



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

Doorbell

**MODEL NUMBER:
DHI-DB10, OEM-DB10, DH-DB10, DB10**

PROJECT NUMBER: 4788197250

**REPORT NUMBER: 4788197250-4
FCC ID: SVNDHI-DB10**

ISSUE DATE: Jan. 4, 2018

Prepared for

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Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	1/4/2018	Initial Issue	

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Zhejiang Dahua Vision Technology Co., Ltd.

Address: No.1199, Bin'an road, Binjiang District, Hangzhou,
P.R.China.

Manufacturer Information

Company Name: Zhejiang Dahua Vision Technology Co., Ltd.

Address: No.1199, Bin'an road, Binjiang District, Hangzhou,
P.R.China.

Factory Information

Company Name: ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD

Address: No.1199, Bin'an road, Binjiang District, Hangzhou,
P.R.China.

Company Name: ZHEJIANG DAHUA ZHILIAN CO.,LTD.

Address: No.28, Dongqiao Road, Dongzhou Street, Fuyang District,
Hangzhou,P.R.China.

EUT Description

Product Name Doorbell

Model Name DHI-DB10

Additional No. OEM-DB10, DH-DB10, DB10

Sample Number 1213330-001

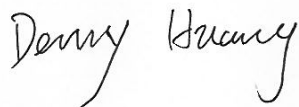
Data of Receipt Sample October 31, 2017

Date Tested Nov. 8, 2017 ~ Dec. 28, 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6db DTS Bandwidth	FCC 15.247 (a) (2)	Complied
2	Peak Conducted Power	FCC 15.247 (b) (3)	Complied
3	Power Spectral Density	FCC 15.247 (e)	Complied
4	Conducted Band edge And Spurious emission	FCC 15.247 (d)	Complied
5	Radiated Band edges and Spurious emission	FCC 15.247 (d) FCC 15.209 FCC 15.205	Complied
6	Conducted Emission Test For AC Power Port	FCC 15.207	Complied (Note1)
7	Antenna Requirement	FCC 15.203	Complied
Note1: Pre-testing all the power supply for the EUT, find the power supply by PC which is the worst case, so only the data of this type is included in this test report.			

Tested By:



Denny Huang
Engineer Project Associate
Approved By:



Stephen Guo
Laboratory Manage

Check By:



Shawn Wen
Laboratory Leader

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC KDB 558074 D01 DTS Meas Guidance v04, 414788 D01 Radiated Test Site v01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

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	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. The Certificate Registration Number is 4102.01. UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The Designation Number is CN1187. UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.

Note:

- 1) 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 worse case from the open field site.
- 2) 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	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.00dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
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:	Doorbell	
Model No.:	DHI-DB10	
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz	
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 : OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel Number:	IEEE 802.11b/g, IEEE 802.11n(HT20): 11 Channels	
Channels Step:	Channels with 5MHz step	
Sample Type:	Fixed production	
Test power grade:	-1 (manufacturer declare)	
Test software of EUT:	Secure CRT (manufacturer declare)	
Antenna Type:	chip antenna	
Antenna Gain:	3dBi	
Power Supply	Battery	Model:MZ887LI Rated Capacity:4900mAh/18.13Wh Normal Voltage:3.7V

Remark:

Model No.:

Number:	Name:	Number:	Name:	Number:	Name:
1	OEM-DB10	2	DH-DB10	3	DB10
4	DHI-DB10				

Only the main model **DHI-DB10** was tested and only the data of this model is shown in this test report.
Since the electrical circuit design, layout, components used and internal wiring were identical for the above models are the same, the difference is the name of the models.

5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	IEE Std. 802.11	Frequency (MHz)	Channel Number	Max PK Conducted Power (dBm)
2400-2483.5	1	IEEE 802.11b	2412-2462	1-11[11]	16.58
2400-2483.5	1	IEEE 802.11g	2412-2462	1-11[11]	19.54
2400-2483.5	1	IEEE 802.11nHT20	2412-2462	1-11[11]	19.62

5.3. CHANNEL LIST

Channel List for 802.11b/g/n (20 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (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				

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

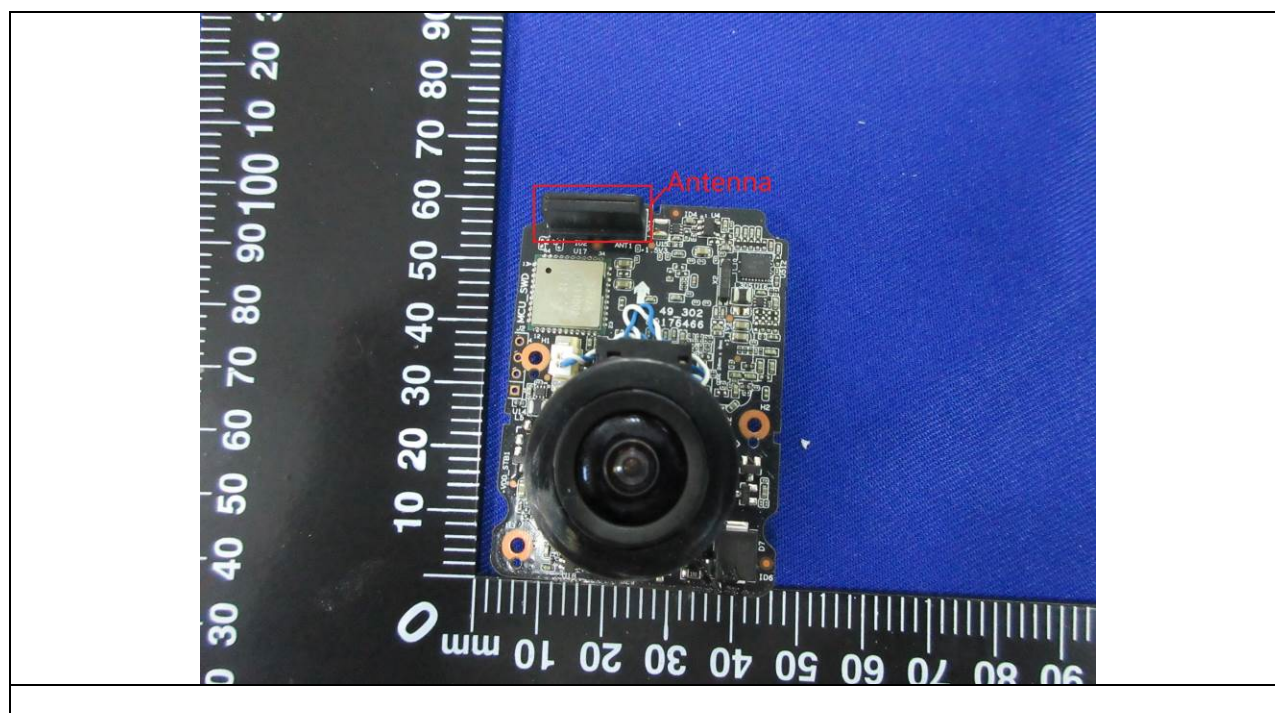
5.5. THE WORSE CASE POWER SETTING PARAMETER

Test Software Version	SecureCRT8.1		
Test Mode	Test Channel	Setting TX Power	Setting data rate (Mbps)
IEEE 802.11b	LCH	44	CCK_1Mbps
	MCH	44	CCK_1Mbps
	HCH	44	CCK_1Mbps
IEEE 802.11g	LCH	44	NO HT_6Mbps
	MCH	44	NO HT_6Mbps
	HCH	44	NO HT_6Mbps
IEEE 802.11n HT20	LCH	44	HT20_MCS_0_20
	MCH	44	HT20_MCS_0_20
	HCH	44	HT20_MCS_0_20

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	chip antenna	3.0

Test Mode	Transmit and Receive Mode	Description
WIFI	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.



5.7. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	DC 3.7V
	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	FCC ID
1	Laptop	ThinkPad	T410	N/A

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

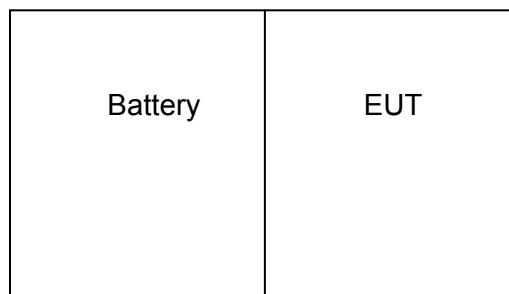
ACCESSORY

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 table PC.

SETUP DIAGRAM FOR TESTS



5.9. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions(Instrument)						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☒	EMI Test Receiver	R&S	ESR3	101961	Dec.20, 2016	Dec.18, 2018
☒	Two-Line V-Network	R&S	ENV216	101983	Dec.20, 2016	Dec.18, 2018
☒	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Feb.10, 2017	Feb.10, 2018
Software						
Used	Description		Manufacturer	Name		Version
☒	Test Software for Conducted disturbance		UL	Antenna port		Ver. 7.2
Radiated Emissions(Instrument)						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☒	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Feb. 24, 2017	Feb. 24, 2018
☒	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Jan.09, 2019
☒	Preamplifier	HP	8447D	2944A09099	Feb. 13, 2017	Feb. 13, 2018
☒	EMI Measurement Receiver	R&S	ESR26	101377	Dec. 20, 2016	Dec. 19, 2018
☒	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Jan. 09, 2019
☒	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Jan.06, 2016	Jan.06, 2019
☒	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Jan. 14, 2017	Jan. 14, 2018
☒	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec. 20, 2016	Dec. 19, 2018
☒	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 26, 2019
☒	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec. 20, 2016	Dec. 19, 2018
Software						
Used	Description		Manufacturer	Name		Version
☒	Test Software for Radiated disturbance		Farad	EZ-EMC		Ver. UL-3A1
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☒	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec. 20, 2016	Dec. 19, 2018
☒	Power Meter	Keysight	N9031A	MY55416024	Feb. 13, 2017	Feb. 13, 2018
☒	Power Sensor	Keysight	N9323A	MY55440013	Feb. 13, 2017	Feb. 13, 2018

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

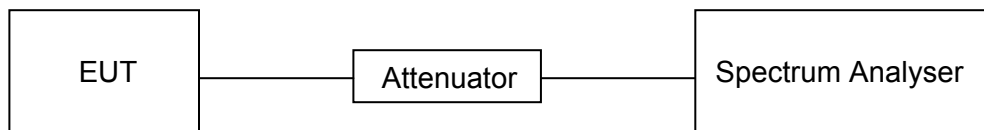
LIMITS

None; for reporting purposes only

PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



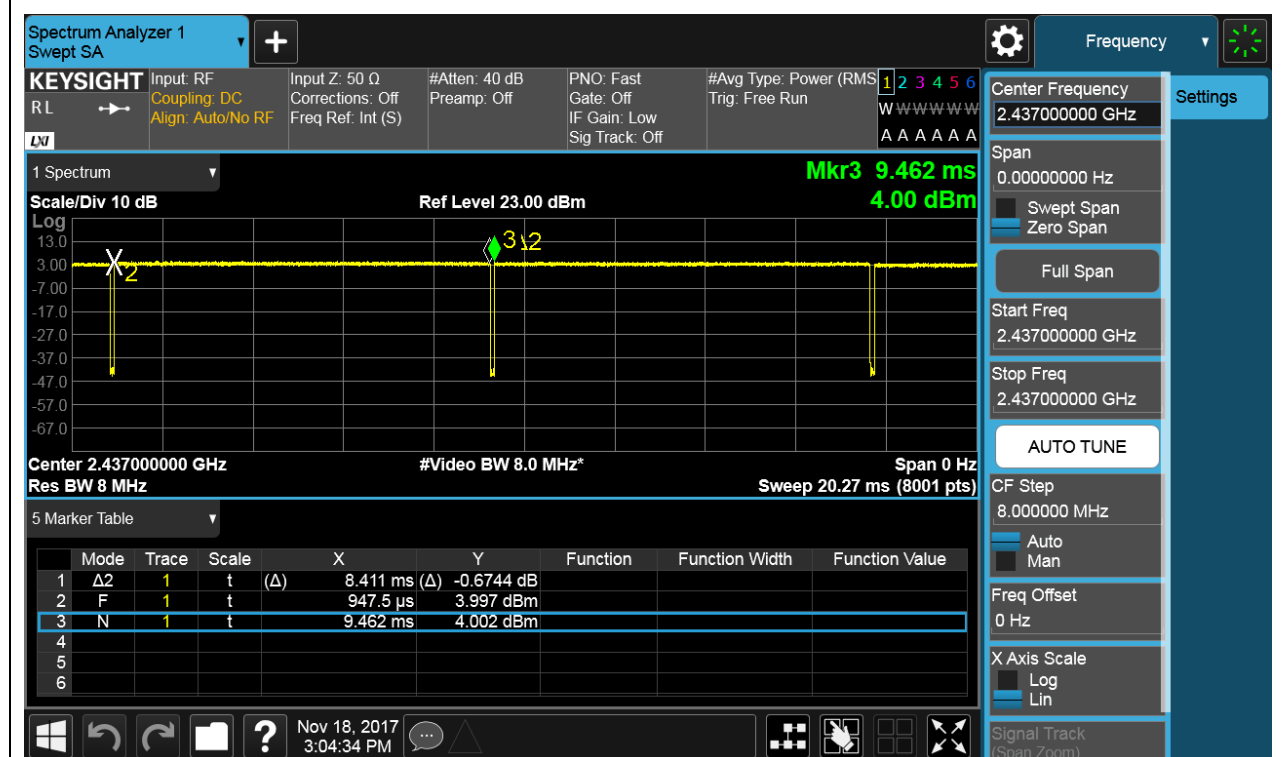
RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)
11B	90.2	100	1	90.2	0.4	1.1
11G	90.3	100	1	90.3	0.4	1.1
11NSISO20	92.5	100	1	92.5	0.4	1.1

