CFR 47 FCC PART 15 SUBPART C

TEST REPORT

For

300Mbps Wi-Fi Range Extender

MODEL NUMBER: TL-WA855RE

FCC ID: TE7WA855REV5

REPORT NUMBER: 4789222380.1-3

ISSUE DATE: December 24, 2019

Prepared for

TP-Link Technologies Co., Ltd.
Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	12/24/2019	Initial Issue	

Summary of Test Results			
Clause	**Test Items**	**FCC Rules**	**Test Results**
1	6dB Bandwidth and 99% Occupied Bandwidth	FCC Part 15.247 (a) (2)	Pass
2	Peak Conducted Output Power	FCC Part 15.247 (b) (3)	Pass
3	Power Spectral Density	FCC Part 15.247 (e)	Pass
4	Conducted Bandedge and Spurious Emission	FCC Part 15.247 (d)	Pass
5	Radiated Bandedge and Spurious Emission	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205	Pass
6	Conducted Emission Test For AC Power Port	FCC Part 15.207	Pass
7	Antenna Requirement	FCC Part 15.203	Pass
Note: This test report is only published to and used by the applicant, and it is not for evidence purpose in China.			

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	TP-Link Technologies Co., Ltd.
Address:	Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

Manufacturer Information

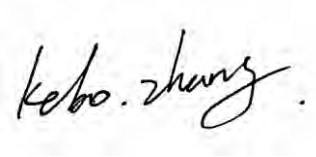
Company Name:	TP-Link Technologies Co., Ltd.
Address:	Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

EUT Information

EUT Name:	300Mbps Wi-Fi Range Extender
Model:	TL-WA855RE
Brand:	tp-link
Sample Status:	Normal
Sample ID:	2639620
Sample Received Date:	October 23, 2019
Date of Tested:	October 24, 2019 ~ December 24, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C	PASS

Prepared By:



Kebo Zhang
Project Engineer

Checked 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 KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, KDB 662911 D01 Multiple Transmitter Output v02r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15 and ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

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 **ISED(Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. 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 OFS.

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 recognize national standards.

4.2. CMEASUREMENT UNCERTAINTY

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

Test Item	Uncertainty
Conduction emission	3.62dB
Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.00dB
Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	5.78dB (1GHz-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

EUT Name	300Mbps Wi-Fi Range Extender
Model	TL-WA855RE
Radio Technology	IEEE802.11b/g/n HT20/n HT40
Operation frequency	IEEE 802.11b: 2412MHz—2462MHz IEEE 802.11g: 2412MHz—2462MHz IEEE 802.11n HT20: 2412MHz—2462MHz IEEE 802.11n HT40: 2422MHz—2452MHz
Modulation	IEEE 802.11b: DSSS(CCK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Rated Input	AC120V,60Hz

5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains (NTX)	IEE Std. 802.11	Frequency (MHz)	Channel Number	Max AVG Conducted Power (dBm)
2	IEEE 802.11b	2412-2462	1-11[11]	23.28
2	IEEE 802.11g	2412-2462	1-11[11]	22.34
2	IEEE 802.11nHT20	2412-2462	1-11[11]	22.87
2	IEEE 802.11nHT40	2422-2452	3-9[7]	22.70

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	4	2427	7	2442	10	2457
2	2417	5	2432	8	2447	11	2462
3	2422	6	2437	9	2452	/	/

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	Frequency(MHz)
802.11b	CH 1, CH2 CH 6,CH10 CH 11	2412, 2417, 2437, 2457, 2462
802.11g	CH 1, CH2 CH 6,CH10 CH 11	2412, 2417, 2437, 2457, 2462
802.11n HT20	CH 1, CH2 CH 6,CH10 CH 11	2412, 2417, 2437, 2457, 2462
802.11n HT40	CH 3, CH4, CH 6, CH8, CH 9	2422, 2427,2437, 2447, 2452

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band											
Test Software		QATool_Dbg									
Modulation Mode	Transmit Antenna Number	Test Software Setting Value									
		NCB: 20MHz					NCB: 40MHz				
		CH1	CH2	CH7	CH10	CH13	CH3	CH4	CH7	CH8	CH11
802.11b	2	1F	1D	22	1E	1D	NA				
802.11g	2	17	1F	20	1C	15					
802.11n HT20	2	17	1F	22	1A	14					
802.11n HT40	2	NA	NA	NA	NA	NA	11	13	20	10	0F

5.6. THE WORSE CASE CONFIGURATIONS

For 2TX MIMO modes, ANTENNA 0 and ANTENNA 1, used at the same time.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0

5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
0	2412-2462	Omni-Directional	2
1	2412-2462	Omni-Directional	2

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	☒2TX, 2RX	Antenna 0 or Antenna 1 can be used as transmitting/receiving antenna.
IEEE 802.11g	☒2TX, 2RX	Antenna 0 or Antenna 1 can be used as transmitting/receiving antenna
IEEE 802.11n HT20	☒2TX, 2RX	Antenna 0 and Antenna 1 can be used as transmitting/receiving antenna
IEEE 802.11n HT40	☒2TX, 2RX	Antenna 0 and Antenna 1 can be used as transmitting/receiving antenna

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	PC	Dell	Vostro 3902	8KNDDB2
2	USB TO UART	/	/	/

I/O CABLES

Item	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	0.50	/

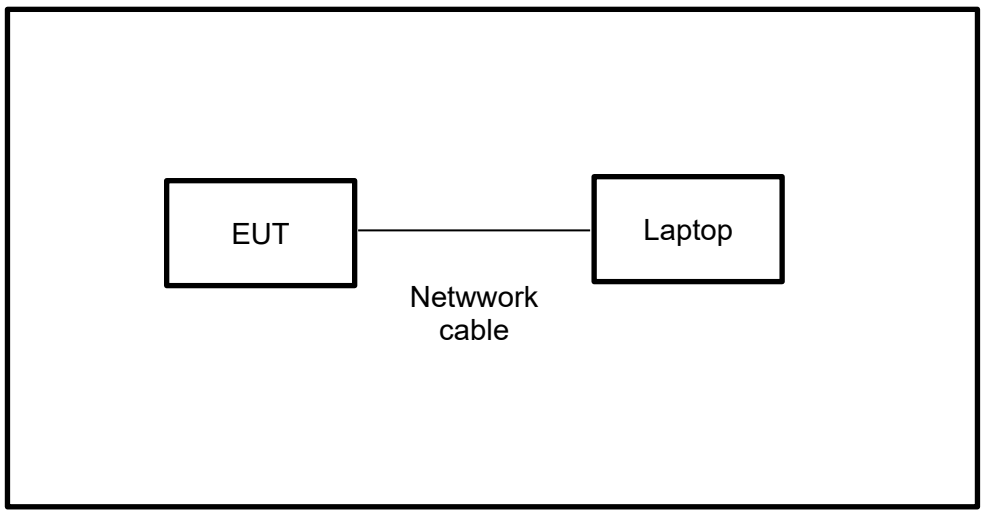
ACCESSORIES

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

TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



6. MEASURING INSTRUMENT AND SOFTWARE USED

For the previous calibration information

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.10,2018	Dec.10,2019
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.10,2018	Dec.10,2019
☑	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.10,2018	Dec.10,2019
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Conducted disturbance		Farad	EZ-EMC	Ver. UL-3A1	
Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.10,2018	Dec.10,2019
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	HP	8447D	2944A09099	Dec.10,2018	Dec.10,2019
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.10,2018	Dec.10,2019
☑	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Aug.11, 2018	Aug.11, 2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.10,2018	Dec.10,2019
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.10,2018	Dec.10,2019
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.07, 2019	Jan.07, 2022
☑	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec.10,2018	Dec.10,2019
☑	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec.10,2018	Dec.10,2019
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.10,2018	Dec.10,2019
☑	Power Meter	Keysight	N1911A	MY55416024	Dec.10,2018	Dec.10,2019
☑	Power Sensor	Keysight	U2021XA	MY5100022	Dec.10,2018	Dec.10,2019

Note: This table records the previous calibration information

For the last calibration information

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.05,2019	Dec.05,2020
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.05,2019	Dec.05,2020
☑	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.05,2019	Dec.05,2020
Software						
Used	Description			Manufacturer	Name	Version
☑	Test Software for Conducted disturbance			Farad	EZ-EMC	Ver. UL-3A1
Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.06,2019	Dec.06,2020
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.17, 2021
☑	Preamplifier	HP	8447D	2944A09099	Dec.05,2019	Dec.05,2020
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.05,2019	Dec.05,2020
☑	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.17, 2021
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Aug.11, 2018	Aug.11, 2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.05,2019	Dec.05,2020
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.05,2019	Dec.05,2020
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.07, 2019	Jan.07, 2022

☑	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec.05,2019	Dec.05,2020
☑	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec.05,2019	Dec.05,2020

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.06,2019	Dec.06,2020
☑	Power Meter	Keysight	N1911A	MY55416024	Dec.06,2019	Dec.06,2020
☑	Power Sensor	Keysight	U2021XA	MY5100022	Dec.06,2019	Dec.06,2020

Note: This table records the last calibration information

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

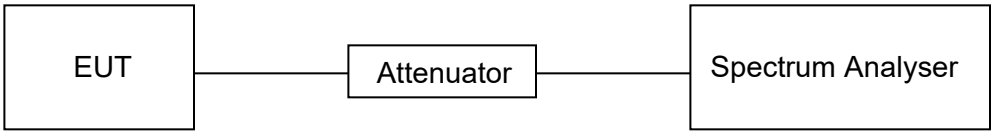
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	50%
Atmosphere Pressure	101kPa	Test Voltage	AC120V,60Hz

RESULTS

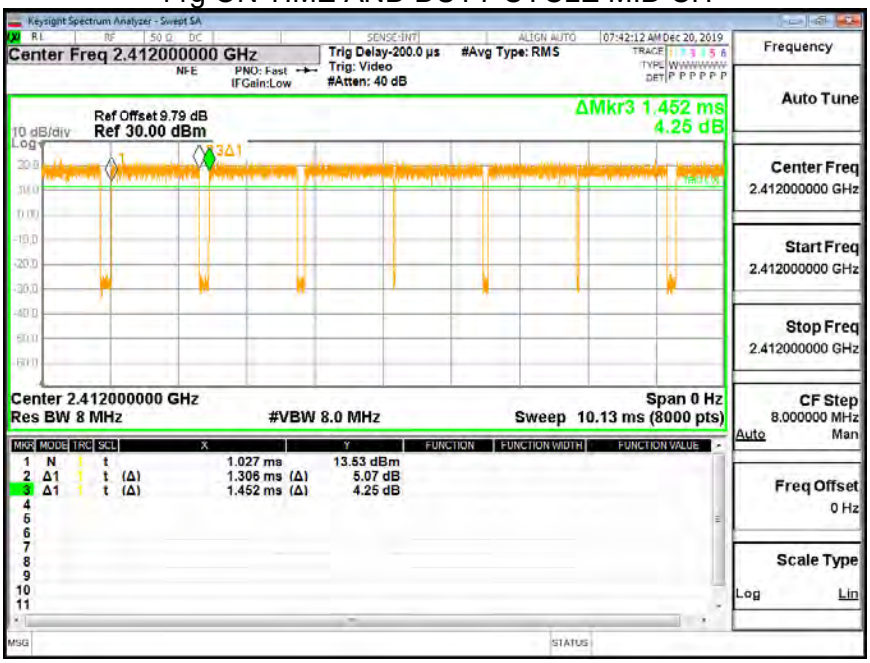
ANTENNA 0

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (KHz)	Final setting For VBW (KHz)
11b	8.42	8.56	0.984	98.4%	0.07	0.01	0.01
11g	1.306	1.452	0.899	89.9%	0.46	0.77	1
11n20	1.310	1.445	0.907	90.7%	0.42	0.76	1
11n40	0.6447	0.8081	0.798	79.8%	0.98	1.55	2

Note:
Duty Cycle Correction Factor=10log (1/x).
Where: x is Duty Cycle (Linear)
Where: T is On Time
If that calculated VBW is not available on the analyzer then the next higher value should be used.
Antenna 0 and Antenna 1 has the same duty cycle, only Antenna 0 data show here.
For mode 11b, the duty cycle is greater than 98%, so it can set VBW to 10Hz.

11b ON TIME AND DUTY CYCLE MID CH

11g ON TIME AND DUTY CYCLE MID CH



11n HT20 ON TIME AND DUTY CYCLE MID CH

11n HT40 ON TIME AND DUTY CYCLE MID CH

7.2. 6 dB DTS BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(a)(2) ISED RSS-247 5.2 (a)	6 dB Bandwidth	≥ 500KHz	2400-2483.5
ISED RSS-Gen Clause 6.7	99% Occupied Bandwidth	For reporting purposes only.	2400-2483.5

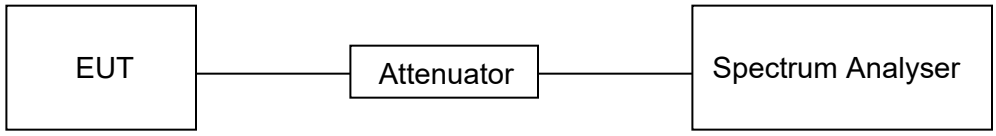
TEST PROCEDURE

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 6dB Bandwidth :100kHz For 99% Occupied Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : ≥3 × RBW For 99% Occupied Bandwidth : ≥3 × 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



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	50%
Atmosphere Pressure	101kPa	Test Voltage	AC120V,60Hz

RESULTS

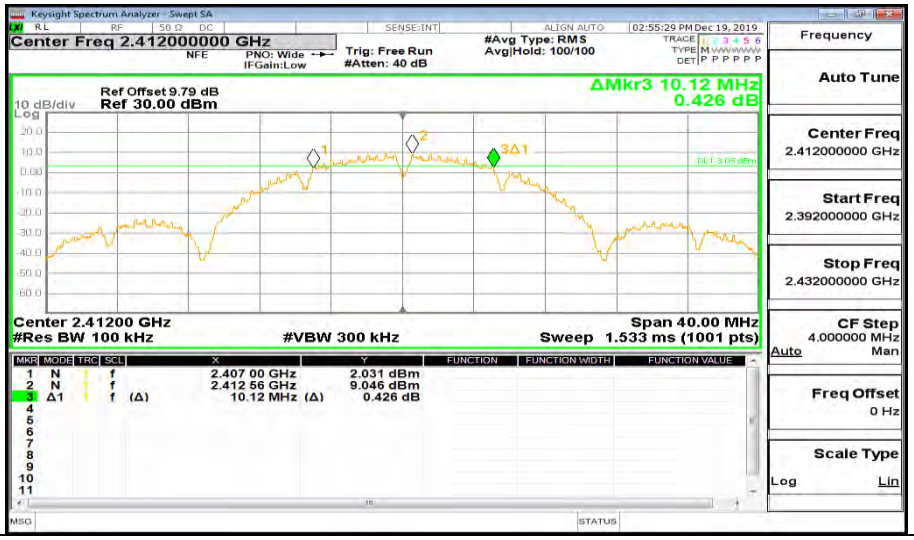
7.2.1. 802.11b MIMO MODE

ANTENNA 0

Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB BW (kHz)	Result
CH1	10.12	14.968	≥500	Pass
CH2	9.64	14.826	≥500	Pass
CH6	9.68	15.212	≥500	Pass
CH10	10.16	14.706	≥500	Pass
CH11	10.12	14.621	≥500	Pass

