**ISSUED BY** Shenzhen BALUN Technology Co., Ltd.



FOR

# **Notebook Computer**

**ISSUED TO** Lenovo (Shanghai) Electronics Technology Co., Ltd.

Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA



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RF

ES REPORT

1/189



## **Revision History**

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# **1 ADMINISTRATIVE DATA (GENERAL INFORMATION)**

### **1.1 Identification of the Testing Laboratory**

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road,
Address	Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

## **1.2 Identification of the Responsible Testing Location**

Test Location Shenzhen BALUN Technology Co., Ltd.		
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road,	
Address	Nanshan District, Shenzhen, Guangdong Province, P. R. China	
	The laboratory has been listed by Industry Canada to perform	
Accreditation	electromagnetic emission measurements. The recognition numbers of	
Certificate	test site are 11524A-1.	
Certificate	The laboratory is a testing organization accredited by FCC as a	
	accredited testing laboratory. The designation number is CN1196.	
	All measurement facilities used to collect the measurement data are	
Description	located at Block B, FL 1, Baisha Science and Technology Park, Shahe	
Description	Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R.	
	China 518055	

### **1.3 Laboratory Condition**

Ambient Temperature	20°C to 25°C
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

### 1.4 Announce

- (1) The test report reference to the report template version v6.6.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.



# **2 PRODUCT INFORMATION**

## **2.1 Applicant Information**

Applicant	Lenovo (Shanghai) Electronics Technology Co., Ltd.		
Address	Section 304-305, Building No. 4, # 222, Meiyue Road, China		
Address	(Shanghai) Pilot Free Trade Zone, 200131, CHINA		

## 2.2 Manufacturer Information

Manufacturer	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay,
Address	Hong Kong, P.R. China

## 2.3 General Description for Equipment under Test (EUT)

EUT Name	Notebook Computer		
Model Name Under Test	IP Duet 3 Chrome 11Q727		
Series Model Name	IP Duet 3 Chrome 11******		
Series woder name	(* can be 0-9, a-z, A-Z, any symbol, blank or nothing)		
Description of Model	Only differences are model names for trading purpose.		
name differentiation	Only differences are model names for trading purpose.		
Serial Number	YX03EWG5		
Hardware Version	V5		
Software Version	R97-14324.31.0 (dev channel)		
Dimensions (Approx.)	N/A		
Weight (Approx.)	N/A		

#### Antenna Information:

	Model Name	Antenna Manufacturer		Antenna Gain (dBi)			
Antenna Port			Antenna Type	2.4	5.15-	5.47-	5.725-
Antenna Fort				GHz	5.35	5.725	5.85
					GHz	GHz	GHz
Main Antenna	2.00005205	ZhongTionYun	PIFA	1.92	2.77	2.71	2.39
Auxiliary Antenna	2.00005206	ZhongTianXun	PIFA	1.85	2.71	2.89	2.54
Main Antenna	N12-8055-R0A		PIFA	1.55	2.05	2.23	0.52
Auxiliary Antenna	N12-8056-R0A	South Star	PIFA	1.18	2.05	1.93	1.46
Note: The report only shown the antenna which matches the antenna with the highest antenna gain.							



# 2.4 Technical Information

Bluetooth			Bluetooth (BR+EDR+BLE)		
Network and Wireless		l Wireless	2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40)		
	connectivity		5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80)		
			U-NII-1/2A/2C/3		
The req	uirement for t	he following techni	cal information of the EUT was tested in this report:		
			802.11b/g/n(20 MHz): 2.412 GHz - 2.462 GHz		
			f <sub>c</sub> = 2412 MHz + (N-1)*5 MHz, where		
			- $f_c$ = "Operating Frequency" in MHz,		
	F		- N = "Channel Number" with the range from 1 to 11.		
	Frequency F	kange	802.11n(40 MHz): 2.422 GHz - 2.452 GHz		
			f <sub>c</sub> = 2412 MHz + (N-1)*5 MHz, where		
			- $f_c$ = "Operating Frequency" in MHz,		
			- N = "Channel Number" with the range from 3 to 9.		
	Modulation 7	Гуре	DSSS, OFDM		
	Product Type	e	⊠ Portable		
			Fix Location		
	Antonno Sur	stem (eg., MIMO,	Cyclic Delay Diversity (CDD) for 802.11n		
	Smart Anten		Basic methodology with NANT transmit antennas, each with		
	Smart Anten	na)	the same directional gain GANT dBi for 802.11b/g		
	Categorization as Correlated		Categorization as Correlated		
	or Completely Uncorrelated		Calegorization as Correlated		
	Antenna	Main Antenna	PIFA Antenna		
	Туре	Aux. Antenna			
		Main Antenna	1.92 dBi (In test items related to antenna gain, the final results		
	Antenna		reflect this figure. This value is provided by the applicant.)		
	Gain	Aux. Antenna	1.85 dBi (In test items related to antenna gain, the final results		
			reflect this figure. This value is provided by the applicant.)		
		For power	1.92 dBi		
		spectral	Formulas: Directional gain = GANT + Array Gain, Array Gain =		
		density(PSD)	<i>10 log(NANT/NSS) dB. NSS</i> =1, GANT set equal to the gain of		
		measurements	the antenna having the highest gain.		
	Total		1.92 dBi		
	directional	For power	Formulas: Directional gain = GANT + Array Gain, Array Gain =		
	gain	measurements	0, GANT set equal to the gain of the antenna having the		
	gain		highest gain.		
		For Conducted	1.92 dBi		
		Out-of-Band	Formulas: Directional gain = GANT + Array Gain, Array Gain =		
		and Spurious	<i>10 log(NANT/NSS) dB. NSS</i> =1, GANT set equal to the gain of		
		Measurements	the antenna having the highest gain.		
	About the Pr	oduct	Only the WIFI 802.11b, 802.11g and 802.11n (HT20/40) was		
	About the Floduct		tested in this report.		



Mode	Antenna					
Mode	Main Antenna	Aux. Antenna	MIMO			
802.11b	$\checkmark$	$\checkmark$	$\checkmark$			
802.11g	$\checkmark$	$\checkmark$	$\checkmark$			
802.11n20	$\checkmark$	$\checkmark$	$\checkmark$			
802.11n40	$\checkmark$	$\checkmark$	$\checkmark$			
Note: All the configurations were tested, but only the worst data was shown in this report						

rations were tested, but only the worst data was shown in this report. Note. All the coning

Modulation technology	Modulation Type	Transfer Rate (Mbps)
	DBPSK	1
DSSS (802.11b)	DQPSK	2
	ССК	5.5/11
	BPSK	6/9
	QPSK	12/18
OFDM (802.11g)	16QAM	24/36
	64QAM	48/54
	BPSK	6.5/7.2
OFDM	QPSK	13/19.5/14.4/21.7
(802.11n-20MHz)	16QAM	26/39/28.9/43.3
	64QAM	52/58.5/65/57.8/65/72.2
	BPSK	13.5/15
OFDM	QPSK	27/40.5/30/45
(802.11n-40MHz)	16QAM	54/81/60/90
	64QAM	108/121.5/135/120/150

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel		
Output Power	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
6dB Bandwidth	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
Conducted	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
Spurious Emission	110/119/11120/11140	1/0/0.5/13.5 10005	1/0/11/12/13	3/0/9/10/11	
Conducted	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
Emission	110/119/11120/11140	1/0/0.5/13.5 10005	1/0/11/12/13	3/0/9/10/11	
Radiated Spurious	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
Emission	110/119/11120/11140	1/0/0.3/13.3 10005	1/0/11/12/13	3/0/9/10/11	
Band Edge	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
Power spectral	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11/12/13	3/6/9/10/11	
density (PSD)	110/119/11120/11140	1/0/0.3/13.3 10005	1/0/11/12/13	3/0/9/10/11	

Note: The above EUT information in section 2.4 and 2.6 was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.



## 2.5 Additional Instructions

#### EUT Software Settings:

		$\square$	Special software is used.
	Mode		The software provided by client to enable the EUT under
			transmission condition continuously at specific channel
			frequencies individually.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power level setup in so	ftware		
Test Software Version	QRCT4		
Support Units	Description	Manufacturer	Model
(Software installation media)	Notebook	HP	N/A
Mode	Channel	Soft	Set
mode	Charmon	Main Antenna	Aux. Antenna
	1	15.0	14.0
	6	15.0	14.5
802.11b	11	15.0	14.5
	12	14.5	14.5
	13	14.5	14.5
	1	15.0	14.5
	6	15.0	14.5
802.11g	11	15.0	14.5
	12	13.0	12.5
	13	2.5	2.0
	1	15.0	14.5
	6	15.0	14.5
802.11n20	11	15.5	15.0
	12	13.5	12.5
	13	2.5	2.0
	3	13.5	13.0
	4	14.5	14.5
	6	14.5	14.0
802.11n40	7	15.0	14.5
002.111140	8	14.5	14.0
	9	14.0	13.0
	10	8.0	7.0
	11	2.0	-0.5



#### Run software:

W Qualcomm Radio Control Tool	File View S	Settings Help				- 0
arget WLAN_Standalone *	and the second second	2.168.10.23	Disconnect			↔ 🗠 🖬 🗎
) 🕞 Un-named		↔ Commands				P 100% P D
		TX ×				
stegory WLAN -		H 1 AUTO D	ETECT CHIP LOAD SE	ELECTED CHIP		
sipset WCN39XX mmands, Logs and Custom APis	×	TX SETUP		TX REPORT		
D All		CONTRACTOR OF	PHY	Property	РНУ	
AUTO DETECT CHIP	_	RF Mode	PhyA_only =	Good Packets	240654	
43 NV			PhyA -	ThermCal 1	94	
⇔ RX		Tx Mode	Cont. Tx TX99 =	ThermCal 2	0	
O TX			2412	RSSI	0	
COMMON		Channel2	6716 ·	Throughput	0	
LEGACY CHIP - WCN36XX		TX Power Control	TxPowerForce CLPC =	Gain Index	0	
		TX Power(dBm)	15	DAC GAIN	9	
		HT Mode	No_HT	PACEG	0	
form Conliguration		Data Rate	RATE_6Mbps -	PDADC1	o	
NV RFC		Tx Pattern	PN9 PATTERN	PDADC2		
p		Short Guard	OFF -	PDADC3		
				Derb Antonia		
		Aclivity				P 100% C
		ORCT OMSL	NUM PARTY			
		7 H G B	Status Polling			
		Time Category 06:49:26:870 Info	QLIB_FTM_WLAN_TLV2_AddP	areastownDo shate D 1		Message
		06.49.26.870 Info	QUB_FTM_WLAN_TLV2_AddP			
		06:49:26.870 Info	QLIB_FTM_WLAN_TLV2_AddP			
		06:49.26.870 Info	QLIB_FTM_WLAN_TLV2_Comp	dete()		
		06.49.26.870 Info	REC: SUCCESS			
		1 ka				
ResourceID 192.168.10.23 Conn	nected -	Mode: User Define	ed Transport			



# **3 SUMMARY OF TEST RESULTS**

## 3.1 Test Standards

No.	Identity	Document Title		
1	47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services		
		GUIDANCE FOR COMPLIANCE MEASUREMENTS ON		
2	KDB Publication 558074	DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING		
2	D01v05r02	SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES		
		OPERATING UNDER SECTION 15.247 OF THE FCC RULES		
3	ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of		
3	ANSI C63. 10-2013	Unlicensed Wireless Devices		
4	KDB Publication	Emissions Testing of Transmitters with Multiple Outputs in the Same		
4	662911 D01v02r01	Band (e.g., MIMO, Smart Antenna, etc)		
5	RSS-Gen Issue 5 General Requirements for Compliance of Radio Apparatus			
		Digital Transmission Systems (DTSs), Frequency Hopping		
6	RSS-247 Issue 2	Systems(FHSs) and Licence-Exempt Local Area Network (LE-LAN)		
		Devices		

## 3.2 Verdict

Description	FCC PART No.	ISED Part No.	Test Result	Verdict
Antenna Requirement	15.203	RSS-247, 5.4 (f)	N/A	Pass <sup>Note 1</sup>
Output Power	15.247 (b)	RSS-247, 5.4 (d)	ANNEX A.1	Pass
6dB Bandwidth	15.247 (a)	RSS-GEN, 6.7; RSS-247, 5.2 (a)	ANNEX A.2	Pass
Conducted Spurious Emission	15.247 (d)	RSS-247, 5.5	ANNEX A.3	Pass
Band Edge(Authorized- band band-edge)	15.247 (d)	RSS-GEN, 8.9; RSS-247, 5.5	ANNEX A.4	Pass
Conducted Emission	15.207	RSS-GEN, 8.8	ANNEX A.5	Pass
Radiated Spurious Emission	15.209; 15.247 (d)	RSS-247, 5.5	ANNEX A.6	Pass
Band Edge(Restricted- band band-edge)	15.209; 15.247 (d)	RSS-247, 5.5	ANNEX A.7	Pass
Power spectral density (PSD)	15.247 (e)	RSS-247, 5.2 (b)	ANNEX A.8	Pass
10 Receiver Spurious N/A Emissions		RSS-Gen, 7.3	N/A	N/A Note 2
	Antenna Requirement Output Power 6dB Bandwidth Conducted Spurious Emission Band Edge(Authorized- band band-edge) Conducted Emission Radiated Spurious Emission Band Edge(Restricted- band band-edge) Power spectral density (PSD) Receiver Spurious	Antenna Requirement15.203Output Power15.247 (b)6dB Bandwidth15.247 (a)6dB Bandwidth15.247 (a)Conducted Spurious Emission15.247 (d)Band Edge(Authorized- band band-edge)15.247 (d)Conducted Emission15.207Radiated Spurious Emission15.209; 15.247 (d)Band Edge(Restricted- band band-edge)15.209; 15.247 (d)Band Edge(Restricted- band band-edge)15.209; 15.247 (d)Power spectral density (PSD)15.247 (e)Receiver SpuriousN/A	Antenna Requirement $15.203$ RSS-247, 5.4 (f)Output Power $15.247$ (b)RSS-247, 5.4 (d) $6dB$ Bandwidth $15.247$ (a)RSS-GEN, 6.7; RSS-247, 5.2 (a) $6dB$ Bandwidth $15.247$ (a)RSS-247, 5.2 (a)Conducted Spurious Emission $15.247$ (d)RSS-247, 5.5Band Edge(Authorized- band band-edge) $15.247$ (d)RSS-GEN, 8.9; RSS-247, 5.5Conducted Emission $15.207$ RSS-GEN, 8.8Radiated Spurious Emission $15.209; 15.247$ (d)RSS-247, 5.5Band Edge(Restricted- band band-edge) $15.209; 15.247$ (d)RSS-247, 5.5Band Edge(Restricted- band band-edge) $15.209; 15.247$ (d)RSS-247, 5.5Power spectral density (PSD) $15.247$ (e)RSS-247, 5.2 (b)Receiver Spurious $N/A$ RSS-Gen, 7.3	Antenna Requirement15.203RSS-247, 5.4 (f)N/AOutput Power15.247 (b)RSS-247, 5.4 (d)ANNEX A.1 $6dB$ Bandwidth $15.247$ (a)RSS-GEN, 6.7; RSS-247, 5.2 (a)ANNEX A.2Conducted Spurious Emission $15.247$ (d)RSS-247, 5.5 (a)ANNEX A.3Band Edge(Authorized- band band-edge) $15.247$ (d)RSS-GEN, 8.9; RSS-247, 5.5 (c)ANNEX A.4Conducted Emission $15.247$ (d)RSS-GEN, 8.9; RSS-247, 5.5 (c)ANNEX A.4Band Edge(Authorized- band band-edge) $15.207$ (c)RSS-GEN, 8.8 (c)ANNEX A.5Radiated Spurious Emission $15.209; 15.247$ (d)RSS-247, 5.5 (c)ANNEX A.6Band Edge(Restricted- band band-edge) $15.209; 15.247$ (d)RSS-247, 5.5 (c)ANNEX A.6Band Edge(Restricted- band band-edge) $15.209; 15.247$ (d)RSS-247, 5.5 (c)ANNEX A.6Power spectral density (PSD) $15.247$ (e)RSS-247, 5.2 (b)ANNEX A.8Receiver SpuriousN/ARSS-Gen, 7.3 (c)N/A

Note <sup>2</sup>: Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements, so this test is not applicable.



