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Test Report for FCC

FCC ID :YCK-DR750XP

Report Number		ESTRFC2104-003		
Applicant	Company name	Pittasoft Co.,Ltd.		
	Address	A4th floor, ABN Tower, 331, Pangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, south Korea		
	Telephone	+82-31-8039-7789		
	Contack person	Hyunmin Hur		
Product	Product name	CAR DASHCAM		
	Factory address1	A4th floor, ABN Tower, 331, Pangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, south Korea		
	Factory address2	#470-1 Dangjung-Dong, Gunpo-Si, Kyungki-Do, 435-833, KOREA / South Korea		
	Model No.	DR750X Plus	Manufacturer	Pittasoft Co.,Ltd. SMSC Co., Ltd.
	Serial No.	None	Country of origin	KOREA
Test date	15-Mar-21 ~ 22-Mar-21		Date of issue	15-Apr-21
Testing location	140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Korea			
Standard	FCC PART 15 Subpart C (15.247) , ANSI C 63.10(2013) , KDB 558074 D01(2018)			
Measurement facility registration number	659627			
Tested by	Senior Engineer H.G. 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
- This test report is not related to KOLAS accreditation
- Additional models name:

'DR750X-2CH Plus, DR750X-1CH Plus, DR750X-2CH IR Plus, DR750X-2CH Truck Plus, DR750G-1CH Pro
DR750G-2CH Pro, DR750G-1CH Pro Plus, DR750G-2CH Pro Plus, DR755X-3CH Plus, DR755X-3CH Truck Plus
DR755X-3CH IR Plus, DR755X-3CH DMS Plus, DR750X-3CH Plus, DR750X-3CH Truck Plus
DR750X-3CH IR Plus, DR750X-3CH DMS Plus, DR750X-2CH DMS Plus

- Basic and additional Model(s) are same products, only model name are different

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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, MCS7
Number of Channel	:	11 ch
PEAK Output Power	:	6.94 dBm
Rating	:	DC 12V-24V The EUT is Tested by Cigar jack
Receipt Date	:	18-Feb-20
Testing Voltage	::	15-Feb-21
X-tal list(s) or Frequencies generated	:	The highest operating frequency is 2 462 MHz

2.2 General descriptions of EUT

Category	Specification
Color/Size/Weight	Front: Black / Width 118.5 mm x Height 36 mm / 103 g Rear: Black / Width 67.4 mm x Height 25 mm / 25 g
Memory	microSD Card (32 GB / 64 GB / 128 GB / 256 GB)
Recording Modes	Normal recording, Event recording (when impact is detected in normal and parking mode), Manual recording and Parking recording (when motion is detected) *When using Hardwiring Power Cable, ACC+ will trigger parking mode. When using other methods, G-sensor will trigger parking mode.
Camera	Front: STARVIS™ CMOS Sensor (Approx. 2.1 M Pixel) Rear: STARVIS™ CMOS Sensor (Approx. 2.1 M Pixel)
Resolution/Frame Rate	<Front - Rear> Full HD @60fps - Full HD @30fps *Frame rate may vary during Wi-Fi streaming.
Image Quality	Highest (Extreme), Highest, High, Normal
Video Compression Mode	MP4
Wi-Fi	Built-in (802.11 b.g.n)
Bluetooth	Built-in (4.2 LE, BDR, EDR)
GPS	Built-in (Dual Band : GPS, GLONASS)
LTE	External
Microphone	Built-in

Category	Specification
LED Indicators	Front: Recording LED, GPS LED, LTE/Wi-Fi LED, Front Security LED, Proximity Sensing indicator LED Rear: Rear Security LED
Button	Wi-Fi button: *Press once to turn on/off Wi-Fi. Proximity sensor: Touching the proximity sensor turns on/o audio recording or triggers manual recording depending on the rmware settings.
Sensor	3-Axis Acceleration Sensor
Backup Battery	Built-in super capacitor
Input Power	DC 12V-24V (3 pole DC Plug (Ø3.5 x Ø1.1)) to Wires (Black: GND / Yellow: B+ / Red: ACC)
Power Consumption	DR750X-1CH Plus : Normal Mode (WiFi On / GPS On / 1CH) : Avg. 250mA / 12V Normal Mode (WiFi Off / GPS On / 1CH) : Avg. 200mA / 12V Parking Mode (WiFi On / GPS Off / 1CH) : Avg. 230mA / 12V Parking Mode (WiFi Off / GPS Off / 1CH) : Avg. 180mA / 12V
	DR750X Plus / DR750X-2CH Plus : Normal Mode (WiFi On / GPS On / 2CH) : Avg. 390mA / 12V Normal Mode (WiFi Off / GPS On / 2CH) : Avg. 340mA / 12V Parking Mode (WiFi On / GPS Off / 2CH) : Avg. 350mA / 12V Parking Mode (WiFi Off / GPS Off / 2CH) : Avg. 300mA / 12V *Actual power consumption may vary depending on use conditions and environment.
Operation Temperature	-20 °C ~ 80 °C (-4 °F ~ 176 °F)
Speaker (Voice Guidance)	Built-in

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

Test Method : ANSI C 63.10 (2013) & KDB558074 D01(2018)

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 decides 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 method apply to the measurement of individual units or systems comprised

Summary of Test Results

Applied Satandard : 47 CFR Part 15 Subpart C				remark
Standard	Test Type	Result	Remark	Limit
15.207	AC Power Conducted Emission	N/A		
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 ouput power	Pass	Meet the requirement	Max. 30 dBm
15.209	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

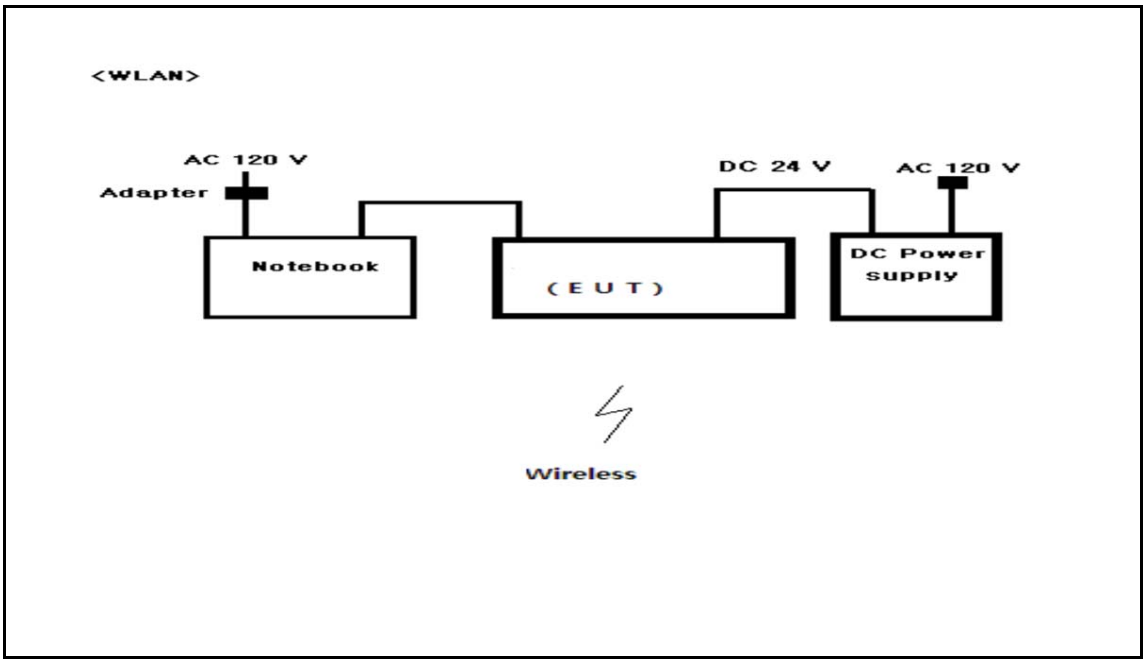
d. Test rate : 11 Mbps, 54 Mbps, Mcs7

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(802.11b, 802.11g, 802.11n20, 802.11n40)

4.3 Configuration and Peripherals



4.4 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
CAR DASHCAM	DR750X Plus	NONE	Pittasoft Co.,Ltd. SMSC Co., Ltd.	EUT
Notebook	NONE	NONE	Hewlett-Packed Company	
Adapter	HSTNN-DA40	NONE	DELTA ELECTRONICS (JIANGSU)LTD.	
DC Power supply	AK3010	NONE	VU POWER	

4.5 Cable Connecting

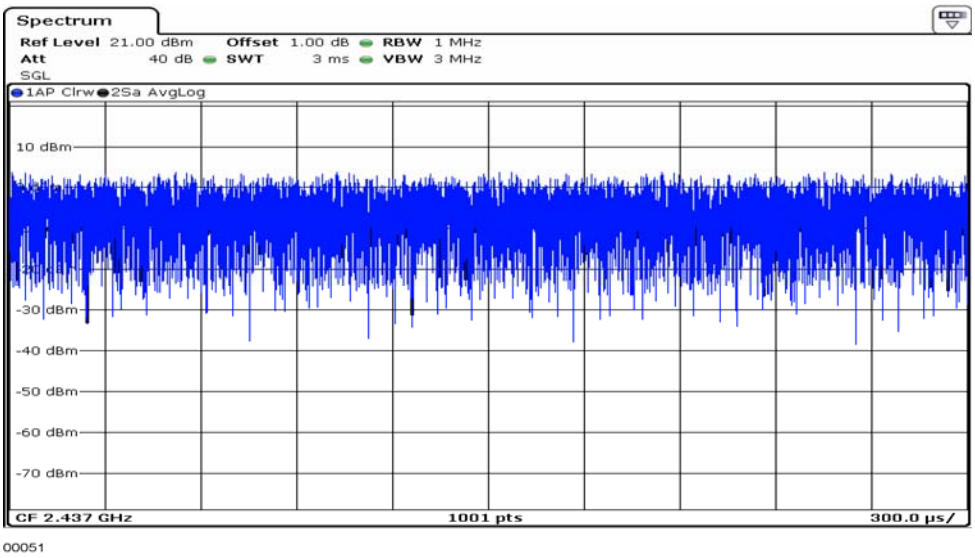
Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
CAR DASHCAM	Power	DC power supply	-	2.0	Unshielded	
CAR DASHCAM	Zig	Notebook	-	0.5	Unshielded	
Notebook	Power	Adapter	-	2.0	Unshielded	

4.6 DUTY CYCLE OF TEST SIGNAL

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

802.11b

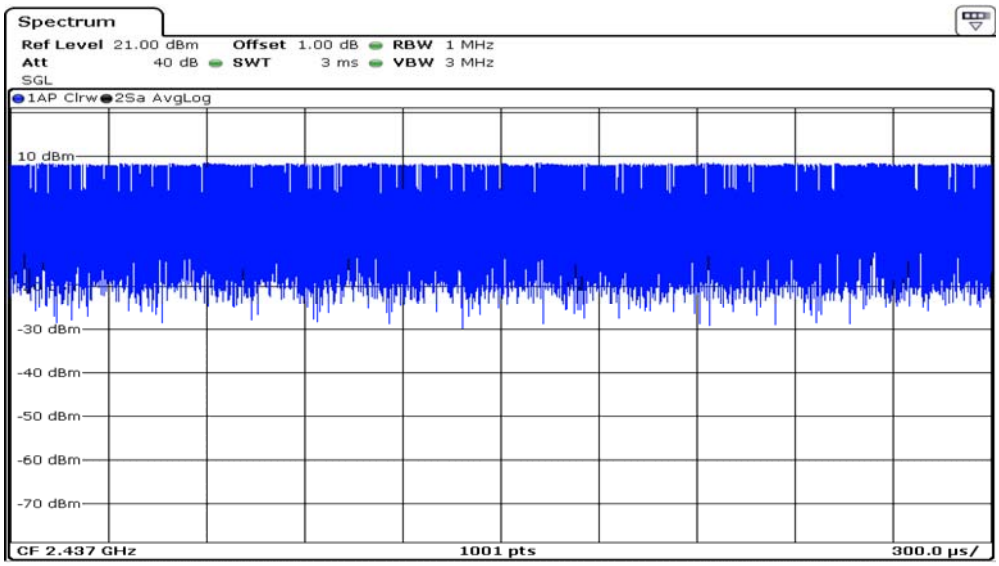
duty cycle = 100 % , duty factor = 10*log(1/1) =0



00051

802.11g

duty cycle = 100 % , duty factor = 10*log(1/1) =0

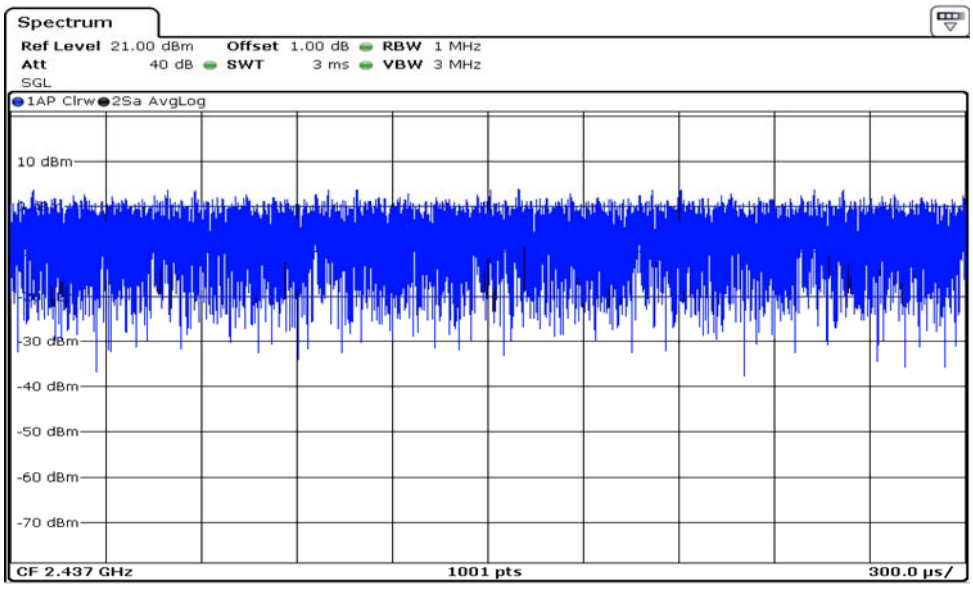


00051

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

802.11n20

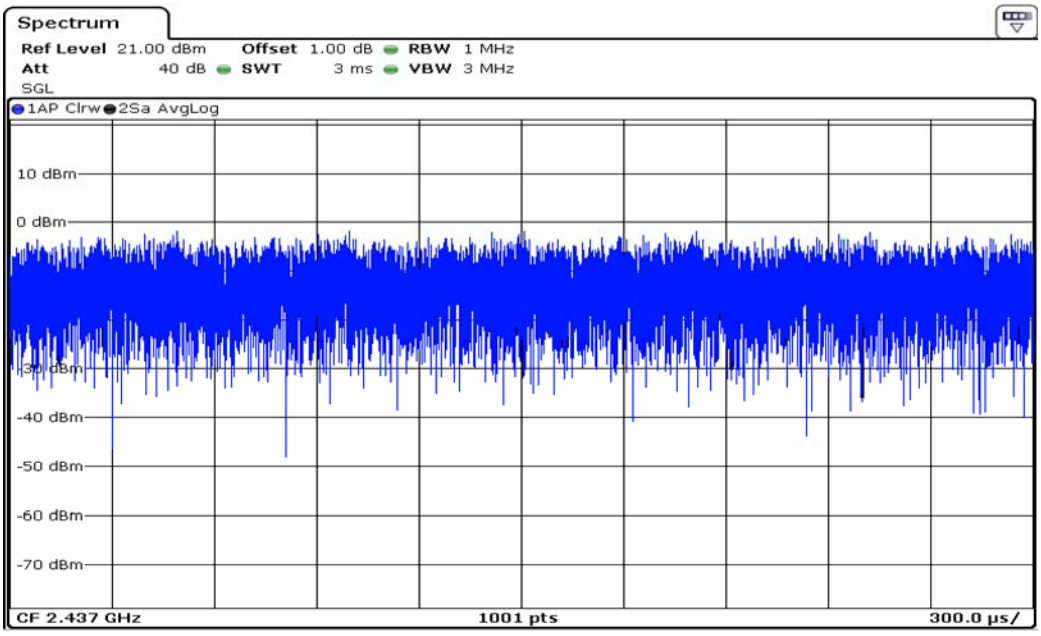
duty cycle = 100 % , duty factor = 10*log(1/1) =0



00051

802.11n40

duty cycle = 100 % , duty factor = 10*log(1/1) =0



00051

5. DTS bandwidth

5.1 Test procedure

558074 D01 DTS Meas Guidance v05 8.2 Option 2 :The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥ 3 x RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

5.2 might be > 6 dB Test instruments and measurement setup

The spectrum analyzer is set to as following.

. RBW= 100 KHz . VBW≥ 3 x RBW

. 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	1-Dec-21
RF Cable	Length: 30 cm	-	
-Spectrum Analyzer <=> EUT	Loss: 1.0 dB	-	

5.3 Measurement results

EUT	CAR DASHCAM	MODEL	DR750X Plus
MODE	802.11b, g, n20, n40	ENVIRONMENTAL CONDITION	23.0 ℃, 47.0 % R.H.
INPUT POWER	DC 24.0 V		

MODE - 802.11b

Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 412	14.49	9.34	0.5	PASS
2 437	14.47	9.86	0.5	PASS
2 462	14.36	9.49	0.5	PASS

MODE - 802.11g

Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 412	16.15	15.89	0.5	PASS
2 437	15.92	15.88	0.5	PASS
2 462	16.37	16.16	0.5	PASS

MODE - 802.11n20

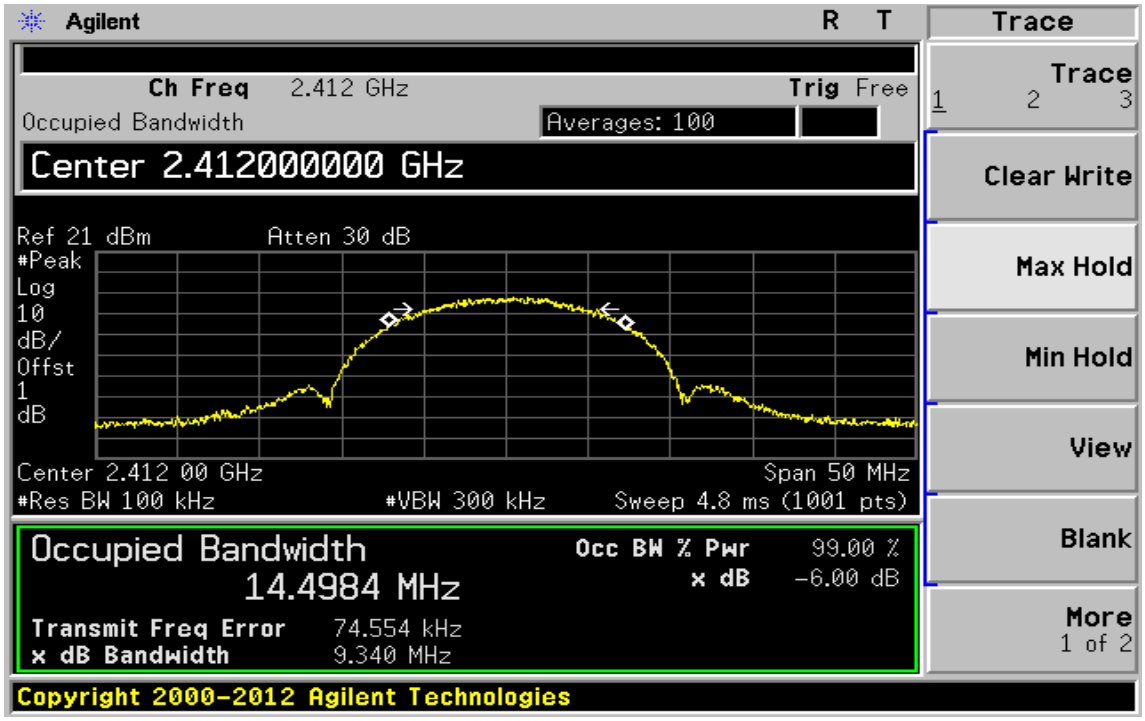
Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 412	17.29	16.91	0.5	PASS
2 437	17.33	16.10	0.5	PASS
2 462	17.54	16.15	0.5	PASS

MODE - 802.11n40

Channel Frequency (MHz)	Emission bandwidth (MHz)	Bandwidth at 6dB below(MHz)	Minimum Limit (MHz)	PASS/FAIL
2 422	35.67	35.05	0.5	PASS
2 437	35.95	35.61	0.5	PASS
2 462	35.73	35.24	0.5	PASS

5.4 Trace data - 802.11b

(ch_1)



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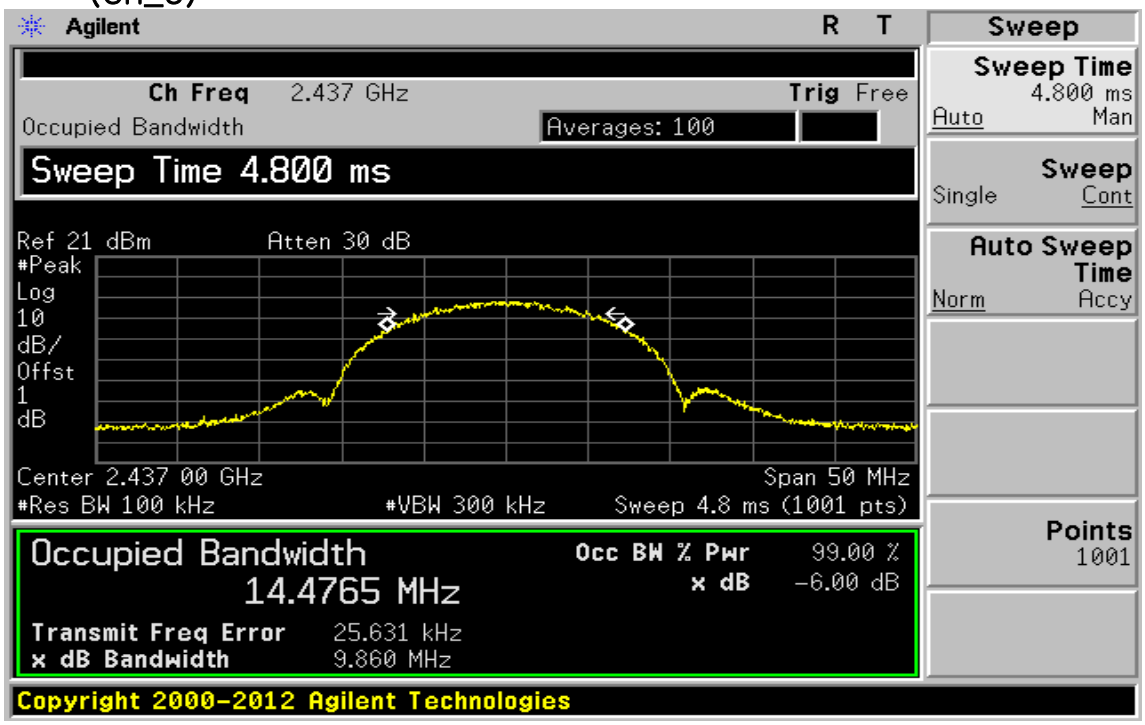
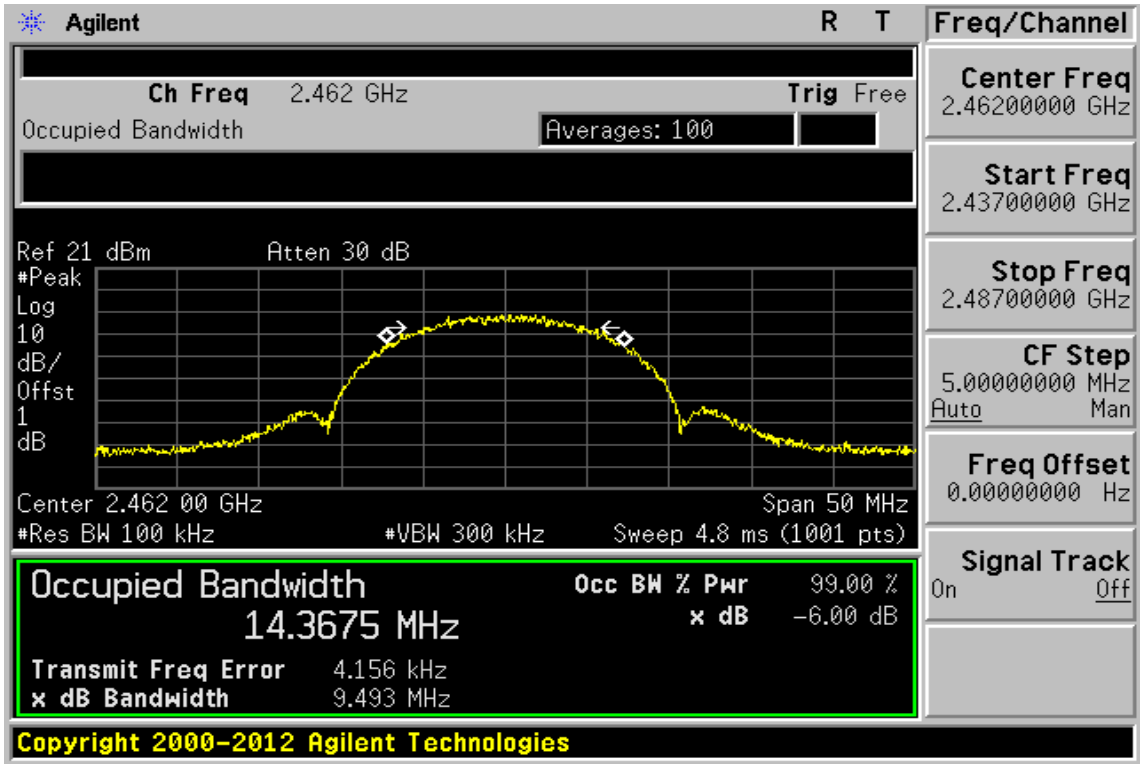
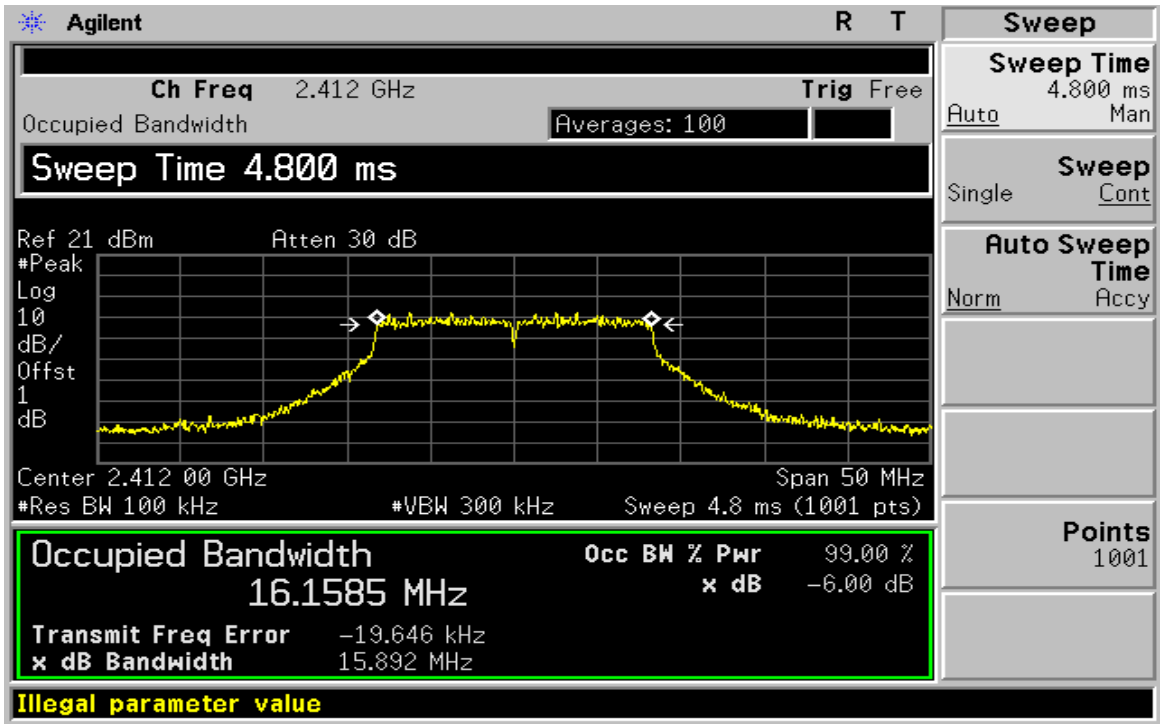


(ch_11)

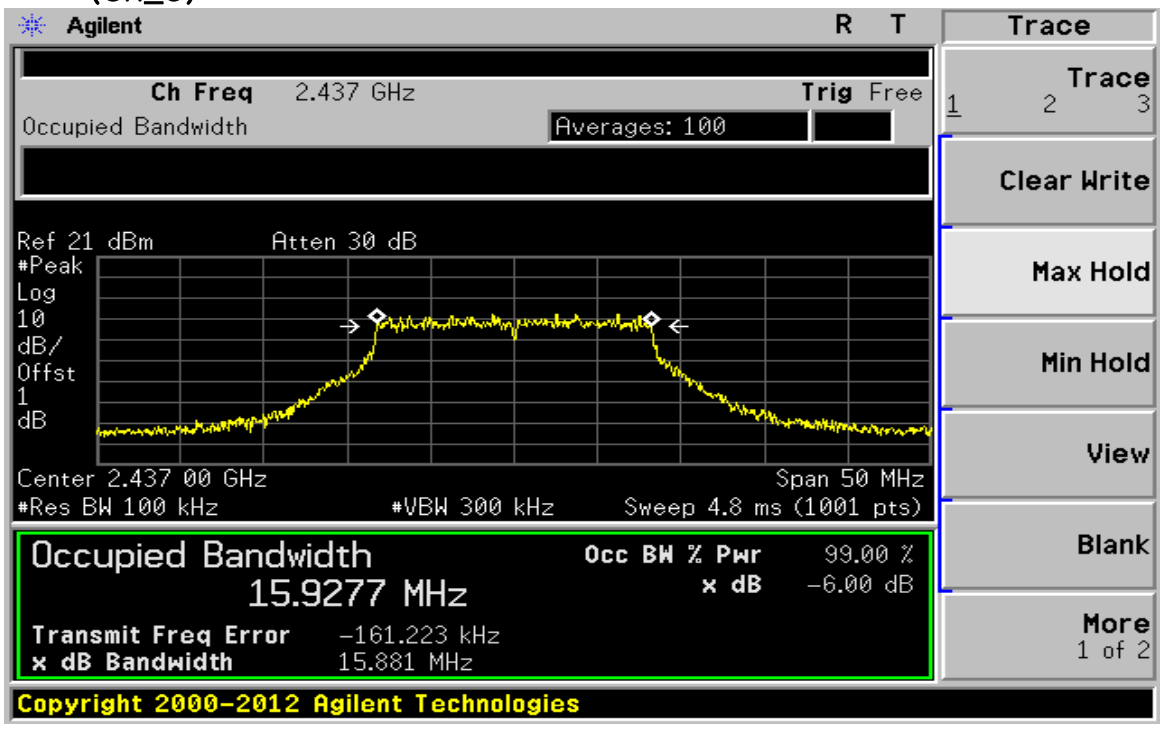

Agilent
R T
Freq/Channel
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Averages: 100
Center Freq
2.46200000 GHz
Start Freq
2.43700000 GHz
Stop Freq
2.48700000 GHz
CF Step
5.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Center 2.462 00 GHz
Span 50 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 4.8 ms (1001 pts)
Occupied Bandwidth
14.3675 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 4.156 kHz
x dB Bandwidth 9.493 MHz
Copyright 2000-2012 Agilent Technologies

5.4 Trace data - 802.11g

(ch_1)



(ch_6)



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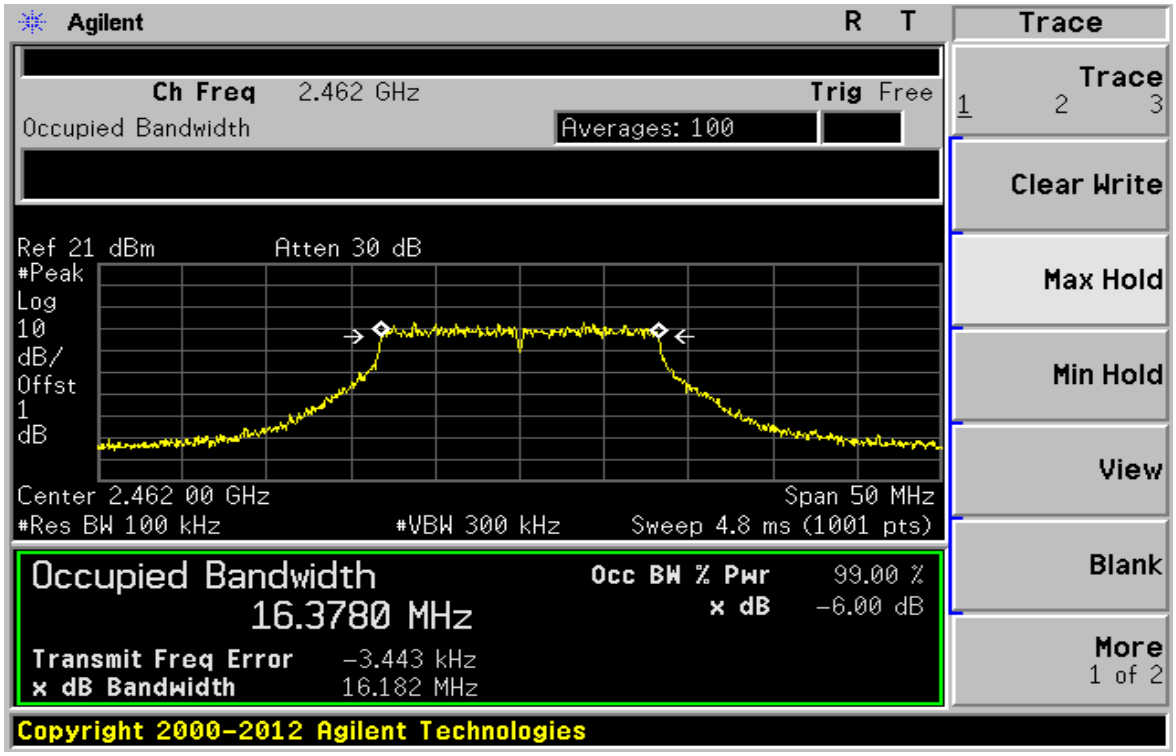
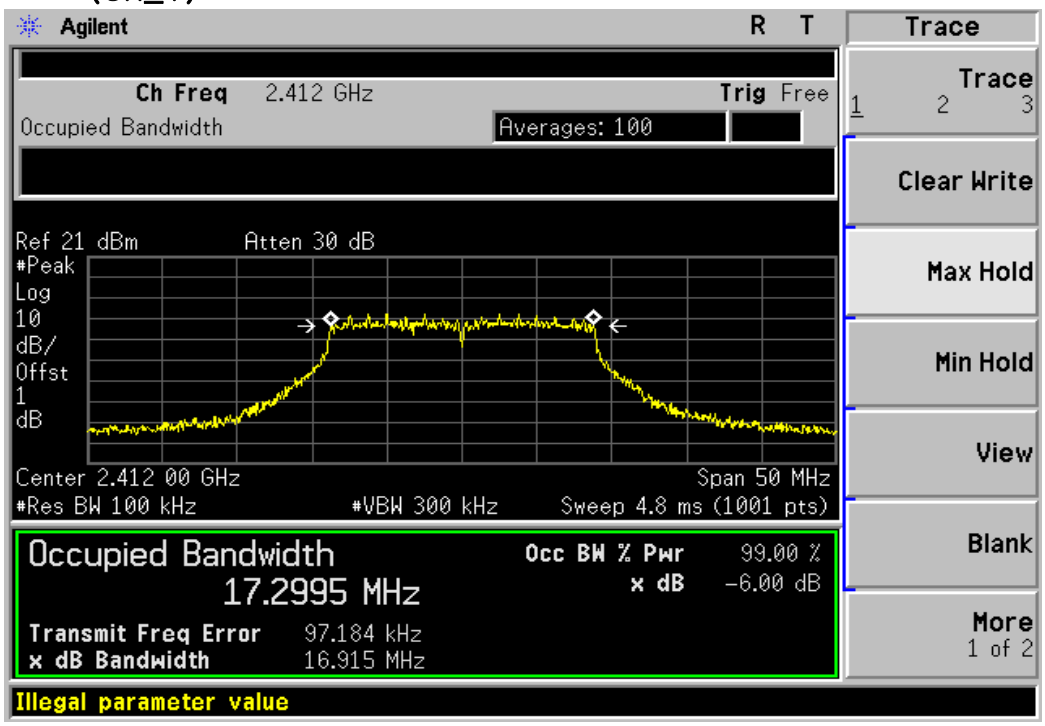