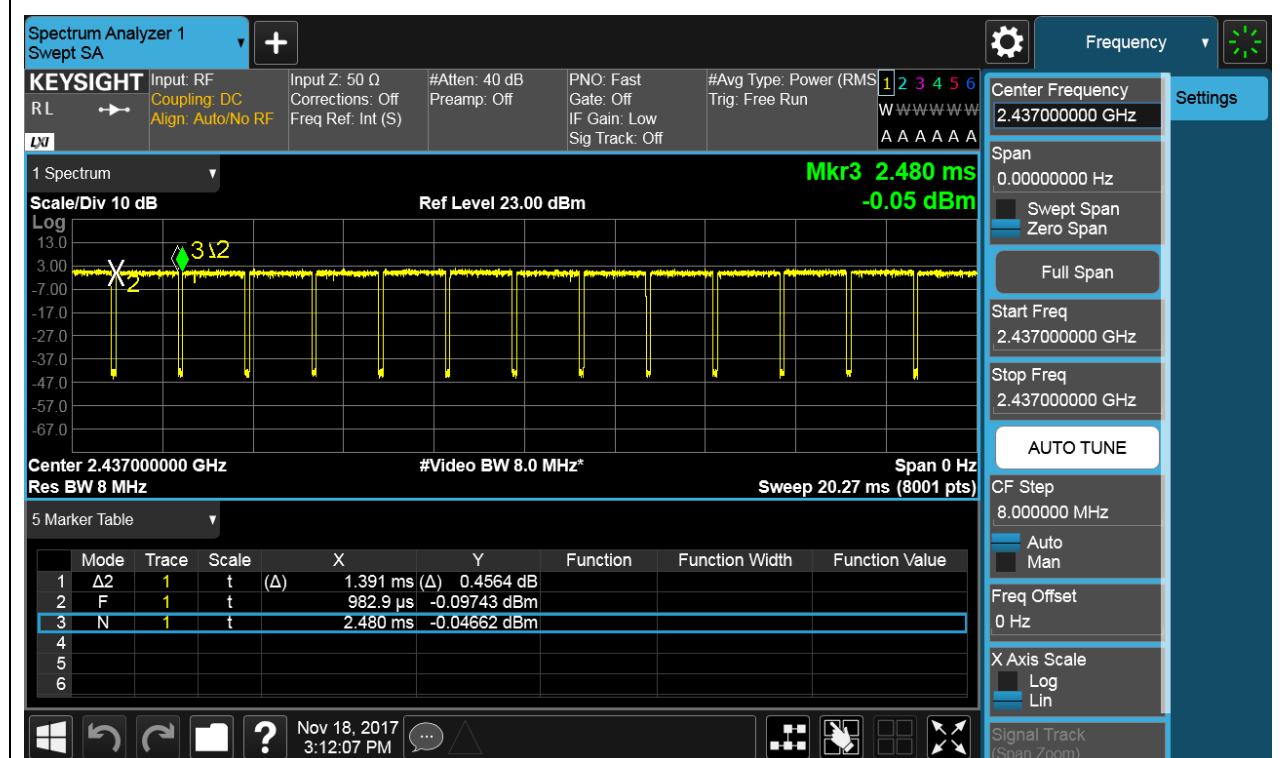
Note: Duty Cycle Correction Factor= $10\log(1/x)$.
Where: x is Duty Cycle(Linear)
Where: T is On Time (transmit duration)

ON TIME AND DUTY CYCLE MID CH

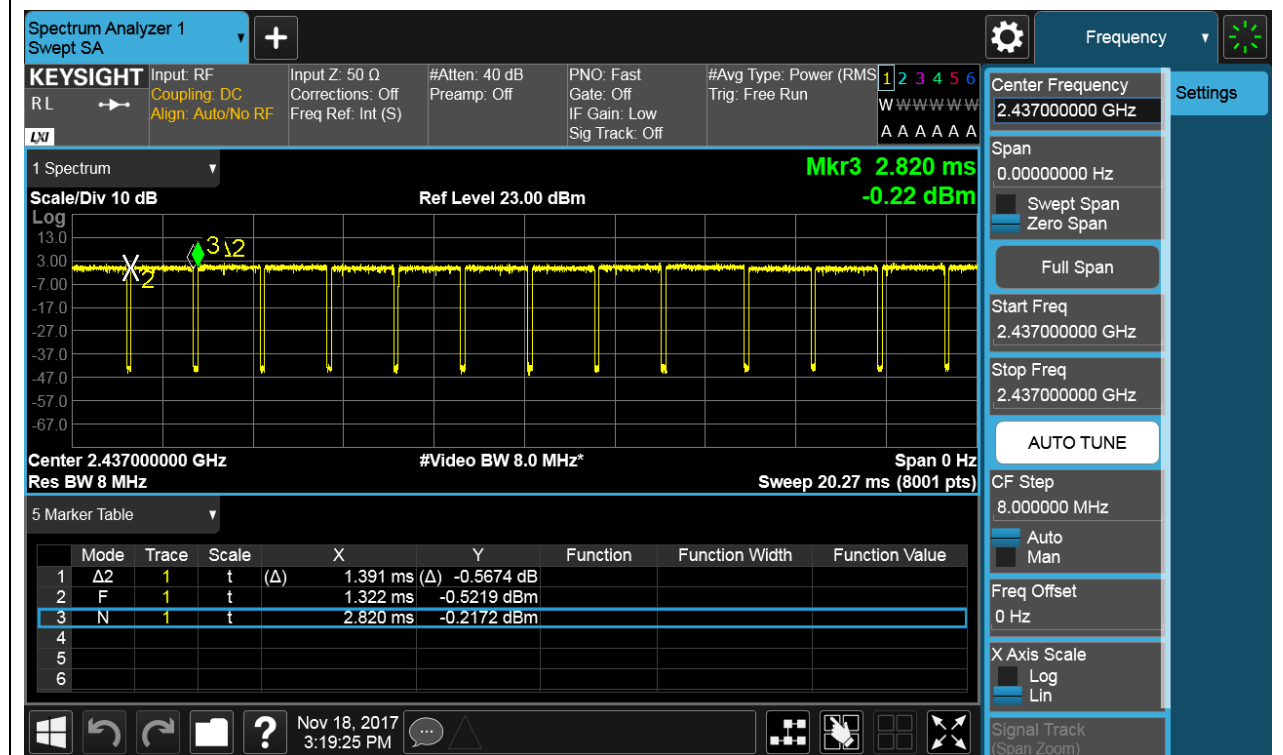
11B



11G



11NSISO20



6.2. 6 dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2)	6dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5

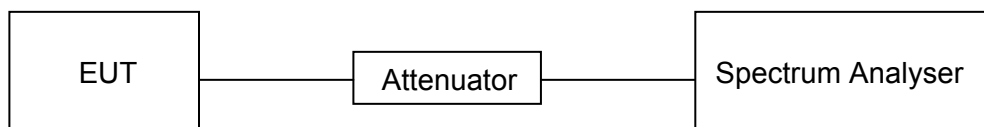
TEST PROCEDURE

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

Center Frequency	The centre 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 relative to the maximum level measured in the fundamental emission.

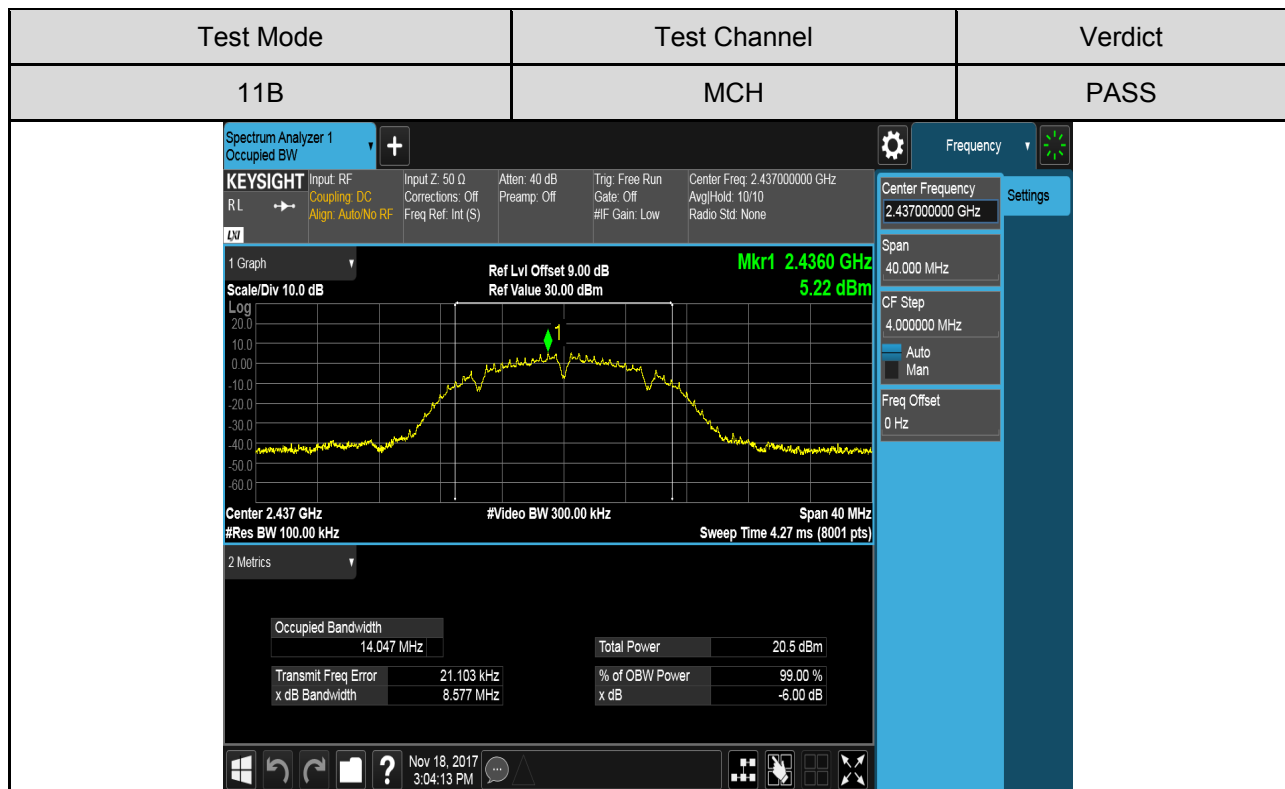
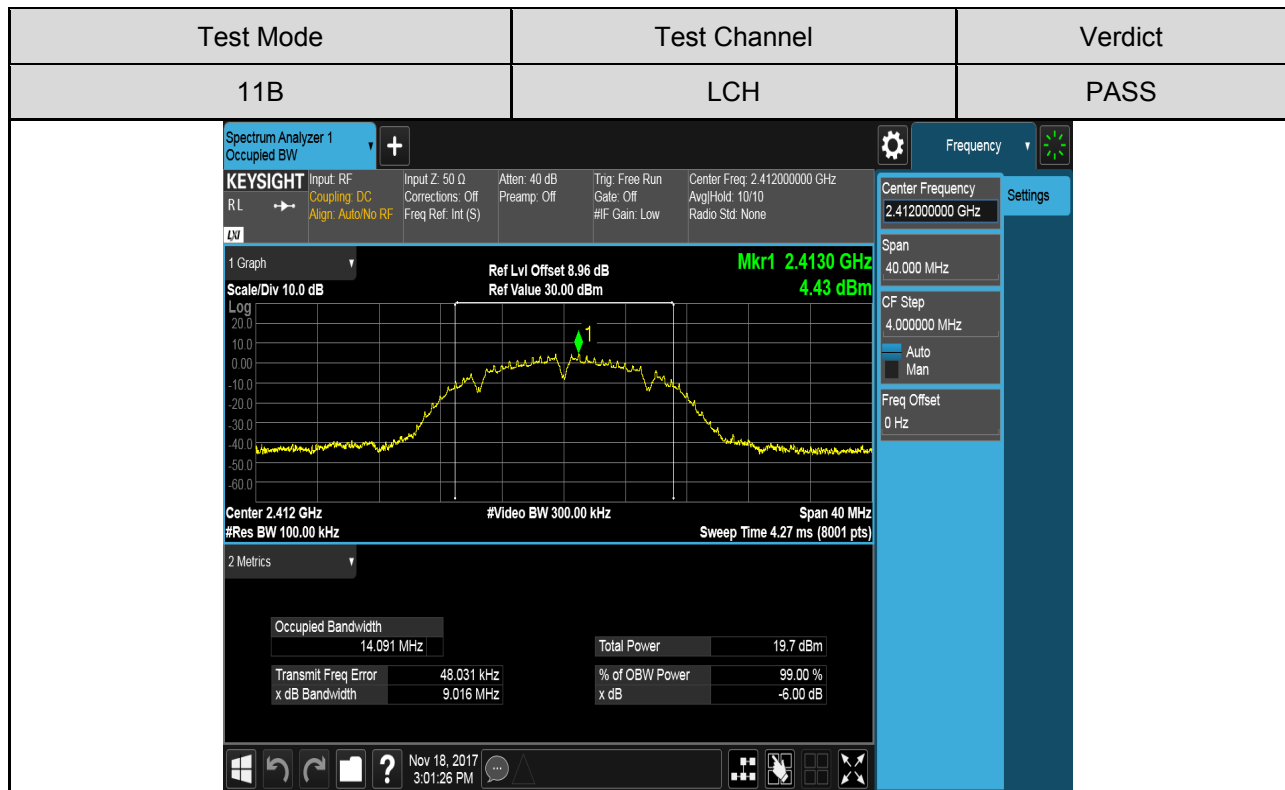
TEST SETUP

