FCC 47 CFR PART 15 SUBPART E

ISED RSS-247 ISSUE 2

CERTIFICATION TEST REPORT

For

Videoconferencing Endpoint

MODEL: HUAWEI Bar 500

FCC ID: QIS-BAR500

IC: 6369A-BAR500

REPORT NUMBER: 4788832561.1-4

ISSUE DATE: January 16, 2019

Prepared for

HUAWEI TECHNOLOGIES CO., LTD.
Administration Building, Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, P.R. China, 518129

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
	01/16/2018	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6/26db Bandwidth	FCC 15.407 (a)&(e) RSS-247 Clause 6.2	PASS
2	99% Bandwidth	RSS-Gen Clause 6.6	PASS
3	Maximum Conducted Output Power	FCC 15.407 (a) RSS-247 Clause 6.2	PASS
4	Power Spectral Density	FCC 15.407 (a) RSS-247 Clause 6.2	PASS
5	Antenna Conducted Spurious Emission	FCC 15.407 (b) RSS-247 Clause 6.2	PASS
6	Radiated Bandedge and Spurious Emission	FCC 15.407 (a) FCC 15.209 FCC 15.205 RSS-247 Clause 6.2 RSS-GEN Clause 8.9	PASS
7	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	PASS
8	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	PASS

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	HUAWEI TECHNOLOGIES CO., LTD.
Address:	Administration Building, Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, P.R. China, 518129

Manufacturer Information

Company Name:	HUAWEI TECHNOLOGIES CO., LTD.
Address:	Administration Building, Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, P.R. China, 518129

EUT Name:	Videoconferencing Endpoint
Model:	HUAWEI Bar 500
Sample Status:	Normal
Brand:	HUAWEI
Sample Received:	Dec.24, 2018
Date of Tested:	Dec.26, 2018 ~ Jan.14, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART E	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 789033 D02, KDB 662911 D01 v02r01, RSS-GEN Issue 4, RSS-247 Issue 2 and KDB414788 D01 Radiated Test Site v01.

3. FACILITIES AND ACCREDITATIO

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

Note 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.

Note 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 recognize 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)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 40GHz)(include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	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

EUT Name	Videoconferencing Endpoint
Model Name	HUAWEI Bar 500
Band Name	HUAWEI
Radio Technology	IEEE802.11a/n HT20/n HT40/802.11ac HT20/802.11ac HT40/ 802.11ac HT80
Power Rate (AC/DC POWER ADAPTER)	Input:100-240Vac,50/60 Hz,2.5A Output:19Vdc; 7.89A (Input: 100-176V) Output:19Vdc; 9.5A (Input: 176-240V)

5.2. CHANNEL LIST

20 MHz Bandwidth Channel frequencies		
Band	Channel	Frequency (MHz)
UNII-1	36	5180
	40	5200
	44	5220
	48	5240

40 MHz Bandwidth Channel frequencies		
Band	Channel	Frequency (MHz)
UNII-1	38	5190
	46	5230

80 MHz Bandwidth Channel frequencies		
Band	Channel	Frequency (MHz)
UNII-1	42	5210

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna manufacturer: NIPPO

Chain Ant.	Frequency (MHz)	Max Antenna Gain (dBi)	Antenna Type
0	5150-5250	5.80	Dipole Antenna
1	5150-5250	4.75	Dipole Antenna

Antenna manufacturer: Amphenol

Chain1 Ant.	Frequency (MHz)	Max Antenna Gain (dBi)	Antenna Type
0	5150-5250	5.5	Dipole Antenna
1	5150-5250	4.7	Dipole Antenna

Test Mode	Transmit and Receive Mode	Description
802.11a	1TX, 1RX	Chain 0 or Chain 1can be used as transmitting/receiving antenna.
802.11n HT20	2TX, 2RX	Chain 0 and Chain 1 can be can be used as transmitting/receiving antenna.
802.11n HT40	2TX, 2RX	Chain 0 and Chain 1 can be can be used as transmitting/receiving antenna.
802.11ac HT20	2TX, 2RX	Chain 0 and Chain 1 can be can be used as transmitting/receiving antenna.
802.11ac HT40	2TX, 2RX	Chain 0 and Chain 1 can be can be used as transmitting/receiving antenna.
802.11ac HT80	2TX, 2RX	Chain 0 and Chain 1 can be can be used as transmitting/receiving antenna.

Directional gain				
Mode	Frequency (MHz)	Max Antenna Gain (dBi)	For power measurements Directional gain Gain (dBi)	For power spectral density (PSD) measurements Directional gain Gain (dBi)
SISO	5150-5250	5.8	5.8	5.8
CDD 2TX	5150-5250	5.8	5.8	8.8
Note：Directional gain = GANT + Array Gain For power spectral density (PSD) measurements on all devices, Array Gain = 10 log(N_{ANT}/NSS) dB. For power measurements on IEEE 802.11 devices, [1,2] Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4; Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT; Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less, for 20-MHz channel widths with NANT ≥ 5.				

Note:
Note: The antenna of the EUT is provided by two manufacturers. The antenna types of the two manufacturers are the same, NIPPO antenna gain is greater, So the NIPPO antenna is selected for the test.

5.4. WORST-CASE CONFIGURATIONS

The Worse Case Power Setting Parameter under 5150 ~ 5250MHz Band							
Test Software		adb					
Modulation Mode	Transmit Chain	Test Channel					
		BW: 20MHz					
		CH 36	CH 40	CH 48	\	\	\
802.11a	0&1	14	13.5	13.5	\	\	\
802.11n HT20	0&1	8	8	8	\	\	\
802.11ac HT20	0&1	8	8	8	\	\	\

The Worse Case Power Setting Parameter under 5150 ~ 5250MHz Band							
Test Software		adb					
Modulation Mode	Transmit Chain	Test Channel					
		BW: 40MHz					
		CH 38	CH 46	\	\	\	\
802.11n HT40	0&1	7	10	\	\	\	\
802.11ac HT40	0&1	8	10	\	\	\	\

The Worse Case Power Setting Parameter under 5150 ~ 5250MHz Band							
Test Software		adb					
Modulation Mode	Transmit Chain	Test Channel					
		BW: 80MHz					
		CH 42	\	\	\	\	\
802.11ac HT80	0&1	8.5	\	\	\	\	\

Remarks: EUT support for SISO and CDD MIMO Transmission, only 802.11a not supports CDD MIMO Mode, SISO mode sets the same power level as MIMO mode, so MIMO mode is the worst case.

5.5. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	35 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	15 ~ 35°C
Voltage :	VL	N/A
	VN	AC 120V/60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.6. WORST-CASE CONFIGURATIONS

IEE Std. 802.11	Modulation Technology	Modulation Type	Data Rate (Mbps)	Worst Case (Mbps)
a	OFDM	BPSK,QPSK,16QAM, 64QAM	54/48/36/24/18/12/9/6	6

IEE Std. 802.11	Modulation Technology	Modulation Type	Data Rate (Mbps)	Worst Case (Mbps)
n HT20	OFDM	BPSK, QPSK, 16QAM, 64QAM	(MCS0~MCS15)	MCS0
n HT40	OFDM	BPSK, QPSK, 16QAM, 64QAM	(MCS0~MCS15)	MCS0

IEE Std. 802.11	Modulation Technology	Modulation Type	Data Rate (Mbps)	Worst Case (Mbps)
ac HT20	OFDM	BPSK, QPSK, 16QAM, 64QAM	(MCS0~MCS9)	MCS0
ac HT40	OFDM	BPSK, QPSK, 16QAM, 64QAM	(MCS0~MCS9)	MCS0
ac HT80	OFDM	BPSK, QPSK, 16QAM, 64QAM	(MCS0~MCS9)	MCS0

Remarks: EUT support for SISO and CDD MIMO Transmission, only 802.11a not supports CDD MIMO Mode, SISO mode sets the same power level as MIMO mode, so MIMO mode is the worst case.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	ThinkPad	T460S	SL10K24796 JS
2	High Pass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	4
3	Band Reject Filter	Wainwright	WRCJV20-5120-5150-5350-5380-60SS	2

I/O CABLES

Cable No	Port	Connector Type	Shield	Cable Length(m)	Remarks
1	RJ45	RJ45	Yes	5	/

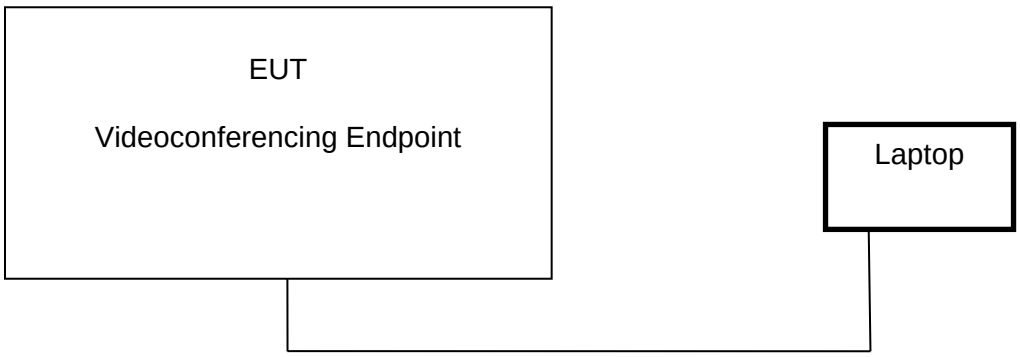
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	POWER ADPTER	HUAWEI	HW-190950T0D	Input:100-240Vac,50/60 Hz,2.5A Output: 19Vdc; 7.89A (Input: 100-176V) Output:19Vdc; 9.5A (Input: 176-240V)

TEST SETUP

The EUT can work in engineering mode with the inside software.

SETUP DIAGRAM FOR TESTS



6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.10,2018	Dec.09,2019
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.10,2018	Dec.09,2019
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Conducted disturbance		UL	Antenna port	Ver. 7.2	
Radiated Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.10,2018	Dec.09,2019
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Sep.17, 2018	Sep.16, 2021
☑	Preamplifier	HP	8447D	2944A09099	Dec.10,2018	Dec.09,2019
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec.10,2018	Dec.09,2019
☑	Horn Antenna	TDK	HRN-0118	130939	Sep.17, 2018	Sep.16, 2021
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Sep.17, 2018	Sep.16, 2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.10,2018	Dec.09,2019
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.10,2018	Dec.09,2019
☑	Preamplifier	TDK	PA-02-3	TRS-308-00002	Dec.10,2018	Dec.09,2019
☑	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 26, 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.09,2019
☑	Power Sensor	Keysight	U2021XA	MY57030004	Dec.10,2018	Dec.09,2019

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

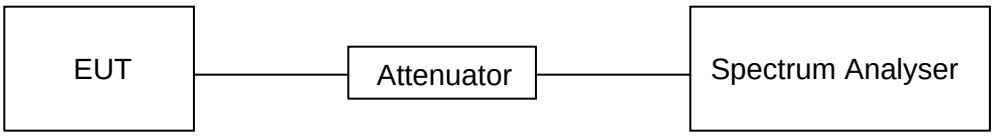
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

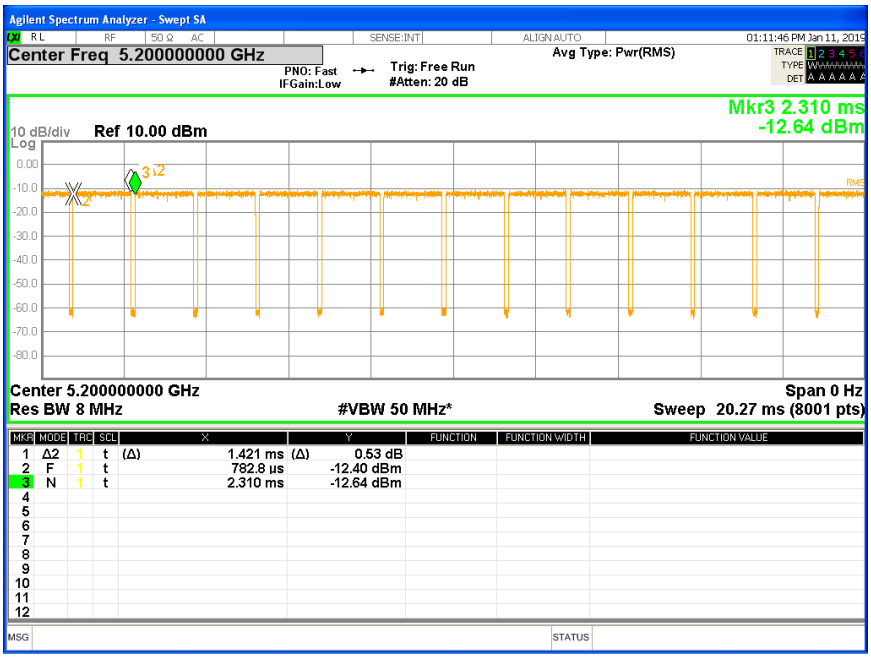
Temperature	23.4°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS

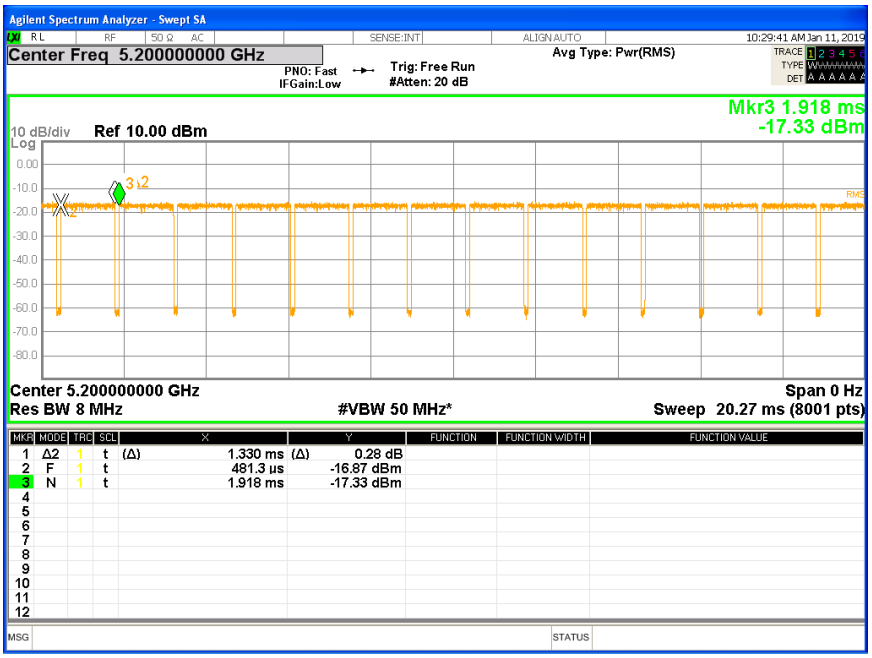
Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (KHz)	Final setting For VBW (KHz)
11a	1.421	1.527	0.9306	93.06	0.31	0.70	1
11n HT20	1.330	1.437	0.9255	92.55	0.34	0.75	1
11n HT40	0.659	0.762	0.8648	86.48	0.63	1.52	2
11ac HT20	0.692	0.795	0.8704	87.04	0.60	1.45	2
11ac HT40	0.355	0.461	0.7700	77.00	1.13	2.82	3
11ac HT80	0.188	0.292	0.6438	64.38	1.91	5.32	6

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.
Chain 0 and Chain 1 has the same duty cycle, only Chain 0 data show here.