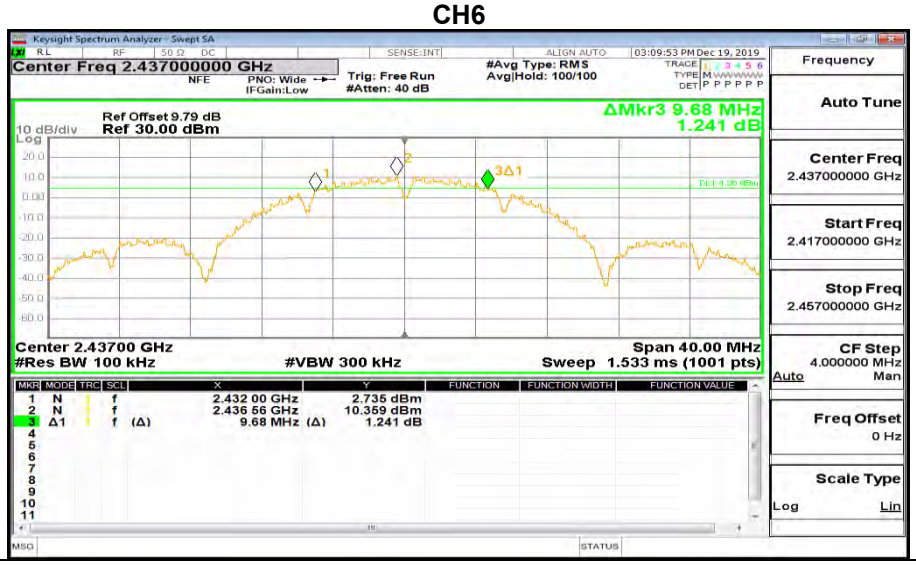
6dB bandwidth

CH1

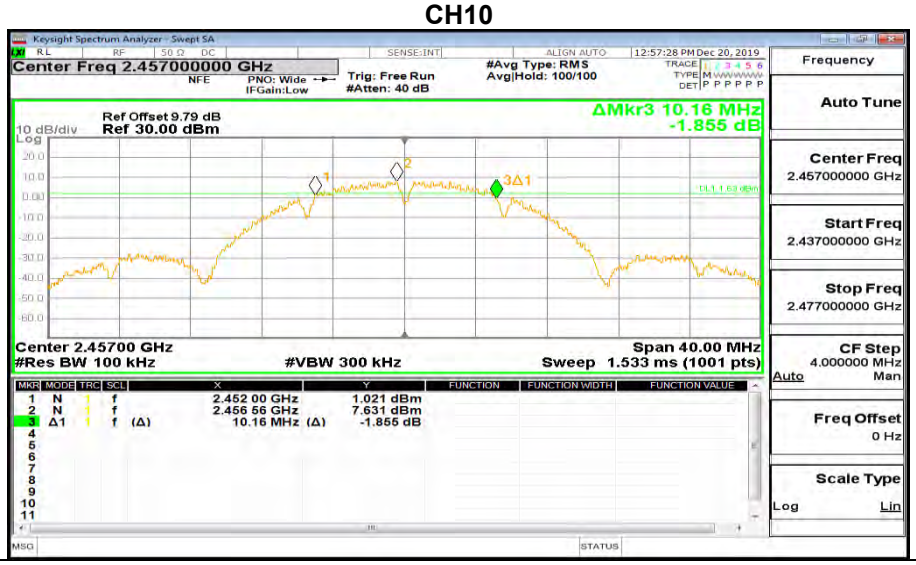


CH2

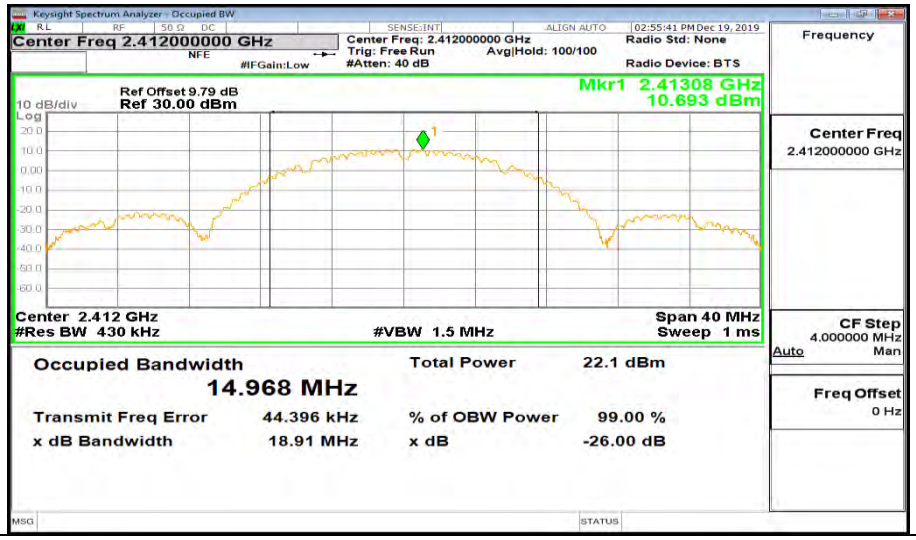
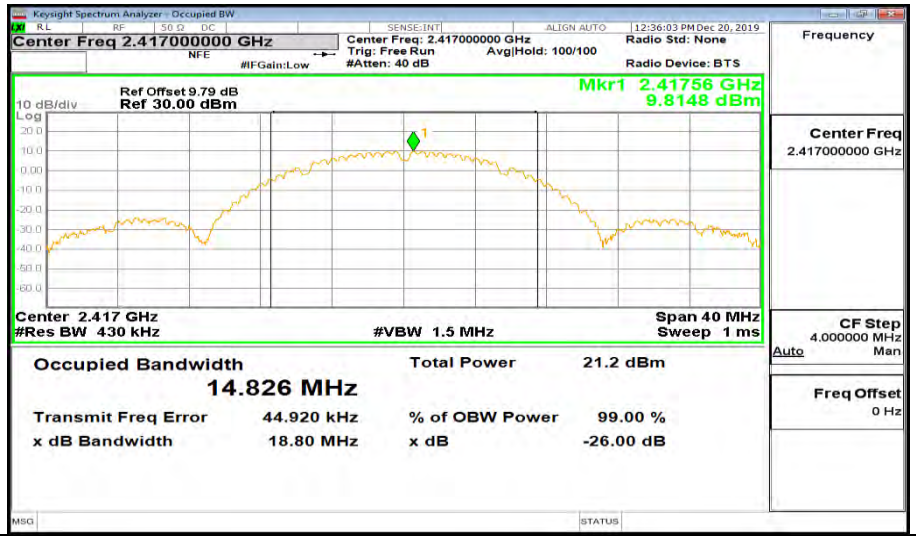
CH6



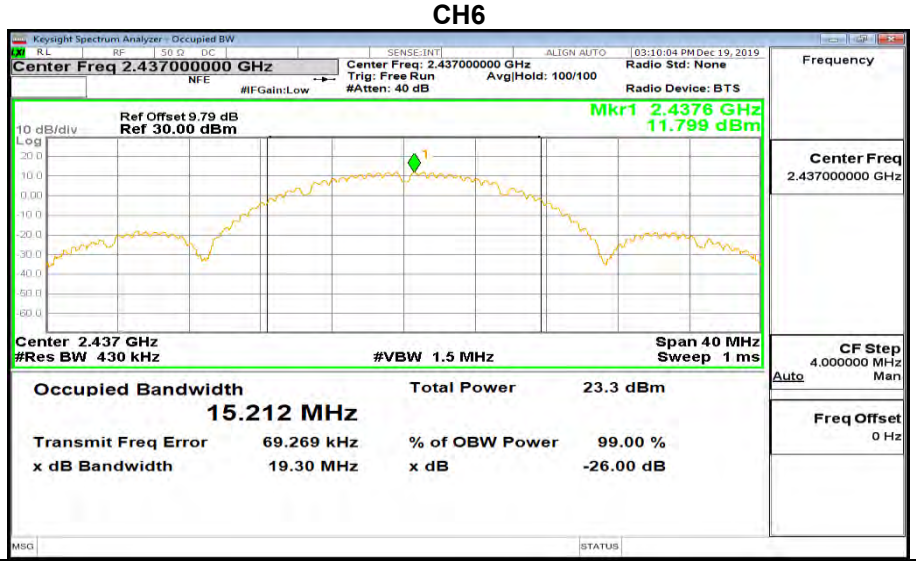
CH10



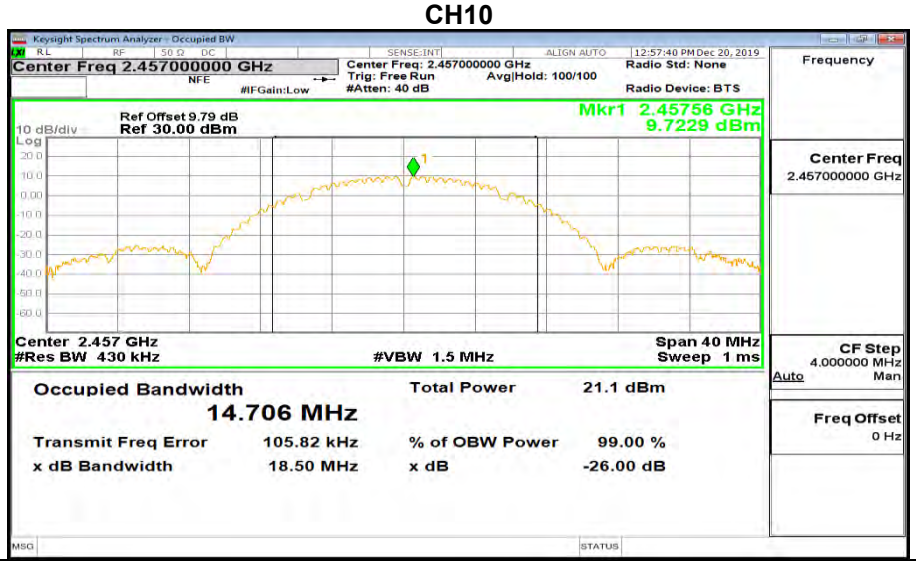
CH11

99% bandwidth
CH1

CH2


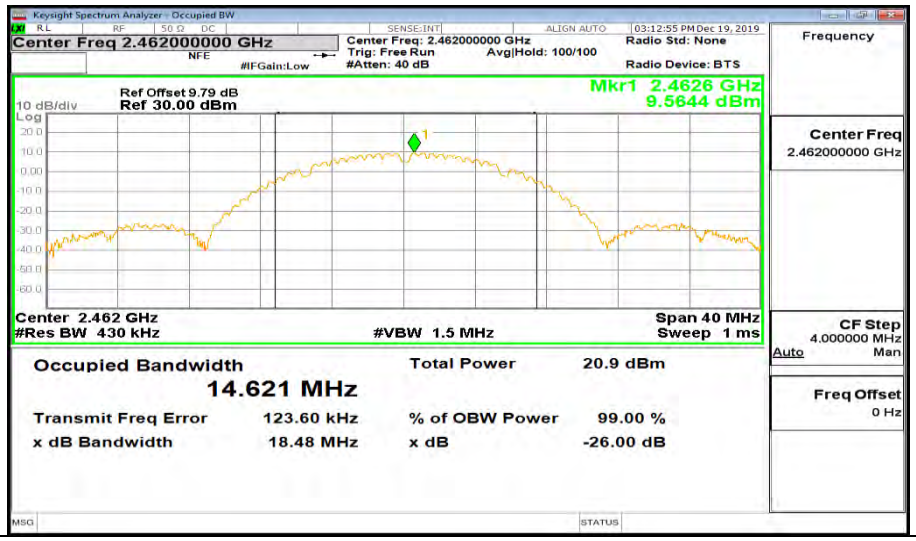
CH6



CH10



CH11



Note: All the modes and antenna ports had been tested, only the worst data recorded in the report.

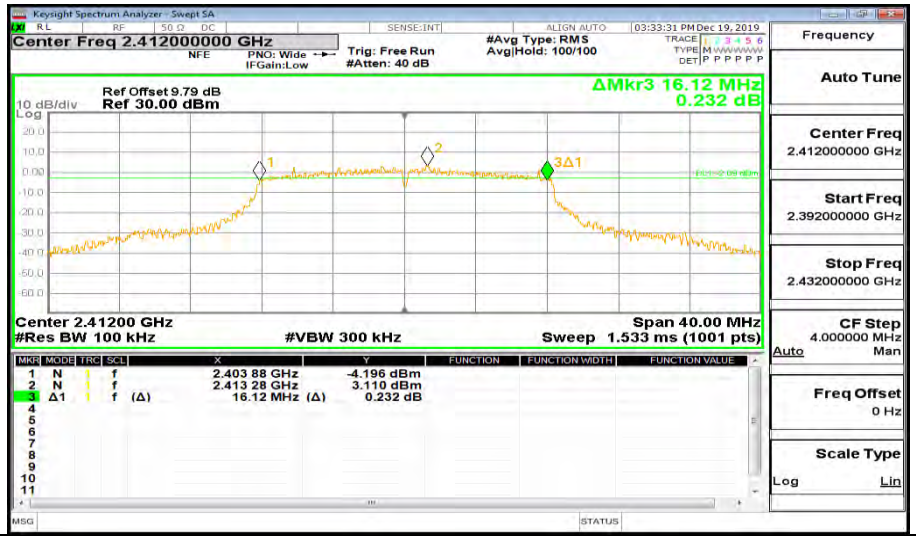
7.2.2. 802.11g MIMO MODE

ANTENNA 0

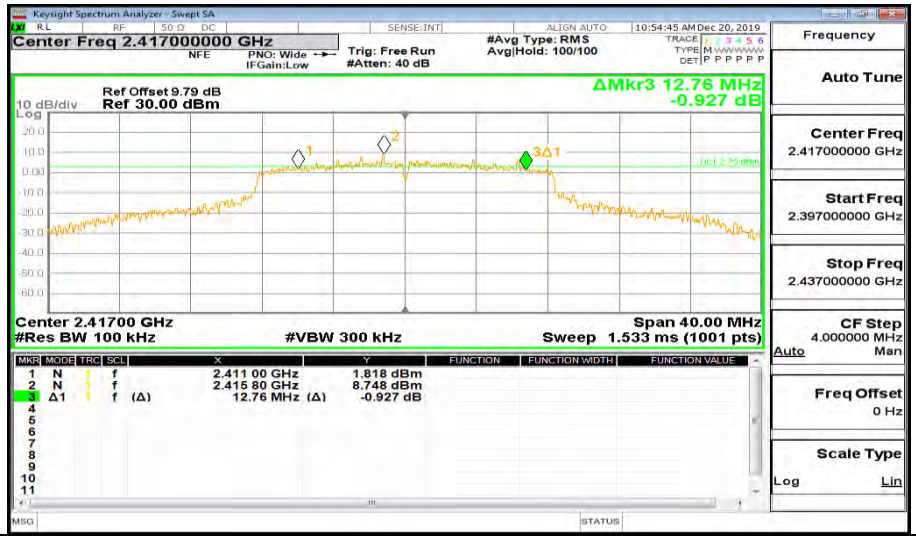
Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB BW (kHz)	Result
CH1	16.120	16.841	≥500	Pass
CH2	12.760	17.815	≥500	Pass
CH6	15.200	17.883	≥500	Pass
CH10	16.360	17.130	≥500	Pass
CH11	11.040	16.818	≥500	Pass

