FCC RF TEST REPORT

ISSUED BY Shenzhen BALUN Technology Co., Ltd.

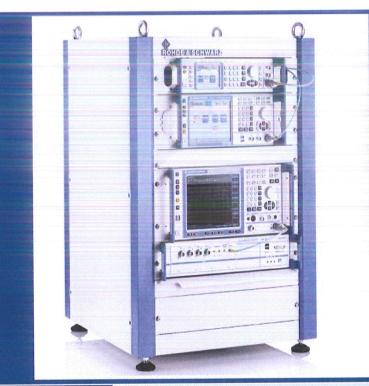


FOR

Tri-band Wireless Gigabit Router

ISSUED TO GL Technologies (Hong Kong) Limited

FLAT/RM 203 2/F BUILDING 19W 19 SCIENCE PARK WEST AVENUE SHATIN NT





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Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055 TEL: +86-755-66850100, FAX: +86-755-61824271 Email: qc@baluntek.com www.baluntek.com



Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Oct. 16, 2020</u>	Initial Issue
Rev. 02	<u>Oct. 20, 2020</u>	Update the directional antenna gain table

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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
	electromagnetic emission measurements. The recognition numbers of
	test site are 11524A-1.
	The laboratory is a testing organization accredited by FCC as a
Accreditation	accredited testing laboratory. The designation number is CN1196.
Certificate	The laboratory is a testing organization accredited by American
Certificate	Association for Laboratory Accreditation(A2LA) according to ISO/IEC
	17025.The accreditation certificate is 4344.01.
	The laboratory is a testing organization accredited by China National
	Accreditation Service for Conformity Assessment (CNAS) according to
	ISO/IEC 17025. The accreditation certificate number is L6791.
	All measurement facilities used to collect the measurement data are
Description	located at Block B, FL 1, Baisha Science and Technology Park, Shahe
	Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R.
	China 518055

1.3 Laboratory Condition

Ambient Temperature	20°C to 25°C
Ambient Relative	45% to 55%
Humidity	45 % 10 55 %
Ambient Pressure	100 kPa to 102 kPa



1.4 Announce

- (1) The test report reference to the report template version v6.4.
- (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	GL Technologies (Hong Kong) Limited
Address	FLAT/RM 203 2/F BUILDING 19W 19 SCIENCE PARK WEST
Audress	AVENUE SHATIN NT

2.2 Manufacturer Information

Manufacturer	Shenzhen Guanglianzhitong Tech Co., Ltd
Address	Room 305-306, Skyworth Digital Building, Shiyan Street, Baoan
Audiess	District, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	Tri-band Wireless Gigabit Router
Model Name Under Test	GL-B2200
Series Model Name	N/A
Description of Model	N/A
name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A



2.5 Technical Information

Network and Wireless connectivity	Bluetooth(BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/HT40) 5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80) U-NII-1/3
	ZigBee

The requirement for the following technical information of the EUT was tested in this report:

·	<u>0</u>			
		802.11b/g/n(20 MHz): 2.412 GHz - 2.462 GHz		
		$f_c = 2412 \text{ MHz} + (N-1)*5 \text{ MHz}$, where		
		- f _c = "Operating Frequency" in MHz,		
	D	- N = "Channel Number" with the range from 1 to 11.		
Frequency F	Range	802.11n(40 MHz): 2.422 GHz - 2.452 GHz		
		f_c = 2412 MHz + (N-1)*5 MHz, where		
		- f_c = "Operating Frequency" in MHz,		
		- N = "Channel Number" with the range from 3 to 9.		
Modulation -	Туре	DSSS, OFDM		
		🛛 Mobile		
Product Typ	e	Portable		
		Fix Location		
Antonno Su	stom (og MIMO	Cyclic Delay Diversity (CDD) for 802.11n		
-	stem (eg., MIMO,	Basic methodology with NANT transmit antennas, each with		
Smart Antenna)		the same directional gain GANT dBi for 802.11b/g		
Categorization as Correlated or		Catagorization of Correlated		
Completely Uncorrelated		Categorization as Correlated		
Antenna Main Antenna		PIFA Antenna		
Туре	Aux. Antenna	FIFAAntenna		
Antenna	Main Antenna	3.0 dBi (This value is provided by the applicant.)		
Gain	Aux. Antenna			
	For power spectral	6.0 dBi		
	density(PSD)	Formulas: Directional gain = GANT + Array Gain, <i>Array Gain</i>		
	measurements	= 10 log(NANT/NSS) dB. NSS =1, GANT set equal to the		
		gain of the antenna having the highest gain.		
Total		3.0 dBi		
directional	For power	Formulas: Directional gain = GANT + Array Gain, Array Gain		
gain for	measurements	= 0, GANT set equal to the gain of the antenna having the		
802.11n		highest gain.		
	For Conducted	6.0 dBi		
	Out-of-Band and	Formulas: Directional gain = GANT + Array Gain, Array Gain		
	Spurious	= 10 log(NANT/NSS) dB. NSS =1, GANT set equal to the		
	Measurements	gain of the antenna having the highest gain.		
About the P	roduct	Only the WIFI 802.11b, 802.11g and 802.11n (HT20/40)		
		was tested in this report.		



Antenna							
Main Antenna	Aux. Antenna	MIMO-Main Antenna	MIMO-Aux. Antenna	MIMO			
\checkmark	\checkmark	-	-	-			
\checkmark	\checkmark	-	-	-			
\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			
\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			
	Main Antenna √ √ √ √ √	Main AntennaAux. Antenna√√√√√√√√√√√√	Main Antenna Aux, Antenna MIMO-Main	Main Antenna Aux, Antenna MIMO-Main MIMO-Aux.			

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

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	Cha	nnel
Output Power	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
6dB Bandwidth	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Conducted Spurious Emission	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Conducted Emission	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Radiated Spurious Emission	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Band Edge	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9
Power spectral density (PSD)	11b/11g/11n20/11n40	1/6/6.5/13.5 Mbps	1/6/11	3/6/9

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.



2.6 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	QRCT3				
Support Units	Description	Manuf	acturer	Model	
(Software installation media)	Notebook	Len	ονο	X220	
			Soft	Set	
Mode	Channel	Main	Aux.	MIMO-Main	MIMO-Aux.
		Antenna	Antenna	Antenna	Antenna
	CH1	19.5	21.0		
802.11 b	CH6	22.0	21.5		
	CH11	20.0	21.5		
	CH1	11.5	14.5		
802.11 g	CH6	21.0	20.5		
	CH11	14.5	17.0		
	CH1	11.0	13.0	13.5	13.5
802.11 n20	CH6	21.0	20.5	17.5	17.5
	CH11	12.5	18.0	15.0	15.0
	CH3	9.0	13.5	9.0	9.0
802.11 n40	CH6	20.5	20.5	17.0	17.0
	CH9	13.5	17.5	12.5	12.5

Run software:

Device Conne	ct + HW Ver QMSL Lit	arary Mode + Target + .			
NLAN					# x QRCT Debug Message #
Radio Control	MAC/OTP Settings Cv T	one RSSI GoldenBinGen			Clear Save Print
Tu Be	 - TRANSMITTER SETTIN	GS			(12Chailed, 2) 09:16:46: 9123, JTB_TLAE_TLA_A68Farms (pktime), 1900) 09:16:46: 9123, JTB_TLAE_TLA_A68Farms (chart/fourt.0)
	Cont. Tx TX99	TX Mode	0	# of Packets (0 for Cont. TX)	
	155 (5775)	Channel (MHz)	Enable -	ANI Algorithm Scrambler	09.16:46 QLIP_FTB_WIAN_TLY_AddFaran (dutyCycle, 10)
	TxPowerForce_CLPC	TX Power Control	1	AIFSN	09:16:46 QLEB_FTM_VLAN_TLV_AddFaran GromFackets, 0)
	15	TX Power (dBm)	1500	Packet Size	09:16:46 QLEB FTW YLAH TLV AddParam
	VHT80_0	HT Mode	0	Antenna	(tuPattern, 4)
	RATE_AC_MCS_0_80	Data Rate	TxChain1 •	TX Chain	09:16:46 QLDB_FTM_FLAR_TLV_AddPorter
	PN9_PATTERN	TX Pattern	9	Gain Index	(scrablerOff, 0)
	Don't Use	Short Guard	0	Dac Gain	09:16:46 QLEB_FTM_VLAB_TLV_AddParam(agg, 1)
	1	Aggregate	0	PACFG	09:16:46 QLIE_FTM_VLAN_TLV_AddP or un
	0	• IF8	Unicest 💌	broadcastUnicast	(ai fun, 1)
	10	Duty Cycle (0~100%)			09:16:46 QLIB_FTM_VLAN_TLV_AddParan (Drowdcast, 0)
	STOP TX		SET TX O	IN	
	Flags Setting	DPDmode IT HeavyClip			09:16:46 QLIE_FTH_VLAN_TLV_AddFaram (flags.24) 09:16:46 QLIE_FTH_VLAN_TLV_Complete()
	Tx report				



