FCC Test Report

FCC ID	:	**2AAS9-2251XW**
Equipment	:	**Dual Radio 802.11a/n+b/g/n Outdoor Access Point**
Model No.	:	**BW2251**
Brand Name	:	**BROWAN**
Applicant	:	**BROWAN COMMUNICATIONS Co., Ltd.**
Address	:	**No. 15-1, Zhonghua Rd., Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, R. O. C.**
Manufacturer	:	**Gemtek Technology Co., Ltd.**
Address	:	**No. 15-1, Zhonghua Rd., Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, R. O. C.**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Aug. 21, 2013**
Tested Date	:	**Aug. 21 ~ Oct. 23, 2013**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:

Gary Chang / Manager

Testing Laboratory 2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Local Support Equipment List 7
1.3 Test Setup Chart 8
1.4 The Equipment List 9
1.5 Test Standards 10
1.6 Measurement Uncertainty 10

2 TEST CONFIGURATION 11

2.1 Testing Condition 11
2.2 The Worst Test Modes and Channel Details 11

3 TRANSMITTER TEST RESULTS 12

3.1 Conducted Emissions 12
3.2 6dB and Occupied Bandwidth 15
3.3 RF Output Power 18
3.4 Power Spectral Density 20
3.5 Unwanted Emissions into Restricted Frequency Bands 22
3.6 Unwanted Emissions into Non-Restricted Frequency Bands 42

4 TEST LABORATORY INFORMATION 49

Release Record

Report No.	Version	Description	Issued Date
FR390501AI	Rev. 01	Initial issue	Feb. 14, 2014

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 1.223MHz 44.86 (Margin -1.14dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]:34.85MHz 38.98 (Margin -1.02dB) - QP	Pass
15.247(b)(3)	Fundamental Emission Output Power	Power [dBm]: 11a: 29.76 HT20: 29.80 HT40: 29.81	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	**IEEE Std. 802.11**	**Ch. Freq. (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**Data Rate / MCS**
5725-5850	a	5745-5825	149-165 [5]	2	6-54 Mbps
5725-5850	n (HT20)	5745-5825	149-165 [5]	2	MCS 0-15
5725-5850	n (HT40)	5755-5795	151-159 [2]	2	MCS 0-15
Note 1: RF output power specifies that Maximum Conducted Output Power. Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Details

Ant. No.	Model	Type	Gain (dBi)	Connector
1	BA5071	Omni-directional	5	N type

1.1.3 EUT Operational Condition

Power Supply Type	48Vdc from AC adapter. 8~57Vdc from POE

1.1.4 Accessories

Accessories		
No.	**Equipment**	**Description**
1	AC adapter	Brand Name: LEI Model Name: MU24-B480050-A1 Power Rating: I/P: 100-240Vac, 50-60Hz, 1.0A O/P: 48Vdc, 0.5A Power Line: AC 1.5m non-shielded cable w/o core
2	POE	Brand Name: BROWAN Model Name: BE3013 Power Rating: I/P: 8 ~ 57Vdc O/P: 8 ~ 57Vdc

1.1.5 Channel List

Frequency band (MHz)		5725~5850	
802.11 a / HT20		802.11n HT40	
Channel	**Frequency(MHz)**	**Channel**	**Frequency(MHz)**
149	5745	151	5755
153	5765	159	5795
157	5785	---	---
161	5805	---	---
165	5825	---	---

1.1.6 Test Tool and Duty Cycle

Test tool	ART2-GUI V2.3
Duty Cycle Of Test Signal (%)	100.00% - IEEE 802.11a 100.00% - IEEE 802.11n (HT20) 100.00% - IEEE 802.11n (HT40)
Duty Factor	0 - IEEE 802.11a 0 - IEEE 802.11n (HT20) 0 - IEEE 802.11n (HT40)

1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11a	5745	17
11a	5785	17
11a	5825	17
HT20	5745	17
HT20	5785	17
HT20	5825	17
HT40	5755	17
HT40	5795	17

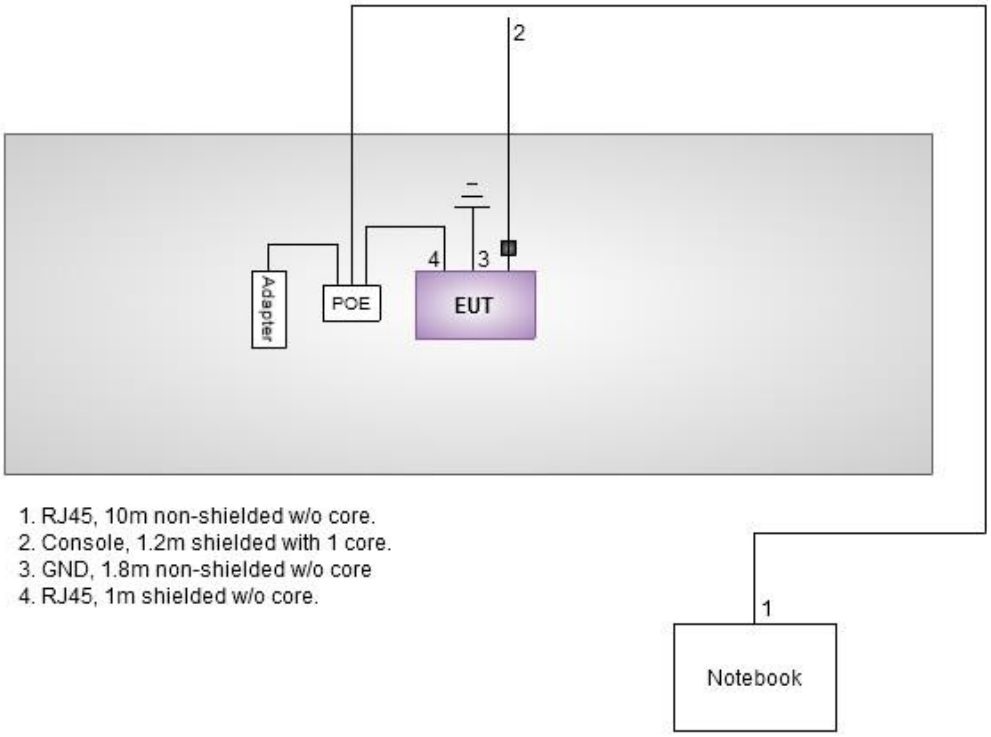
1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	E6430	---	DoC	RJ45 10m non-shielded w/o core.

Note: Console cable was supplied by applicant.

1.3 Test Setup Chart

Test Setup Diagram



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
LISN	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-667	Dec. 04, 2012	Dec. 03, 2013
LISN (Support Unit)	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-666	Dec. 04, 2012	Dec. 03, 2013
ISN	TESEQ	ISN T800	34406	Apr. 08, 2013	Apr. 07, 2014
ISN	TESEQ	ISN T200A	30494	Apr. 09, 2013	Apr. 08, 2014
ISN	TESEQ	ISN ST08	22589	Jan. 24, 2013	Jan. 23, 2014
RF Current Probe	FCC	F-33-4	121630	Dec. 04, 2012	Dec. 03, 2013
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Dec. 25, 2012	Dec. 24, 2013
ESH3-Z6 V-Network(+)	R&S	ESH3-Z6	100920	Nov. 21, 2012	Nov. 20, 2013
ESH3-Z6 V-Network(-)	R&S	ESH3-Z6	100951	Jan. 30, 2013	Jan. 29, 2014
Two-Line V-Network	R&S	ENV216	101579	Jan. 07, 2013	Jan. 06, 2014
50 ohm terminal	NA	50	01	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal (Support Unit)	NA	50	04	Apr. 22, 2013	Apr. 21, 2014
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission above 1GHz				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
3m semi-anechoic chamber	CHAMPRO	SAC-03	03CH01-WS	Jan. 04, 2013	Jan. 03, 2014
Spectrum Analyzer	R&S	FSV40	101498	Jan. 24, 2013	Jan. 23, 2014
Receiver	ROHDE&SCHWARZ	ESR3	101658	Jan. 28, 2013	Jan. 27, 2014
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 11, 2013	Jan. 10, 2014
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Feb. 18, 2013	Feb. 17, 2014
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Jan. 14, 2013	Jan. 13, 2014
Amplifier	Burgeon	BPA-530	100219	Nov. 28, 2012	Nov. 27, 2013
Amplifier	Agilent	83017A	MY39501308	Dec. 18, 2012	Dec. 17, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 25, 2012	Dec. 24, 2013
RF Cable-R03m	Woken	CFD400NL-LW	CFD400NL-001	Dec. 25, 2012	Dec. 24, 2013
RF Cable-R10m	Woken	CFD400NL-LW	CFD400NL-002	Dec. 25, 2012	Dec. 24, 2013
Note: Calibration Interval of instruments listed above is one year.					

Loop Antenna	R&S	HFH2-Z2	100330	Nov. 15, 2012	Nov. 14, 2014
Amplifier	MITEQ	AMF-6F-260400	9121372	Apr. 19, 2013	Apr. 18, 2015
Note: Calibration Interval of instruments listed above is two year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV 40	101063	Feb. 18, 2013	Feb. 17, 2014
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 29, 2012	Nov. 28, 2013
Power Meter	Anritsu	ML2495A	1241001	Oct. 08, 2013	Oct. 07, 2014
Power Sensor	Anritsu	MA2411B	1207362	Oct. 08, 2013	Oct. 07, 2014
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
ANSI C63.10-2009
FCC KDB 558074 D01 DTS Meas Guidance v03r01
FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Note: The EUT has been tested and complied with FCC part 15B requirement. FCC Part 15B test results are issued to another report.

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±35.286 Hz
Conducted power	±0.536 dB
Frequency error	±35.286 Hz
Temperature	±0.3 ^{o}C
Conducted emission	±2.946 dB
AC conducted emission	±2.43 dB
Radiated emission	±2.49 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	25°C / 62%	Skys Huang
Radiated Emissions	03CH01-WS	24°C / 62%	Haru Yang Aska Huang
RF Conducted	TH01-WS	23°C / 62%	Brad Wu

- FCC site registration No.: 657002
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data rate (Mbps) / MCS	Test Configuration
Conducted Emissions	HT40	5795	MCS 0	---
Radiated Emissions (below 1GHz)	HT40	5795	MCS 0	---
Radiated Emissions (above 1GHz)	11a HT20 HT40	5745 / 5785 / 5825 5745 / 5785 / 5825 5755 / 5795	6 Mbps MCS 0 MCS 0	---
Fundamental Emission Output Power	11a HT20 HT40	5745 / 5785 / 5825 5745 / 5785 / 5825 5755 / 5795	6 Mbps MCS 0 MCS 0	---
6dB bandwidth				
Power spectral density				

3 Transmitter Test Results

3.1 Conducted Emissions

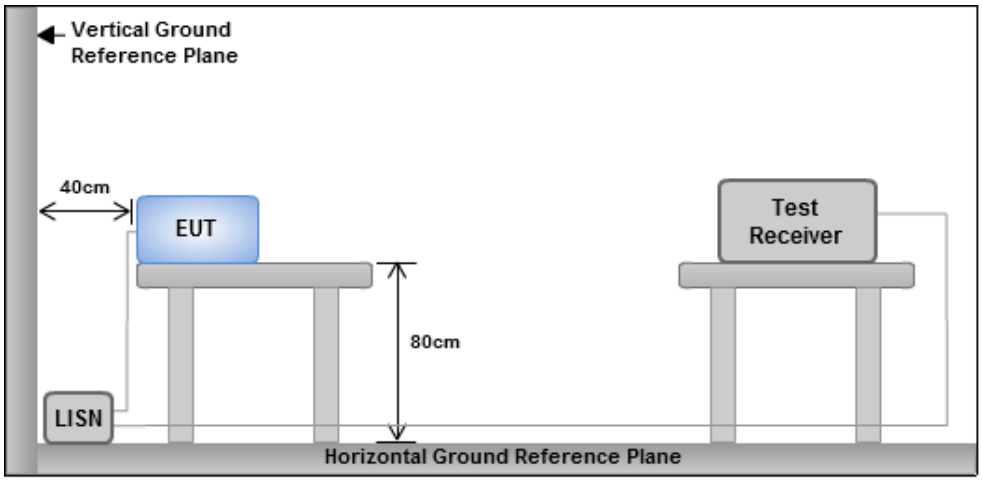
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