6dB bandwidth

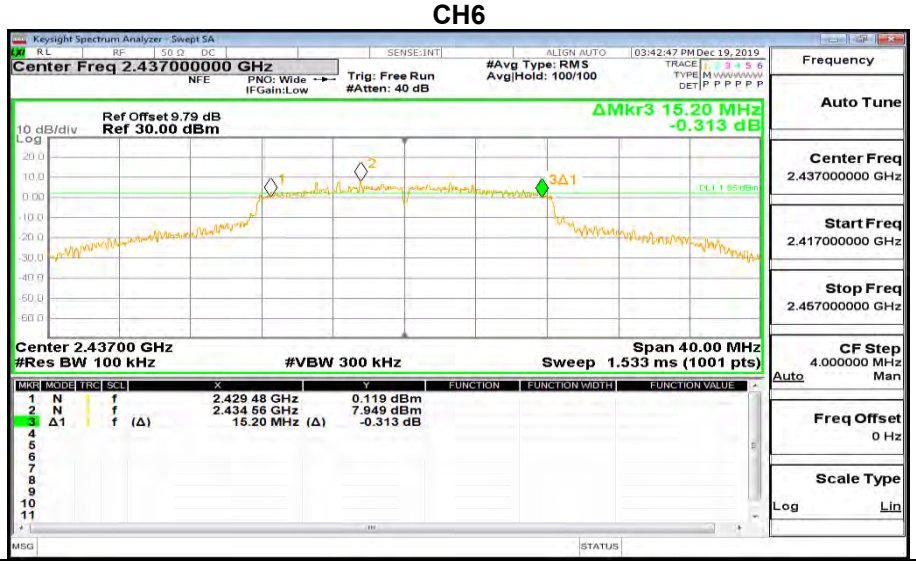
CH1



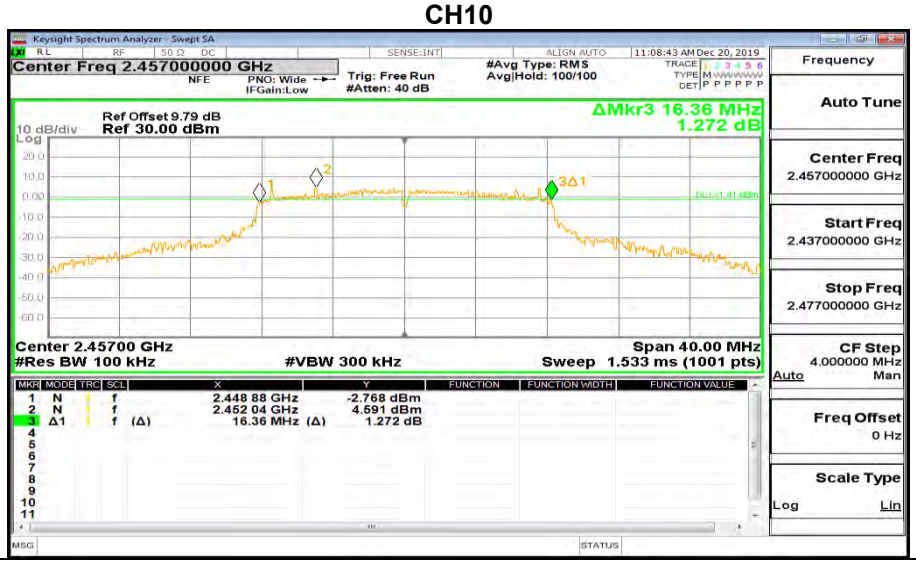
CH2



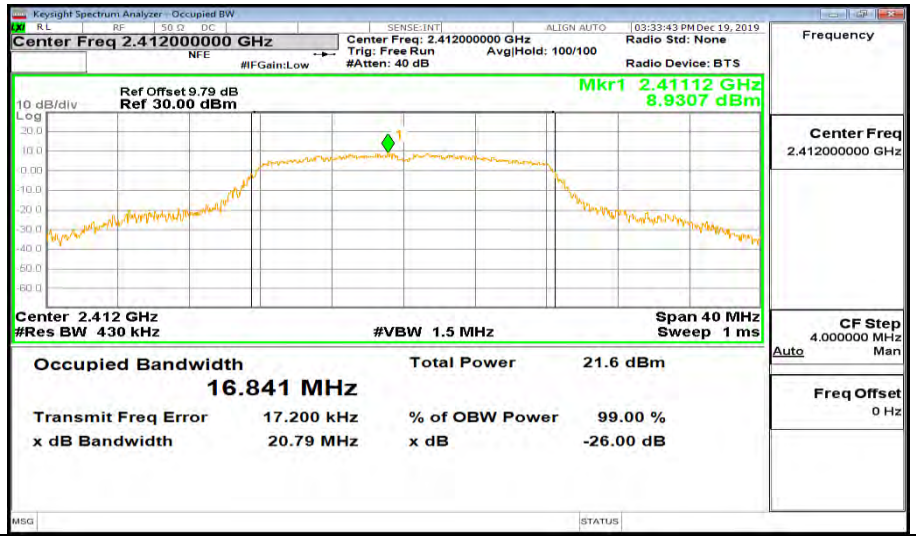
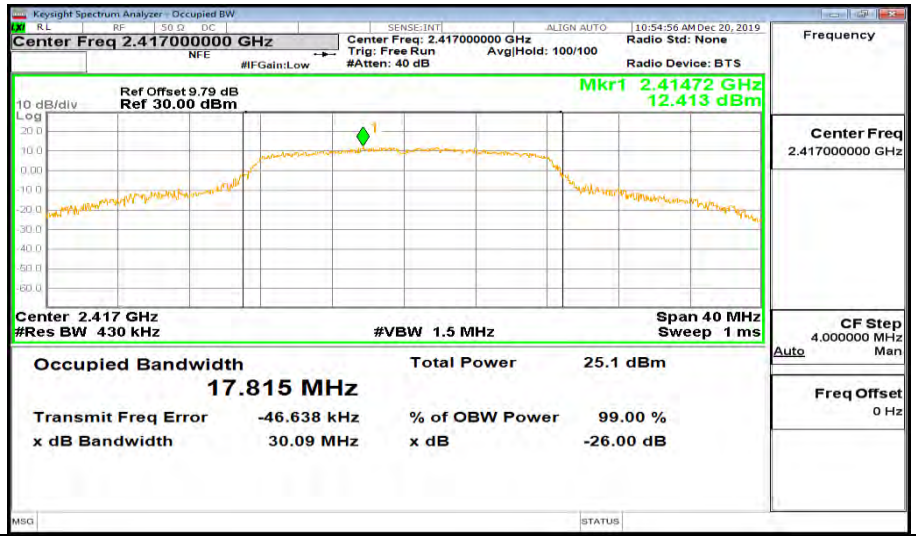
CH6



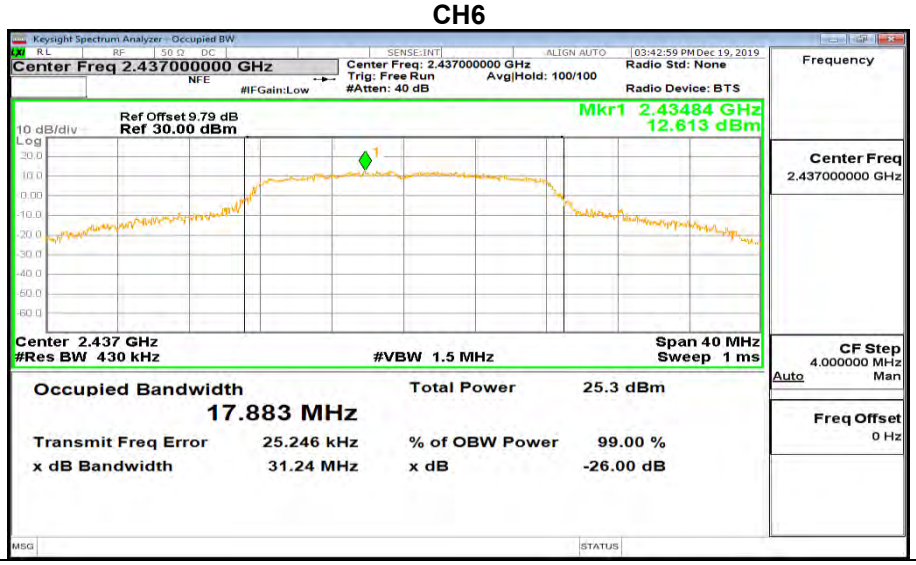
CH10



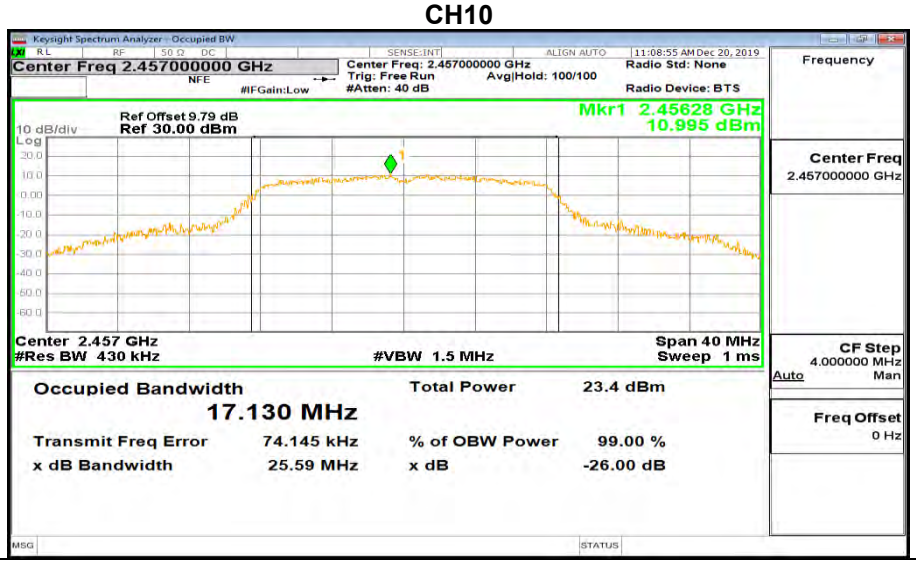
CH11

99% bandwidth
CH1

CH2


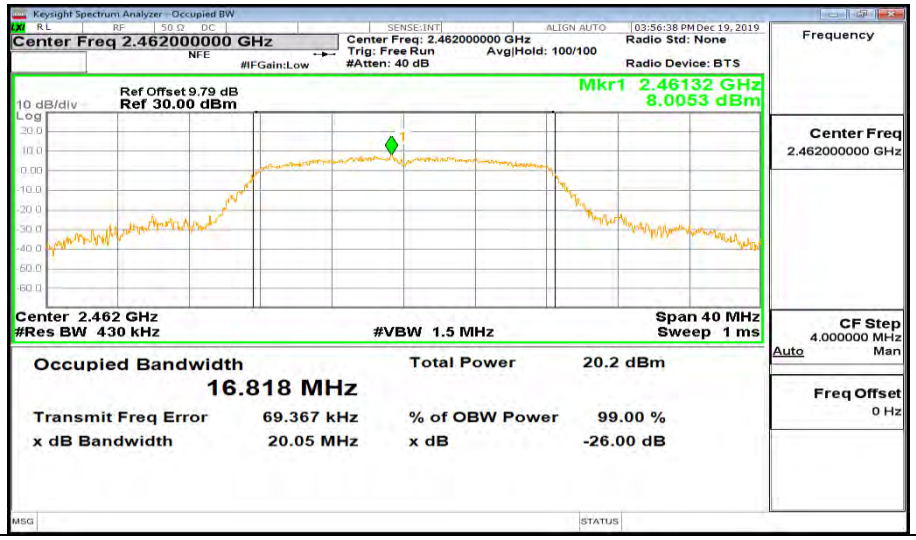
CH6



CH10



CH11



Note: All the modes and antenna ports had been tested, only the worst data recorded in the report

7.2.1. 802.11n20 MIMO MODE

ANTENNA 0

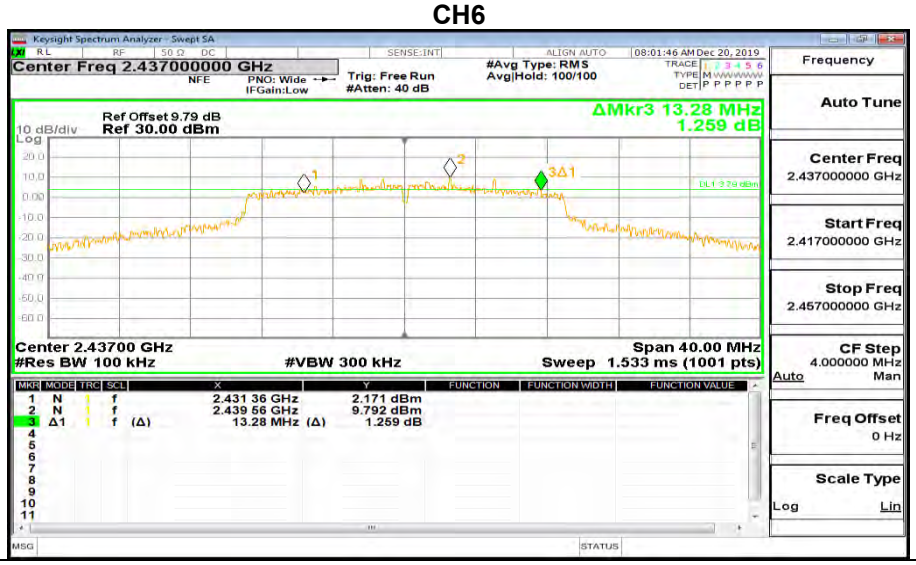
Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB BW (kHz)	Result
CH1	13.960	17.814	≥500	Pass
CH2	15.120	18.596	≥500	Pass
CH6	13.280	19.978	≥500	Pass
CH10	15.200	17.879	≥500	Pass
CH11	11.760	17.703	≥500	Pass

6dB bandwidth

CH1

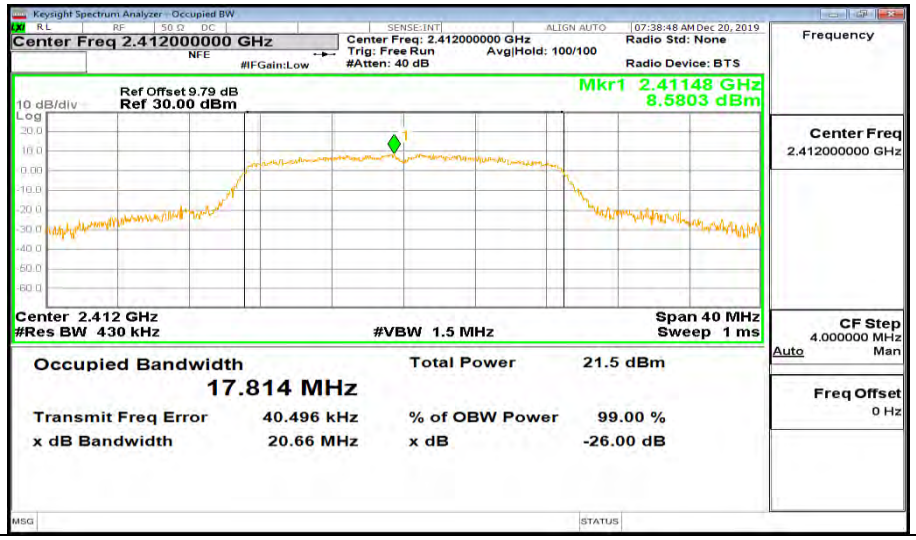
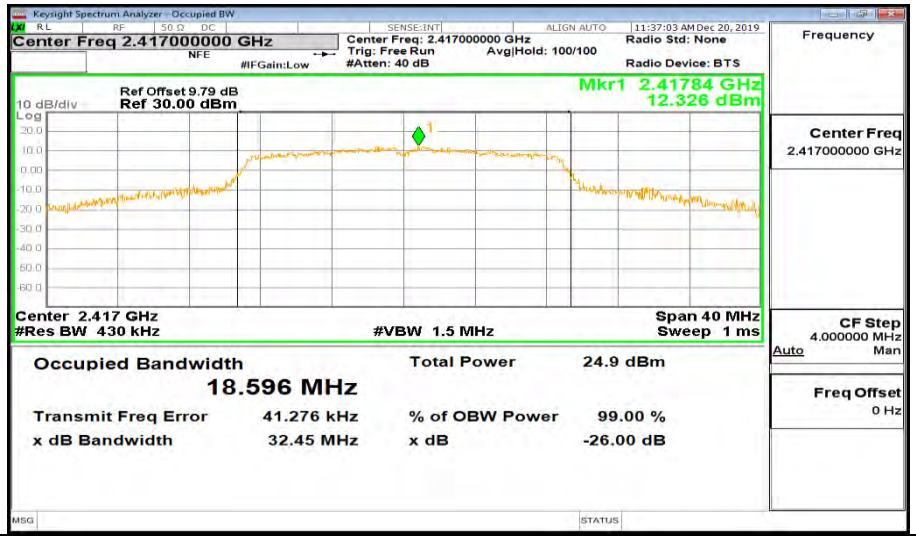
CH2

