FCC Test Report

FCC ID	:	**P27NA502S**
Equipment	:	**Multiple RF Home Gateway**
Model No.	:	**NA502S**
Brand Name	:	**Sercomm**
Multiple Listing	:	**Refer to item 1.1.1 for more details**
Applicant	:	**Sercomm Corporation**
Address	:	**8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.**
Standard	:	**47 CFR FCC Part 15.247**
Received Date	:	**Nov. 21, 2016**
Tested Date	:	**Nov. 29 ~ Dec. 14, 2016**

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.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR6N2103ZB	Rev. 01	Initial issue	Mar. 03, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.406MHz 41.30 (Margin -6.43dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 4950.00MHz 52.76 (Margin -1.24dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 16.67	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 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Sercomm	NA502Sxxxxxxxx	Multiple RF Home Gateway	the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-" , for marketing purpose.
MiOS	G550xxxxx	Multiple RF Home Gateway	
Nortek	GC1xxxxxxxx	Multiple RF Home Gateway	
Vera	VeraSecurexxxxx	Multiple RF Home Gateway	
Vera	VeraSecurexxxxx	Advanced Smart Home Security Controller	
✦ All models are electrically identical, different model names are for marketing purpose. ✦ The above models, model **NA502S** was selected as a representative one for the final test and only its data was recorded in this report.			

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	**Mode**	**Ch. Frequency (MHz)**	**Channel Number**	**Data Rate**
2400~2483.5	ZigBee	2405~2480	11-26 [16]	250kbps
Note 1: ZigBee uses DSSS-O-QPSK modulation.				

1.1.3 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	PIFA	UFL	3.4	---

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter

1.1.5 Accessories

Accessories		
No.	**Equipment**	**Description**
1	Adapter	Brand: LEI Model: MU24-Y120200-A2 I/P: 100-240Vac, 50/60Hz, 0.7A O/P: 12Vdc, 2A Power line: 1.5m non-shielded without core
2	Adapter	Brand: APD Model: WA-24Q12FU I/P: 100-240Vac, 50-60Hz, 0.7A O/P: 12Vdc, 2A Power line: 1.5m non-shielded without core
3	Lithium-ion Battery	Brand: Simplo Technology Co. LTD. Model: A3EQ2009H Rating: 7.5Vdc, 2400mAh

1.1.6 Channel List

Channel No.	Frequency (MHz)
11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
26	2480

1.1.7 Test Tool and Duty Cycle

Test Tool	Ember Desktop, V3.0.990
Duty Cycle Of Test Signal (%)	100%
Duty Factor (dB)	0

1.1.8 Power Setting

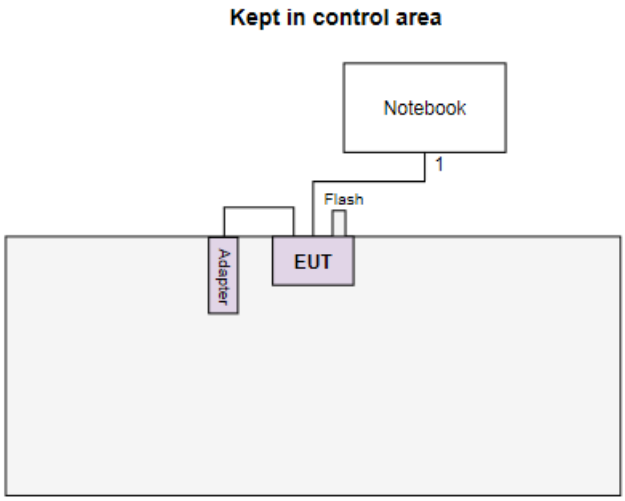
Modulation Mode	Test Frequency (MHz)	Power Set
DSSS	2405	1
DSSS	2445	-1
DSSS	2470	-1
DSSS	2475	-1
DSSS	2480	-0d

1.2 Local Support Equipment List

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	Latitude E6430	9ZFB4X1	DoC	RJ45, 10m non-shielded.
2	USB Flash	SONY	USM16GU	0000020	---	---

1.3 Test Setup Chart

Test Setup Diagram



1. RJ45, 10m non-shielded

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Dec. 12, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Jan. 12, 2016	Jan. 11, 2017
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 08, 2016	Nov. 07, 2017
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Nov. 29 ~ Dec. 06, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Nov. 25, 2016	Nov. 24, 2017
Receiver	R&S	ESR3	101658	Nov. 24, 2016	Nov. 23, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 04, 2016	Aug. 03, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 25, 2016	Oct. 24, 2017
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 10, 2016	Nov. 09, 2017
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	EMC	EMC02325	980225	Aug. 05, 2016	Aug. 04, 2017
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2016	Oct. 05, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16052	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Dec. 14, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
Power Meter	Anritsu	ML2495A	1241002	Oct. 06, 2016	Oct. 05, 2017
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
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 C63.10-2013
FCC KDB 558074 D01 DTS Meas Guidance v03r05
FCC KDB 662911 D01 Multiple Transmitter Output v02r01

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	±34.134 Hz
Conducted power	±0.808 dB
Power density	±0.463 dB
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 60%	Howard Huang
Radiated Emissions	03CH01-WS	21-22°C / 61%	Vincent Yeh Kevin Lee
RF Conducted	TH01-WS	22°C / 63%	Alex Huang

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate
Conducted Emissions	DSSS	2405	250kbps
Radiated Emissions ≤1GHz	DSSS	2405	250kbps
Radiated Emissions >1GHz Maximum Output Power 6dB bandwidth Power spectral density	DSSS	2405 / 2445 / 2470 / 2475 / 2480	250kbps

NOTE:

1. Two adapters (LEI & APD) had been covered during the pretest and found that **LEI adapter** was the worst case and was selected for final test.
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Conducted Emissions

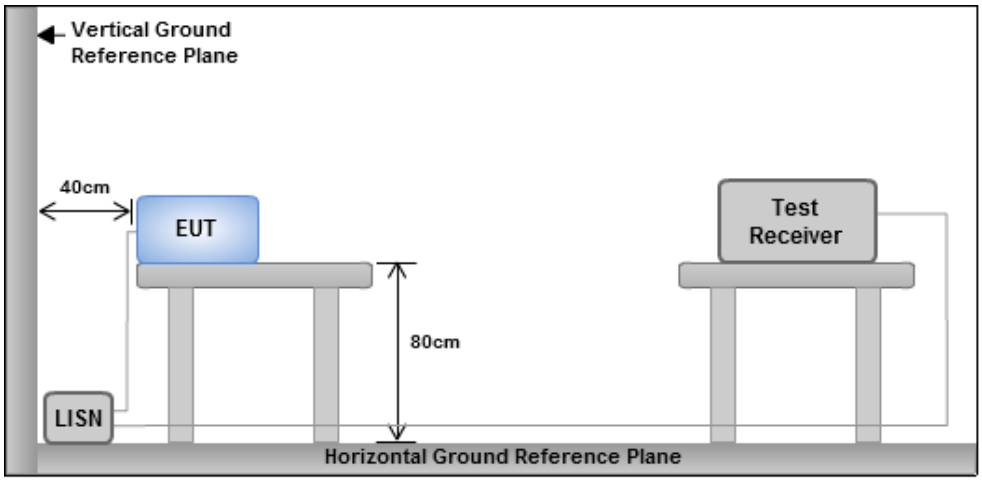
3.1.1 Limit of Conducted Emissions

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.

