Shenzhen Huatongwei International Inspection Co., Ltd.
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TEST REPORT

Report No.....:	**CHTEW19050131** Report Verification:
Project No.....:	**SHT1904069805EW**
FCC ID..... :	**2AK4CPP20US**
Applicant's name..... :	**Petcube, Inc.**
Address.....:	2711 Centerville Road,Suite 400,Wilmington Delaware United States 19808
Manufacturer.....:	Petcube, Inc.
Address.....:	2711 Centerville Road,Suite 400,Wilmington Delaware United States 19808
Test item description ..... :	**Petcube Play 2**
Trade Mark .....:	Petcube
Model/Type reference.....:	PP20US
Listed Model(s) .....:	-
Standard ..... :	**FCC CFR Title 47 Part 15 Subpart E Section 15.407**
Date of receipt of test sample.....:	May 13, 2019
Date of testing.....:	May 13, 2019- May 29, 2019
Date of issue.....:	May 30, 2019
Result..... .....:	**PASS**

Compiled by (position+printedname+signature)...:	File administrators Echo Wei	Echo Wei
Supervised by (position+printedname+signature)....:	Project Engineer Jerry Zhao	Jerry zhao
Approved by (position+printedname+signature)....:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:
FCC Rules Part 15.407: General technical requirements.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

KDB789033 D02 v02r01: GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E

1.2. Report Version

Revision No.	Date of issue	Description
N/A	2019-05-30	Original

2. TEST DESCRIPTION

Test Item	FCC Rule	Result	Test Engineer
Antenna Requirement	15.203	PASS	JiongSheng.Feng
Line Conducted Emissions (AC Main)	15.207	PASS	Zhiwei Liu
Maximum Conducted Output Power	15.407(a)	PASS	JiongSheng.Feng
Maximum Power Spectral Density	15.407(a)	PASS	JiongSheng.Feng
26dB Bandwidth and 99% Ocuppy bandwith	15.407(a)	PASS	JiongSheng.Feng
6dB Bandwidth	15.407(a)	PASS	JiongSheng.Feng
Band edge	15.407(b)	PASS	JiongSheng.Feng
Radiated Spurious Emissions	15.209	PASS	Tony Duan
Frequency Stability	15.407(g)	PASS	JiongSheng.Feng

Remark: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	Petcube, Inc.
Address:	2711 Centerville Road,Suite 400,Wilmington Delaware United States 19808
Manufacturer:	Petcube, Inc.
Address:	2711 Centerville Road,Suite 400,Wilmington Delaware United States 19808

3.2. Product Description

Name of EUT	Petcube Play 2		
Trade Mark:	Petcube		
Model No.:	PP20US		
Listed Model(s):	-		
Power supply:	DC 5V, 2A		
Adapter information 1:	-		
Adapter information 2:	-		
5G WIFI			
Supported type:	☒ 802.11a	☒ 802.11n(HT20)	☒ 802.11n(HT40)
	☒ 802.11ac(HT20)	☒ 802.11ac(HT40)	☒ 802.11ac(HT80)
Function:	☐ Outdoor AP	☐ Indoor AP	☐ Fixed P2P
	☒ Client		
DFS type:	☐ master devices	☐ Slave devices with radar detection	☒ Slave devices without radar detection
Modulation:	BPSK, QPSK, 16QAM, 64QAM		
Operation frequency:	☒ Band I:	5150MHz~5250MHz	
	☒ Band II:	5250MHz~5350MHz	
	☒ Band III:	5470MHz~5725MHz	
	☒ Band IV:	5725MHz~5850MHz	
Supported Bandwidth	20MHz:	802.11ac, 802.11n, 802.11a	
	40MHz:	802.11ac, 802.11n	
	80MHz:	802.11ac	
Antenna type:	1 Transmit, 1 Receive		
Antenna gain:	0.5dB		

3.3. Operation state

➢ **Frequency list**

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

Band	Test Channel	20MHz		40MHz		80MHz	
		Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
I	CH_L	36	5180	38	5190	-	-
	CH_M	44	5220	-	-	42	5210
	CH_H	48	5240	46	5230	-	-
II	CH_L	52	5260	54	5270	-	-
	CH_M	56	5280	-	-	58	5290
	CH_H	64	5320	62	5310	-	-
III	CH_L	100	5500	102	5510	106	5530
	CH_M	120	5600	118	5590	122	5610
	CH_H	140	5700	134	5670	138	5690
IV	CH_L	149	5745	151	5755	-	-
	CH_M	157	5785	-	-	155	5775
	CH_H	165	5825	159	5795	-	-

➢ **Data Rated**

Preliminary tests were performed in different data rate, and found which the below bit rate is worst case mode, so only show data which it is a worst case mode.

Mode	Data rate (worst mode)
802.11a	6Mbps
802.11n(HT20)/ 802.11ac(HT20)	MCS0
802.11n(HT40)/ 802.11ac(HT40)	MCS0
802.11ac(HT80)	MCS0

➢ **Test mode**

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).
For AC power line conducted emissions:
The EUT was set to connect with the WLAN AP under large package sizes transmission.
For Radiated suprious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit(duty cycle>98%). The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- ● - supplied by the manufacturer
- ○ - supplied by the lab

○	-	Manufacturer :	-
		Model No. :	-
○	-	Manufacturer :	-
		Model No. :	-

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. Test Facility

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

IC-Registration No.:5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377B-1.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 “Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1” and TR-100028-02 “Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2” and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.51 dB	(1)
Conducted spurious emissions 9kHz~40GHz	0.63 dB	(1)
Conducted Disturbance 150kHz~30MHz	3.02 dB	(1)
Radiated Emissions below 1GHz	4.90 dB	(1)
Radiated Emissions above 1GHz	4.96 dB	(1)
Occupied Bandwidth	70 Hz	(1)
Frequency error	70 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.5. Equipments Used during the Test

●	Conducted Emission					
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	ESCI	101247	2018/10/27	2019/10/26
●	Artificial Mains	SCHWARZBECK	NNLK 8121	573	2018/10/27	2019/10/26
●	Pulse Limiter	R&S	ESH3-Z2	100499	2018/10/27	2019/10/26
●	RF Connection Cable	HUBER+SUHNER	EF400	N/A	2018/11/15	2019/11/14
●	Test Software	R&S	ES-K1	N/A	N/A	N/A
○	Single Balanced Telecom Pair ISN	FCC	FCC-TLISN-T2-02	20371	2018/10/28	2019/10/27
○	Two Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T4-02	20373	2018/10/28	2019/10/27
○	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T8-02	20375	2018/10/28	2019/10/27
○	V-Network	R&S	ESH3-Z6	100211	2018/10/27	2019/10/26
○	V-Network	R&S	ESH3-Z6	100210	2018/10/27	2019/10/26
○	2-Line V-Network	R&S	ESH3-Z5	100049	2018/10/27	2019/10/26
●	Radiated Emission-6th test site					
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	SAC-3m-02	N/A	2018/09/30	2021/09/29
●	EMI Test Receiver	R&S	ESCI	100900	2018/10/28	2019/10/27
●	Loop Antenna	R&S	HFH2-Z2	100020	2017/11/20	2020/11/19
●	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	546	2017/04/05	2020/04/04
●	Pre-Amplifer	SCHWARZBECK	BBV 9742	N/A	2018/11/15	2019/11/14
●	RF Connection Cable	HUBER+SUHNER	N/A	N/A	2018/09/28	2019/09/27
●	RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	2018/09/28	2019/09/27
●	Test Software	R&S	ES-K1	N/A	N/A	N/A
●	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
●	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A
●	Radiated emission-7th test site					
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	SAC-3m-01	N/A	2018/09/30	2021/09/29
●	Spectrum Analyzer	R&S	FSP40	100597	2018/10/27	2019/10/26
●	Horn Antenna	SCHWARZBECK	9120D	1011	2017/03/27	2020/03/26
●	Pre-amplifier	BONN	BLWA0160-2M	1811887	2018/11/14	2019/11/13
●	Pre-amplifier	CD	PAP-0102	12004	2018/11/14	2019/11/13
●	Broadband Pre-amplifier	SCHWARZBECK	BBV 9718	9718-248	2019/04/28	2020/04/27
●	RF Connection Cable	HUBER+SUHNER	RE-7-FH	N/A	2018/11/15	2019/11/14
●	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	2018/11/15	2019/11/14
●	Test Software	Audix	E3	N/A	N/A	N/A
●	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
●	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

● RF Conducted Method						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2018/10/28	2019/10/27
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2018/09/29	2019/09/28
●	OSP	R&S	OSP120	101317	N/A	N/A
○	Radio communication tester	R&S	CMW500	137688-Lv	2018/09/29	2019/09/28
○	Test software	Tonscend	JS1120-1(LTE)	N/A	N/A	N/A
○	Test software	Tonscend	JS1120-2(WIFI)	N/A	N/A	N/A
○	Test software	Tonscend	JS1120-3(WCDMA)	N/A	N/A	N/A
○	Test software	Tonscend	JS1120-4(GSM)	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

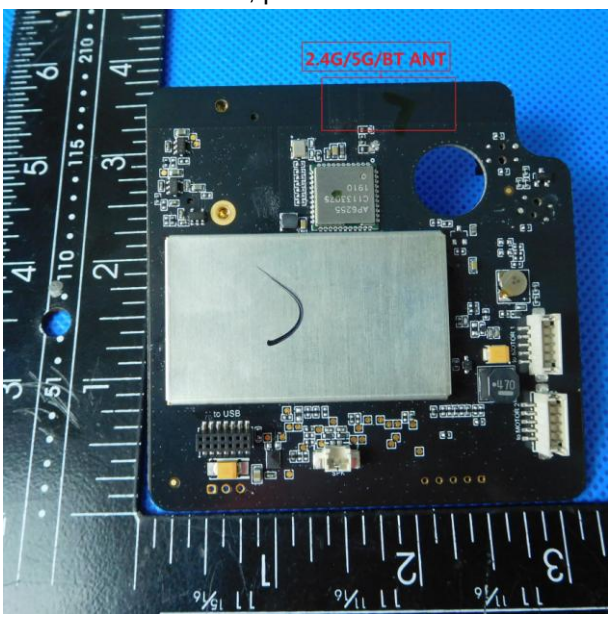
Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of anantenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Result:

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



5.2. Conducted Emissions (AC Main)

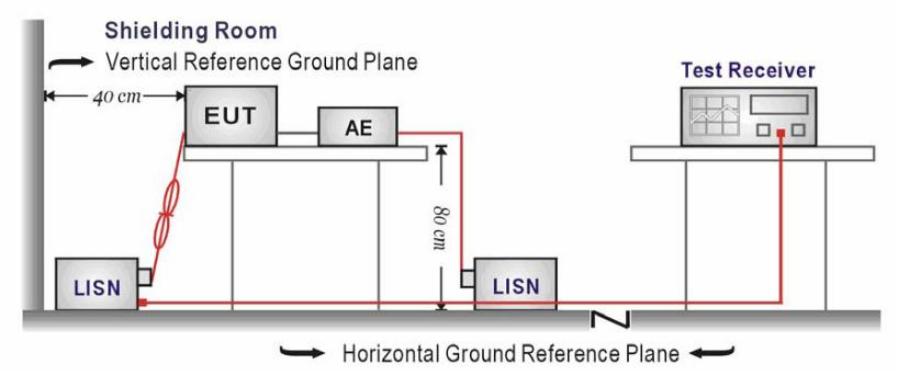
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor,was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE:

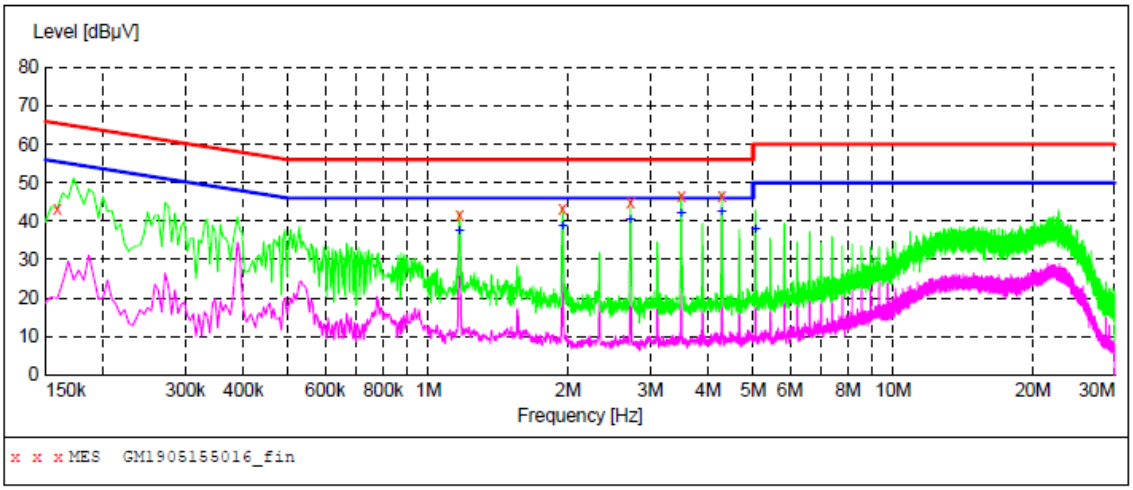
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:
1) Transd=Cable lose+ Pulse Limiter Factor + Artificial Mains Factor
2) Margin= Limit -Level

Test Line:	L



MEASUREMENT RESULT: "GM1905155016_fin"

5/15/2019 1:32PM

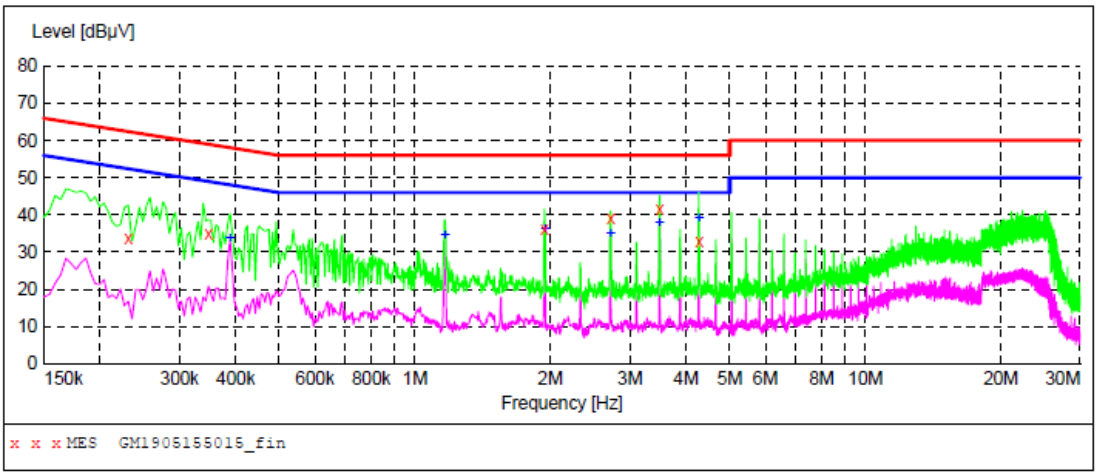
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	43.30	9.9	66	22.2	QP	L1	GND
1.167000	41.70	9.9	56	14.3	QP	L1	GND
1.945500	43.10	9.9	56	12.9	QP	L1	GND
2.724000	44.80	9.9	56	11.2	QP	L1	GND
3.502500	46.50	9.9	56	9.5	QP	L1	GND
4.281000	46.70	9.9	56	9.3	QP	L1	GND

MEASUREMENT RESULT: "GM1905155016_fin2"

5/15/2019 1:32PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.167000	37.40	9.9	46	8.6	AV	L1	GND
1.945500	38.70	9.9	46	7.3	AV	L1	GND
2.724000	40.30	9.9	46	5.7	AV	L1	GND
3.502500	42.20	9.9	46	3.8	AV	L1	GND
4.281000	42.40	9.9	46	3.6	AV	L1	GND
5.059500	37.80	10.0	50	12.2	AV	L1	GND

Test Line:	N



MEASUREMENT RESULT: "GM1905155015_fin"

5/15/2019 1:29PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.231000	33.80	9.9	62	28.6	QP	N	GND
0.348000	34.80	9.9	59	24.2	QP	N	GND
1.941000	36.10	9.9	56	19.9	QP	N	GND
2.719500	38.90	9.9	56	17.1	QP	N	GND
3.498000	41.50	9.9	56	14.5	QP	N	GND
4.272000	32.90	9.9	56	23.1	QP	N	GND

MEASUREMENT RESULT: "GM1905155015_fin2"

5/15/2019 1:29PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.388500	33.50	9.9	48	14.6	AV	N	GND
1.167000	34.70	9.9	46	11.3	AV	N	GND
1.945500	36.10	9.9	46	9.9	AV	N	GND
2.719500	34.90	9.9	46	11.1	AV	N	GND
3.498000	37.90	9.9	46	8.1	AV	N	GND
4.276500	39.00	9.9	46	7.0	AV	N	GND

5.3. Maximum Conducted Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a):

For the 5.15~5.25GHz band:

- Outdoor AP
  The maximum conducted output power (P_{out}) shall not exceed the lesser of 1W (30dBm).
  if G_{Tx}>6dBi, then P_{out} =30-(G_{Tx}-6). e.i.r.p. at any elevation angle above 30 degrees≤125mW (21dBm)
- Indoor AP
  The maximum conducted output power (P_{out}) shall not exceed the lesser of 1W (30dBm).
  if G_{Tx}>6dBi, then Pout =30-(G_{Tx}-6).
- Point-to-point AP
  The maximum conducted output power (P_{out}) shall not exceed the lesser of 1W (30dBm).
  if G_{Tx}>23dBi, then Pout =30-(G_{Tx}-23).
- Client devices
  The maximum conducted output power (P_{out}) shall not exceed the lesser of 250W (24dBm).
  if G_{Tx}>6dBi, then Pout =24-(G_{Tx}-6).

