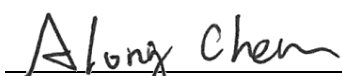


FCC Test Report

FCC ID : 2ALXW-LCM001915010
Equipment : Gateway Lora
Model No. : LCM001
Brand Name : Liyatech
Applicant : Liyatech Corporation
Address : 20F-8, No.7, Sec. 3, New Taipei Blvd.,
Xinzhuang Dist., New Taipei City, Taiwan
24250
Standard : 47 CFR FCC Part 15.247
Received Date : Jan. 10, 2018
Tested Date : Apr. 12 ~ Apr. 19, 2018

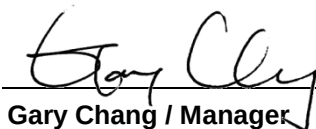
We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval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

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR811003	Rev. 01	Initial issue	Jun. 29, 2018

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.285MHz 40.96 (Margin -9.70dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2782.50MHz 53.83 (Margin -0.17dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 16.23	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)	Ch. Freq. (MHz)	Channel Number	Physical bit rate (bit/s)	Spread Factor	Channel Bandwidth (kHz)
902 ~ 928	923.3 ~ 927.5	1-8[8]	980 ~ 21900	12 ~ 7	500
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: The device uses CSS modulation.					

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remark
1	Monopole	SMA Male	2	---
2	Dipole	SMA Male	0.41	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	24Vdc from adapter (Support unit only)
-------------------	---

1.1.4 Accessories

N/A

1.1.5 Channel List

Channel	Frequency(MHz)
1	923.3
2	923.9
3	924.5
4	925.1
5	925.7
6	926.3
7	926.9
8	927.5

1.1.6 Test Tool and Duty Cycle

Test Tool	Terminal, version: 3.18.3	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
	100%	0

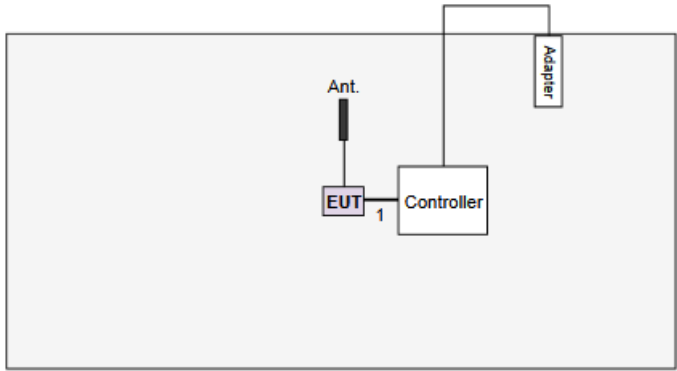
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	
	923.3	927.5
CSS	"--pa 3 --dig 0 --mix 11	"--pa 3 --dig 0 --mix 11

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Adapter	MEAN WELL	GST40A24	DoC	I/P: 100-240Vac, 50/60Hz, 1.0A O/P: 24Vdc, 1.67A, 40W MAX Provided by applicant.
2	Controller	Matrix	MXE-202i-MI3	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram	
	
No.	Signal cable / Length (m)
1	Control cable, provided by applicant.

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
Receiver	R&S	ESR3	101657	Jan. 05, 2018	Jan. 04, 2019
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2017	Nov. 12, 2018
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 18, 2017	Dec. 17, 2018
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)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2017	Dec. 03, 2018
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 25, 2017	Jul. 24, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 20, 2017	Dec. 19, 2018
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 23, 2017	Nov. 22, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980225	Jul. 28, 2017	Jul. 27, 2018
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2017	Oct. 05, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 22, 2017	Aug. 21, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 07, 2017	Dec. 06, 2018
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16052	Dec. 07, 2017	Dec. 06, 2018
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 07, 2017	Dec. 06, 2018
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 07, 2017	Dec. 06, 2018
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)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101486	Nov. 21, 2017	Nov. 20, 2018
Power Meter	Anritsu	ML2495A	1241002	Oct. 16, 2017	Oct. 15, 2018
Power Sensor	Anritsu	MA2411B	1207366	Oct. 16, 2017	Oct. 15, 2018
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 01, 2017	Nov. 30, 2018
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 v04

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 / 59%	Alex Tsai
Radiated Emissions	03CH01-WS	22-25°C / 62%	Akun Chung
RF Conducted	TH01-WS	22°C / 64%	Brad Wu

- 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	Test Frequency (MHz)	Channel Bandwidth (kHz)	Modulation / SF	Test Configuration
Conducted Emissions Maximum Output Power 6dB Bandwidth Power Spectral Density	923.3 / 927.5	500	CSS / 12	1
Radiated Emissions ≤1GHz Radiated Emissions >1GHz	923.3 / 927.5	500	CSS / 12	1, 2

Note:

- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.
- Two types antenna was selected to perform radiated emission test that listed as below configuration.
Test Configuration 1: with Monopole ANT
Test Configuration 2: with Dipole ANT

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

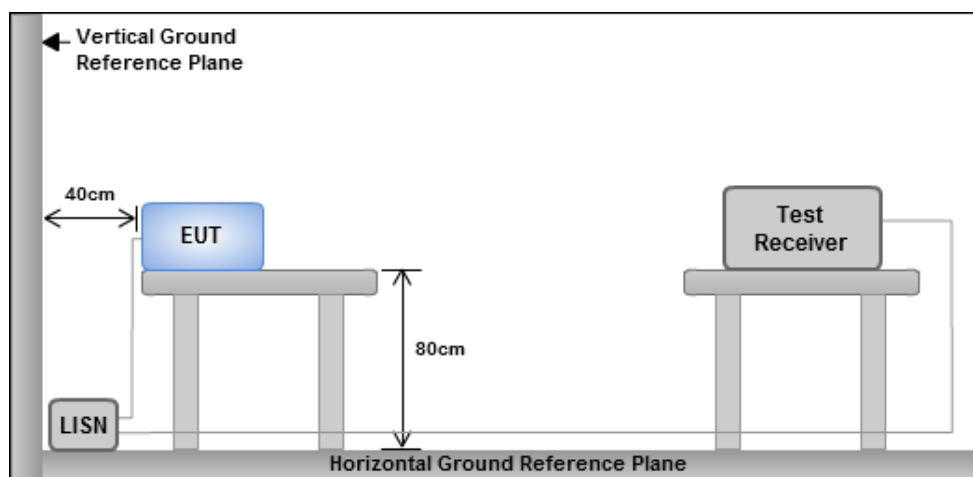
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

