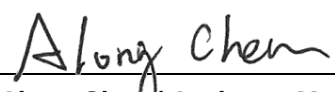


FCC Test Report

FCC ID : 2ADWC-S76S
Equipment : LoRa Wireless Communication Module
Model No. : S76S
Brand Name : Acsip
Applicant : AcSiP Technology Corporation
Address : 3F,-1 No.207, Fusing Rd., Taoyuan City,
Taoyuan County, 33066 Taiwan
Standard : 47 CFR FCC Part 15.247
Received Date : Oct. 05, 2017
Tested Date : Oct. 16 ~ Nov. 06, 2017

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:

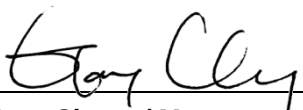

Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR730201-04	Rev. 01	Initial issue	Dec. 04, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.156MHz 50.68 (Margin -15.01dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 8176.50MHz 52.98 (Margin -1.02dB) - AV	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(2)(3)	Conducted Output Power	Power [dBm]: 17.22	Pass
15.247(a)(1)(i)	Number of Hopping Channels	Meet the requirement of limit	Pass
15.247(a)(1)	Hopping Channel Separation	Meet the requirement of limit	Pass
15.247(f)	Dwell Time	Meet the requirement of limit	Pass
15.247(f)	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	Data Rate (bit/sec)	Spread Factor	Channel Bandwidth (kHz)
902 ~ 928	902.3 ~ 914.9	1-64[64]	980 ~ 5470	7 ~ 10	125
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: The device uses CSS modulation. Note 3: The device supports hybrid mode.					

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remark
1	Dipole	I-PEX	1.44	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.3Vdc from host
-------------------	------------------

1.1.4 Accessories

N/A

1.1.5 Channel List

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	902.3	17	905.5	33	908.7	49	911.9
2	902.5	18	905.7	34	908.9	50	912.1
3	902.7	19	905.9	35	909.1	51	912.3
4	902.9	20	906.1	36	909.3	52	912.5
5	903.1	21	906.3	37	909.5	53	912.7
6	903.3	22	906.5	38	909.7	54	912.9
7	903.5	23	906.7	39	909.9	55	913.1
8	903.7	24	906.9	40	910.1	56	913.3
9	903.9	25	907.1	41	910.3	57	913.5
10	904.1	26	907.3	42	910.5	58	913.7
11	904.3	27	907.5	43	910.7	59	913.9
12	904.5	28	907.7	44	910.9	60	914.1
13	904.7	29	907.9	45	911.1	61	914.3
14	904.9	30	908.1	46	911.3	62	914.5
15	905.1	31	908.3	47	911.5	63	914.7
16	905.3	32	908.5	48	911.7	64	914.9

1.1.6 Test Tool and Duty Cycle

Test Tool	termite, version: 3.3
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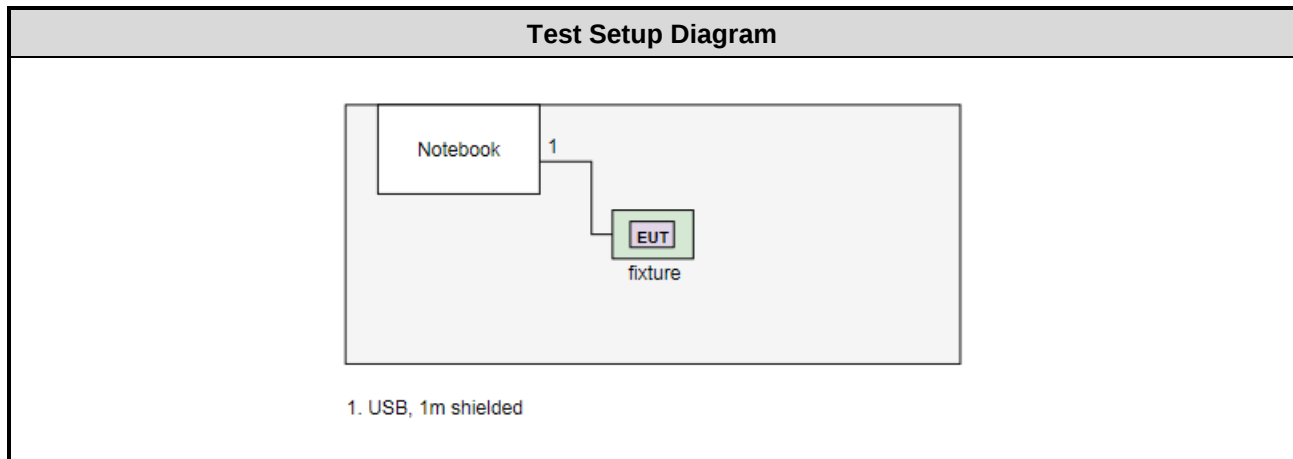
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)		
	902.3	908.5	914.9
CSS	20	20	20

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	Latitude E6430	DoC	USB, 1m shielded.

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Nov. 03, 2017				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Dec. 21, 2016	Dec. 20, 2017
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 08, 2016	Nov. 07, 2017
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 20, 2016	Dec. 19, 2017
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 chamber 3 / (03CH03-WS)				
Tested Date	Oct. 16, 2017				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101486	Nov. 15, 2016	Nov. 14, 2017
Receiver	Agilent	N9038A	MY53290044	Sep. 26, 2017	Sep. 25, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 28, 2017	Apr. 27, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 09, 2017	Feb. 08, 2018
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. 09, 2016	Dec. 08, 2017
Preamplifier	EMC	EMC02325	980187	Sep. 04, 2017	Sep. 03, 2018
Preamplifier	Agilent	83017A	MY53270014	Aug. 21, 2017	Aug. 20, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 22, 2017	Aug. 21, 2018
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 04, 2017	Feb. 03, 2018
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 04, 2017	Feb. 03, 2018
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 04, 2017	Feb. 03, 2018
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 04, 2017	Feb. 03, 2018
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 04, 2017	Feb. 03, 2018
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 04, 2017	Feb. 03, 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)				
Tested Date	Nov. 06, 2017				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Mar. 15, 2017	Mar. 14, 2018
Power Meter	Anritsu	ML2495A	1241002	Oct. 16, 2017	Oct. 15, 2018
Power Sensor	Anritsu	MA2411B	1207366	Oct. 16, 2017	Oct. 15, 2018
Signal Generator	R&S	SMB100A	175727	Oct. 26, 2017	Oct. 25, 2018
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 26, 2017	Oct. 25, 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

FCC KDB 453039

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	±5.37 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	23°C / 59%	Alex Tsai
Radiated Emissions	03CH03-WS	25°C / 65%	Vincent Yeh
RF Conducted	TH01-WS	22°C / 64%	Aska Huang

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- IC site registration No.: 10807C-1

2.2 The Worst Test Modes and Channel Details

Test item	Test Frequency (MHz)	Channel Bandwidth (kHz)	Modulation / SF
Conducted Emissions Radiated Emissions ≤ 1GHz Radiated Emissions > 1GHz Conducted Output Power Hopping Channel Separation 20dB and Occupied bandwidth Power Spectral Density	902.3 / 908.5 / 914.9	125	CSS / 7
Number of Hopping Channels	902.3 ~ 914.9	125	CSS / 7
Dwell Time	902.3	125	CSS: 10 / 9 / 8 / 7
NOTE: 1. 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. 2. Hopping channels supports 3 operation modes as below: 1) 8 channels 2) 16 channels 3) 64 channels			

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

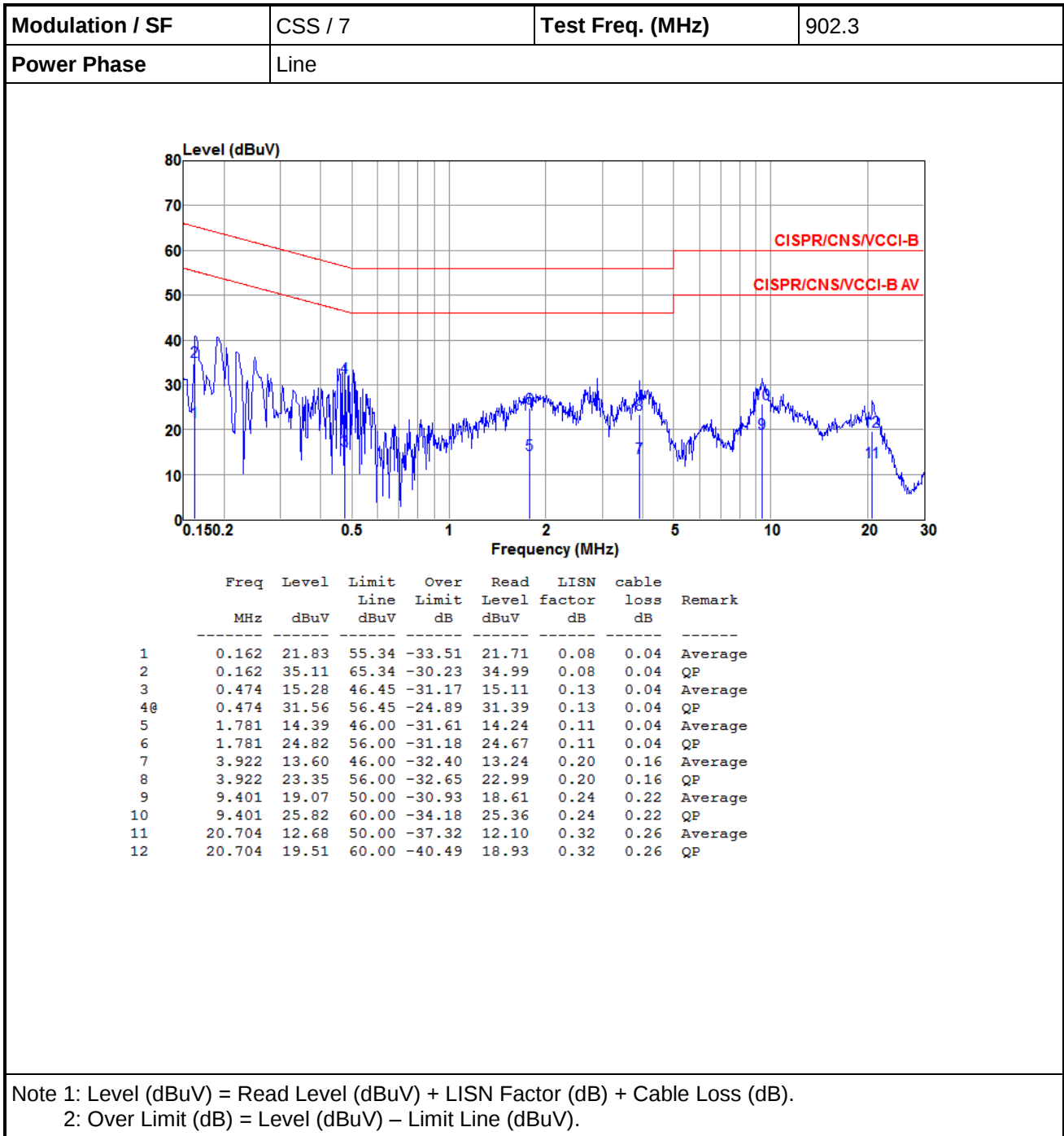
1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels 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