For the 5.25~5.35GHz band:

The maximum conducted output power (P_{out}) shall not exceed the lesser of 250mW (24dBm) or 11dBm+10 log B, where B is the 26dB emission bandwith in MHz.
if G_{Tx}>6dBi, then P_{out} =24-(G_{Tx}-6).

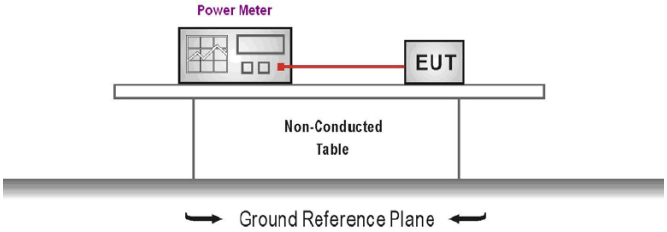
For the 5.47~5.725GHz band:

The maximum conducted output power (P_{out}) shall not exceed the lesser of 250mW (24dBm) or 11dBm+10 log B, where B is the 26dB emission bandwith in MHz.
if G_{Tx}>6dBi, then P_{out} =24-(G_{Tx}-6).

For the 5.725~5.85GHz band:

- Point-to-multipoint systems (P2M)
  The maximum conducted output power (P_{out}) shall not exceed the lesser of 1W (30dBm).
  if G_{Tx}>6dBi, then P_{out} =30-(G_{Tx}-6).
- Point-to-point systems (P2P)
  The maximum conducted output power (P_{out}) shall not exceed the lesser of 1W (30dBm).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was tested according to KDB789033 Section E-3-b)
2. The maximum conducted output power may be measured using a broadband AVG RF power meter.
3. Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor.
4. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.
5. Record the measurement data.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Band	Bandwidth (MHz)	Type	Channel	Conducted Output Power (dBm)	Limit (dBm)	Result
I	20	802.11ac	CH_L	15.35	24.00	Pass
			CH_M	15.37		
			CH_H	15.78		
		802.11n	CH_L	15.07	24.00	Pass
			CH_M	15.00		
			CH_H	15.65		
		802.11a	CH_L	14.83	24.00	Pass
			CH_M	14.79		
			CH_H	15.28		
	40	802.11ac	CH_L	15.58	24.00	Pass
			CH_H	15.69		
		802.11n	CH_L	15.06	24.00	Pass
			CH_H	15.94		
	80	802.11ac	CH_M	15.88	24.00	Pass
II	20	802.11ac	CH_L	15.57	24.00	Pass
			CH_M	15.38		
			CH_H	16.16		
		802.11n	CH_L	15.71	24.00	Pass
			CH_M	15.37		
			CH_H	16.07		
		802.11a	CH_L	15.42	24.00	Pass
			CH_M	15.04		
			CH_H	15.83		
	40	802.11ac	CH_L	15.86	24.00	Pass
			CH_H	16.09		
		802.11n	CH_L	15.78	24.00	Pass
			CH_H	15.86		
	80	802.11ac	CH_M	15.91	24.00	Pass

Band	Bandwidth (MHz)	Type	Channel	Conducted Output Power (dBm)	Limit (dBm)	Result
III	20	802.11ac	CH_L	16.09	24.00	Pass
			CH_M	16.22		
			CH_H	15.74		
		802.11n	CH_L	15.49	24.00	Pass
			CH_M	16.25		
			CH_H	15.45		
		802.11a	CH_L	15.41	24.00	Pass
			CH_M	15.91		
			CH_H	15.24		
	40	802.11ac	CH_L	14.68	24.00	Pass
			CH_M	14.95		
			CH_H	14.53		
		802.11n	CH_L	15.33	24.00	Pass
			CH_M	15.71		
			CH_H	15.41		
	80	802.11ac	CH_L	15.47	24.00	Pass
			CH_M	15.39		
			CH_H	14.57		
IV	20	802.11ac	CH_L	15.15	30.00	Pass
			CH_M	13.84		
			CH_H	14.03		
		802.11n	CH_L	15.22	30.00	Pass
			CH_M	13.83		
			CH_H	13.99		
		802.11a	CH_L	14.94	30.00	Pass
			CH_M	13.63		
			CH_H	12.66		
	40	802.11ac	CH_L	15.99	30.00	Pass
			CH_H	14.60		
		802.11n	CH_L	15.47	30.00	Pass
			CH_H	14.32		
	80	802.11ac	CH_M	15.44	30.00	Pass

5.4. Maximum Power Spectral Density

LIMIT

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a):

For the 5.15~5.25GHz band:

- Outdoor AP
  The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
  if G_{Tx}>6dBi, then PSD =17-(G_{Tx}-6).
- Indoor AP
  The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
  if G_{Tx}>6dBi, then PSD =17-(G_{Tx}-6).
- Point-to-point AP
  The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
  if G_{Tx}>23dBi, then PSD =17-(G_{Tx}-23).
- Client devices
  The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
  if G_{Tx}>6dBi, then PSD =11-(G_{Tx}-6).

For the 5.25~5.35GHz band:

The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
if G_{Tx}>6dBi, then PSD =11-(G_{Tx}-6).

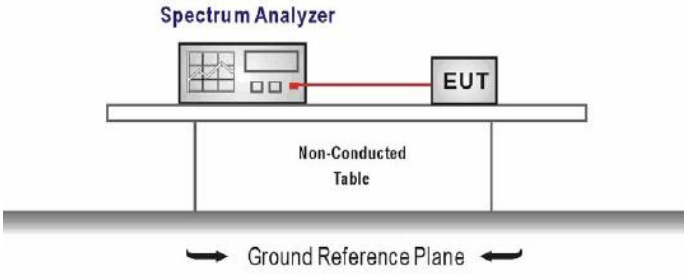
For the 5.47~5.725GHz band:

The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
if G_{Tx}>6dBi, then PSD =11-(G_{Tx}-6).

For the 5.725~5.85GHz band:

- Point-to-multipoint systems (P2M)
  The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.
  if G_{Tx}>6dBi, then PSD =30-(G_{Tx}-6).
- Point-to-point systems (P2P)
  The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. According KDB 789033 D02 – Section F
2. Analyzer was setting as follow:
   Center frequency: test channel
   Span was set to encompass the entire emission bandwidth of the signal
   RBW=1MHz for devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz
   RBW=500kHz for devices operating in the band 5.725-5.85 GHz
   VBW ≥ 3 RBW
   Number of sweep points > 2 x (span/RBW)
   Sweep time = auto
   Detector = Peak
   Trigger was set to free run for all modes, trace was averaged over 100 sweeps
3. The peak search function of the spectrum analyzer was used to find the peak of the spectrum.

TEST MODE:

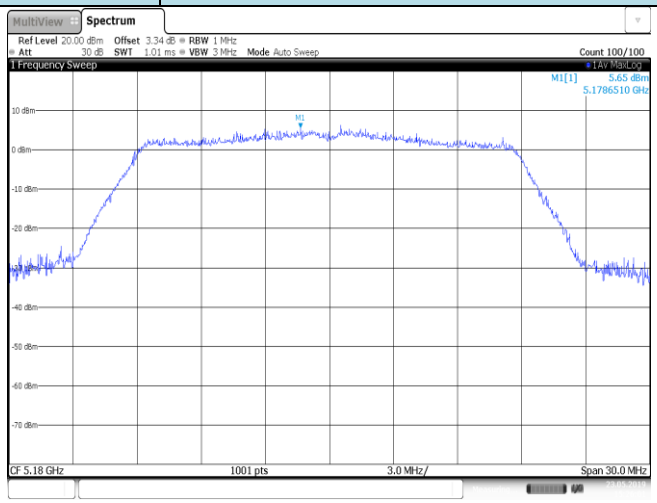
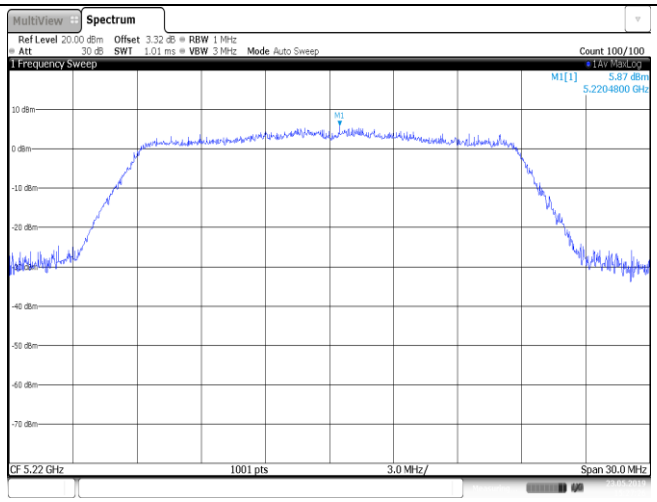
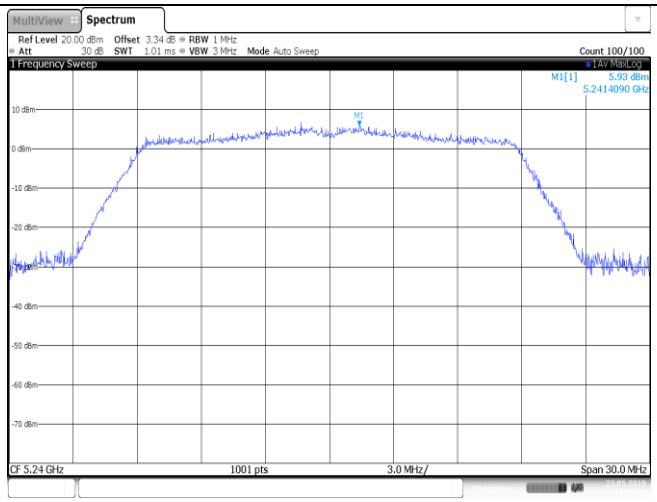
Please refer to the clause 3.3

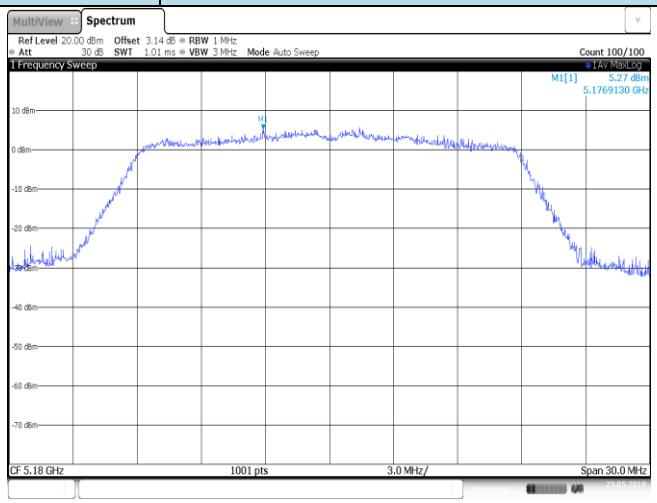
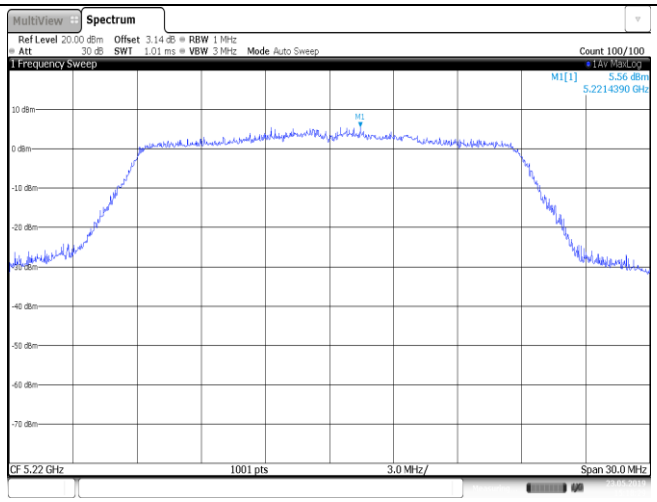
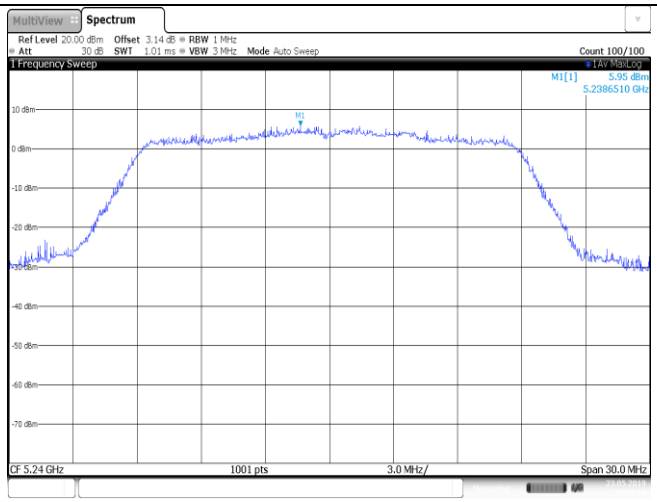
TEST RESULTS
☒ **Passed** ☐ **Not Applicable**

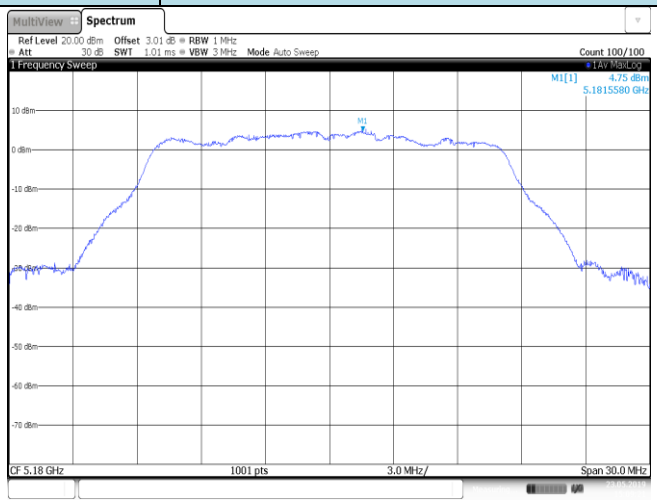
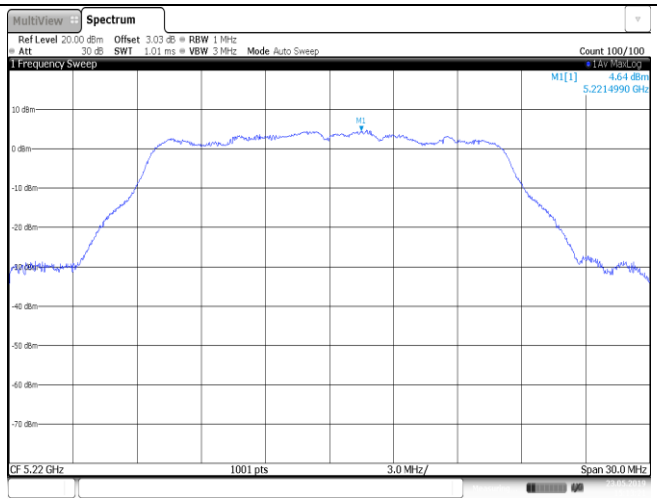
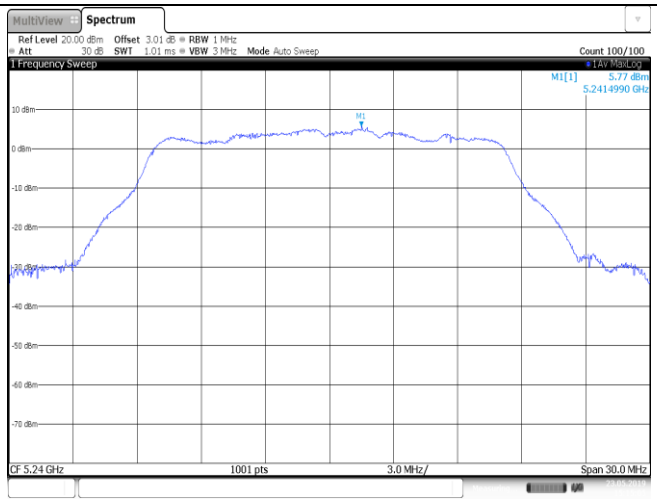
Band	Bandwidth (MHz)	Type	Channel	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Result
I	20	802.11ac	CH_L	5.65	11.00	Pass
			CH_M	5.87		
			CH_H	5.93		
		802.11n	CH_L	5.27	11.00	Pass
			CH_M	5.56		
			CH_H	5.95		
		802.11a	CH_L	4.75	11.00	Pass
			CH_M	4.64		
			CH_H	5.77		
	40	802.11ac	CH_L	4.02	11.00	Pass
			CH_H	4.14		
		802.11n	CH_L	2.70	11.00	Pass
			CH_H	2.71		
	80	802.11ac	CH_M	0.77	11.00	Pass
II	20	802.11ac	CH_L	6.75	11.00	Pass
			CH_M	5.57		
			CH_H	5.84		
		802.11n	CH_L	6.22	11.00	Pass
			CH_M	6.22		
			CH_H	6.23		
		802.11a	CH_L	5.93	11.00	Pass
			CH_M	5.18		
			CH_H	6.01		
	40	802.11ac	CH_L	3.05	11.00	Pass
			CH_H	3.29		
		802.11n	CH_L	3.18	11.00	Pass
			CH_H	3.10		
	80	802.11ac	CH_M	0.29	11.00	Pass

