



**FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 2**

CERTIFICATION TEST REPORT

For

Communication Module

MODEL NUMBER: 1CQ

PROJECT NUMBER: 4788296310

REPORT NUMBER: 4788296310-3

FCC ID: VPYLB1CQ

IC ID: 772C-LB1CQ

ISSUE DATE: Jan. 31, 2019

Prepared for

Murata Manufacturing Co.,Ltd.

Prepared by

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake
Hi-Tech Development Zone Dongguan, People's Republic of China**

Tel: +86 769 22038881

Fax: +86 769 33244054

Website: www.ul.com



Revision History

Rev.	Issue Date	Revisions	Revised By
--	1/31/2019	Initial Issue	

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	7
4.1. <i>MEASURING INSTRUMENT CALIBRATION.....</i>	7
4.2. <i>MEASUREMENT UNCERTAINTY.....</i>	7
5. EQUIPMENT UNDER TEST	8
5.1. <i>DESCRIPTION OF EUT.....</i>	8
5.2. <i>MAXIMUM OUTPUT POWER</i>	9
5.3. <i>CHANNEL LIST.....</i>	9
5.4. <i>TEST CHANNEL CONFIGURATION.....</i>	10
5.5. <i>THE WORSE CASE POWER SETTING PARAMETER.....</i>	11
5.6. <i>DESCRIPTION OF AVAILABLE ANTENNAS.....</i>	13
5.7. <i>TEST ENVIRONMENT.....</i>	14
5.8. <i>DESCRIPTION OF TEST SETUP</i>	15
5.9. <i>MEASURING INSTRUMENT AND SOFTWARE USED</i>	16
6. ANTENNA PORT TEST RESULTS	17
6.1. <i>ON TIME AND DUTY CYCLE.....</i>	17
6.2. <i>6 dB BANDWIDTH</i>	20
6.3. <i>PEAK CONDUCTED OUTPUT POWER</i>	34
6.4. <i>POWER SPECTRAL DENSITY.....</i>	37
6.5. <i>CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS</i>	51
6.6. <i>RADIATED TEST RESULTS.....</i>	110
6.6.1. <i>LIMITS AND PROCEDURE</i>	110
6.6.2. <i>RESTRICTED BANDEDGE</i>	115
6.6.3. <i>SPURIOUS EMISSIONS</i>	132
6.6.4. <i>SPURIOUS EMISSIONS 1GHz~18GHz</i>	133
6.6.5. <i>SPURIOUS EMISSIONS 18G ~ 26GHz.....</i>	157
6.6.6. <i>SPURIOUS EMISSIONS 30M ~ 1GHz</i>	159
6.6.7. <i>SPURIOUS EMISSIONS BELOW 30M.....</i>	161
7. AC POWER LINE CONDUCTED EMISSIONS	164
8. ANTENNA REQUIREMENTS.....	166



1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Murata Manufacturing Co.,Ltd.
Address: 10-1, Higashikotari 1- chome,Nagaokakyo-shi,Kyoto
617-8555, Japan

Manufacturer Information

Company Name: Murata Manufacturing Co.,Ltd.
Address: 10-1,Higashikotari 1-chome,Nagaokakyo-shi,Kyoto
617-8555, Japan

EUT Description

Product Name	Communication Module
Model Name	1CQ
Sample Number	1468264
Data of Receipt Sample	March 8, 2018
Date Tested	March 8, 2018~Jan 31, 2019

APPLICABLE STANDARDS

STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
ISED RSS-GEN Issue 5	PASS
ISED RSS-247 Issue 2	PASS



Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6db DTS Bandwidth and 99% Bandwidth	FCC 15.247 (a) (2) RSS-247 Clause 5.2 (a)	Complied
2	Peak Conducted Power	FCC 15.247 (b) (3) RSS-247 Clause 5.4 (e)	Complied
3	Power Spectral Density	FCC 15.247 (e) RSS-247 Clause 5.2 (b)	Complied
4	Conducted Band edge And Spurious emission	FCC 15.247 (d) RSS-247 Clause 5.5	Complied
5	Radiated Band edges and Spurious emission	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	Complied
6	Conducted Emission Test for AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	Complied
7	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	Complied

Remark:

- 1) For this product, it has two antennas, antenna1 and antenna2, it can transmit at the same time during work at 802.11B & 802.11G & 802.11N20 & 802.11N40 modes, but only the 802.11N20 & 802.11N40 modes support the MIMO technical.
- 2) Pre-testing Antenna 1 and Antenna2, and pre-testing SISO and MIMO modes, only the data of the worst case is shown in this test report.

Tested By:

Denny Huang
Engineer Project Associate

Check By:

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC KDB 558074 D01 DTS Meas Guidance v05, 414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-247 Issue 2, and RSS-GEN Issue 5

3. FACILITIES AND ACCREDITATION

Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Accreditation Certificate	A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules IC(Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320. VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note:

1. All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
2. The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.
3. For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OATS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	3.62dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.00dB
Uncertainty for Radiation Emission test (1GHz to 40GHz)(include Fundamental emission)	5.78dB(1-18GHz) 5.23dB (18GHz-26Gz) 5.64dB (26GHz-40Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Product Name:	Communication Module	
Model No.:	1CQ	
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz	
Type of Modulation:	IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n (HT20 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel Number:	IEEE 802.11b/g, IEEE 802.11n(HT20): 11 Channels IEEE 802.11n(HT40): 7 Channels	
Channels Step:	Channels with 5MHz step	
Sample Type:	Fixed production	
Test software of EUT:	Tera Term & QRCT	
Antenna Type:	PCB Antenna	
Antenna Gain:	Antenna 1:	0 dBi
	Antenna 2:	0 dBi
	Directional:	3.01 dBi
Power Supply	VDD_3P3/SWREG_IN/VDD_FEM: Typ. DC3.3V, Max. DC3.5V, Min. DC3.1V	
	VDDIO_GPIO0/1/VDDIO_Xtal: Typ. DC1.8V or DC3.3V, Max. DC3.46V, Min. DC1.71V	

Note:

1. Directional Gain = $10\log N$, N is the number of antennas;
2. The directional gain shall be calculated when we calculate the MIMO power.



5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	IEEE Std. 802.11	Frequency (MHz)	Channel Number	Max PK Conducted Power-Antenna 1 (dBm)	Max PK Conducted Power-Antenna 2 (dBm)	Max PK Conducted Power-Antenna1+2 (dBm)
2412-2462	1/2	IEEE 802.11b	2412-2462	1-11[11]	19.90	19.80	22.86
2412-2462	1/2	IEEE 802.11g	2412-2462	1-11[11]	21.94	22.14	24.99
2412-2462	1/2	IEEE 802.11nHT20	2412-2462	1-11[11]	20.81	20.53	23.52
2422-2452	1/2	IEEE 802.11nHT40	2422-2452	3-9[7]	20.73	20.30	23.46

5.3. CHANNEL LIST

Channel List for 802.11 b/g/n (20 MHz)							
Channel	Frequency (MHz)	Channel	Frequenc y(MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	5	2432	9	2452		
2	2417	6	2437	10	2457		
3	2422	7	2442	11	2462		
4	2427	8	2447				

Channel List for 802.11n (40 MHz)							
Channel	Frequency (MHz)	Channel	Frequenc y(MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	5	2432	7	2442	9	2452
4	2427	6	2437	8	2447		

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel (MHz)
IEEE 802.11B	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11G	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11n HT20	LCH: CH01 2412
	MCH: CH06 2437
	HCH: CH11 2462
IEEE 802.11n HT40	LCH: CH03 2422
	MCH: CH06 2437
	HCH: CH09 2452

5.5. THE WORSE CASE POWER SETTING PARAMETER

1) For SISO mode

Test Antenna	Test Software Version	QRCT			
		Test Mode	Test Channel	Setting TX Power	Setting data rate (Mbps)
Antenna 1	IEEE 802.11B	LCH	18	CCK_1Mbps	
		MCH	18	CCK_1Mbps	
		HCH	18	CCK_1Mbps	
	IEEE 802.11G	LCH	15.5	NO HT_6Mbps	
		MCH	15	NO HT_6Mbps	
		HCH	15.5	NO HT_6Mbps	
	IEEE 802.11n HT20	LCH	14.5	HT20_MCS_0_20	
		MCH	14	HT20_MCS_0_20	
		HCH	14.5	HT20_MCS_0_20	
	IEEE 802.11n HT40	LCH	13.5	HT40+MCS_0_40	
		MCH	14	HT40+MCS_0_40	
		HCH	13.5	HT40+MCS_0_40	
Antenna 2	IEEE 802.11B	LCH	18	CCK_1Mbps	
		MCH	18	CCK_1Mbps	
		HCH	18	CCK_1Mbps	
	IEEE 802.11G	LCH	15.5	NO HT_6Mbps	
		MCH	15	NO HT_6Mbps	
		HCH	15.5	NO HT_6Mbps	
	IEEE 802.11n HT20	LCH	14.5	HT20_MCS_0_20	
		MCH	14	HT20_MCS_0_20	
		HCH	14.5	HT20_MCS_0_20	
	IEEE 802.11n HT40	LCH	13.5	HT40+MCS_0_40	
		MCH	14	HT40+MCS_0_40	
		HCH	13.5	HT40+MCS_0_40	

2) For MIMO mode:

Test Antenna	Test Software Version	QRCT		
	Test Mode	Test Channel	Setting TX Power	Setting data rate (Mbps)
Antenna 1	IEEE 802.11B	LCH	18	CCK_1Mbps
		MCH	18	CCK_1Mbps
		HCH	18	CCK_1Mbps
	IEEE 802.11G	LCH	15.5	NO HT_6Mbps
		MCH	15	NO HT_6Mbps
		HCH	15.5	NO HT_6Mbps
	IEEE 802.11n HT20	LCH	14.5	HT20_MCS_0_20
		MCH	14	HT20_MCS_0_20
		HCH	14.5	HT20_MCS_0_20
	IEEE 802.11n HT40	LCH	13.5	HT40+MCS_0_40
		MCH	14	HT40+MCS_0_40
		HCH	13.5	HT40+MCS_0_40
Antenna 2	IEEE 802.11B	LCH	18	CCK_1Mbps
		MCH	18	CCK_1Mbps
		HCH	18	CCK_1Mbps
	IEEE 802.11G	LCH	15.5	NO HT_6Mbps
		MCH	15	NO HT_6Mbps
		HCH	15.5	NO HT_6Mbps
	IEEE 802.11n HT20	LCH	14.5	HT20_MCS_0_20
		MCH	14	HT20_MCS_0_20
		HCH	14.5	HT20_MCS_0_20
	IEEE 802.11n HT40	LCH	13.5	HT40+MCS_0_40
		MCH	14	HT40+MCS_0_40
		HCH	13.5	HT40+MCS_0_40

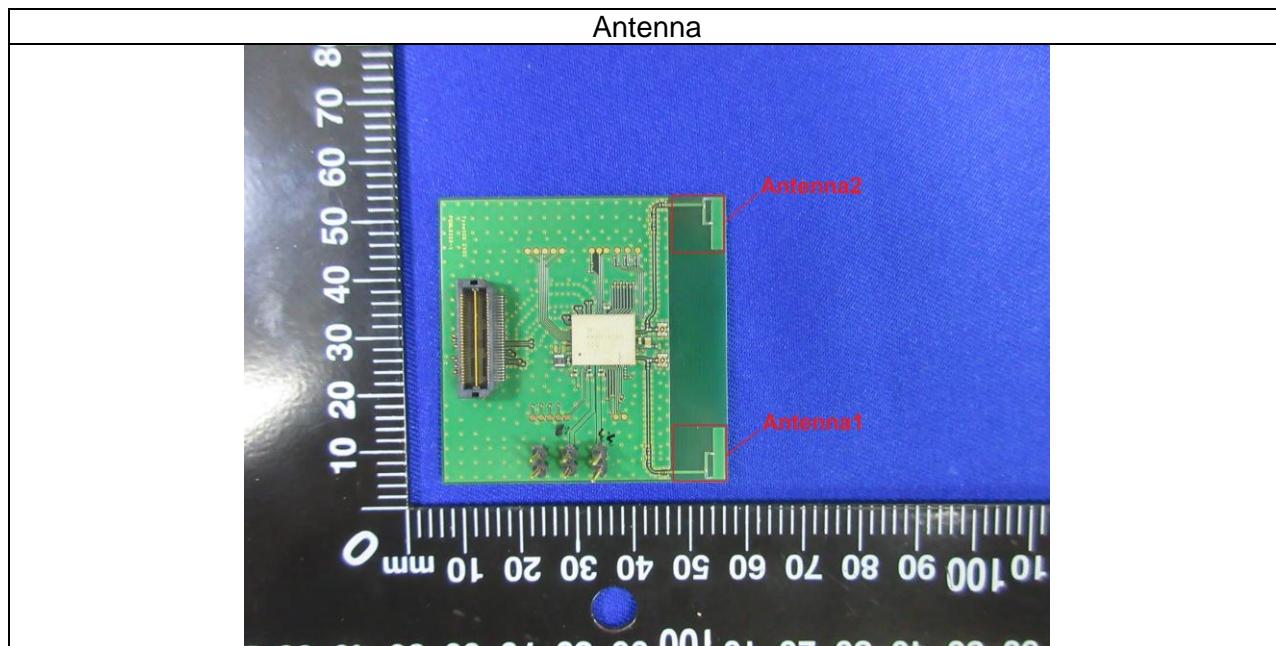
Note:

1. The antenna1 and antenna2 can transmit at the same time during work at 802.11B & 802.11G & 802.11N20 & 802.11N40 mode, but only the 802.11N20 & 802.11N40 modes support the MIMO technical.
2. The power setting of MIMO mode is same as the power setting of SISO mode, so the MIMO mode is worse case.

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	PCB Antenna	0
2	2400-2483.5	PCB Antenna	0

Test Mode	Transmit and Receive Mode	Description
11B	<input checked="" type="checkbox"/> 2TX, 2RX	Both antennas can be used as transmitting/receiving antenna.
11G	<input checked="" type="checkbox"/> 2TX, 2RX	Both antennas can be used as transmitting/receiving antenna.
11N20	<input checked="" type="checkbox"/> 2TX, 2RX	Both antennas can be used as transmitting/receiving antenna.
11N40	<input checked="" type="checkbox"/> 2TX, 2RX	Both antennas can be used as transmitting/receiving antenna.