CH6

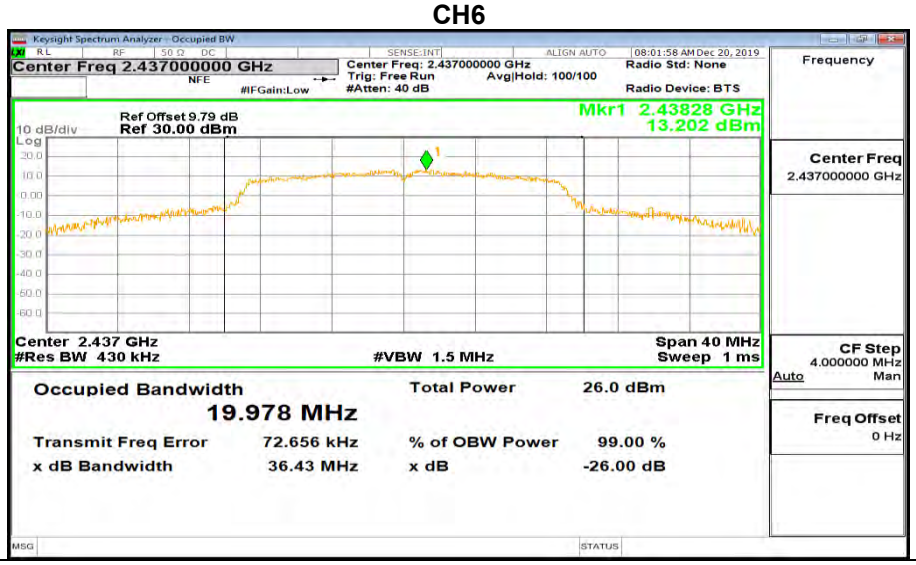


CH10

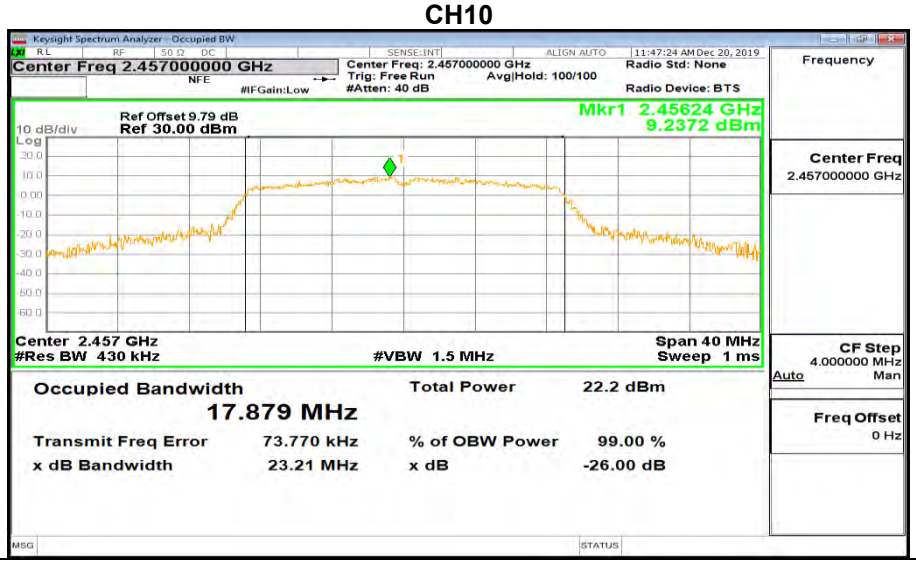
CH11

99% bandwidth
CH1

CH2


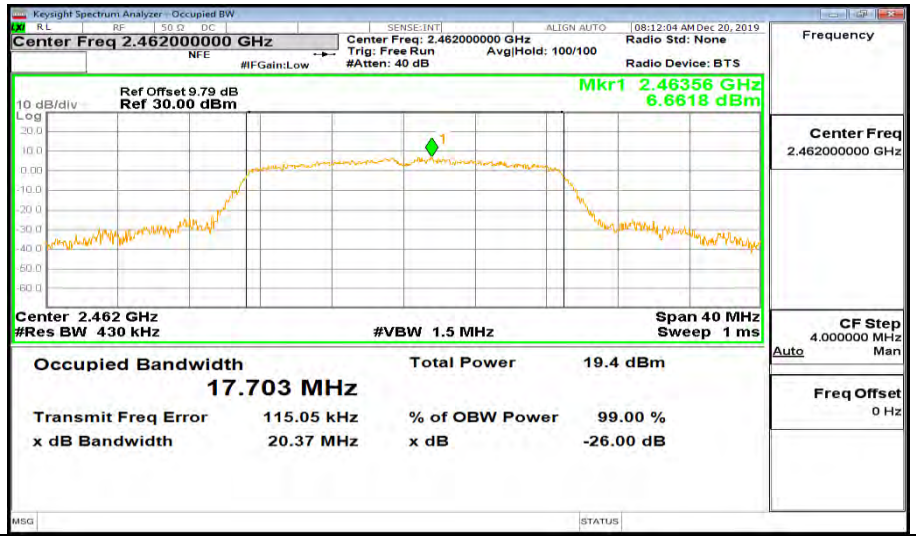
CH6



CH10



CH11



Note: All the modes and antenna ports had been tested, only the worst data recorded in the report

7.2.1. 802.11n40 MIMO MODE

ANTENNA 0

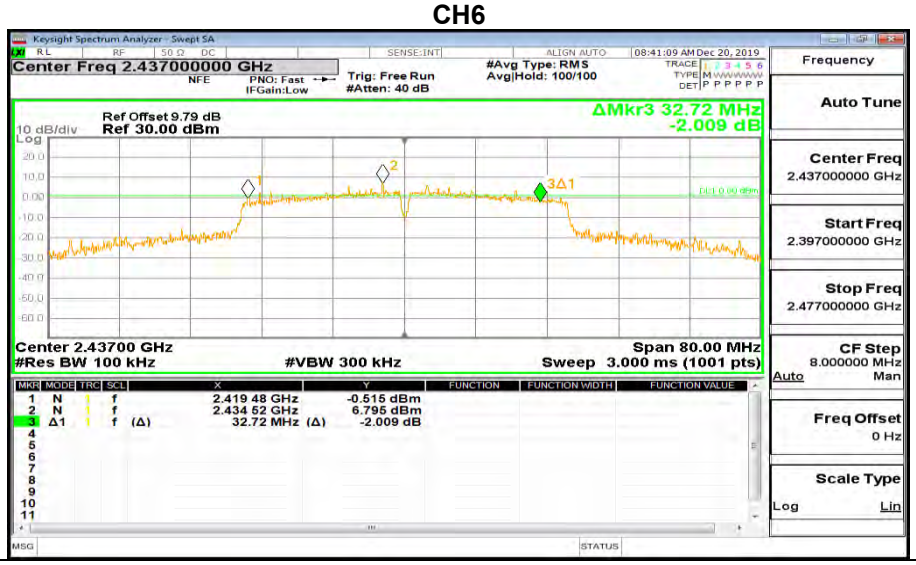
Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB BW (kHz)	Result
CH3	31.520	35.992	≥500	Pass
CH4	32.800	35.982	≥500	Pass
CH6	32.720	36.956	≥500	Pass
CH8	32.720	35.920	≥500	Pass
CH9	34.000	35.961	≥500	Pass

6dB bandwidth

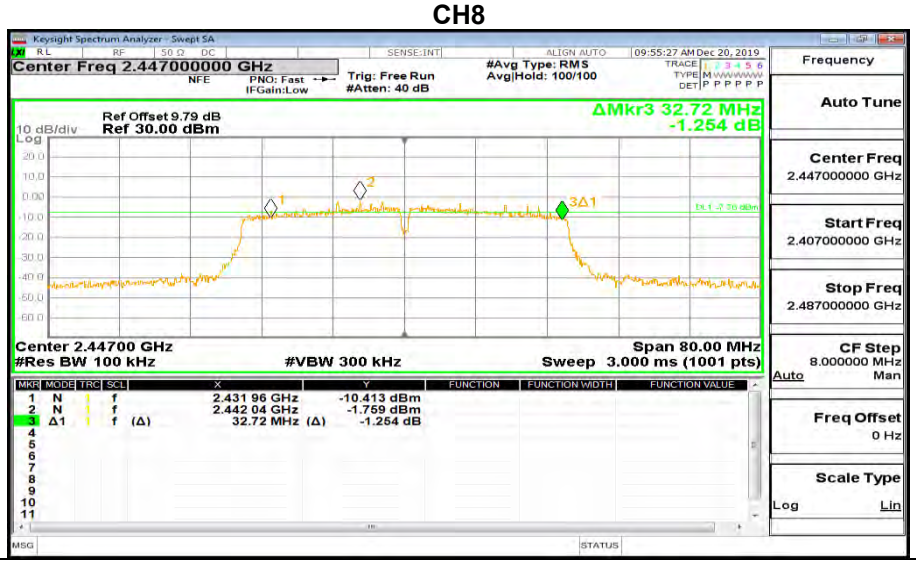
CH3

CH4

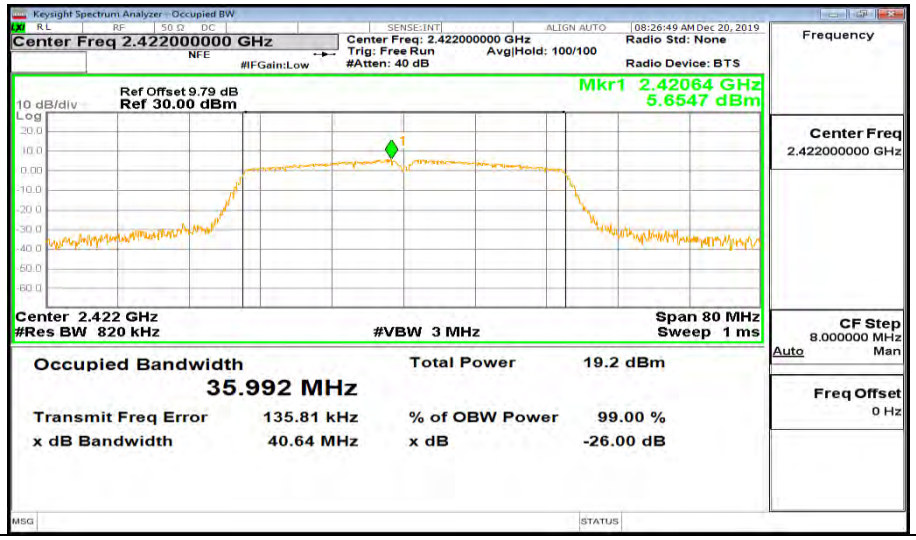
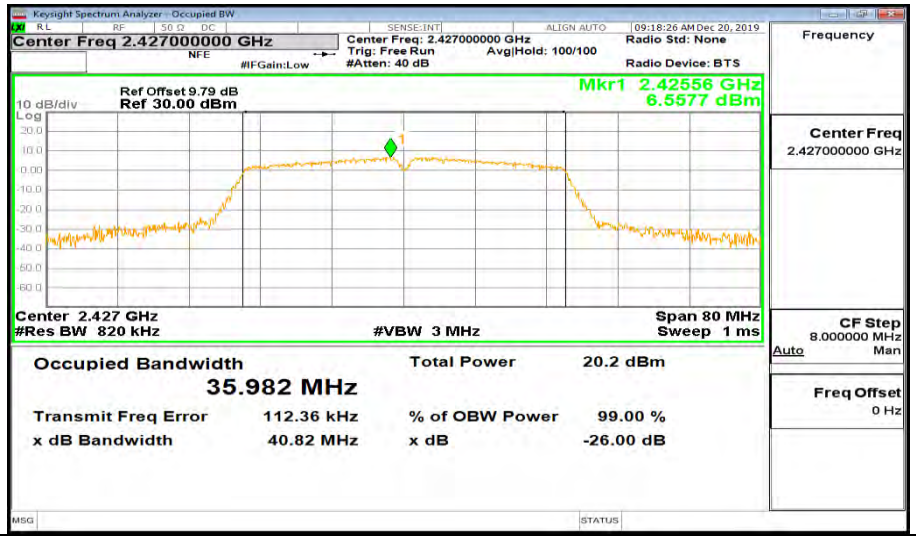
CH6



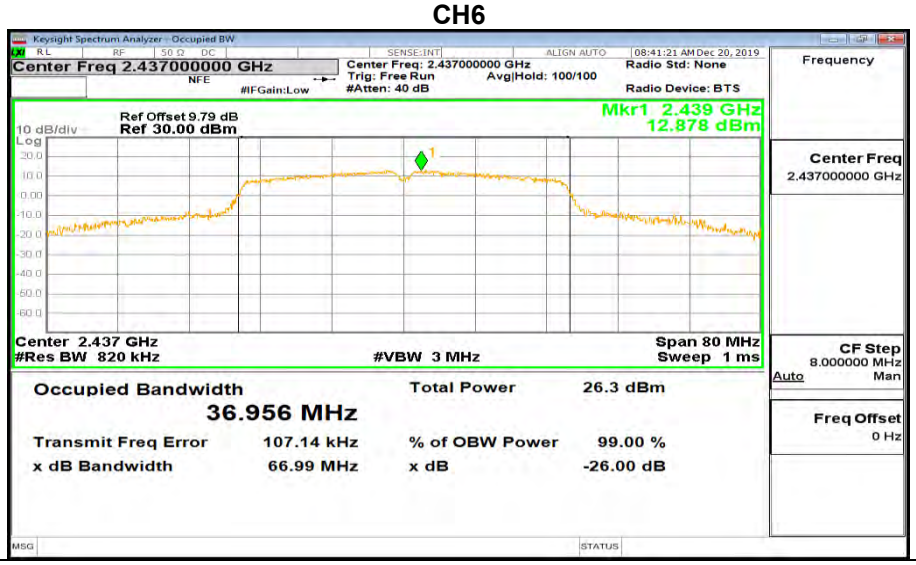
CH8



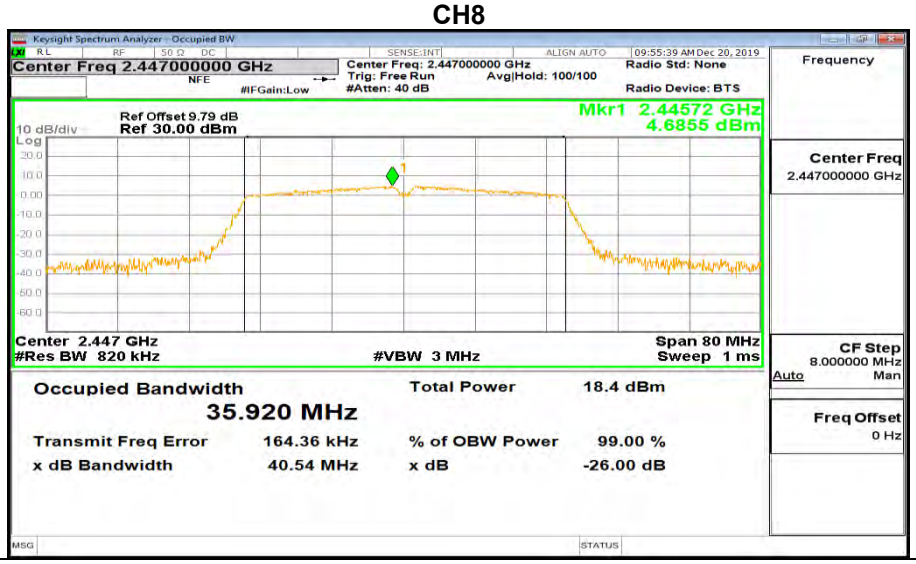
CH9

99% bandwidth
CH3

CH4


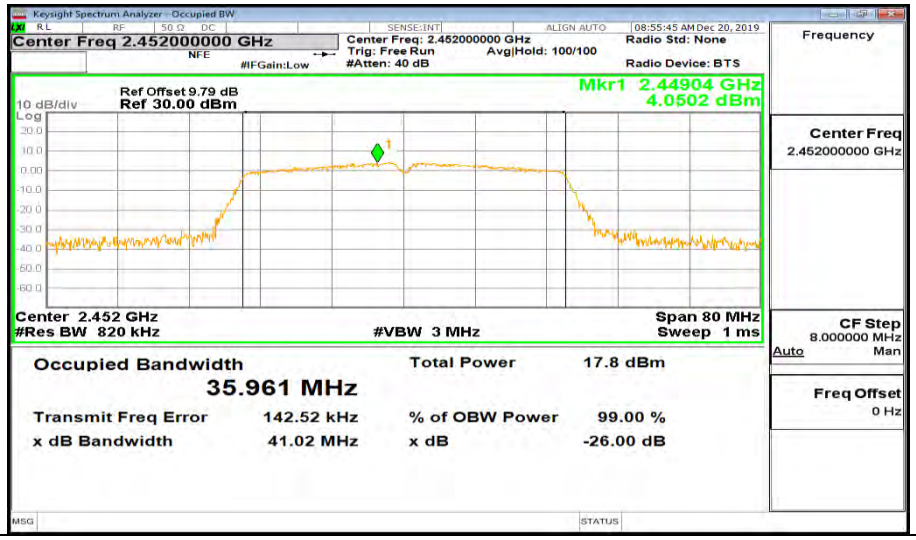
CH6



CH8



CH9



Note: All the modes and antenna ports had been tested, only the worst data recorded in the report

7.3. CONDUCTED OUTPUT POWER

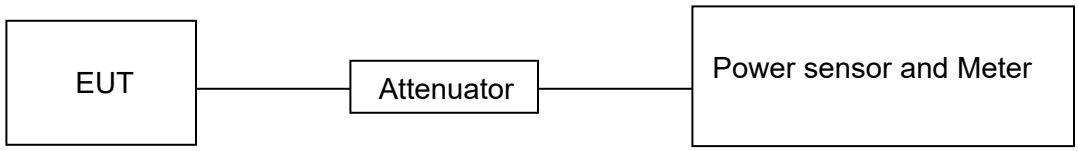
LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3) ISED RSS-247 5.4 (d)	Peak Output Power	1 watt or 30dBm (See Note 1/2)	2400-2483.5
1. The total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi 2. Directional gain = G_{ANT} + 10 log(N_{ANT}) dBi, where N_{ANT} is the number of outputs, G_{ANT} is the Antenna gain.			

TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
Measure AVG power each channel.
AVG Detector use for AVG result.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	50%
Atmosphere Pressure	101kPa	Test Voltage	AC120V,60Hz

RESULTS

Mode	Frequency (MHz)	ANT	AV Conducted Power (dBm)	Total (dBm)
802.11b	2412	0	18.97	21.42
		1	17.76	
	2417	0	18.33	21.10
		1	17.84	
	2437	0	20.47	**23.28**
		1	20.05	
	2457	0	18.24	21.15
		1	18.04	
	2462	0	18.01	20.86
		1	17.67	
802.11g	2412	0	15.73	18.58
		1	15.40	
	2417	0	19.11	22.08
		1	19.02	
	2437	0	19.39	**22.34**
		1	19.26	
	2457	0	17.55	20.45
		1	17.33	
	2462	0	14.35	17.18
		1	13.98	

802.11n20	2412	0	15.46	18.39
		1	15.30	
	2417	0	18.98	22.00
		1	19.01	
	2437	0	19.90	**22.87**
		1	19.82	
	2457	0	16.26	19.32
		1	16.37	
	2462	0	13.39	16.44
		1	13.47	
802.11n40	2422	0	12.78	15.70
		1	12.60	
	2427	0	13.78	16.61
		1	13.40	
	2437	0	19.83	**22.70**
		1	19.54	
	2447	0	13.78	16.61
		1	13.40	
	2452	0	11.39	14.40
		1	11.38	

7.4. POWER SPECTRAL DENSITY

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.247 (e) ISED RSS-247 5.2 (b)	Power Spectral Density	8 dBm/3 kHz (See Note 1)	2400-2483.5
1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.			

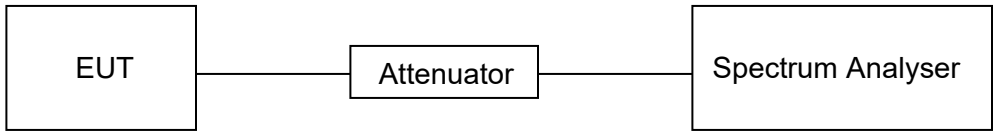
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	AVG
RBW	3 kHz ≤ RBW ≤100 kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace Mode	Trace averaging (rms) mode over a minimum of 100 traces
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



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	50%
Atmosphere Pressure	101kPa	Test Voltage	AC120V, 60Hz

RESULTS

Mode	Frequency (MHz)	ANT	AV Power Spectral Density (dBm/3kHz)	DCCF (dB)	Total (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	2412	0	-10.96	0.07	-7.90	8
		1	-11.00			
	2417	0	-10.23	0.07	-7.97	
		1	-12.05			
	2437	0	-7.86	0.07	-4.87	
		1	-8.04			
	2457	0	-9.94	0.07	-6.77	
		1	-9.76			
	2462	0	-10.15	0.07	-7.30	
		1	-10.63			
802.11g	2412	0	-6.38	0.46	-3.38	
		1	-6.41			
	2417	0	-6.71	0.46	-2.83	
		1	-5.12			
	2437	0	-6.68	0.46	-3.98	
		1	-7.33			
	2457	0	-7.61	0.46	-4.06	
		1	-6.59			
	2462	0	-12.01	0.46	-8.85	
		1	-11.72			

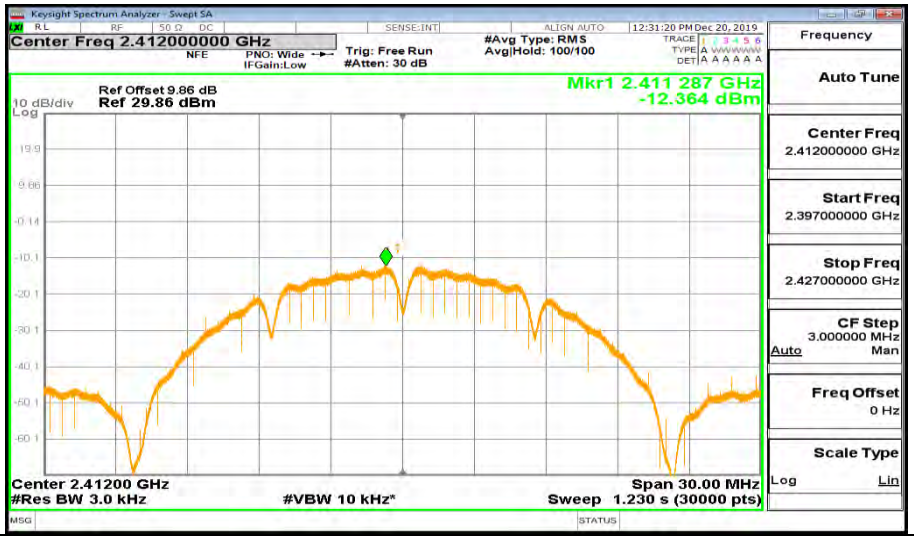
802.11n20	2412	0	-10.34	0.42	-6.78	8
		1	-9.30			
	2417	0	-6.71	0.42	-2.83	
		1	-5.12			
	2437	0	-6.72	0.42	-2.94	
		1	-5.30			
	2457	0	-7.61	0.42	-4.06	
		1	-6.59			
	2462	0	-11.39	0.42	-8.06	
		1	-10.78			
802.11n40	2422	0	-16.16	0.98	-12.97	
		1	-15.80			
	2427	0	-14.98	0.98	-12.25	
		1	-15.56			
	2437	0	-9.39	0.98	-6.18	
		1	-8.99			
	2447	0	-17.00	0.98	-13.68	
		1	-16.40			
	2452	0	-16.76	0.98	-13.83	
		1	-16.93			

Note: 1.PSD=Meas. Level+ Correction Factor
2. About correction Factor please refer to section 7.1

