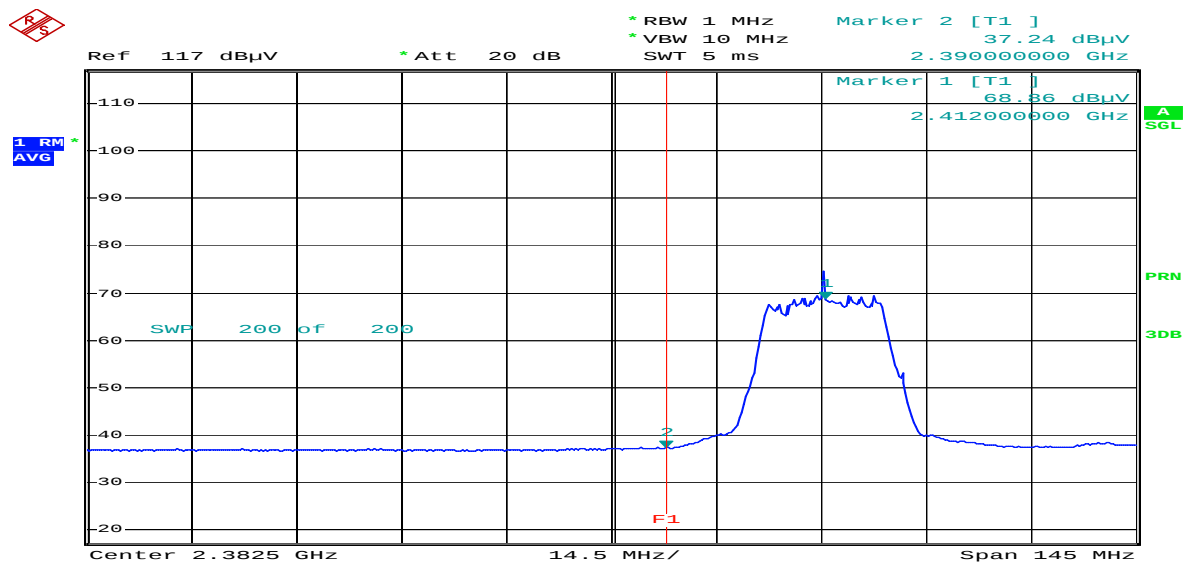
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

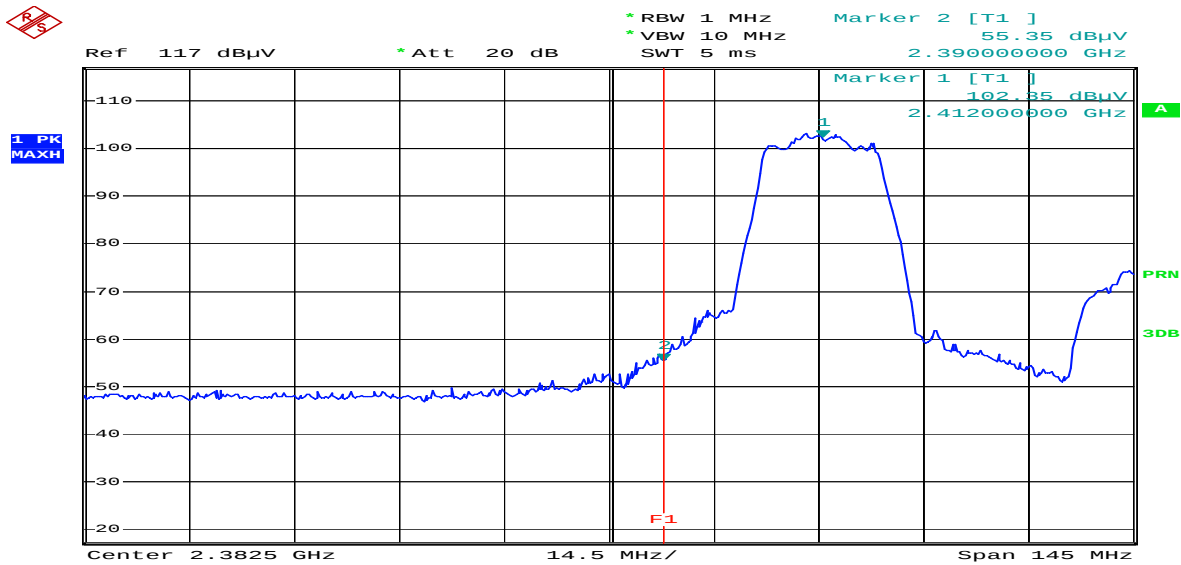
Polarity:Horizontal



Band Edges(CH Low)