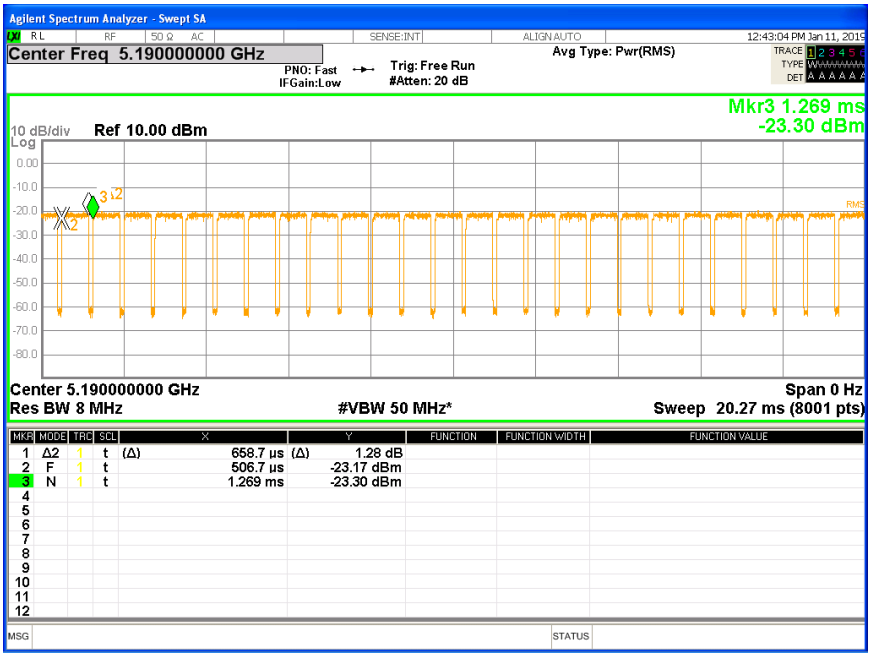
DUTY CYCLE 802.11a MODE



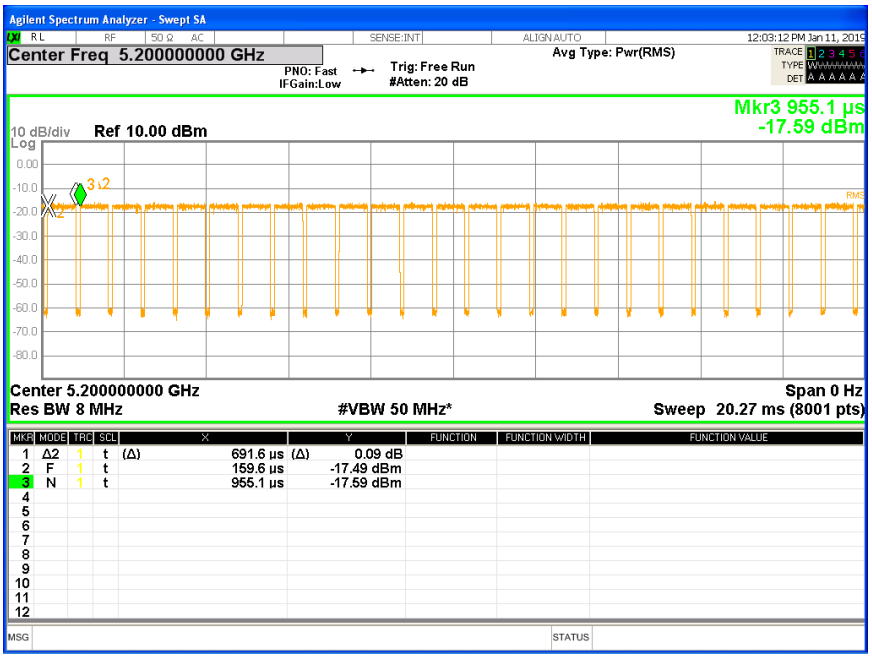
DUTY CYCLE 802.11n HT20 MODE



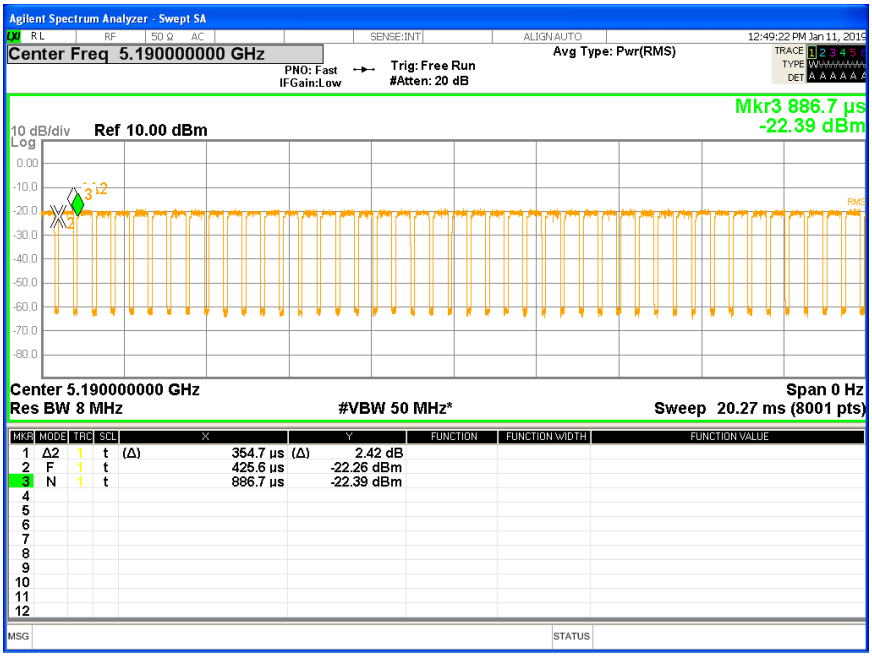
DUTY CYCLE 802.11n HT40 MODE



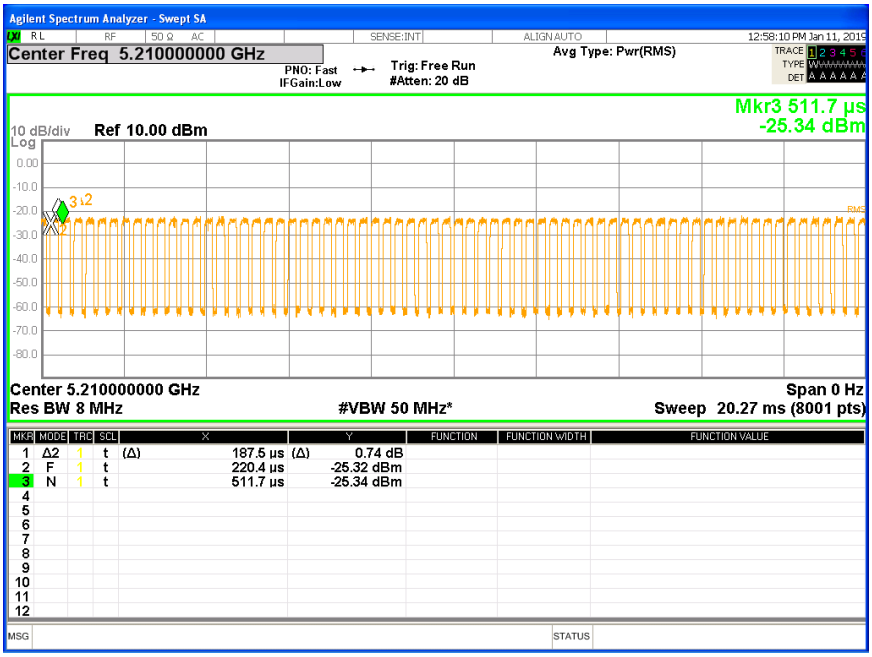
DUTY CYCLE 802.11ac HT20 MODE



DUTY CYCLE 802.11ac HT40 MODE



DUTY CYCLE 802.11ac HT80 MODE



7.1. 26 dB BANDWIDTH &99% OCCUPIED BANDWIDTH

LIMITS

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Bandwidth	26 dB Bandwidth	5150-5250
	26 dB Bandwidth	5250-5350
	26 dB Bandwidth	For FCC:5470-5725 For IC:5470-5600 5650-5725
	Minimum 500kHz 6dB Bandwidth	5725-5850

TEST PROCEDUREC

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

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth: RBW=100kHz For 26dB Bandwidth: approximately 1% of the emission bandwidth. For 99 % Occupied Bandwidth: approximately 1%~5% of the emission bandwidth.
VBW	For 6dB Bandwidth : VBW=300kHz For 26dB Bandwidth : >3RBW For 99% Occupied Bandwidth : >3RBW
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 6/26/& 99% Occupied Bandwidth dB relative to the maximum level measured in the fundamental emission.

TEST SETUP

TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

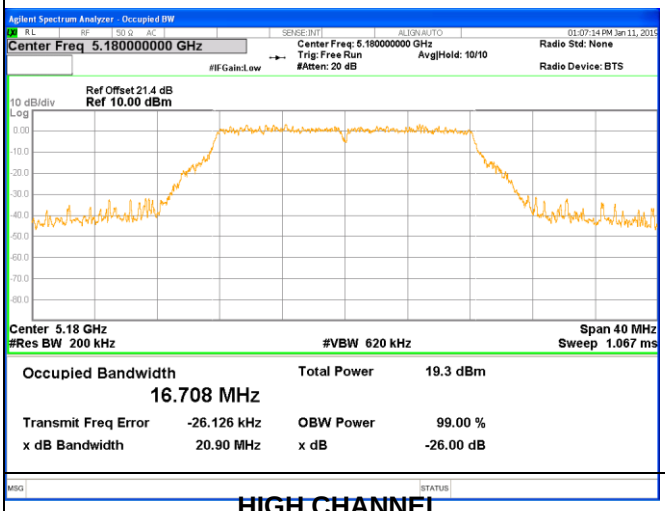
RESULTS

7.1.1. 802.11a MODE

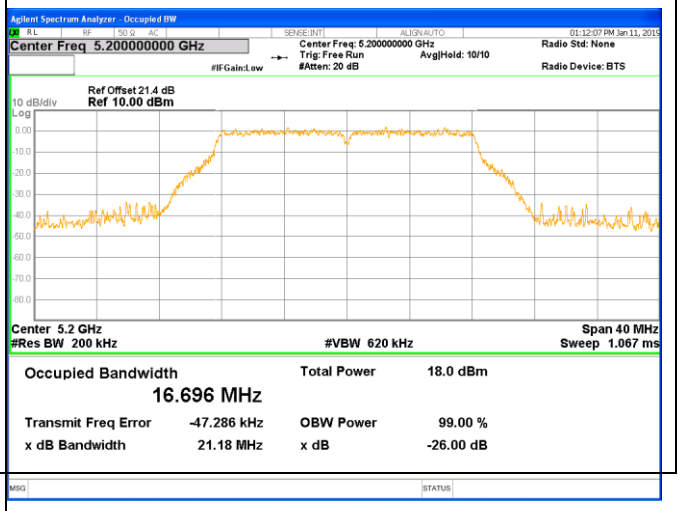
Chain 0

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	20.90	16.708
Mid	5200	21.18	16.696
High	5240	21.14	16.713

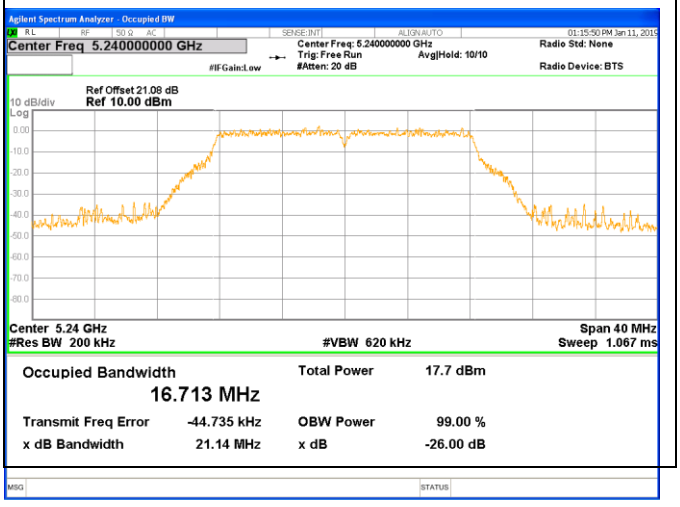
LOW CHANNEL



MID CHANNEL



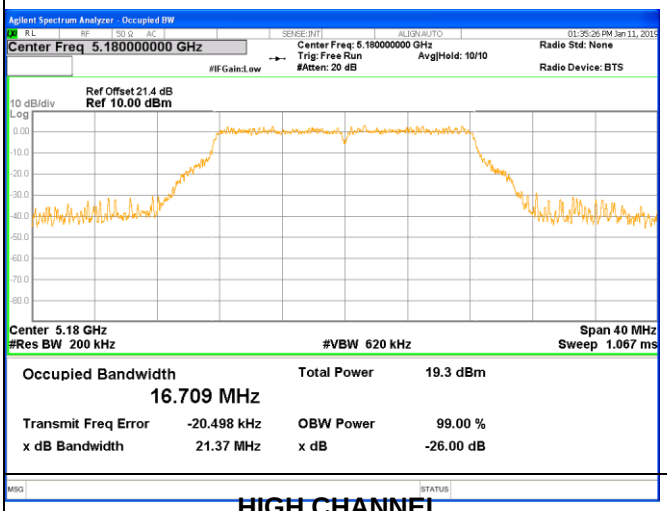
HIGH CHANNEL



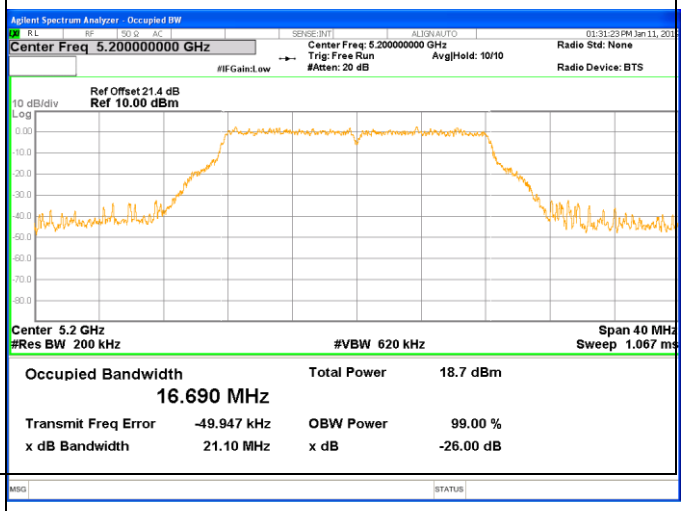
Chain 1

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.37	16.709
Mid	5200	21.10	16.690
High	5240	21.23	16.676

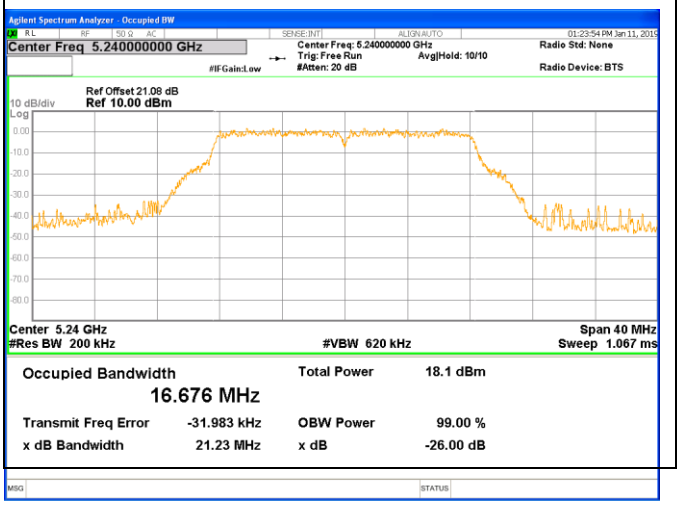
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

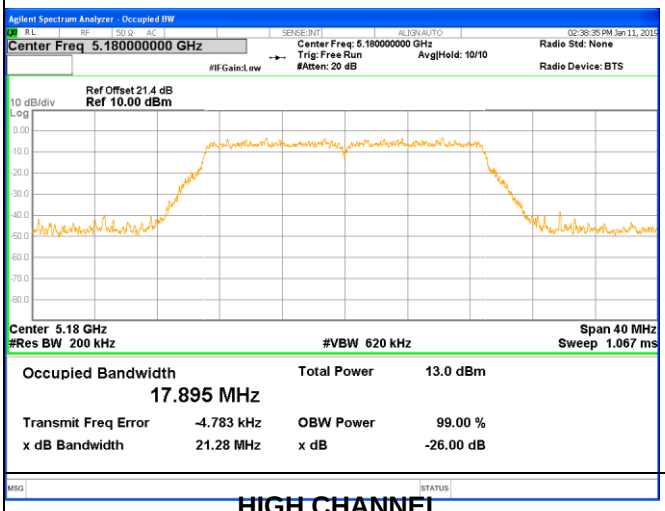


7.1.2. 802.11n HT20 MODE

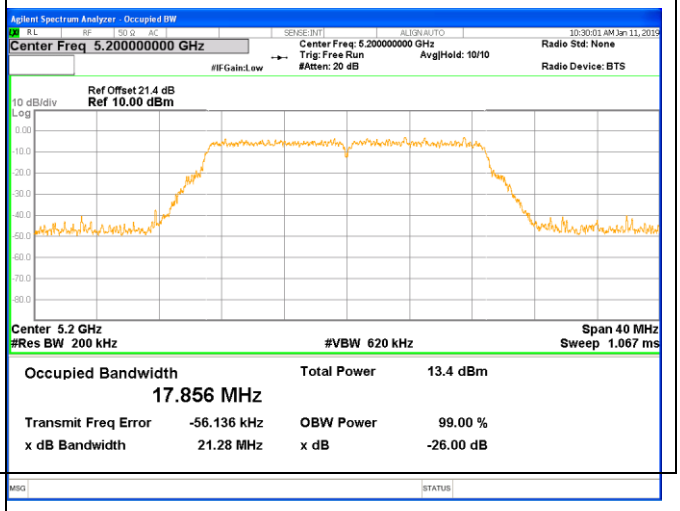
Chain 0

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.28	17.895
Mid	5200	21.28	17.856
High	5240	21.42	17.838

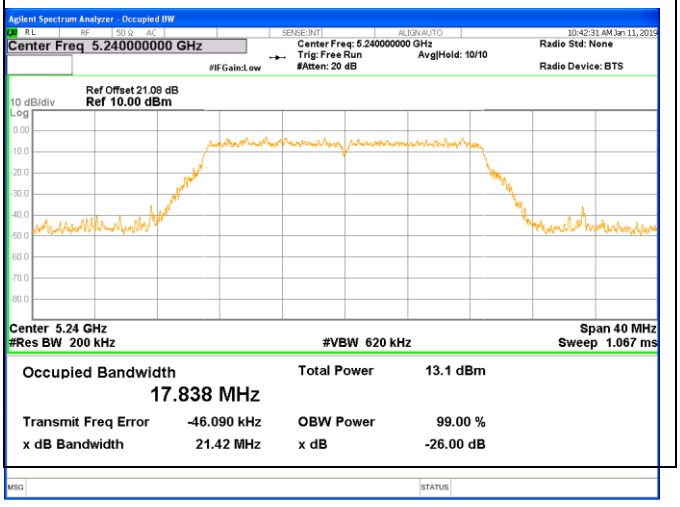
LOW CHANNEL



MID CHANNEL



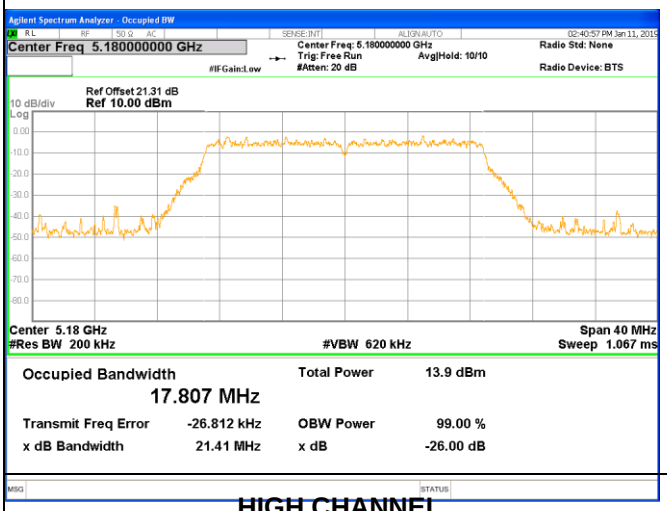
HIGH CHANNEL



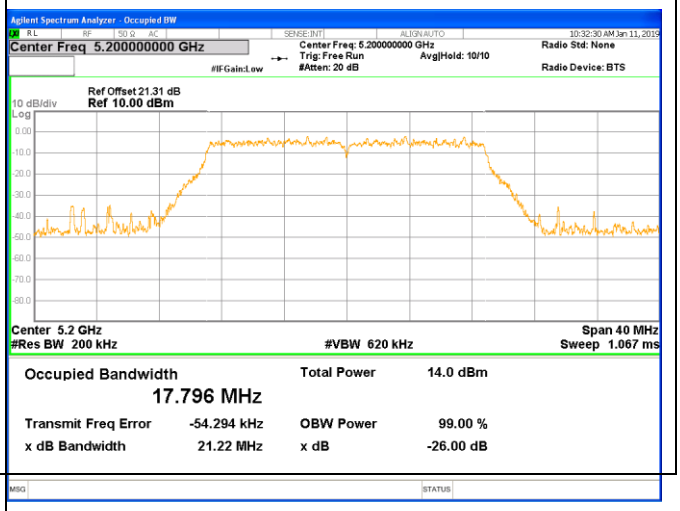
Chain 1

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.41	17.807
Mid	5200	21.22	17.796
High	5240	21.31	17.808