3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title			
1	47 CFR Part 15,	Miscellaneous Wireless Communications Services			
I	Subpart C				
		GUIDANCE FOR COMPLIANCE MEASUREMENTS ON			
2	KDB Publication	DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD			
2	558074 D01v05r02	SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING			
		UNDER SECTION 15.247 OF THE FCC RULES			
3	KDB Publication	Emissions Testing of Transmitters with Multiple Outputs in the Same Band			
5	662911 D01v02r01	(e.g., MIMO, Smart Antenna, etc)			
4	ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of			
4	ANGI 603.10-2013	Unlicensed Wireless Devices			

3.2 Verdict

Antonna Baguiromant			Verdict
Antenna Requirement	15.203; 15.247(b)	N/A	Pass ^{Note 1}
Output Power	15.247(b)	ANNEX A.1	Pass
6dB Bandwidth	15.247(a)	ANNEX A.2	Pass
Conducted Spurious Emission	15.247(d)	ANNEX A.3	Pass
Band Edge(Authorized-band band-edge)	15.209; 15.247(d)	ANNEX A.4	Pass
Conducted Emission	15.207	ANNEX A.5	Pass
Radiated Spurious Emission	15.209; 15.247(d)	ANNEX A.6	Pass
Band Edge(Restricted-band band-edge)	15.209; 15.247(d)	ANNEX A.7	Pass
Power spectral density (PSD)	15.247(e)	ANNEX A.8	Pass
Receiver Spurious Emissions	N/A	N/A	N/A Note 2
	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)	6dB Bandwidth15.247(a)Conducted Spurious Emission15.247(d)Band Edge(Authorized-band band-edge)15.209; 15.247(d)Conducted Emission15.207Radiated Spurious Emission15.209; 15.247(d)Band Edge(Restricted-band band-edge)15.209; 15.247(d)Power spectral density (PSD)15.247(e)Receiver Spurious EmissionsN/A	6dB Bandwidth15.247(a)ANNEX A.2Conducted Spurious Emission15.247(d)ANNEX A.3Band Edge(Authorized-band band-edge)15.209; 15.247(d)ANNEX A.4Conducted Emission15.207ANNEX A.5Radiated Spurious Emission15.209; 15.247(d)ANNEX A.6Band Edge(Restricted-band band-edge)15.209; 15.247(d)ANNEX A.6Band Edge(Restricted-band band-edge)15.209; 15.247(d)ANNEX A.7Power spectral density (PSD)15.247(e)ANNEX A.8Receiver Spurious EmissionsN/AN/A

Note ¹: Please refer to section 5.1.

Note ²: 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)	5 V	

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2020.06.08	2021.06.07
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2020.06.08	2021.06.07
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2020.06.09	2021.06.08
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2020.06.09	2021.06.08
LISN	SCHWARZBECK	NSLK 8127	8127-687	2020.06.09	2021.06.08
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2020.06.08	2021.06.07
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2020.06.08	2021.06.07
Power Splitter	KMW	DCPD-LDC	1305003215		
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2020.06.08	2021.06.07
Attenuator (20 dB)	KMW	ZA-S1-201	110617091		
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189		
Temperature Chamber	АНК	SP20	1412	2020.06.10	2021.06.09
Test Antenna- Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2019.10.29	2021.10.28
Test Antenna- Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2019.07.02	2021.07.01
Test Antenna- Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1917	2019.07.02	2021.07.01
Test Antenna- Horn (18-40 GHz)	A-INFO	LB-180400 KF	J211060273	2019.01.06	2021.01.05
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	2018.08.08	2021.08.07
Shielded Enclosure	ChangNing	CN-130701	130703		
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2020.06.08	2021.06.07
Power Amplifier	OPHIR RF	5225F	1037	2020.02.19	2021.02.18
Power Amplifier	OPHIR RF	5273F	1016	2020.02.19	2021.02.18
Directional Coupler	Werlantone	C5982-10	109275	N/A	N/A
Directional Coupler	Werlantone	CHP-273E	S00801z-01	N/A	N/A
Sound Level Meter	B&K	NL-20	00844023	2019.11.12	2020.11.11
Ear Simulator	B&K	4185	2409449	2019.11.12	2020.11.11
Ear Simulator	B&K	4195	2418189	2019.11.12	2020.11.11



Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Audio analyzer	B&K	UPL 16	100129	2019.11.12	2020.11.11

4.3 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.

Measurement	Value	
Occupied Channel Bandwidth	±4%	
RF output power, conducted	±1.4 dB	
Power Spectral Density, conducted	±2.5 dB	
Unwanted Emissions, conducted	±2.8 dB	
All emissions, radiated	±5.4 dB	
Temperature	±1°C	
Humidity	±4%	

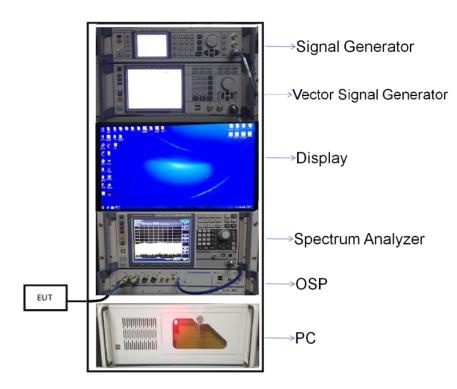


4.4 Description of Test Setup

4.4.1 For Antenna Port Test

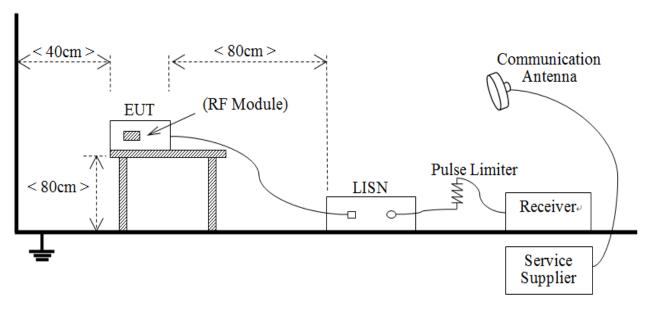
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

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)

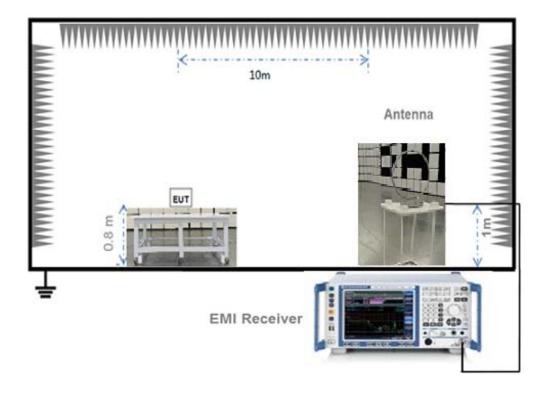




(Diagram 2)

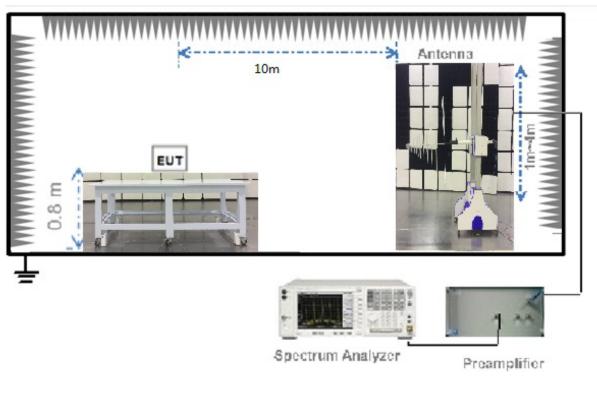


4.4.3 For Radiated Test (Below 30 MHz)





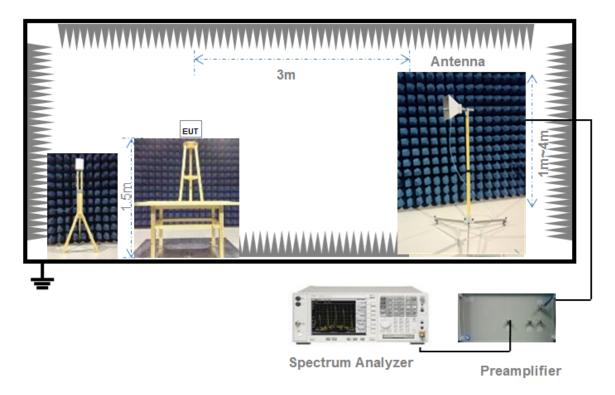
4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)



4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)



4.5 Measurement Results Explanation Example

4.5.1 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.