5.7. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1005Pa	
Temperature	TN	-20 ~ 70°C
Voltage	VL	N/A
	VN	VDD_3P3/SWREG_IN/VDD_FEM:DC3.3V VDDIO_GPIO0/1/VDDIO_Xtal:DC1.8V
	VH	N/A

Note: VL= Lower Extreme Test Voltage

VN= Nominal Voltage

VH= Upper Extreme Test Voltage

TN= Normal Temperature

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	ThinkPad	E450	N/A

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	LAN	LAN	N/A	0.2	N/A
2	USB	USB	Unshielded	0.5	N/A

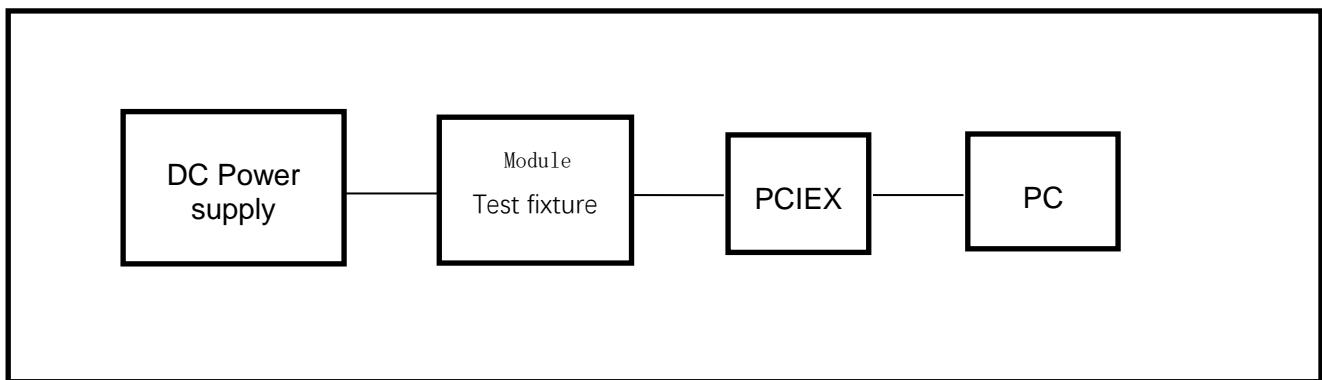
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

TEST SETUP

The EUT can work in an engineer mode with a software through a PC.

SETUP DIAGRAM FOR TESTS





5.9. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	101983	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
Software							
Used	Description		Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance		UL	Antenna port	Ver. 7.2		
Radiated Emissions							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY564000	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Sept. 17, 2018	Sept.17, 2021
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A0909	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Sept. 17, 2018	Sept.17, 2021
<input checked="" type="checkbox"/>	High Gain Horn	Schwarzbe	BBHA-9170	691	Jan.06, 2016	Aug.11, 2018	Aug.11, 2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.12,2017	Dec.10, 2018	Dec.10, 2019
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbe	1519B	00008	Mar. 26,	Mar. 26, 2016	Mar. 26, 2019
Software							
Used	Description		Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance		Farad	EZ-EMC	Ver. UL-3A1		
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9030A	MY554105 12	Dec.12,2017	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Power Sensor	Keysight	U2021XA	MY570300 04	Dec.12,2017	Dec.10,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Power Meter	Keysight	N1911A	MY554160 24	Dec.12,2017	Dec.11,2018	Dec.10,2019
<input checked="" type="checkbox"/>	High Pass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	4	Dec.12,2017	Dec.11,2018	Dec.10,2019
<input checked="" type="checkbox"/>	Band Reject Filter	Wainwright	WRCJV20-5440-5470-5725-5755-60SS	1	Dec.12,2017	Dec.11,2018	Dec.10,2019

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

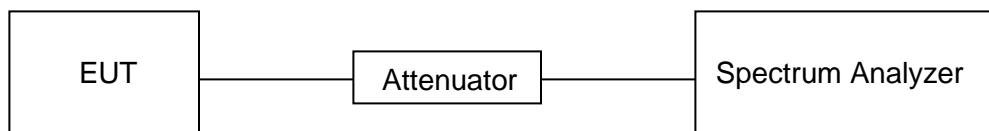
LIMITS

None; for reporting purposes only

PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



RESULTS

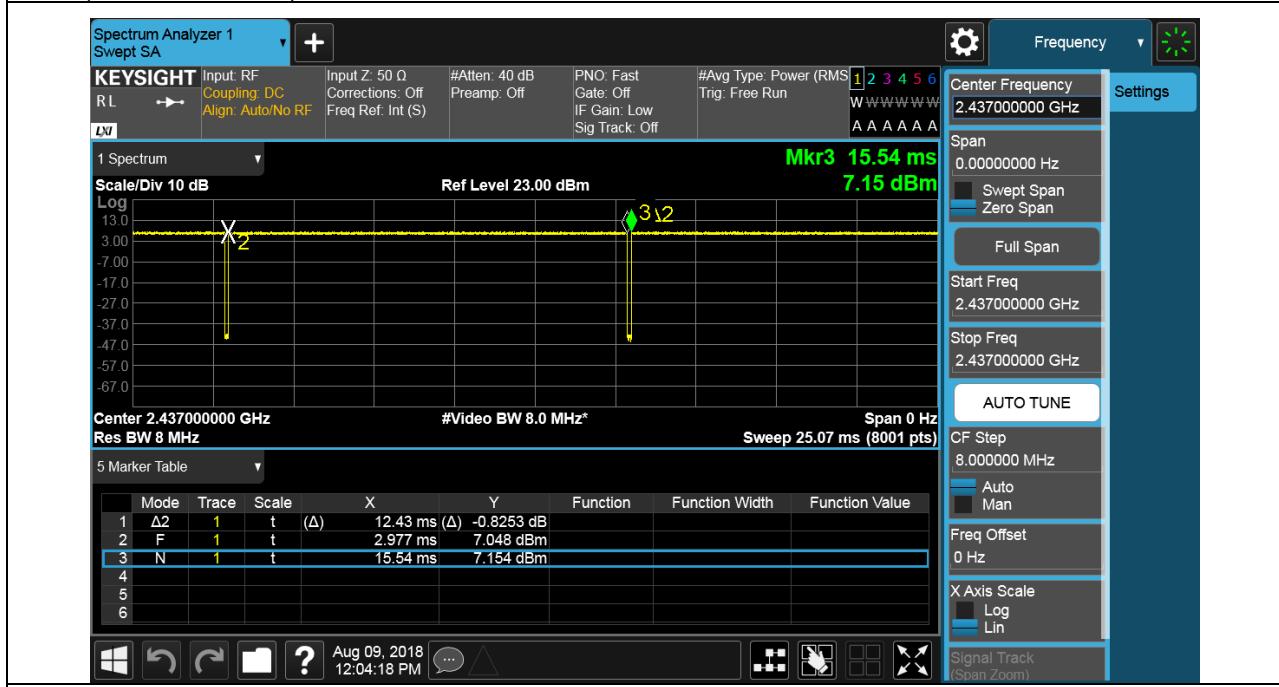
Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)
11B	12.43	12.563	0.9894	98.94%	0.0462	0.0805
11G	2.059	2.2085	0.9323	93.23%	0.3044	0.4857
11N20 MIMO	1.918	2.074	0.9248	92.48%	0.3395	0.5213
11N40 MIMO	0.9431	1.0557	0.8933	89.33%	0.4900	1.060

Note:

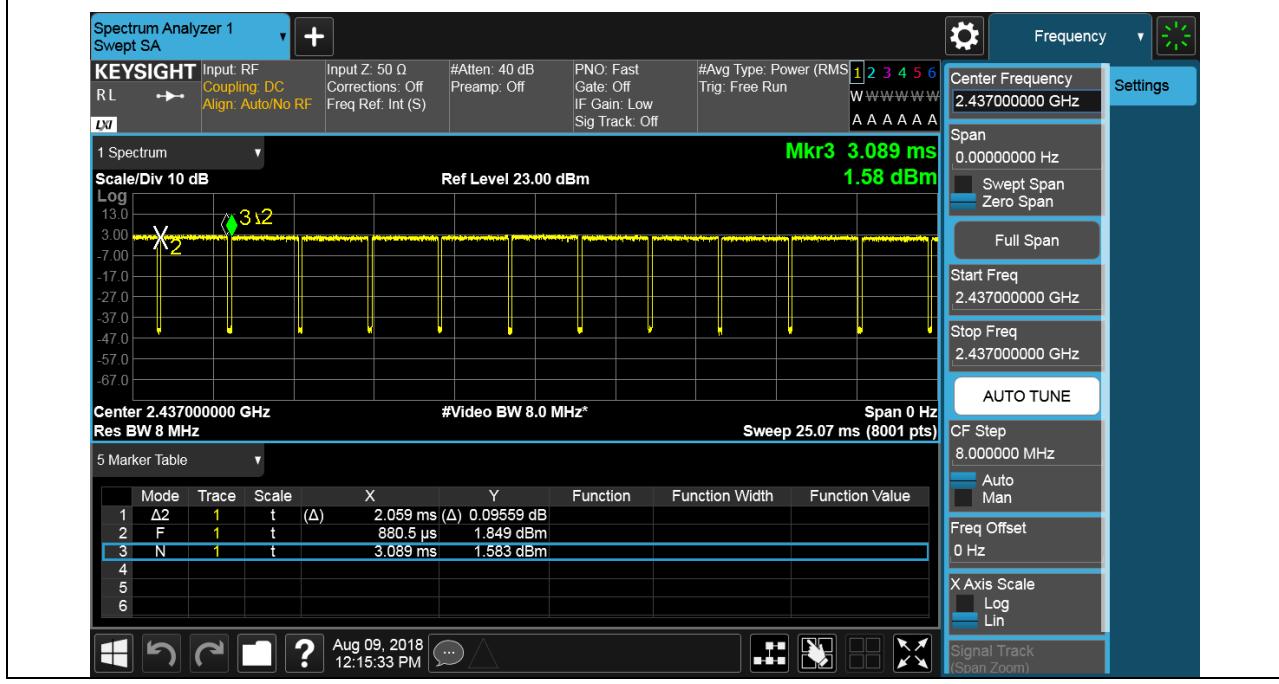
1. Duty Cycle Correction Factor=10log(1/x).
2. Where: x is Duty Cycle (Linear)
3. Where: T is On Time (transmit duration)
4. If that calculated VBW is not available on the analyzer then the next higher value should be used.
5. Antenna 1 and Antenna 2 have the same duty cycle.
6. Pre-testing the 11N SISO Mode and MIMO mode, only the MIMO Mode which is worse case is recorded in this report.

ON TIME AND DUTY CYCLE MID CH

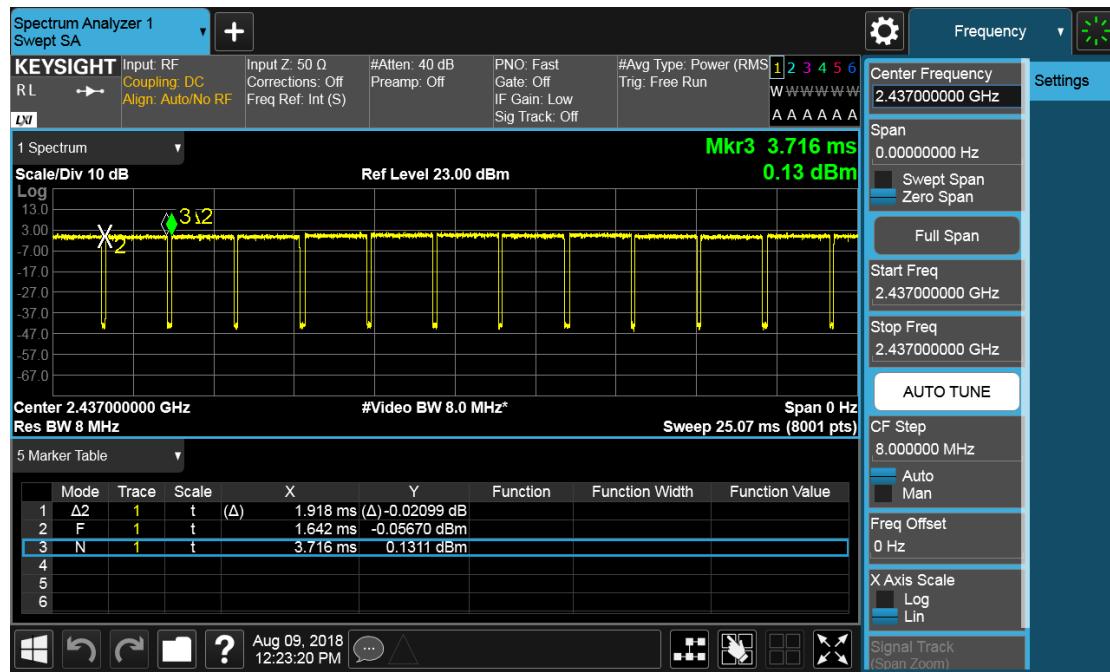
11B (WORSE CASE)



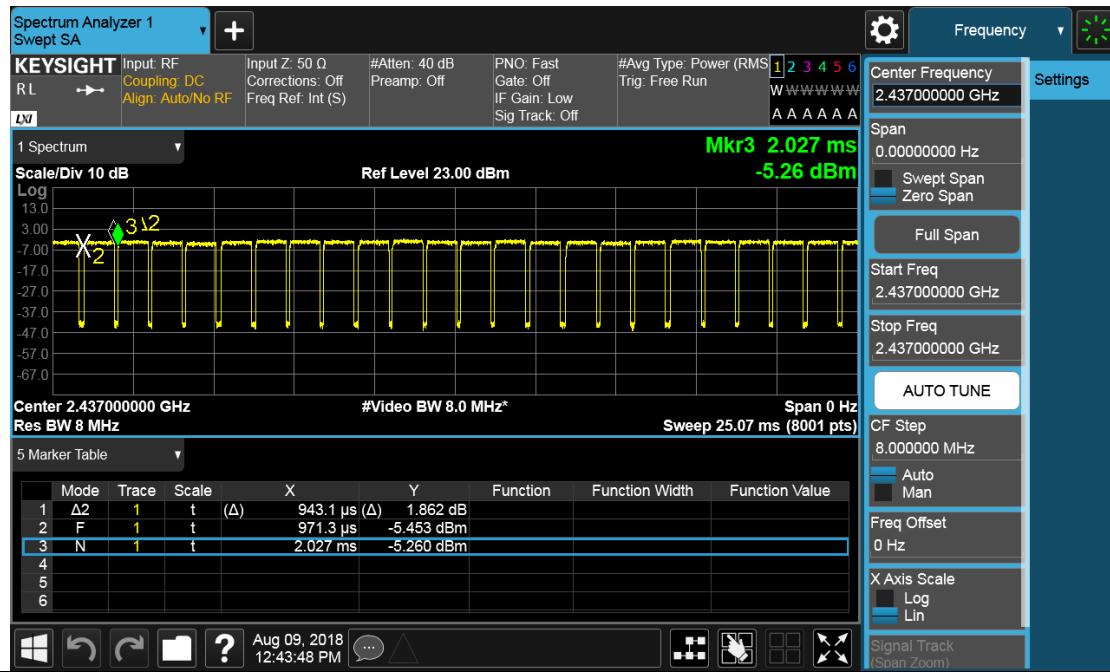
11G (WORSE CASE)



11N20 MIMO(WORSE CASE)



11N40MIMO(WORSE CASE)



6.2. 6 dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2) RSS-247 5.1 (a)	6dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5
RSS-Gen Clause 6.6	99% Bandwidth	For reporting purposes only.	2400-2483.5

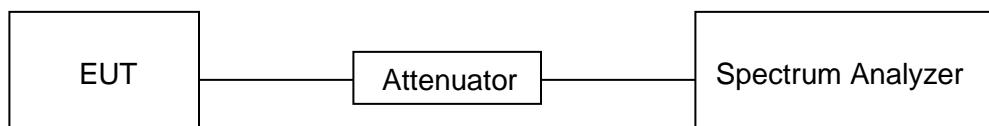
TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth :100K For 99% Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$ For 99% Bandwidth : approximately $3\times\text{RBW}$
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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 and 99% relative to the maximum level measured in the fundamental emission.