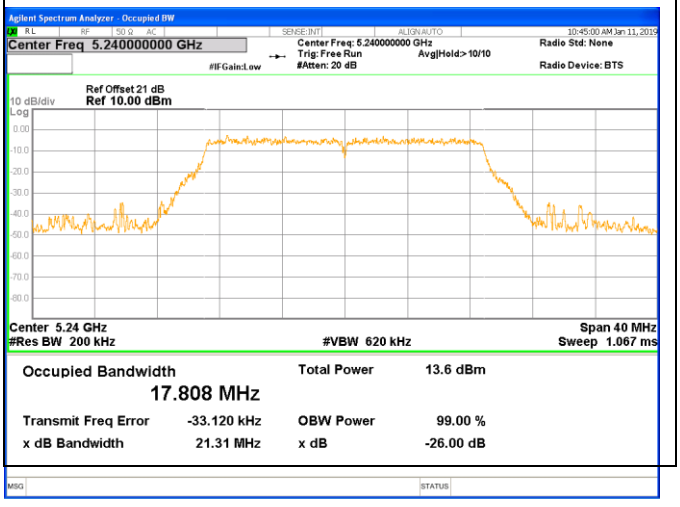
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

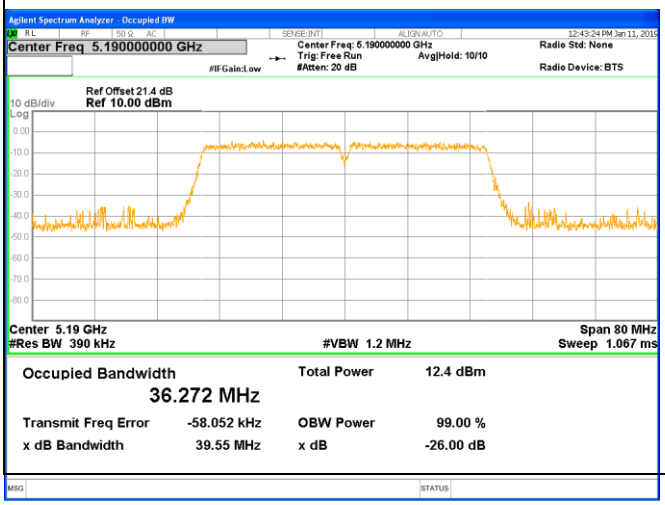


7.1.3. 802.11n HT40 MODE

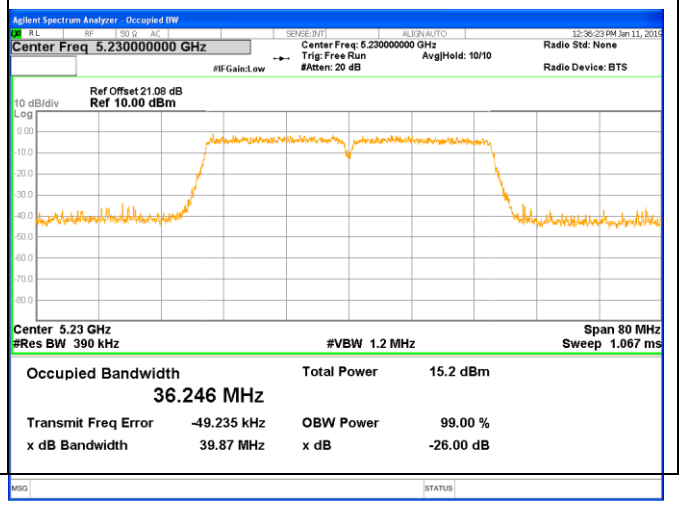
Chain 0

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5190	39.55	36.272
High	5230	39.87	36.246

LOW CHANNEL



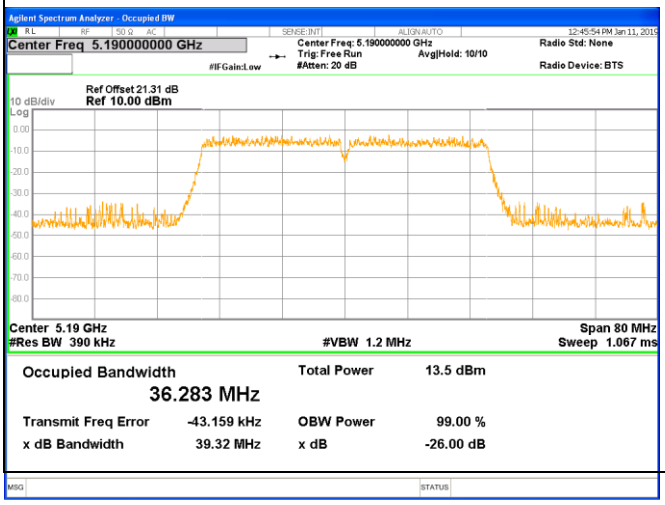
HIGH CHANNEL



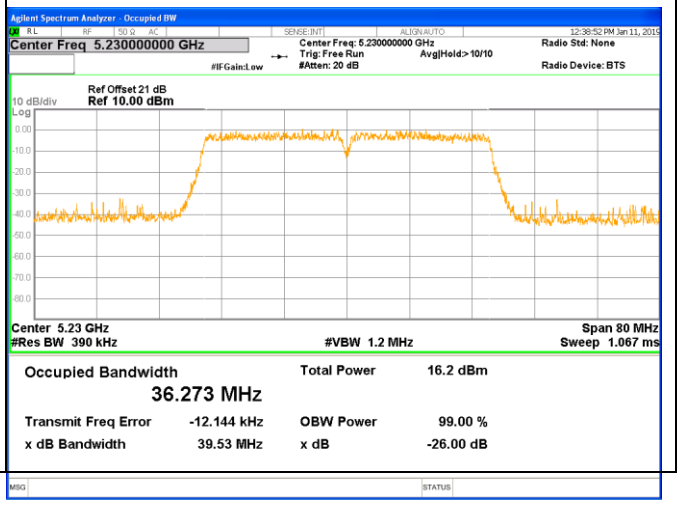
Chain 1

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5190	39.32	36.283
High	5230	39.53	36.273

LOW CHANNEL



HIGH CHANNEL

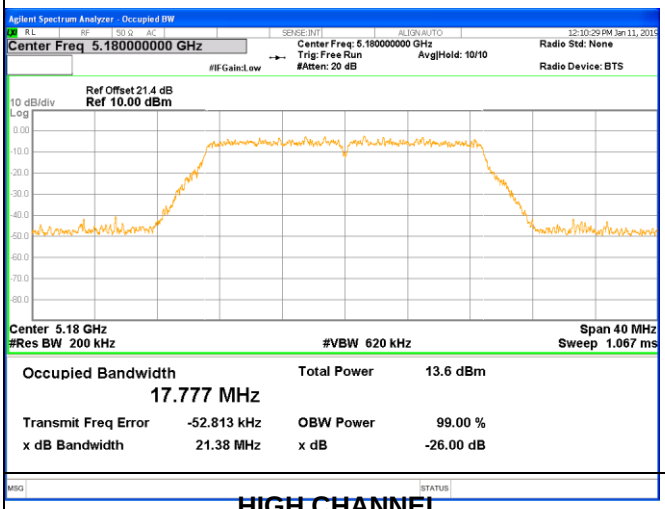


7.1.4. 802.11ac HT20 MODE

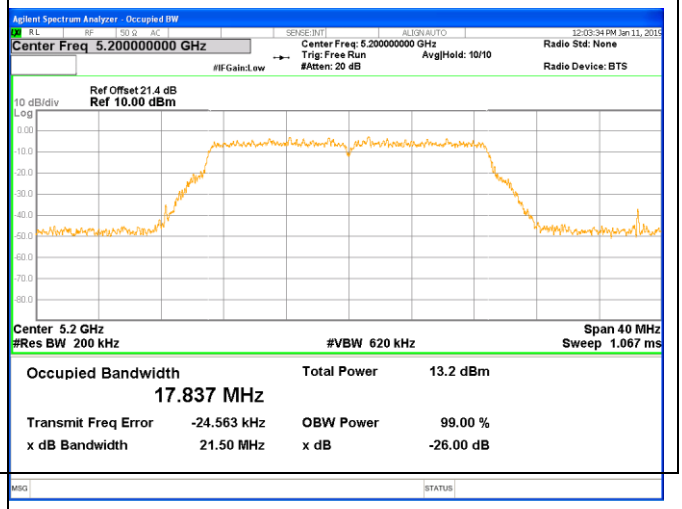
Chain 0

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.38	17.777
Mid	5200	21.50	17.837
High	5240	21.42	17.842

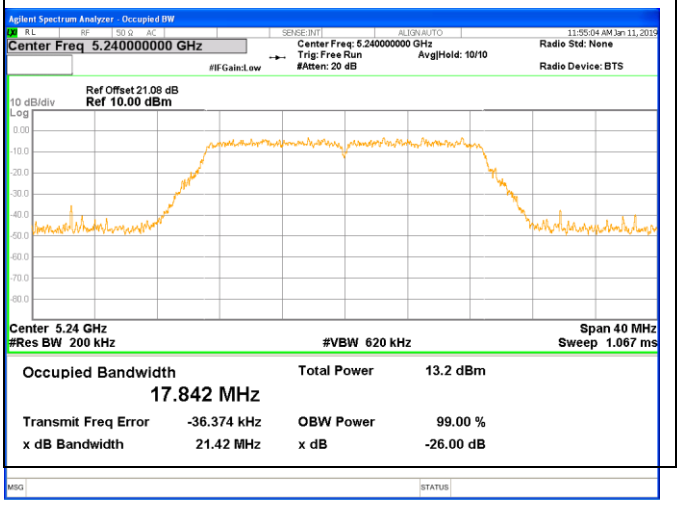
LOW CHANNEL



MID CHANNEL



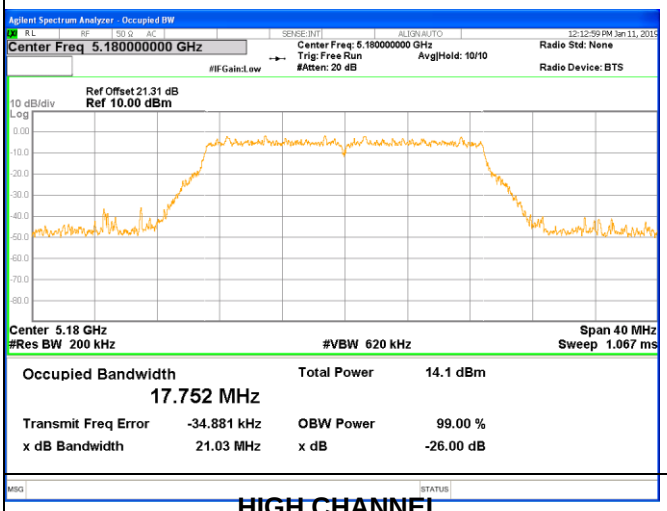
HIGH CHANNEL



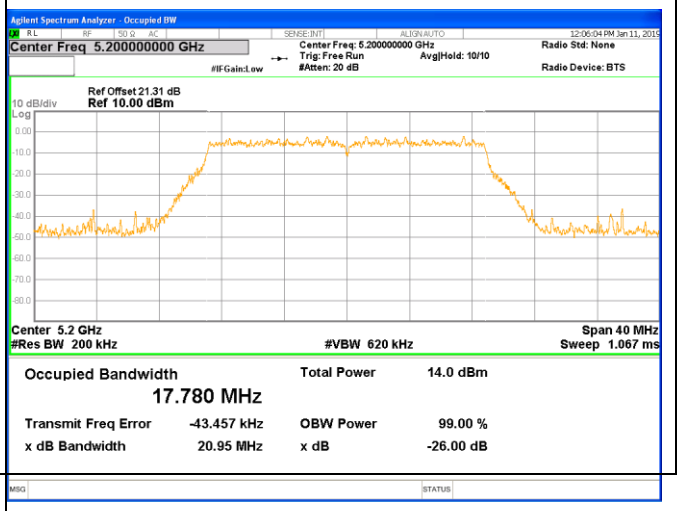
Chain 1

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5180	21.03	17.752
Mid	5200	20.95	17.780
High	5240	21.36	17.793

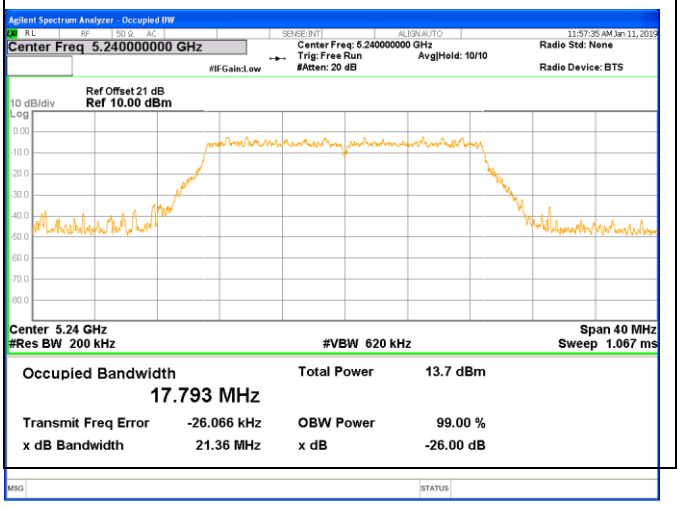
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

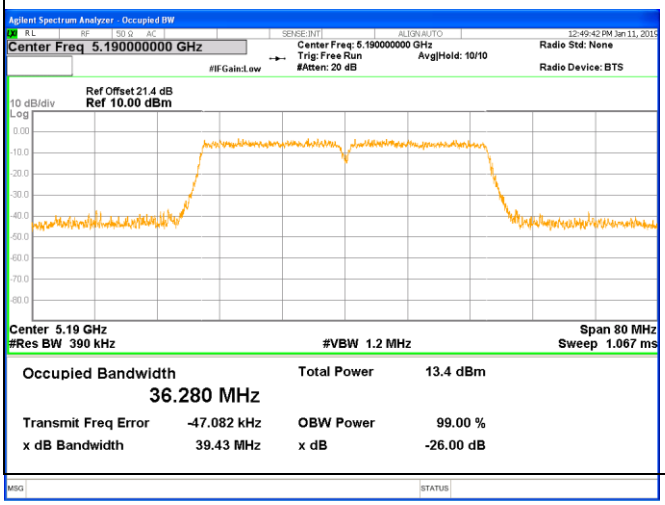


7.1.5. 802.11ac HT40 MODE

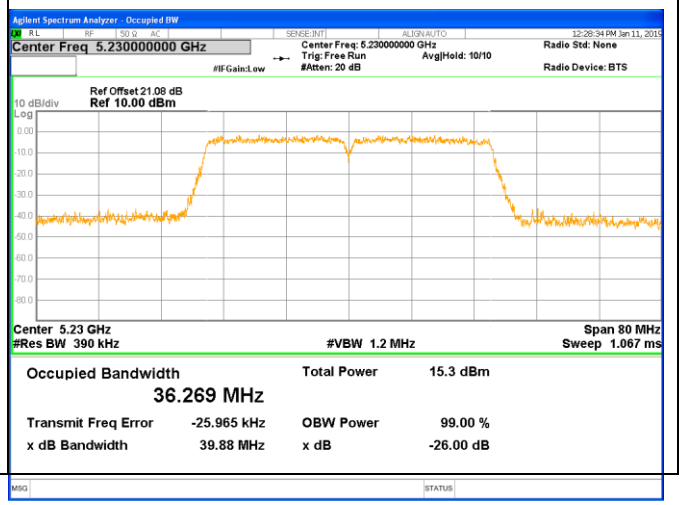
Chain 0

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5190	39.43	36.280
High	5230	39.88	36.269

LOW CHANNEL



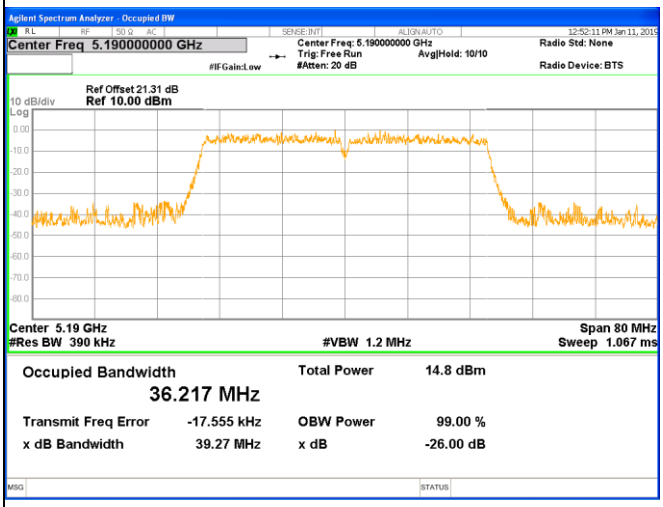
HIGH CHANNEL



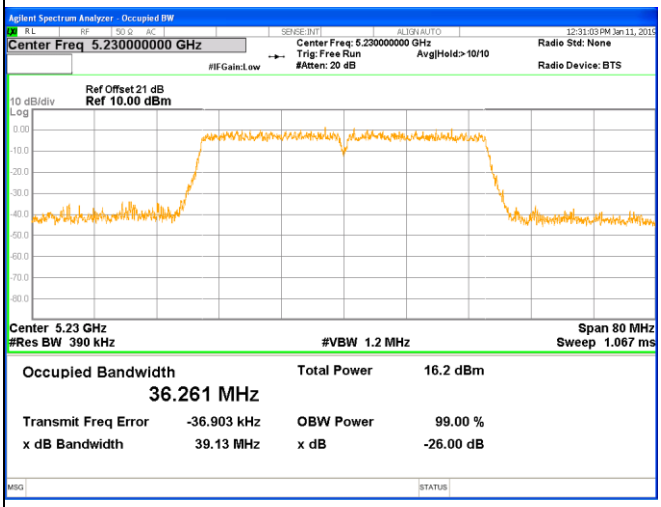
Chain 1

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5190	39.27	36.217
High	5230	39.13	36.261