4.5.2 For radiated band edges and spurious emission test:

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.

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 & 15.247(b); 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 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 dements.

5.2.2 Test Setup

See section 4.4.1 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

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 4.4.1 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 4.4.1 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 4.4.1 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 50μ H/50 Ω 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 4.4.2 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(c); 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 4.4.3 to 4.4.5 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).

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

Table 1—RBW as a function of frequency

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(c); 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 4.4.1 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(d); 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 4.4.1 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

Duty Cycle

Test Mode	Duty Cycle	T (ms)	1/T(kHz)
802.11b	98.75%	12.4044	0.08
802.11g	95.69%	2.05556	0.49
802.11n-20 MHz	97.85%	4.97810	0.20
802.11n-40 MHz	96.18%	2.42520	0.41

Peak Power Test Data

Main Antenna

802.11b Mode:

Channel	Measured Out	Measured Output Peak Power		Limit	
Channel	dBm	mW	dBm	mW	Verdict
Low	21.54	142.56			Pass
Middle	23.48	222.84	30	1000	Pass
High	22.30	169.82			Pass

802.11g Mode:

Channel	Measured Output Peak Power Limit		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
Low	19.12	81.66			Pass	
Middle	27.12	515.23	30	30	1000	Pass
High	22.61	182.39			Pass	

802.11n-20 MHz Mode:

Channel	Measured Out	Measured Output Peak Power Limit Ver		Limit		
Channel	dBm	mW	dBm	mW	Verdict	
Low	18.76	75.16			Pass	
Middle	27.38	547.02	30	30 100	1000	Pass
High	20.67	116.68			Pass	

802.11n-40 MHz Mode:

Channel	Measured Out	Measured Output Peak Power Limit		Limit			
Channel	dBm	mW	dBm	mW	Verdict		
Low	16.62	45.92	30	30 1			Pass
Middle	27.47	558.47			1000	Pass	
High	21.45	139.64			Pass		



Aux. Antenna

802.11b Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
Low	23.80	239.88	30		Pass	
Middle	23.70	234.42		30 1000	1000	Pass
High	23.21	209.41			Pass	

802.11g Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
Low	23.20	208.93	30		Pass	
Middle	27.42	552.08		30 1000	1000	Pass
High	25.43	349.14			Pass	

802.11n-20 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
Low	21.83	152.41	30		Pass	
Middle	27.76	597.04		30	1000	Pass
High	26.43	439.54			Pass	

802.11n-40 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
Low	22.22	166.72	30	30		Pass
Middle	27.86	610.94			1000	Pass
High	26.23	419.76			Pass	

MIMO-Main Antenna

802.11n-20 MHz Mode:

	Channel	Measured Output Peak Power		Limit		Vordiot	
		dBm	mW	dBm	mW	Verdict	
	Low	21.06	127.64	30			Pass
	Middle	24.87	306.90		30 1000	Pass	
	High	23.02	200.45			Pass	

802.11n-40 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	Verdict
Low	16.42	43.85	30	1000	Pass
Middle	24.38	274.16			Pass
High	20.27	106.41			Pass



MIMO-Aux. Antenna

802.11n-20 MHz Mode:	

Channel	Measured Output Peak Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	22.50	177.83	30		Pass
Middle	25.16	328.10		30 1000	Pass
High	23.61	229.61			Pass

802.11n-40 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
Low	17.73	59.29	30	30	1000	Pass
Middle	24.47	279.90				Pass
High	21.09	128.53			Pass	

<u>MIMO</u>

802.11n-20 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict	
	dBm	mW	dBm	mW	Verdict	
Low	24.85	305.47	30		Pass	
Middle	28.03	635.00		30 1000	1000	Pass
High	26.34	430.06			Pass	

802.11n-40 MHz Mode:

Channel	Measured Output Peak Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	20.13	103.15			Pass
Middle	27.44	554.06	30	30 1000	Pass
High	23.71	234.94			Pass

Average Power Test Data

Main Antenna

802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	Verdict
Low	18.65	73.28	30		Pass
Middle	20.95	124.45		30	1000
High	19.26	84.33			Pass

802.11g Mode:

Channel	Measured Output Average Power		Limit		Verdict
	dBm	mW	dBm	mW	Verdict
Low	10.37	10.89	30	1000	Pass
Middle	19.71	93.54			Pass
High	13.80	23.99			Pass

802.11n-20 MHz Mode:



Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
Low	9.94	9.86				Pass
Middle	19.74	94.19	30	30 1000	Pass	
High	11.74	14.93			Pass	

802.11n-40 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	8.00	6.31			Pass
Middle	19.85	96.61	30	1000	Pass
High	12.78	18.97			Pass

<u>Aux. Antenna</u>

802.11b Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	20.46	111.17			Pass
Middle	20.99	125.60	30	30 1000	Pass
High	20.68	116.95			Pass

802.11g Mode:

Channel	Measured Outp	ut Average Power	Limit		Verdict			
Channel	dBm	mW	dBm	mW	Verdict			
Low	14.10	25.70						Pass
Middle	19.72	93.76	30	1000	Pass			
High	16.64	46.13			Pass			

802.11n-20 MHz Mode:

Channal	Measured Output Average Power		Limit		Vordiot
Channel	dBm	mW	dBm	mW	Verdict
Low	12.57	18.07			Pass
Middle	19.76	94.62	30	1000	Pass
High	17.42	55.21			Pass

Channel	Measured Output Average Power		Limit		Verdict	
Channel	dBm	mW	dBm	mW	Verdict	
Low	13.22	20.99				Pass
Middle	20.11	102.57	30	1000	Pass	
High	17.19	52.36			Pass	



MIMO-Main Antenna

802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	12.84	19.23			Pass
Middle	16.86	48.53	30	1000	Pass
High	14.47	27.99			Pass

802.11n-40 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	8.48	7.05			Pass
Middle	16.82	48.08	30	1000	Pass
High	11.90	15.49			Pass

MIMO-Aux. Antenna

802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	12.87	19.36			Pass
Middle	16.93	49.32	30	1000	Pass
High	14.66	29.24			Pass

802.11n-40 MHz Mode:

Channal	Measured Output Average Power		Limit		Vordiot
Channel	dBm	mW	dBm	mW	Verdict
Low	8.76	7.52			Pass
Middle	16.81	47.97	30	1000	Pass
High	12.04	16.00			Pass

<u>MIMO</u>

802.11n-20 MHz Mode:

Channel	Measured Output Average Power		Limit		Verdict
Channel	dBm	mW	dBm	mW	Verdict
Low	15.87	38.60			Pass
Middle	19.91	97.85	30	30 1000	Pass
High	17.58	57.23			Pass

Channel	Measured Output Average Power		Limit		Vordiot
Channel	dBm	mW	dBm	mW	Verdict
Low	11.63	14.56			Pass
Middle	19.83	96.06	30	1000	Pass
High	14.98	31.48			Pass



A.2 Bandwidth

<u>Test Data</u>

Main Antenna

802.11b Mode:

Channel	6 dB Bandwidth 99% Bandwidth		6 dB Bandwidth	
Channel	(MHz)	(MHz)	Limits (kHz)	
Low 8.610840		13.487699	≥500	
Middle	Middle 7.159180		≥500	
High	9.111572	14.066570	≥500	

802.11g Mode:

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth	
Channer	(MHz)	(MHz)	Limits (kHz)	
Low 16.420654		16.613603	≥500	
Middle 16.420654		17.192475	≥500	
High 16.420654		16.729378	≥500	

802.11n-20MHz Mode:

Chappel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
Channel	(MHz)	(MHz)	Limits (kHz)
Low	17.721924	17.771346	≥500
Middle	17.421631	18.060781	≥500
High	17.721924	17.771346	≥500

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
	(MHz)	(MHz)	Limits (kHz)
Low	35.372070	36.000000	≥500
Middle	35.171875	36.400000	≥500
High	35.422119	36.000000	≥500



Aux. Antenna

802.11b Mode:

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth	
Channel	(MHz)	(MHz)	Limits (kHz)	
Low	8.610840	13.429812	≥500	
Middle	Middle 7.609619		≥500	
High	High 7.709717		≥500	

802.11g Mode:

Ĭ	Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth	
	Channel	(MHz)	(MHz)	Limits (kHz)	
	Low	16.420654	16.613603	≥500	
	Middle 16.420654		16.787265	≥500	
	High	16.420654	16.729378	≥500	

