

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: Approved by:

Along Chen / Assistant Manager Gary Chang / Manager

Testing Laboratory

Report No.: FR730201-04 Page: 1 of 50



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information	5
1.2	Local Support Equipment List	
1.3	Test Setup Chart	
1.4	The Equipment List	
1.5	Test Standards	g
1.6	Measurement Uncertainty	g
2	TEST CONFIGURATION	10
2.1	Testing Condition	10
2.2	The Worst Test Modes and Channel Details	10
3	TRANSMITTER TEST RESULTS	11
3.1	Conducted Emissions	11
3.2	Unwanted Emissions into Restricted Frequency Bands	18
3.3	Unwanted Emissions into Non-Restricted Frequency Bands	32
3.4	Conducted Output Power	35
3.5	Number of Hopping Frequency	36
3.6	20dB and Occupied Bandwidth	37
3.7	Channel Separation	39
3.8	Number of Dwell Time	41
3.9	Power Spectral Density	48
4	TEST LABORATORY INFORMATION	50



Release Record

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

Report No.: FR730201-04 Page: 3 of 50



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

Report No.: FR730201-04 Page: 4 of 50



1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information						
Frequency Range (MHz) Channel (bit/sec) Spre					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		Connector	Gain (dBi)	Remark
1	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

Report No.: FR730201-04 Page: 5 of 50



1.1.5 Channel List

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
-----------	-----------------------

1.1.7 Power Setting

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

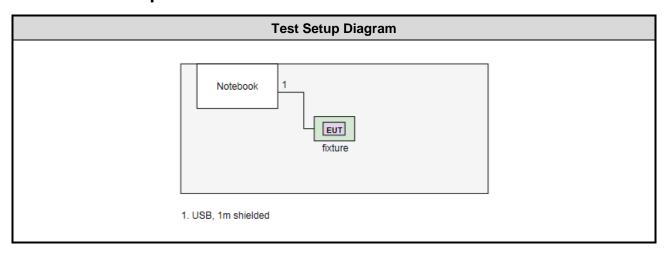
Report No.: FR730201-04 Page: 6 of 50



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



Report No.: FR730201-04 Page: 7 of 50



1.4 The Equipment List

Test Item	Conducted Emission						
Test Site	Conduction room 1 /	Conduction room 1 / (CO01-WS)					
Tested Date	Nov. 03, 2017	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	RF Cable-CON EMC EMCCFD300-BM-BM-6000 50821 Dec. 20, 2016 Dec. 19, 201						
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 / (03C	H03-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-300 0	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 NA						
Note: Calibration Inter	val of instruments liste	d above is one year.				

Report No.: FR730201-04 Page: 8 of 50



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 Inter	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	±3.66 dB								
Radiated emission > 1GHz	±5.37 dB								

Report No.: FR730201-04 Page: 9 of 50



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	902.3 / 908.5 / 914.9	125	CSS/7		
Power Spectral Density 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 channles supports 3 operation modes as below:
 - 1) 8 channels
 - 2) 16 channels
 - 3) 64 channels