LOW CHANNEL



HIGH CHANNEL

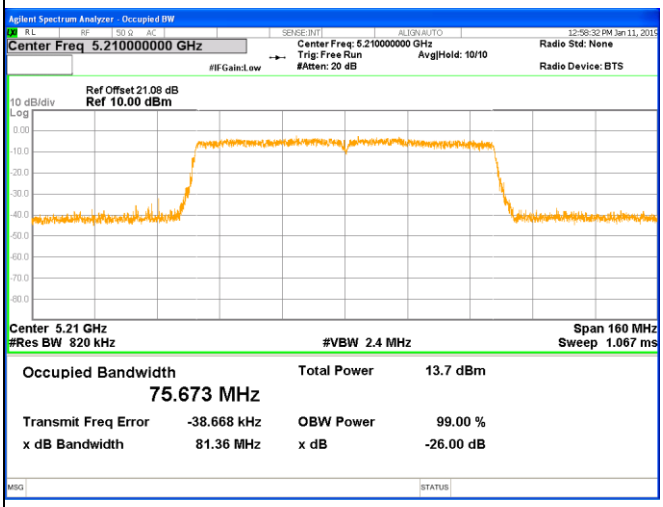


7.1.6. 802.11ac HT80 MODE

Chain 0

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5210	81.36	75.673

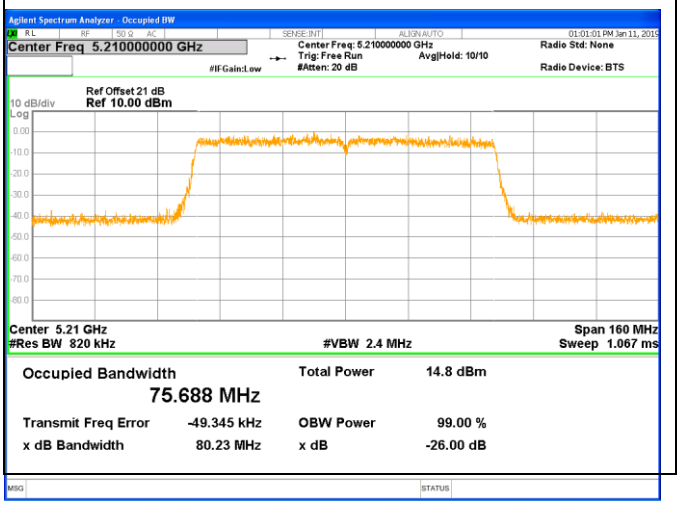
LOW CHANNEL



Chain 1

Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
Low	5210	80.23	75.688

LOW CHANNEL



7.2. MAXIMUM CONDUCTED OUTPUT POWER

LIMITS

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	FCC: For an indoor access point :1W (30dBm) FCC:For client devices: 250mw (24dBm)	5150-5250
	For RSS:e.i.r.p. power: not exceed 200 mW(23dBm) or 10 + 10 log10 B, B is the 99% emission bandwidth in megahertz	
	250mW (24dBm)	5250-5350
	250mW (24dBm)	For FCC:5470-5725 For IC:5470-5600 5650-5725
	1 Watt (30dBm)	5725-5850

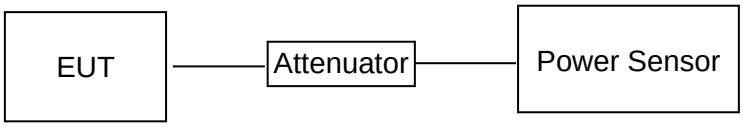
Note: 1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. Directional gain: Please refer to the description in section 5.3.

TEST PROCEDURE

Refer to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Connect the EUT to the a broadband gated RF average power meter, the power meter shall have a video bandwidth that is greater than or equal to the bandwidth and shall utilize a fast-responding diode detector.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS

Mode	Channel	Chain	CONDUCTED POWER (dBm)		Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
			Single	Total			
a	5180	0	13.67		24	18.42	22.22
		1	13.63		24	19.43	22.22
	5200	0	12.41		24	17.16	22.22
		1	13.14		24	18.94	22.22
	5240	0	12.05		24	16.80	22.22
		1	12.31		24	18.11	22.22
n HT20	5180	0	7.42	10.96	24	19.76	22.50
		1	8.43				
	5200	0	7.75	11.18	24	19.98	22.50
		1	8.56				
	5240	0	7.42	10.86	24	19.66	22.50
		1	8.24				
ac HT20	5180	0	7.90	11.33	24	20.13	22.49
		1	8.71				
	5200	0	7.51	11.10	24	19.90	22.49
		1	8.60				
	5240	0	7.45	10.87	24	19.67	22.49
		1	8.24				
n HT40	5190	0	6.95	10.40	24	19.20	23
		1	7.78				
	5230	0	9.63	13.09	24	21.89	23
		1	10.48				
ac HT40	5190	0	7.99	11.59	24	20.39	23
		1	9.10				
	5230	0	9.84	13.26	24	22.06	23
		1	10.63				
ac HT80	5210	0	7.82	11.30	24	20.10	23
		1	8.71				

Remarks: 1.All the antennas ports had been tested, but only the worst data recorded in the report.
2.EIRP= Conducted Out Power+ Directional gain.

7.3. POWER SPECTRAL DENSITY

LIMITS

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	For FCC: Other than Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz	5150-5250
	For RSS:10dBm/MHz	
	11dBm/MHz	5250-5350
	11dBm/MHz	For FCC:5470-5725 For IC:5470-5600 5650-5725
	30dBm/500kHz	5725-5850

Note: 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. Directional gain: Please refer to the description in section 5.3.

TEST PROCEDURE

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

For U-NII-1, U-NII-2A and U-NII-2C band:

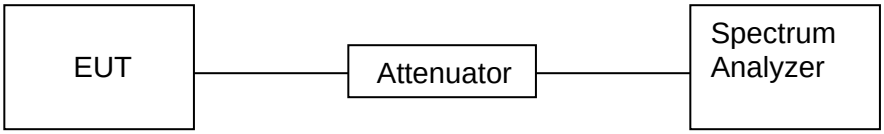
Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	1MHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

For U-NII-3:

Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	500KHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.
Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS

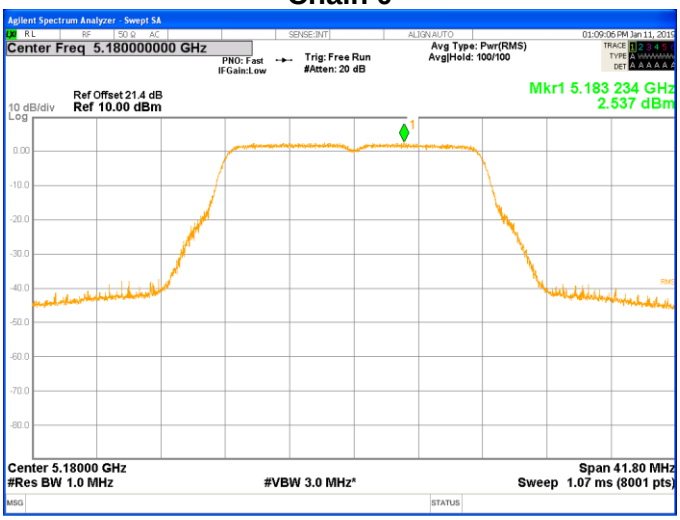
Mode	Channel	Chain	Conducted PSD (dBm)		Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
			Single	Total			
a	5180	0	2.847		11	7.597	10
		1	2.628		11	8.428	10
	5200	0	1.359		11	6.109	10
		1	2.294		11	8.094	10
	5240	0	0.966		11	5.716	10
		1	1.395		11	7.195	10
n HT20	5180	0	-3.513	-0.04	8.2	8.76	10
		1	-2.643				
	5200	0	-3.667	-0.02	8.2	8.78	10
		1	-2.481				
	5240	0	-4.105	-0.57	8.2	8.23	10
		1	-3.113				
ac HT20	5180	0	-3.344	0.08	8.2	8.88	10
		1	-2.559				
	5200	0	-3.721	-0.26	8.2	8.54	10
		1	-2.867				
	5240	0	-3.726	-0.40	8.2	8.40	10
		1	-3.107				
n HT40	5190	0	-7.149	-3.84	8.2	4.96	10
		1	-6.570				
	5230	0	-4.466	-1.09	8.2	7.71	10
		1	-3.760				
ac HT40	5190	0	-5.874	-2.42	8.2	6.38	10
		1	-5.026				
	5230	0	-4.329	-0.85	8.2	7.95	10
		1	-3.437				
ac HT80	5210	0	-8.955	-5.68	8.2	3.12	10
		1	-8.430				
Note: PSD= TEST PLOT Value + 10 log (1/x), where x is the duty cycle.							

Remarks: 1. All the antennas ports had been tested, but only the worst data recorded in the report.
2.EIRP PSD= Conducted PSD+ Directional gain.