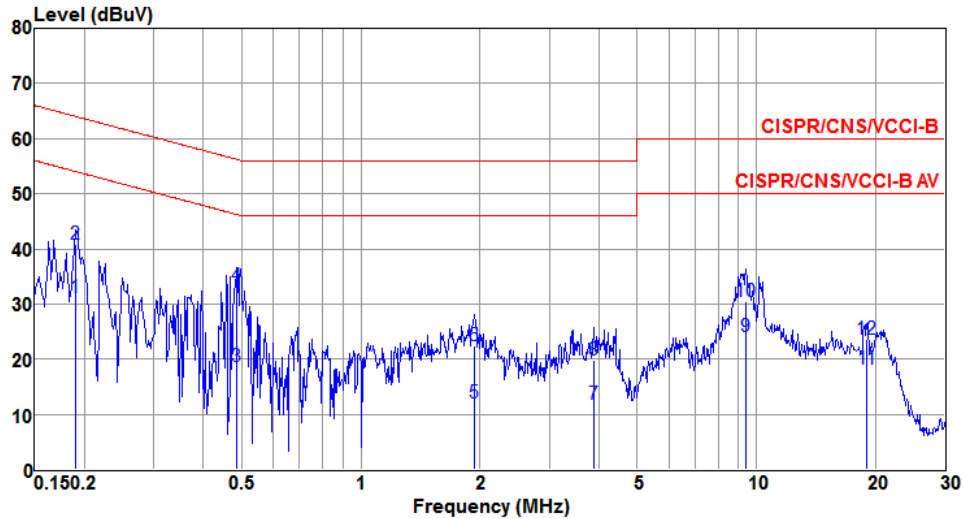


- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions



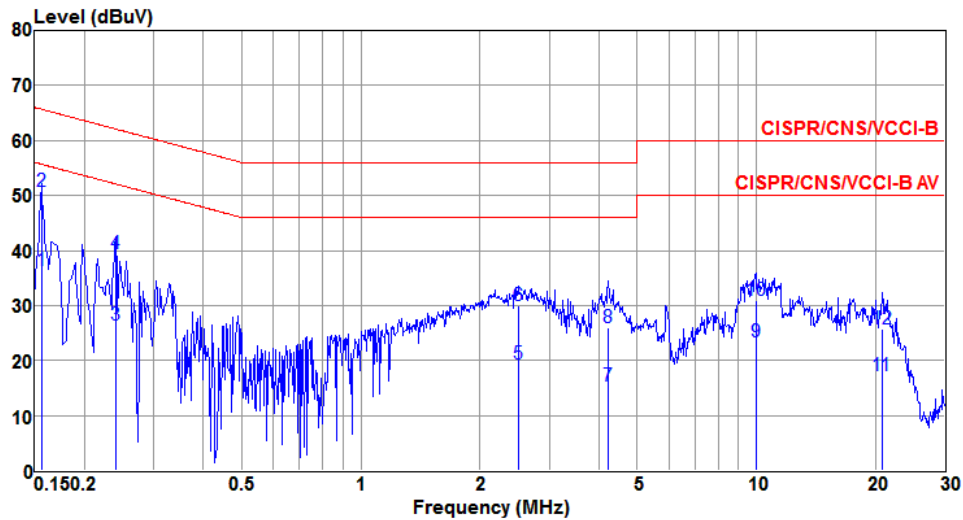
Modulation / SF	CSS / 7	Test Freq. (MHz)	902.3
Power Phase	Neutral		



	Freq	Level	Limit	Over	Read	LISN	cable	Remark
	MHz	dBuV	Line	Limit	Level	factor	loss	
			dBuV	dB	dBuV	dB	dB	
1@	0.189	31.10	54.06	-22.96	30.95	0.11	0.04	Average
2	0.189	40.72	64.06	-23.34	40.57	0.11	0.04	QP
3	0.486	18.64	46.23	-27.59	18.50	0.10	0.04	Average
4	0.486	33.23	56.23	-23.00	33.09	0.10	0.04	QP
5	1.939	12.09	46.00	-33.91	11.94	0.11	0.04	Average
6	1.939	22.32	56.00	-33.68	22.17	0.11	0.04	QP
7	3.881	11.85	46.00	-34.15	11.49	0.21	0.15	Average
8	3.881	19.90	56.00	-36.10	19.54	0.21	0.15	QP
9	9.401	23.97	50.00	-26.03	23.58	0.17	0.22	Average
10	9.401	30.51	60.00	-29.49	30.12	0.17	0.22	QP
11	19.021	18.12	50.00	-31.88	17.51	0.36	0.25	Average
12	19.021	23.53	60.00	-36.47	22.92	0.36	0.25	QP

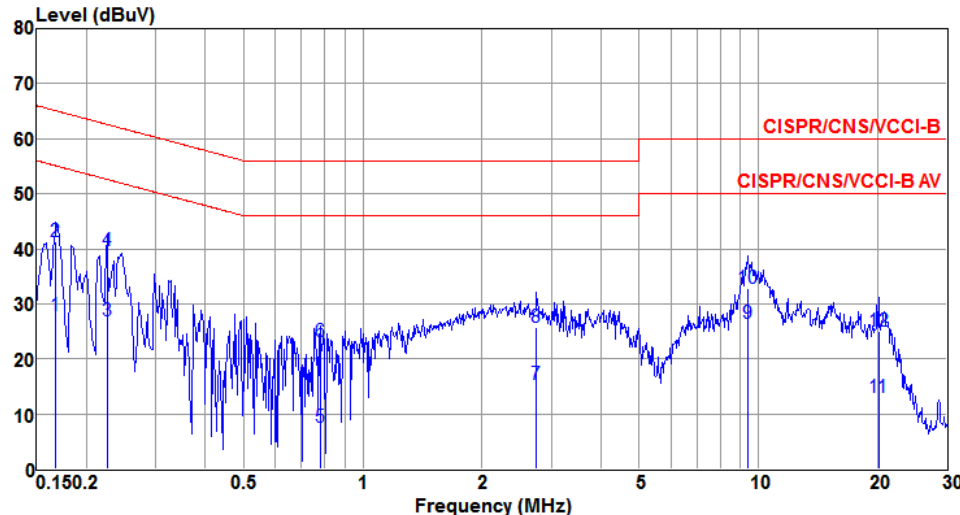
Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation / SF	CSS / 7	Test Freq. (MHz)	908.5
Power Phase	Line		

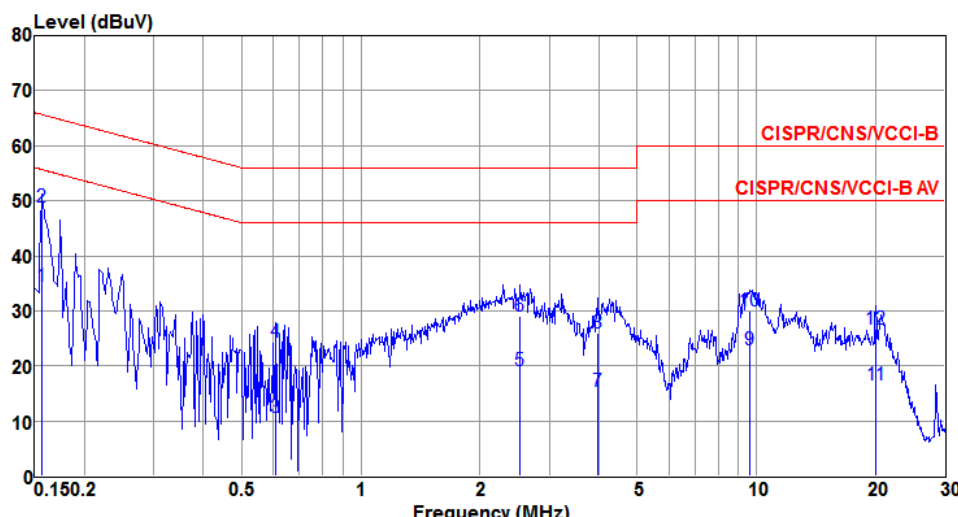


	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	LISN factor dB	cable loss dB	Remark
1	0.156	36.46	55.69	-19.23	36.34	0.08	0.04	Average
2@	0.156	50.68	65.69	-15.01	50.56	0.08	0.04	QP
3	0.240	26.40	52.08	-25.68	26.24	0.12	0.04	Average
4	0.240	39.53	62.08	-22.55	39.37	0.12	0.04	QP
5	2.500	19.47	46.00	-26.53	19.25	0.14	0.08	Average
6	2.500	29.86	56.00	-26.14	29.64	0.14	0.08	QP
7	4.224	15.45	46.00	-30.55	15.09	0.20	0.16	Average
8	4.224	25.92	56.00	-30.08	25.56	0.20	0.16	QP
9	9.966	23.26	50.00	-26.74	22.80	0.24	0.22	Average
10	9.966	31.00	60.00	-29.00	30.54	0.24	0.22	QP
11	20.814	17.27	50.00	-32.73	16.68	0.32	0.27	Average
12	20.814	25.79	60.00	-34.21	25.20	0.32	0.27	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 / 7	Test Freq. (MHz)	908.5																																																																																																																																							
Power Phase	Neutral																																																																																																																																									
Level (dBuV)  <table><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><tr><td>1</td><td>0.168</td><td>27.79</td><td>55.08</td><td>-27.29</td><td>27.67</td><td>0.08</td><td>0.04</td><td>Average</td></tr><tr><td>2</td><td>0.168</td><td>41.29</td><td>65.08</td><td>-23.79</td><td>41.17</td><td>0.08</td><td>0.04</td><td>QP</td></tr><tr><td>3</td><td>0.226</td><td>26.84</td><td>52.61</td><td>-25.77</td><td>26.68</td><td>0.12</td><td>0.04</td><td>Average</td></tr><tr><td>4@</td><td>0.226</td><td>39.74</td><td>62.61</td><td>-22.87</td><td>39.58</td><td>0.12</td><td>0.04</td><td>QP</td></tr><tr><td>5</td><td>0.779</td><td>7.60</td><td>46.00</td><td>-38.40</td><td>7.47</td><td>0.09</td><td>0.04</td><td>Average</td></tr><tr><td>6</td><td>0.779</td><td>23.07</td><td>56.00</td><td>-32.93</td><td>22.94</td><td>0.09</td><td>0.04</td><td>QP</td></tr><tr><td>7</td><td>2.750</td><td>15.40</td><td>46.00</td><td>-30.60</td><td>15.15</td><td>0.16</td><td>0.09</td><td>Average</td></tr><tr><td>8</td><td>2.750</td><td>25.80</td><td>56.00</td><td>-30.20</td><td>25.55</td><td>0.16</td><td>0.09</td><td>QP</td></tr><tr><td>9</td><td>9.401</td><td>26.41</td><td>50.00</td><td>-23.59</td><td>26.02</td><td>0.17</td><td>0.22</td><td>Average</td></tr><tr><td>10</td><td>9.401</td><td>32.73</td><td>60.00</td><td>-27.27</td><td>32.34</td><td>0.17</td><td>0.22</td><td>QP</td></tr><tr><td>11</td><td>20.162</td><td>12.88</td><td>50.00</td><td>-37.12</td><td>12.25</td><td>0.37</td><td>0.26</td><td>Average</td></tr><tr><td>12</td><td>20.162</td><td>25.08</td><td>60.00</td><td>-34.92</td><td>24.45</td><td>0.37</td><td>0.26</td><td>QP</td></tr></table>					Freq	Level	Limit	Over	Read	LISN	cable			MHz	dBuV	Line	Limit	Level	factor	loss	Remark				dBuV	dB	dBuV	dB	dB		1	0.168	27.79	55.08	-27.29	27.67	0.08	0.04	Average	2	0.168	41.29	65.08	-23.79	41.17	0.08	0.04	QP	3	0.226	26.84	52.61	-25.77	26.68	0.12	0.04	Average	4@	0.226	39.74	62.61	-22.87	39.58	0.12	0.04	QP	5	0.779	7.60	46.00	-38.40	7.47	0.09	0.04	Average	6	0.779	23.07	56.00	-32.93	22.94	0.09	0.04	QP	7	2.750	15.40	46.00	-30.60	15.15	0.16	0.09	Average	8	2.750	25.80	56.00	-30.20	25.55	0.16	0.09	QP	9	9.401	26.41	50.00	-23.59	26.02	0.17	0.22	Average	10	9.401	32.73	60.00	-27.27	32.34	0.17	0.22	QP	11	20.162	12.88	50.00	-37.12	12.25	0.37	0.26	Average	12	20.162	25.08	60.00	-34.92	24.45	0.37	0.26	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). Note 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).																																																																																																																																										

Modulation / SF	CSS / 7	Test Freq. (MHz)	914.9
Power Phase	Line		



The graph displays the measured level in dBuV across a frequency range from 0.1502 MHz to 30 MHz. Two red limit lines are shown: CISPR/CNS/VCCI-B (upper) and CISPR/CNS/VCCI-B AV (lower). The measured signal is a blue line with several peaks. Vertical blue lines with numbers 1 through 12 indicate specific measurement points.