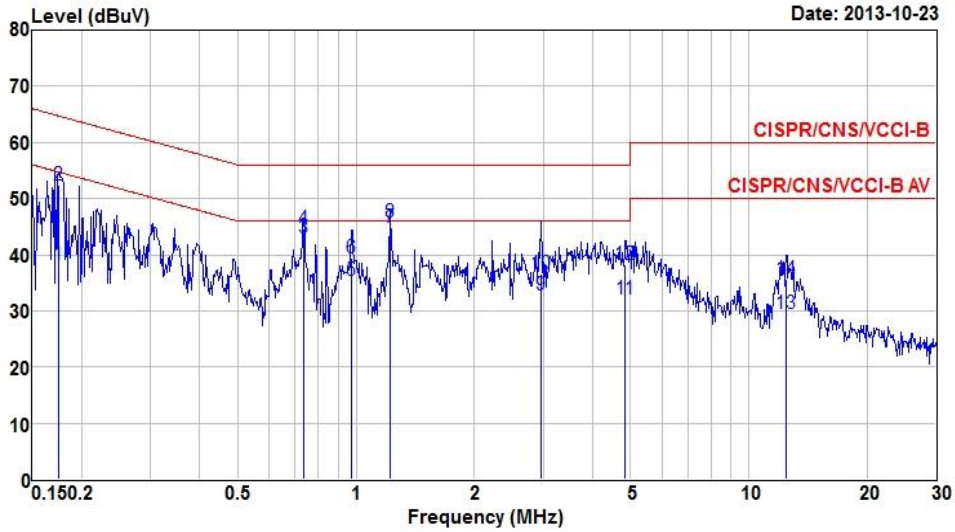
3.1.3 Test Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

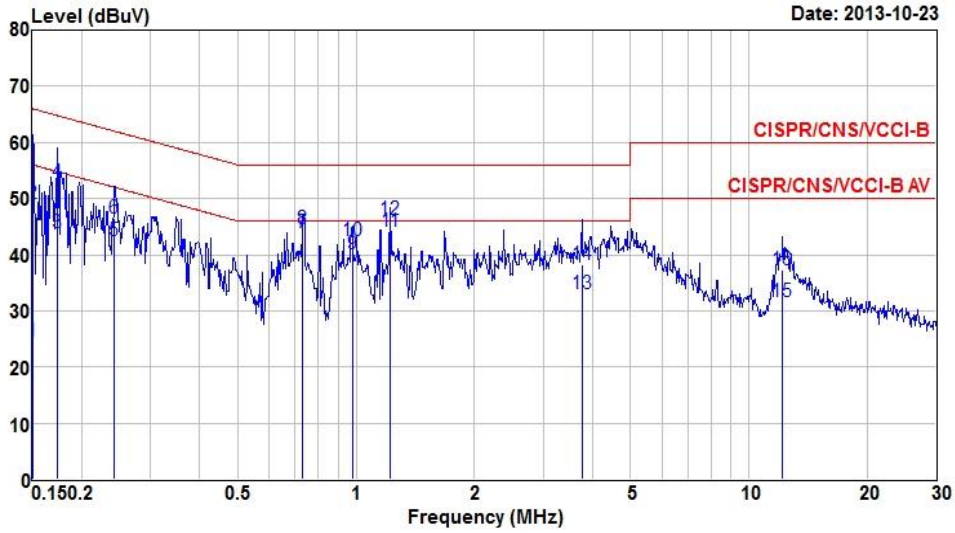
Modulation Mode	HT40	Test Freq. (MHz)	5795
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.175	38.14	54.72	-16.58	37.98	0.03	0.13	Average
2	0.175	52.43	64.72	-12.29	52.27	0.03	0.13	QP
3	0.735	43.02	46.00	-2.98	42.95	0.03	0.04	Average
4	0.735	44.61	56.00	-11.39	44.54	0.03	0.04	QP
5	0.974	35.36	46.00	-10.64	35.29	0.03	0.04	Average
6	0.974	39.39	56.00	-16.61	39.32	0.03	0.04	QP
7	1.223	44.86	46.00	-1.14	44.75	0.04	0.07	Average
8	1.223	45.82	56.00	-10.18	45.71	0.04	0.07	QP
9	2.962	32.78	46.00	-13.22	32.52	0.05	0.21	Average
10	2.962	36.54	56.00	-19.46	36.28	0.05	0.21	QP
11	4.848	32.16	46.00	-13.84	31.89	0.06	0.21	Average
12	4.848	38.17	56.00	-17.83	37.90	0.06	0.21	QP
13	12.449	29.57	50.00	-20.43	29.30	0.15	0.12	Average
14	12.449	35.72	60.00	-24.28	35.45	0.15	0.12	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dBuV) = Limit Line (dBuV) – Level (dBuV).

Modulation Mode	HT40	Test Freq. (MHz)	5795
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.151	24.54	55.96	-31.42	24.46	0.02	0.06	Average
2	0.151	49.06	65.96	-16.90	48.98	0.02	0.06	QP
3	0.174	43.98	54.77	-10.79	43.84	0.02	0.12	Average
4	0.174	52.97	64.77	-11.80	52.83	0.02	0.12	QP
5	0.243	42.42	52.00	-9.58	42.26	0.02	0.14	Average
6	0.243	46.59	62.00	-15.41	46.43	0.02	0.14	QP
7	0.731	43.97	46.00	-2.03	43.84	0.09	0.04	Average
8	0.731	44.60	56.00	-11.40	44.47	0.09	0.04	QP
9	0.979	40.18	46.00	-5.82	40.12	0.02	0.04	Average
10	0.979	42.42	56.00	-13.58	42.36	0.02	0.04	QP
11	1.223	44.03	46.00	-1.97	43.93	0.03	0.07	Average
12	1.223	46.15	56.00	-9.85	46.05	0.03	0.07	QP
13	3.759	33.00	46.00	-13.00	32.72	0.05	0.23	Average
14	3.759	38.25	56.00	-17.75	37.97	0.05	0.23	QP
15	12.188	31.57	50.00	-18.43	31.30	0.15	0.12	Average
16	12.188	37.37	60.00	-22.63	37.10	0.15	0.12	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dBuV) = Limit Line (dBuV) – Level (dBuV).

3.2 6dB and Occupied Bandwidth

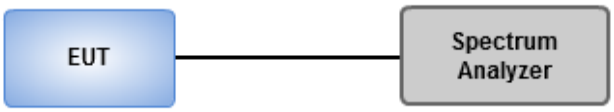
3.2.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.2.2 Test Procedures

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

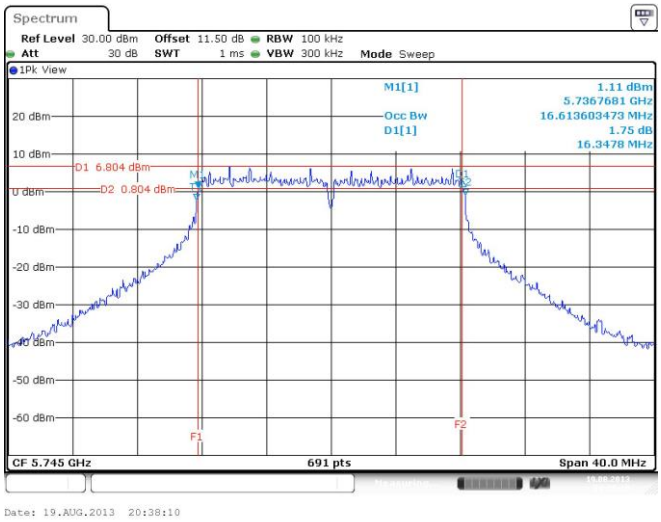
3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

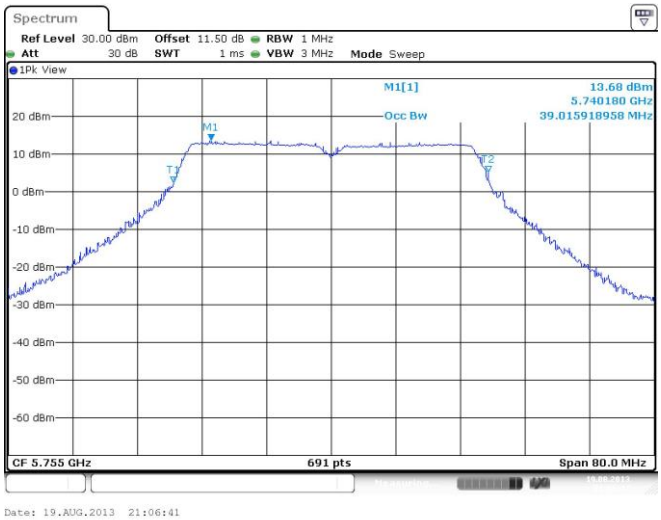
Modulation Mode	N_{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11a	2	5745	16.35	16.41	---	---	500
11a	2	5785	16.41	16.46	---	---	500
11a	2	5825	16.41	16.41	---	---	500
HT20	2	5745	17.57	17.62	---	---	500
HT20	2	5785	17.57	17.62	---	---	500
HT20	2	5825	17.57	17.62	---	---	500
HT40	2	5755	36.41	36.41	---	---	500
HT40	2	5795	36.41	36.41	---	---	500

Worst Plots



Modulation Mode	N_{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11a	2	5745	17.42	17.13	---	---
11a	2	5785	17.42	17.13	---	---
11a	2	5825	17.42	17.08	---	---
HT20	2	5745	18.52	18.35	---	---
HT20	2	5785	18.47	18.29	---	---
HT20	2	5825	18.41	18.18	---	---
HT40	2	5755	39.02	38.67	---	---
HT40	2	5795	39.02	38.55	---	---

Worst Plots



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

☒ Antenna gain <= 6dBi, no any corresponding reduction is in output power limit.

☐ Antenna gain > 6dBi

☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

☐ Fixed, point to point operations
Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak 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.

Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations ,no any corresponding reduction is in transmitter peak output power

3.3.2 Test Procedures

☒ Maximum Peak Conducted Output Power

☐ **Spectrum analyzer**

1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.

☒ **Power meter**

1. A broadband Peak RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

☒ Maximum Conducted Output Power (For reference only)

☒ **Power meter**

1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.3.3 Test Setup

3.3.4 Test Result of Maximum Output Power

Modulation Mode	N_{TX}	Freq. (MHz)	Peak conducted output power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11a	2	5745	27.02	26.18	---	---	918.455	29.63	30.00
11a	2	5785	27.13	26.34	---	---	946.943	29.76	30.00
11a	2	5825	26.95	26.2	---	---	912.320	29.60	30.00
HT20	2	5745	27.13	26.22	---	---	935.210	29.71	30.00
HT20	2	5785	27.18	26.35	---	---	953.915	29.80	30.00
HT20	2	5825	26.84	26.35	---	---	914.578	29.61	30.00
HT40	2	5755	27.16	26.41	---	---	957.518	29.81	30.00
HT40	2	5795	27.19	26.28	---	---	948.220	29.77	30.00

Modulation Mode	N_{TX}	Freq. (MHz)	Conducted (average) output power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11a	2	5745	18.24	17.19	---	---	119.041	20.76	30.00
11a	2	5785	18.11	17.28	---	---	118.171	20.73	30.00
11a	2	5825	18.26	17.32	---	---	120.940	20.83	30.00
HT20	2	5745	18.36	17.47	---	---	124.396	20.95	30.00
HT20	2	5785	18.59	17.64	---	---	130.353	21.15	30.00
HT20	2	5825	18.22	17.51	---	---	122.738	20.89	30.00
HT40	2	5755	19.11	17.68	---	---	140.084	21.46	30.00
HT40	2	5795	19.21	17.82	---	---	143.902	21.58	30.00

Note: Conducted average output power is for reference only.