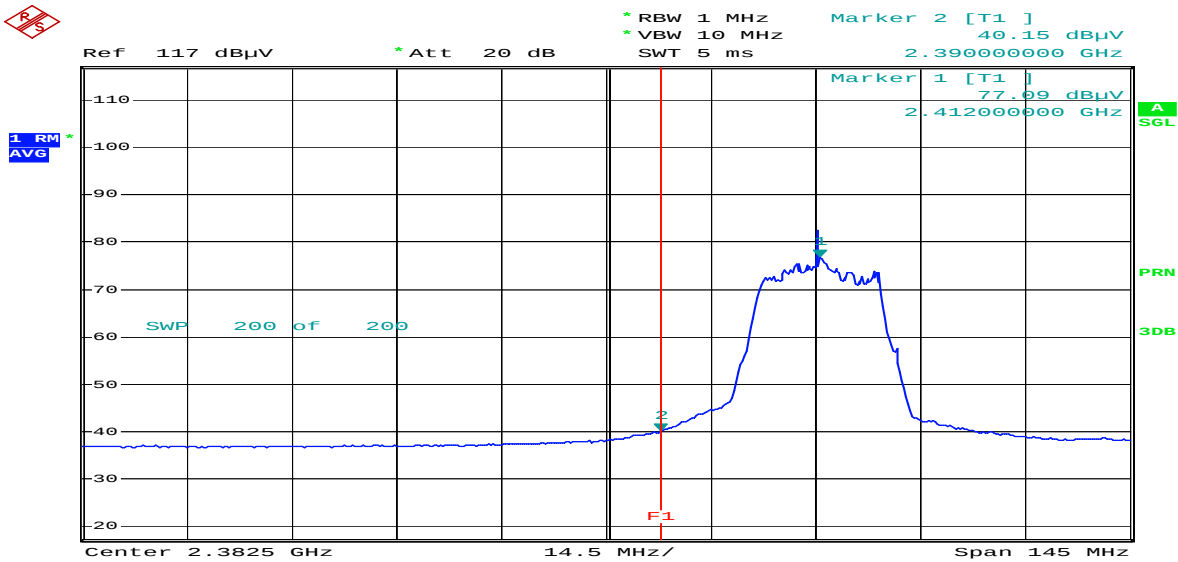
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

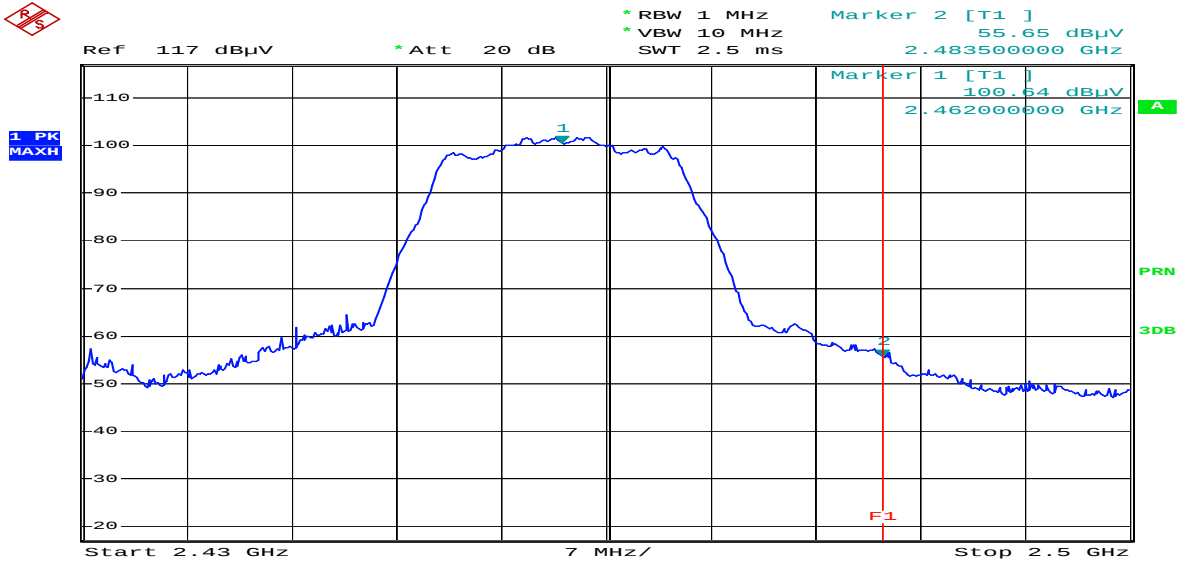
Polarity:Vertical



Band Edges(CH High)