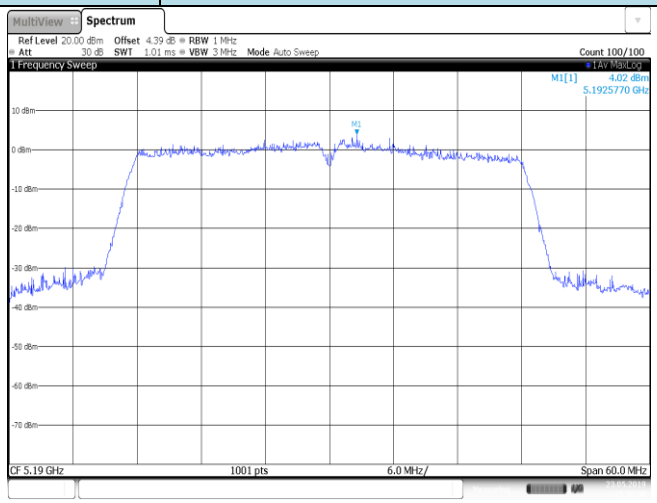
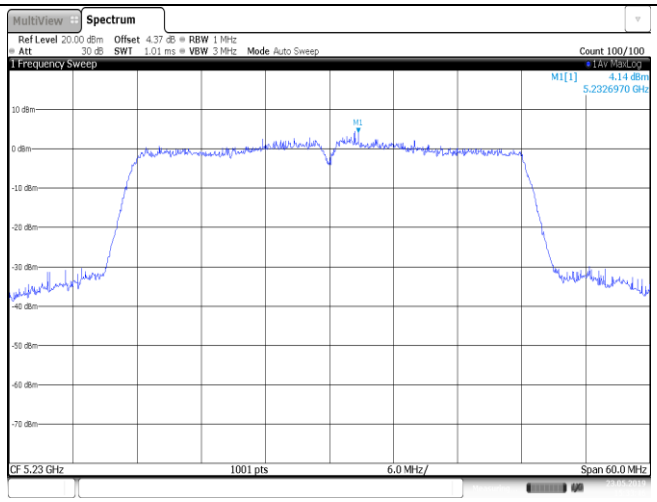
Band	Bandwidth (MHz)	Type	Channel	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Result
III	20	802.11ac	CH_L	6.33	11.00	Pass
			CH_M	6.40		
			CH_H	5.66		
		802.11n	CH_L	6.13	11.00	Pass
			CH_M	6.41		
			CH_H	5.84		
		802.11a	CH_L	6.04	11.00	Pass
			CH_M	6.27		
			CH_H	5.77		
	40	802.11ac	CH_L	3.18	11.00	Pass
			CH_M	3.38		
			CH_H	2.08		
		802.11n	CH_L	3.27	11.00	Pass
			CH_M	2.79		
			CH_H	2.72		
	80	802.11ac	CH_L	-0.37	11.00	Pass
			CH_M	-0.56		
			CH_H	0.35		
Band	Bandwidth (MHz)	Type	Channel	Power Spectral Density (dBm/500kHz)	Limit (dBm/500KHz)	Result
IV	20	802.11ac	CH_L	3.87	30.00	Pass
			CH_M	2.78		
			CH_H	2.17		
		802.11n	CH_L	3.84	30.00	Pass
			CH_M	1.74		
			CH_H	2.40		
		802.11a	CH_L	3.06	30.00	Pass
			CH_M	1.61		
			CH_H	0.74		
	40	802.11ac	CH_L	1.22	30.00	Pass
			CH_H	0.72		
		802.11n	CH_L	1.28	30.00	Pass
			CH_H	-0.49		
	80	802.11ac	CH_M	-1.85	30.00	Pass

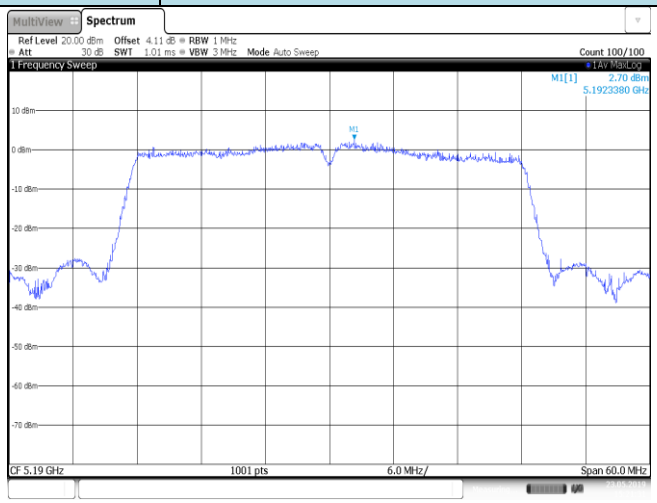
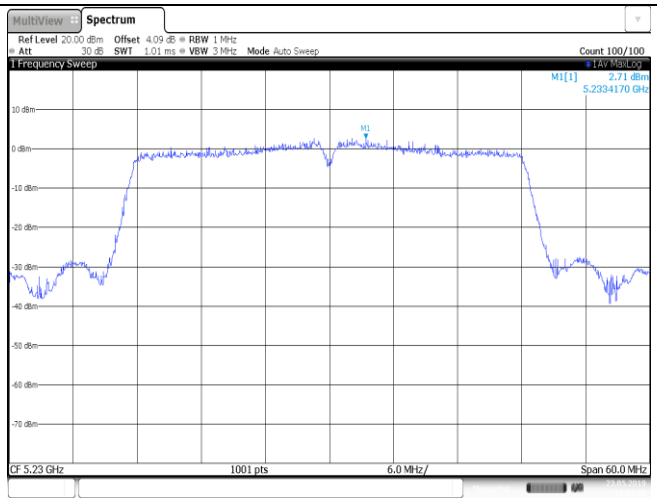
Test plot as follows:

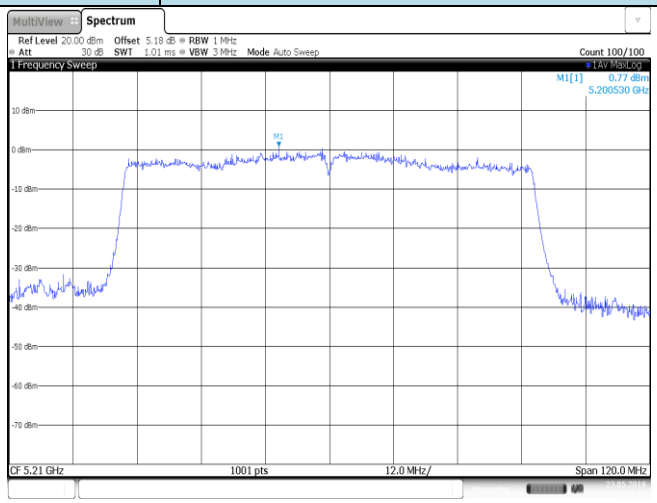
Band I	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

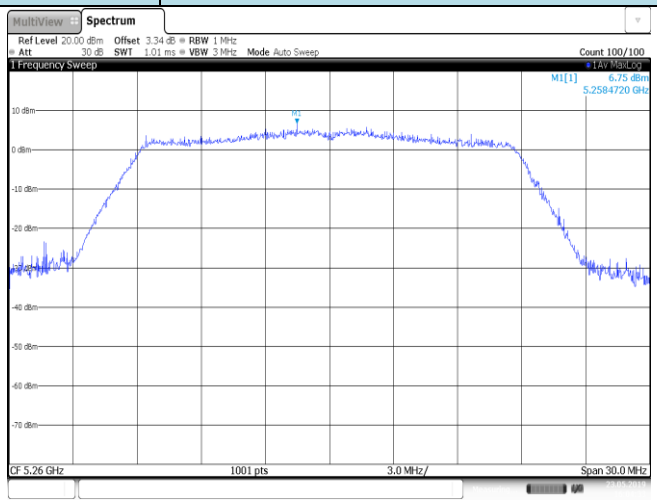
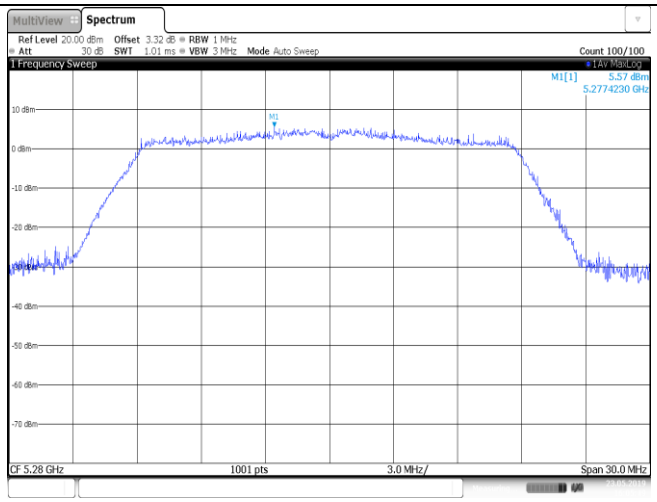
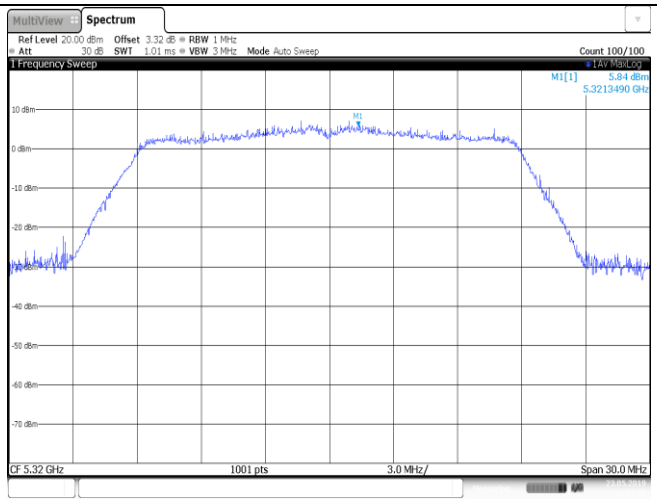
Band I	802.11n (HT20)
CH_L	
CH_M	
CH_H	

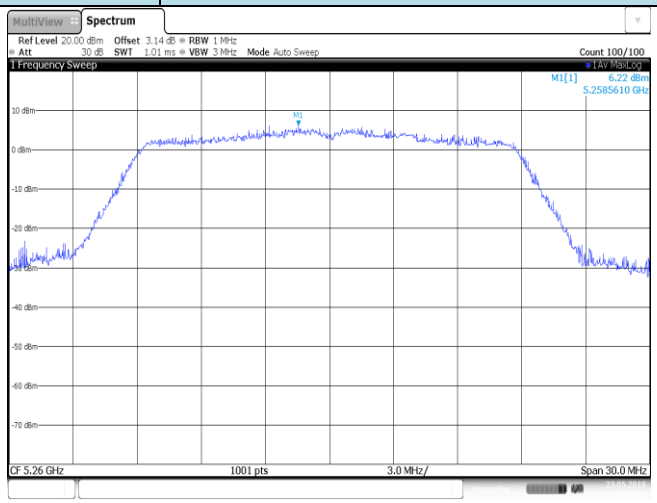
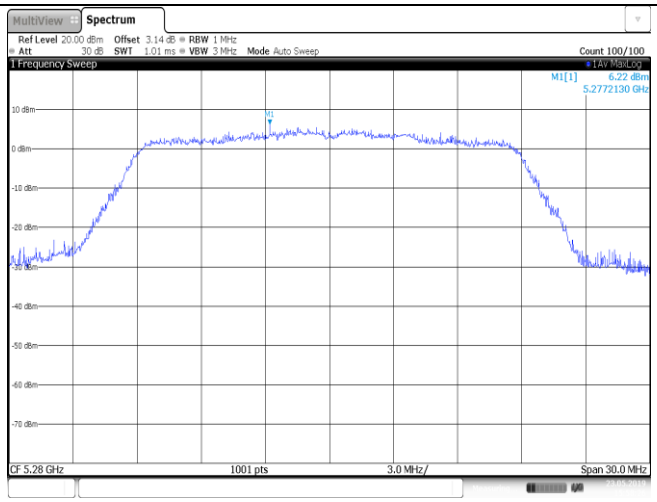
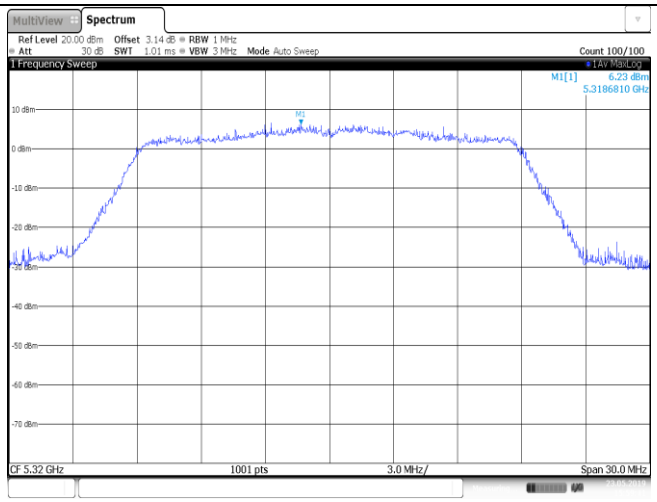
Band I	802.11a
CH_L	
CH_M	
CH_H	

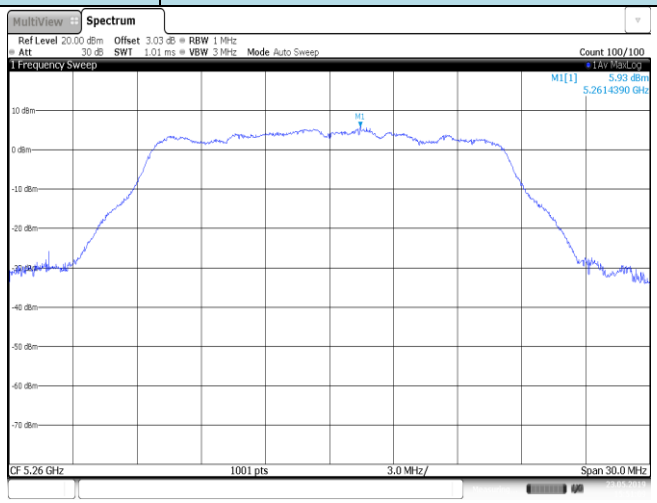
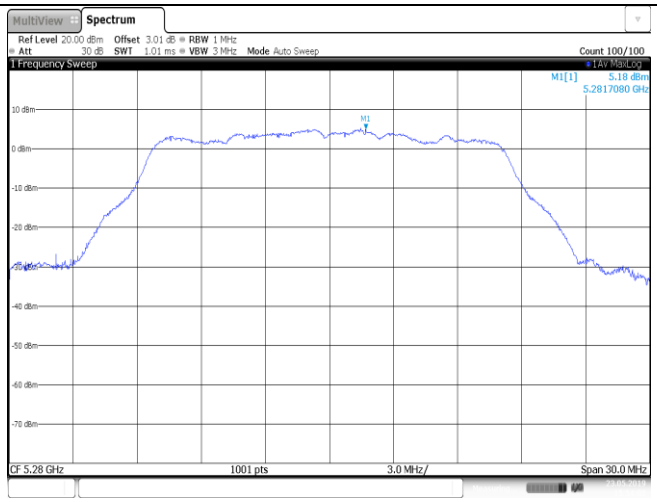
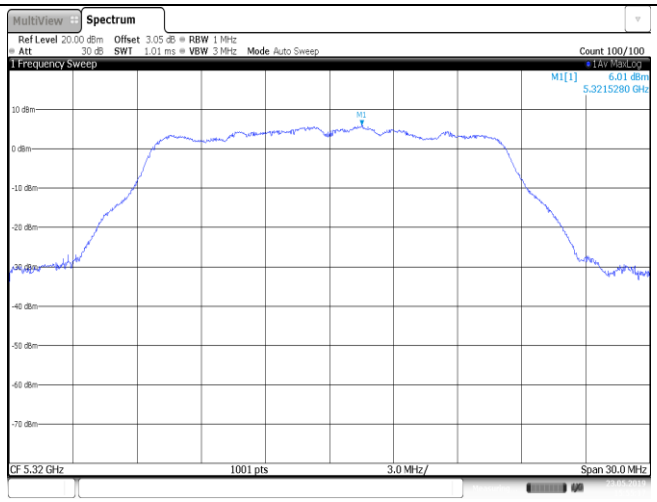
Band I	802.11ac (HT40)
CH_L	
CH_H	

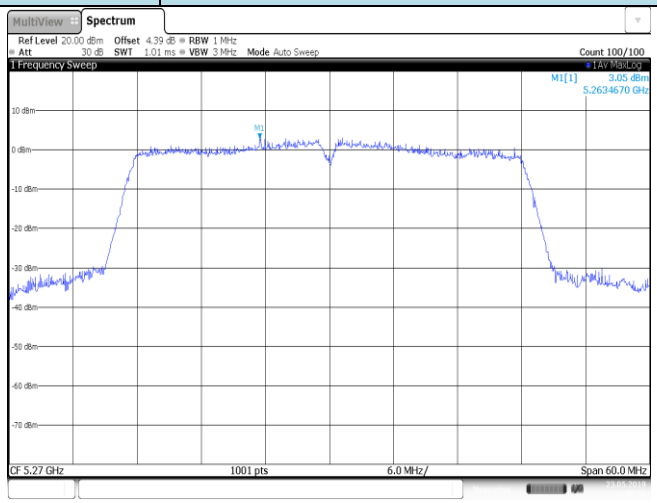
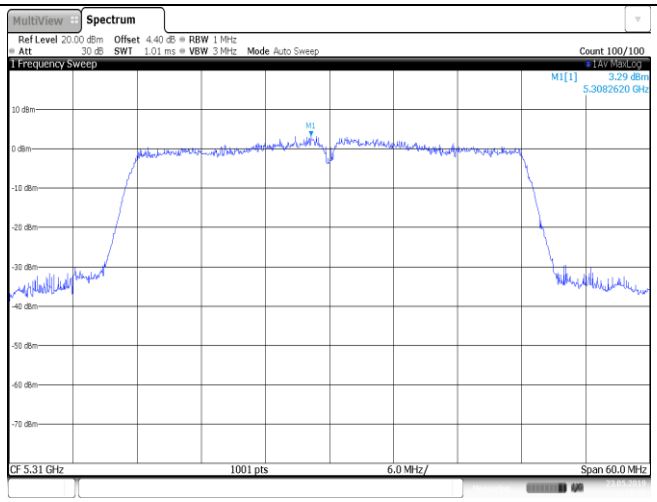
Band I	802.11n (HT40)
CH_L	
CH_H	

