TEST REPORT

Dt&C

DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042 Tel : 031-321-2664, Fax : 031-321-1664

1.	Report	No	;	DRTFCC1706-0096
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- 2. Customer
 - Name : Sena Technologies, Inc.
 - Address : 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, South Korea
- 3. Use of Report : FCC Original Grant
- 4. Product Name / Model Name : X1 PRO CAM / SP43

FCC ID : S7A-SP43

5. Test Method Used : KDB 558074, ANSI C63.10-2013 Test Specification : FCC Part 15 Subpart C.247

RSS-247 Issue 2 (2017-02), RSS-GEN Issue 4 (2014-11)

- 6. Date of Test : 2017.05.08 ~ 2017.05.16
- 7. Testing Environment : See appended test report.
- 8. Test Result : Refer to the attached test result.

Affirmation	Tested by	Technical Manager					
	Name : JungWoo Kim (Sigradure)	Name : HyunSu Son (SMSare)					
The test	results presented in this test report are limited	only to the sample supplied by applicant and					
the use of the	his test report is inhibited other than its purpose	e. This test report shall not be reproduced except					
	in full, without the written appro	val of DT&C Co., Ltd.					
	2017.06.12.						
	DT&C Co	., Ltd.					

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1706-0096	June. 12, 2017	Initial issue

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1. GENERAL INFORMATION

1.1 Testing Laboratory

DT&C	Co., l	_td.			
Standard Site number		Site numb	Address		
	\square	165783	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
500		804488	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
FCC		596748	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
		678747	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080		
10		5740A-3	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
IC		5740A-2	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080		
www.d	tnc.ne	<u>et</u>			
Telephone : + 82		: .	2-31-321-2664		
FAX : + 82-31-321-1664			+ 82-31-321-1664		

1.2 Test Environment

Ambient Condition				
 Temperature 	+24 ~ +25 °C			
 Relative Humidity 	39 % ~ 42 %			

1.3 Measurement Uncertainty

Test items	Measurement uncertainty	
Transmitter Output Power	0.70 dB (The confidence level is about 95 %, $k = 2$)	
Conducted spurious emission	0.94 dB (The confidence level is about 95 %, $k = 2$)	
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, $k = 2$)	
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)	
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, $k = 2$)	



1.4 Details of Applicant

Applicant	:	Sena Technologies,Inc.
Address	:	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, South Korea
Contact person	:	Seunghyun Kim

1.5 Description of EUT

EUT	X1 PRO CAM		
Model Name	SP43		
Add Model Name	N/A		
Power Supply	DC 3.7 V		
Hardware version	1.0		
Software version	1.0		
Frequency Range	2.4GHz Band • 802.11b/g/n(HT20) : 2412 MHz ~ 2462 MHz		
Max. RF Output Power (Peak)	2.4GHz Band • 802.11b : 8.96 dBm • 802.11g : 15.94 dBm • 802.11n (HT20) : 15.78 dBm		
Modulation Type	802.11b : DSSS/CCK 802.11g/n : OFDM		
Antenna Specification	Internal Antenna • 2.4GHz Band Max. peak gain : 3.01 dBi		

1.6 Support Equipment

Equipment	Manufacturer	Model No.	Serial No.	Note
-	-	-	-	-
-	-	-	-	-

2. SUMMARY OF TESTS

FCC Part	RSS Std.	Parameter	Limit	Test Condition	Status Note 1	
15.247(a)	RSS-247 [5.2]	6 dB Bandwidth	> 500 kHz	Conducted	С	
15.247(b)	RSS-247 [5.4]	Transmitter Output Power	< 1 Watt		С	
15.247(d)	RSS-247 [5.5]	Out of Band Emissions / Band Edge	20 dBc in any 100 kHz BW		с	
		Transmitter Power Spectral Density < 8 dBm/3 kHz			С	
-	RSS-Gen [6.6]	Occupied Bandwidth (99 %)	RSS-Gen(6.6)		С	
15.247(d) 15.205 15.209	RSS-247 [5.5] RSS-GEN [8.9] RSS-GEN [8.10]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	С	
15.207	RSS-Gen [8.8]	AC Line Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA Note 2	
15.203 - Antenna Requirements F		FCC 15.203	-	С		
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable Note 2: The power supply of this device is only DC (Internal Battery) and Bluetooth function is disabled in charging status.						



3. TEST METHODOLOGY

Generally the tests were performed according to the KDB558074 D01 v04. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the test mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB 558074. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10.

The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB 558074. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10 as stated on section 12.1 of the KDB 558074.

The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axes.

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.



4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

5. ANTENNA REQUIREMENTS

5.1 According to FCC 47 CFR §15.203:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The antenna is printed to the internal PCB (Refer to Internal Photo file.) Therefore this E.U.T Complies with the requirement of §15.203.

6. TEST RESULT

6.1 6 dB Bandwidth

Test Requirements and limit, §15.247(a)

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6 dB bandwidth is 500 kHz.

TEST CONFIGURATION

Refer to the APPENDIX I.

TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074

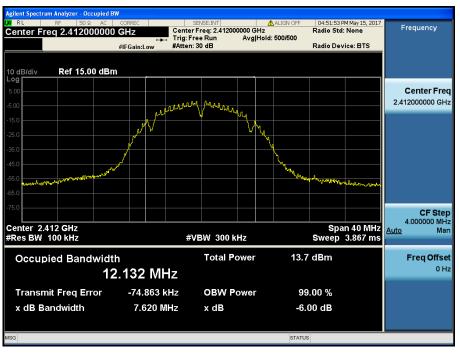
- 1. Set resolution bandwidth (RBW) = 100 kHz.
- 2. Set the video bandwidth (VBW) \ge 3 x RBW.
- (RBW : 100 kHz / VBW : 300 kHz) 3. Detector = Peak.
- 3. Detector = Peak.
- 4. Trace mode = Max hold.
- 5. Sweep = Auto couple.
- 6. Allow the trace to stabilize.
- 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST RESULTS: Comply

Test Mode	Data Rate	Frequency [MHz]	Test Results [MHz]
	1 Mbps	2412	7.620
802.11b		2437	8.076
		2462	7.596
	6 Mbps	2412	15.140
802.11g		2437	15.130
		2462	15.090
	MCS 0	2412	15.110
802.11n (HT20)		2437	15.130
		2462	15.150

RESULT PLOTS

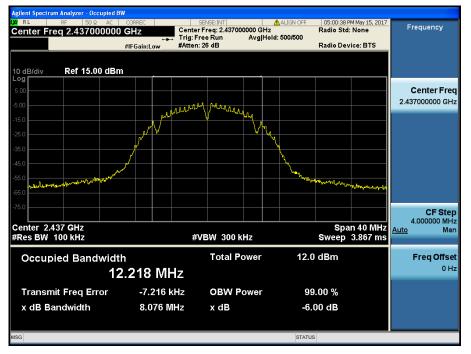
6 dB Bandwidth



6 dB Bandwidth

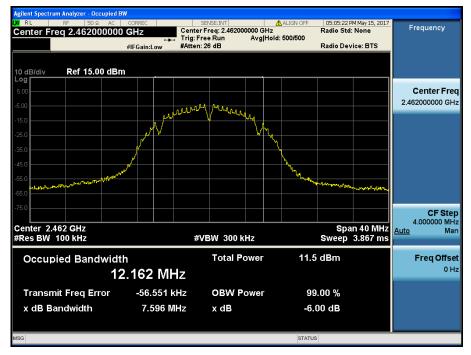
Test Mode: 802.11b & 1 Mbps & 2437 MHz

Test Mode: 802.11b & 1 Mbps & 2412 MHz



6 dB Bandwidth

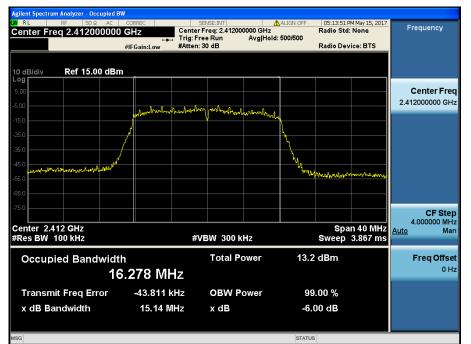
Test Mode: 802.11b & 1 Mbps & 2462 MHz



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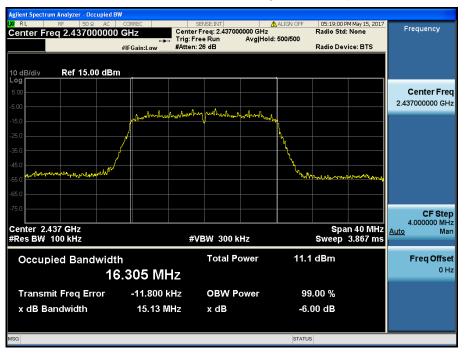
6 dB Bandwidth