3.4 Power Spectral Density

3.4.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.4.2 Test Procedures

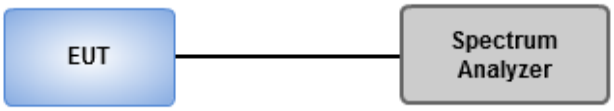
☒ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 3kHz, VBW = 10kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

☐ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 100kHz, VBW = 300 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Set the sweep time to: ≥ 10 x (number of measurement points in sweep) x (maximum data rate per stream).
4. Perform the measurement over a single sweep.
5. Use the peak marker function to determine the maximum amplitude level.\

3.4.3 Test Setup



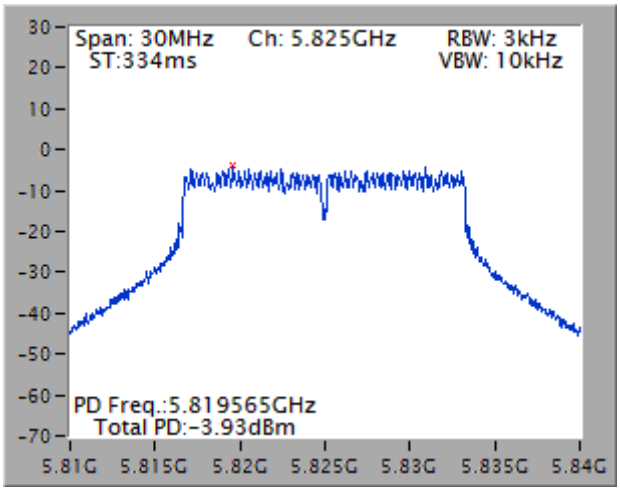
3.4.4 Test Result of Power Spectral Density

Modulation Mode	N_{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11a	2	5745	-4.92	5.99
11a	2	5785	-4.48	5.99
11a	2	5825	-3.93	5.99
HT20	2	5745	-4.76	5.99
HT20	2	5785	-4.68	5.99
HT20	2	5825	-4.30	5.99
HT40	2	5755	-7.44	5.99
HT40	2	5795	-7.88	5.99

Note:

1. Test result is bin-by-bin summing measured value of each TX port.
2. Directional gain = 5 + 10*log(2/1) = 8.01 dBi > 6 dBi
   Limit shall be reduced to 8 dBm – (8.01 dBi – 6 dBi)=5.99 dBm

Worst Plots



Note: Power density plot without duty factor

3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

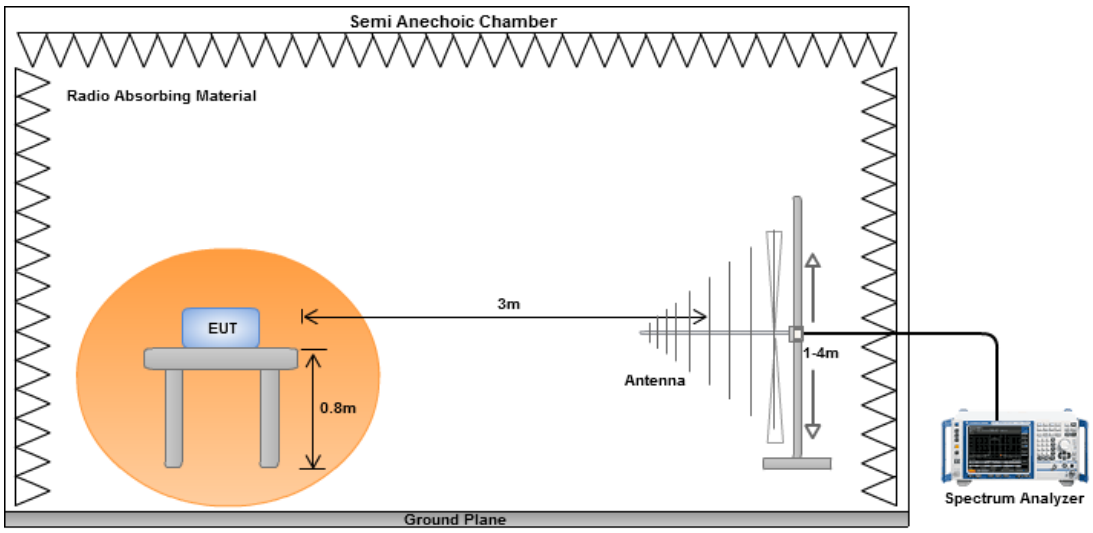
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

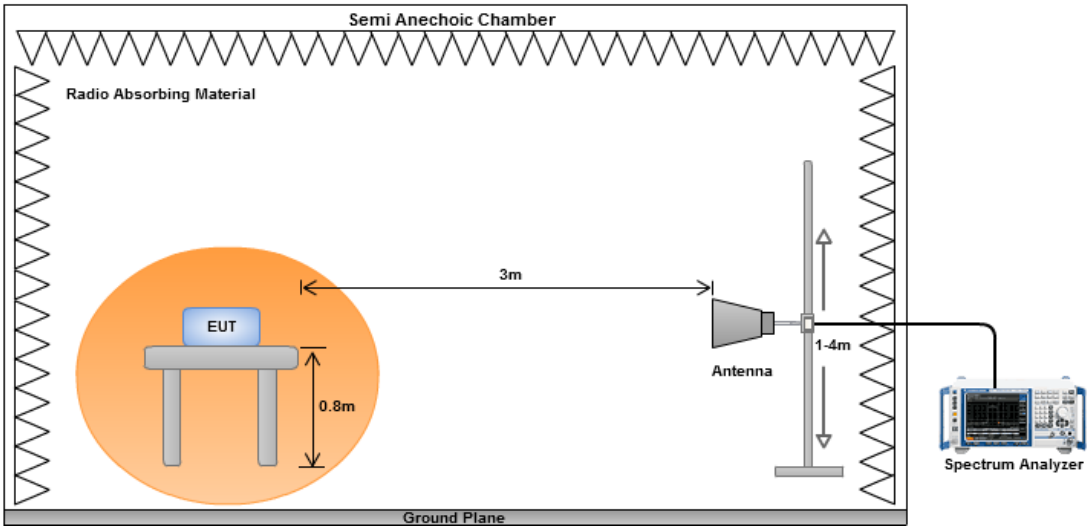
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.5.3 Test Setup

Radiated Emissions below 1 GHz

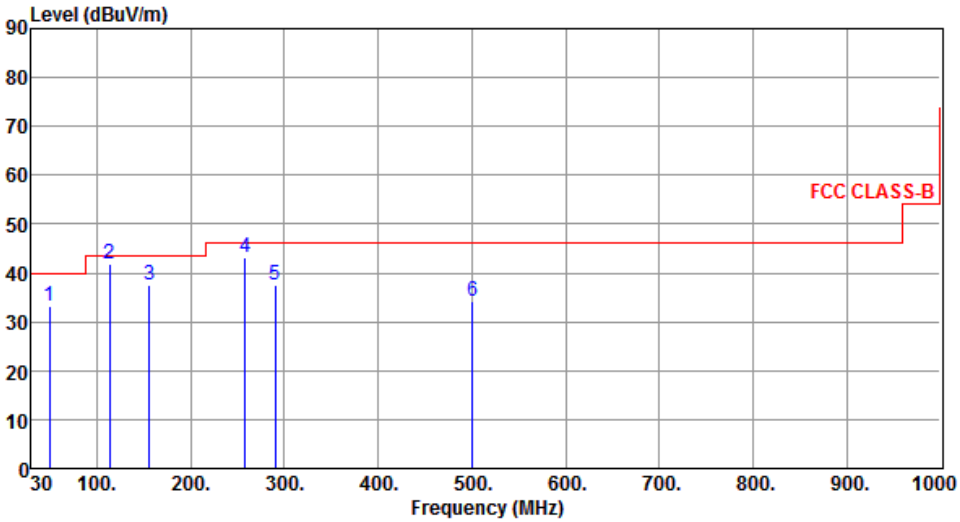


Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

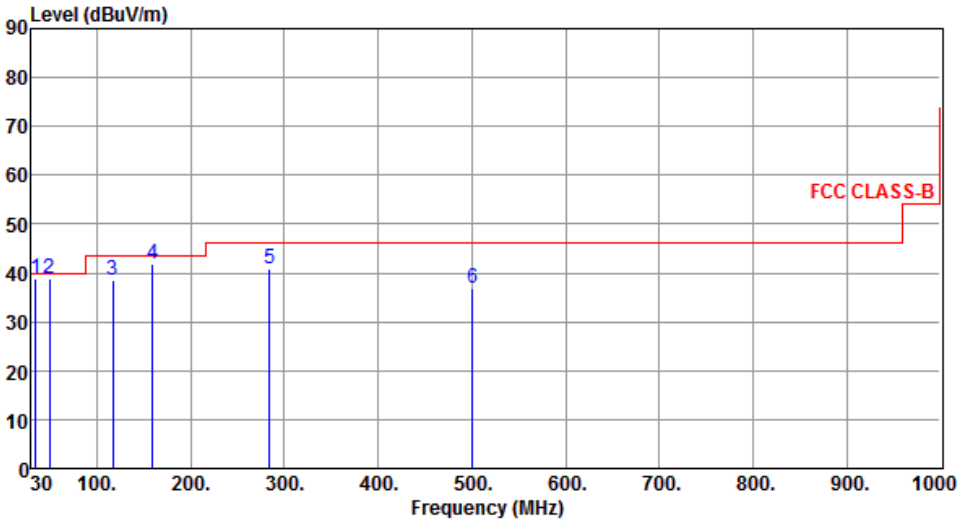
Modulation	HT40	**Test Freq. (MHz)**	5795
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	49.40	33.26	40.00	-6.74	49.83	-16.57	Peak	---	---
2	113.42	41.81	43.50	-1.69	61.51	-19.70	Peak	---	---
3	156.10	37.37	43.50	-6.13	54.24	-16.87	Peak	---	---
4	257.95	43.21	46.00	-2.79	60.84	-17.63	Peak	---	---
5	289.96	37.37	46.00	-8.63	53.72	-16.35	Peak	---	---
6	500.45	34.07	46.00	-11.93	45.63	-11.56	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT40	Test Freq. (MHz)	5795
Polarization	Vertical		

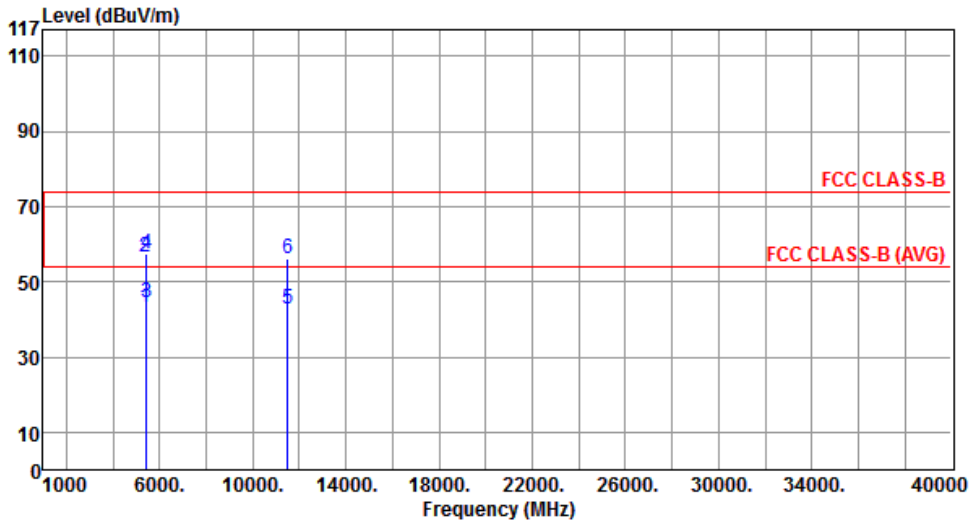


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	34.85	38.98	40.00	-1.02	56.41	-17.43	QP	---	---
2	49.76	38.92	40.00	-1.08	55.48	-16.56	QP	---	---
3	117.30	38.40	43.50	-5.10	57.77	-19.37	Peak	---	---
4	159.01	41.84	43.50	-1.66	58.66	-16.82	Peak	---	---
5	284.14	40.77	46.00	-5.23	57.31	-16.54	Peak	---	---
6	500.45	36.74	46.00	-9.26	48.30	-11.56	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11a