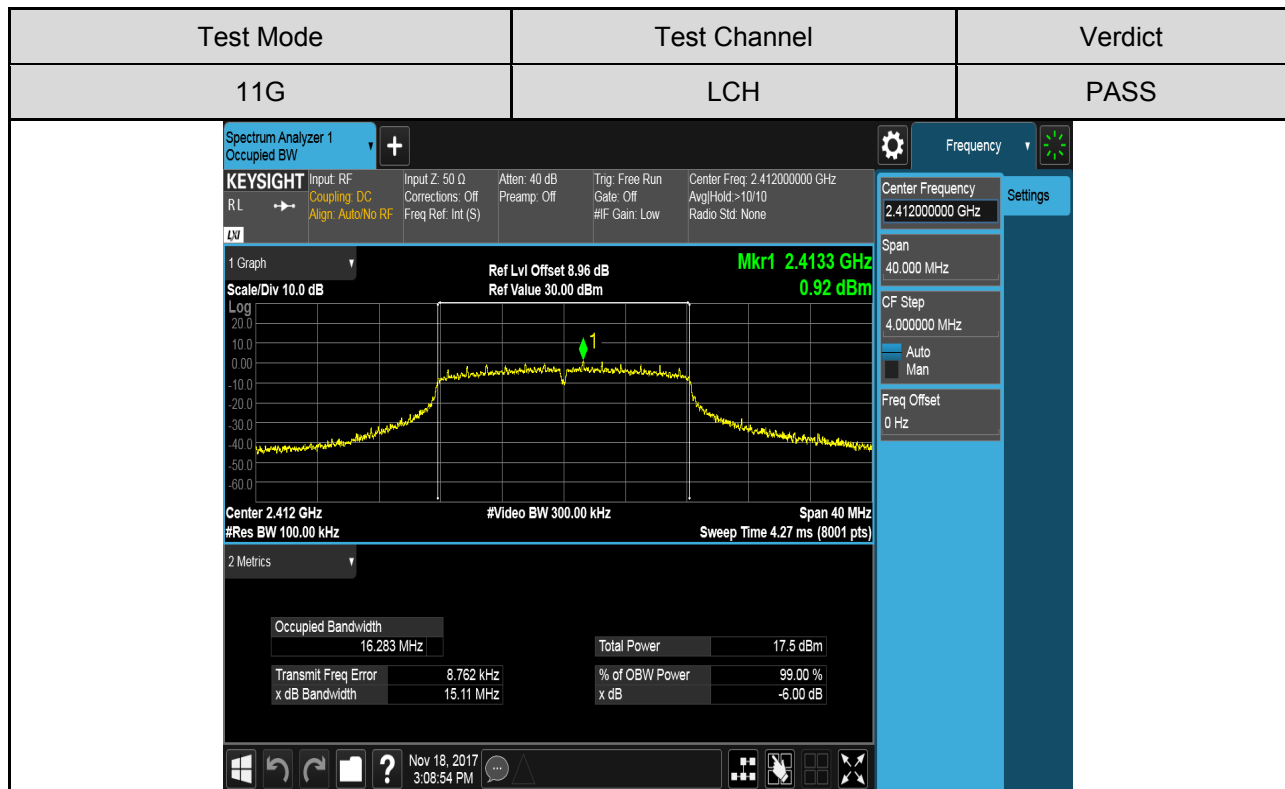
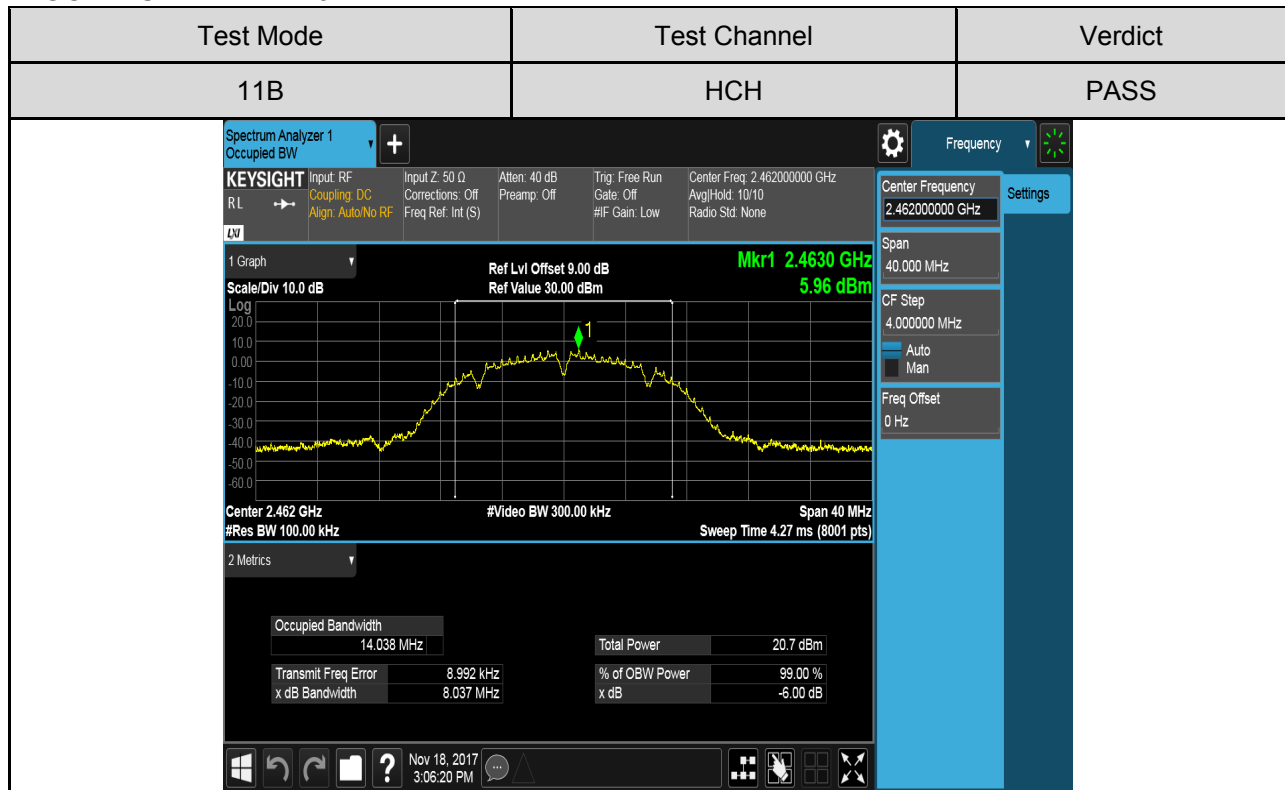


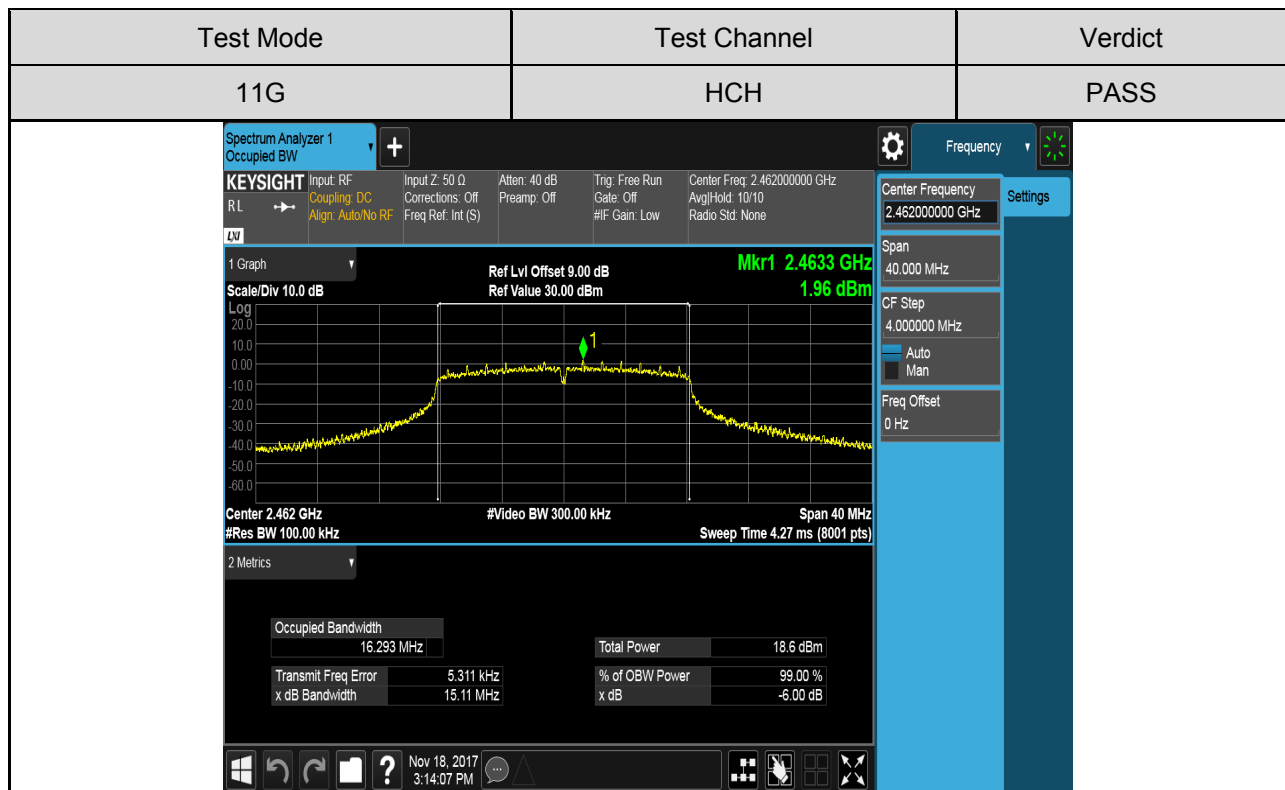
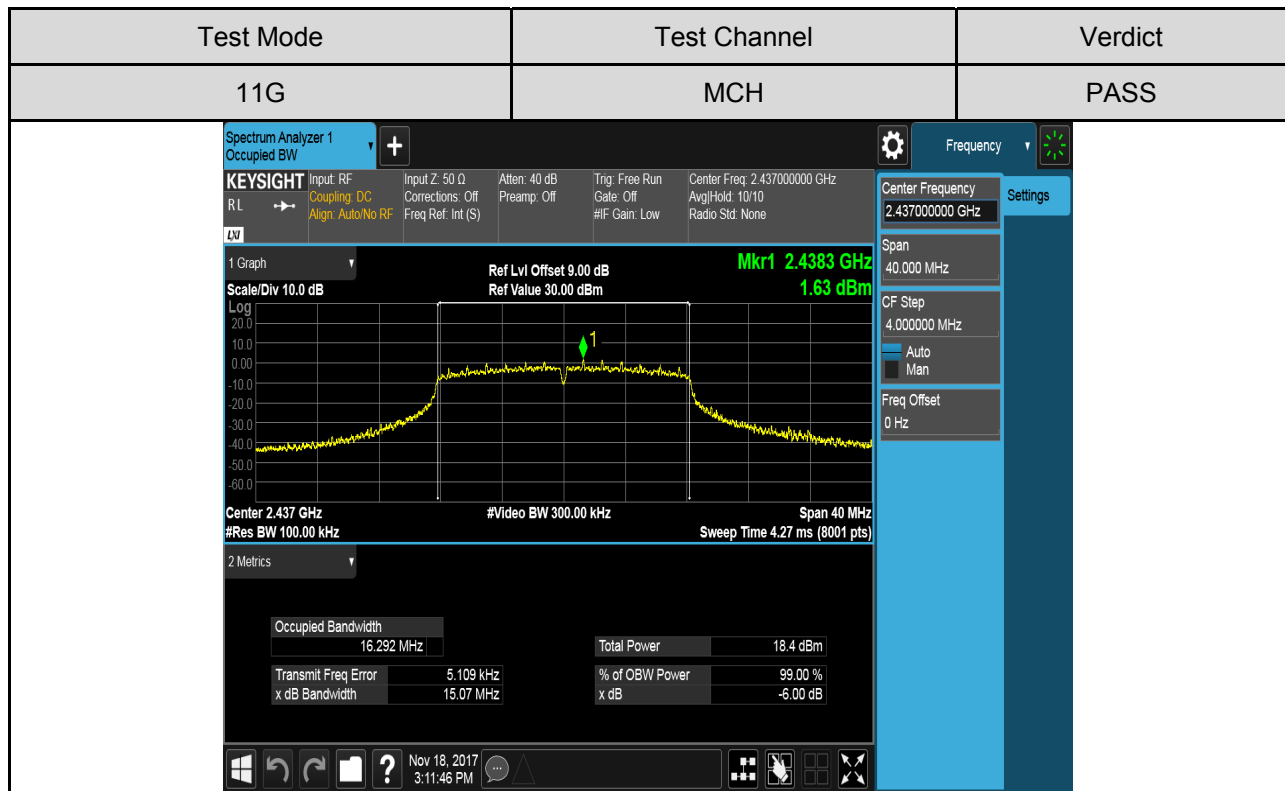
RESULTS