Test Mode: 802.11g & 6 Mbps & 2412 MHz



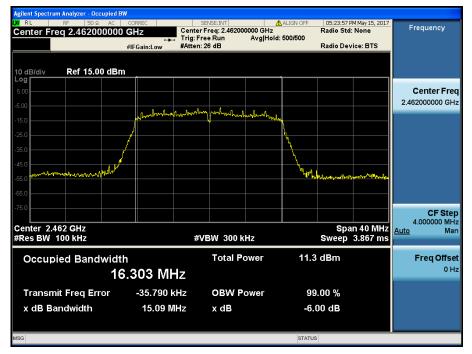
6 dB Bandwidth

Test Mode: 802.11g & 6 Mbps & 2437 MHz



6 dB Bandwidth

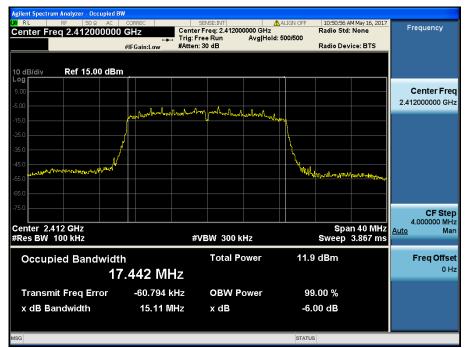
Test Mode: 802.11g & 6 Mbps & 2462 MHz



Dt&C

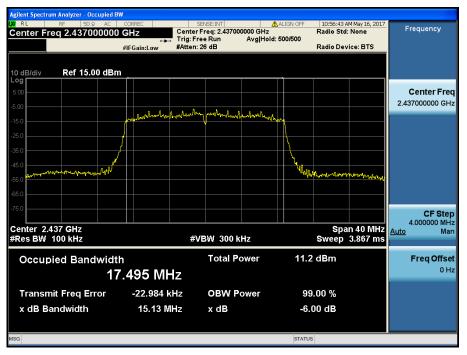
6 dB Bandwidth

Test Mode: 802.11n(HT20) & MCS 0 & 2412 MHz



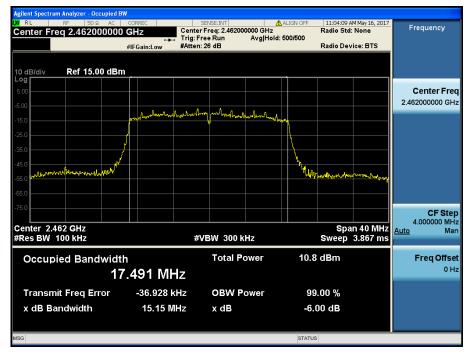
6 dB Bandwidth

Test Mode: 802.11n(HT20) & MCS 0 & 2437 MHz



6 dB Bandwidth

Test Mode: 802.11n(HT20) & MCS 0 & 2462 MHz

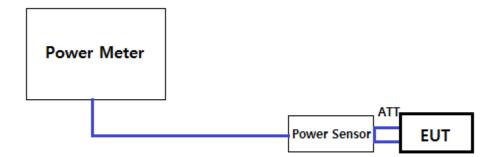


6.2 Maximum Peak Conducted Output Power

Test Requirements and limit, §15.247(b)

The maximum permissible conducted output power is 1 Watt.

TEST CONFIGURATION



TEST PROCEDURE

1. PKPM1 Peak power meter method of KDB558074

The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.

2. Method AVGPM-G (Measurement using a gated RF average power meter) of KDB558074

The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

TEST RESULTS: Comply

- Measurement Data:

- Test Results

					Test Result [dBm]								
Mode	Channel	Frequency [MHz]	^y Detector	DATA RATE [Mbps]									
				1	2	5.5	11	NA	NA	NA	NA		
	4	2412	PK	8.96	8.95	8.95	8.92	-	-	-	-		
	1		AV	5.94	5.88	5.83	5.78	-	-	-	-		
002 445	C	0407	PK	8.81	8.79	8.73	8.73	-	-	-	-		
802.11b	6	2437	AV	5.73	5.72	5.67	5.65	-	-	-	-		
	44	2462	PK	8.69	8.67	8.66	8.62	-	-	-	-		
	11	2462	AV	5.53	5.47	5.46	5.39	-	-	-	-		

		Frequency [MHz]		-			Test Result [dBm]						
Mode	Channel			ector DATA RATE [Mbps]									
				6	9	12	18	24	36	48	54		
	1	2412	PK	15.94	15.93	15.91	15.88	15.84	15.84	15.82	15.82		
			AV	5.92	5.91	5.85	5.78	5.70	5.64	5.59	5.52		
000 11 -	6	0407	PK	15.43	15.42	15.42	15.36	15.30	15.27	15.19	15.18		
802.11g	6	2437	AV	5.53	5.48	5.44	5.37	5.36	5.31	5.29	5.26		
	11	2462	РК	15.38	15.32	15.29	15.22	15.22	15.20	15.16	15.11		
		2462	AV	5.33	5.31	5.26	5.24	5.21	5.14	5.09	5.01		

					Test Result [dBm]							
Mode	Channel	Frequency [MHz]		etector DATA RATE [MCS]								
				0	1	2	3	4	5	6	7	
	1	2412	PK	15.78	15.77	15.76	15.74	15.74	15.68	15.66	15.66	
	I		AV	5.81	5.79	5.72	5.68	5.64	5.60	5.58	5.57	
802.11n	G	2427	PK	15.39	15.34	15.33	15.27	15.26	15.24	15.21	15.17	
(HT20)	6	2437	AV	5.45	5.43	5.39	5.31	5.25	5.23	5.17	5.09	
	11	2462	РК	15.16	15.12	15.11	15.06	15.06	15.04	14.96	14.88	
		2462	AV	5.25	5.19	5.12	5.05	5.03	4.97	4.97	4.95	



6.3 Maximum Power Spectral Density

Test requirements and limit, §15.247(e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST CONFIGURATION

Refer to the APPENDIX I.

Test Procedure

Method PKPSD of KDB558074 is used.

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to 1.5 times the DTS bandwidth.
- 3. Set the RBW to : **3 kHz** ≤ RBW ≤ **100 kHz**
- 4. Set the VBW \ge 3 x RBW
- 5. Detector = **Peak**
- 6. Sweep time = Auto couple
- 7. Trace mode = **Max hold.**
- 8. Allow trace to fully stabilize.

9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.

10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Mode	Data Rate	Frequency [MHz]	RBW [kHz]	PKPSD [dBm]
		2412	3	-14.72
802.11b	1 Mbps	2437	3	-14.97
		2462	3	-16.75
	6 Mbps	2412	3	-18.06
802.11g		2437	3	-18.36
		2462	3	-19.51
		2412	3	-17.98
802.11n (HT20)	MCS 0	2437	3	-18.42
(=0)		2462	3	-19.11

TEST RESULTS: Comply

Test Mode: 802.11b & 1 Mbps & 2412 MHz

RESULT PLOTS

Maximum PKPSD



Maximum PKPSD

Test Mode: 802.11b & 1 Mbps & 2437 MHz



Test Mode: 802.11b & 1 Mbps & 2462 MHz





Test Mode: 802.11g & 6 Mbps & 2412 MHz



Maximum PKPSD

Test Mode: 802.11g & 6 Mbps & 2437 MHz



Test Mode: 802.11g & 6 Mbps & 2462 MHz



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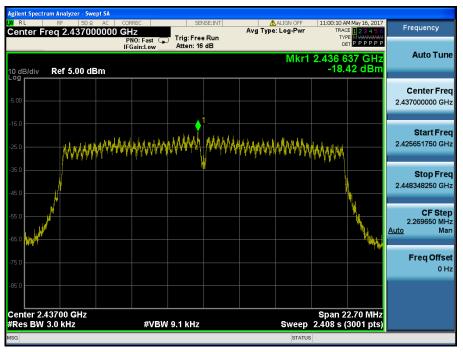
Maximum PKPSD

Test Mode: 802.11n(HT20) & MCS 0 & 2412 MHz

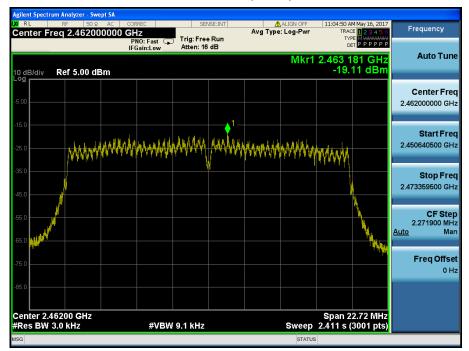


Maximum PKPSD

Test Mode: 802.11n(HT20) & MCS 0 & 2437 MHz



Test Mode: 802.11n(HT20) & MCS 0 & 2462 MHz





6.4 Out of Band Emissions at the Band Edge / Conducted Spurious Emissions

Test requirements and limit, §15.247(d)

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions :

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in §15.209(a) is not required.

TEST CONFIGURATION

Refer to the APPENDIX I.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 – Reference Level

- 1. Set instrument center frequency to DTS channel center frequency.
- 2. Set the span to \geq 1.5 times the DTS bandwidth.
- 3. Set the RBW = **100 kHz.**
- 4. Set the VBW \geq 3 x RBW.
- 5. Detector = Peak.
- 6. Sweep time = **Auto couple.**
- 7. Trace mode = **Max hold.**
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum PSD level.

- Measurement Procedure 2 - Unwanted Emissions

- 1. Set the center frequency and span to encompass frequency range to be measured.
- 2. Set the RBW = 100 kHz. (Actual 1 MHz , See below note)
- 3. Set the VBW \geq 3 x RBW. (Actual 3 MHz, See below note)
- 4. Detector = **Peak**.
- 5. Ensure that the number of measurement points \geq Span / RBW.
- 6. Sweep time = Auto couple.
- 7. Trace mode = **Max hold**.
- 8. Allow the trace to stabilize. (this may take some time, depending on the extent of the span)
- 9. Use the peak marker function to determine the maximum amplitude level.

Note: The conducted spurious emission was tested with below settings.

Frequency range: 9 kHz ~ 30 MHz

RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

Frequency range: 30 MHz ~ 10 GHz, 10 GHz ~25 GHz RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

Also the path loss for conducted measurement setup was used as described on the Appendix I of this test report.