	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.156	34.53	55.69	-21.16	34.41	0.08	0.04	Average
2	0.156	48.88	65.69	-16.81	48.76	0.08	0.04	QP
3	0.611	10.56	46.00	-35.44	10.39	0.13	0.04	Average
4	0.611	24.33	56.00	-31.67	24.16	0.13	0.04	QP
5	2.527	19.16	46.00	-26.84	18.94	0.14	0.08	Average
6	2.527	29.02	56.00	-26.98	28.80	0.14	0.08	QP
7	3.985	15.43	46.00	-30.57	15.07	0.20	0.16	Average
8	3.985	25.91	56.00	-30.09	25.55	0.20	0.16	QP
9	9.603	22.80	50.00	-27.20	22.34	0.24	0.22	Average
10	9.603	29.90	60.00	-30.10	29.44	0.24	0.22	QP
11	20.056	16.49	50.00	-33.51	15.92	0.31	0.26	Average
12	20.056	26.57	60.00	-33.43	26.00	0.31	0.26	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 / 7	Test Freq. (MHz)	914.9
Power Phase	Neutral		

Level (dBuV)

CISPR/CNS/VCCI-B

CISPR/CNS/VCCI-B AV

Frequency (MHz)

	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.168	32.17	55.08	-22.91	32.05	0.08	0.04	Average
2@	0.168	48.42	65.08	-16.66	48.30	0.08	0.04	QP
3	0.228	27.03	52.52	-25.49	26.87	0.12	0.04	Average
4	0.228	38.45	62.52	-24.07	38.29	0.12	0.04	QP
5	0.532	12.39	46.00	-33.61	12.25	0.10	0.04	Average
6	0.532	27.42	56.00	-28.58	27.28	0.10	0.04	QP
7	2.540	15.71	46.00	-30.29	15.49	0.14	0.08	Average
8	2.540	25.08	56.00	-30.92	24.86	0.14	0.08	QP
9	4.224	15.49	46.00	-30.51	15.12	0.21	0.16	Average
10	4.224	24.41	56.00	-31.59	24.04	0.21	0.16	QP
11	9.502	25.92	50.00	-24.08	25.53	0.17	0.22	Average
12	9.502	32.17	60.00	-27.83	31.78	0.17	0.22	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 Unwanted Emissions into Restricted Frequency Bands

3.2.1 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.

3.2.2 Test Procedures

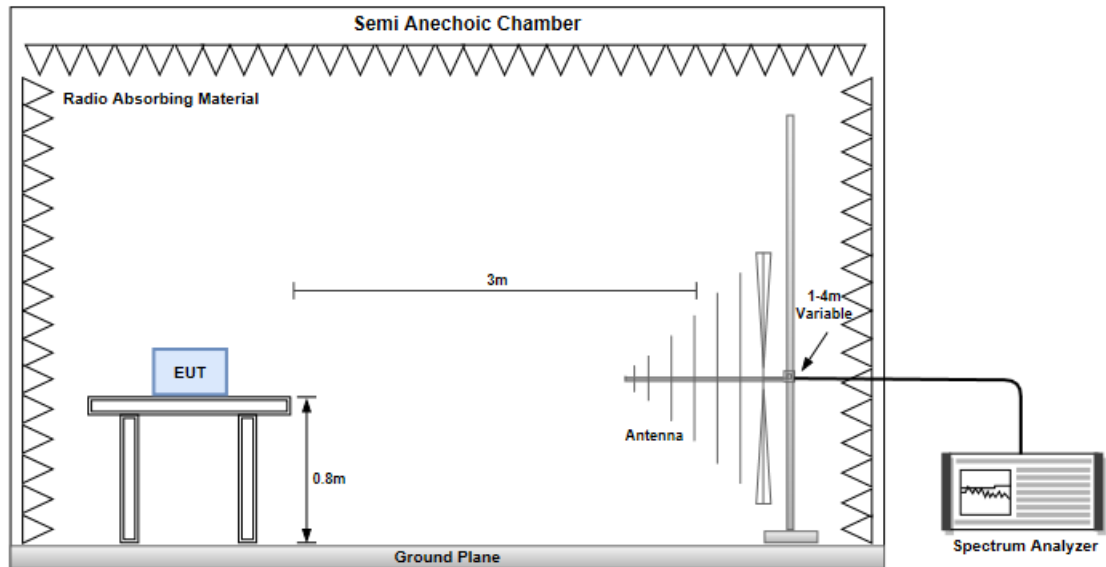
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

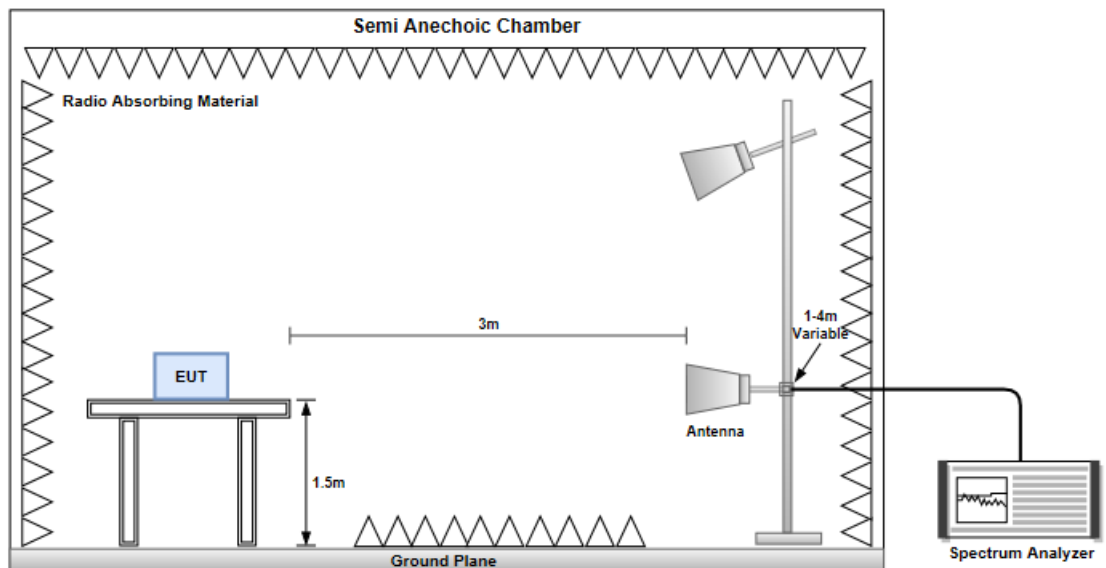
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.2.3 Test Setup

Radiated Emissions below 1 GHz



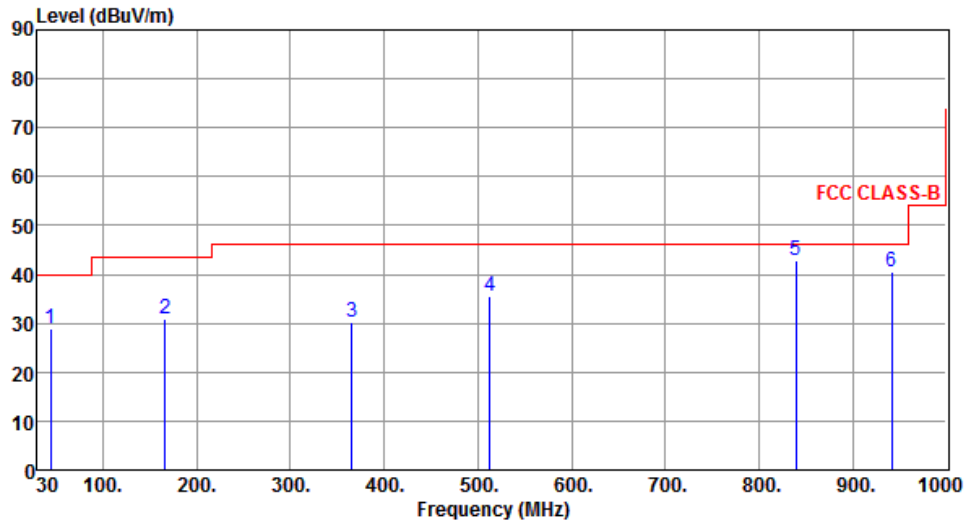
Radiated Emissions above 1 GHz



3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	CSS / 7	Test Freq. (MHz)	902.3
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation / SF	CSS / 7	Test Freq. (MHz)	902.3
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	44.26	28.82	40.00	-11.18	37.25	-8.43	Peak	---	---
2	166.44	30.83	43.50	-12.67	39.29	-8.46	Peak	---	---
3	365.27	30.26	46.00	-15.74	36.57	-6.31	Peak	---	---
4	513.25	35.64	46.00	-10.36	38.71	-3.07	Peak	---	---
5	839.27	42.74	46.00	-3.26	40.08	2.66	Peak	---	---
6	941.29	40.40	46.00	-5.60	35.94	4.46	Peak	---	---

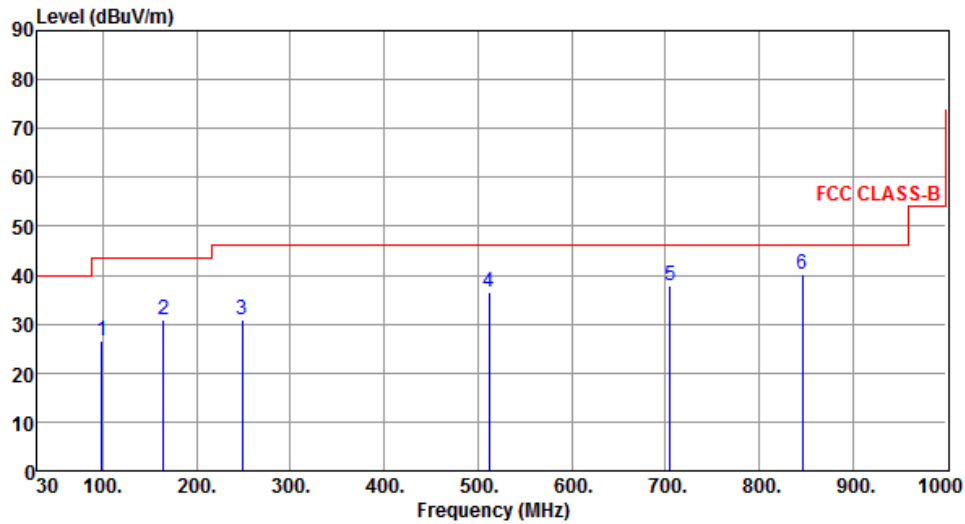
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / 7	Test Freq. (MHz)	908.5
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	98.87	26.42	43.50	-17.08	40.00	-13.58	Peak	---	---
2	164.83	30.75	43.50	-12.75	39.16	-8.41	Peak	---	---
3	248.25	30.76	46.00	-15.24	40.17	-9.41	Peak	---	---
4	512.09	36.59	46.00	-9.41	39.69	-3.10	Peak	---	---
5	705.12	37.95	46.00	-8.05	37.50	0.45	Peak	---	---
6	846.74	40.15	46.00	-5.85	37.40	2.75	Peak	---	---