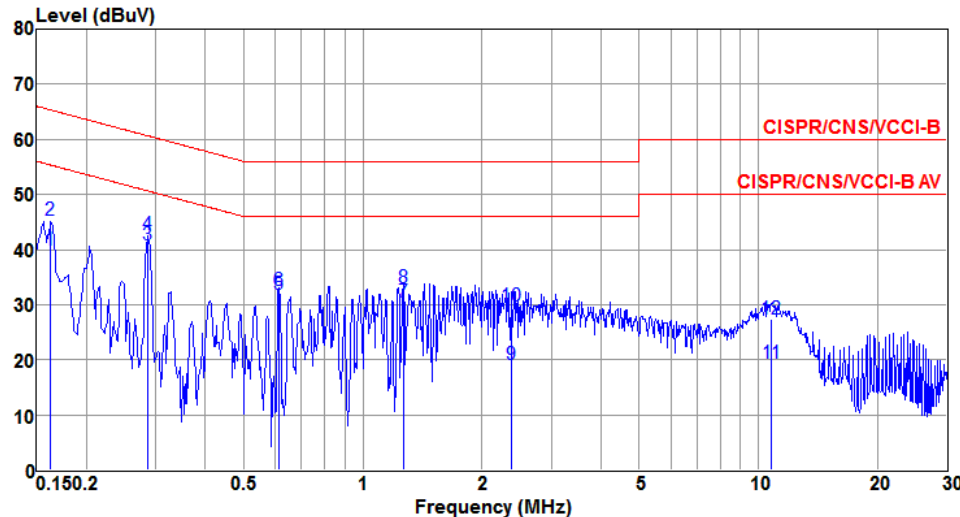
3.1.3 Test Setup



- 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

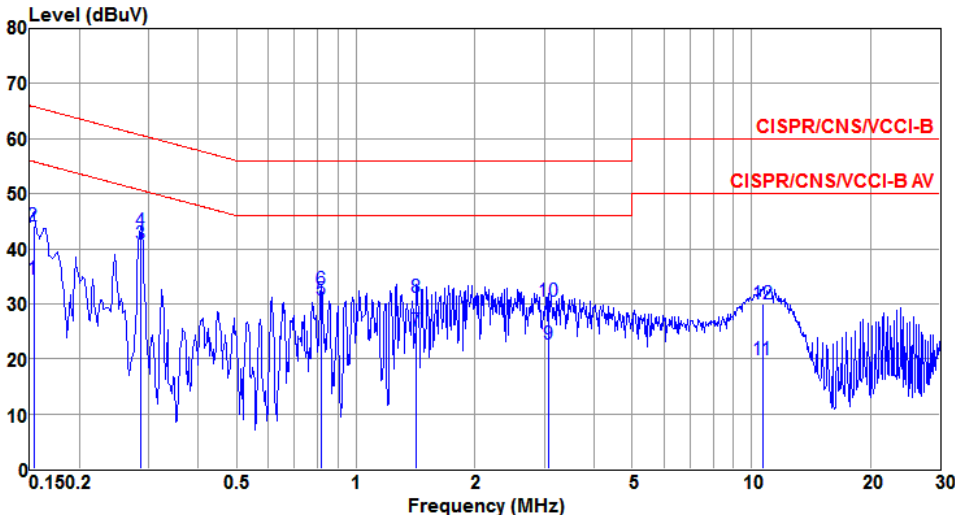
Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Power Phase	Line		



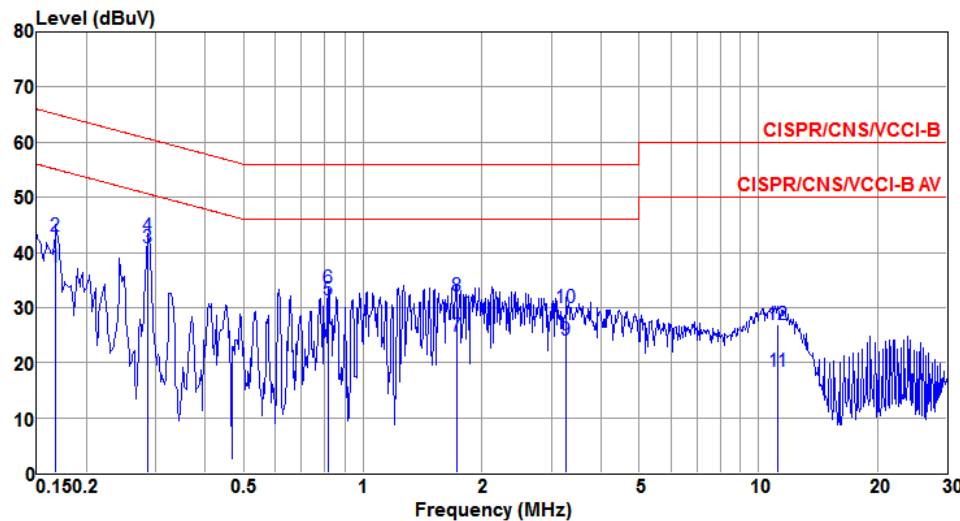
	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.162	39.99	55.34	-15.35	39.90	0.07	0.02	Average
2	0.162	45.32	65.34	-20.02	45.23	0.07	0.02	QP
3	0.286	40.79	50.64	-9.85	40.69	0.08	0.02	Average
4	0.286	42.83	60.64	-17.81	42.73	0.08	0.02	QP
5	0.614	31.93	46.00	-14.07	31.83	0.08	0.02	Average
6	0.614	32.50	56.00	-23.50	32.40	0.08	0.02	QP
7	1.269	30.41	46.00	-15.59	30.26	0.10	0.05	Average
8	1.269	33.10	56.00	-22.90	32.95	0.10	0.05	QP
9	2.384	19.21	46.00	-26.79	18.96	0.12	0.13	Average
10	2.384	29.70	56.00	-26.30	29.45	0.12	0.13	QP
11	10.790	19.38	50.00	-30.62	18.85	0.21	0.32	Average
12	10.790	27.40	60.00	-32.60	26.87	0.21	0.32	QP

Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB).

2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3																																																																																																																																							
Power Phase	Neutral																																																																																																																																									
Level (dBuV)  Frequency (MHz) <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>LISN</th><th>cable</th><th></th></tr><tr><th></th><th>MHz</th><th>dBuV</th><th>Line</th><th>Limit</th><th>Level</th><th>factor</th><th>loss</th><th>Remark</th></tr><tr><th></th><th></th><th></th><th>dBuV</th><th>dB</th><th>dBuV</th><th>dB</th><th>dB</th><th></th></tr></thead><tbody><tr><td>1</td><td>0.153</td><td>34.56</td><td>55.82</td><td>-21.26</td><td>34.51</td><td>0.04</td><td>0.01</td><td>Average</td></tr><tr><td>2</td><td>0.153</td><td>44.12</td><td>65.82</td><td>-21.70</td><td>44.07</td><td>0.04</td><td>0.01</td><td>QP</td></tr><tr><td>3@</td><td>0.285</td><td>40.75</td><td>50.67</td><td>-9.92</td><td>40.69</td><td>0.04</td><td>0.02</td><td>Average</td></tr><tr><td>4</td><td>0.285</td><td>43.18</td><td>60.67</td><td>-17.49</td><td>43.12</td><td>0.04</td><td>0.02</td><td>QP</td></tr><tr><td>5</td><td>0.817</td><td>30.68</td><td>46.00</td><td>-15.32</td><td>30.60</td><td>0.05</td><td>0.03</td><td>Average</td></tr><tr><td>6</td><td>0.817</td><td>32.61</td><td>56.00</td><td>-23.39</td><td>32.53</td><td>0.05</td><td>0.03</td><td>QP</td></tr><tr><td>7</td><td>1.426</td><td>25.12</td><td>46.00</td><td>-20.88</td><td>24.99</td><td>0.06</td><td>0.07</td><td>Average</td></tr><tr><td>8</td><td>1.426</td><td>31.23</td><td>56.00</td><td>-24.77</td><td>31.10</td><td>0.06</td><td>0.07</td><td>QP</td></tr><tr><td>9</td><td>3.074</td><td>22.63</td><td>46.00</td><td>-23.37</td><td>22.38</td><td>0.08</td><td>0.17</td><td>Average</td></tr><tr><td>10</td><td>3.074</td><td>30.41</td><td>56.00</td><td>-25.59</td><td>30.16</td><td>0.08</td><td>0.17</td><td>QP</td></tr><tr><td>11</td><td>10.676</td><td>19.89</td><td>50.00</td><td>-30.11</td><td>19.39</td><td>0.18</td><td>0.32</td><td>Average</td></tr><tr><td>12</td><td>10.676</td><td>30.01</td><td>60.00</td><td>-29.99</td><td>29.51</td><td>0.18</td><td>0.32</td><td>QP</td></tr></tbody></table>					Freq	Level	Limit	Over	Read	LISN	cable			MHz	dBuV	Line	Limit	Level	factor	loss	Remark				dBuV	dB	dBuV	dB	dB		1	0.153	34.56	55.82	-21.26	34.51	0.04	0.01	Average	2	0.153	44.12	65.82	-21.70	44.07	0.04	0.01	QP	3@	0.285	40.75	50.67	-9.92	40.69	0.04	0.02	Average	4	0.285	43.18	60.67	-17.49	43.12	0.04	0.02	QP	5	0.817	30.68	46.00	-15.32	30.60	0.05	0.03	Average	6	0.817	32.61	56.00	-23.39	32.53	0.05	0.03	QP	7	1.426	25.12	46.00	-20.88	24.99	0.06	0.07	Average	8	1.426	31.23	56.00	-24.77	31.10	0.06	0.07	QP	9	3.074	22.63	46.00	-23.37	22.38	0.08	0.17	Average	10	3.074	30.41	56.00	-25.59	30.16	0.08	0.17	QP	11	10.676	19.89	50.00	-30.11	19.39	0.18	0.32	Average	12	10.676	30.01	60.00	-29.99	29.51	0.18	0.32	QP
	Freq	Level	Limit	Over	Read	LISN	cable																																																																																																																																			
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Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).																																																																																																																																										