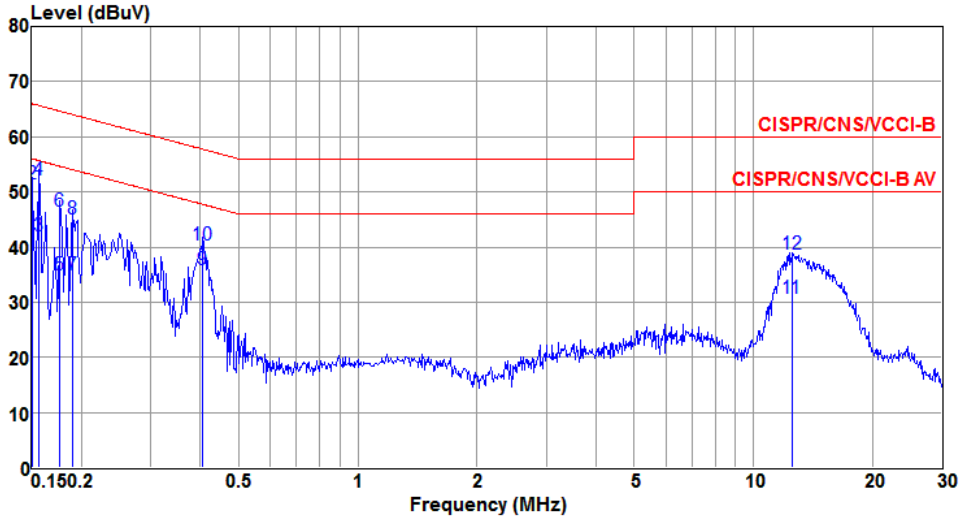
3.1.3 Test Setup



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

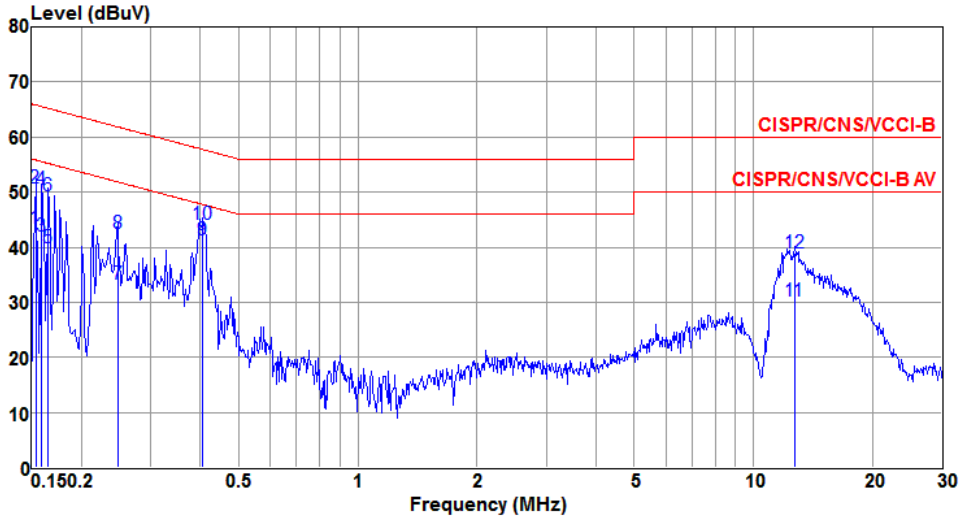
Modulation	DSSS	Test Freq. (MHz)	2405
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.150	42.68	56.00	-13.32	42.59	0.07	0.02	Average
2	0.150	51.36	66.00	-14.64	51.27	0.07	0.02	QP
3	0.156	41.94	55.65	-13.71	41.85	0.07	0.02	Average
4	0.156	52.15	65.65	-13.50	52.06	0.07	0.02	QP
5	0.177	35.01	54.64	-19.63	34.90	0.09	0.02	Average
6	0.177	46.47	64.64	-18.17	46.36	0.09	0.02	QP
7	0.189	34.84	54.06	-19.22	34.73	0.09	0.02	Average
8	0.189	45.07	64.06	-18.99	44.96	0.09	0.02	QP
9@	0.406	35.77	47.73	-11.96	35.68	0.06	0.03	Average
10	0.406	40.40	57.73	-17.33	40.31	0.06	0.03	QP
11	12.516	30.74	50.00	-19.26	30.29	0.26	0.19	Average
12	12.516	38.63	60.00	-21.37	38.18	0.26	0.19	QP

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

Modulation	DSSS	Test Freq. (MHz)	2405
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.153	43.47	55.82	-12.35	43.35	0.10	0.02	Average
2	0.153	50.74	65.82	-15.08	50.62	0.10	0.02	QP
3	0.159	42.02	55.52	-13.50	41.90	0.10	0.02	Average
4	0.159	50.53	65.52	-14.99	50.41	0.10	0.02	QP
5	0.165	39.83	55.21	-15.38	39.71	0.10	0.02	Average
6	0.165	49.41	65.21	-15.80	49.29	0.10	0.02	QP
7	0.247	33.29	51.86	-18.57	33.17	0.10	0.02	Average
8	0.247	42.48	61.86	-19.38	42.36	0.10	0.02	QP
9@	0.406	41.30	47.73	-6.43	41.14	0.13	0.03	Average
10	0.406	44.14	57.73	-13.59	43.98	0.13	0.03	QP
11	12.716	30.23	50.00	-19.77	29.70	0.34	0.19	Average
12	12.716	38.93	60.00	-21.07	38.40	0.34	0.19	QP

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

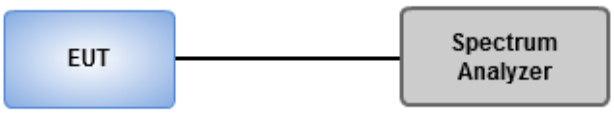
6dB Bandwidth

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.

Occupied Bandwidth

1. Set resolution bandwidth (RBW) = 1 MHz, Video bandwidth = 3 MHz.
2. Detector = Sample, Trace mode = max hold.
3 Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

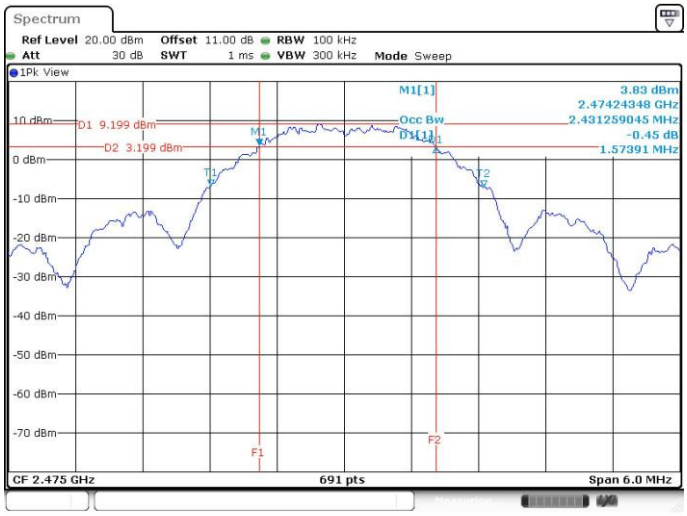
3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

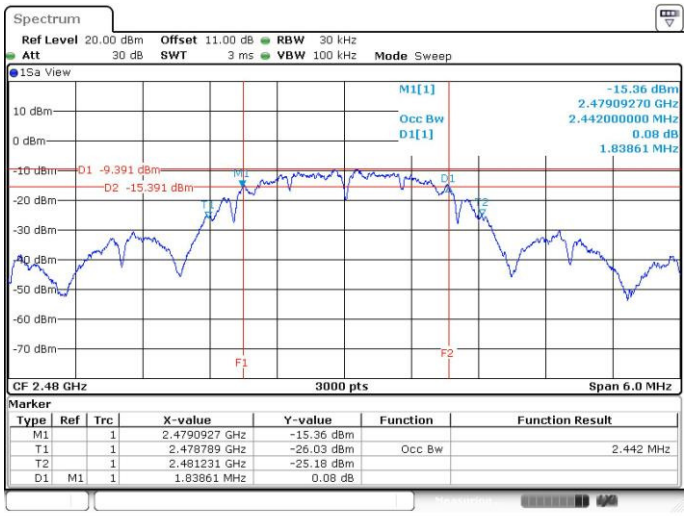
Modulation Mode	Freq. (MHz)	6dB Bandwidth (MHz)	Limit (kHz)
DSSS	2405	1.600	500
DSSS	2445	1.626	500
DSSS	2470	1.609	500
DSSS	2475	1.574	500
DSSS	2480	1.609	500