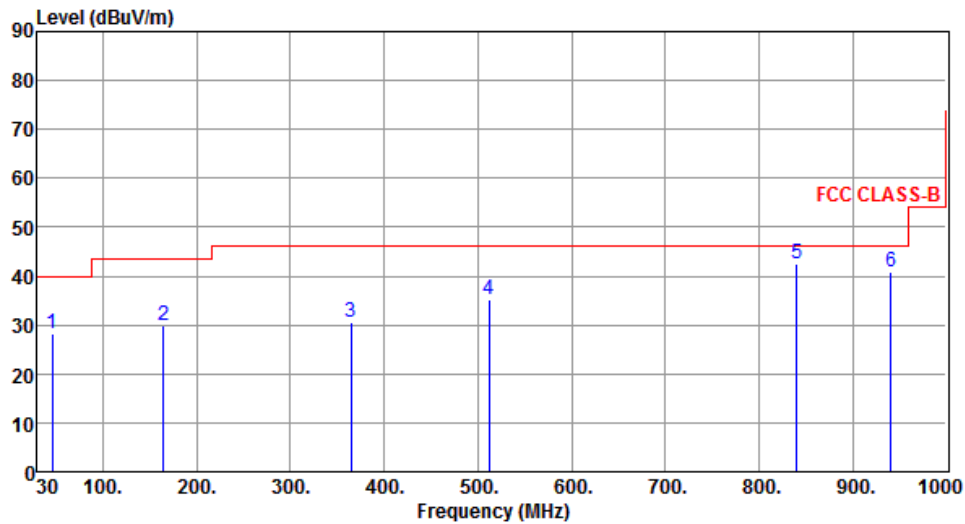
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / 7	Test Freq. (MHz)	908.5
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	45.52	28.19	40.00	-11.81	36.55	-8.36	Peak	---	---
2	164.83	29.91	43.50	-13.59	38.32	-8.41	Peak	---	---
3	364.65	30.54	46.00	-15.46	36.88	-6.34	Peak	---	---
4	512.09	35.16	46.00	-10.84	38.26	-3.10	Peak	---	---
5	839.95	42.67	46.00	-3.33	39.99	2.68	Peak	---	---
6	940.83	40.87	46.00	-5.13	36.42	4.45	Peak	---	---

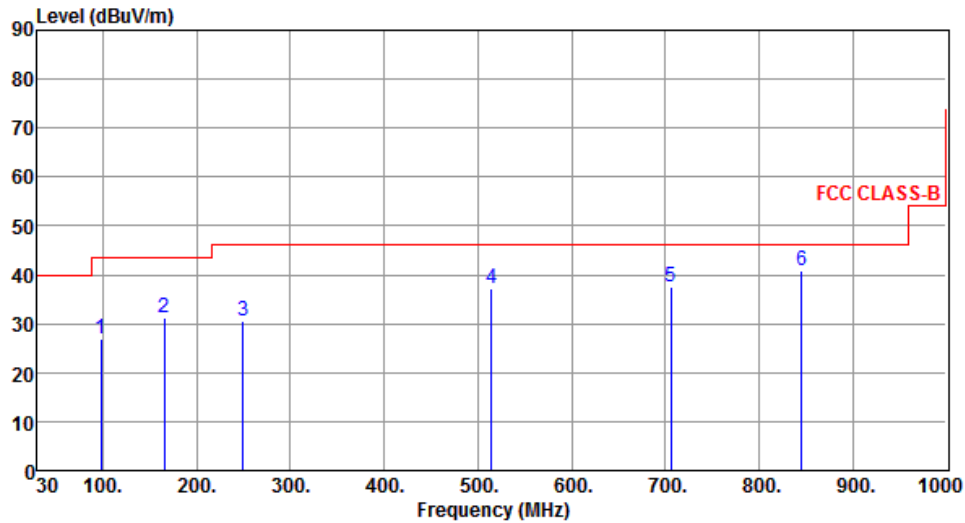
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / 7	Test Freq. (MHz)	914.9
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	97.68	26.95	43.50	-16.55	40.65	-13.70	Peak	---	---
2	165.43	31.22	43.50	-12.28	39.65	-8.43	Peak	---	---
3	249.18	30.46	46.00	-15.54	39.85	-9.39	Peak	---	---
4	514.28	37.12	46.00	-8.88	40.17	-3.05	Peak	---	---
5	706.08	37.62	46.00	-8.38	37.15	0.47	Peak	---	---
6	845.74	40.85	46.00	-5.15	38.10	2.75	Peak	---	---

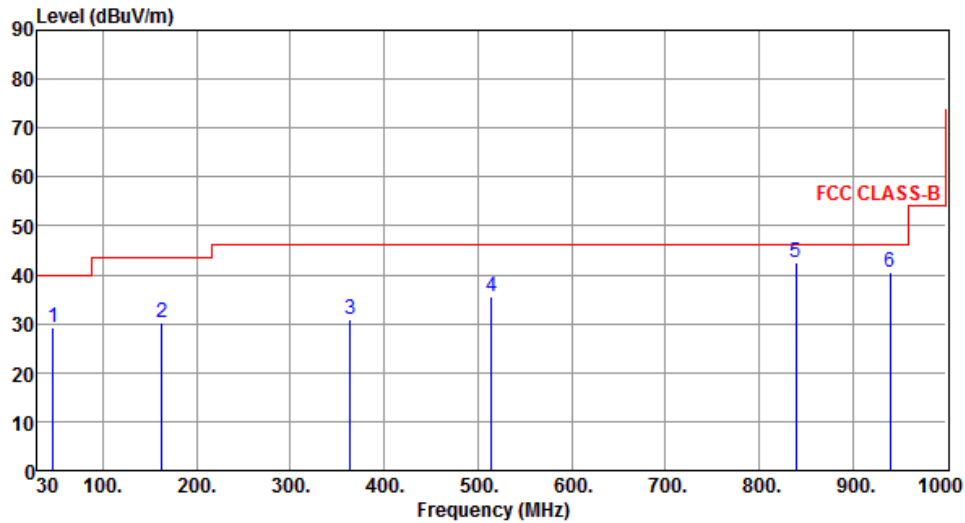
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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 / 7	Test Freq. (MHz)	914.9
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	46.59	29.06	40.00	-10.94	37.37	-8.31	Peak	---	---
2	162.72	30.26	43.50	-13.24	38.61	-8.35	Peak	---	---
3	363.81	30.92	46.00	-15.08	37.28	-6.36	Peak	---	---
4	514.33	35.55	46.00	-10.45	38.60	-3.05	Peak	---	---
5	839.28	42.46	46.00	-3.54	39.80	2.66	Peak	---	---
6	939.83	40.52	46.00	-5.48	36.09	4.43	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).

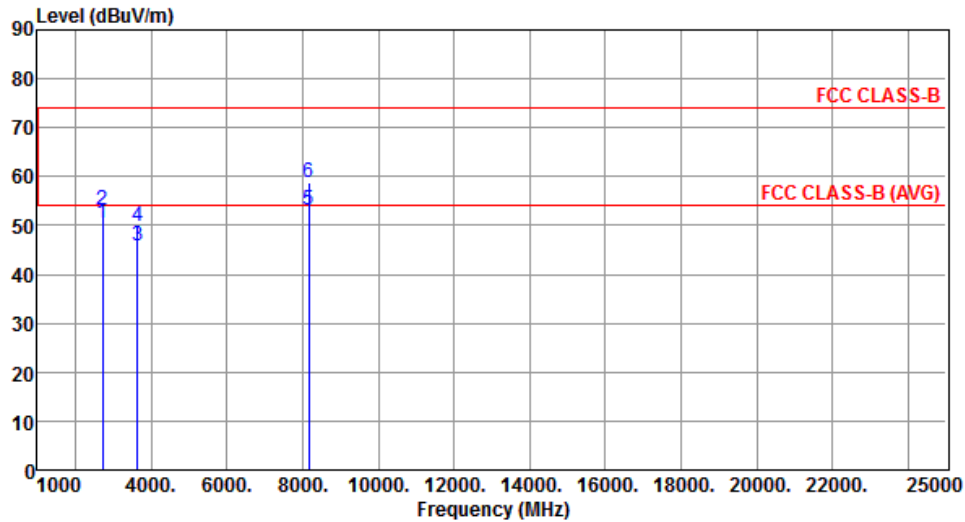
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.2.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation / SF	CSS / 7	Test Freq. (MHz)	902.3
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation / SF	CSS / 7	Test Freq. (MHz)	902.3
Polarization	Vertical		
Level (dBUV/m)			

Modulation / SF	CSS / 7	Test Freq. (MHz)	908.5
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	2725.50	50.55	54.00	-3.45	51.30	-0.75	Average	272	19
2	2725.50	53.20	74.00	-20.80	53.95	-0.75	Peak	272	19
3	3634.00	45.91	54.00	-8.09	44.42	1.49	Average	200	0
4	3634.00	49.95	74.00	-24.05	48.46	1.49	Peak	200	0
5	8176.50	52.98	54.00	-1.02	42.69	10.29	Average	187	48
6	8176.50	58.66	74.00	-15.34	48.37	10.29	Peak	187	48

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 / 7	Test Freq. (MHz)	908.5
Polarization	Vertical		
Level (dBUV/m) </			

Modulation / SF	CSS / 7	Test Freq. (MHz)	914.9
Polarization	Horizontal		
Level (dBUV/m)			

Modulation / SF	CSS / 7	Test Freq. (MHz)	914.9
Polarization	Vertical		
Level (dBuV/m)			

3.3 Unwanted Emissions into Non-Restricted Frequency Bands

3.3.1 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 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.3.2 Test Procedures

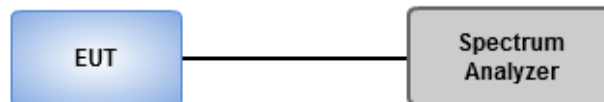
Reference Level Measurement

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.

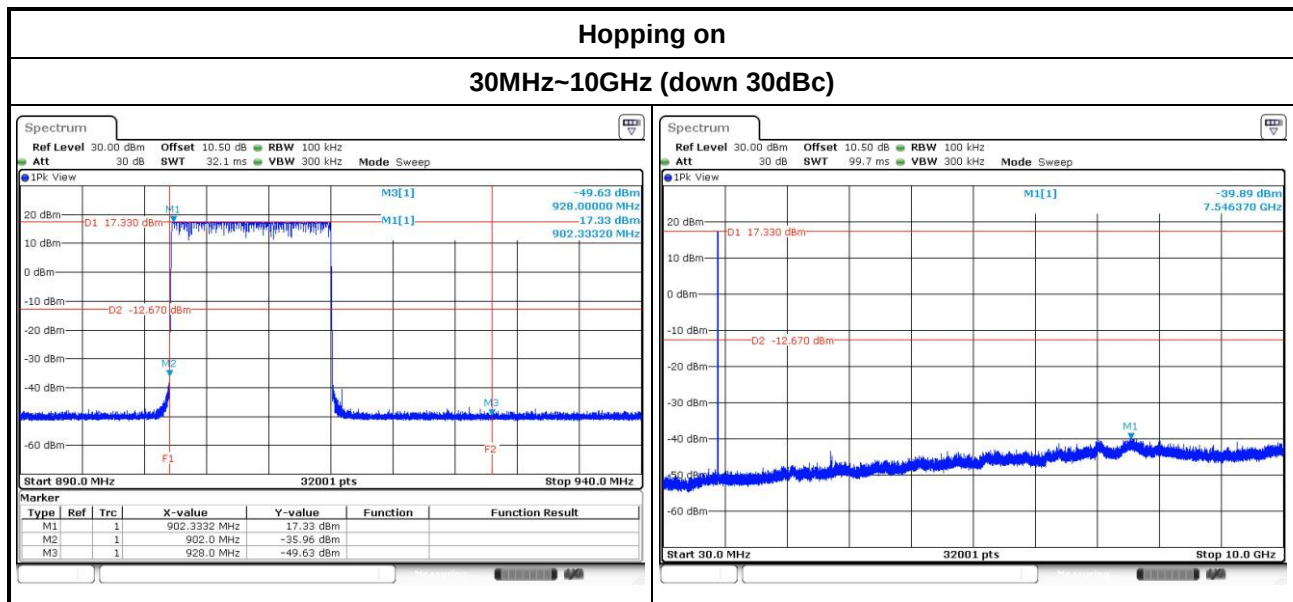
Unwanted Emissions Level Measurement

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.