Modulation / SF	CSS / 12	Test Freq. (MHz)	927.5
Power Phase	Line		

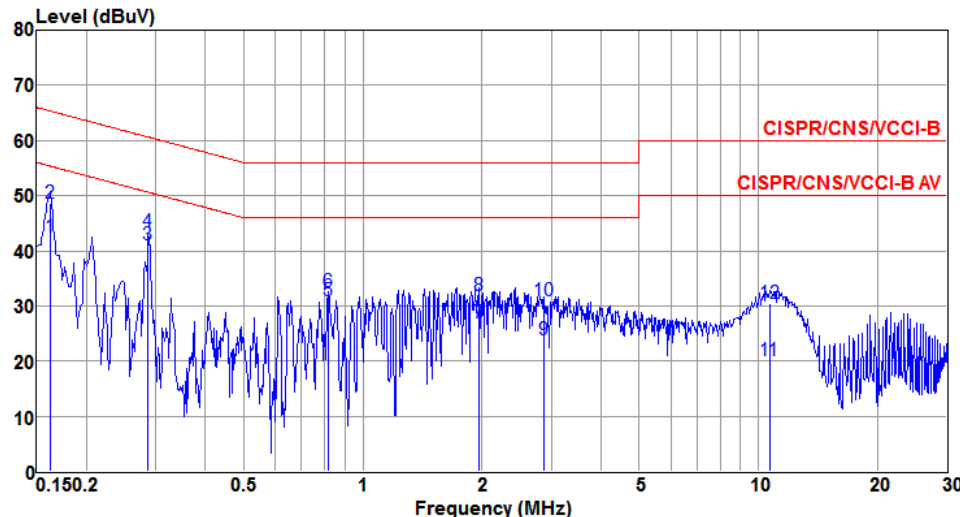


Freq	Level	Limit	Over	Read	LISN	cable		
MHz	dBuV	Line	Limit	Level	factor	loss	Remark	
		dBuV	dB	dBuV	dB	dB		
1	0.168	37.29	55.08	-17.79	37.20	0.07	0.02	Average
2	0.168	42.95	65.08	-22.13	42.86	0.07	0.02	QP
3@	0.286	40.78	50.65	-9.87	40.68	0.08	0.02	Average
4	0.286	42.89	60.65	-17.76	42.79	0.08	0.02	QP
5	0.817	31.37	46.00	-14.63	31.25	0.09	0.03	Average
6	0.817	33.42	56.00	-22.58	33.30	0.09	0.03	QP
7	1.725	24.90	46.00	-21.10	24.70	0.11	0.09	Average
8	1.725	32.11	56.00	-23.89	31.91	0.11	0.09	QP
9	3.276	24.08	46.00	-21.92	23.77	0.12	0.19	Average
10	3.276	29.96	56.00	-26.04	29.65	0.12	0.19	QP
11	11.198	18.32	50.00	-31.68	17.79	0.21	0.32	Average
12	11.198	27.01	60.00	-32.99	26.48	0.21	0.32	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).

2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation / SF	CSS / 12	Test Freq. (MHz)	927.5
Power Phase	Neutral		



	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.162	42.49	55.34	-12.85	42.43	0.04	0.02	Average
2	0.162	48.56	65.34	-16.78	48.50	0.04	0.02	QP
3	0.285	40.96	50.66	-9.70	40.90	0.04	0.02	Average
4	0.285	43.34	60.66	-17.32	43.28	0.04	0.02	QP
5	0.817	30.83	46.00	-15.17	30.75	0.05	0.03	Average
6	0.817	32.67	56.00	-23.33	32.59	0.05	0.03	QP
7	1.959	26.91	46.00	-19.09	26.74	0.07	0.10	Average
8	1.959	31.88	56.00	-24.12	31.71	0.07	0.10	QP
9	2.869	23.77	46.00	-22.23	23.53	0.08	0.16	Average
10	2.869	30.84	56.00	-25.16	30.60	0.08	0.16	QP
11	10.676	20.11	50.00	-29.89	19.61	0.18	0.32	Average
12	10.676	30.36	60.00	-29.64	29.86	0.18	0.32	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