802.11n-20MHz Mode:

Channel	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limits (kHz)	
Low	17.721924	17.771346	≥500	
Middle	17.621826	17.829233	≥500	
High	17.721924	17.887120	≥500	

802.11n-40MHz Mode:

Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth	
Channer	(MHz)	(MHz)	Limits (kHz)	
Low 35.422119		36.000000	≥500	
Middle	35.221924	36.100000	≥500	
High	35.171875	36.000000	≥500	

Test plots

Main Antenna

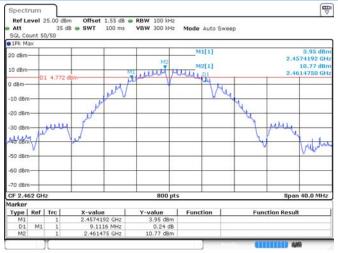
6 dB Bandwidth



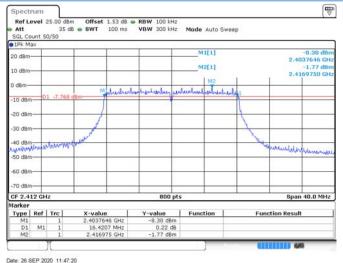
Date: 26.SEP.2020 10:04:23



802.11b HIGH CHANNEL

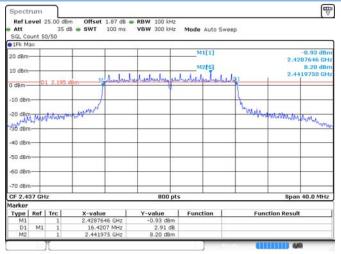


802.11g LOW CHANNEL



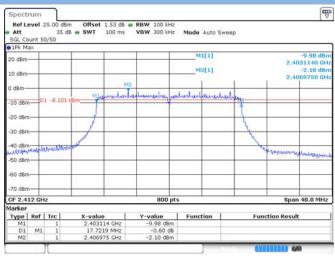
Date: 26.SEP.2020 10:08:29

802.11g MIDDLE CHANNEL



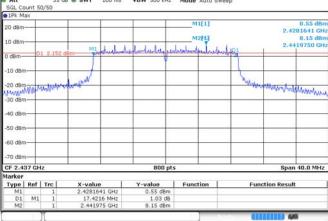
Date: 1.AUG 2020 14:10:01

802.11n-20 MHz LOW CHANNEL



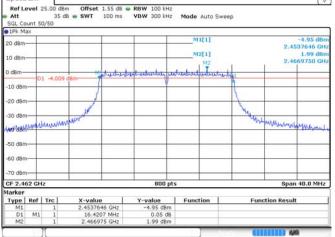


802.11 n-20 MHz MIDDLE CHANNEL



Date: 1.AUG.2020 14:17:37

Spectrum

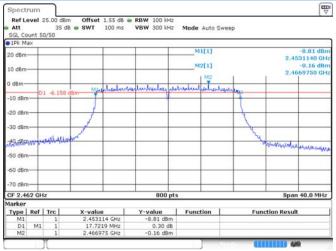


Date: 26.SEP.2020 11:50:01

Date: 26 SEP 2020 11:52:25

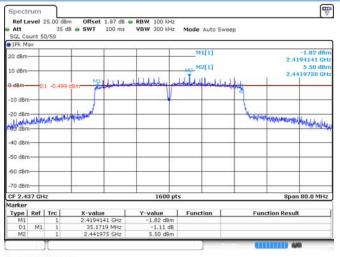


802.11n-20 MHz HIGH CHANNEL



Date: 26 SEP 2020 11:54:55

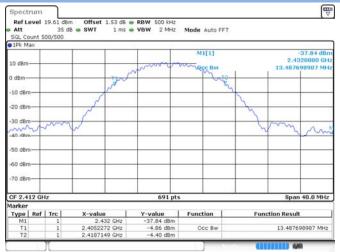
802.11n-40 MHz MIDDLE CHANNEL



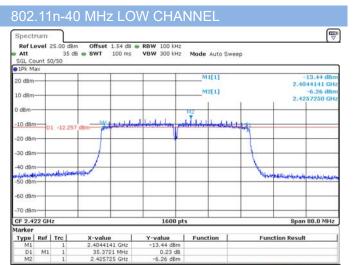
Date: 1 AUG 2020 14:24:59

99% Bandwidth

802.11b LOW CHANNEL

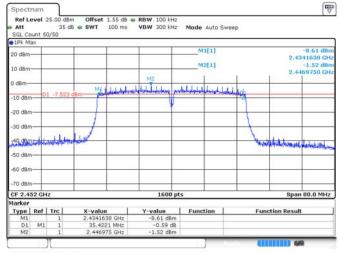


Date: 26.SEP.2020 10:04:33



Date: 26.SEP.2020 11:57:40

802.11n-40 MHz HIGH CHANNEL



Date: 26.SEP.2020 12:00:09

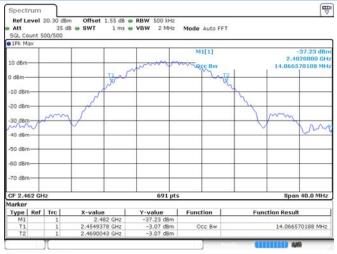
802.11b MIDDLE CHANNEL ₽ Spectrum Ref Level 21.87 dBm Att 35 dB Offset 1.87 dB RBW 500 kHz SWT 1 ms VBW 2 MHz Mode Auto FFT 35 dB e SWT SGL Count 500/500 91Pk Max 11[1] -33.47 dB 10 dBm 13.371924747 dBr 10 dBm 20 dBn 30 denn 1 40 dBm -50 dBm -60 dBm -70 dBn CF 2.437 GHz Span 40.0 MHz 691 pts Y-value X-value 2.457 GHz 2.430343 GHz 2.4437149 GHz Type | Ref | Trc | Function 1 Function Result -1.51 dBm -2.37 dBm Occ Bw 13.371924747 MHz -

Date: 1.AUG.2020 14.01:11



440

802.11b HIGH CHANNEL



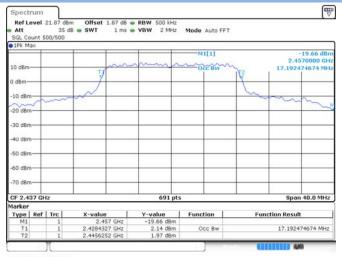
802.11g LOW CHANNEL
 Ref Level
 13.43
 dBm
 Offset
 1.53
 dB
 RBW
 500
 kHz

 Att
 35
 dB
 SWT
 1 ms
 VBW
 2 MHz

 SGL Count 500/500
 91%
 Max
 1 ms
 VBW
 2 MHz
 Spectrum Mode Auto FFT -40.09 dB 2.4320000 GH 613603473 MH 10 dBm-) dBr -10 dBr -20 dB 30 dBn 40 dBm -50 dBm-60 dBm 70 dBm 80 dBn CF 2.412 GHz Marker 691 nts Span 40.0 MHz X-value 2.432 GHz 2.4036643 GHz 2.4202779 GHz Type | Ref | Trc | Y-value -40.09 dBm -1.57 dBm -1.87 dBm Function Function Result Occ Bw 16.613603473 MHz T1 T2