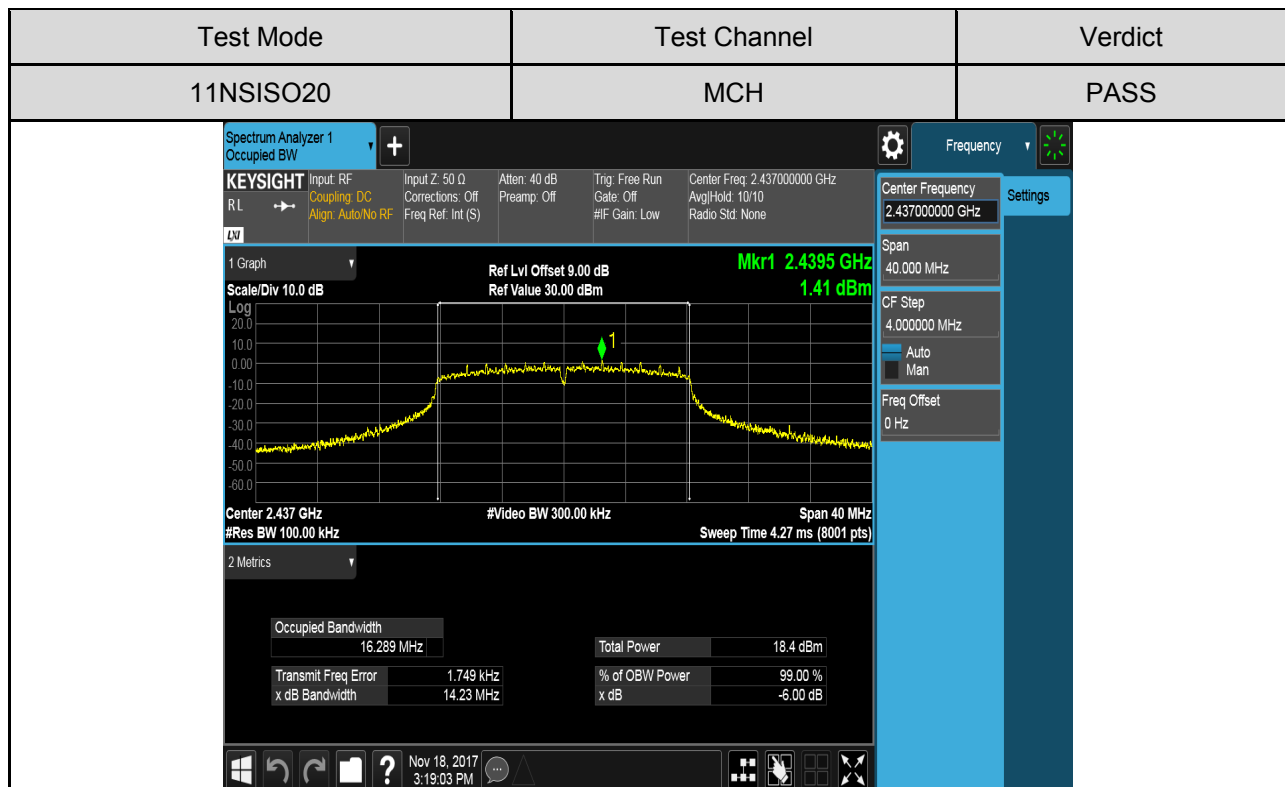
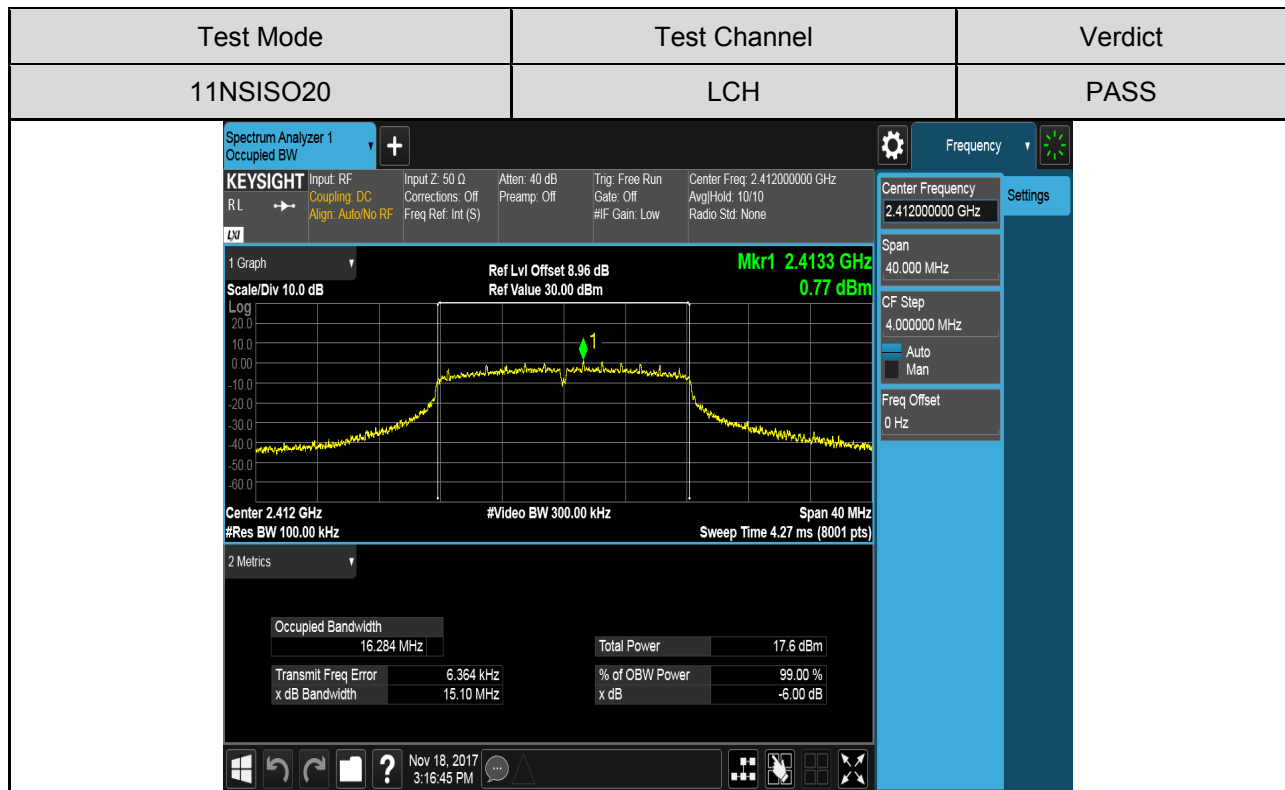
Test Mode	Test Channel	6dB bandwidth (MHz)	Result
11B	LCH	9.016	Pass
	MCH	8.577	Pass
	HCH	8.037	Pass
11G	LCH	15.11	Pass
	MCH	15.07	Pass
	HCH	15.11	Pass
11N20SISO	LCH	15.10	Pass
	MCH	14.23	Pass
	HCH	15.06	Pass

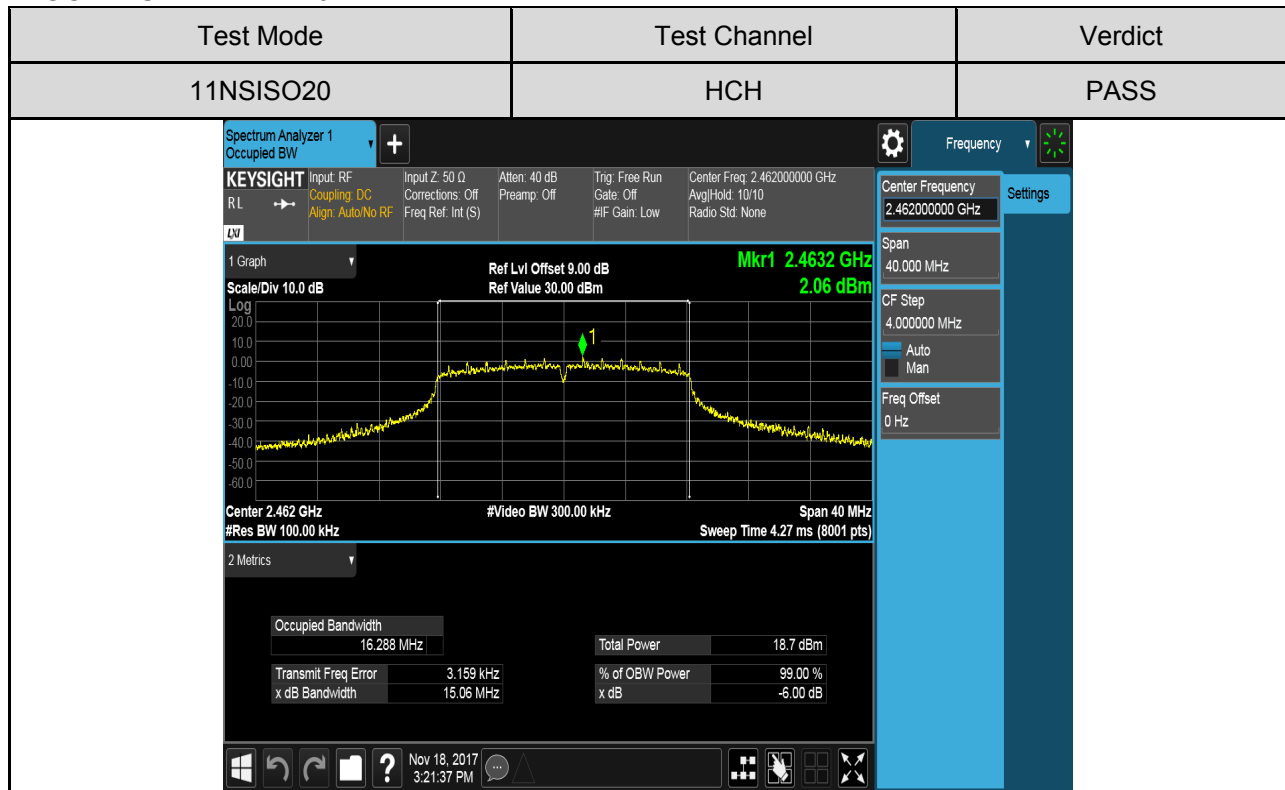
Test Graphs











6.3. PEAK CONDUCTED OUTPUT POWER

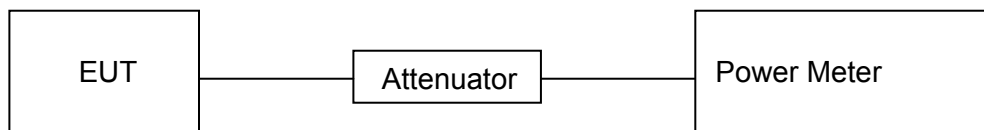
LIMITS

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

TEST PROCEDURE

Refer to FCC KDB 558074

TEST SETUP



RESULTS

Test Mode	Test Channel	Maximum Peak Conducted Output Power(dBm)	EIRP (dBm)	Result
11B	LCH	15.34	18.34	Pass
	MCH	16.21	19.21	Pass
	HCH	16.58	19.58	Pass
11G	LCH	18.42	21.42	Pass
	MCH	19.30	22.30	Pass
	HCH	19.54	22.54	Pass
11N20SISO	LCH	18.57	21.57	Pass
	MCH	19.25	22.25	Pass
	HCH	19.62	22.62	Pass

6.4. POWER SPECTRAL DENSITY

LIMITS

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

TEST PROCEDURE

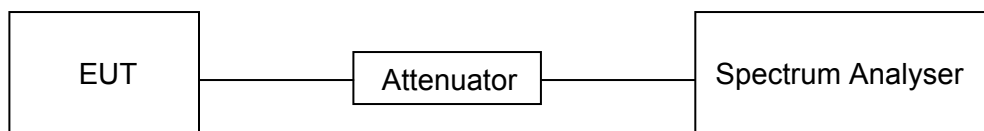
Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

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 x 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.

