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TEST REPORT

Report No. ..... :	**CHTEW19100111**
Project No. ……:	**SHT1909040101EW**
FCC ID..... :	**2ATSUSPSSL1909**
Applicant's name..... :	**SHANGHAI SUPERSUN TECHNOLOGY LIGHTING CO.,LTD**
Address.....:	Room.1038 ,First build ,Shangfeng Road NO.633 ,ShangHai , China
Manufacturer.....:	JIANGXI SUPERSUN TECHNOLOGY LIGHTING CO.,LTD
Address.....:	SUPERSUN Park, Fengshou Industrial zone ,Wannian Town,Shangrao City, JiangXi Province ,China
Test item description ..... :	**LED SHOPLIGHT, LED FLUSH MOUNT**
Trade Mark .....:	SUPERSUN
Model/Type reference.....:	SPS-SL-42WS2XXZ
Listed Model(s) .....:	SPSCL-19WS5YXXZ ,SPSCL-16WS5YXXZ
Standard ..... :	**FCC CFR Title 47 Part 15 Subpart C Section 15.247**
Date of receipt of test sample……....:	Sep.23,2019
Date of testing……..:	Sep.23,2019 ~ Oct.29,2019
Date of issue……....:	Oct.29,2019
Result..... ……..:	**PASS**

Report Verification:

Compiled by (position+printedname+signature)...:	File administrators Yueming Li	Yueming.Li
Supervised by (position+printedname+signature)....:	Project Engineer Kiki Kong	Kiki Kong
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

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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10:2013: American National Standard forTesting Unlicensed Wireless Devices

KDB 558074 D01 15.247 Meas Guidance v05r02: Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of The FCC Rules

1.2. Report version

Revision No.	Date of issue	Description
N/A	2019-10-29	Original

2. TEST DESCRIPTION

Test Item	FCC Rule	Result	Test Engineer
Antenna requirement	15.203/15.247(c)	PASS	Ximing Huang
Line Conducted Emissions (AC Main)	15.207	PASS	Ximing Huang
Conducted Peak Output Power	15.247(b)(3)	PASS	Ximing Huang
Power Spectral Density	15.247(e)	PASS	Ximing Huang
6dB Bandwidth	15.247(a)(2)	PASS	Ximing Huang
Restricted band	15.247(d)/15.205	PASS	Ximing Huang
Spurious Emissions	15.247(d)/15.209	PASS	Ximing Huang

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

3. SUMMARY

3.1. Client Information

Applicant:	SHANGHAI SUPERSUN TECHNOLOGY LIGHTING CO.,LTD
Address:	Room.1038 ,First build ,Shangfeng Road NO.633 ,ShangHai ,China
Manufacturer:	JIANGXI SUPERSUN TECHNOLOGY LIGHTING CO.,LTD
Address:	SUPERSUN Park, Fengshou Industrial zone ,Wannian Town,Shangrao City, JiangXi Province ,China

3.2. Product Description

Name of EUT:	LED SHOPLIGHT, LED FLUSH MOUNT
Trade Mark:	SUPERSUN
Model No.:	SPS-SL-42WS2XXZ
Listed Model(s):	SPSCL-19WS5YXXZ ,SPSCL-16WS5YXXZ
Differences Declaration:	1. The wireless modules used by SPS-SL-42WS2XXZ, SPSCL-19WS5YXXZ and SPSCL-16WS5YXXZ are the same. 2. The circuit principles and Layout of SPSCL-19WS5YXXZ and SPSCL-16WS5YXXZ are consistent. the model name is different. The appearance and color of SPSCL-19WS5YXXZ and SPSCL-16WS5YXXZ are different. See the figure below for the specific differences. 3.SPSCL-19WS5YXXZ , SPSCL-16WS5YXXZ and SPS-SL-42WS2XXZ shape structure is different; number of beads and some parameters are different; Layout is different; works the same way.
Power supply:	AC 120V 60HZ
Hardware version:	SPS-SL-42WS2 driver;SPSCL-16W, SPSCL-25W
Software version:	2.2.2

WIFI	
Supported type:	802.11b/802.11g/802.11n(HT20)
Modulation:	DSSS for 802.11b OFDM for 802.11g/802.11n(HT20)
Operation frequency:	2412MHz~2462MHz
Channel number:	13
Channel separation:	5MHz
Antenna type:	PCB antenna
Antenna gain:	2.5dbi

3.3. Operation state

➢ **Test 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 below blue bottom.

802.11b/g/n(HT20)	
Channel	Frequency (MHz)
01	2412
02	2417
...	...
06	2437
...	...
10	2457
11	2462

➢ **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

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.:5377A

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.: 5377A.

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	0.51 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)

(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	2019/10/26	2020/10/25
●	Artificial Mains	SCHWARZBECK	NNLK 8121	573	2019/10/23	2020/10/22
●	Pulse Limiter	R&S	ESH3-Z2	100499	2019*10/27	2020/10/26
●	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	2019/10/23	2020/10/22
○	Two Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T4-02	20373	2019/10/28	2020/10/27
○	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T8-02	20375	2019/10/23	2020/10/22
○	V-Network	R&S	ESH3-Z6	100211	2019/10/23	2020/10/22
○	V-Network	R&S	ESH3-Z6	100210	2019/10/23	2020/10/22
○	2-Line V-Network	R&S	ESH3-Z5	100049	2018/10/27	2020/10/27

●	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	2019/10/28	2020/10/27
●	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	2019/08/21	2020/08/20
●	RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	2019/05/27	2020/05/26
●	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	2019/10/26	2020/10/25
●	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	2019/04/26	2020/04/25
●	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	2020/10/26	2020/10/25
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2020/10/26	2020/10/25
●	OSP	R&S	OSP120	101317	N/A	N/A
○	Radio communication tester	R&S	CMW500	137688-Lv	2018/10/08	2020/10/07
○	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.

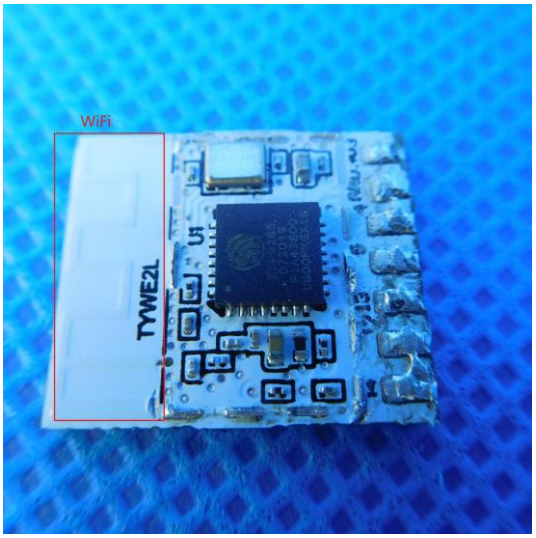
FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

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



5.2. Conducted Emissions (AC Main)

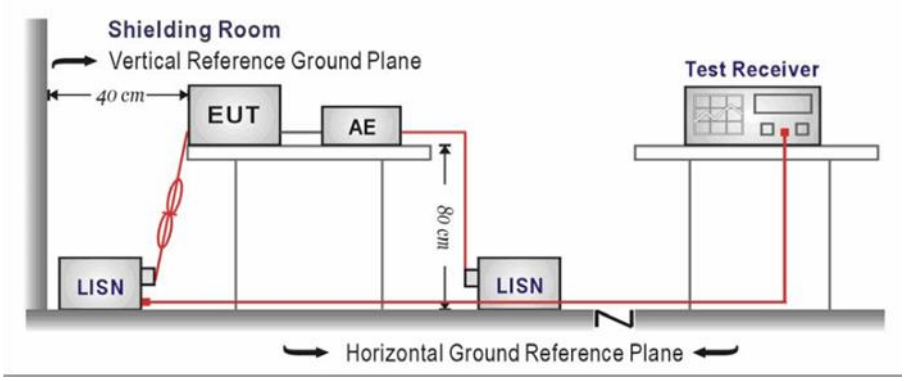
LIMIT

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

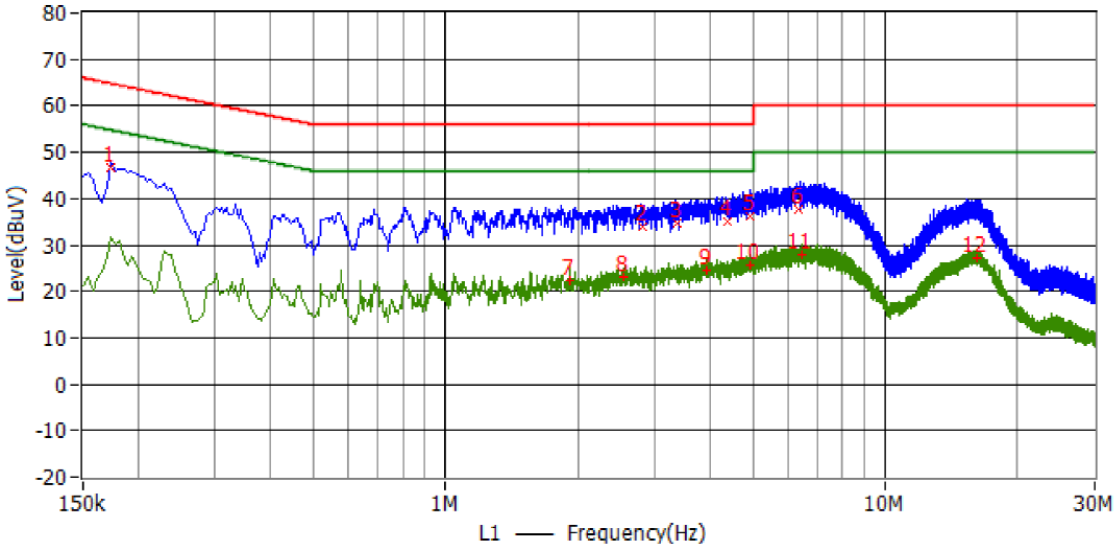
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

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

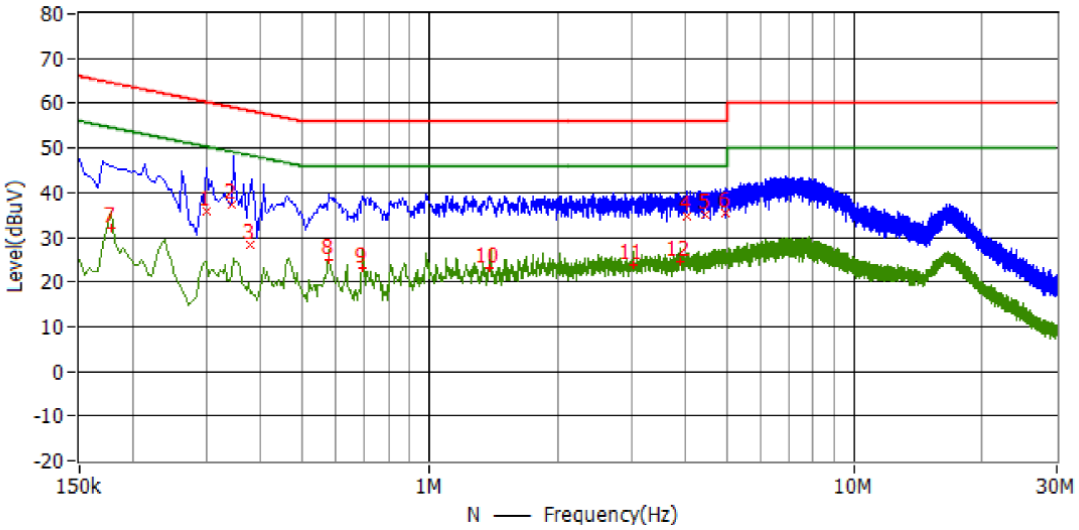
SPS-SL-42WS2XXZ:

Test Line:	L



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Factor dB	Detector	Phase
1	174.000 kHz	64.8	46.7	-18.0	10.1	QP	L1
2	2.822 MHz	56.0	33.8	-22.2	10.1	QP	L1
3	3.362 MHz	56.0	34.6	-21.4	10.1	QP	L1
4	4.382 MHz	56.0	35.2	-20.8	10.1	QP	L1
5	4.938 MHz	56.0	36.1	-19.9	10.1	QP	L1
6	6.370 MHz	60.0	37.8	-22.2	10.2	QP	L1
7	1.918 MHz	46.0	22.4	-23.6	10.1	AV	L1
8	2.542 MHz	46.0	23.1	-22.9	10.1	AV	L1
9	3.918 MHz	46.0	24.4	-21.6	10.1	AV	L1
10	4.926 MHz	46.0	25.8	-20.2	10.1	AV	L1
11	6.446 MHz	50.0	27.9	-22.1	10.2	AV	L1
12	16.194 MHz	50.0	27.2	-22.8	10.2	AV	L1

