

FCC Test Report

FCC ID : MXF-WMDD209

Equipment : Lora module

Model No. : WMDD-209

Brand Name : Gemtek

Applicant : Gemtek Technology Co., Ltd.

Address : No.15-1 Zhoughua Rd, Hsinchu Industrial

Park, Hukou, Hsinchu, Taiwan, R.O.C

Standard : 47 CFR FCC Part 15.247

Received Date : Mar. 09, 2017

Tested Date : Mar. 23 ~ Apr. 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: Approved by:

Along Chen / Assistant Manager Gary Chang / Manager

Testing Laboratory

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Release Record

Report No.	Version	Description	Issued Date
FR730901	Rev. 01	Initial issue	Apr. 24, 2017

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Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 21.486MHz 39.02 (Margin -10.98dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 732.28MHz 40.53 (Margin -5.47dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(2)(3)	Conducted Output Power	Power [dBm]: 19.02	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

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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]	977 ~ 5469	10 ~ 7	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.	Туре	Connector	Gain (dBi)	Remark
1	Dipole	IPEX	0	

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from host

1.1.4 Accessories

N/A

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1.1.5 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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	HyperTerminal, version: 5.1.2600.0
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1.1.7 Power Setting

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

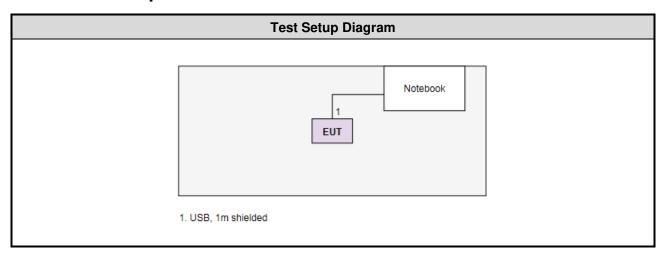
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1.2 Local Support Equipment List

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

1.3 Test Setup Chart



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1.4 The Equipment List

Test Item	Conducted Emission							
Test Site	Conduction room 1 /	Conduction room 1 / (CO01-WS)						
Instrument	Manufacturer	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,							
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 Into	Note: Calibration Interval of instruments listed above is one year.							

Test Item	Radiated Emission							
Test Site	966 chamber 3 / (03CH03-WS)							
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until			
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 09, 2016	Sep. 08, 2017			
Receiver	Agilent	N9038A	MY53290044	Oct. 06, 2016	Oct. 05, 2017			
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 26, 2016	Apr. 25, 2017			
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 09, 2017	Feb. 08, 2018			
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. 08, 2016	Sep. 07, 2017			
Preamplifier	Agilent	83017A	MY53270014	Aug. 22, 2016	Aug. 21, 2017			
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-300	131103	Feb. 04, 2017	Feb. 03, 2018			
LF cable-13M	EMC	EMC8D-NM-NM-130 00	131104	Feb. 04, 2017	Feb. 03, 2018			
Measurement Software	AUDIX	e3	6.120210g	NA	NA			
Note: Calibration Inter	val of instruments liste	d above is one year.						

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Test Item	RF Conducted				
Test Site	(TH01-WS)				
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. 06, 2016	Oct. 05, 2017
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 20, 2016	Oct. 19, 2017
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Inte	rval of instruments liste	d 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	±3.72 dB
Radiated emission > 1GHz	±5.65 dB

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2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	20°C / 58%	Howard Huang
Radiated Emissions	03CH03-WS	24°C / 62%	Kevin Lee Vincent Yeh
RF Conducted	TH01-WS	22°C / 63%	Brad Wu

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	902.3 / 908.5 / 914.9	125	CSS / 10
Hopping Channel Separation			
20dB and Occupied bandwidth			
Power Spectral Density			
Number of Hopping Channels	902.3 ~ 914.9	125	CSS / 10
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 **Z-plane** results were found as the worst case and were shown in this report.
- 2. Hopping channles supports 3 operation modes as below:
 - 1) 8 channels
 - 2) 16 channels
 - 3) 64 channels

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3 Transmitter Test Results

3.1 Conducted Emissions

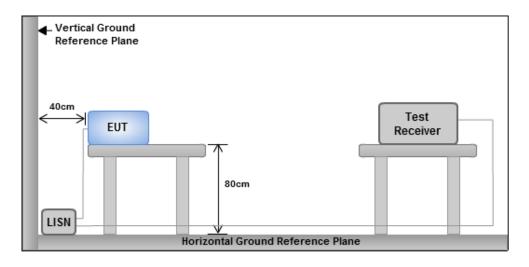
3.1.1 Limit of Conducted Emissions

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 logarith	m 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



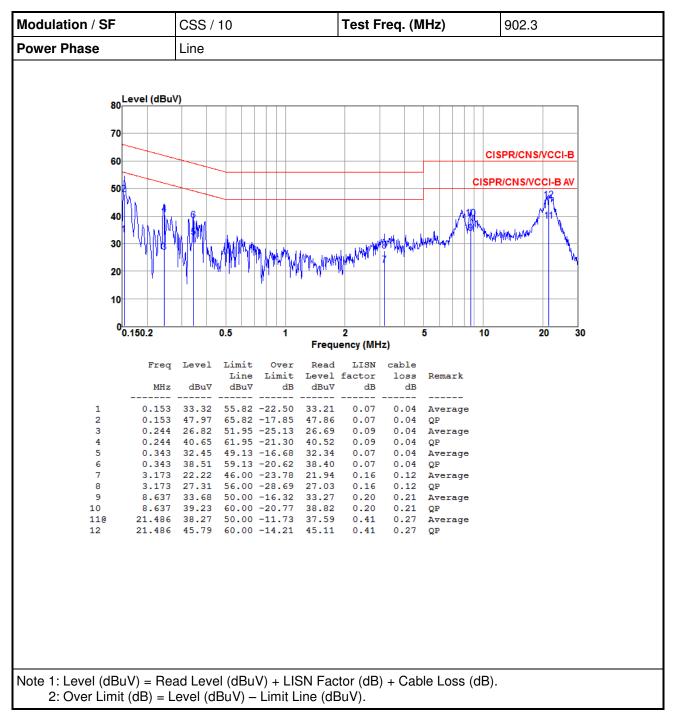
Note: 1. Support units were connected to second LISN.

Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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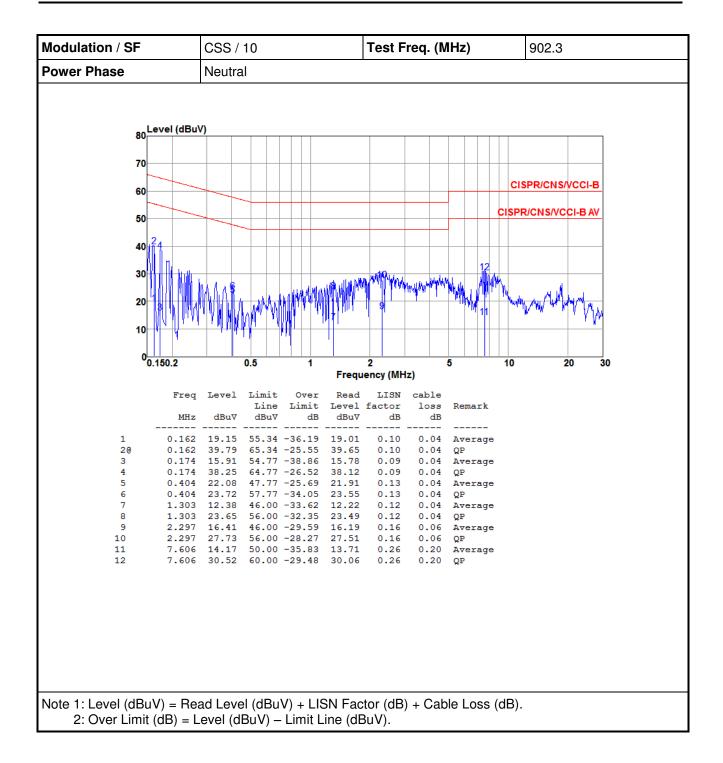


3.1.4 Test Result of Conducted Emissions



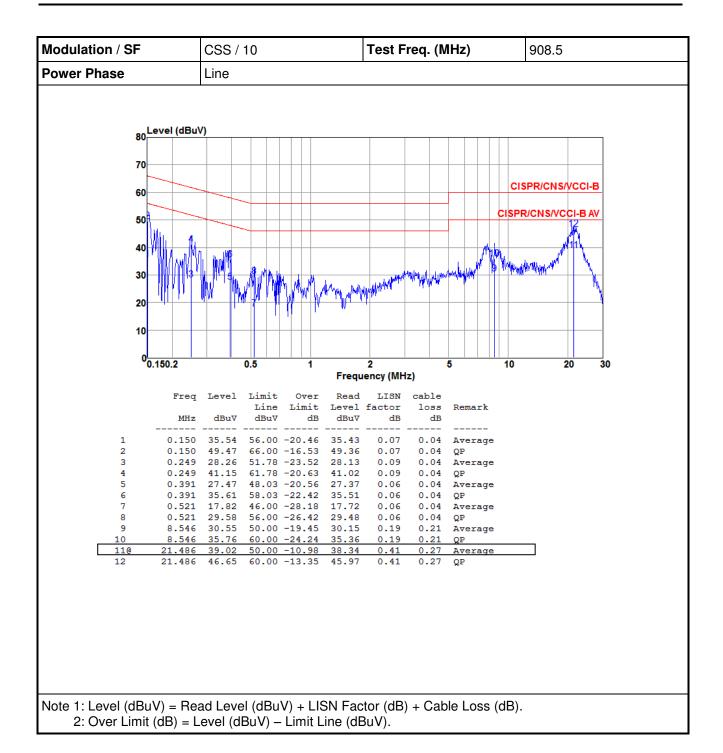
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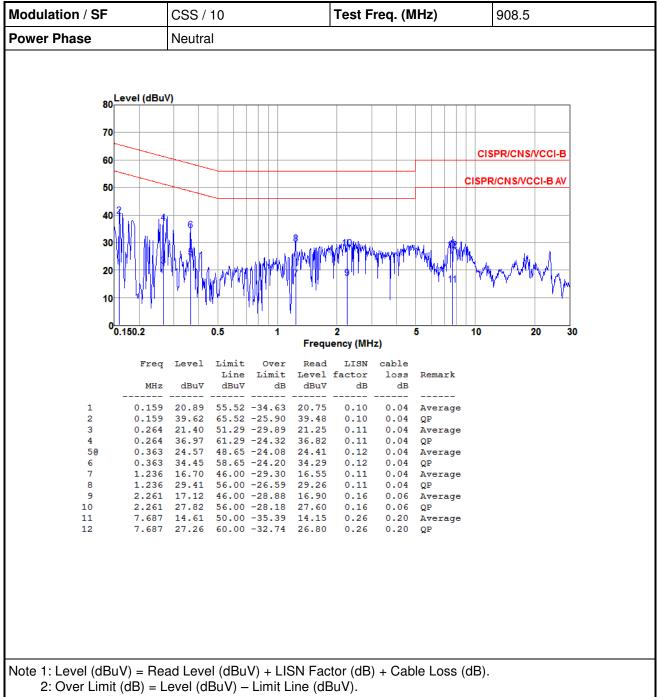
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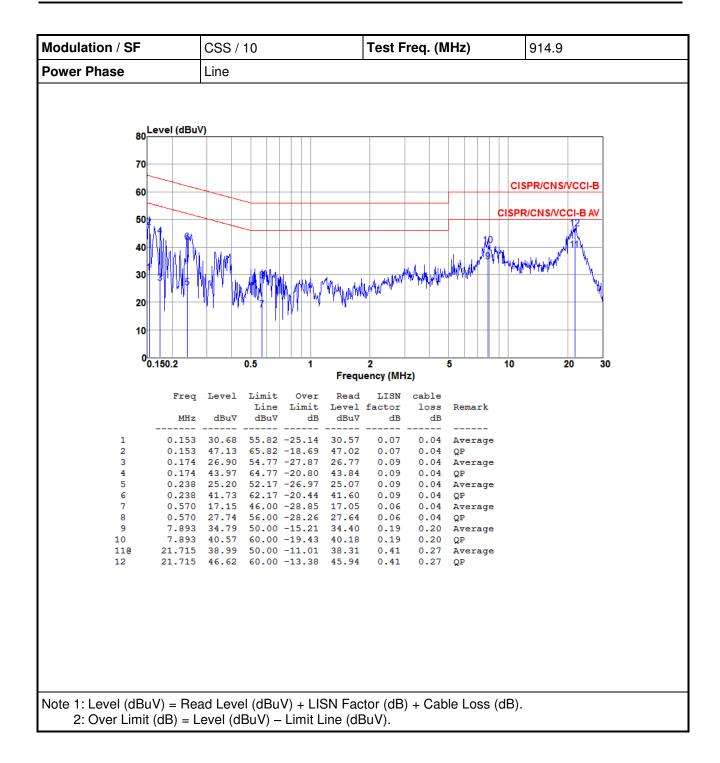
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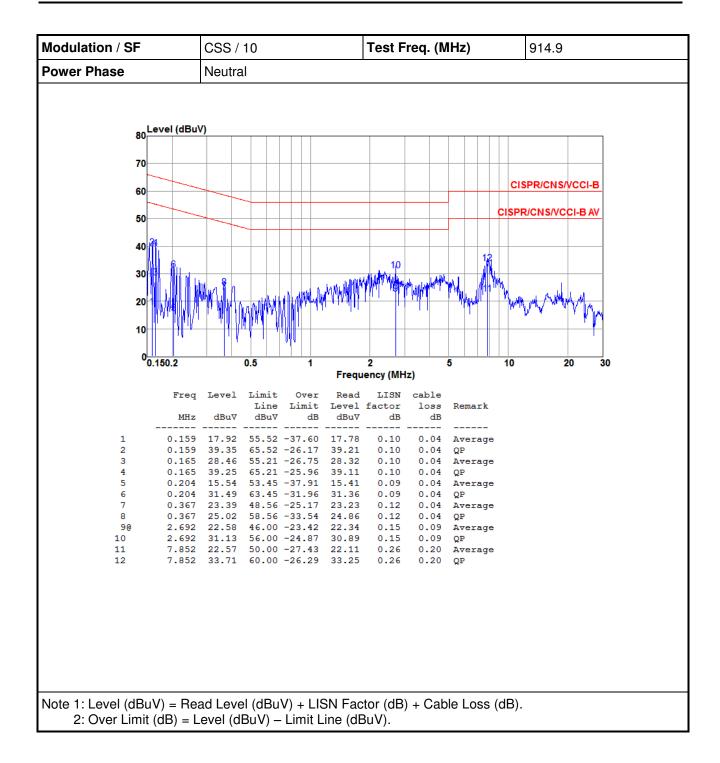
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3.2 Unwanted Emissions into Restricted Frequency Bands