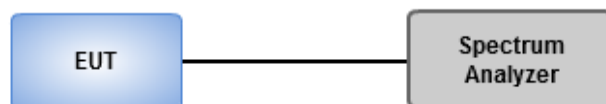
6dB Bandwidth

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

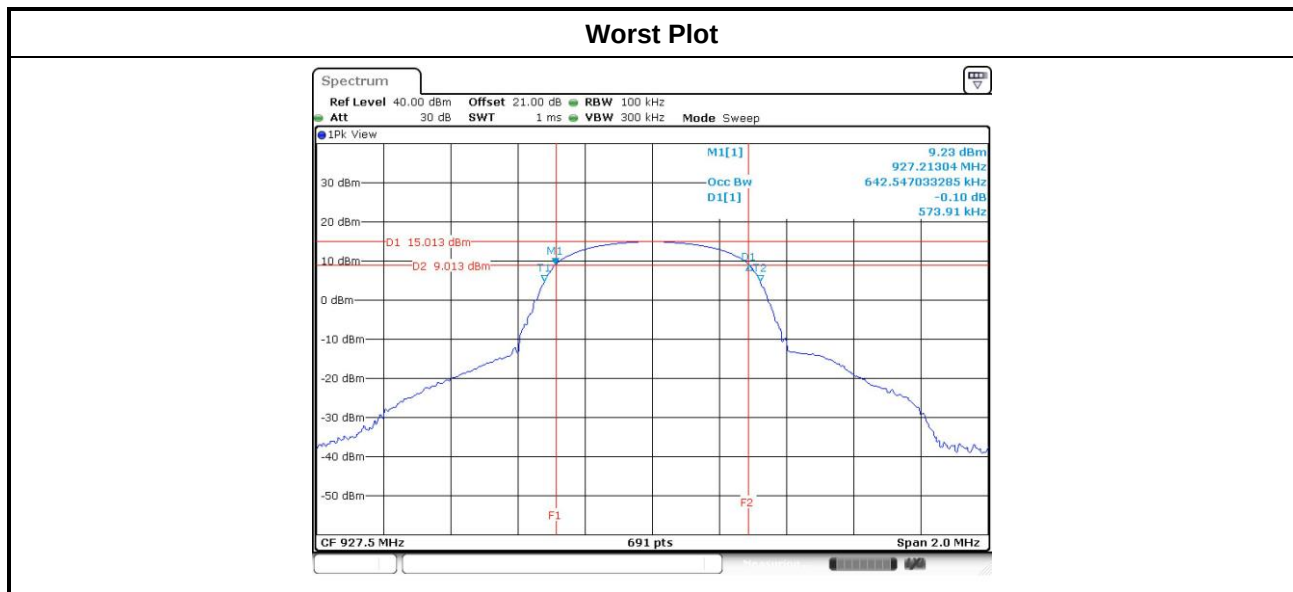
1. Set resolution bandwidth (RBW) = 10kHz, Video bandwidth = 30kHz.
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.2.3 Test Setup

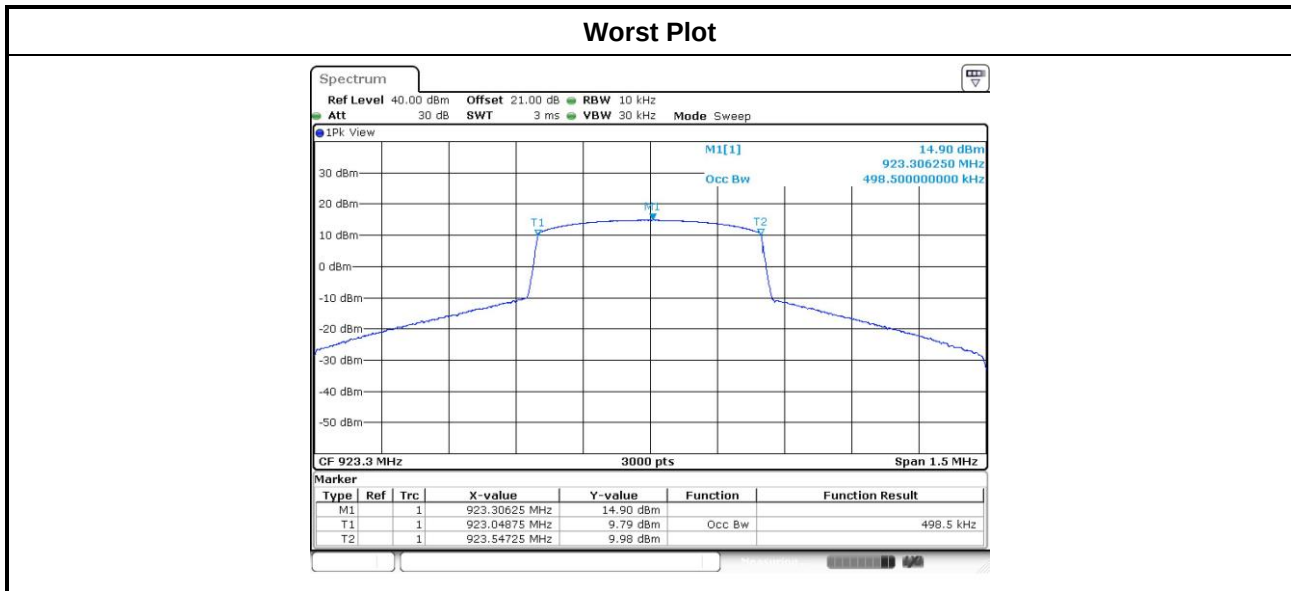


3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation / SF	Freq. (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
CSS / 12	923.3	0.577	0.5
CSS / 12	927.5	0.574	0.5



Modulation / SF	Freq. (MHz)	99% Occupied Bandwidth (MHz)
CSS / 12	923.3	0.499
CSS / 12	927.5	0.499



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

Antenna gain ≤ 6 dBi, no any corresponding reduction is in output power limit.

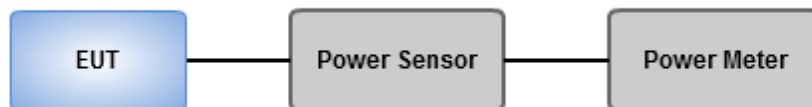
Antenna gain > 6 dBi

Transmitting antennas of directional gain greater than 6 dBi are used, 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 dBi

3.3.2 Test Procedures

A broadband 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 / SF	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (dBm)
CSS / 12	923.3	41.976	16.23	30
CSS / 12	927.5	40.551	16.08	30

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

Peak PSD

1. Set the RBW = 3 kHz, VBW = 10 kHz.
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.

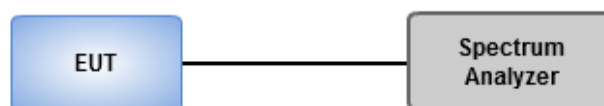
Average PSD, duty cycle $\geq 98\%$

1. Set the RBW = 3 kHz, VBW = 10 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Sweep time = auto couple.
4. Employ trace averaging (RMS) mode over a minimum of 100 traces.
5. Use the peak marker function to determine the maximum amplitude level.

Average PSD, duty cycle $< 98\%$

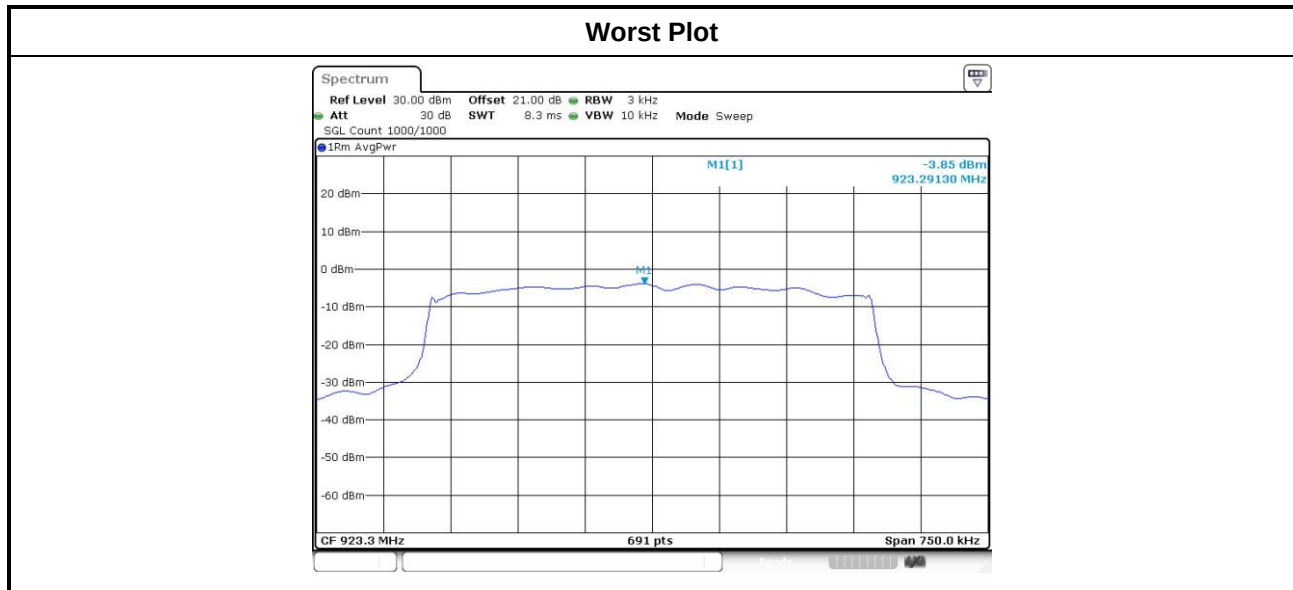
1. Set the RBW = 3 kHz, VBW = 10 kHz. Detector = RMS.
2. Set the sweep time to: ≥ 10 (number of measurement points in sweep) $\times$ (total on/off period of the transmitted signal).
3. Perform the measurement over a single sweep.
4. Use the peak marker function to determine the maximum amplitude level.
5. Add $10 \log (1/x)$, where x is the duty cycle.