TEST SETUP



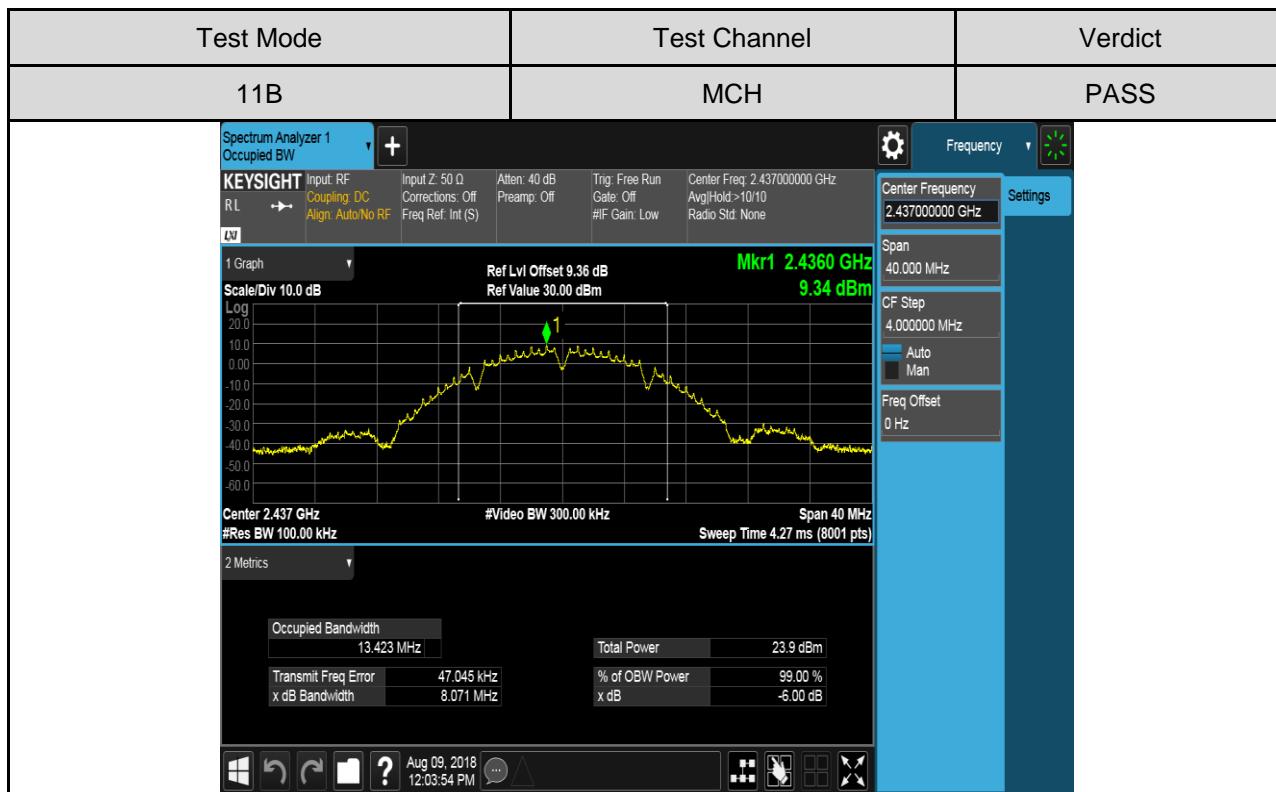
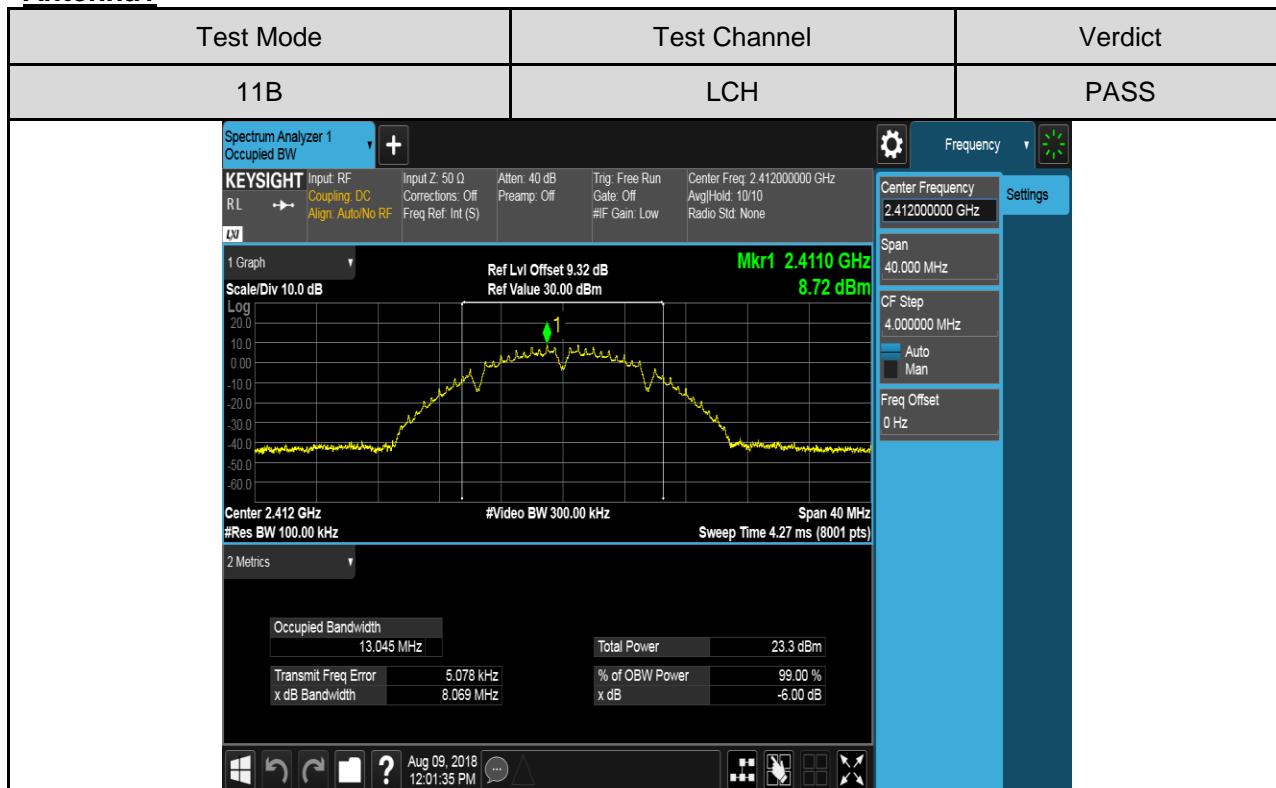