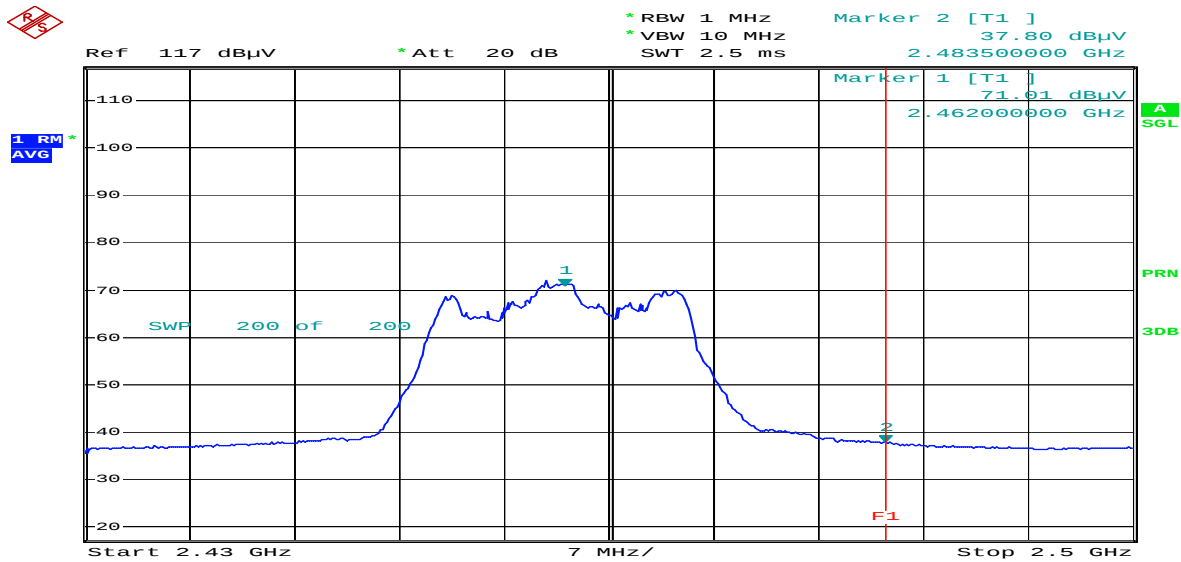
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

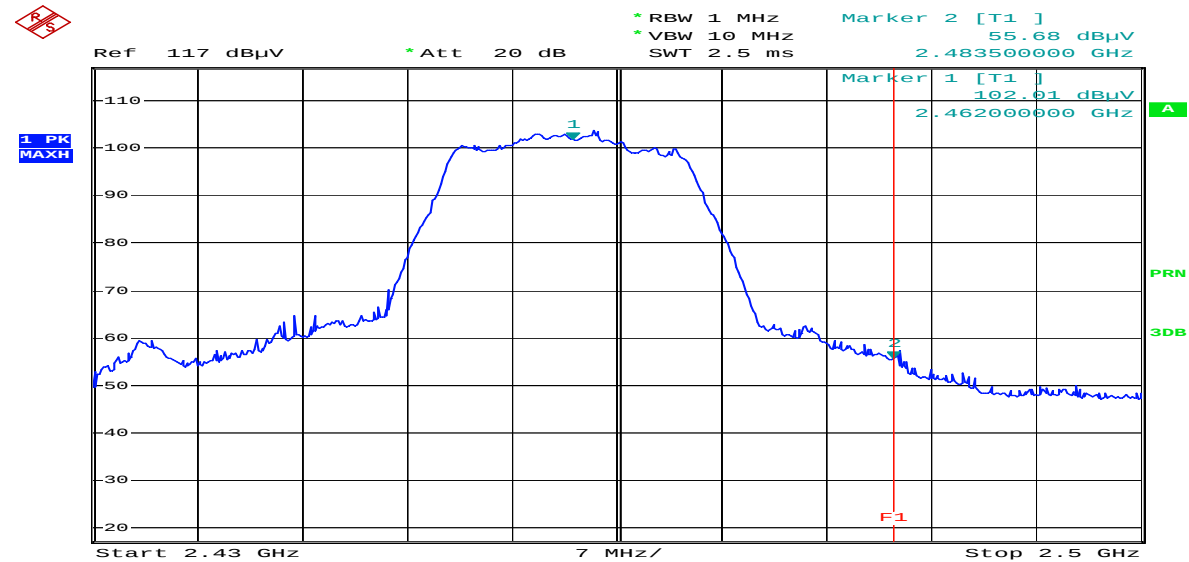
Polarity:Horizontal



Band Edges(CH High)

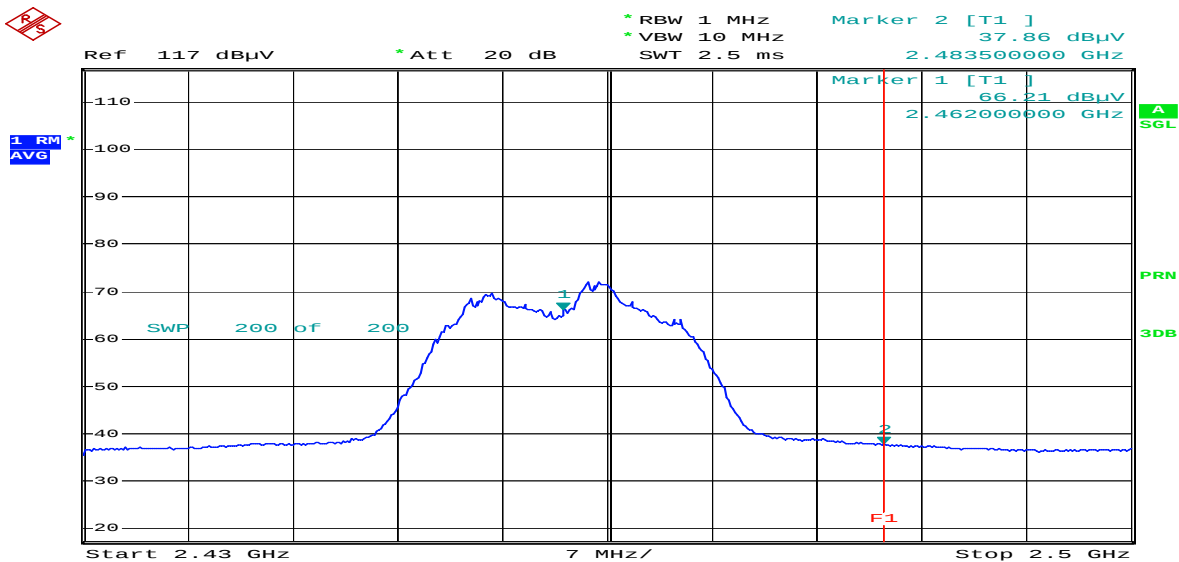
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