7.4.1. 802.11b MIMO MODE

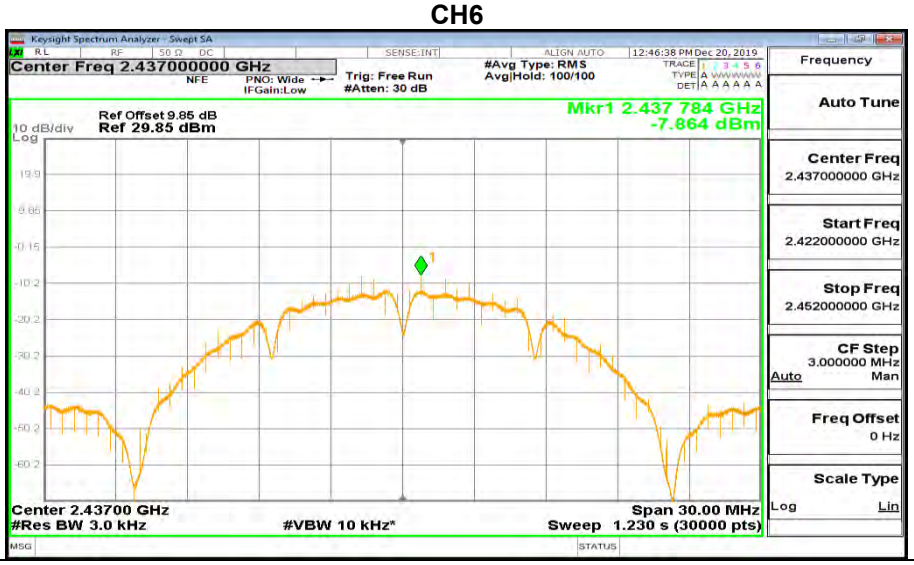
ANTENNA 0

CH1

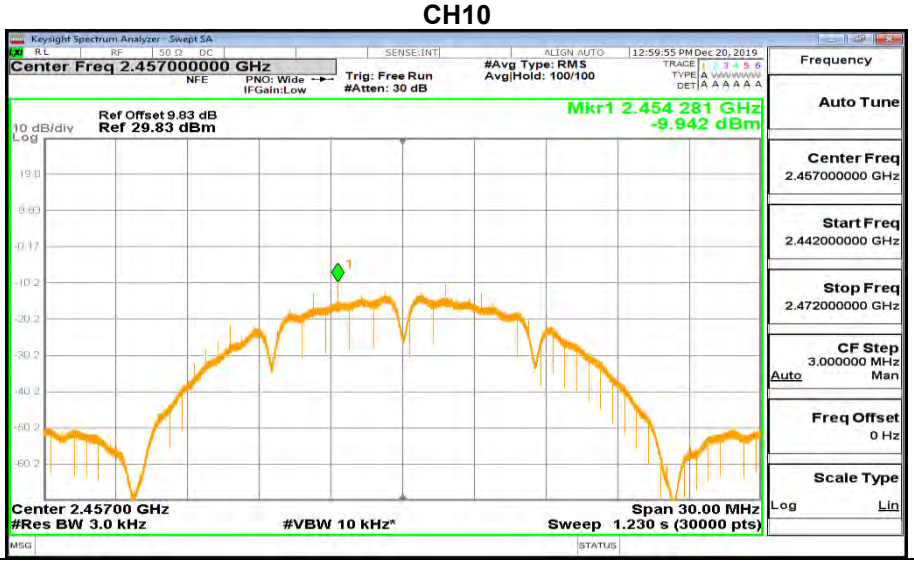


CH2

CH6



CH10

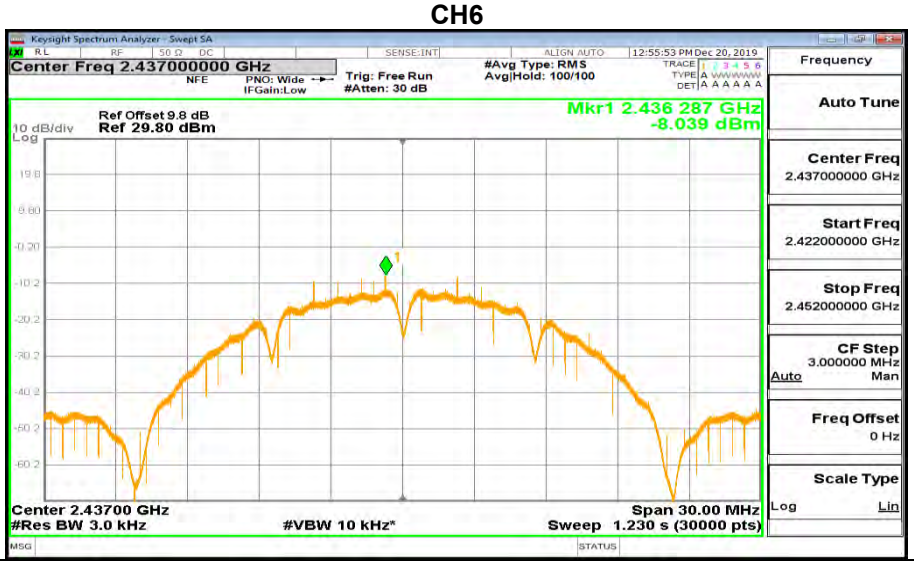


CH11

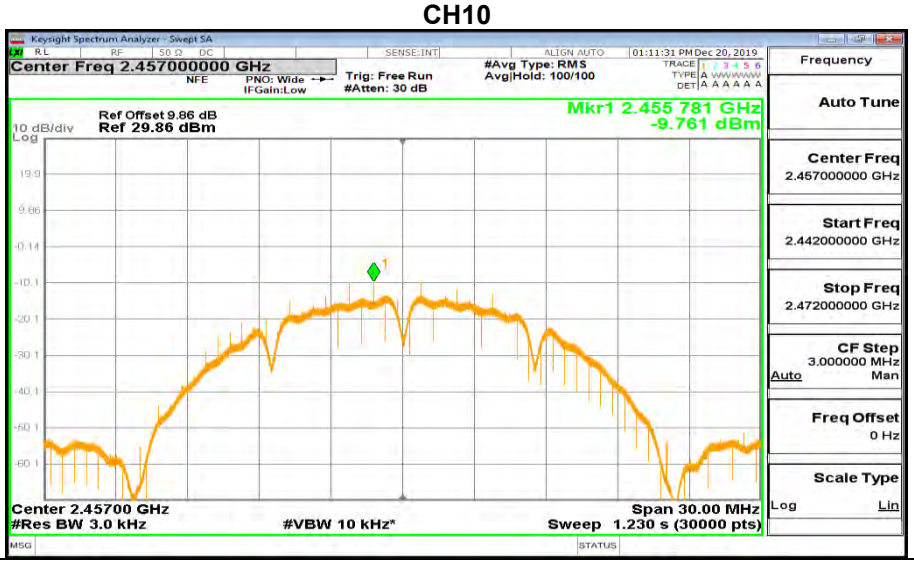
ANTENNA 1
CH1

CH2


CH6



CH10



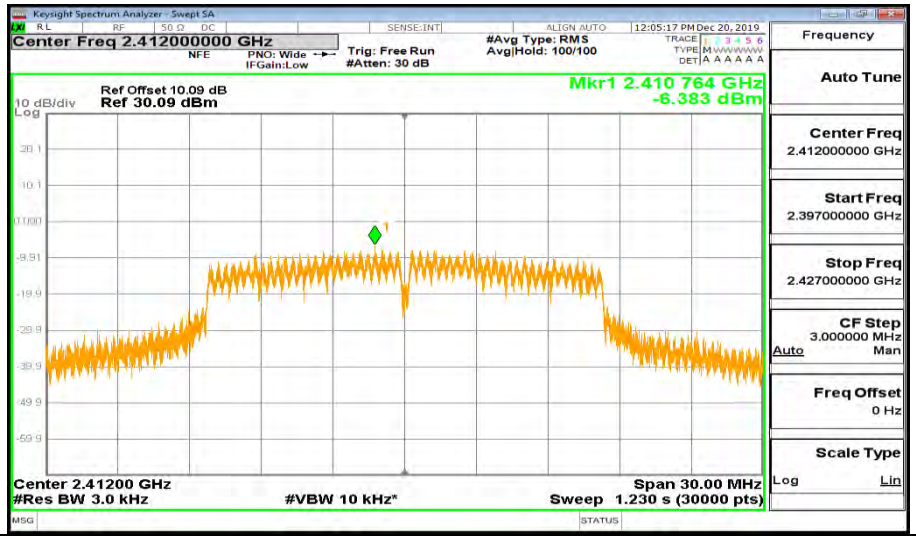
CH11

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report

7.4.1. 802.11g MIMO MODE

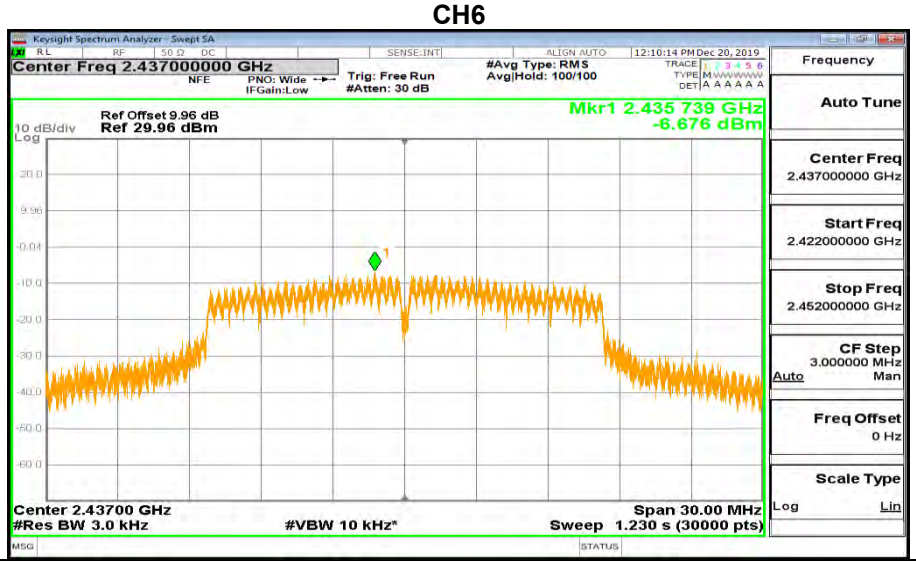
ANTENNA 0

CH1

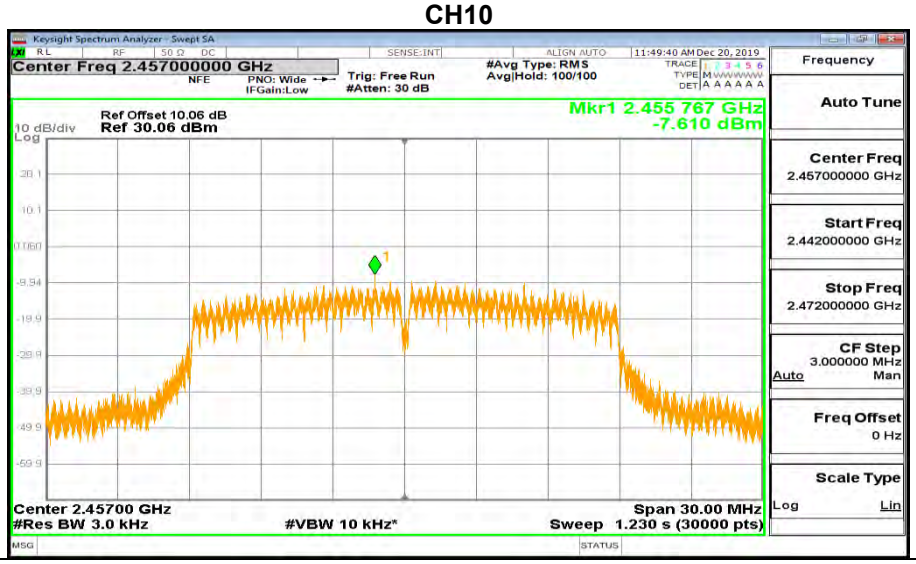


CH2

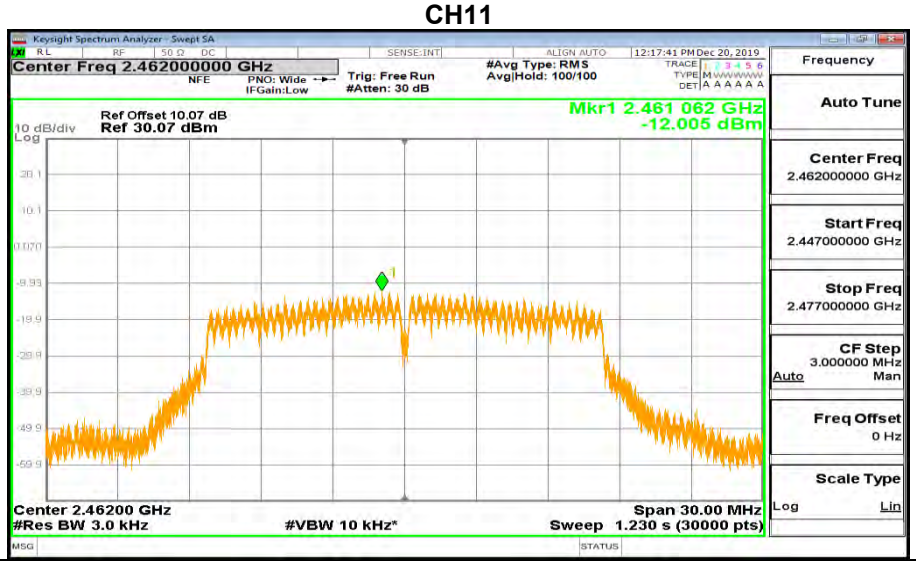
CH6

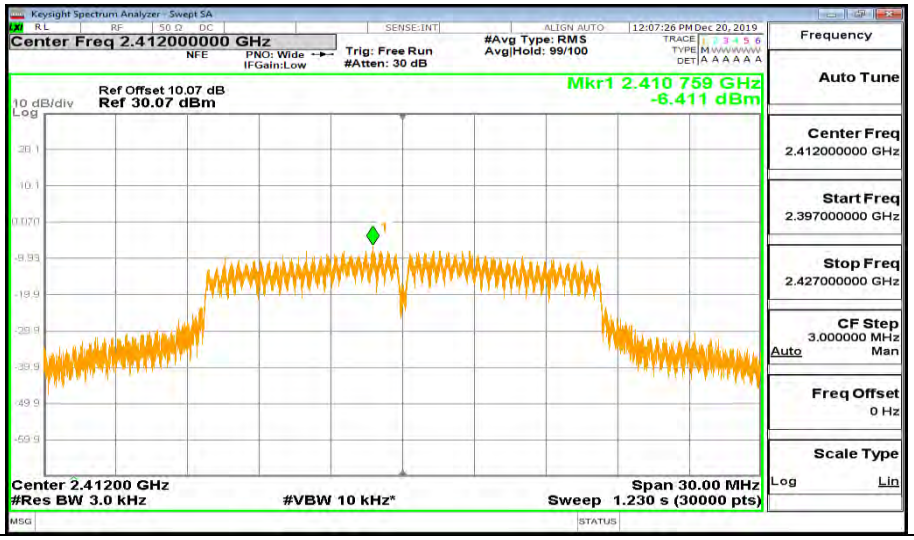


CH10

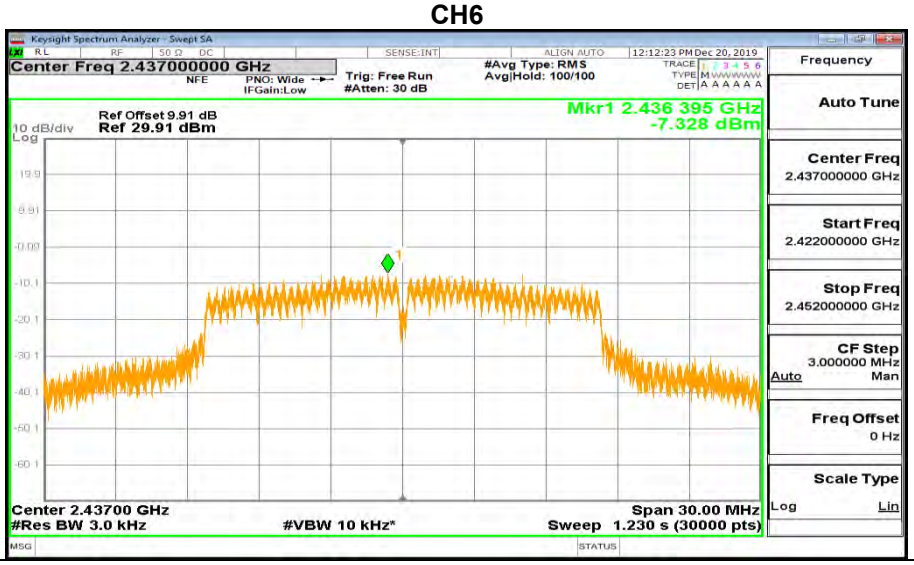


CH11

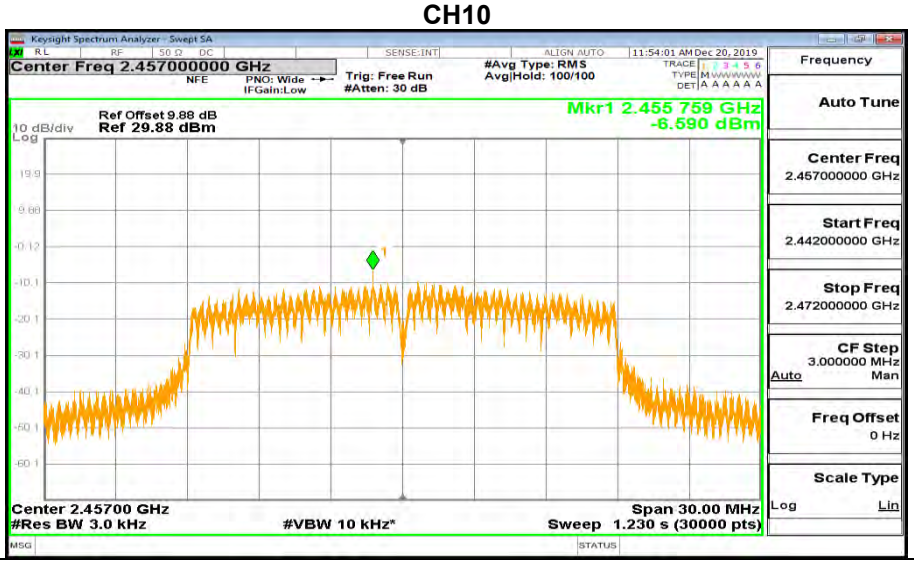


ANTENNA 1
CH1

CH2


CH6



CH10



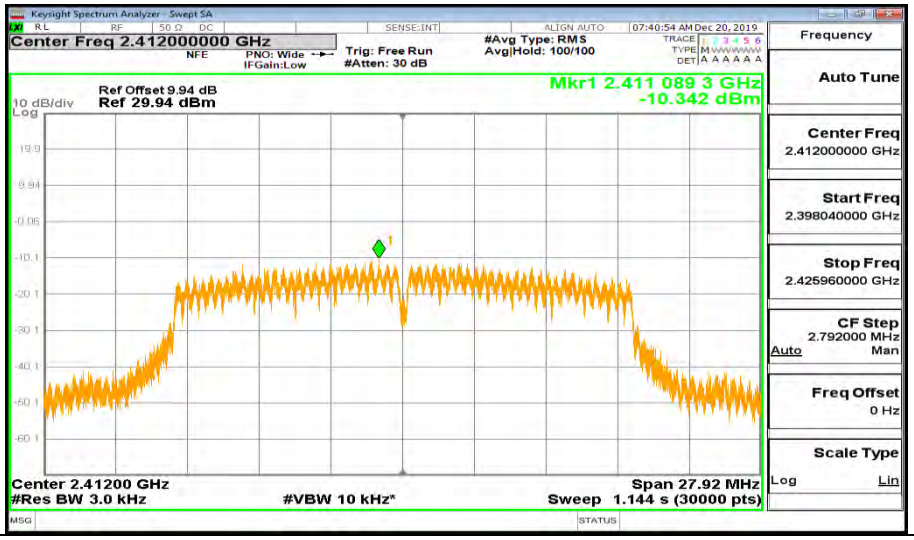
CH11

Note: All the modes and antenna ports had been tested, only the worst data recorded in the report