3.3.3 Test Setup

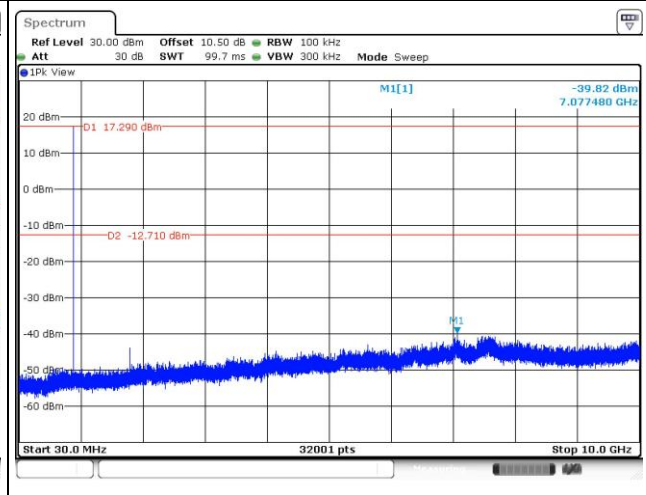
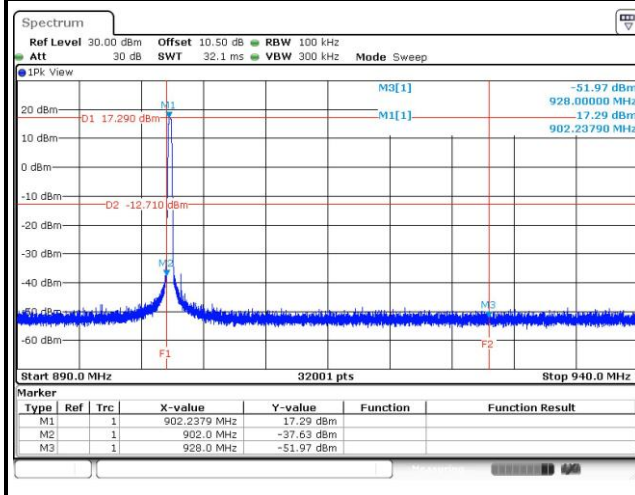


3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

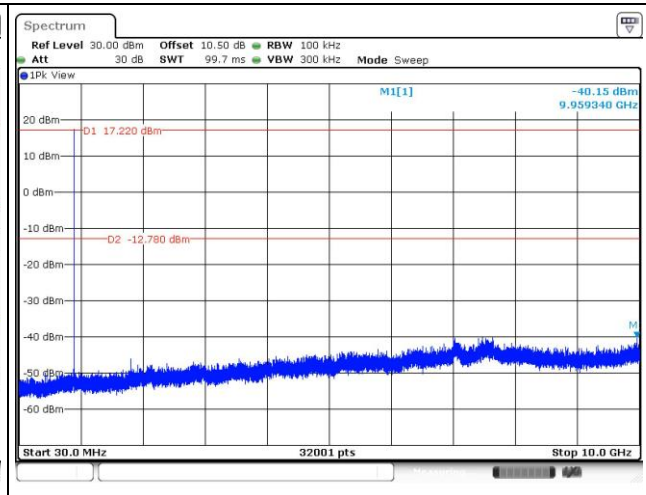
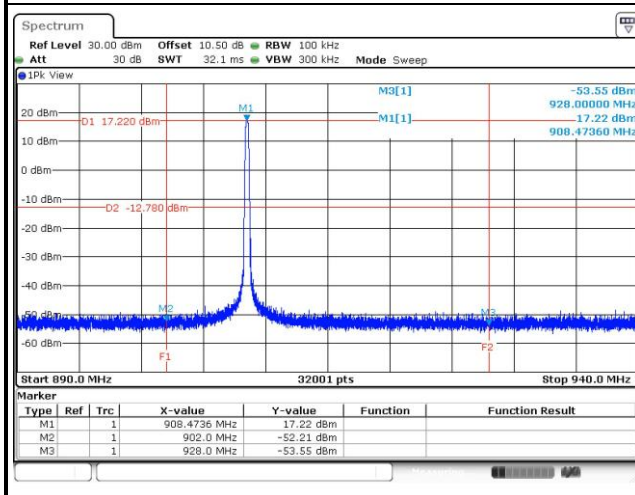


Hopping off

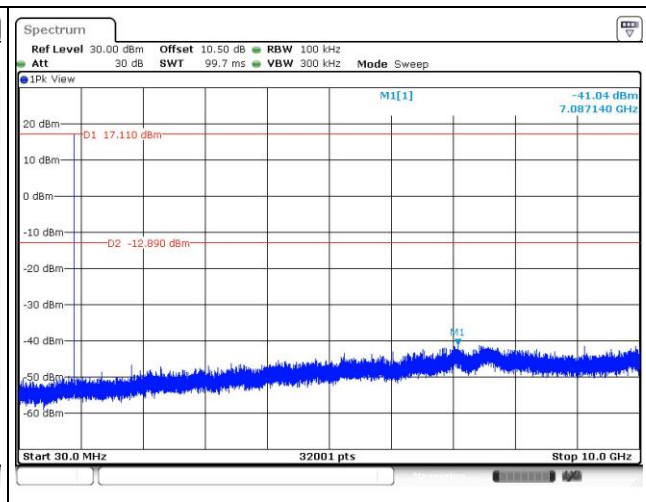
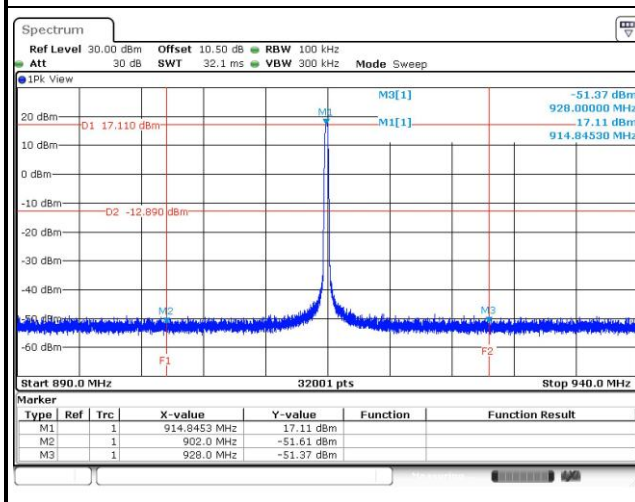
TX Frequency 902.3MHz / 30MHz~10GHz (down 30dBc)



TX Frequency 908.5MHz / 30MHz~10GHz (down 30dBc)



TX Frequency 914.9MHz / 30MHz~10GHz (down 30dBc)



3.4 Conducted Output Power

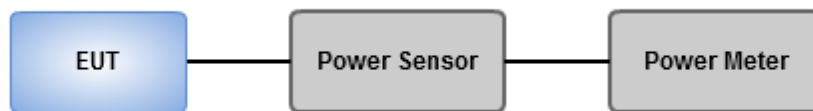
3.4.1 Limit of Conducted Output Power

- ☒ 1 Watt, systems employing at least 50 hopping channels;
- ☐ 0.25 Watt, for systems employing less than 50 hopping channels, but at least 25 hopping channels,

3.4.2 Test Procedures

1. A wideband power meter is used for power measurement. Bandwidth of power sensor and meter is 50MHz
2. 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

3.4.3 Test Setup



3.4.4 Test Result of Conducted Output Power

Modulation / SF	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (W)
CSS / 7	902.3	52.24	17.18	1
CSS / 7	908.5	52.72	17.22	1
CSS / 7	914.9	52.00	17.16	1

3.5 Number of Hopping Frequency

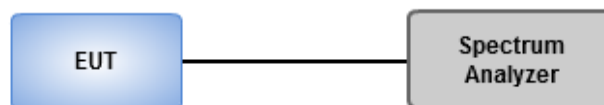
3.5.1 Limit of Number of Hopping Frequency

Number of Hopping Frequencies Limit for Frequency Hopping Systems	
☒	902-928 MHz Band:
☐	$N \geq 50$, 20 dB bandwidth of the hopping channel is less than 250 kHz
☐	$N \geq 25$, 20 dB bandwidth of the hopping channel is 250 kHz or greater
☒	Hybrid mode, No minimum number of hopping channels associated with hybrid system.
N: Number of Hopping Frequencies	

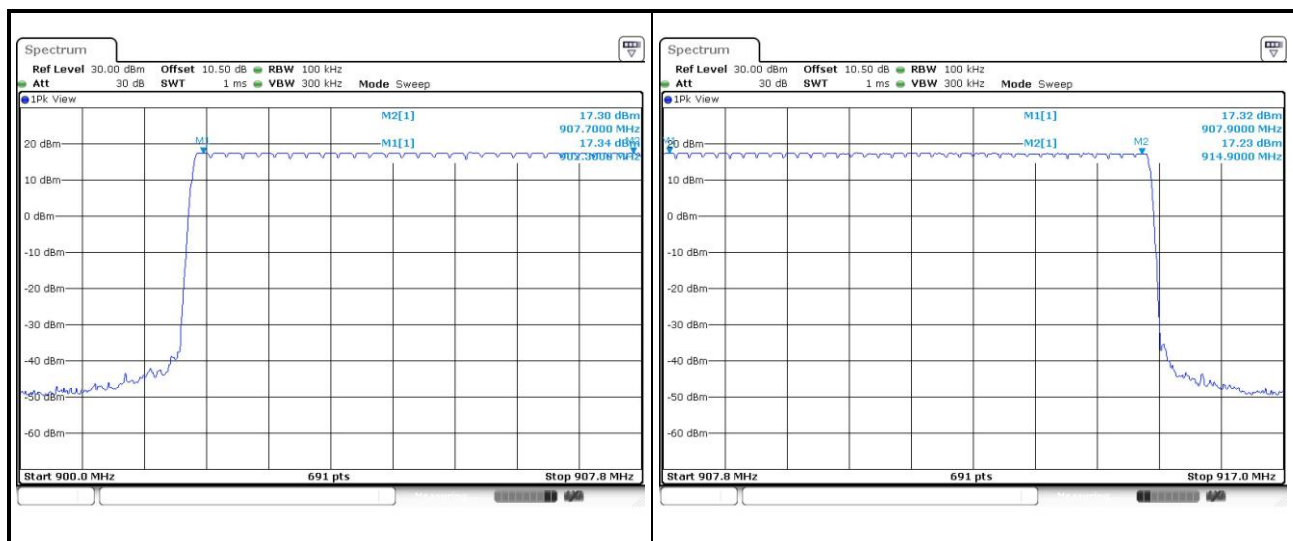
3.5.2 Test Procedures

1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2. Allow trace to stabilize.