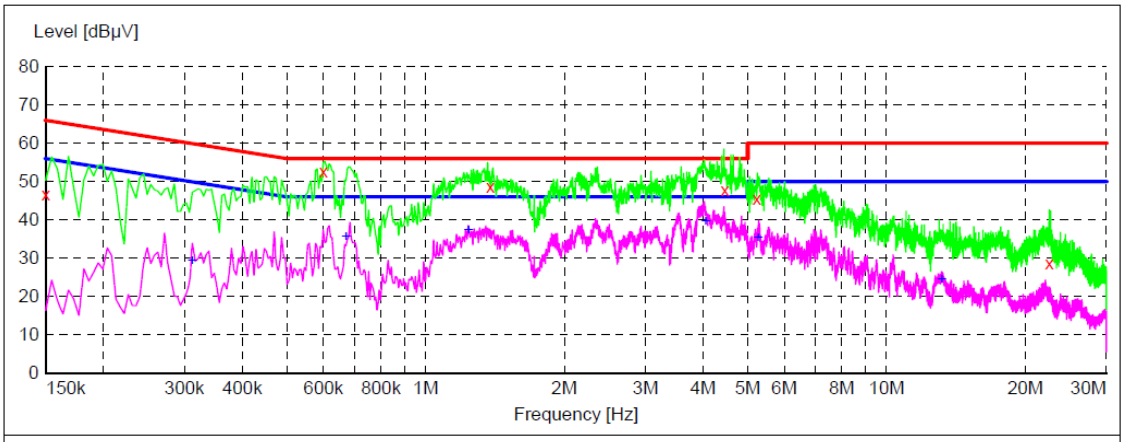
Test Line:	N



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Factor dB	Detector	Phase
1	298.000 kHz	60.3	35.8	-24.5	9.9	QP	N
2	342.000 kHz	59.2	37.2	-22.0	9.9	QP	N
3	378.000 kHz	58.3	28.4	-29.9	9.9	QP	N
4	4.038 MHz	56.0	34.8	-21.2	10.0	QP	N
5	4.474 MHz	56.0	35.2	-20.8	10.0	QP	N
6	4.970 MHz	56.0	35.4	-20.6	10.0	QP	N
7	178.000 kHz	54.6	32.1	-22.5	9.9	AV	N
8	582.000 kHz	46.0	24.8	-21.2	9.9	AV	N
9	698.000 kHz	46.0	23.1	-22.9	9.9	AV	N
10	1.386 MHz	46.0	23.2	-22.8	9.9	AV	N
11	3.014 MHz	46.0	23.8	-22.2	10.0	AV	N
12	3.902 MHz	46.0	24.6	-21.4	10.0	AV	N

SPSCL-19WS5YXXZ ,SPSCL-16WS5YXXZ

Test Line:	L



MEASUREMENT RESULT: "GM1910165068_fin"

10/16/2019 5:57PM

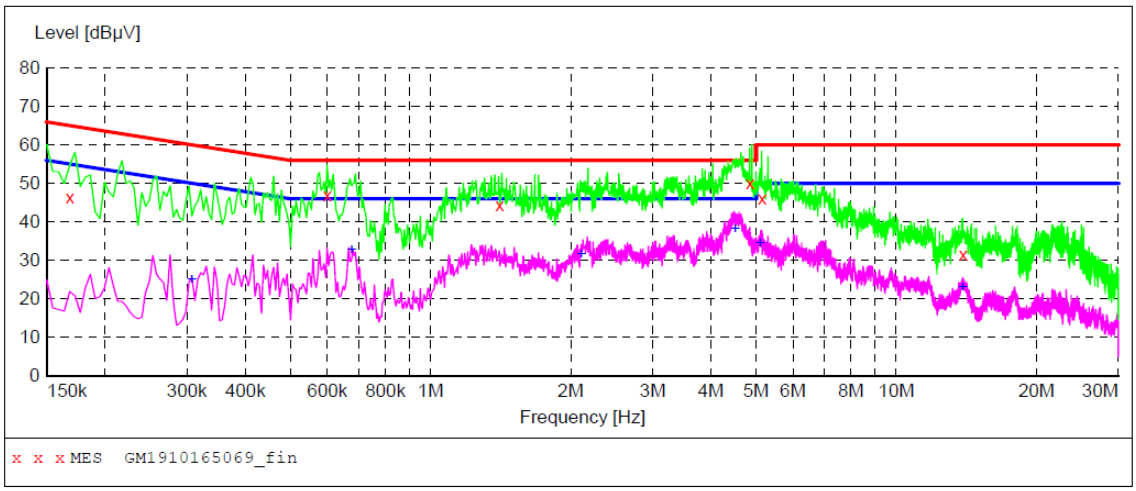
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	46.80	10.1	66	19.2	QP	L1	GND
0.600000	52.80	10.1	56	3.2	QP	L1	GND
1.383000	48.80	10.1	56	7.2	QP	L1	GND
4.456500	47.80	10.1	56	8.2	QP	L1	GND
5.226000	45.50	10.2	60	14.5	QP	L1	GND
22.537500	28.70	10.2	60	31.3	QP	L1	GND

MEASUREMENT RESULT: "GM1910165068_fin2"

10/16/2019 5:57PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.312000	29.30	10.1	50	20.6	AV	L1	GND
0.672000	35.60	10.1	46	10.4	AV	L1	GND
1.239000	37.20	10.1	46	8.8	AV	L1	GND
4.051500	39.50	10.1	46	6.5	AV	L1	GND
5.266500	35.30	10.2	50	14.7	AV	L1	GND
13.164000	24.50	10.2	50	25.5	AV	L1	GND

Test Line:	N



MEASUREMENT RESULT: "GM1910165069_fin"

10/16/2019 6:00PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.168000	46.30	10.1	65	18.8	QP	N	GND
0.600000	47.00	10.1	56	9.0	QP	N	GND
1.405500	44.30	10.1	56	11.7	QP	N	GND
4.857000	50.20	10.1	56	5.8	QP	N	GND
5.154000	46.00	10.2	60	14.0	QP	N	GND
13.915500	31.40	10.2	60	28.6	QP	N	GND

MEASUREMENT RESULT: "GM1910165069_fin2"

10/16/2019 6:00PM

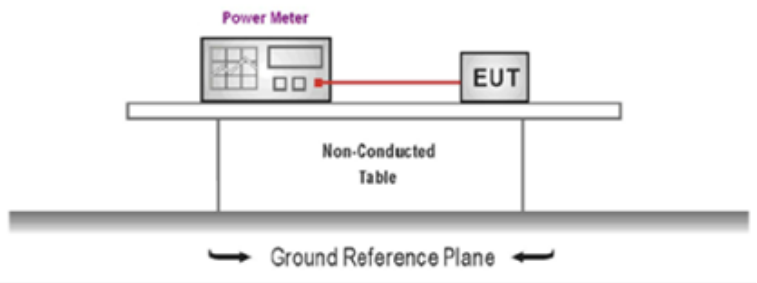
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.307500	24.90	10.1	50	25.1	AV	N	GND
0.676500	32.60	10.1	46	13.4	AV	N	GND
2.107500	31.60	10.1	46	14.4	AV	N	GND
4.510500	38.20	10.1	46	7.8	AV	N	GND
5.100000	34.50	10.1	50	15.5	AV	N	GND
13.884000	22.90	10.2	50	27.1	AV	N	GND

5.3. Conducted Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): 30dBm

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 15.247 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector
4. Record the measurement data.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

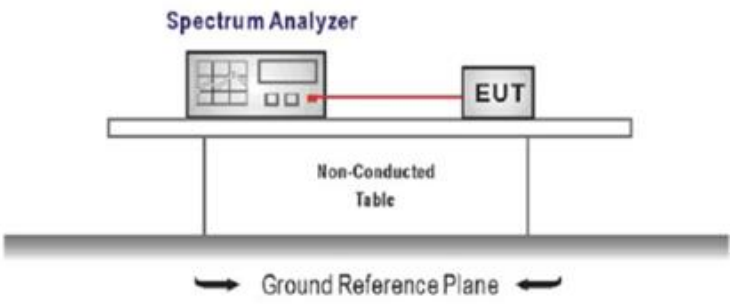
Type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
802.11b	01	17.11	15.16	≤30.00	Pass
	06	15.97	14.86		
	11	15.69	14.75		
802.11g	01	16.44	12.56	≤30.00	Pass
	06	17.39	13.45		
	11	16.84	12.65		
802.11n(HT20)	01	17.23	13.18	≤30.00	Pass
	06	16.74	12.92		
	11	16.75	12.86		

5.4. Power Spectral Density

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e):
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input,
2. Configure the spectrum analyzer as shown below:
   Center frequency=DTS channel center frequency
   Span =1.5 times the DTS bandwidth
   RBW = 3 kHz ≤ RBW ≤ 100 kHz, VBW ≥ 3 × RBW
   Sweep time = auto couple
   Detector = peak
   Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Use the peak marker function to determine the maximum amplitude level within the RBW.
5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST MODE:

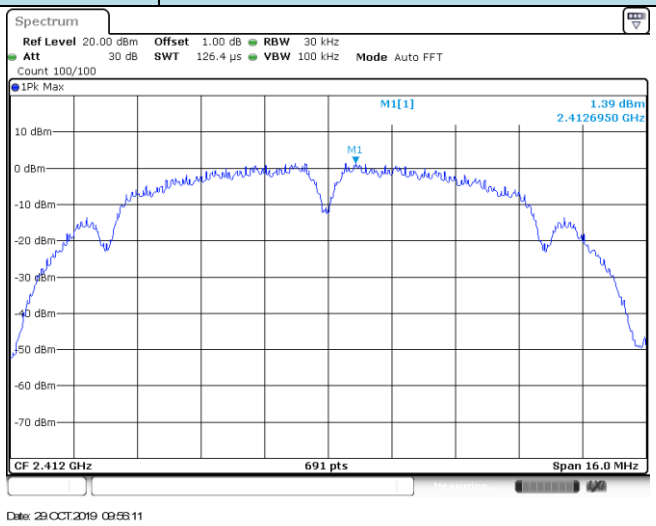
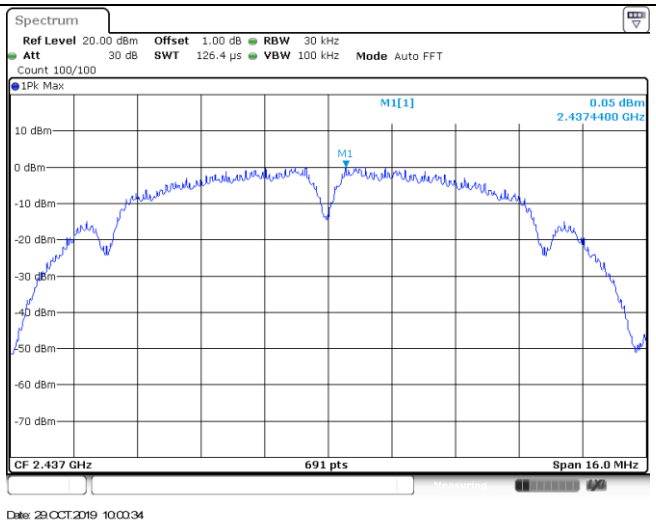
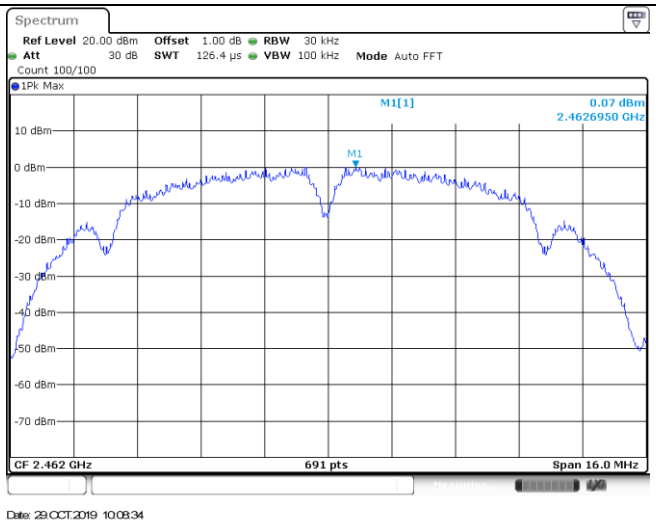
Please refer to the clause 3.3