Agilent
R T
Trace
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Averages: 100
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Center 2.462 00 GHz
Span 50 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 4.8 ms (1001 pts)
Occupied Bandwidth
16.3780 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -3.443 kHz
x dB Bandwidth 16.182 MHz
Copyright 2000-2012 Agilent Technologies

5.4 Trace data - 802.11n20

(ch_1)



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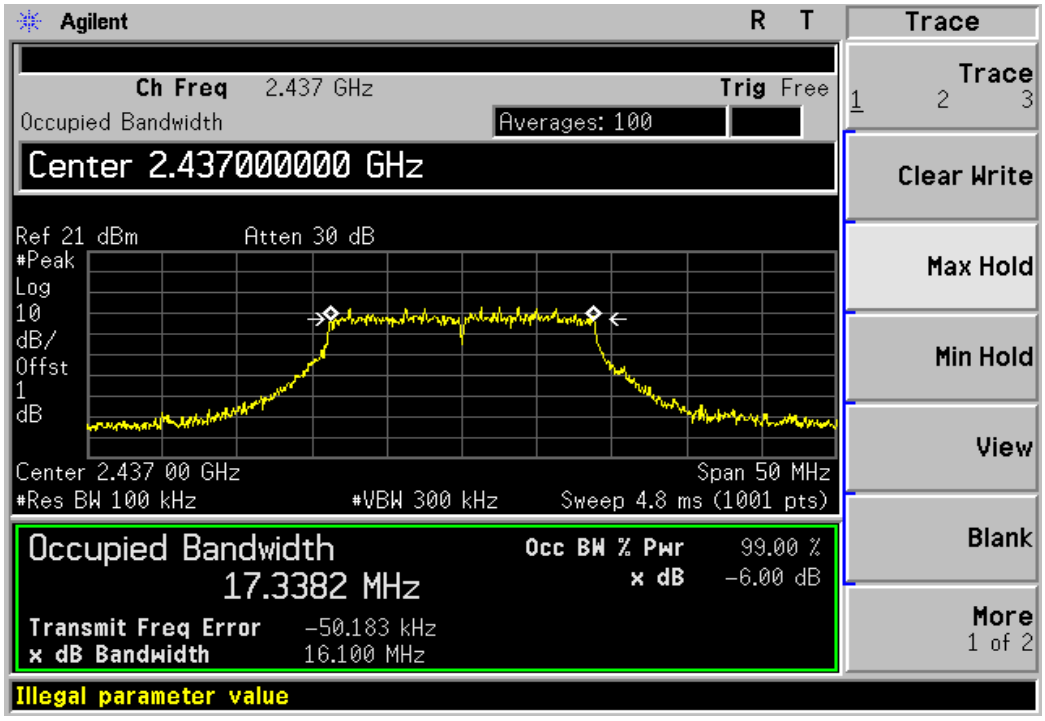
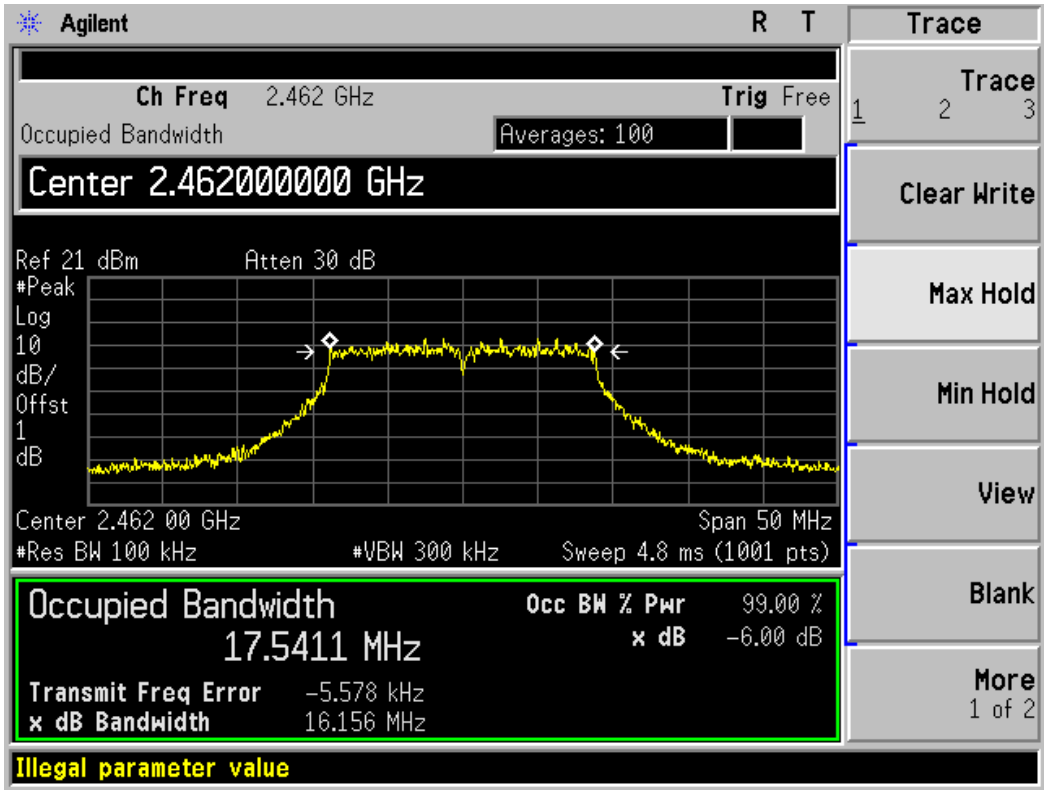
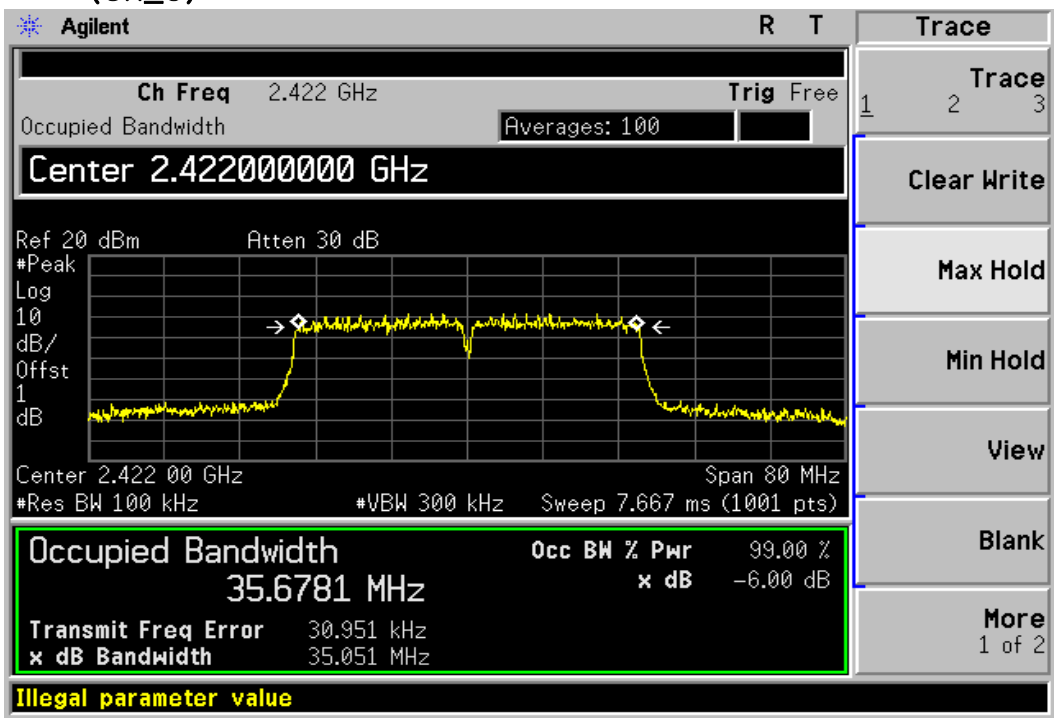


(ch_11)


Agilent
R T
Trace
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Averages: 100
Center 2.462000000 GHz
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Center 2.462 00 GHz
Span 50 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 4.8 ms (1001 pts)
Occupied Bandwidth
17.5411 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -5.578 kHz
x dB Bandwidth 16.156 MHz
Illegal parameter value

5.4 Trace data - 802.11n40

(ch_3)



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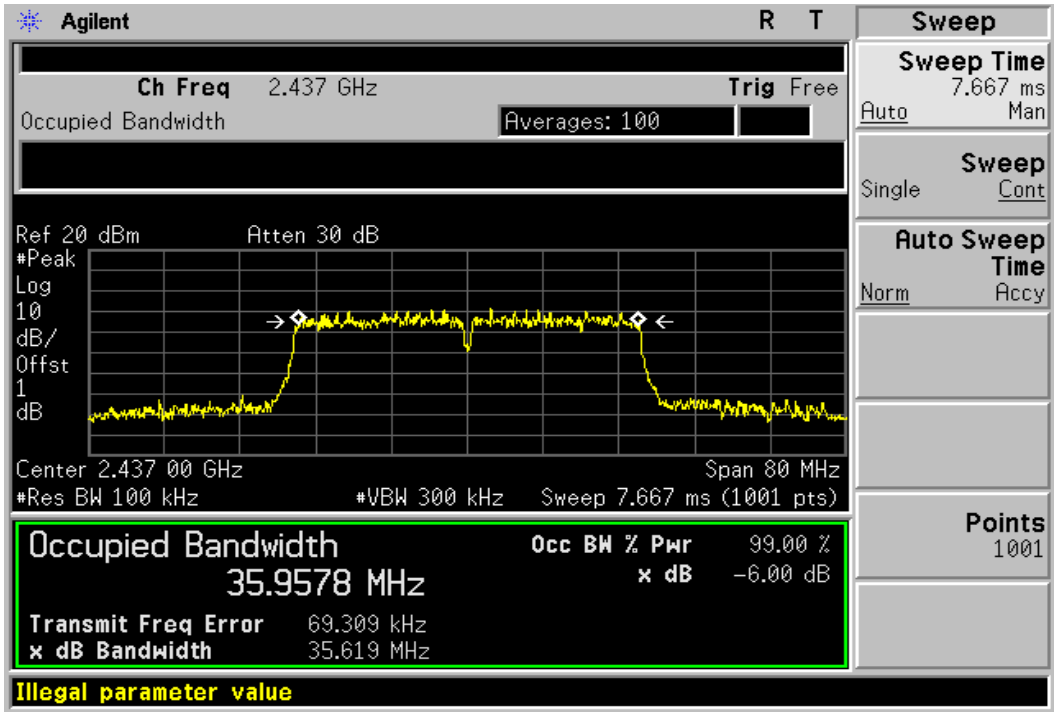
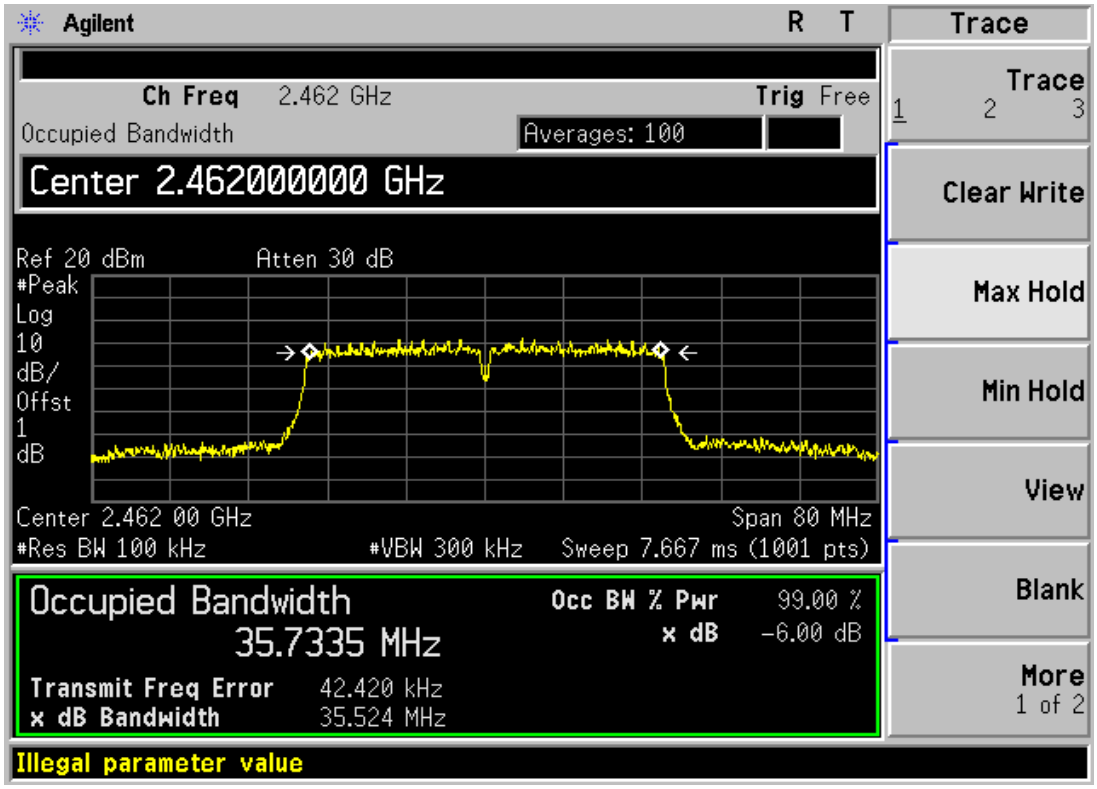


(ch_11)


Agilent
R T
Trace
Ch Freq 2.462 GHz
Trig Free
Occupied Bandwidth
Averages: 100
Center 2.462000000 GHz
Trace
1 2 3
Clear Write
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Max Hold
Min Hold
View
Center 2.462 00 GHz
Span 80 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 7.667 ms (1001 pts)
Occupied Bandwidth
35.7335 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 42.420 kHz
x dB Bandwidth 35.524 MHz
Blank
More
1 of 2
Illegal parameter value

6. Maximum peak conducted output power

6.1 Test procedure

The transmitter antenna terminal is connected to the input of a Power Sensor. Measurement is made while EUT is operating in transmission mode at the appropriate center frequency. The maximum peak output power measurement is 30 dBm.

Maximum Peak Output Power Test Instruments

Description	Model	Serial Number	Cal. Due Date
Power Meter	N1921A	MY45100570	1-Dec-21
Power Sensor	N1921A	MY45240427	1-Dec-21
Power Meter <=> EUT	Loss: 1 dB	-	

6.2 Measurement results

EUT	CAR DASHCAM	MODEL	DR750X Plus
MODE	802.11b, g, n20, n40	ENVIRONMENTAL CONDITION	23.0 ℃, 47.0 % R.H.
INPUT POWER	DC 24.0 V		

MODE - 802.11b

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
1	2 412	PEAK	6.10	0.0041	30.0	PASS
6	2 437	PEAK	6.11	0.0041	30.0	PASS
11	2 462	PEAK	6.94	0.0049	30.0	PASS

MODE - 802.11g

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
1	2 412	PEAK	1.72	0.0015	30.0	PASS
6	2 437	PEAK	2.36	0.0017	30.0	PASS
11	2 462	PEAK	2.78	0.0019	30.0	PASS

MODE - 802.11n20

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
1	2 412	PEAK	0.85	0.0012	30.0	PASS
6	2 437	PEAK	0.82	0.0012	30.0	PASS
11	2 462	PEAK	1.34	0.0014	30.0	PASS

MODE - 802.11n40

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Limit[1W] (dBm)	PASS/FAIL
		Detector	(dBm)	(W)		
3	2 422	PEAK	-1.87	0.0007	30.0	PASS
6	2 437	PEAK	-1.34	0.0007	30.0	PASS
11	2 462	PEAK	-0.94	0.0008	30.0	PASS

7. Maximum conducted (average) output power

7.1 Test procedure

The transmitter antenna terminal is connected to the input of a Power Sensor. Measurement is made while EUT is operating in transmission mode at the appropriate center frequency. The maximum Average output power measurement is 30 dBm.

Maximum conducted (average) output power Test Instruments

Description	Model	Serial Number	Cal. Due Date
Power Meter	N1921A	MY45100570	1-Dec-21
Power Sensor	N1921A	MY45240427	1-Dec-21
Power Meter <=> EUT	Loss: 1 dB	-	

7.2 Measurement results

EUT	CAR DASHCAM	MODEL	DR750X Plus
MODE	802.11b, g, n20, n40	ENVIRONMENTAL CONDITION	23.0 ℃, 47.0 % R.H.
INPUT POWER	DC 24.0 V		

MODE - 802.11b

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
1	2 412	AVG	-7.97	0.00	-7.97	0.0002
6	2 437	AVG	-8.97	0.00	-8.97	0.0001
11	2 462	AVG	-9.32	0.00	-9.32	0.0001

MODE - 802.11g

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
1	2 412	AVG	-9.90	0.00	-9.90	0.0001
6	2 437	AVG	-9.28	0.00	-9.28	0.0001
11	2 462	AVG	-10.20	0.00	-10.20	0.0001

MODE - 802.11n20

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
1	2 412	AVG	-10.91	0.00	-10.91	0.0001
6	2 437	AVG	-11.20	0.00	-11.20	0.0001
11	2 462	AVG	-12.11	0.00	-12.11	0.0001

MODE - 802.11n40

CHANNEL	Channel requency (MHz)	Conducted Power Output(dBm)			Measured + Duty Cycle(dBm)	Measured + Duty Cycle(W)
		Detector	(dBm)	Duty Cycle		
3	2 422	AVG	-10.91	0.00	-10.91	0.0001
6	2 437	AVG	-11.20	0.00	-11.20	0.0001
11	2 462	AVG	-12.11	0.00	-12.11	0.0001

8. Maximum power spectral density level in the fundamental emission

8.1 Test procedure

KDB 558074 D01 DTS Meas Guidance V05 10.2 Method PKPSD (peak PSD)

8.2 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 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ 3 x 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	FSV40	100393	1-Dec-21
Spectrum Analyzer	E4440A	US42041291	1-Dec-21
RF Cable	Length: 30 cm	-	
Spectrum Analyzer <=> EUT	Loss: 1.0 dB	-	

8.3 Measurement results

EUT	CAR DASHCAM	MODEL	DR750X Plus
MODE	802.11b, g, n20, n40	ENVIRONMENTAL CONDITION	22.0 ℃, 47.0 % R.H.
INPUT POWER	DC 24.0 V		

MODE - 802.11b

CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
1	2 412	-16.39	8.00	24.39
6	2 437	-16.50	8.00	24.50
11	2 462	-16.27	8.00	24.27

MODE - 802.11g

CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
1	2 412	-17.17	8.00	25.17
6	2 437	-16.66	8.00	24.66
11	2 462	-16.30	8.00	24.30

MODE - 802.11n20

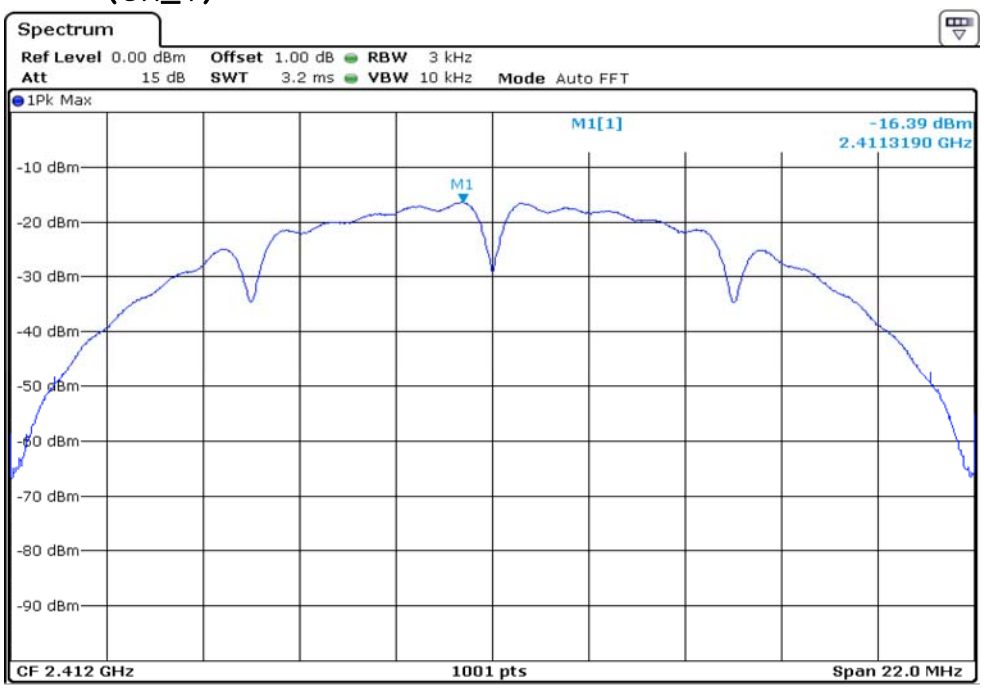
CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
1	2 412	-17.85	8.00	25.85
6	2 437	-17.47	8.00	25.47
11	2 462	-17.75	8.00	25.75

MODE - 802.11n40

CHANNEL	Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Maximum Permissible Power Density (dBm/3kHz)	Margin
3	2 422	-18.83	8.00	26.83
6	2 437	-19.15	8.00	27.15
11	2 462	-18.03	8.00	26.03

8.4 Trace data - 802.11b mode

(ch_1)



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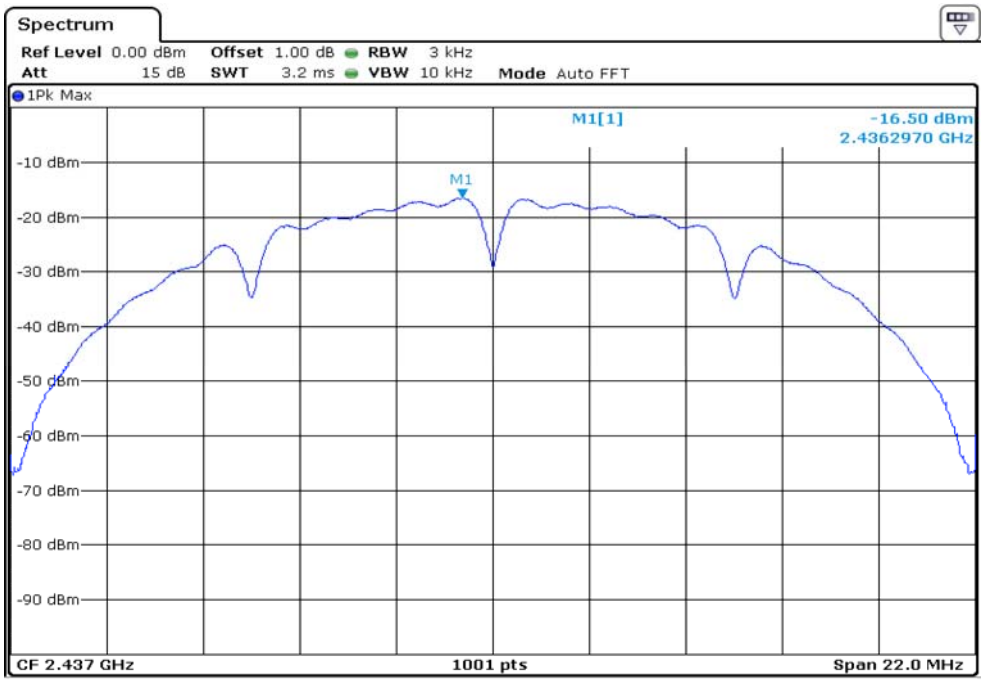
(ch_6)



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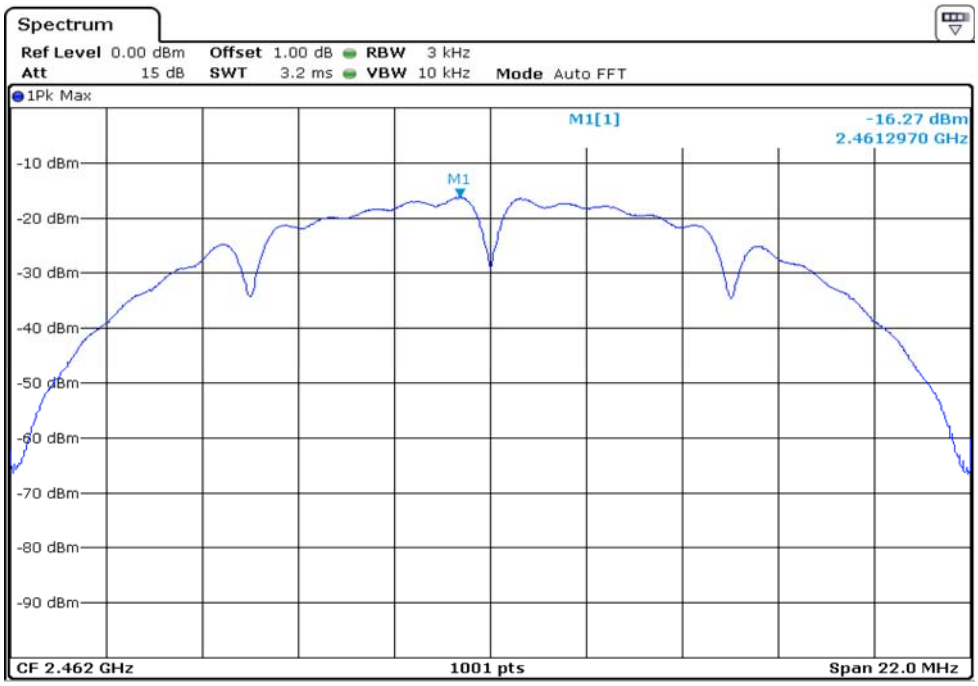
8.4 Trace data - 802.11b

(ch_11)



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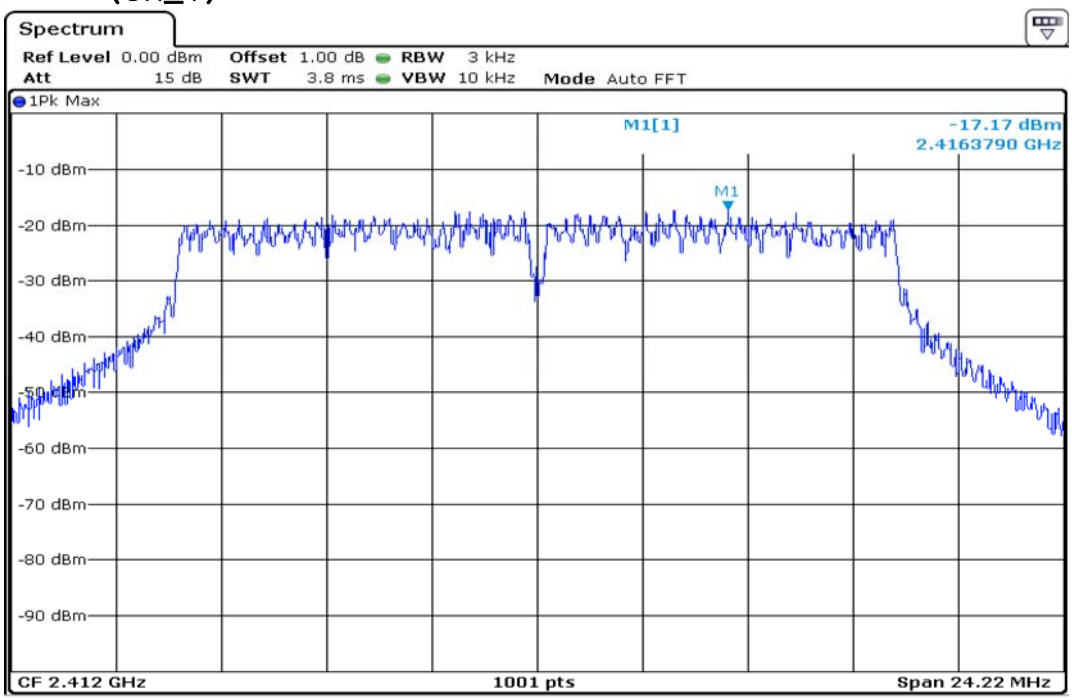
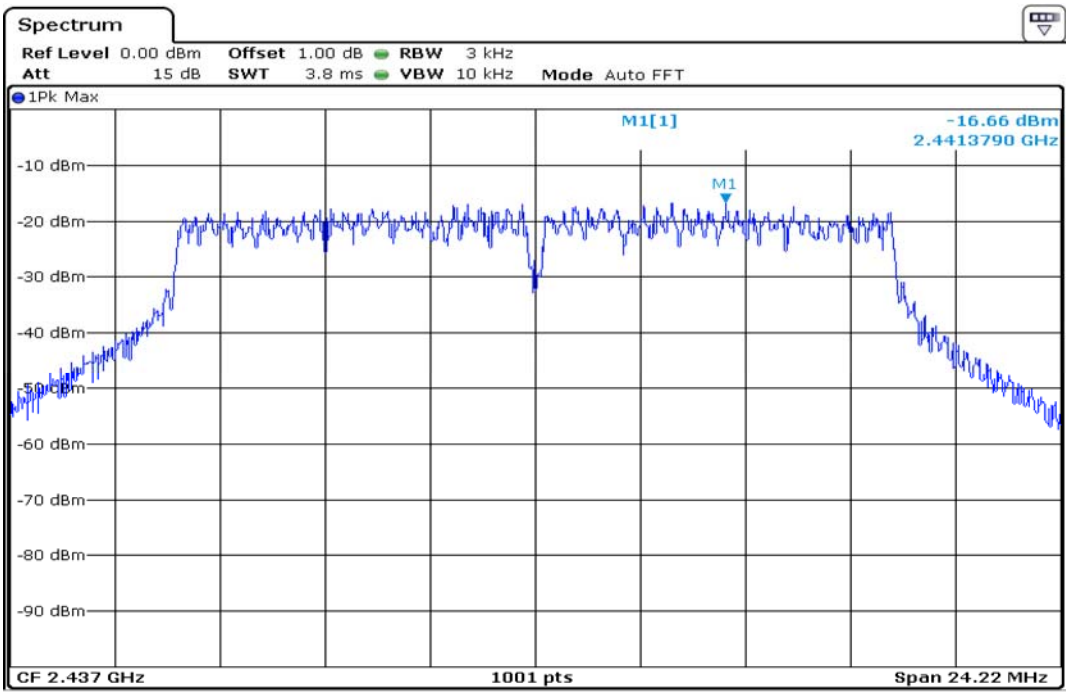
8.4 Trace data - 802.11g mode

(ch_1)



00051

(ch_6)



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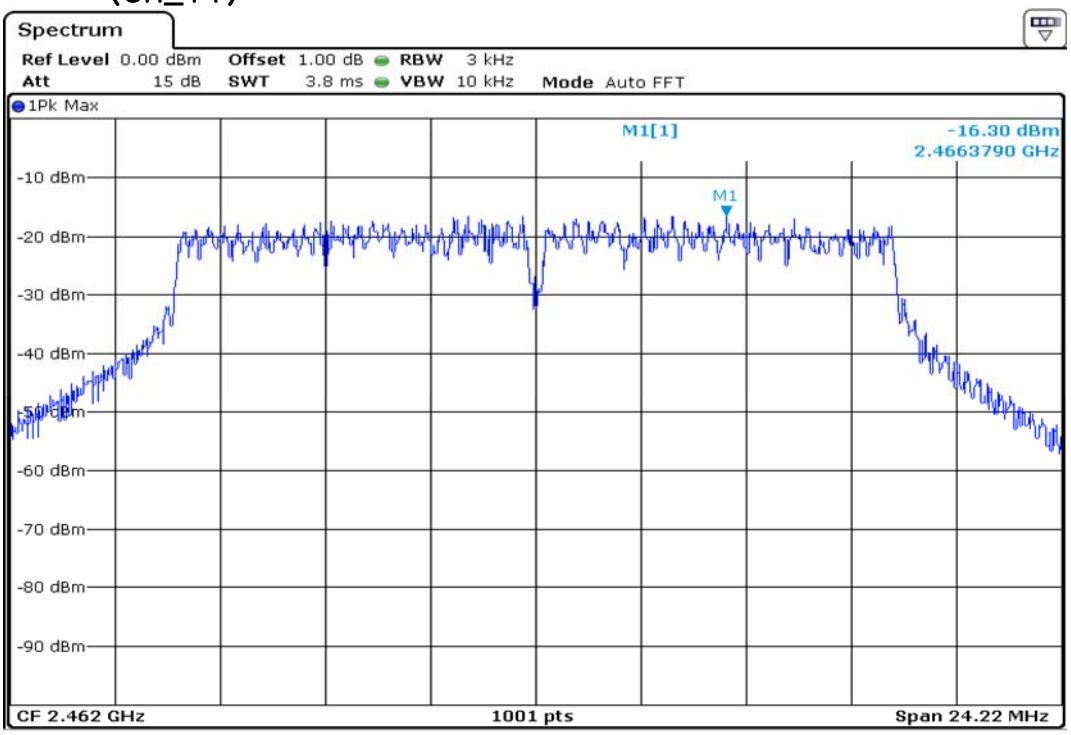
8.4 Trace data - 802.11g mode

(ch_11)