Report No.: FR730201-04 Page: 10 of 50



3 Transmitter Test Results

3.1 Conducted Emissions

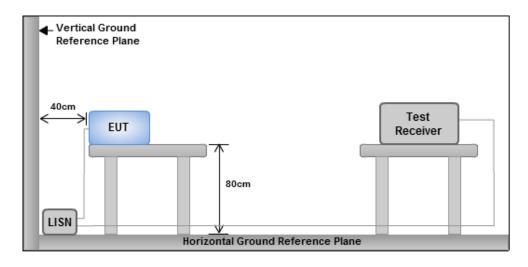
3.1.1 Limit of Conducted Emissions

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



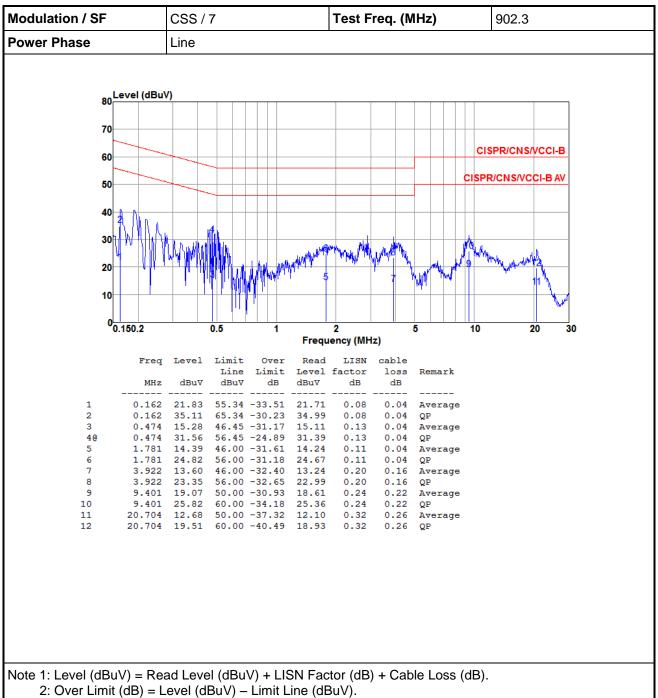
Note: 1. Support units were connected to second LISN.