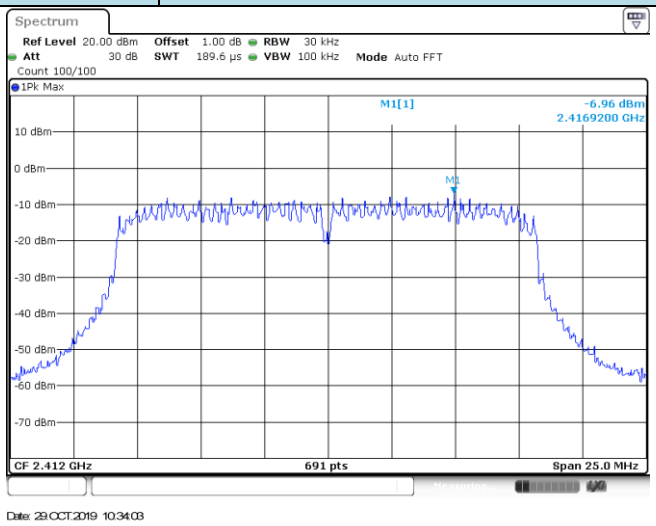
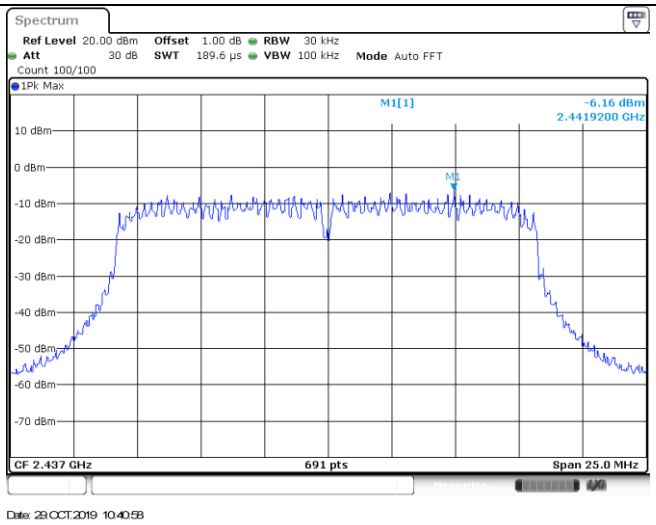
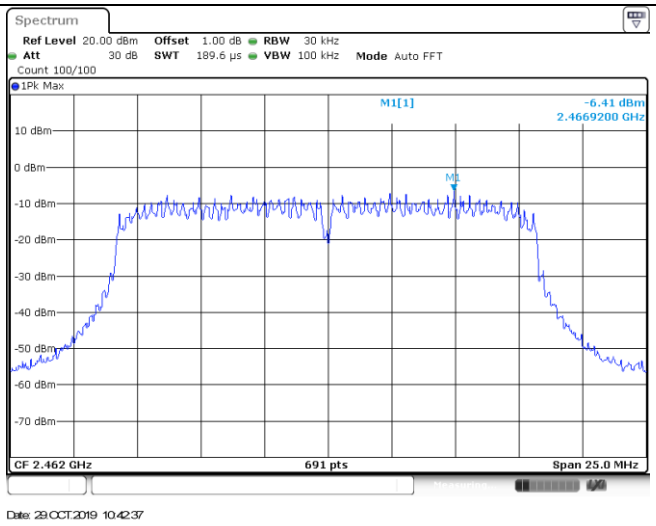
TEST RESULTS

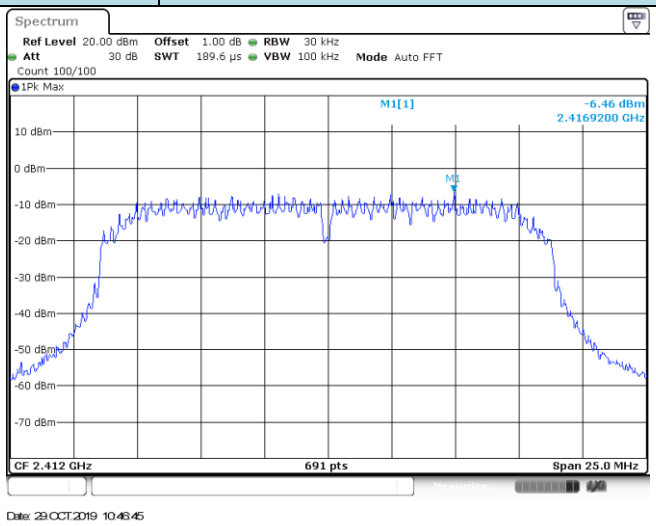
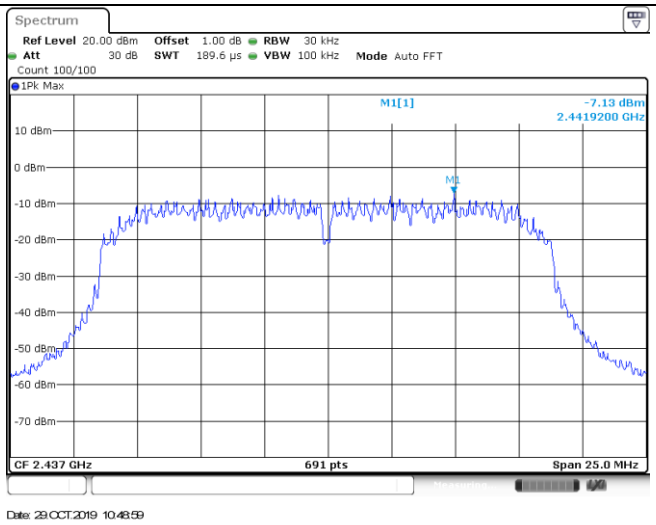
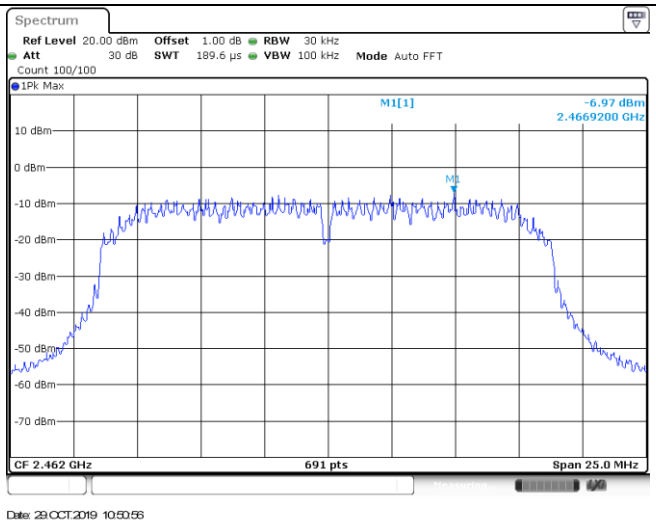
☒ **Passed** ☐ **Not Applicable**

Type	Channel	Power Spectral Density (dBm/30KHz)	Limit (dBm/3KHz)	Result
802.11b	01	1.39	≤8.00	Pass
	06	0.05		
	11	0.07		
802.11g	01	-6.96	≤8.00	Pass
	06	-6.16		
	11	-6.41		
802.11n(HT20)	01	-6.46	≤8.00	Pass
	06	-7.13		
	11	-6.97		

Test plot as follows:

Type:	802.11 b
CH01	
CH06	
CH11	

Type:	802.11 g
CH01	
CH06	
CH11	

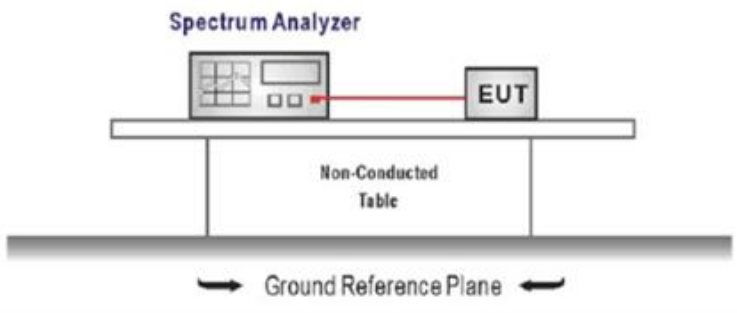
Type:	802.11n(HT20)
CH01	
CH06	
CH11	

5.5. 6dB bandwidth

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
   Center Frequency =DTS channel center frequency
   Span=2 x DTS bandwidth
   RBW = 100 kHz, VBW ≥ 3 × RBW
   Sweep time= auto couple
   Detector = Peak
   Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission, and record the pertinent measurements.

TEST MODE:

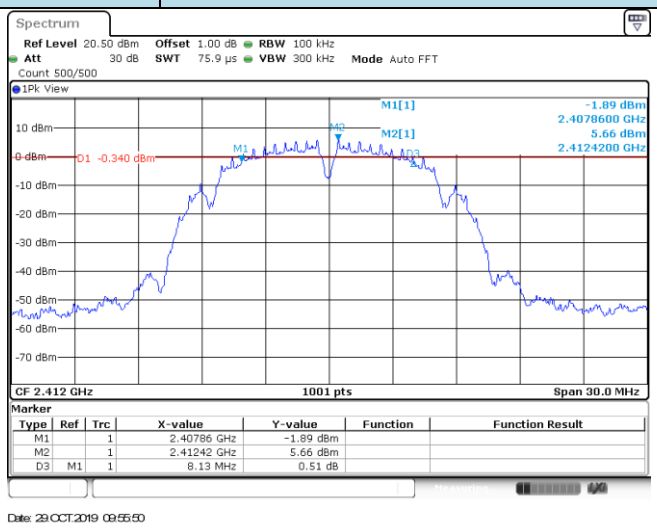
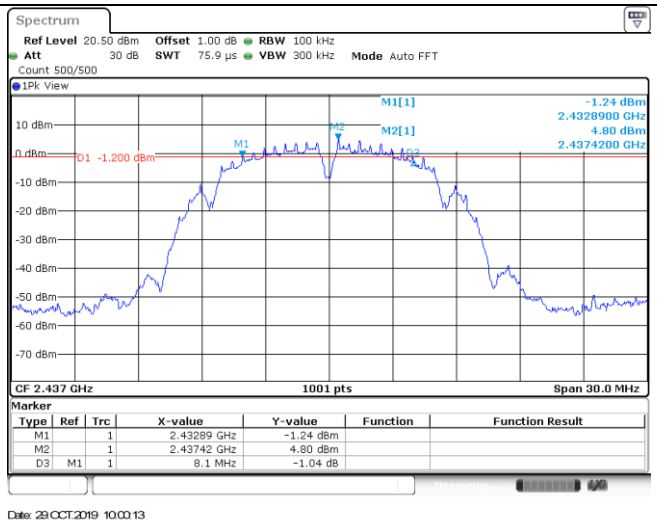
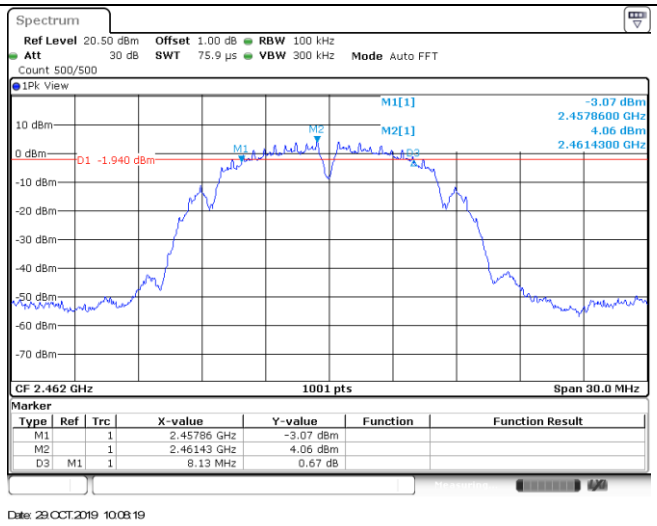
Please refer to the clause 3.3