Polarity:Vertical

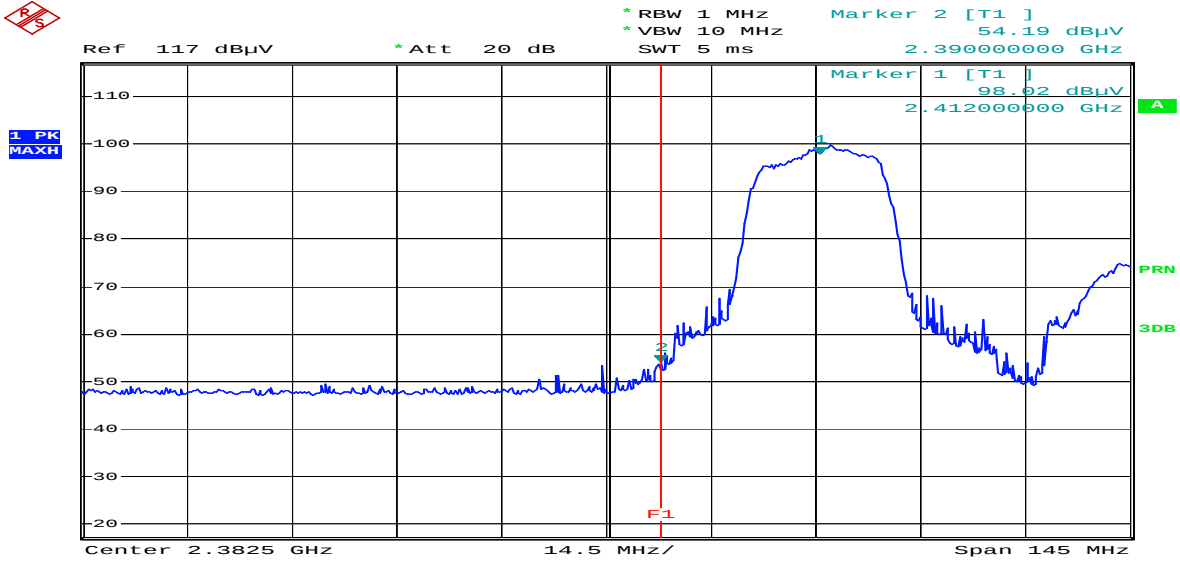


*802.11n20 Mode

Band Edges(CH Low)

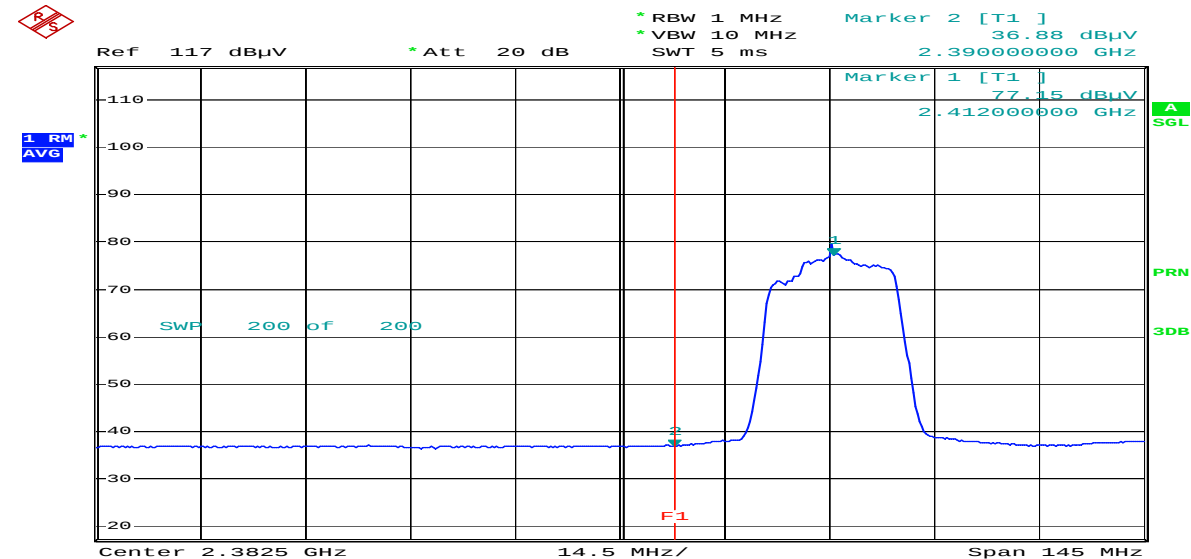
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