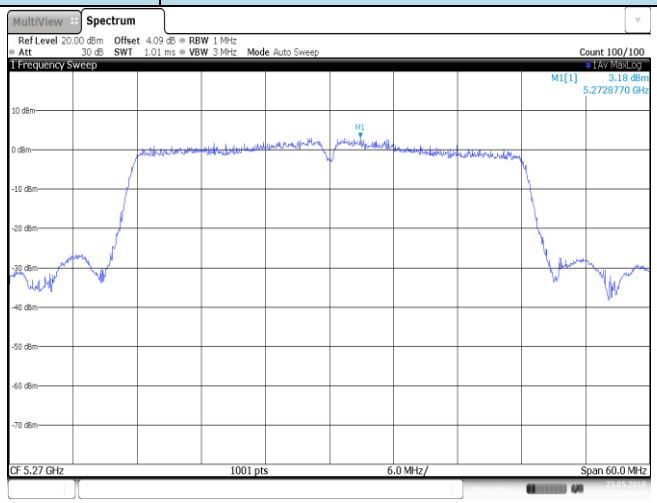
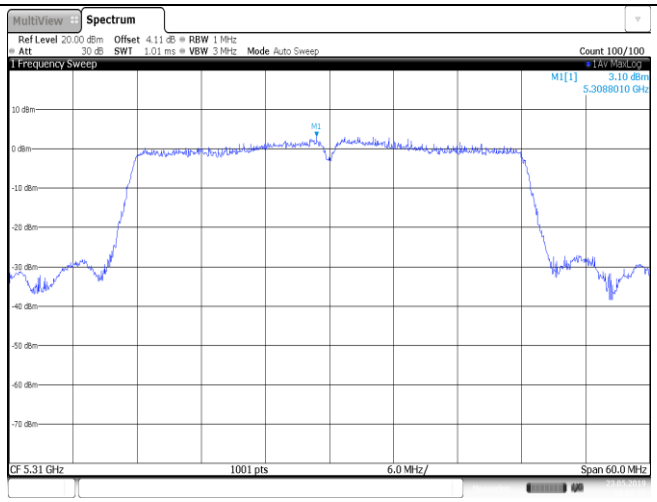
Band I	802.11ac (HT80)
CH_M	

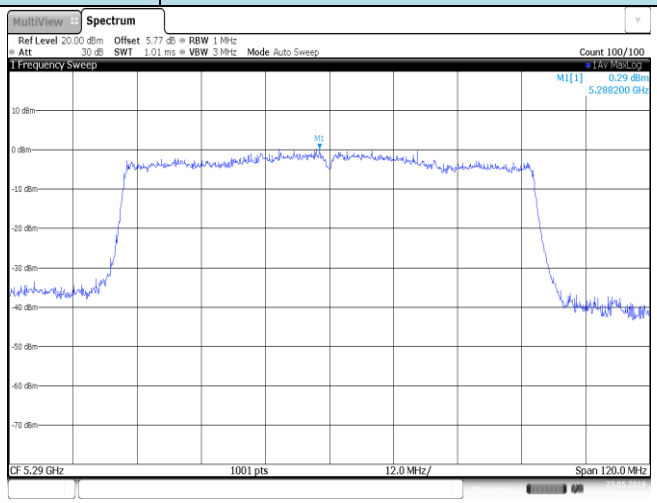
Band II	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

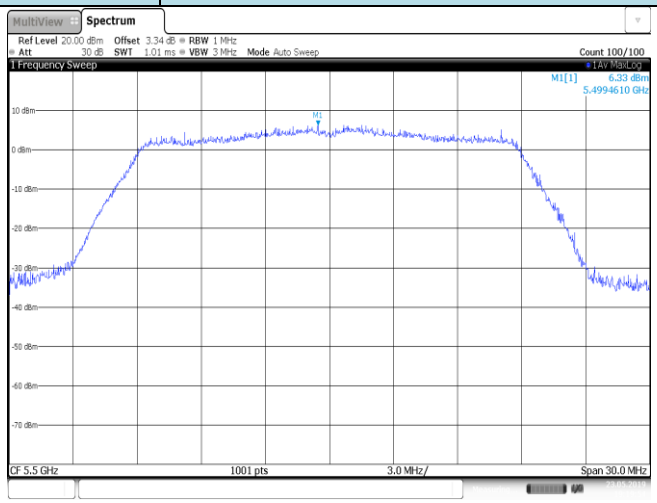
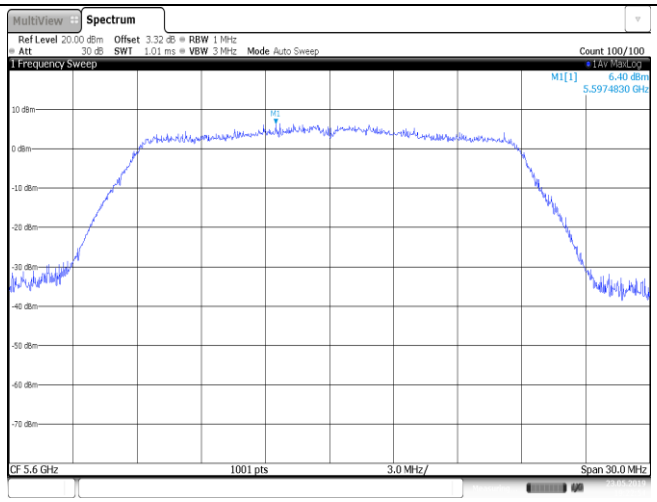
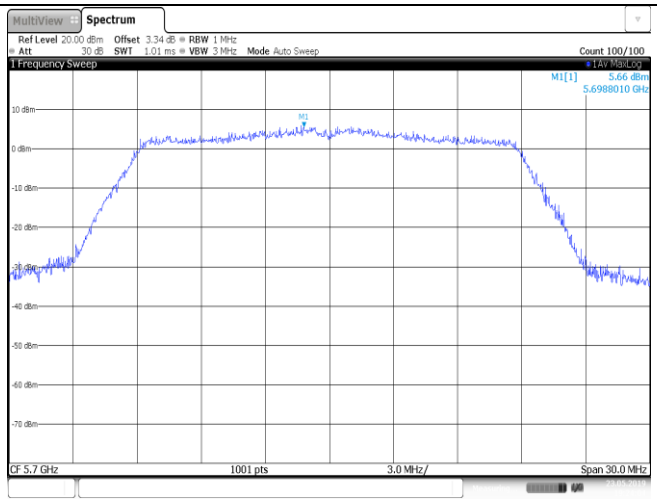
Band II	802.11n (HT20)
CH_L	
CH_M	
CH_H	

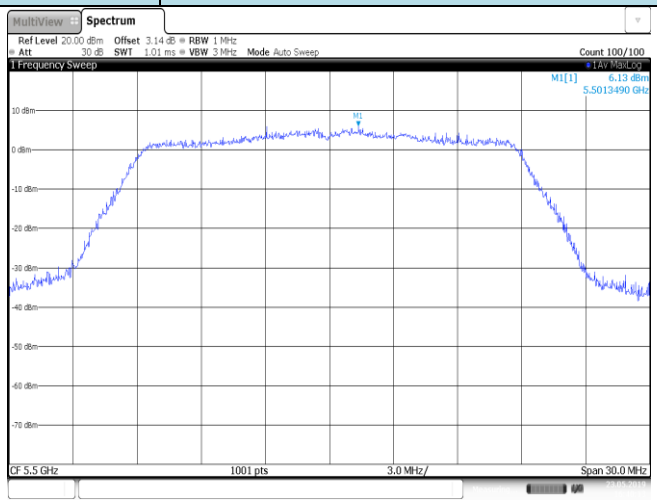
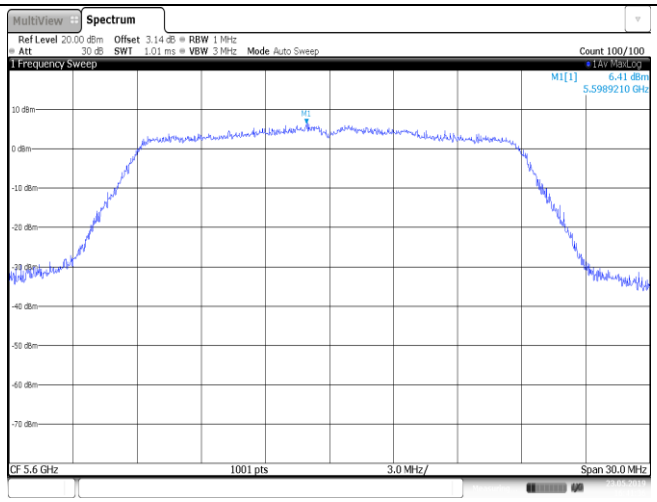
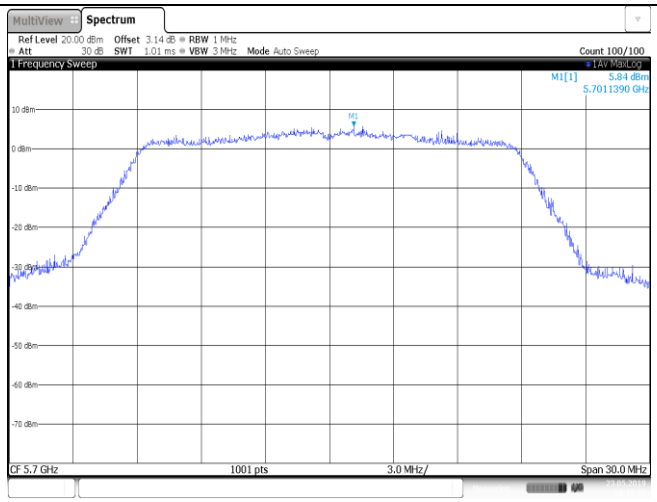
Band II	802.11a
CH_L	
CH_M	
CH_H	

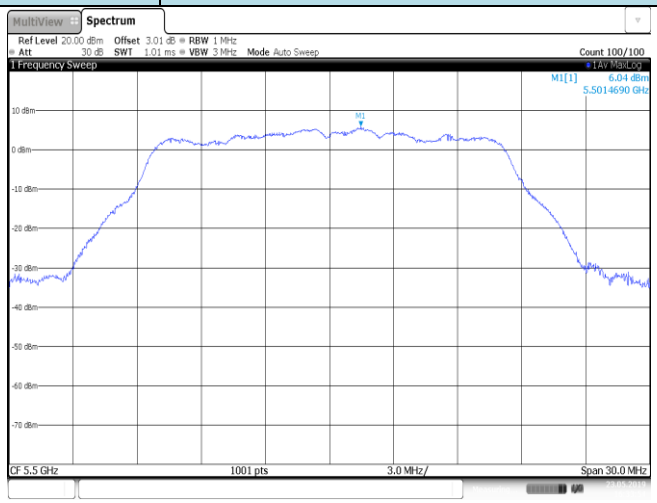
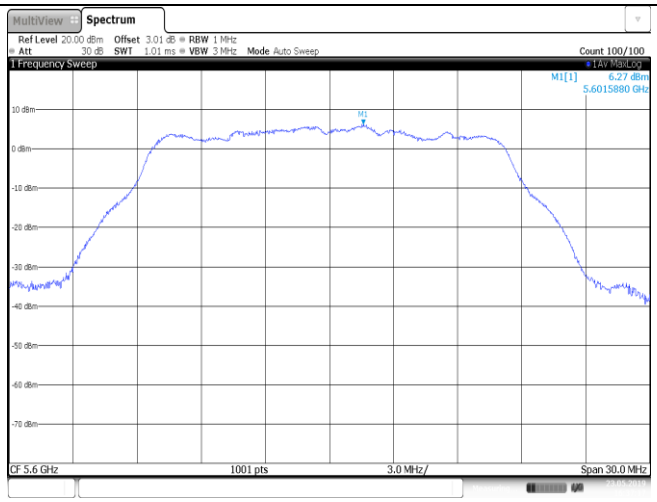
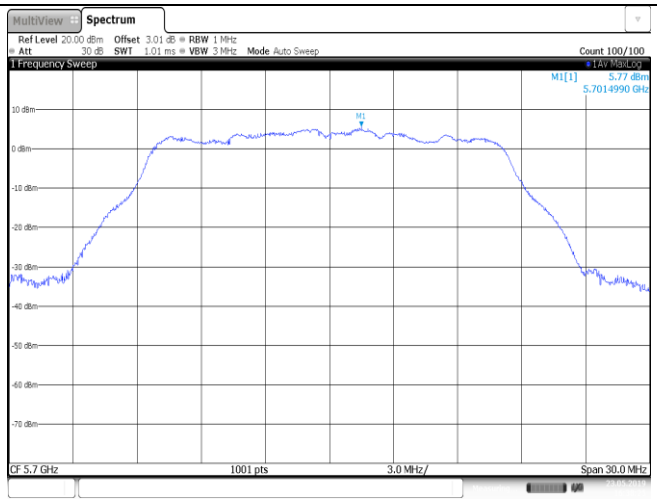
Band II	802.11ac (HT40)
CH_L	
CH_H	

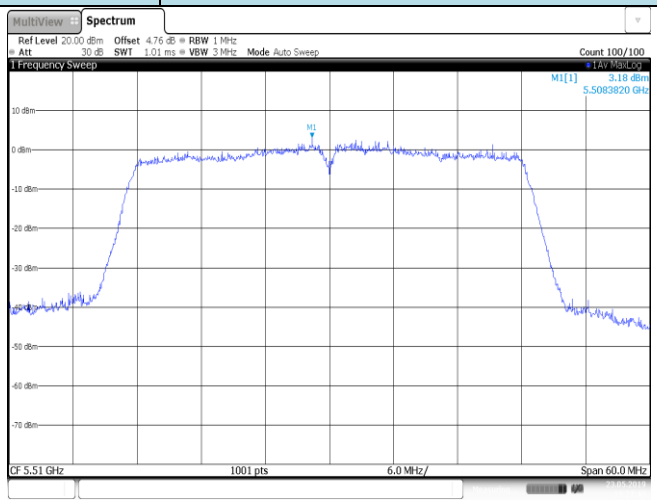
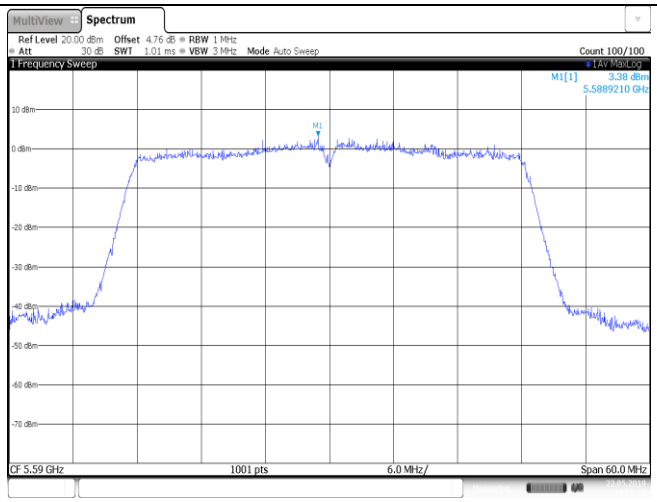
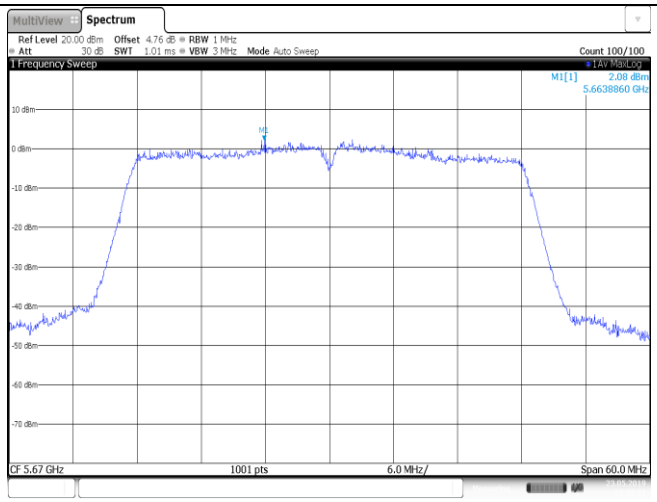
Band II	802.11n (HT40)
CH_L	
CH_H	