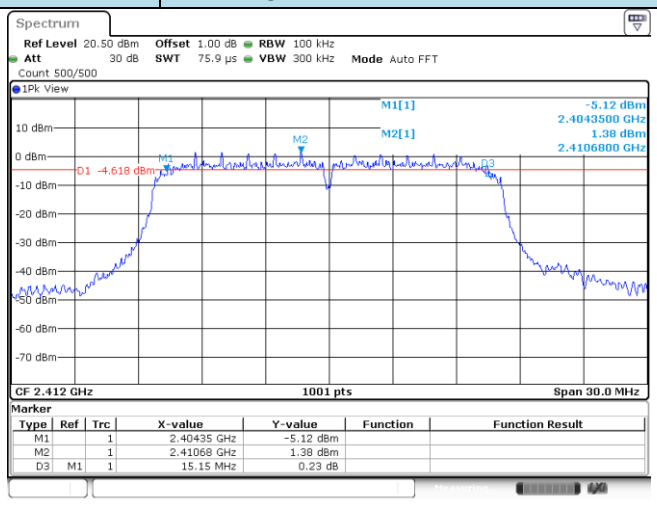
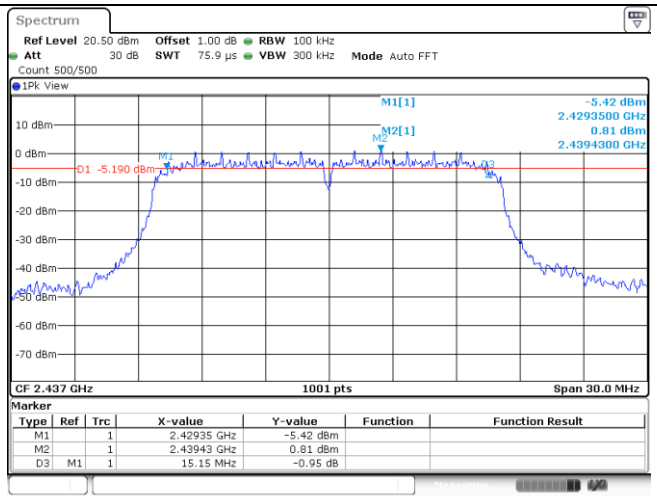
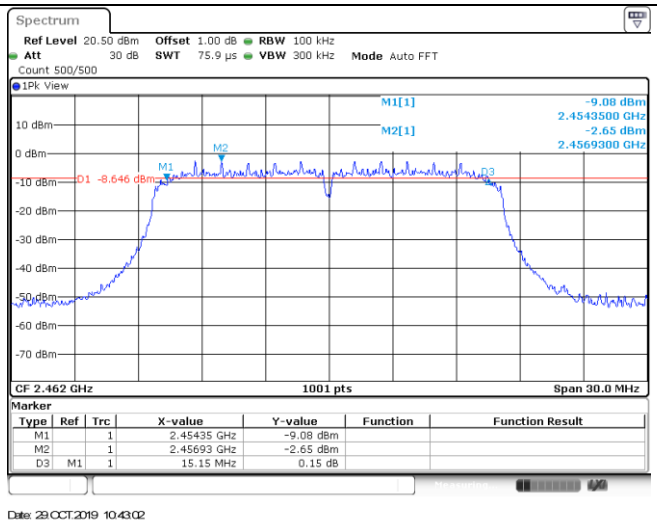
TEST RESULTS

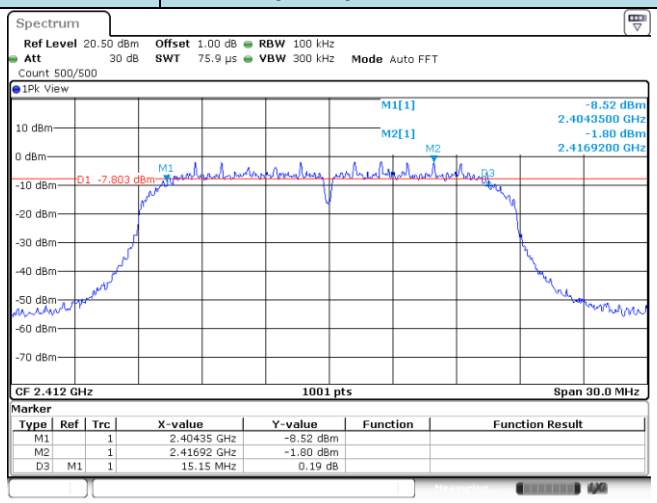
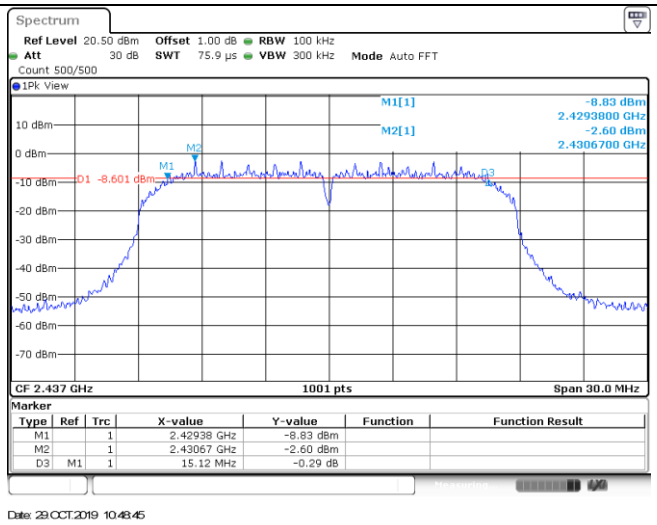
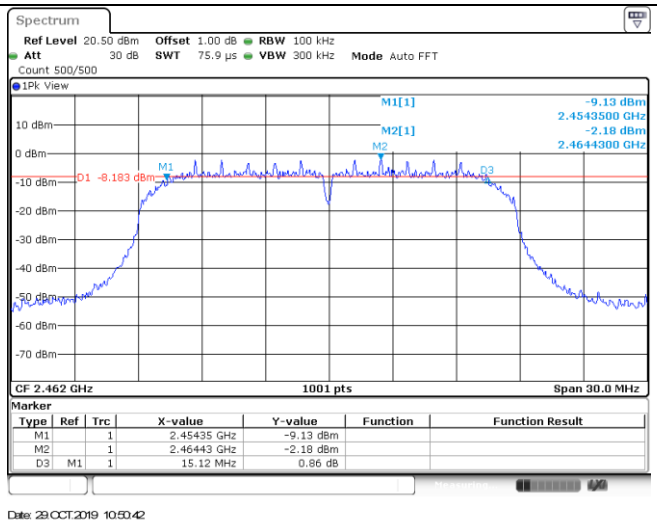
☒ **Passed** ☐ **Not Applicable**

Type	Channel	6dB Bandwidth (MHz)	Limit (kHz)	Result
802.11b	01	8.13	≥500	Pass
	06	8.10		
	11	8.13		
802.11g	01	15.15	≥500	Pass
	06	15.15		
	11	15.15		
802.11n(HT20)	01	15.15	≥500	Pass
	06	15.12		
	11	15.12		

Test plot as follows:

Type:	802.11 b
CH01	
CH06	
CH11	

Type:	802.11 g
CH01	
CH06	
CH11	

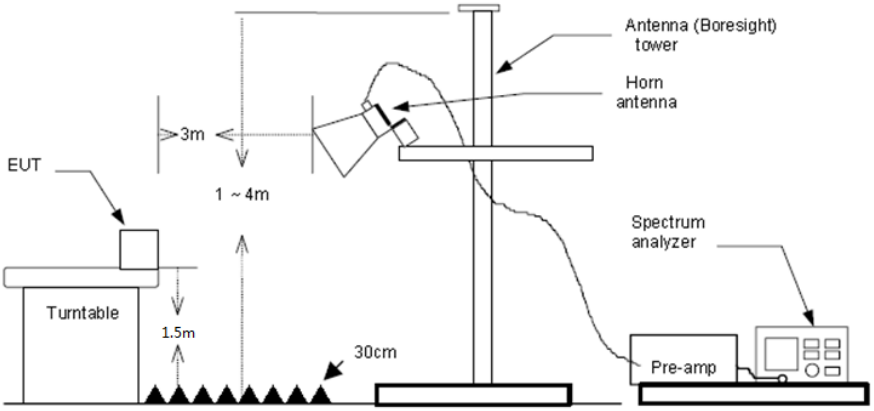
Type:	802.11n(HT20)
CH01	
CH06	
CH11	

5.6. Restricted band

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1) The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2) The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3) The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4) The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find themaximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5) The receiver set as follow:
   RBW=1MHz, VBW=3MHz PEAK detector for Peak value.
   RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:
1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor

802.11b :

Test channel:	CH00	Polarity	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	22.02	35.78	57.80	74.00	16.20	Horizontal	PK
2	2390.000	21.85	35.50	57.35	74.00	16.65	Horizontal	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	11.87	35.78	47.65	54.00	6.35	Horizontal	AV
2	2390.000	11.55	35.50	47.05	54.00	6.95	Horizontal	AV

Test channel:	CH00	Polarity	Vertical

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	22.80	35.78	58.58	74.00	15.42	Vertical	PK
2	2390.000	21.98	35.50	57.48	74.00	16.52	Vertical	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	11.91	35.78	47.69	54.00	6.31	Vertical	AV
2	2390.000	11.45	35.50	46.95	54.00	7.05	Vertical	AV

Test channel:	CH11	Polarity	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	23.60	35.31	58.91	74.00	15.09	Horizontal	PK
2	2500.000	22.09	35.28	57.37	74.00	16.63	Horizontal	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	11.61	35.31	46.92	54.00	7.08	Horizontal	AV
2	2500.000	11.31	35.28	46.59	54.00	7.41	Horizontal	AV

Test channel:	CH11	Polarity	Vertical

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	22.80	35.31	58.11	74.00	15.89	Vertical	PK
2	2500.000	22.26	35.28	57.54	74.00	16.46	Vertical	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	11.64	35.31	46.95	54.00	7.05	Vertical	AV
2	2500.000	11.40	35.28	46.68	54.00	7.32	Vertical	AV

802.11g :

Test channel:	CH00	Polarity	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	23.48	35.78	59.26	74.00	14.74	Horizontal	PK
2	2390.000	22.80	35.50	58.30	74.00	15.70	Horizontal	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	12.08	35.78	47.86	54.00	6.14	Horizontal	AV
2	2390.000	11.89	35.50	47.39	54.00	6.61	Horizontal	AV

Test channel:	CH00	Polarity	Vertical

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	22.61	35.78	58.39	74.00	15.61	Vertical	PK
2	2390.000	21.77	35.50	57.27	74.00	16.73	Vertical	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	11.97	35.78	47.75	54.00	6.25	Vertical	AV
2	2390.000	11.66	35.50	47.16	54.00	6.84	Vertical	AV

Test channel:	CH11	Polarity	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	23.52	35.31	58.83	74.00	15.17	Horizontal	PK
2	2500.000	22.46	35.28	57.74	74.00	16.26	Horizontal	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	11.42	35.31	46.73	54.00	7.27	Horizontal	AV
2	2500.000	11.47	35.28	46.75	54.00	7.25	Horizontal	AV

Test channel:	CH11	Polarity	Vertical

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	22.10	35.31	57.41	74.00	16.59	Vertical	PK
2	2500.000	22.66	35.28	57.94	74.00	16.06	Vertical	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	11.70	35.31	47.01	54.00	6.99	Vertical	AV
2	2500.000	11.46	35.28	46.74	54.00	7.26	Vertical	AV

802.11n(H20):

Test channel:	CH00	Polarity	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	22.40	35.78	58.18	74.00	15.82	Horizontal	PK
2	2390.000	22.65	35.50	58.15	74.00	15.85	Horizontal	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	11.82	35.78	47.60	54.00	6.40	Horizontal	AV
2	2390.000	12.41	35.50	47.91	54.00	6.09	Horizontal	AV

Test channel:	CH00	Polarity	Vertical

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	22.63	35.78	58.41	74.00	15.59	Vertical	PK
2	2390.000	22.56	35.50	58.06	74.00	15.94	Vertical	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2310.000	12.24	35.78	48.02	54.00	5.98	Vertical	AV
2	2390.000	11.60	35.50	47.10	54.00	6.90	Vertical	AV

Test channel:	CH11	Polarity	Horizontal

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	23.66	35.31	58.97	74.00	15.03	Horizontal	PK
2	2500.000	22.59	35.28	57.87	74.00	16.13	Horizontal	PK

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	11.43	35.31	46.74	54.00	7.26	Horizontal	AV
2	2500.000	11.42	35.28	46.70	54.00	7.30	Horizontal	AV

Test channel:	CH11	Polarity	Vertical

Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	22.44	35.31	57.75	74.00	16.25	Vertical	PK
2	2500.000	22.50	35.28	57.78	74.00	16.22	Vertical	PK