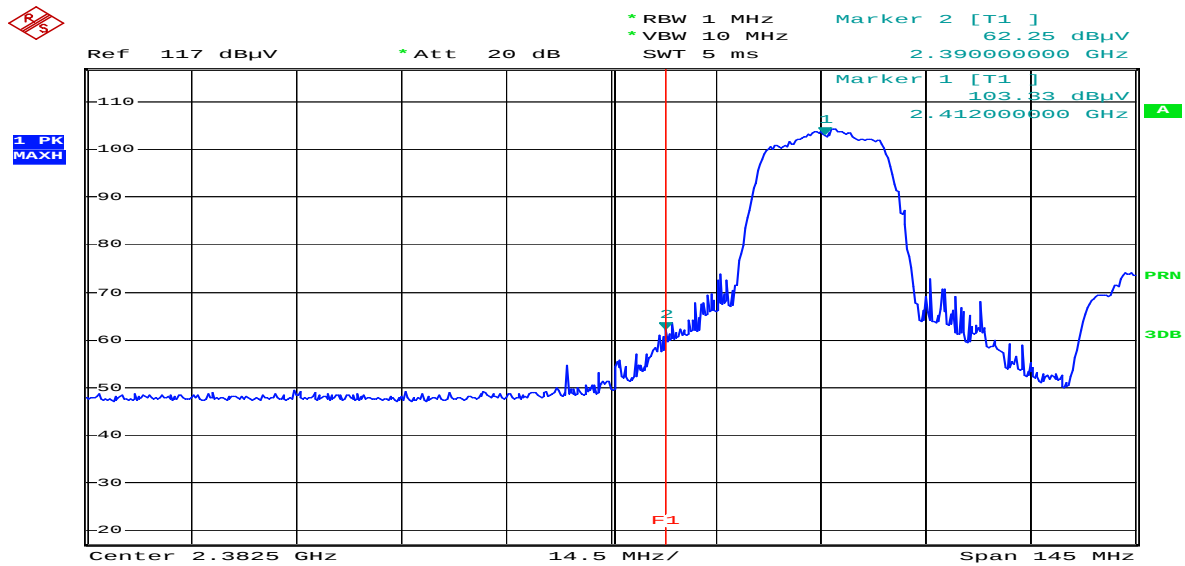
Polarity:Horizontal



Band Edges(CH Low)

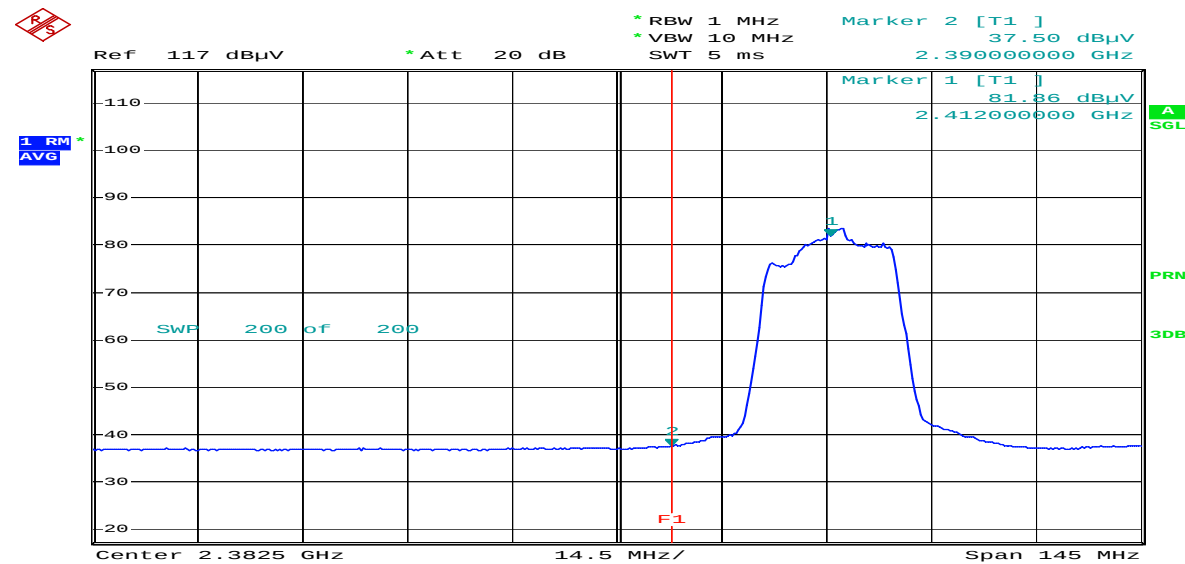
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