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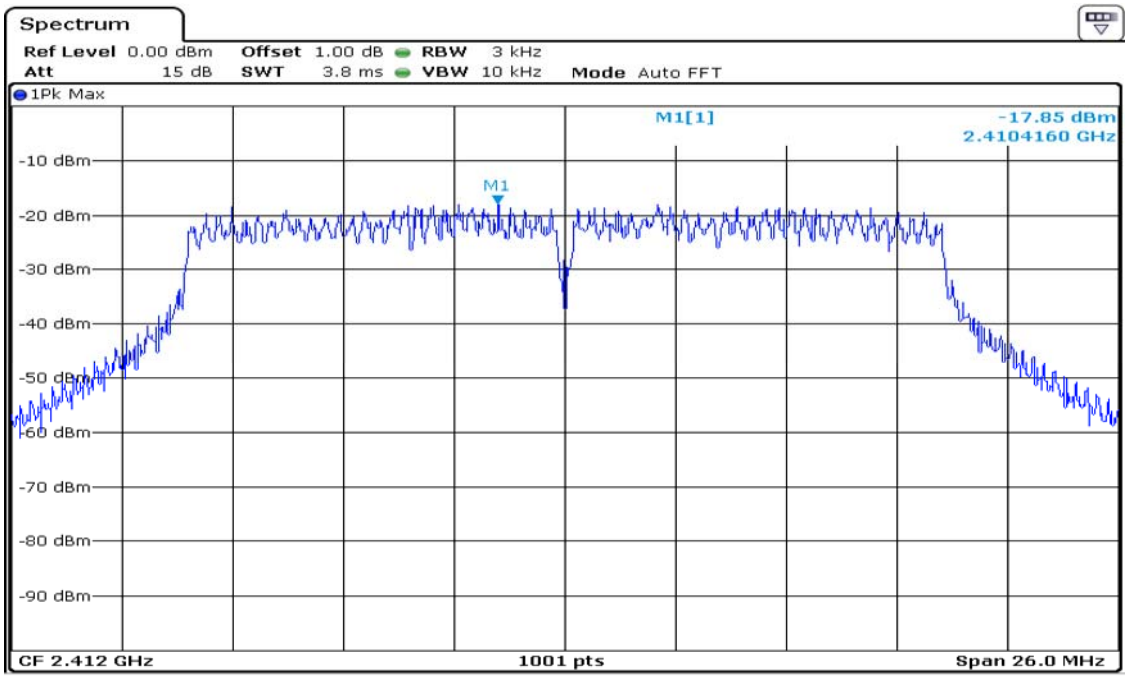
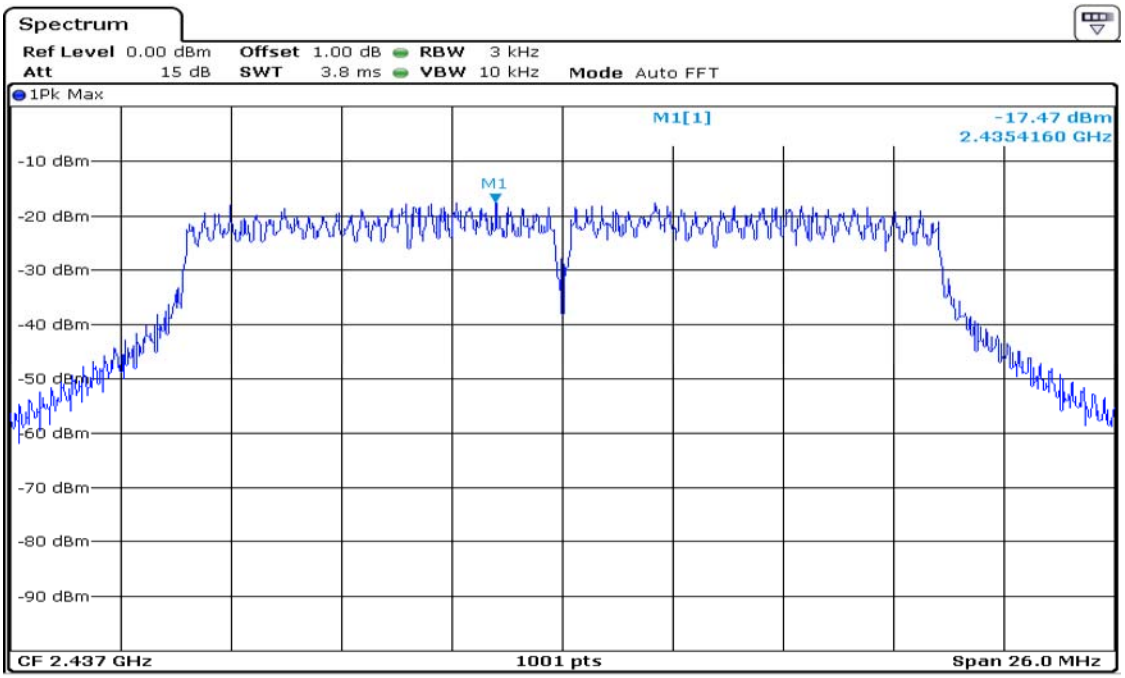
8.4 Trace data - 802.11n20 mode

(ch_1)



00051

(ch_6)



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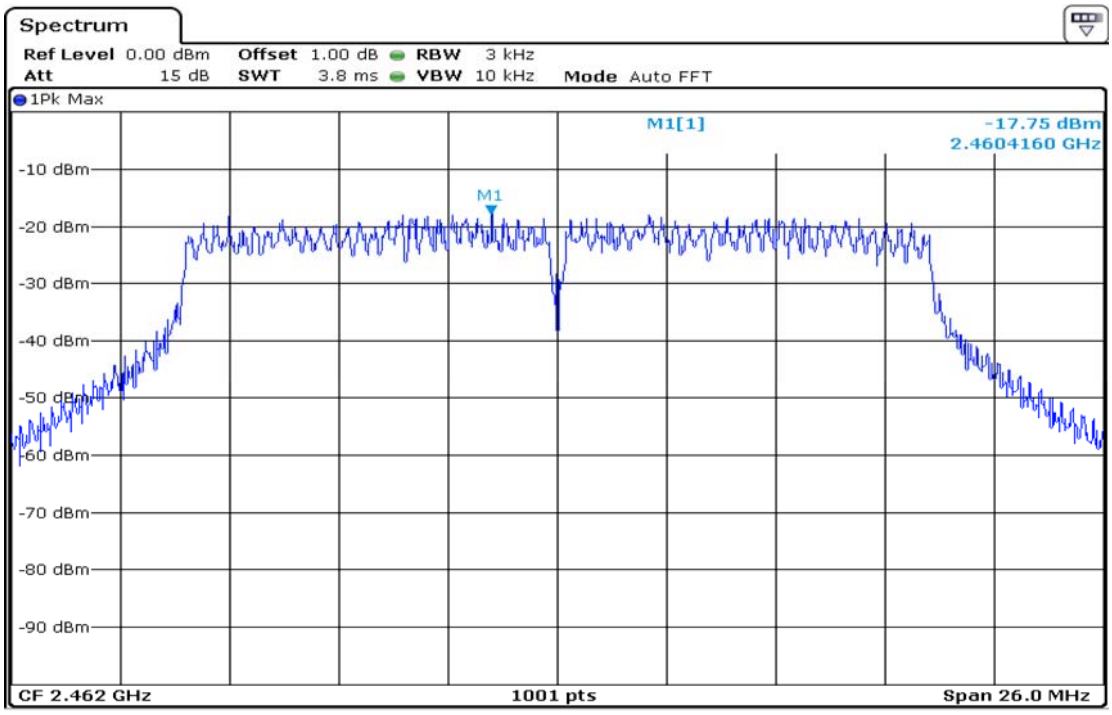
8.4 Trace data - 802.11g mode

(ch_11)



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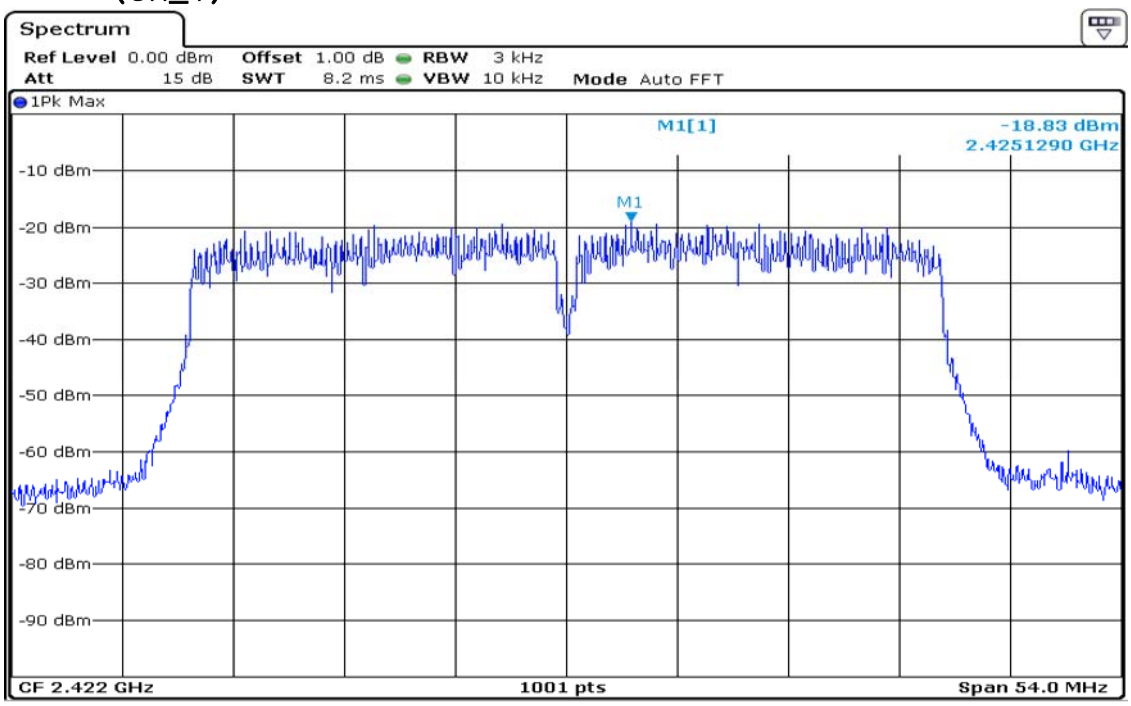
8.4 Trace data - 802.11n40 mode

(ch_1)



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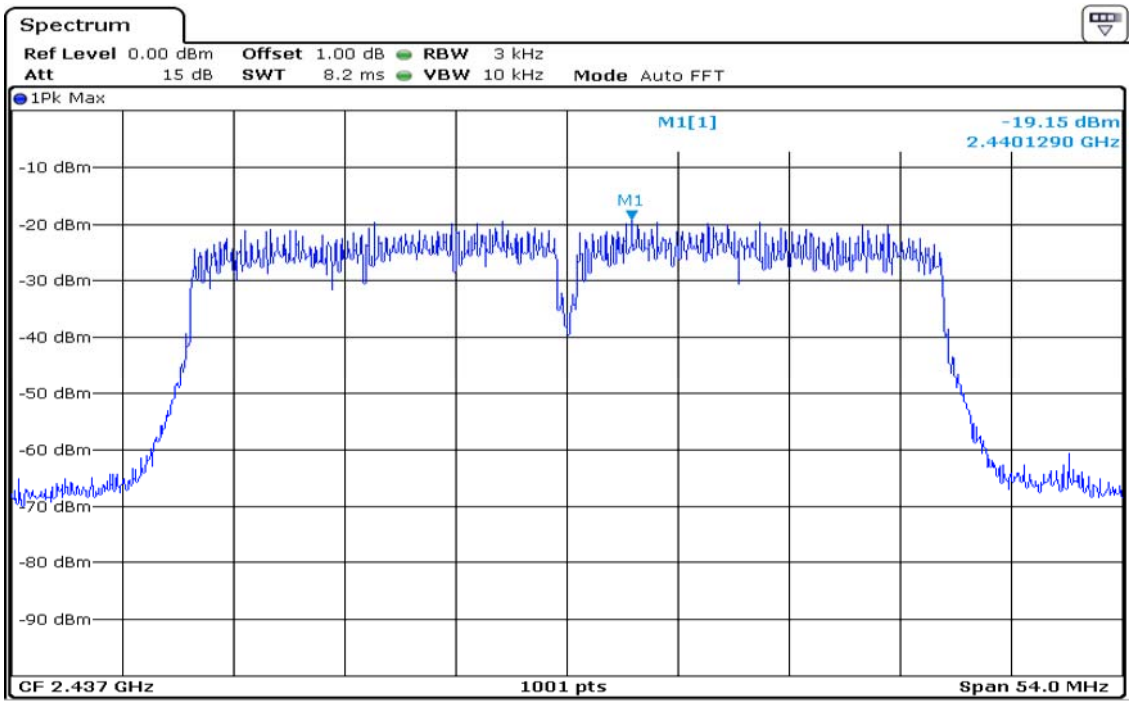
(ch_6)



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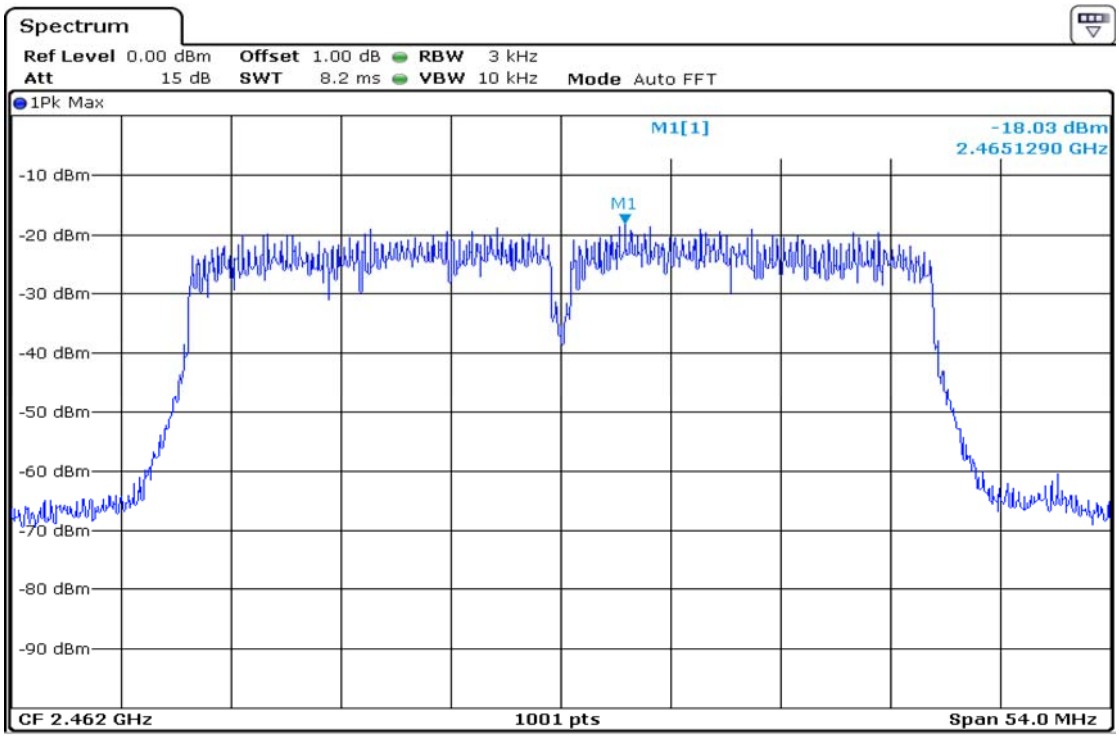
8.4 Trace data - 802.11g mode

(ch_11)



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9. Emissions in non-restricted frequency bands

9.1 Test procedure

KDB 558074 D01 DTS Meas Guidance V05

9.2 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 ≥ 3 x 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	1-Dec-21
Spectrum Analyzer	FSV40	100939	1-Dec-21
RF Cable	Length: 30 cm		-
-Spectrum Analyzer <=> EUT	Loss: 1.0 dB		-

9.3 Measurement results of band-edge & out of emission - Adapter

EUT	CAR DASHCAM	MODEL	DR750X Plus
MODE	802.11b, g, n20, n40	ENVIRONMENTAL CONDITION	22.0 ℃, 47.0 % R.H.
INPUT POWER	DC 24.0 V		

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

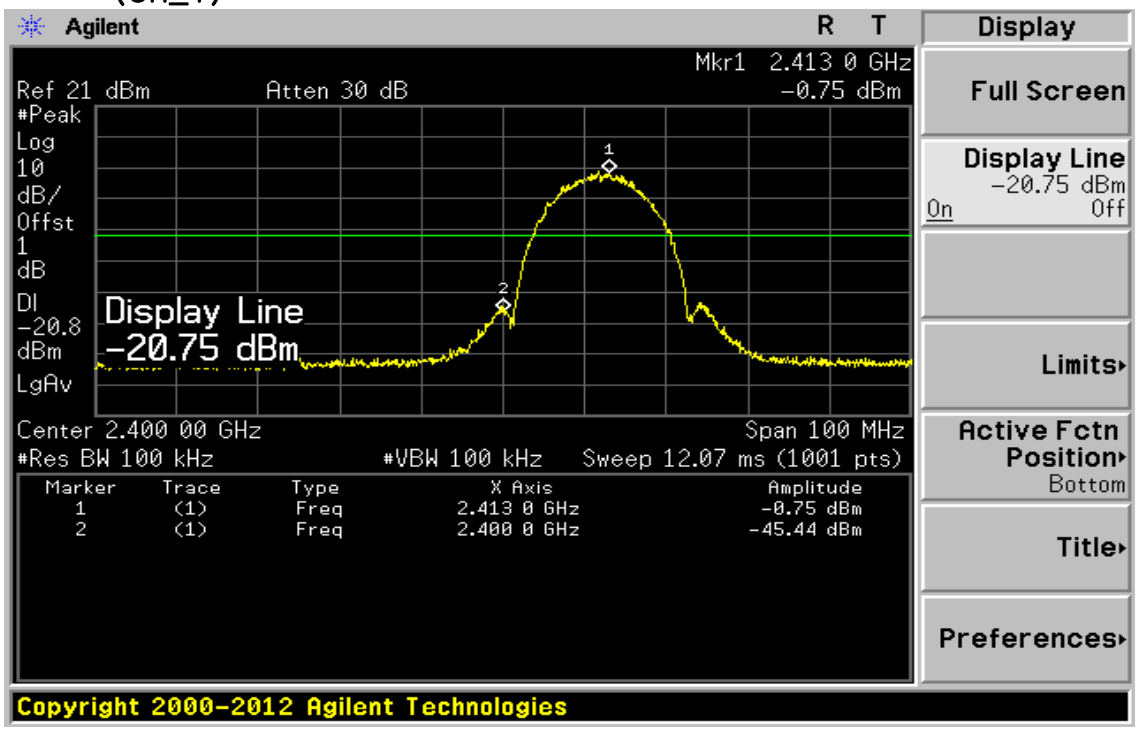
CHANNEL	Channel Frequency (MHz)	limit	PASS/FAIL
1	2 412	20dBc	PASS
11	2 462	20dBc	PASS

MODE -802.11n40

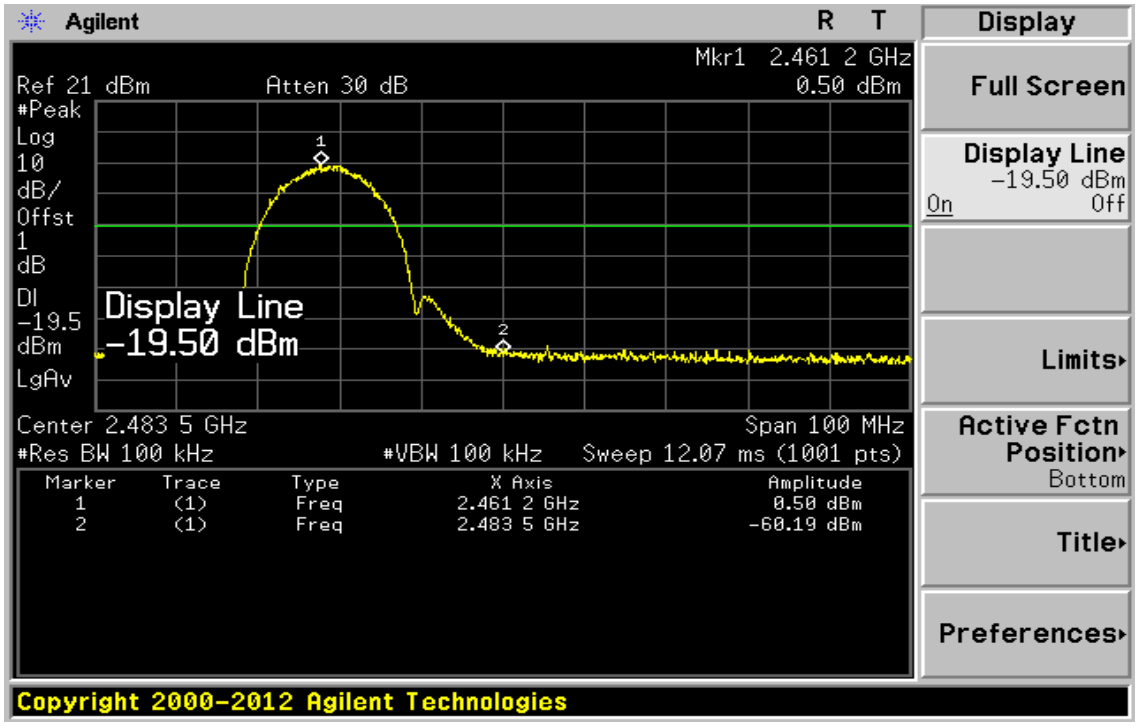
CHANNEL	Channel Frequency (MHz)	limit	PASS/FAIL
3	2 422	20dBc	PASS
11	2 462	20dBc	PASS

9.4 Trace data of band-edge & Out of Emission - 802.11b mode

(ch_1)

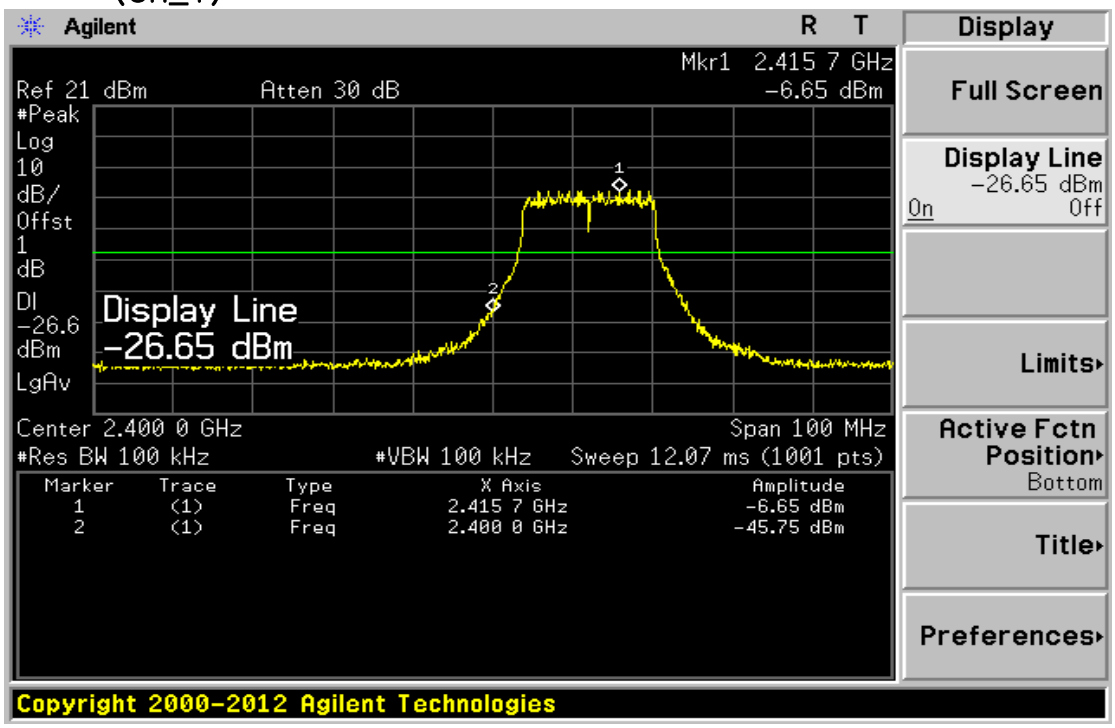


(ch_11)

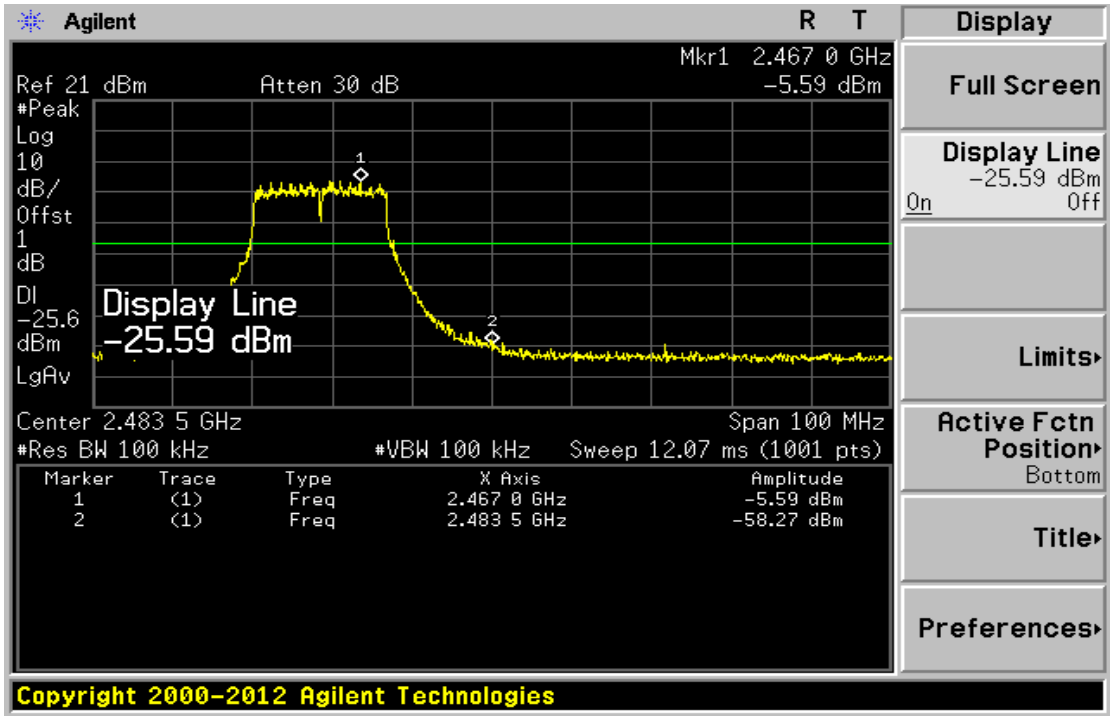


9.4 Trace data of band-edge & Out of Emission - 802.11g mode

(ch_1)

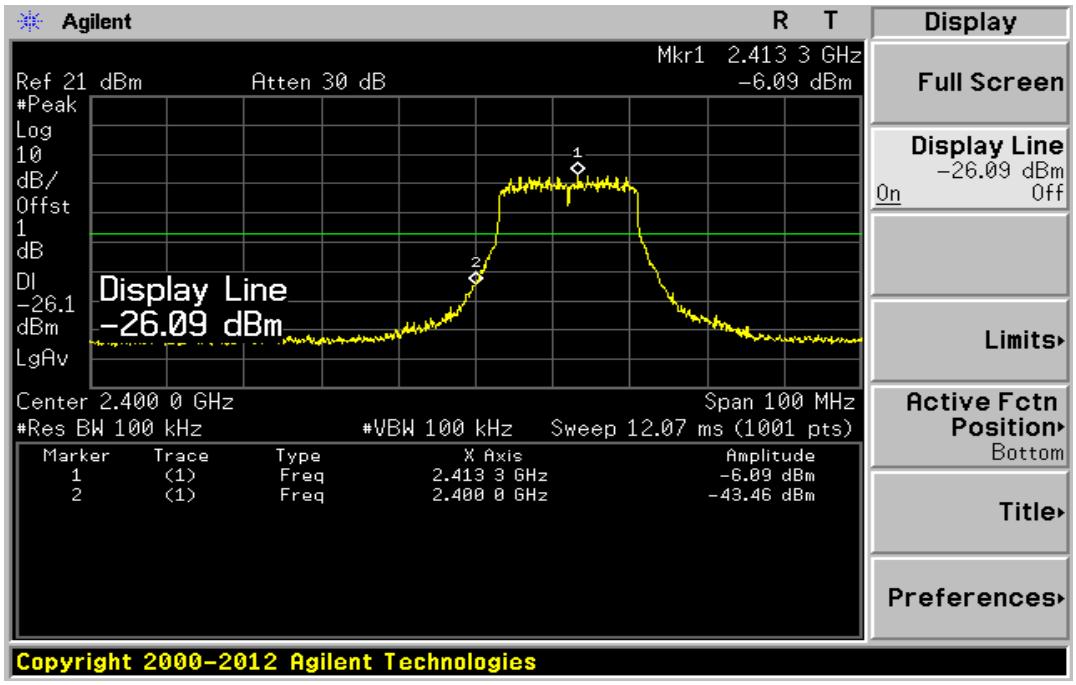


(ch_11)

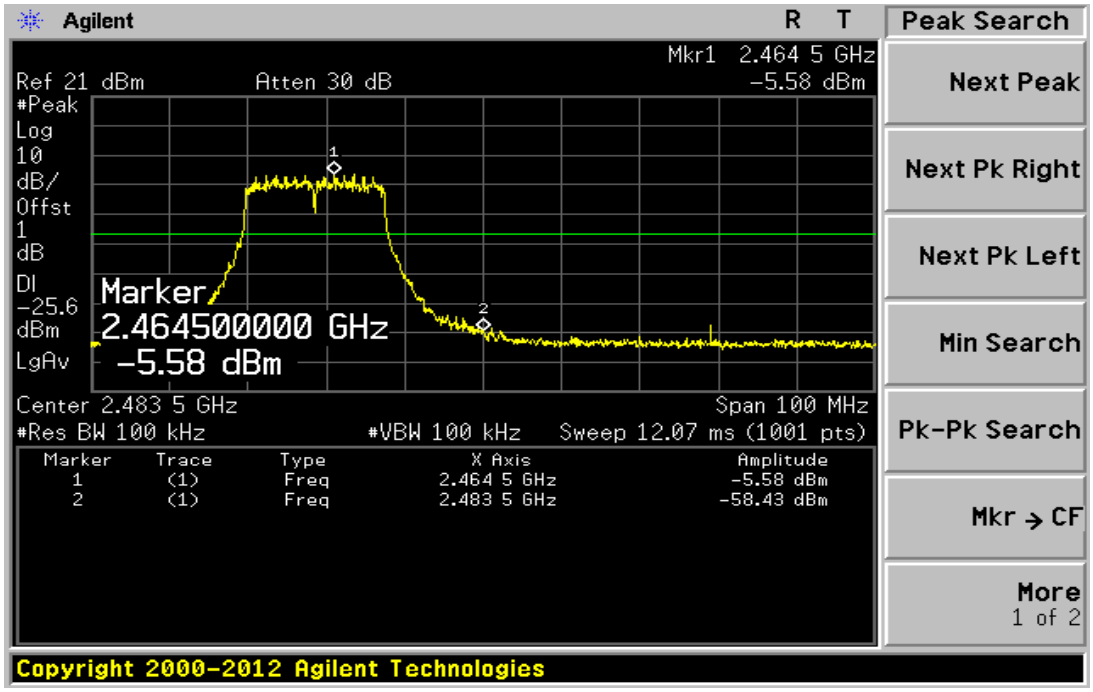


9.4 Trace data of band-edge & Out of Emission - 802.11n20 mode

(ch_1)

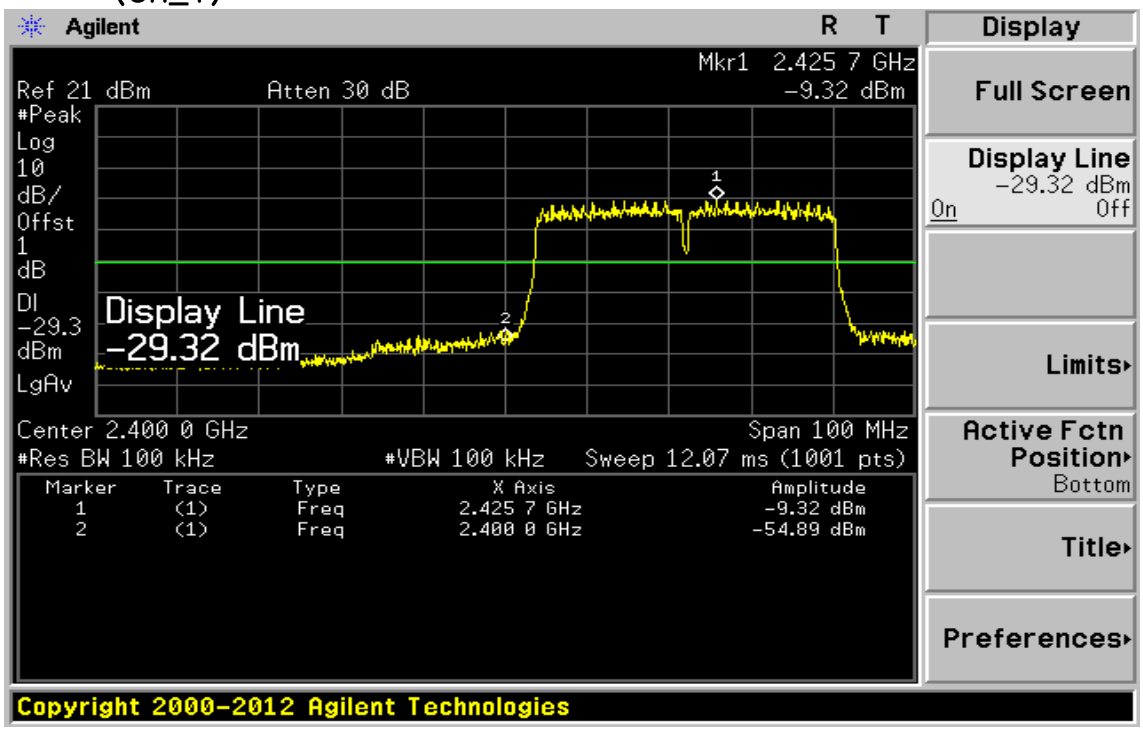


(ch_11)