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:

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.

3.2.2 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.

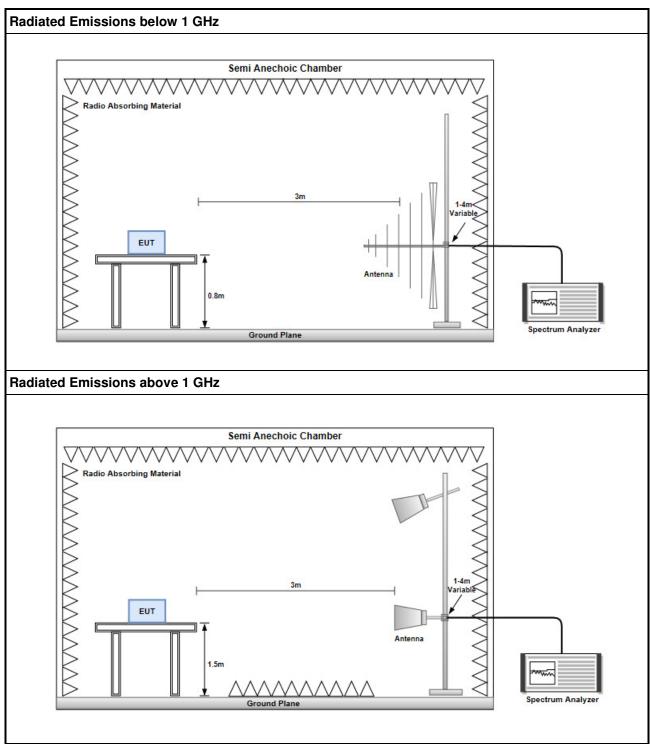
Note:

- 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.
- RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

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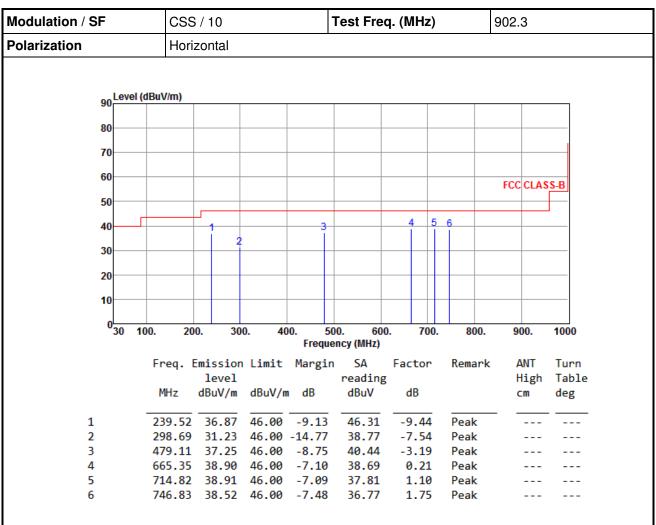
3.2.3 Test Setup