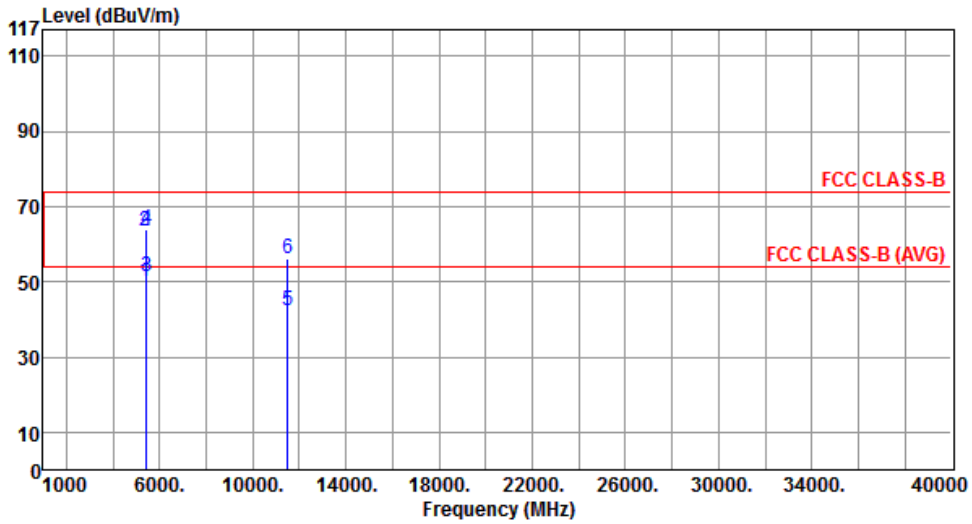
Modulation	11a	**Test Freq. (MHz)**	5745
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.22	54.00	-10.78	38.12	5.10	Average	---	---
2	5400.00	56.72	74.00	-17.28	51.62	5.10	Peak	---	---
3	5440.00	44.33	54.00	-9.67	39.18	5.15	Average	---	---
4	5440.00	57.37	74.00	-16.63	52.22	5.15	Peak	---	---
5	11490.00	42.82	54.00	-11.18	27.85	14.97	Average	---	---
6	11490.00	56.23	74.00	-17.77	41.26	14.97	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

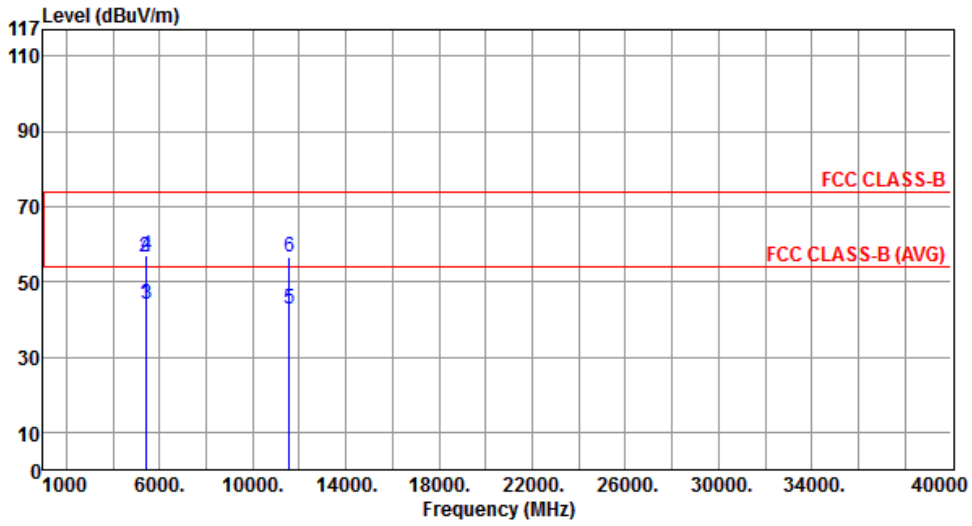
Modulation	11a	Test Freq. (MHz)	5745
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	50.23	54.00	-3.77	45.13	5.10	Average	---	---
2	5400.00	63.63	74.00	-10.37	58.53	5.10	Peak	---	---
3	5440.00	51.55	54.00	-2.45	46.40	5.15	Average	---	---
4	5440.00	64.04	74.00	-9.96	58.89	5.15	Peak	---	---
5	11490.00	42.49	54.00	-11.51	27.52	14.97	Average	---	---
6	11490.00	55.98	74.00	-18.02	41.01	14.97	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

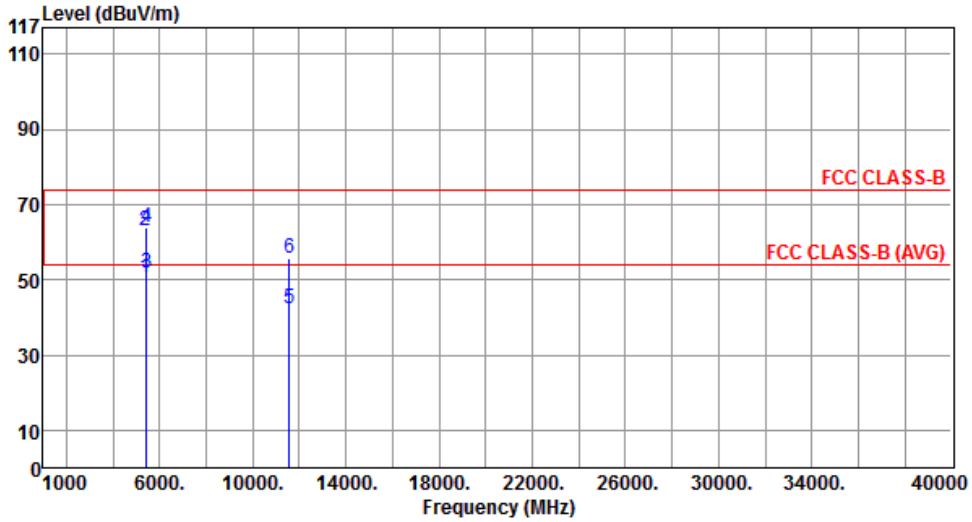
Modulation	11a	Test Freq. (MHz)	5785
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.94	54.00	-10.06	38.84	5.10	Average	---	---
2	5400.00	56.68	74.00	-17.32	51.58	5.10	Peak	---	---
3	5440.00	44.05	54.00	-9.95	38.90	5.15	Average	---	---
4	5440.00	57.03	74.00	-16.97	51.88	5.15	Peak	---	---
5	11570.00	42.83	54.00	-11.17	27.96	14.87	Average	---	---
6	11570.00	56.50	74.00	-17.50	41.63	14.87	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

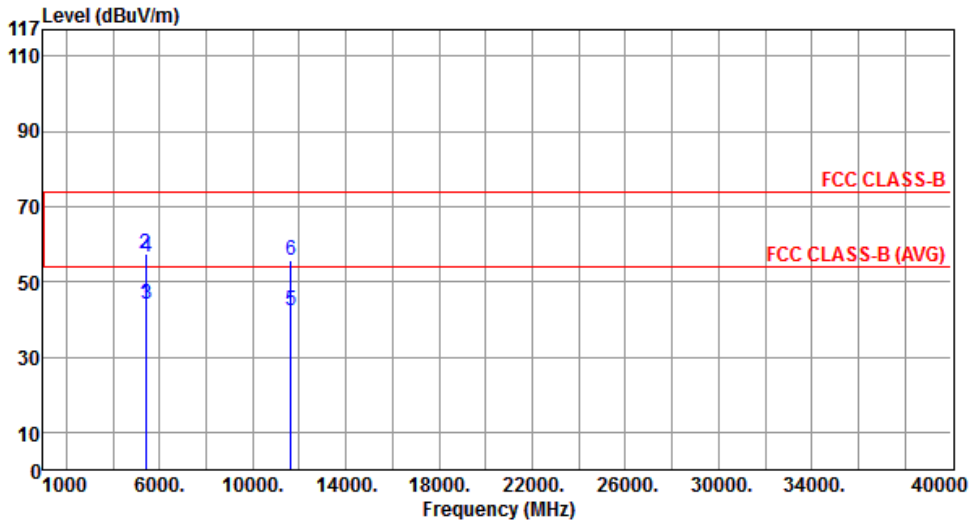
Modulation	11a	Test Freq. (MHz)	5785
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	50.46	54.00	-3.54	45.36	5.10	Average	---	---
2	5400.00	62.94	74.00	-11.06	57.84	5.10	Peak	---	---
3	5440.00	51.76	54.00	-2.24	46.61	5.15	Average	---	---
4	5440.00	63.80	74.00	-10.20	58.65	5.15	Peak	---	---
5	11570.00	42.30	54.00	-11.70	27.43	14.87	Average	---	---
6	11570.00	55.55	74.00	-18.45	40.68	14.87	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

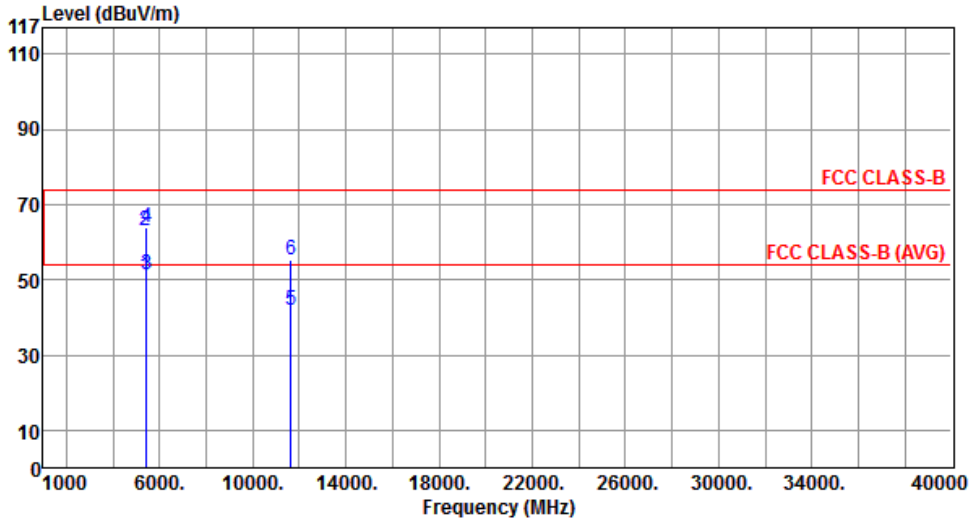
Modulation	11a	Test Freq. (MHz)	5825
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.87	54.00	-10.13	38.77	5.10	Average	---	---
2	5400.00	57.29	74.00	-16.71	52.19	5.10	Peak	---	---
3	5440.00	43.88	54.00	-10.12	38.73	5.15	Average	---	---
4	5440.00	56.70	74.00	-17.30	51.55	5.15	Peak	---	---
5	11650.00	42.26	54.00	-11.74	27.50	14.76	Average	---	---
6	11650.00	55.71	74.00	-18.29	40.95	14.76	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11a	Test Freq. (MHz)	5825
Polarization	Vertical		

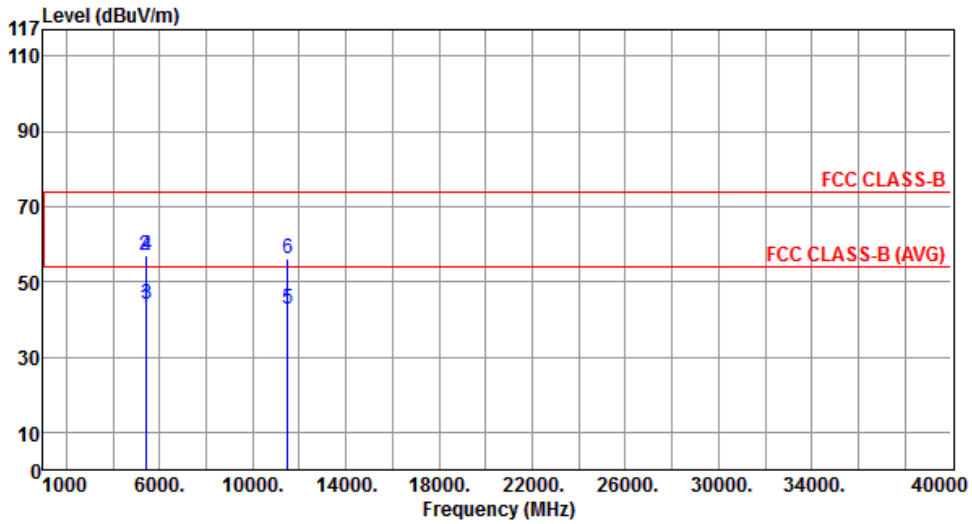


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	51.14	54.00	-2.86	46.04	5.10	Average	---	---
2	5400.00	62.92	74.00	-11.08	57.82	5.10	Peak	---	---
3	5440.00	51.33	54.00	-2.67	46.18	5.15	Average	---	---
4	5440.00	63.90	74.00	-10.10	58.75	5.15	Peak	---	---
5	11650.00	41.99	54.00	-12.01	27.23	14.76	Average	---	---
6	11650.00	55.12	74.00	-18.88	40.36	14.76	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT20