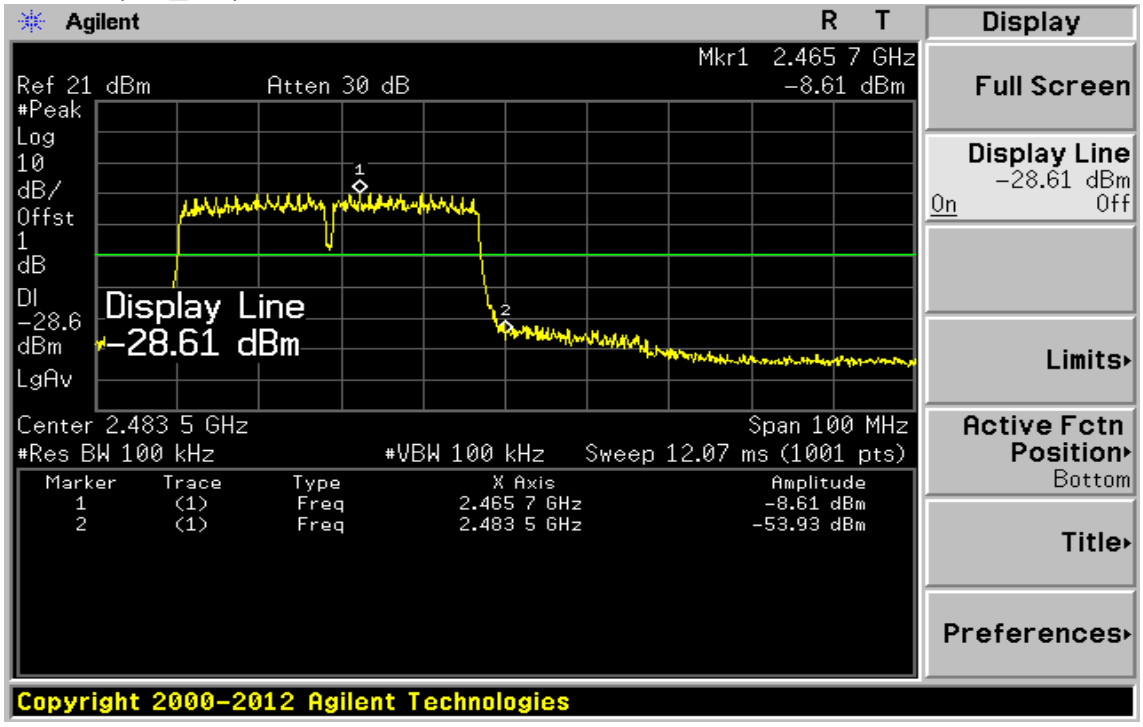


9.4 Trace data of band-edge & Out of Emission - 802.11n40 mode

(ch_1)

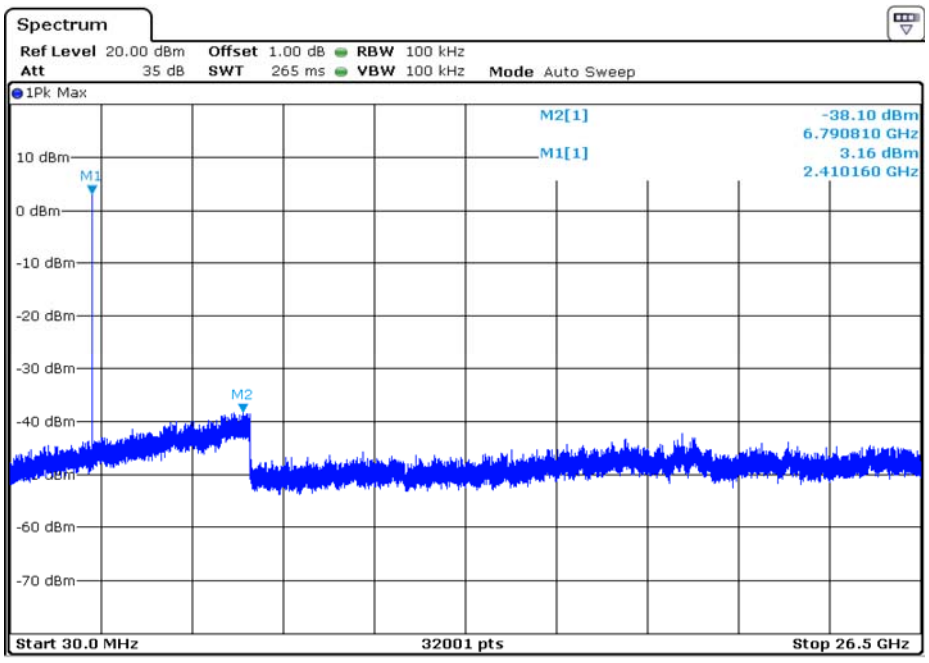


(ch_11)



9.4 Trace data of Out of Emission - 802.11b mode

(ch_1)



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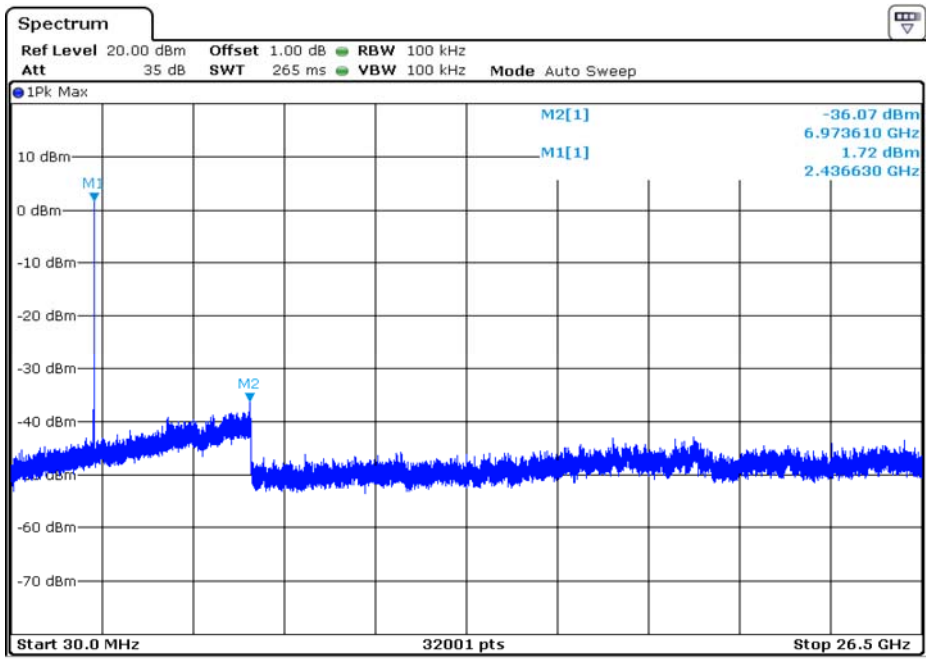
(ch_6)



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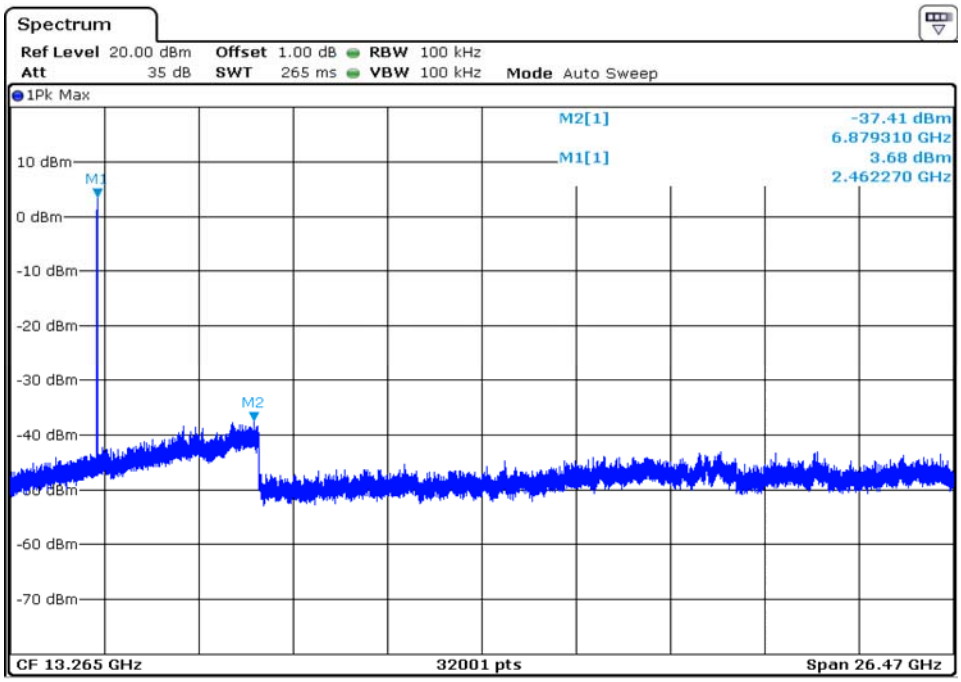
9.4 Trace data of Out of Emission - 802.11b mode

(ch_11)



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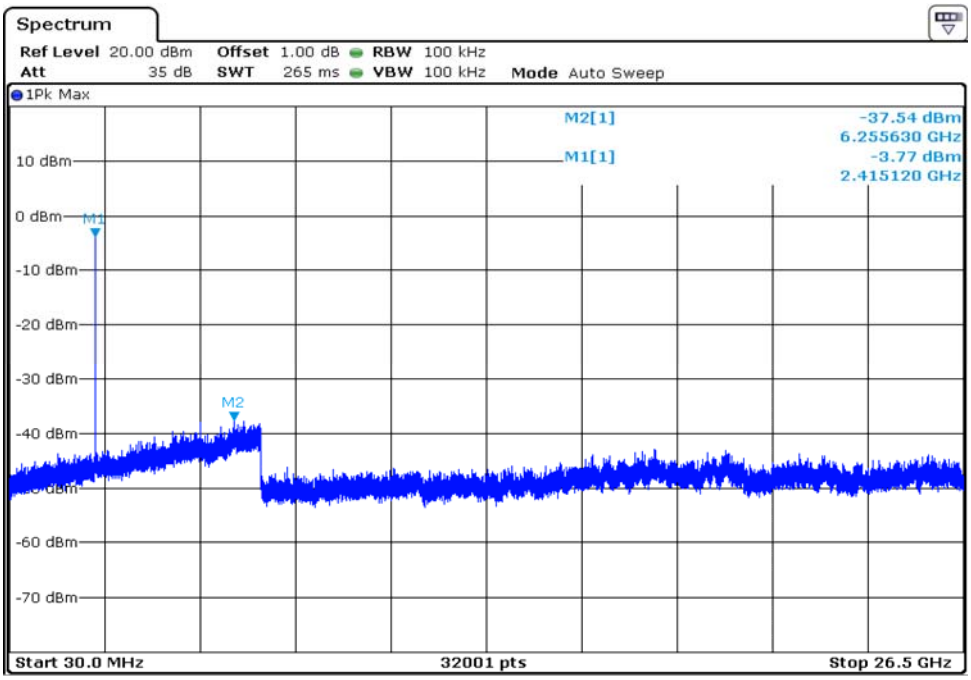
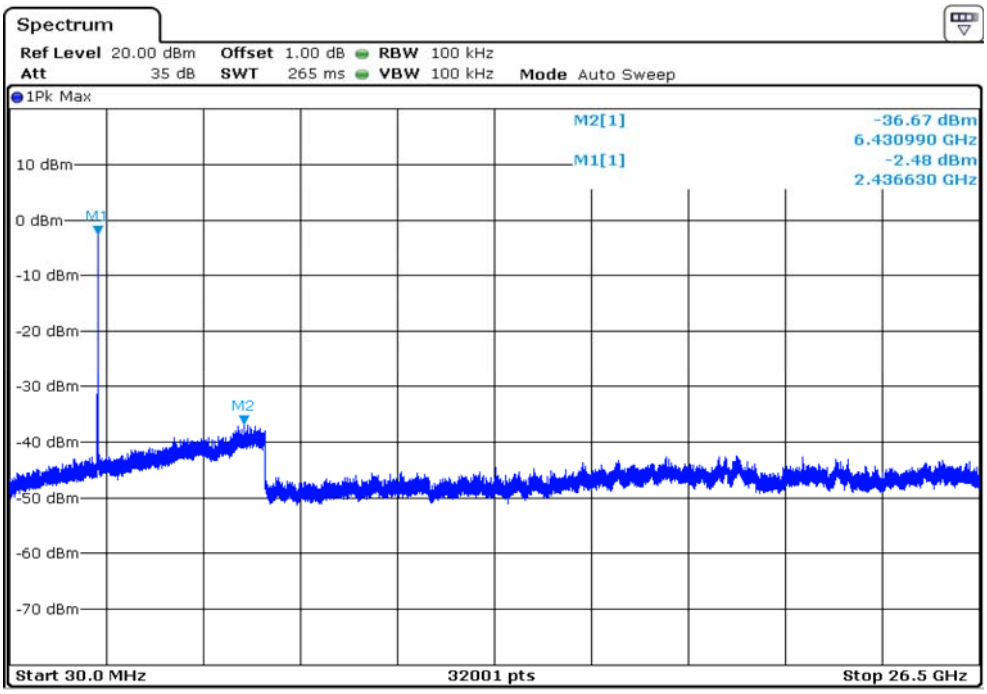
9.4 Trace data of Out of Emission - 802.11g mode

(ch_1)



00051

(ch_6)



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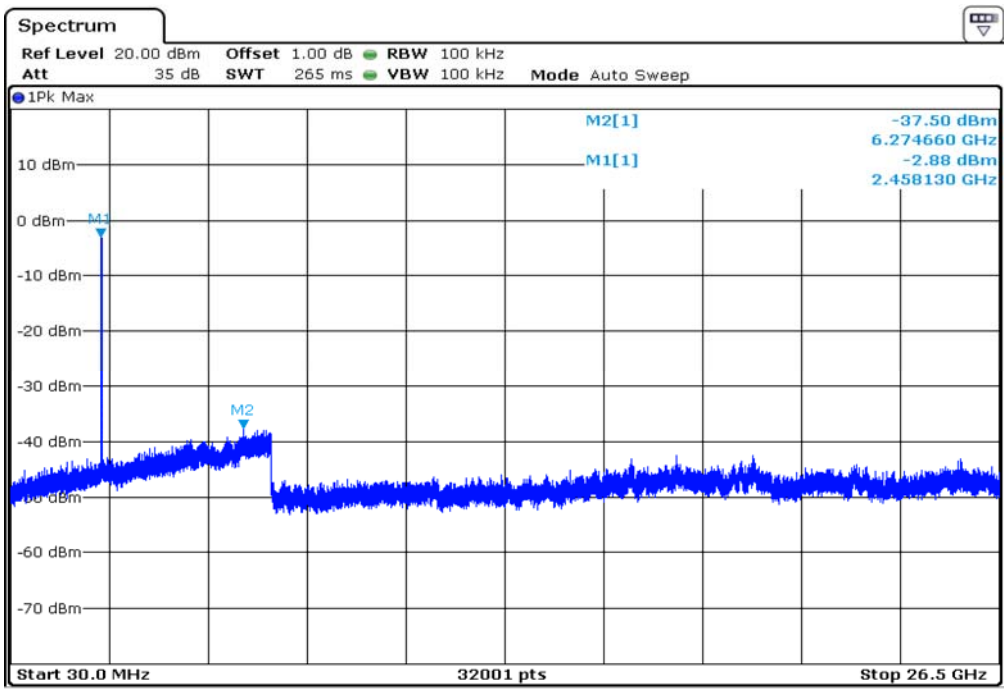
9.4 Trace data of Out of Emission - 802.11g mode

(ch_11)



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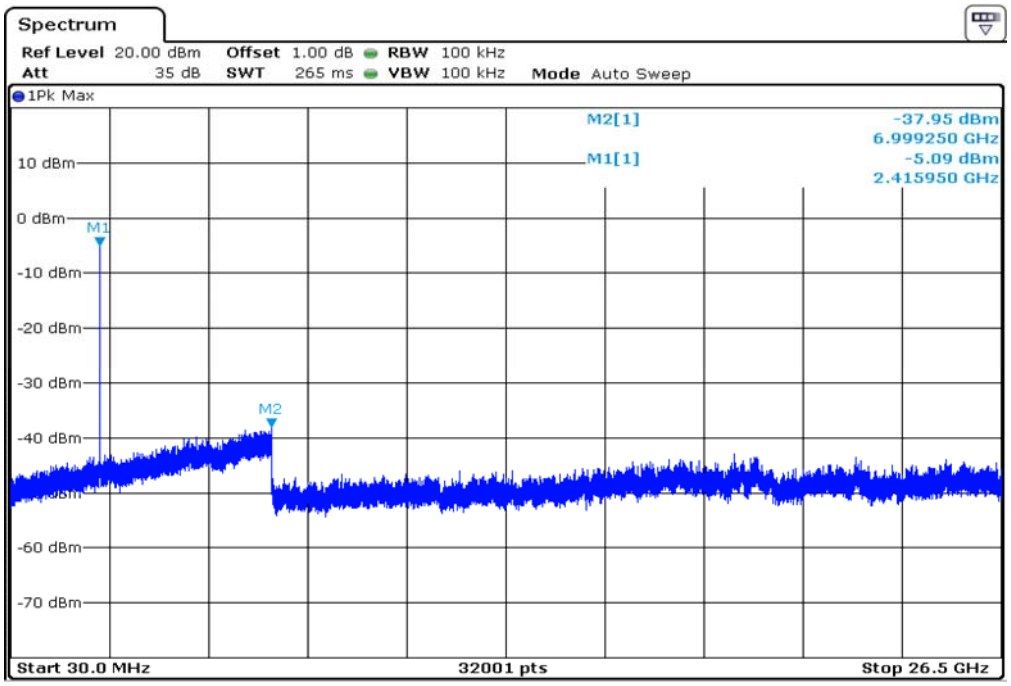
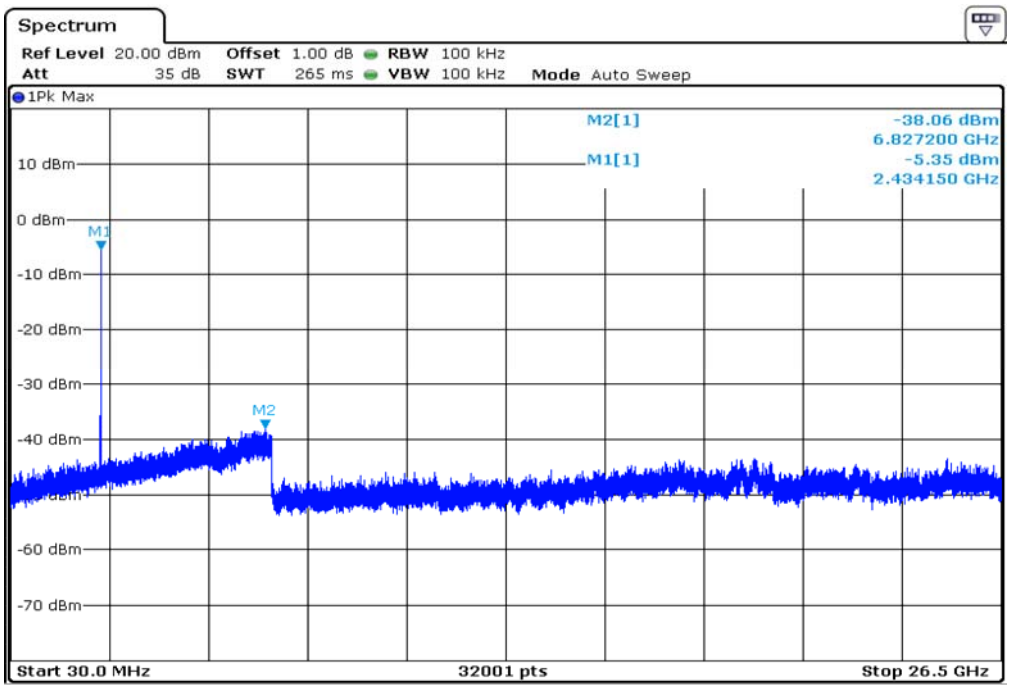
9.4 Trace data of Out of Emission - 802.11n20 mode

(ch_1)



00051

(ch_6)



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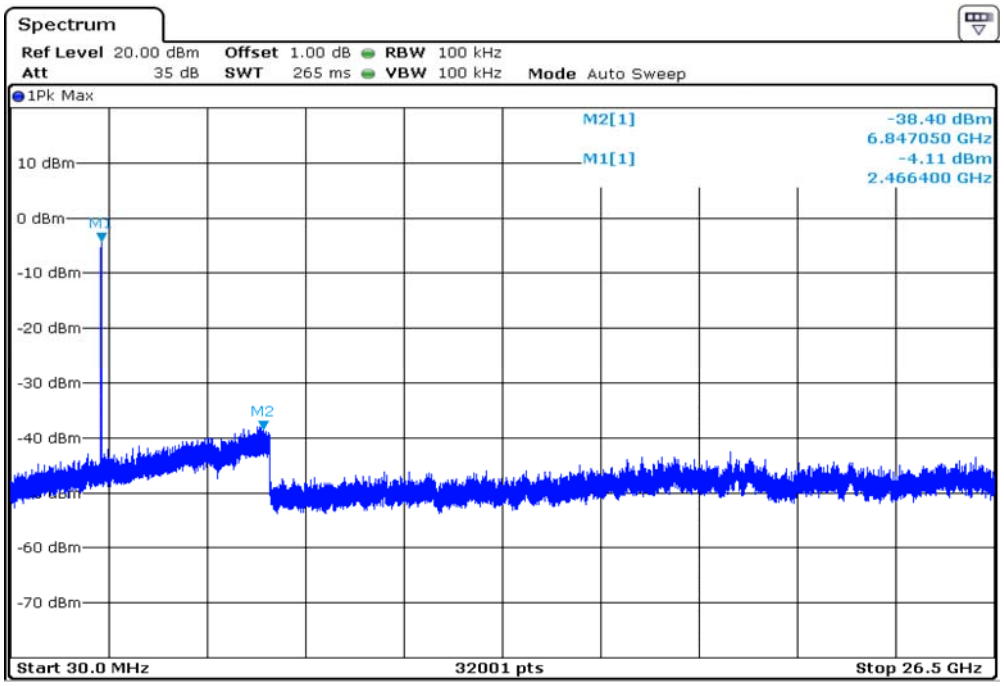
9.4 Trace data of Out of Emission - 802.11n20 mode

(ch_11)



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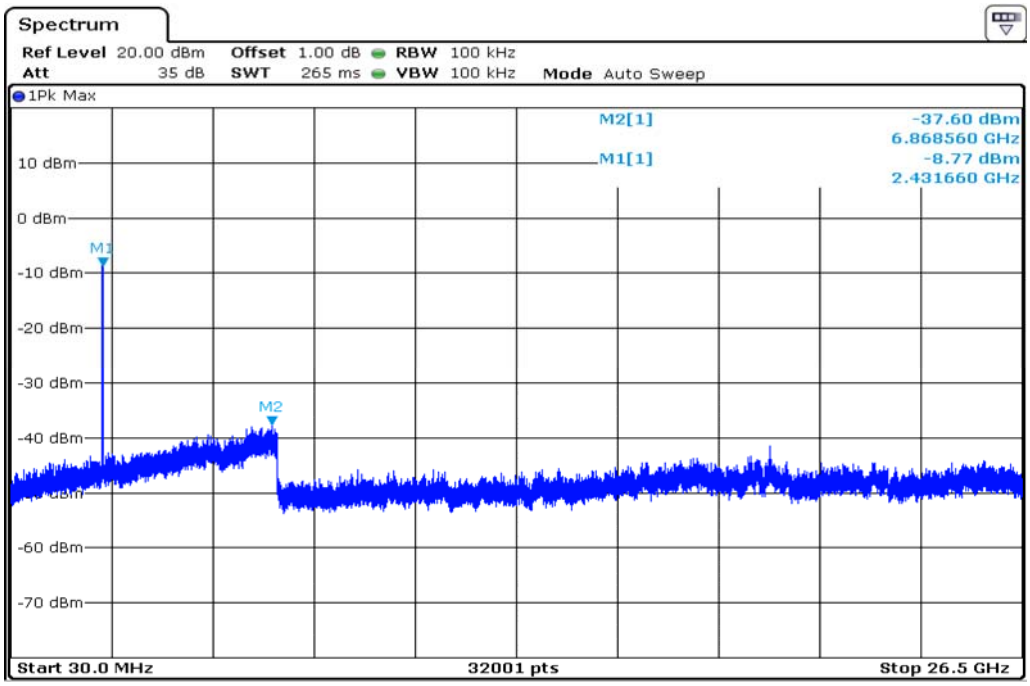
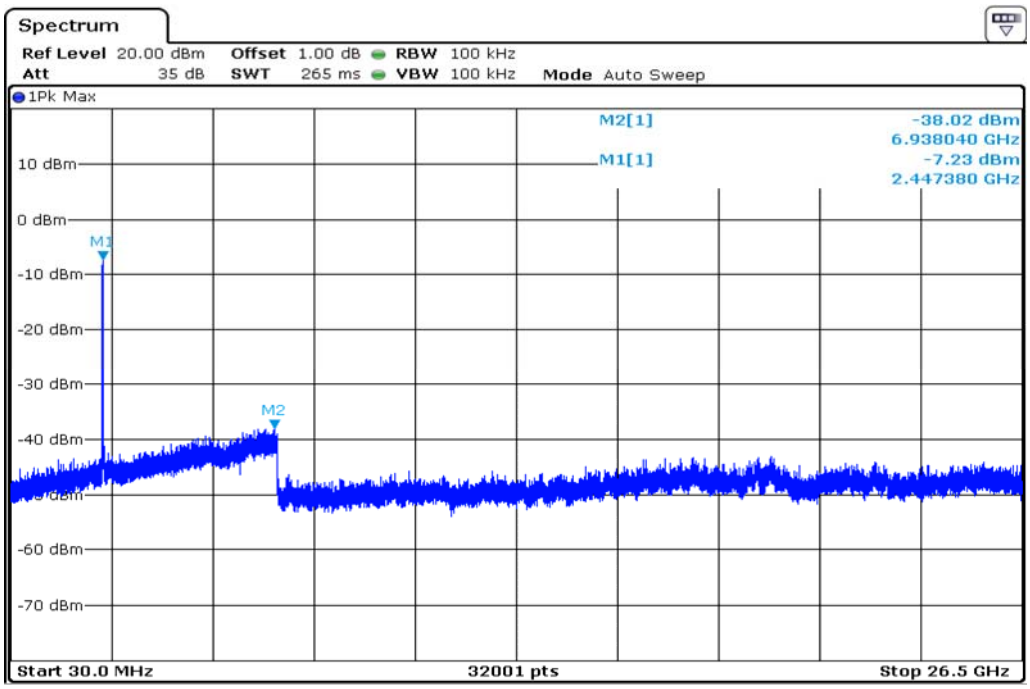
9.4 Trace data of Out of Emission - 802.11n40 mode

(ch_3)



00051

(ch_6)



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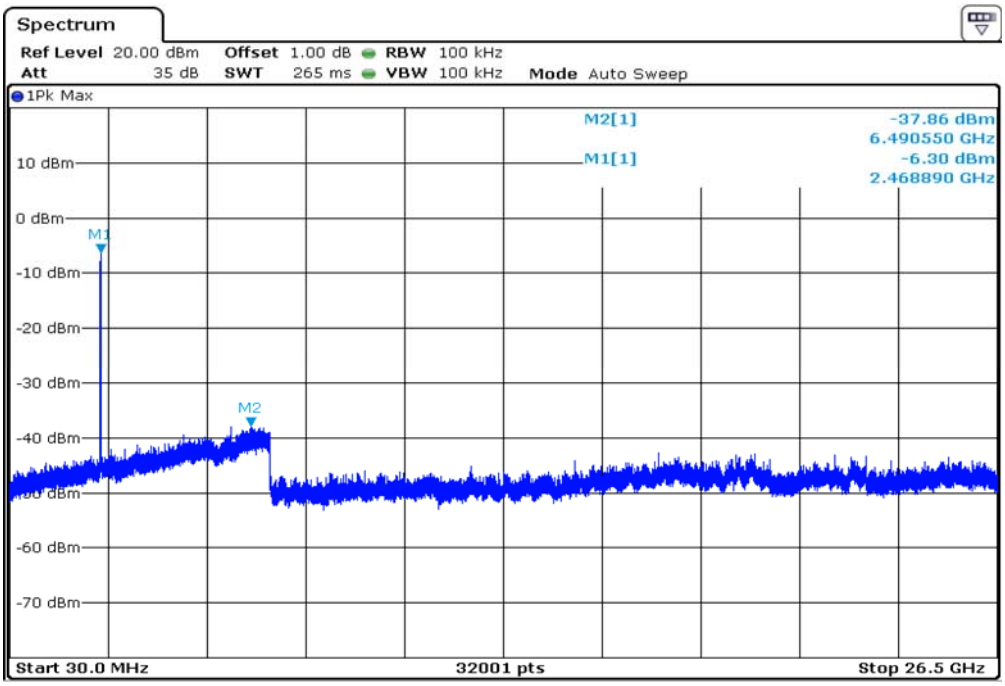
9.4 Trace data of Out of Emission - 802.11n40 mode

(ch_11)



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10. 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 (2013) & 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.

10.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	100916	24-Aug-21
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	14-Jan-22
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
PREAMPLIFIER	8449B	AGILENT	3008A00581	25-Aug-21
Horn Antenna	BBHA9120D	SCHWARZBECK	469	24-Dec-21
Test Receiver	ESPI7	ROHDE & SCHWARZ	100185	24-Aug-21
Signal Analyzer	FSV40	ROHDE & SCHWARZ	100393	1-Dec-21
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Horn Antenna	BBHA 9170	SCHWARZBECK	752	15-Oct-21
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/642 /28051111/L	-

10.2 Environmental Condition

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

WLAN 802.11 b,g,n20 Mode

Temperature (°C) : 22.5 ℃

Humidity (% R.H.) : 50.7 % R.H.

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

WLAN 802.11 b,g,n20 Mode

Temperature (°C) : 24 ℃

Humidity (% R.H.) : 49.6 % R.H.

10.3 Measurement Instrument setting for Radiated Emission

10.3.1 Frequency range below 1 GHz

Detector : Quasi-Peak

10.3.2 Frequency range above 1 GHz

Peak Power Measurement Procedure (KDB 558074 section 12.2.4)

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

Average Power Measurement Procedures (KDB 558074 section 12.2.5.2)

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	100.0	1.000	1.000	0.000
802.11g	100.0	1.000	1.000	0.000
802.11n20	100.0	1.000	1.000	0.000
802.11n40	100.0	1.000	1.000	0.000

* 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.

10.4-1 Test Data (802.11 b)

Test Date 15-Mar-21 Measurement Distance : 3 m

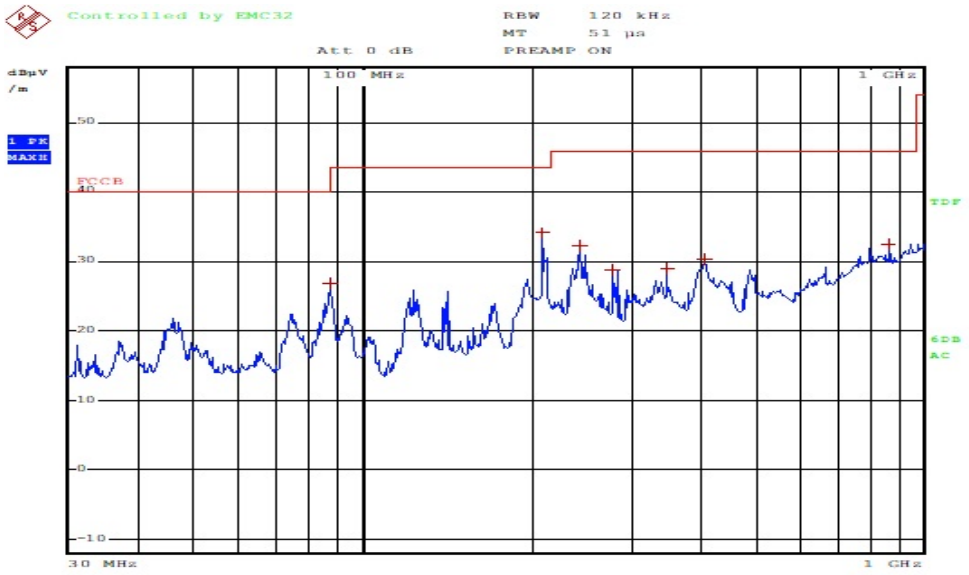
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
36.30	20.54	V	1.0	12.91	1.51	40.00	34.96	5.04
46.70	20.95	V	1.0	9.90	2.21	40.00	33.06	6.94
209.50	15.62	H	1.4	15.40	3.21	43.50	34.23	9.27
244.00	8.94	H	1.4	19.50	3.96	46.00	32.40	13.60
498.20	6.86	V	1.5	22.40	4.64	46.00	33.90	12.10
864.00	3.07	H	1.0	24.29	5.22	46.00	32.58	13.42

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.

10.4-2 radiated Graph(30 MHz ~ 1 GHz)

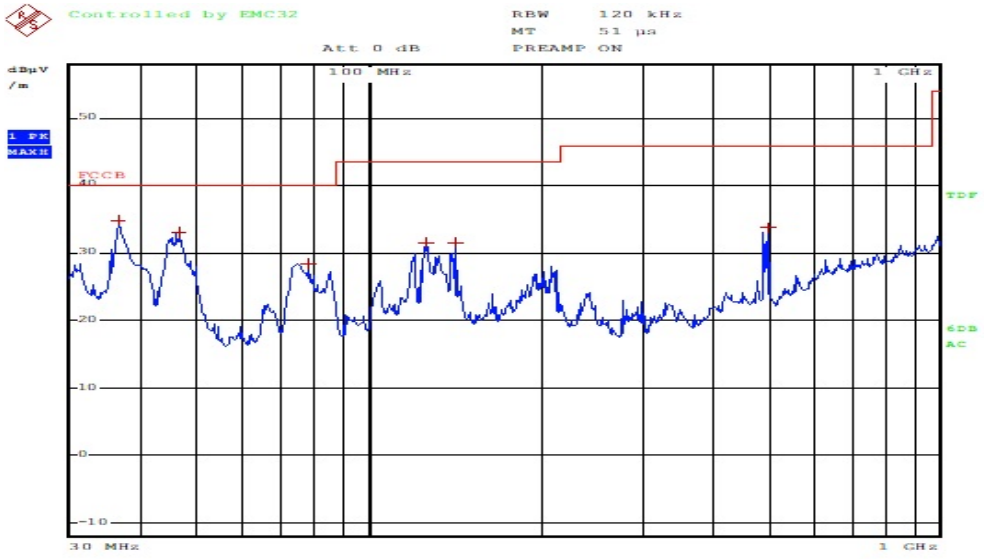
*802.11b Mode

Polarity:Horizontal



ESTR-21-00051

Polarity:Vertical



ESTR-21-00051

10.4-3 Test Data

Test Date : 16-Mar-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	55.04	H	1.5	27.83	-40.17		74.00	42.70	31.30
2390.00	55.92	V	1.6	27.83	-40.17		74.00	43.58	30.42
4824.00	62.50	H	1.5	31.52	-37.89		74.00	56.13	17.87
4824.00	61.90	V	1.6	31.52	-37.89		74.00	55.53	18.47
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	43.24	H	1.5	27.83	-40.17	0.00	54.00	30.90	23.10
2390.00	45.22	V	1.6	27.83	-40.17	0.00	54.00	32.88	21.12
4824.00	57.10	H	1.5	31.52	-37.89	0.00	54.00	50.73	3.27
4824.00	56.50	V	1.6	31.52	-37.89	0.00	54.00	50.13	3.87

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-4 Test Data

Test Date : 17-Mar-20 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
4874.00	61.60	H	1.6	31.57	-37.26		74.00	55.91	18.09
4874.00	60.90	V	1.5	31.57	-37.26		74.00	55.21	18.79
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	55.80	H	1.6	31.57	-37.26	0.00	54.00	50.11	3.89
4874.00	53.50	V	1.5	31.57	-37.26	0.00	54.00	47.81	6.19

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-5 Test Data

Test Date : 17-Mar-20 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	53.14	H	1.6	27.50	-30.92		74.00	49.72	24.28
2483.50	55.06	V	1.5	27.50	-30.92		74.00	51.64	22.36
2493.20	56.85	H	1.6	31.55	-27.35		74.00	61.05	12.95
4924.00	61.20	H	1.6	31.55	-27.35		74.00	65.40	8.60
4924.00	61.10	V	1.5	31.55	-27.35		74.00	65.30	8.70
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	42.58	H	1.6	27.50	-30.92	0.00	54.00	39.16	14.84
2483.50	44.56	V	1.5	27.50	-30.92	0.00	54.00	41.14	12.86
2493.20	43.70	H	1.6	31.55	-27.35	0.00	54.00	47.90	6.10
4924.00	55.10	H	1.6	31.55	-27.35	0.00	54.00	59.30	-5.30
4924.00	53.50	V	1.5	31.55	-27.35	0.00	54.00	57.70	-3.70

Remark

H : Horizontal, V : Vertical TEST MODE : 802.11 b - CH 11(2 462 MHz)

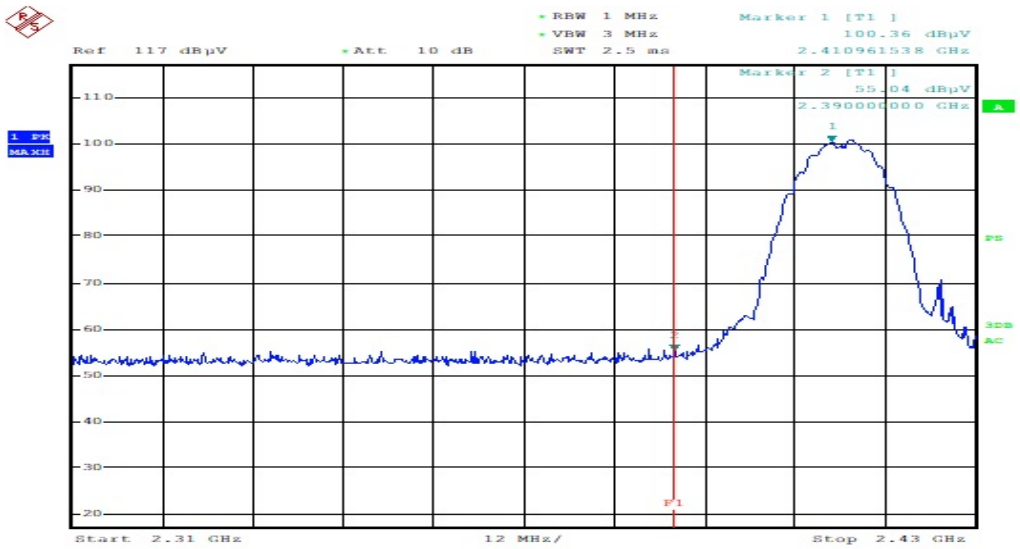
*The TX signal wasn't detected from 3th harmonics.
*Checked in all 3 axis and the maximum measured data were reported.(Worst data is Z axis of position)
*Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Duty Cycle Correction
*This test was radiated up to 26.5 GHz but no noise was measured.