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3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

*Factor includes antenna factor, cable loss and amplifier gain

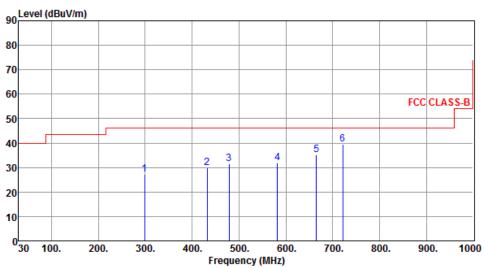
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

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

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Modulation / SF	CSS / 10	Test Freq. (MHz)	902.3
Polarization	Vertical		



	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	298.69	27.37	46.00	-18.63	34.91	-7.54	Peak		
2	432.55	29.94	46.00	-16.06	34.11	-4.17	Peak		
3	479.11	31.61	46.00	-14.39	34.80	-3.19	Peak		
4	581.93	31.98	46.00	-14.02	33.07	-1.09	Peak		
5	665.35	35.14	46.00	-10.86	34.93	0.21	Peak		
6	721.61	39.37	46.00	-6.63	38.12	1.25	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.

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Modulation / SF	CSS	CSS / 10				Test Freq. (MHz) 90			
Polarization	Horiz	zontal		•				•	
	I								
Love	el (dBuV/m)								
90	i (ubu viiii)								
80									
70									
60								FCC (CLASS-B
50								rcc	LA33-D
30							5 6		
40		1		3		4 - 1	6		
30									
20									
10									
0									
030	100. 20	0. 30	0. 40		00. 60(ency (MHz)	0. 700	. 800.	900	0. 1000
	Frea. E	missior	Limit	Margi		Factor	Remark	: AN	IT Turi
		level		J	reading	5		Hi	igh Tab
	MHz	dBuV/m	dBuV/r	n dB	dBuV	dB		cn	n deg
1	220 52	26 99	46.00	0.13	46 33		Dools		
1 2	239.52 298.69	36.88 31.83		-9.12 -14.17	46.32 39.37	-9.44 -7.54	Peak Peak	-	
3	479.11		46.00		40.44	-3.19	Peak		
4	664.38	38.15	46.00			0.20	Peak	-	
5	721.61	39.89	46.00	-6.11	38.64	1.25	Peak	-	

1.72

Peak

36.22

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).

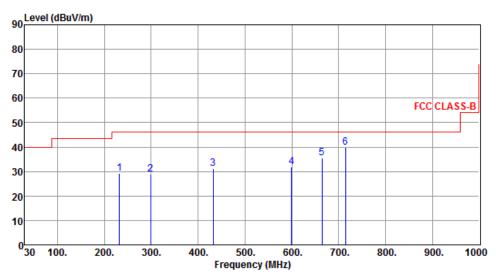
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

744.89 37.94 46.00 -8.06

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Modulation / SF	CSS / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m		Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	231.76	29.21	46.00	-16.79	38.59	-9.38	Peak		
2	298.69	28.96	46.00	-17.04	36.50	-7.54	Peak		
3	432.55	31.08	46.00	-14.92	35.25	-4.17	Peak		
4	599.39	32.00	46.00	-14.00	32.66	-0.66	Peak		
5	664.38	35.48	46.00	-10.52	35.28	0.20	Peak		
6	714.82	39.92	46.00	-6.08	38.82	1.10	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.

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Modulation / SF	CS	CSS / 10			Test Fre	q. (MHz)	914.9		
Polarization	Hoi	izontal		•					
90 <u>Le</u>	vel (dBuV/m)								
80									
70									
60									
								FCC CLA	SS-B
50		 					_		
40		1		3	4	5	6		
30		2	!						
30									
20									
10									
0 30	100. 2	00. 30	0. 40		00. 600 ency (MHz)	0. 700	. 800.	900.	1000
	Freq.	Emission	Limit	Margi	n SA	Factor	Remark	ANT	Turn
		level		Ü	reading	,		High	Table
	MHz	dBuV/m	dBuV/r	n dB	dBuV	dB		cm	deg
1	239.52	37.23	16 00	-8.77	46.67	-9.44	Peak		
1 2	298.69		46.00			-7.54	Peak		
3	479.11		46.00			-3.19	Peak		
4		34.89				-1.07	Peak		
5	664.38	38.62	46.00	-7.38	38.42	0.20	Peak		

-5.47

39.07

1.46

Peak

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

732.28 40.53 46.00

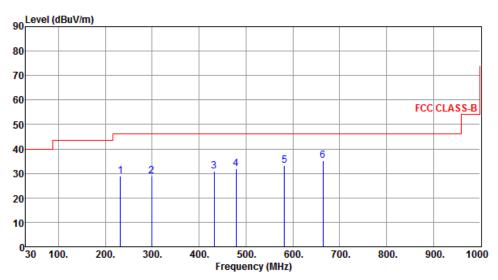
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

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Polarization Vertical	Modulation / SF	CSS / 10	Test Freq. (MHz)	914.9
	Polarization	Vertical		



	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	231.76	29.04	46.00	-16.96	38.42	-9.38	Peak		
2	298.69	28.81	46.00	-17.19	36.35	-7.54	Peak		
3	432.55	30.95	46.00	-15.05	35.12	-4.17	Peak		
4	479.11	32.00	46.00	-14.00	35.19	-3.19	Peak		
5	581.93	33.06	46.00	-12.94	34.15	-1.09	Peak		
6	664.38	35.13	46.00	-10.87	34.93	0.20	Peak		