Date: 26 SEP 2020 10:08:39

802.11g MIDDLE CHANNEL

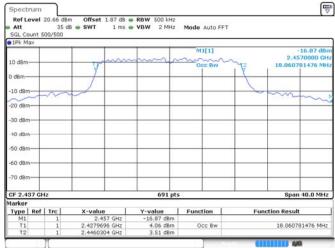


Date: 1.AUG.2020 14:10:11

802.11n-20 MHz LOW CHANNEL



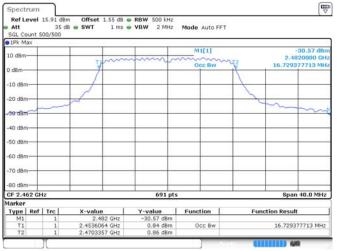
802.11 n-20 MHz MIDDLE CHANNEL



Date: 1.AUG.2020 14:17:47

Date: 26.SEP.2020 11:47:30

802.11g HIGH CHANNEL

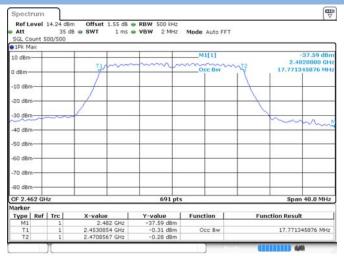


Date: 26.SEP.2020 11:50:11

Date: 26 SEP 2020 11:52:35



802.11n-20 MHz HIGH CHANNEL



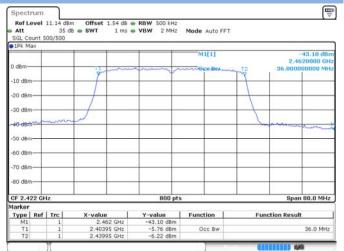
Date: 26 SEP 2020 11:55:05

802.11n-40 MHz MIDDLE CHANNEL

Att SGL Co			ib e SWT		RBW 500 kHz VBW 2 MHz	Mode Auto FF	т		
1Pk M	эx		12		19 <u>. 36</u> .	0.000			_
				-		M1[1]			20.07 dBn
10 dBm	-		-	mm	A AND A AND A AND A	WWW DCC BW			70000 GH
			Th	with	- Incontraction	OCE BW	mile	36.40000	0000 MH
0 dBm-	-		1 1						
					1 1			1 1	
-10 dBm		m	mant		+ +		1		
so		www			1 1			mm	mmi
20 dBr	-								1
-30 dBm	-		-						
-30 ubii									
-40 dBm	-							-	
								1 1	
-50 dBm			+		+ +			+ +	
								1 1	
-60 dBrr			-		1		-		
70.40-									
-70 dBm	-								
	_								
CF 2.4	37 GH	z			800 pt	5		Span	80.0 MHz
larker									
Туре	Ref		X-value		Y-value	Function	Fu	nction Result	
M1	_	1		77 GHz	-20.07 dBm	Occ Bw			36.4 MHz
T1 T2	_	1		75 GHz 15 GHz	1.73 dBm 3.19 dBm	OCC BW			30.4 MHZ

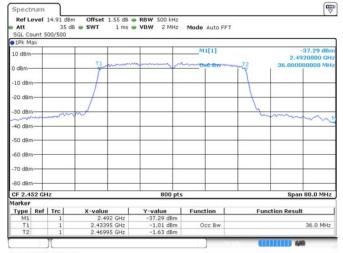
Date: 1.AUG.2020 14:25:11

802.11n-40 MHz LOW CHANNEL



Date: 26.SEP.2020 11:57:52

802.11n-40 MHz HIGH CHANNEL



Date: 26 SEP 2020 12:00:22



and Maria

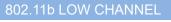
Span 40.0 MHz

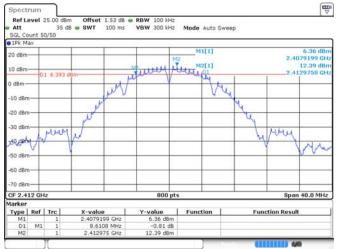
440

Function Result

Aux. Antenna

6 dB Bandwidth





802.11b MIDDLE CHANNEL Ref Level 25.00 dbm Offset 1.87 db RBW 100 lHz Att 35 db SWT 100 ms VBW 300 lHz Mode Auto Sweep SGL Count 50/50 91k Max 100 ms VBW 300 lHz Mode Auto Sweep 4.93 dB 2.4329700 GF 11.49 dB 2.4374750 GF 20 dBm Hour gin M2[1] 10 dBr fund 01 5.488 0 dBm N 4 -10 dB -20 dBm

800 pts

0.55 dB 11.49 dBm

| Function |

Y-value

X-value 2.43297 GHz 7.6096 MHz 2.437475 GHz

802.11b HIGH CHANNEL

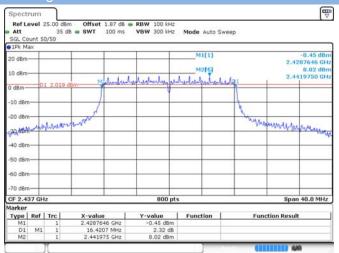
Date: 26 SEP 2020 10:23:21





Date: 1.AUG 2020 14:56:36

802.11g MIDDLE CHANNEL



Date: 1 AUG 2020 15 01:03

Date: 26.SEP.2020 10.26.07

30 dBm-

50 dBm

60 dBrr

70 d8n

arker

CF 2.437 GHz

Type | Ref | Trc |

Date: 1 AUG 2020 14 53 31

M1 D1 M1 M2

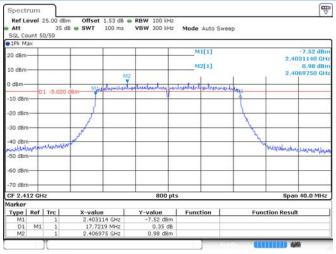
de de tri Muni

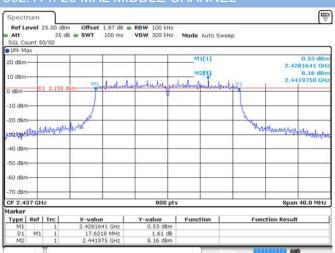
802.11g HIGH CHANNEL ₩ Spectrum Ref Level 25.00 Att 3 0 dBm Offset 1.55 dB RBW 100 kHz 35 dB SWT 100 ms VBW 300 kHz Mode Auto Sweep SGL Count 50/50 9 1Pk Max M1[1] -1.86 dB 20 dBm-M2[1] 4.67 dB 10 dBmabuntre hadred 0 dBm-01 -1.329 -10 dBm -20 dBm 14 -30 dBm alphabeth appearing on a la -50 dBm 60 dBm -70 dBm Span 40.0 MHz CF 2.462 GHz 800 pts Y-value X-value 2.4537646 GHz 16.4207 MHz 2.460725 GHz Type | Ref | Trc | Function Function Result D1 M1 M2 0.26 dB 4.67 dBm 10 440

Date 26 SEP 2020 10 28:55

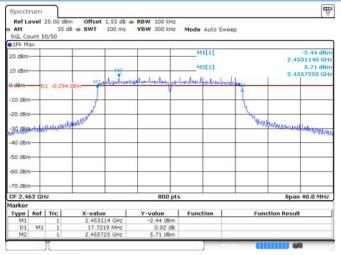


802.11n-20 MHz LOW CHANNEL





Date: 26 SEP 2020 10:31:13





0.72 dB 0.63 dBm

440

-3.40 dB

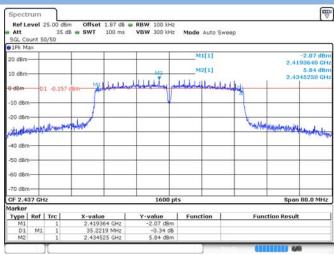
2.4343640 GH

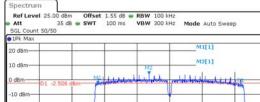
3.49 dBn 2.4469750 GH

440

Date: 26 SEP 2020 10:33:26

802.11n-40 MHz MIDDLE CHANNEL





802.11n-40 MHz HIGH CHANNEL

20 dBm 30 dBn -40 dB -50 dBm -60 dBm -70 dBm Span 80.0 MHz CF 2.452 GHa 1600 pts Y-value X-value 2.434364 GHz 35.1719 MHz 2.446975 GHz Type | Ref | Trc | Function Function Result M1