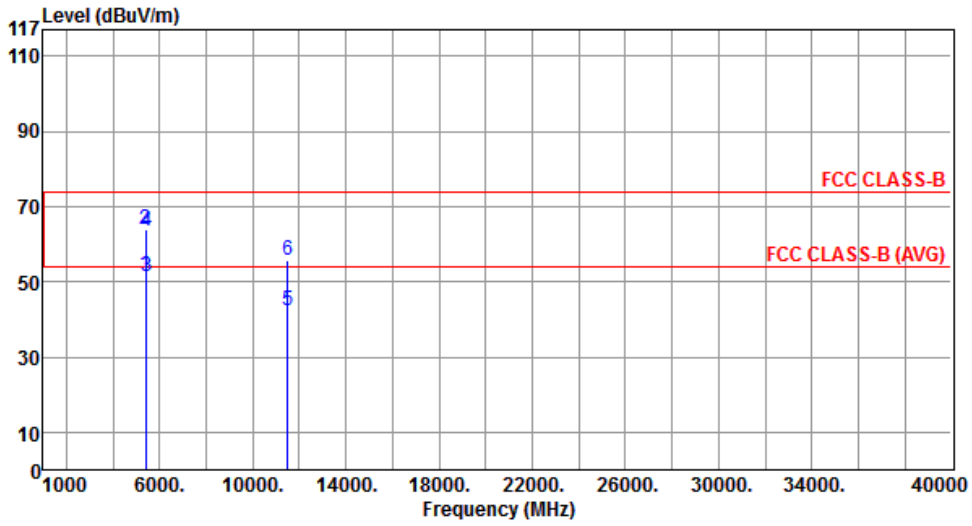
Modulation	HT20	**Test Freq. (MHz)**	5745
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.13	54.00	-10.87	38.03	5.10	Average	---	---
2	5400.00	56.86	74.00	-17.14	51.76	5.10	Peak	---	---
3	5440.00	44.00	54.00	-10.00	38.85	5.15	Average	---	---
4	5440.00	57.12	74.00	-16.88	51.97	5.15	Peak	---	---
5	11490.00	42.62	54.00	-11.38	27.65	14.97	Average	---	---
6	11490.00	56.16	74.00	-17.84	41.19	14.97	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

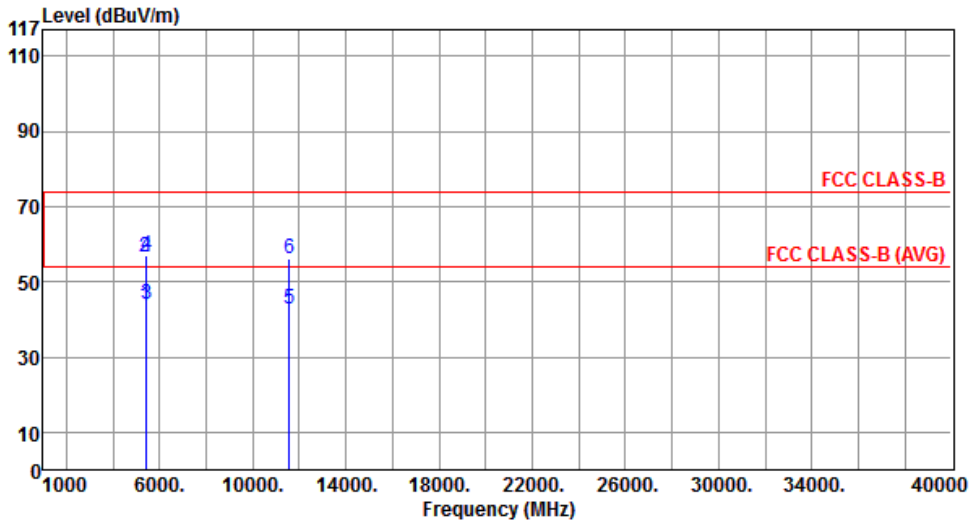
Modulation	HT20	Test Freq. (MHz)	5745
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	52.01	54.00	-1.99	46.91	5.10	Average	---	---
2	5400.00	63.99	74.00	-10.01	58.89	5.10	Peak	---	---
3	5440.00	51.42	54.00	-2.58	46.27	5.15	Average	---	---
4	5440.00	63.56	74.00	-10.44	58.41	5.15	Peak	---	---
5	11490.00	42.26	54.00	-11.74	27.29	14.97	Average	---	---
6	11490.00	55.63	74.00	-18.37	40.66	14.97	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

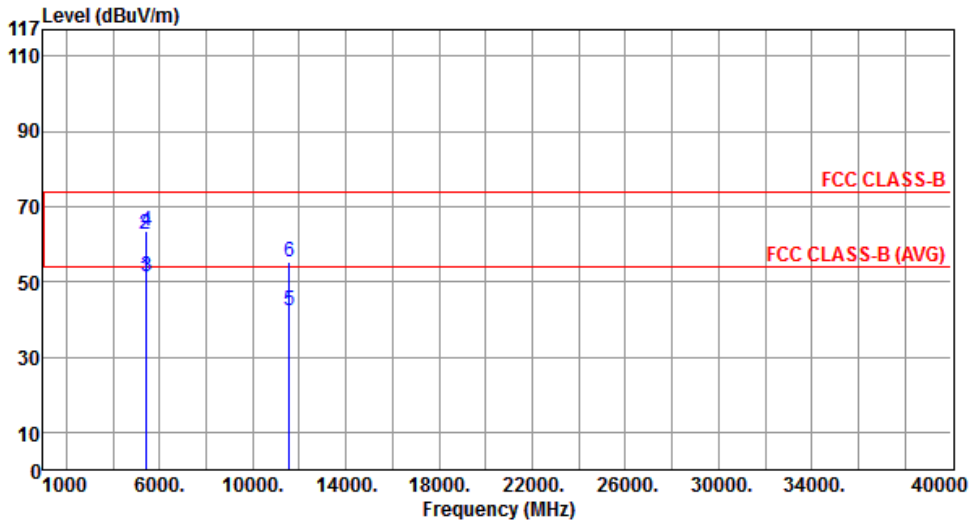
Modulation	HT20	Test Freq. (MHz)	5785
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.55	54.00	-10.45	38.45	5.10	Average	---	---
2	5400.00	56.72	74.00	-17.28	51.62	5.10	Peak	---	---
3	5440.00	43.97	54.00	-10.03	38.82	5.15	Average	---	---
4	5440.00	57.12	74.00	-16.88	51.97	5.15	Peak	---	---
5	11570.00	42.55	54.00	-11.45	27.68	14.87	Average	---	---
6	11570.00	56.11	74.00	-17.89	41.24	14.87	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

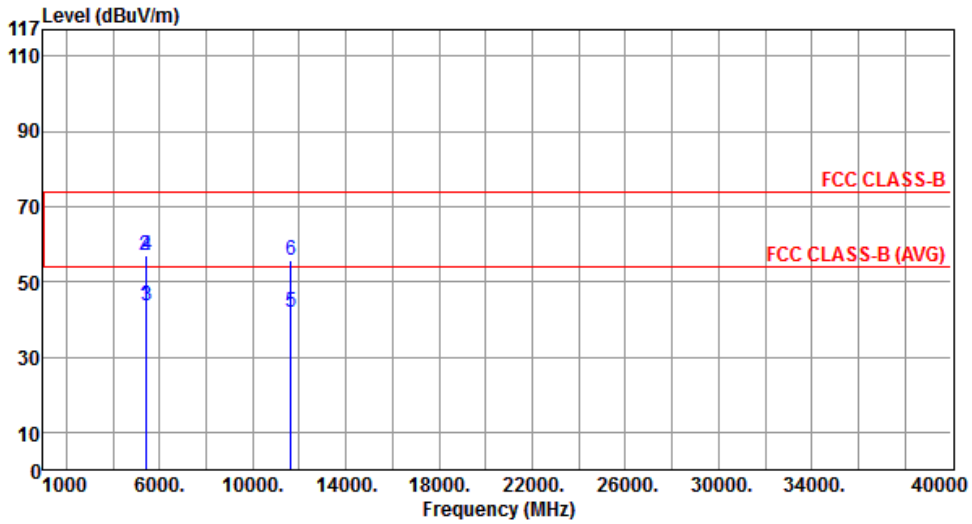
Modulation	HT20	Test Freq. (MHz)	5785
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	50.74	54.00	-3.26	45.64	5.10	Average	---	---
2	5400.00	62.68	74.00	-11.32	57.58	5.10	Peak	---	---
3	5440.00	51.52	54.00	-2.48	46.37	5.15	Average	---	---
4	5440.00	63.56	74.00	-10.44	58.41	5.15	Peak	---	---
5	11570.00	42.46	54.00	-11.54	27.59	14.87	Average	---	---
6	11570.00	55.23	74.00	-18.77	40.36	14.87	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

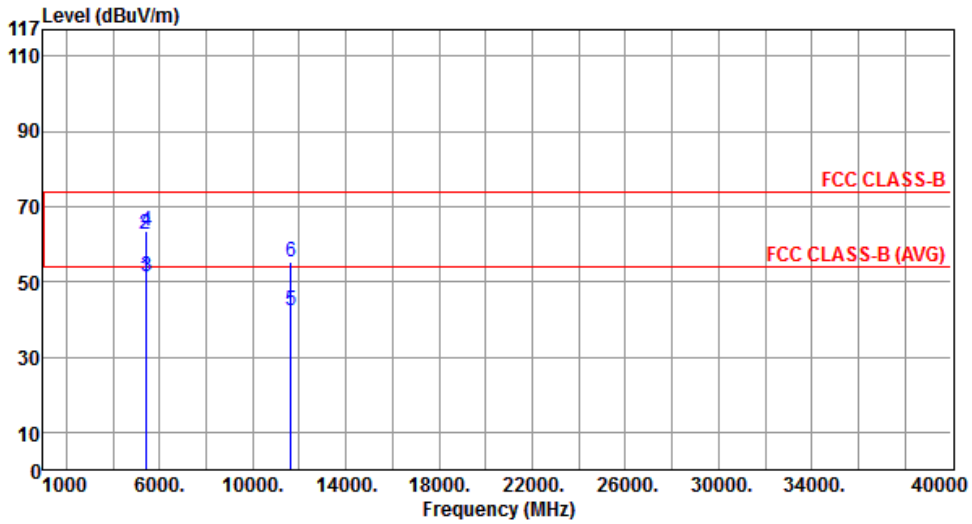
Modulation	HT20	Test Freq. (MHz)	5825
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.72	54.00	-10.28	38.62	5.10	Average	---	---
2	5400.00	57.13	74.00	-16.87	52.03	5.10	Peak	---	---
3	5440.00	43.77	54.00	-10.23	38.62	5.15	Average	---	---
4	5440.00	56.83	74.00	-17.17	51.68	5.15	Peak	---	---
5	11650.00	42.08	54.00	-11.92	27.32	14.76	Average	---	---
6	11650.00	55.59	74.00	-18.41	40.83	14.76	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	5825
Polarization	Vertical		

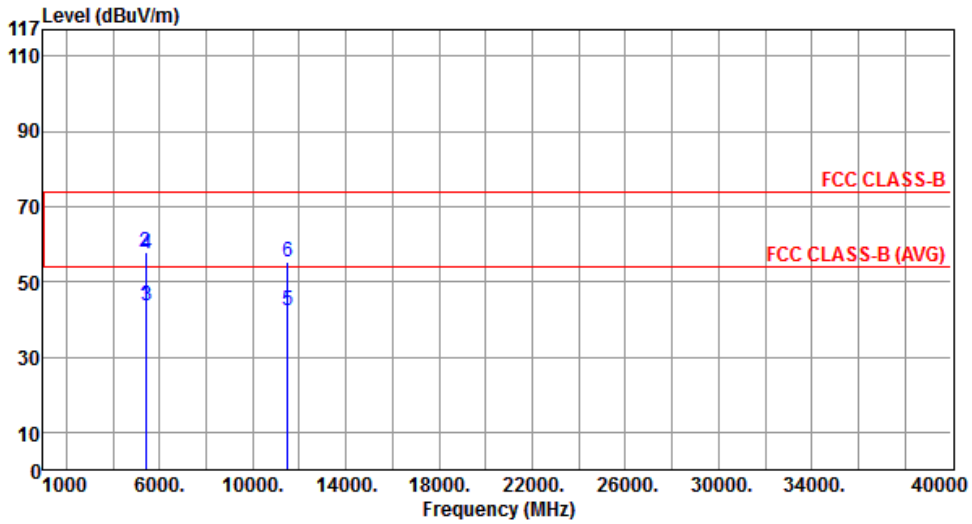


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	51.03	54.00	-2.97	45.93	5.10	Average	---	---
2	5400.00	62.66	74.00	-11.34	57.56	5.10	Peak	---	---
3	5440.00	51.17	54.00	-2.83	46.02	5.15	Average	---	---
4	5440.00	63.52	74.00	-10.48	58.37	5.15	Peak	---	---
5	11650.00	42.16	54.00	-11.84	27.40	14.76	Average	---	---
6	11650.00	55.33	74.00	-18.67	40.57	14.76	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT40