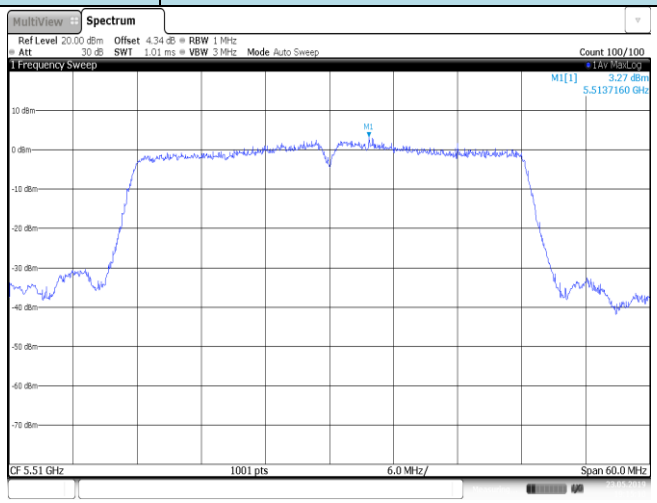
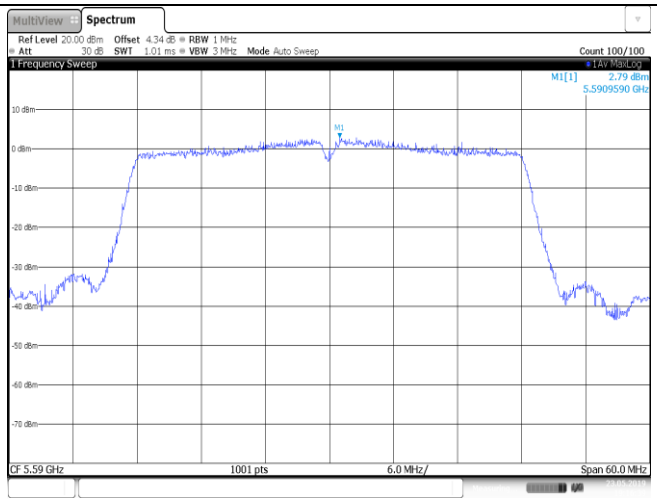
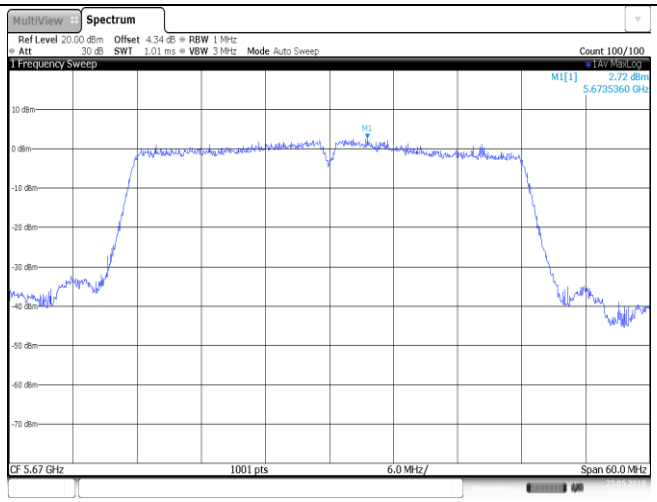
Band II	802.11ac (HT80)
CH_M	

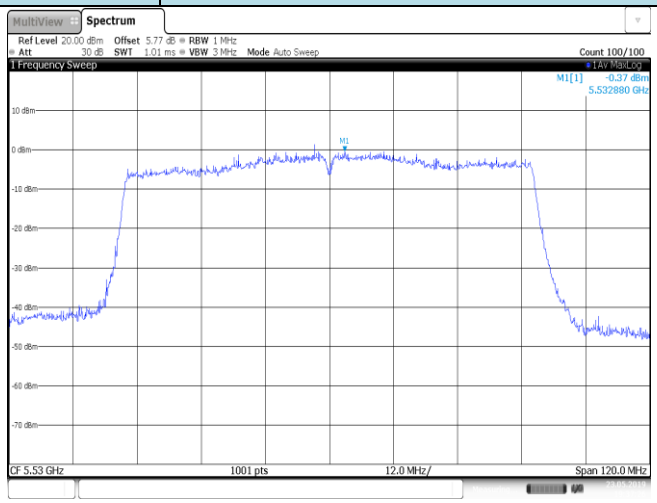
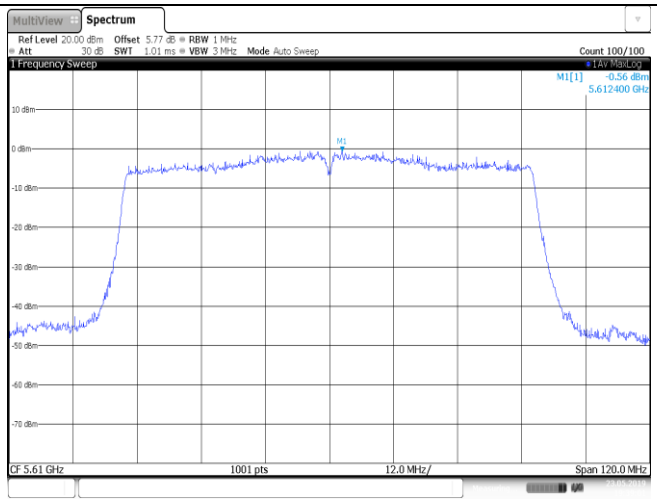
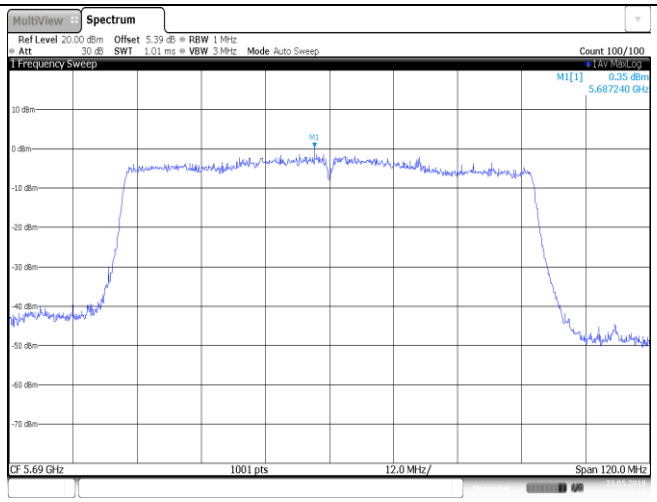
Band III	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

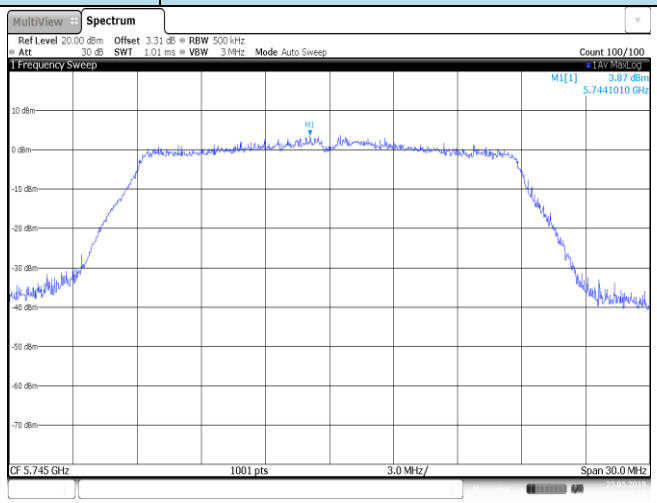
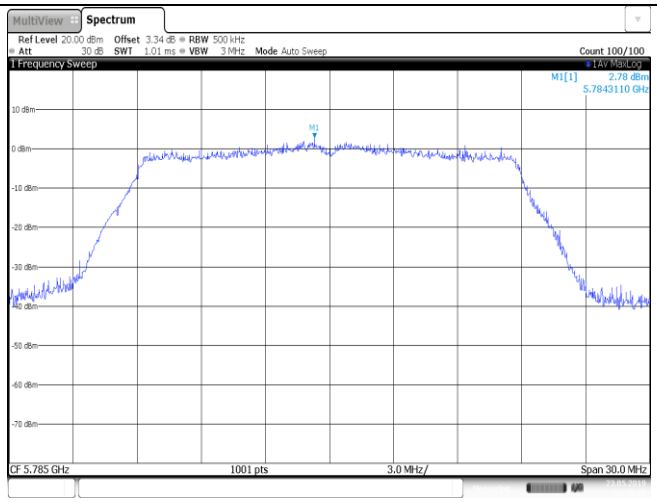
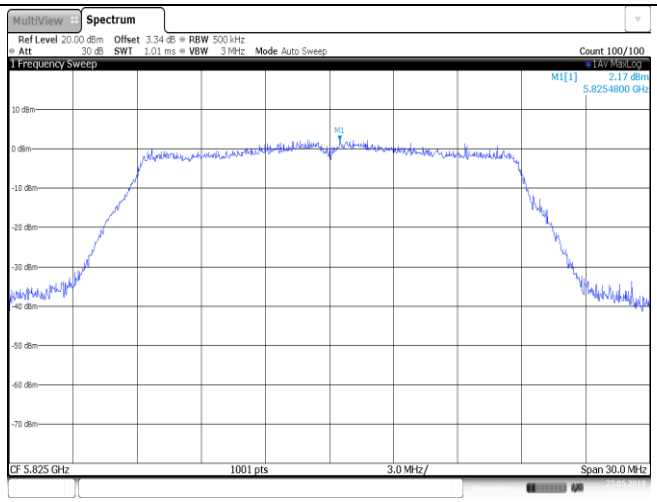
Band III	802.11n (HT20)
CH_L	
CH_M	
CH_H	

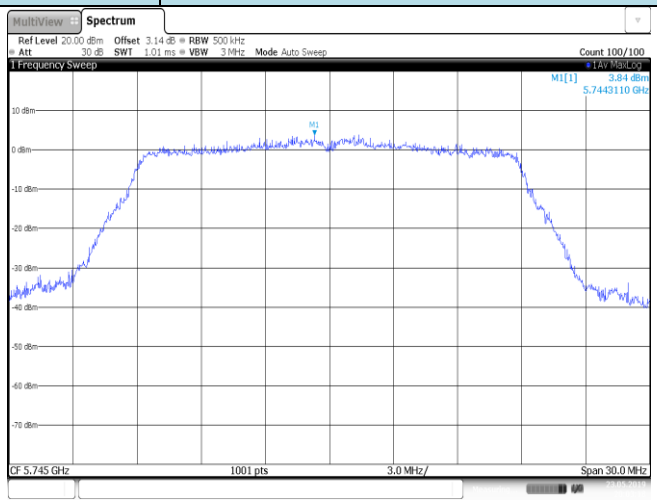
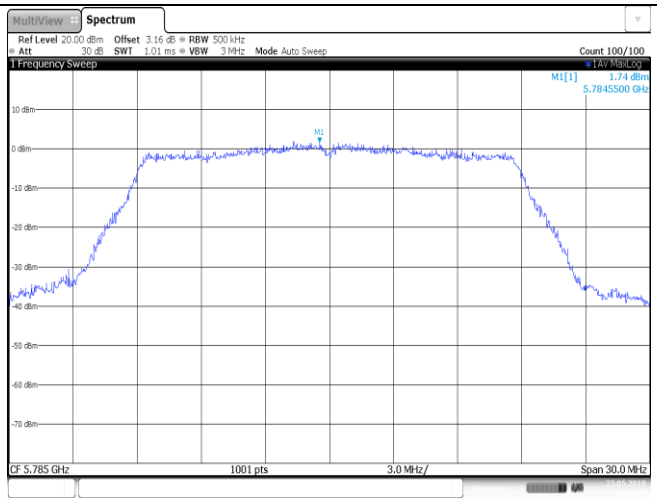
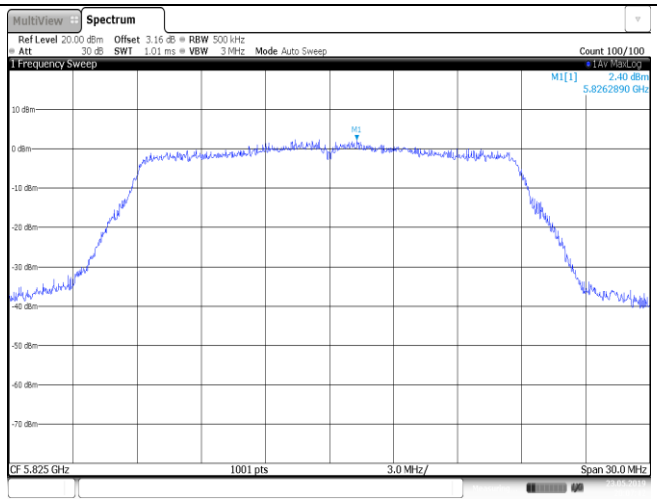
Band III	802.11a
CH_L	
CH_M	
CH_H	

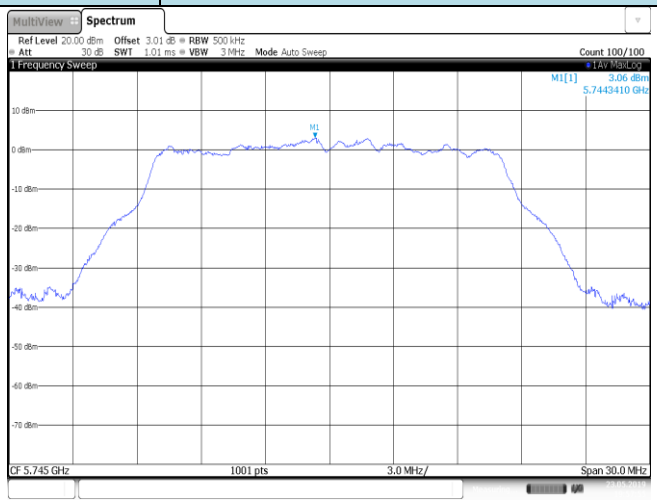
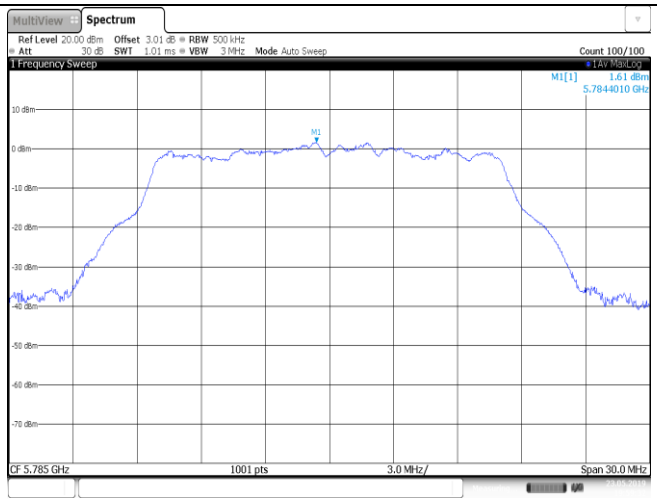
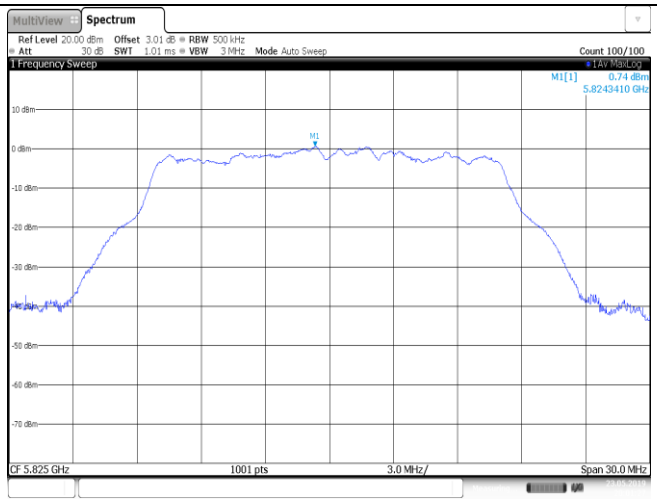
Band III	802.11ac (HT40)
CH_L	
CH_M	
CH_H	

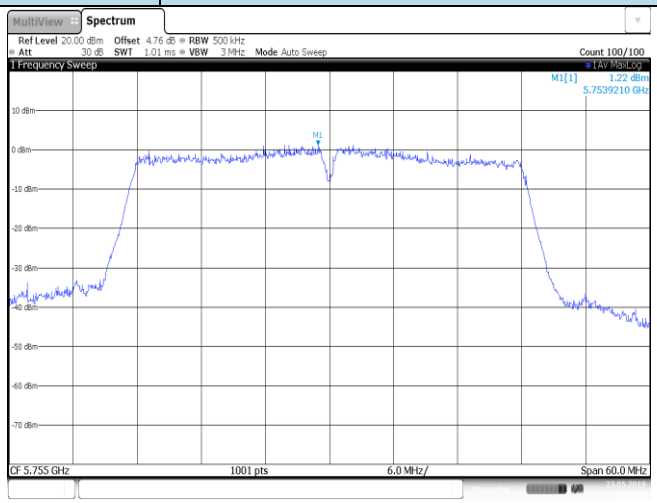
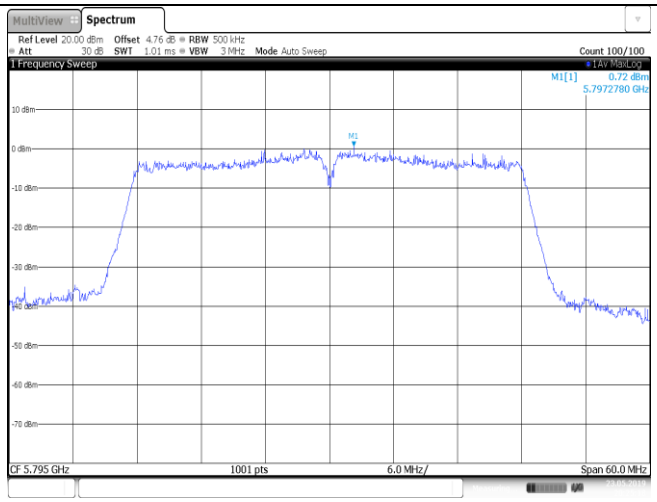
Band III	802.11n (HT40)
CH_L	
CH_M	
CH_H	