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

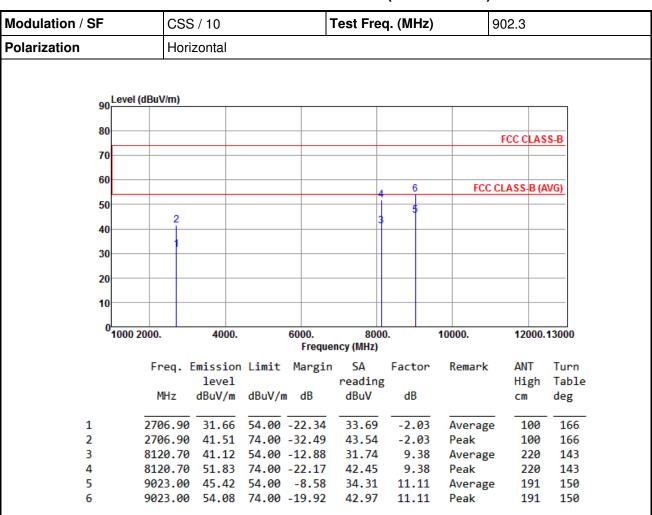
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

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3.2.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)



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).

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Modulation / SF	CSS	S / 10		-	Test Freq. (MHz)			902.3		
Polarization	Vert	ical								
	L									
Lov	vel (dBuV/m)									
90 10	ver (ubu v/iii)									
80										
								FCC CLAS	SS-B	
70										
60										
					4	6	FCC	CLASS-B (A	NVG)	
50						5				
40	2				3					
30										
20										
10										
0	00 2000.	4000.		6000.	800		10000.	42000	42000	
100	00 2000.	4000.			ncy (MHz)	υ.	10000.	12000.	13000	
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
		level			reading			High	Table	
	MHz	dBuV/m	dBuV/m	ı dB	dBuV	dB		cm	deg	
1	2706 00	36.68	54 00	17 32	38.71	-2.03	Average	170	183	
2		42.58			44.61	-2.03	Peak	170	183	
3		40.79			31.41	9.38	Average		223	
4		51.52			42.14	9.38	Peak	100	223	
5	9023.00	43.39	54.00	-10.61	32.28	11.11	Average	e 100	215	
	0022 00	F2 07	74 00	24 42	44 76	44 44	Darat.	100	24.5	

41.76

11.11

Peak

100

215

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

9023.00 52.87 74.00 -21.13

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

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Modulation / SF	CS	SS / 10		7	est Fre	q. (MHz	2)	908.5	
Polarization	Но	orizontal							
90 Level	(dBuV/m)								¬
80									
70								FCC CLASS-E	3
60						4 6	FC	C CLASS-B (AVG	<u>)</u>
50	2					3 5			_
40									_
30									_
20									_
10									_
0									
1000	2000.	4000		6000. Freque	800 (MHz) ncy		10000.	12000.130	000
	Freq.	Emissio		Margin		Factor	Remark		urn
	MHz	level dBuV/m	n dBuV/m	dB	reading dBuV	g dB		_	able eg

54.00 -21.84

74.00 -31.62

54.00 -10.15

54.00 -6.66

52.58 74.00 -21.42

34.14

44.36

34.35

43.08

36.02

43.40

-1.98

-1.98

9.50

9.50

11.32

11.32

Average

Average

Average

Peak

Peak

Peak

111

111

213

213

201

201

169

169

12

12

11

11

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).

2725.50

2725.50

8176.50

8176.50 43.85

9085.00 47.34

2

3

4

5

6

32.16

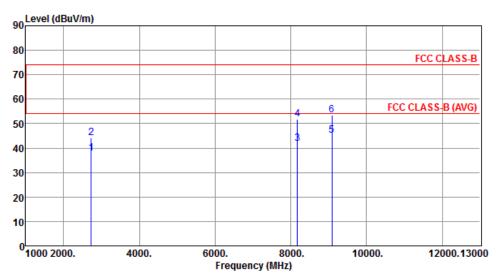
42.38

9085.00 54.72 74.00 -19.28

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Modulation / SF	CSS / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		



	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2725 50	37.98	<u></u> .	16 02	30.06	1 00	A	165	198
1	2/25.50	37.90	54.00	-10.02	39.96	-1.98	Average	100	190
2	2725.50	44.29	74.00	-29.71	46.27	-1.98	Peak	165	198
3	8176.50	41.89	54.00	-12.11	32.39	9.50	Average	182	279
4	8176.50	51.91	74.00	-22.09	42.41	9.50	Peak	182	279
5	9085.00	45.16	54.00	-8.84	33.84	11.32	Average	125	336
6	9085.00	53.40	74.00	-20.60	42.08	11.32	Peak	125	336

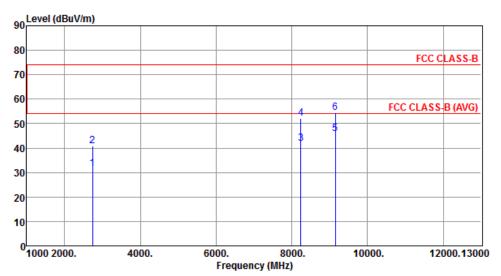
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

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

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Modulation / SF	CSS / 10	Test Freq. (MHz)	914.9
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
									- 0
1	2744.70	31.50	54.00	-22.50	33.41	-1.91	Average	100	15
2	2744.70	40.76	74.00	-33.24	42.67	-1.91	Peak	100	15
3	8234.10	41.81	54.00	-12.19	32.26	9.55	Average	257	214
4	8234.10	52.20	74.00	-21.80	42.65	9.55	Peak	257	214
5	9149.00	45.99	54.00	-8.01	34.47	11.52	Average	200	311
6	9149.00	54.57	74.00	-19.43	43.05	11.52	Peak	200	311

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).