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

Report No.: FR730201-04 Page: 11 of 50

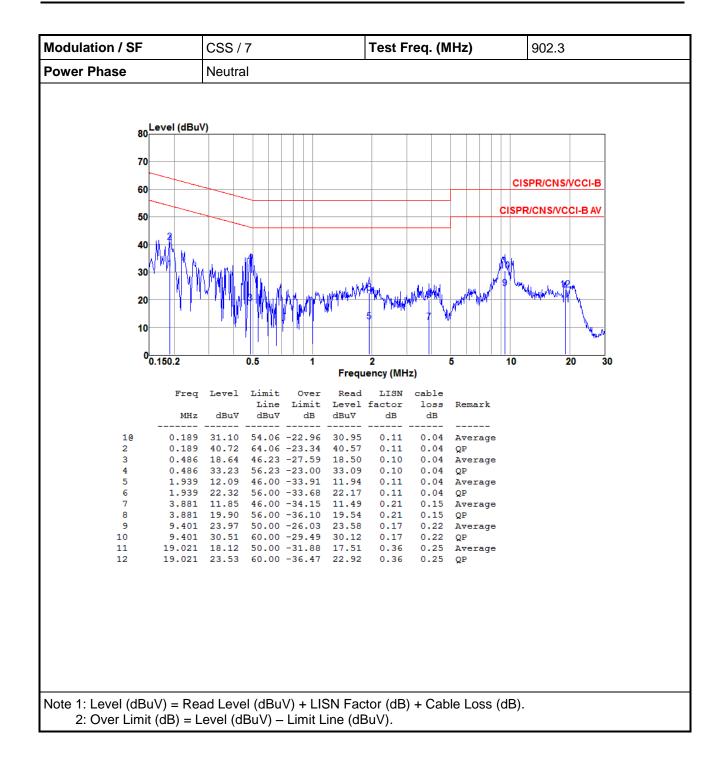


Test Result of Conducted Emissions 3.1.4



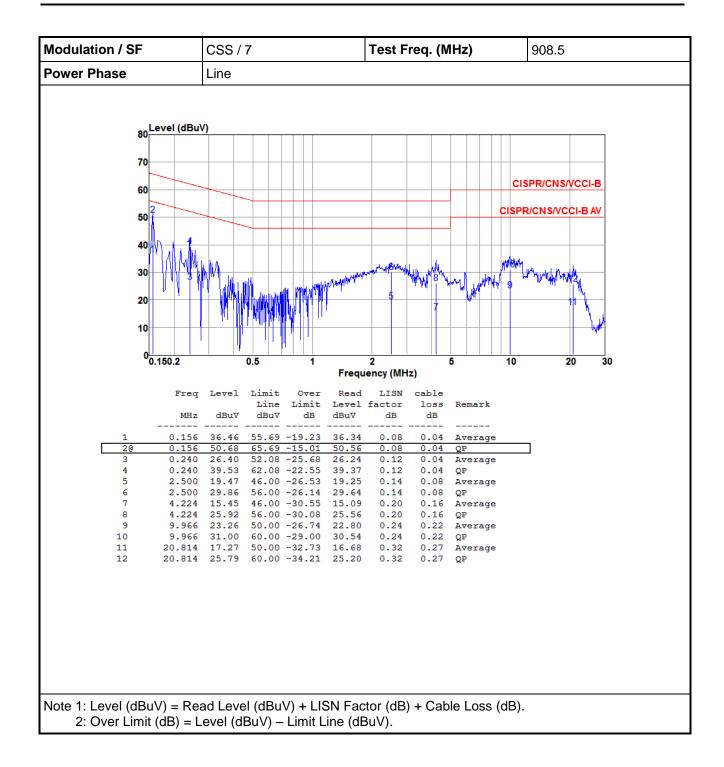
Report No.: FR730201-04 Page: 12 of 50





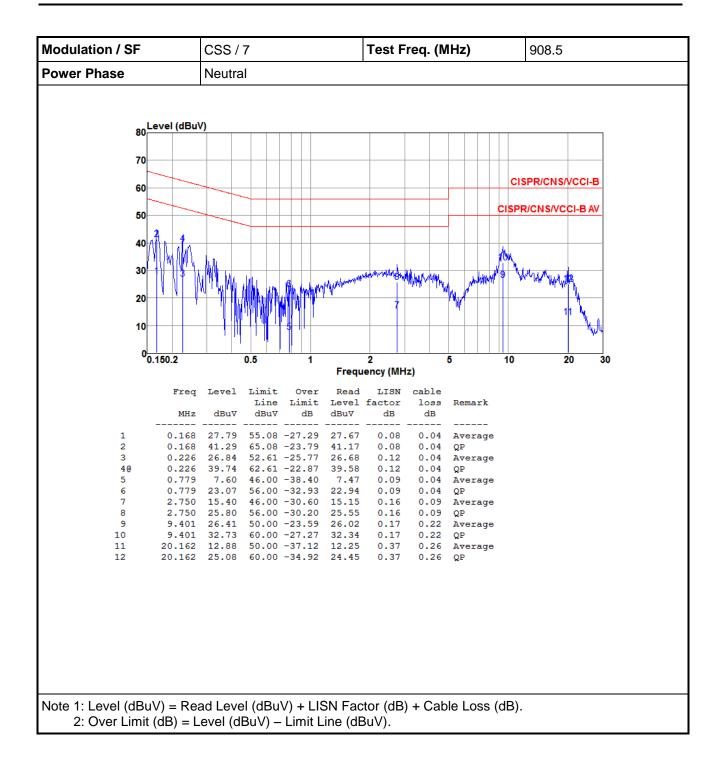
Report No.: FR730201-04 Page: 13 of 50





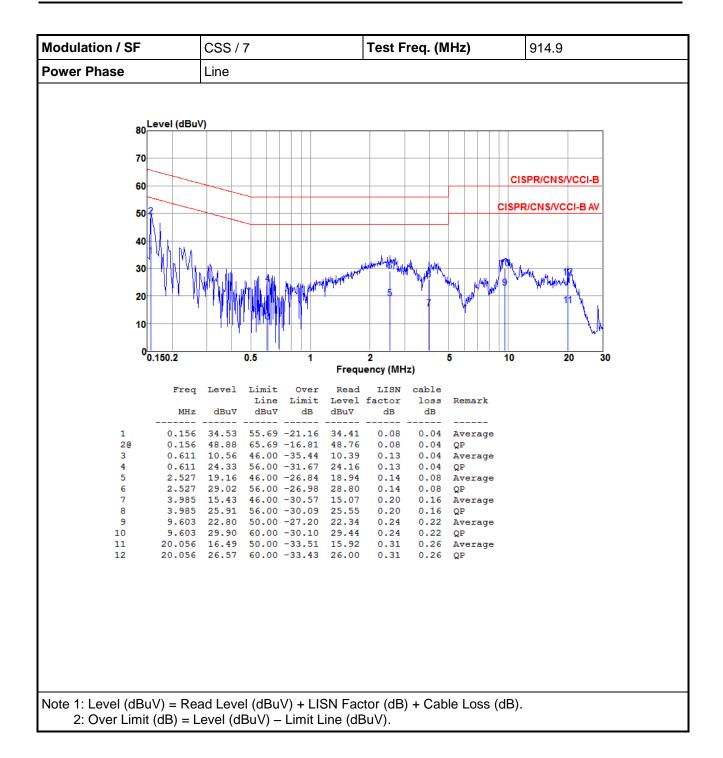