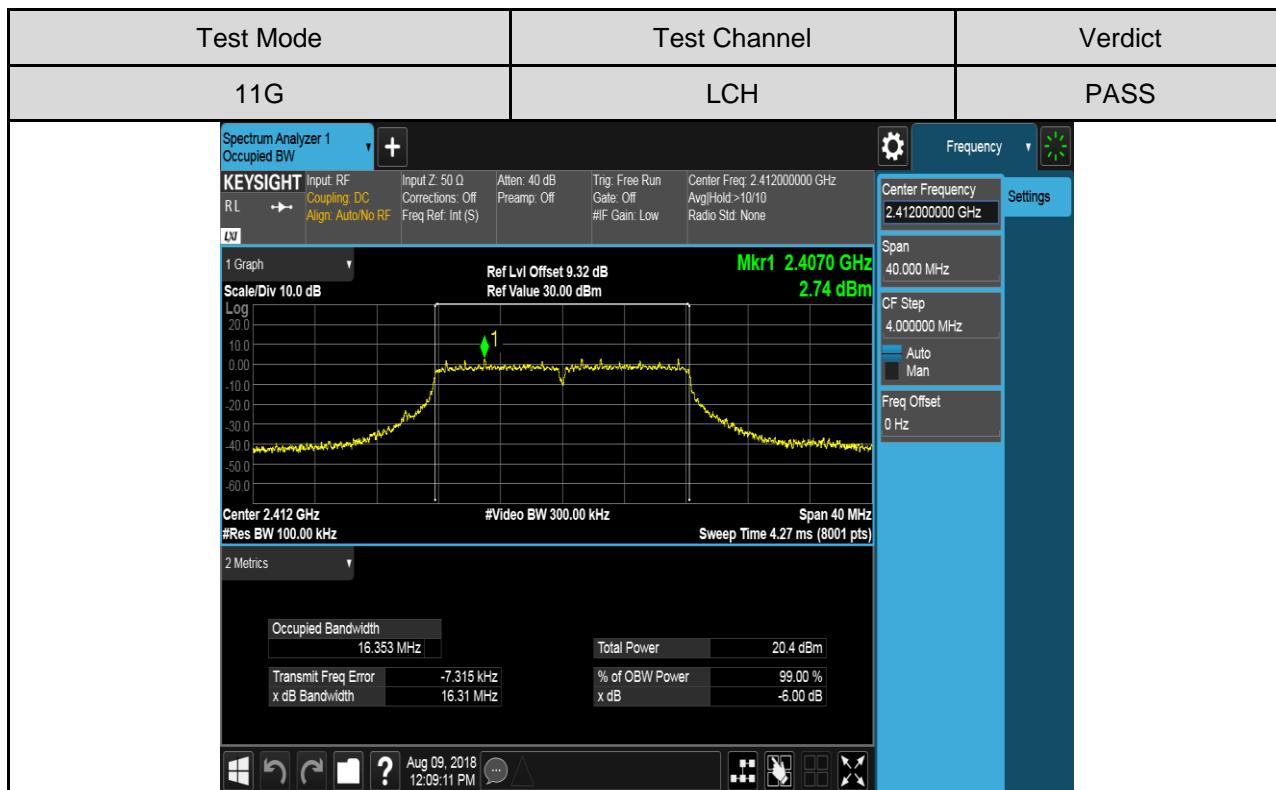
RESULTS

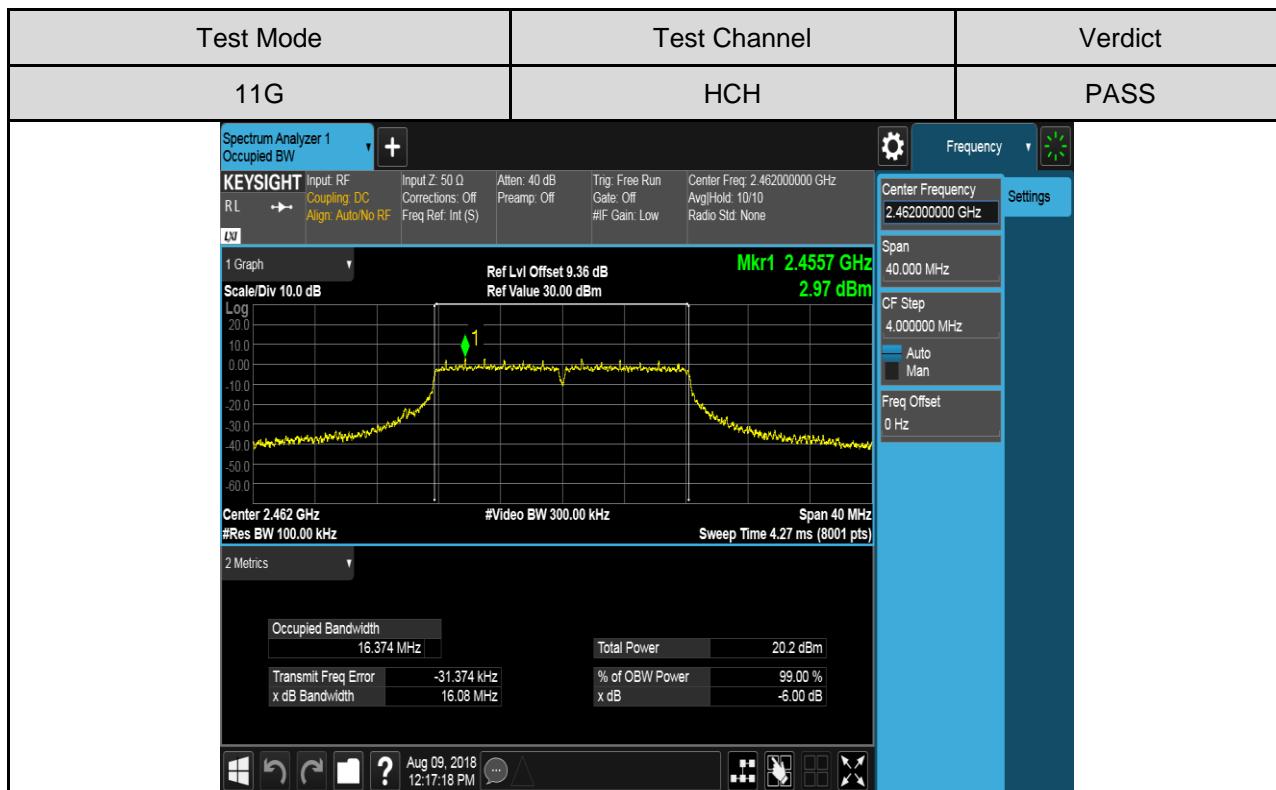
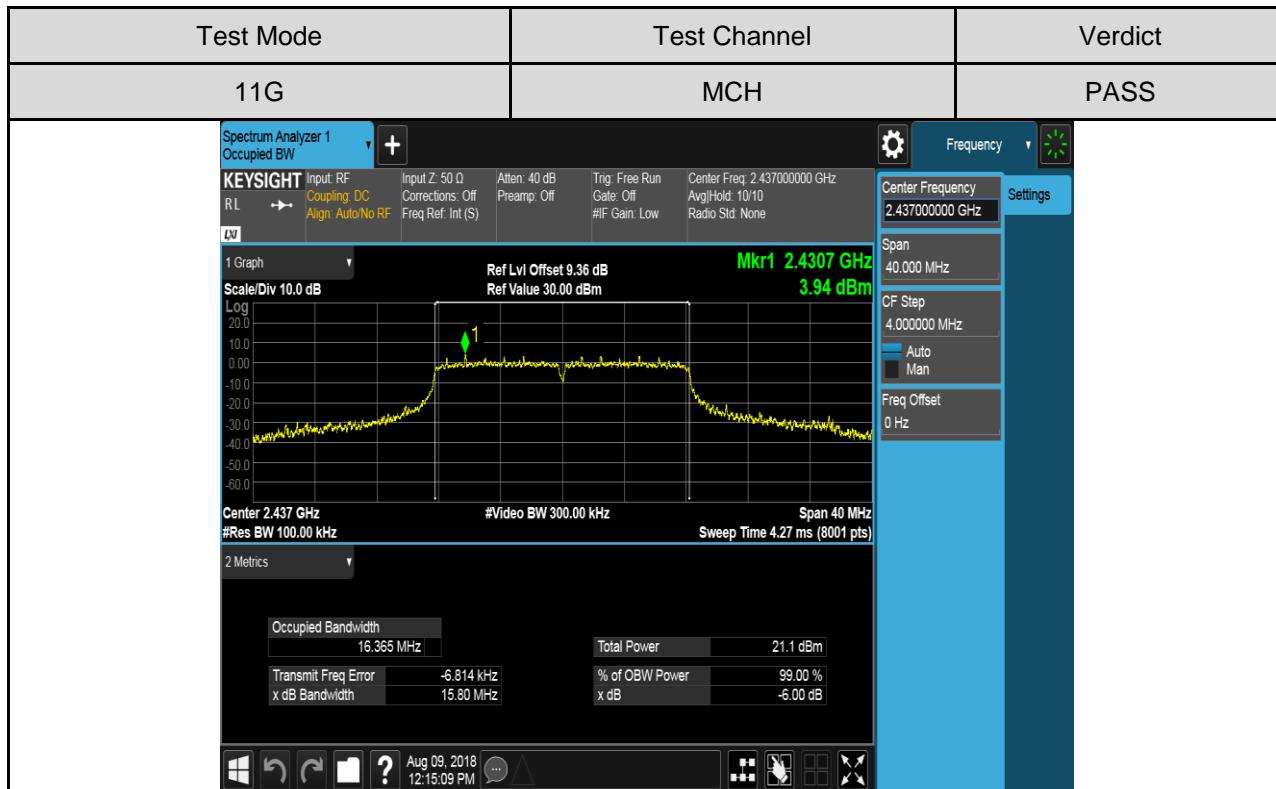
Test Mode	Test Antenna	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
11B	Antenna 1	LCH	8.069	13.045	Pass
		MCH	8.071	13.423	Pass
		HCH	8.067	13.309	Pass
	Antenna 2	LCH	8.067	13.054	Pass
		MCH	8.072	13.159	Pass
		HCH	8.067	13.471	Pass
11G	Antenna 1	LCH	16.31	16.353	Pass
		MCH	15.80	16.365	Pass
		HCH	16.08	16.374	Pass
	Antenna 2	LCH	16.33	16.359	Pass
		MCH	15.88	16.353	Pass
		HCH	15.74	16.382	Pass
11N20 MIMO	Antenna 1	LCH	16.94	17.550	Pass
		MCH	17.00	17.539	Pass
		HCH	17.19	17.563	Pass
	Antenna 2	LCH	16.80	17.546	Pass
		MCH	16.30	17.527	Pass
		HCH	17.18	17.558	Pass
11N40MIMO	Antenna 1	LCH	35.06	36.012	Pass
		MCH	35.17	35.938	Pass
		HCH	35.32	36.025	Pass
	Antenna 2	LCH	36.08	36.096	Pass
		MCH	35.36	35.970	Pass
		HCH	35.12	35.931	Pass

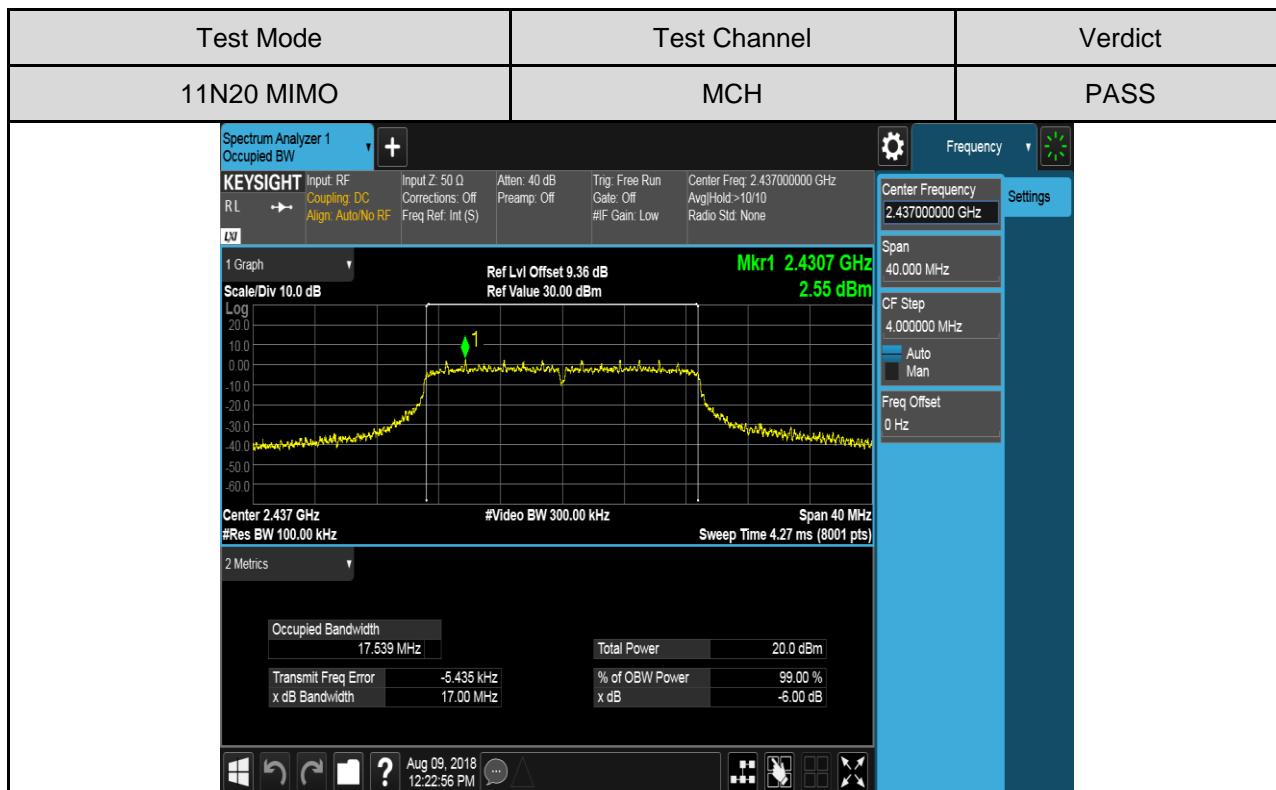
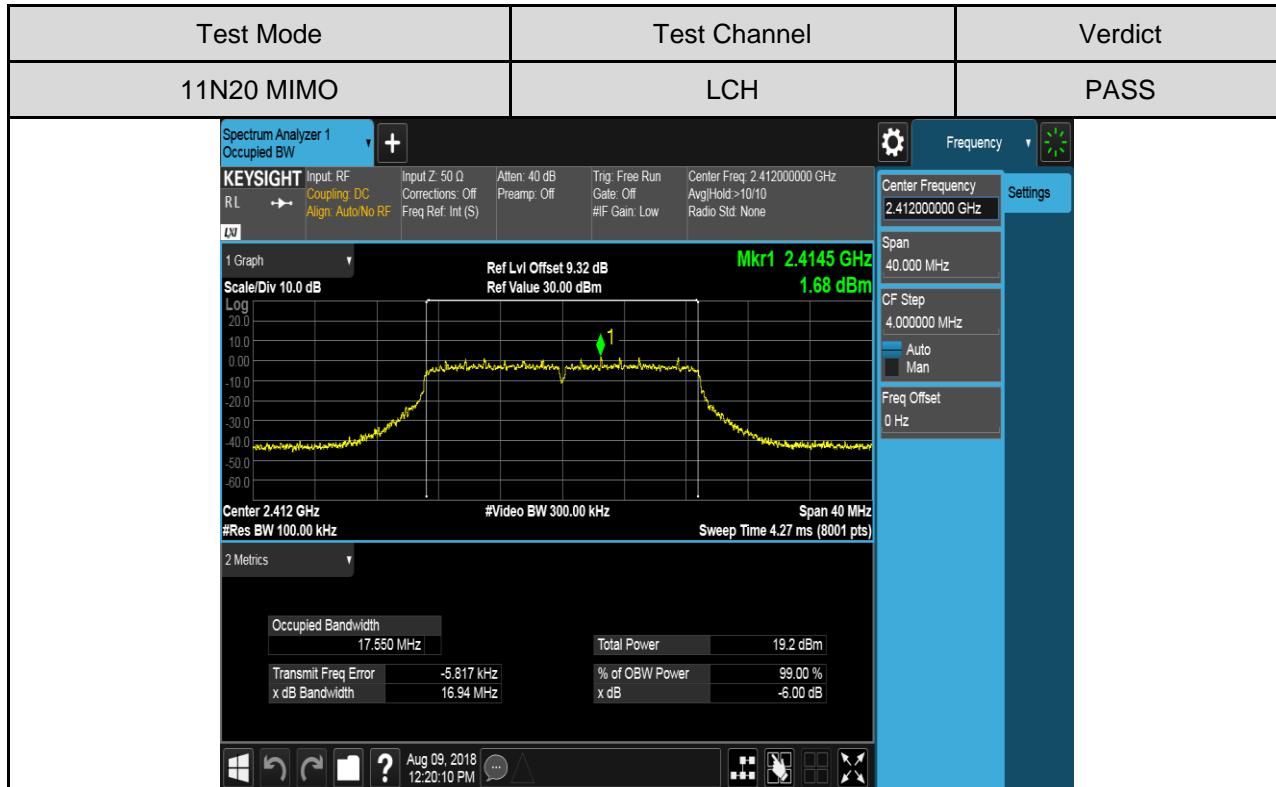
Test Graphs