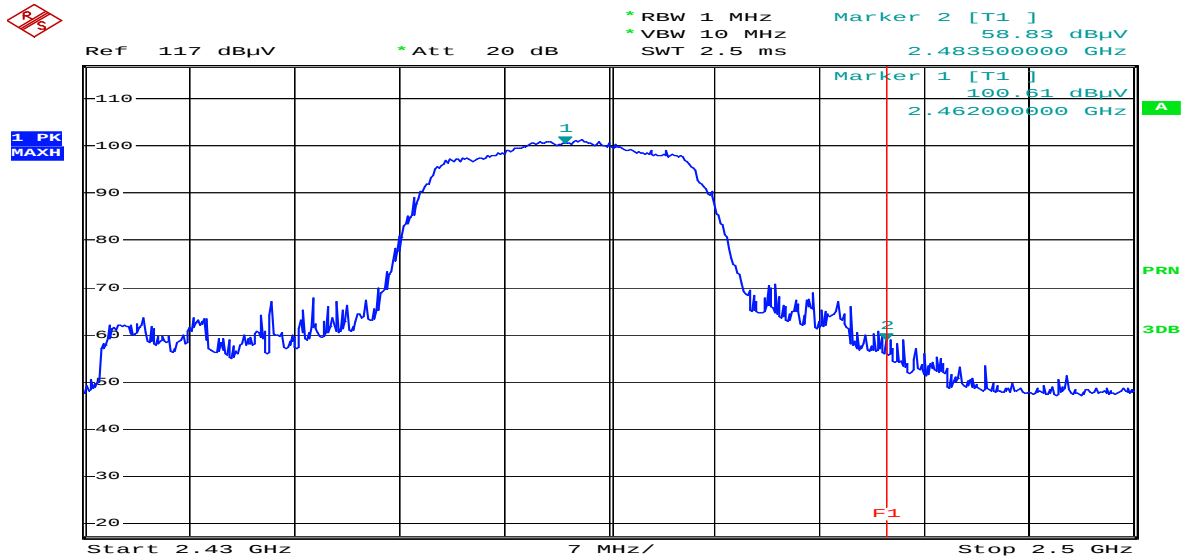
Polarity:Vertical



Band Edges(CH High)

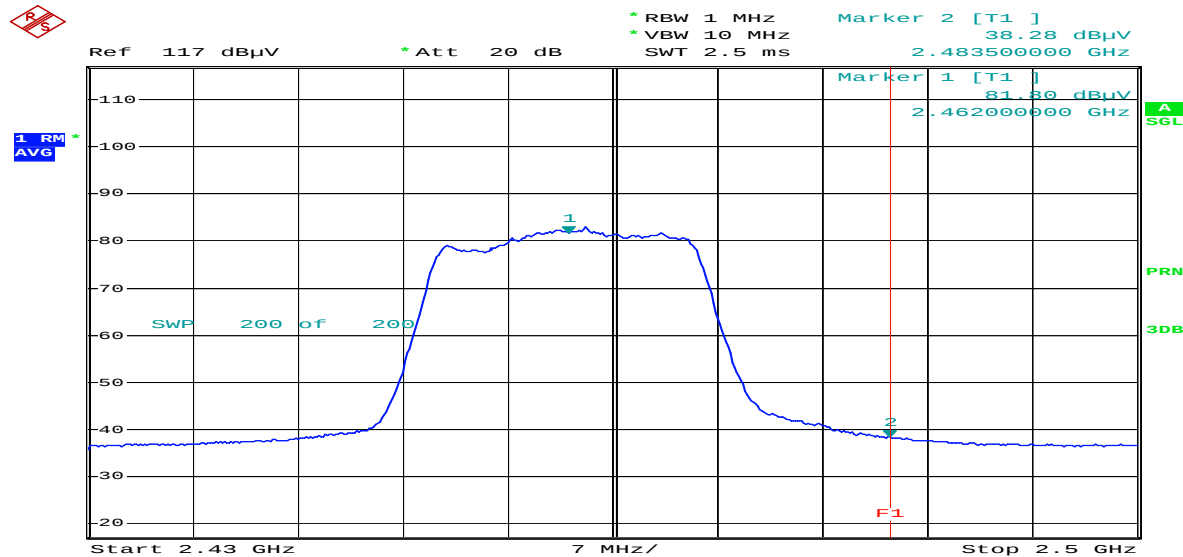
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