Suspected Data List

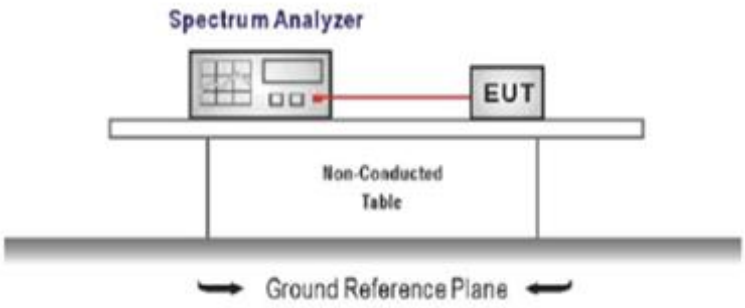
NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1	2483.500	11.03	35.31	46.34	54.00	7.66	Vertical	AV
2	2500.000	11.19	35.28	46.47	54.00	7.53	Vertical	AV

5.7. Band edge and Spurious Emissions (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Establish a reference level by using the following procedure
   Center frequency=DTS channel center frequency
   The span = 1.5 times the DTS bandwidth.
   RBW = 100 kHz, VBW ≥ 3 x RBW
   Detector = peak, Sweep time = auto couple, Trace mode = max hold
   Allow trace to fully stabilize
   Use the peak marker function to determine the maximum PSD level

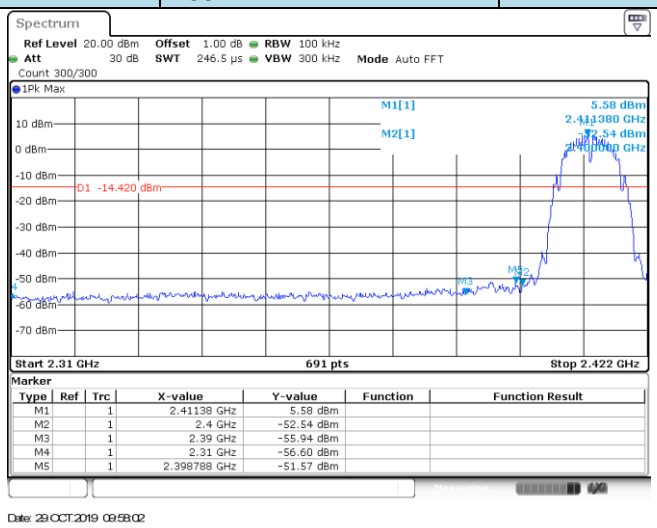
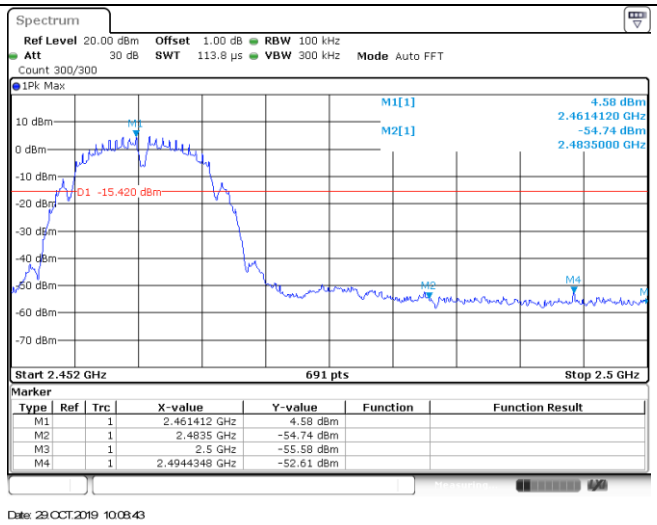
   Note: the channel found to contain the maximum PSD level can be used to establish the reference level.
3. Emission level measurement
   Set the center frequency and span to encompass frequency range to be measured
   RBW = 100 kHz, VBW ≥ 3 x RBW
   Detector = peak, Sweep time = auto couple, Trace mode = max hold
   Allow trace to fully stabilize
   Use the peak marker function to determine the maximum amplitude level.
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
5. Ensure that the amplitude of all unwanted emission outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emission relative to the limit.

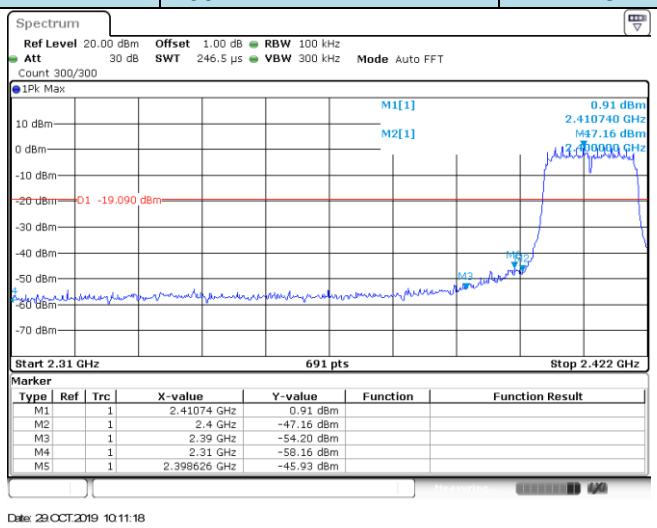
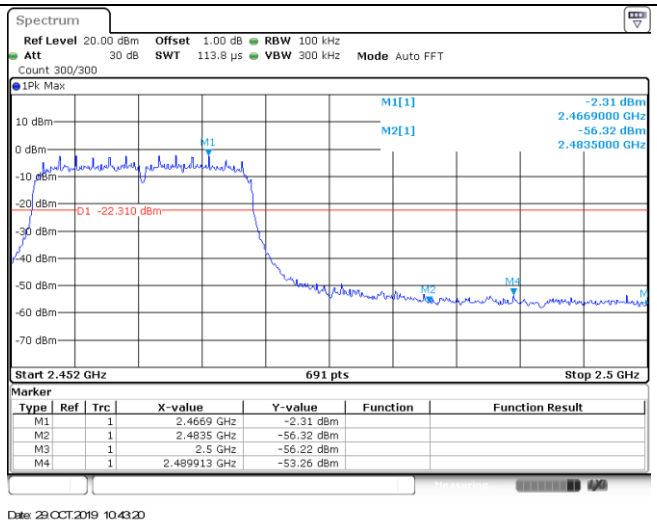
TEST MODE:

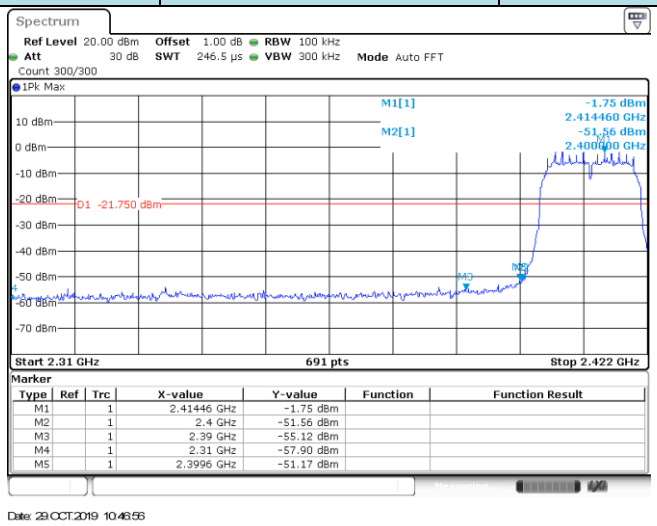
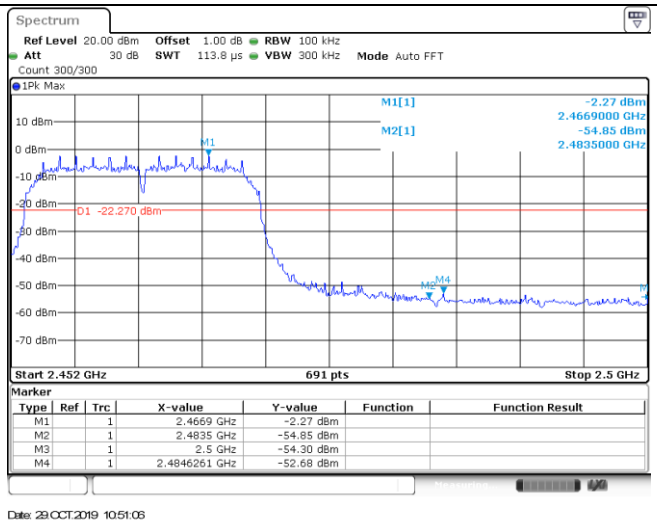
Please refer to the clause 3.3

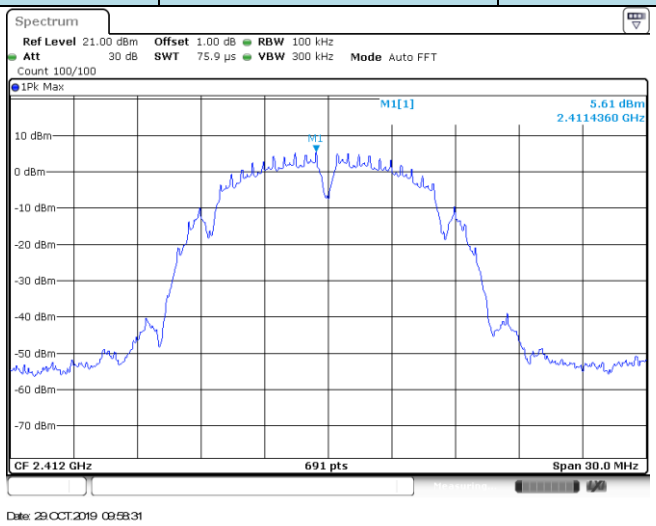
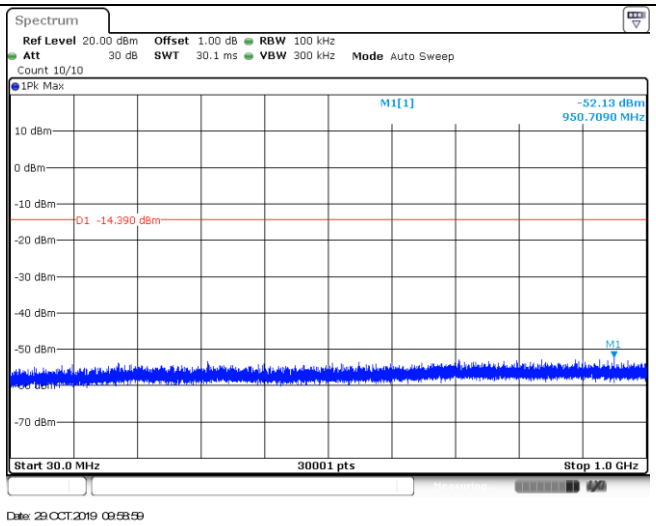
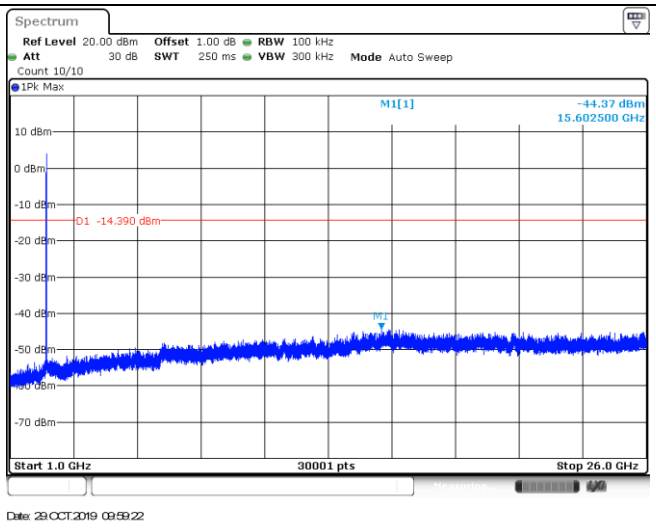
TEST RESULTS