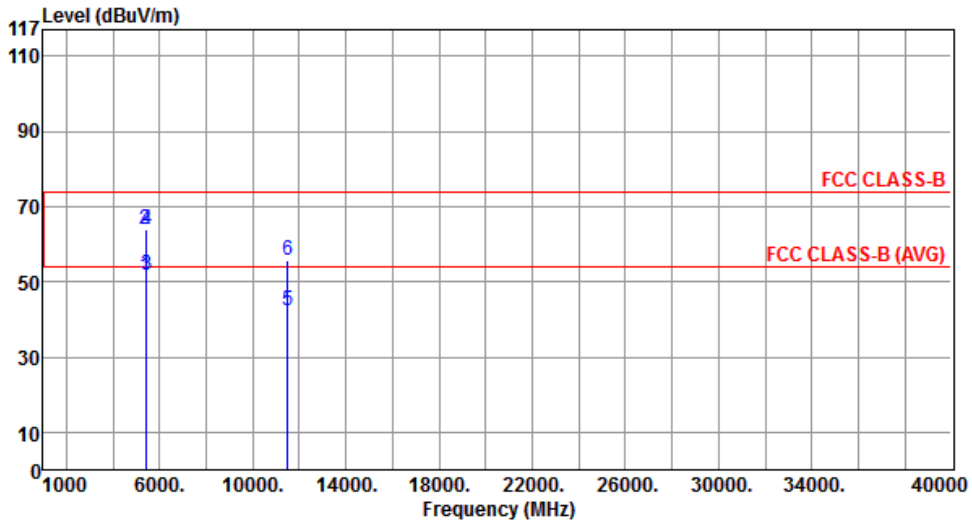
Modulation	HT40	**Test Freq. (MHz)**	5755
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.61	54.00	-10.39	38.51	5.10	Average	---	---
2	5400.00	57.78	74.00	-16.22	52.68	5.10	Peak	---	---
3	5440.00	43.56	54.00	-10.44	38.41	5.15	Average	---	---
4	5440.00	57.48	74.00	-16.52	52.33	5.15	Peak	---	---
5	11510.00	42.39	54.00	-11.61	27.43	14.96	Average	---	---
6	11510.00	55.24	74.00	-18.76	40.28	14.96	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

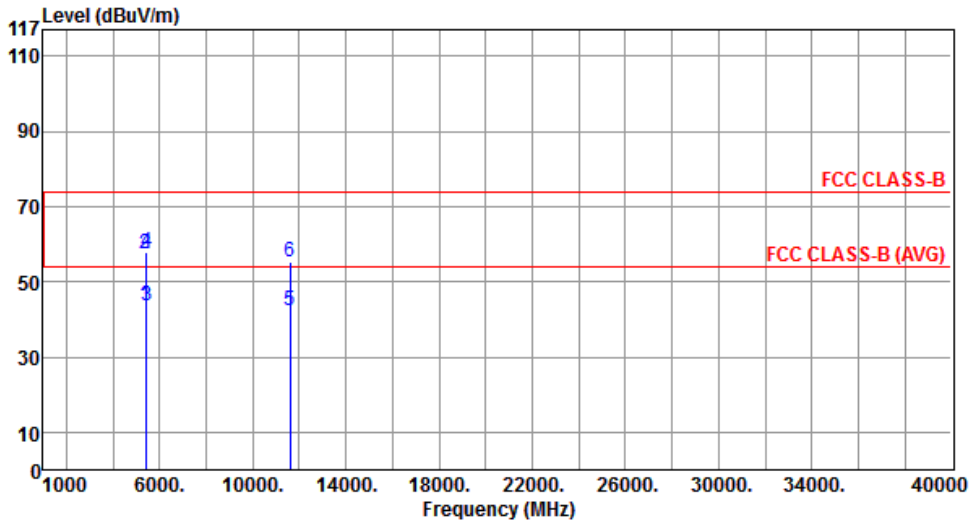
Modulation	HT40	Test Freq. (MHz)	5755
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	51.36	54.00	-2.64	46.26	5.10	Average	---	---
2	5400.00	63.75	74.00	-10.25	58.65	5.10	Peak	---	---
3	5440.00	51.71	54.00	-2.29	46.56	5.15	Average	---	---
4	5440.00	63.98	74.00	-10.02	58.83	5.15	Peak	---	---
5	11510.00	42.29	54.00	-11.71	27.33	14.96	Average	---	---
6	11510.00	55.53	74.00	-18.47	40.57	14.96	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

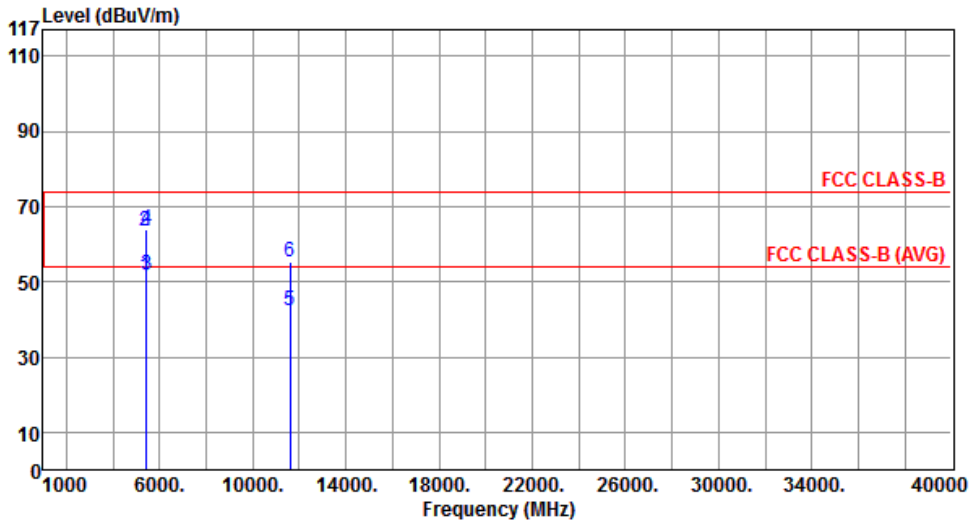
Modulation	HT40	Test Freq. (MHz)	5795
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	43.53	54.00	-10.47	38.43	5.10	Average	---	---
2	5400.00	57.63	74.00	-16.37	52.53	5.10	Peak	---	---
3	5440.00	43.77	54.00	-10.23	38.62	5.15	Average	---	---
4	5440.00	57.72	74.00	-16.28	52.57	5.15	Peak	---	---
5	11590.00	42.12	54.00	-11.88	27.28	14.84	Average	---	---
6	11590.00	55.39	74.00	-18.61	40.55	14.84	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT40	Test Freq. (MHz)	5795
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5400.00	51.25	54.00	-2.75	46.15	5.10	Average	---	---
2	5400.00	63.58	74.00	-10.42	58.48	5.10	Peak	---	---
3	5440.00	51.76	54.00	-2.24	46.61	5.15	Average	---	---
4	5440.00	63.94	74.00	-10.06	58.79	5.15	Peak	---	---
5	11590.00	42.44	54.00	-11.56	27.60	14.84	Average	---	---
6	11590.00	55.31	74.00	-18.69	40.47	14.84	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.6 Unwanted Emissions into Non-Restricted Frequency Bands

3.6.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

☒ The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

☐ The peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

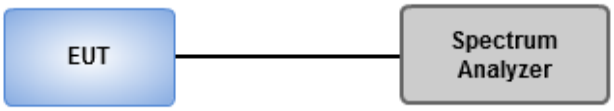
Reference Level Measurement

1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Set Sweep time = auto couple, Trace mode = max hold.
3. Allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

Unwanted Emissions Level Measurement

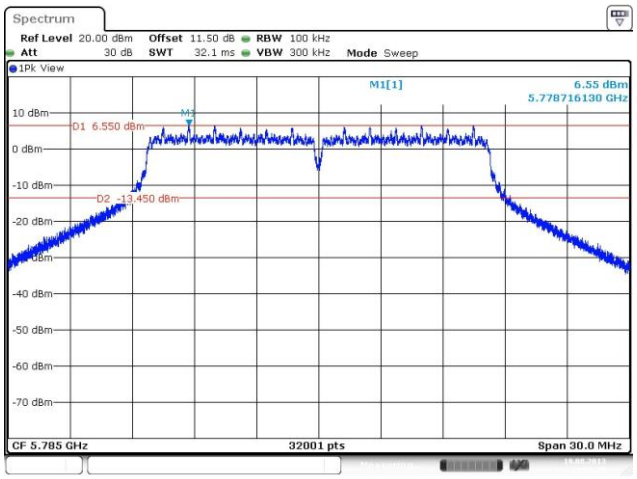
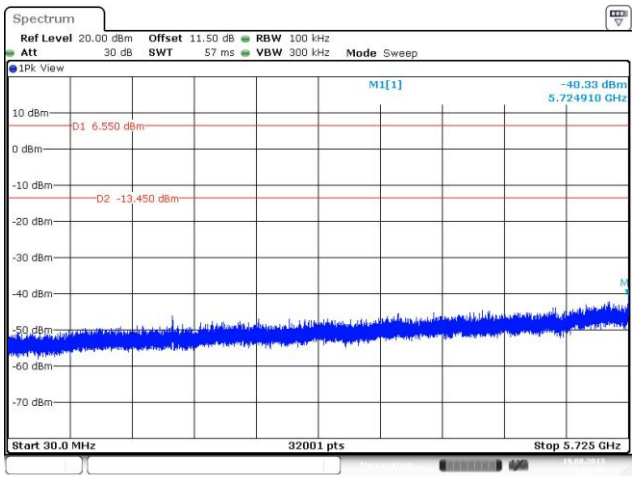
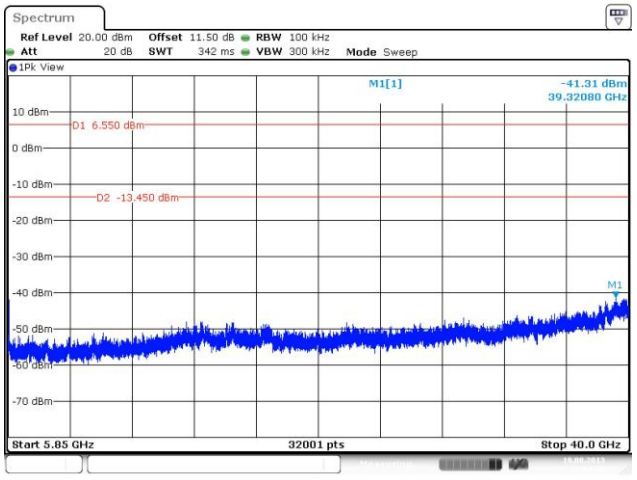
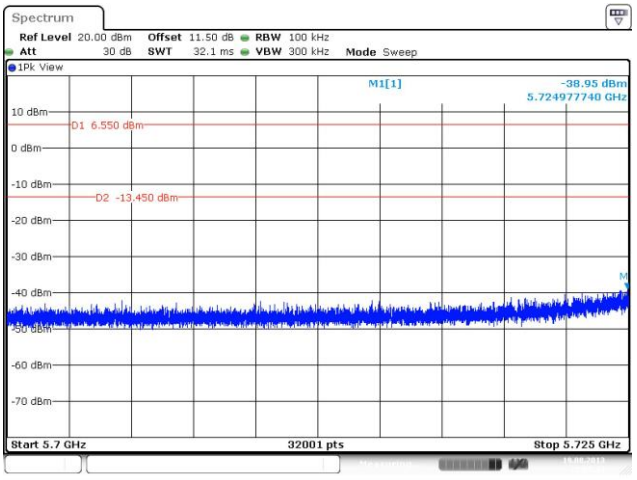
1. Set RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Trace Mode = max hold, Sweep = auto couple.
3. Allow the trace to stabilize.
4. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