# **4 GENERAL TEST CONFIGURATIONS**

## **4.1 Test Environments**

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	45% - 55%		
Atmospheric Pressure	100 kPa - 102 kPa		
Temperature	NT (Normal Temperature)	+22°C to +25°C	
Working Voltage of the EUT	NV (Normal Voltage)	7.7 V	

## 4.2Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2021.04.01	2022.03.31
Bluetooth Signaling Unit	ROHDE&SCHWARZ	CMW500	142028	2021.06.01	2022.05.31
Power Sensor	KEYSIGHT	U2063XA	MY58000247	2021.05.08	2022.05.07
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2021.06.01	2022.05.31
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.06.01	2022.05.31
LISN	SCHWARZBECK	NSLK 8127	8127-687	2021.06.01	2022.05.31
Test Antenna- Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2021.04.16	2024.04.15
Test Antenna- Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19
Test Antenna- Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1917	2019.07.02	2022.07.01
Test Antenna- Horn (18-40 GHz)	A-INFO	LB- 180400KF	J211060273	2021.07.02	2023.07.01
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2022.02.20
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60 *7.35m	N/A	2019.08.08	2022.08.07
Shielded Enclosure	ChangNing	CN-130701	130703		

## 4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.	Applicable test Setup
BL410R	BALUN	V2.1.1.488	N/A	The section 4.5.1
BL410E	BALUN	V19.8.28.435	N/A	The section 4.5.2&4.5.3&4.5.4&4.5.5



### 4.4 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

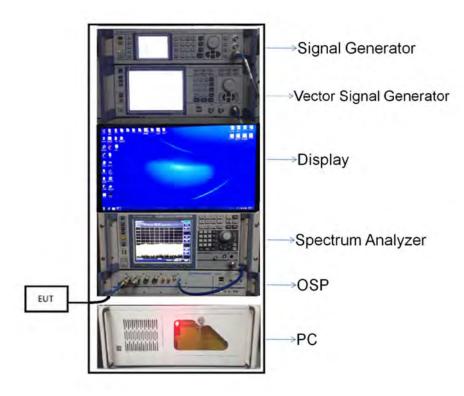
Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.82°C
Humidity	4.1%

### 4.5 Description of Test Setup

4.5.1 For Antenna Port Test

Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

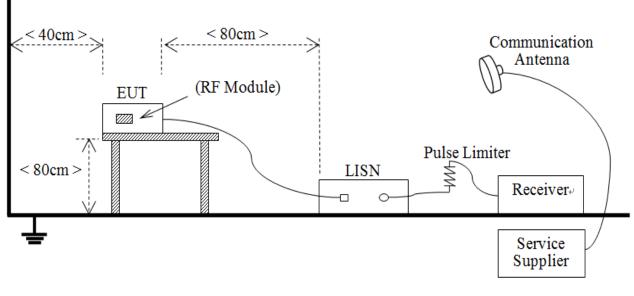
For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT: Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



(Diagram 1)

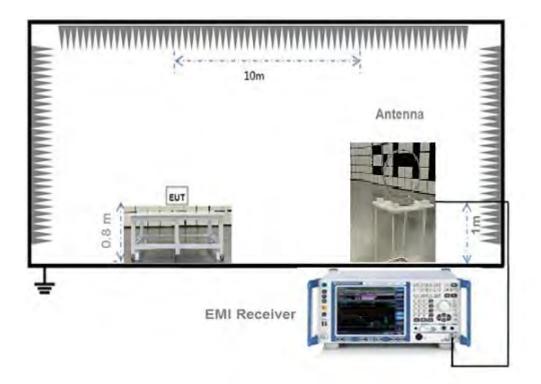


### 4.5.2 For AC Power Supply Port Test





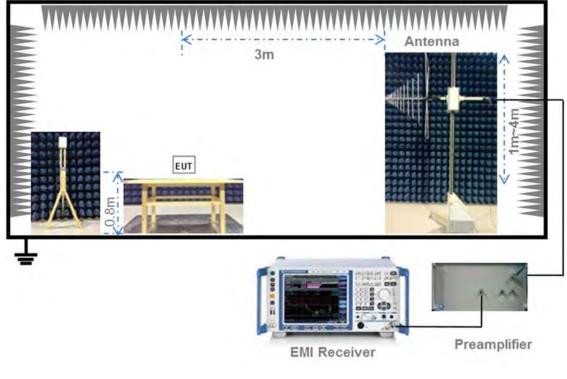
4.5.3 For Radiated Test (Below 30 MHz)





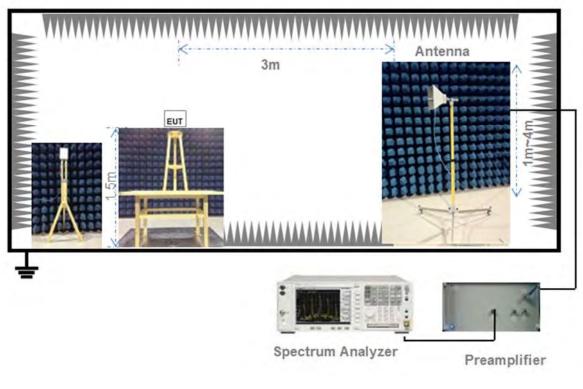


4.5.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.5.5 For Radiated Test (Above 1 GHz)







## 4.6 Measurement Results Explanation Example

4.6.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

4.6.2 For radiated band edges and spurious emission test:

 $\mathsf{E} = \mathsf{EIRP} - 20\log\mathsf{D} + 104.8$ 

where:

 $E = electric field strength in dB\mu V/m$ ,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

EIRP= Measure Conducted output power Value (dBm) + Maximum transmit antenna gain (dBi) + the appropriate maximum ground reflection factor (dB)



# 5 TEST ITEMS

## 5.1 Antenna Requirements

#### 5.1.1 Relevant Standards

#### FCC §15.203; RSS-247, 5.4 (f)

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

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

#### 5.1.2 Antenna Anti-Replacement Construction

#### The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the	An embedded-in antenna design is used.
product.	

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

### 5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



### 5.2 Output Power

#### 5.2.1 Test Limit

FCC § 15.247(b); RSS-247, 5.4 (d)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antennas and antennas and antennas and antennas elements.

#### 5.2.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.2.3 Test Procedure

#### Maximum peak conducted output power

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

#### Maximum conducted (average) output power (Reporting Only)

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed

using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

1) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.

2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a

factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as

described in Section 6.0.

c) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

d) Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

#### Measurements of duty cycle

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.)

5.2.4 Test Result

Please refer to ANNEX A.1.



### 5.36dB Bandwidth

#### 5.3.1 Limit

FCC §15.247(a); RSS-GEN, 6.7; RSS-247, 5.2 (a)

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.

#### 5.3.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.3.3 Test Procedure

Use the following spectrum analyzer settings:

Set RBW = 100 kHz.

Set the video bandwidth (VBW)  $\geq$  3 RBW.

Detector = Peak.

Trace mode = max hold.

Sweep = auto couple.

Allow the trace to stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.3.4 Test Result

Please refer to ANNEX A.2.



## 5.4 Conducted Spurious Emission

#### 5.4.1 Limit

FCC §15.247(d); RSS-247, 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

#### 5.4.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.4.3 Test Procedure

The DTS rules specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

a) If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

 b) If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

c) In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required.

The following procedures shall be used to demonstrate compliance to these limits. Note that these procedures can be used in either an antenna-port conducted or radiated test set-up. Radiated tests must conform to the test site requirements and utilize maximization procedures defined herein.

#### Reference level measurement

Establish a reference level by using the following procedure:

Set instrument center frequency to DTS channel center frequency.

Set the span to  $\geq$  1.5 times the DTS bandwidth.

Set the RBW = 100 kHz.

Set the VBW  $\geq$  3 x RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum PSD level.



#### Emission level measurement

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

Set the RBW = 100 kHz.

Set the VBW  $\geq$  3 x RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

5.4.4 Test Result

Please refer to ANNEX A.3.





## 5.5 Band Edge (Authorized-band band-edge)

#### 5.5.1 Limit

#### FCC §15.247(d); RSS-GEN, 8.9, RSS-247, 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

#### 5.5.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.5.3 Test Procedure

The following procedures may be used to determine the peak or average field strength or power of an unwanted emission that is within 2 MHz of the authorized band edge. If a peak detector is utilized, use the procedure described in 13.2.1. Use the procedure described in 13.2.2 when using an average detector and the EUT can be configured to transmit continuously (i.e., duty cycle  $\geq$  98%). Use the procedure described in 13.2.3 when using an average detector and the EUT cannot be configured to transmit continuously but the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent). Use the procedure described in 13.2.4 when using an average detector for those cases where the EUT cannot be configured to transmit continuously and the duty cycle is not constant (duty cycle variations equal or exceed 2 percent).

When using a peak detector to measure unwanted emissions at or near the band edge (within 2 MHz of the authorized band), the following integration procedure can be used.

Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).

Set span to 2 MHz

RBW = 100 kHz.

VBW  $\geq$  3 x RBW.

```
Detector = peak.
```

Sweep time = auto.

Trace mode = max hold.

Allow sweep to continue until the trace stabilizes (required measurement time may increase for low duty cycle applications)

Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency (femission)  $\pm$  0.5 MHz. If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission  $\pm$  0.5 MHz.

Standard method(The 99% OBW of the fundamental emission is without 2 MHz of the authorized band):

Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.



Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

Attenuation: Auto (at least 10 dB preferred).

Sweep time: Coupled.

Resolution bandwidth: 100 kHz.

Video bandwidth: 300 kHz.

Detector: Peak.

Trace: Max hold.

5.5.4 Test Result

Please refer to ANNEX A.4.



## 5.6 Conducted Emission

#### 5.6.1 Limit

#### FCC §15.207; RSS-GEN, 8.8

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

Frequency range	Conducted Limit (dBµV)			
(MHz)	Quai-peak	Average		
0.15 - 0.50	66 to 56	56 to 46		
0.50 - 5	56	46		
0.50 - 30	60	50		

#### 5.6.2 Test Setup

See section 4.5.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

#### 5.6.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

#### 5.6.4 Test Result

Please refer to ANNEX A.5.



## 5.7 Radiated Spurious Emission

#### 5.7.1 Limit

FCC §15.209&15.247(d); RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
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

Note:

- 1. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- 2. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

#### 5.7.2 Test Setup

See section 4.5.3 to 4.5.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.7.3 Test Procedure

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

#### General Procedure for conducted measurements in restricted bands

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).



b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies  $\leq$  30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

#### E = EIRP - 20log D + 104.8

where:

 $E = electric field strength in dB\mu V/m$ ,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

f) Compare the resultant electric field strength level to the applicable limit.

g) Perform radiated spurious emission test.

#### Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

#### Peak power measurement procedure

Peak emission levels are measured by setting the instrument as follows:

- a) RBW = as specified in Table 1.
- b) VBW  $\geq$  3 x RBW.
- c) Detector = Peak.
- d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be longer for low duty cycle applications).

Table 1—RBW as a function of frequency

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

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (i.e., duty cycle  $\ge$  98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than  $\pm$  2 percent), then the following procedure shall be used:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.

b) Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.

c) RBW = 1 MHz (unless otherwise specified).

d) VBW  $\geq$  3 x RBW.

e) Detector = RMS, if span/(# of points in sweep)  $\leq$  (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

f) Averaging type = power (i.e., RMS).

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.

2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

g) Sweep time = auto.

h) Perform a trace average of at least 100 traces.

i) 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 f), 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 f), then the applicable correction factor is  $20 \log(1/x)$ , where x is the duty cycle.

3) If a specific emission is demonstrated to be continuous ( $\geq$  98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

#### Determining the applicable transmit antenna gain

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).



Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

#### Radiated spurious emission test

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured RBW = 1 MHz for  $f \ge 1$  GHz, 100 kHz for f < 1 GHz VBW  $\ge$  RBW Sweep = auto Detector function = peak Trace = max hold

#### 5.7.4 Test Result

Please refer to ANNEX A.6.



## 5.8 Band Edge (Restricted-band band-edge)

#### 5.8.1 Limit

FCC §15.209&15.247(d); RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

#### 5.8.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.8.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured RBW = 1 MHz for  $f \ge 1$  GHz, 100 kHz for f < 1 GHz VBW  $\ge$  RBW Sweep = auto Detector function = peak Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

For transmitters operating above 1 GHz repeat the measurement with an average detector.