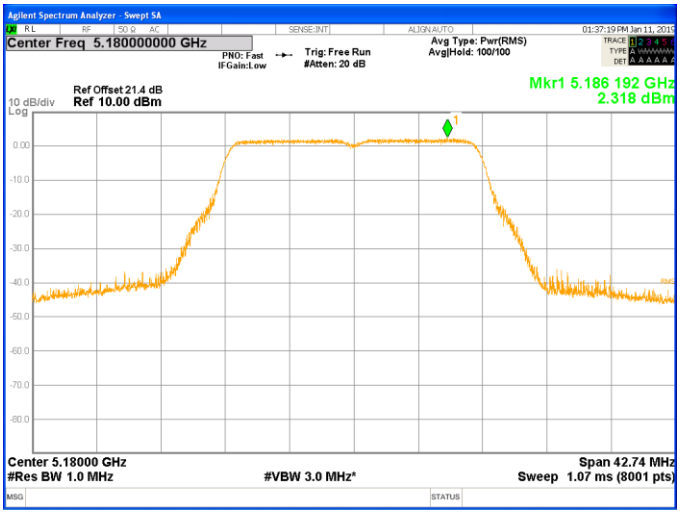
TEST PLOT FOR ANTENNA B AND C

802.11a Mode

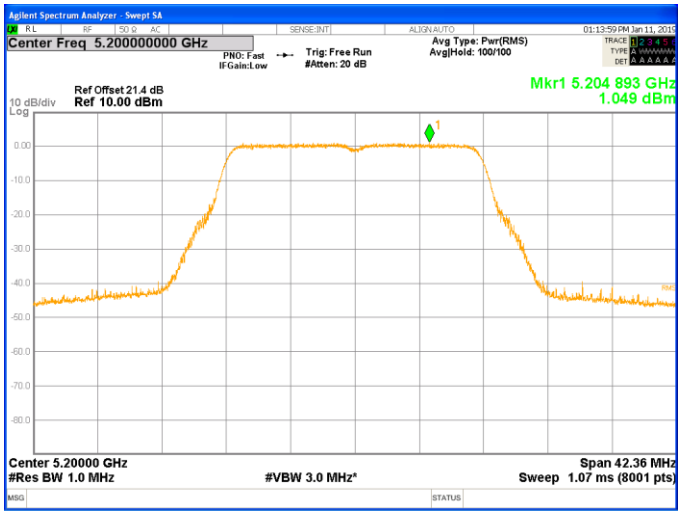
5180MHz
Chain 0



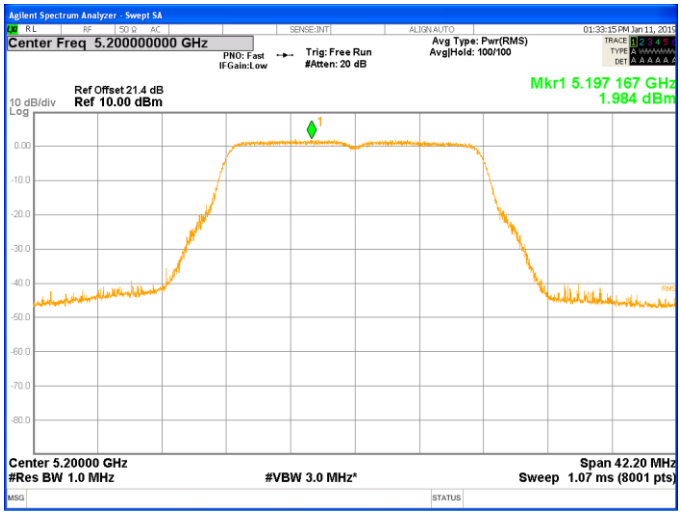
Chain 1



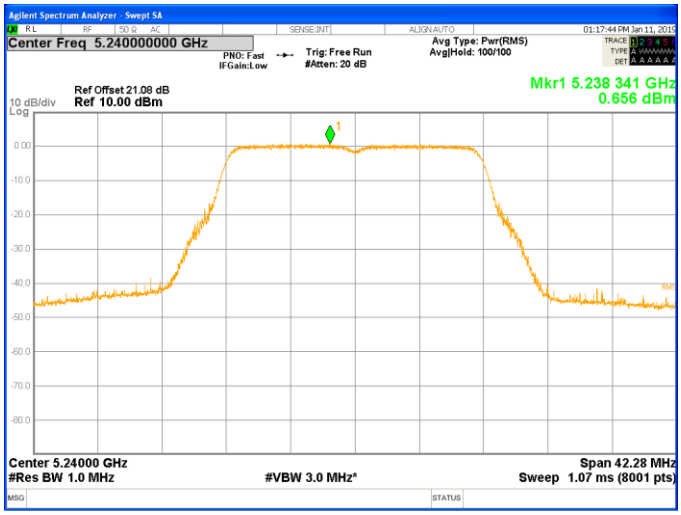
5200MHz
Chain 0



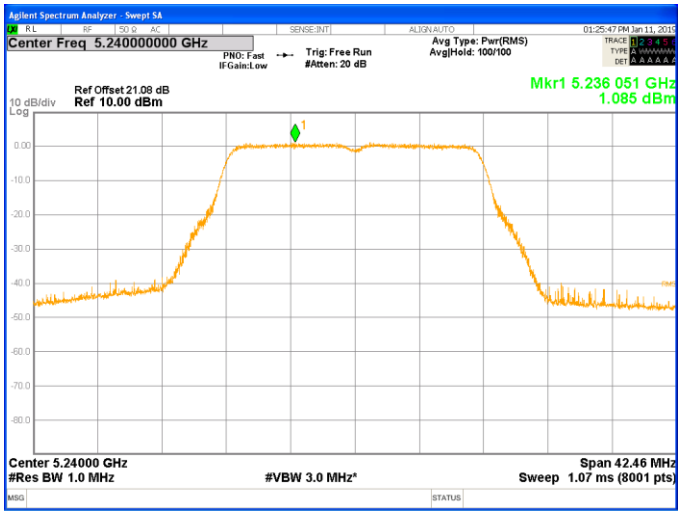
Chain 1



5240MHz
Chain 0



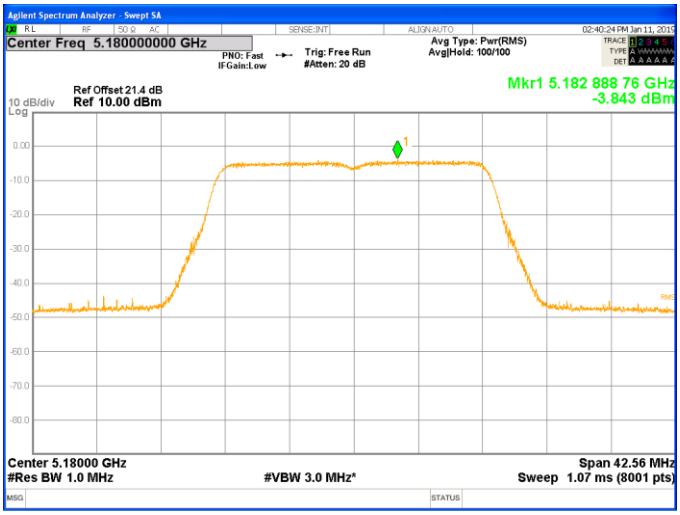
Chain 1



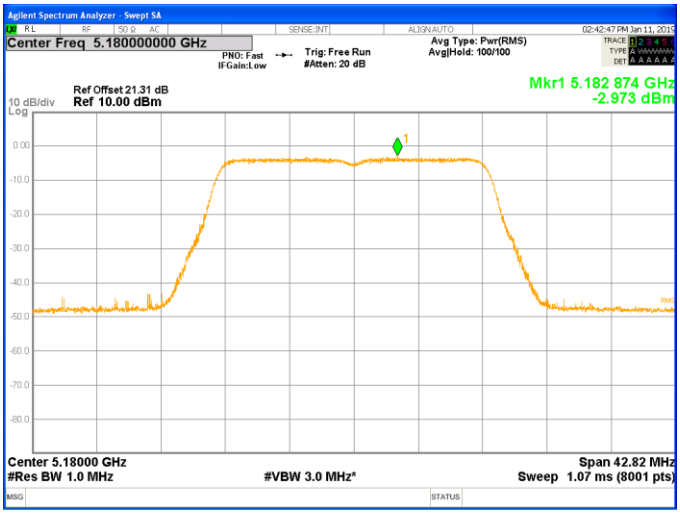
802.11 n HT20 Mode

5180MHz

Chain 0

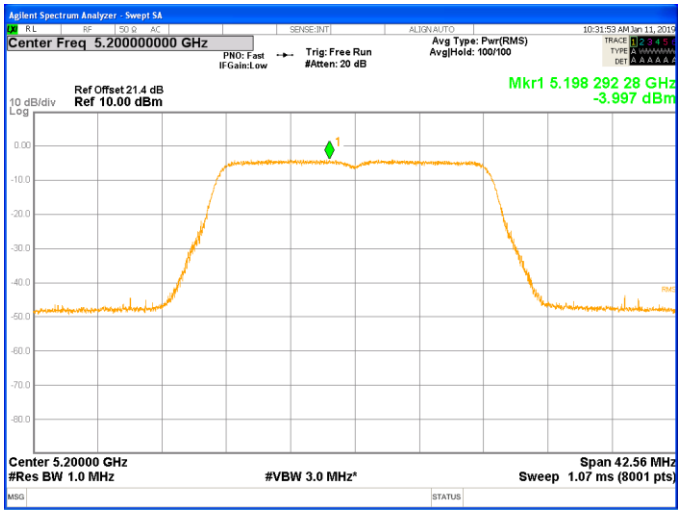


Chain 1

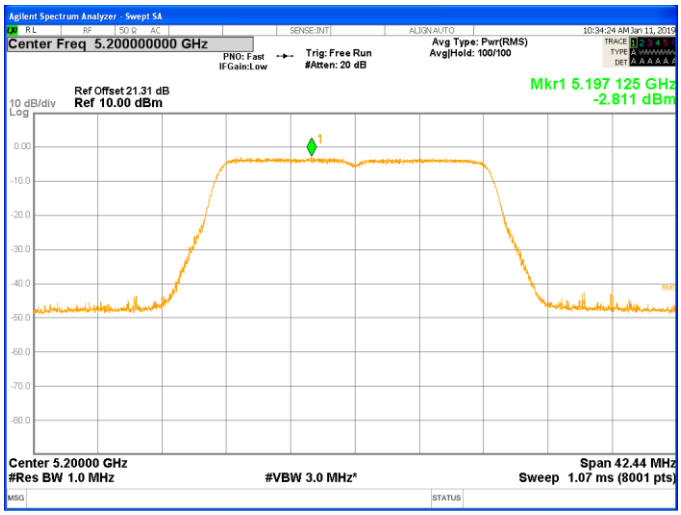


5200MHz

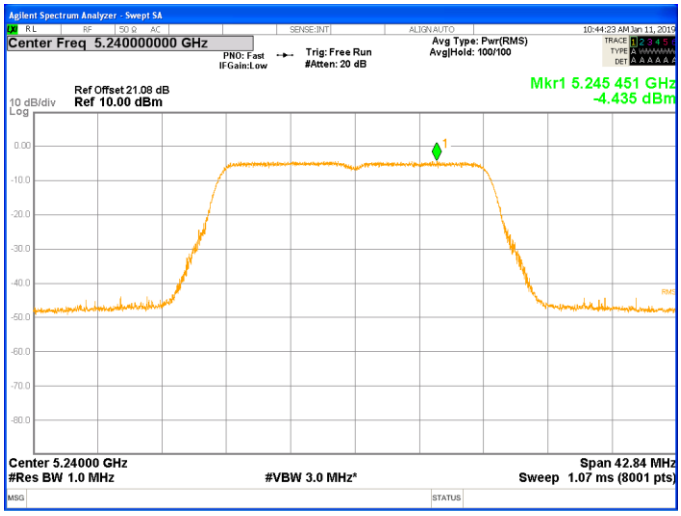
Chain 0



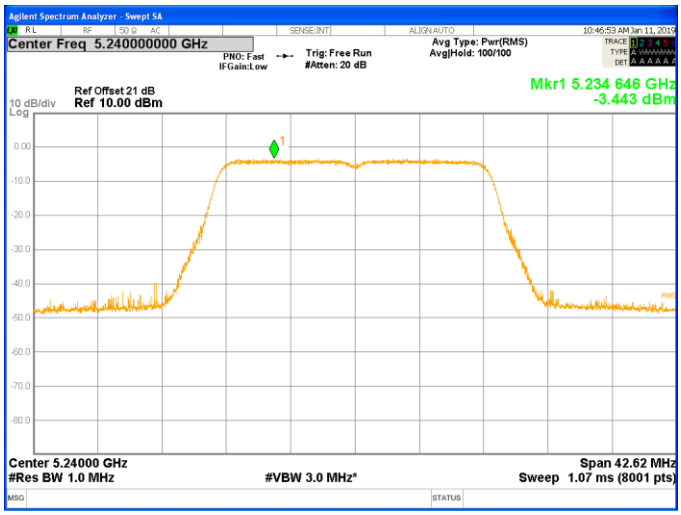
Chain 1



5240MHz
Chain 0



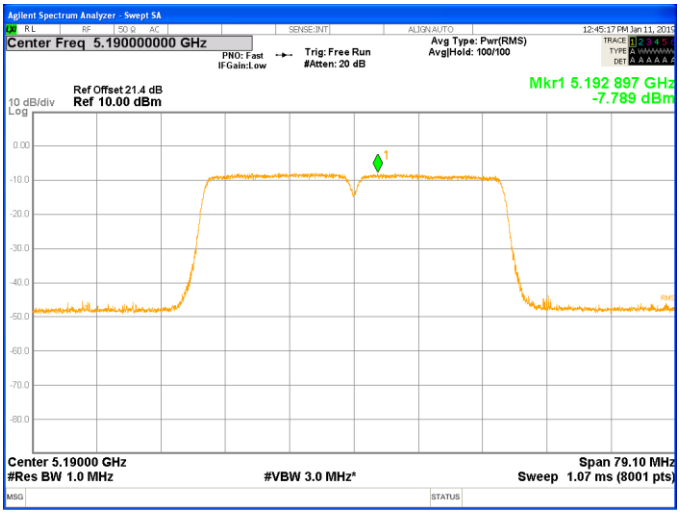
Chain 1



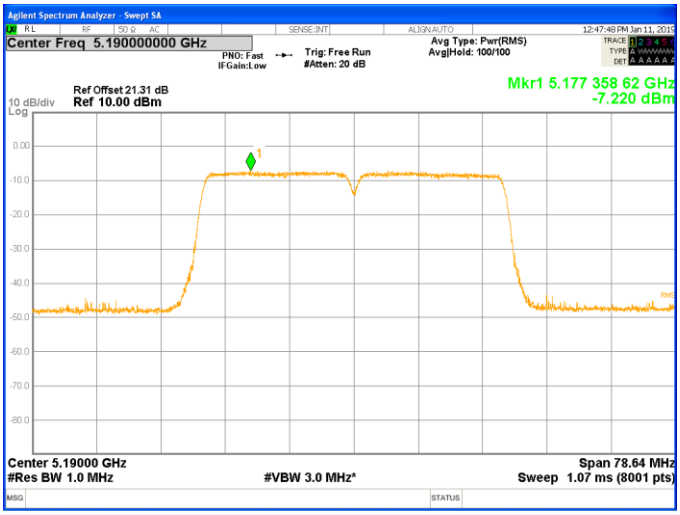
802.11n HT40 Mode

5190MHz

Chain 0

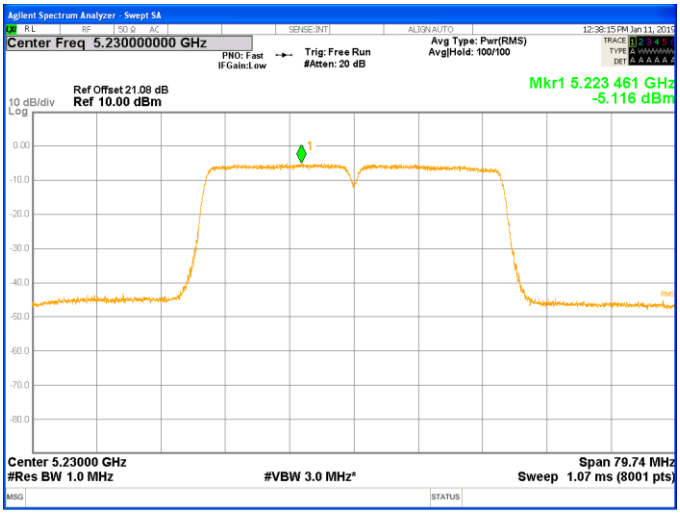


Chain 1

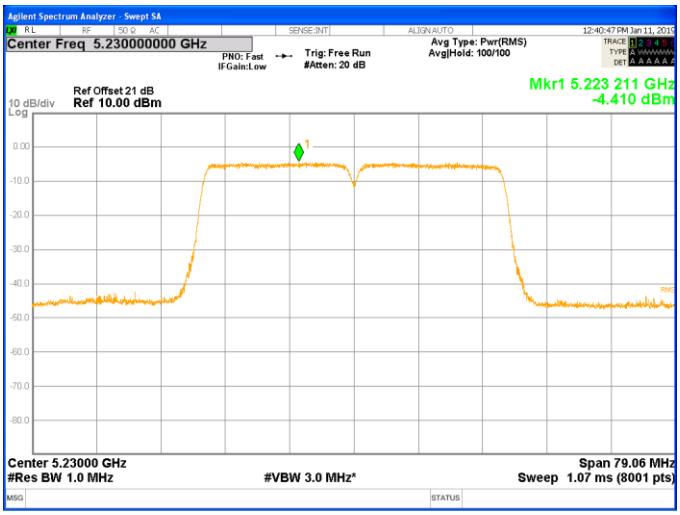


5230MHz

Chain 0

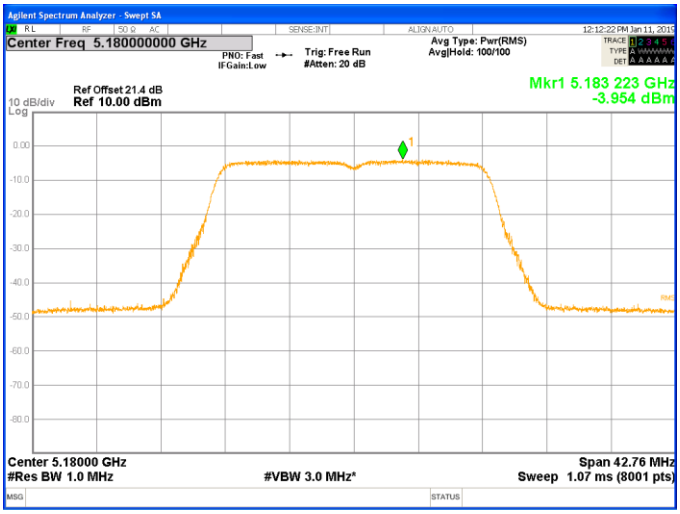


Chain 1

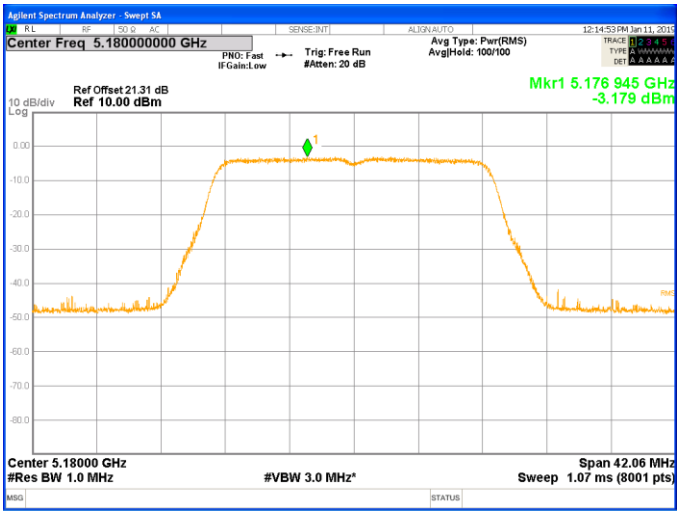


802.11 ac HT20 Mode

5180MHz
Chain 0

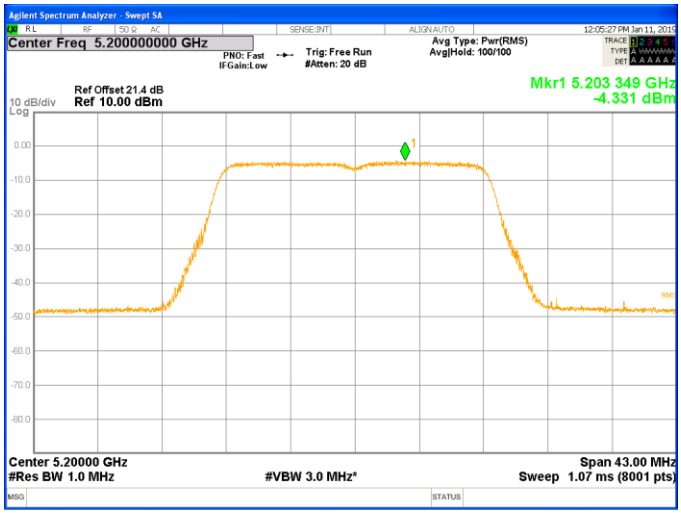


Chain 1

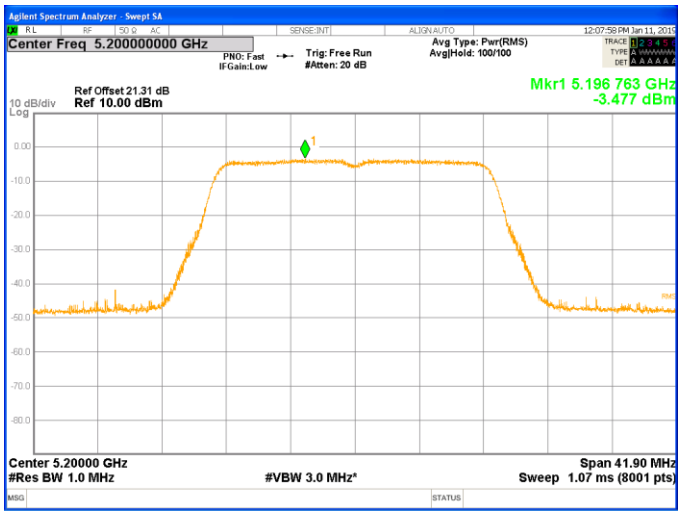


5200MHz

Chain 0

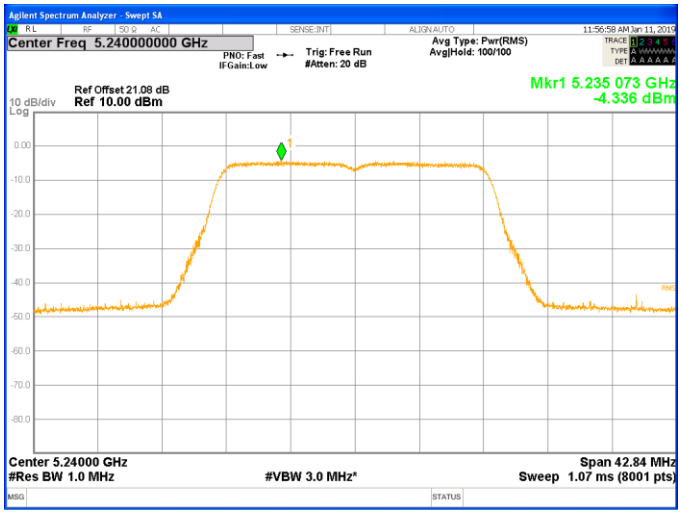


Chain 1

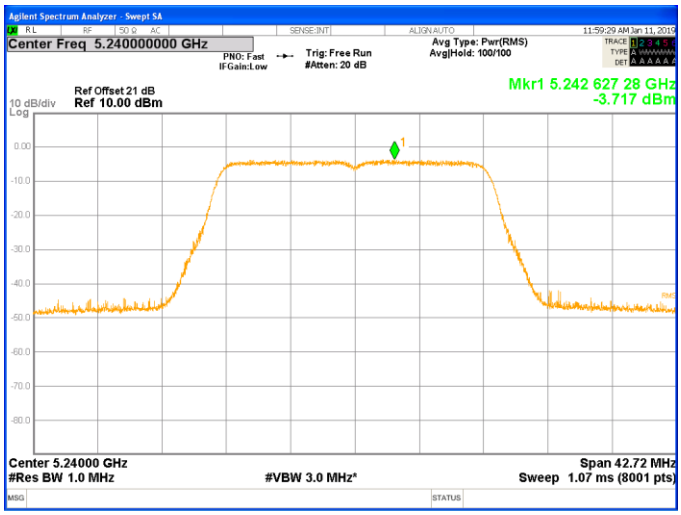


5240MHz

Chain 0

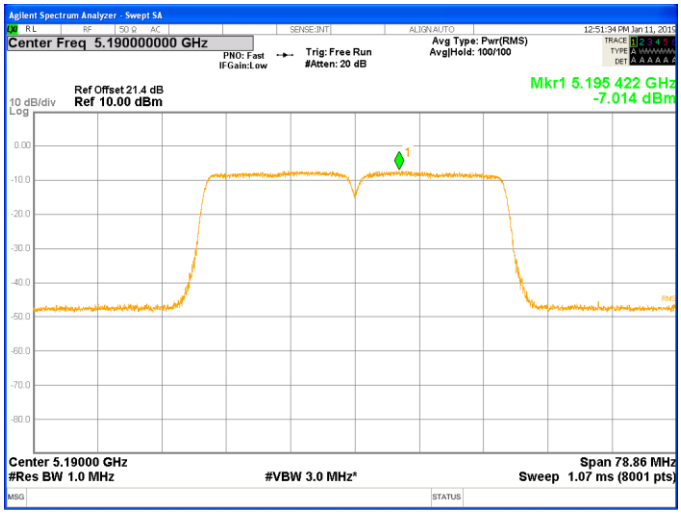


Chain 1

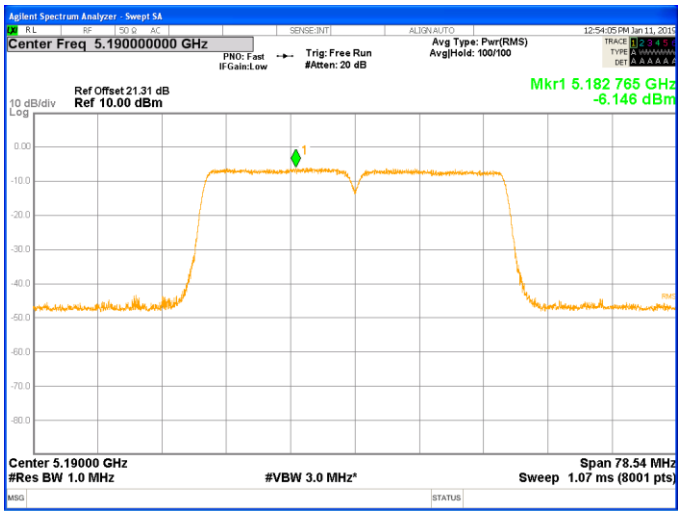


802.11ac HT40 Mode

5190MHz
Chain 0

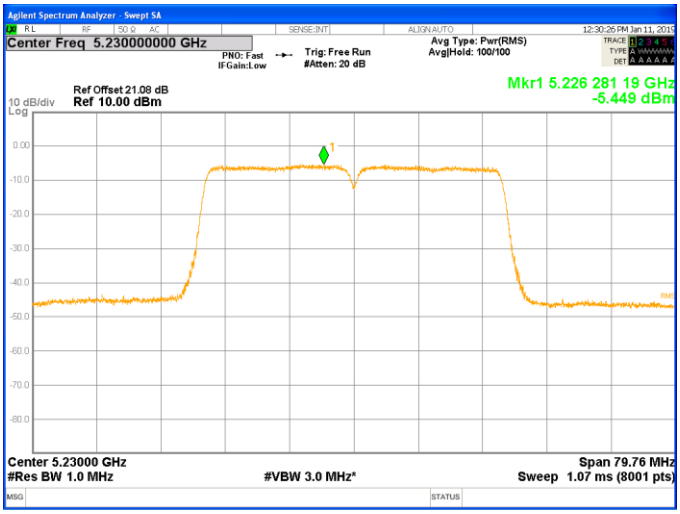


Chain 1

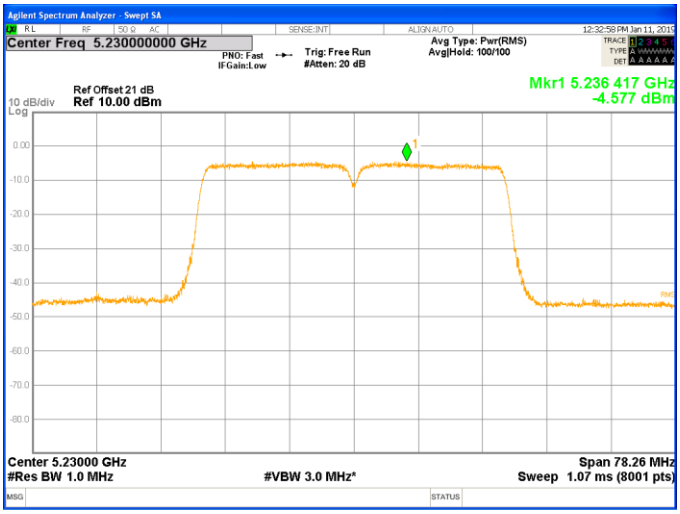


5230MHz

Chain 0



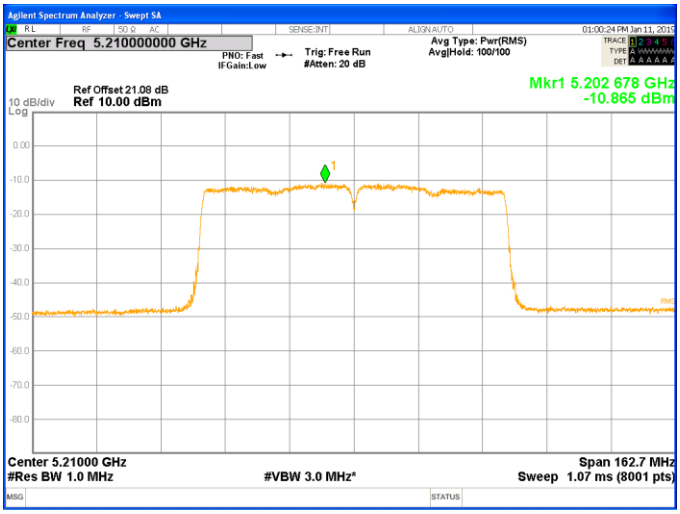
Chain 1



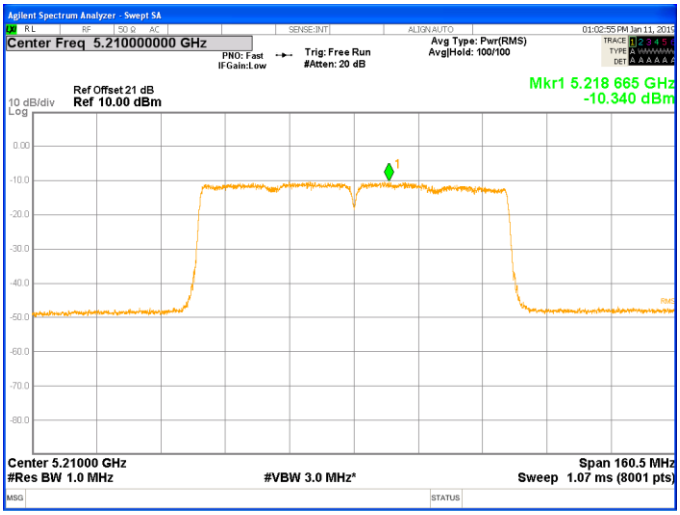
802.11ac HT80 Mode

5210MHz

Chain 0



Chain 1



8. RADIATED TEST RESULTS

LIMITS

Please refer to FCC §15.205, §15.209 and §15.407(b) (4)

Please refer to RSS-GEN Clause 8.9 (Transmitter)

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

IC Restricted bands please refer to ISED RSS-GEN Clause 8.10.