Worst Plot



Modulation Mode	Freq. (MHz)	99% Occupied Bandwidth (MHz)
DSSS	2405	2.436
DSSS	2445	2.436
DSSS	2470	2.430
DSSS	2475	2.418
DSSS	2480	2.442

Worst Plot



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

Peak conducted Output Power (dBm)							
Modulation Mode	Freq. (MHz)	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Ant. Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
DSSS	2405	46.452	16.67	30	3.4	20.07	36
DSSS	2445	26.669	14.26	30	3.4	17.66	36
DSSS	2470	23.281	13.67	30	3.4	17.07	36
DSSS	2475	22.961	13.61	30	3.4	17.01	36
DSSS	2480	0.851	-0.7	30	3.4	2.70	36

Conducted (Average) Output Power (dBm)			
Modulation Mode	Freq. (MHz)	Total Power (mW)	Total Power (dBm)
DSSS	2405	46.026	16.63
DSSS	2445	26.485	14.23
DSSS	2470	22.961	13.61
DSSS	2475	22.646	13.55
DSSS	2480	0.811	-0.91

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

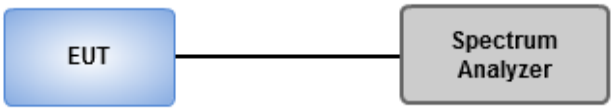
☒ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.

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.

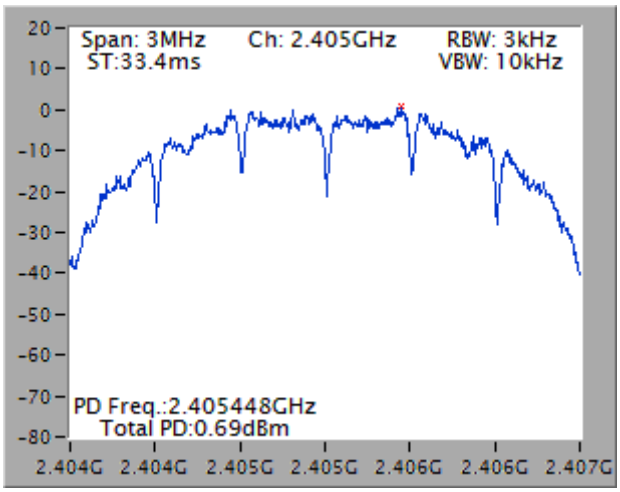
3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation Mode	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
DSSS	2405	0.69	8
DSSS	2445	-1.53	8
DSSS	2470	-2.61	8
DSSS	2475	-2.68	8
DSSS	2480	-17.17	8

Worst Plot



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

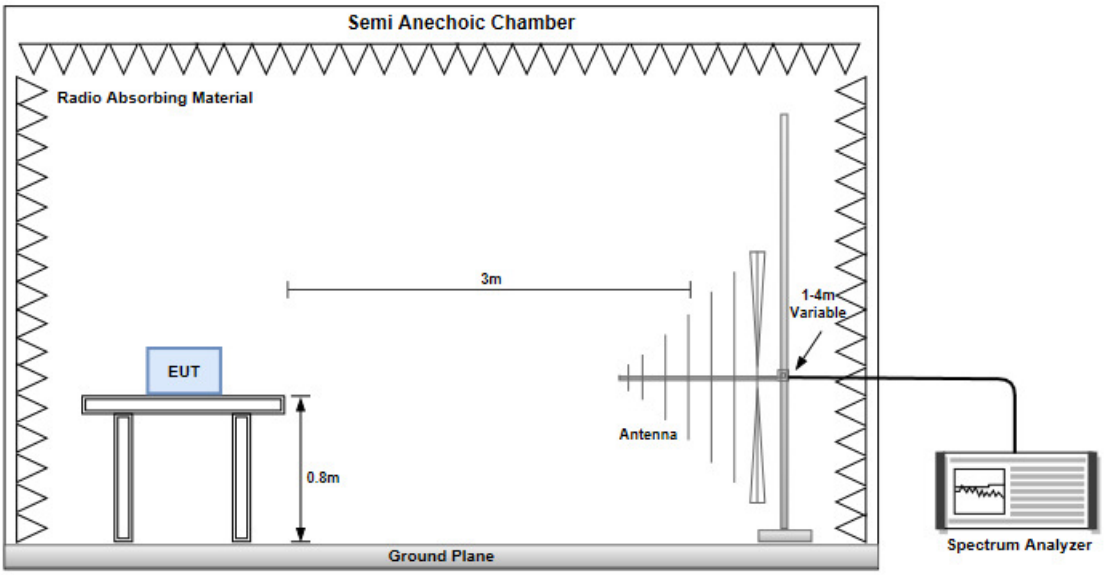
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
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:

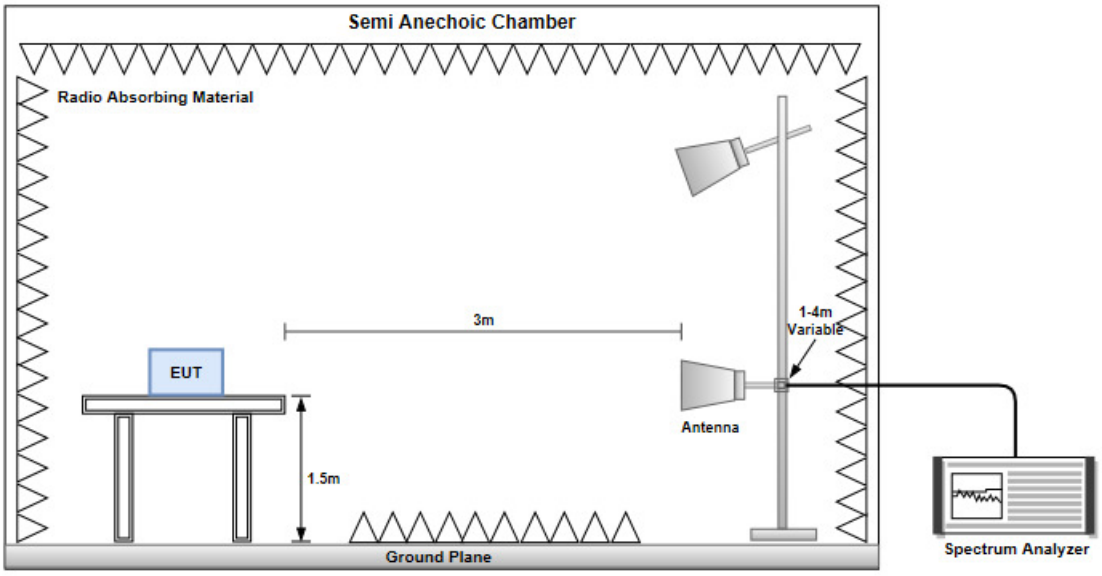
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz

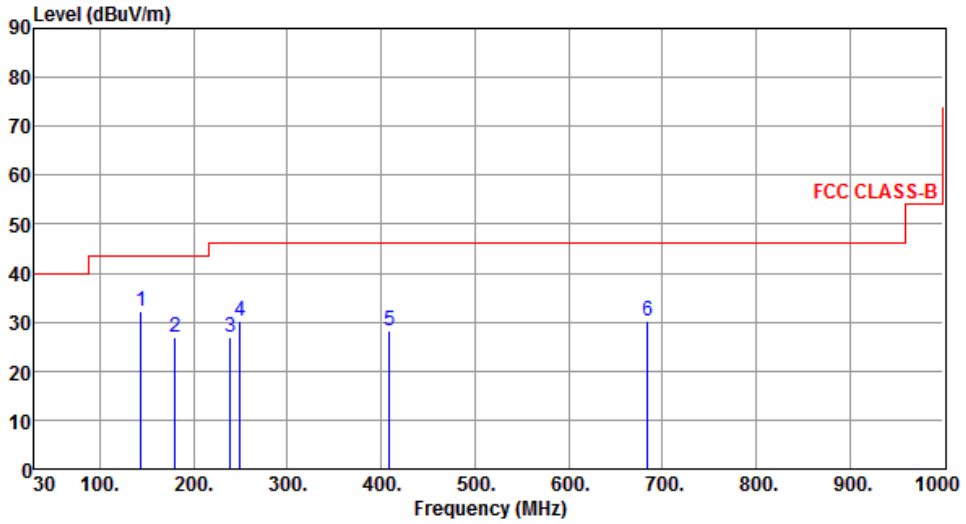


Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

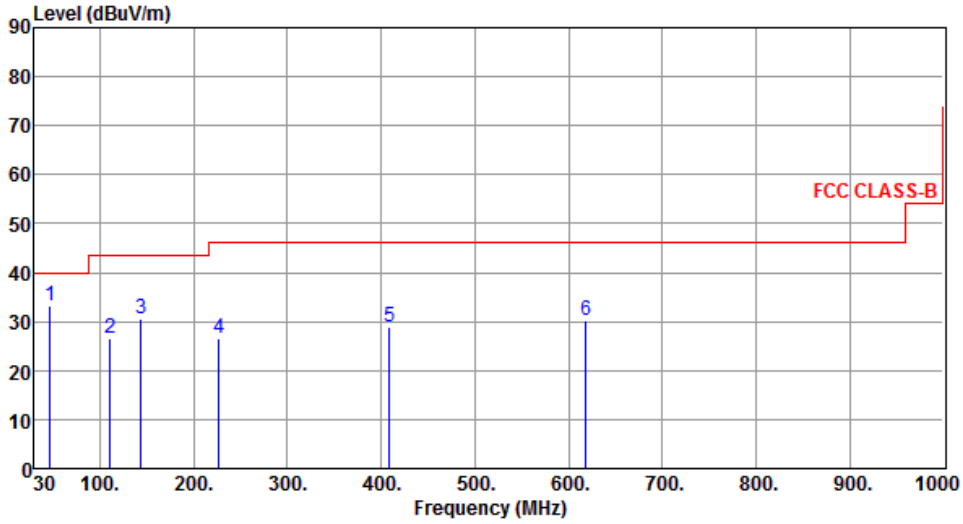
Modulation	DSSS	**Test Freq. (MHz)**	2405
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	143.49	32.13	43.50	-11.37	40.43	-8.30	Peak	---	---
2	180.35	26.85	43.50	-16.65	36.64	-9.79	Peak	---	---
3	239.52	26.91	46.00	-19.09	36.33	-9.42	Peak	---	---
4	249.22	30.19	46.00	-15.81	39.40	-9.21	Peak	---	---
5	409.27	28.13	46.00	-17.87	32.90	-4.77	Peak	---	---
6	684.75	30.33	46.00	-15.67	29.94	0.39	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).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	DSSS	Test Freq. (MHz)	2405
Polarization	Vertical		

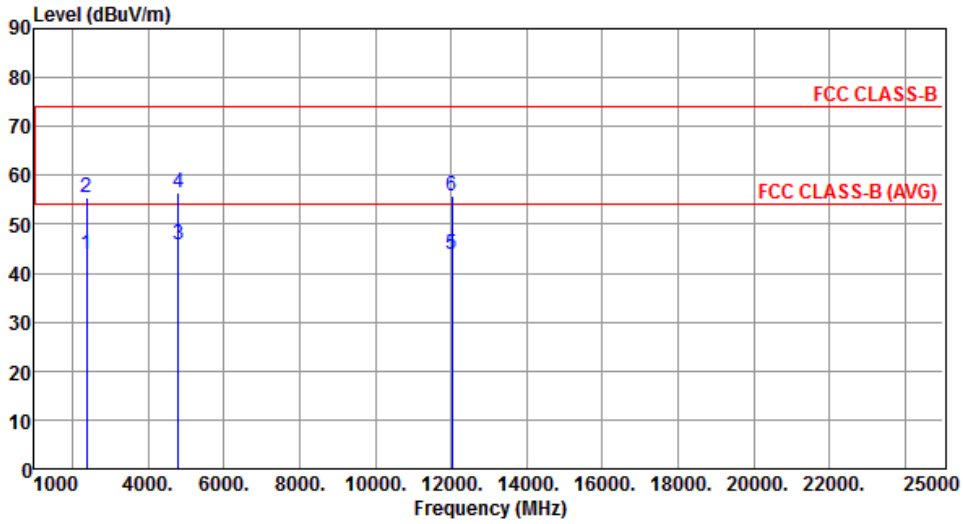


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.49	33.07	40.00	-6.93	40.62	-7.55	Peak	---	---
2	110.51	26.60	43.50	-16.90	37.72	-11.12	Peak	---	---
3	143.49	30.50	43.50	-13.00	38.80	-8.30	Peak	---	---
4	226.91	26.73	46.00	-19.27	36.48	-9.75	Peak	---	---
5	409.27	28.74	46.00	-17.26	33.51	-4.77	Peak	---	---
6	618.79	30.33	46.00	-15.67	30.82	-0.49	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).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

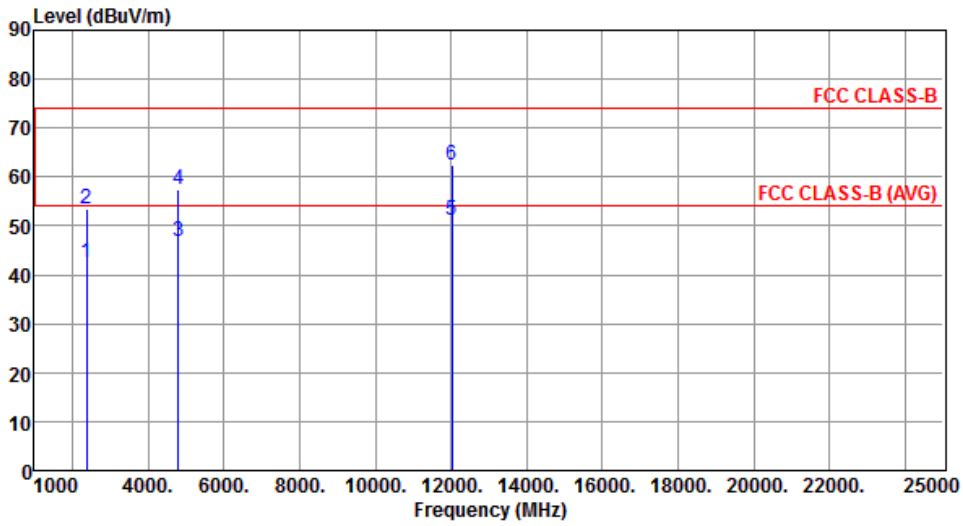
Modulation	DSSS	**Test Freq. (MHz)**	2405
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	43.76	54.00	-10.24	47.05	-3.29	Average	289	341
2	2390.00	55.47	74.00	-18.53	58.76	-3.29	Peak	289	341
3	4810.00	45.73	54.00	-8.27	42.24	3.49	Average	245	172
4	4810.00	56.30	74.00	-17.70	52.81	3.49	Peak	245	172
5	12025.00	43.91	54.00	-10.09	29.60	14.31	Average	100	268
6	12025.00	55.66	74.00	-18.34	41.35	14.31	Peak	100	268

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).