#### 5.8.4 Test Result

Please refer to ANNEX A.7.



## 5.9 Power Spectral density (PSD)

5.9.1 Limit

FCC §15.247(e); RSS-247, 5.2 (b)

The same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used.

#### 5.9.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

#### 5.9.3 Test Procedure

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: 3 kHz  $\leq$  RBW  $\leq$  100 kHz.

Set the VBW  $\geq$  3 RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

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

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

5.9.4 Test Result

Please refer to ANNEX A.8.



# ANNEX A TEST RESULT

## A.1 Output Power

Note: All the configurations were tested, but only the worst data was shown in this report. <u>Duty Cycle</u>

Test Mode	On Time (ms)	On+Off time (ms)	Duty Cycle
802.11b	13.2000	13.3300	99.02%
802.11g	2.1970	2.2350	98.30%
802.11n-20 MHz	2.0370	2.0870	97.60%
802.11n-40 MHz	0.9997	1.0550	94.76%

#### Peak Power Test Data

#### Main Antenna

#### 802.11b Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
1	16.51	44.77			Pass	
6	16.85	48.42				
11	16.71	46.88	30	1000	Pass	
12	15.72	37.33			Pass	
13	15.75	37.58			Pass	

#### 802.11g Mode:

Channel	Measured Out	put Peak Power	Lir	nit	Verdict	
Channel	dBm	mW	dBm	mW	verdict	
1	19.64	92.04			Pass	
6	19.52	89.54				
11	19.20	83.18	30	1000	Pass	
12	16.70	46.77			Pass	
13	7.36	5.45			Pass	

#### 802.11n-20 MHz Mode:

Channel	Measured Out	put Peak Power	Lir	nit	Verdict	
Channel	dBm	mW	dBm	mW	verdict	
1	19.61	91.41			Pass	
6	19.41	87.30				
11	19.64	92.04	30	1000	Pass	
12	17.03	50.47			Pass	
13	7.18	5.22			Pass	



#### 802.11n-40 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict										
Channel	dBm	mW	dBm	mW	Verdict										
3	18.30	67.61			Pass										
4	19.74	94.19	30	30 1000											Pass
6	19.57	90.57						Pass							
7	19.89	97.50			1000	Pass									
8	18.91	77.80			1000	Pass									
9	18.19	65.92			Pass										
10	11.46	14.00			Pass										
11	5.02	3.18			Pass										

#### Aux. Antenna

#### 802.11b Mode:

Channel	Measured Out	put Peak Power	Lir	nit	Verdict	
Channel	dBm	mW	dBm	mW	Verdici	
1	16.38	43.45	30		Pass	
6	16.79	47.75		30		Pass
11	17.02	50.35			1000	Pass
12	15.79	37.93			Pass	
13	15.46	35.16			Pass	

### 802.11g Mode:

Channel	Measured Output Peak Power		Lir	nit	Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
1	19.85	96.61			Pass	
6	19.73	93.97				
11	19.56	90.36	30	1000	Pass	
12	17.18	52.24			Pass	
13	7.69	5.87			Pass	

#### 802.11n-20 MHz Mode:

Channel	Measured Out	Measured Output Peak Power		nit	Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
1	19.27	84.53	30		Pass	
6	19.44	87.90				Pass
11	19.42	87.50		1000	Pass	
12	16.90	48.98			Pass	
13	7.67	5.85			Pass	



#### 802.11n-40 MHz Mode:

Channel	Measured Out	put Peak Power	Lir	nit	Verdict
Channel	dBm	mW	dBm	mW	Verdict
3	18.12	64.86			Pass
4	19.71	93.54			Pass
6	19.49	88.92			Pass
7	19.67	92.68	30	1000	Pass
8	19.03	79.98		1000	Pass
9	18.04	63.68			Pass
10	11.52	14.19			
11	5.05	3.20			Pass

#### <u>MIMO</u>

#### 802.11b Mode:

Channel	Measured Out	put Peak Power	er Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
1	19.46	88.22	30	30 1000	Pass	
6	19.83	96.17			Pass	
11	19.88	97.23			Pass	
12	18.77	75.26			Pass	
13	18.62	72.74			Pass	

#### 802.11g Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
1	22.76	188.65			Pass	
6	22.64	183.51			Pass	
11	22.39	173.54	30	1000	Pass	
12	19.96	99.01				Pass
13	10.54	11.32			Pass	

#### 802.11n-20 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	Verdict
1	22.45	175.94		1000	Pass
6	22.44	175.20			Pass
11	22.54	179.54	30		Pass
12	19.98	99.44			Pass
13	10.44	11.07			Pass



#### 802.11n-40 MHz Mode:

Channel	Measured Out	put Peak Power	Limit		Verdict
Channel	dBm	mW	dBm	mW	verdict
3	21.22	132.47			Pass
4	22.74	187.73			Pass
6	22.54	179.49			Pass
7	22.79	190.18	20	1000	Pass
8	21.98	157.79	30	1000	Pass
9	21.13	129.60			Pass
10	14.50	28.19			Pass
11	8.05	6.38			Pass



### Average Power Test Data

#### Main Antenna

#### 802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	verdict
1	13.90	24.55	30	1000	Pass
6	13.54	22.59			Pass
11	13.34	21.58			Pass
12	12.51	17.82			Pass
13	12.62	18.28			Pass

### 802.11g Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	verdict
1	13.63	23.07	30	1000	Pass
6	13.62	23.01			Pass
11	13.35	21.63			Pass
12	11.04	12.71			Pass
13	1.44	1.39			Pass

#### 802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	verdict
1	13.71	23.50	30	1000	Pass
6	13.42	21.98			Pass
11	13.86	24.32			Pass
12	11.37	13.71			
13	1.23	1.33			Pass

#### 802.11n-40 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdici
3	12.04	16.00			Pass
4	13.35	21.63			Pass
6	13.46	22.18			Pass
7	13.80	23.99	30	1000	Pass
8	13.06	20.23		1000	Pass
9	12.37	17.26			Pass
10	5.43	3.49			
11	-1.09	0.78			Pass



# Aux. Antenna

# 802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	verdict	
1	13.39	21.83			Pass	
6	13.61	22.96			Pass	
11	13.15	20.65	30	30 1000	Pass	
12	12.70	18.62				Pass
13	13.79	23.93			Pass	

# 802.11g Mode:

Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	verdict	
1	13.56	22.70			Pass	
6	13.45	22.13			Pass	
11	13.50	22.39	30	30 1000	Pass	
12	11.03	12.68				Pass
13	1.65	1.46			Pass	

#### 802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
1	13.55	22.65			Pass	
6	13.40	21.88			Pass	
11	13.60	22.91	30	1000	Pass	
12	11.11	12.91				Pass
13	1.51	1.42			Pass	

Channel	Measured Output Average Power		Limit		Verdict		
Channel	dBm	mW	dBm	mW	verdict		
3	12.29	16.94					Pass
4	13.65	23.17			Pass		
6	13.34	21.58			Pass		
7	13.87	24.38	20	1000	Pass		
8	13.20	20.89	30	1000	Pass		
9	11.94	15.63				Pass	
10	5.47	3.52			Pass		
11	-1.06	0.78			Pass		



# <u>MIMO</u>

## 802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	verdict	
1	16.66	46.37			Pass	
6	16.59	45.56		30 1000	Pass	
11	16.26	42.23	30		Pass	
12	15.62	36.44				Pass
13	16.25	42.21			Pass	

# 802.11g Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	verdict
1	16.61	45.77			Pass
6	16.55	45.15			Pass
11	16.44	44.01	30	30 1000	Pass
12	14.05	25.38			Pass
13	4.56	2.86			Pass

#### 802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
1	16.64	46.14			Pass	
6	16.42	43.86			Pass	
11	16.74	47.23	30	30 1000	Pass	
12	14.25	26.62				Pass
13	4.38	2.74			Pass	

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	verdict
3	15.18	32.94			Pass
4	16.51	44.80			Pass
6	16.41	43.76			Pass
7	16.85	48.37	30	1000	Pass
8	16.14	41.12	30	1000	Pass
9	15.17	32.89			Pass
10	8.46	7.02			Pass
11	1.94	1.56			Pass



# E.I.R.P Test Data (For ISED)

## Main Antenna

802.11b Mode:

Channel	E.I.R.P		Limit		Verdict				
Channel	dBm	mW	dBm	W	verdict				
1	18.43	69.66							Pass
6	18.77	75.34			Pass				
11	18.63	72.95	36	4	Pass				
12	17.64	58.08	1			Pass			
13	17.67	58.48			Pass				

# 802.11g Mode:

Channel	E.I.R.P		Limit		Verdict	
	dBm	mW	dBm	W	verdict	
1	21.56	143.22			Pass	
6	21.44	139.32			Pass	
11	21.12	129.42	36	36 4	Pass	
12	18.62	72.78				Pass
13	9.28	8.47			Pass	

#### 802.11n-20 MHz Mode:

Channel	E.I.R.P		Limit		Verdict	
Channel	dBm	mW	dBm	W	verdict	
1	21.53	142.23				Pass
6	21.33	135.83			Pass	
11	21.56	143.22	36	4	Pass	
12	18.95	78.52				Pass
13	9.10	8.13			Pass	

Channel	E.I.R.P		Limit		Verdict	
Channel	dBm	mW	dBm	W	verdict	
3	20.22	105.20	-		Pass	
4	21.66	146.55				
6	21.49	140.93			Pass	
7	21.81	151.71	36	4	Pass	
8	20.83	121.06	30	4	Pass	
9	20.11	102.57			Pass	
10	13.38	21.78				Pass
11	6.94	4.94			Pass	



# Aux. Antenna

## 802.11b Mode:

Channel	E.I.R.P		Limit		Verdict
Channel	dBm	mW	dBm	W	verdict
1	18.23	66.53			Pass
6	18.64	73.11			Pass
11	18.87	77.09	36	4	Pass
12	17.64	58.08			Pass
13	17.31	53.83			Pass

# 802.11g Mode:

Channel	E.I.R.P		Limit		Verdict
Channel	dBm	mW	dBm	W	verdict
1	21.70	147.91			Pass
6	21.58	143.88			Pass
11	21.41	138.36	36	4	Pass
12	19.03	79.98			Pass
13	9.54	8.99			Pass

#### 802.11n-20 MHz Mode:

Channel	E.I.R.P		Limit		Verdict
Channel	dBm	mW	dBm	W	Verdici
1	21.12	129.42			Pass
6	21.29	134.59			Pass
11	21.27	133.97	36	4	Pass
12	18.75	74.99			Pass
13	9.52	8.95			Pass

Channel	E.I	.R.P	Lir	nit	Verdict
Channel	dBm	mW	dBm	W	verdict
3	19.97	99.31			Pass
4	21.56	143.22			Pass
6	21.34	136.14			Pass
7	21.52	141.91	36		Pass
8	20.88	122.46	30	4	Pass
9	19.89	97.50			Pass
10	13.37	21.73			Pass
11	6.90	4.90			Pass



# <u>MIMO</u>

## 802.11b Mode:

Channel	E.I.R.P		Limit		Verdict
Channel	dBm	mW	dBm	W	verdict
1	21.34	136.19			Pass
6	21.72	148.45	36	4	Pass
11	21.76	150.04			Pass
12	20.65	116.15			Pass
13	20.50	112.31			Pass

# 802.11g Mode:

Channel	E.I.R.P		Limit		Verdict
Channel	dBm	mW	dBm	W	verdict
1	24.64	291.13			Pass
6	24.52	283.20			Pass
11	24.28	267.78	36	4	Pass
12	21.84	152.76			Pass
13	12.42	17.47			Pass

#### 802.11n-20 MHz Mode:

Channel	E.I.R.P		Limit		Verdict
Channel	dBm	mW	dBm	W	verdict
1	24.34	271.65			Pass
6	24.32	270.42			Pass
11	24.43	277.19	36	4	Pass
12	21.86	153.51			Pass
13	12.33	17.08			Pass

Channel	E.I	.R.P	Lir	nit	Verdict
Channel	dBm	mW	dBm	W	verdict
3	23.11	204.51			Pass
4	24.62	289.77			Pass
6	24.43	277.07			Pass
7	24.68	293.61	36		Pass
8	23.87	243.52	30	4	Pass
9	23.01	200.06			Pass
10	16.39	43.50			Pass
11	9.93	9.84			Pass



# A.2 Bandwidth

Note: All the configurations were tested, but only the worst data was shown in this report.