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3

4

5

6

Modulation / SF	CSS	S / 10		7	Test Fred	q. (MHz)		914.9	
Polarization	Vert	ical							
90 <mark>Le</mark>	/el (dBuV/m)								
30									
80								FCC CLAS	S-B
70									
60									
00					- 4	4 6	FCC	CLASS-B (A	(VG)
50						5			
40	2				,				
30-	1								
20									
10									
0									
100	00 2000.	4000.		6000. Freque	8000 ncy (MHz)).	10000.	12000.	13000
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
		level			reading			High	Table
	MHz	dBuV/m	dBuV/m	ı dB	dBuV	dB		cm	deg
1	2744.70	29.95	54.00	-24.05	31.86	-1.91	Average	134	116
2		40.54				-1.91	Peak	134	116

32.35

43.40

32.91

41.83

9.55

9.55

11.52

11.52

Average

Average

Peak

Peak

143

143

130

130

129

129

9

9

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

8234.10 41.90 54.00 -12.10

8234.10 52.95 74.00 -21.05

9149.00 44.43 54.00 -9.57

9149.00 53.35 74.00 -20.65

*Factor includes antenna factor, cable loss and amplifier gain

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

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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

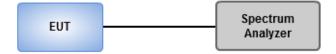
Reference Level Measurement

- 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.

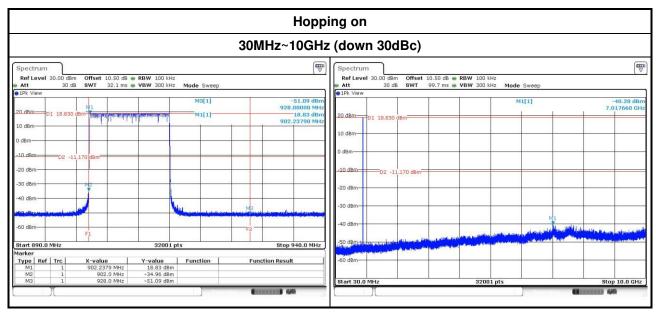
3.3.3 Test Setup



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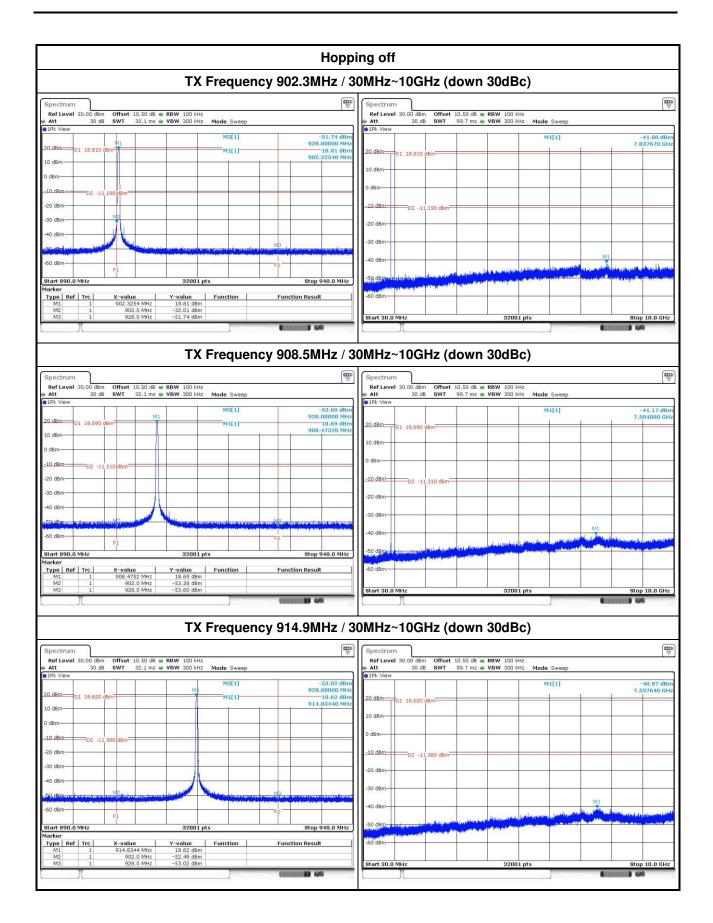


3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands



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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

- A wideband power meter is used for power measurement. Bandwidth of power senor 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 / 10	902.3	79.80	19.02	1
CSS / 10	908.5	79.25	18.99	1
CSS / 10	914.9	78.89	18.97	1

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3.5 Number of Hopping Frequency

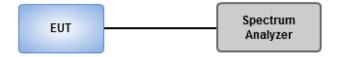
3.5.1 Limit of Number of Hopping Frequency

	Number of Hopping Frequencies Limit for Frequency Hopping Systems								
\boxtimes	902-928 MHz Band:								
	N ≥ 50, 20 dB bandwidth of the hopping channel is less than 250 kHz								
	N ≥ 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 : N	N: Number of Hopping Frequencies								

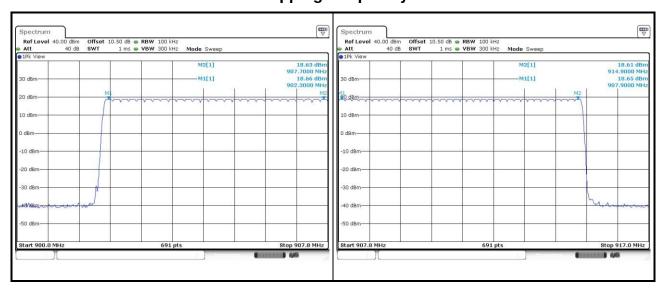
3.5.2 Test Procedures

- 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



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3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

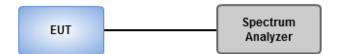
20dB Bandwidth

- 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



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3.6.3 Test result of 20dB and Occupied Bandwidth