7.4.1. 802.11nHT20 MIMO MODE

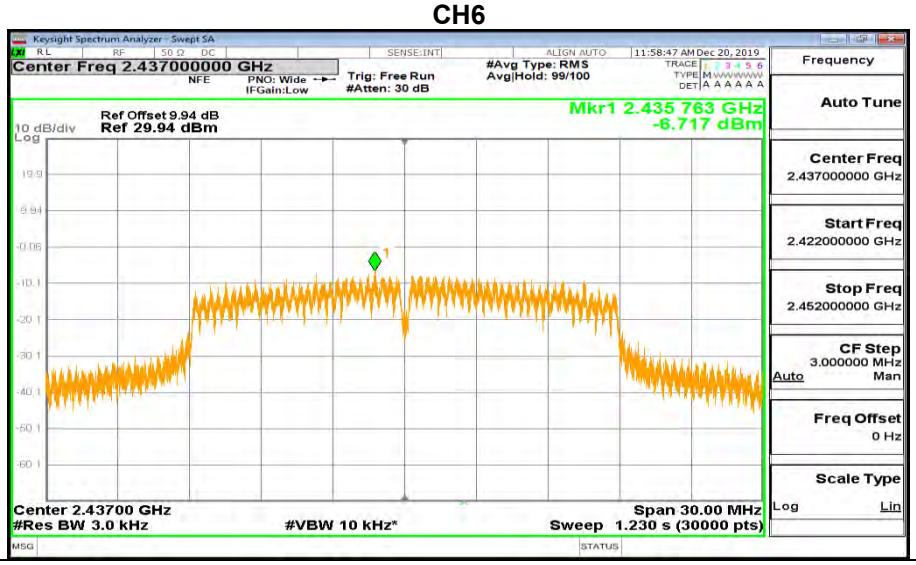
ANTENNA 0

CH1

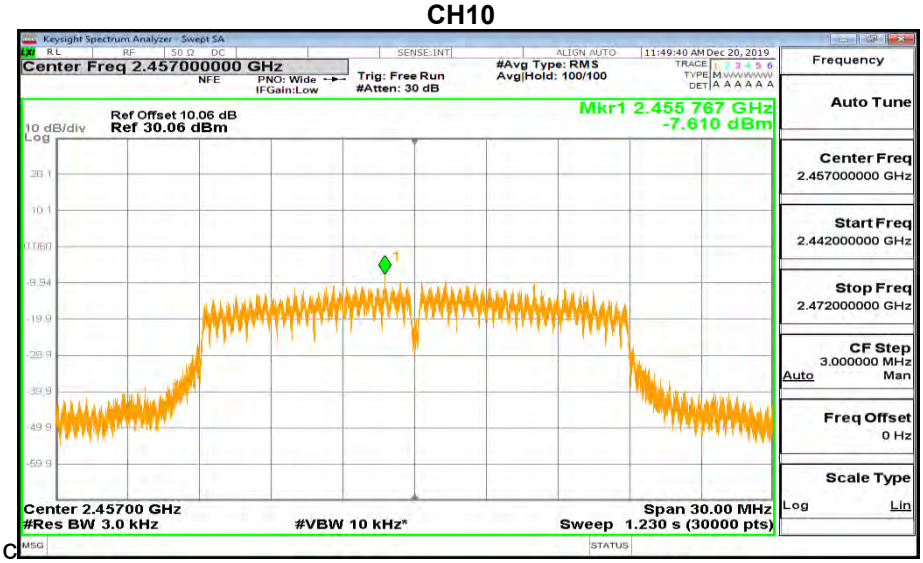


CH2

CH6

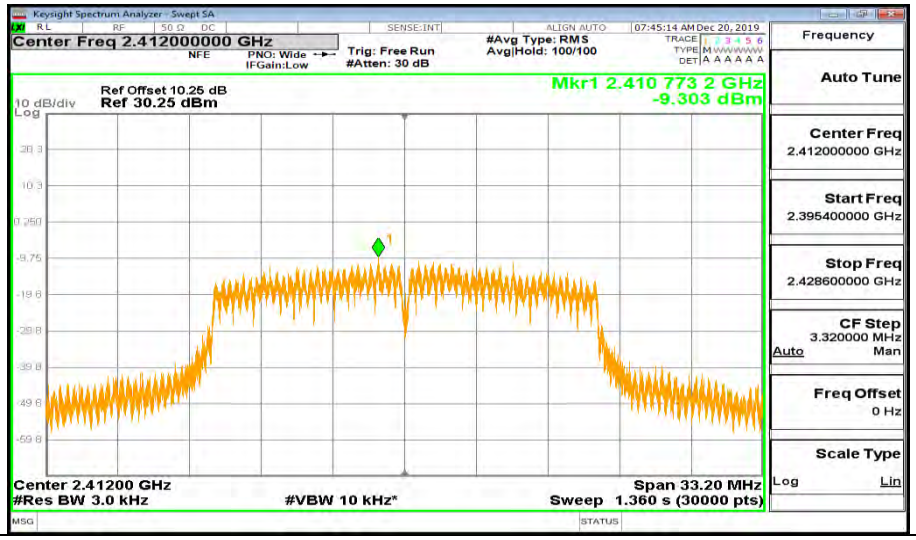


CH10

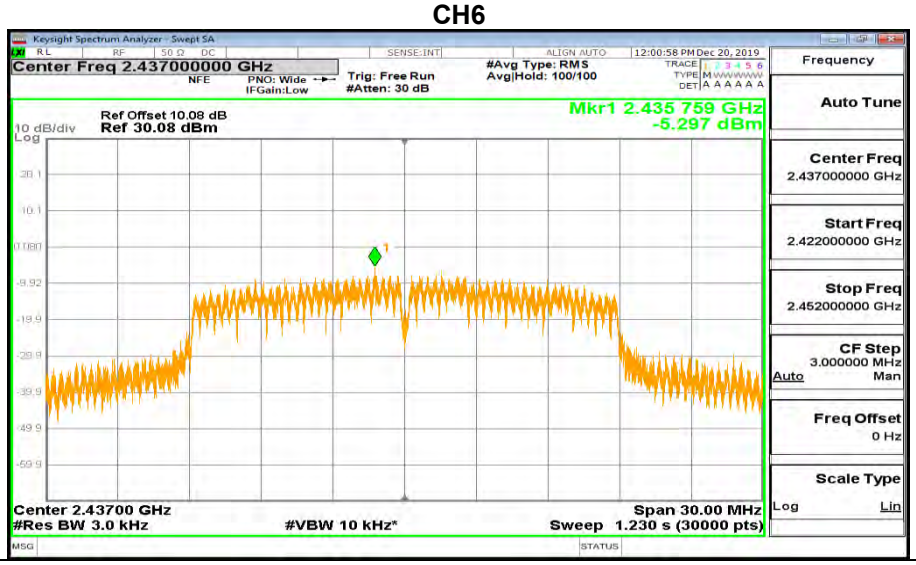


C

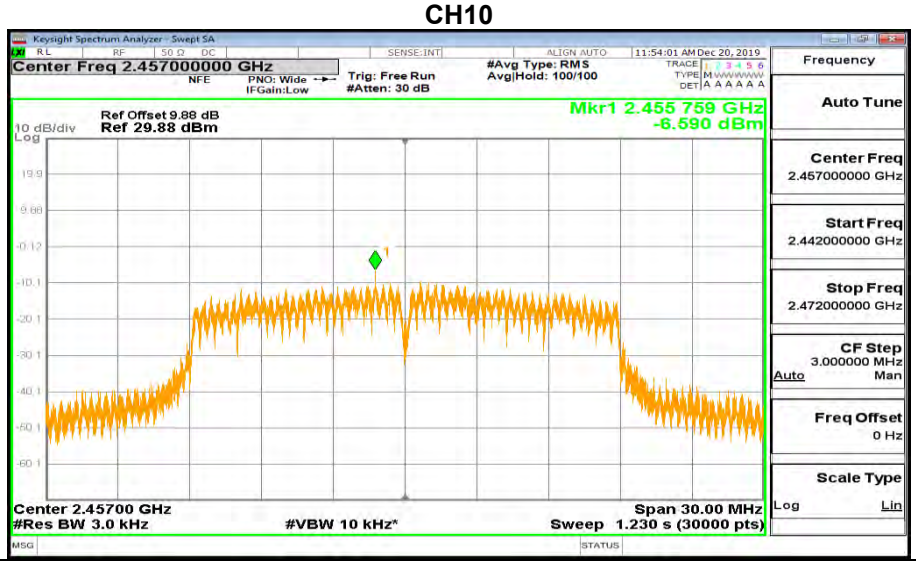
CH11

ANTENNA 1
CH1

CH2


CH6



CH10

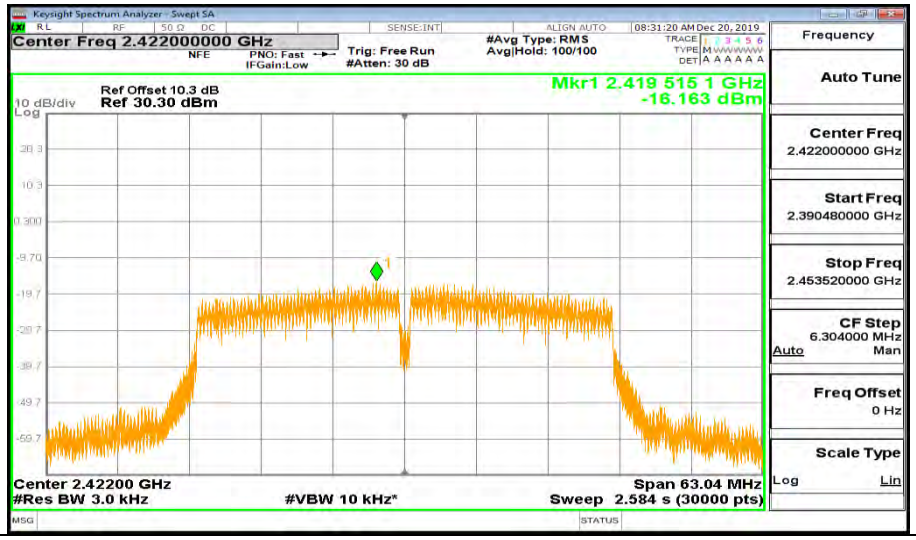


CH11

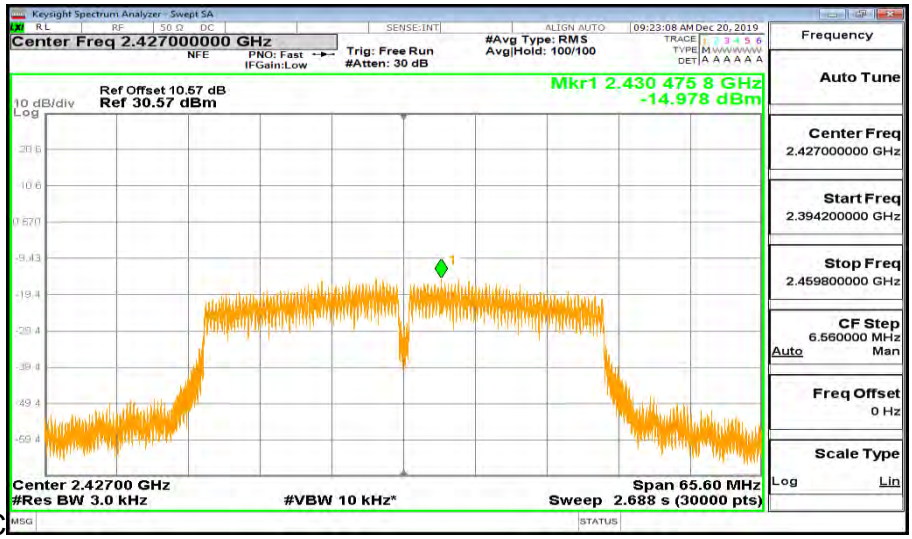
7.4.1. 802.11nHT40 MIMO MODE

ANTENNA 0

CH3

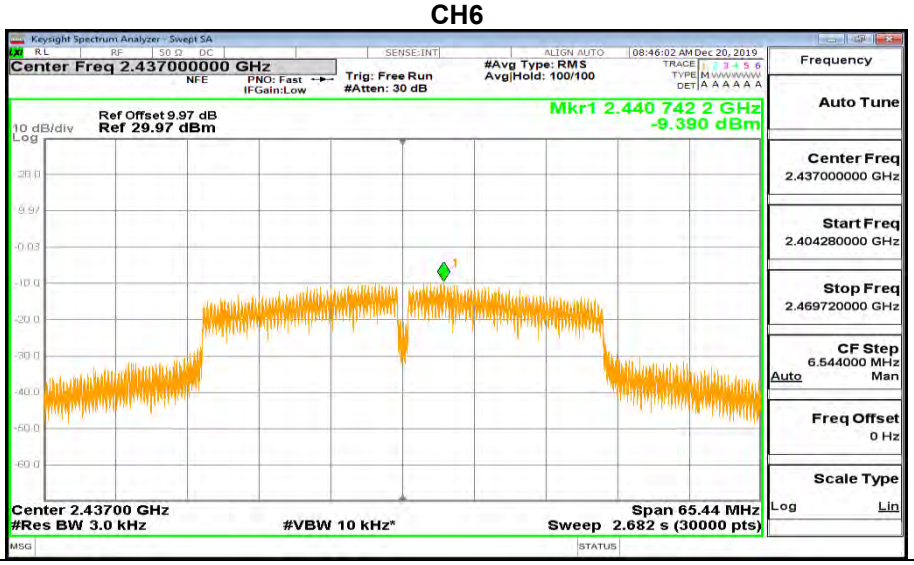


CH4

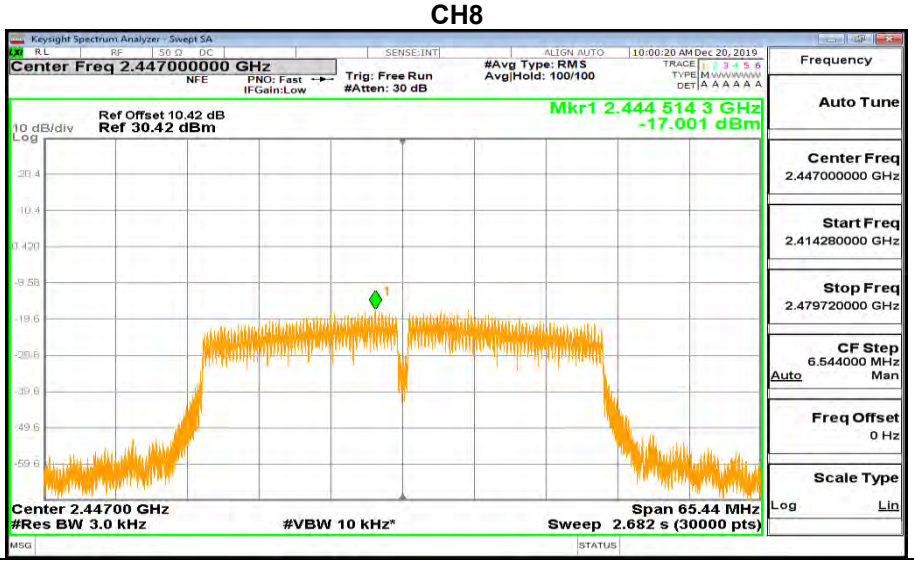


C

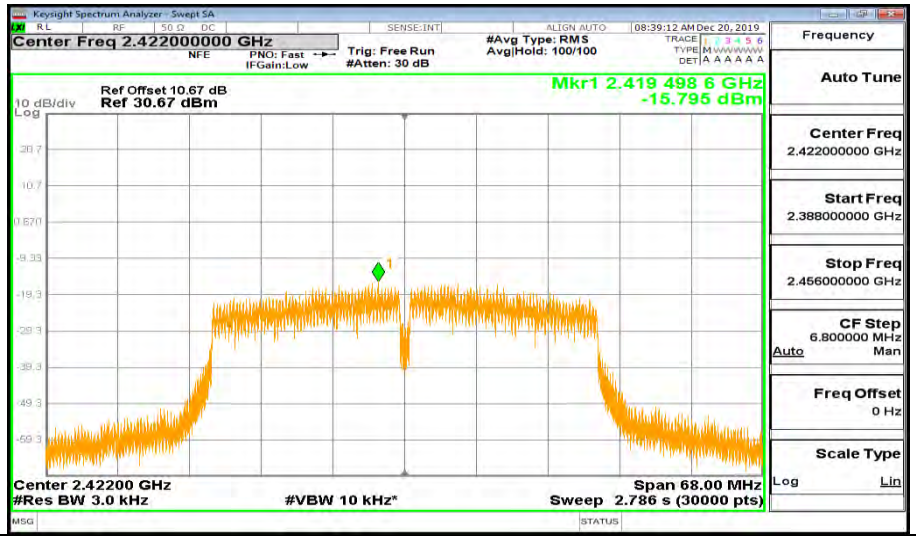
CH6



CH8



CH9

ANTENNA 1
CH3

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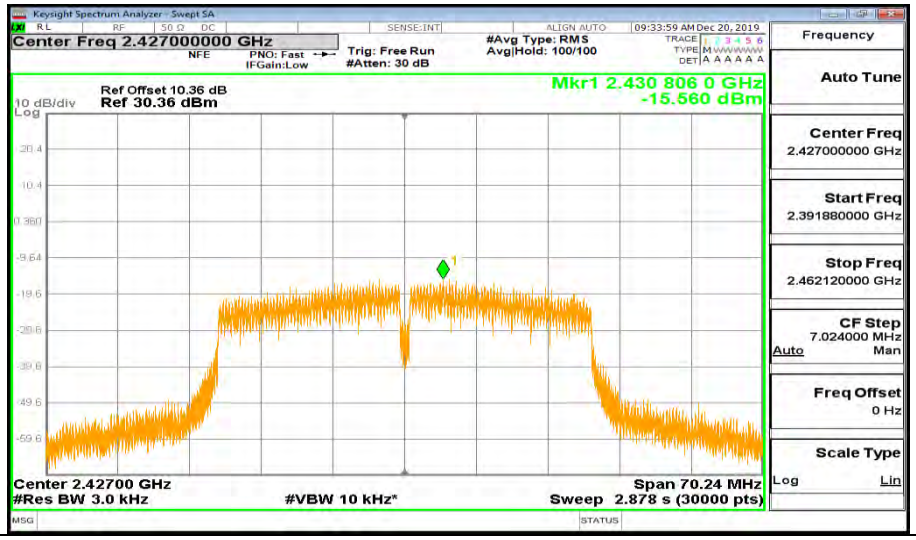
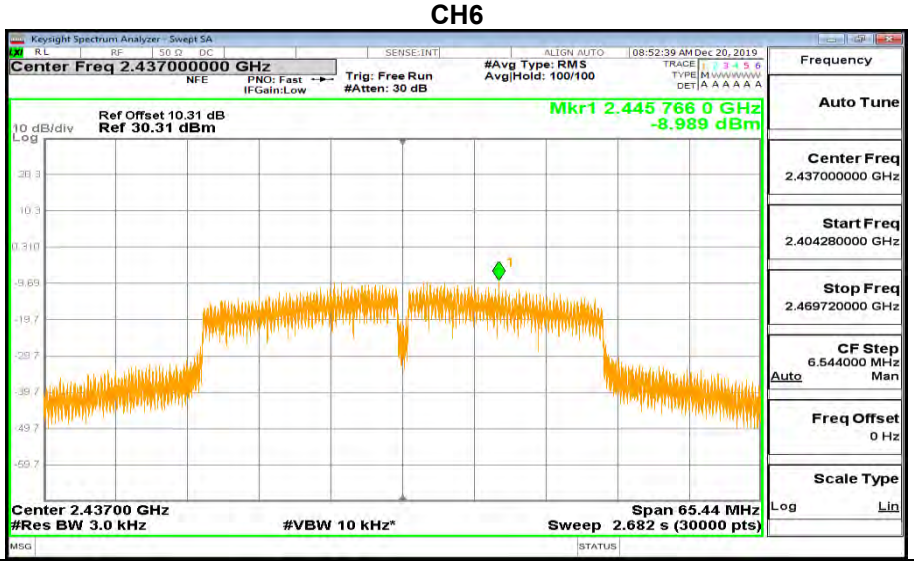