# <u>Test Data</u>

Main Antenna

802.11b Mode:

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
Channel	(MHz)	(MHz)	Limits (kHz)
1	9.100000	13.814000	≥500
6	8.650000	13.809000	≥500
11	8.600000	13.652000	≥500
12	9.100000	13.944000	≥500
13	9.100000	13.831000	≥500

## 802.11g Mode:

	Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
Ī	1	15.500000	16.833000	≥500
ſ	6	16.000000	16.884000	≥500
	11	15.800000	16.850000	≥500
	12	16.350000	16.906000	≥500
ſ	13	15.400000	16.801000	≥500

# 802.11n-20MHz Mode:

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
Channer	(MHz)	(MHz)	Limits (kHz)
1	17.100000	18.005000	≥500
6	16.100000	17.989000	≥500
11	16.400000	18.038000	≥500
12	17.000000	18.049000	≥500
13	17.000000	17.951000	≥500

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
	(MHz)	(MHz)	Limits (kHz)
3	35.200000	36.309000	≥500
4	35.150000	36.316000	≥500
6	35.400000	36.286000	≥500
7	35.200000	36.289000	≥500
8	35.200000	36.206000	≥500
9	35.200000	36.227000	≥500
10	35.500000	36.289000	≥500
11	35.800000	36.303000	≥500



# Aux. Antenna

#### 802.11b Mode:

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
Channel	(MHz)	(MHz)	Limits (kHz)
1	8.650000	13.787000	≥500
6	8.600000	13.728000	≥500
11	8.650000	13.896000	≥500
12	9.150000	14.000000	≥500
13	8.150000	13.774000	≥500

# 802.11g Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
1	15.800000	16.987000	≥500
6	15.350000	16.996000	≥500
11	15.550000	17.040000	≥500
12	16.150000	17.058000	≥500
13	15.500000	16.978000	≥500

#### 802.11n-20MHz Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
1	16.000000	18.051000	≥500
6	15.200000	18.023000	≥500
11	16.400000	18.066000	≥500
12	17.000000	18.092000	≥500
13	15.200000	18.018000	≥500

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)
3	36.150000	36.365000	≥500
4	36.150000	36.432000	≥500
6	35.150000	36.240000	≥500
7	35.200000	36.209000	≥500
8	35.500000	36.184000	≥500
9	35.200000	36.236000	≥500
10	35.750000	36.347000	≥500
11	35.800000	36.323000	≥500



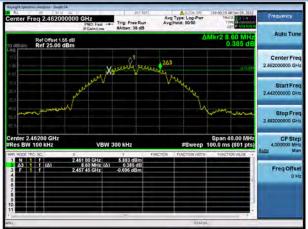
## Test Plots Main Antenna

#### 6 dB Bandwidth

#### 802.11b CHANNEL 1



# 802.11b CHANNEL 11



# 802.11b CHANNEL 13



#### 802.11b CHANNEL 6



#### 802.11b CHANNEL 12





# 802.11g CHANNEL 1



# 802.11g CHANNEL 6



#### 802.11g CHANNEL 11



## 802.11g CHANNEL 13



#### 802.11g CHANNEL 12

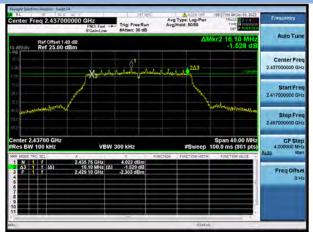




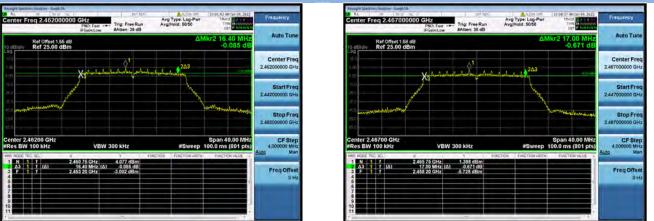
#### 802.11n-20 MHz CHANNEL 1



#### 802.11n-20 MHz CHANNEL



#### 802.11n-20 MHz CHANNEL 12



#### 802.11n-20 MHz CHANNEL 13

802.11n-20 MHz CHANNEL 11





#### 802.11n-40 MHz CHANNEL 3

802.11n-40 MHz CHANNEL 6

Eryanit Spectral Auspect Surgest August States States

X

2.442.00 GHz 0.600 dBm 35.40 MHz (Δ) -1.188 dB 2.419.20 GHz -5.719 dBm

Ref Offset 1,49 dB Ref 25.00 dBm

enter 2.43700 GHz tes BW 100 kHz

A3 1 7 (A) F 1 7



Avg Type: Log-Pwr Avg Hold: 50:50 11:15:11:44 Jan (6, 202 TRACZ T 2 4 TIPE

5.40 MH

Span 80.00 MH eep 100.1 ms (1601 pt Auto Tun

Center Free 2.437000000 GH

2.39

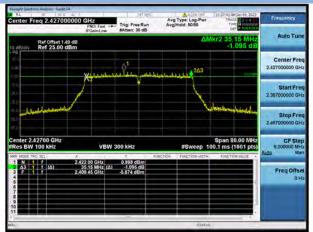
Start Fre

Stop Fre

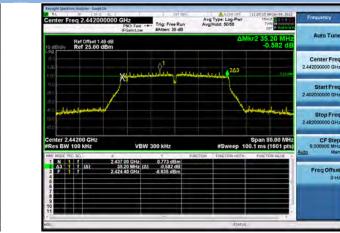
CF Step

Freq Offse

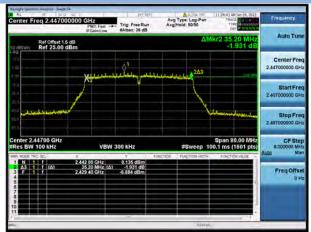
#### 802.11n-40 MHz CHANNEL



#### 802.11n-40 MHz CHANNEL 7



#### 802.11n-40 MHz CHANNEL 8



#### 802.11n-40 MHz CHANNEL 9

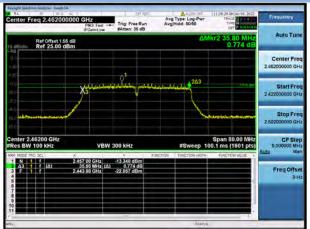




#### 802.11n-40 MHz CHANNEL 10



# 802.11n-40 MHz CHANNEL 11





#### 99% Bandwidth

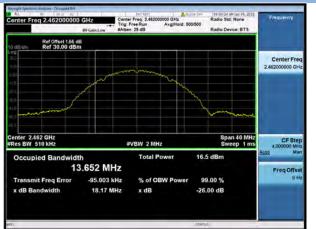




#### 802.11b CHANNEL 6



#### 802.11b CHANNEL 11



#### 802.11b CHANNEL 13



#### 802.11b CHANNEL 12





# 802.11g CHANNEL 1



#### 802.11g CHANNEL 6



#### 802.11g CHANNEL 11



#### 802.11g CHANNEL 13



#### 802.11g CHANNEL 12





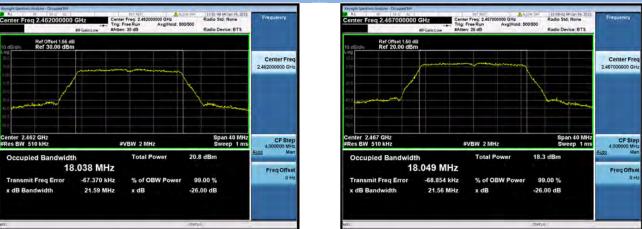
#### 802.11n-20 MHz CHANNEL 1



#### 302.11n-20 MHz CHANNEL 6



#### 802.11n-20 MHz CHANNEL 12



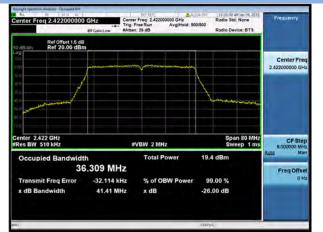
#### 802.11n-20 MHz CHANNEL 13

802.11n-20 MHz CHANNEL 11





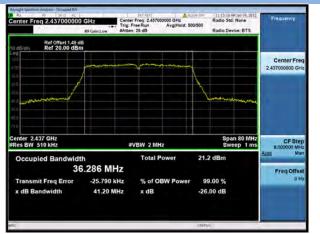
#### 802.11n-40 MHz CHANNEL 3



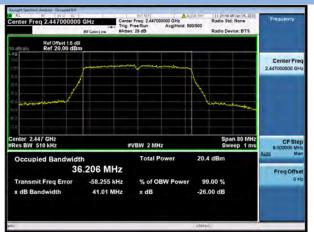
#### 302.11n-40 MHz CHANNEL



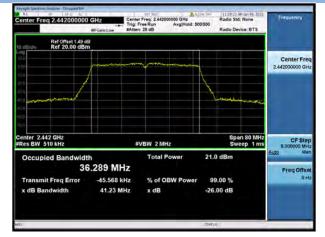
#### 802.11n-40 MHz CHANNEL 6



#### 802.11n-40 MHz CHANNEL 8



#### 802.11n-40 MHz CHANNEL 7



# 802.11n-40 MHz CHANNEL 9





# 802.11n-40 MHz CHANNEL 10

Center Freq 2.457000000	Trig: I	r Freq: 2.457000000 GHz Free Run Avg(Hold: 5 h: 20 dB	CON ON: 11:34:40 AM tan 0 Radio Std: Non Radio Device: B	Frequency
to dEraily Ref Offset 1,53 d				
160 6 00 160 360	/	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Center Freq 2.457000000 GHz
			himme	
Center 2.457 GHz #Res BW 510 kHz	*	VBW 2 MHz	Span 80 Sweep	1 ms 8.000000 MHz
Occupied Bandwidt	<sup>h</sup> 5.289 MHz	Total Power	13.3 dBm	Auto Man Freq Offset
Transmit Freq Error x dB Bandwidth	-51.250 kHz 41.12 MHz	% of OBW Power x dB	99.00 % -26.00 dB	0 Hz
uso.			STATUS	

# 802.11n-40 MHz CHANNEL 11





# Aux. Antenna

## 6 dB Bandwidth



#### 802.11b CHANNEL 6



Ma





## 802.11b CHANNEL 13





# 802.11g CHANNEL 1



# 802.11g CHANNEL 6



#### 802.11g CHANNEL 11



#### 802.11g CHANNEL 13



#### 802.11g CHANNEL 12

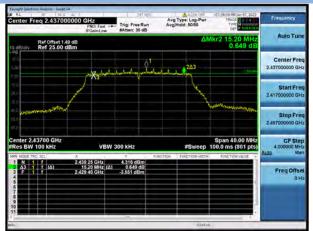




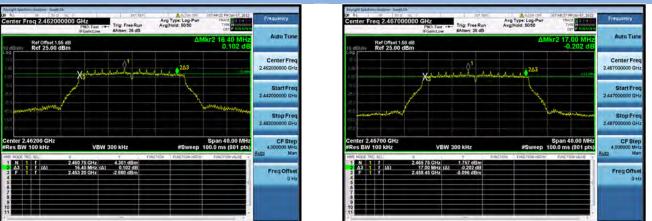
#### 802.11n-20 MHz CHANNEL 1



#### 802.11n-20 MHz CHANNEL



#### 802.11n-20 MHz CHANNEL 12



#### 802.11n-20 MHz CHANNEL 13

802.11n-20 MHz CHANNEL 11





Auto Tun

Center Fre 2.442000000 GH

Start Fre

Stop Fre

CF Ster 8.000000 MH Ma

Freq Offset

#### 802.11n-40 MHz CHANNEL 3

802.11n-40 MHz CHANNEL 6

Tenuer Spectrum Analysis - Sector - Physics -

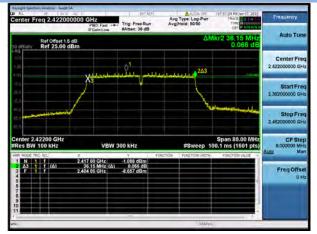
VIL

2.440 75 GHz 0.664 dBm 35,15 MHz (Δ) -1.166 dB 2.419 45 GHz -5.404 dBm

Ref Offset 1,49 dB Ref 25.00 dBm

enter 2.43700 GHz tes BW 100 kHz

Δ3 1 7 ΙΔ1. F 1 f



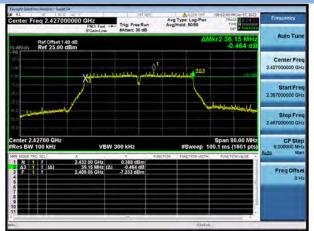
Avg Type: Log-Pwr Avg/Hold: 50/50

TIPE

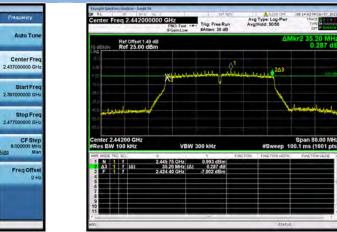
5.15 MI -1.166 c

Span 80.00 MH

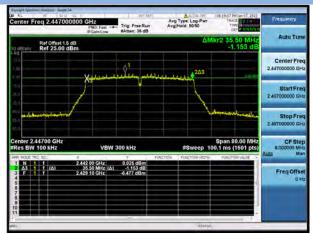
#### 802.11n-40 MHz CHANNEL



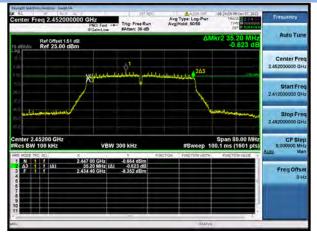
#### 802.11n-40 MHz CHANNEL 7



#### 802.11n-40 MHz CHANNEL 8



#### 802.11n-40 MHz CHANNEL 9

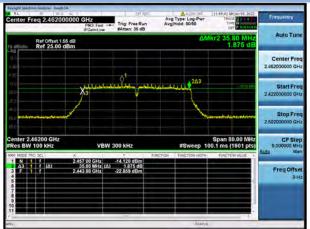




#### 802.11n-40 MHz CHANNEL 10



# 802.11n-40 MHz CHANNEL 11





#### 99% Bandwidth

#### 802.11b CHANNEL 1



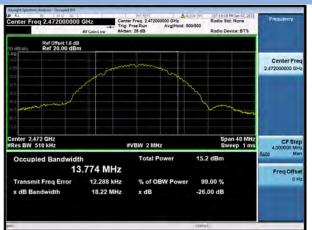
#### 802.11b CHANNEL 6



#### 802.11b CHANNEL 11



#### 802.11b CHANNEL 13

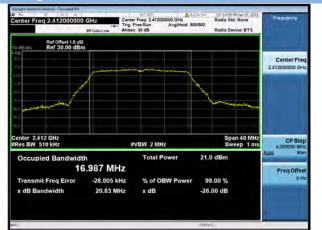


#### 802.11b CHANNEL 12





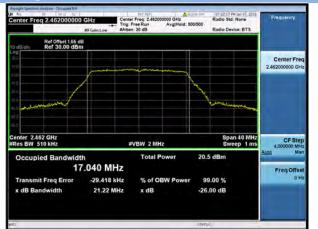
# 802.11g CHANNEL 1



#### 802.11g CHANNEL 6



#### 802.11g CHANNEL 11



#### 802.11g CHANNEL 13



#### 802.11g CHANNEL 12





#### 802.11n-20 MHz CHANNEL 1



#### 802.11n-20 MHz CHANNEL 6



#### 802.11n-20 MHz CHANNEL 12



#### 802.11n-20 MHz CHANNEL 13

802.11n-20 MHz CHANNEL 11





802.11n-40 MHz CHANNEL 6

enter Freq 2.437000000 GHz

Ref Offset 1.49 dB Ref 20.00 dBm

Center 2.437 GHz #Res BW 510 kHz

Occupied Bandwidth

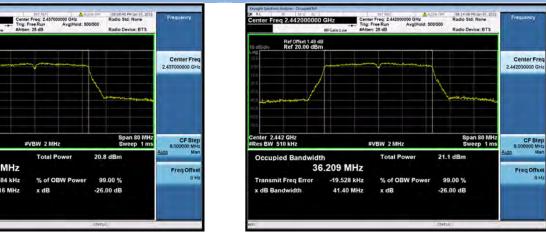
Transmit Freq Error

x dB Bandwidth





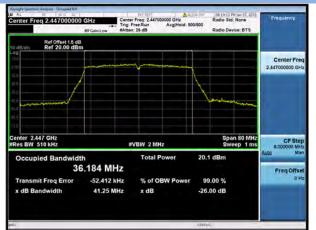
#### 802.11n-40 MHz CHANNEL 7



36.240 MHz

-13.684 kHz

41.16 MHz







#### 802.11n-40 MHz CHANNEL 10



# 802.11n-40 MHz CHANNEL 11





# A.3 Conducted Spurious Emissions

Note: All the configurations were tested, but only the worst data was shown in this report.