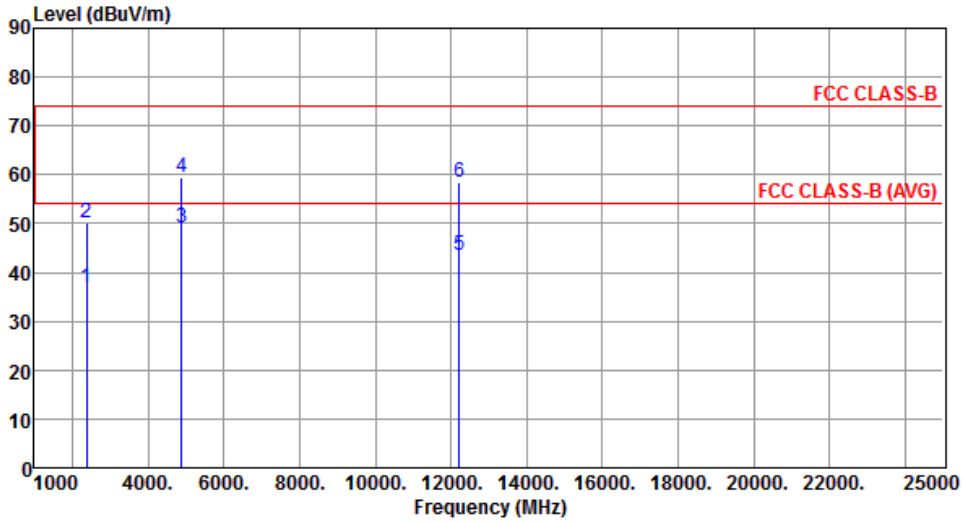
Modulation	DSSS	Test Freq. (MHz)	2405
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	42.62	54.00	-11.38	45.91	-3.29	Average	320	316
2	2390.00	53.42	74.00	-20.58	56.71	-3.29	Peak	320	316
3	4810.00	46.77	54.00	-7.23	43.28	3.49	Average	321	232
4	4810.00	57.53	74.00	-16.47	54.04	3.49	Peak	321	232
5	12025.00	51.23	54.00	-2.77	36.92	14.31	Average	343	65
6	12025.00	62.31	74.00	-11.69	48.00	14.31	Peak	343	65

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).

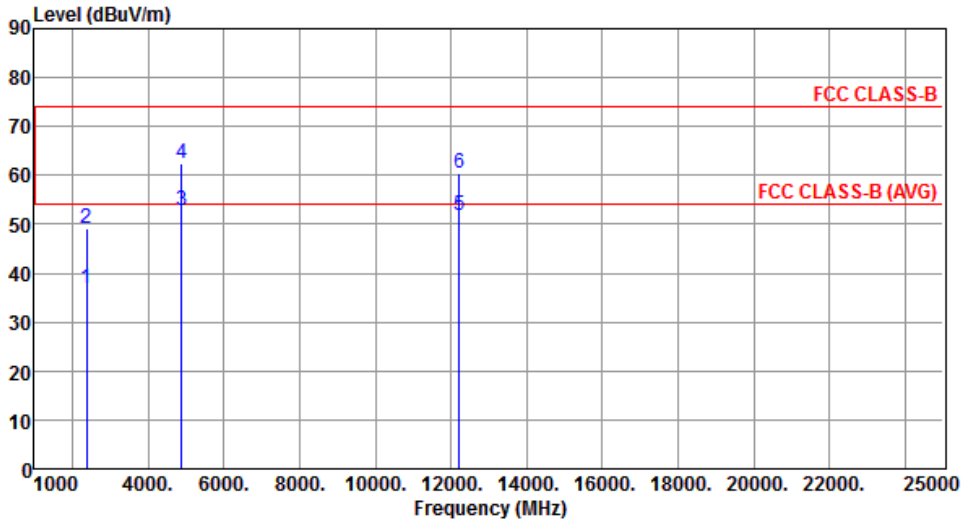
Modulation	DSSS	Test Freq. (MHz)	2445
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	36.91	54.00	-17.09	40.20	-3.29	Average	315	345
2	2390.00	50.16	74.00	-23.84	53.45	-3.29	Peak	315	345
3	4890.00	49.26	54.00	-4.74	45.51	3.75	Average	192	186
4	4890.00	59.59	74.00	-14.41	55.84	3.75	Peak	192	186
5	12225.00	43.62	54.00	-10.38	29.11	14.51	Average	100	283
6	12225.00	58.31	74.00	-15.69	43.80	14.51	Peak	100	283

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).

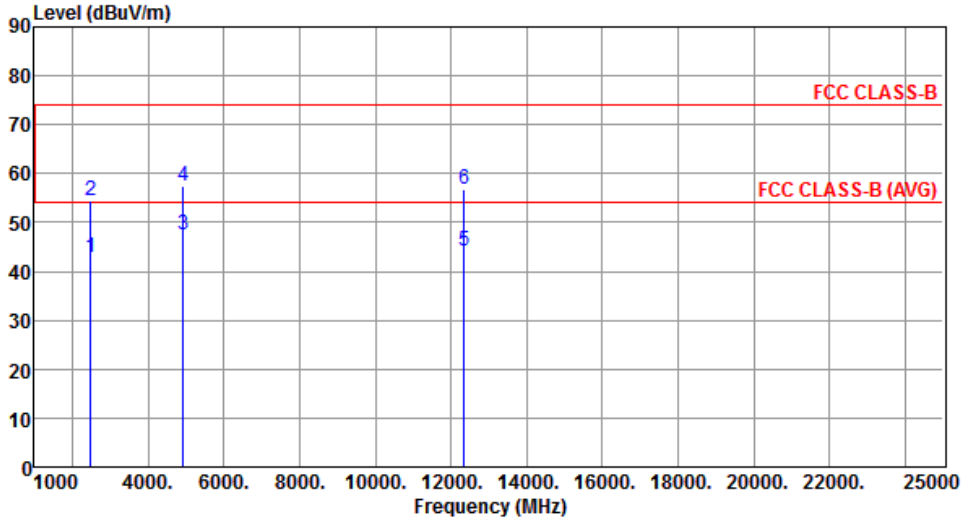
Modulation	DSSS	Test Freq. (MHz)	2445
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	36.98	54.00	-17.02	40.27	-3.29	Average	326	355
2	2390.00	49.03	74.00	-24.97	52.32	-3.29	Peak	326	355
3	4890.00	52.65	54.00	-1.35	48.90	3.75	Average	275	224
4	4890.00	62.30	74.00	-11.70	58.55	3.75	Peak	275	224
5	12225.00	51.91	54.00	-2.09	37.40	14.51	Average	328	332
6	12225.00	60.40	74.00	-13.60	45.89	14.51	Peak	328	332

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).