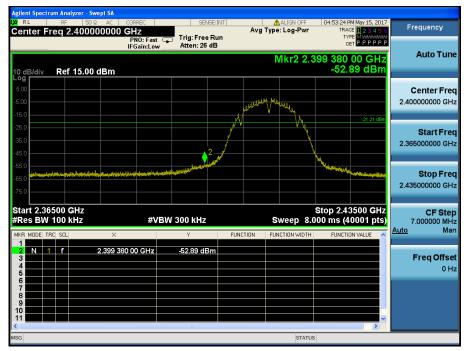
RESULT PLOTS

802.11b & 1 Mbps & 2412 MHz



Reference

Low Band-edge





Agilent Spectrum Analyzer - Swept SA					
₩ RL RF 50 Ω ALDC Center Freq 15.004500 MI	CORREC	SENSE:INT Avg	ALIGN OFF	04:53:42 PM May 15, 2017 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P	Frequency
10 dB/div Ref 15.00 dBm		: 26 dB		^{рет} РРРРР Mkr2 281.9 kHz -59.04 dBm	Auto Tune
5.00 -5.00 -15.0					Center Freq 15.004500 MHz
-25.0 -35.0 -45.0				-21.21 dBm	Start Freq 9.000 kHz
-55.0 2 -65.0	ะ) _{กล้อง} เหติ้มรูประกังประกัง (1994)	llengt filly with the second field of the fille	(เช่นเป็นนี้ กินทุ่มไปของ เช่นเป็นไปของ	histopholysender fan de felere op die de	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VBW 300 k	Hz	Sweep 5.3	Stop 30.00 MHz 333 ms (40001 pts)	CF Step 2.999100 MHz
2 N 1 f 3 4 4 5		FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Man Freq Offset 0 Hz
6					
MSG			STATUS	DC Coupled	
Agilent Spectrum Analyzer - Swept SA					

Agilent Spectrum Analyzer - Swept SA					
KL RF 50 Ω AC Center Freq 5.015000000	GHz		ALIGN OFF	04:54:01 PM May 15, 2017 TRACE 1 2 3 4 5 6	Frequency
		Free Run 1: 26 dB	Mkrt		Auto Tune
10 dB/div Ref 15.00 dBm				-45.65 dBm	
-5.00					Center Freq 5.015000000 GHz
-25.0 -35.0 -45.0	²			-21.21 dBm	Start Freq 30.000000 MHz
-55.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBW 3.0 M			Stop 10.000 GHz 67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
2 N 1 f 3.6 3 N 1 f 2.1 4 N 1 f 2.1 5 N 1 f 2.1 6	18 20 GHz -43.3 75 79 GHz -43.7 59 84 GHz -45.1	FUNCTION 5 dBm 4 dBm 3 dBm 5 dBm 5 dBm	FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
7 8 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10 1	п			~	
MSG			STATUS		



802.11b & 1 Mbps & 2437 MHz



Reference

Agilent Spectrum Analyzer - Swept SA LXI RL RF 50 Q 🛕 DC	CORREC SENSE:INT	🔥 ALIGN OFF	05:03:26 PM May 15, 2017	Frequency
Center Freq 15.004500 MH	PNO: Fast Frig: Free Run IFGain:Low Atten: 26 dB	Avg Type: Log-Pwr	TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
10 dB/div Ref 15.00 dBm			Mkr2 281.9 kHz -58.94 dBm	Auto Tune
-15.00				Center Freq 15.004500 MHz
-15.0 -25.0 -35.0 -45.0			-21.73 dBm	Start Freq 9.000 kHz
-56.0 -66.0 -75.0	₩₽₽₩₽₩₽₩₽₩₽₩₩₽₩₩₽₽₩₽₽₩₽₽₩₽₩₩₽₩₩₽₩₩₽₩₽₩₽₩	anyton Navan Ji Andahan Aga natura inany	anternation account destrictions are more than	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz MKR MODE TRC SCL X	#VBW 300 kHz	Sweep 5.	Stop 30.00 MHz 333 ms (40001 pts) FUNCTION VALUE	CF Step 2.999100 MHz <u>Auto</u> Man
2 N 1 F 3 4 5 6 7 7	281.9 kHz 58.94 dBm			Freq Offset 0 Hz
8 9 9 10 11 11			> C Coupled	



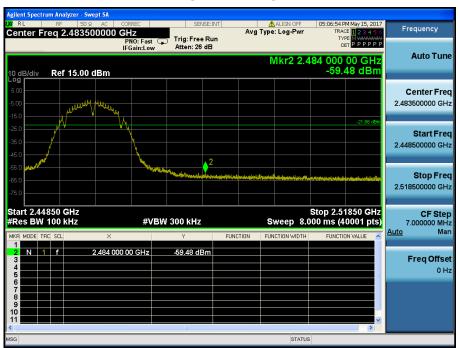
Agilent Spectrum Analyzer - Swept S					
RL RF 50 Ω A Center Freq 17.500000	000 GHz	Avg Typ		02 PM May 15, 2017 IRACE 123456 TYPE MIAMAMAAAA	Frequency
	PNO: Fast Trig: Fr IFGain:Low Atten: 2		Mkr3 23.194	DETPPPP	Auto Tune
10 dB/div Ref 15.00 dBr	n			9.98 dBm	
5.00 -5.00 -15.0					Center Freq 17.50000000 GHz
-25.0				-21.73 dBm	Start Freq 10.00000000 GHz
-55.0 -65.0 -75.0 -75.0					Stop Freq 25.00000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MH		weep 40.00 ms		CF Step 1.50000000 GHz Auto Man
1 N 1 f 24 2 N 1 f 22 3 N 1 f 23 4 5 5	× Y 1.636 250 GHz -38.38 (2.246 375 GHz -39.60 (3.194 000 GHz -39.98 (dBm dBm	NCTION WIDTH FUN	CTION VALUE	Freq Offset 0 Hz
6 7 8 9 10 11				×	
MSG			STATUS		

802.11b & 1 Mbps & 2462 MHz



Reference

High Band-edge





	um Analyzer - S									
Center Fi	RF 50 req 15.004		CORREC Z PNO: Fast				ALIGN OFF	TRAC	M May 15, 2017 26 1 2 3 4 5 6 26 M WWWWWWW 27 P P P P P P	Frequency
10 dB/div	Ref 15.00) dBm	IFGain:Low	Atten: 26			ľ	/kr2 32	3.9 kHz 01 dBm	Auto Tune
5.00 -5.00 -15.0										Center Freq 15.004500 MHz
-25.0 -35.0 -45.0									-21.86 dBm	Start Freq 9.000 kHz
-55.0	nya dan dan mana ya kana kana kana kana kana kana kan	n ja kala sere kasi ja	utafalaja, esitélat se	and a factor from the second	ېر د کې د	inter professifiel	in alarikan sanga k	elytup: Jalahan Kathan	ad an air an an air	Stop Freq 30.000000 MHz
Start 9 kH #Res BW			#VB	W 300 kHz		S	weep 5.3	Stop 3 33 ms (4	0.00 MHz 0001 pts)	CF Step 2.999100 MHz
MKR MODE TR 1 N 1 2 N 1 3 4 5 5	f		23.9 kHz 23.9 kHz	-59.01 dB -59.01 dB	FUNCTIO m m	N FUN	ICTION WIDTH	FUNCTIO	ON VALUE	<u>Auto</u> Man Freq Offset 0 Hz
6 7 8 9 10 11				ш					~	
MSG							STATUS	L DC Cou	pled	
Agilent Spectr	um Analyzer - S	wept SA	CORREC	SEN	BEINT		ALIGN OFF	05:07:30 P	M May 15, 2017	

Agilent Spectr	rum Analyze	er - Swept SA							
LXI RL	RF	50 Ω AC	CORREC	SENSE		ALIGN OFF	05:07:30 PM Ma		Frequency
Center F	req 5.0	15000000		Trig: Free R		g Type: Log-Pwr		23456	riequency
			PNO: Fast G	Atten: 26 di			DET P	PPPPP	
			IFGam.cow	raterii 20 wi					Auto Tune
						MK	r5 1.229 64	GHz	ruto runo
10 dB/div	Ref 1:	5.00 dBm					-48.08	dBm	
Log		^	1						
5.00		$ \rightarrow $							Center Freq
-5.00									5.015000000 GHz
-15.0								21.86 dBm	
-25.0									Start Freq
-35.0			^2						
	5		- I - Y						30.000000 MHz
-45.0		Á.	at a d a catalana		and block differences and	a la facial de la constante		1.11	
-55.0 www.end	and the second se	and the second se	teres and the second						
-65.0									Stop Freq
									10.00000000 GHz
-75.0									
							Ot 10.00		
Start 30 M		_					Stop 10.00		CF Step
#Res BW	1.U MH	z	#VBV	V 3.0 MHz		Sweep 1	8.67 ms (4000	n pts)	997.000000 MHz
MKR MODE T	RC SCL	×		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VA	LUE 🔼	<u>Auto</u> Man
1 N 1	1 f	2.4	62 18 GHz	1.26 dBm					
2 N	f	3.6	92 98 GHz	-41.77 dBm					Freq Offset
3 N 1	f	2.1	60 34 GHz 22 65 GHz	-43.07 dBm -44.61 dBm					
5 N 1	f	1.2	29 64 GHz	-48.08 dBm				-	0 Hz
6									
7 8	\rightarrow								
9									
10									
11								~	
<				10				>	
MSG						STATL	JS		