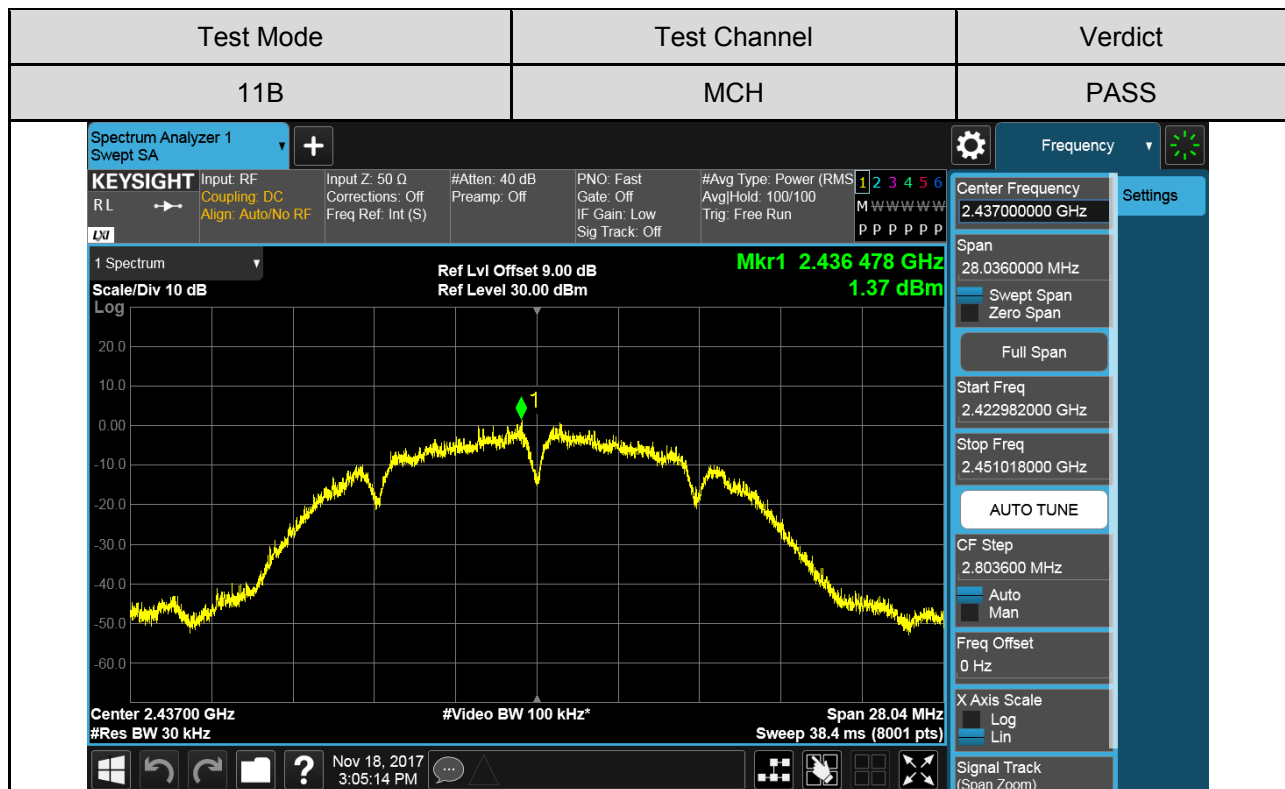
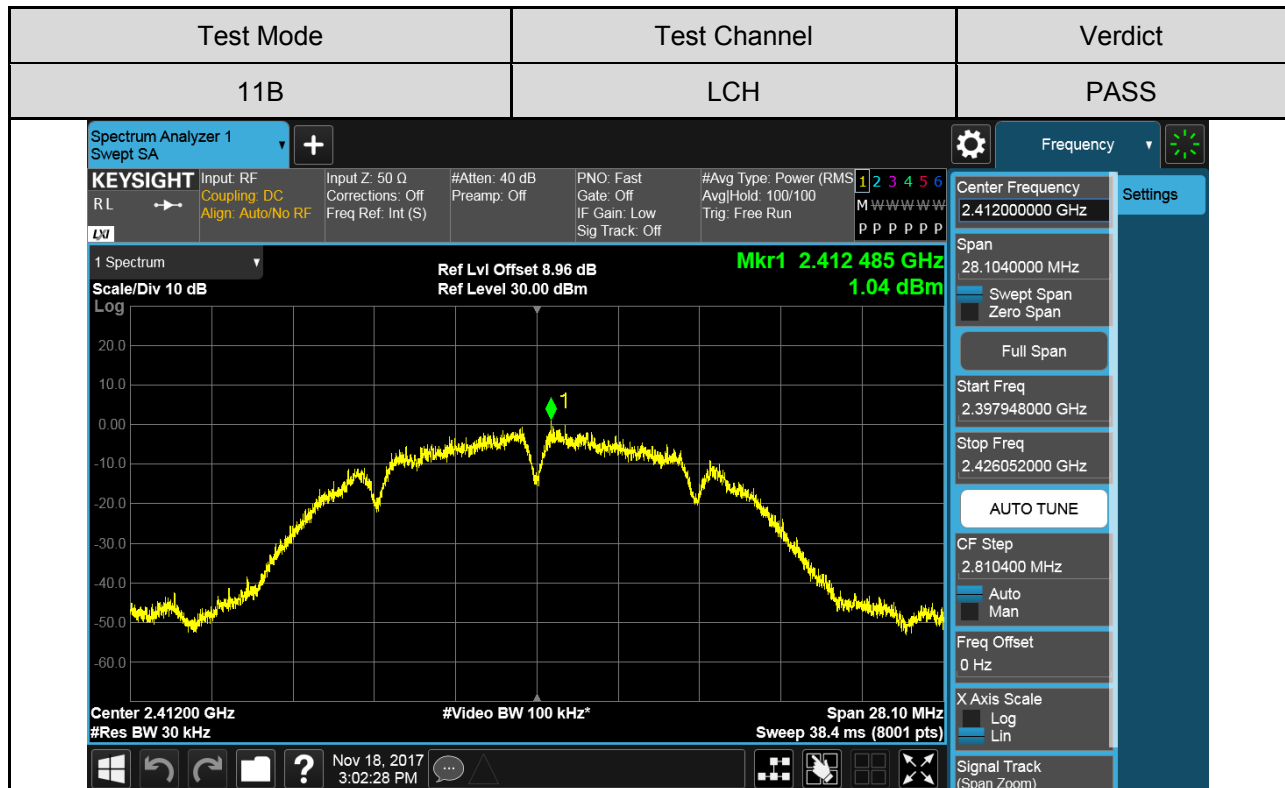
TEST SETUP

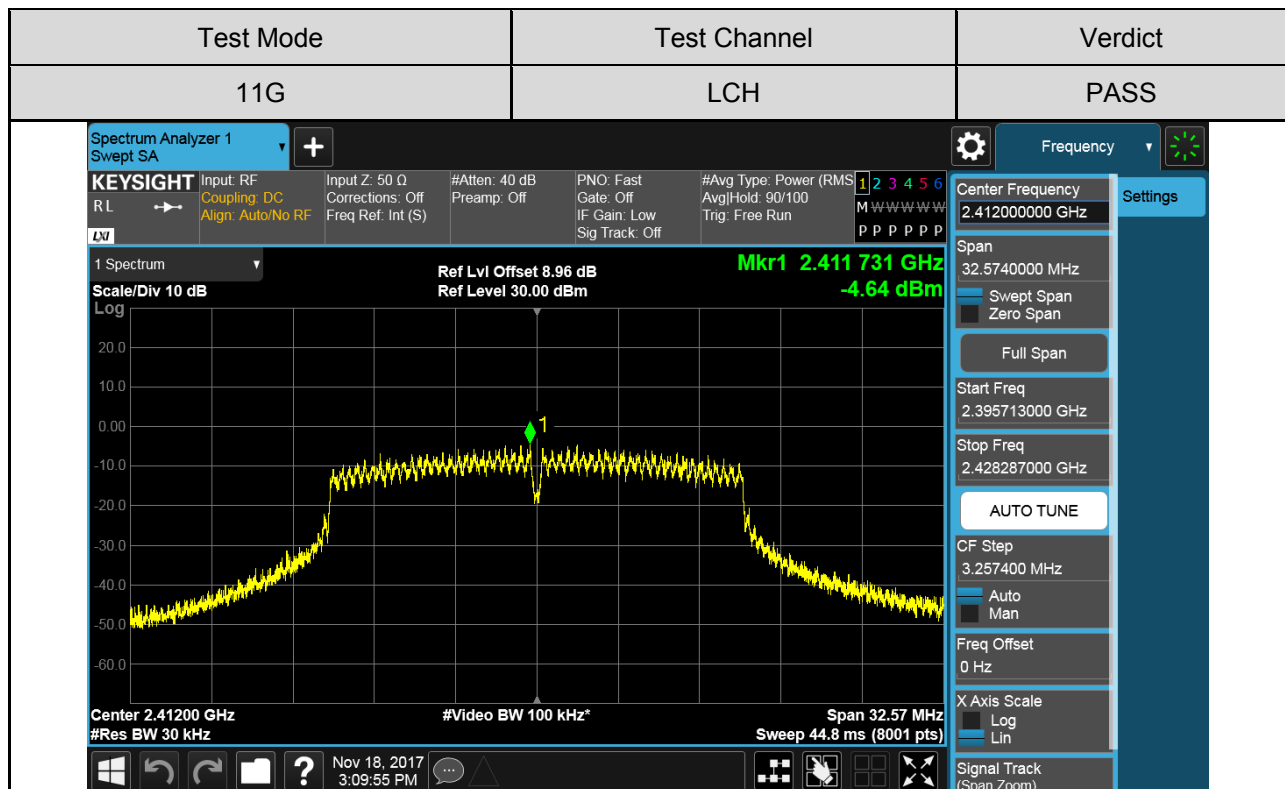
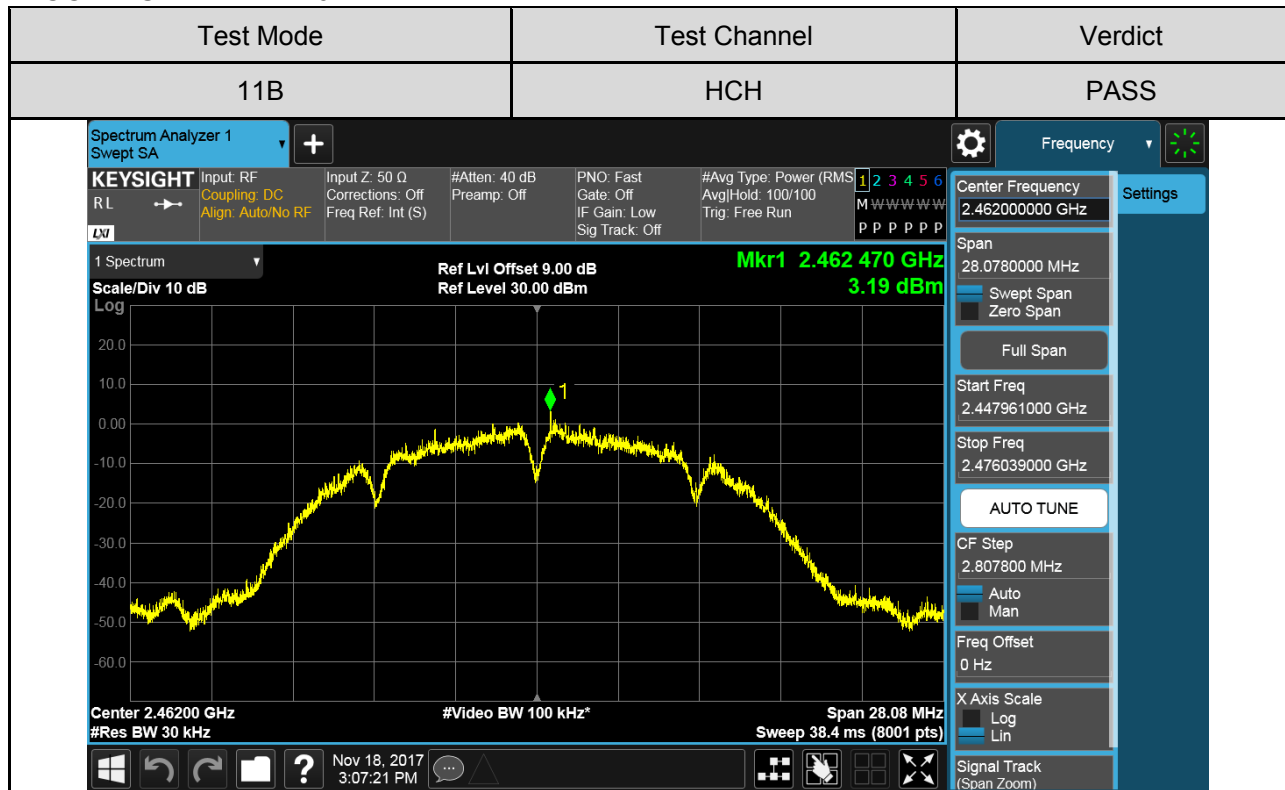