10.4-6 Restricted Band Edges

*802.11b Mode

Band Edges(CH Low)

Detector mode:Peak Polarity:Horizontal



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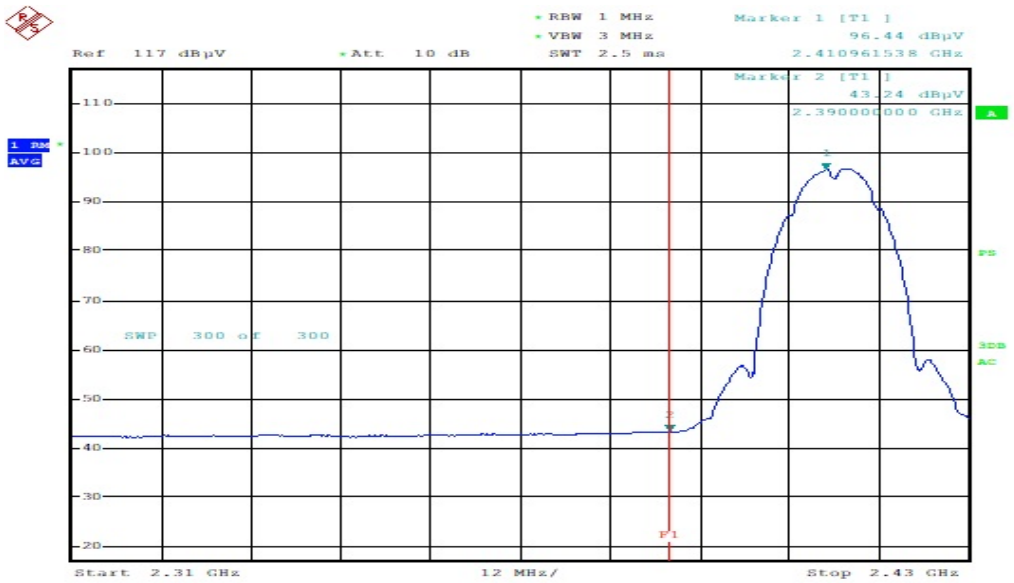
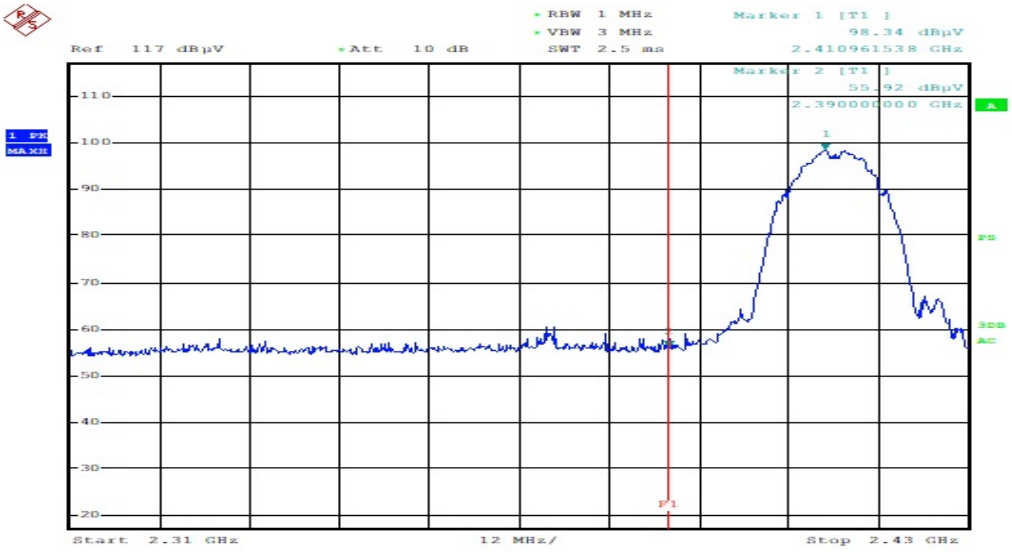
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

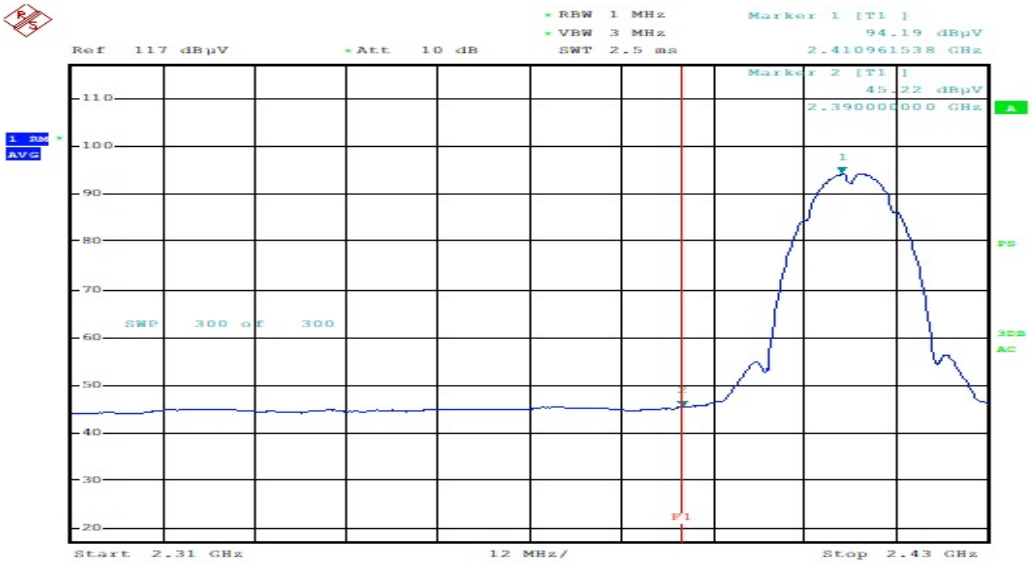
Band Edges(CH Low)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

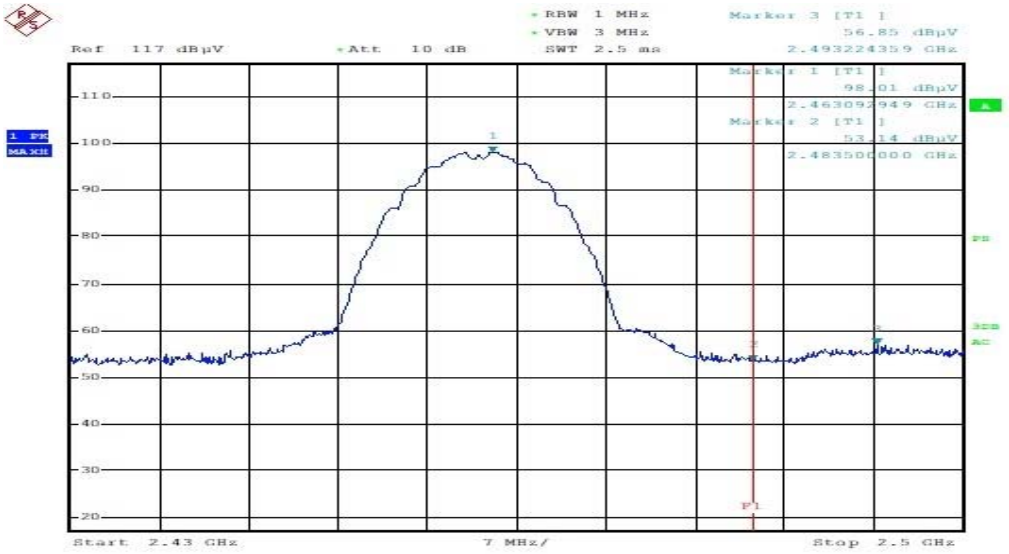
Detector mode:Average Polarity:Vertical



ESTR-21-00051

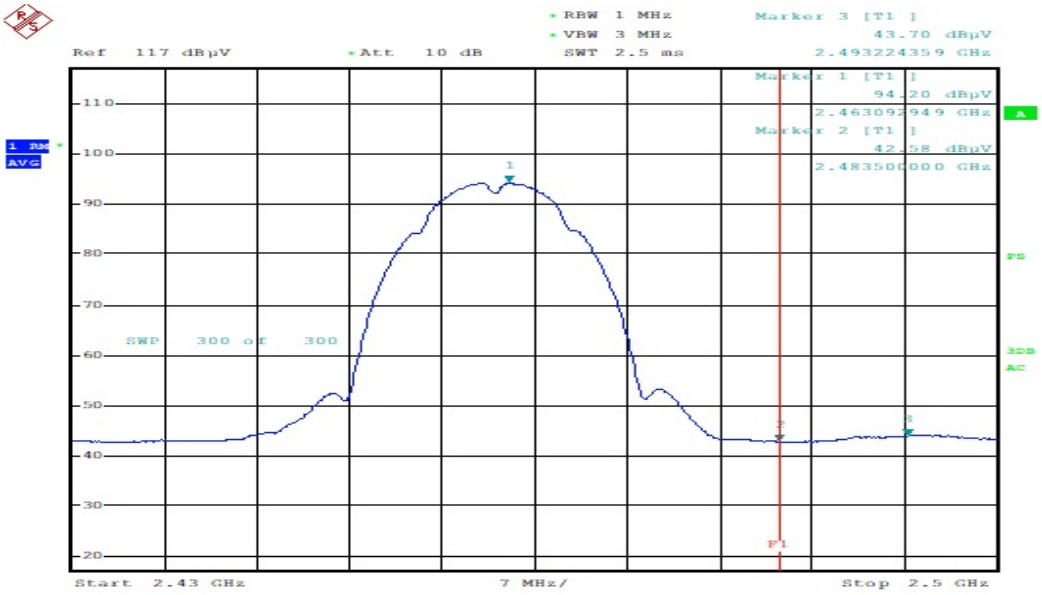
Band Edges(CH High)

Detector mode:Peak Polarity:Horizontal



ESTR-21-00051

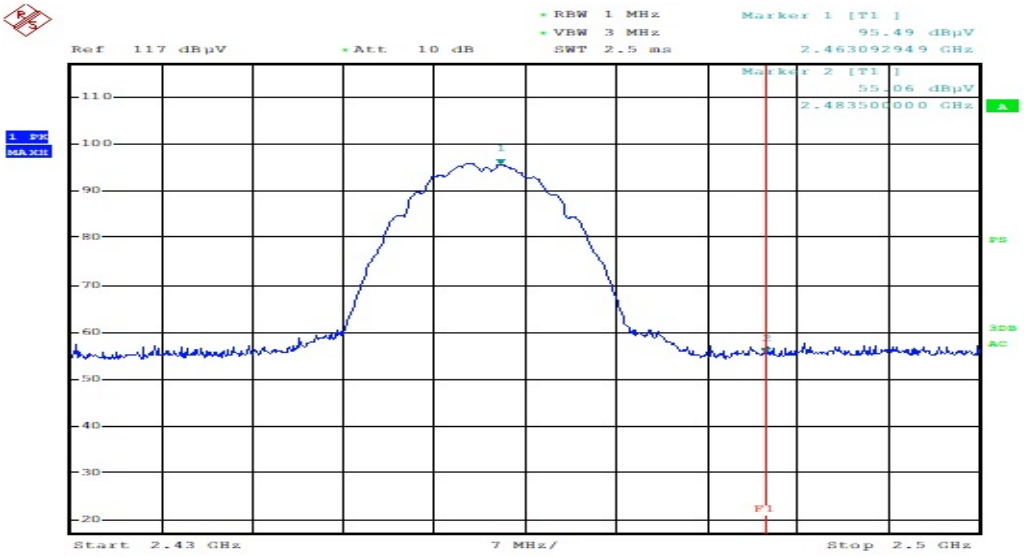
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

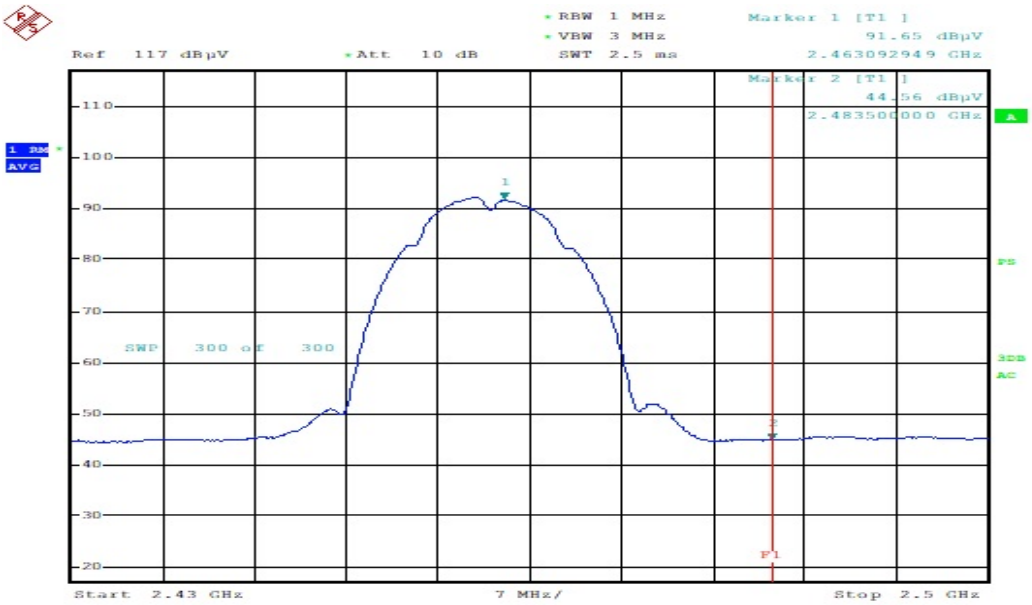
Band Edges(CH High)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

Detector mode:Average Polarity:Vertical

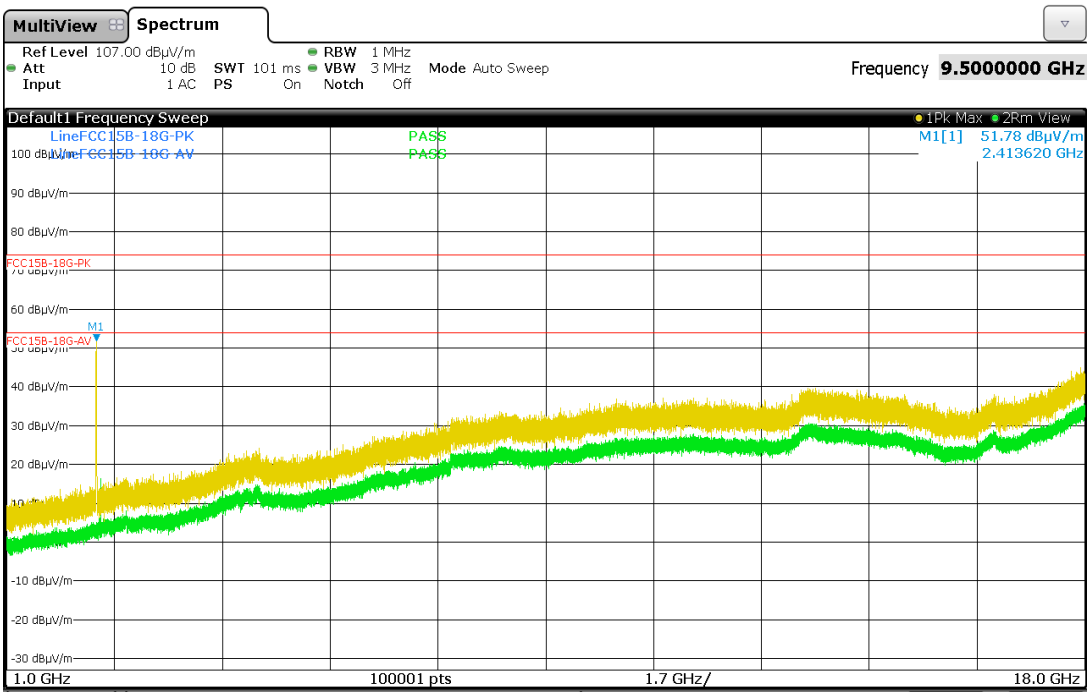


ESTR-21-00051

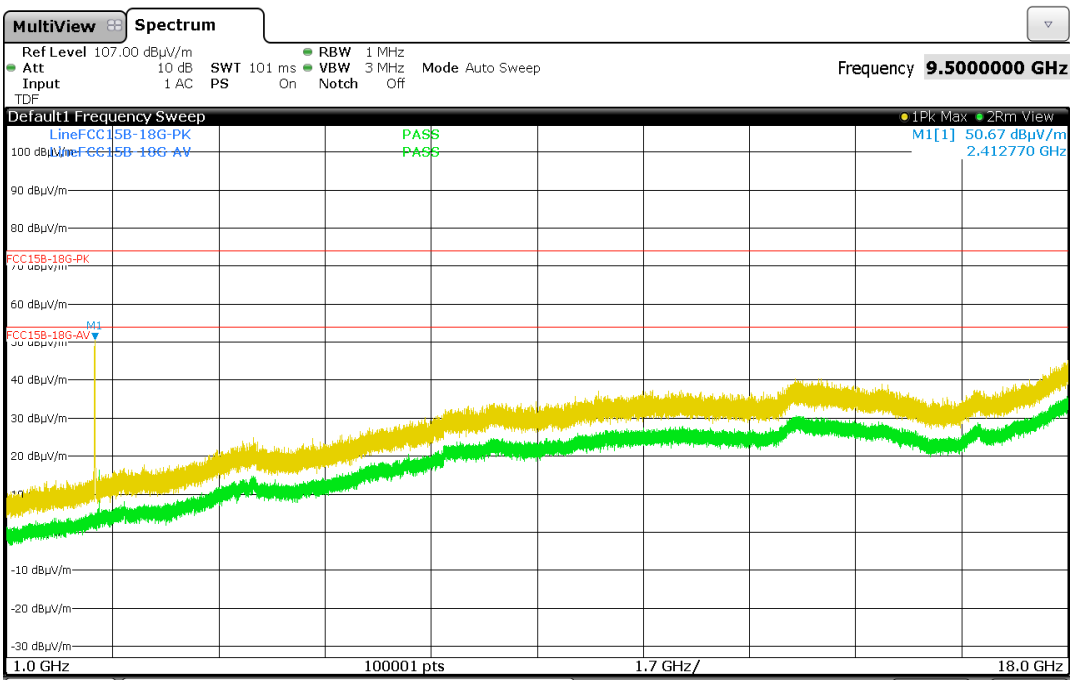
10.4-7 Restricted Band Edges

*802.11b Mode CH1

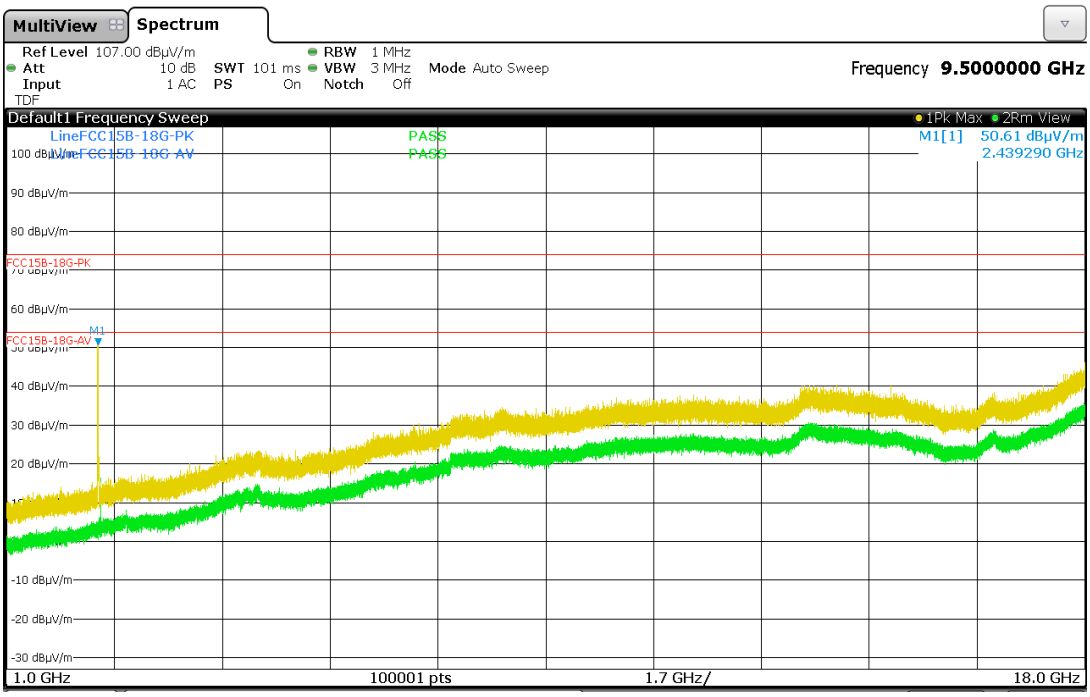
Polarity:Horizontal



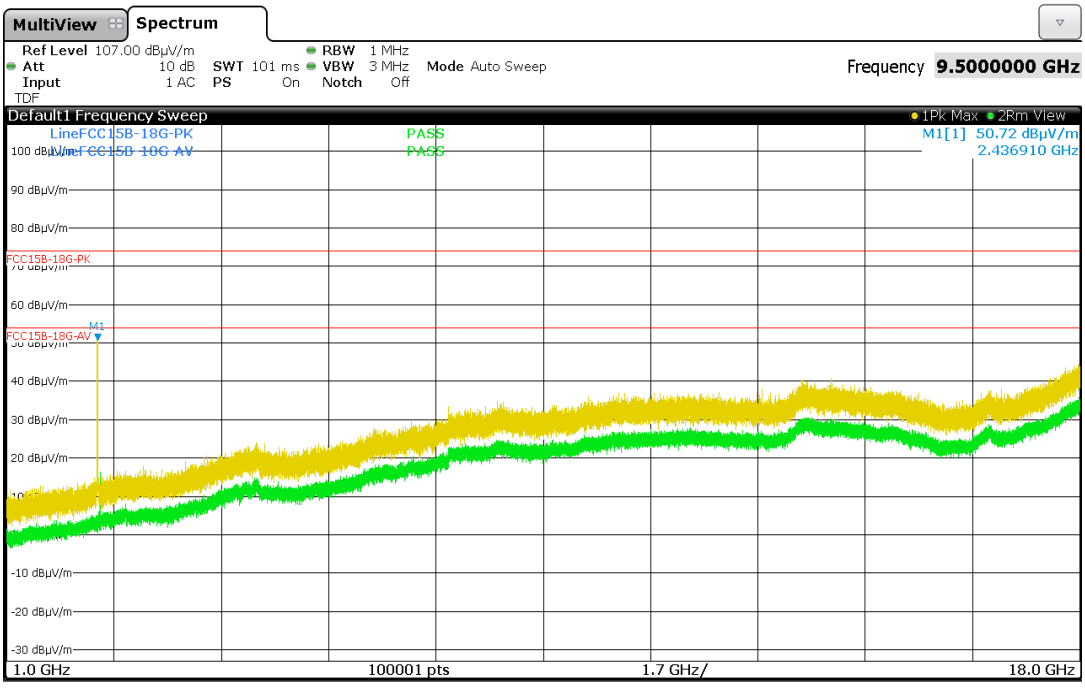
Polarity:Vertical



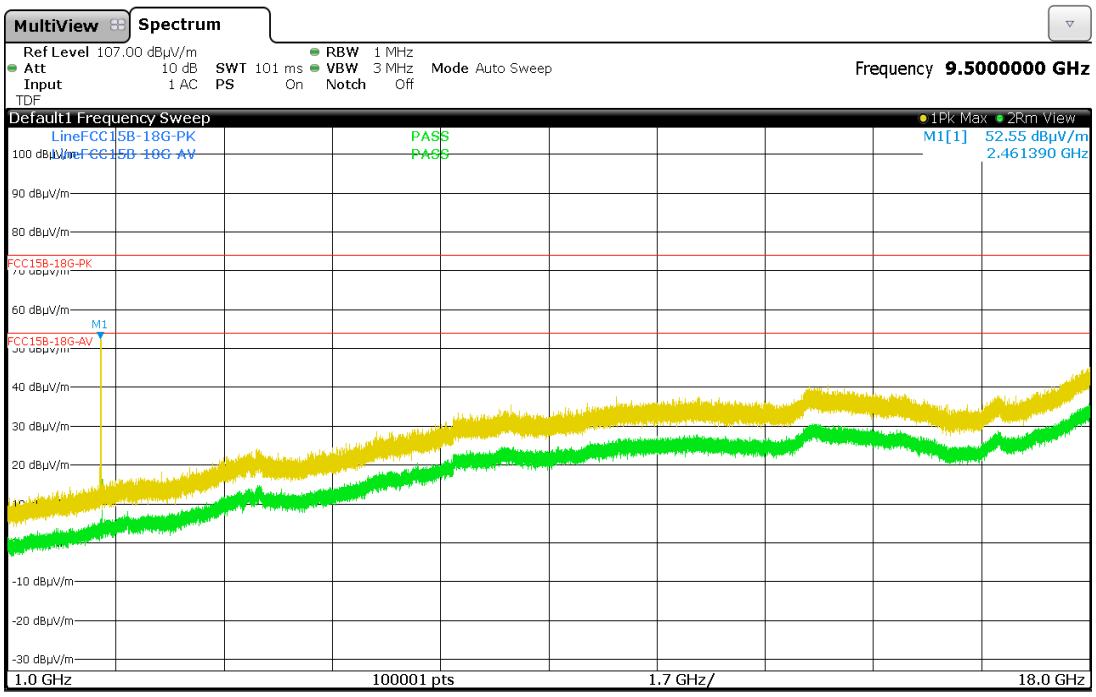
*802.11b Mode CH6 Polarity:Horizontal



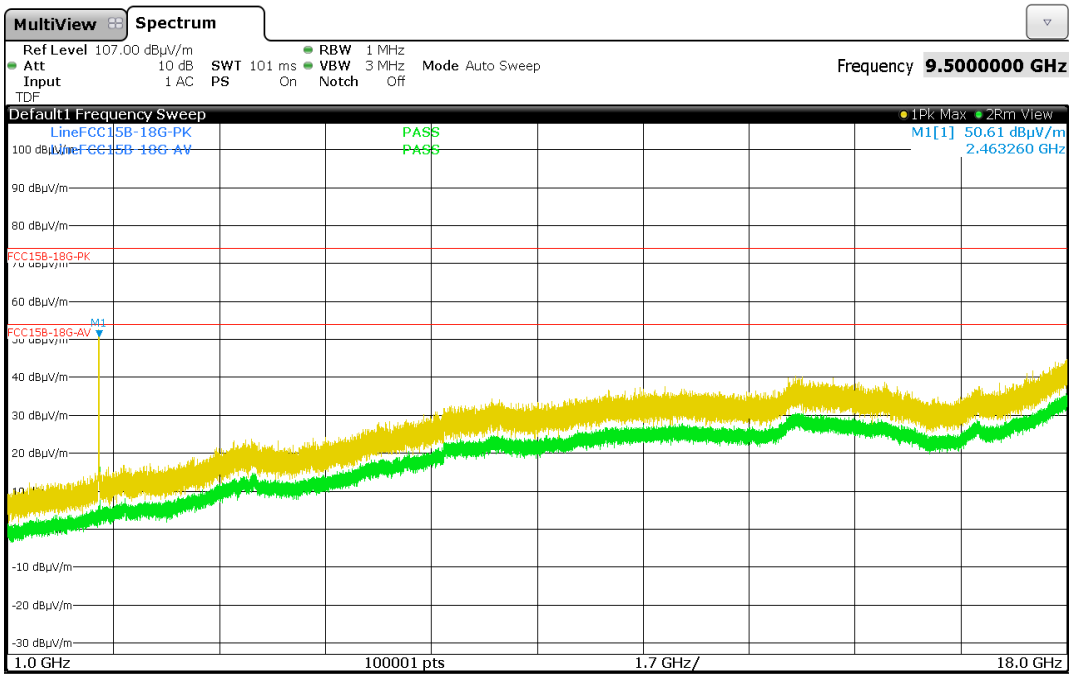
Polarity:Vertical



*802.11b Mode CH11 Polarity:Horizontal



Polarity:Vertical



10.4-8 Test Data (802.11 g)

Test Date : 15-Mar-21 Measurement Distance : 3 m

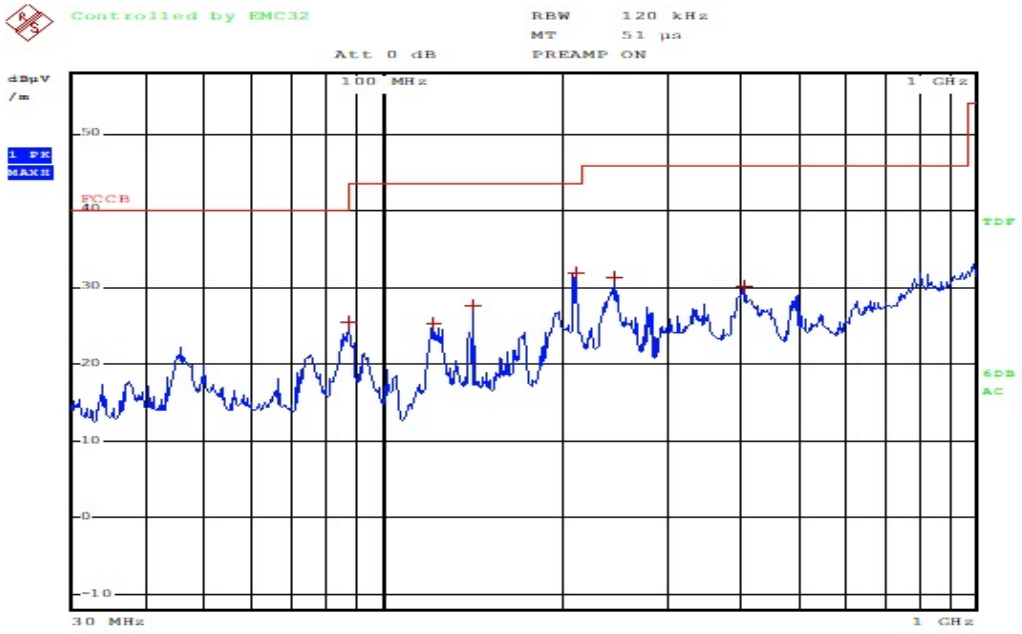
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
36.80	21.75	V	1.0	12.91	1.51	40.00	36.17	3.83
45.90	20.84	V	1.0	9.90	2.21	40.00	32.95	7.05
126.20	13.15	V	1.4	15.40	3.21	43.50	31.76	11.74
212.60	8.47	H	1.6	19.50	3.96	43.50	31.93	11.57
245.80	4.38	H	1.6	22.40	4.64	46.00	31.42	14.58
489.20	4.44	V	1.7	24.29	5.22	46.00	33.95	12.05

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.