<u>Test Data</u>

Main Antenna

802.11b Mode:

	Measured Max. Out of	Limit (	dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-46.63	5.28	-14.72	Pass
6	-46.98	5.83	-14.17	Pass
11	-48.52	5.86	-14.14	Pass
12	-48.51	4.58	-15.42	Pass
13	-46.44	4.25	-15.75	Pass

#### 802.11g Mode:

	Manaurad Max, Out of	Measured Max. Out of		
Channel	Band Emission (dBm)	Corrier Lovel	Calculated 20	Verdict
	Danu Emission (ubm)	(dBm) Carrier Level	dBc Limit	
1	-46.54	5.16	-14.84	Pass
6	-48.39	4.53	-15.47	Pass
11	-48.79	4.43	-15.57	Pass
12	-47.38	1.90	-18.10	Pass
13	-47.87	-7.01	-27.01	Pass

	Measured Max. Out of	Limit (	dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20	Verdict
		Camer Lever	dBc Limit	
1	-46.98	4.63	-15.37	Pass
6	-46.94	4.70	-15.30	Pass
11	-47.77	4.74	-15.26	Pass
12	-46.56	2.09	-17.91	Pass
13	-46.52	-6.81	-26.81	Pass



## 802.11n-40MHz Mode:

	Measured Max. Out of	Limit (	dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
3	-47.51	-1.03	-21.03	Pass
4	-47.65	1.04	-18.96	Pass
6	-47.11	0.71	-19.29	Pass
7	-47.21	0.95	-19.05	Pass
8	-47.97	0.34	-19.66	Pass
9	-48.69	-0.25	-20.25	Pass
10	-47.87	-6.76	-26.76	Pass
11	-48.32	-13.28	-33.28	Pass

## Aux. Antenna

802.11b Mode:

	Measured Max. Out of	Limit (	dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-46.66	5.40	-14.60	Pass
6	-47.80	5.84	-14.16	Pass
11	-48.18	5.72	-14.28	Pass
12	-47.33	4.55	-15.45	Pass
13	-48.08	4.69	-15.31	Pass

# 802.11g Mode:

	Measured Max. Out of	Limit (	dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-46.65	4.93	-15.07	Pass
6	-47.54	4.98	-15.02	Pass
11	-45.53	4.32	-15.68	Pass
12	-46.61	1.78	-18.22	Pass
13	-47.33	-7.10	-27.10	Pass

	Measured Max. Out of	Limit (	dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-46.85	4.97	-15.03	Pass
6	-46.48	5.00	-15.00	Pass
11	-46.60	4.81	-15.19	Pass
12	-47.01	2.09	-17.91	Pass
13	-47.21	-7.21	-27.21	Pass

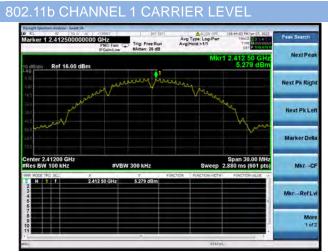


Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		
		Carrier Level	Calculated 20 dBc Limit	Verdict
3	-47.79	-0.93	-20.93	Pass
4	-47.31	0.62	-19.38	Pass
6	-47.46	0.79	-19.21	Pass
7	-46.92	1.26	-18.74	Pass
8	-47.01	0.25	-19.75	Pass
9	-47.80	-0.51	-20.51	Pass
10	-46.64	-7.28	-27.28	Pass
11	-47.32	-13.88	-33.88	Pass

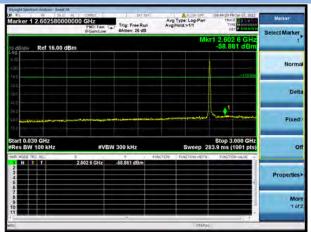


#### Test Plots

#### Main Antenna



802.11b CHANNEL 1, SPURIOUS 30 MHz ~ 3 GHz



# 802.11b CHANNEL 1, SPURIOUS 2 GHz ~ 25 GHz

Aarker 1 21.113000000	000 GHz PN0: Fast G IFGaint.ow	Trig: Free Run #Atten: 26 dB	Avg Type: Log-Pwr Avg Hold.>1/1	CALL PLAN 07, 2022	Peak Search Next Peak
9 dBL/8// Ref 15.00 dBm					
8 00 4.00					Next Pk Righ
12.0 24.0 51.0				•1	Next Pk Lei
	www.una	and the second second		umum.	Marker Delt
Start 2.00 GHz Res BW 100 kHz		V 300 kHz	Sweep	Stop 25.00 GHz 2.198 s (4001 pts)	MkrC
	1.113 00 GHz	-46.625 dBm			Mkr-+Ref L
6 7 8 9 10					Mor 1 of
90)			STATU	117	

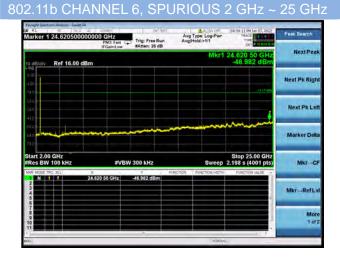
#### 802.11b CHANNEL 6 CARRIER LEVEL





802.11b CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz

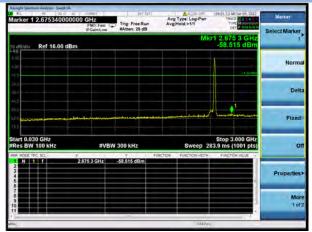
or 1 2,648370000000 GHz PN0: Fast Car PN0: Fast Car Atten: 28 dB Avg Type: Log-Pwr AvgHold:>1/1 Marke THACE THE MUNICIPAL Select Marker Mkr1 2.648 4 0 Ref 16.00 dBm Norm Delt ¢ Fixed Start 0.030 GHz Res BW 100 kHz Stop 3.000 GHz Sweep 283.9 ms (1001 pts) #VBW 300 kHz 01 2 648 4 GHz Prop Mon



## 802.11b CHANNEL 11 CARRIER LEVEL



#### 802.11b CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz 802.11b CHANNEL 11, SPURIOUS 2 GHz ~ 25 GHz







# 802.11b CHANNEL 12 CARRIER LEVEL



# 802.11b CHANNEL 12, SPURIOUS 30 MHz ~ 3 GHz 802.11b CHANNEL 12, SPURIOUS 2 GHz ~ 25 GHz

Reyout

ect Marker,
Norma
Deita
Fixed
n
Properties
Mon

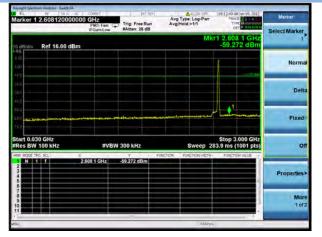
Marker 1 24.22375000	PNO: Fast Trig: Free Run EFGaint.ow #Atten: 26 dB	Avg Type: Log-Pwr Avg Hold > 1/1 Time Ott	Peak Search Next Peak		
Mkr1 24.223 75 GHz 9 dBidly Ref 16.00 dBm 448.512 dBm					
4.00 4.00		-1142/00	Next Pk Righ		
320 340 440			Next Pk Lef		
640 910 110	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Marker Delta		
Start 2.00 GHz #Res BW 100 kHz	#VBW 300 kHz	Stop 25.00 GHz Sweep 2.198 s (4001 pts)	MkrCl		
HORE INCIDE TRG SCL	24.223 75 GHz 48.512 dBm	NCTION FUNCTION WETH FUNCTION VALUE -	MkrRef Lv		
6 7 8 9 10			Mor 1 of 3		
y Hab)		STATUS			

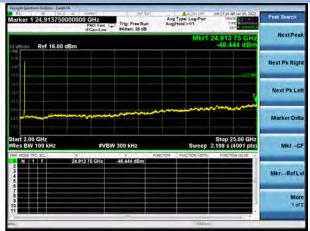
# 802.11b CHANNEL 13 CARRIER LEVEL





#### 802.11b CHANNEL 13, SPURIOUS 30 MHz ~ 3 GHz 802.11b CHANNEL 13, SPURIOUS 2 GHz ~ 25 GHz

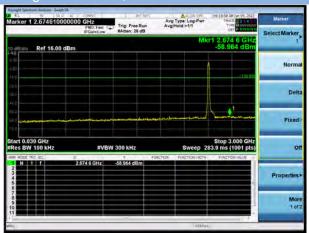


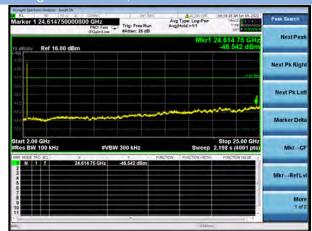


#### 802.11g CHANNEL 1 CARRIER LEVEL



#### 802.11g CHANNEL 1, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 1, SPURIOUS 2 GHz ~ 25 GHz





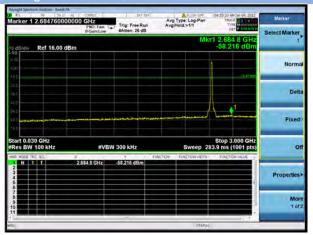


Peak Sea

# 802.11g CHANNEL 6 CARRIER LEVEL



#### 802.11g CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz



#### Marker 121.13600000000 GHz PND: Fast Trig: Free Run PND: Fast Avg Type: Log-Pwr Avg/Hold >1/1 109-25:32 4H Jan 09, 202 TRACE 101 41 TITRE NextPeak 21.136 00 Ref 16.00 dBm Next Pk Righ Next Pk Lef Marker Del Stop 25.00 GHz es BW 100 kHz #VBW 300 kHz 21.136 00 GHz Mkr-RefL More 1 of 2

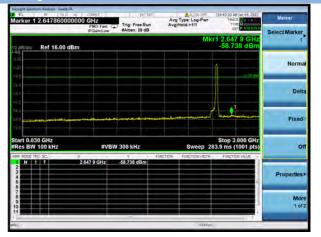
802.11g CHANNEL 6, SPURIOUS 2 GHz ~ 25 GHz

# 802.11g CHANNEL 11 CARRIER LEVEL





#### 802.11g CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 11, SPURIOUS 2 GHz ~ 25 GHz

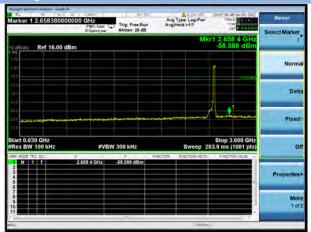




### 802.11g CHANNEL 12 CARRIER LEVEL



#### 802.11g CHANNEL 12, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 12, SPURIOUS 2 GHz ~ 25 GHz







16 OFF 169-51-10 AH tan 09, 2022

# 802.11g CHANNEL 13 CARRIER LEVEL



# 802.11g CHANNEL 13, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 13, SPURIOUS 2 GHz ~ 25 GHz

Reysonth Sp

arker 1 2.81183000	00000 GHz	Trig: Free Run	Avg Type: Log-Pwr Avg/Hold>1/1	199:50:57 44 tan (0, 2)22 76AC2 199:50 4	Marker
	IFGaintLow	#Atten: 26 dB		OUT PRIMINAN	Seject Marker
o dBraw Ref 16.00 d	r1 2.811 8 GHz -58.659 dBm	1			
-00 -00 					Norma
12.0 (2.0 36.0				-Pie Ko	Deita
40 99 19 19		ang kanalan menanan	الدينة مقرم المرجوع والمرجوع والمرجوع	lamon las	Fixed
Start 0.030 GHz Res BW 100 kHz		300 kHz		Stop 3.000 GHz 83.9 ms (1001 pts)	o
PR MODE TRG SCL	2.811 8 GHz	-58,659 dBm	NCTION FUNCTION WOTH	FORCTION VALUE	Properties
6 7 8 9 10					Mor 1 of
		~		ULT .	1

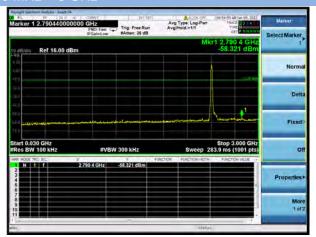
Peak Search		76	Type: Log-Pwr Hold:>1/1	hun Av	Trig: Free Ro	GHz PNO: Fast Gain:Low	000000	182000	1 21.	ker 1	Mar
NextPeak	2 00 GHz 865 dBm	21.18	Mkr1				dBm	16.00	Re	Brdiy	10 di
Next Pk Righ											
Next Pk Lei		<b>●</b> 1									
Marker Delt		m			m	-	-	معجيني		-	543) 548 548 760
MkrC	25.00 GHz (4001 pts)	2.198 s			W 300 kHz			kHz	100	rt 2.0 s BW	≡Re
_	TION VALUE	FUNC	FUNCTION WOTH		-47.865 dBm				NG SCI		2
Mkr-Ref Ly											345
Mon 1 of	1										0789 10
-	_		STÁTU						-	-	ena)

### 802.11n-20 MHz CHANNEL 1 CARRIER LEVE





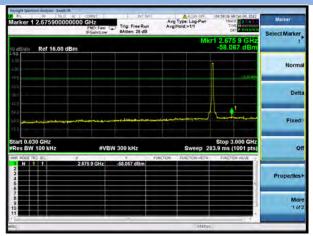
# 802.11n-20 MHz CHANNEL 1, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 6 CARRIER LEVE