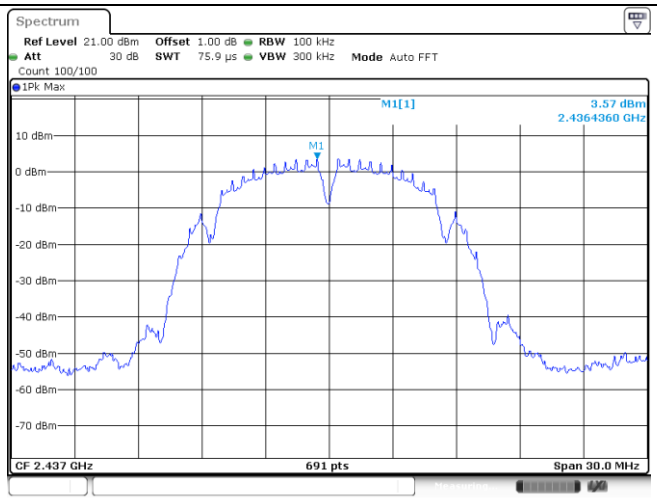
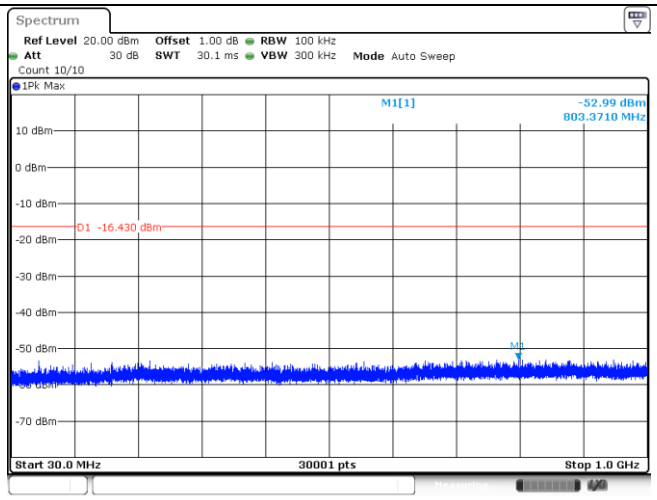
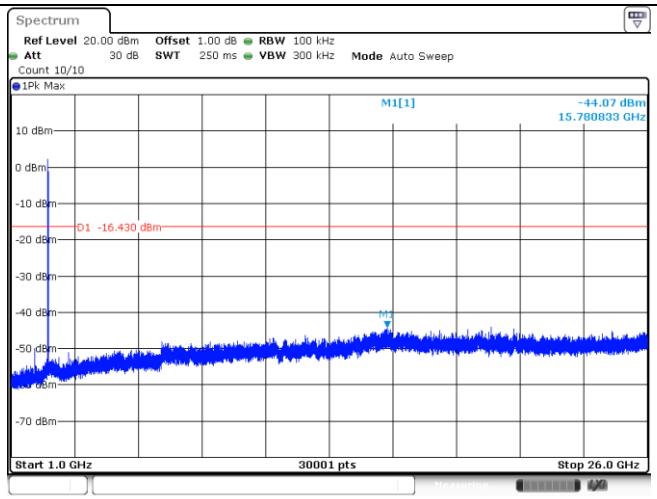
☒ **Passed** ☐ **Not Applicable**

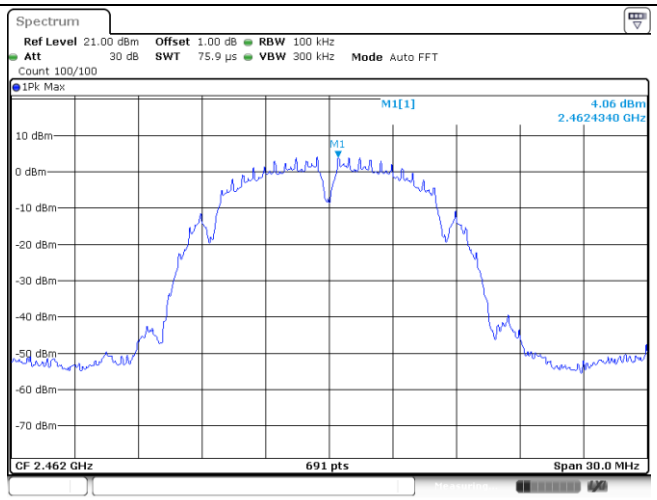
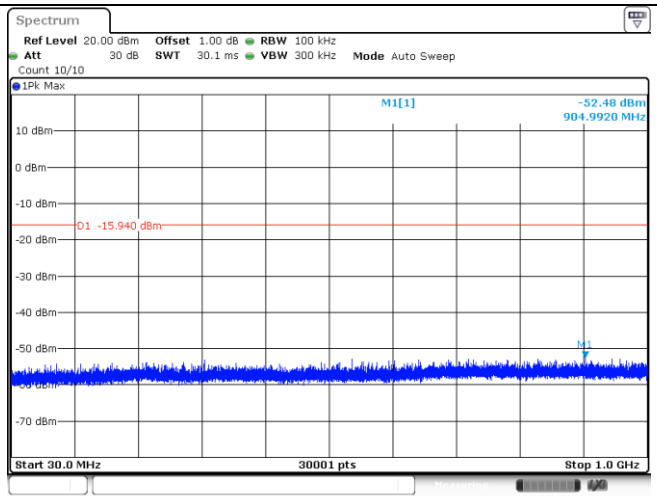
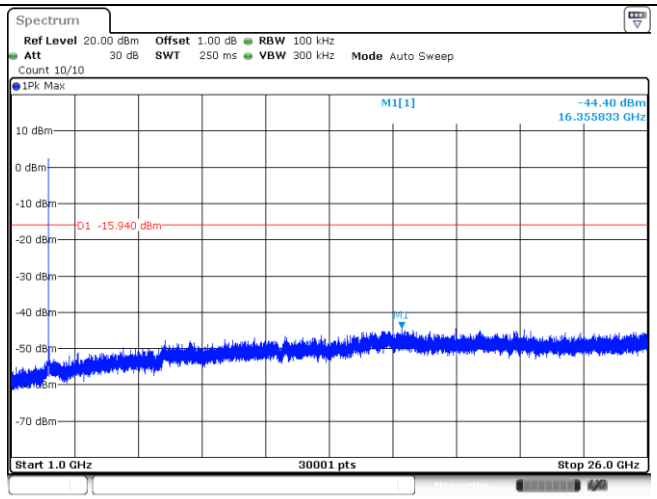
Test Item:	Bandedge	Type:	802.11 b
CH01			
CH11			

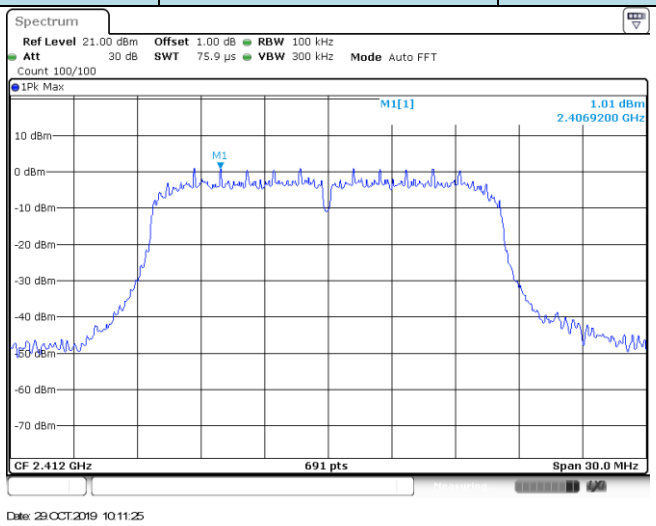
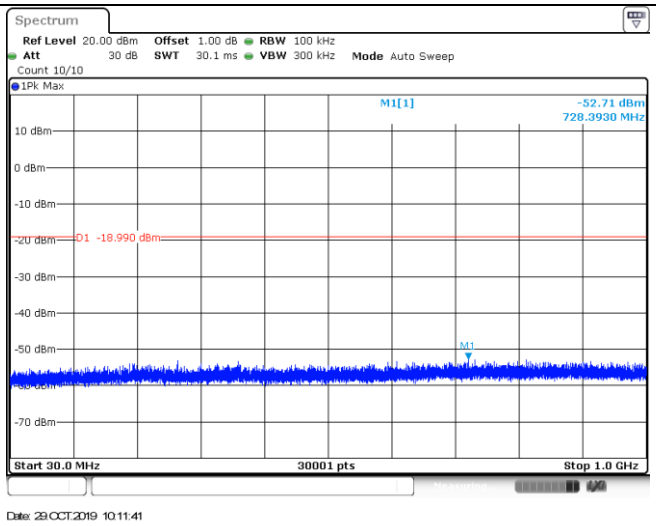
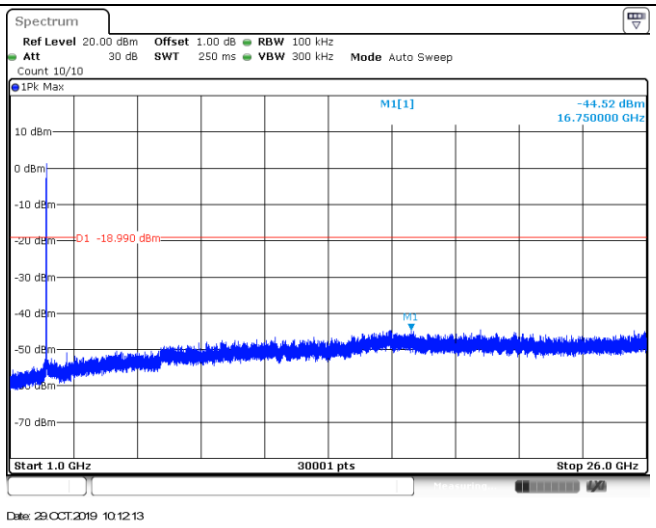
Test Item:	Bandedge	Type:	802.11 g
CH01	
CH11	

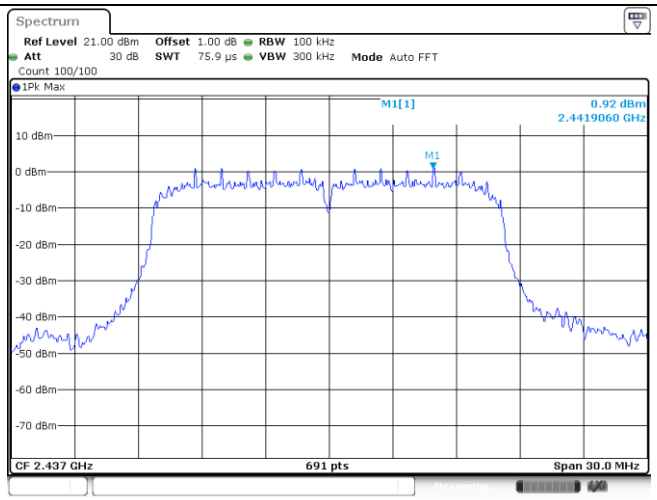
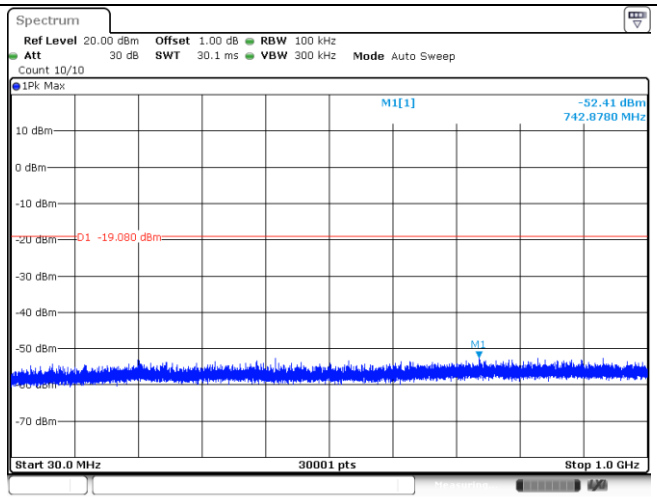
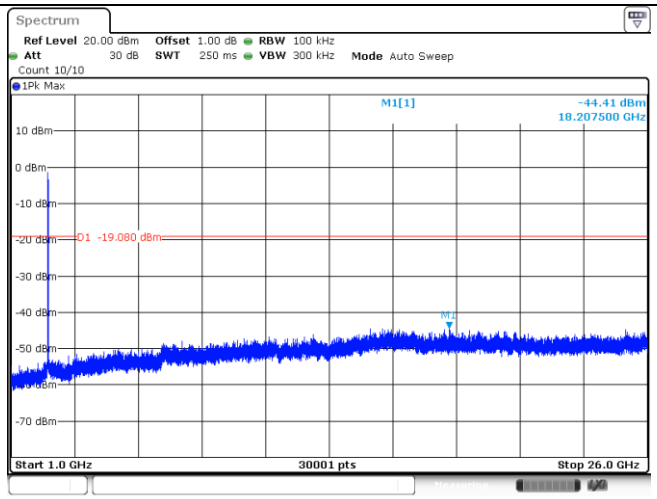
Test Item:	Bandedge	Type:	802.11 n(HT20)
CH01			
CH11			