0.36 dB 3.49 dBm

Date: 1.AUG 2020 15:15:47

Date: 26.SEP 2020 10:38:12

Date: 26 SEP 2020 10:35:51

Date: 1 AUG 2020 15 08 57

802.11 n-20 MHz MIDDLE CHANNEL



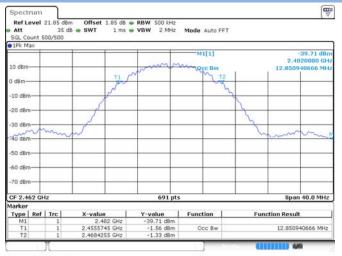
99% Bandwidth

802.11b LOW CHANNEL



Date: 26.SEP.2020 10:23:31

802.11b HIGH CHANNEL

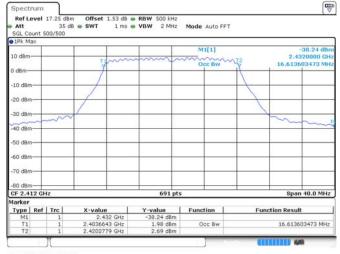




Date: 1.AUG.2020 14:53:41

802.11g LOW CHANNEL

802.11b MIDDLE CHANNEL



Date: 1.AUG.2020 14:56:46

802.11g MIDDLE CHANNEL



Date: 1.AUG.2020 15:01:13

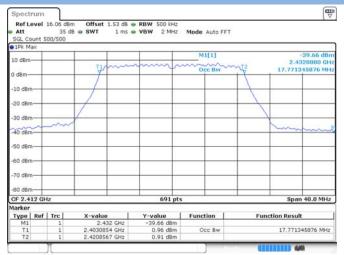
Date: 26.SEP.2020 10:26:16



Date: 26 SEP 2020 10:29:05



802.11n-20 MHz LOW CHANNEL



Date: 26.SEP.2020 10:31:23

802.11n-20 MHz HIGH CHANNEL



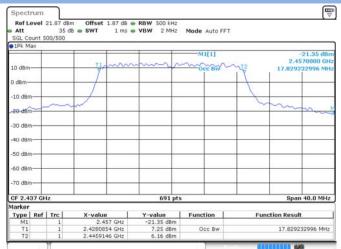
Date: 26 SEP 2020 10:33:36

802.11n-40 MHz MIDDLE CHANNEL



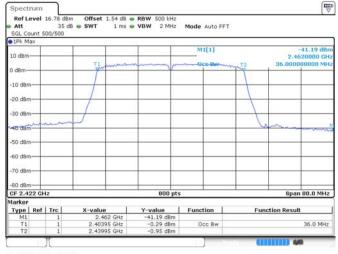
Date: 1.AUG 2020 15:15:59

802.11 n-20 MHz MIDDLE CHANNEL



Date: 1.AUG.2020 15:09:07

802.11n-40 MHz LOW CHANNEL



Date: 26 SEP 2020 10:36:03



Date: 26 SEP 2020 10:38:24





A.3 Conducted Spurious Emissions

<u>Test Data</u>

Main Antenna

802.11b Mode:

Channel		Measured Max. Out of	Limit (
	Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
	Low	-33.35	10.01	-9.99	Pass
	Middle	-35.77	11.76	-8.24	Pass
	High	-35.73	10.36	-9.64	Pass

802.11g Mode:

Channel	Measured Max. Out of	Limit (
	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-45.26	-1.32	-21.32	Pass
Middle	-35.71	8.69	-11.31	Pass
High	-48.04	1.94	-18.06	Pass

802.11n-20MHz Mode:

	Measured Max. Out of	Limit (
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-45.96	-1.76	-21.76	Pass
Middle	-36.68	8.63	-11.37	Pass
High	-50.19	0.10	-19.90	Pass

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-45.24	-6.12	-26.12	Pass
Middle	-35.80	6.12	-13.88	Pass
High	-50.23	-3.34	-23.34	Pass



Aux. Antenna

802.11b Mode:

	Measured Max. Out of	Limit (dBm)	
Channel	Channel Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-35.13	12.41	-7.59	Pass
Middle	-35.43	12.68	-7.32	Pass
High	-35.56	12.07	-7.93	Pass

802.11g Mode:

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-50.19	2.86	-17.14	Pass
Middle	-35.89	8.78	-11.22	Pass
High	-50.26	4.98	-15.02	Pass

802.11n-20MHz Mode:

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-51.64	1.00	-19.00	Pass
Middle	-35.88	8.80	-11.20	Pass
High	-49.79	5.81	-14.19	Pass

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-50.69	-2.12	-22.12	Pass
Middle	-36.12	4.94	-15.06	Pass
High	-41.16	3.54	-16.46	Pass





MIMO-Main Antenna 802.11n-20MHz Mode:

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-45.63	0.55	-19.45	Pass
Middle	-46.38	4.37	-15.63	Pass
High	-50.53	2.07	-17.93	Pass

802.11n-40MHz Mode:

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-45.40	-6.73	-26.73	Pass
Middle	-47.90	1.93	-18.07	Pass
High	-50.84	-2.58	-22.58	Pass

MIMO-Aux. Antenna

802.11n-20MHz Mode:

	Measured Max. Out of	Limit (dBm)	
Channel	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-51.44	1.47	-18.53	Pass
Middle	-51.17	4.78	-15.22	Pass
High	-51.43	2.35	-17.65	Pass

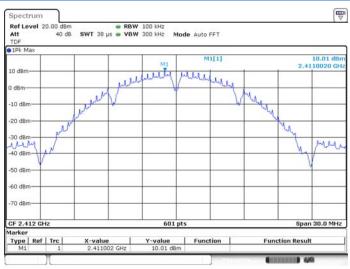
Channel	Measured Max. Out of	Limit (d	dBm)	
	Band Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-50.58	-5.08	-25.08	Pass
Middle	-50.41	2.82	-17.18	Pass
High	-51.32	-4.39	-24.39	Pass



Test Plots

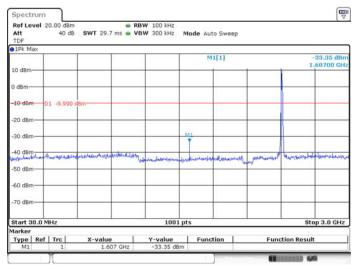
Main Antenna

802.11b LOW CHANNEL CARRIER LEVEL



Date: 26.SEP 2020 11:44:38

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



Spectrum
 Ref Level
 20.00 dBm
 @ RBW
 100 kHz

 Att
 40 dB
 SWT
 230 ms
 ♥ VBW
 300 kHz

 TDF

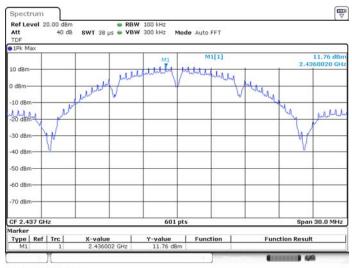
 < Mode Auto Sweep 0 1Pk Ma -36.47 dBn 23.89340 GH M1[1] 10 dB 01 -9.990 0 dBm 0 dBm M1 0 dBm -50 dBm--60 dBm -70 dBm Start 2.0 GH 4001 pt Stop 25.0 GHz larker Type Ref Trc X-value 23.8934 GHz -36.47 dBm 1 Function Result Section 10 AN

Date: 26.SEP.2020 11:44:58

Date: 26 SEP 2020 11:45:07



802.11b MIDDLE CHANNEL CARRIER LEVEL



Date: 27.SEP.2020 18:44:39

802.11b MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

Att TDF	vel 20.0		WT 29.7 r		♥ 100 kHz ♥ 300 kHz	Mode Aut	o Sweep			
1Pk M	lax					54	1[1]			36.26 dBm
10 dBm						19	1[1]			62480 GHz
10 dBm				1					1	
0 dBm-										
	-01	8.240 dBm								
-10 dBn	0-01	0.2 TO USIN								
20 dBn	n								1	
-30 dBn	n					MI				-
40 dBn	n	A guilt	العلم الساليد	in straining in					Se Latters	withnesseene
		Mr. Mr. Martin			warthingthemeter	andustria	Respersively and	ed another	-re-approve	
50 dBn	n									
-60 dBn	n	-	-							-
-70 dBn	n			- ii						
Start 3	0.0 MHz				1001	ots			Sto	p 3.0 GHz
		200		0.5			< - 100M			
larker	Ref Tr		X-value		Y-value	Func			tion Result	

Date: 27 SEP 2020 18:44:53

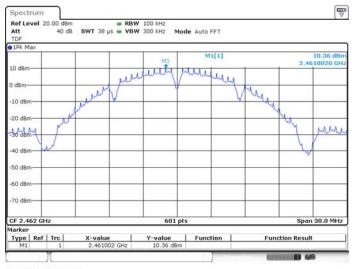
802.11b MIDDLE CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

Ref Level 2 Att TDF	0.00 dBm 40 dB		0 ms e VB	W 100 kHz W 300 kHz	Mode Auto	o Sweep			
1Pk Max									
2					M	1[1]			-35.77 dBr .88570 GH
10 dBm			-						1
0 dBm								-	
-10 dBm0	1 -8.240	dBm							
-20 dBm									
0 dBm			-			1	-		
o demand	with the	- Antopositio	-	-	-	-	-	-	the start
50 dBm									
-60 dBm			-	-				-	-
70 dBm									
Start 2.0 GH	z			4001	pts			Sto	p 25.0 GHz
1arker	(c. 20)		5.0			10256			
Type Ref M1	Trc 1	X-valu	BS7 GHz	-35.77 dBn	Func	tion	Fun	ction Resul	t

Date: 27.SEP.2020 18:45:03



802.11b HIGH CHANNEL CARRIER LEVEL



Date: 26.SEP.2020 11:45:38

802.11b HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

Ref Le Att TDF	vel 20.00 de 40		 RBW 100 kHz VBW 300 kHz 	Mode Auto Sweep		
1Pk M	a×	1 1		M1[1]		-35,73 dBn
				(artri		1.64260 GH
10 dBm						
0 dBm-						
-10 dBn	D1 -9.64	0 dBm				
-20 dBn	n					
-30 dBn	n			MI		
-40 dBn	1		Label			يستحمد والعرفية والمعرود
		Plana retrational and and	horisel banacherson laway	himelian and a grant	myselsonical men	rances and a constraints
-50 dBn	n					
-60 dBn	n					_
-70 dBn	n					
Start 3	0.0 MHz		1001 (ots		Stop 3.0 GHz
larker						
	Ref Trc	X-value	Y-value	Function	Function R	esult