FCC Restricted bands please refer to CFR 47 FCC 15.209.

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

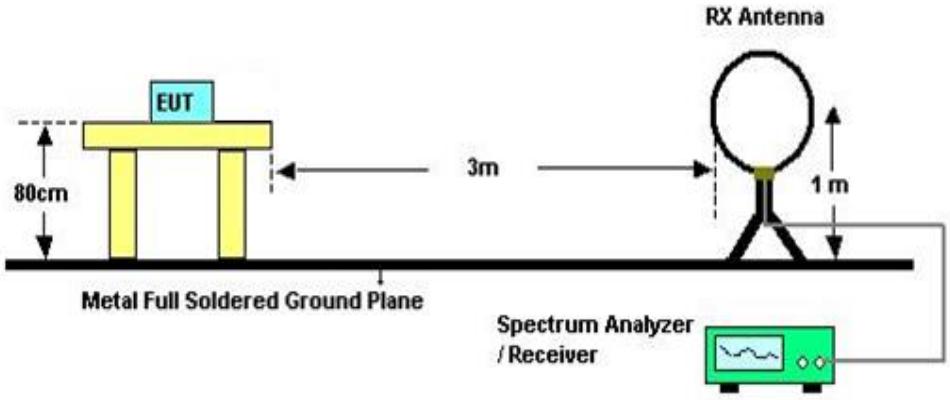
LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1GHz)			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

Limits of unwanted emission out of the restricted bands

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1GHz)		
Frequency Range (MHz) 30 - 88	EIRP Limit	Field Strength Limit (dBuV/m) at 3 m
5150~5250 MHz	PK:-27 (dBm/MHz)	PK:68.2(dBµV/m)
5250~5350 MHz		
5470~5725 MHz		
5725~5850 MHz	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
Note: *1 beyond 75 MHz or more above of the band edge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

TEST SETUP AND PROCEDURE

Below 30MHz



The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

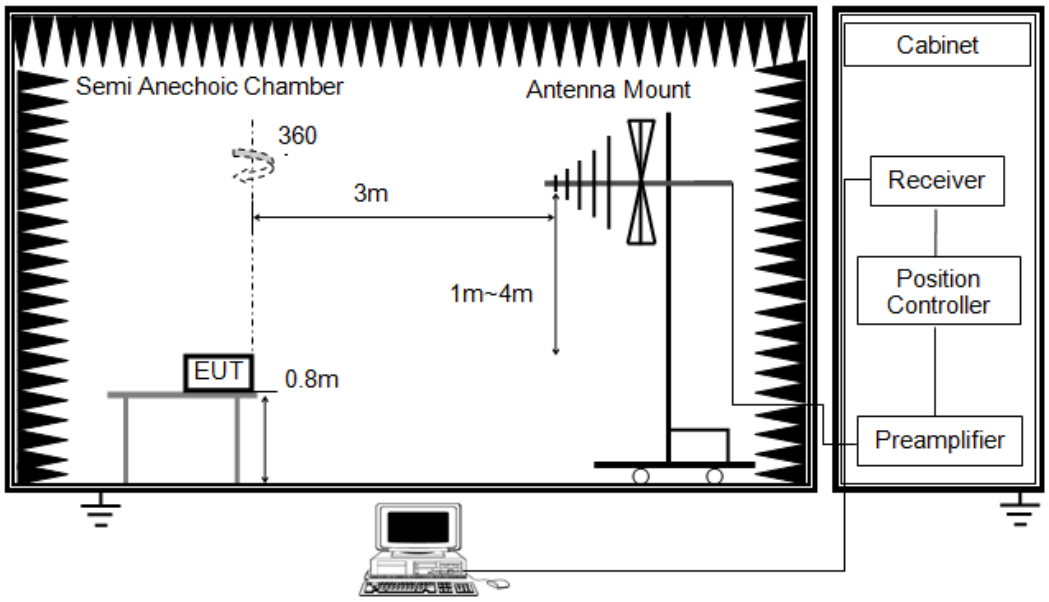
3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Below 1G



The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

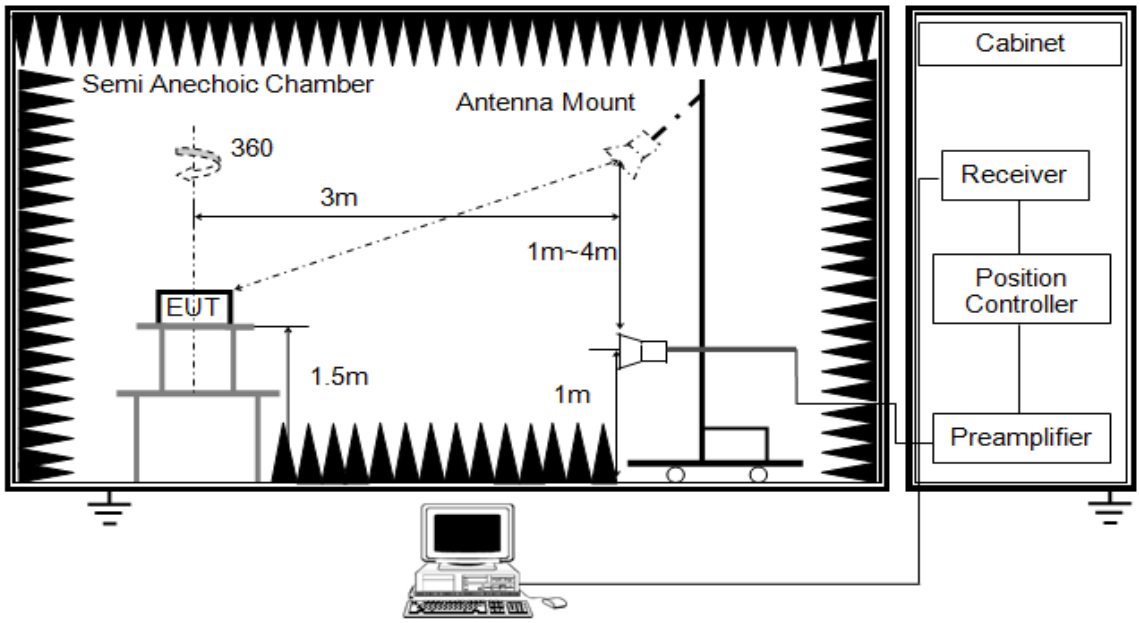
3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Above 1G



The setting of the spectrum analyser

RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

TEST ENVIRONMENT

Temperature	24.4°C	Relative Humidity	52%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

TEST RESULTS

Note1:The chart shows Limits 74dBuV for Peak, 54dBuV for AVG, but Unwanted Emissions that fall Outside of the Restricted Bands is 68.2dBuV for Peak, No limit for AVG. All test results are in compliance with the limits.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

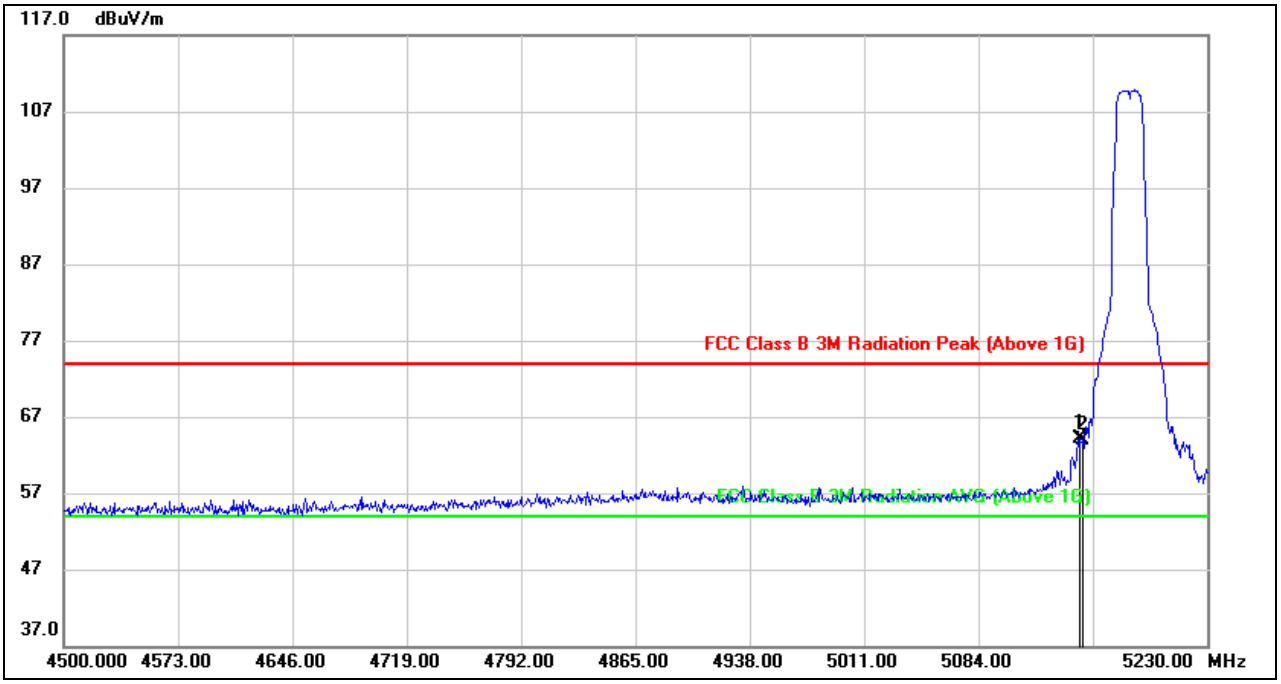
8.1. 802.11a MODE

8.1.1. UNII-1 BAND

SISO Chain 0

RESTRICTED BANDEDGE LOW CHANNEL

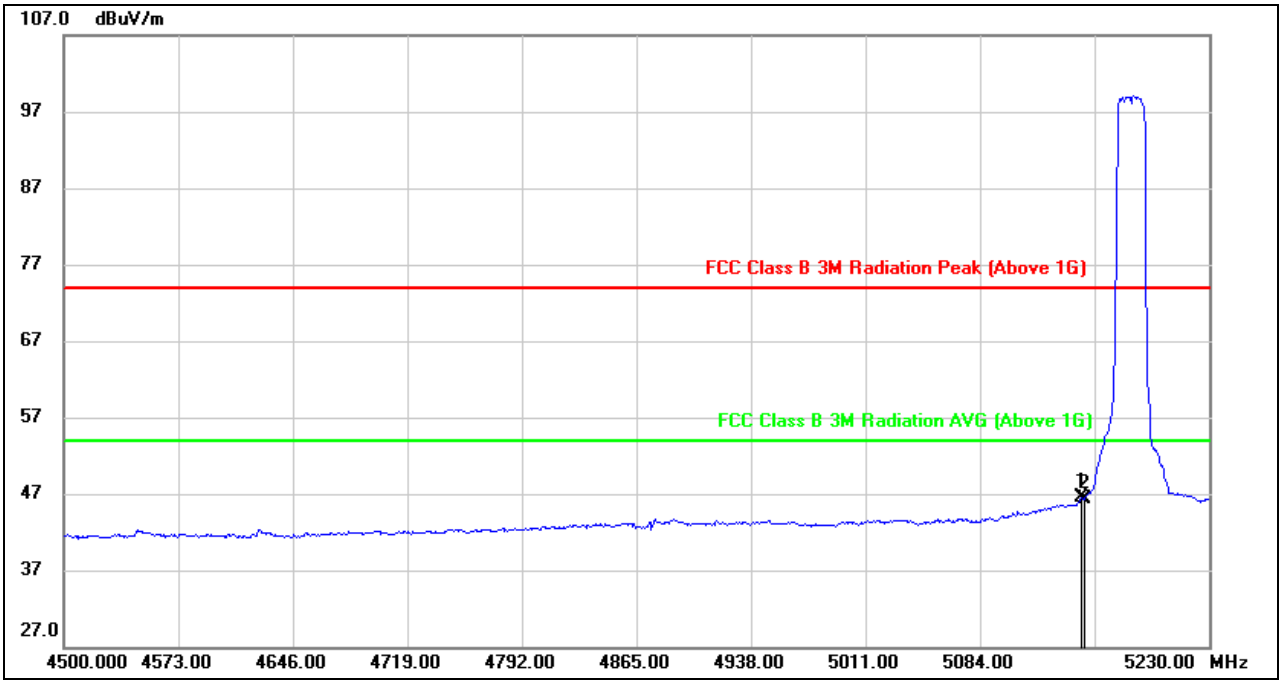
HORIZONTAL RESULTS
PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5148.970	23.63	40.46	64.09	74.00	-9.91	peak
2	5150.000	23.40	40.46	63.86	74.00	-10.14	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