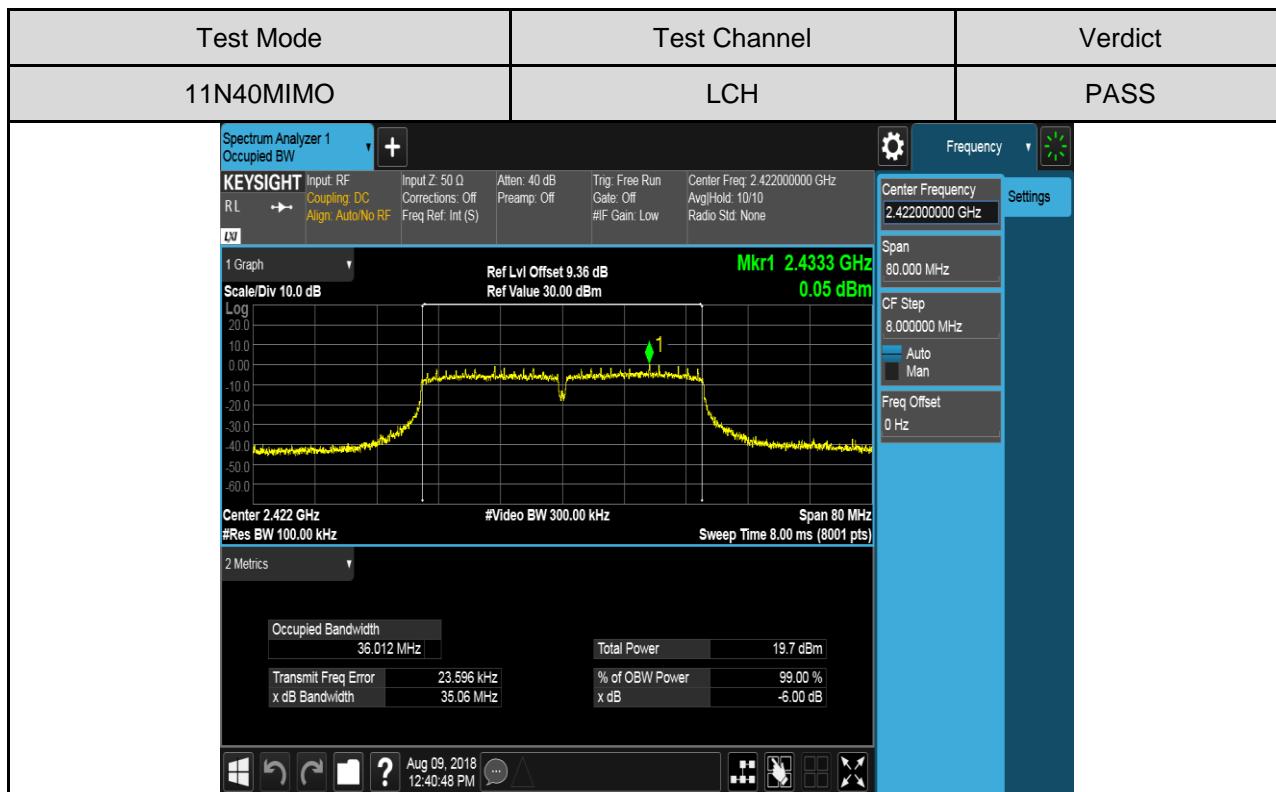
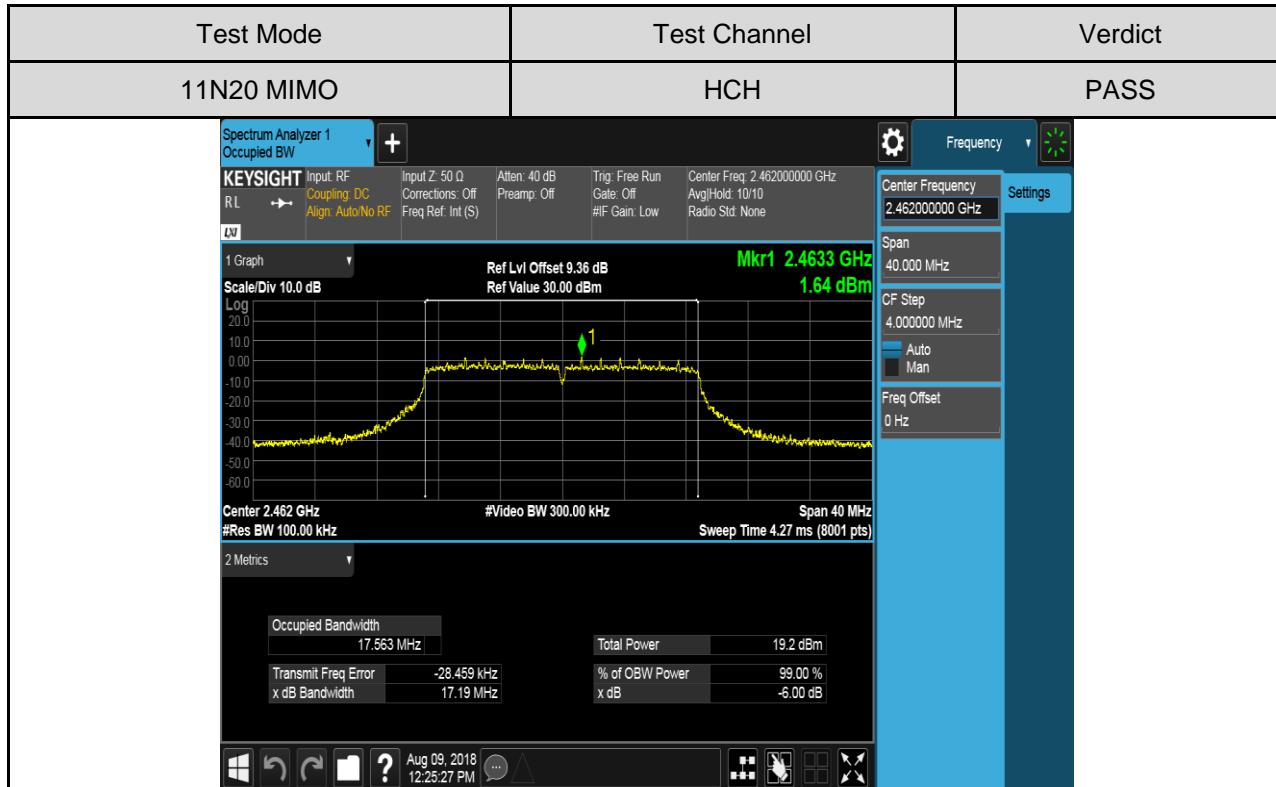
Antenna1

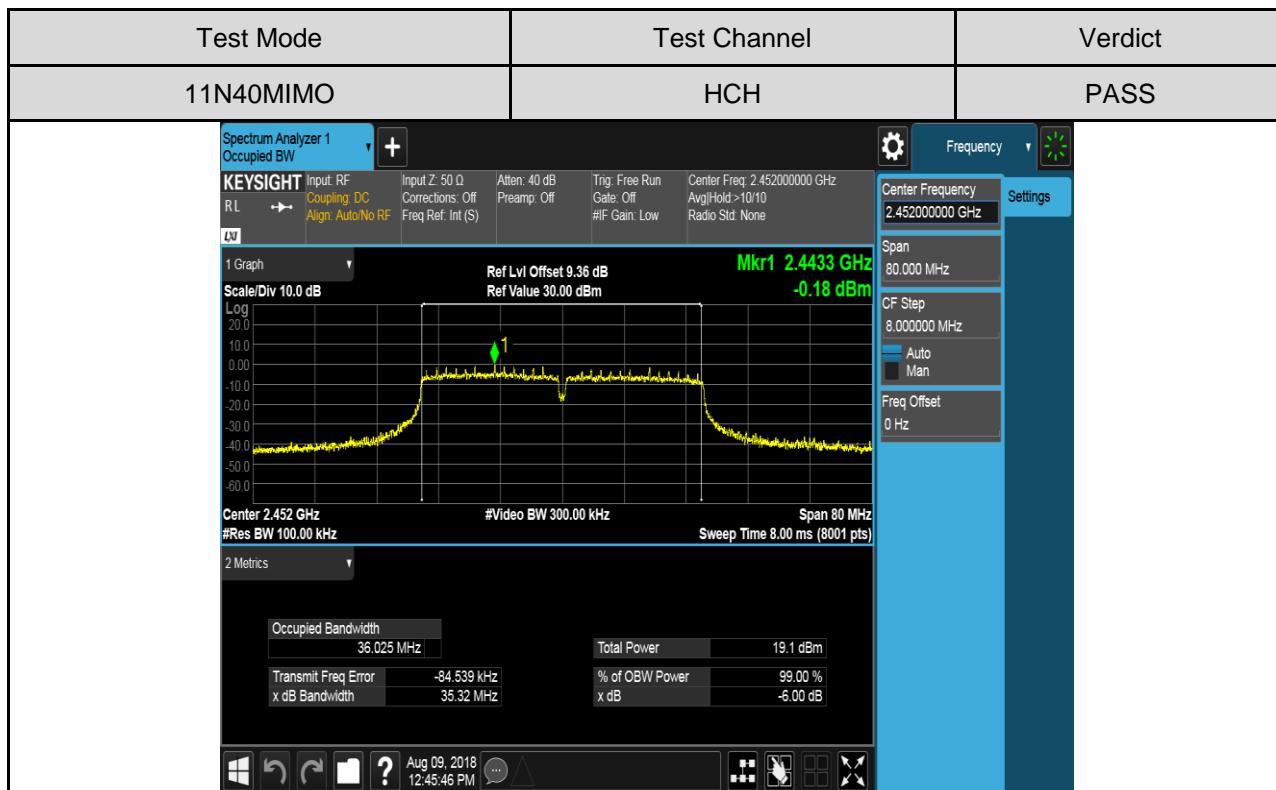
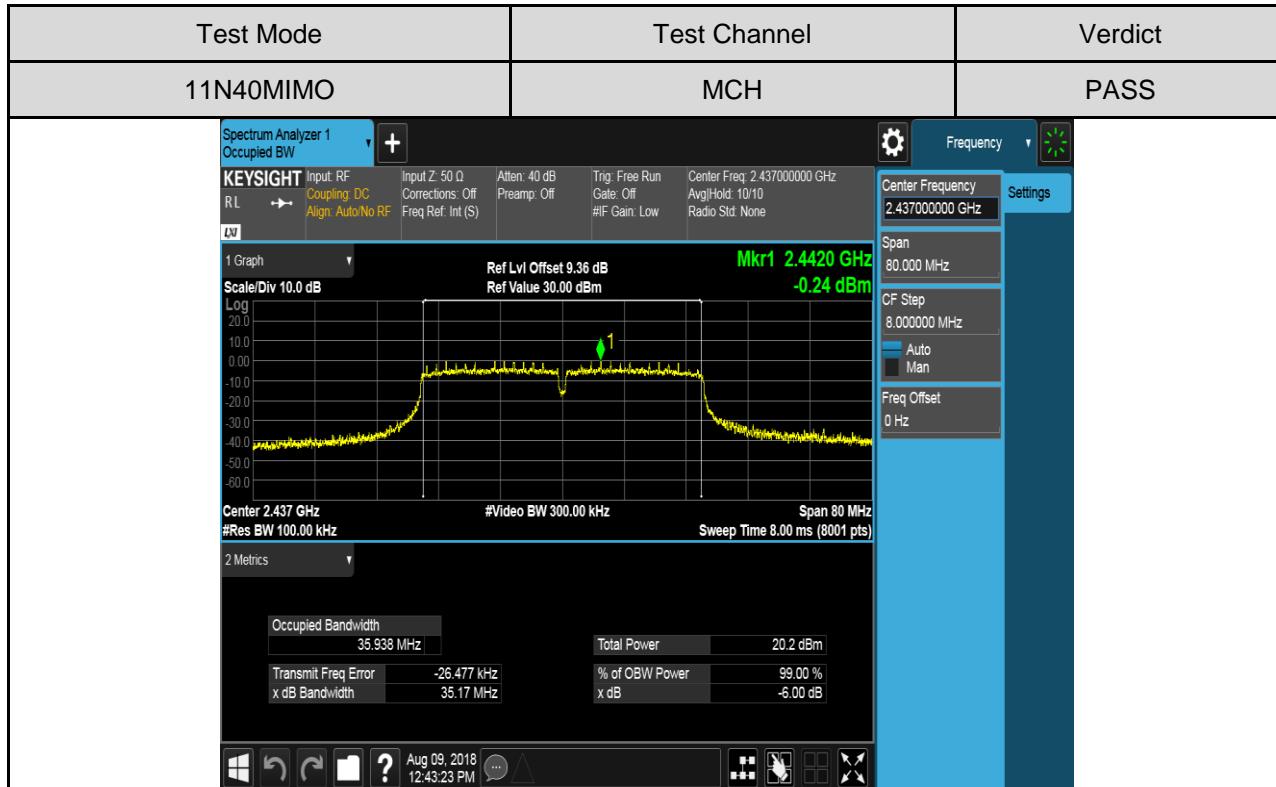




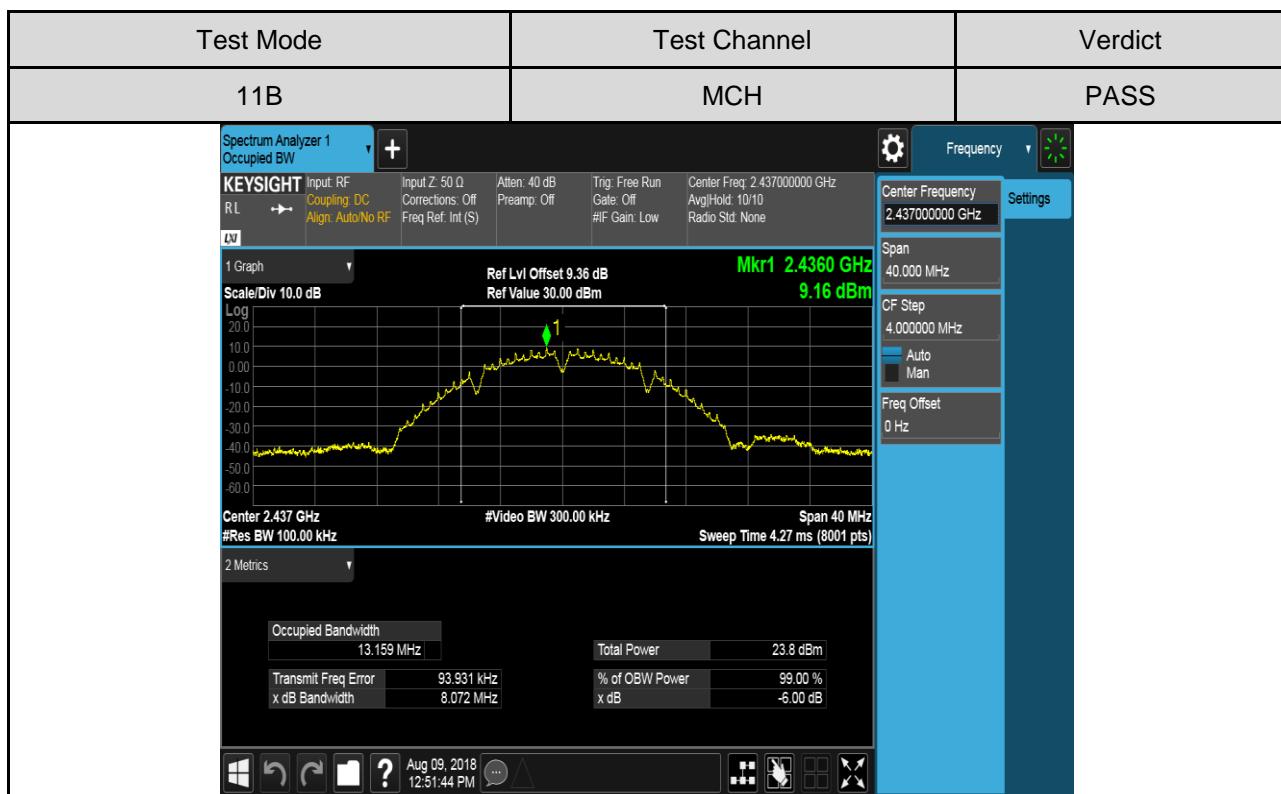
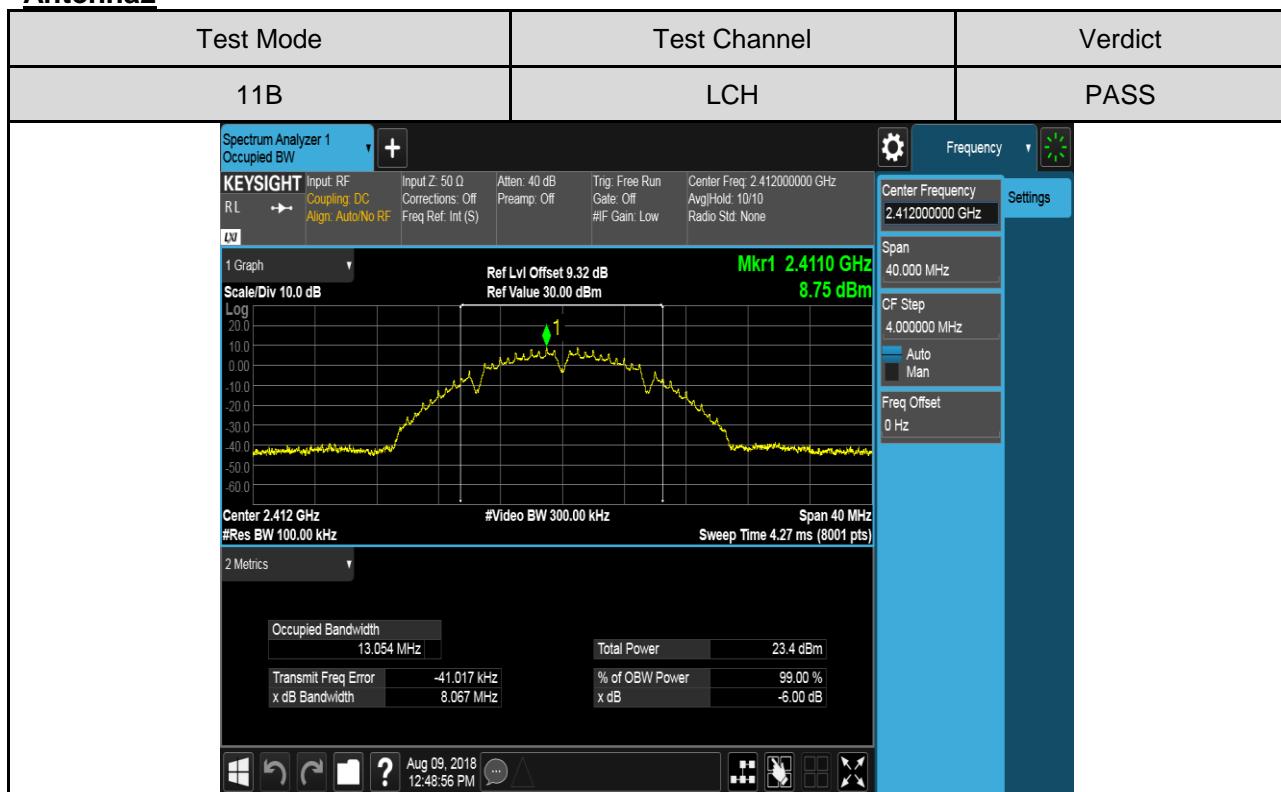