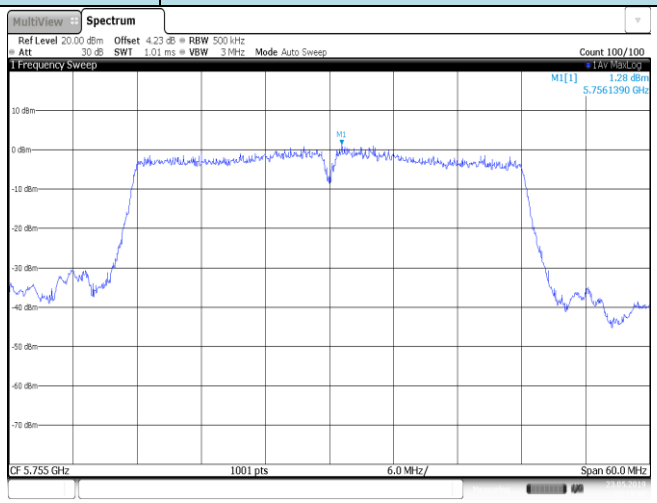
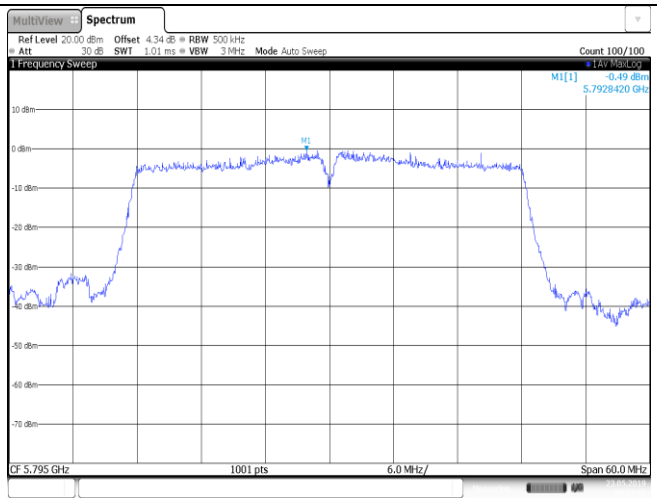
Band III	802.11ac (HT80)
CH_L	
CH_M	
CH_H	

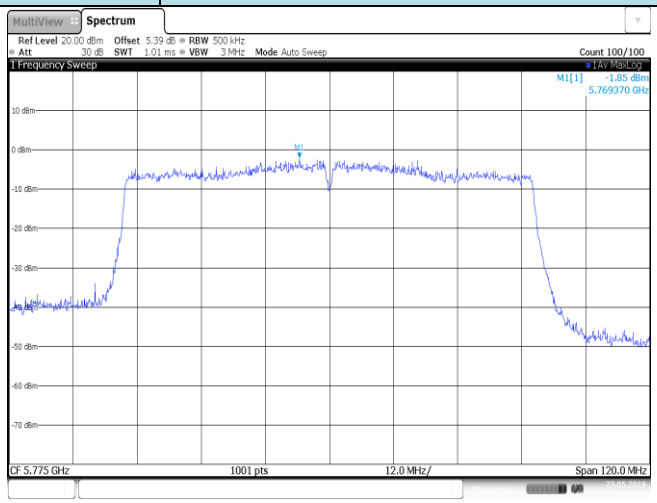
Band IV	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

Band IV	802.11n (HT20)
CH_L	
CH_M	
CH_H	

Band IV	802.11a
CH_L	
CH_M	
CH_H	

Band IV	802.11ac (HT40)
CH_L	
CH_H	

Band IV	802.11n (HT40)
CH_L	
CH_H	

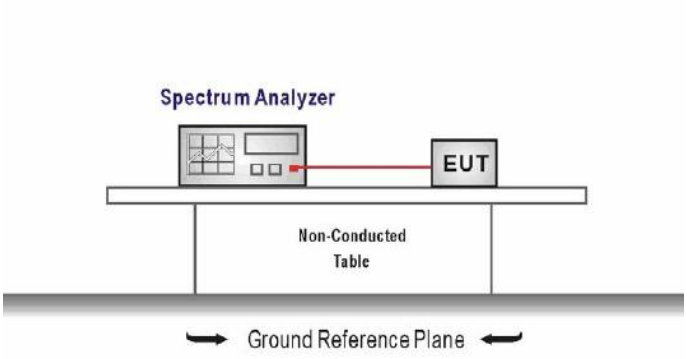
Band IV	802.11ac (HT80)
CH_M	

5.5. 26dB bandwidth and 99% Occupy bandwidth

LIMIT

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 , and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

TEST CONFIGURATION



TEST PROCEDURE

1. According KDB 789033 D02 – Section C
2. Connect the antenna port(s) to the spectrum analyzer input.
3. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
   Center Frequency =Channel center frequency
   Span=2 x emission bandwidth
   RBW = 1% to 5% of the emission bandwidth
   VBW>3 x RBW
   Sweep time= auto couple
   Detector = Peak
   Trace mode = max hold
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission, and use the 99 % power bandwidth function of the instrument

TEST MODE:

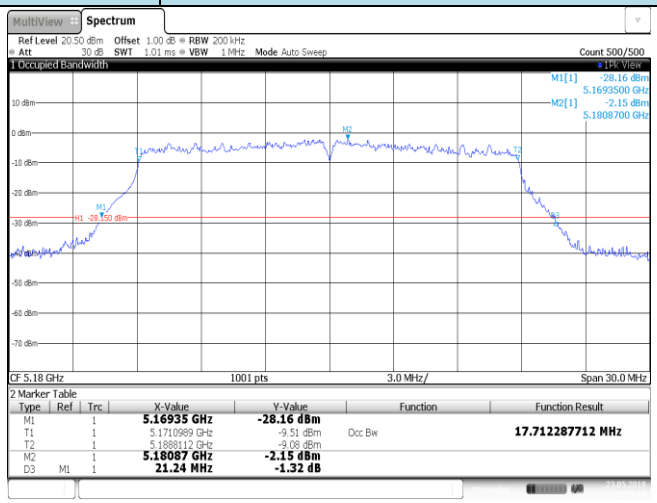
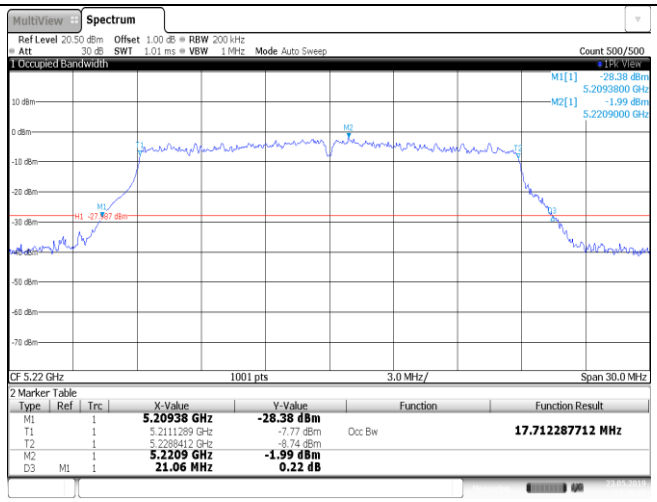
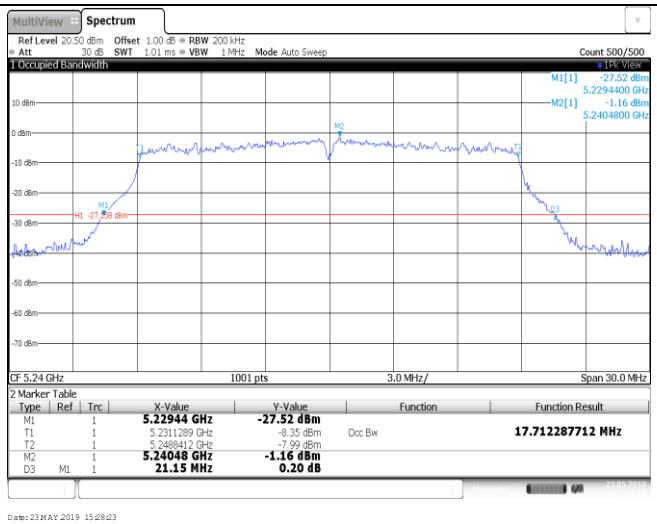
Please refer to the clause 3.3

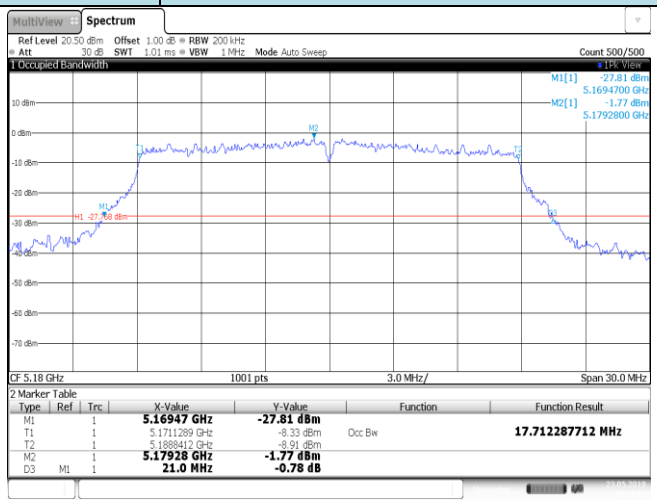
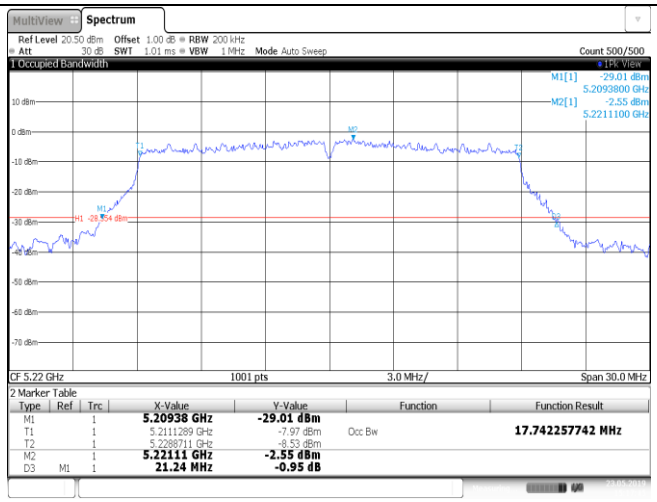
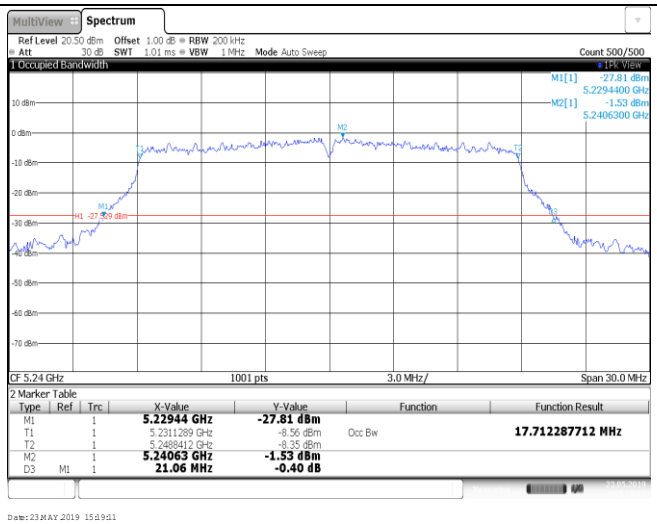
TEST RESULTS

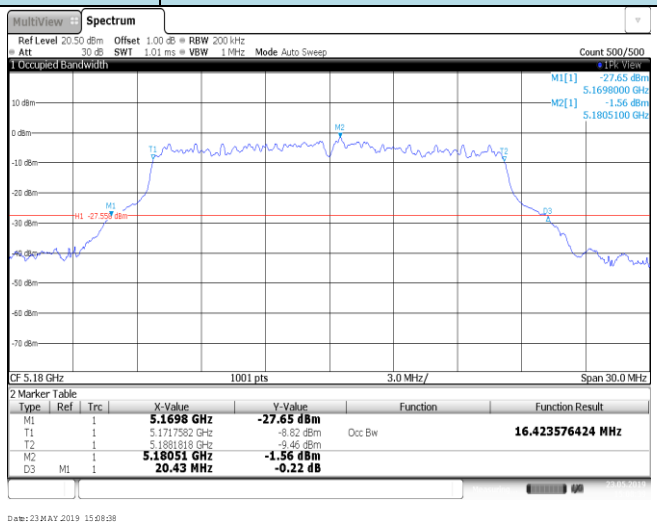
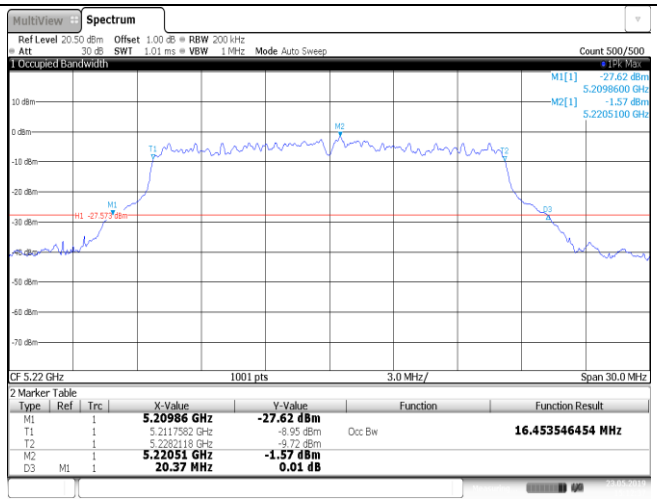
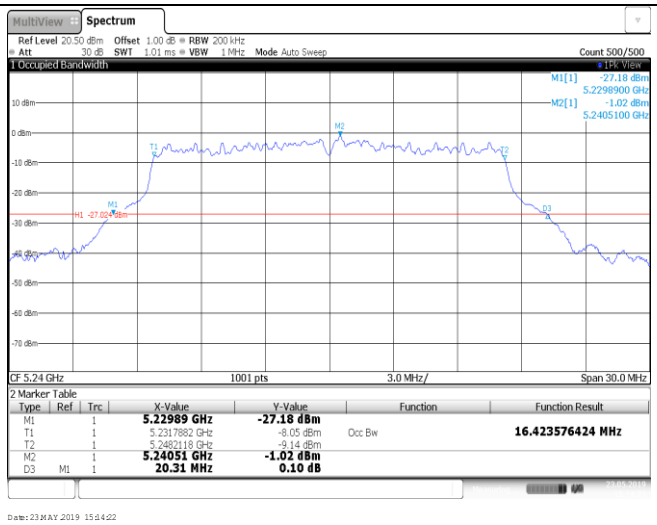
☒ **Passed** ☐ **Not Applicable**

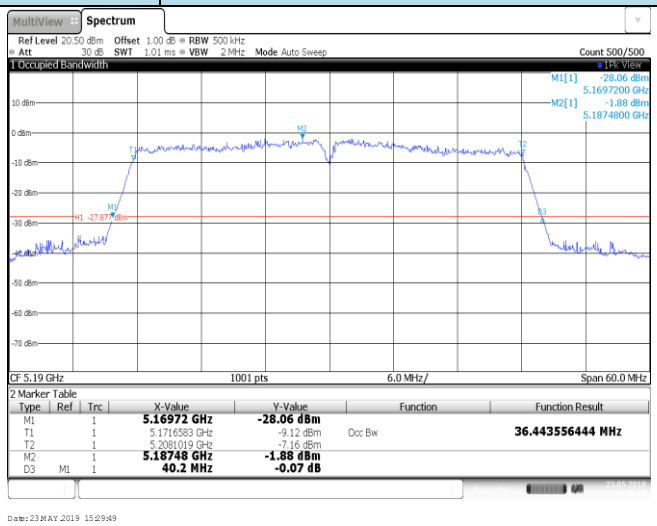
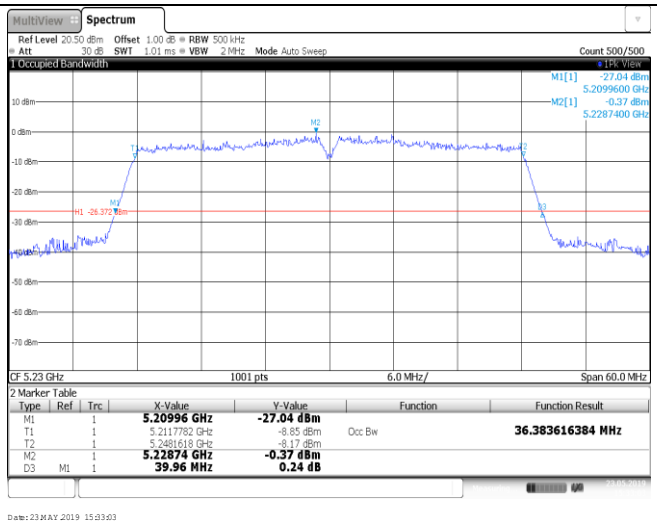
Band	Bandwidth (MHz)	Type	Channel	99% Occupy bandwith (MHz)	26dB bandwidth (MHz)	Result
I	20	802.11ac	CH_L	17.71	21.24	Pass
			CH_M	17.71	21.06	
			CH_H	17.71	21.15	
		802.11n	CH_L	17.71	21.00	Pass
			CH_M	17.74	21.24	
			CH_H	17.71	21.06	
		802.11a	CH_L	16.42	20.43	Pass
			CH_M	16.45	20.37	
			CH_H	16.42	20.31	
	40	802.11ac	CH_L	36.44	40.20	Pass
			CH_H	36.38	39.96	
		802.11n	CH_L	36.26	39.60	Pass
			CH_H	36.26	39.66	
	80	802.11ac	CH_M	75.64	81.24	Pass
II	20	802.11ac	CH_L	17.71	21.09	Pass
			CH_M	17.71	21.15	
			CH_H	17.71	21.27	
		802.11n	CH_L	17.68	21.30	Pass
			CH_M	17.71	21.21	
			CH_H	17.74	21.03	
		802.11a	CH_L	16.42	20.37	Pass
			CH_M	16.42	20.40	
			CH_H	16.42	20.31	
	40	802.11ac	CH_L	36.50	40.02	Pass
			CH_H	36.44	40.02	
		802.11n	CH_L	36.32	39.60	Pass
			CH_H	36.26	39.90	
	80	802.11ac	CH_M	75.52	81.12	Pass