Report No.: FR730201-04 Page : 14 of 50





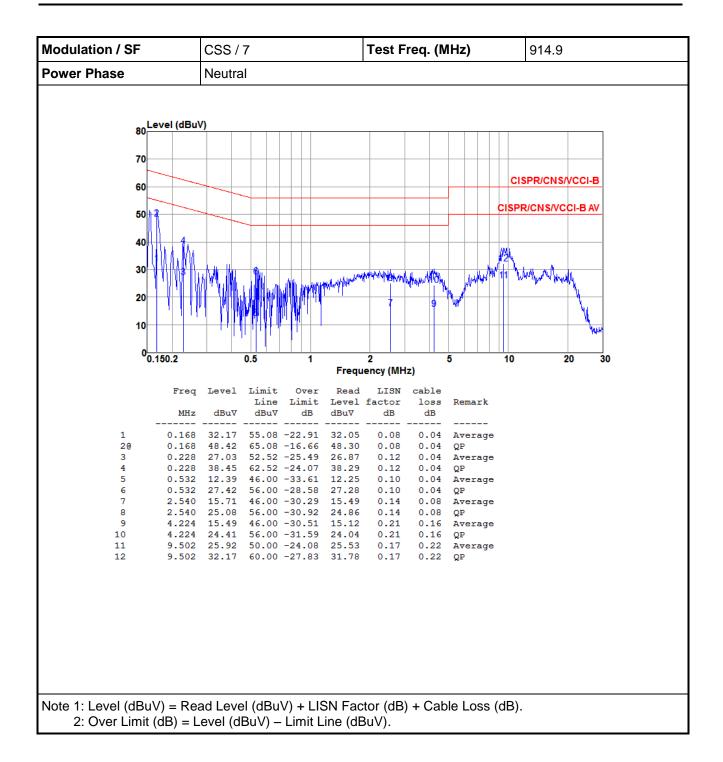
Report No.: FR730201-04 Page: 15 of 50





Report No.: FR730201-04 Page: 16 of 50





Report No.: FR730201-04 Page: 17 of 50



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

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.

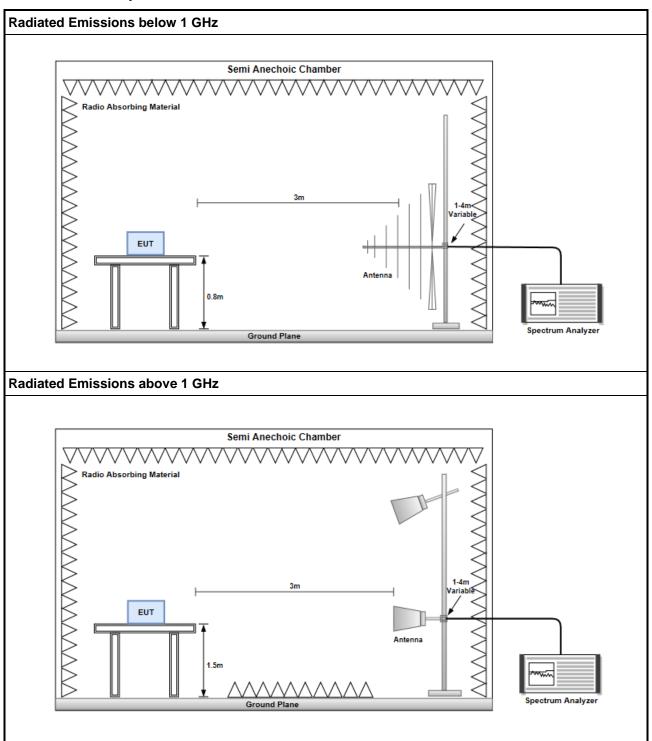
Note:

- 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.