802.11b HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

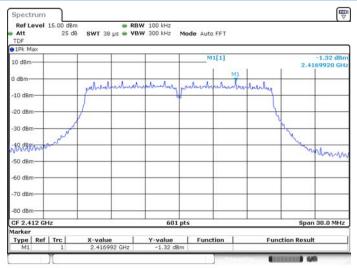
Ref Le Att TDF	vel 20.00 dBr 40 dt	n 8 SWT 230 ms	RBW 100 kHz VBW 300 kHz	Mode Auto Swee	p			
• 1Pk M	a×	1	1 1	M1[1]		-36.52 dBr		
10 dBm				16.32				
10 GDIII								
0 dBm-					-			
10 dBm	D1 -9.640	dBm						
-20 dBm	<u> </u>				_			
-30 dBm		+ +		M1	-			
-Q dBr	-	A standard and	munder the	and the state of t	المورد المراجع والمراجع	the manufacture of the second		
-50 dBm					and the second	10 July 1990		
-50 0.51								
-60 dBm		+ + +						
-70 dBm					_			
Start 2	.0 GHz		4001	pts		Stop 25.0 GHz		
larker		22	7					
Type M1	Ref Trc 1	X-value 16.3283 GH	2 -36.52 dBr	Function	Fund	tion Result		

Date: 26.SEP.2020 11:45:57

Date: 26.SEP.2020 11:46:04

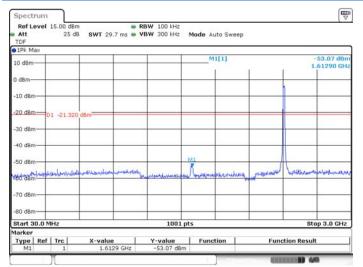


802.11g LOW CHANNEL CARRIER LEVEL



Date: 26.SEP.2020 11:47:54

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



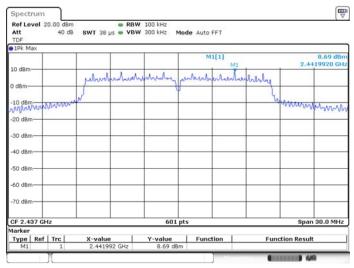
Ref L	evel 15.00 d		RBW 100 kHz	Mode Auto Swee	97			
TDF	2000	00 0W1 230 m3 -	Ton ooo aa	Note Add She	eb			
1Pk M	ax	1		M1[1]		-45.26 dB		
10 dBm				3.21580 GH				
0 dBm-				1		11		
- O dBr		-	-		-			
-20 dBm								
	01 -21.3	20 dBm						
-30 dBr					-			
+0 dBu								
-SO den	-							
Aunth	-	min has we want to a second	A Strongell Barrier	مريعة ومالية المريقي والمريقي	-	ومعراط يسلحه تعاقبهم المعاقبة		
60 dBn								
-70 dBm		_	_					
-80 dBm	-							
	.0 GHz		4001 p	001 pts Stop 25.0 G				
larker	and and	Muselus I	the second second	1				
Type	Ref Trc	X-value 3.2158 GHz	-45.26 dBm	Function	Functi	on Result		

Date: 26.SEP.2020 11:48:09

Date: 26.SEP.2020 11:48:31



802.11g MIDDLE CHANNEL CARRIER LEVEL



Date: 27.SEP.2020 18:45:51

802.11g MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

Ref Le Att TDF	vel 2	0.00 dBm 40 dB	● F SWT 29.7 ms ● V	RBW 100 kHz VBW 300 kHz M	Iode Auto Sweep		
1Pk M	ax		1 1		M1[1]		-39,78 dBm
10 dBm	_					_	455.80 MHz
in anti							8
0 dBm-	+			-			
10 dBm	-	1 -11.310	dBm				
20 dBn	+					-	
30 dBm	+	M1					
40 dBm			encompanyation	u .	A	4 panelsine	an proventing allow must
50 dBm				The followed and a state of the second state of the second state of the second state of the second state of the	a sundrading frieds	harmon	
60 dBri	+					-	
70 dBm	+						
Start 3	0.0 N	IHz		1001 pt	s		Stop 3.0 GHz
larker	Def	Teal	X-value	Y-value	Function	Francis	tion Result
Type M1	Ket	1	455.8 MHz	-39.78 dBm	Function	Func	cion Result

Date: 27.SEP 2020 18.46.06

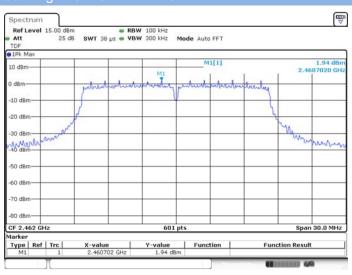
802.11g MIDDLE CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

Ref Le Att TDF	vel 20	1.00 dBm 40 dB	SWT 230		W 100 kHz 300 kHz	Mode Au	to Sweep			
01Pk M	9×									-
							11[1]		1	-35,71 dBr 6,32830 GH
10 dBm	-				-		1	-	1	1
0 dBm-	-			-			-		_	
-10 dBm	-01	-11.310	dBm	-			_	_		
-20 dBm	-				-		-	_		
-30 dBm	-					-	MI			
-19 dan	-	-	-	Marine	-	-	-	Sur Allerande	1	in the second
-50 dBm								-		
-60 dBr				-	-		-			-
-70 dBr	-				-					
Start 2	.0 GH	2			4001	pts			Sto	op 25.0 GHz
1arker					10	1010				
Type M1	Ref	Trc 1	X-valu	83 GHz	-35.71 dB		ction	Fu	nction Resu	ilt

Date: 27.SEP.2020 18:46:15



802.11g HIGH CHANNEL CARRIER LEVEL



Date: 26.SEP.2020 11:50:24

802.11g HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

Ref Lo	evel 1	5.00 dBm 25 dB			88W 100 kHz 78W 300 kHz	Mode A	uto Sweep			
1DF	ax									
10 dBm-						M	1[1]			48.04 dBn 64260 GH
0 dBm—	_								1	04200 GH
10 dBm				0						-
20 dBm	D1	-18.060	dBm							_
30 dBrr	-									
40 dBm	+				· · · · · ·	M1	<u> </u>		<u>A</u>	
50 dBm		121-1-1				1	10000		H_	
od dBm	AR	gelasters)	www.moldo	hannenhard	several-weeks	week bestures	white the states	and a classificant	MANAN	e-howipers
70 dBm										
-80 dBm	-									
Start 3	0.0 MI	lz		-	1001	pts			Sto	p 3.0 GHz
larker				4		10	1020			
Type M1	Ref	Trc 1	X-value	26 GHz	-48.04 dBm	Func	tion	Funct	tion Result	

Date: 26 SEP 2020 11:50:38

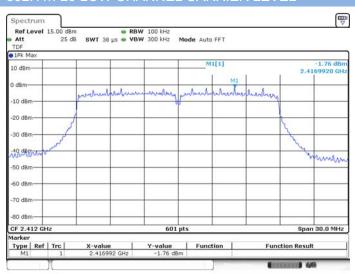
802.11g HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

Ref L Att TDF	evel	15.00 dBn 25 dB			V 100 kHz V 300 kHz	Mode Au	to Sweep			
• 1Pk M	ax									
10 dBm	+					M	1[1]			49.50 dBr .28480 GH
							1	1		20100 GH
0 dBm-	-							-		-
1000										
-10 dBn	0									-
-20 dBn	0	1 -18.060	dBm							
-20 0.01										
-30 dBn	n				-				-	
- 0 dBn								-		-
-50 dEn			100						1.111	
10.04	-	wither the	1	100.00	vienierenie	n annathi	A dean la	Same burnes	- sichist	-
-60 dBn	0		- Lange Antonia and	ad-realise	A Million Bar Ales				-	1000
-70 dBn	n			-				-		-
-80 dBn										
	S									
Start 2	.0 GH	z	17 No. 1		4001	pts			Stop	25.0 GHz
Marker Type	Def	Ten I	X-value	1	Y-value	Fund	ten 1	From	tion Result	
M1	Ket	1	3,2848 Gi	1	-49.50 dBn		cion	Fund	aion Result	L