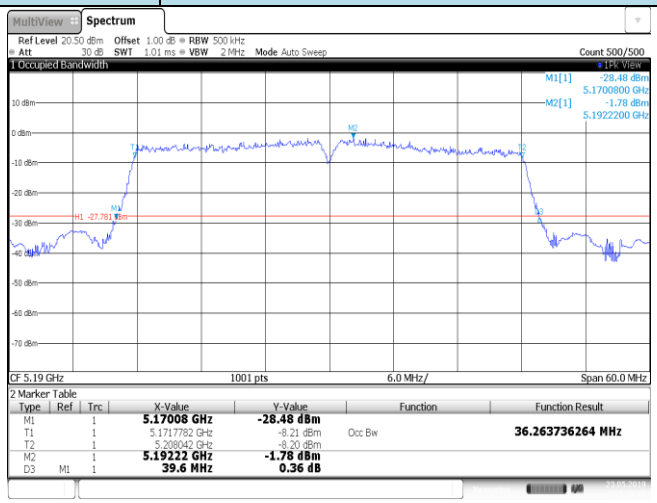
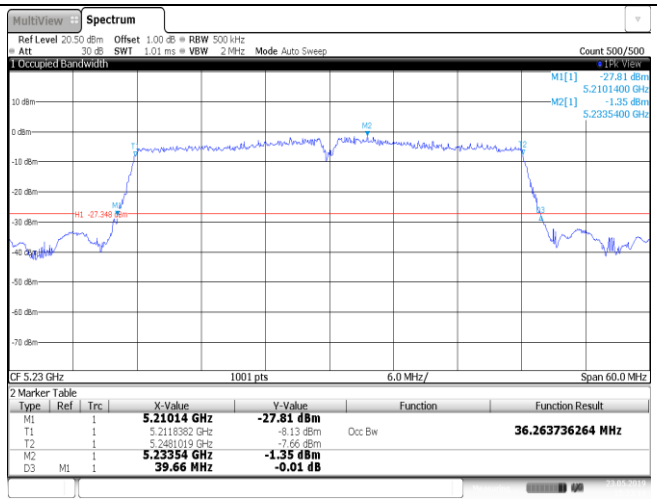
Band	Bandwidth (MHz)	Type	Channel	99% Occupy bandwith (MHz)	26dB bandwidth (MHz)	Result
III	20	802.11ac	CH_L	17.74	21.18	Pass
			CH_M	17.71	20.73	
			CH_H	17.71	20.91	
		802.11n	CH_L	17.71	21.30	Pass
			CH_M	17.71	21.18	
			CH_H	17.74	21.18	
		802.11a	CH_L	16.42	20.40	Pass
			CH_M	16.42	20.31	
			CH_H	16.42	20.37	
	40	802.11ac	CH_L	36.38	40.26	Pass
			CH_M	36.36	40.04	
			CH_H	36.38	40.14	
		802.11n	CH_L	36.20	39.78	Pass
			CH_M	36.20	39.42	
			CH_H	36.20	39.66	
	80	802.11ac	CH_L	75.40	81.60	Pass
			CH_M	75.52	81.36	
			CH_H	75.64	81.48	

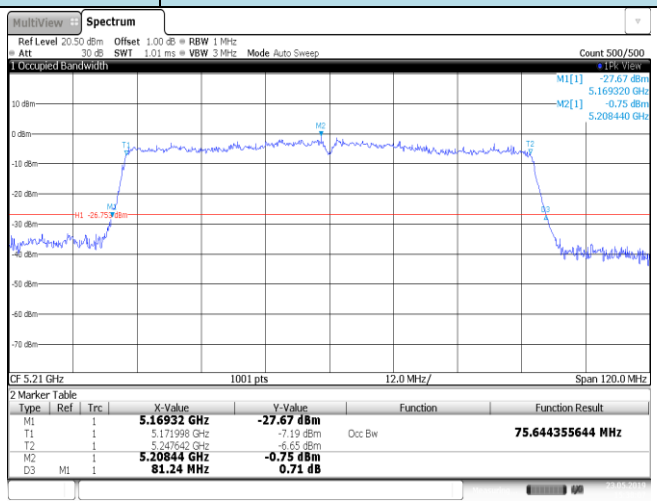
Band I	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

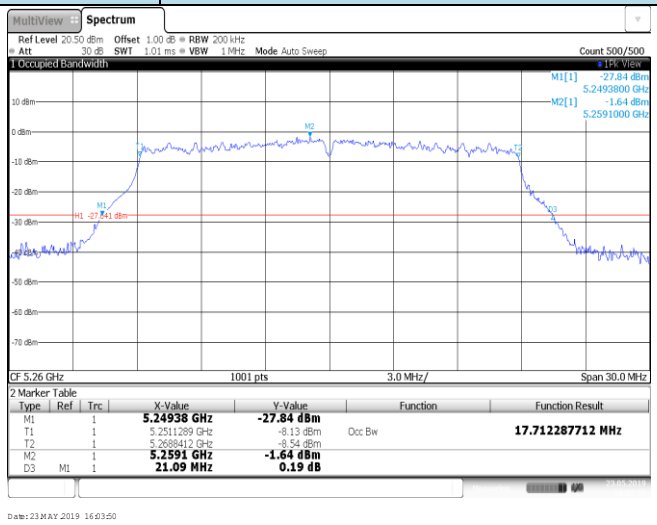
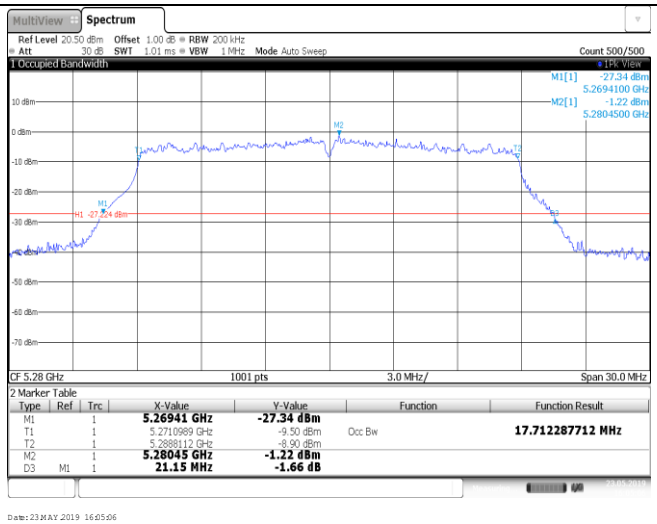
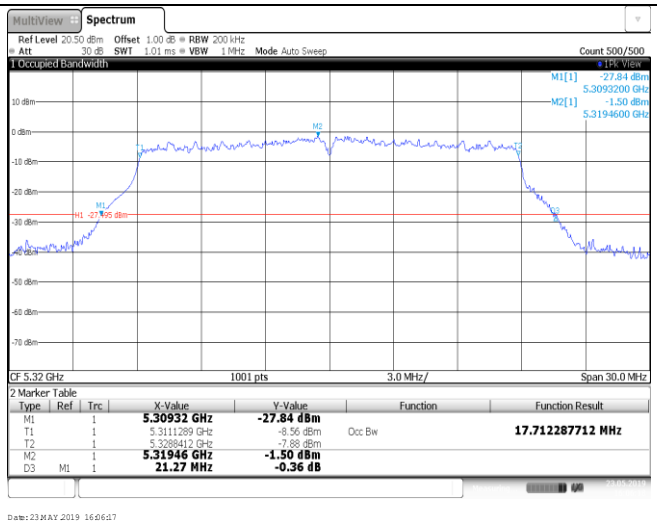
Band I	802.11n (HT20)
CH_L	
CH_M	
CH_H	

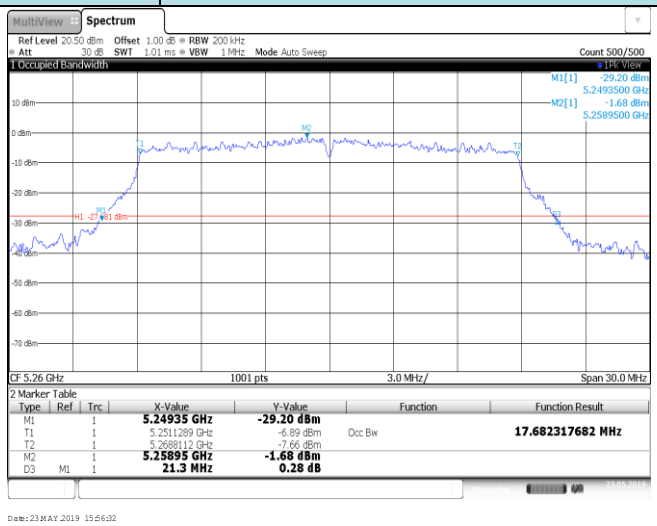
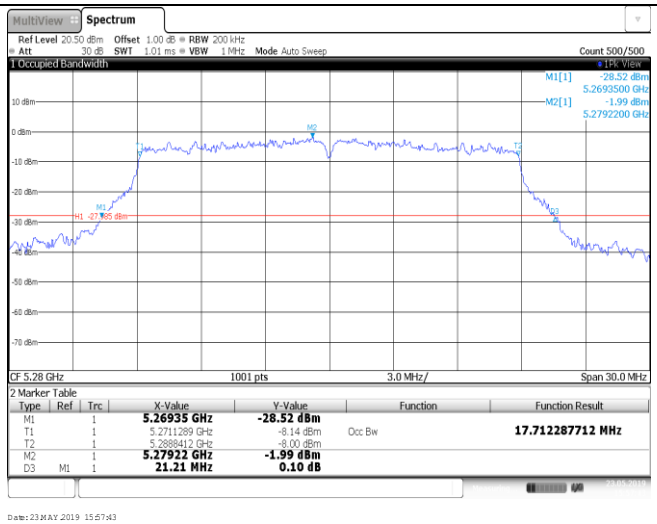
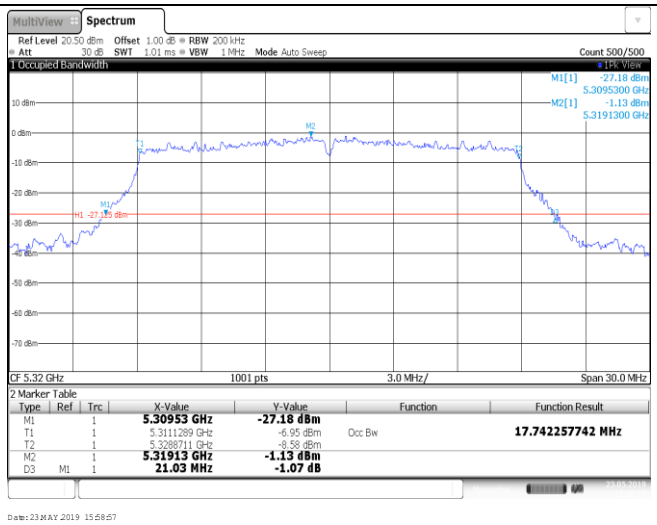
Band I	802.11a
CH_L	
CH_M	
CH_H	

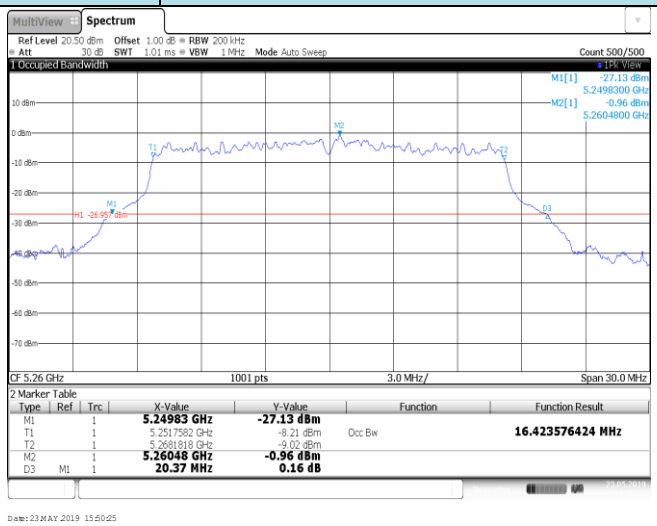
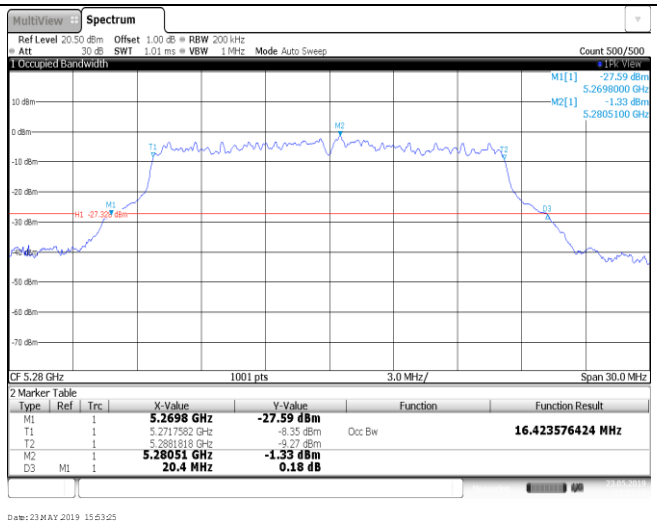
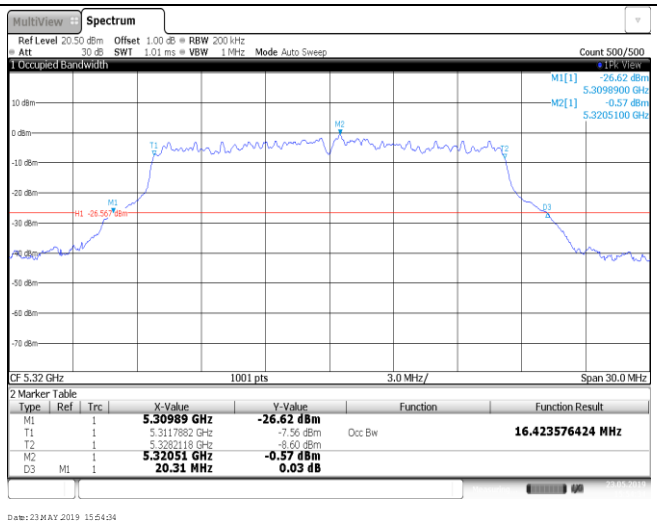
Band I	802.11ac (HT40)
CH_L	
CH_H	

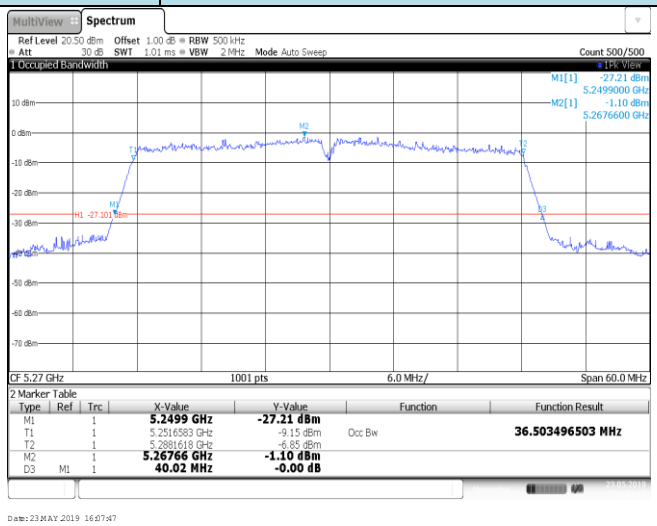
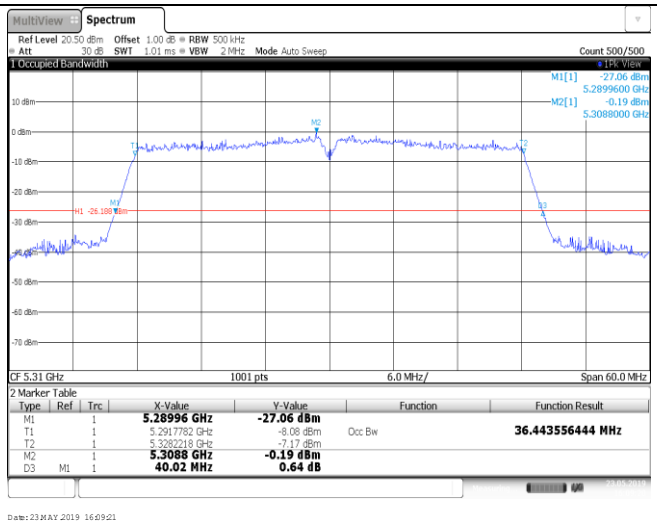
Band I	802.11n (HT40)
CH_L	
CH_H	

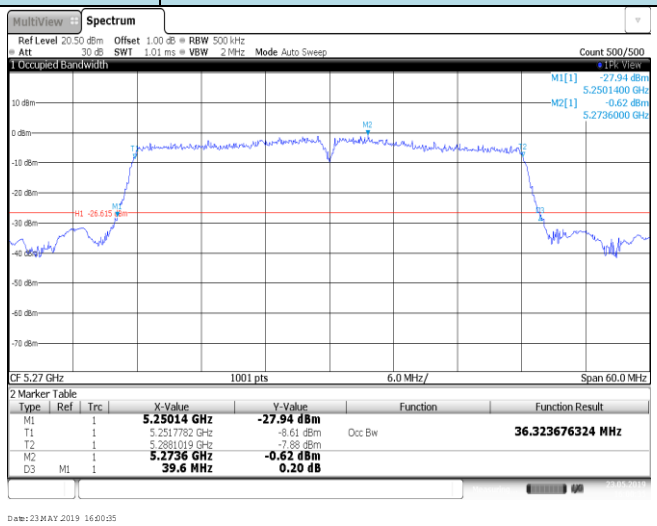
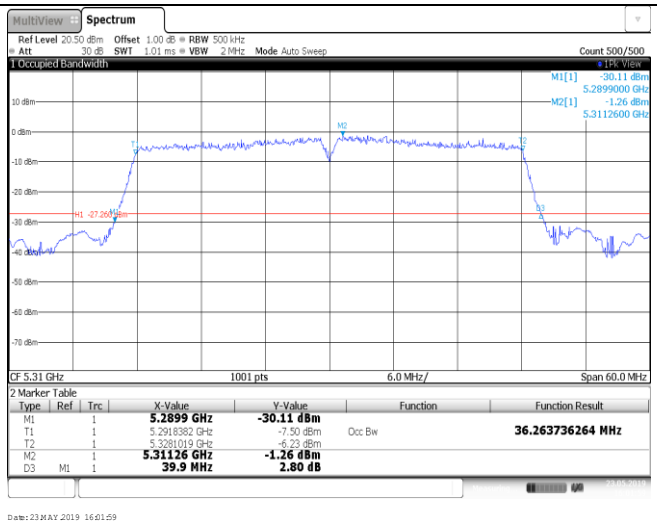
Band I	802.11ac (HT80)
CH_M	