802.11g & 6 Mbps & 2412 MHz



Reference

Low Band-edge





Agilent Spectru										
Center Fr			CORREC Z		SE:INT		ALIGN OFF	TRA	M May 15, 2017 CE 123456	Frequency
			PNO: Fast G	Trig: Free Atten: 26				TY D	PE MWWWWW ET P P P P P P	
								Mkr2 28	1.9 kHz	Auto Tune
10 dB/div	Ref 15.00	dBm						-58.	77 dBm	
Log 5.00										Center Freq
-5.00										15.004500 MHz
-15.0										
-25.0									-24.39 dBm	Start Freq
-35.0										9.000 kHz
-45.0										
-55.0 🔶 🚄 🛁										Stop Freq
-65.0	en had entrie the of	elegelet.L.Lyters/incom	diament and the state	ala fol air ann ann a	utine in the second state	a the second		and the state of	and the second secon	30.000000 MHz
-75.0										
Start 9 kH									0.00 MHz	CF Step
#Res BW ′	100 kHz		#VB\	W 300 kHz			Sweep 5.3	333 ms (4	0001 pts)	2.999100 MHz
MKR MODE TRO		×	81.9 kHz	Y -58.77 dB		ICTION FL	INCTION WIDTH	FUNCTI	ON VALUE	<u>Auto</u> Man
2 N 1 3	f		81.9 kHz	-58.77 dB	im					Freq Offset
4										0 Hz
5									=	
7 8										
9										
11				III					~	
MSG							STATUS	DC Co	upled	
Agilent Spectru	m Analyzer - Si	went SA								
LXI RL	RF 50	Ω AC C	CORREC	SEN	SE:INT		ALIGN OFF		M May 15, 2017	Frequency
Center Fr	eq 5.0150	00000 G	GHz	Tuinu Ene e	D	Avg Typ	e: Log-Pwr	TRA/	CE 123456	riequency

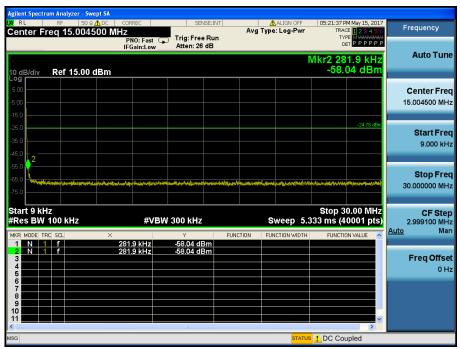
Agilent Spectrum Analyzer - S					
lxi RL RF 50		SENSE:INT	ALIGN OFF	05:16:12 PM May 15, 2017	Frequency
Center Freq 5.0150	000000 GHz	Trig: Free Run	Avg Type: Log-Pwr	TRACE 123456	ricqueriey
	PNO: Fast IFGain:Low	Atten: 26 dB		TYPE MWWWWWW DET P P P P P P	
	II Gain.cow				Auto Tune
			MKR	5 2.654 60 GHz	
10 dB/div Ref 15.00	0 dBm			-48.82 dBm	
Log	<u>∆1</u>				
5.00					Center Freq
-5.00					5.015000000 GHz
-15.0					
				-24.39 dBm	
-25.0					Start Freq
-35.0		2			30.000000 MHz
-45.0					00.000000 Mil 12
	and the second	ويستعيرون بيسيقين المراجع	و بينامندو بينوم و بيرويوم متعصير منتقو	and	
-55.0					Oton Eron
-65.0					Stop Freq
-75.0					10.00000000 GHz
13.0					
Start 30 MHz				Stop 10.000 GHz	05 04.0
#Res BW 1.0 MHz	#VE	3W 3.0 MHz	Sween 18	.67 ms (40001 pts)	CF Step 997.000000 MHz
	<i></i>				Auto Man
MKR MODE TRC SCL	X		FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Auto
1 N 1 f	2.411 09 GHz 3.618 20 GHz	3.64 dBm -43.17 dBm			
2 N 1 F	2.170 31 GHz	-46.69 dBm			Freq Offset
4 N 1 f	3.180 02 GHz	-48.29 dBm			0 Hz
5 N 1 f	2.654 60 GHz	-48.82 dBm		3	0 112
6					
8					
9					
10					
11				~	
MSG			STATUS		



802.11g & 6 Mbps & 2437 MHz



Reference





Agilent Spe															
Center		RF 17.5	50 Q	AC COF	RREC			E:INT	Avg		ALIGN OFF : Log-Pwr	TRA	PM May 15, 201 CE <mark>1 2 3 4 5</mark>		Frequency
					NO: Fast Gain:Low		g:Freel en:26 d					TY D		ř	
											Mkr3 2		00 GHz		Auto Tune
10 dB/div Log	R	ef 15	.00 d	Bm								-40.	32 dBm		
5.00															Center Freq
-5.00															17.50000000 GHz
-15.0															
-25.0													-24.78 dBm		Start Freq
-35.0											\rightarrow	² • 3			10.000000000 GHz
-45.0		ld a - Altered		And the Party of the	- and a second second	Contraction of the local division of the loc							- North Contraction	1	
-55.0															Stop Freq
-65.0															25.000000000 GHz
-75.0															
Start 10			I		1		I					Stop 25	.000 GHz		CF Step
#Res B	W 1.0) MHz			#VI	3W 3.0	MHz								1.500000000 GHz Auto Man
MKR MODE	TRC 9	CL F		× 24.655 37	5 CH7	۲ ۲۵۰-	10 dBr		INCTION	FUN	CTION WIDTH	FUNCTI	DN VALUE	-	<u>tuto</u> iniari
2 N 3 N	1	f		21.802 37 22.367 50	5 GHz	-40	.29 dBr .32 dBr	n							Freq Offset
4				22.367 50	UGHZ	-40.	.32 aBr	n							0 Hz
5															
7 8	\vdash														
9															
11													~		
MSG	SG STATUS														
MSG			_				_				STATUS				

802.11g & 6 Mbps & 2462 MHz



Reference

High Band-edge





	ım Analyzer - Sw										
Center Fr	RF 50 S	2 🚹 DC CORR 500 MHz	EC	SENSE			ALIGN OFF	TRAC	M May 15, 2017 E 1 2 3 4 5 6	Freque	ncy
10 dB/div	Ref 15.00	IFG	0:Fast G ain:Low	Trig: Free R Atten: 26 dE				DI Mkr2 29	а.9 kHz 64 dBm	Aut	o Tune
-15.00											e r Freq 500 MHz
-25.0 -35.0 -45.0									-25.43 dBm		rt Freq 000 kHz
-55.0	helertettettette	ى اوراد دار الاينيد بارد ارد معمول ان	يواي المياويية و ير <mark>ا</mark> وو	nddjaarra taytaatiiti arraf	ing tal article pil Atta Aspe	la fan gewinder	ninspecie (Internet and	line op station front of the	unn de de la casa de la		p Freq 000 MHz
Start 9 kH #Res BW			#VB\	N 300 kHz		s	weep 5.3	Stop 3 333 ms (4	0.00 MHz 0001 pts)		F Step
MKR MODE TR	C SCL	× 293.0) kHz	۲ -58.64 dBm	FUNCTIO	DN FUN	ICTION WIDTH	FUNCTIO	IN VALUE	<u>Auto</u>	Man
2 N 1 3 4 5 5	f		kHz	-58.64 dBm						Freq	Offset 0 Hz
6 7 8 9 10											
11				Ш					>		
MSG							STATUS	L DC Cou	ıpled		

Agilent Spectrum Analyzer - Sw					
Center Freq 5.0150	PNO: Fast 🗔	SENSE:INT	Avg Type: Log-Pwr	05:26:18 PM May 15, 2017 TRACE 1 2 3 4 5 6 TYPE M MMMMMM DET P P P P P P	Frequency
10 dB/div Ref 15.00	IFGain:Low	Atten: 26 dB	Mkr	5 1.231 39 GHz -48.44 dBm	Auto Tune
5.00 -5.00 -15.0					Center Freq 5.015000000 GHz
-25.0 -35.0 -45.0		مغتمدا ليتغمر بالمحمد ال	i i i i i i i i i i i i i i i i i i i	-25.43 dBm	Start Freq 30.000000 MHz
-55.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz MKR MODE TRC SCL	#VBW	/ 3.0 MHz Y FUI 2.58 dBm	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts) FUNCTION VALUE	CF Step 997.000000 MHz <u>Auto</u> Man
2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6 N 1 f 7	2.460 89 GHz 3.692 98 GHz 2.160 34 GHz 2.222 65 GHz 1.231 39 GHz	-42.13 dBm -45.29 dBm -46.08 dBm -48.44 dBm			Freq Offset 0 Hz
8 9 10 11 K		Ш	STATUS	×	



802.11n(HT20) & MCS 0 & 2412 MHz



Reference

Low Band-edge





Agilent Spectrum Analyzer - Swept SA						
Center Freq 15.004500 M	CORREC	SENSE:INT	Avg T	ALIGN OFF	10:52:57 AM May 16, 2017 TRACE 2 3 4 5 6 TYPE M WWWWWW	Frequency
10 dB/div Ref 15.00 dBm	IFGain:Low	Atten: 26 dB		ſ	/kr2 281.9 kHz -58.88 dBm	Auto Tune
-5.00 -5.00 -15.0						Center Freq 15.004500 MHz
-25.0					-24.24 dBm	Start Freq 9.000 kHz
-55.0	ntrané falousiere atomiche	olif fastligt attende of sky standard	nen anderen andere a	Naga Maring Salar Sa	spransynafiliter franklige falliger stransfer faller.	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VBW	300 kHz		Sweep 5.3	Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MHz
MKR MODE TRC SCL X		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
	281.9 kHz 281.9 kHz	-58.88 dBm -58.88 dBm				Freq Offset 0 Hz
6 7 8 9 10						
11		ш			×	
MSG				STATUS	L DC Coupled	
Agilent Spectrum Analyzer - Swept SA	CORREC	SENSE:INT		🔥 ALIGN OFF	10:53:16 AM May 16, 2017	Frequency