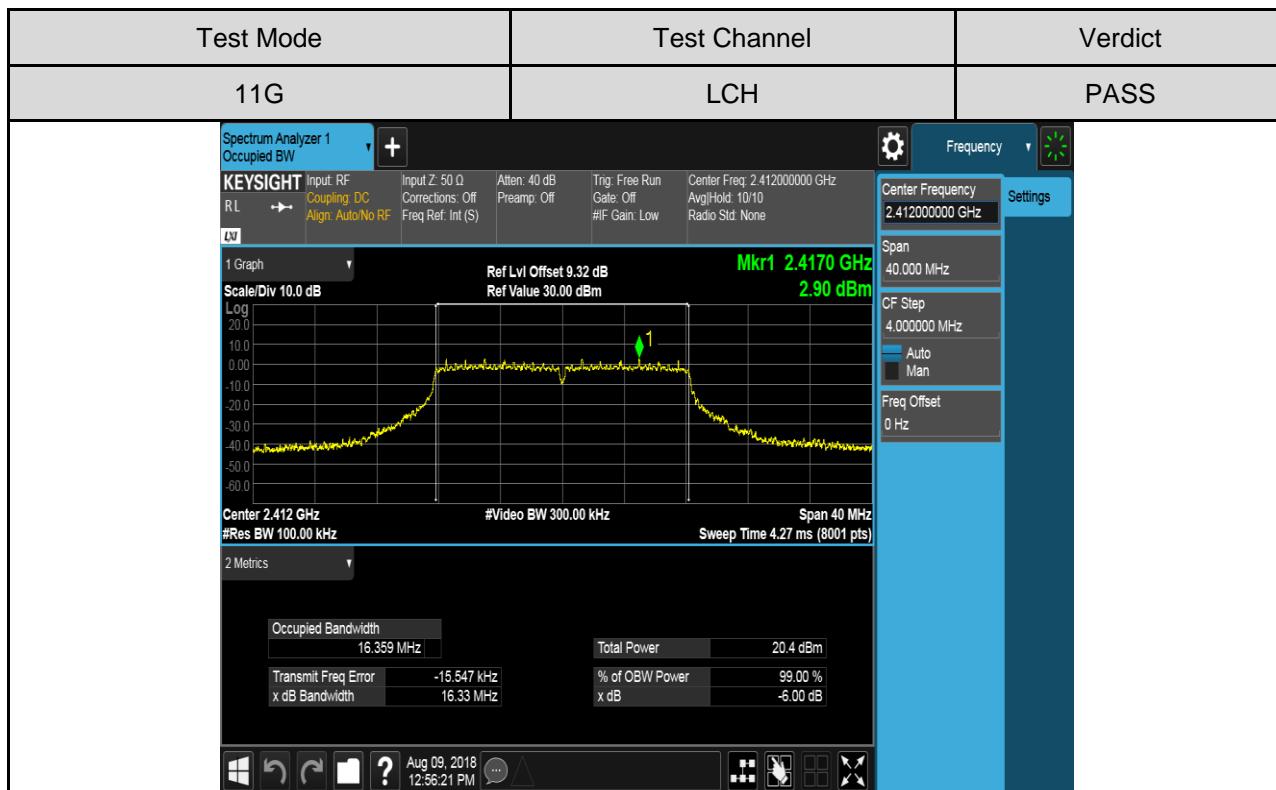
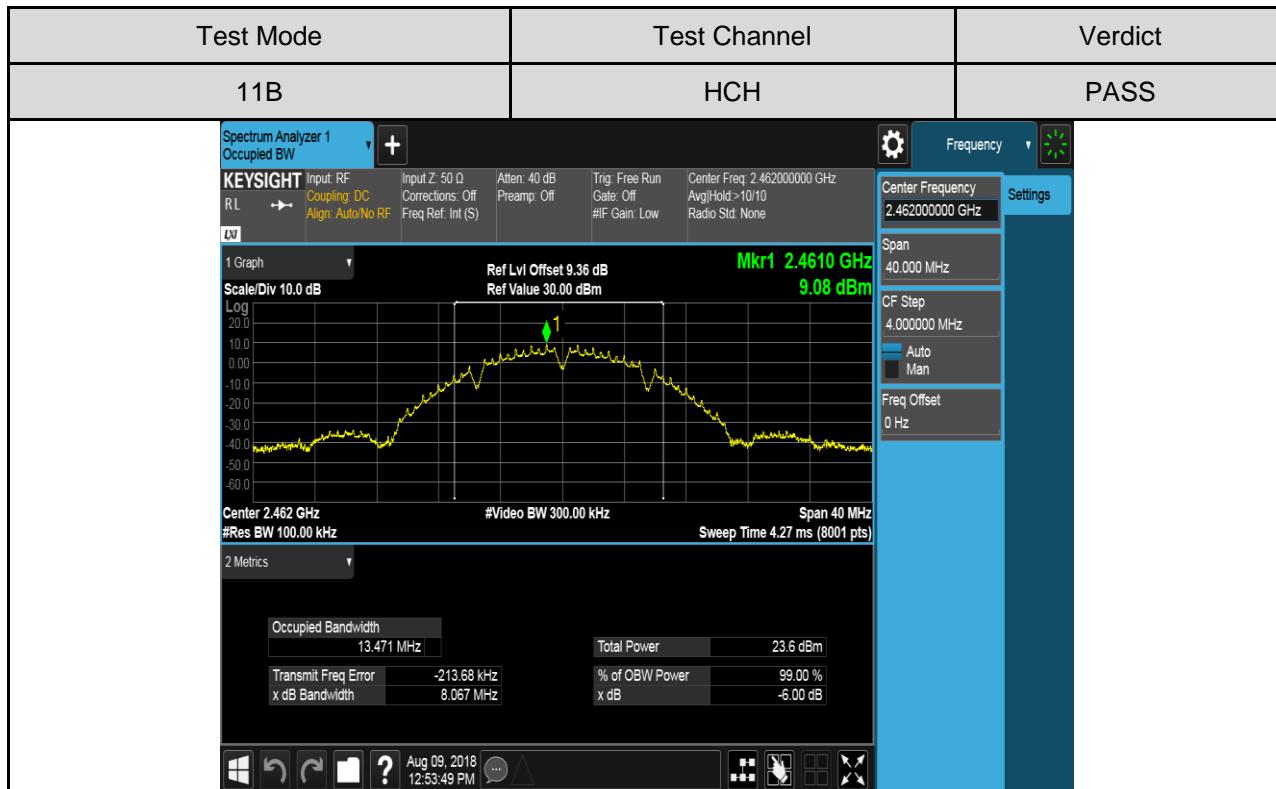


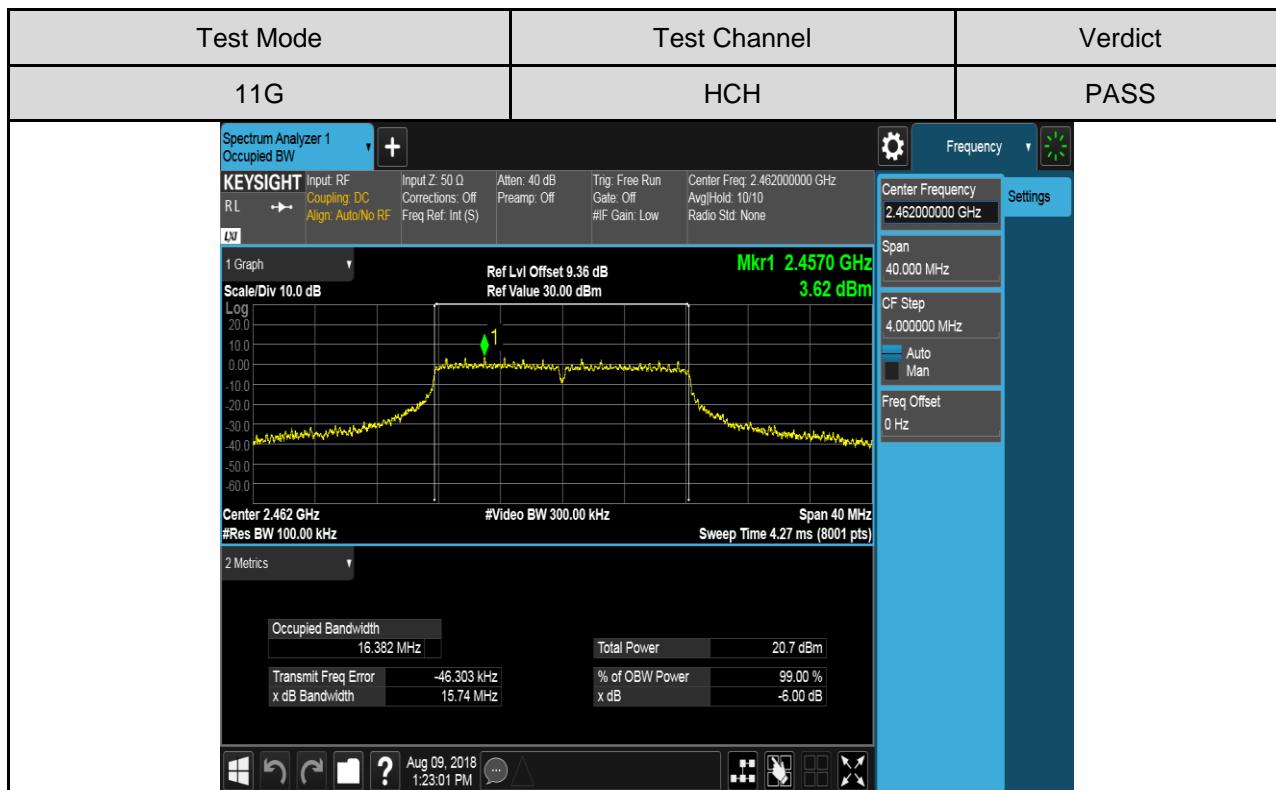
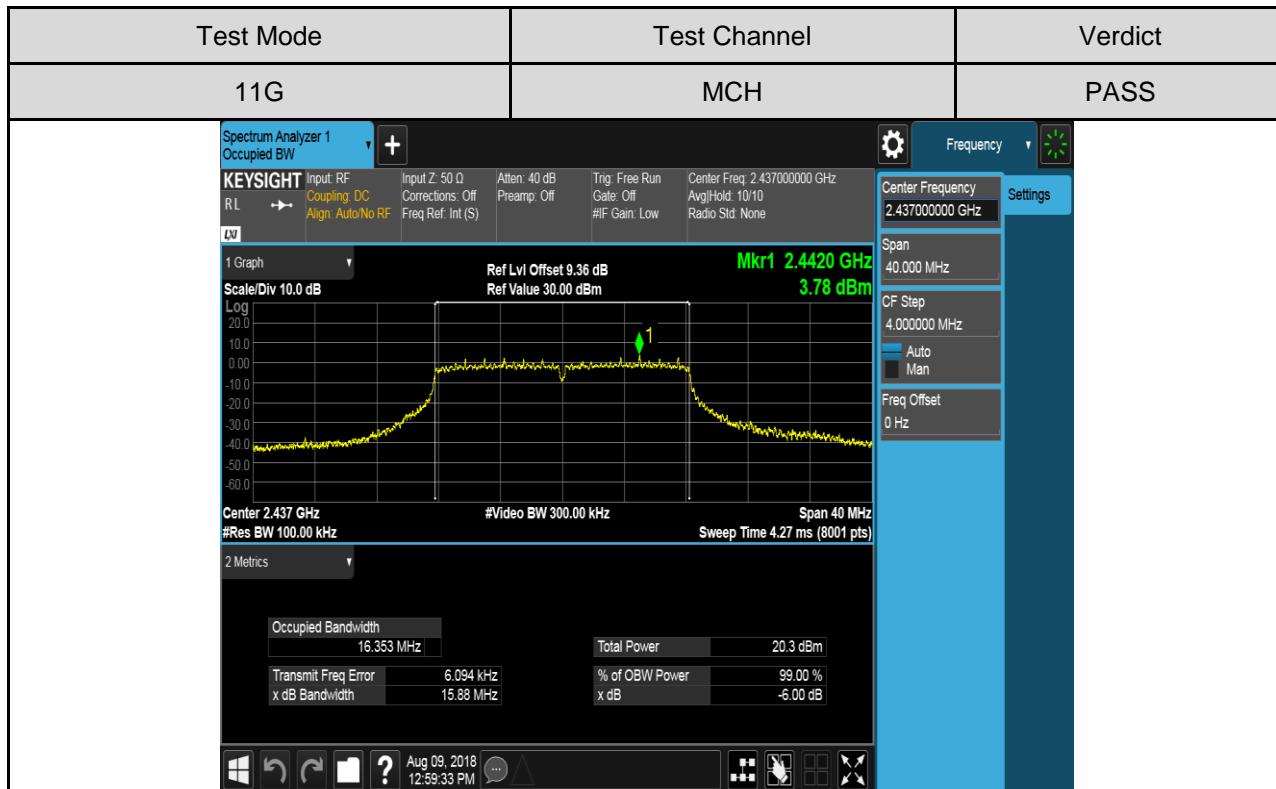