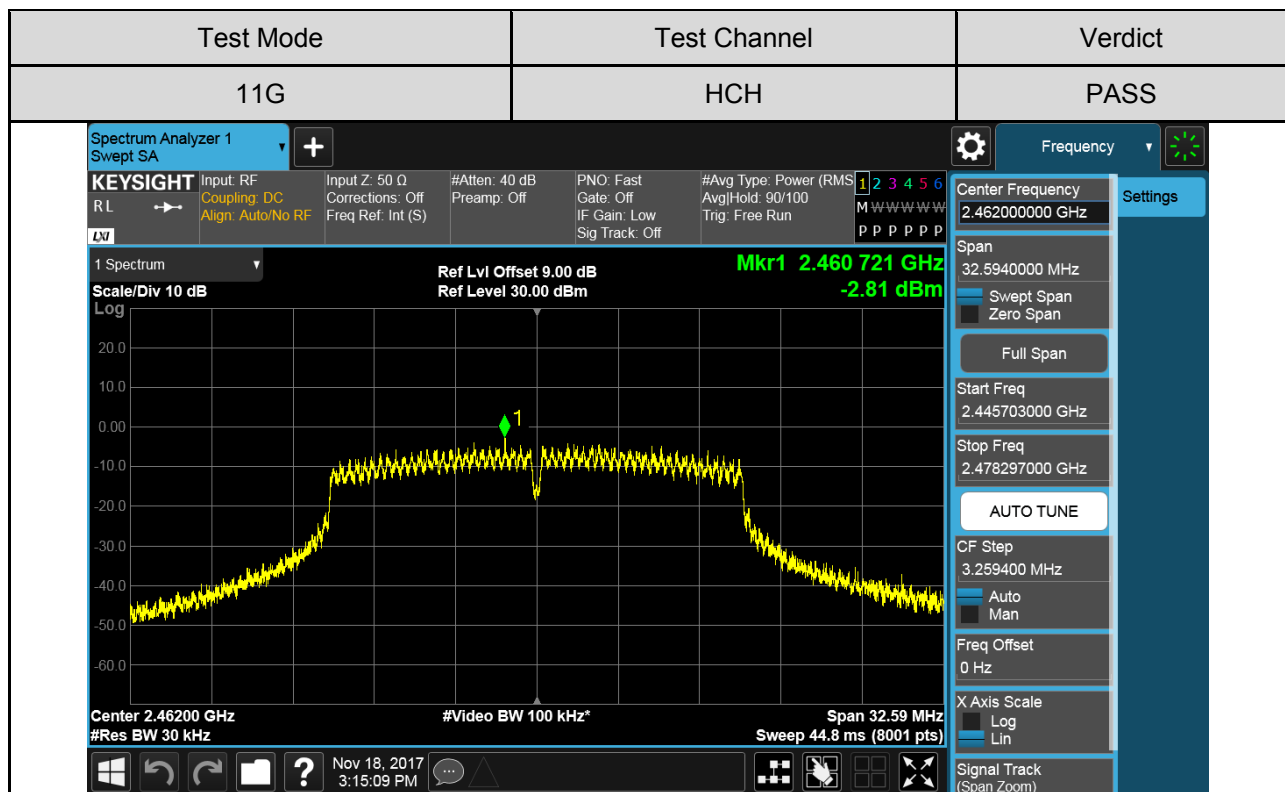
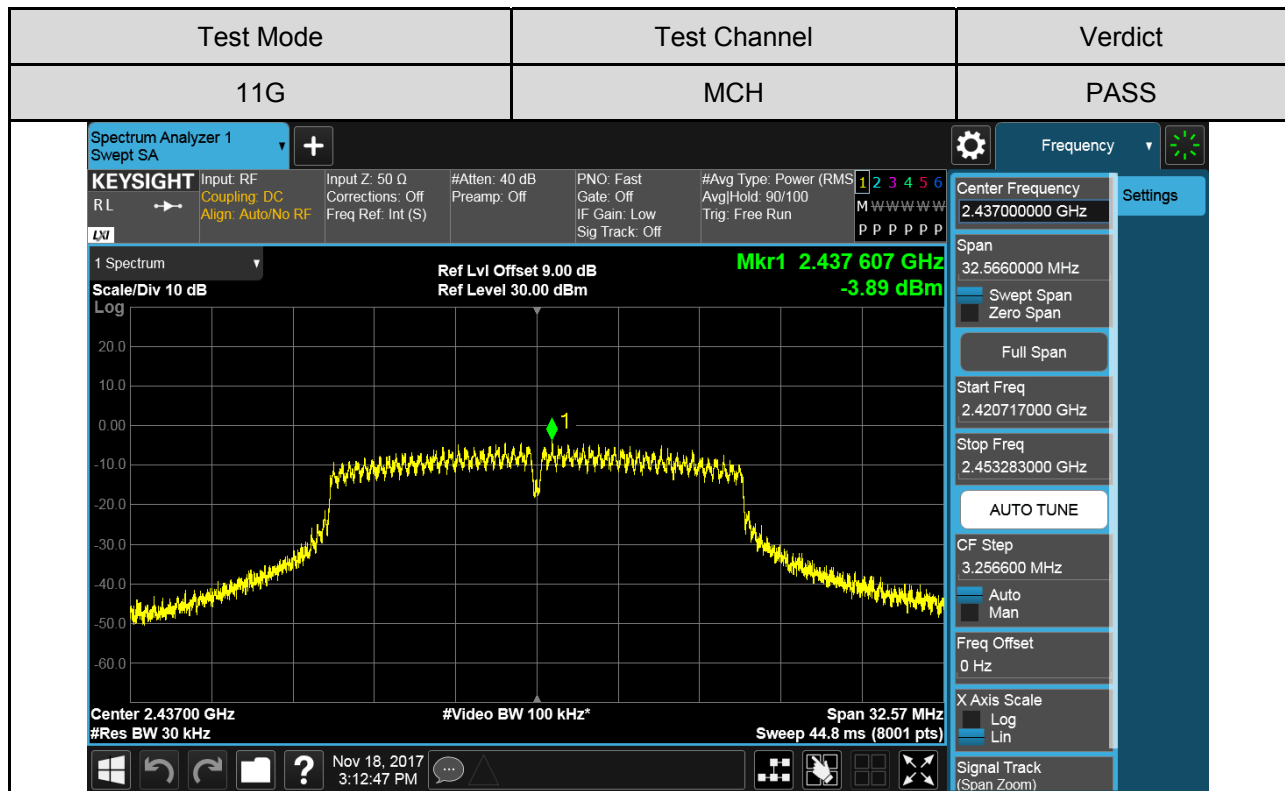
RESULTS

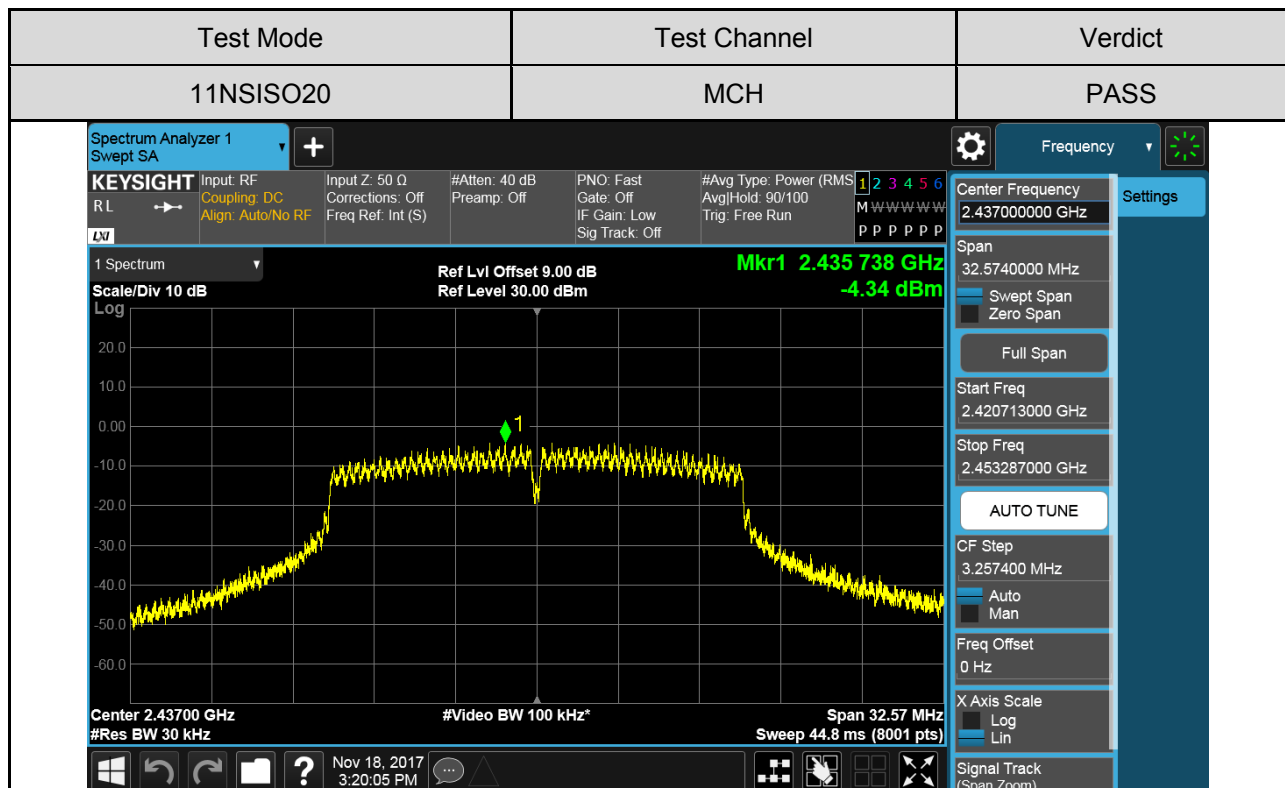
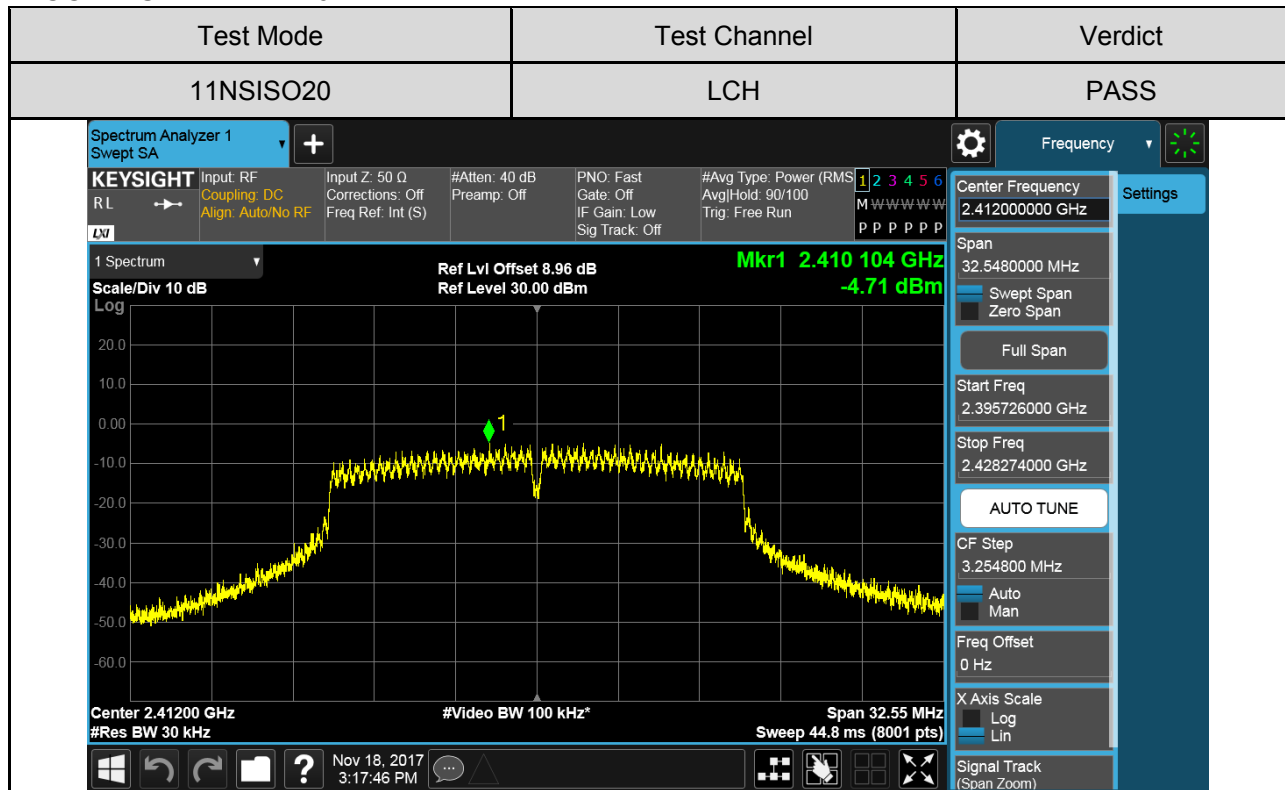
Test Mode	Test Channel	Maximum Peak power spectral density (dBm)	Result
11B	LCH	1.04	Pass
	MCH	1.37	Pass
	HCH	3.19	Pass
11G	LCH	-4.64	Pass
	MCH	-3.89	Pass
	HCH	-2.81	Pass
11N20SISO	LCH	-4.71	Pass
	MCH	-4.34	Pass
	HCH	-3.55	Pass

Test Graphs:









Spectrum Analyzer 1
Swept SA

KEYSIGHT Input: RF Coupling: DC Align: Auto/No RF
RL → Corrections: Off Freq Ref: Int (S)
#Atten: 40 dB Preamp: Off PNO: Fast Gate: Off IF Gain: Low Sig Track: Off
#Avg Type: Power (RMS) Avg/Hold: 90/100 Tng: Free Run

Center Frequency: 2.462000000 GHz
Span: 32.5700000 MHz
Swept Span
Zero Span
Full Span
Start Freq: 2.445715000 GHz
Stop Freq: 2.478285000 GHz
AUTO TUNE
CF Step: 3.257000 MHz
Auto
Man
Freq Offset: 0 Hz
X Axis Scale: Log
Lin
Signal Track (Span Zoom)

1 Spectrum
Scale/Div 10 dB
Log

Ref Lvl Offset 9.00 dB
Ref Level 30.00 dBm

Mkr1 2.464 479 GHz
-3.55 dBm

Center 2.46200 GHz
#Res BW 30 kHz
#Video BW 100 kHz*
Span 32.57 MHz
Sweep 44.8 ms (8001 pts)

Nov 18, 2017 3:22:38 PM

6.5. CONDUCTED BANDEGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following

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

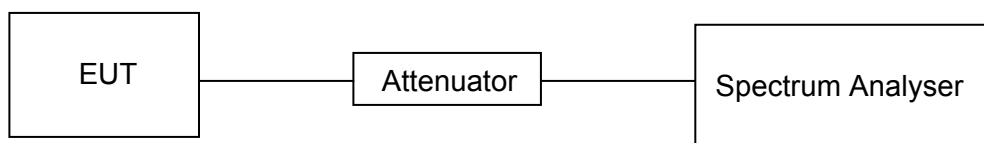
settings:

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

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

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

TEST SETUP

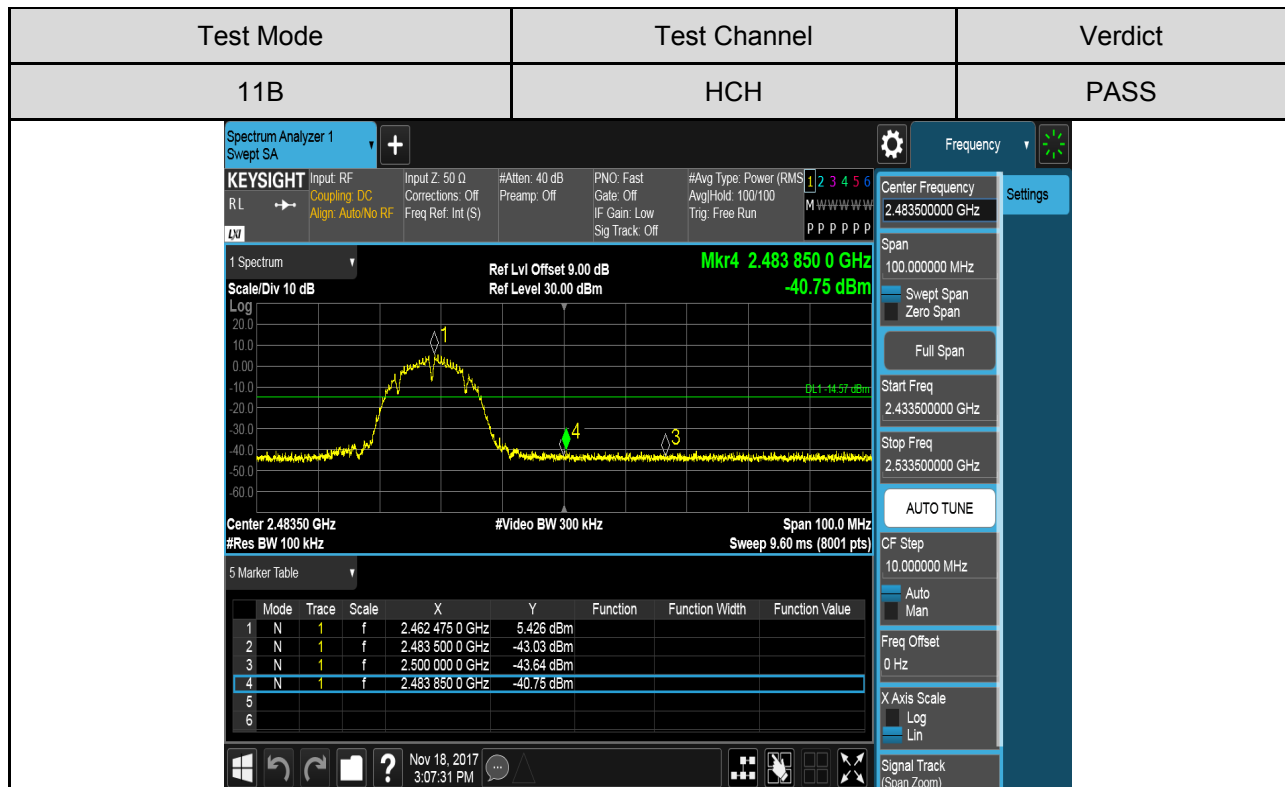
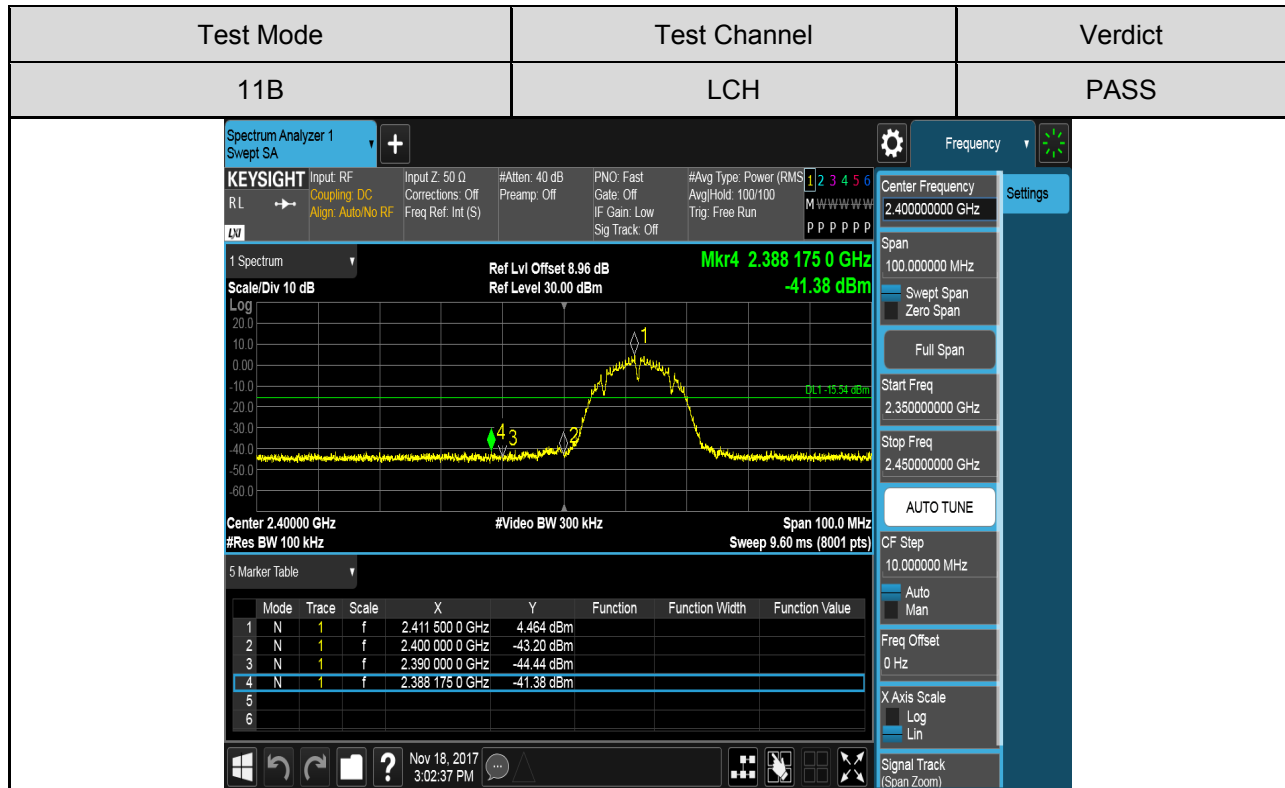


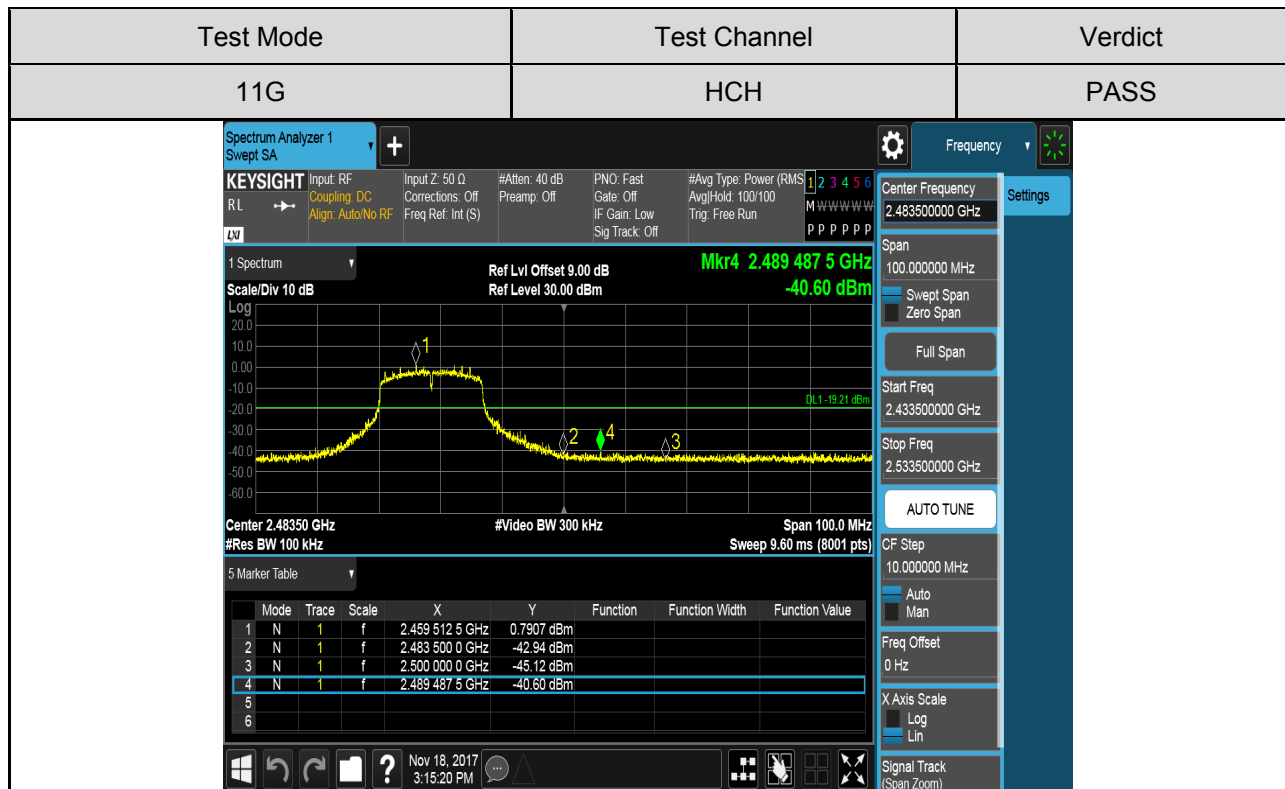
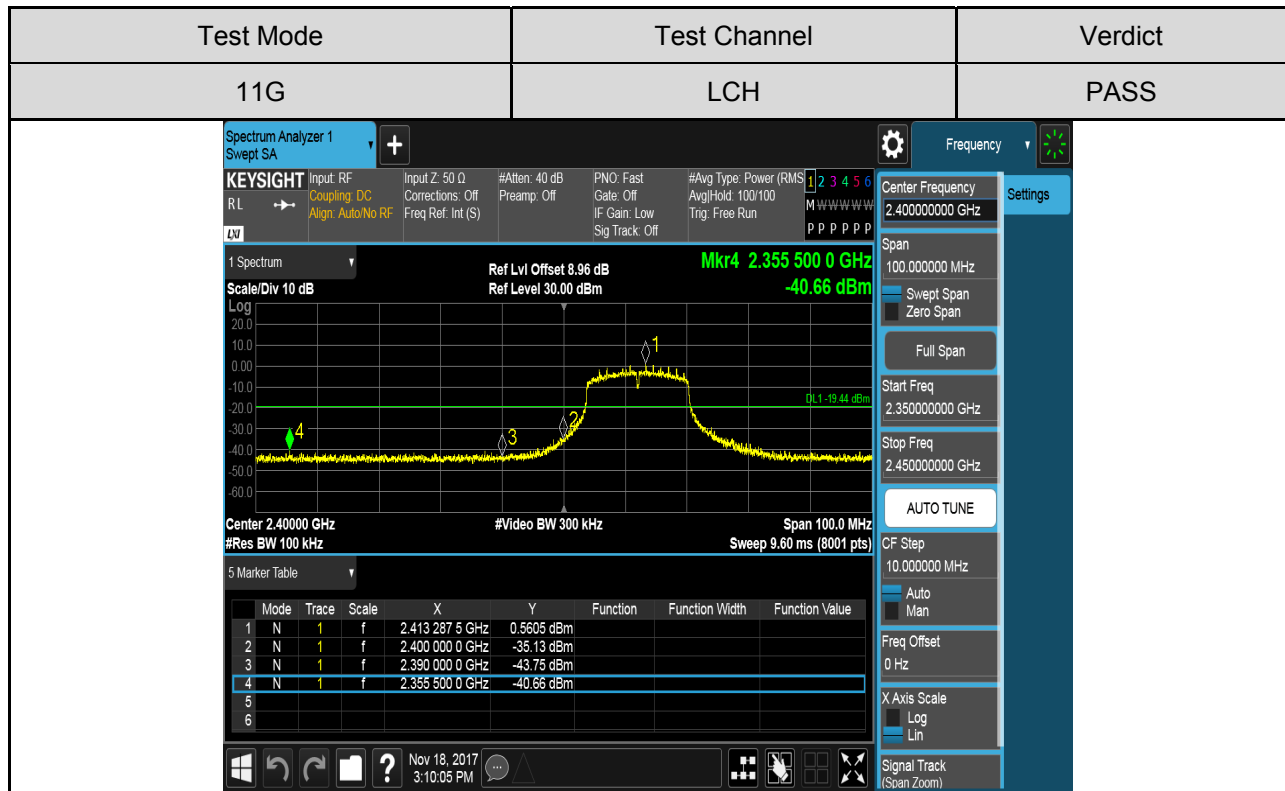
Part I :Conducted Bandedge