3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
CSS / 12	923.3	-3.85	8.00
CSS / 12	927.5	-4.56	8.00



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:
Quasi-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

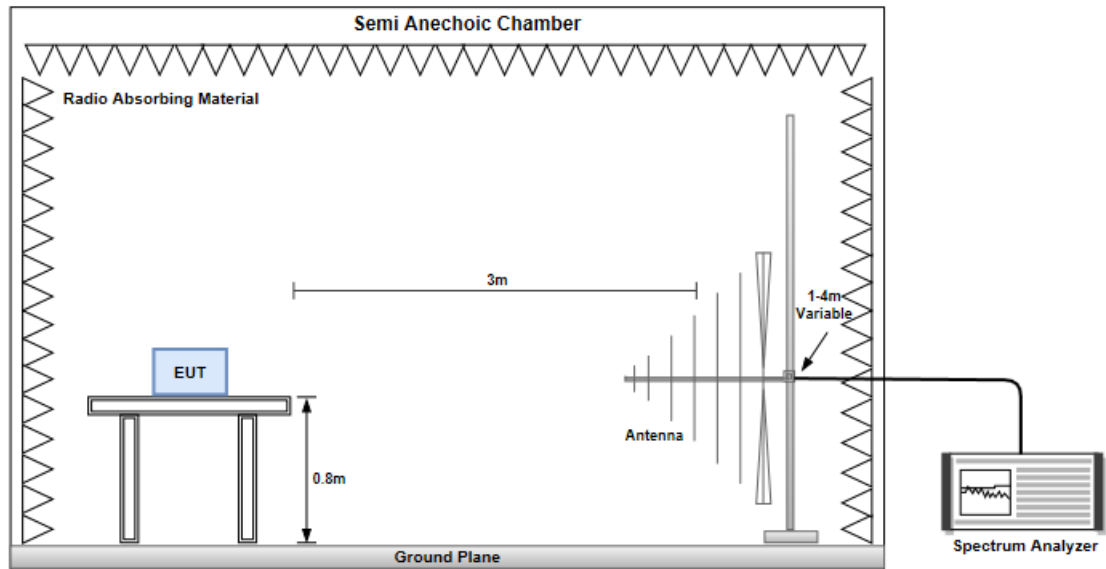
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

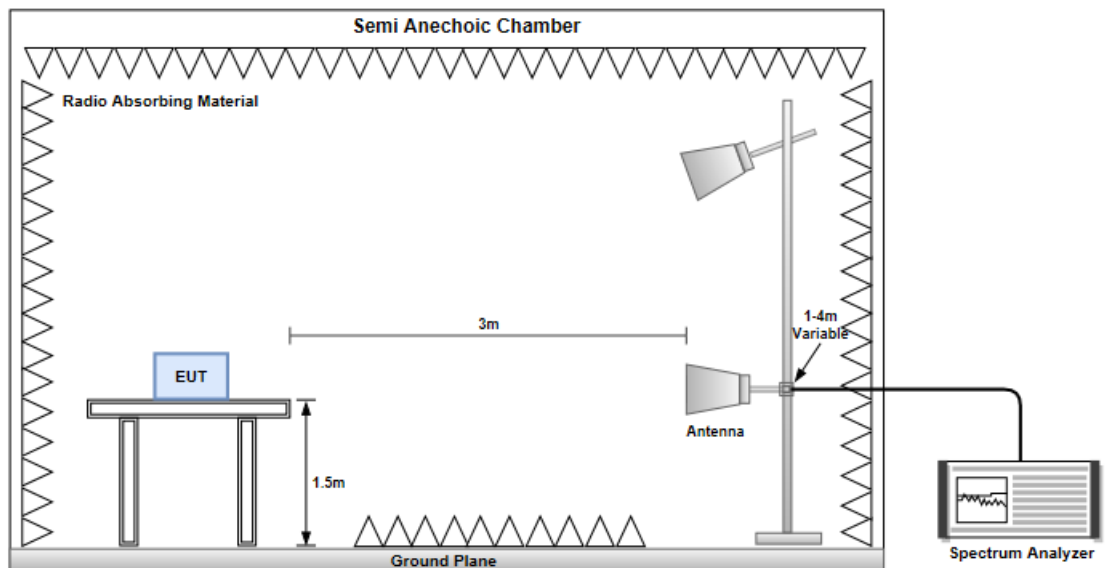
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

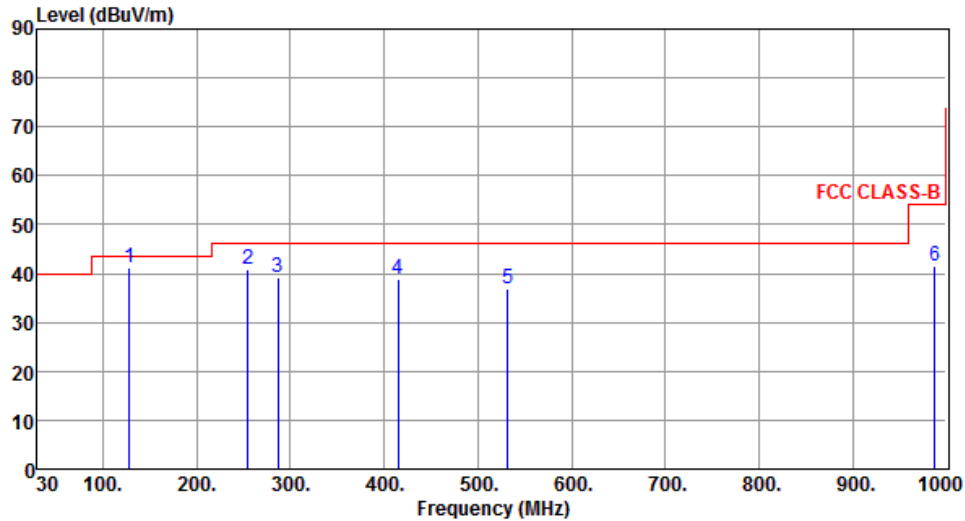


Configuration 1: with Monopole ANT

3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Polarization	Horizontal		
Level (dBuV/m) <			