Agilent Spectrum Analyzer - Swept SA				
Center Freq 5.015000000	CORREC SENSE:INT	ALIGN OFF	10:53:16 AM May 16, 2017 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast Trig: Free Run IFGain:Low Atten: 26 dB		TYPE M MAAMAAA DET PPPPP	Auto Tune
10 dB/div Ref 15.00 dBm		WIKP	5 3.573 84 GHz -48.83 dBm	
Log 5.00 ↓ 1 -5.00 ↓ 1 -15.0				Center Freq 5.015000000 GHz
-25.0 -35.0 -45.0	5		-24.24 dBm	Start Freq 30.000000 MHz
-55.0 -65.0 -75.0				Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
2 N 1 f 2.42 3 N 1 f 3.61 4 N 1 f 2.17	Y 383 GHz 2.70 dBm 25 29 GHz -36.89 dBm 17 95 GHz -43.34 dBm 73 55 GHz -45.65 dBm 73 84 GHz -48.83 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
MSG		STATUS		

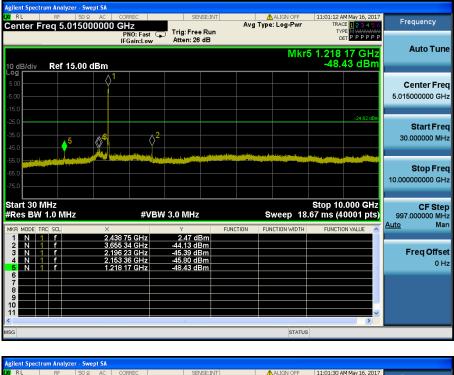


802.11n(HT20) & MCS 0 & 2437 MHz



Reference

RL RF 50.0 ▲DC enter Freq 15.004500 MH	CORREC	SENSE:INT	Avg T	ALIGN OFF	11:00:53 AM May 16, 2 TRACE 1 2 3 4 TYPE M MANAGE	5.6 Frequency
) dB/div Ref 15.00 dBm	IFGain:Low	Atten: 26 dB		N	^{Det} PPPP /kr2 281.9 kł -59.52 dB	Auto Tun
50						Center Fre 15.004500 M⊦
5.0 5.0 5.0 2					-24.62	Start Fre 9.000 kH
5.0 5.0 5.0	çanı, eşimeni oler, etiyalış bel	filling by a colour invited at a consolity bi	falmlår værdesteler	yyusbilatumuyanytiny	بالروما ول دوالاردة الركام (دار مرب مال الله الر	Stop Fre 30.000000 Mi
tart 9 kHz Res BW 100 kHz KR MODE TRC SCL X		300 kHz	FUNCTION	Sweep 5.3	Stop 30.00 MI 33 ms (40001 p FUNCTION VALUE	
	281.9 kHz 281.9 kHz	-59.52 dBm -59.52 dBm				Freq Offs 0 H



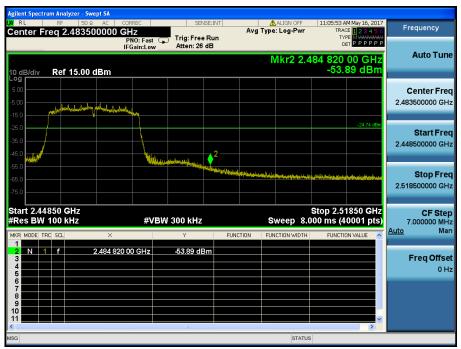
Agilent Spect										
LXI RL			CORREC	SENSI			ALIGN OFF		M May 16, 2017	Frequency
Center F	req 17.5	00000000) GHz	Trig: Free F		Avg Type	e: Log-Pwr	TRA	CE 123456	riequency
			PNO: Fast C	Atten: 26 d					PE MWWWWWW ET P P P P P P	
			IFGalli.Low		5		_			Auto Tune
							Mkr3 2			
10 dB/div	Ref 15.0	00 dBm						-40.	53 dBm	
Log										
5.00										Center Freq
-5.00										17.50000000 GHz
-15.0										
									-24.62 dBm	
-25.0									-24.02 dbm	Start Freq
-35.0								\$ ²	3¢_	10.000000000 GHz
15.0							and a state of the second state	Landard Landard	Part I and a state	10.0000000 GHZ
-45.0	فالعميدان والمراجع	The subscription of the su				-				
-55.0		Andreas of the Party of Control of								
-65.0										Stop Freq
										25.00000000 GHz
-75.0										
Start 10.0								Ofen 05		
				W 3.0 MHz		~			.000 GHz	CF Step
#Res BW	1.0 MHZ		#VD	W 3.0 WHZ		3	weep 40	.00 MS (4	0001 pts)	1.50000000 GHz
MKR MODE T	RC SCL	×		Y	FUNCTIO	N FUN	ICTION WIDTH	FUNCTI	ON VALUE 🛛 🔼	<u>Auto</u> Man
1 N ′	1 f		750 GHz	-38.63 dBr	n					
2 N *	1 f	21.960	250 GHz 875 GHz	-40.13 dBr -40.53 dBr	n					Freq Offset
4		23.192	8/5 GHZ	-40.53 dBr	1					
5									=	0 Hz
6										
7 8					_					
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10										
11									~	
<				Ш					>	
MSG							STATUS	6		
						_				

802.11n(HT20) & MCS 0 & 2462 MHz



Reference

High Band-edge





Agilent Spectrum Analyzer - Swept SA							
Center Freq 15.004500		SENSE:INT		ALIGN OFF	TRAC	4 May 16, 2017 E 1 2 3 4 5 6 E M WWWWWW T P P P P P P	Frequency
10 dB/div Ref 15.00 dBm	IFGain:Low	Atten: 26 dB		Γ	Mkr2 28		Auto Tune
Log 5.00 -5.00 -15.00							Center Freq 15.004500 MHz
-25.0 -35.0 -45.0						-24.74 dBm	Start Freq 9.000 kHz
-55.0 -75.0	algot office of the second	hanabaga 1940 and fal adams to restore	terretterel angled and the second part	and possible water of	Arthy Constant Arth Backy and	udi,serieta,aardy,	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VBW	/ 300 kHz	s	weep 5.3).00 MHz)001 pts)	CF Step 2.999100 MHz
MKR MODE TRC SCL X	282.7 kHz	-59.07 dBm	FUNCTION FU	NCTION WIDTH	FUNCTIO	N VALUE	<u>Auto</u> Man
2 N 1 F 3 4 5 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	282.7 kHz	-59.07 dBm					Freq Offset 0 Hz
6 7 8 9							
10 11		ш				~	
MSG				STATUS	L DC Cou	pled	
Agilent Spectrum Analyzer - Swept SA							

Agilent Spectrum Analyzer - Swept SA					
KL RF 50 Ω AC Center Freq 5.015000000	CORREC GHz	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	11:06:29 AM May 16, 2017 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 😱 IFGain:Low	Trig: Free Run Atten: 26 dB			Auto Tune
10 dB/div Ref 15.00 dBm			Mkı	5 2.954 45 GHz -49.06 dBm	Auto Tune
5.00 15.00 15.00					Center Freq 5.015000000 GHz
-25.0 -36.0 -45.0	5,4 ²	الملطقة بدر السار	مر بر محمد من ماد ماد مر محمد به ماد المربع مر محمد به	-24.74 dBm	Start Freq 30.000000 MHz
-56.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBW	3.0 MHz	· · · ·	Stop 10.000 GHz 3.67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
2 N 1 f 3.65 3 N 1 f 2.10 4 N 1 f 3.10	60 19 GHz 93 48 GHz 50 34 GHz 51 08 GHz 54 45 GHz	2.22 dBm -42.52 dBm -44.75 dBm -48.49 dBm -49.06 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
MSG			STATU	S	



6.5 Radiated Spurious Emissions

Test Requirements and limit,

§15.247(d), §15.205, §15.209

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

• FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 - 0.490	2400/F (KHz)	300
0.490 – 1.705	24000/F (KHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

• FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240	3600 ~ 4400		
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

• FCC Part 15.205(b): The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.



TEST CONFIGURATION

Refer to the APPENDIX I.

TEST PROCEDURE

1. The EUT is placed on a non-conductive table, emission measurements at below 1 GHz, the table height is 80 cm and above 1 GHz, the table height is 1.5 m.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until the measurements for all frequencies are complete.

Measurement Instrument Setting for Radiated Emission Measurements.

The radiated emission was tested according to the section 6.3, 6.4, 6.5 and 6.6 of the ANSI C63.10-2013 with following settings.