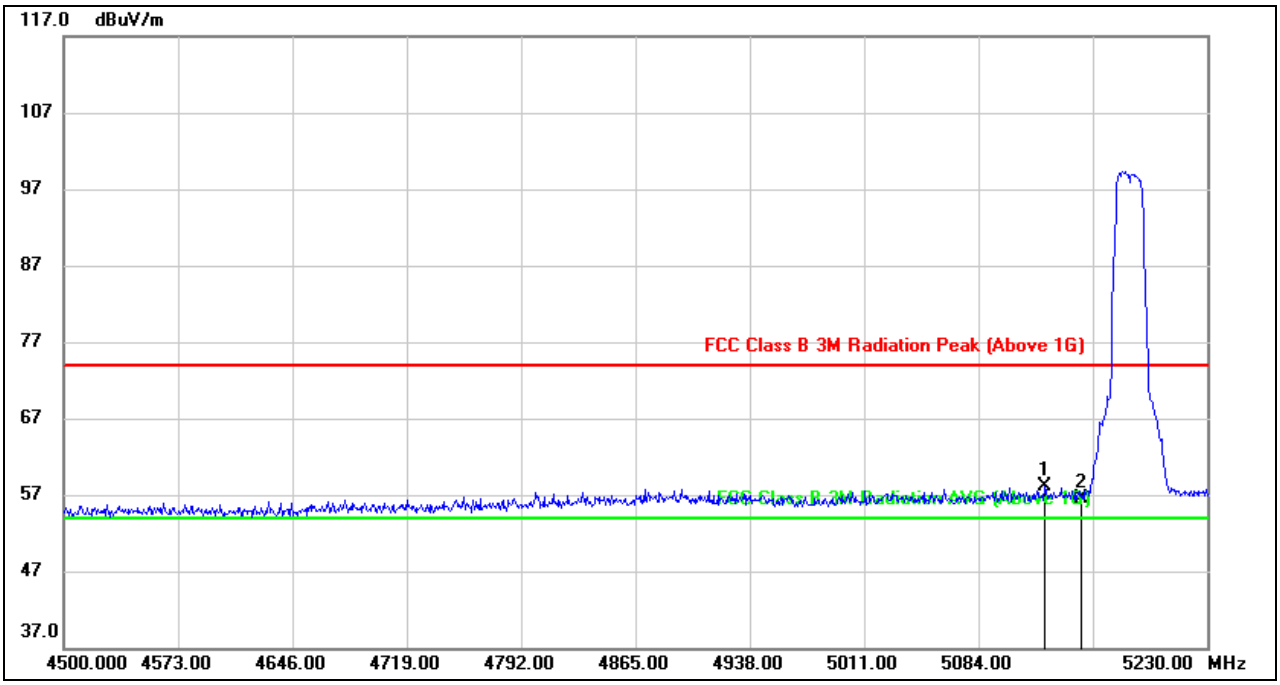
AVG



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5148.970	6.01	40.46	46.47	54.00	-7.53	AVG
2	5150.000	5.93	40.46	46.39	54.00	-7.61	AVG

Note: 1. Measurement = Reading Level + Correct Factor
3. AVG: VBW=1/Ton where: ton is transmit duration.
4. For transmit duration, please refer to clause 7.1.

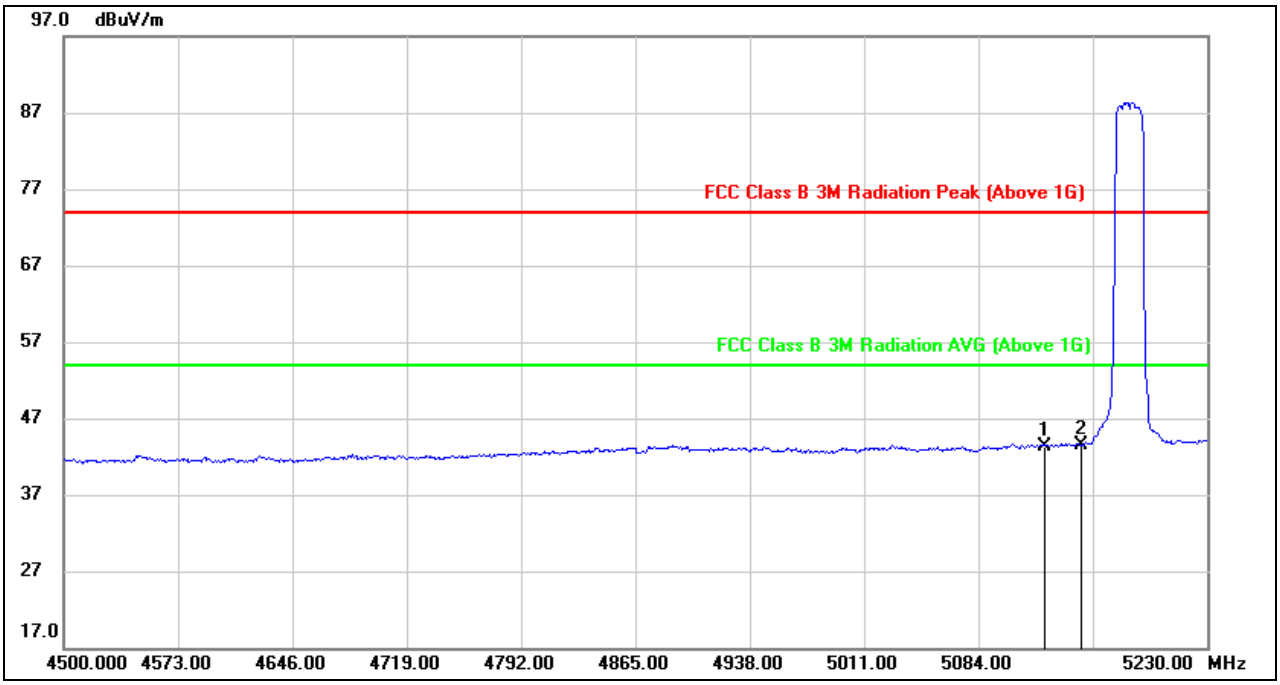
VERTICAL RESULTS
PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5126.340	17.73	40.33	58.06	74.00	-15.94	peak
2	5150.000	16.11	40.46	56.57	74.00	-17.43	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

AVG

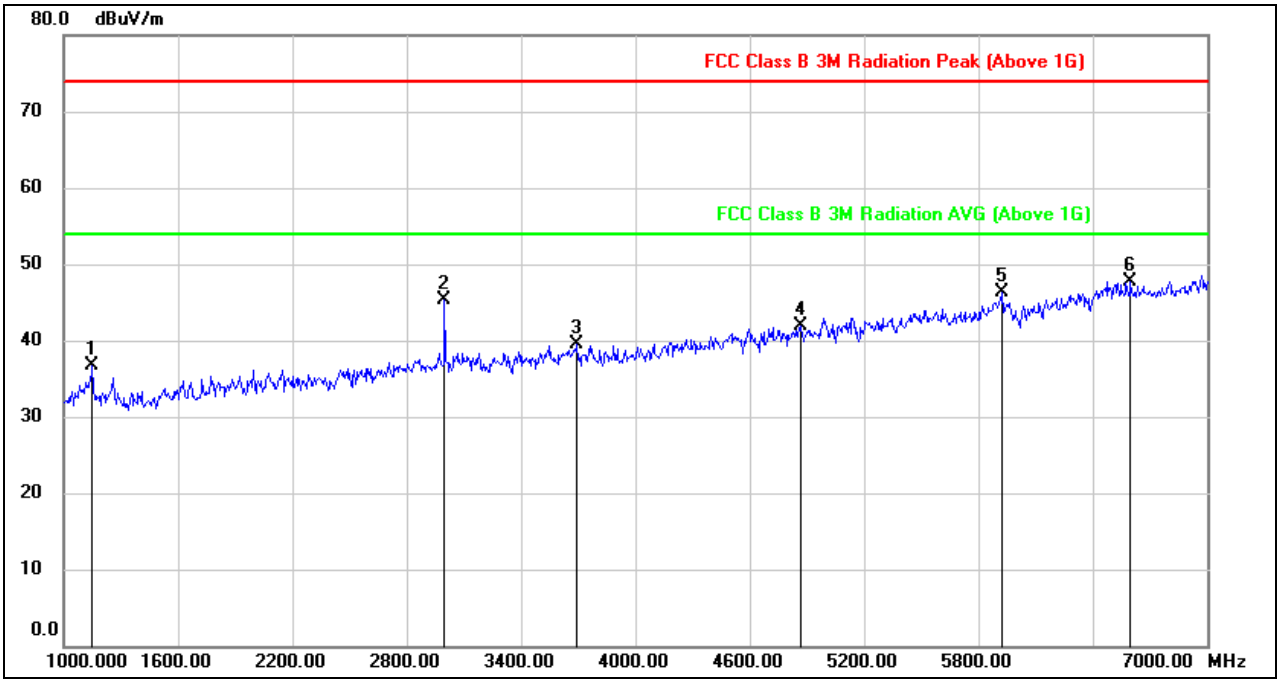


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5126.340	3.07	40.33	43.40	54.00	-10.60	AVG
2	5150.000	3.05	40.46	43.51	54.00	-10.49	AVG

Note: 1. Measurement = Reading Level + Correct Factor
3. AVG: VBW=1/Ton where: ton is transmit duration.
4. For transmit duration, please refer to clause 7.1.

HARMONICS AND SPURIOUS EMISSIONS LOW CHANNEL

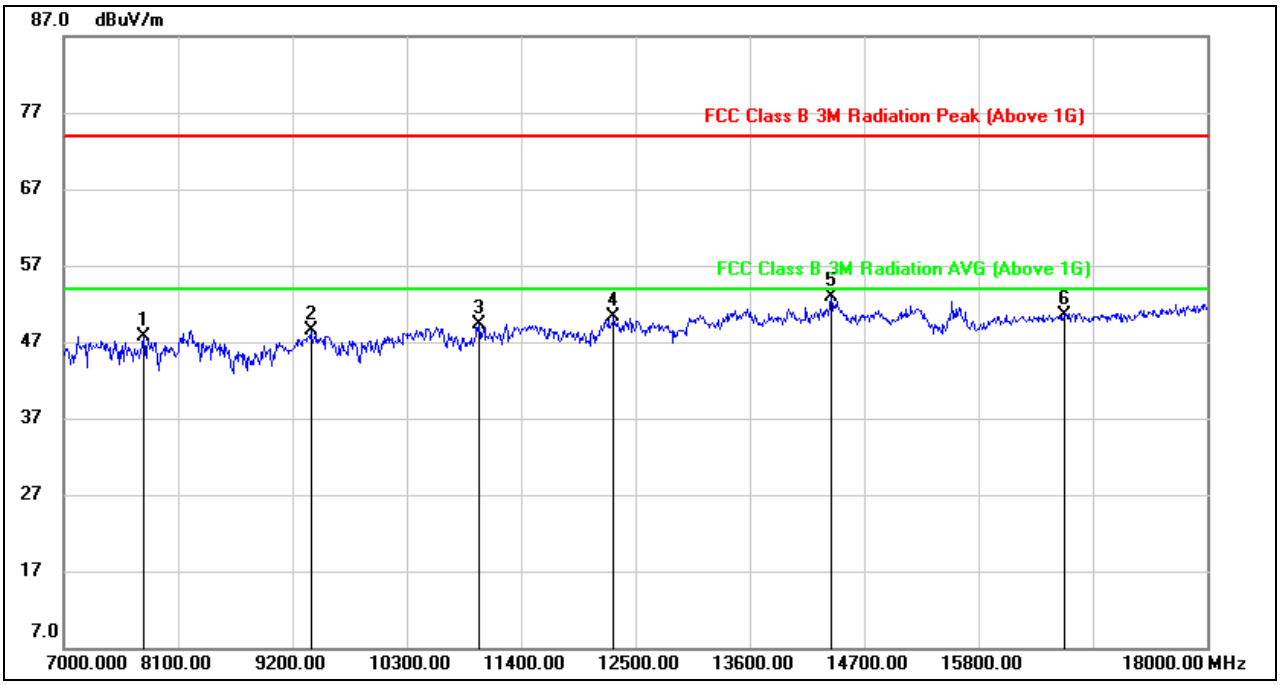
HORIZONTAL RESULTS
1-7GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1150.000	50.52	-13.80	36.72	74.00	-37.28	peak
2	2998.000	51.71	-6.34	45.37	74.00	-28.63	peak
3	3694.000	43.93	-4.34	39.59	74.00	-34.41	peak
4	4864.000	42.74	-0.83	41.91	74.00	-32.09	peak
5	5926.000	42.35	3.88	46.23	74.00	-27.77	peak
6	6598.000	42.53	5.21	47.74	74.00	-26.26	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

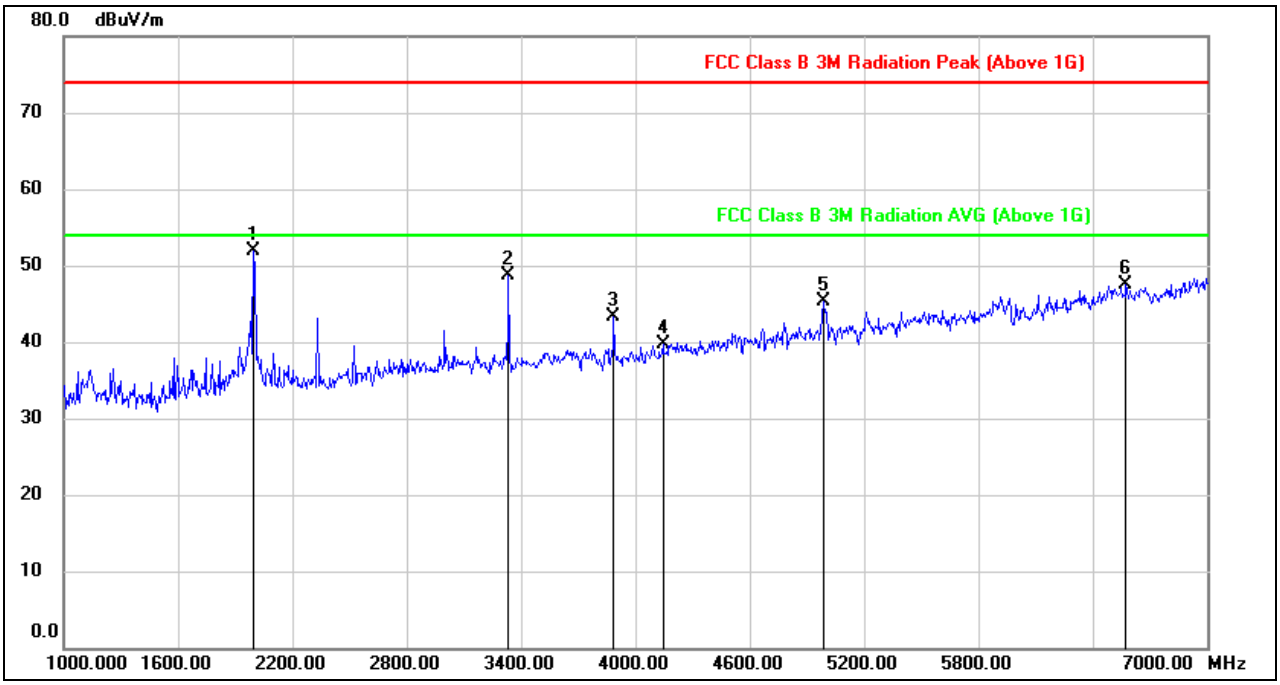
HORIZONTAL RESULTS
7-18GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7770.000	39.65	8.11	47.76	74.00	-26.24	peak
2	9376.000	38.87	9.66	48.53	74.00	-25.47	peak
3	10993.000	36.99	12.29	49.28	74.00	-24.72	peak
4	12291.000	36.79	13.44	50.23	74.00	-23.77	peak
5	14381.000	36.41	16.40	52.81	74.00	-21.19	peak
6	16625.000	31.70	18.89	50.59	74.00	-23.41	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

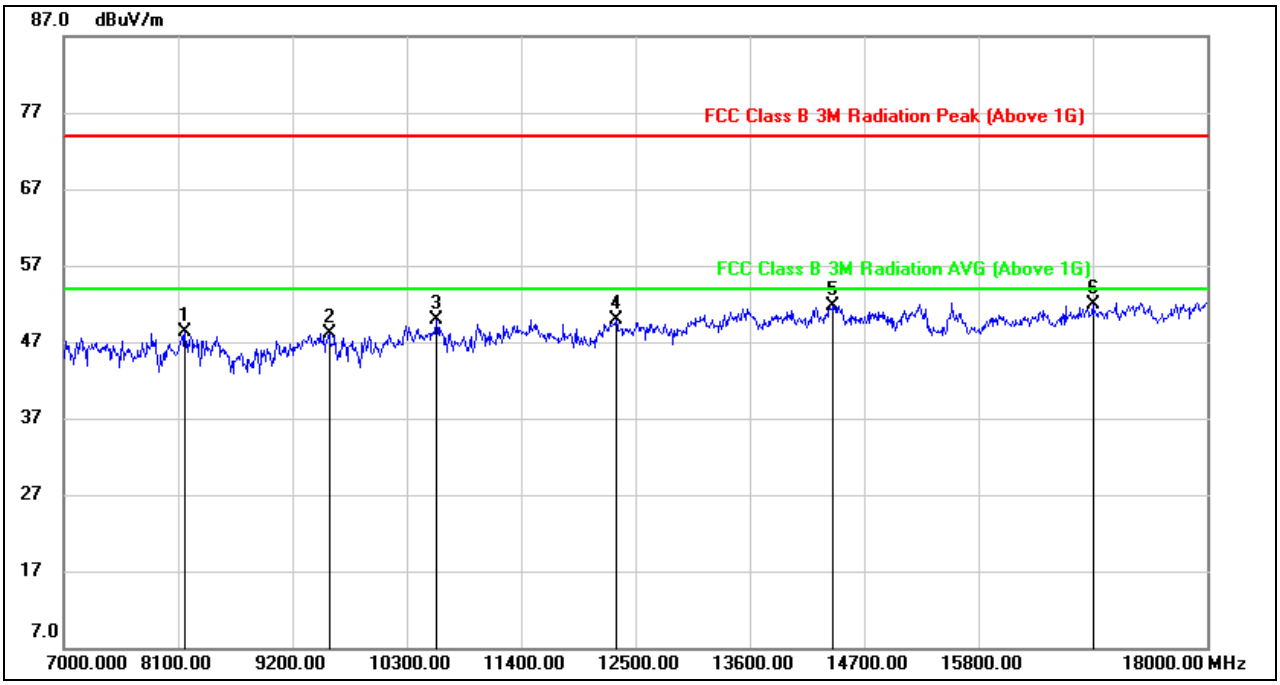
VERTICAL RESULTS
1-7GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1996.000	62.56	-10.70	51.86	74.00	-22.14	peak
2	3334.000	54.45	-5.78	48.67	74.00	-25.33	peak
3	3886.000	47.69	-4.47	43.22	74.00	-30.78	peak
4	4144.000	43.43	-3.69	39.74	74.00	-34.26	peak
5	4984.000	45.36	-0.10	45.26	74.00	-28.74	peak
6	6574.000	42.18	5.27	47.45	74.00	-26.55	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