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
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	128.01	41.14	43.50	-2.36	50.91	-9.77	QP	100	127
2	255.04	40.85	46.00	-5.15	50.03	-9.18	Peak	---	---
3	287.05	39.25	46.00	-6.75	47.17	-7.92	Peak	---	---
4	415.09	38.72	46.00	-7.28	43.32	-4.60	Peak	---	---
5	531.49	36.78	46.00	-9.22	38.92	-2.14	Peak	---	---
6	987.39	41.57	54.00	-12.43	36.11	5.46	Peak	---	---

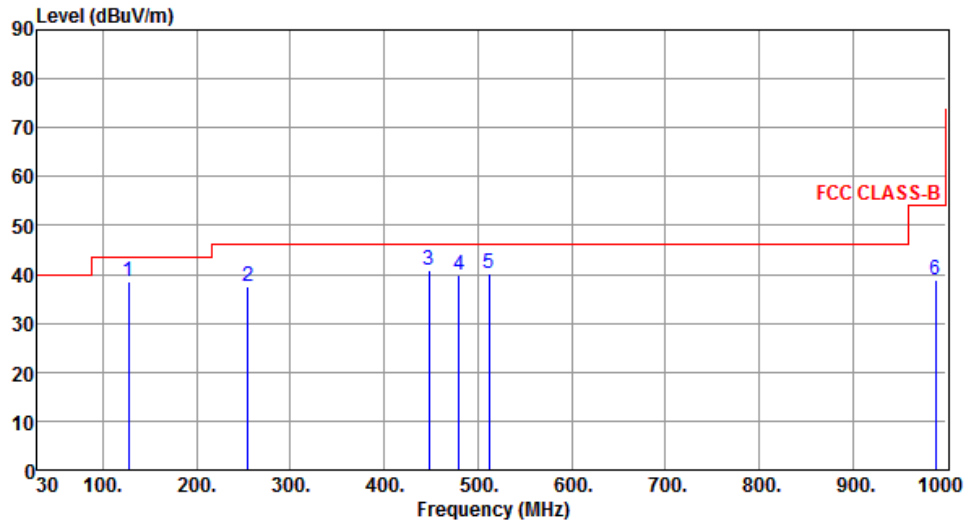
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / SF	CSS / 12	Test Freq. (MHz)	927.5
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	127.52	38.44	43.50	-5.06	66.77	-28.33	Peak	---	---
2	254.94	37.69	46.00	-8.31	66.09	-28.40	Peak	---	---
3	447.48	40.75	46.00	-5.25	69.02	-28.27	Peak	---	---
4	480.29	39.69	46.00	-6.31	67.93	-28.24	Peak	---	---
5	512.37	40.14	46.00	-5.86	68.35	-28.21	Peak	---	---
6	988.35	38.89	54.00	-15.11	66.37	-27.48	Peak	---	---

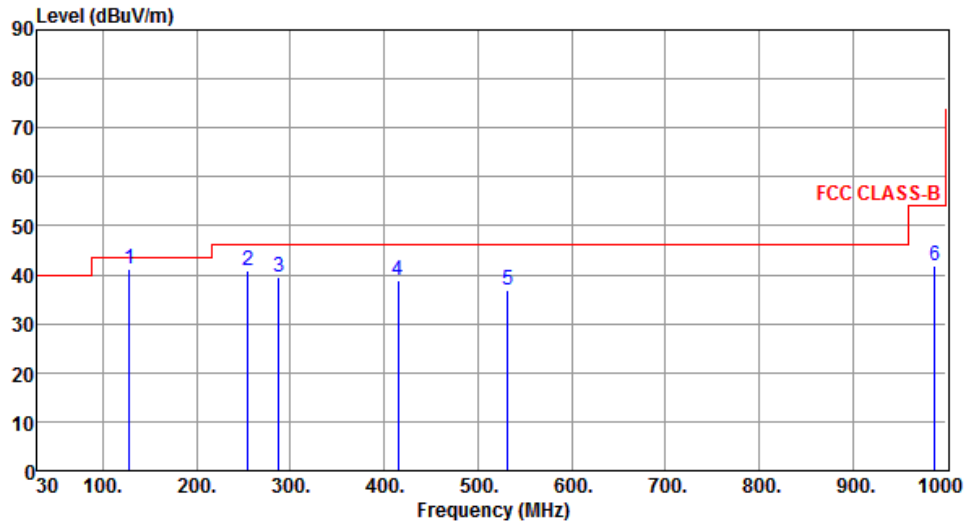
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / SF	CSS / 12	Test Freq. (MHz)	927.5
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	127.89	41.23	43.50	-2.27	69.56	-28.33	QP	100	129
2	254.92	40.94	46.00	-5.06	69.34	-28.40	Peak	---	---
3	287.54	39.53	46.00	-6.47	67.94	-28.41	Peak	---	---
4	415.29	38.89	46.00	-7.11	67.19	-28.30	Peak	---	---
5	531.78	36.89	46.00	-9.11	65.09	-28.20	Peak	---	---
6	987.58	42.00	54.00	-12.00	69.48	-27.48	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).

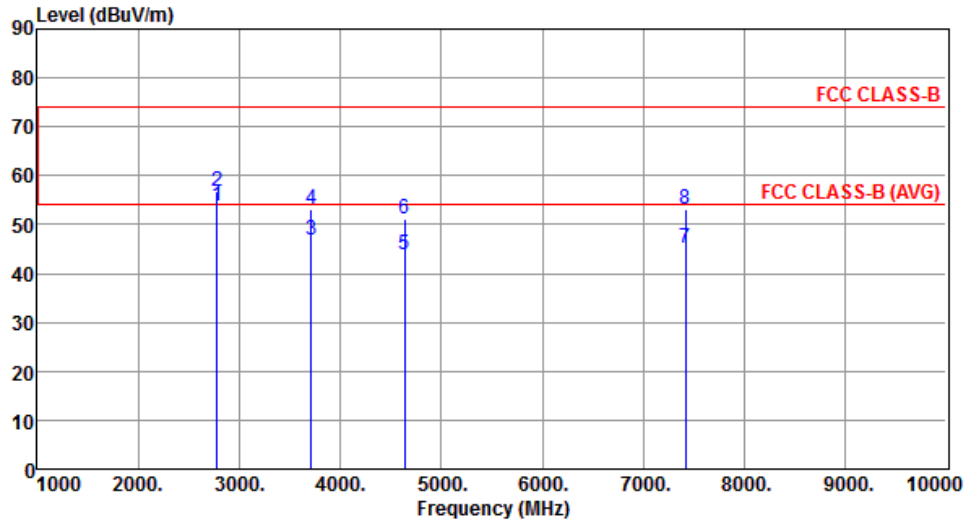
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Polarization	Horizontal		
Level (dBuV/m)			

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Polarization	Vertical		
Level (dBUV/m) <			