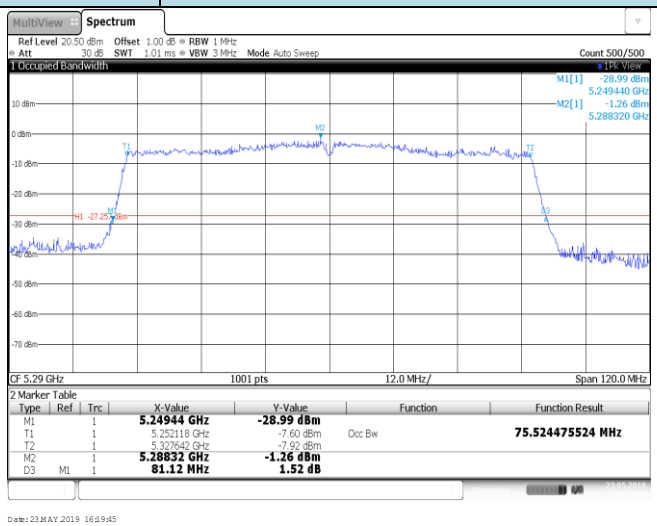
Band II	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

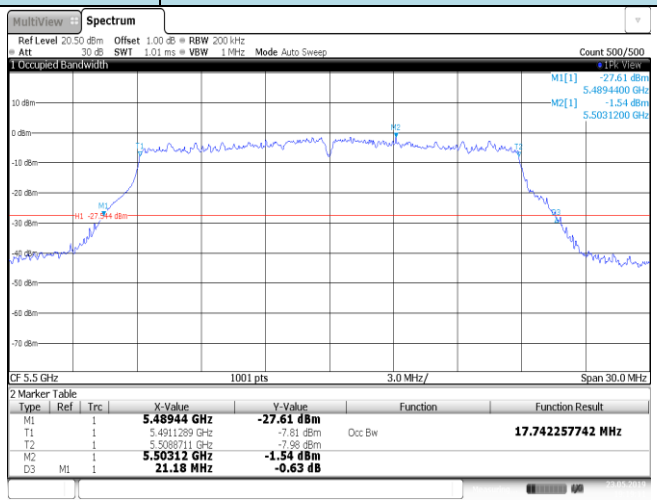
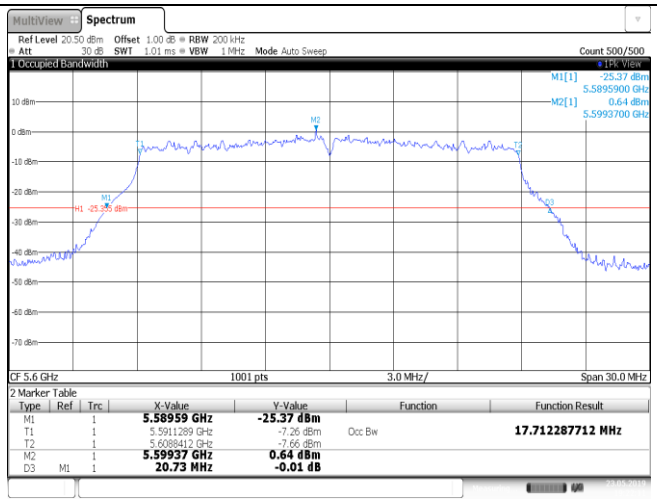
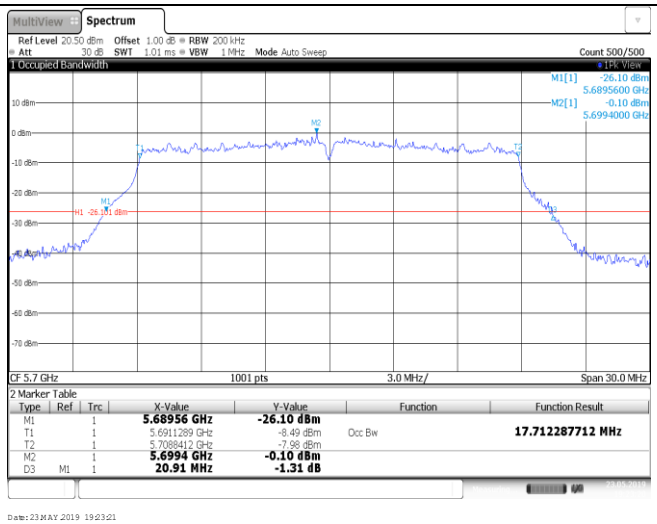
Band II	802.11n (HT20)
CH_L	
CH_M	
CH_H	

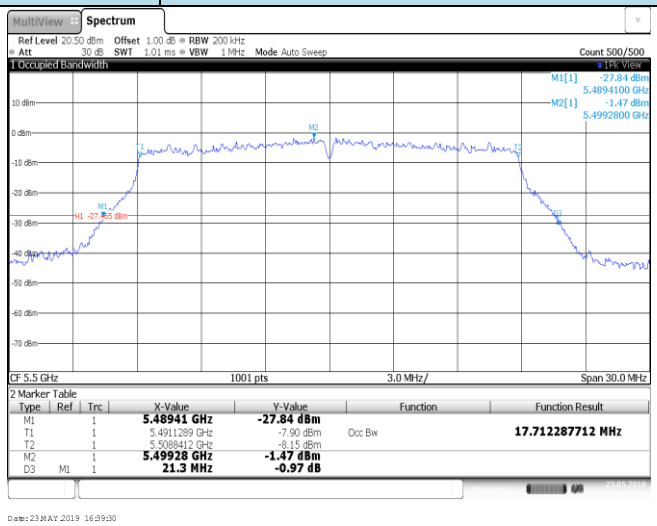
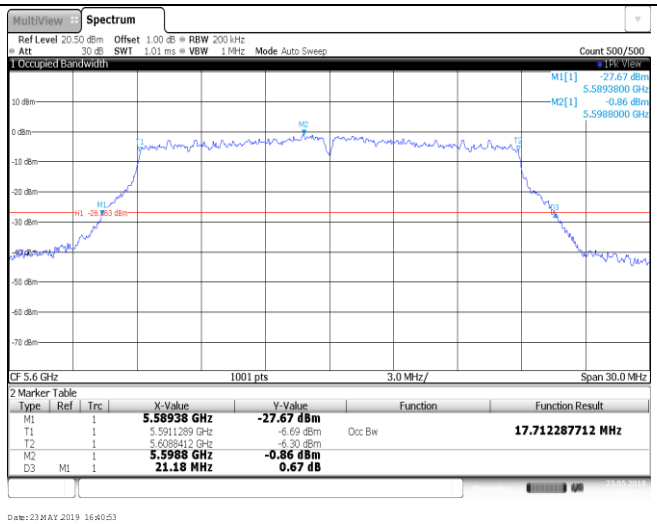
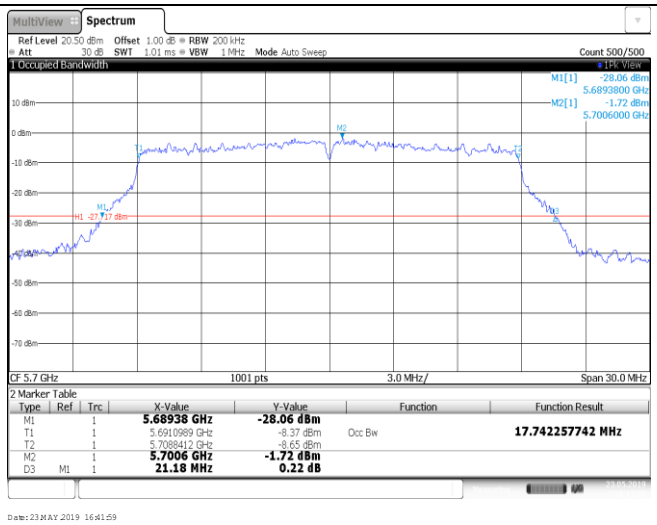
Band II	802.11a
CH_L	
CH_M	
CH_H	

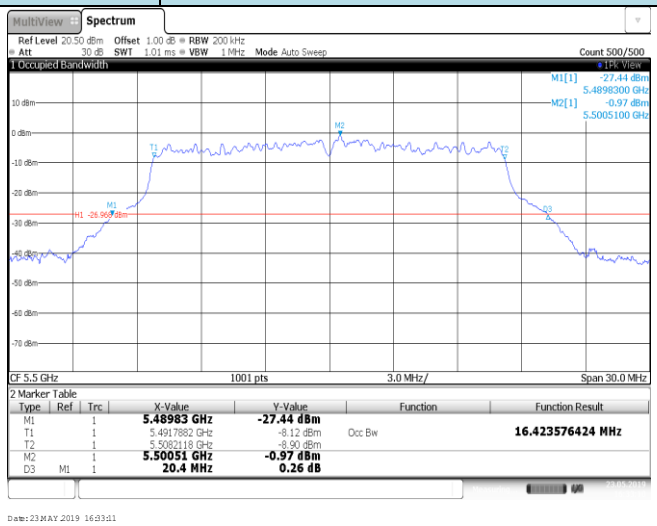
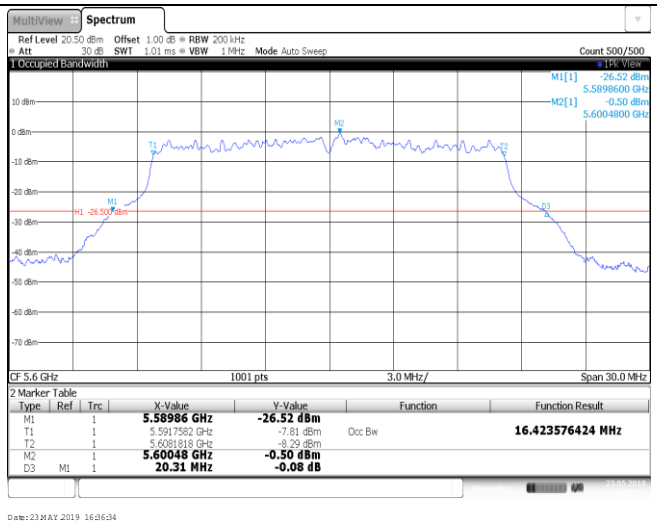
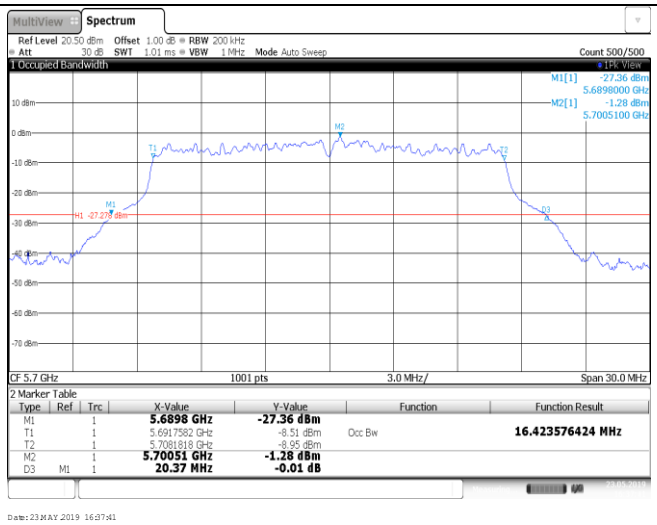
Band II	802.11ac (HT40)
CH_L	
CH_H	

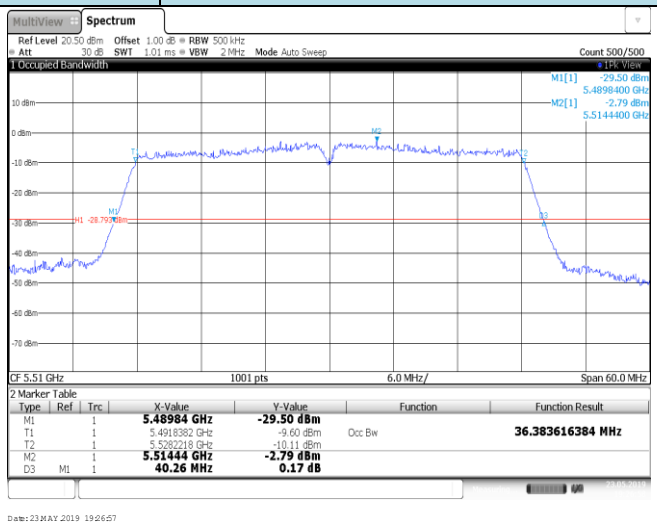
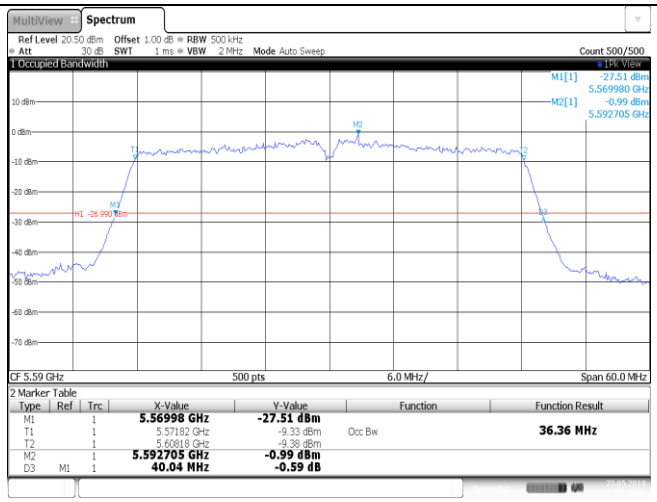
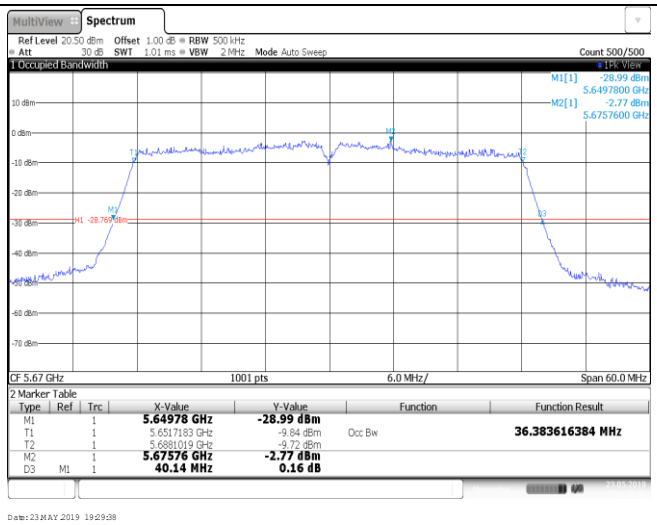
Band II	802.11n (HT40)
CH_L	
CH_H	

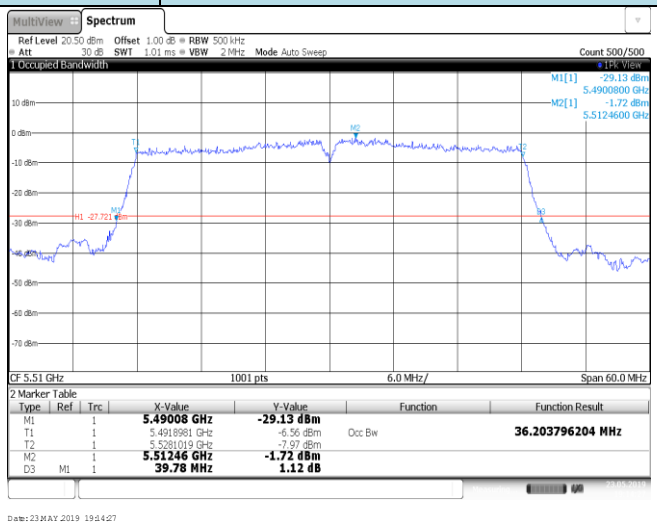
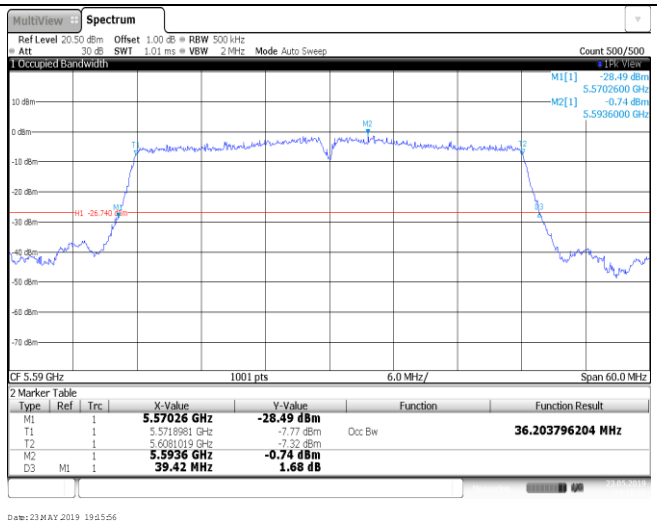
Band II	802.11ac (HT80)
CH_M	

Band III	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

Band III	802.11n (HT20)
CH_L	
CH_M	
CH_H	

Band III	802.11a
CH_L	
CH_M	
CH_H	

Band III	802.11ac (HT40)
CH_L	
CH_M	
CH_H	

Band III	802.11n (HT40)
CH_L	
CH_M	
CH_H