Report No.: FR730201-04 Page: 18 of 50



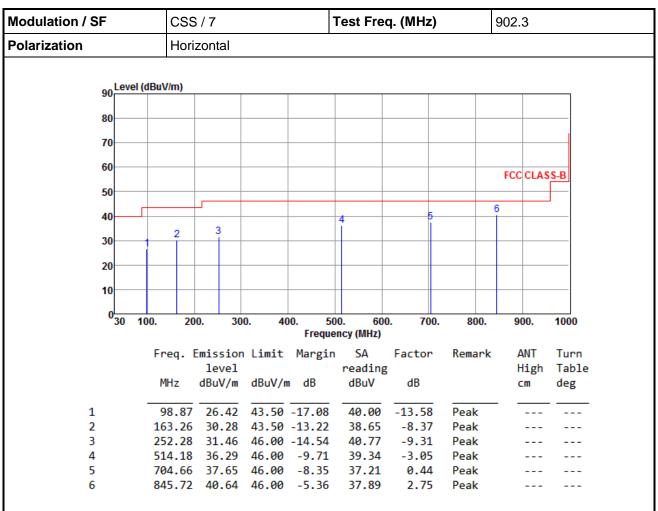
3.2.3 Test Setup



Report No.: FR730201-04 Page: 19 of 50



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.

Report No.: FR730201-04 Page: 20 of 50



Modulation / SI	F		C	CSS	5/7			Test Fre	q. (MHz)		902.	902.3		
Polarization			١	/ert	ical		•							
	۰۰L	.evel	(dBuV/n	n)										
	90													
	80													
	70													
l	10													
1	60										FCC	CLAS	SS_B	
	50											- C		
											5	6	١ ١	
	40		1	_				4						
	30	1		2		3								
	20													
	20													
	10													
	0													
	03	0 1	100.	20	0. 30	00. 4		00. 60 ency (MHz)	0. 700	. 800.	9	00.	1000	
			Engl		Emissio	o Limit	Margir		Factor	Remark	, ,	ANT	Turn	
			116	1	level		nai gri	reading		ricinal r		ligh	Table	
			MH:	Z	dBuV/m	dBuV/	m dB	dBuV	dB			EM .	deg	
1			44.	.26	28.82	40.00	-11.18	37.25	-8.43	Peak				
2							-12.67	39.29		Peak				
3							-15.74			Peak				
4			513	. 25		46.00	-10.36	38.71	-3.07	Peak				

40.08

35.94

2.66

4.46

Peak

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.

839.27 42.74 46.00 -3.26

941.29 40.40 46.00 -5.60

Report No.: FR730201-04 Page: 21 of 50

Report Version: Rev. 01

5



Modulation / S	SF.		CSS/7	7		-	Test Fre	q. (MHz))	908.	5	
Polarization			Horizor	ntal						•		
	oo Leve	el (dBuV	/m)									
	90											
	80											
	70											
	60											
										FCC	CLAS	S-B
	50											
	40						4	5		6		
	30		2	3								
		i										
	20											
	10											
	030	100.	200.	30	0. 40	00. 50	0. 60	0. 700	. 800.	9	00.	1000
							ncy (MHz)					
		Fre			n Limit	Margin		Factor	Remark		ANT	Turn
				evel	JD-A//	- AD	reading				ligh	Table
		MI	Hz dB	uv/m	dBuV/r	n ab	dBuV	dB		(=m	deg
1		- 98	8.87 2	6.42	43.50	-17.08	40.00	-13.58	Peak			
2					43.50		39.16	-8.41	Peak			
3				0.76 6.59	46.00 46.00		40.17	-9.41	Peak			
5				7.95		-9.41 -8.05	39.69 37.50	-3.10 0.45	Peak Peak			
6				0.15			37.40	2.75	Peak			

*Factor includes antenna factor, cable loss and amplifier gain

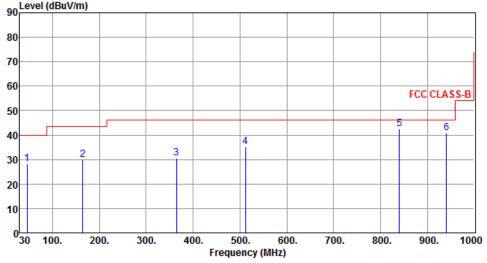
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