Date: 26.SEP 2020 11:50:51



802.11n-20 LOW CHANNEL CARRIER LEVEL



Date: 26 SEP 2020 11:52:53

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

Ref Lo	evel 15	.00 dBm 25 dB			BW 100 kHz BW 300 kHz	Mada A	ito Sweep		
TDF		25 08	5WI 29	7 ms 🖝 🕶	BW 300 KH2	MODE AL	ito sweep		
1Pk M.	ax								
10 dBm-	+					M	1[1]		-52.36 dBm 1.60990 GH
0 dBm-	-			0					
-10 dBm									
-20 dBm	D1	-21.760	dBm						
-30 dBm									
-40 dBm					-		-		
-50 dBm						M1			
do dem	Number	northanda	ralitionstrated	alout hereig	ALASAME MAN	and have the	entration of the	a sub-enable	Wedness and the
-70 dBm									
-80 dBrr	-				-				
Start 3	0.0 MH	z			1001	pts			Stop 3.0 GHz
Marker		205		0.5			- 000		10 C
Type M1	Ref	1	X-value	9 GHz	-52.36 dBr	Fund	tion	Fund	tion Result

802.11n-20 LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

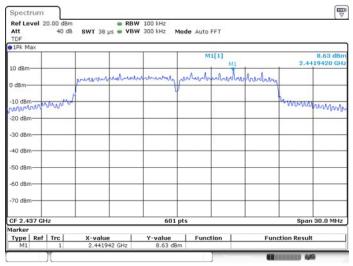
Ref Level 15.00 de Att 25		RBW 100 kHz VBW 300 kHz	Mode Auto Swe	ep			
1Pk Max					15 D.C. 10		
10 dBm			M1[1] -45.96 dBr 3.21580 GH				
0 dBm				1 1			
U dBm							
- 0 dBm	-			_			
-20 dBm-D1 -21.76	50 dBm						
30 dBm	-						
10 dBm							
SO dam							
60 dBm	Me universities	to a manufacture of the second	ni how we wanted	half the faith is the second	بعضائية فاستها ومعيقة الرفناني تعر		
60 dBm	a state of the second						
-70 dBm		-		-			
-80 dBm							
Start 2.0 GHz larker		4001	ots		Stop 25.0 GHz		
Type Ref Trc	X-value	Y-value	Function	Fund	tion Result		
M1 1	3.2158 GHz	-45.96 dBm		Func	tion Result		

Date: 26.SEP 2020 11:53:06

Date: 26.SEP.2020 11:53:34

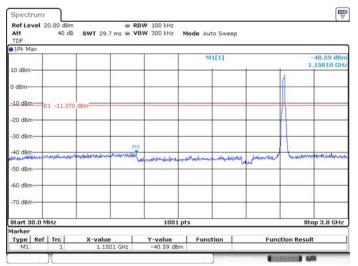


802.11n-20 MIDDLE CHANNEL CARRIER LEVEL



Date: 27.SEP.2020 18:53:44

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



Date: 27.SEP.2020 18:54:05

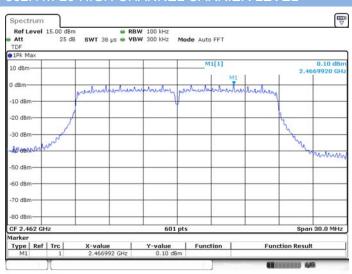
802.11n-20 MIDDLE CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

Ref Level 20.00 dBm Att 40 dB SWT 2 TDF 2 2 2 2 2	 RBW 100 kHz 30 ms VBW 300 kHz 	Mode Auto Sweep		
1Pk Max	1 1 1			-36.68 dBr
8		M1[1]		-36.68 dBr
10 dBm				-
0 dBm				_
-10 dBm D1 -11.370 dBm				_
-20 dBm				
-30 dBmM1				
10 demander and	And the superior of the superior of the superior	-	المعيمان المجمود ومعارك المعراد	Saure of Literary
-50 dBm		1964		_
-60 dBm				
-70 dBm				
Start 2.0 GHz	4001	pts		Stop 25.0 GHz
1arker				
Type Ref Trc X-va	ue Y-value 9121 GHz -36.68 dBn	Function	Function Re	esult

Date: 27.SEP.2020 18:54:13



802.11n-20 HIGH CHANNEL CARRIER LEVE



Date: 26 SEP 2020 11 55:44

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

Att	evel 1	25 dB			BW 100 kHz BW 300 kHz	Mode Au	to Sweep			
TDF 1Pk M	ix.									
10 dBm-						м	1[1]			52.61 dBr 63960 GH
) dBm—										
10 dBm	_								1	
20 dBm	Di	1 -19.900	dBm							
30 dBrr	-				-					
40 dBm	-			· · · ·						
50 dBm	-					MI			Α	
60 dBm	much	sedin-ration	reinforcesto	channoiting		well-likelor	nerstanding	representation	Ukandi	en ser an and
70 dBm										
80 dBm	-									
Start 3	0.0 M	Hz			1001	pts			Sto	p 3.0 GHz
Type M1	Ref	Trc 1	X-value	96 GHz	Y-value -52.61 dBr	Fund	ion	Funct	ion Result	

Date: 26.SEP 2020 11:56:01

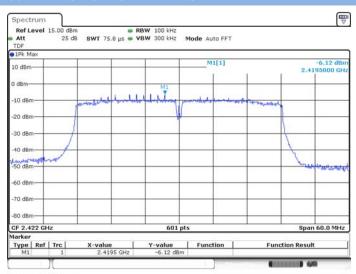
802.11n-20 HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

Ref L	evel	15.00 dBm 25 dB			3W 100 kHz 3W 300 kHz	Mode Au	to Swaan			
TDF		20 00	5 awi 23		54 500 KH2	Mode Au	to sweep			
1Pk M	ax									
10 dBm	-				-	M	1[1]		-50.19 dBr .28480 GH	
					1 1		1	1	1	1
0 dBm-	-				-			-	-	
1										
-10 dBn	-								1	
-30 d0n		1 -19.900	dam							
-20 (10)	10	1 -19.900	ubm							
-30 dBn	-			-				-	-	-
1000	86									
- 0 dBn								+	-	
M1										
-S0 dEn		the stand as	1	Viante Contractor	-	1	the section of	Car Loose S		
60 dBn		in a state of the	-	the second second	- Marine Marine	and the second second	and a second	and the second second second		Lubale and
00 080	1		the station in the							
-70 dBn	-								-	
					1 1					
-80 dBn					+			-	-	
Start 2	.0 GH	z			4001	pts		-	Sto	25.0 GHz
Marker		10 XX		205			2			
-	Pof	Trc	X-value	1	Y-value	Fund	tion	Fun	ction Resul	t
Type M1	1.01	1		48 GHz	-50.19 dB					

Date: 26.SEP 2020 11:56:13



802.11n-40 LOW CHANNEL CARRIER LEVEL



Date: 26 SEP 2020 11:58:07

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

	evel 1	5.00 dBm			RBW 100 kHz	88 99 393	2 22			
TDF		25 dB	SWT 29	.7 ms 👄 🕻	/BW 300 kHz	Mode Au	to Sweep			
1Pk M	a×									
10 dBm-	+					MI	[1]			1.07 dBn 3430 GH
0 dBm-	+									
-10 dBm									└	
-20 dBm	-									
-30 dBm		-26.120	dBm							
40 dBm	-						-			
-50 dBm	-			-						A
bo dan	workenses	murination	menadawalkad	-provell-solution	and the second second	and market	and britten	4 Jasuranes	belegy-lat-scattering	relentro
-70 dBm										
-80 dBm	-				-					
Start 3	0.0 MH	łz		·	1001	pts			Stop	3.0 GHz
larker						<i>V</i>				
Type M1	Ref	Trc 1	X-valu	43 GHz	-54.07 dBr	Funct	ion	Func	tion Result	

802.11n-40 LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

Ref Level 15.00 Att 25 TDF	dBm = 5 dB SWT 230 ms =	RBW 100 kHz VBW 300 kHz	Mode Auto Swei	ep	
1Pk Max					
10 dBm		-	M1[1] -45.24 dBr 3.22730 GH		
0 dBm				-	
-10 dBm	_			_	
-20 dBm		_		_	
-30 dBm	120 dBm				
S0 dBm	www.www.www.www.	eldende arbiererer ar se	. A. M. MINIM	المرور المراجع	المتوادية والمتحدية والمتحدية
-60 dBm	. Arbiter . A star			Total Contraction of the local distance of t	
-70 dBm	_			_	
-80 dBm		-			
Start 2.0 GHz		4001 p	ots		Stop 25.0 GHz
larker Type Ref Trc	X-value	value Y-value		Function Function Result	
M1 1	3.2273 GHz	-45.24 dBm		Fund	aion Result

Date: 26 SEP 2020 11:58:24

Date: 26 SEP 2020 11:58:32