10.4-9 radiated Graph(30 MHz ~ 1 GHz)

*802.11g Mode

Polarity:Horizontal



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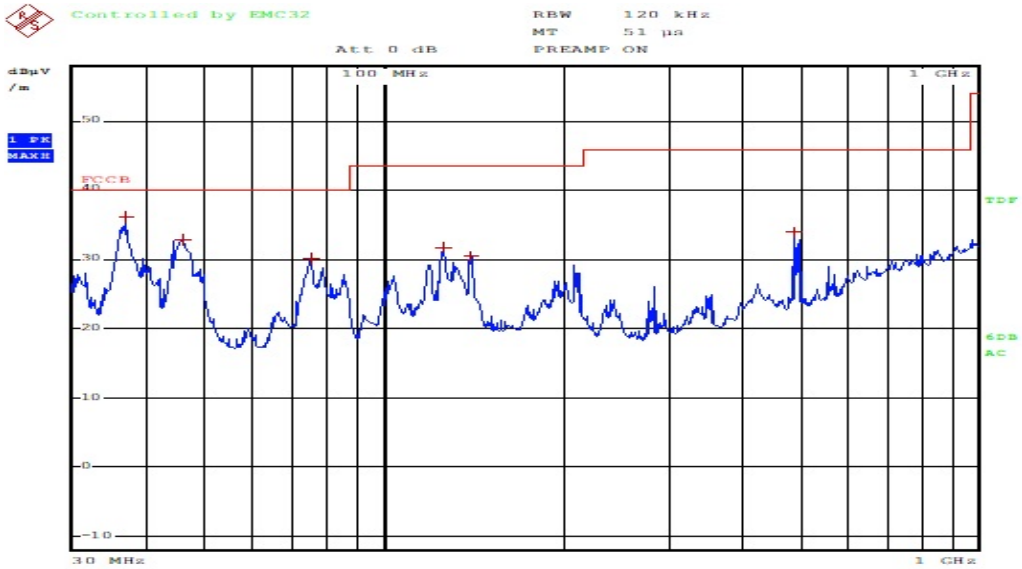
Polarity:Vertical



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10.4-10 Test Data

Test Date : 17-Mar-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	56.25	H	1.6	27.83	-40.17		74.00	43.91	30.09
2390.00	55.70	V	1.6	27.83	-40.17		74.00	43.36	30.64
4824.00	70.22	H	1.6	31.52	-37.89		74.00	63.85	10.15
4824.00	60.10	V	1.6	31.52	-37.89		74.00	53.73	20.27
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	44.45	H	1.6	27.83	-40.17	0.00	54.00	32.11	21.89
2390.00	45.41	V	1.6	27.83	-40.17	0.00	54.00	33.07	20.93
4824.00	56.40	H	1.6	31.52	-37.89	0.00	54.00	50.03	3.97
4824.00	50.12	V	1.6	31.52	-37.89	0.00	54.00	43.75	10.25

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-11 Test Data

Test Date : 18-Mar-20 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
4874.00	66.52	H	1.5	31.57	-37.26		74.00	60.83	13.17
4874.00	63.20	V	1.5	31.57	-37.26		74.00	57.51	16.49
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	57.12	H	1.5	31.57	-37.26	0.00	54.00	51.43	2.57
4874.00	52.12	V	1.5	31.57	-37.26	0.00	54.00	46.43	7.57

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-12 Test Data

Test Date : 18-Mar-20 Measurement Distance : 3 m

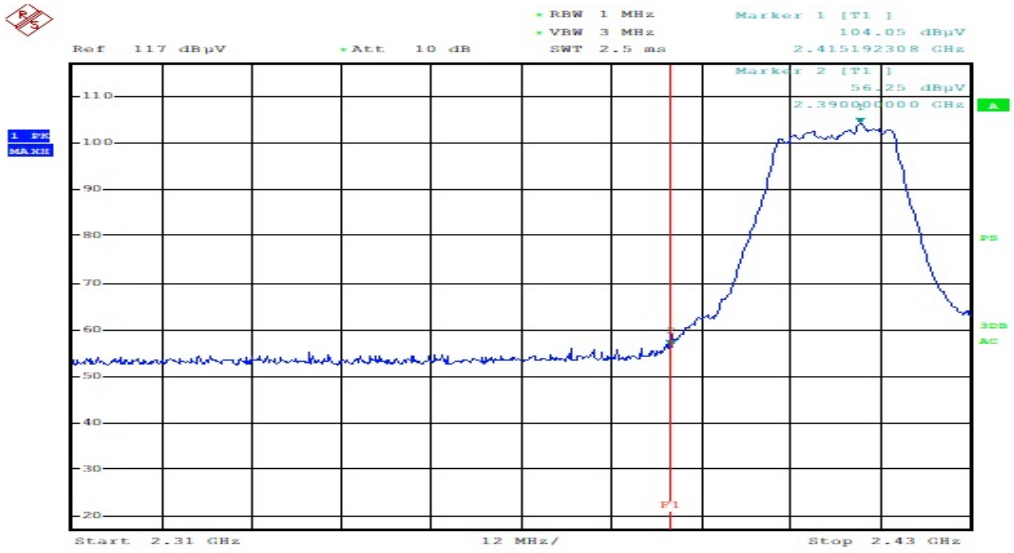
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	57.67	H	1.6	27.63	-40.08		74.00	45.22	28.78
2483.50	56.14	V	1.5	27.63	-40.08		74.00	43.69	30.31
4924.00	65.20	H	1.6	31.67	-37.23		74.00	59.64	14.36
4924.00	63.58	V	1.5	31.67	-37.23		74.00	58.02	15.98
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	44.54	H	1.6	27.63	-40.08	2.08	54.00	34.17	19.83
2483.50	45.00	V	1.5	27.63	-40.08	2.08	54.00	34.63	19.37
4924.00	53.22	H	1.6	31.67	-37.23	2.08	54.00	49.74	4.26
4924.00	51.00	V	1.5	31.67	-37.23	2.08	54.00	47.52	6.48

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-13 Restricted Band Edges
*802.11g Mode

Band Edges(CH Low)

Detector mode:Peak Polarity:Horizontal



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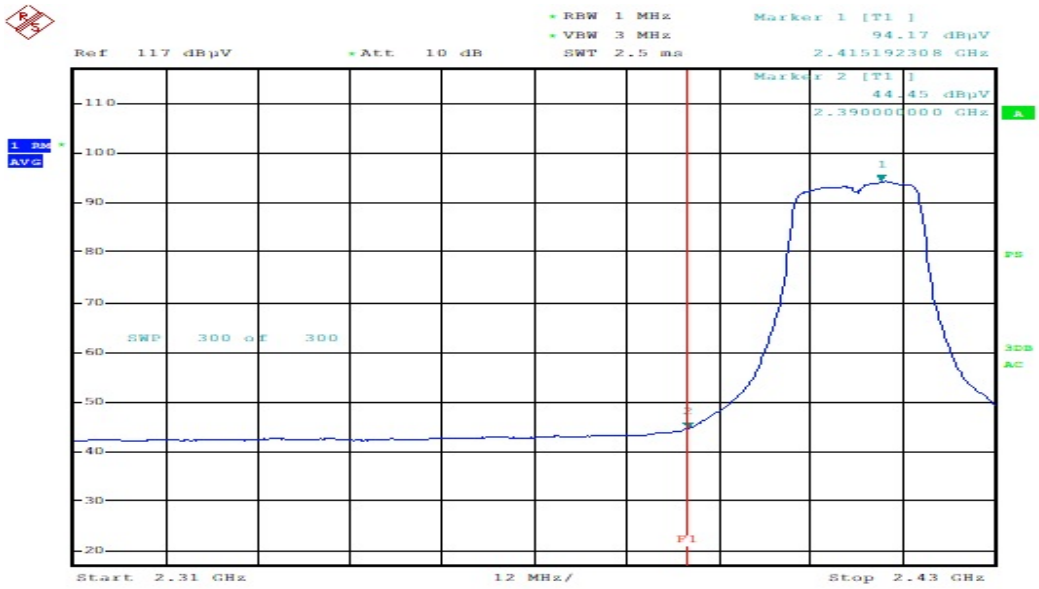
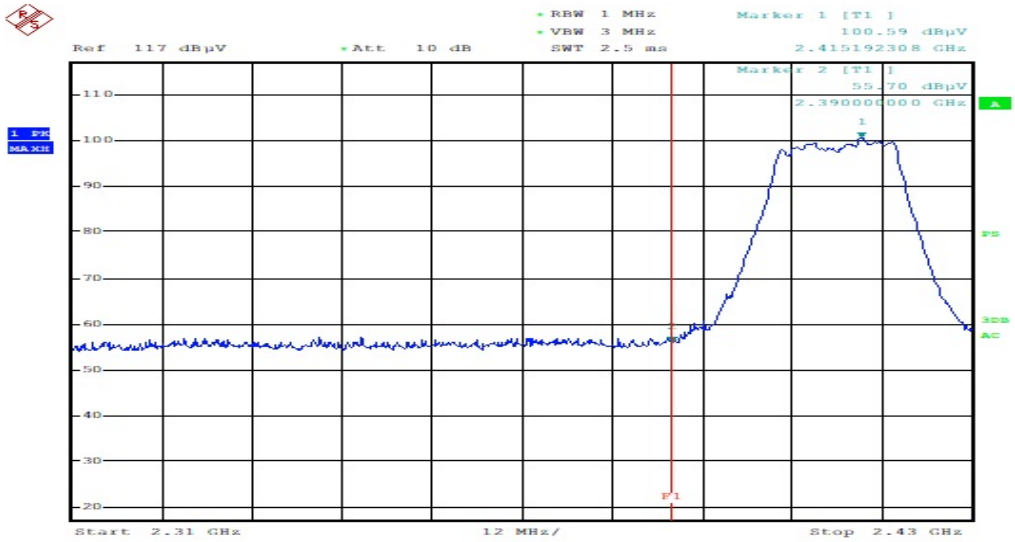
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

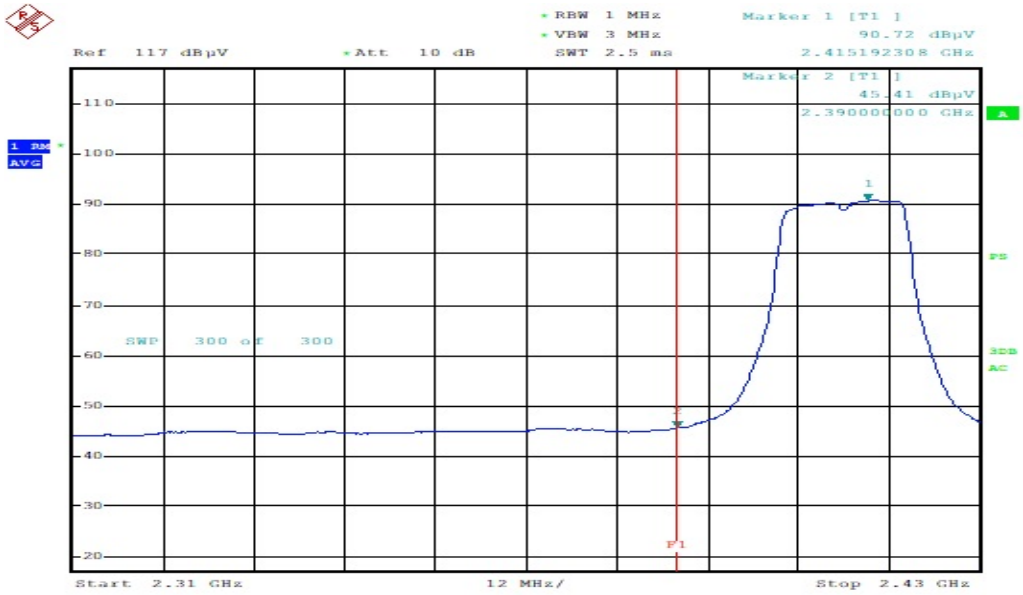
Band Edges(CH Low)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

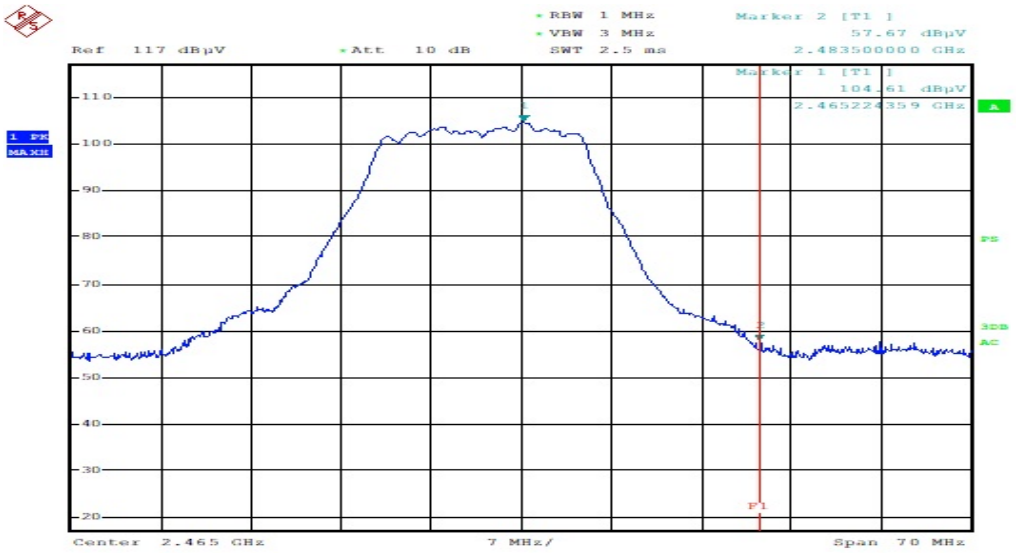
Detector mode:Average Polarity:Vertical



ESTR-21-00051

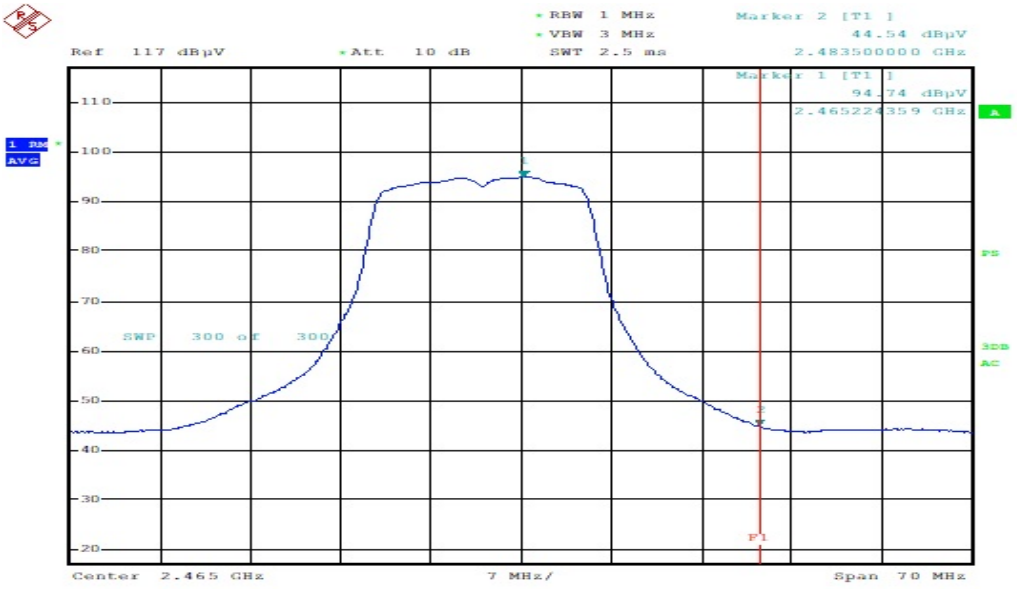
Band Edges(CH High)

Detector mode:Peak Polarity:Horizontal



ESTR-21-00051

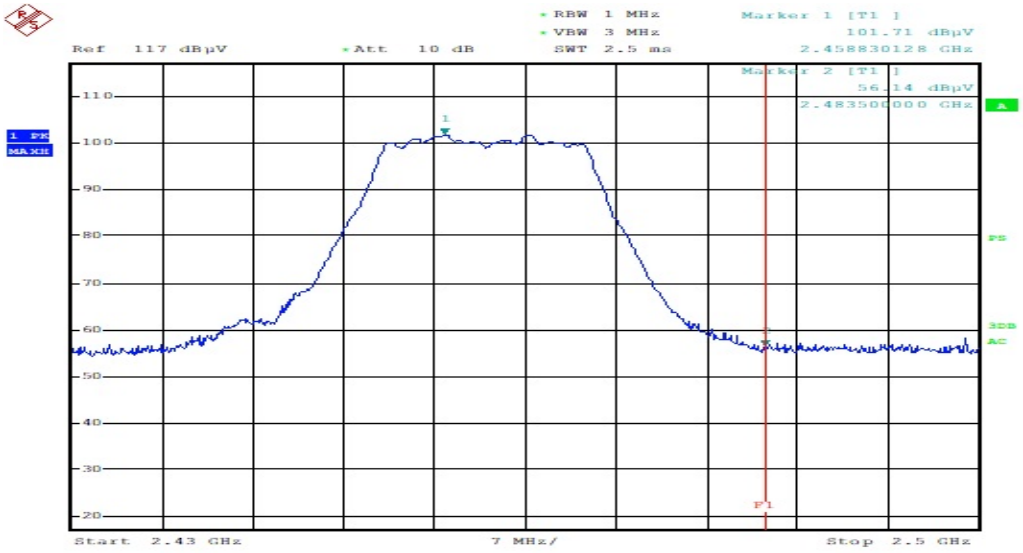
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

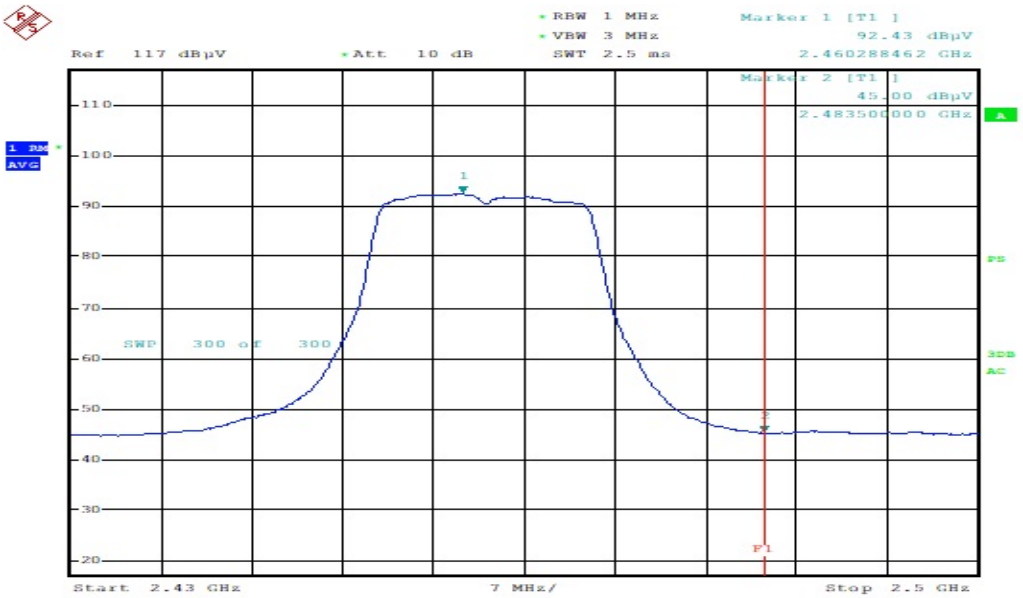
Band Edges(CH High)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

Detector mode:Average Polarity:Vertical

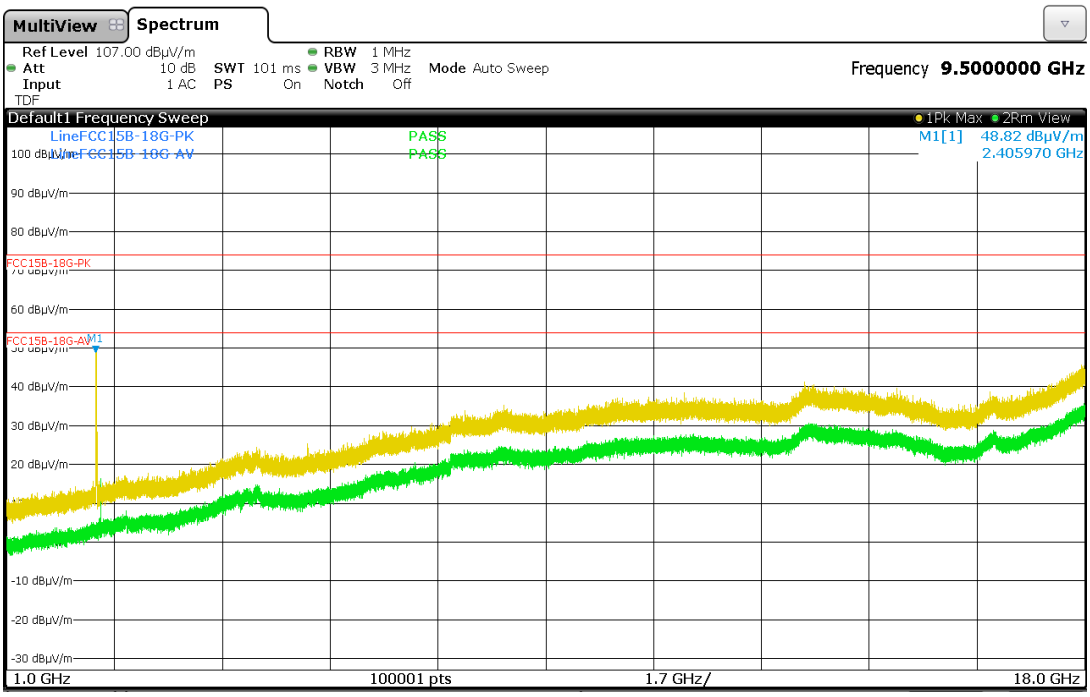


ESTR-21-00051

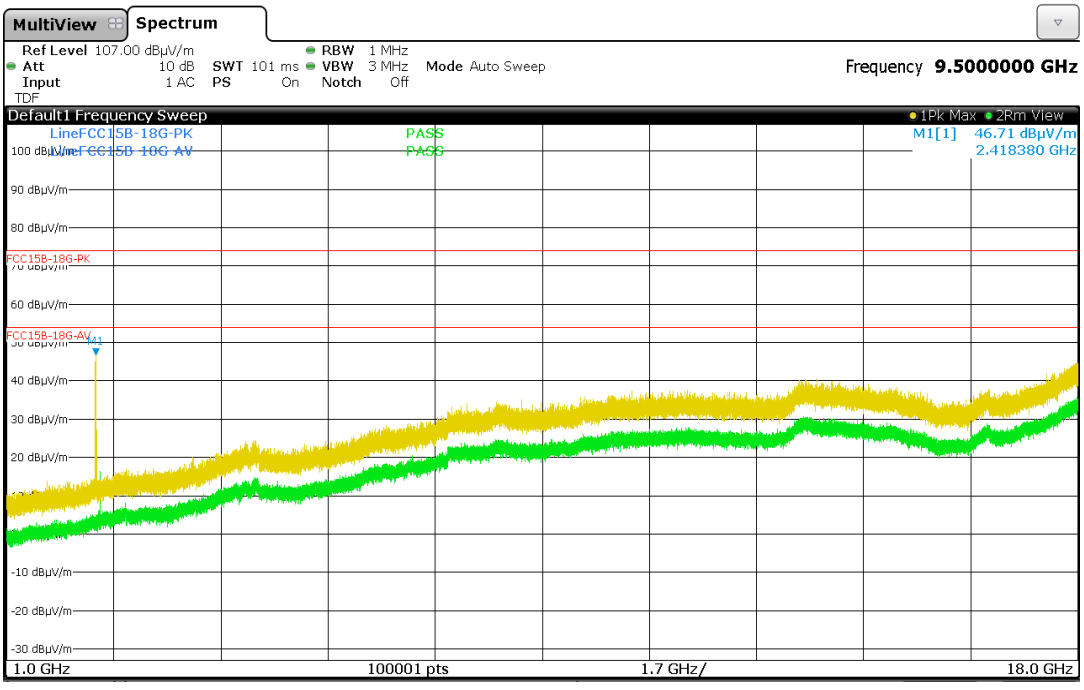
10.4-14 Restricted Band Edges

*802.11g Mode CH1

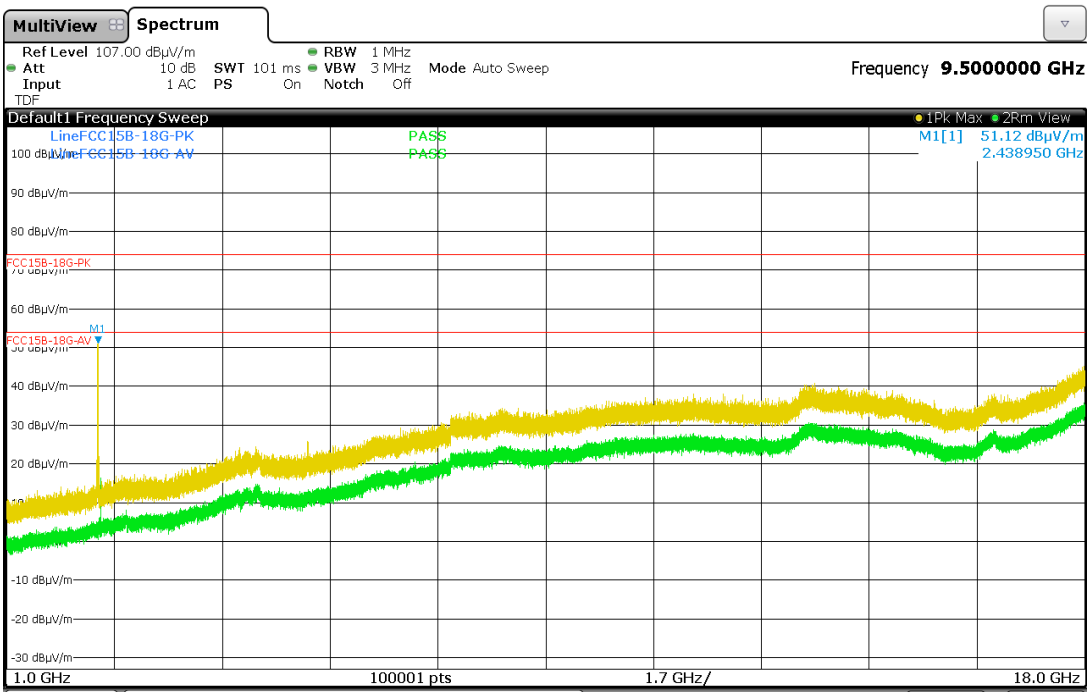
Polarity:Horizontal



Polarity:Vertical

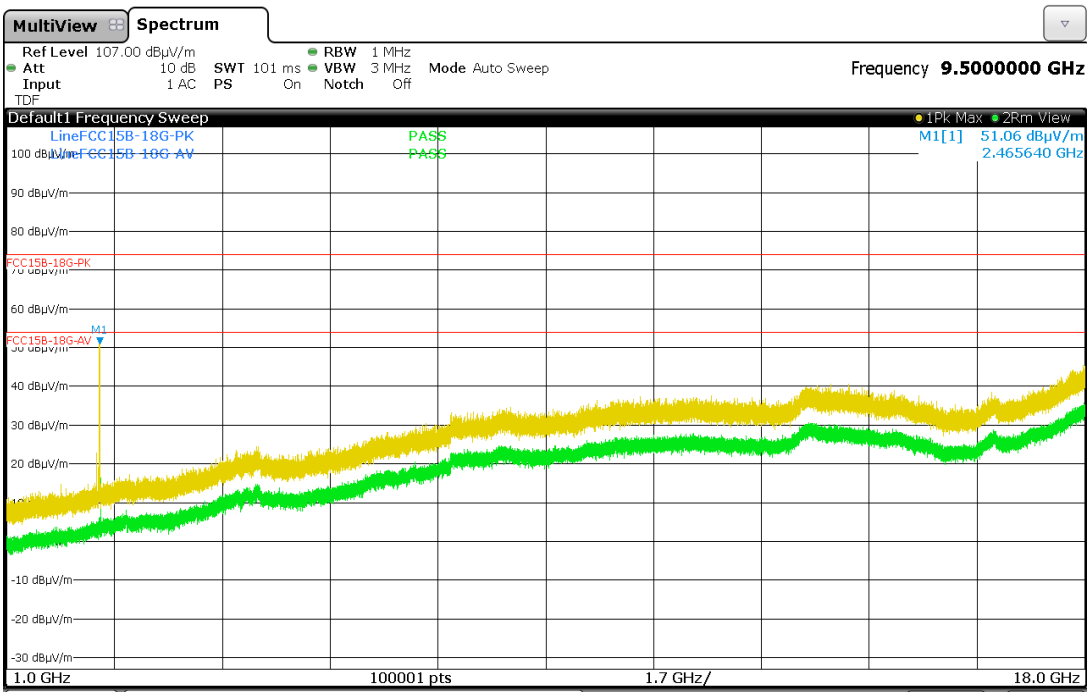


*802.11g Mode CH6 Polarity:Horizontal

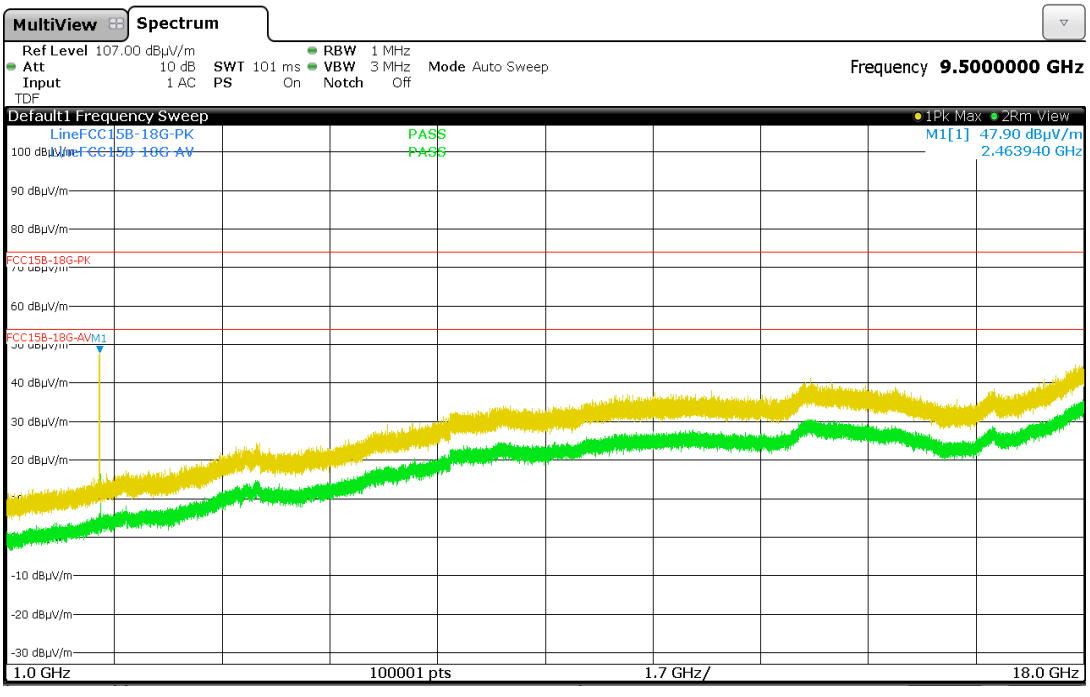


Polarity:Vertical

*802.11g Mode CH11 Polarity:Horizontal



Polarity:Vertical



10.4-15 Test Data (802.11 n20)

Test Date : 15-Mar-21 Measurement Distance : 3 m

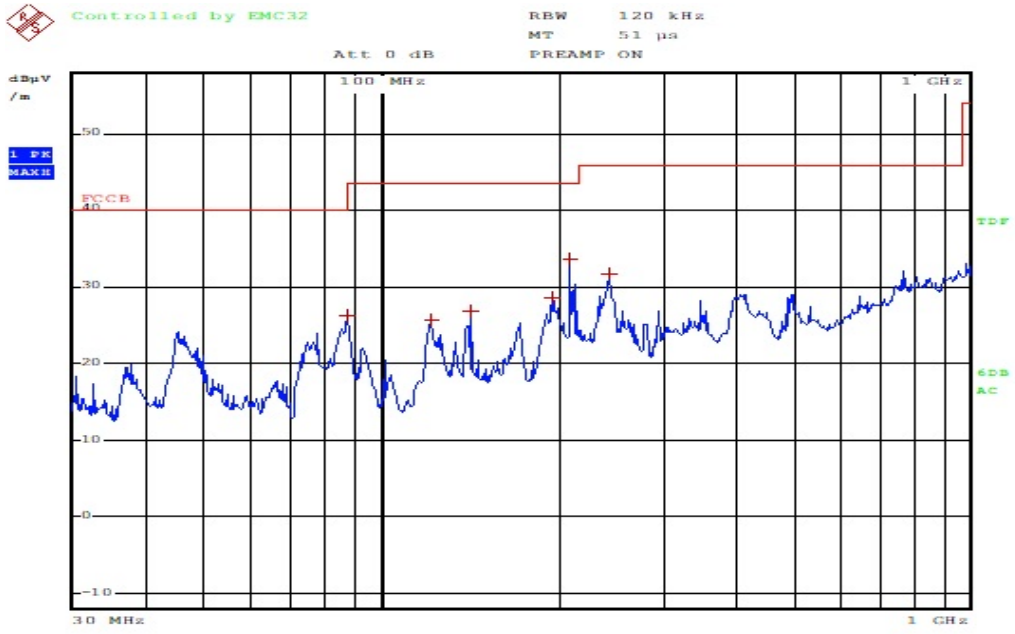
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
37.10	21.43	V	1.0	12.91	1.51	40.00	35.85	4.15
45.90	20.71	V	1.0	9.90	2.21	40.00	32.82	7.18
209.50	15.06	H	1.8	15.40	3.21	43.50	33.67	9.83
213.50	8.32	V	1.4	19.50	3.96	43.50	31.78	11.72
243.30	4.76	H	1.6	22.40	4.64	46.00	31.80	14.20
488.50	4.21	V	1.5	24.29	5.22	46.00	33.72	12.28

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.