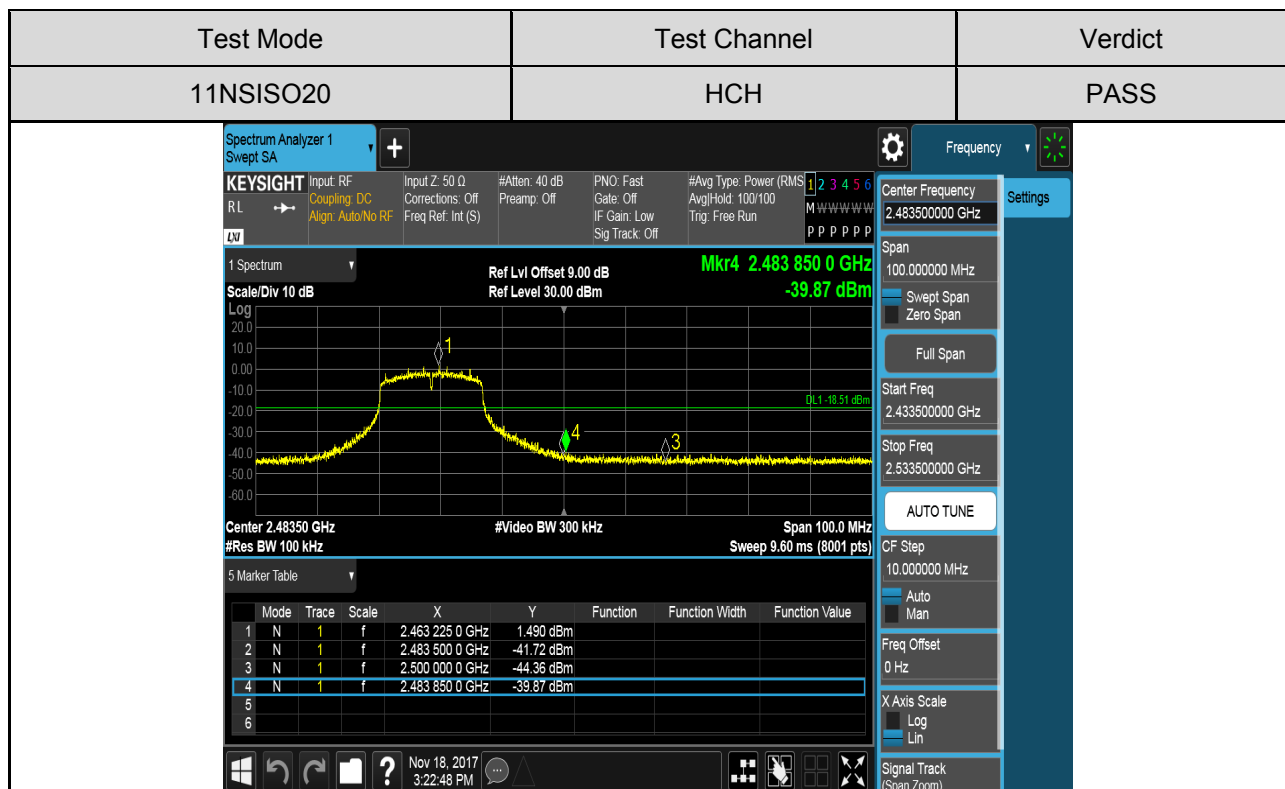
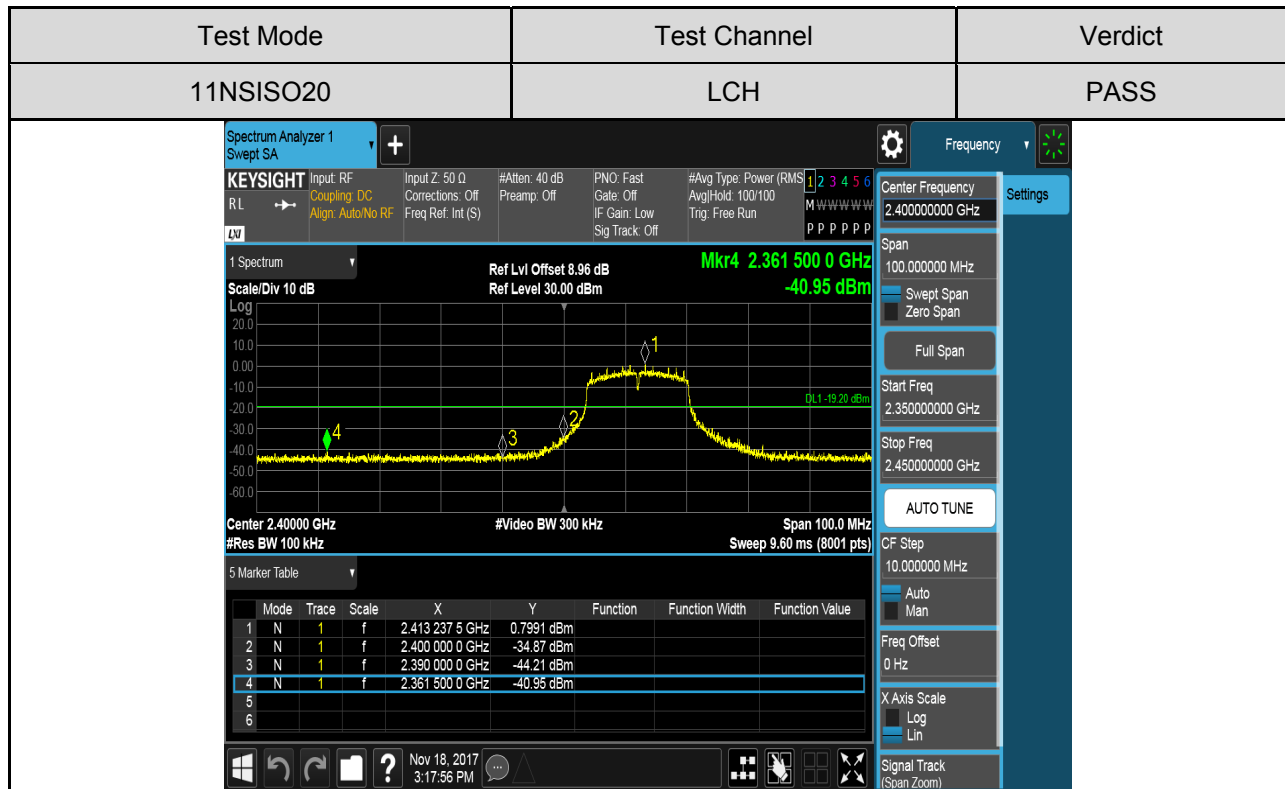
RESULTS TABLE

Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	4.464	-41.377	-15.54	PASS
11B	HCH	5.426	-40.755	-14.57	PASS
11G	LCH	0.560	-40.660	-19.44	PASS
11G	HCH	0.791	-40.599	-19.21	PASS
11N20SISO	LCH	0.799	-40.953	-19.2	PASS
11N20SISO	HCH	1.490	-39.874	-18.51	PASS

TEST GRAPHS







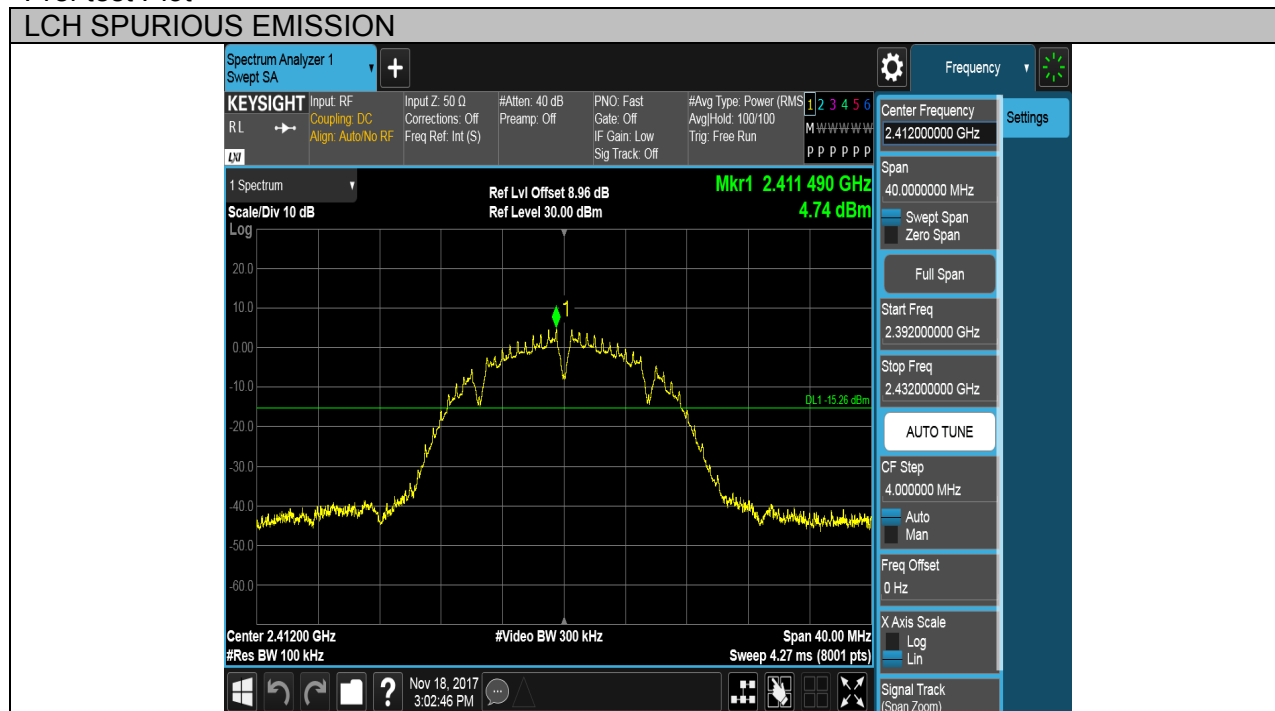
Part II :Conducted Emission

Test Result Table

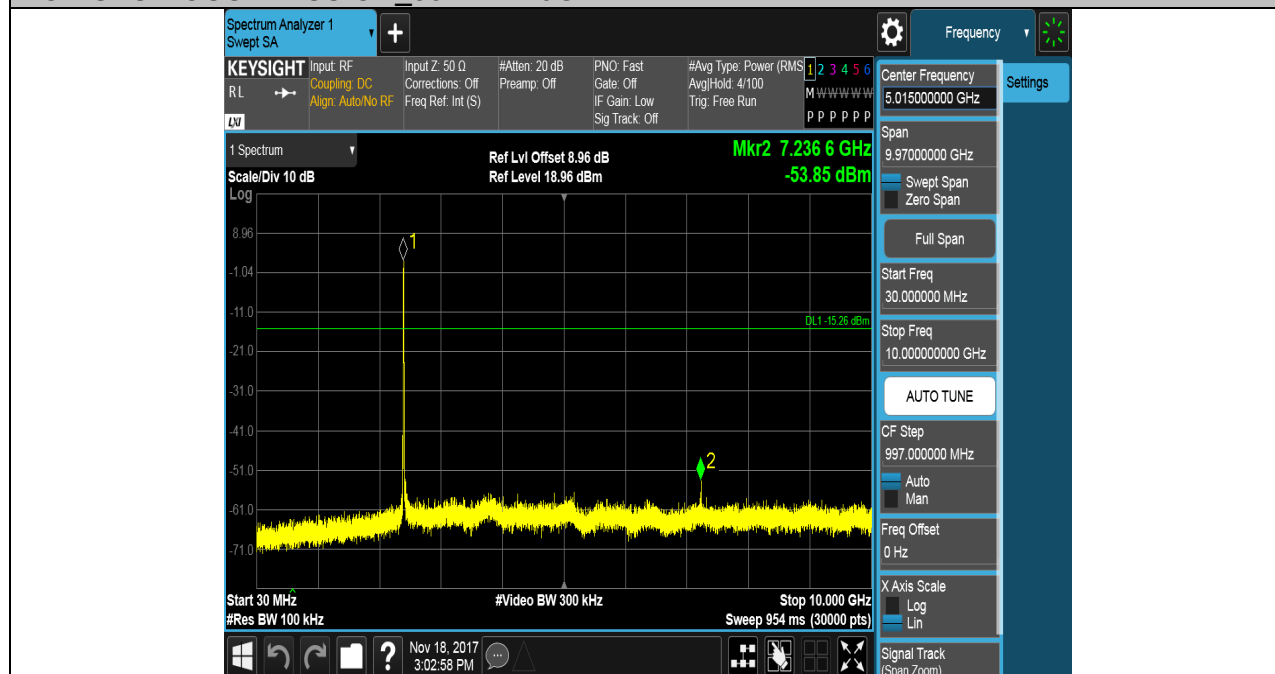
Test Mode	Channel	Pref(dBm)	Puw(dBm)	Verdict
11B	LCH	4.742	<Limit	PASS
	MCH	5.297	<Limit	PASS
	HCH	5.541	<Limit	PASS
11G	LCH	0.481	<Limit	PASS
	MCH	1.708	<Limit	PASS
	HCH	1.582	<Limit	PASS
11NSISO20	LCH	1.071	<Limit	PASS
	MCH	1.252	<Limit	PASS
	HCH	2.198	<Limit	PASS

Test Mode	Channel	Verdict
11B	LCH	PASS

Pref test Plot



LCH SPURIOUS EMISSION_30MHz~10GHz



LCH SPURIOUS EMISSION_10GHz~26GHz