Peak Measurement:

RBW = As specified in below table , VBW ≥ 3 x RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9 - 150 kHz	200 - 300 Hz
0.15 - 30 MHz	9 - 10 kHz
30 - 1000 MHz	100 - 120 kHz
> 1000 MHz	1 MHz

Average Measurement:

- 1. RBW = 1 MHz (unless otherwise specified).
- 2. VBW ≥ 3 x RBW.
- 3. Detector = RMS (Number of points \ge 2 x Span / RBW)
- 4. Averaging type = power. (i.e., RMS)
- 5. Sweep time = auto.
- 6. Perform a trace average of at least 100 traces.
- 7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
- 1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
- 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
- If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Duty Cycle Corrections (Refer to appendix II for duty cycle measurement procedure and plots)

Band	Duty Cycle (%)	T _{on} (ms)	T _{on} + T _{off} (ms)	DCF = 10log(1 / Duty) (dB)
802.11b	99.57	8.415	8.451	-
802.11g	97.01	1.394	1.437	0.13
802.11n(HT20)	96.96	1.307	1.348	0.13
-	-	-	-	-

9 kHz~ 25 GHz Data (802.11b & 1 Mbps)

• 2412 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2319.93	Н	Х	PK	47.62	0.78	N/A	N/A	48.40	74.00	25.60
2319.20	Н	Х	AV	36.61	0.78	N/A	N/A	37.39	54.00	16.61
4822.11	Н	Х	PK	43.89	7.60	N/A	N/A	51.49	74.00	22.51
4822.00	Н	Х	AV	33.61	7.60	N/A	N/A	41.21	54.00	12.79

• 2437 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4875.43	Н	Х	PK	44.91	7.54	N/A	N/A	52.45	74.00	21.55
4875.60	Н	Х	AV	33.53	7.54	N/A	N/A	41.07	54.00	12.93

• 2462 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2484.58	Н	Х	PK	47.47	1.16	N/A	N/A	48.63	74.00	25.37
2484.17	Н	Х	AV	36.54	1.16	N/A	N/A	37.70	54.00	16.30
4924.67	Н	Х	PK	45.43	7.40	N/A	N/A	52.83	74.00	21.17
4924.52	Н	Х	AV	33.59	7.40	N/A	N/A	40.99	54.00	13.01

Note.

1. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz. So Distance Correction Factor : - 9.54 dB = 20*log(1 m / 3 m)

2. No other spurious and harmonic emissions were found greater than listed emissions on above table.

3. The band edge test has performed between 2310-2390 MHz and 2483.5-2500 MHz. The worst results were reported in the table.

4. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF + Distance Factor / T.F = AF + CL – AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCF = Duty Cycle Correction Factor.

9 kHz~ 25 GHz Data (802.11g & 6 Mbps)

• 2412 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.66	V	Z	PK	49.45	0.78	N/A	N/A	50.23	74.00	23.77
2389.58	V	Z	AV	38.75	0.78	0.13	N/A	39.66	54.00	14.34
4822.16	V	Z	PK	44.07	7.60	N/A	N/A	51.67	74.00	22.33
4822.22	V	Z	AV	33.58	7.60	0.13	N/A	41.31	54.00	12.69

• 2437 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4875.70	V	Z	PK	44.53	7.54	N/A	N/A	52.07	74.00	21.93
4875.25	V	Z	AV	33.47	7.54	0.13	N/A	41.14	54.00	12.86

• 2462 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2484.25	V	Z	PK	48.34	1.16	N/A	N/A	49.50	74.00	24.50
2483.53	V	Z	AV	38.16	1.16	0.13	N/A	39.45	54.00	14.55
4923.76	V	Z	PK	44.76	7.40	N/A	N/A	52.16	74.00	21.84
4924.24	V	Z	AV	34.11	7.40	0.13	N/A	41.64	54.00	12.36

Note.

1. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz. So Distance Correction Factor : - 9.54 dB = 20*log(1 m / 3 m)

2. No other spurious and harmonic emissions were found greater than listed emissions on above table.

3. The band edge test has performed between 2310-2390 MHz and 2483.5-2500 MHz. The worst results were reported in the table.

4. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF + Distance Factor / T.F = AF + CL – AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCF = Duty Cycle Correction Factor.



9 kHz~ 25 GHz Data (802.11n HT20 & MCS 0)

• 2412 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2388.97	V	Z	PK	54.38	0.78	N/A	N/A	55.16	74.00	18.84
2389.73	V	Z	AV	41.69	0.78	0.13	N/A	42.60	54.00	11.40
4824.62	V	Z	PK	43.98	7.60	N/A	N/A	51.58	74.00	22.42
4823.70	V	Z	AV	33.60	7.60	0.13	N/A	41.33	54.00	12.67

• 2437 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.18	V	Z	PK	44.90	7.54	N/A	N/A	52.44	74.00	21.56
4874.57	V	Z	AV	33.59	7.54	0.13	N/A	41.26	54.00	12.74

• 2462 MHz

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.73	V	Z	PK	50.30	1.16	N/A	N/A	51.46	74.00	22.54
2483.53	V	Z	AV	39.51	1.16	0.13	N/A	40.80	54.00	13.20
4924.26	V	Z	PK	44.49	7.40	N/A	N/A	51.89	74.00	22.11
4924.89	V	Z	AV	33.96	7.40	0.13	N/A	41.49	54.00	12.51

Note.

1. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz. So Distance Correction Factor : - 9.54 dB = 20*log(1 m / 3 m)

2. No other spurious and harmonic emissions were found greater than listed emissions on above table.

3. The band edge test has performed between 2310-2390 MHz and 2483.5-2500 MHz. The worst results were reported in the table.

4. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCF + Distance Factor / T.F = AF + CL – AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCF = Duty Cycle Correction Factor.



6.6 Power-line conducted emissions

Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range	Conducted	Limit (dBuV)
(MHz)	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

TEST CONFIGURATION

NA

TEST PROCEDURE

- 1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
- 2. The EUT is connected via LISN to the test power supply.
- 3. The measurement results are obtained as described below:
- 4. Detectors Quasi Peak and Average Detector.

Test Results:

NA

Test Requirements, RSS-Gen [6.6]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

TEST CONFIGURATION

Refer to the APPENDIX I.

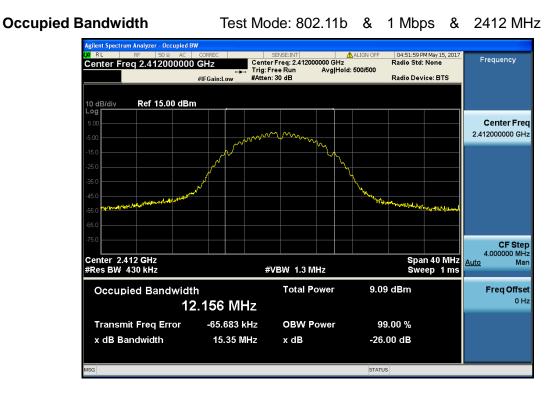
TEST PROCEDURE

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

TEST RESULTS: Comply

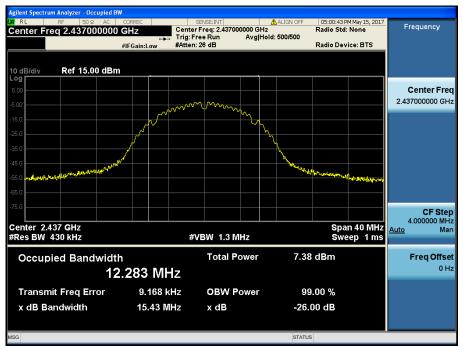
Test Mode	Data Rate	Frequency [MHz]	Test Results [MHz]
		2412	12.156
802.11b	1 Mbps	2437	12.283
		2462	12.240
		2412	16.576
802.11g	6 Mbps	2437	16.594
		2462	16.562
		2412	17.524
802.11n (HT20)	MCS 0	2437	17.572
(,		2462	17.572