VERTICAL RESULTS
7-18GHz

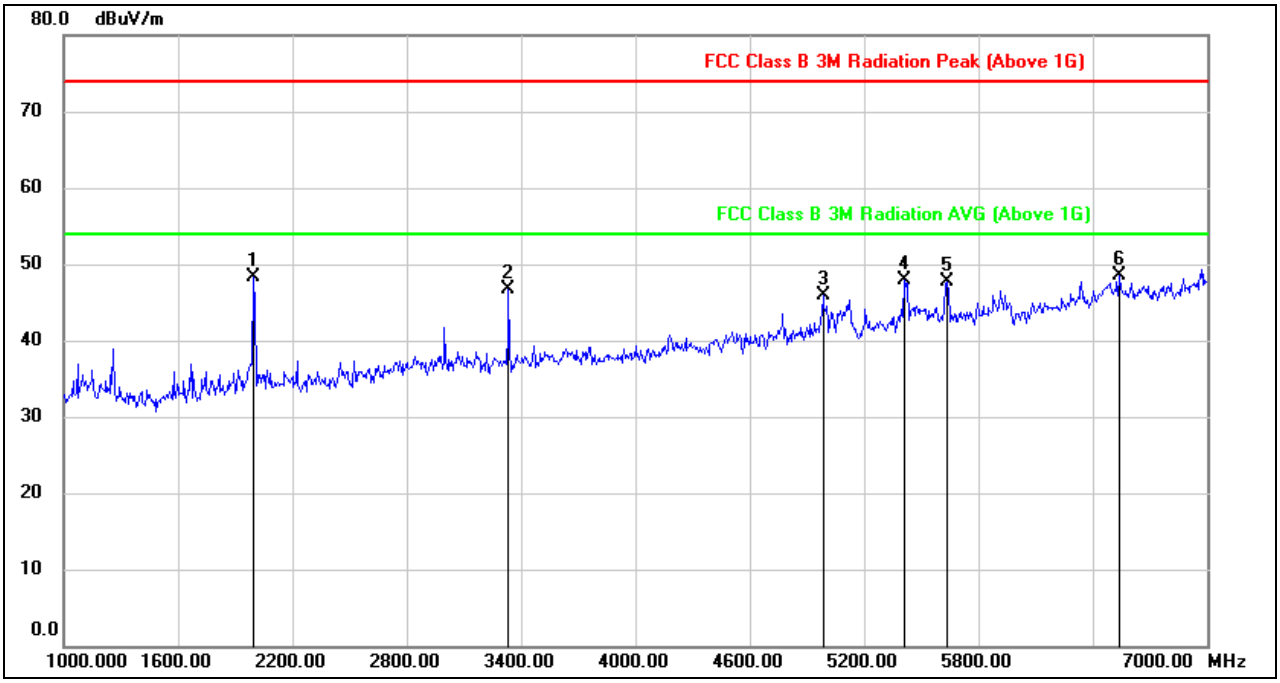


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	8166.000	39.40	8.93	48.33	74.00	-25.67	peak
2	9552.000	38.25	9.81	48.06	74.00	-25.94	peak
3	10586.000	37.93	12.00	49.93	74.00	-24.07	peak
4	12313.000	36.55	13.45	50.00	74.00	-24.00	peak
5	14403.000	35.31	16.44	51.75	74.00	-22.25	peak
6	16900.000	32.73	19.24	51.97	74.00	-22.03	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

HARMONICS AND SPURIOUS EMISSIONS MID CHANNEL

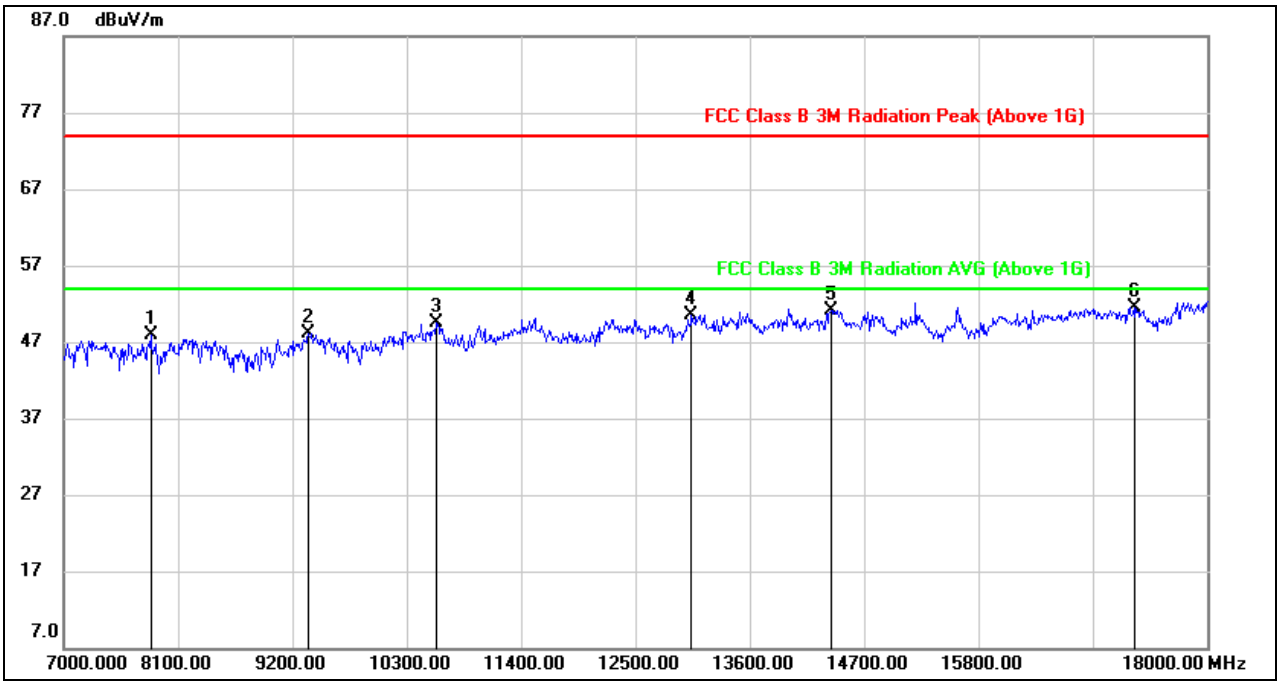
HORIZONTAL RESULTS
1-7GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1996.000	59.02	-10.70	48.32	74.00	-25.68	peak
2	3334.000	52.58	-5.78	46.80	74.00	-27.20	peak
3	4984.000	46.05	-0.10	45.95	74.00	-28.05	peak
4	5410.000	47.13	0.80	47.93	74.00	-26.07	peak
5	5632.000	45.90	1.79	47.69	74.00	-26.31	peak
6	6538.000	43.12	5.40	48.52	74.00	-25.48	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

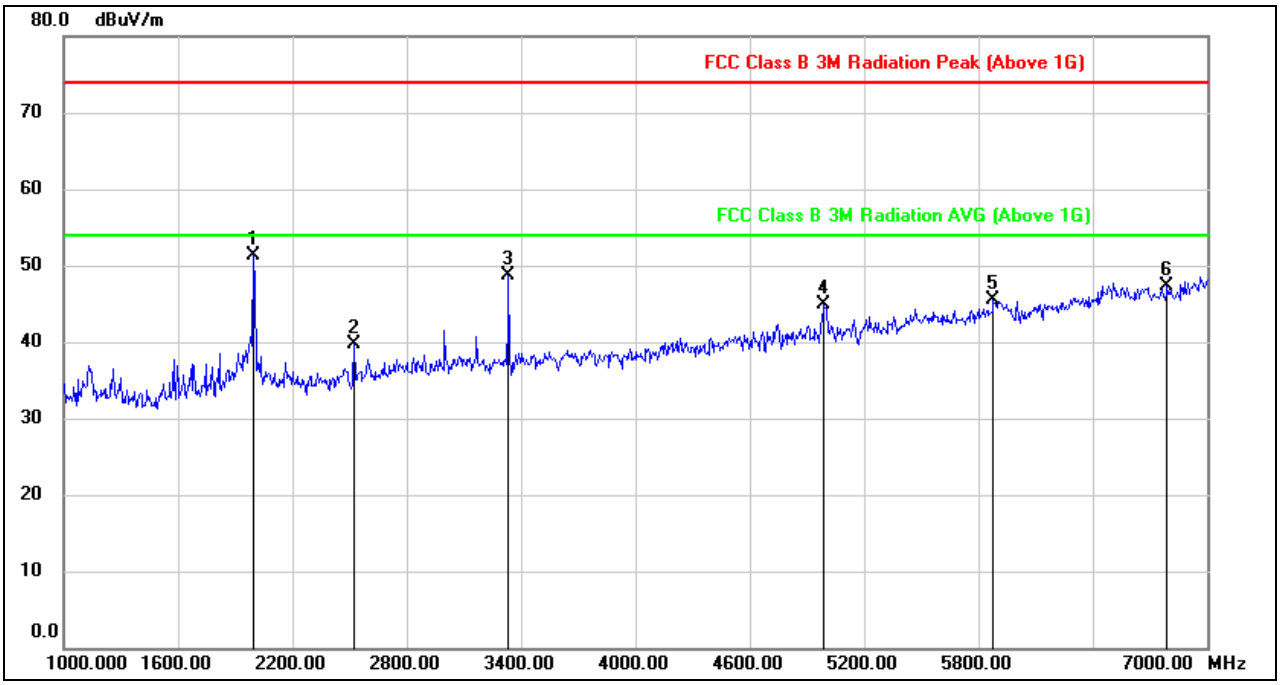
HORIZONTAL RESULTS
7-18GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7836.000	39.64	8.31	47.95	74.00	-26.05	peak
2	9354.000	38.64	9.51	48.15	74.00	-25.85	peak
3	10586.000	37.42	12.00	49.42	74.00	-24.58	peak
4	13039.000	36.09	14.49	50.58	74.00	-23.42	peak
5	14381.000	34.73	16.40	51.13	74.00	-22.87	peak
6	17296.000	30.33	21.13	51.46	74.00	-22.54	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

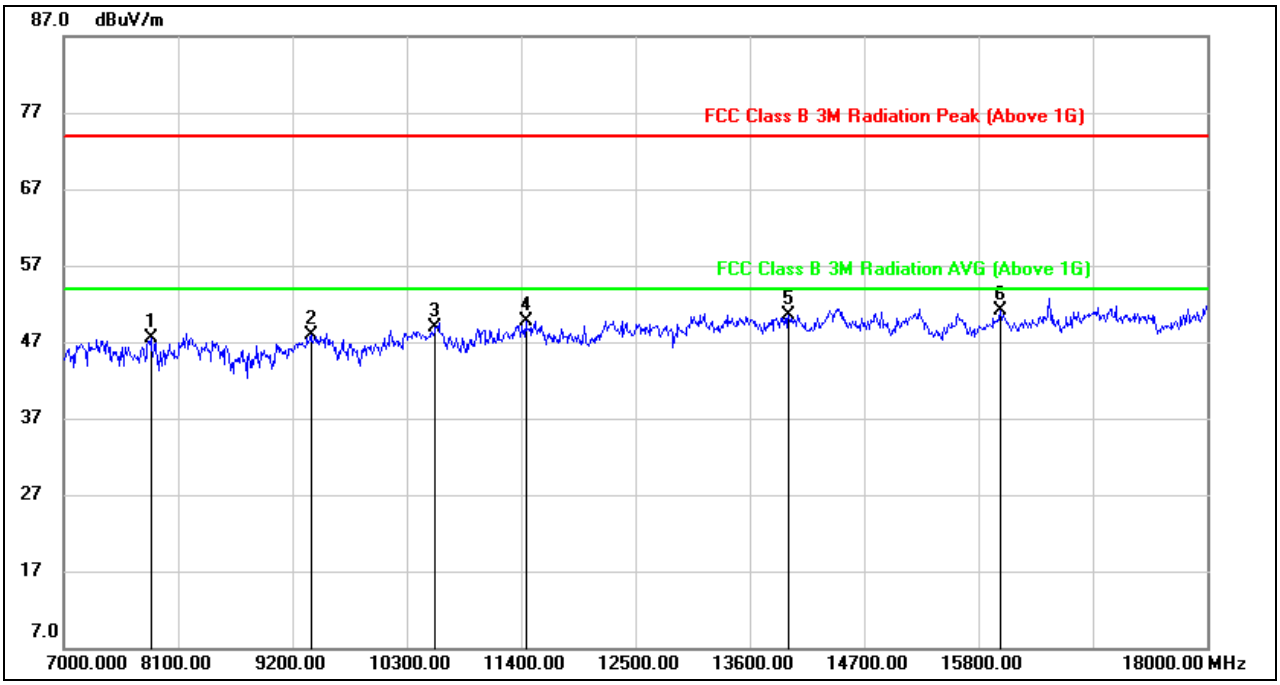
VERTICAL RESULTS
1-7GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1996.000	62.10	-10.70	51.40	74.00	-22.60	peak
2	2524.000	48.00	-8.22	39.78	74.00	-34.22	peak
3	3334.000	54.56	-5.78	48.78	74.00	-25.22	peak
4	4990.000	44.88	-0.04	44.84	74.00	-29.16	peak
5	5878.000	41.59	3.89	45.48	74.00	-28.52	peak
6	6790.000	42.01	5.37	47.38	74.00	-26.62	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

VERTICAL RESULTS
7-18GHz

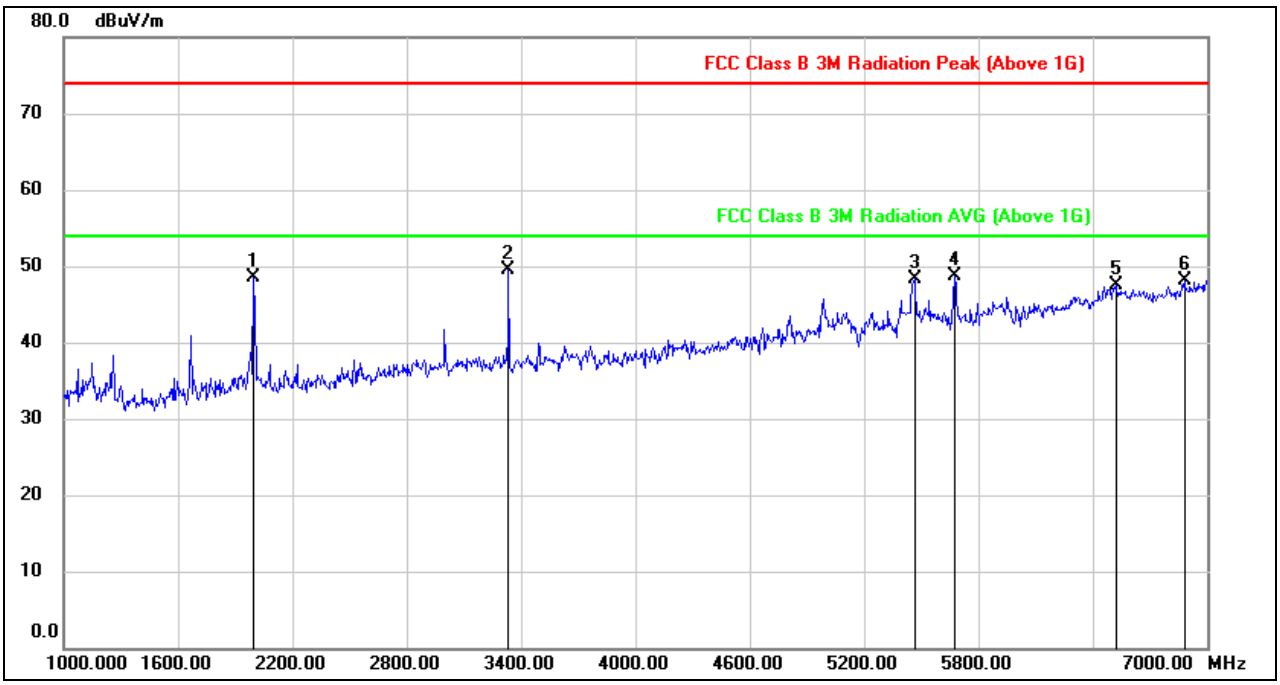


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7836.000	39.15	8.31	47.46	74.00	-26.54	peak
2	9376.000	38.16	9.66	47.82	74.00	-26.18	peak
3	10575.000	37.07	11.89	48.96	74.00	-25.04	peak
4	11444.000	37.13	12.64	49.77	74.00	-24.23	peak
5	13974.000	34.48	15.95	50.43	74.00	-23.57	peak
6	16009.000	34.34	16.84	51.18	74.00	-22.82	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

HARMONICS AND SPURIOUS EMISSIONS HIGH CHANNEL

HORIZONTAL RESULTS
1-7GHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1996.000	59.25	-10.70	48.55	74.00	-25.45	peak
2	3334.000	55.31	-5.78	49.53	74.00	-24.47	peak
3	5464.000	46.66	1.57	48.23	74.00	-25.77	peak
4	5674.000	46.90	1.80	48.70	74.00	-25.30	peak
5	6520.000	41.99	5.45	47.44	74.00	-26.56	peak
6	6880.000	42.06	5.97	48.03	74.00	-25.97	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.