Report No.: FR730201-04 Page: 22 of 50



Modulation / SF	CSS/7	Test Fre	eq. (MHz	z)	908.	908.5			
Polarization	Vertical								
90 Level (dBuV/m)									
30									



	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
	45.50		40.00	44.04	26.55				
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		

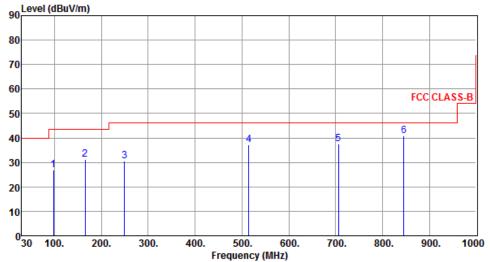
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

Report No.: FR730201-04 Page: 23 of 50



Modulation / SF	CSS / 7	Te	est Fred	q. (MHz	<u>z</u>)	914.	914.9		
Polarization	Horizontal								
90 Level (dBuV/m)									
00									



	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	ı dB	dBuV	dB		cm	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		

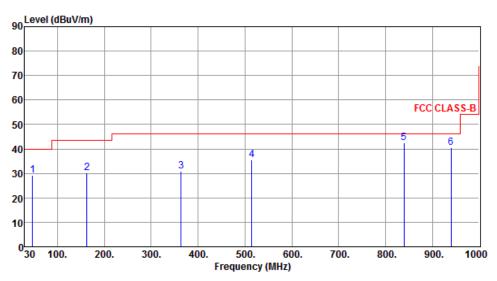
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

Report No.: FR730201-04 Page: 24 of 50



Modulation / SF	CSS / 7	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	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		

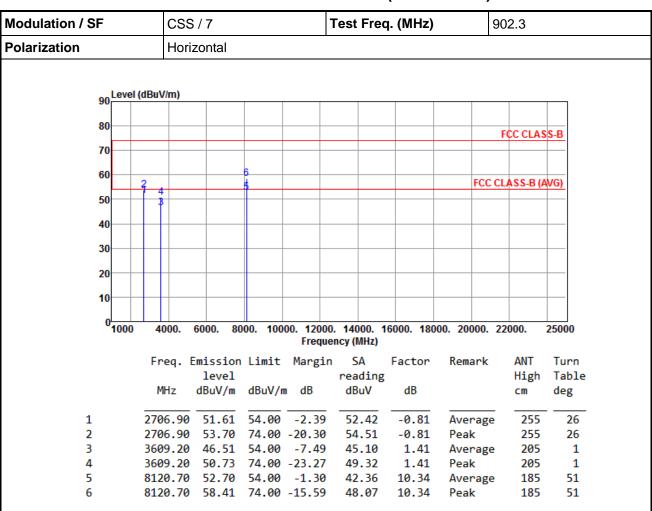
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

Report No.: FR730201-04 Page: 25 of 50



3.2.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)



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

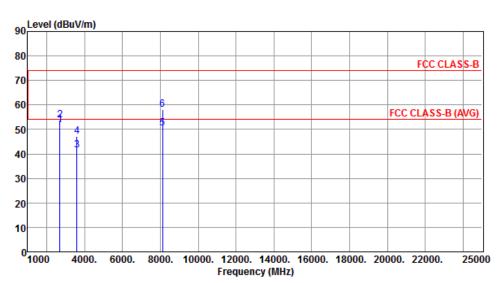
*Factor includes antenna factor, cable loss and amplifier gain

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

Report No.: FR730201-04 Page: 26 of 50



Modulation / SF	CSS/7	Test Freq. (MHz)	902.3
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	2706.90	51.94	54.00	-2.06	52.75	-0.81	Average	181	30
2	2706.90		74.00		54.71	-0.81	Peak	181	30
3	3609.20	41.43	54.00	-12.57	40.02	1.41	Average	100	43
4	3609.20	47.13	74.00	-26.87	45.72	1.41	Peak	100	43
5	8120.70	50.35	54.00	-3.65	40.01	10.34	Average	370	350
6	8120.70	58.08	74.00	-15.92	47.74	10.34	Peak	370	350