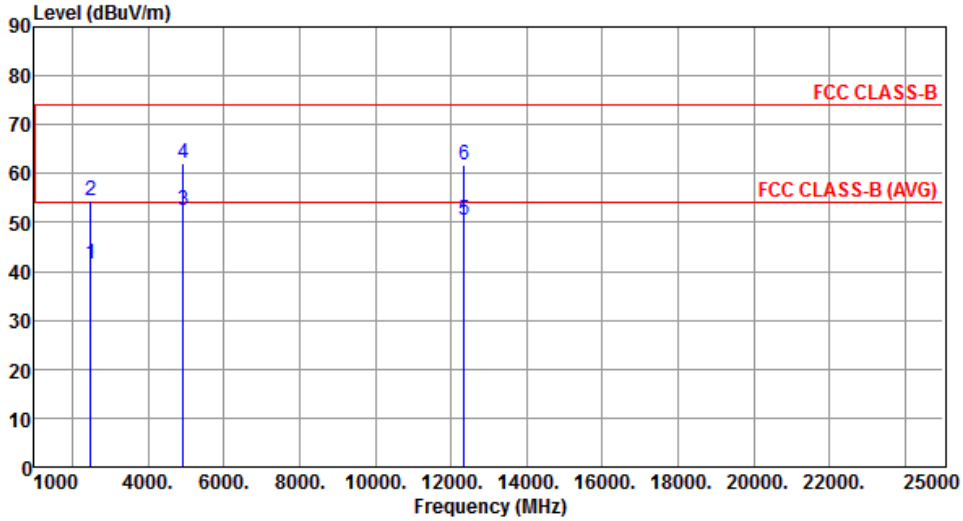
Modulation	DSSS	Test Freq. (MHz)	2470
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	42.70	54.00	-11.30	45.60	-2.90	Average	342	328
2	2483.50	54.45	74.00	-19.55	57.35	-2.90	Peak	342	328
3	4940.00	47.41	54.00	-6.59	43.49	3.92	Average	233	137
4	4940.00	57.35	74.00	-16.65	53.43	3.92	Peak	233	137
5	12350.00	44.17	54.00	-9.83	29.53	14.64	Average	100	286
6	12350.00	56.80	74.00	-17.20	42.16	14.64	Peak	100	286

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).

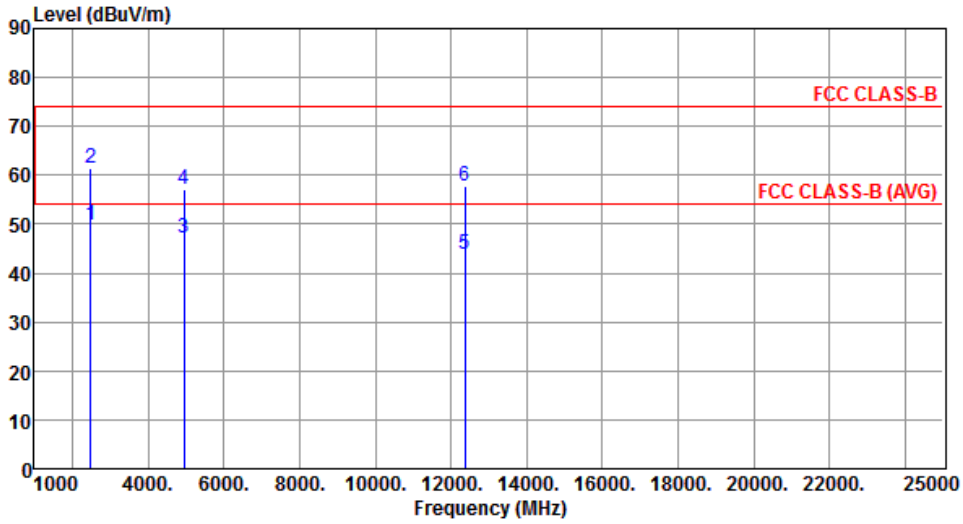
Modulation	DSSS	Test Freq. (MHz)	2470
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	41.46	54.00	-12.54	44.36	-2.90	Average	136	131
2	2483.50	54.35	74.00	-19.65	57.25	-2.90	Peak	136	131
3	4940.00	52.35	54.00	-1.65	48.43	3.92	Average	283	215
4	4940.00	62.00	74.00	-12.00	58.08	3.92	Peak	283	215
5	12350.00	50.52	54.00	-3.48	35.88	14.64	Average	300	43
6	12350.00	61.89	74.00	-12.11	47.25	14.64	Peak	300	43

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).

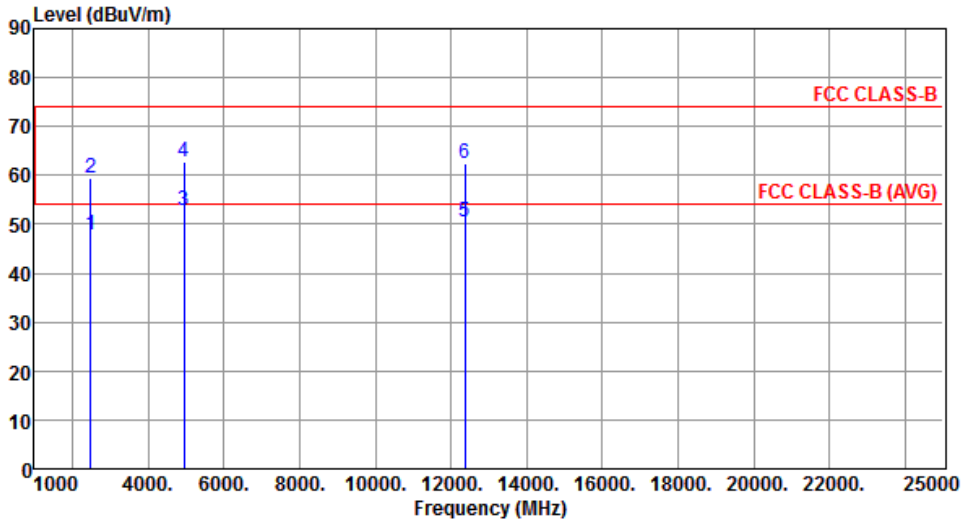
Modulation	DSSS	Test Freq. (MHz)	2475
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	49.88	54.00	-4.12	52.78	-2.90	Average	344	334
2	2483.50	61.28	74.00	-12.72	64.18	-2.90	Peak	344	334
3	4950.00	47.32	54.00	-6.68	43.38	3.94	Average	254	140
4	4950.00	56.97	74.00	-17.03	53.03	3.94	Peak	254	140
5	12375.00	43.98	54.00	-10.02	29.31	14.67	Average	330	317
6	12375.00	57.94	74.00	-16.06	43.27	14.67	Peak	330	317

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).

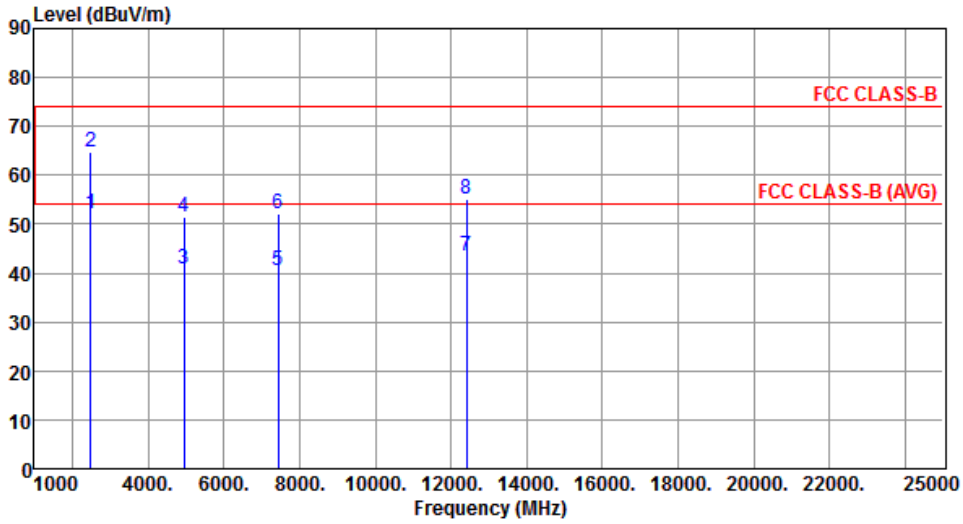
Modulation	DSSS	Test Freq. (MHz)	2475
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	47.98	54.00	-6.02	50.88	-2.90	Average	107	135
2	2483.50	59.57	74.00	-14.43	62.47	-2.90	Peak	107	135
3	4950.00	52.76	54.00	-1.24	48.82	3.94	Average	283	216
4	4950.00	62.86	74.00	-11.14	58.92	3.94	Peak	283	216
5	12375.00	50.38	54.00	-3.62	35.71	14.67	Average	314	18
6	12375.00	62.27	74.00	-11.73	47.60	14.67	Peak	314	18

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).