3.5.3 Test Setup



3.5.4 Test Result of Number of Hopping Frequency



3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

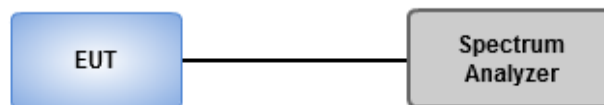
20dB Bandwidth

1. Set RBW=3kHz, VBW=10kHz, Sweep time=Auto, Detector=Peak Trace max hold.
2. Allow trace to stabilize.
3. 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 20 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

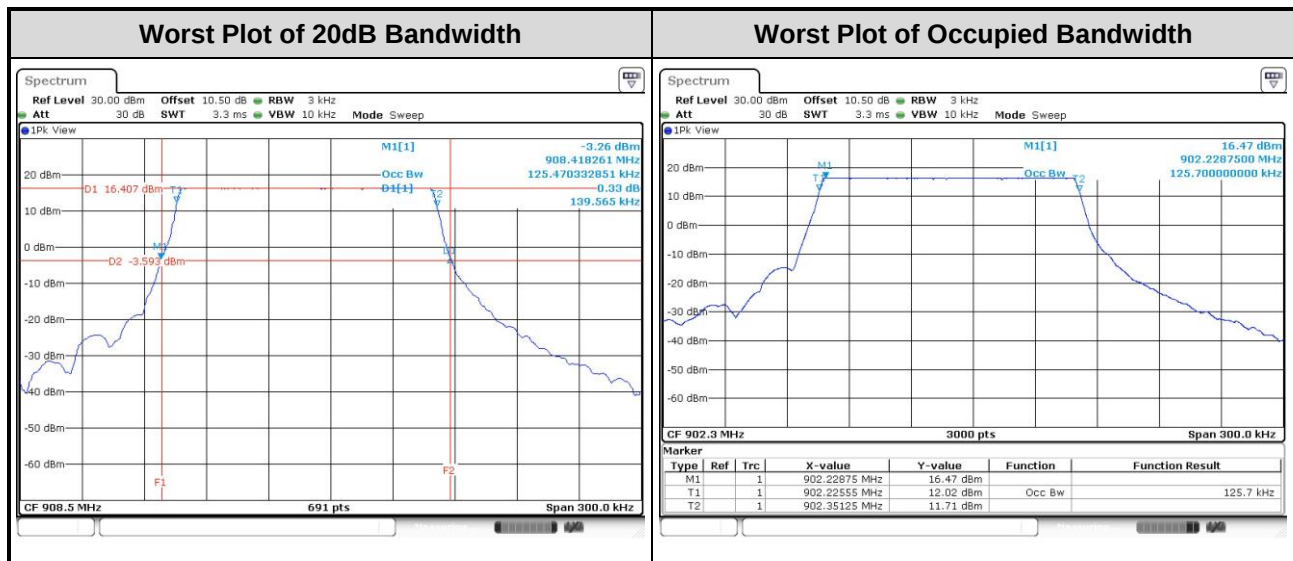
1. Set RBW=3kHz, VBW=10kHz, Sweep time = Auto, Detector=Sample, Trace max hold
2. Allow trace to stabilize
3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

3.6.2 Test Setup



3.6.3 Test result of 20dB and Occupied Bandwidth

Modulation / SF	Freq. (MHz)	20dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
CSS / 7	902.3	138.70	125.70
CSS / 7	908.5	139.57	125.60
CSS / 7	914.9	137.83	125.50



3.7 Channel Separation

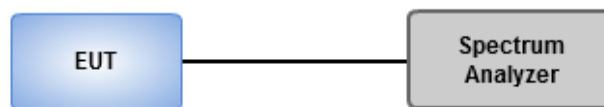
3.7.1 Limit of Channel Separation

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

3.7.2 Test Procedures

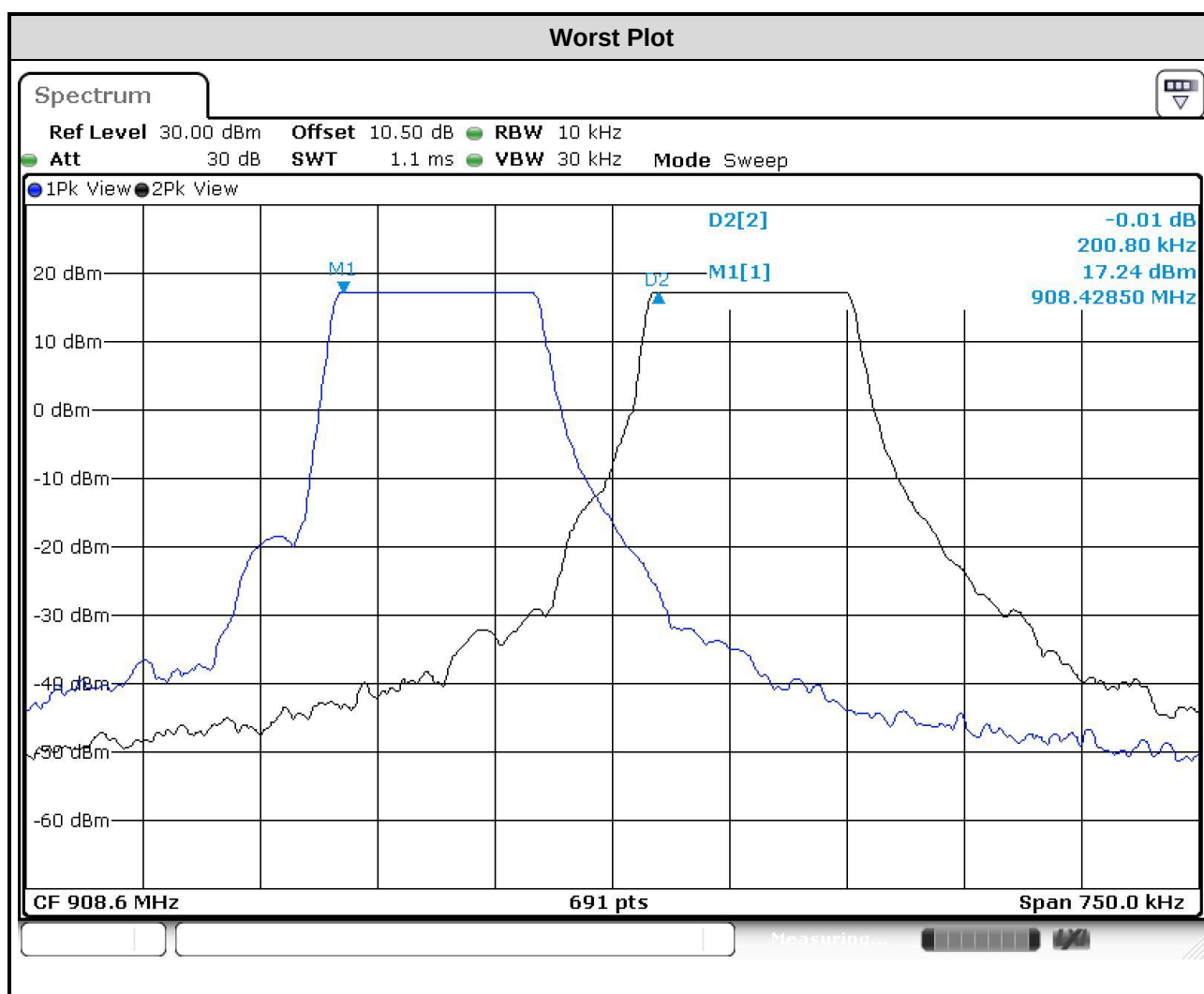
1. Set RBW=10kHz, VBW=30kHz, Sweep time=Auto, Detector=Peak Trace max hold.
2. Allow trace to stabilize.
3. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The EUT shall show compliance with the appropriate regulatory limit

3.7.3 Test Setup



3.7.4 Test result of Channel Separation

Modulation / SF	Freq. (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Pass/Fail
CSS / 7	902.3	200.80	138.70	Pass
CSS / 7	908.5	200.80	139.57	Pass
CSS / 7	914.9	200.80	137.83	Pass



3.8 Number of Dwell Time

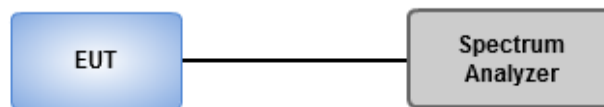
3.8.1 Limit of Dwell time

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems	
☒	902-928 MHz Band:
☐	≤ 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz
☐	≤ 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater
☒	Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

3.8.2 Test Procedures

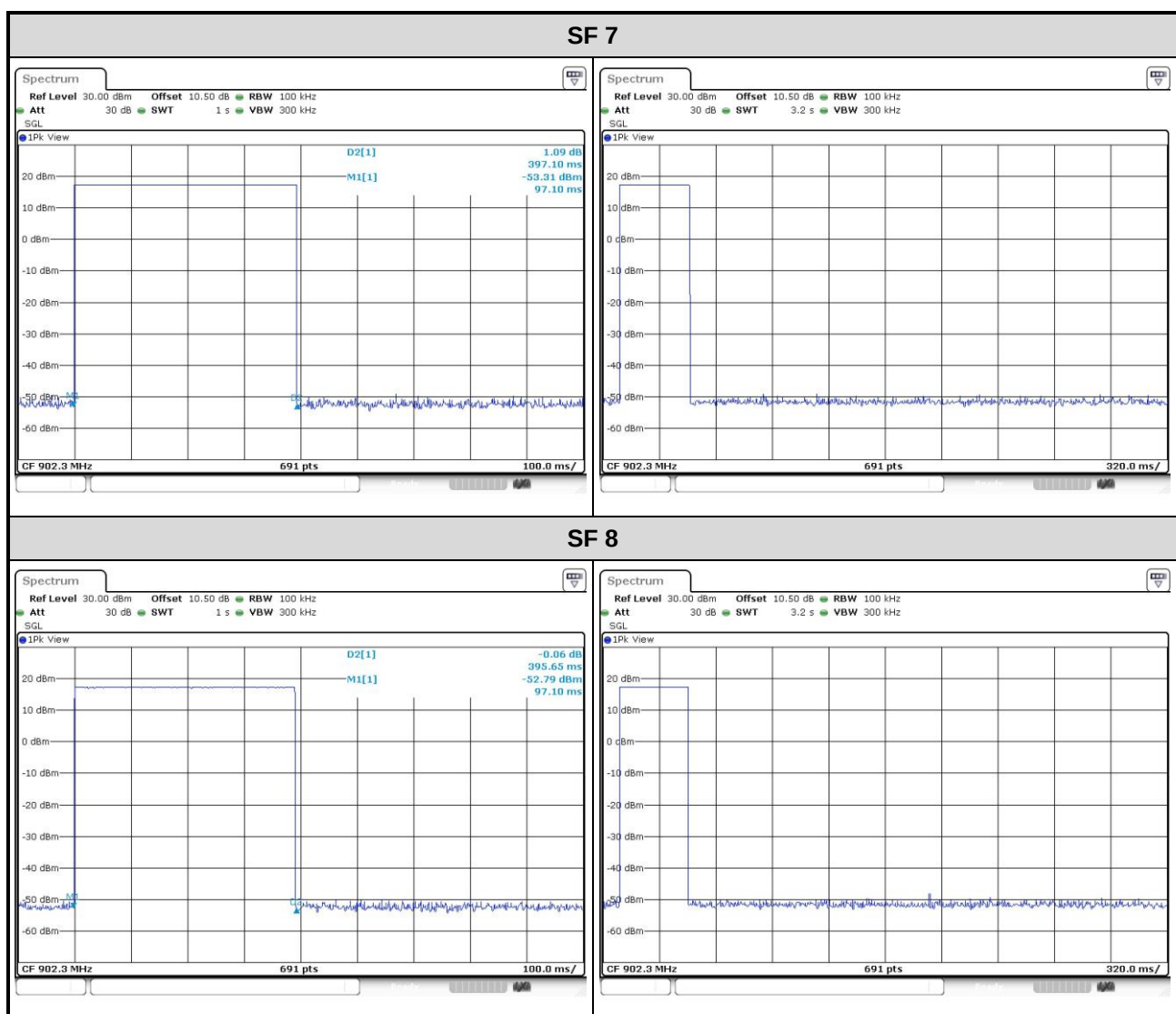
1. Set RBW=100kHz, VBW=300kHz, Sweep time=6.4s / 500ms, Detector=Peak, Span=0Hz, Trace max hold.
2. Measure and record the burst on time.