Modulation / SF	Freq. (MHz)	20dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
CSS / 10	902.3	138.70	125.40
CSS / 10	908.5	138.70	125.70
CSS / 10	914.9	137.83	125.80



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3.7 Channel Separation

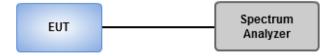
3.7.1 Limit of Channel Separation

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

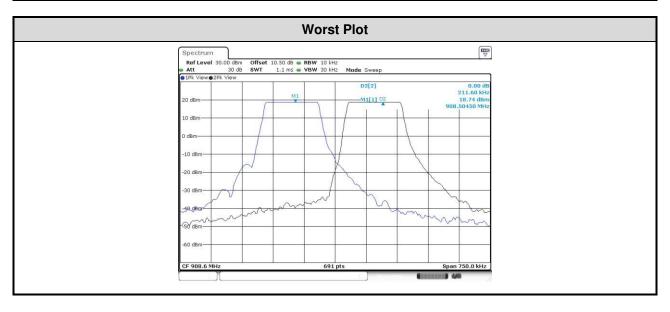


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3.7.4 Test result of Channel Separation

Modulation / SF	Freq. (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Pass/Fail
CSS / 10	902.3	145.40	138.70	Pass
CSS / 10	908.5	211.60	138.70	Pass
CSS / 10	914.9	196.50	137.83	Pass



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3.8 Number of Dwell Time

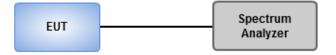
3.8.1 Limit of Dwell time

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems					
902	-928 MHz Band:				
	\leq 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz				
	\leq 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater				
\boxtimes	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

- 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

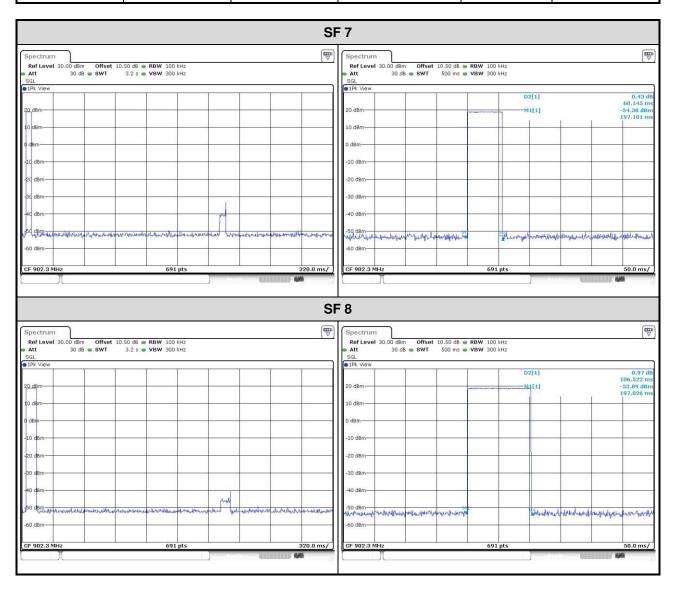


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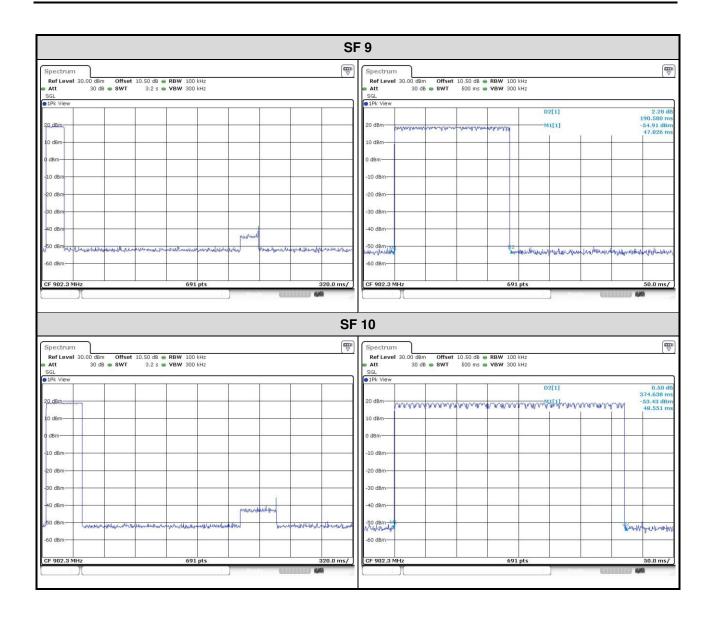
3.8.4 Test Result of Dwell Time

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	0.060145	1	0.060145	0.4
CSS / 8	902.3	0.106522	1	0.106522	0.4
CSS / 9	902.3	0.190580	1	0.190580	0.4
CSS / 10	902.3	0.374638	1	0.374638	0.4



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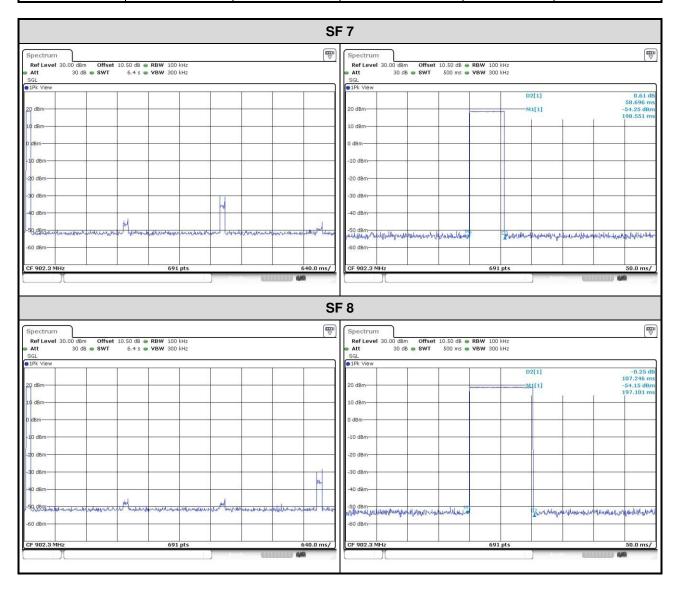