# 802.11n-20 MHz CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz

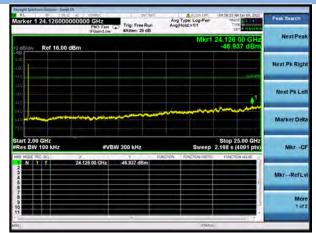


### 802.11n-20 MHz CHANNEL 1, SPURIOUS

### 2 GHz ~ 25 GHz

Peak Search	19935-17 44 tan (9, 2022 TRACE 12 14 14 TIPE A	Type: Log-Pwr Hold:>1/1	Run	10000	GHZ PNO: Fast C.	03250000000	rker 1 24.60				
NextPeak	24.603 25 GHz -46.984 dBm	0 det.dv/ Ref 16.00 dBm - 46.984 dBm									
Next Pk Righ											
Next Pk Lei							0 0				
Marker Delt	······			-	-						
Mkr-C	Stop 25.00 GHz 2.198 s (4001 pts) FUNCTION VALUE			300 kHz		kHz ×	es BW 100 k				
MkrRef Lv				-40,904 Gt	20 GHZ	24.59					
Mon 1 of:											
-		STAPLE		-	_						

# 802.11n-20 MHz CHANNEL 6, SPURIOUS

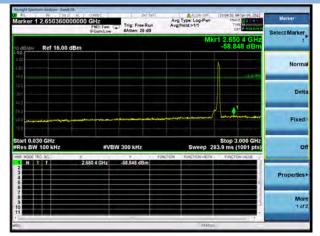




### 802.11n-20 MHz CHANNEL 11 CARRIER LEVEL



# 802.11n-20 MHz CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 12 CARRIER LEVEL

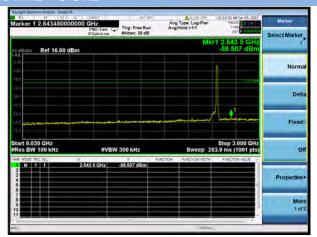


### 802.11n-20 MHz CHANNEL 11, SPURIOUS 2 GHz ~ 25 GHz

Marker 1 24.24675000	0000 GHz PNO: Fast C IFGaint.cm	Trig: Free Run #Atten: 26 dB	Avg Type: Log-Pwr Avg[Hold:>1/1	10:05:11 4H Jan (9, 2)22 TRACZ 00 2012	Peak Search
o dBraw Ref 16.00 dB	24.246 75 GHz -47.772 dBm	Next Peak			
8 00 4.00					Next Pk Righ
140					Next Pk Lef
40 540 540			-	manut	Marker Delta
Start 2.00 GHz Res BW 100 kHz	#VB	W 300 kHz		Stop 25.00 GHz 2.198 s (4001 pts)	MkrCf
	X 24.246 75 GHz	47.772 dBm	NCTION FUNCTION WOTH	FUNCTION VALUE	Mkr-+RefLv
6 7 8 9 10					Mor 1 of:
				100	-



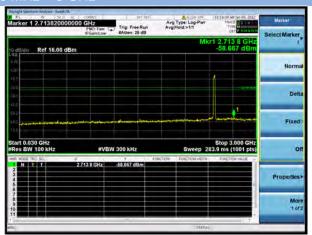
# 802.11n-20 MHz CHANNEL 12, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 13 CARRIER LEVE

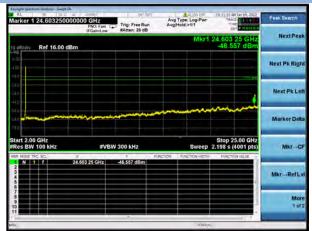


# 802.11n-20 MHz CHANNEL 13, SPURIOUS 30 MHz ~ 3 GHz

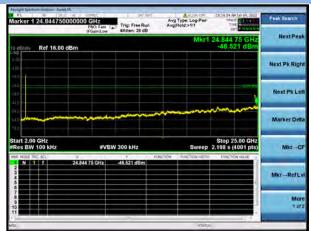


### 802.11n-20 MHz CHANNEL 12, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-20 MHz CHANNEL 13, SPURIOUS

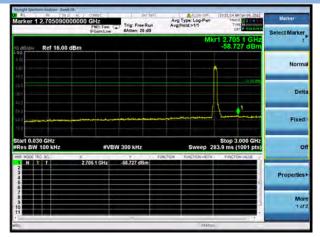




### 802.11n-40 MHz CHANNEL 3 CARRIER LEVE



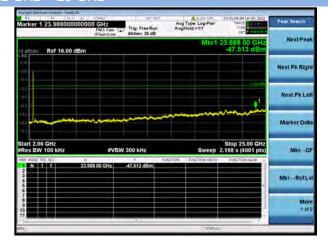
# 802.11n-40 MHz CHANNEL 3, SPURIOUS 30 MHz ~ 3 GHz



# 802.11n-40 MHz CHANNEL 4 CARRIER LEVEL

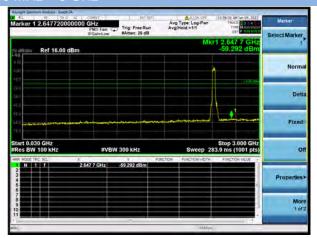


### 802.11n-40 MHz CHANNEL 3, SPURIOUS 2 GHz ~ 25 GHz





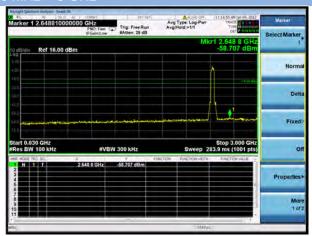
# 802.11n-40 MHz CHANNEL 4, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-40 MHz CHANNEL 6 CARRIER LEVE

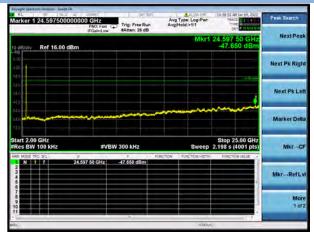


# 802.11n-40 MHz CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz

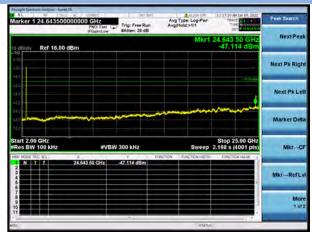


### 802.11n-40 MHz CHANNEL 4, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-40 MHz CHANNEL 6, SPURIOUS

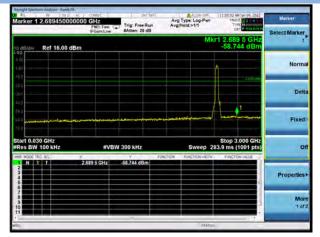




### 802.11n-40 MHz CHANNEL 7 CARRIER LEVEI



# 802.11n-40 MHz CHANNEL 7, SPURIOUS 30 MHz ~ 3 GHz



# 802.11n-40 MHz CHANNEL 8 CARRIER LEVEL

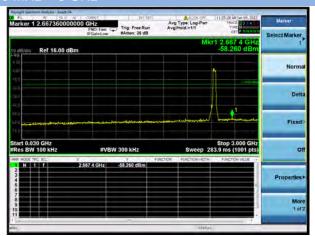


### 802.11n-40 MHz CHANNEL 7, SPURIOUS 2 GHz ~ 25 GHz

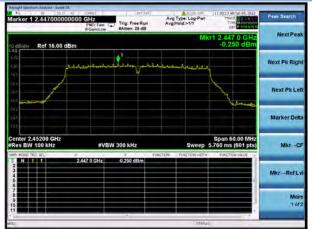
Peak Search	11:31:31 44 3an (9, 2922 THACZ 123 4 5 TIPE MINING	vg Type: Log-Pwr vg Hold.>1/1		10000	DO GHZ PNO: Fast C	2640000000	r 1 24.	Marke		
Next Peak	24.264 00 GHz -47.208 dBm									
Next Pk Righ								-99. 8-67 -		
Next Pk Let	4106.00							440 280 		
Marker Delt	·····				a juma			543) 548 740		
MkrC	Stop 25.00 GHz 2.198 s (4001 pts)			N 300 kHz	#VB	kHz	.00 GH 3W 100	Res		
MkrRef Lv	FUNCTION VALUE	PUNCTION WETH	FDU 3m	-47.208 di	64 00 GHz			1 N 2 3 4 5		
Mon 1 of								6 7 8 9 10		
-	1.1	STAPUS						+ (50)		



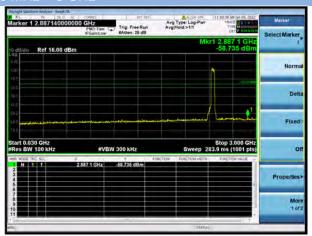
# 802.11n-40 MHz CHANNEL 8, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-40 MHz CHANNEL 9 CARRIER LEVE



# 802.11n-40 MHz CHANNEL 9, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-40 MHz CHANNEL 8, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-40 MHz CHANNEL 9, SPURIOUS

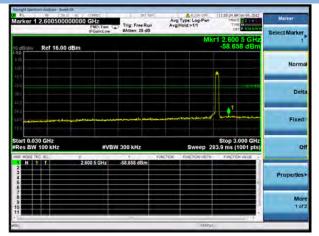




### 802.11n-40 MHz CHANNEL 10 CARRIER LEVEL



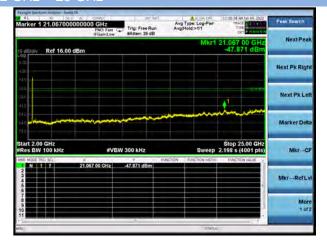
# 802.11n-40 MHz CHANNEL 10, SPURIOUS 30 MHz ~ 3 GHz



# 802.11n-40 MHz CHANNEL 11 CARRIER LEVEL



### 802.11n-40 MHz CHANNEL 10, SPURIOUS 2 GHz ~ 25 GHz





# 802.11n-40 MHz CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz

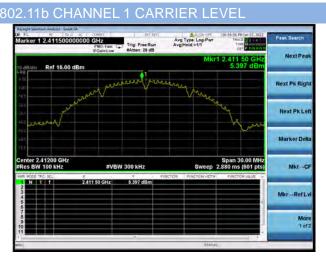
Mainer Select Marker	11:40:30 44 3an 09, 2022 TRACZ 0 2 3 4 2 TIPE OUT P TRACK	Type: Log-Pwr Hold:>1/1	Av Av		00000 GHz PNO: Fast C IFGaintLow	ker 1 2.7272700				
Sejectmarker,	2.727 3 GHz -58.832 dBm	Alstan Ref 16.00 dBm - 59.832 dBm - 59.832 dBm								
Norma										
Deita	-724 (19)									
Fixed		mana daga tangkan di		-						
o	Stop 3.000 GHz 3.9 ms (1001 pts) PUNCTION VALUE		FUNCTION	Ŷ		t 0.030 GHz s BW 100 kHz				
Properties				-58.832 dBn	2.727 3 GHz	N T T				
Mon										
1 613										

# 802.11n-40 MHz CHANNEL 11, SPURIOUS

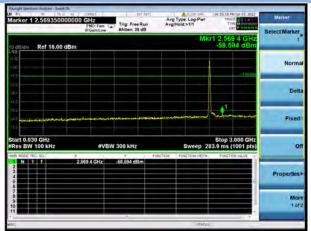
Marker 1 21.141750	AC COMPLC 0000000 GHz PNO: Fast C IFGaintLow	Trig: Free Run #Atten: 26 dB	Avg Type: Log-Pwr Avg(Hold,>1/1	111:40:43 AH tan 09, 2022 TRACE 12 2 4 4 TIRE AUTOM	Peak Search
to dBrdw Ref 16.00	21.141 75 GHz -48.320 dBm	NextPeak			
6 00 4.00					Next Pk Righ
210 -110					Next Pk Lei
543) 510 <b></b>				· ······	Marker Delt
Start 2.00 GHz #Res BW 100 kHz INR MODE TRC SCL	X			Stop 25.00 GHz 2.198 s (4001 pts) FUNCTION VALUE	MkrCl
	21.141 75 GHz	48.320 dBm			Mkr-+RefL
6 7 8 9					Mor



### Aux. Antenna



802.11b CHANNEL 1, SPURIOUS 30 MHz ~ 3 GHz



Marker 1 24.1030000000	PN0: Fast Can IFGaintLow #Atten: 26 dB	Avg Type: Log-Pwr Avg Hold > 11	
to dBldiv Ref 16.00 dBm		Mkr1 24.103 00 GHz -46.661 dBm	Next Peak
8 00 4.00 14 0			Next Pk Righ
240 - -440 -			Next Pk Let
540 93.0 710	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Marker Delt
Start 2.00 GHz #Res BW 100 kHz	#VBW 300 kHz	Stop 25.00 GHz Sweep 2.198 s (4001 pts)	MkrC
	13.00 GHz 46.661 dBm		Mkr-RefLy
7 8 9 10 11			Mor 1 of
ess)		STATUS	

802.11b CHANNEL 1, SPURIOUS 2 GHz ~ 25 GHz

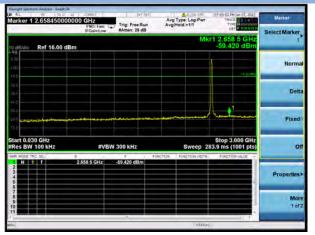
Keysight Sp

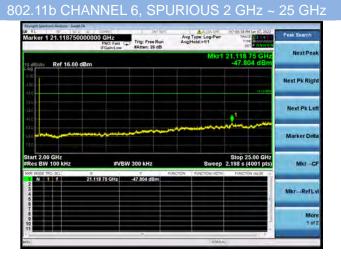
### 802.11b CHANNEL 6 CARRIER LEVEI





802.11b CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz

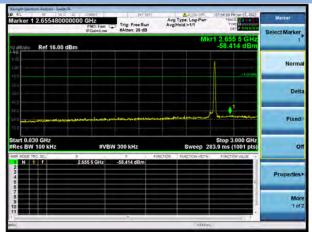




### 802.11b CHANNEL 11 CARRIER LEVEL



### 802.11b CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz 802.11b CHANNEL 11, SPURIOUS 2 GHz ~ 25 GHz







# 802.11b CHANNEL 12 CARRIER LEVEL



# 802.11b CHANNEL 12, SPURIOUS 30 MHz ~ 3 GHz 802.11b CHANNEL 12, SPURIOUS 2 GHz ~ 25 GHz

larker 1 2.801010000	AC COMPLE INF 10 0000 GHz PNO: Fass C Trig: Free Run	Avg Type: Log-Pwr	TRACE DO LE CONTRACT	Mariner				
	IFGain:Low #Atten: 26 dB		OUT P FINISTA	Seject Marker				
Mkr1 2.801 0 GHz 10 dBJaly Ref 16.00 dBm -58.724 dBm								
60 8 00 6.00			1	Norma				
14 () 24 ()			(15.45.805	_				
4.0				Deita				
S40	and the second		l'and the	Fixed				
10				Tured				
Res BW 100 kHz	#VBW 300 kHz	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	or				
N 1 F	2 801 0 GHz -58.724 dBm	FUNCTION PUNCTION WOTH	PUNCTION VALUE					
				Properties				
7. 9 10				Mon 1 of				