3.8.3 Test Setup

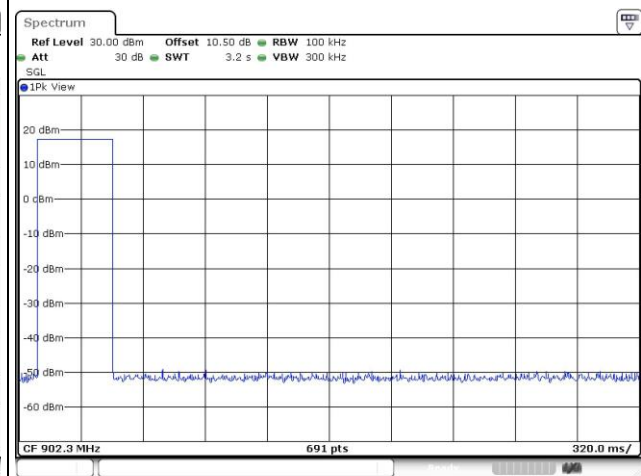
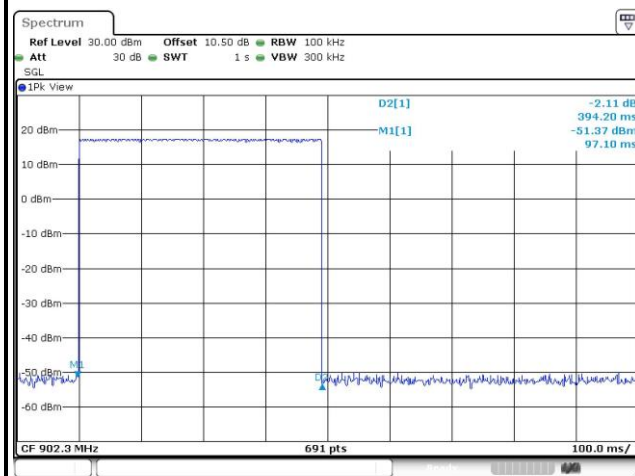


3.8.4 Test Result of Dwell Time

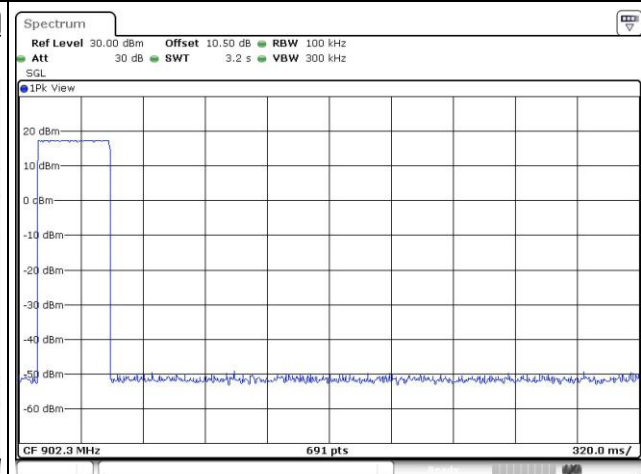
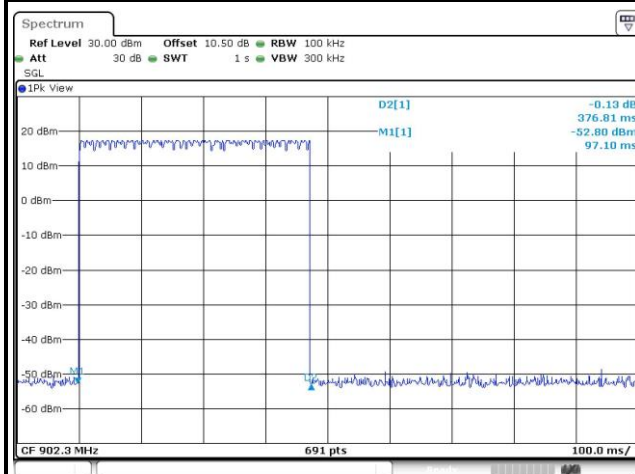
Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 3.2 s (8 Hopping*0.4s)	Result (s)	Limit (s)
CSS / 7	902.3	0.397100	1	0.397	0.4
CSS / 8	902.3	0.395650	1	0.396	0.4
CSS / 9	902.3	0.394200	1	0.394	0.4
CSS / 10	902.3	0.376810	1	0.377	0.4



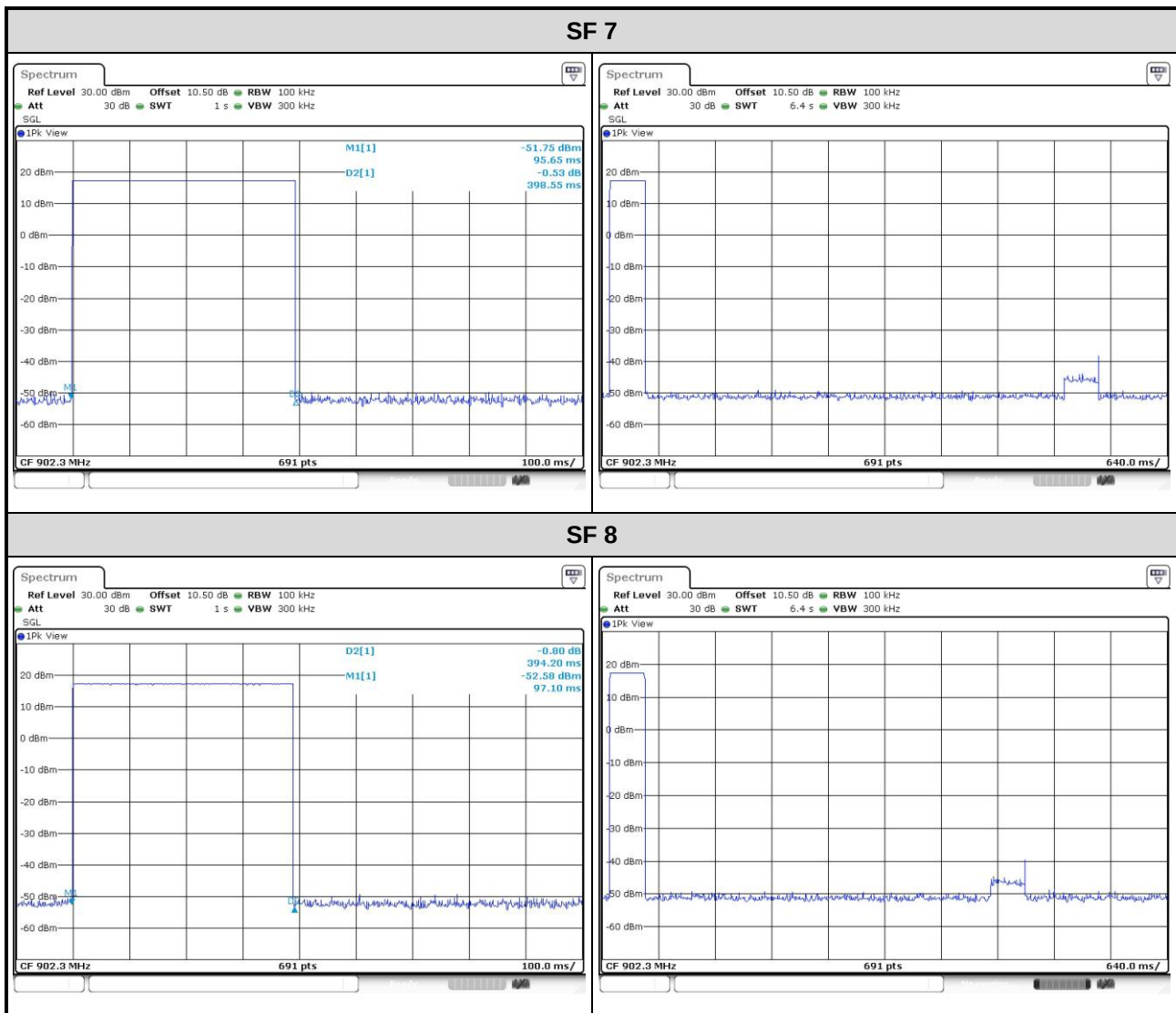
SF 9



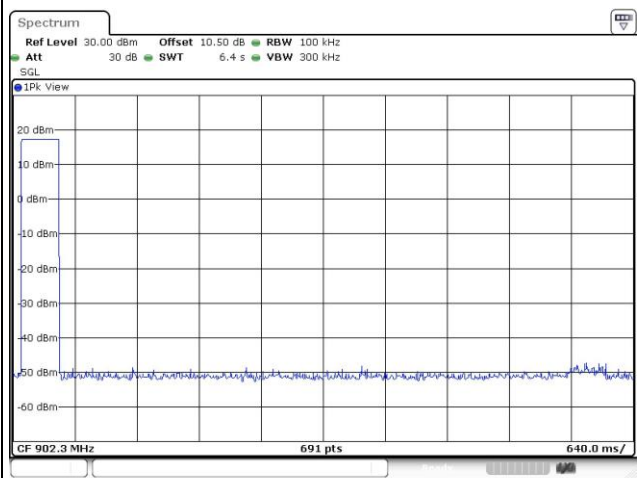
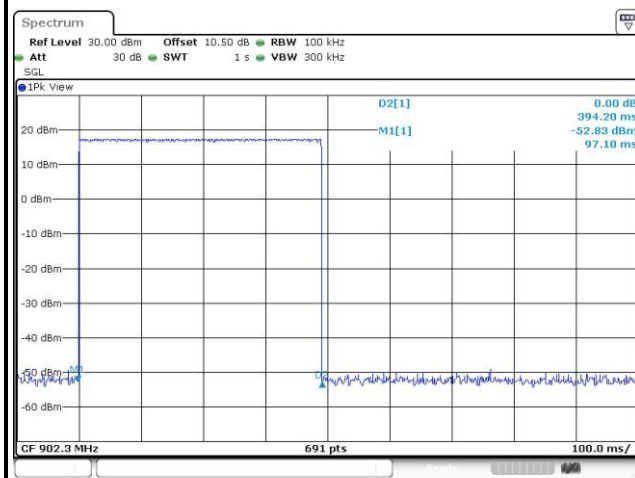
SF 10



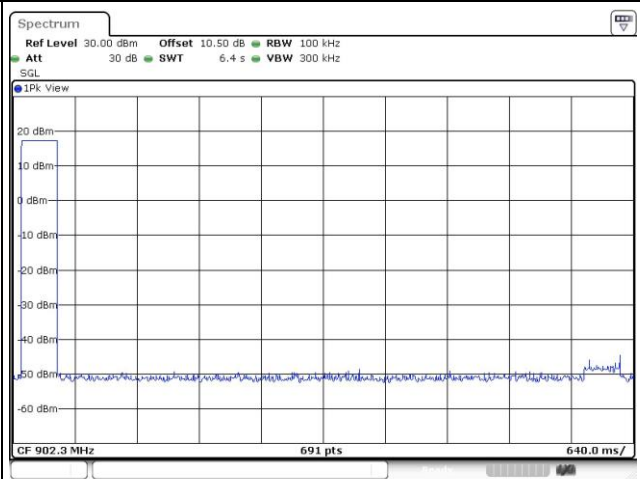
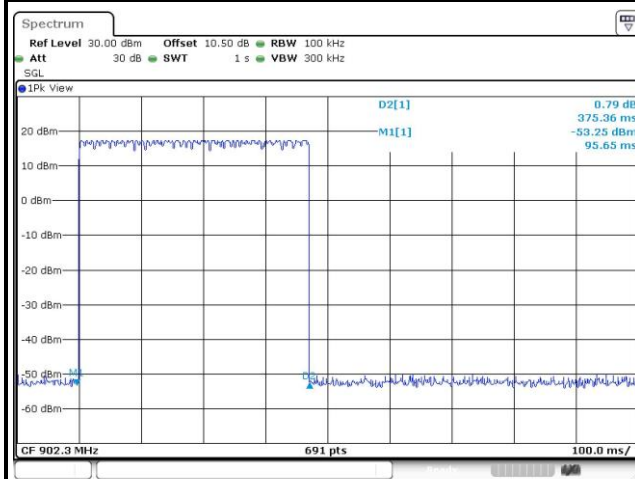
Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 6.4 s (16 Hopping*0.4s)	Result (s)	Limit (s)
CSS / 7	902.3	0.398550	1	0.399	0.4
CSS / 8	902.3	0.394200	1	0.394	0.4
CSS / 9	902.3	0.934200	1	0.934	0.4
CSS / 10	902.3	0.375360	1	0.375	0.4