CH6



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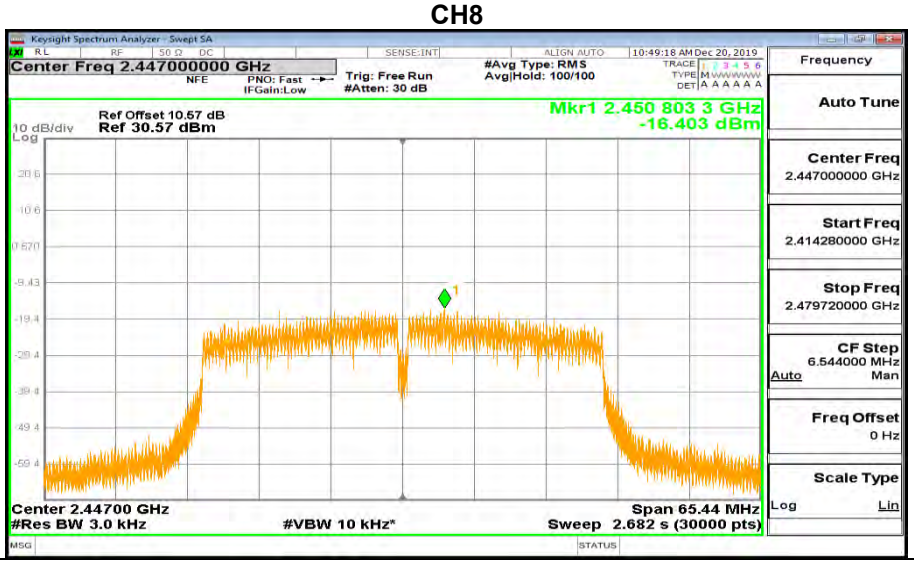

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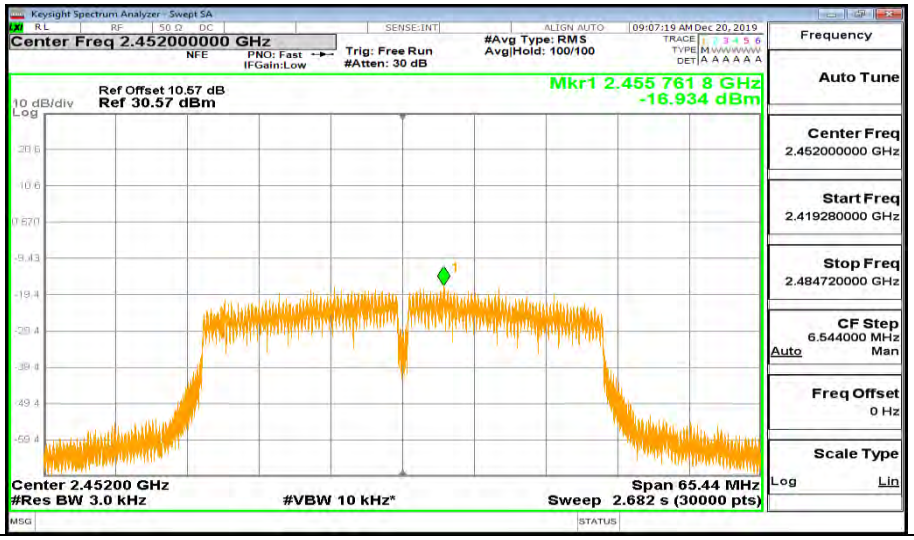


Note: All the modes and antenna ports had been tested, only the worst data recorded in the report

7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d) ISED RSS-247 5.5	Conducted Bandedge and Spurious Emissions	at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

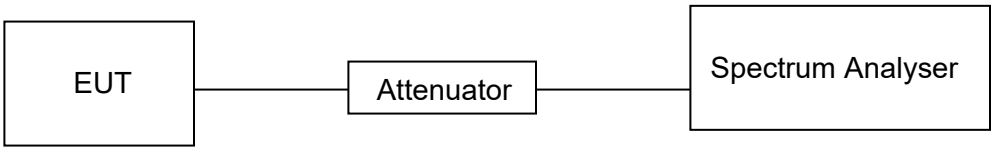
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

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	100kHz
VBW	≥3 × RBW
measurement points	≥span/RBW
Trace	Max hold
Sweep time	Auto couple.

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

TEST SETUP



TEST ENVIRONMENT

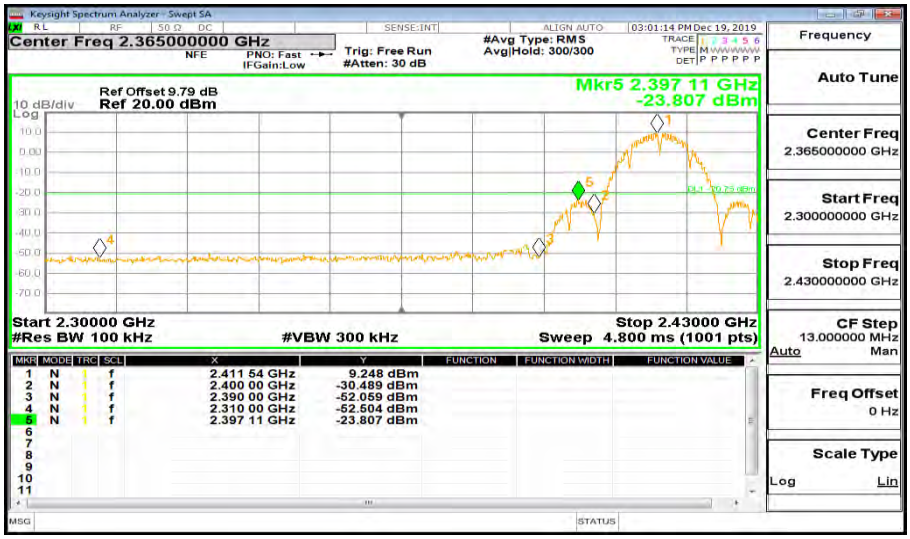
Temperature	23.4°C	Relative Humidity	50%
Atmosphere Pressure	101kPa	Test Voltage	AC120V,60Hz

RESULTS

7.5.1. 802.11b MIMO MODE

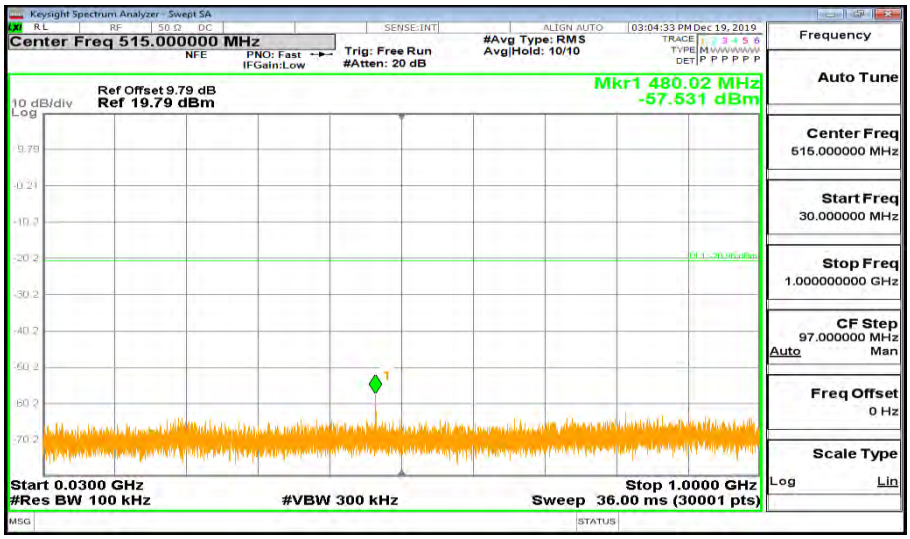
ANTENNA 0

CH1 BANDEDGE

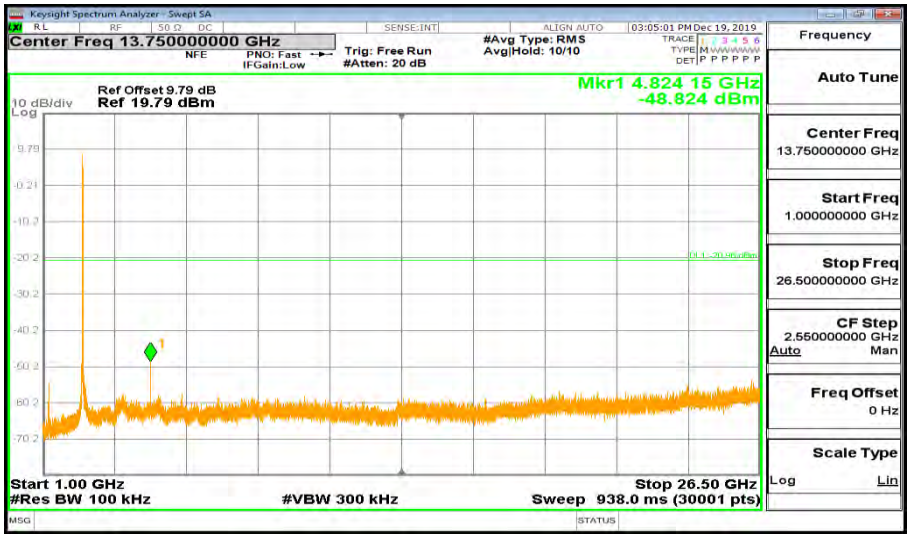


CH1 REFERENCE

CH1 SPURIOUS EMISSIONS 30M-10G



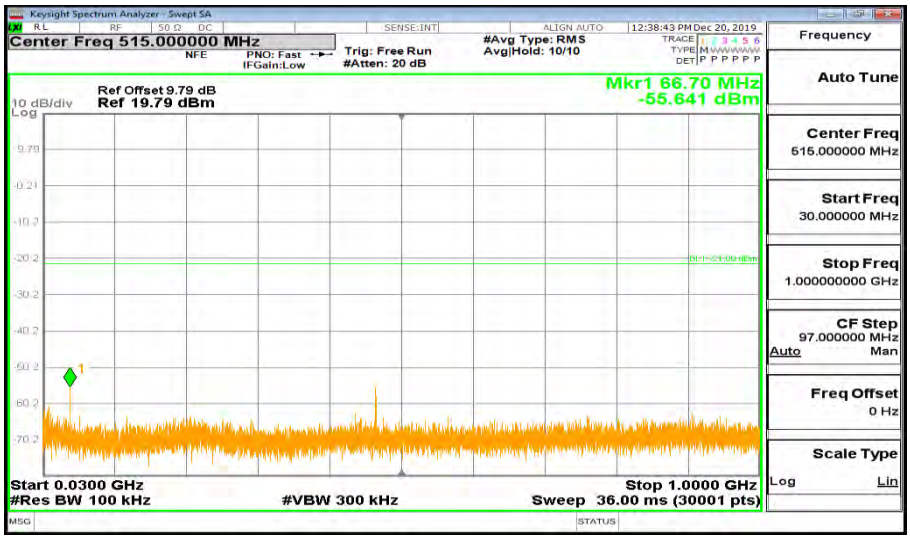
CH1 SPURIOUS EMISSIONS 10G-26G



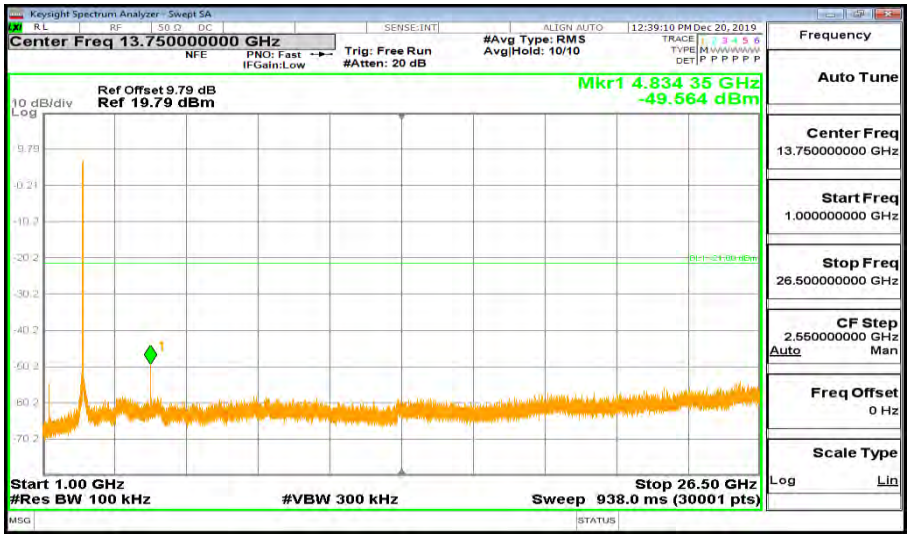
CH2 BANDEDGE

CH2 REFERENCE

CH2 SPURIOUS EMISSIONS 30M-10G

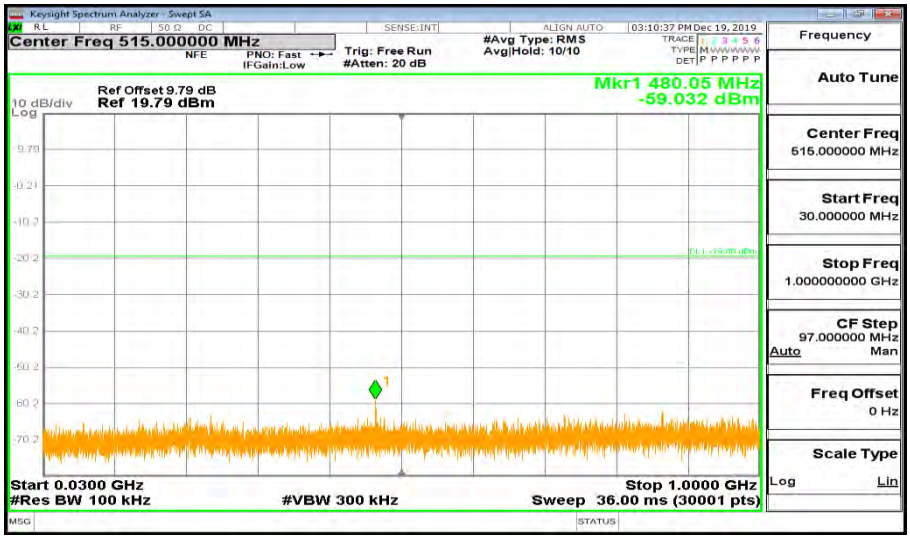


CH2 SPURIOUS EMISSIONS 10G-26G

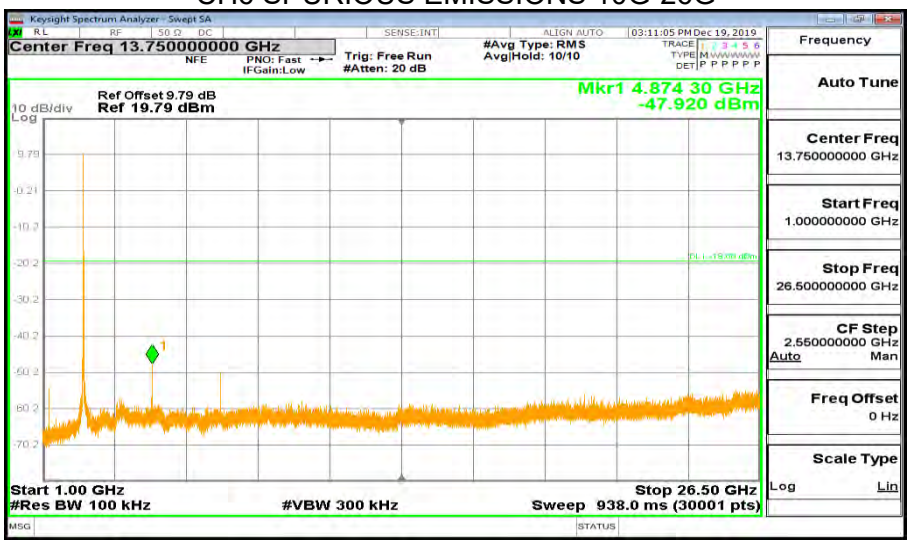


CH6 REFERENCE

CH6 SPURIOUS EMISSIONS 30M-10G



CH6 SPURIOUS EMISSIONS 10G-26G



CH10 BANDEDGE

CH10 REFERENCE