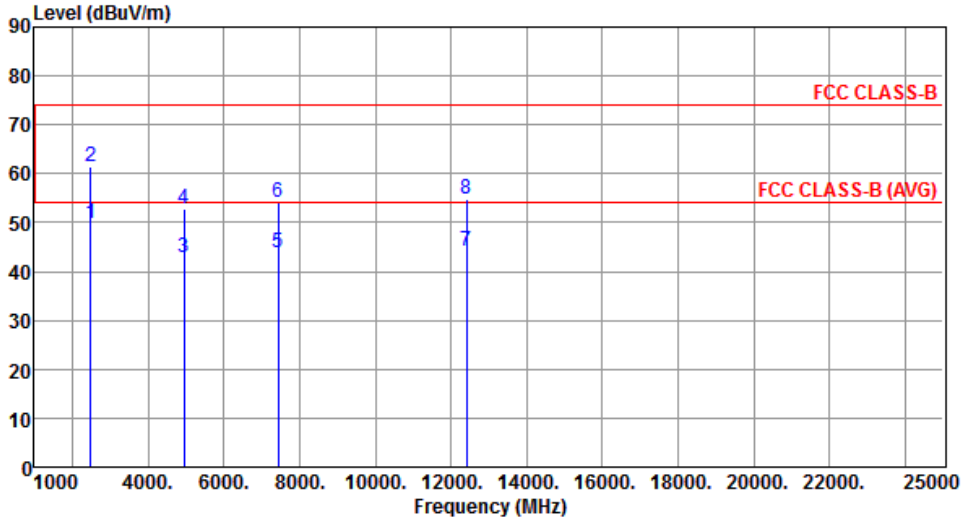
Modulation	DSSS	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.27	54.00	-1.73	55.17	-2.90	Average	342	333
2	2483.50	64.91	74.00	-9.09	67.81	-2.90	Peak	342	333
3	4960.00	40.82	54.00	-13.18	36.84	3.98	Average	116	277
4	4960.00	51.44	74.00	-22.56	47.46	3.98	Peak	116	277
5	7440.00	40.58	54.00	-13.42	31.94	8.64	Average	211	137
6	7440.00	52.21	74.00	-21.79	43.57	8.64	Peak	211	137
7	12400.00	43.53	54.00	-10.47	28.83	14.70	Average	100	280
8	12400.00	54.97	74.00	-19.03	40.27	14.70	Peak	100	280

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	DSSS	Test Freq. (MHz)	2480
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	2483.50	49.87	54.00	-4.13	52.77	-2.90	Average	280	355
2	2483.50	61.60	74.00	-12.40	64.50	-2.90	Peak	280	355
3	4960.00	42.99	54.00	-11.01	39.01	3.98	Average	377	180
4	4960.00	52.75	74.00	-21.25	48.77	3.98	Peak	377	180
5	7440.00	43.90	54.00	-10.10	35.26	8.64	Average	241	137
6	7440.00	54.28	74.00	-19.72	45.64	8.64	Peak	241	137
7	12400.00	44.03	54.00	-9.97	29.33	14.70	Average	298	45
8	12400.00	54.83	74.00	-19.17	40.13	14.70	Peak	298	45

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 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

Peak power 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

3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Reference level measurement

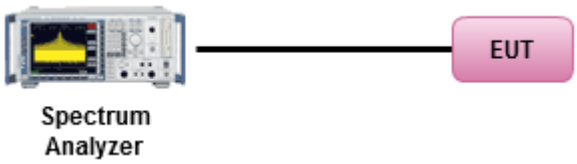
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

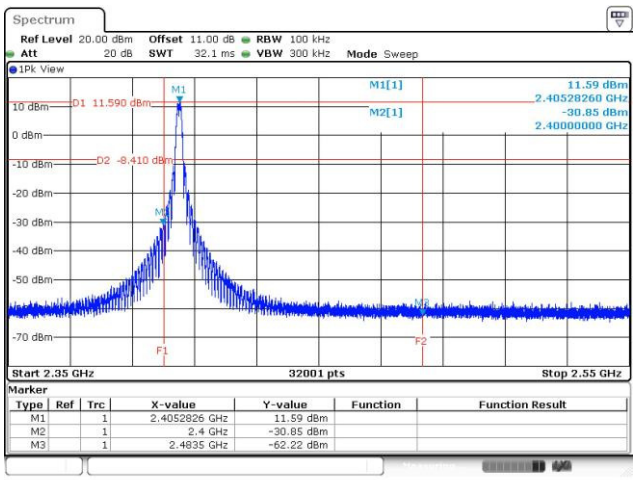
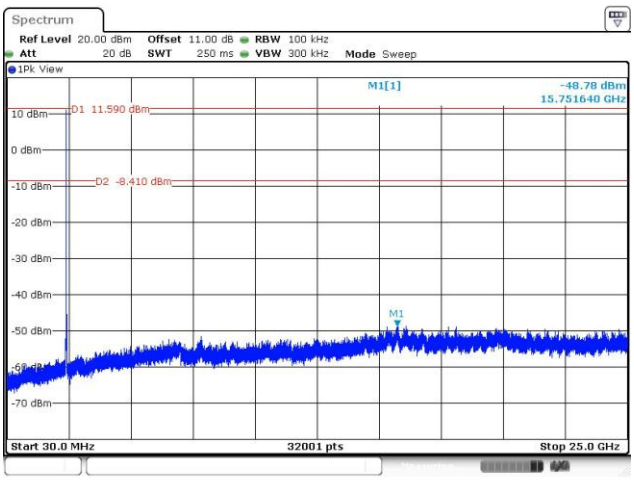
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

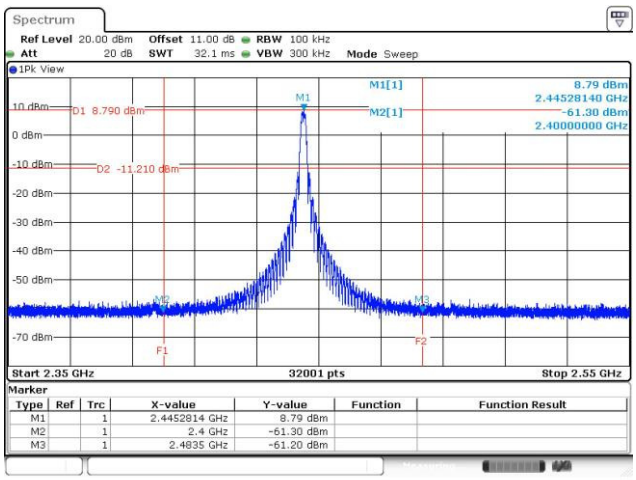
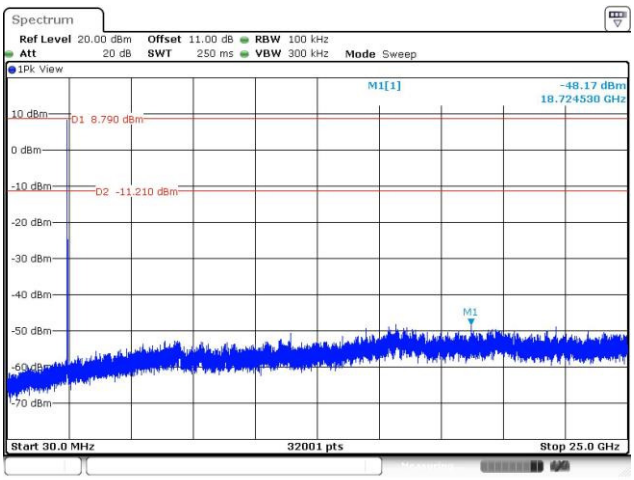
3.6.4 Test Setup