Modulation / SF	CSS / 12	Test Freq. (MHz)	927.5
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	2782.50	53.83	54.00	-0.17	55.94	-2.11	Average	100	85
2	2782.50	56.63	74.00	-17.37	58.74	-2.11	Peak	100	85
3	3710.00	46.83	54.00	-7.17	46.72	0.11	Average	121	22
4	3710.00	53.20	74.00	-20.80	53.09	0.11	Peak	121	22
5	4637.50	43.99	54.00	-10.01	40.97	3.02	Average	100	43
6	4637.50	51.12	74.00	-22.88	48.10	3.02	Peak	100	43
7	7420.00	45.24	54.00	-8.76	36.94	8.30	Average	104	318
8	7420.00	53.16	74.00	-20.84	44.86	8.30	Peak	104	318

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

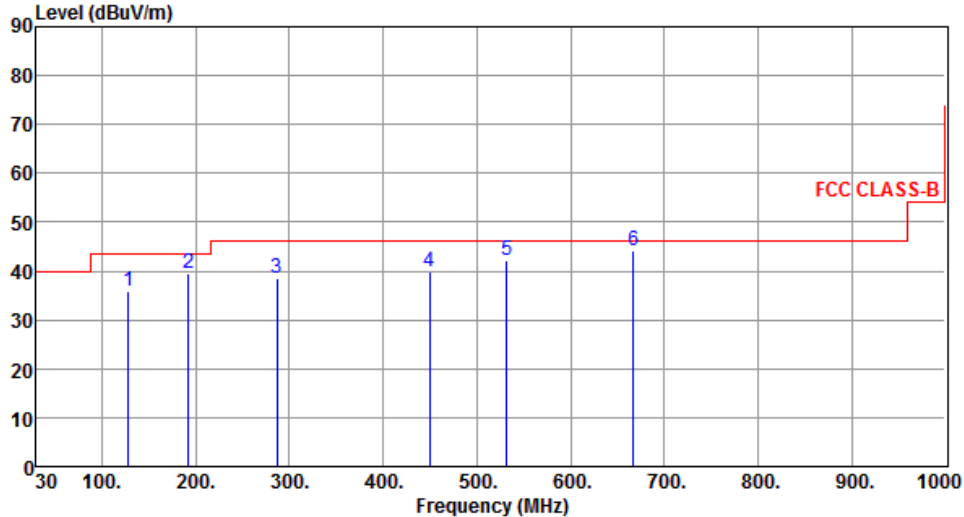
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation / SF	CSS / 12	Test Freq. (MHz)	927.5
Polarization	Vertical		
Level (dBuV/m)			

Configuration 2: with Dipole ANT

3.5.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Polarization	Horizontal		

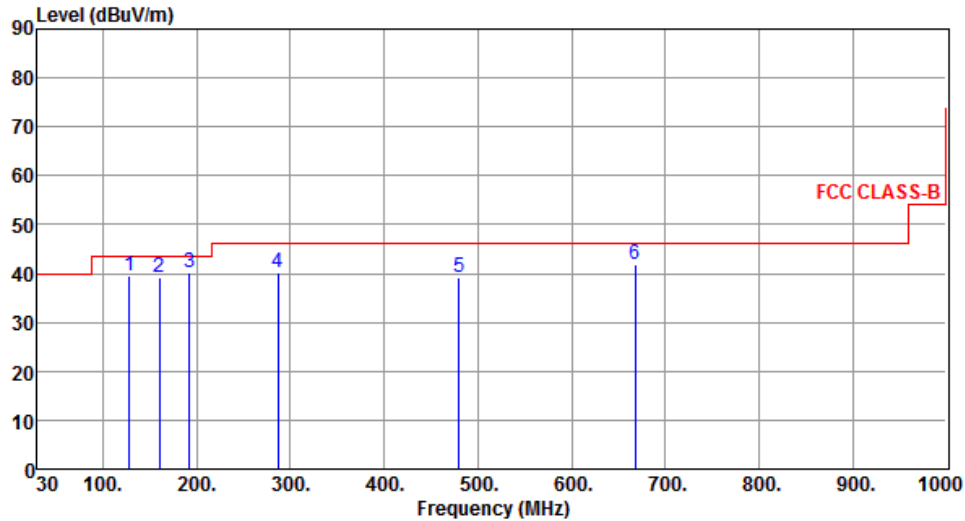


The graph displays the emission level in dBuV/m on the y-axis (0 to 90) against frequency in MHz on the x-axis (30 to 1000). A red line represents the FCC CLASS-B limit, which is 40 dBuV/m from 30 to 100 MHz, 45 dBuV/m from 100 to 300 MHz, and 55 dBuV/m from 300 to 1000 MHz. Six test results are plotted as blue vertical lines, labeled 1 through 6, corresponding to the data in the table below.

	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	128.09	36.02	43.50	-7.48	45.78	-9.76	Peak	---	---
2	192.18	39.52	43.50	-3.98	50.18	-10.66	Peak	---	---
3	287.05	38.41	46.00	-7.59	46.33	-7.92	Peak	---	---
4	450.01	39.85	46.00	-6.15	43.65	-3.80	Peak	---	---
5	531.49	42.07	46.00	-3.93	44.21	-2.14	Peak	---	---
6	667.27	44.24	46.00	-1.76	44.06	0.18	QP	127	7

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 / SF	CSS / 12	Test Freq. (MHz)	923.3
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	128.09	39.64	43.50	-3.86	49.40	-9.76	QP	100	170
2	160.05	39.05	43.50	-4.45	47.25	-8.20	Peak	---	---
3	192.18	40.12	43.50	-3.38	50.78	-10.66	QP	100	156
4	287.05	40.14	46.00	-5.86	48.06	-7.92	Peak	---	---
5	480.08	39.25	46.00	-6.75	42.47	-3.22	Peak	---	---
6	668.26	42.00	46.00	-4.00	41.80	0.20	Peak	---	---

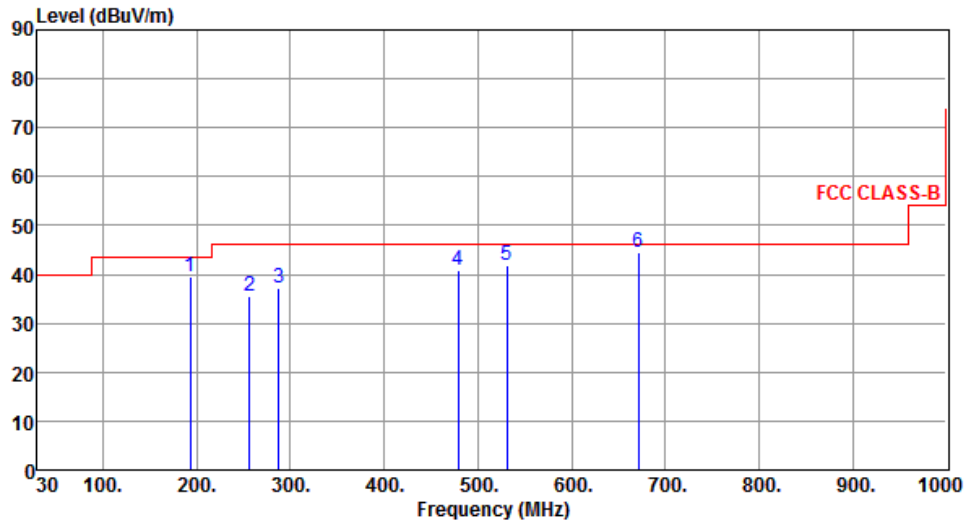
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / SF	CSS / 12	Test Freq. (MHz)	927.5
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	192.96	39.48	43.50	-4.02	50.15	-10.67	Peak	---	---
2	256.01	35.65	46.00	-10.35	44.80	-9.15	Peak	---	---
3	288.02	37.07	46.00	-8.93	44.97	-7.90	Peak	---	---
4	479.20	40.86	46.00	-5.14	44.09	-3.23	Peak	---	---
5	531.20	41.93	46.00	-4.07	44.08	-2.15	Peak	---	---
6	671.36	44.65	46.00	-1.35	44.39	0.26	QP	128	358