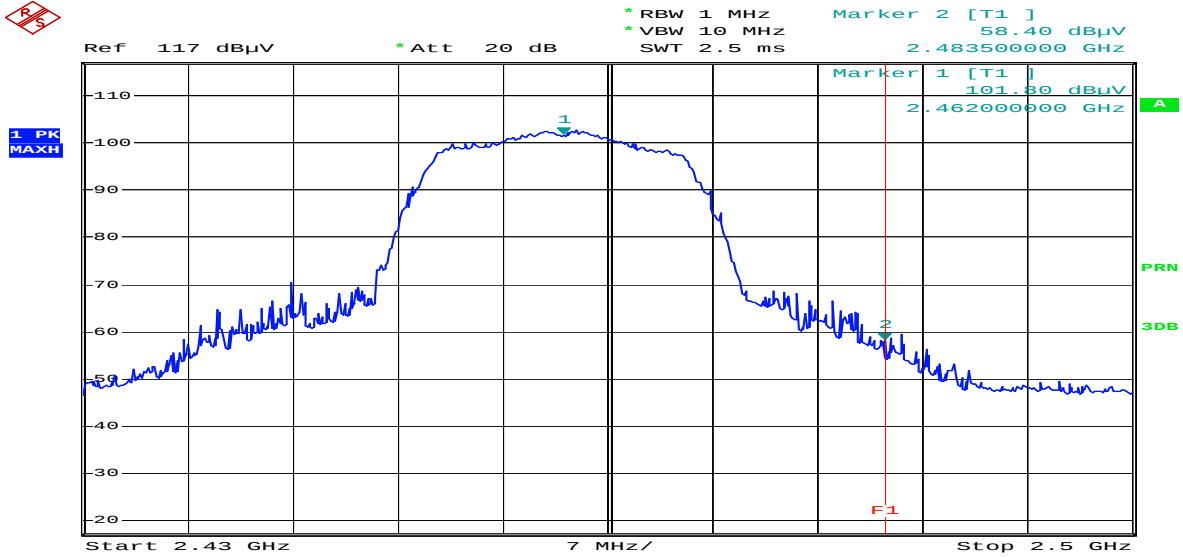
Polarity:Horizontal



Band Edges(CH High)

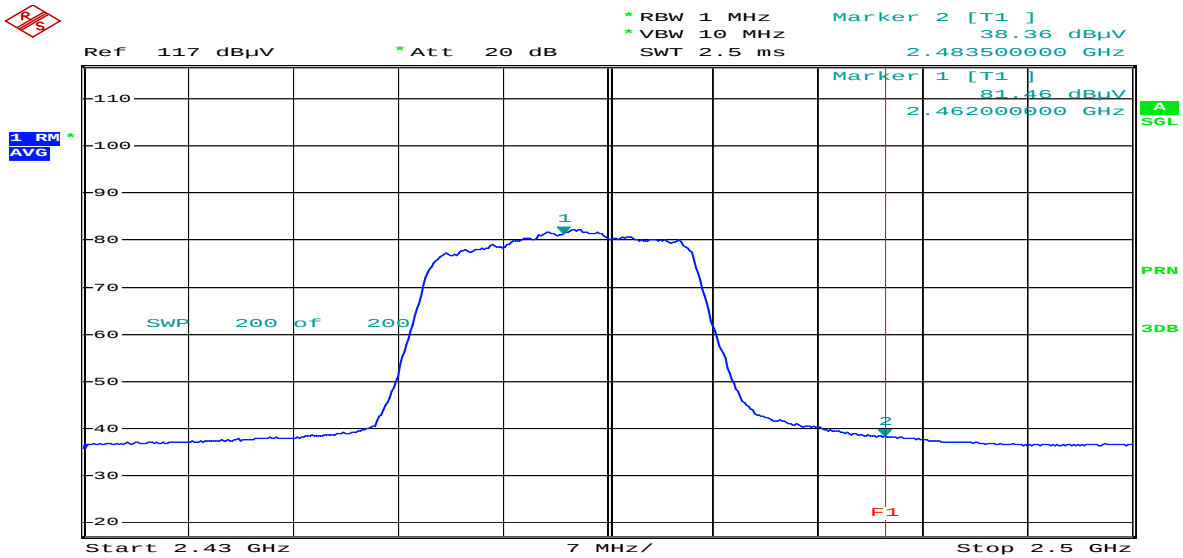
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

Polarity:Vertical



Comment: ESTE-18-08057-HOR
Date: 9.AUG.2018 23:38:51

11. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 MHz to 30 MHz was measured in accordance to FCC PART 15.207. The test setup was made according to ANSI C 63.10 (2009) in a shielded room. The EUT was placed on a non-conductive table at least 0.8 m above the ground plan. A grounded vertical reference plane was positioned in a distance of 0.4 m from the EUT. The distance from the EUT to other metal surfaces was at least 0.8 m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0 m. The test receiver with Quasi Peak detector complies with CISPR 16.

11.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST RECEIVER	ESPI	Rohde & Schwarz	100005	31-Oct-18
LISN	ESH3-Z5	Rohde & Schwarz	836679/025	31-Oct-18
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	31-Oct-18

11.2 Environmental Condition

Test Place : Shielded Room

Temperature (°C) : 22.4 °C

Humidity (% R.H.) : 51.2 % R.H.