10.4-16 radiated Graph(30 MHz ~ 1 GHz)

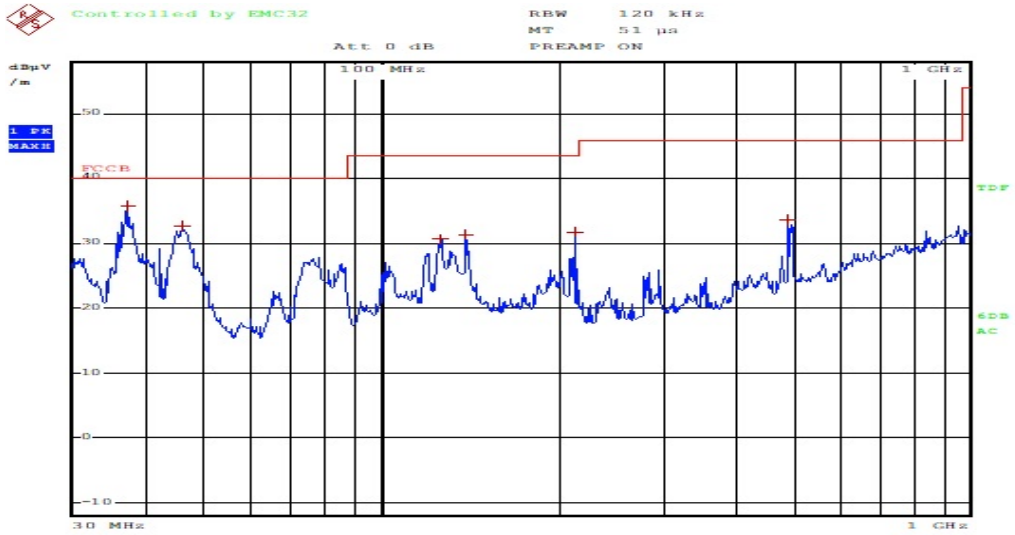
*802.11n20 Mode

Polarity:Horizontal



ESTR-21-00051

Polarity:Vertical



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10.4-17 Test Data

Test Date : 18-Mar-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	60.73	H	1.5	27.83	-40.17		74.00	48.39	25.61
2390.00	56.77	V	1.6	27.83	-40.17		74.00	44.43	29.57
4824.00	70.10	H	1.5	31.52	-37.89		74.00	63.73	10.27
4824.00	63.15	V	1.6	31.52	-37.89		74.00	56.78	17.22
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	46.73	H	1.5	27.83	-40.17	0.00	54.00	34.39	19.61
2390.00	46.08	V	1.6	27.83	-40.17	0.00	54.00	33.74	20.26
4824.00	56.58	H	1.5	31.52	-37.89	0.00	54.00	50.21	3.79
4824.00	50.50	V	1.6	31.52	-37.89	0.00	54.00	44.13	9.87

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-18 Test Data

Test Date : 18-Mar-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
4874.00	63.10	H	1.5	31.57	-37.26		74.00	57.41	16.59
4874.00	61.10	V	1.5	31.57	-37.26		74.00	55.41	18.59
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	55.12	H	1.5	31.57	-37.26	0.00	54.00	49.43	4.57
4874.00	50.10	V	1.5	31.57	-37.26	0.00	54.00	44.41	9.59

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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-19 Test Data

Test Date : 18-Mar-21 Measurement Distance : 3 m

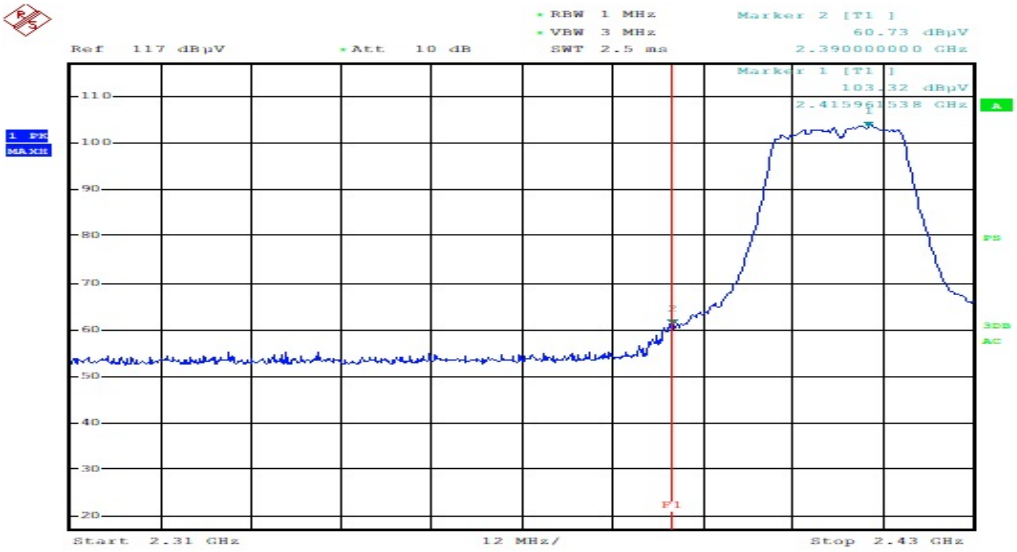
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	59.24	H	1.6	27.63	-40.08		74.00	46.79	27.21
2483.50	56.59	V	1.5	27.63	-40.08		74.00	44.14	29.86
4924.00	70.10	H	1.6	31.67	-37.23		74.00	64.54	9.46
4924.00	63.59	V	1.5	31.67	-37.23		74.00	58.03	15.97
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	46.37	H	1.6	27.63	-40.08	0.00	54.00	33.92	20.08
2483.50	45.60	V	1.5	27.63	-40.08	0.00	54.00	33.15	20.85
4924.00	57.00	H	1.6	31.67	-37.23	0.00	54.00	51.44	2.56
4924.00	50.60	V	1.5	31.67	-37.23	0.00	54.00	45.04	8.96

Remark	H : Horizontal, V : Vertical TEST MODE : 802.11n20 - 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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-20 Restricted Band Edges
*802.11n20 Mode

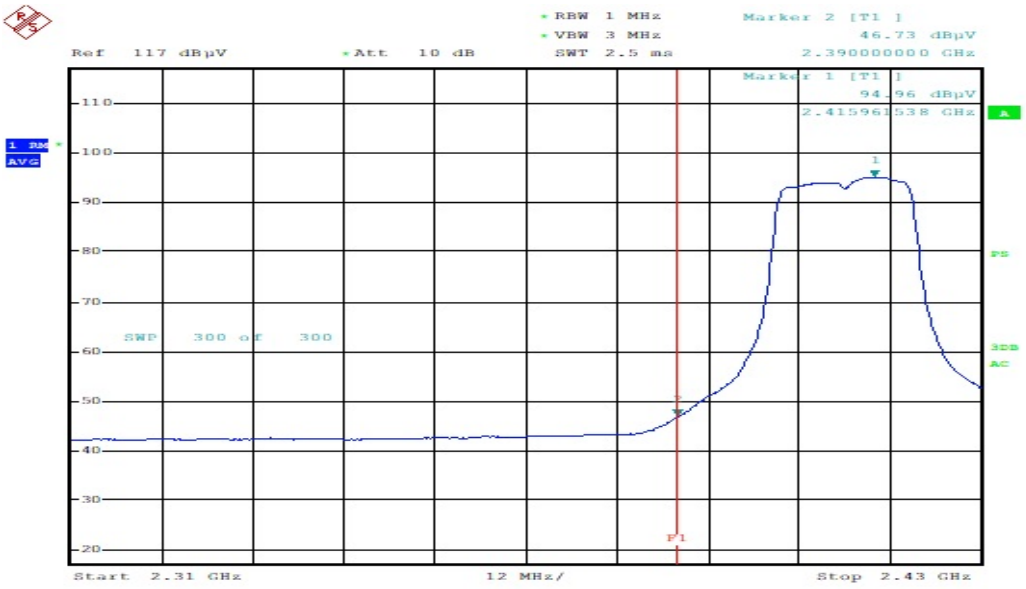
Band Edges(CH Low)

Detector mode:Peak Polarity:Horizontal



ESTR-21-00051

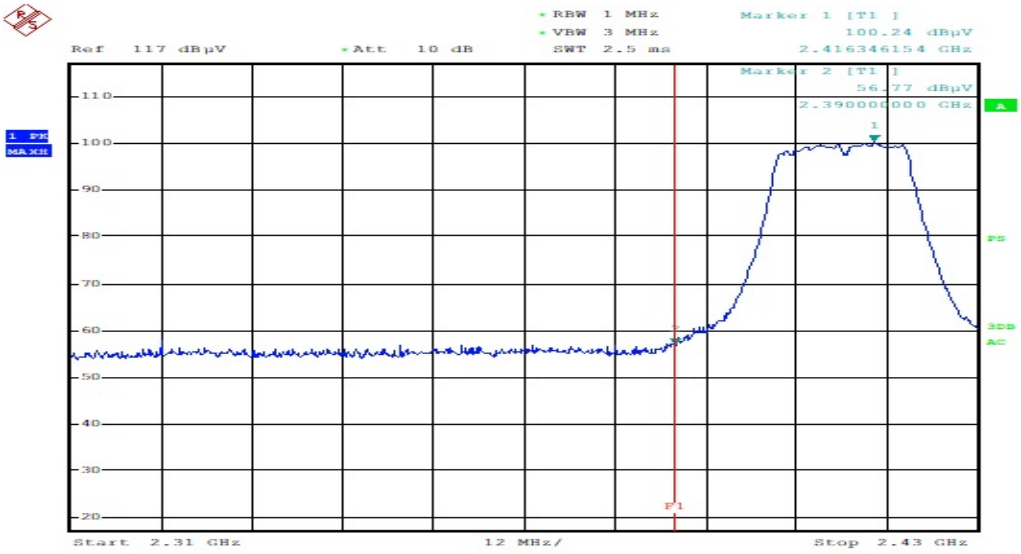
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

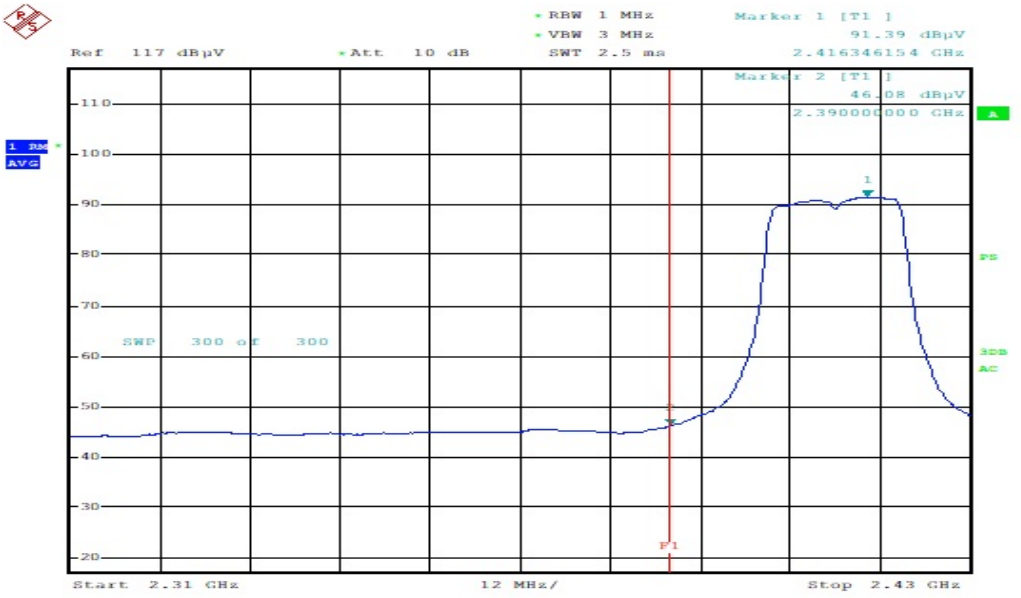
Band Edges(CH Low)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

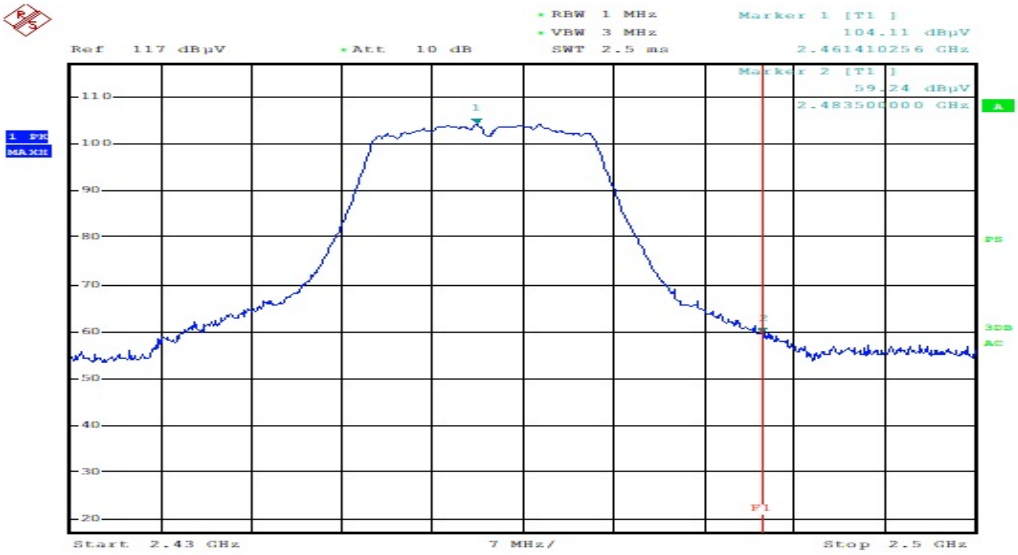
Detector mode:Average Polarity:Vertical



ESTR-21-00051

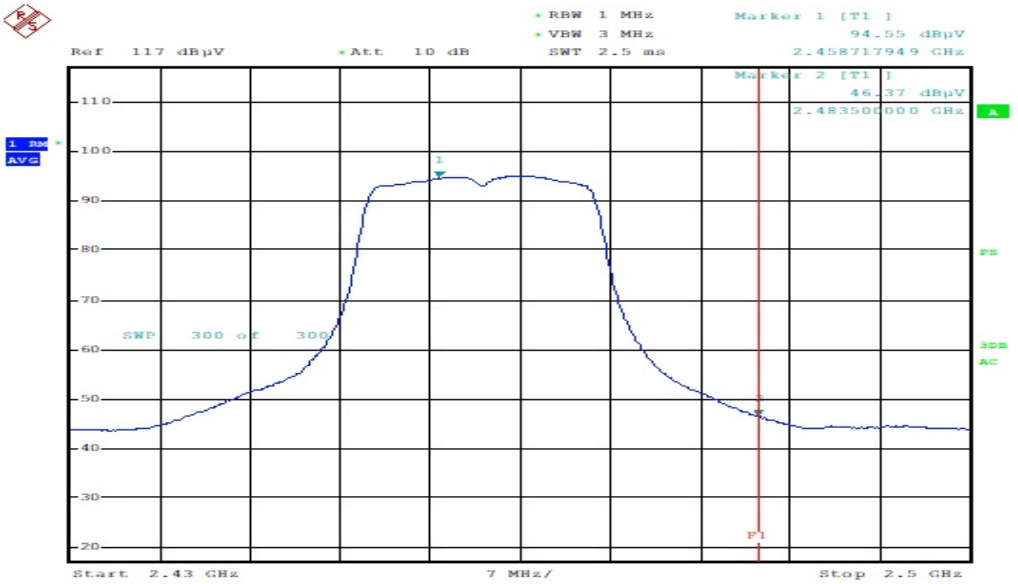
Band Edges(CH High)

Detector mode:Peak Polarity:Horizontal



ESTR-21-00051

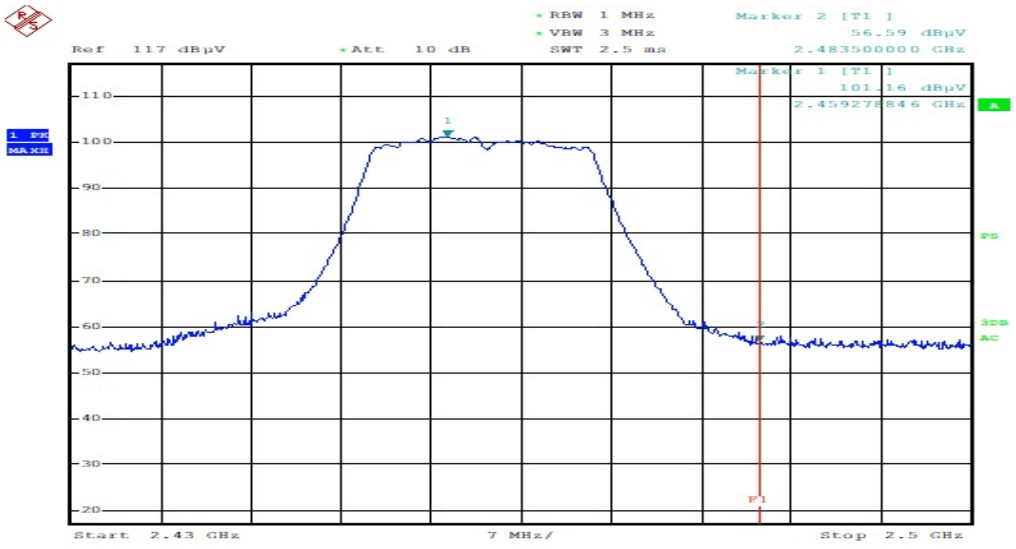
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

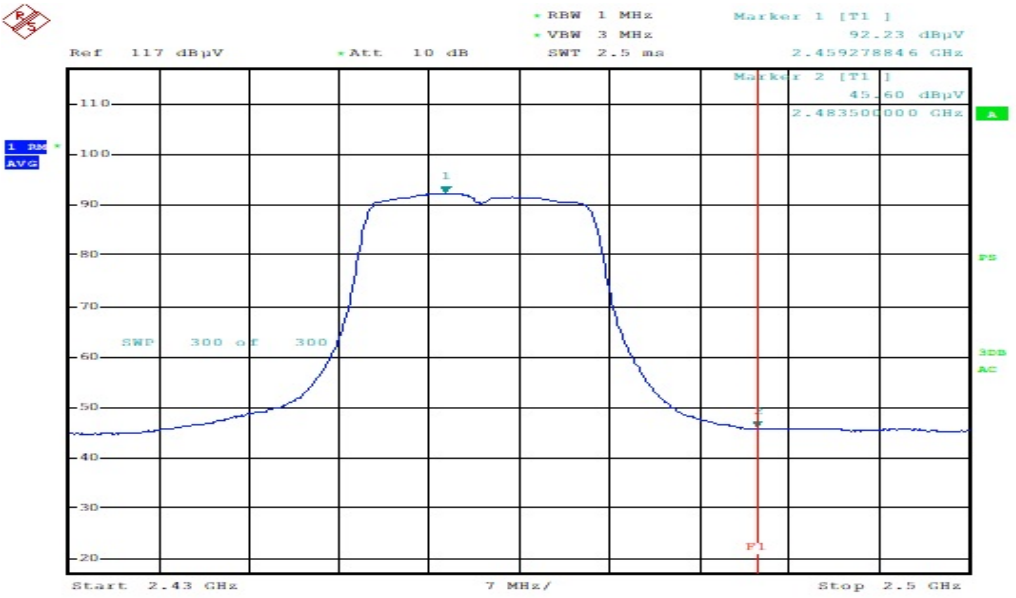
Band Edges(CH High)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

Detector mode:Average Polarity:Vertical

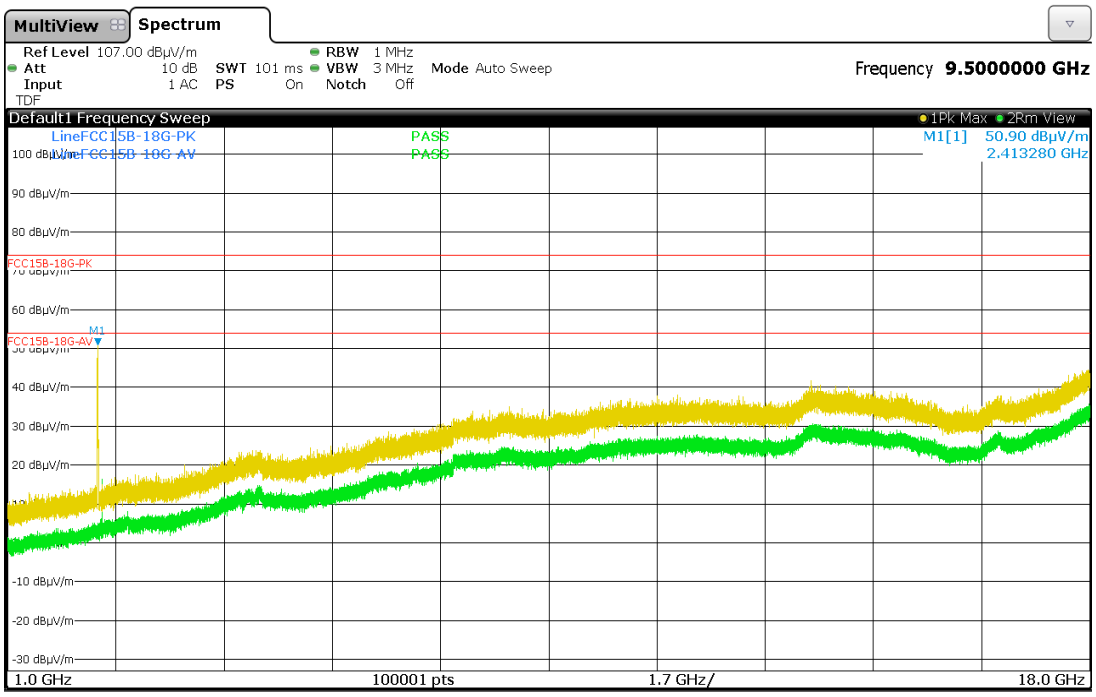


ESTR-21-00051

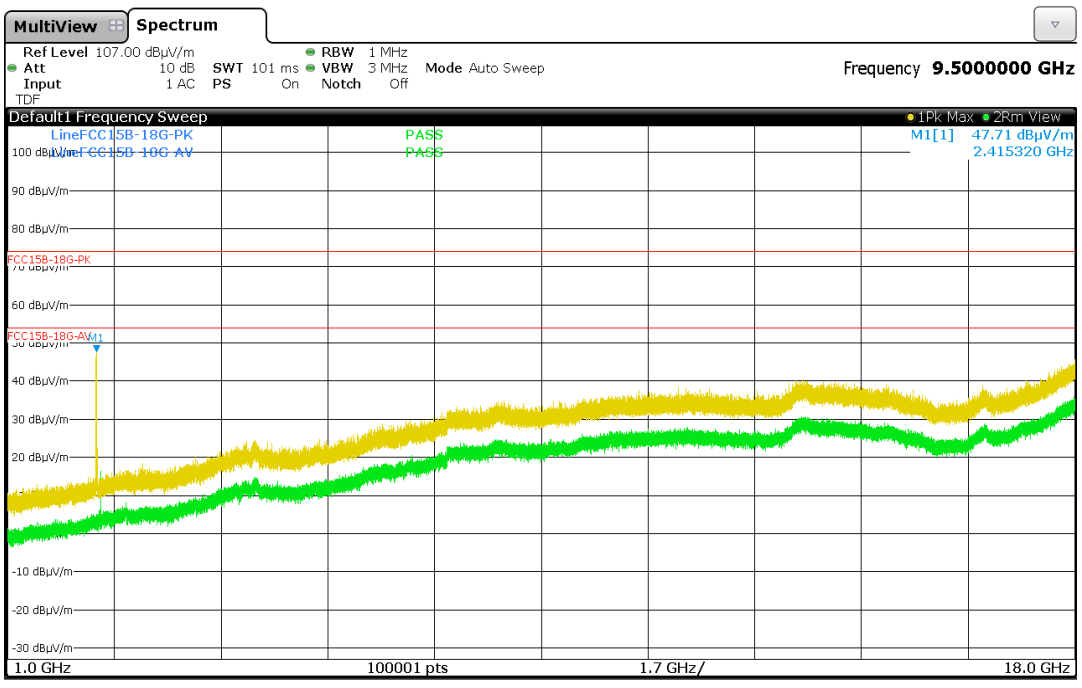
10.4-21 Restricted Band Edges

*802.11n20 Mode CH1

Polarity:Horizontal

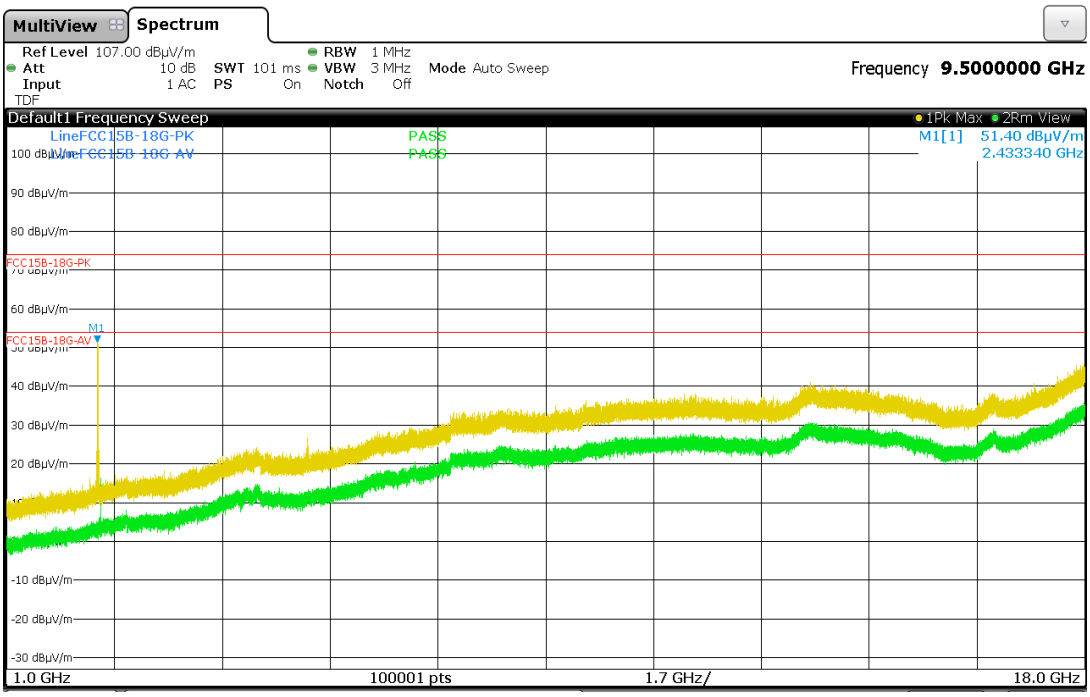


Polarity:Vertical

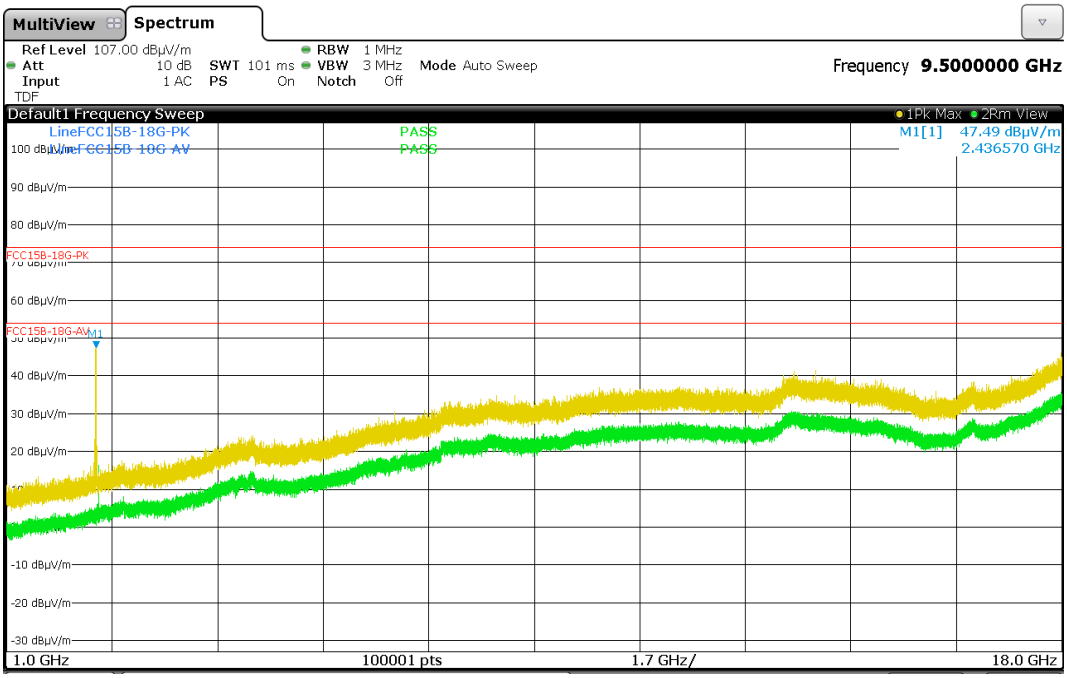


*802.11n20 Mode CH6

Polarity:Horizontal

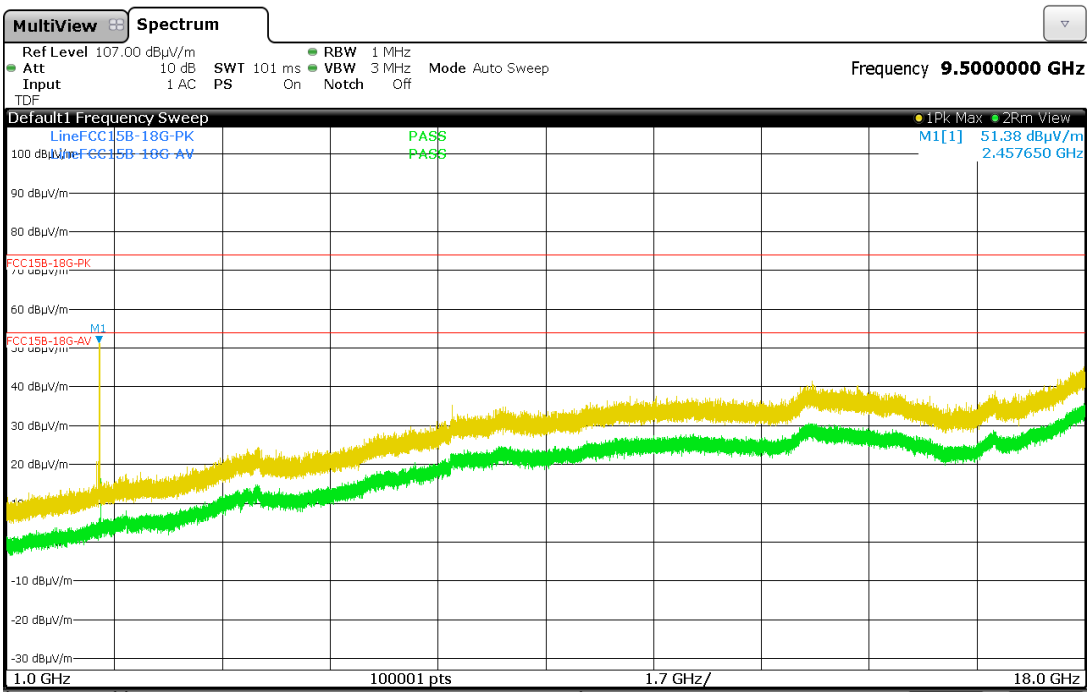


Polarity:Vertical

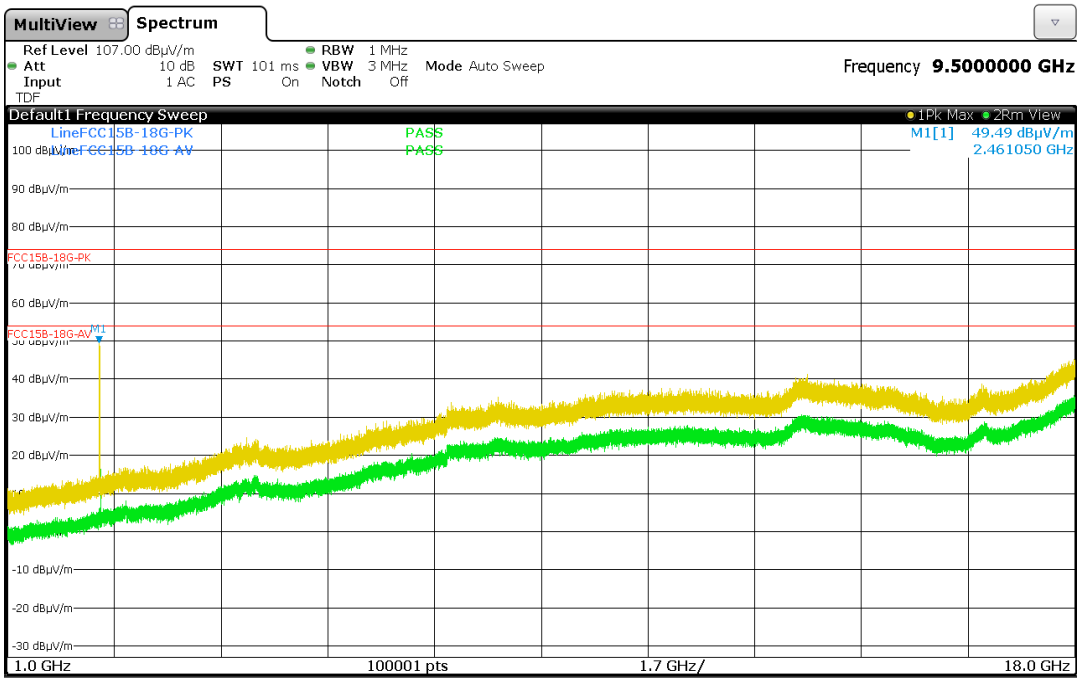


*802.11n20 Mode CH11

Polarity:Horizontal



Polarity:Vertical



10.4-22 Test Data (802.11 n40)

Test Date : ###### Measurement Distance : 3 m

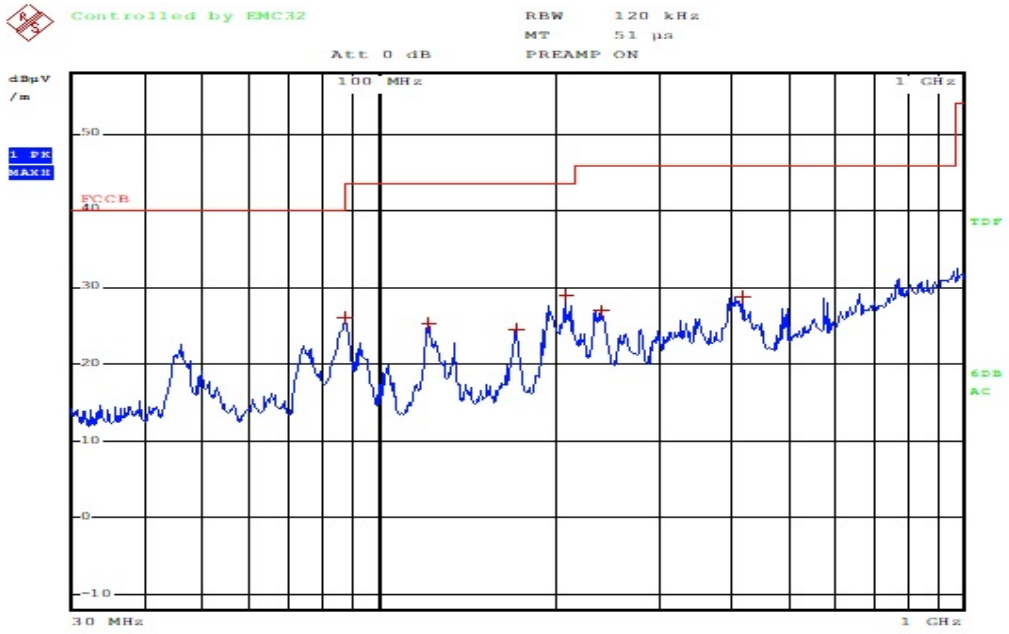
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
36.40	19.67	V	1.0	12.91	1.51	40.00	34.09	5.91
46.20	20.94	V	1.0	9.90	2.21	40.00	33.05	6.95
75.30	10.73	V	1.0	15.40	3.21	40.00	29.34	10.66
126.90	7.16	V	1.1	19.50	3.96	43.50	30.62	12.88
139.80	4.78	V	1.2	22.40	4.64	43.50	31.82	11.68
497.70	3.27	V	1.6	24.29	5.22	46.00	32.78	13.22

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.