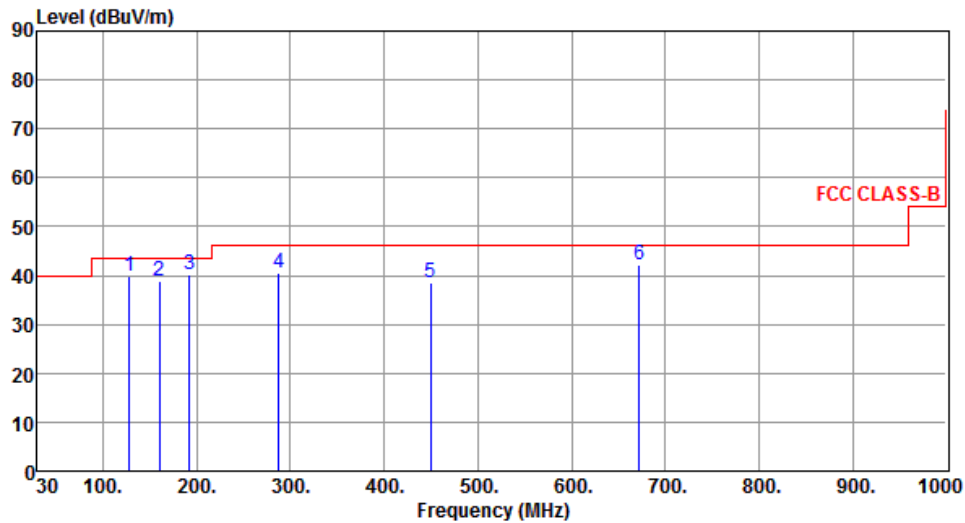
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / SF	CSS / 12	Test Freq. (MHz)	927.5
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	128.09	39.77	43.50	-3.73	49.53	-9.76	QP	100	166
2	160.05	38.95	43.50	-4.55	47.15	-8.20	Peak	---	---
3	192.18	40.10	43.50	-3.40	50.76	-10.66	QP	100	163
4	288.00	40.59	46.00	-5.41	48.49	-7.90	Peak	---	---
5	449.60	38.55	46.00	-7.45	42.37	-3.82	Peak	---	---
6	672.00	42.31	46.00	-3.69	42.04	0.27	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.

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation / SF	CSS / 12	Test Freq. (MHz)	923.3
Polarization	Vertical		
Level (dBuV/m) </			

Modulation / SF	CSS / 12	Test Freq. (MHz)	927.5
Polarization	Horizontal		
Level (dBUV/m)			

Modulation / SF	CSS / 12	Test Freq. (MHz)	927.5
Polarization	Vertical		
Level (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 30 dB relative to the maximum in-band peak PSD level in 100 kHz

3.6.2 Test Procedures

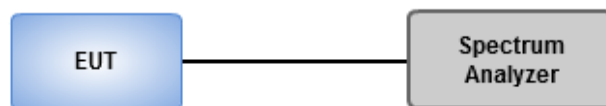
Reference level measurement

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

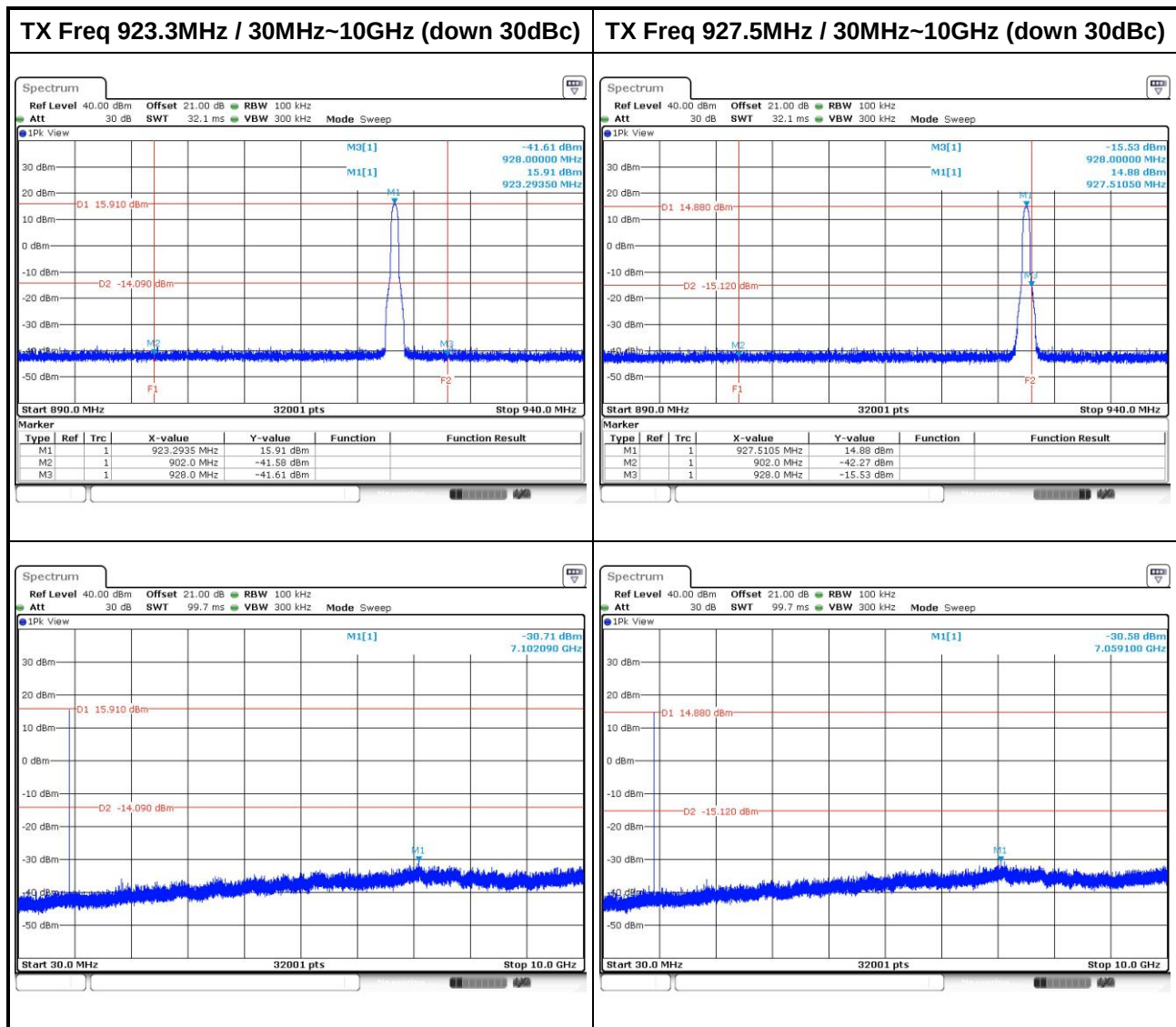
Emission level measurement

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

3.6.3 Test Setup



3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands



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

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 District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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.

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==