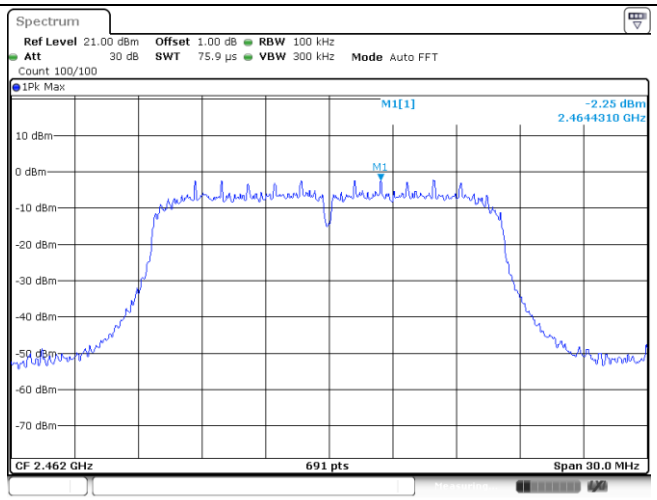
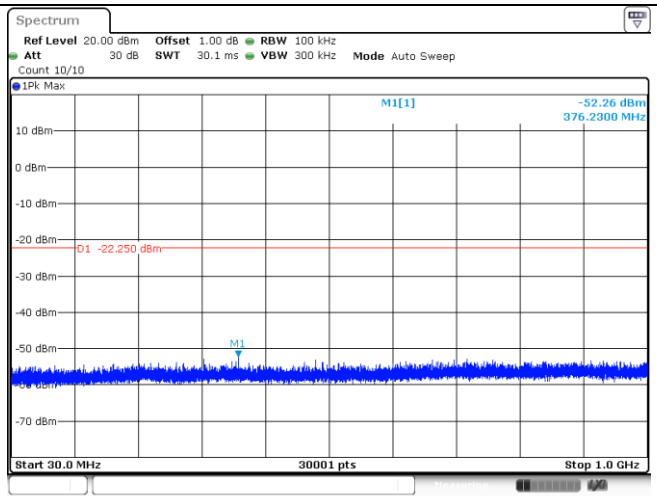
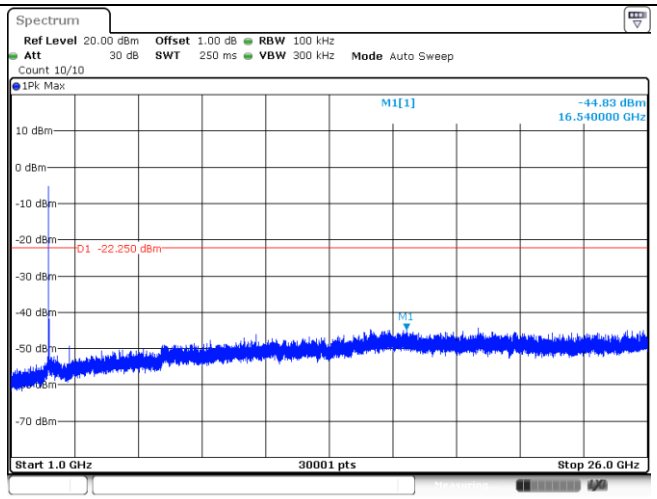
Test Item:	SE	Type:	802.11 b
CH01 Reference level			
CH01 30MHz~1000MHz			
CH01 1GHz~26GHz			

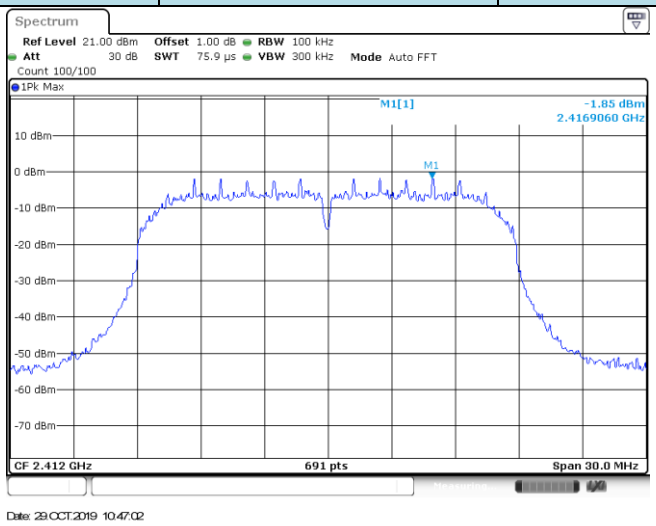
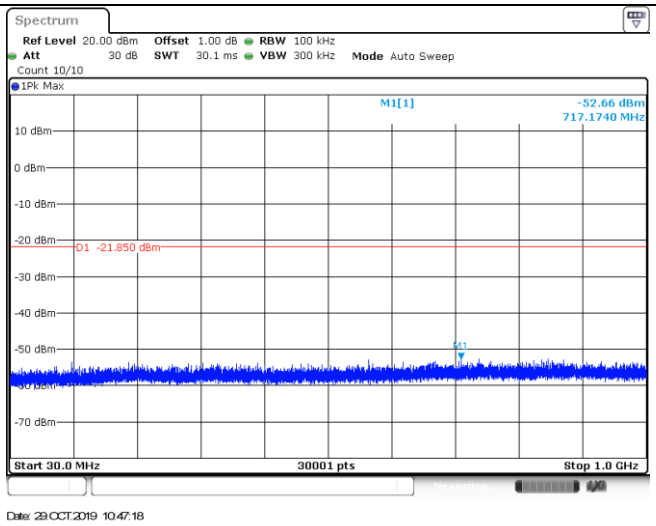
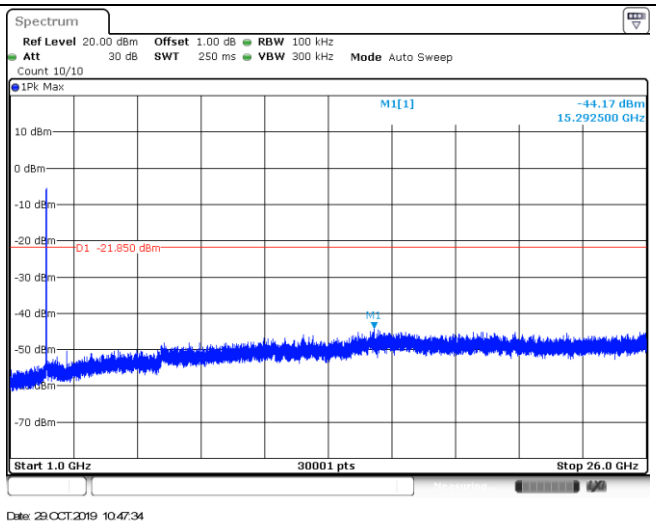
CH06 Reference level	 Date: 29.OCT.2019 10:00:40
CH06 30MHz~1000MHz	 Date: 29.OCT.2019 10:00:55
CH06 1GHz~26GHz	 Date: 29.OCT.2019 10:01:11

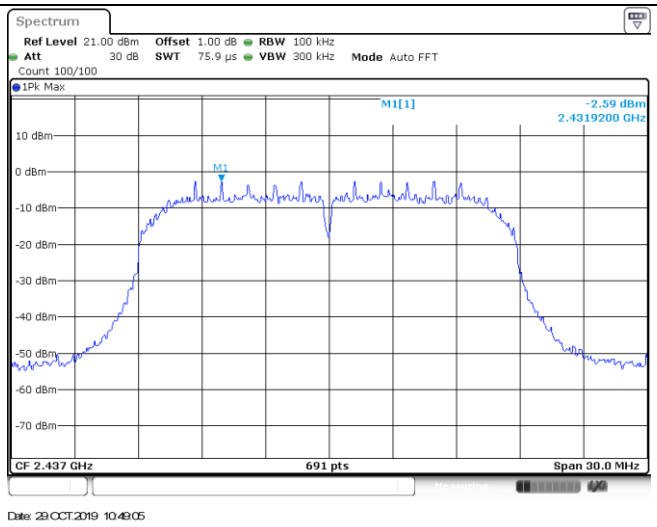
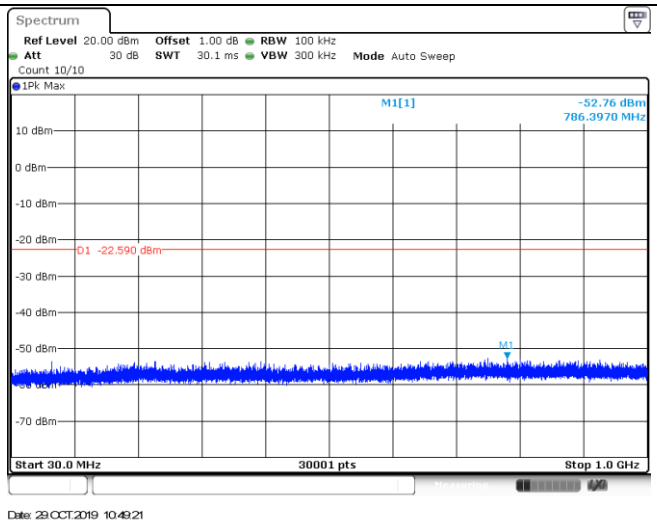
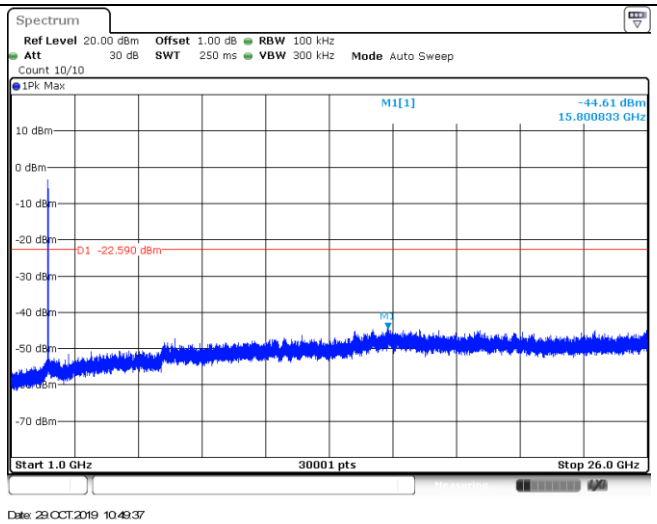
CH11 Reference level	 Date: 29.OCT.2019 10:08:50
CH11 30MHz~1000MHz	 Date: 29.OCT.2019 10:09:06
CH11 1GHz~26GHz	 Date: 29.OCT.2019 10:09:22