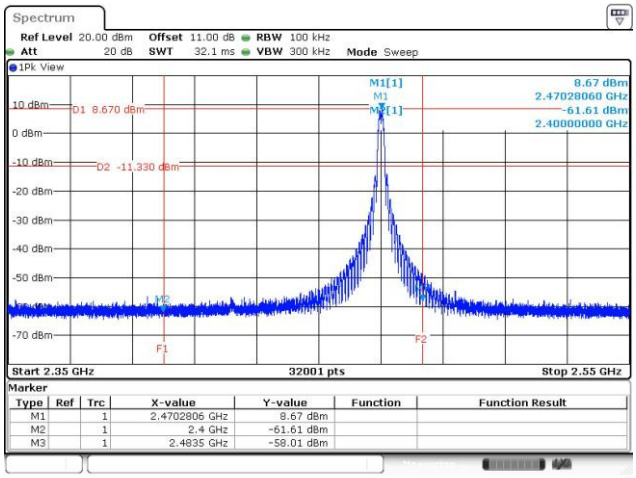
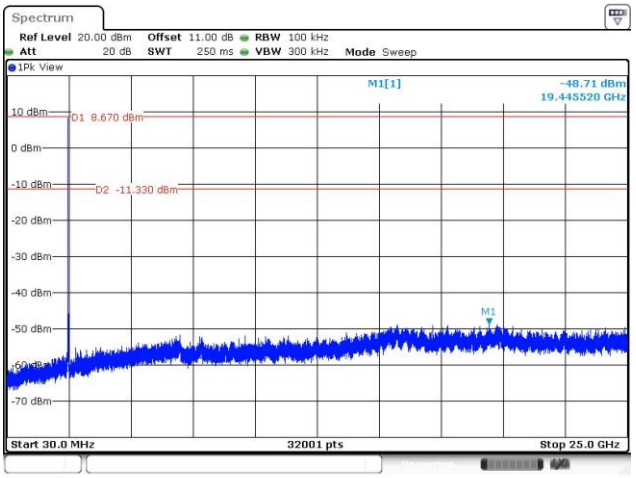
Transmitter Radiated Bandedge Emissions



3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

Tx 2405MHz / Reference Level	Tx 2405MHz / 30MHz~25GHz (down 20dBc)
	

Tx 2445MHz / Reference Level	Tx 2445MHz / 30MHz~25GHz (down 20dBc)
	

Tx 2470MHz / Reference Level	Tx 2470MHz / 30MHz~25GHz (down 20dBc)
	

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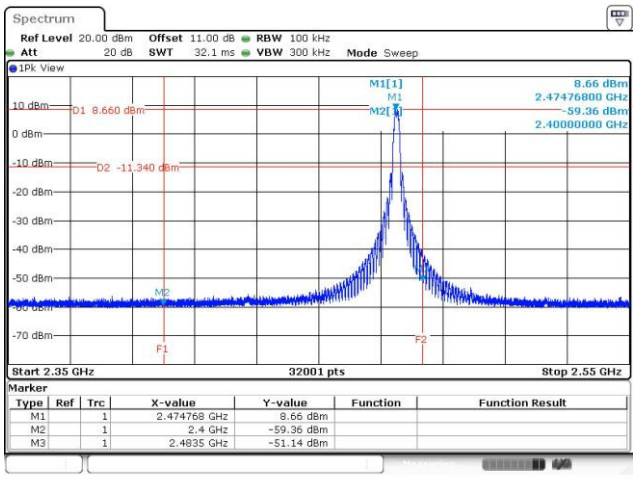
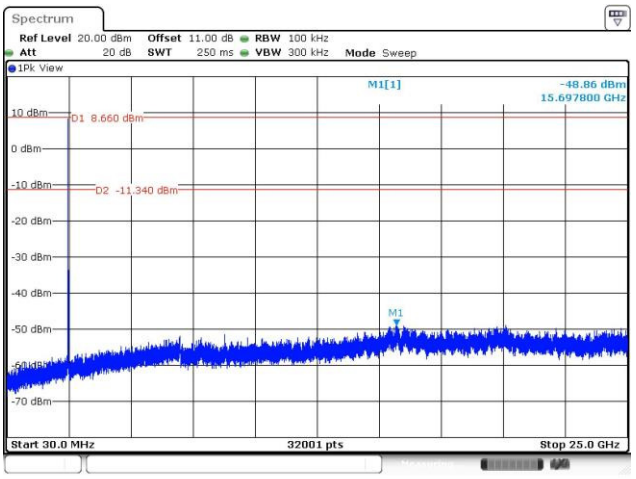
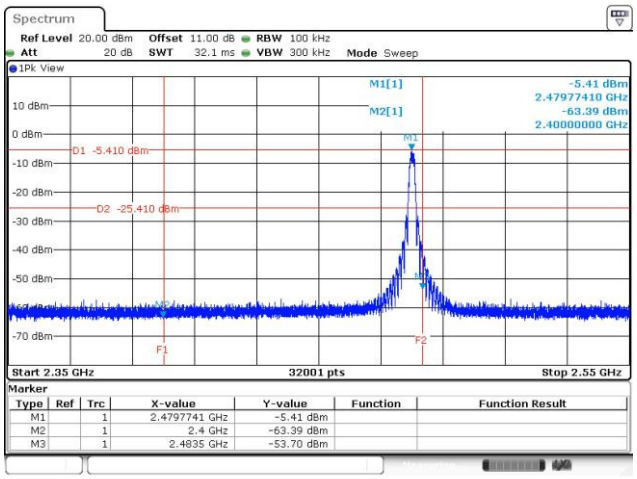
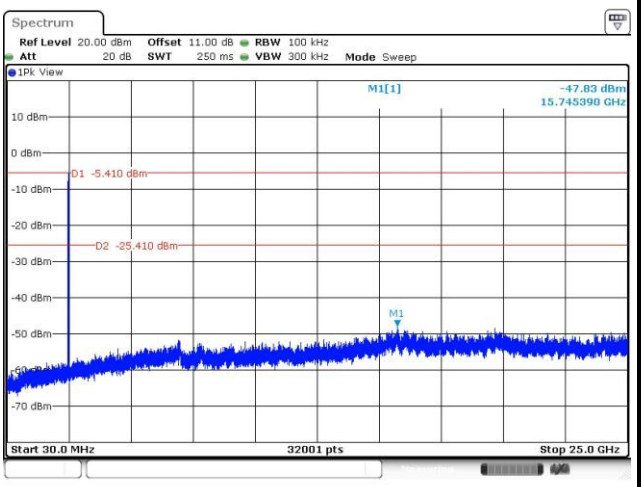
	

Tx 2480MHz / Reference Level	Tx 2480MHz / 30MHz~25GHz (down 20dBc)
	

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 (EMC and Wireless Communication Laboratory), 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 District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

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

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Email: ICC_Service@icertifi.com.tw

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