RESULT PLOTS

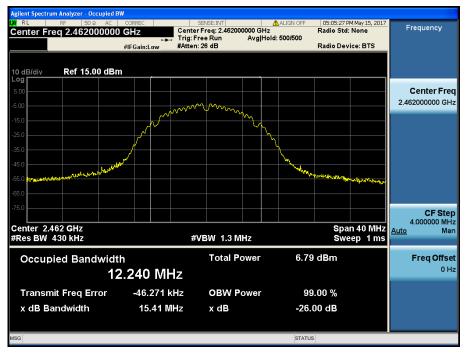


Occupied Bandwidth

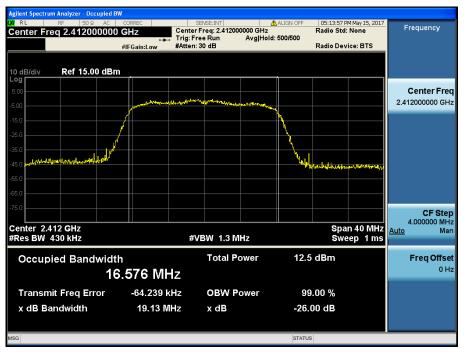
Test Mode: 802.11b & 1 Mbps & 2437 MHz



Test Mode: 802.11b & 1 Mbps & 2462 MHz

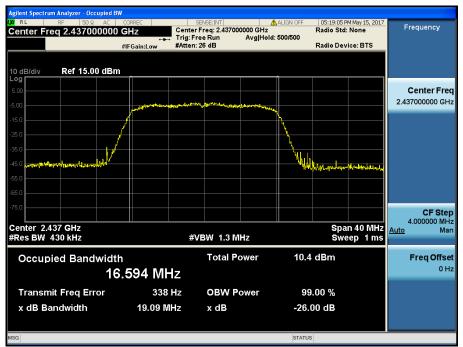


Test Mode: 802.11g & 6 Mbps & 2412 MHz

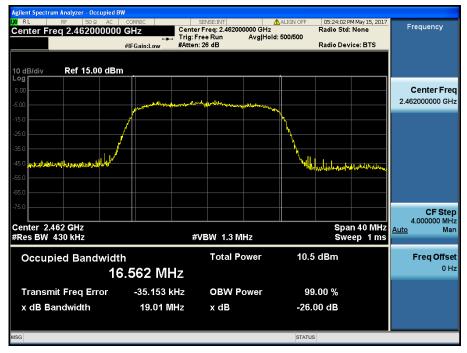


Occupied Bandwidth

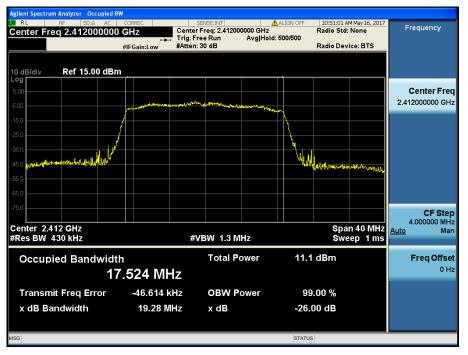
Test Mode: 802.11g & 6 Mbps & 2437 MHz



Test Mode: 802.11g & 6 Mbps & 2462 MHz

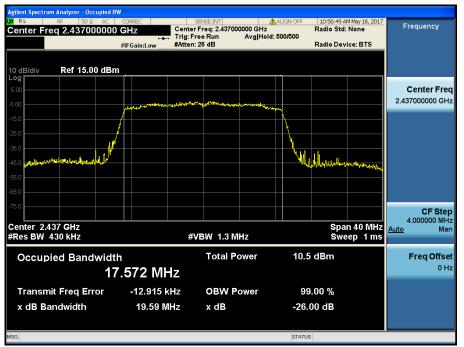


Test Mode: 802.11n(HT20) & MCS 0 & 2412 MHz

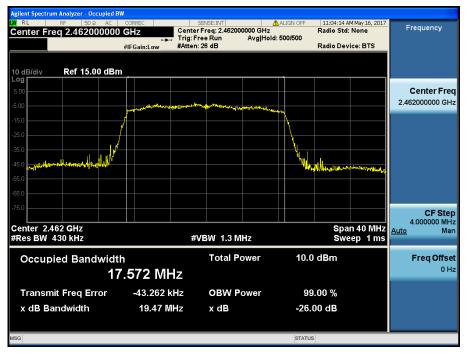


Occupied Bandwidth

Test Mode: 802.11n(HT20) & MCS 0 & 2437 MHz



Test Mode: 802.11n(HT20) & MCS 0 & 2462 MHz



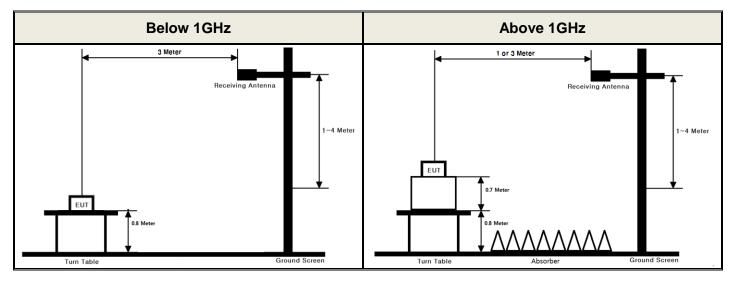
7. LIST OF TEST EQUIPMENT

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	16/09/09	17/09/09	MY50200834
Digital Multimeter	Agilent Technologies	34401A	17/01/04	18/01/04	US36099541
DC Power Supply	SM techno	SDP30-5D	17/01/05	18/01/05	305DLJ204
Signal Generator	Rohde Schwarz	SMBV100A	17/01/04	18/01/04	255571
Signal Generator	Rohde Schwarz	SMF100A 16/06/23		17/06/23	102341
Thermohygrometer	BODYCOM	BJ5478	17/04/11	18/04/11	120612-2
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
Bilog Antenna	SCHAFFNER	CBL6112B	16/05/23	18/05/23	2737
Horn Antenna	ETS-LINDGREN	3117	16/05/03	18/05/03	00140394
Horn Antenna	A.H.Systems Inc.	SAS-574	15/09/03	17/09/03	155
PreAmplifier	Agilent	8449B	17/01/11	18/01/11	3008A00370
PreAmplifier	tsj	MLA-010K01-B01- 27	17/03/06	18/03/06	1844539
EMI TEST RECEIVER	Rohde Schwarz	ESU	16/07/18	17/07/18	100469
Highpass Filter	Wainwright Instruments	WHKX12-2580- 3000-18000-80SS	16/09/09	17/09/09	3
Highpass Filter	Wainwright Instruments	WHNX6-6320- 8000-26500-40CC	16/09/13	17/09/13	1
Attenuator	SMAJK	SMAJK-50-10	16/09/08	17/09/08	15081902
Power Meter & Wide Bandwidth		ML2495A	16/10/19	17/10/19	1338003
Sensor	Anritsu	MA2490A	16/10/19	17/10/19	1249304

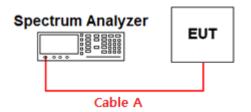
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.19	15	3.50
1	0.80	20	4.86
2.412 & 2.437 & 2.462	1.30	25	5.35
5	1.82	-	-
10	2.70	-	-

Note 1: The path loss from EUT to Spectrum analyzer was measured and used for test. Path loss (S/A's correction factor) = Cable A (Attenuator, Applied only when it was used externally)



APPENDIX II

Duty cycle plots

TEST PROCEDURE

Duty Cycle measured using section 6.0 b) of KDB558074

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

Set the center frequency of the instrument to the center frequency of the transmission. Set RBW \geq OBW if possible; otherwise, set RBW to the largest available value. Set VBW \geq RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T \leq 16.7 microseconds.)

Test Mode: 802.11b & 1Mbps & 2437 MHz

Test Plots :

Swept SA Frequency Avg Type: Log-Pw Trig: Free Ru Atten: 40 dB PNO: Fast IFGain:Low Auto Tune ∆Mkr3 8.451 0.16 Ref 30.00 dBm **Center Freq** 3∆4 2.437000000 GHz X Start Freq 2.437000000 GHz Stop Freq 2.437000000 GHz ter 2.437000000 GHz CF Step Span 0 Hz #VBW 50 MHz Sweep 30.00 ms (10001 pts) Res BW 8 MHz 8.000000 Man Auto 8 68 Freq Offset 0.16 dE 8.68 dBm íΔì 0 Hz

Duty Cycle



Test Mode: 802.11g & 6Mbps & 2437 MHz

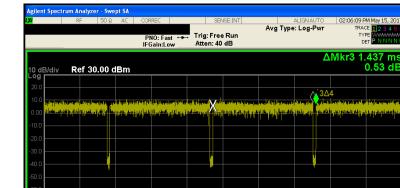
TYPE DE1

Frequency

Auto Tune

Center Freq 2.437000000 GHz

Start Freq



1 t

Duty Cycle

Duty Cycle

2.437000000 GHz Stop Freq 2.437000000 GHz Center 2.437000000 GHz Res BW 8 MHz Span 0 Hz Sweep 5.000 ms (10001 pts) CF Step 8.000000 MHz Man #VBW 50 MHz Auto (Δ) 5.59 dBm 0.53 dB 5.59 dBm Freq Offset s (Δ) 0 Hz STATUS

Test Mode: 802.11n(HT20) & MCS 0 & 2437 MHz

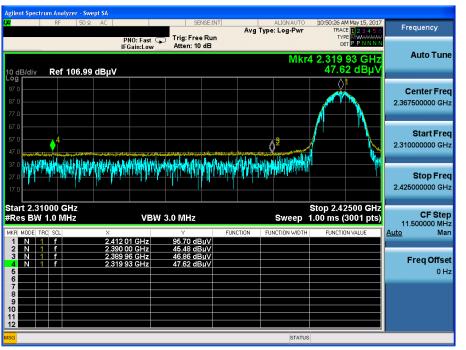
43 AM May 16, 2017 ALIGN OFF Frequency TRACE 1 2 3 4 5 6 TYPE WWWWWWW DET P P P P P P PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 40 dB Auto Tune ΔMkr3 1.348 m -0.04 dI Ref 30.00 dBm **Center Freq** 2.437000000 GHz يتر أناحاك ile **hailechar**tille Start Freq 2.437000000 GHz Stop Freq 2.437000000 GHz Center 2.437000000 GHz Res BW 8 MHz Span 0 Hz Sweep 5.000 ms (10001 pts) CF Step 8.000000 MHz Man #VBW 50 MHz <u>Auto</u> t (Δ) F Δ4 t (Δ) Freq Offset (Δ) -0.04 dl 7.53 dBr 0 Hz STATUS

Detector Mode : PK

APPENDIX III

Unwanted Emissions (Radiated) Test Plot

802.11b & Lowest & X & Hor



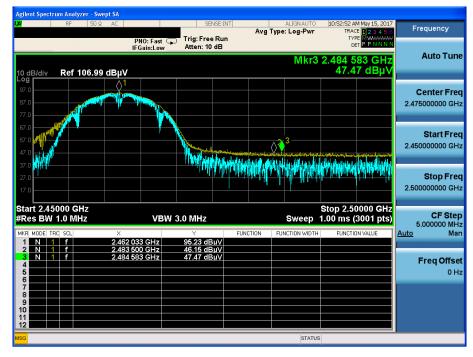
802.11b & Lowest & X & Hor

ctrum Analyzer Avg Type: Pwr(RMS) Avg|Hold: 200/200 Frequency Trig: Free Rur Atten: 10 dB A Wee PNO: Fast IFGain:Low Auto Tune Mkr4 2.319 20 GH 36.613 dBµ Ref 106.99 dBµV Center Freq 2.367500000 GHz Start Freq 2.31000000 GHz iteriter het in der sterne Stop Freq 2.425000000 GHz Start 2.31000 GHz #Res BW 1.0 MHz Stop 2.42500 GHz CF Step 11.500000 MHz VBW 3.0 MHz* Sweep 1.00 ms (3001 pts) FUNCTION Auto Mar 36.590 dBµ\ 36.574 dBµ\ 36.613 dBµ\ Freq Offset 2.319 20 GH 0 Hz STATUS