Marker 1 24,61475000	0000 GHz PNO: Fast C IFGaint on	Trig: Free Run #Atten: 26 dB	Avg Type: Log-Pwr Avg[Hold:>1/1	107:08:13 FM tan 07, 2022 TRACE D 3 4 4 5 TIPE OCT P 10 10 10	Peak Search Next Peak					
o dBldw Ref 16.00 dB	ABRAN Ref 16.00 dBm -47.334 dBm									
-00 0 00 					Next Pk Righ					
224) 34.0 44.0					Next Pk Lei					
541) 945				······	Marker Delt					
Start 2.00 GHz Res BW 100 kHz	#VB	W 300 kHz	Sweep	Stop 25.00 GHz 2.198 s (4001 pts)	MkrC					
1 N 1 F 2 3 4 5	24.614 75 GHz	-47.334 dBm			MkrRefLy					
6 7 8 9 10					Mor 1 of					
en)			STÂRUS	10						

# 802.11b CHANNEL 13 CARRIER LEVEL





### 802.11b CHANNEL 13, SPURIOUS 30 MHz ~ 3 GHz 802.11b CHANNEL 13, SPURIOUS 2 GHz ~ 25 GHz

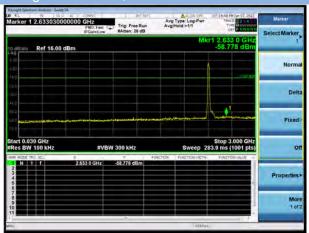




### 802.11g CHANNEL 1 CARRIER LEVEL



### 802.11g CHANNEL 1, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 1, SPURIOUS 2 GHz ~ 25 GHz





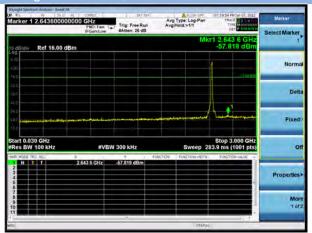


Peak Sea

# 802.11g CHANNEL 6 CARRIER LEVEL



802.11g CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz



### Marker 121.05700000000 GHz PND: Fast PRO: Fast Atten: 28 dB Avg Type: Log-Pwr Avg/Hold >1/1 120 29 Million 07, 202 TRACE 12 14 TIPE NextPeak 21.067 00 Ref 16.00 dBm Next Pk Righ Next Pk Lef Marker Del es BW 100 kHz Stop 25.00 GH 2.198 s (4001 pts #VBW 300 kHz 21.067 00 GHz Mkr-RefL More 1 of 2

802.11g CHANNEL 6, SPURIOUS 2 GHz ~ 25 GHz

# 802.11g CHANNEL 11 CARRIER LEVEL





### 802.11g CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 11, SPURIOUS 2 GHz ~ 25 GHz

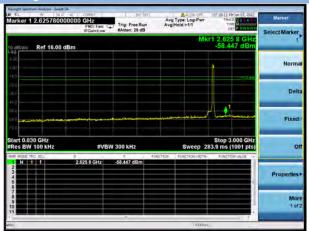




### 802.11g CHANNEL 12 CARRIER LEVEL



### 802.11g CHANNEL 12, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 12, SPURIOUS 2 GHz ~ 25 GHz







# 802.11g CHANNEL 13 CARRIER LEVEL



# 802.11g CHANNEL 13, SPURIOUS 30 MHz ~ 3 GHz 802.11g CHANNEL 13, SPURIOUS 2 GHz ~ 25 GHz

Mainer	107-32-29 PM ban 07, 2022 TRACZ 0 2 4 4 2 TIPE 0 2 4 4 2 TIPE 0 2 4 4 2	Type: Log-Pwr Hold.>1/1		Trig: Free		0000000 G	660410	ker 1 2.
Select Marka				#Atten: 26	FGaintLow	1		
	10 dB/div Ref 15.00 dBm -59.499 dBm							
Norr								
_	1							
De								
_	01							
Fixe	- Jana Manada an		-Acreato-				- Alexander	
z	Stop 3.000 GHz 83.9 ms (1001 pts)	Sweep 28		300 kHz	#VBW			rt 0.030 ( s BW 10
	FUNCTION VALUE	FUNCTION WETH	FUNC	-58,499 dB	4 GHz	× 2.660		NODE TRO I
Propertie								ی ہے۔ اے ای
M								
11								
		STATUS	_				_	

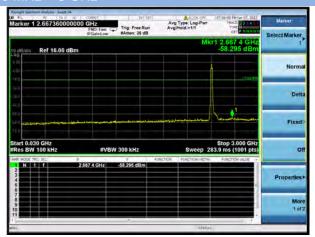
arker 1 24.6	14750000000 G		tun Avgl	Type: Log-Pwr Hold:>1/1	07:32:44 PM Jan 07, 2022 TRACE 2 2 2 4 2 TIPE: M	Peak Search Next Pea			
o dBrdiy Ref	Bildiv Ref 16.00 dBm 47.332 dBm								
100						Next PK Rig			
40 40 40						Next Pk La			
					manna	Marker De			
tart 2.00 GHz Res BW 100	kHz	#VBW 300 kHz	FUNCTION	Sweep	Stop 25.00 GHz 2.198 s (4001 pts)	Mkr0			
N 1 1 2 3 4 5	24.61475	GHz -47.332 dBn				Mkr-+RefL			
						<b>Mo</b> 1 of			
0			_	STATU	114	-			

### 802.11n-20 MHz CHANNEL 1 CARRIER LEVE





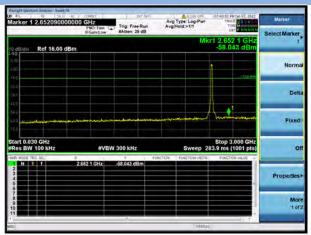
# 802.11n-20 MHz CHANNEL 1, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 6 CARRIER LEVE



# 802.11n-20 MHz CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 1, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-20 MHz CHANNEL 6, SPURIOUS

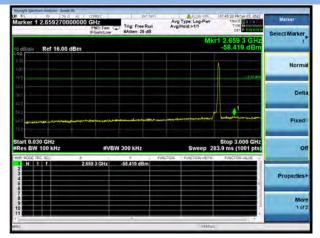




### 802.11n-20 MHz CHANNEL 11 CARRIER LEVEL



### 802.11n-20 MHz CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 12 CARRIER LEVEL

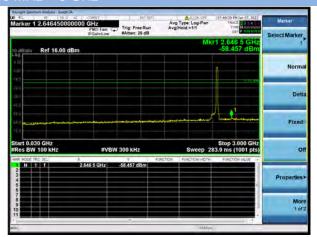


### 802.11n-20 MHz CHANNEL 11, SPURIOUS 2 GHz ~ 25 GHz

Peek Search	107:46-23 PM tan 07, 2022 TRACE 02 4 4 1 TIRE M	Type: Log-Pwr Hold:>1/1		Trig: Free R	000000 GHz PNO: Fast C IFGaint.cm	609000	arker 1 2
NextPeak	24.609 00 GHz -46.598 dBm	Mkr1				Ref 16.00 (	dB/div
Next Pk Righ							
Next Pk Lef							Ф
Marker Delta	· ······			·····			
MkrCf	Stop 25.00 GHz 2.198 s (4001 pts)	Sweep	FUNCTI	W 300 kHz	#VB	0 kHz	art 2.00 d tes BW 1
MkrRefLv				-46,598 dBm	24.609 00 GHz		N 1
More 1 of 3							
2		STAPUS	_				



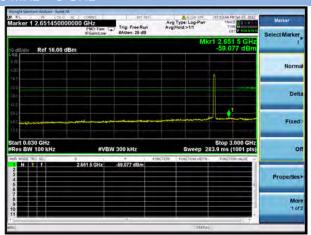
# 802.11n-20 MHz CHANNEL 12, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-20 MHz CHANNEL 13 CARRIER LEVE



# 802.11n-20 MHz CHANNEL 13, SPURIOUS 30 MHz ~ 3 GHz

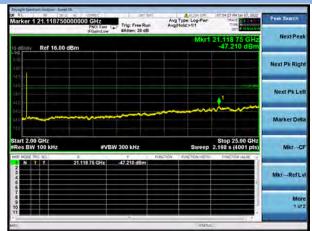


### 802.11n-20 MHz CHANNEL 12, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-20 MHz CHANNEL 13, SPURIOUS

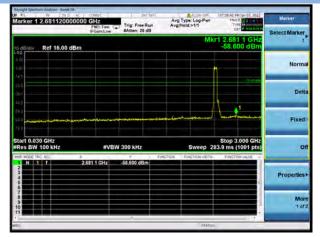




### 802.11n-40 MHz CHANNEL 3 CARRIER LEVEI



# 802.11n-40 MHz CHANNEL 3, SPURIOUS 30 MHz ~ 3 GHz



# 802.11n-40 MHz CHANNEL 4 CARRIER LEVEL

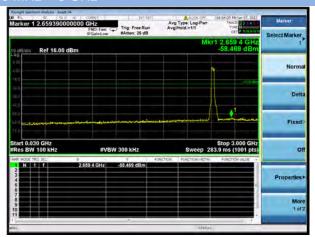


### 802.11n-40 MHz CHANNEL 3, SPURIOUS 2 GHz ~ 25 GHz





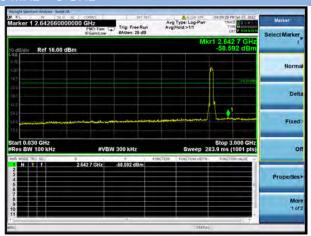
# 802.11n-40 MHz CHANNEL 4, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-40 MHz CHANNEL 6 CARRIER LEVE



# 802.11n-40 MHz CHANNEL 6, SPURIOUS 30 MHz ~ 3 GHz

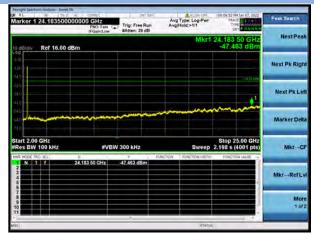


### 802.11n-40 MHz CHANNEL 4, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-40 MHz CHANNEL 6, SPURIOUS

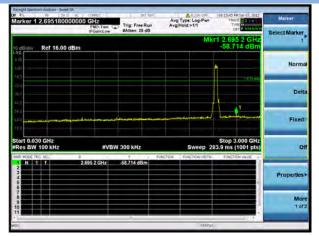




### 802.11n-40 MHz CHANNEL 7 CARRIER LEVEI



# 802.11n-40 MHz CHANNEL 7, SPURIOUS 30 MHz ~ 3 GHz



# 802.11n-40 MHz CHANNEL 8 CARRIER LEVEL

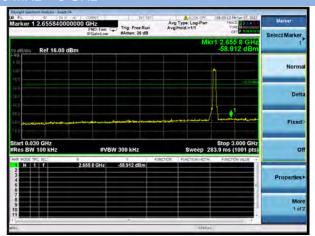


### 802.11n-40 MHz CHANNEL 7, SPURIOUS 2 GHz ~ 25 GHz

Marker 1 24,609000000	DO GH2 PNO: Fast C Trig: Free Run EGainclow #Atten: 28 dB	Avg Type: Log-Pwr Avg Hold > 1/1	108-10-00 FM tan 07, 2022 TRACE 0 2 F 400 TIRE 0 2 F 400 CAT P 400 FM 100	Peak Search
to dBraw Ref 16.00 dBm	Puper, University of the	Mkr1	24.609 00 GHz -46.917 dBm	Next Peak
8 00 4.00				Next Pk Righ
140				Next Pk Lef
520 510 710			And a start	Marker Delta
Start 2.00 GHz ≢Res BW 100 kHz	#VBW 300 kHz		Stop 25.00 GHz 2.198 s (4001 pts)	MkrCr
1978 MODE TRG SCI X 1 N 1 1 24. 2 3 4 5	609 00 GHz -46.917 dBm	שוכדומא די אינדומא אומדא	FUNCTION VALUE	MkrRef Lv
6 7 8 9 10				More 1 of 3
t Fal		STÁTU		



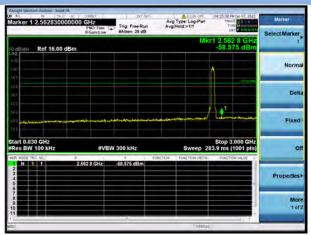
# 802.11n-40 MHz CHANNEL 8, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-40 MHz CHANNEL 9 CARRIER LEVE

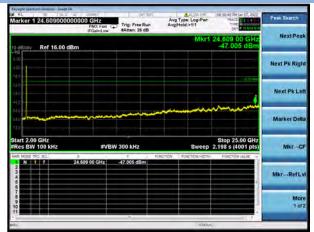


# 802.11n-40 MHz CHANNEL 9, SPURIOUS 30 MHz ~ 3 GHz



### 802.11n-40 MHz CHANNEL 8, SPURIOUS

### 2 GHz ~ 25 GHz



# 802.11n-40 MHz CHANNEL 9, SPURIOUS

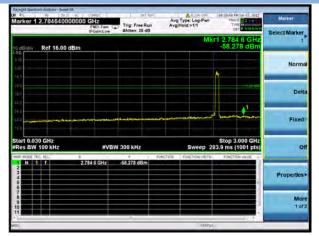




### 802.11n-40 MHz CHANNEL 10 CARRIER LEVEL



# 802.11n-40 MHz CHANNEL 10, SPURIOUS 30 MHz ~ 3 GHz



# 802.11n-40 MHz CHANNEL 11 CARRIER LEVEL



### 802.11n-40 MHz CHANNEL 10, SPURIOUS 2 GHz ~ 25 GHz

w 41	PNO: Fast Carrier Trig: Free Run IFGaint.ow #Atten: 26 dB	Avg Type: Log-Pwr	19830-07 He tan 07, 2022 TRACE DI TRACE TIPE MUNICIPALITY	Peek Search			
10 dBidw Ref 16.00 dBm	IFGainLow #Atten: 20 00 Mkr1 24.609 00 GHz						
600 -100				Next Pk Righ			
440 240 -340 -440				Next Pk Lef			
540 540 540 740			manut	Marker Delta			
Start 2.00 GHz #Res BW 100 kHz	#VBW 300 kHz		Stop 25.00 GHz 2.198 s (4001 pts)	MkrCf			
	.609 00 GHz -46.638 dBm	FUNCTION PUNCTION WOTH	FONCTION VALUE	MkrRefLv			
6 7 8 9 10				More 1 of 3			
* (50)		STATE	11.3				