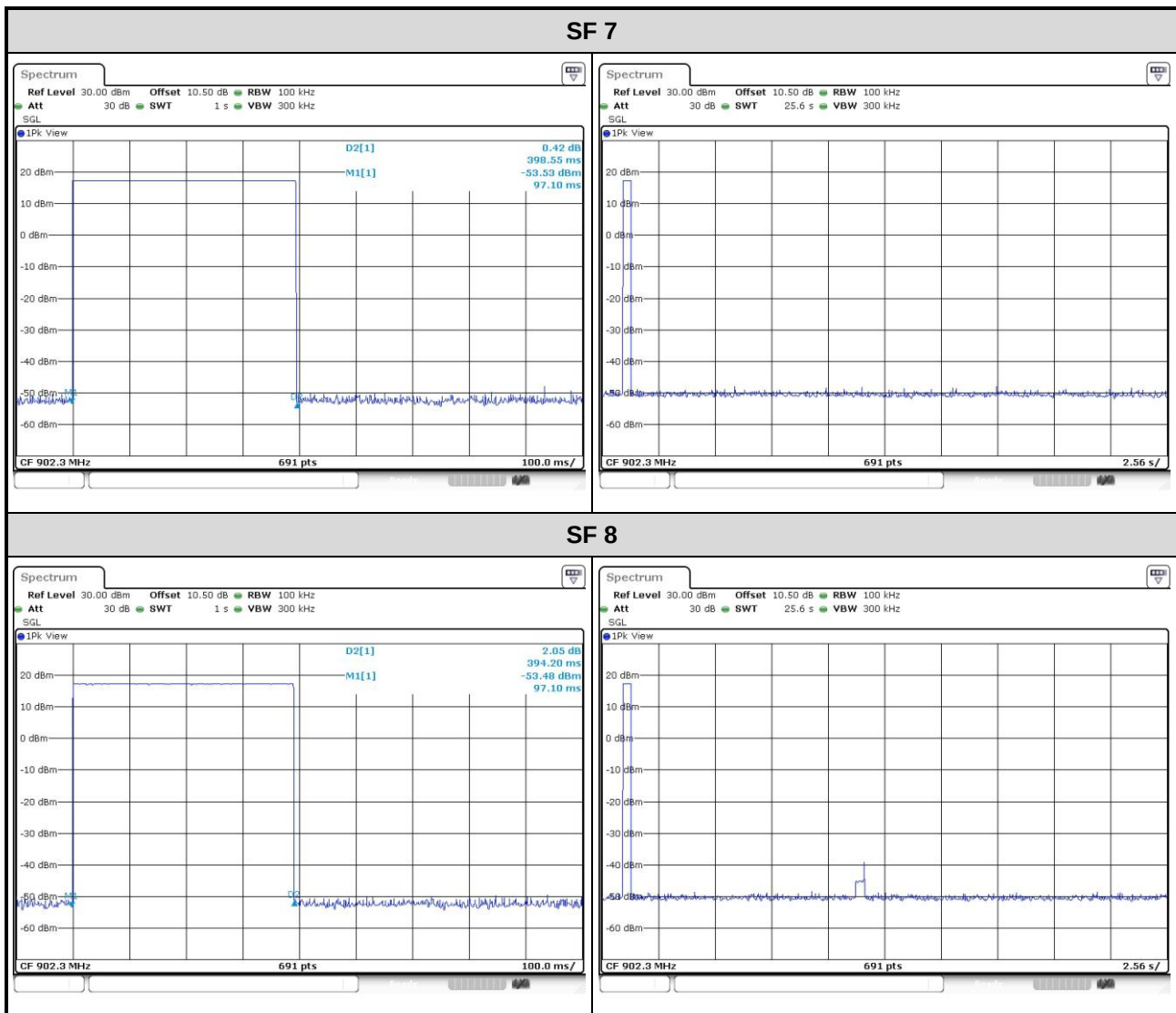
SF 9



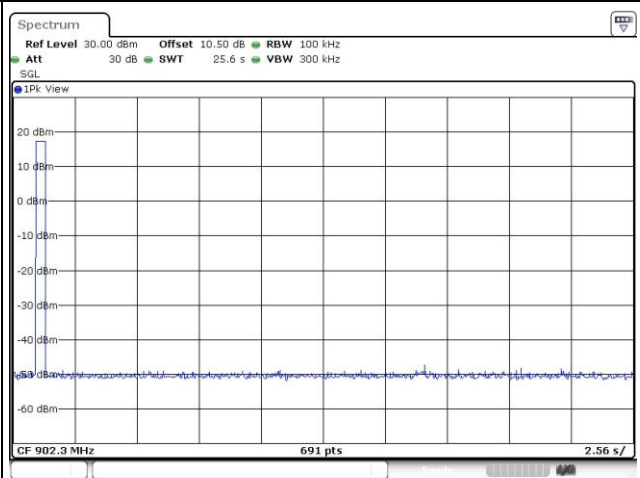
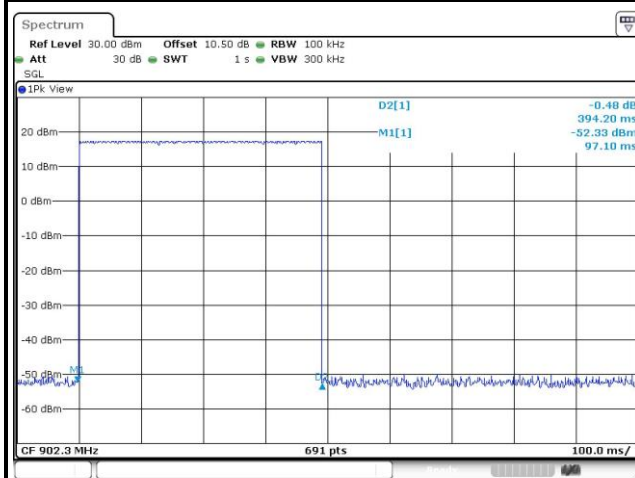
SF 10



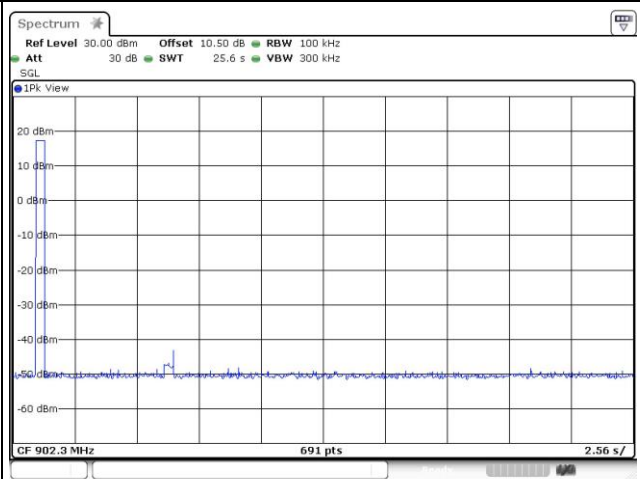
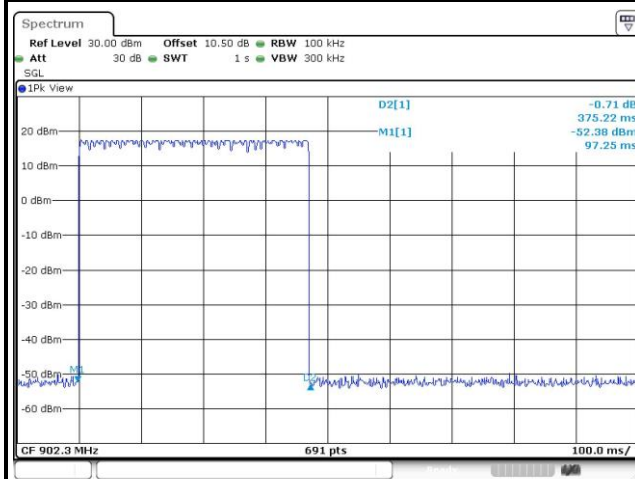
Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 25.6 s (64 Hopping*0.4s)	Result (s)	Limit (s)
CSS / 7	902.3	0.398550	1	0.399	0.4
CSS / 8	902.3	0.394200	1	0.394	0.4
CSS / 9	902.3	0.394200	1	0.394	0.4
CSS / 10	902.3	0.375220	1	0.375	0.4



SF 9



SF 10



3.9 Power Spectral Density

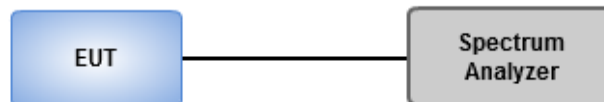
3.9.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band. This item is for Hybrid mode.

3.9.2 Test Procedures

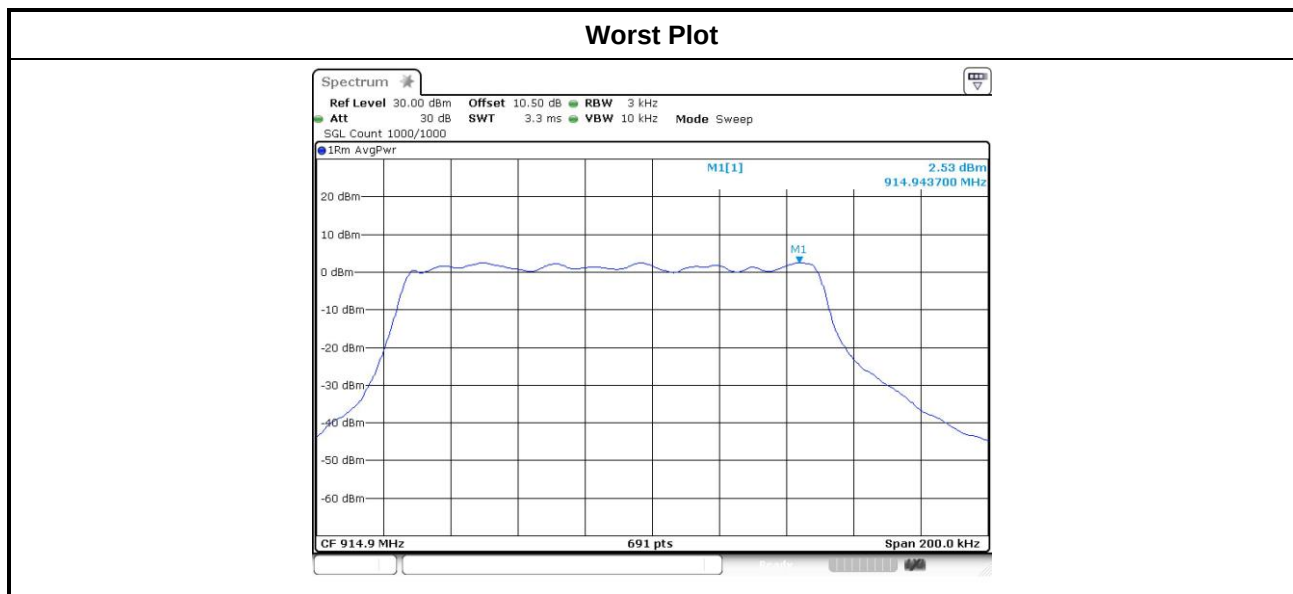
- ☐ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 3kHz, VBW = 10kHz.
 2. Detector = Peak, Sweep time = auto couple.
 3. Trace mode = max hold, allow trace to fully stabilize.
 4. Use the peak marker function to determine the maximum amplitude level.
- ☒ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 3kHz, VBW = 10 kHz.
 2. Detector = RMS, Sweep time = auto couple.
 3. Employ trace averaging (RMS) mode over a minimum of 100 traces
 4. Use the peak marker function to determine the maximum amplitude level.

3.9.3 Test Setup



3.9.4 Test Result of Power Spectral Density

Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
CSS / 7	902.3	2.33	8.00
CSS / 7	908.5	2.37	8.00
CSS / 7	914.9	2.53	8.00



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

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