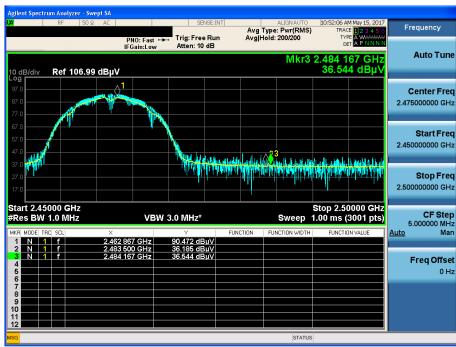


802.11b & Highest & X & Hor



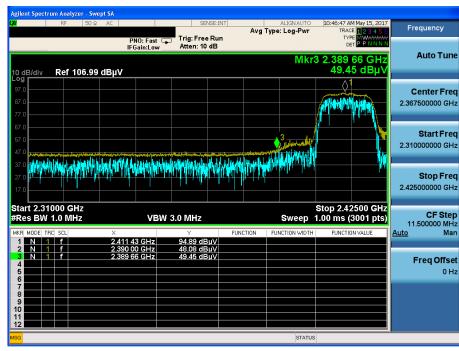


802.11b & Highest & X & Hor

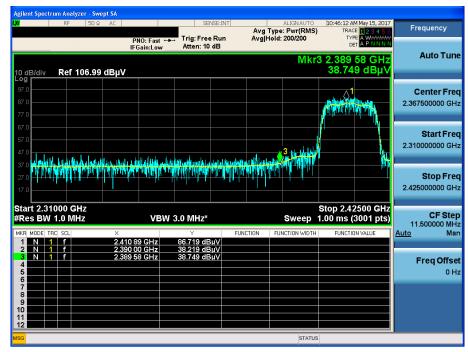


802.11g & Lowest & Z & Ver





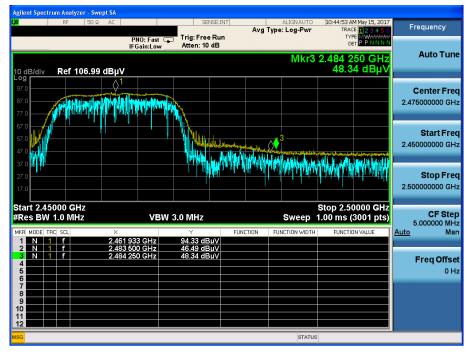
802.11g & Lowest & Z & Ver



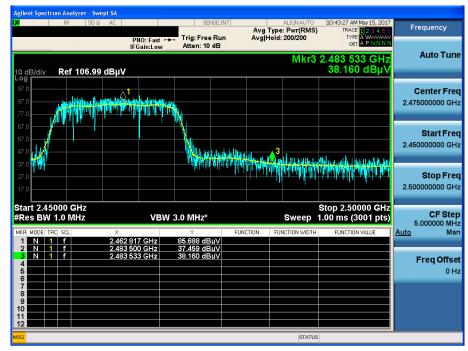


Detector Mode : PK

802.11g & Highest & Z & Ver



802.11g & Highest & Z & Ver



Dt&C

802.11n(HT20) & Lowest & Z & Ver

Detector Mode : PK

Agilent Spectrum Analyzer - S							
LXI RF 50	Ω AC		SENSE		ALIGN AUTO	10:35:06 AM May 15, 2017	
			.		Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW	
		PNO: Fast	Trig: Free R Atten: 10 dB			DET P P N N N N	
		IFGain:Low	Attent to at				Auto Tune
					Mkr	3 2.388 97 GHz	Autorune
10 dB/div Ref 106.9	9 dBuV					54.38 dBµV	
Log	5 abpt						
97.0							Center Freq
87.0							
							2.367500000 GHz
77.0							
67.0							
					<mark></mark> 3≀	(7	Start Freq
57.0							2.310000000 GHz
47.0 minimum management	and manager staffs		lan harden an	ميكنط أرادك ومحتوره معاديهما والتقاعله	al all all all all all all all all all		
37.0 Million Albein die Mindela	ALL MAR	والألار فيهودوا ال	الالار والمكار والموجود والمحالي والمحال	بعالقا وخيبا السرارا	adding a diright has	فيردنش والالباط وفالالالاجام الاراد	
			THE REPORT OF THE PARTY OF THE P	t folgeligte, fillet states	la de la de la dela de la dela dela dela		Stop Freq
27.0	1.00		بالتحريل المحراك	1. I . II. I. I	1. 1. a. 1 11 e	1, 1 , 1 , 1 , 11	
17.0				·			2.425000000 GHz
Start 2.31000 GHz						Stop 2.42500 GHz 1.00 ms (3001 pts)	
#Res BW 1.0 MHz		VBV	V 3.0 MHz		Sweep	CF Step	
				THE OTHER			11.500000 MHz
MKR MODE TRC SCL	×	1 81 GHz	γ 97.34 dBu\	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 N 1 f		0 00 GHz	53.12 dBu\				
3 N 1 F		8 97 GHz	54.38 dBu\				Ener Offerst
4							Freq Offset
5							0 Hz
6							
8							
9							
10							
11							
MSG					STATU	5	

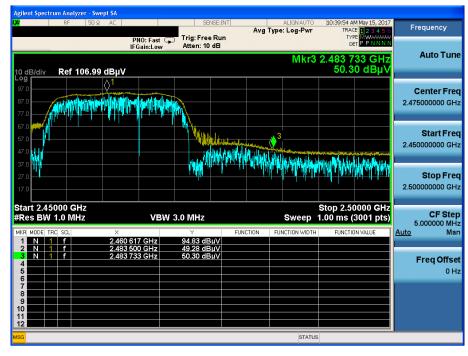
Detector Mode : AV

802.11n(HT20) & Lowest & Z & Ver

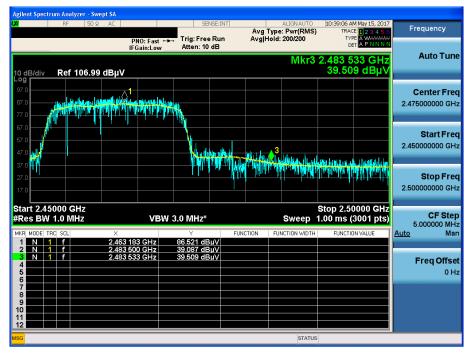
Agilent Spectrum Analyzer - Swept SA					
LXI RF 50Ω AC		SENSE:INT	ALIGN AUTO Avg Type: Pwr(RMS)	10:32:49 AM May 15, 2017 TRACE 1 2 3 4 5 6	Frequency
		rig: Free Run Atten: 10 dB	Avg Hold: 200/200	TYPE A WWWWW DET A P N N N N	Auto Tune
10 dB/div Ref 106.99 dBµV			Mkr	3 2.389 73 GHz 41.691 dBµV	Auto Tune
97.0 87.0 77.0					Center Freq 2.367500000 GHz
67.0 57.0 47.0 37.0 de let ibi de cir, her tok alter aber o da	lina andela sulla entetta d	lation characteric North Cock	a A. M. alman Market		Start Freq 2.310000000 GHz
27.0 17.0					Stop Freq 2.425000000 GHz
Center 2.36750 GHz #Res BW 1.0 MHz	VBW 3.0			Span 115.0 MHz 1.00 ms (3001 pts)	CF Step 11.500000 MHz
2 N 1 f 2.39	0 00 GHz 41	Y FUNC 0.017 dBµV 1.803 dBµV	TION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
3 N 1 f 2.38 4 5 6 6	9 73 GHz 41	l.691 dBµV			Freq Offset 0 Hz
7 8 9					
10 11 12					
MSG			STATUS		

802.11n(HT20) & Highest & Z & Ver

Detector Mode : PK

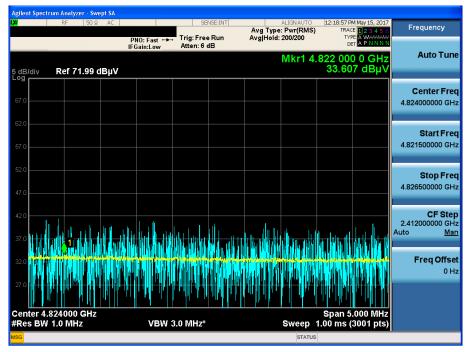


802.11n(HT20) & Highest & Z & Ver

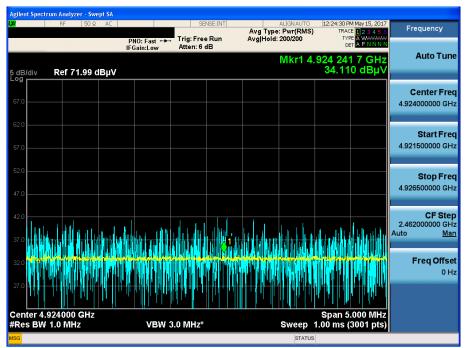


802.11b & Lowest & X & Hor





802.11g & Highest & Z & Ver





802.11n(HT20) & Highest & Z & Ver