# 802.11n-40 MHz CHANNEL 11, SPURIOUS 30 MHz ~ 3 GHz

Mainer Select Marker	11:45 28 44 34 09, 2922 TRACE 2 3 4 5 TIPE MILLION	Type: Log-Pwr Hold:>1/1	Run				ker 1 2.68569
Seject marker	1 2.685 7 GHz -58.333 dBm	Mik				6.00 dBm	Bidly Ref 16.0
Norma							
Delt	-2500 dile						
Fixed	Inantanan	ngandaaybershijded	n <b>t-</b> iter-iterge			- And a second	
or	Stop 3.000 GHz 3.9 ms (1001 pts) FUNCTION VALUE			¥		×	rt 0.030 GHz es BW 100 kHz MORE TRO SCL
Properties				-58.333 dB	1857 GHz	2.68	N 1 1
Mon 1 of:							
-	10	STAPUS		~			

# 802.11n-40 MHz CHANNEL 11, SPURIOUS

Marker 1 24.344500	COMPLC INTERI COODOLOG CH2 PNOT Fast Trig: Free Run IFGain:Low #Atten: 28 dB	Avg Type: Log-Pwr Avg[Hold.>1/1	111:45(44 AH Jan (H, 2)22 THAC2 113 2 4 5 THRE MANY	Peak Search Next Peak	
ID d5xdw Ref 16.00 dBm -47.319 dBm					
400 400 400				Next PK Righ	
24.0 54.0				Next Pk Lei	
540 540 540	·····		man	Marker Delt	
Start 2.00 GHz Res BW 100 kHz	#VBW 300 kHz		Stop 25.00 GHz 2.198 s (4001 pts)	MkrC	
N 1 7	24.344 50 GHz 47.319 dBm			MkrRef L	
5					



# A.4 Band Edge (Authorized-band band-edge)

Note <sup>1</sup>: All the configurations were tested, but only the worst data was shown in this report.

Note <sup>2</sup>: The 99% OBW of the fundamental emission is without 2 MHz of the authorized band. <u>Test Data</u>

### Main Antenna

### 802.11b Mode:

	Measured Max. Band	Limit		
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20	Verdict
	,		dBc Limit	
1	-46.10	5.28	-14.72	Pass
11	-56.52	5.86	-14.14	Pass
12	-54.07	4.58	-15.42	Pass
13	-48.09	4.25	-15.75	Pass

### 802.11g Mode:

	Measured Max. Band	Limit		
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-42.21	5.16	-14.84	Pass
11	-51.99	4.43	-15.57	Pass
12	-50.27	1.90	-18.10	Pass
13	-53.35	-7.01	-27.01	Pass

### 802.11n-20 MHz Mode:

	Measured Max. Band	Limit		
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-41.58	4.63	-15.37	Pass
11	-50.93	4.74	-15.26	Pass
12	-50.59	2.09	-17.91	Pass
13	-52.56	-6.81	-26.81	Pass

### 802.11n-40 MHz Mode:

	Measured Max. Band	Limit	(dBm)	
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20	Verdict
			dBc Limit	
3	-40.55	-1.03	-21.03	Pass
4	-43.97	1.04	-18.96	Pass
7	-52.02	0.95	-19.05	Pass
8	-52.50	0.34	-19.66	Pass
9	-51.89	-0.25	-20.25	Pass
10	-56.51	-6.76	-26.76	Pass
11	-50.62	-13.28	-33.28	Pass



# Aux. Antenna

# 802.11b Mode:

	Measured Max. Band		Limit (dBm)		
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict	
1	-43.28	5.40	-14.60	Pass	
11	-56.05	5.72	-14.28	Pass	
12	-53.94	4.55	-15.45	Pass	
13	-48.92	4.69	-15.31	Pass	

### 802.11g Mode:

	Measured Max. Band		Limit	Limit (dBm)		
	Channel			Calculated 20	Verdict	
		Edge Emission (dBm)	Carrier Level	dBc Limit		
ſ	1	-41.53	4.93	-15.07	Pass	
ſ	11	-51.98	4.32	-15.68	Pass	
	12	-51.15	1.78	-18.22	Pass	
ſ	13	-51.75	-7.10	-27.10	Pass	

# 802.11n-20 MHz Mode:

	Measured Max. Band	Limit		
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
1	-40.70	4.97	-15.03	Pass
11	-49.43	4.81	-15.19	Pass
12	-50.15	2.09	-17.91	Pass
13	-51.18	-7.21	-27.21	Pass

### 802.11n-40 MHz Mode:

Channel	Measured Max. Band Edge Emission (dBm)	Limit (dBm)		
		Carrier Level	Calculated 20	Verdict
			dBc Limit	
3	-40.00	-0.93	-20.93	Pass
4	-45.09	0.62	-19.38	Pass
7	-50.42	1.26	-18.74	Pass
8	-50.93	0.25	-19.75	Pass
9	-50.65	-0.51	-20.51	Pass
10	-56.94	-7.28	-27.28	Pass
11	-50.20	-13.88	-33.88	Pass



### Test Plots

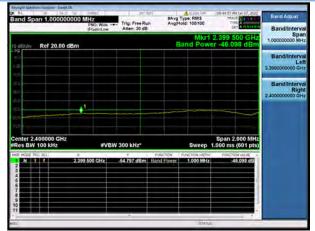
### Main Antenna



### 802.11b CHANNEL 1, Reference leve



### 802.11b CHANNEL 1, Band Edge

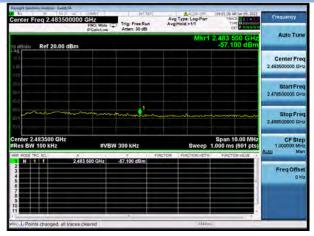


### 802.11b CHANNEL 11, Carrier leve

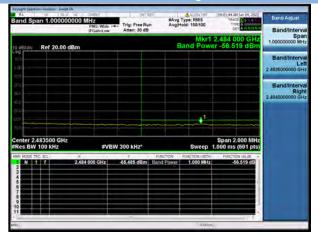




# 802.11b CHANNEL 11, Reference level



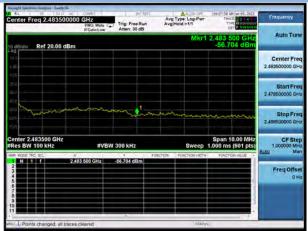
### 02.11b CHANNEL 11, Band Edge



### 802.11b CHANNEL 12, Carrier level



### 802.11b CHANNEL 12, Reference leve



### 802.11b CHANNEL 12, Band Edge





# 802.11b CHANNEL 13, Carrier level



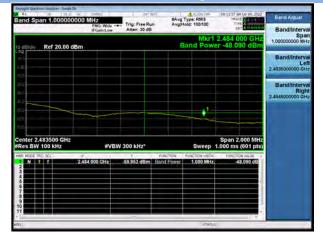
### 802.11b CHANNEL 13, Reference leve



# 802.11g CHANNEL 1, Carrier level



### 802.11b CHANNEL 13, Band Edge





# 802.11g CHANNEL 1, Reference level

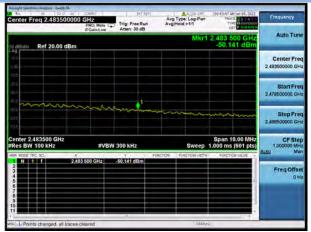


# 802.11g CHANNEL 1, Band Edge

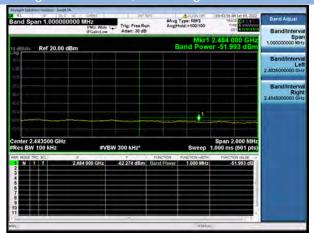
### 802.11g CHANNEL 11, Carrier level



# 802.11g CHANNEL 11, Reference level



# 802.11g CHANNEL 11, Band Edge

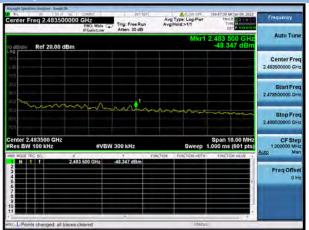




# 802.11g CHANNEL 12, Carrier level



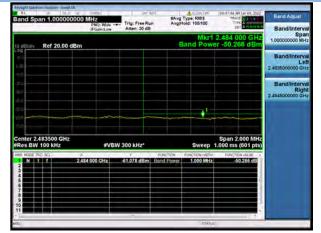
### 802.11g CHANNEL 12, Reference level



# 802.11g CHANNEL 13, Carrier level



### 802.11g CHANNEL 12, Band Edge





### 802.11g CHANNEL 13, Reference leve



### 02.11g CHANNEL 13, Band Edg



### 802.11n-20 MHz CHANNEL 1, Carrier level



### 802.11n-20 MHz CHANNEL 1, Reference leve



### 802.11n-20 MHz CHANNEL 1. Band Edg

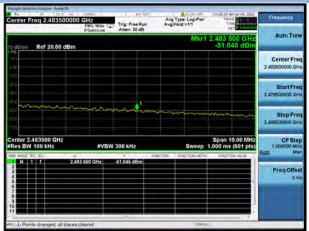




# 802.11n-20 MHz CHANNEL 11, Carrier level



### 802.11n-20 MHz CHANNEL 11, Reference level



### 802.11n-20 MHz CHANNEL 12, Carrier leve

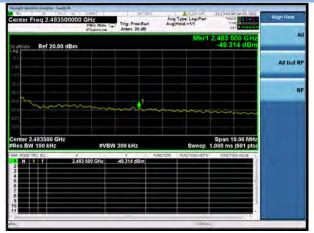


### 802.11n-20 MHz CHANNEL 11, Band Edge

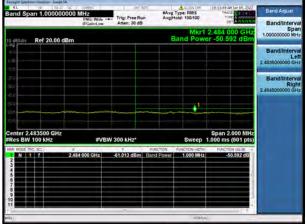




### 802.11n-20 MHz CHANNEL 12, Reference level



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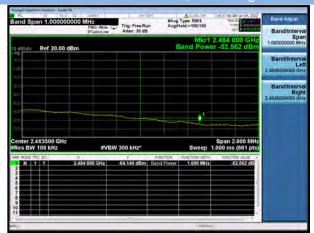
### 802.11n-20 MHz CHANNEL 13, Carrier level



### 802.11n-20 MHz CHANNEL 13, Reference level

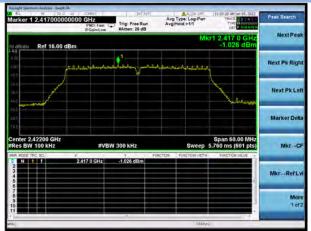


### 802.11n-20 MHz CHANNEL 13, Band Edge





# 802.11n-40 MHz CHANNEL 3, Carrier level



### 802.11n-40 MHz CHANNEL 3, Reference level



### 802.11n-40 MHz CHANNEL 4, Carrier leve

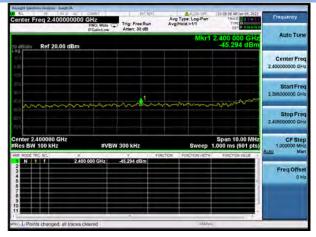


### 802.11n-40 MHz CHANNEL 3, Band Edge

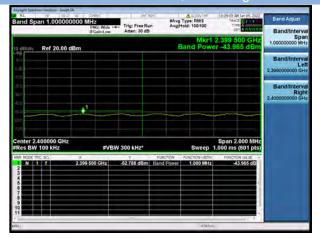




# 802.11n-40 MHz CHANNEL 4, Reference level



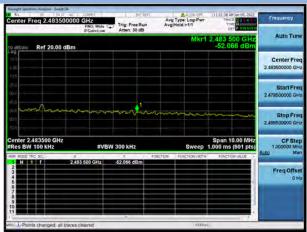
### 02.11n-40 MHz CHANNEL 4, Band Edge



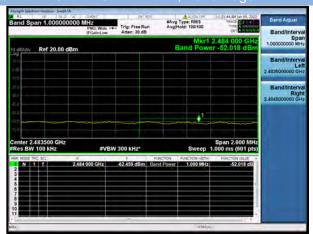
### 802.11n-40 MHz CHANNEL 7, Carrier level



### 802.11n-40 MHz CHANNEL 7, Reference leve



### 802.11n-40 MHz CHANNEL 7. Band Edg

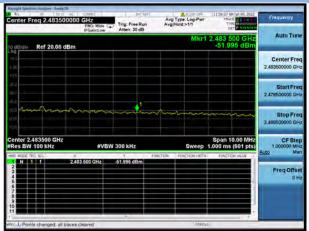




# 802.11n-40 MHz CHANNEL 8, Carrier level



### 802.11n-40 MHz CHANNEL 8, Reference level



### 802.11n-40 MHz CHANNEL 9, Carrier leve

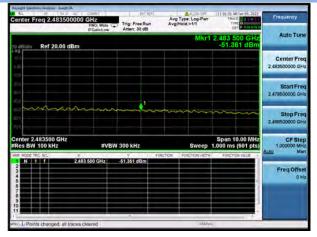


### 802.11n-40 MHz CHANNEL 8, Band Edge

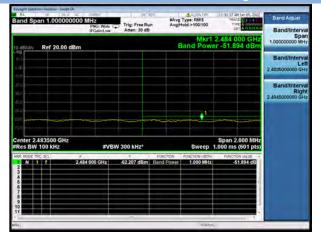




# 802.11n-40 MHz CHANNEL 9, Reference level



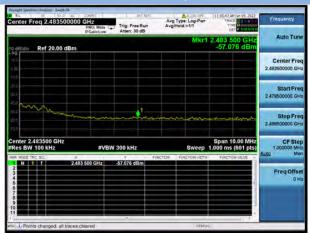
### 2.11n-40 MHz CHANNEL 9, Band Edg



### 802.11n-40 MHz CHANNEL 10, Carrier level



### 802.11n-40 MHz CHANNEL 10, Reference leve



### 802.11n-40 MHz CHANNEL 10. Band Edge