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

Report No.: FR730201-04 Page: 27 of 50



Modulation / SF		CSS	S / 7			Test Fred	q. (MHz)		908.5	
Polarization		Hori	izontal		•					
ا	vel (dBu	W/m)								
90	VCI (UDC	, , , , , , , , , , , , , , , , , , ,								
80-										
									FCC CLAS	S-B
70	_									
60				6						
	2	,		5				FCC	CLASS-B (A	WG)
50		3								
40										
40										
30										
20										
10										-
10	000	4000.	6000. 80	00. 100		0. 14000. 1	6000. 180	00. 20000.	22000.	25000
					•	ency (MHz)				
	F	req.	Emission	Limit	Margi		Factor	Remark	ANT	Turn
			level	ID 1//	ID.	reading			High	
		MHz	dBuV/m	dBuV/i	m dB	dBuV	dB		cm	deg
1	27	25 50	50.55	54 00	_3 /5	51.30	-0.75	Average	272	19
2		25.50 25.50			-20.80	53.95	-0.75	Peak	272	19
3		34.00			-8.09	44.42	1.49	Average		0
4		34.00			-24.05	48.46	1.49	Peak	200	0
5			52.98			42.69	10.29	Average		48
6	01	76 60	E0 CC	74 00	15 24	40 27	10 20	Dook	107	40

48.37

10.29

Peak

187

48

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

58.66

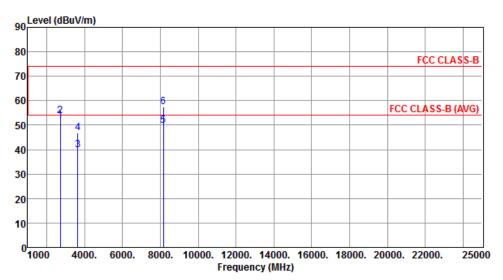
74.00 -15.34

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

Report No.: FR730201-04 Page: 28 of 50



Modulation / SF	CSS / 7	Test Freq. (MHz)	908.5
Polarization	Vertical		



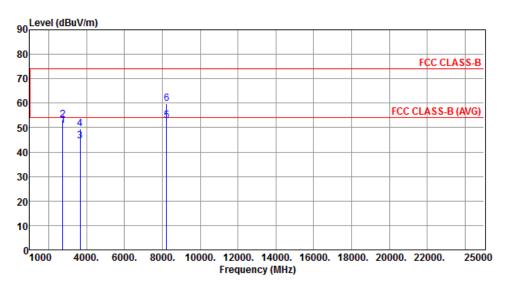
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2725.50	51.80	54.00	-2.20	52.55	-0.75	Average	154	35
2	2725.50	53.90	74.00	-20.10	54.65	-0.75	Peak	154	35
3	3634.00	39.82	54.00	-14.18	38.33	1.49	Average	200	36
4	3634.00	46.76	74.00	-27.24	45.27	1.49	Peak	200	36
5	8176.50	49.65	54.00	-4.35	39.36	10.29	Average	206	355
6	8176.50	57.39	74.00	-16.61	47.10	10.29	Peak	206	355

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

Report No.: FR730201-04 Page: 29 of 50



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



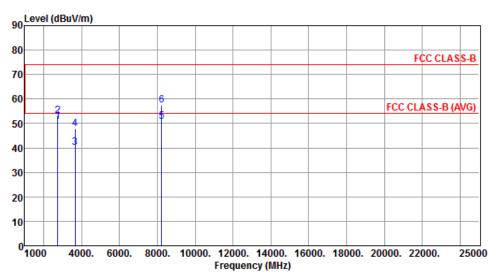
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2744.70	50.96	54.00	-3.04	51.64	-0.68	Average	247	25
2	2744.70	53.10	74.00	-20.90	53.78	-0.68	Peak	247	25
3	3659.60	44.64	54.00	-9.36	43.07	1.57	Average	187	0
4	3659.60	49.43	74.00	-24.57	47.86	1.57	Peak	187	0
5	8234.10	52.90	54.00	-1.10	42.60	10.30	Average	169	47
6	8234.10	59.90	74.00	-14.10	49.60	10.30	Peak	169	47