10.4-23 radiated Graph(30 MHz ~ 1 GHz)

*802.11n Mode

Polarity:Horizontal



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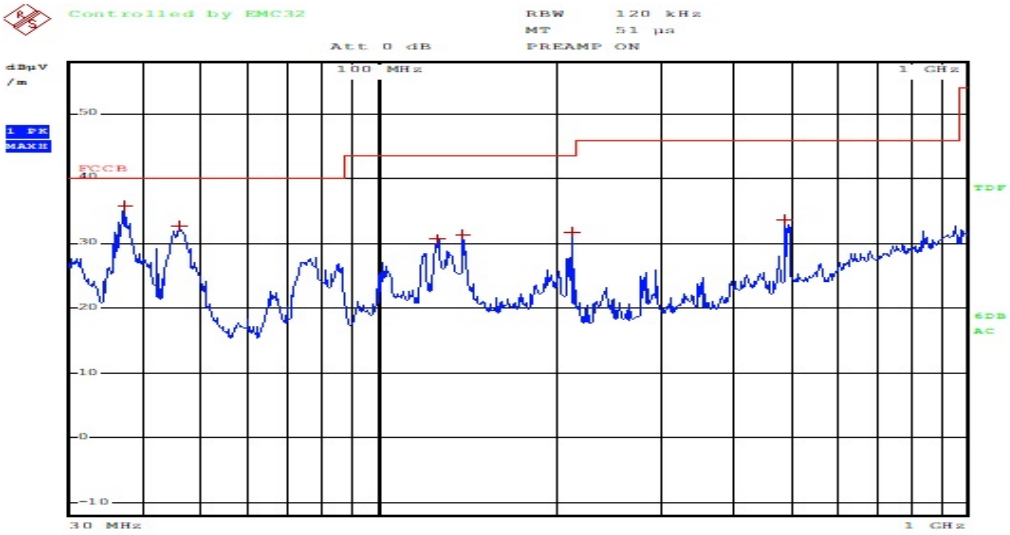
Polarity:Vertical



ESTR-21-00051

10.4-24 Test Data

Test Date : 19-Mar-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	61.62	H	1.5	27.83	-40.17		74.00	49.28	24.72
2390.00	59.25	V	1.6	27.83	-40.17		74.00	46.91	27.09
4844.00	65.36	H	1.5	31.54	-37.26		74.00	59.64	14.36
4844.00	61.80	V	1.6	31.54	-37.26		74.00	56.08	17.92
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	49.97	H	1.5	27.83	-40.17	2.08	54.00	39.71	14.29
2390.00	47.56	V	1.6	27.83	-40.17	2.08	54.00	37.30	16.70
4844.00	54.50	H	1.5	31.54	-37.26	2.08	54.00	50.86	3.14
4844.00	49.70	V	1.6	31.54	-37.26	2.08	54.00	46.06	7.94

Remark	H : Horizontal, V : Vertical TEST MODE : 802.11n40 - CH 3(2 422 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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-25 Test Data

Test Date : 19-Mar-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 100 kHz VBW: 300 kHz)									
4874.00	63.50	H	1.5	31.57	-37.26		74.00	57.81	16.19
4874.00	60.80	V	1.5	31.57	-37.26		74.00	55.11	18.89
AV(RBW: 1 MHz VBW: 3 MHz)									
4874.00	53.50	H	1.5	31.57	-37.26	0.00	54.00	47.81	6.19
4874.00	50.80	V	1.5	31.57	-37.26	0.00	54.00	45.11	8.89

Remark	H : Horizontal, V : Vertical TEST MODE : 802.11 n40 - 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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-26 Test Data

Test Date : 19-Mar-21 Measurement Distance : 3 m

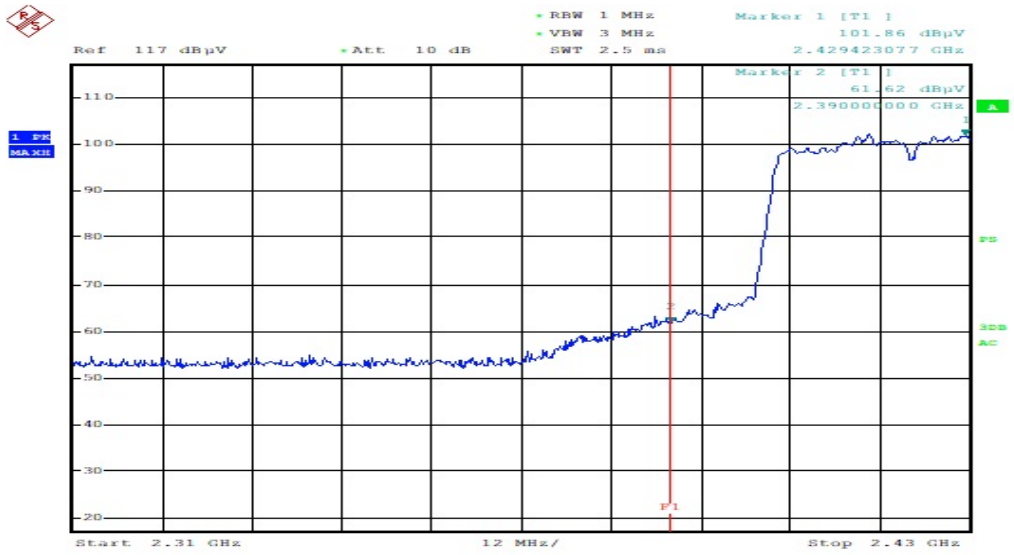
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW: 100 kHz VBW: 300 kHz)									
2483.50	65.06	H	1.6	27.63	-40.08		74.00	52.61	21.39
2483.50	61.79	V	1.5	27.63	-40.08		74.00	49.34	24.66
4924.00	65.60	H	1.6	31.67	-37.23		74.00	60.04	13.96
4924.00	60.80	V	1.5	31.67	-37.23		74.00	55.24	18.76
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	54.39	H	1.6	27.63	-40.08	0.00	54.00	41.94	12.06
2483.50	49.81	V	1.5	27.63	-40.08	0.00	54.00	37.36	16.64
4924.00	54.20	H	1.6	31.67	-37.23	0.00	54.00	48.64	5.36
4924.00	50.50	V	1.5	31.67	-37.23	0.00	54.00	44.94	9.06

Remark	H : Horizontal, V : Vertical TEST MODE : 802.11n40 - 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 *This test was radiated up to 26.5 GHz but no noise was measured.

10.4-27 Restricted Band Edges
*802.11n40 Mode

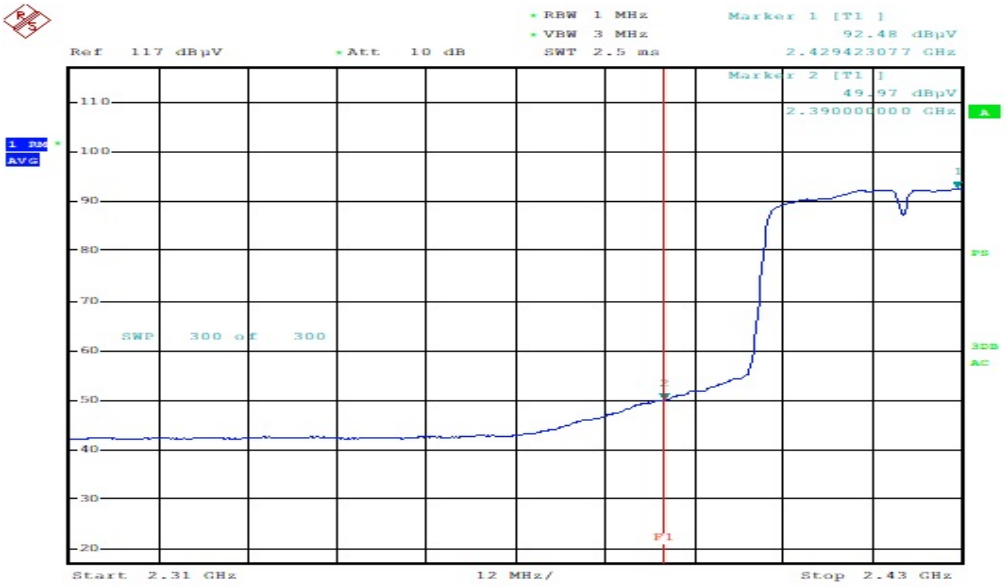
Band Edges(CH Low)

Detector mode:Peak Polarity:Horizontal



ESTR-21-00051

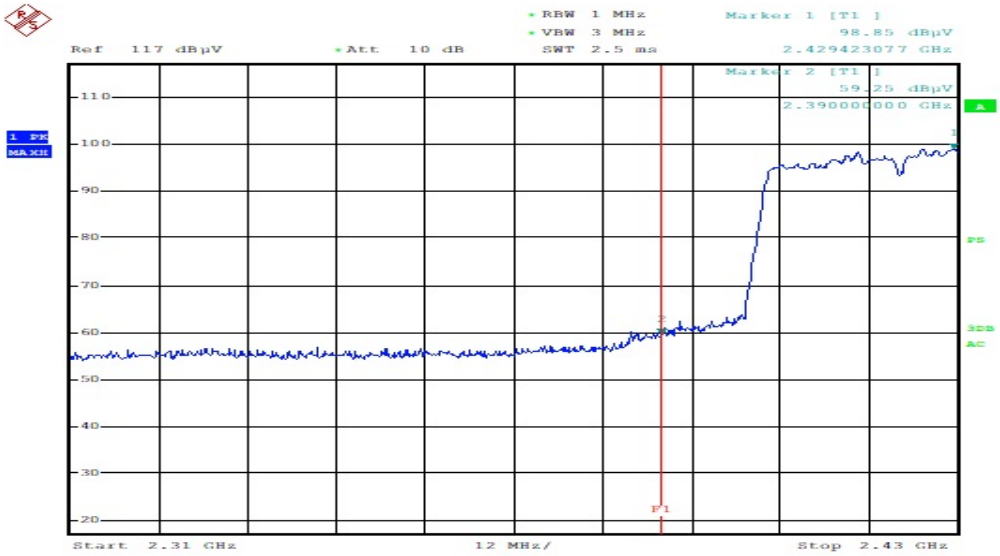
Detector mode:Average Polarity:Horizontal



ESTR-21-00051

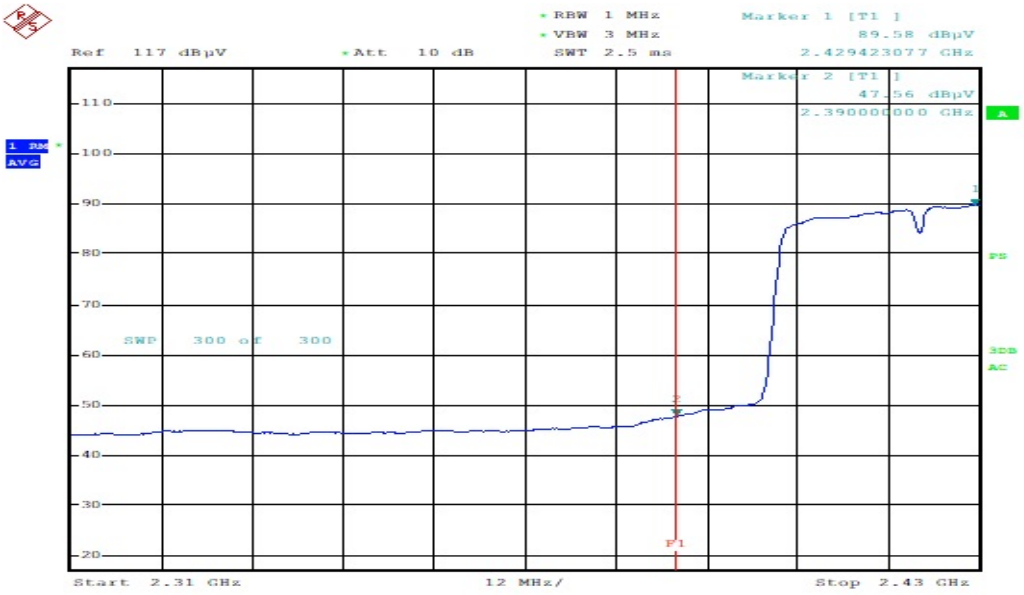
Band Edges(CH Low)

Detector mode:Peak Polarity:Vertical



ESTR-21-00051

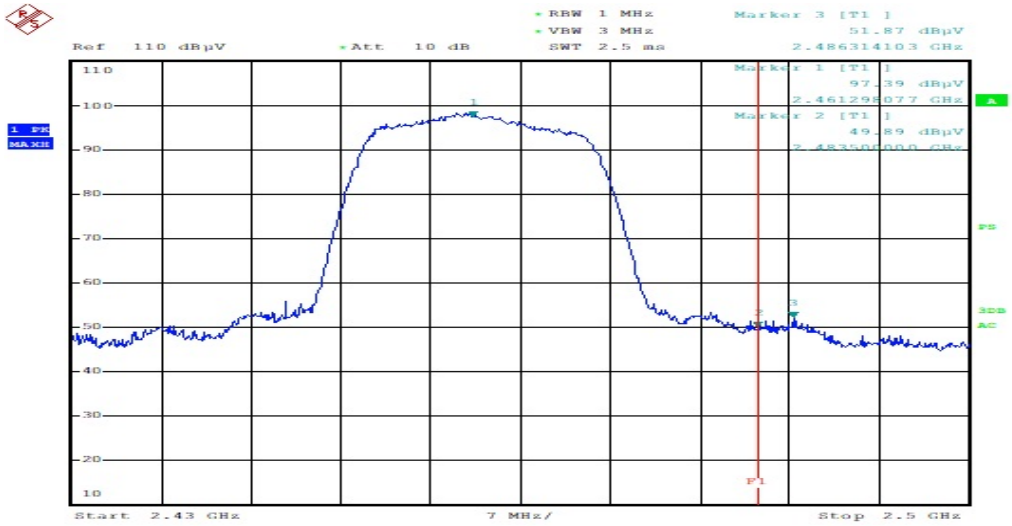
Detector mode:Average Polarity:Vertical



ESTR-21-00051

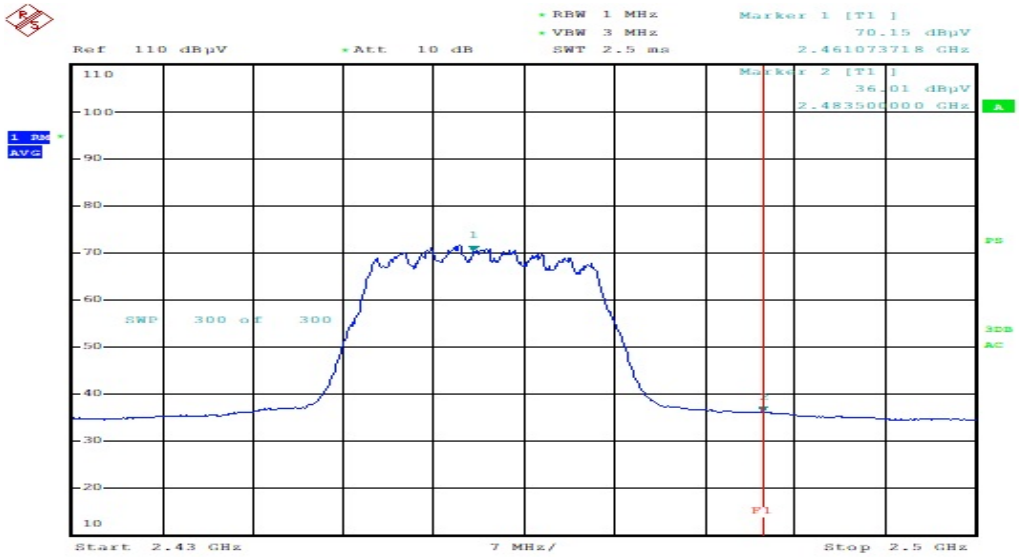
Band Edges(CH High)

Detector mode:Peak Polarity:Horizontal



RP70A BIO_11n20_CH11_PEAK_HOR

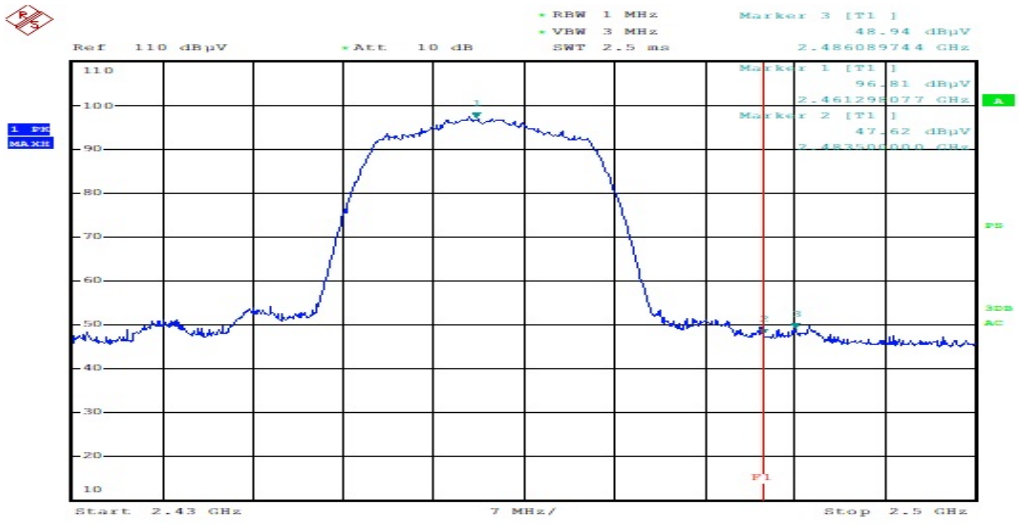
Detector mode:Average Polarity:Horizontal



RP70A BIO_11n20_CH11_AV_HOR

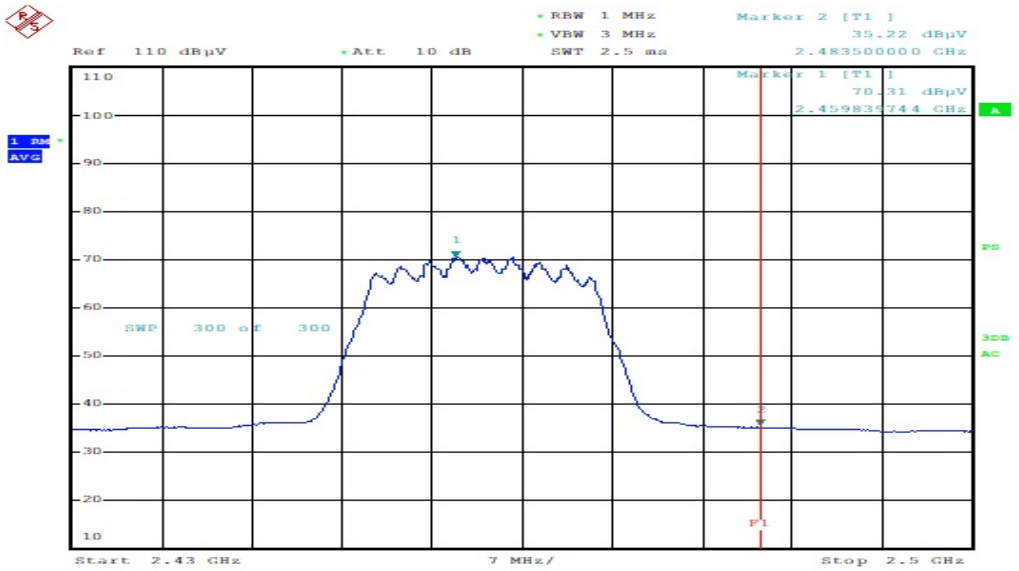
Band Edges(CH High)

Detector mode:Peak Polarity:Vertical



RP70A BIO_11n20_CH11_PEAK_VER

Detector mode:Average Polarity:Vertical

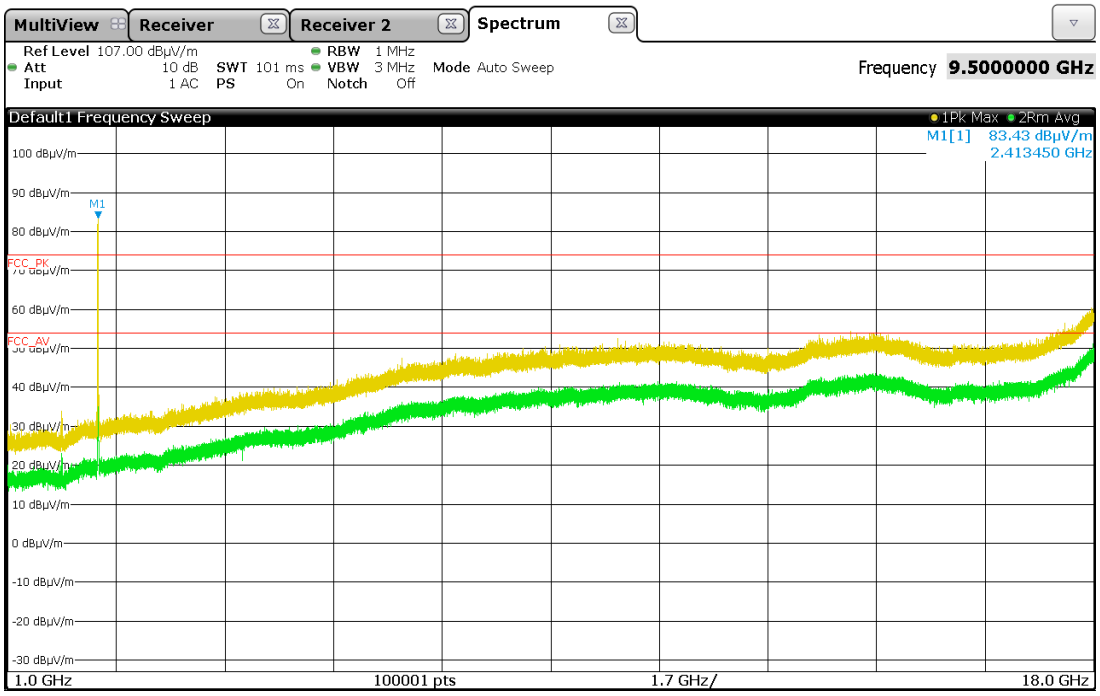


RP70A BIO_11n20_CH11_AV_VER

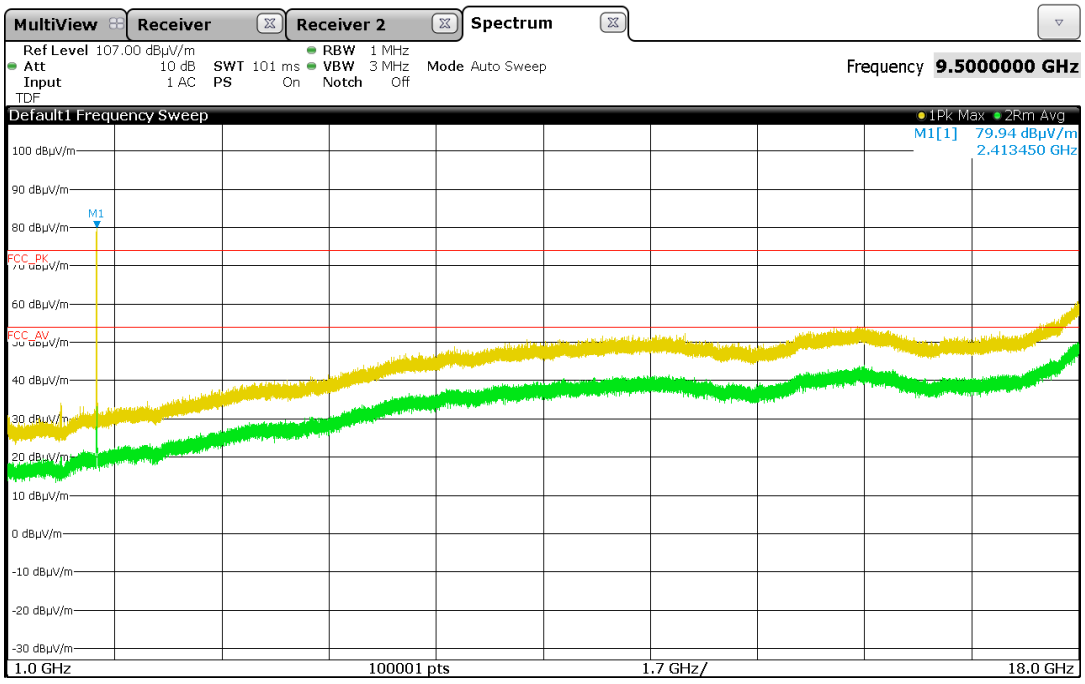
10.4-28 Restricted Band Edges

*802.11n40 Mode CH3

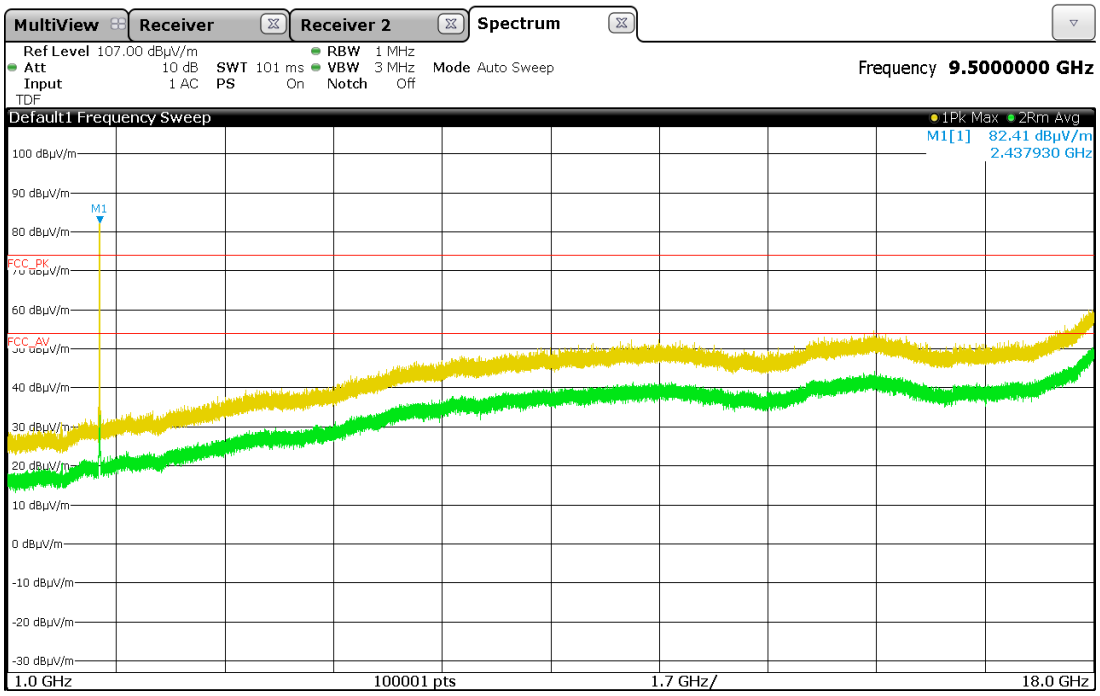
Polarity:Horizontal



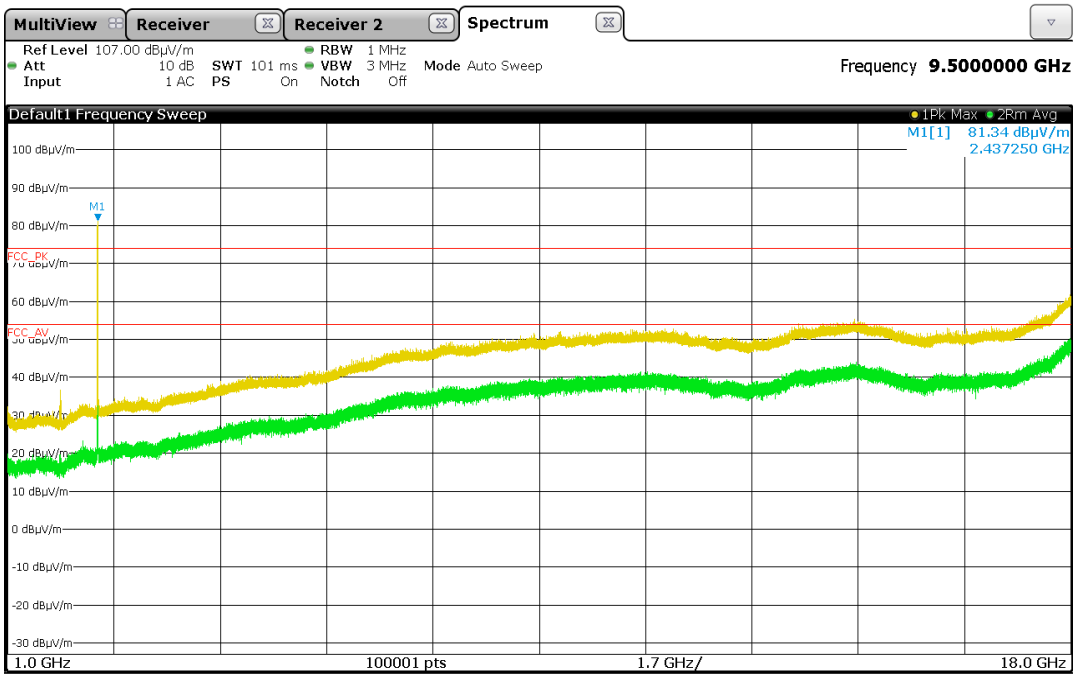
Polarity:Vertical



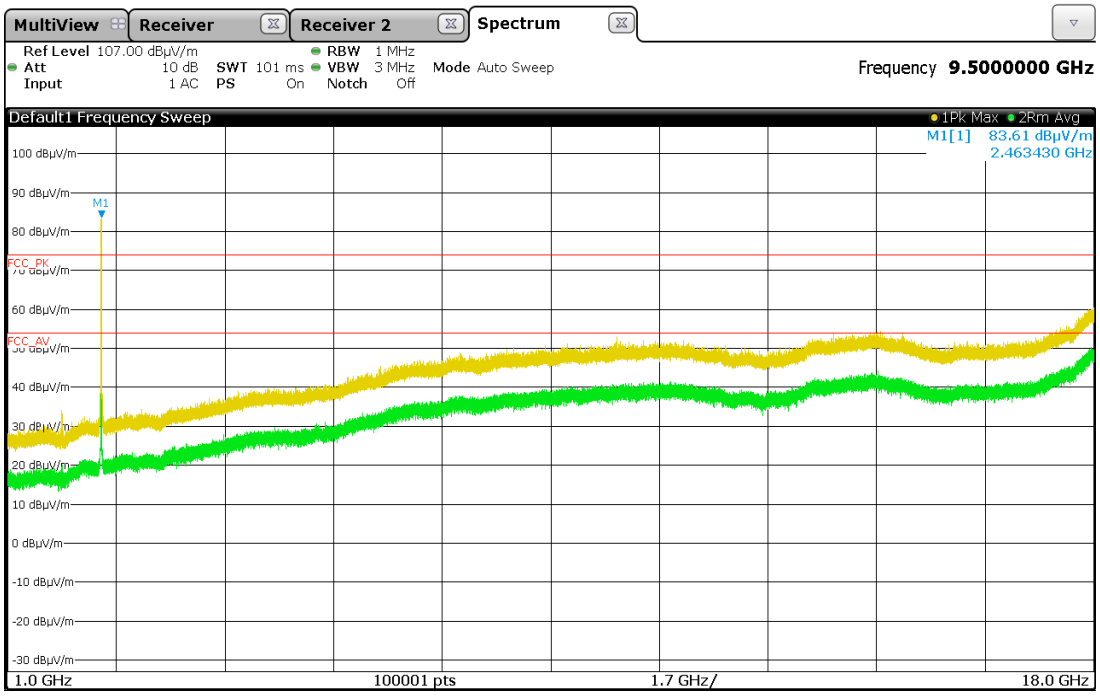
*802.11n40 Mode CH6 Polarity:Horizontal



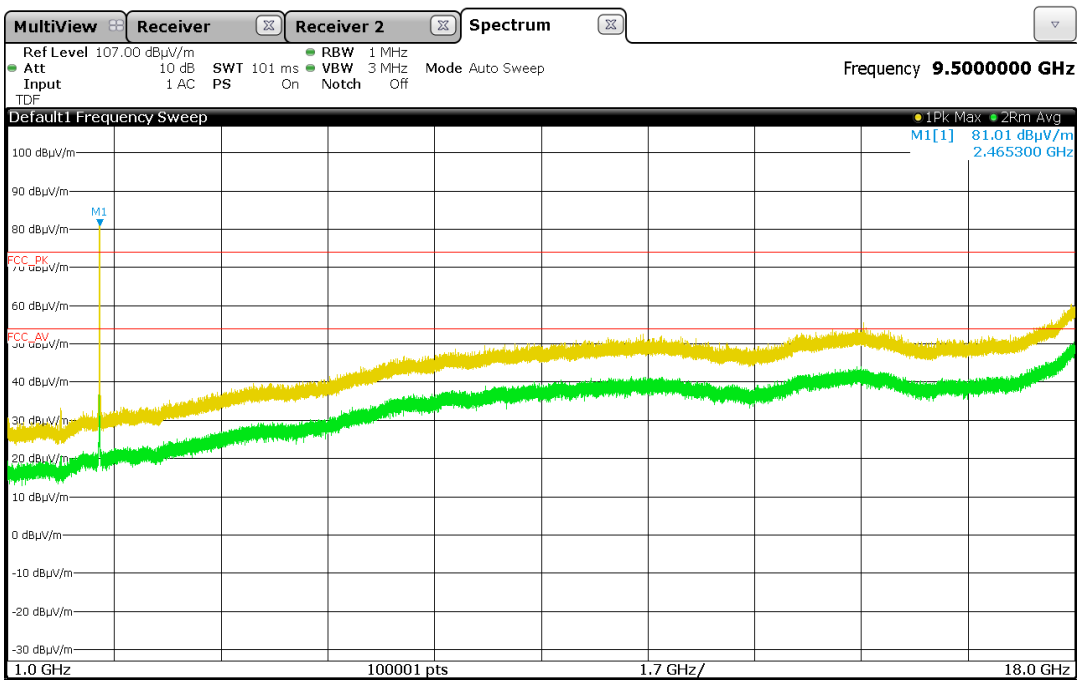
Polarity:Vertical



*802.11n40 Mode CH11 Polarity:Horizontal



Polarity:Vertical



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	24-Aug-21
LISN	ESH3-Z5	Rohde & Schwarz	836679/025	24-Aug-21
LISN	ENV216	Rohde & Schwarz	101231	24-Aug-21
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	24-Aug-21

11.2 Environmental Condition

Test Place : Shielded Room

Temperature (°C) : °C
Humidity (% R.H.) : % R.H.

11.3-1 Test Data (802.11 b)

Test Date : N/A

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dBμV)	Reading (dBμV)	Result (dBμV)	Limit (dBμV)	Reading (dBμV)	Result (dB)
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

11.3-2 Test Data (802.11 g)

Test Date : N/A

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dBμV)	Reading (dBμV)	Result (dBμV)	Limit (dBμV)	Reading (dBμV)	Result (dB)
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

11.3-3 Test Data (802.11 n20)

Test Date : N/A

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dBμV)	Reading (dBμV)	Result (dBμV)	Limit (dBμV)	Reading (dBμV)	Result (dB)
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

11.3-4 Test Data (802.11 n40)

Test Date : N/A

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dBμV)	Reading (dBμV)	Result (dBμV)	Limit (dBμV)	Reading (dBμV)	Result (dB)
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

Appendix 1. Special diagram (802.11 b)

*CONDUCTED EMISSION-N/A

* HOT LINE

* NEUTRAL LINE

Appendix 1. Special diagram (802.11 g)

*CONDUCTED EMISSION-N/A

* HOT LINE

* NEUTRAL LINE

Appendix 1. Special diagram (802.11 n20)

*CONDUCTED EMISSION-N/A

* HOT LINE

* NEUTRAL LINE

Appendix 1. Special diagram (802.11 n40)

*CONDUCTED EMISSION-N/A

* HOT LINE

* NEUTRAL LINE

Appendix 2. Antenna information

1. Antenna information

antenna type : Dielectric Chip Antenna.
antenna location : Integnal
antenna gain : 1.88 dBi
No temporary RF connector provided