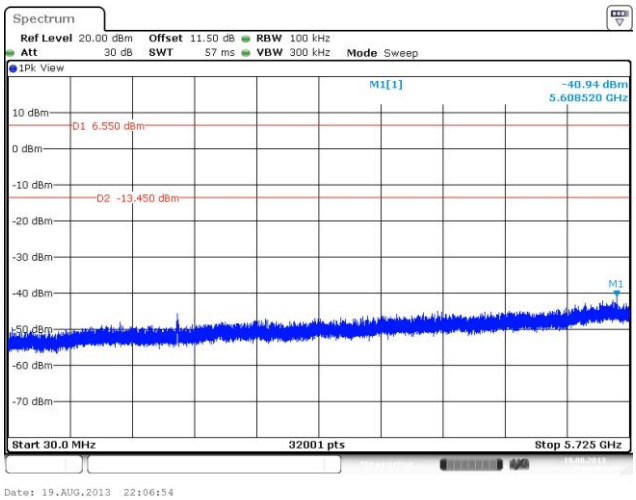
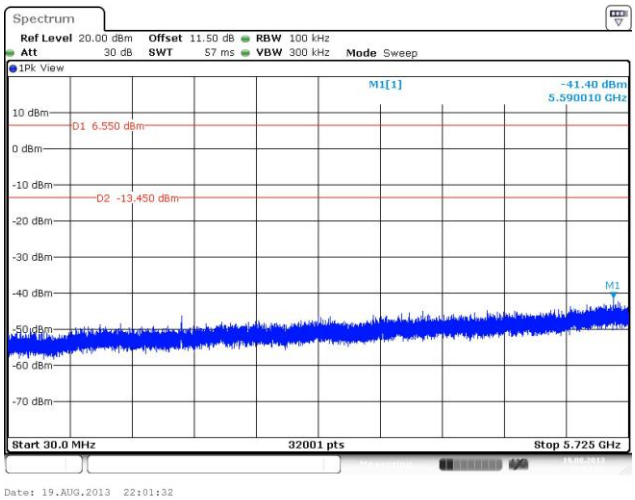
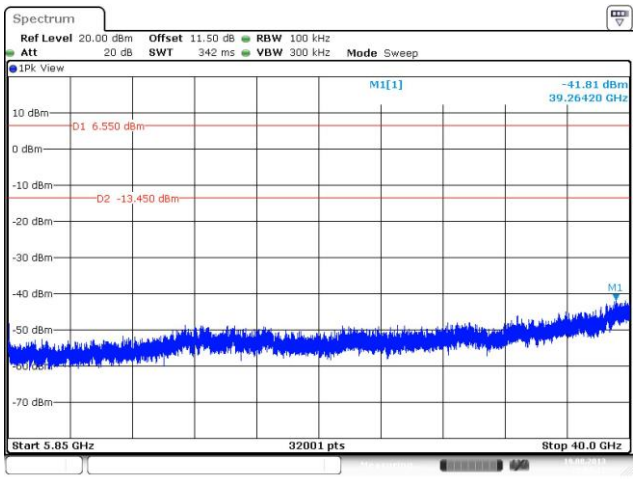
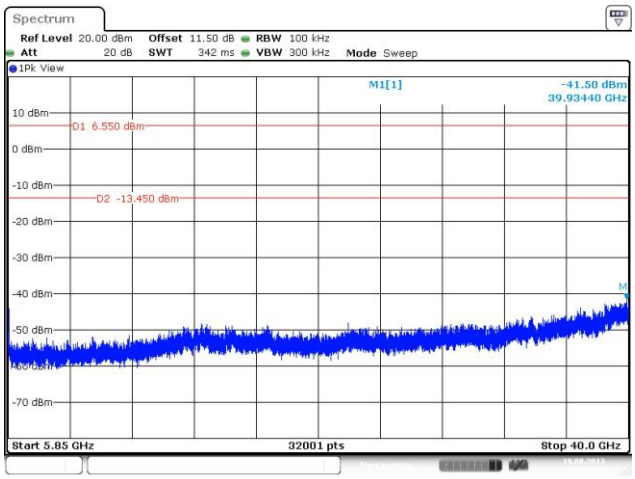
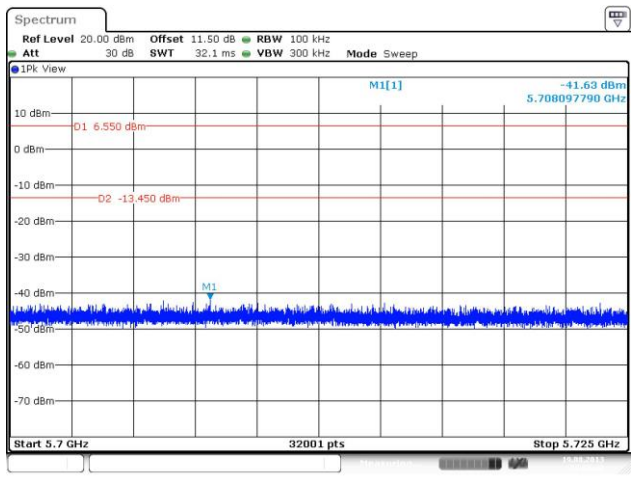
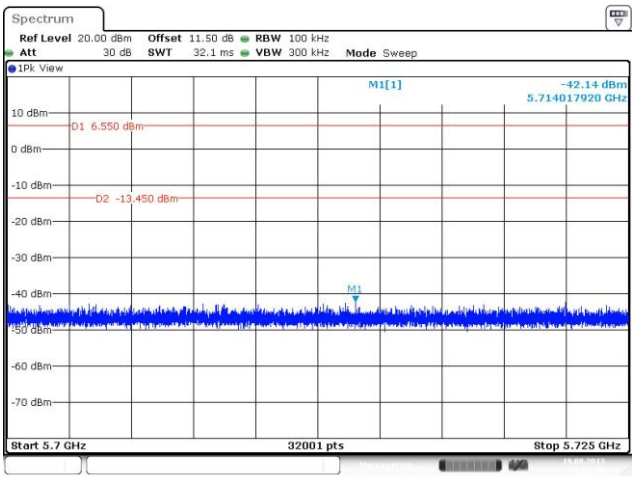
3.6.3 Test Setup



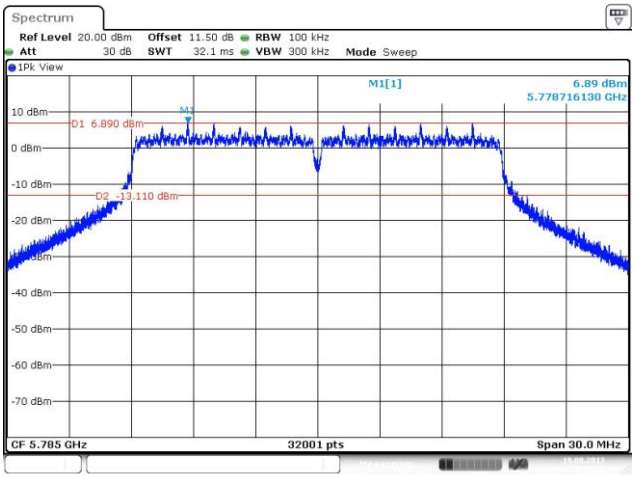
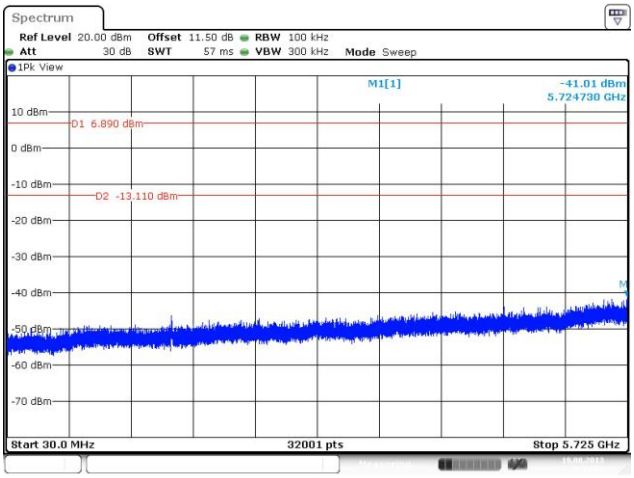
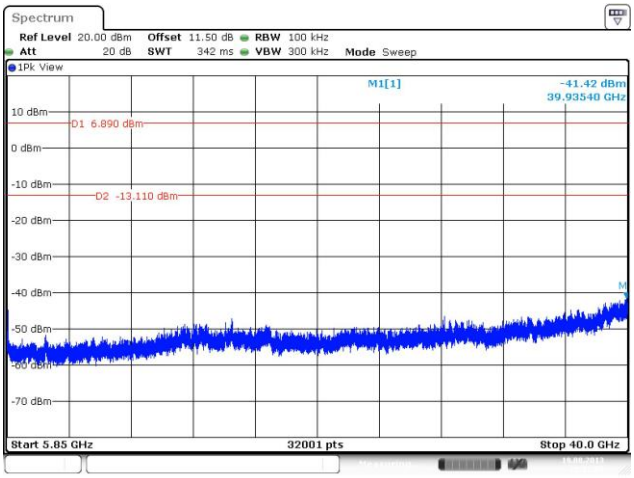
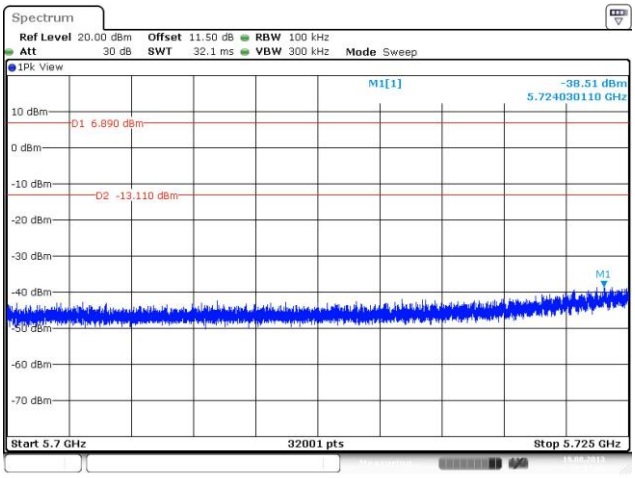
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