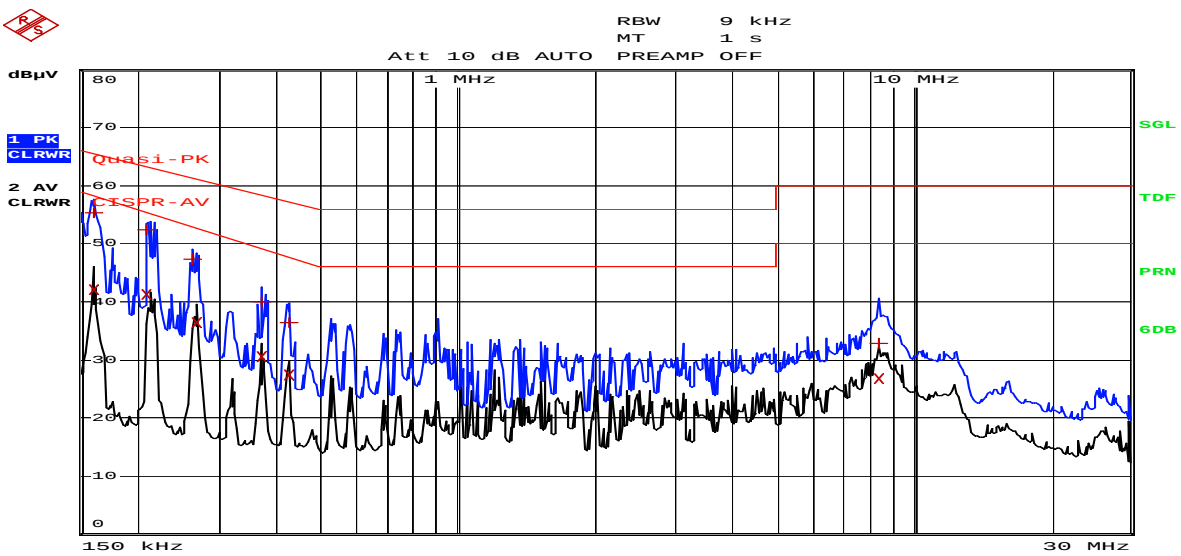
11.3-1 Test Data

Test Date : 3-Feb-17

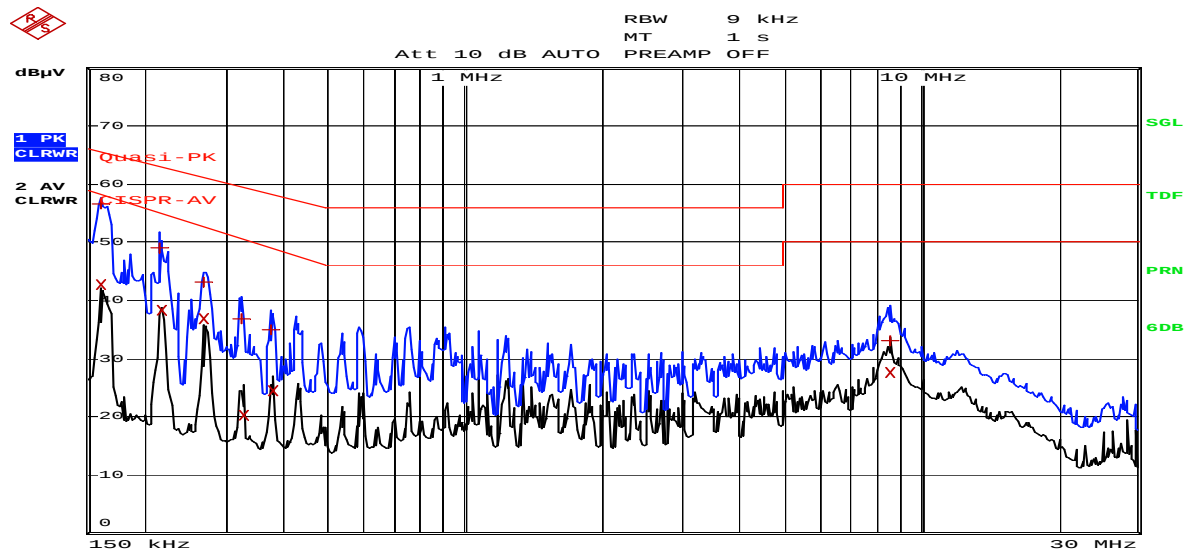
Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB/μV)	Reading (dB/μV)	Result (dB/μV)	Limit (dB/μV)	Reading (dB/μV)	Result (dB)
0.16	0.16	0.13	H	65.52	56.54	56.83	55.52	42.66	42.95
0.21	0.09	0.20	N	63.21	52.48	52.77	53.21	41.31	41.60
0.27	0.16	0.20	H	61.21	43.12	43.48	51.21	36.76	37.12
0.37	0.09	0.21	N	58.52	39.96	40.26	48.52	30.65	30.95
8.45	0.29	0.38	N	60.00	32.35	32.92	50.00	26.82	27.48
8.57	0.39	0.37	H	60.00	33.05	33.81	50.00	27.53	28.29
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

Appendix 1. Special diagram

* HOT LINE



* NEUTRAL LINE



Appendix 2. Antenna Requirement

1. Antenna Requirement

1.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.204

1.2 Antenna Connected Construction

The antenna types used in this product are Intergrated carrier antenna . The maximum Gain of this antenna is -2.0 dBi.