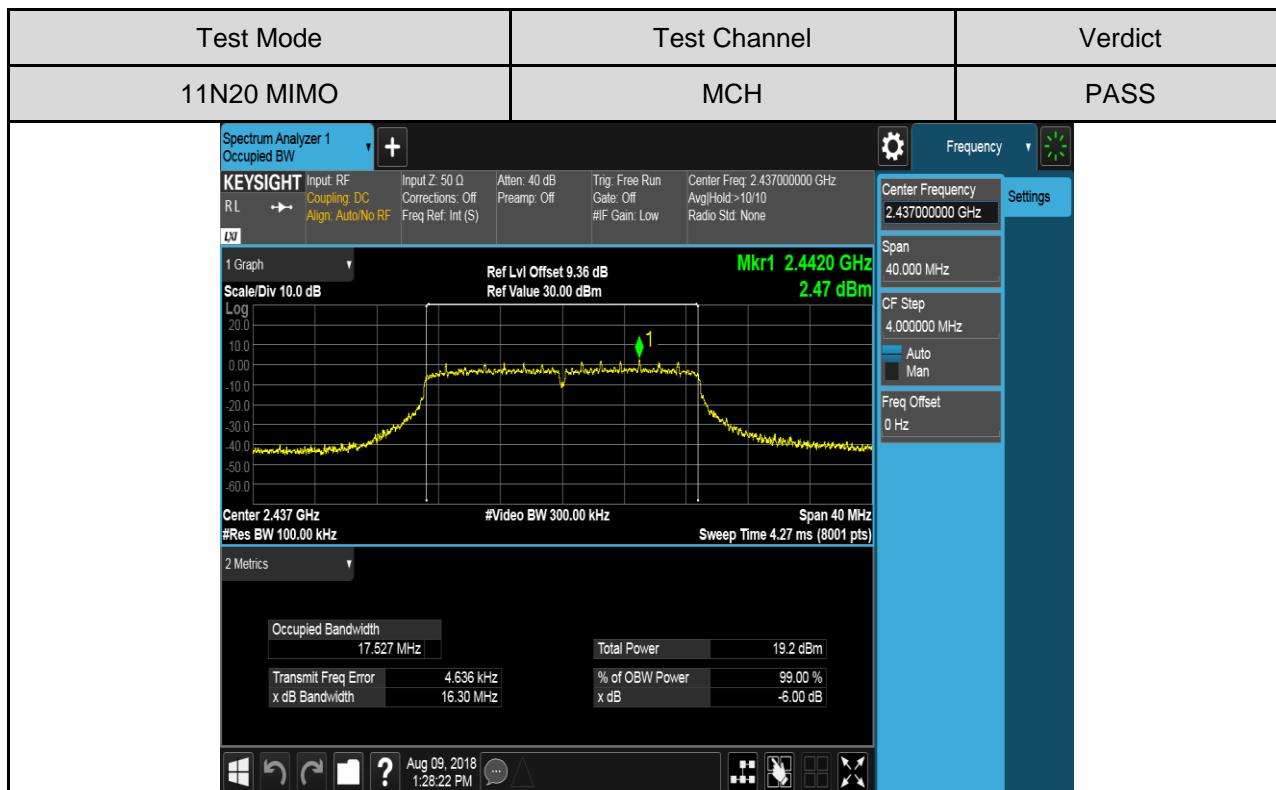
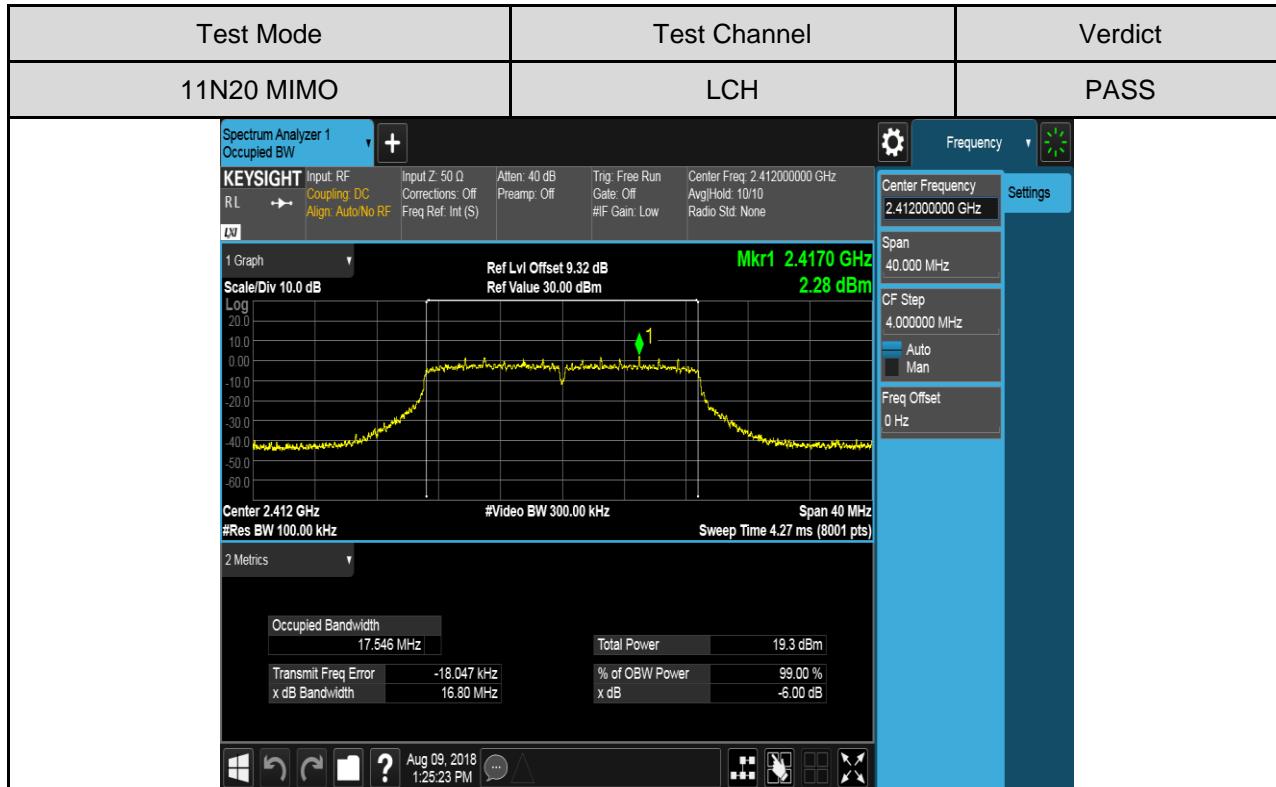


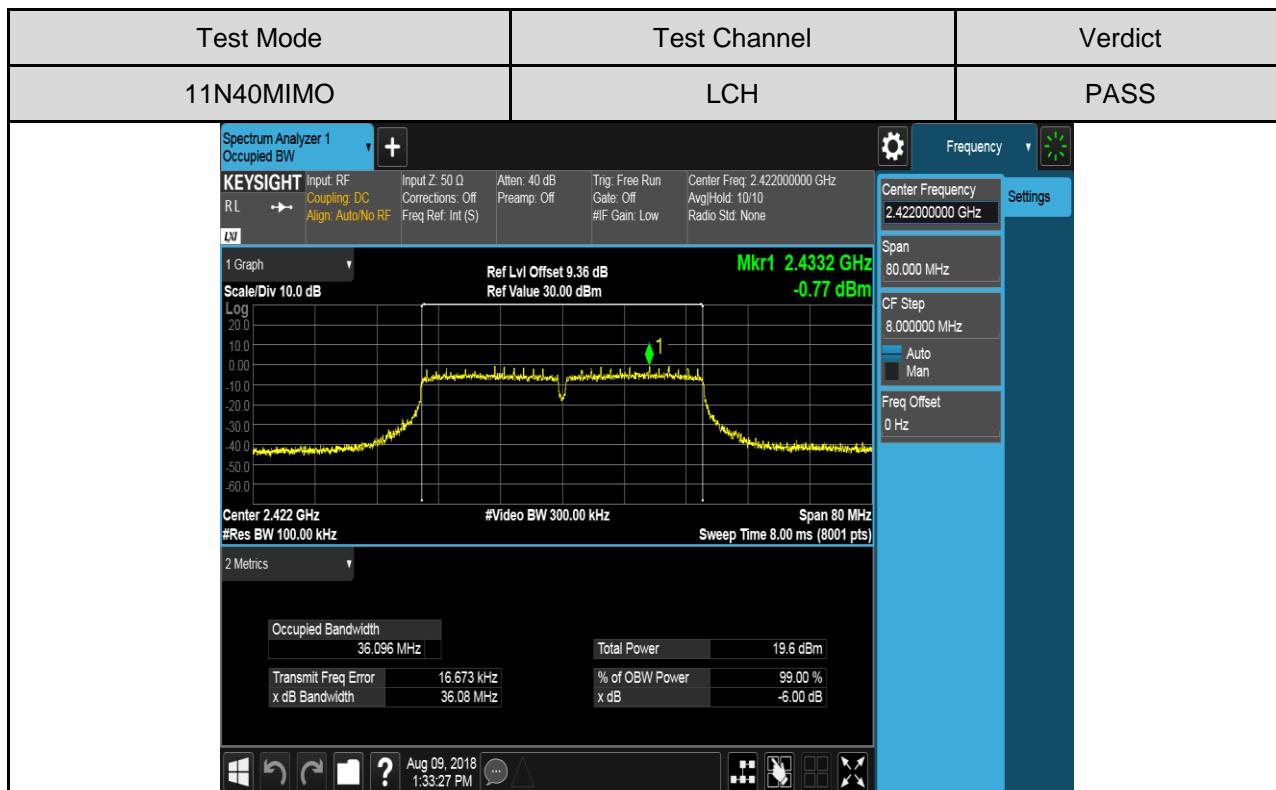
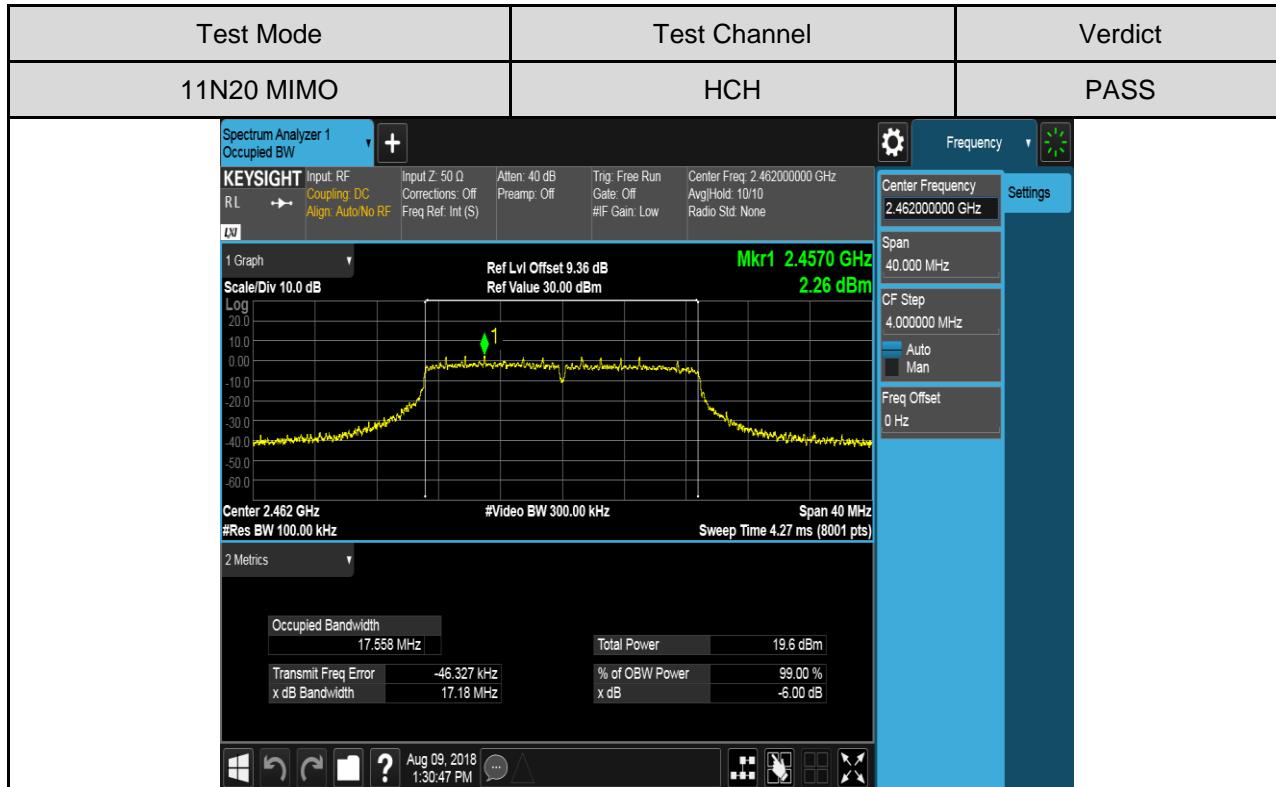
Antenna2