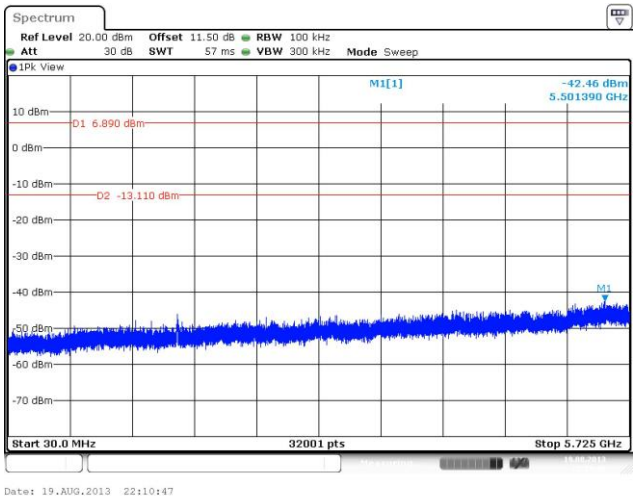
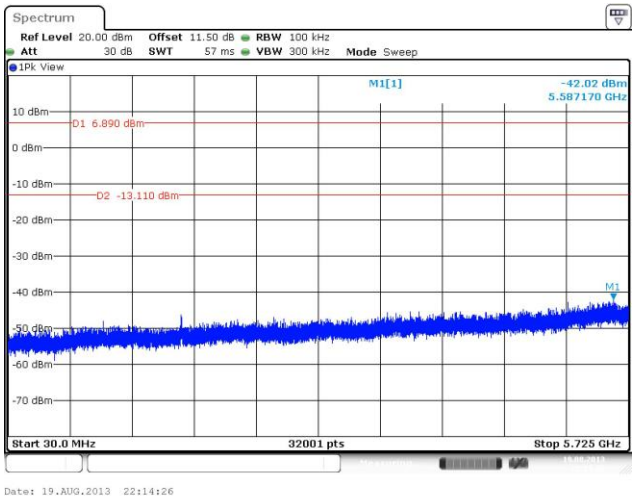
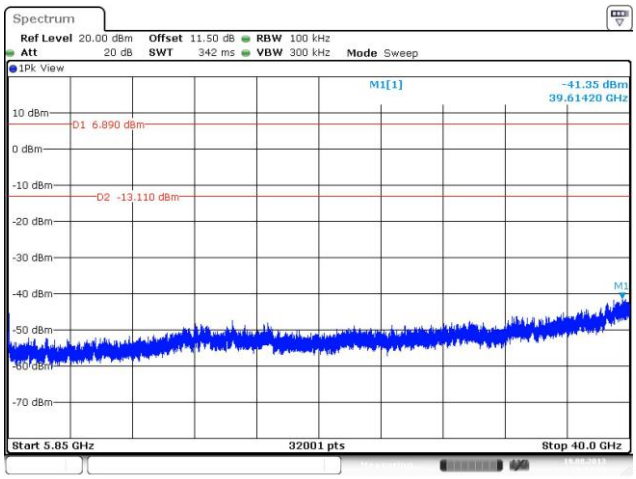
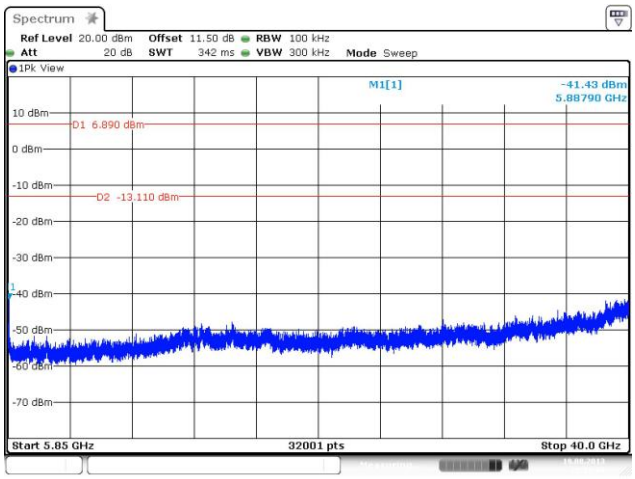
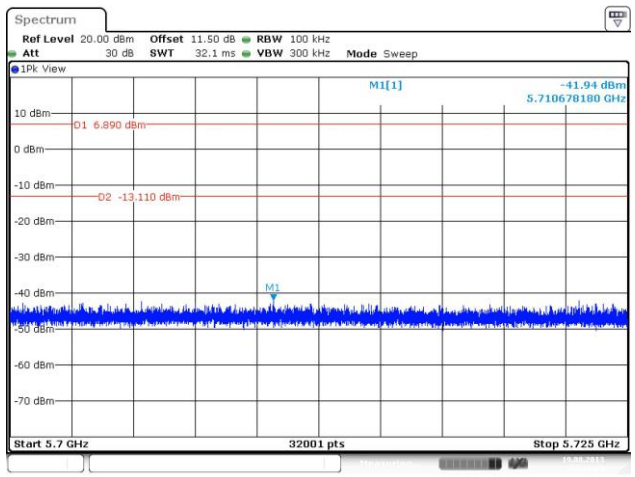
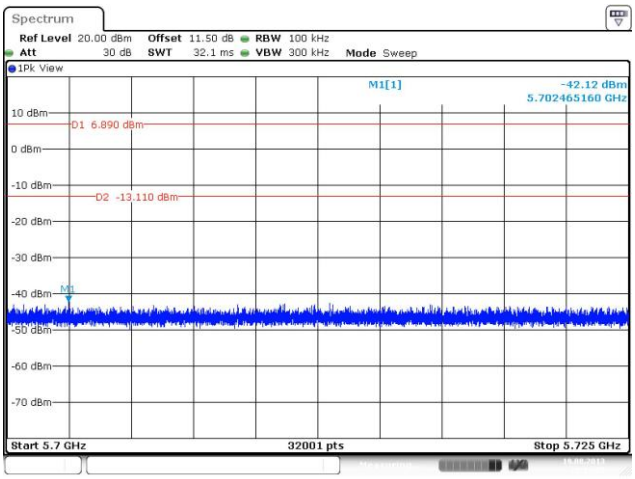
802.11a

Reference Level	Tx 5745MHz / 30MHz~40GHz (down 20dBc)
	
---	
---	

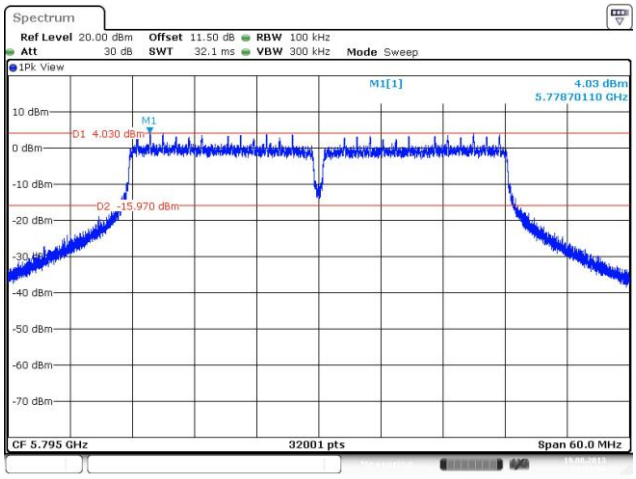
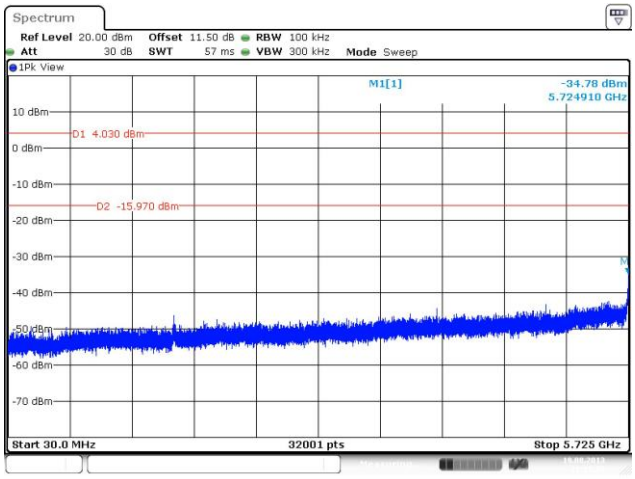
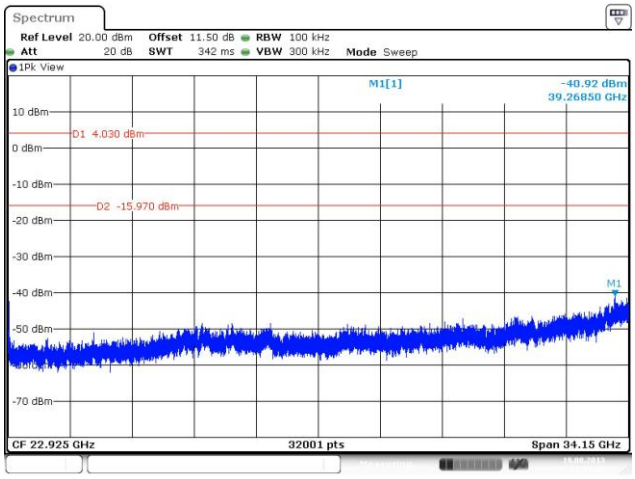
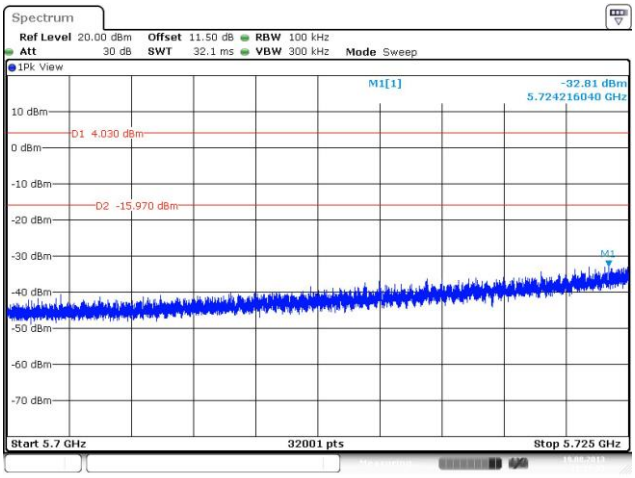
Tx 5785MHz / 30MHz~40GHz (down 20dBc)	Tx 5825MHz / 30MHz~40GHz (down 20dBc)
	
	
	

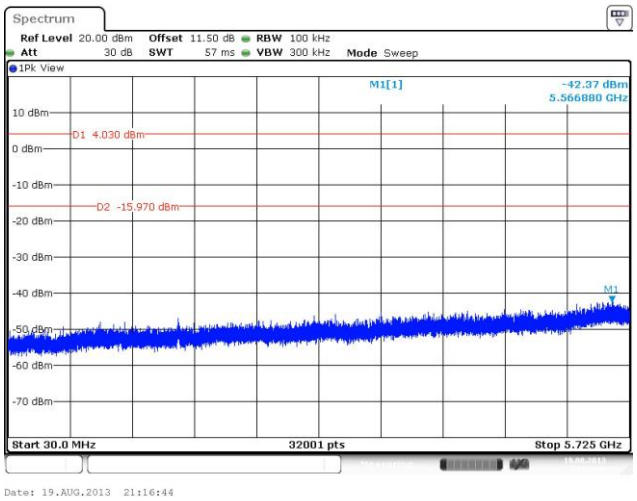
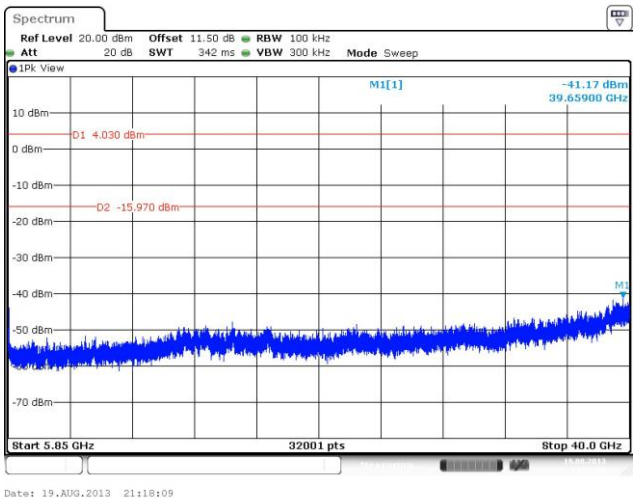
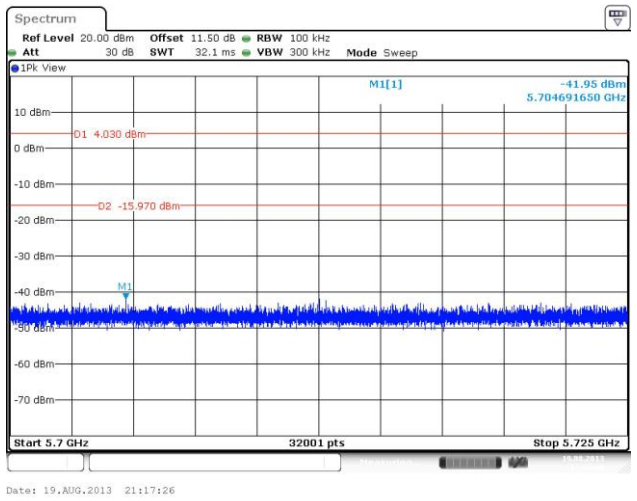
802.11n HT20

Reference Level	Tx 5745MHz / 30MHz~40GHz (down 20dBc)
	
---	
---	

Tx 5785MHz / 30MHz~40GHz (down 20dBc)	Tx 5825MHz / 30MHz~40GHz (down 20dBc)
	
	
	

802.11n HT40

Reference Level	Tx 5755MHz / 30MHz~40GHz (down 20dBc)
	
---	
---	

Tx 5795MHz / 30MHz~40GHz (down 20dBc)	---
	---
	---
	---

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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