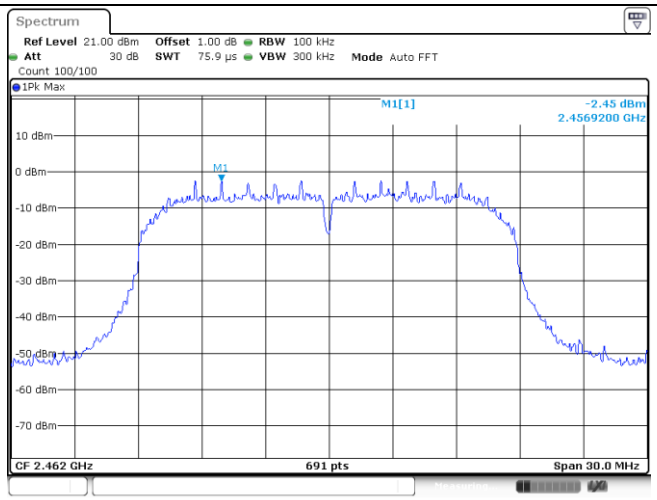
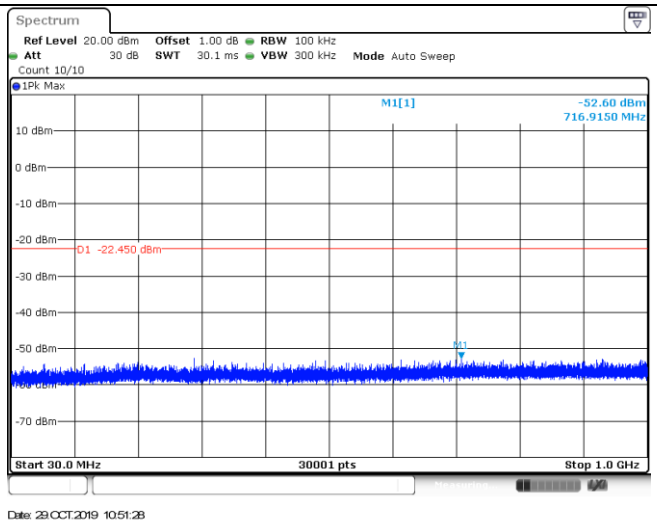
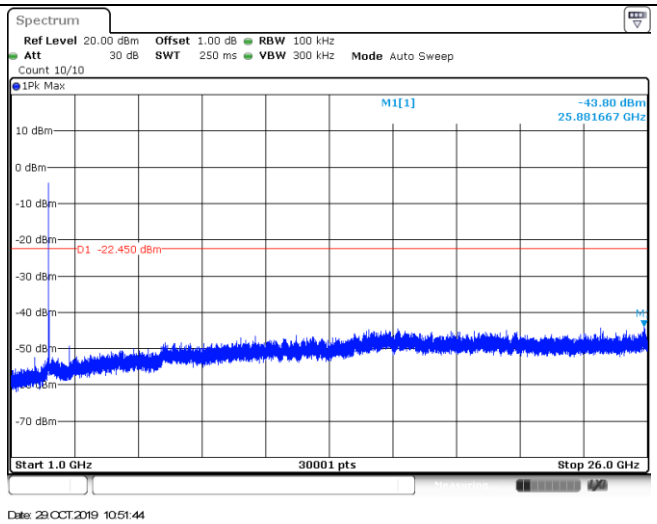
Test Item:	SE	Type:	802.11 g
CH01 Reference level			
CH01 30MHz~1000MHz			
CH01 1GHz~26GHz			

CH06 Reference level	 Date: 29.OCT.2019 10:14:03
CH06 30MHz~1000MHz	 Date: 29.OCT.2019 10:14:18
CH06 1GHz~26GHz	 Date: 29.OCT.2019 10:14:34

CH11 Reference level	 Date: 29.OCT.2019 10:43:27
CH11 30MHz~1000MHz	 Date: 29.OCT.2019 10:43:43
CH11 1GHz~26GHz	 Date: 29.OCT.2019 10:43:59

Test Item:	SE	Type:	802.11 n(HT20)
CH01 Reference level			
CH01 30MHz~1000MHz			
CH01 1GHz~26GHz			

CH06 Reference level	
CH06 30MHz~1000MHz	
CH06 1GHz~26GHz	

CH11 Reference level	
CH11 30MHz~1000MHz	
CH11 1GHz~26GHz	

5.8. Spurious Emissions (radiated)

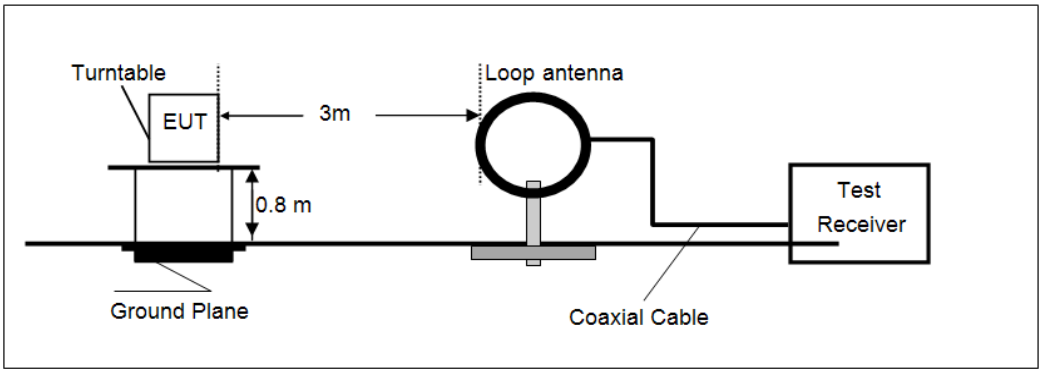
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

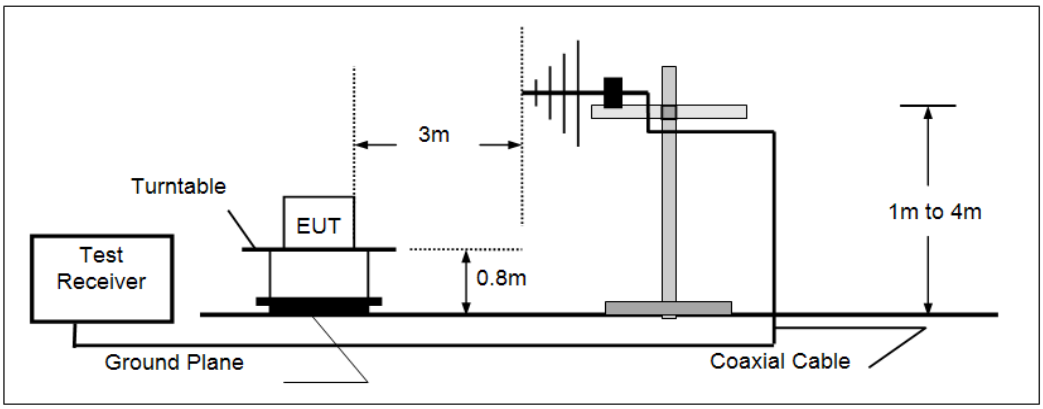
Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

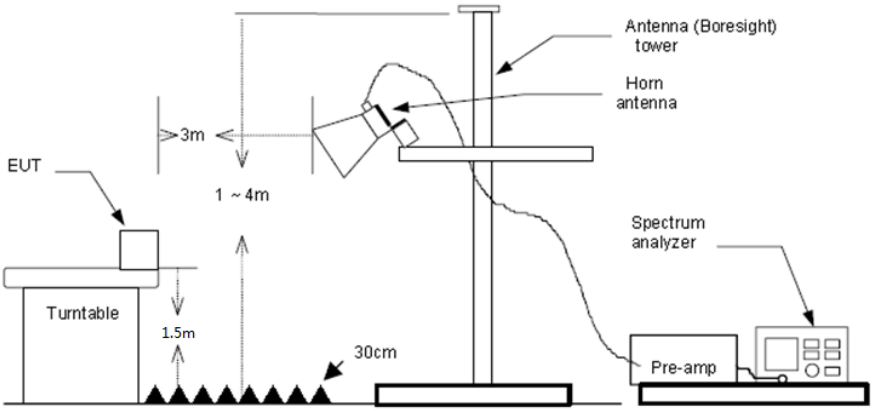
- 9kHz ~30MHz



- 30MHz ~ 1GHz



- Above 1GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, 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 to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Below 1 GHz:
   RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
   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.
   (3) From 1 GHz to 10th harmonic:
   RBW=1MHz, VBW=3MHz Peak detector for Peak value.
   RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:
1) Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2) The emission levels of other frequencies are very lower than the limit and not show in test report.

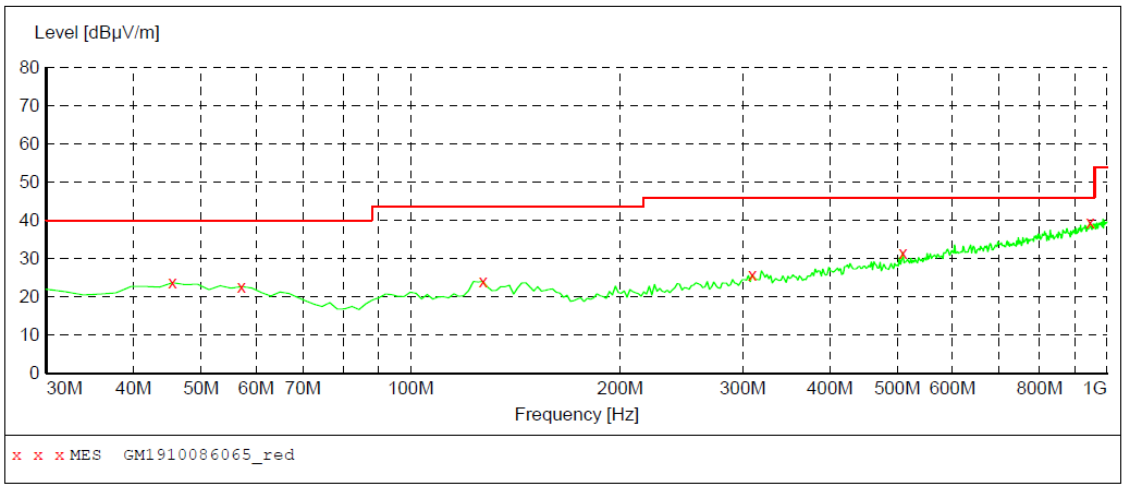
- **9kHz ~ 30MHz**
  The EUT was pre-scanned the frequency band (9kHz~30MHz), found the radiated level lower than the limit, so don't show on the report.

- **30MHz ~1000MHz**
  Have pre-scan all modulation mode, found the 802.11b mode CH01 which it was worst case, so only the worst case's data on the test report.

➢ **30MHz ~ 1GHz**

SPS-SL-42WS2XXZ:

Polarization:	Vertical

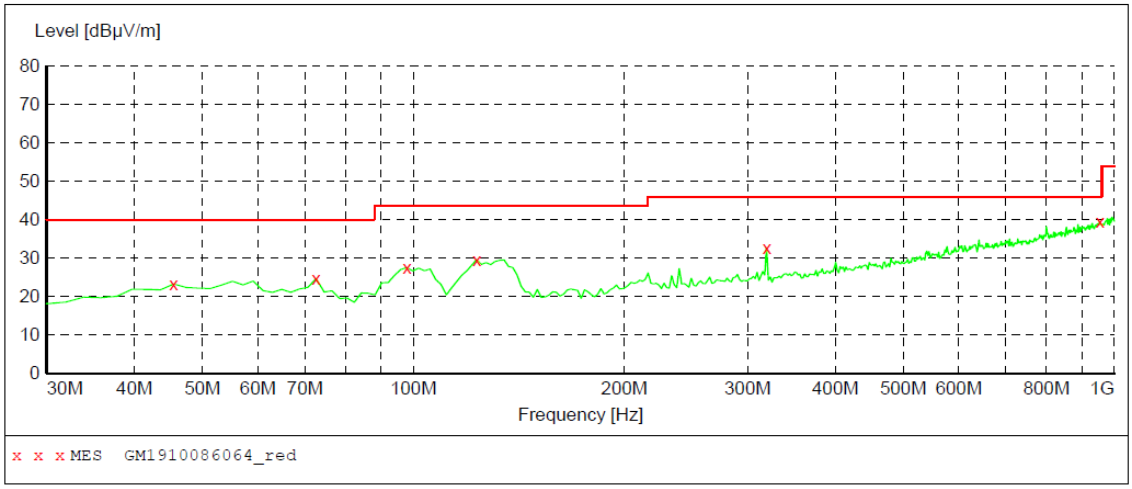


MEASUREMENT RESULT: "GM1910086065_red"

10/8/2019 6:56PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.520000	23.70	-4.4	40.0	16.3	QP	100.0	341.00	VERTICAL
57.160000	22.70	-4.7	40.0	17.3	QP	100.0	259.00	VERTICAL
127.000000	24.10	-8.5	43.5	19.4	QP	100.0	283.00	VERTICAL
309.360000	25.80	-2.3	46.0	20.2	QP	100.0	119.00	VERTICAL
509.180000	31.60	2.9	46.0	14.4	QP	100.0	272.00	VERTICAL
945.680000	39.50	12.1	46.0	6.5	QP	100.0	294.00	VERTICAL

Polarization:	Horizontal



MEASUREMENT RESULT: "GM1910086064_red"

10/8/2019 6:53PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.520000	23.30	-4.4	40.0	16.7	QP	300.0	359.00	HORIZONTAL
72.680000	24.70	-9.8	40.0	15.3	QP	300.0	360.00	HORIZONTAL
97.900000	27.50	-6.4	43.5	16.0	QP	300.0	158.00	HORIZONTAL
123.120000	29.60	-8.1	43.5	13.9	QP	300.0	193.00	HORIZONTAL
319.060000	32.70	-2.1	46.0	13.3	QP	100.0	310.00	HORIZONTAL
953.440000	39.60	12.2	46.0	6.4	QP	300.0	311.00	HORIZONTAL