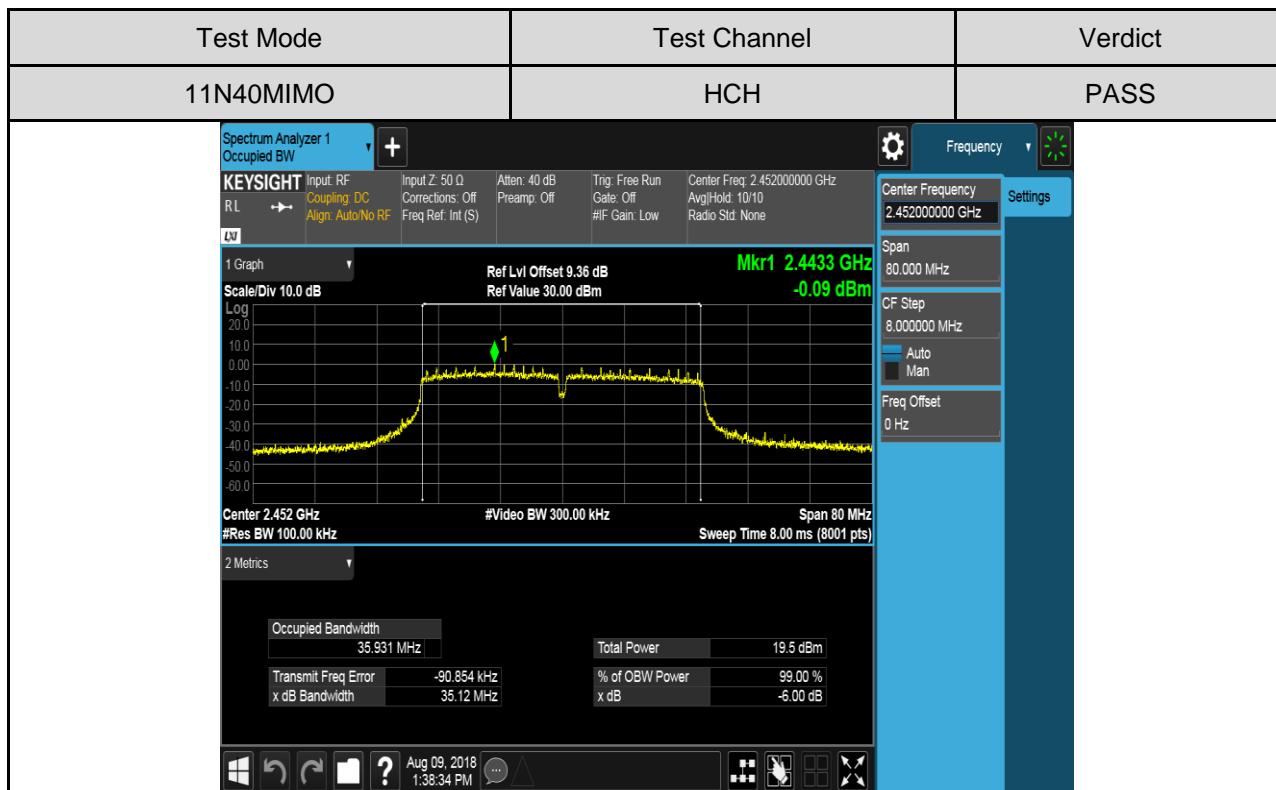
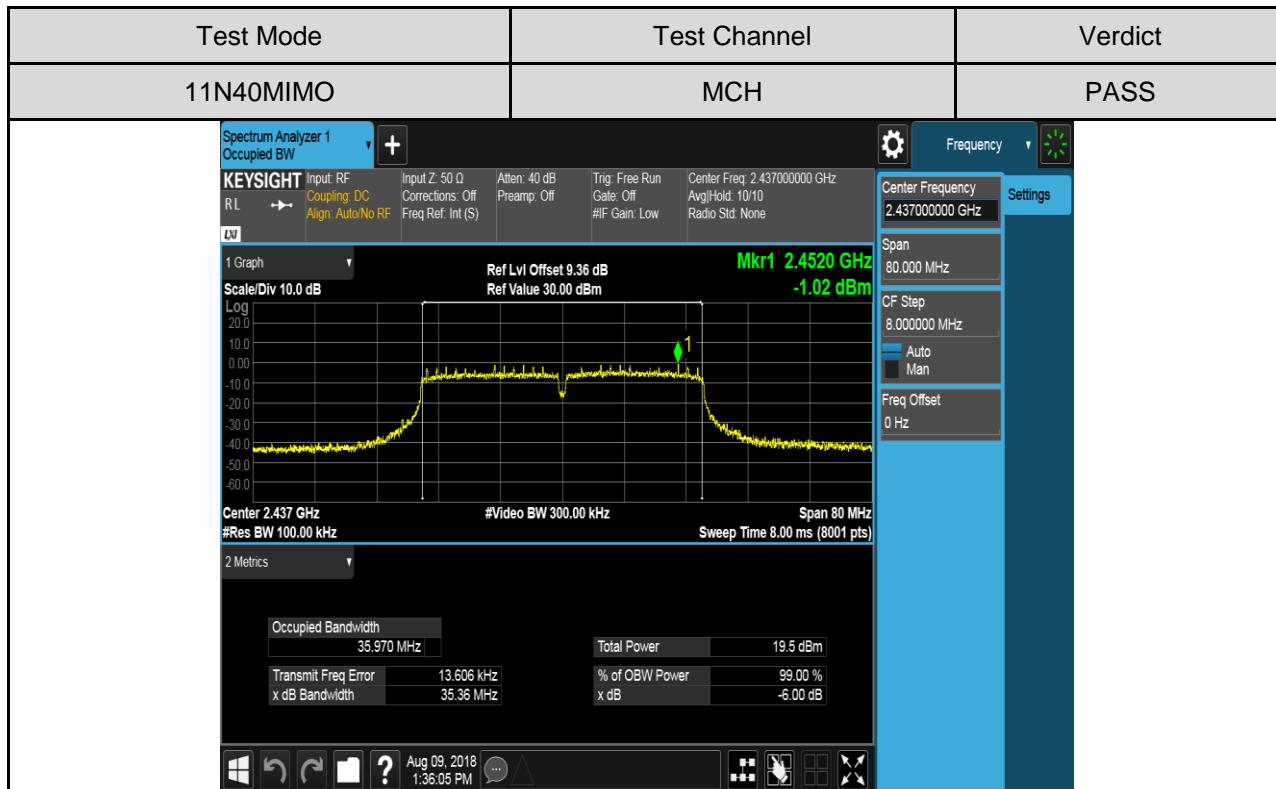












6.3. PEAK CONDUCTED OUTPUT POWER

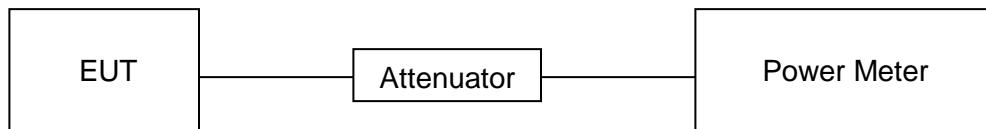
LIMITS

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3) RSS-247 5.4 (e)	Peak Output Power	1 watt or 30dBm	2400-2483.5

TEST PROCEDURE

Refer to FCC KDB 558074

TEST SETUP



**RESULTS**

1) Maximum Peak Conducted Output Power

Test Mode	Test Antenna	Test Channel	Maximum Peak Conducted Output Power(dBm)	EIRP (dBm)	Result
11B	Antenna 1	LCH	19.36	19.36	Pass
		MCH	19.8	19.8	Pass
		HCH	19.52	19.52	Pass
	Antenna 2	LCH	19.34	19.34	Pass
		MCH	19.9	19.9	Pass
		HCH	19.21	19.21	Pass
	Antenna 1+2	LCH	22.36	25.37	Pass
		MCH	22.86	25.87	Pass
		HCH	22.37	25.38	Pass
11G	Antenna 1	LCH	22.14	22.14	Pass
		MCH	22.01	22.01	Pass
		HCH	22.27	22.27	Pass
	Antenna 2	LCH	21.12	21.12	Pass
		MCH	21.94	21.94	Pass
		HCH	20.97	20.97	Pass
	Antenna 1+2	LCH	24.67	27.68	Pass
		MCH	24.99	28.00	Pass
		HCH	24.68	27.69	Pass
11N20 MIMO	Antenna 1	LCH	20.26	20.26	Pass
		MCH	20.18	20.18	Pass
		HCH	20.53	20.53	Pass
	Antenna 2	LCH	20.00	20.00	Pass
		MCH	20.81	20.81	Pass
		HCH	19.91	19.91	Pass
	Antenna 1+2	LCH	23.14	26.15	Pass
		MCH	23.52	26.53	Pass
		HCH	23.24	26.25	Pass
11N40 MIMO	Antenna 1	LCH	20.30	20.30	Pass
		MCH	20.14	20.14	Pass
		HCH	20.28	20.28	Pass
	Antenna 2	LCH	20.27	20.27	Pass
		MCH	20.73	20.73	Pass
		HCH	19.72	19.72	Pass
	Antenna 1+2	LCH	23.30	26.31	Pass
		MCH	23.46	26.47	Pass
		HCH	23.02	26.03	Pass



2) Maximum Average Conducted Output Power

Test Mode	Test Antenna	Test Channel	Maximum Average Conducted Output Power(dBm)	EIRP (dBm)	Result
11B	Antenna 1	LCH	16.83	16.83	Pass
		MCH	16.97	16.97	Pass
		HCH	17.08	17.08	Pass
	Antenna 2	LCH	16.77	16.77	Pass
		MCH	17.03	17.03	Pass
		HCH	16.69	16.69	Pass
	Antenna 1+2	LCH	19.81	22.82	Pass
		MCH	20.01	23.02	Pass
		HCH	19.90	22.91	Pass
11G	Antenna 1	LCH	13.86	13.86	Pass
		MCH	13.54	13.54	Pass
		HCH	14.17	14.17	Pass
	Antenna 2	LCH	13.88	13.88	Pass
		MCH	14.42	14.42	Pass
		HCH	13.67	13.67	Pass
	Antenna 1+2	LCH	16.88	19.89	Pass
		MCH	17.01	20.02	Pass
		HCH	16.94	19.95	Pass
11N20	Antenna 1	LCH	12.65	12.65	Pass
		MCH	12.48	12.48	Pass
		HCH	13.03	13.03	Pass
	Antenna 2	LCH	12.60	12.60	Pass
		MCH	13.30	13.30	Pass
		HCH	13.53	13.53	Pass
	Antenna 1+2	LCH	15.64	18.65	Pass
		MCH	15.92	18.93	Pass
		HCH	16.30	19.31	Pass
11N40	Antenna 1	LCH	12.81	12.81	Pass
		MCH	12.46	12.46	Pass
		HCH	12.86	12.86	Pass
	Antenna 2	LCH	12.84	12.84	Pass
		MCH	13.07	13.07	Pass
		HCH	12.76	12.76	Pass
	Antenna 1+2	LCH	15.84	18.85	Pass
		MCH	15.79	18.80	Pass
		HCH	15.82	18.83	Pass

- Note: 1. The average conducted output power is measured by power meter for calculating the tune-up power.
2. Average conducted output power = power meter reading level + duty cycle correction factor.
3. For duty cycle correction factor please refer to clause 6.1. ON TIME AND DUTY CYCLE.
4. Please refer to the KDB 558074 about the test method.

6.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e) RSS-247 5.2 (b)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

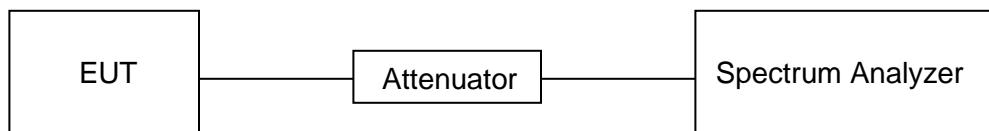
Refer to FCC KDB 558074, connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	$1.5 \times \text{DTS bandwidth}$
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and 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.

TEST SETUP



RESULTS

Test Mode	Test Antenna	Test Channel	Maximum Peak power spectral density (dBm)	Result
11B	Antenna 1	LCH	0.51	Pass
		MCH	-0.80	Pass
		HCH	0.97	Pass
	Antenna 2	LCH	0.72	Pass
		MCH	1.62	Pass
		HCH	1.42	Pass
	Antenna 1+2	LCH	3.63	Pass
		MCH	3.59	Pass
		HCH	4.21	Pass
11G	Antenna 1	LCH	-12.20	Pass
		MCH	-12.74	Pass
		HCH	-13.07	Pass
	Antenna 2	LCH	-13.12	Pass
		MCH	-12.41	Pass
		HCH	-12.53	Pass
	Antenna 1+2	LCH	-9.63	Pass
		MCH	-9.56	Pass
		HCH	-9.78	Pass
11N20 MIMO	Antenna 1	LCH	-13.24	Pass
		MCH	-13.12	Pass
		HCH	-14.18	Pass
	Antenna 2	LCH	-13.49	Pass
		MCH	-13.94	Pass
		HCH	-12.92	Pass
	Antenna 1+2	LCH	-10.35	Pass
		MCH	-10.50	Pass
		HCH	-10.49	Pass
11N40MIMO	Antenna 1	LCH	-16.26	Pass
		MCH	-15.21	Pass
		HCH	-15.85	Pass
	Antenna 2	LCH	-15.69	Pass
		MCH	-15.27	Pass
		HCH	-14.34	Pass
	Antenna 1+2	LCH	-12.96	Pass
		MCH	-12.23	Pass
		HCH	-12.02	Pass

Test Graphs

Antenna1