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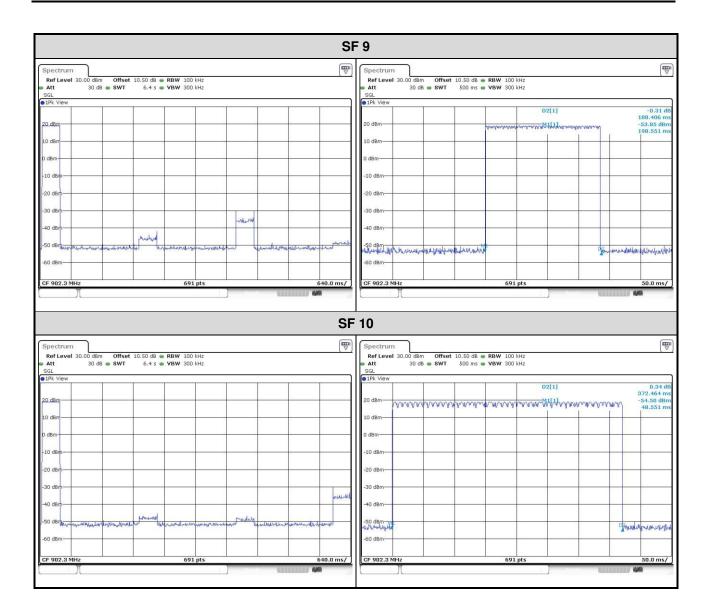


Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 6.4 s (16 Hopping*0.4s)	Result (s)	Limit (s)
CSS / 7	902.3	0.058696	1	0.058696	0.4
CSS / 8	902.3	0.107246	1	0.107246	0.4
CSS / 9	902.3	0.188406	1	0.188406	0.4
CSS / 10	902.3	0.372464	1	0.372464	0.4



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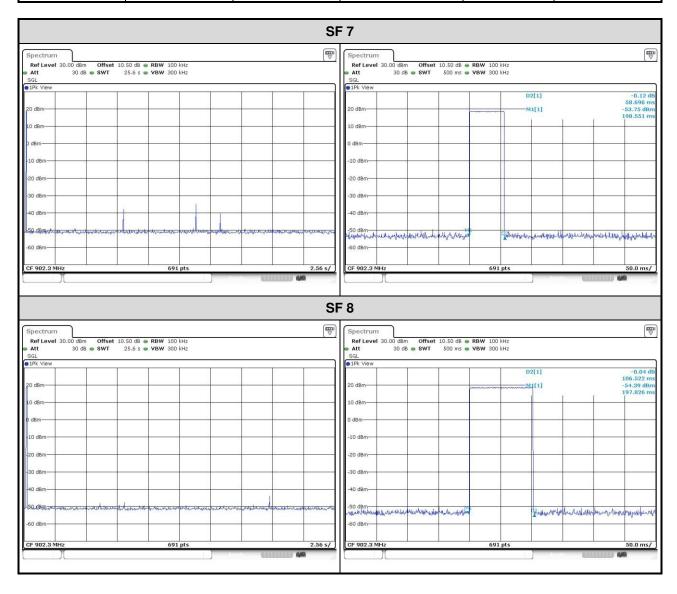




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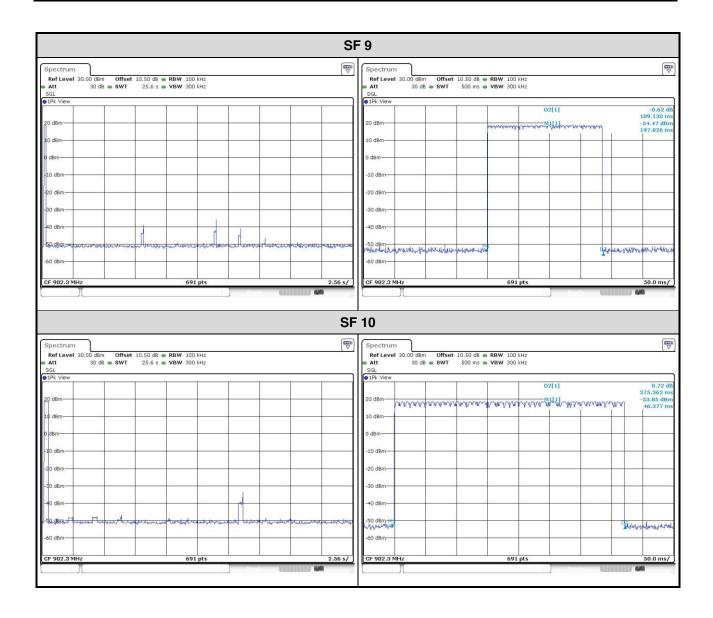


Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 25.6 s (64 Hopping*0.4s)	Result (s)	Limit (s)
CSS / 7	902.3	0.058696	1	0.058696	0.4
CSS / 8	902.3	0.106522	1	0.106522	0.4
CSS / 9	902.3	0.189130	1	0.189130	0.4
CSS / 10	902.3	0.375362	1	0.375362	0.4



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3.9 Power Spectral Density

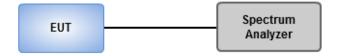
3.9.1 Limit of Power Spectral Density

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.
 - 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



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3.9.4 Test Result of Power Spectral Density

Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
CSS / 10	902.3	3.91	8.00
CSS / 10	908.5	3.97	8.00
CSS / 10	914.9	4.07	8.00



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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.

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.

Kwei Shan

Tel: 886-3-271-8666 Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==

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