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

Report No.: FR730201-04 Page: 30 of 50



Modulation / SF	CSS / 7	Test Freq. (MHz)	914.9
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	2744.70	50.90	54.00	-3.10	51.58	-0.68	Average	162	36
2	2744.70	53.17	74.00	-20.83	53.85	-0.68	Peak	162	36
3	3659.60	40.02	54.00	-13.98	38.45	1.57	Average	211	34
4	3659.60	47.68	74.00	-26.32	46.11	1.57	Peak	211	34
5	8234.10	50.92	54.00	-3.08	40.62	10.30	Average	180	358
6	8234.10	57.50	74.00	-16.50	47.20	10.30	Peak	180	358

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

Report No.: FR730201-04 Page: 31 of 50



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

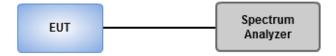
Reference Level Measurement

- 1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
- 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.

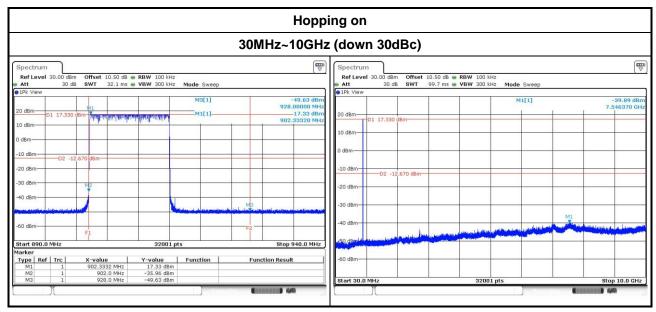
3.3.3 Test Setup



Report No.: FR730201-04 Page: 32 of 50

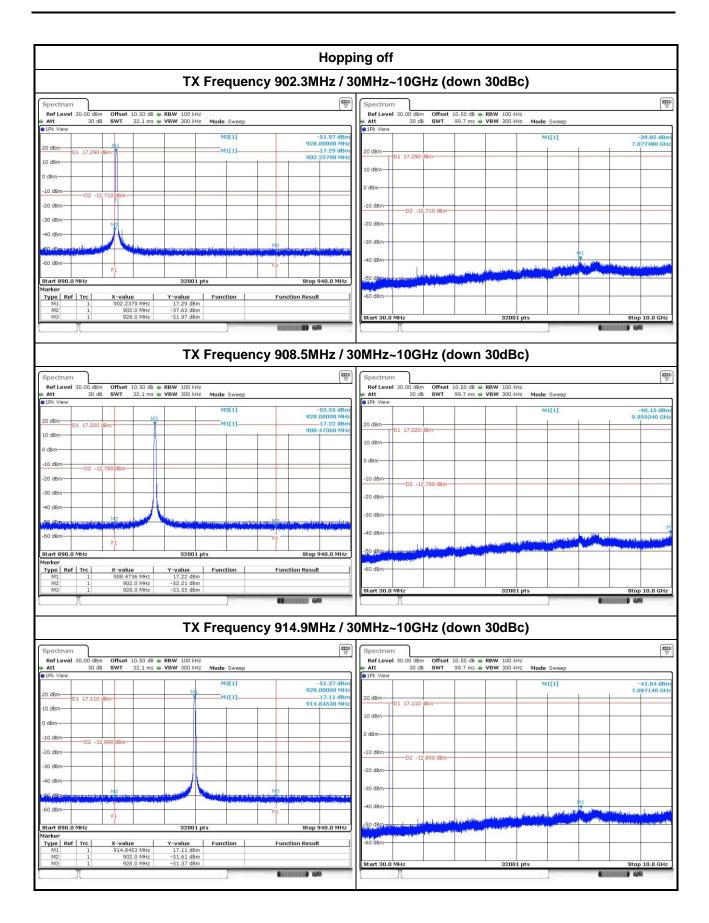


3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands



Report No.: FR730201-04 Page: 33 of 50





Report No.: FR730201-04 Page: 34 of 50



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 senor and meter is 50MHz
- 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)	•	
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

Report No.: FR730201-04 Page: 35 of 50



3.5 Number of Hopping Frequency

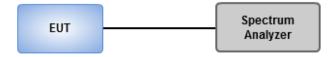
3.5.1 Limit of Number of Hopping Frequency

	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: Number of Hopping Frequencies		

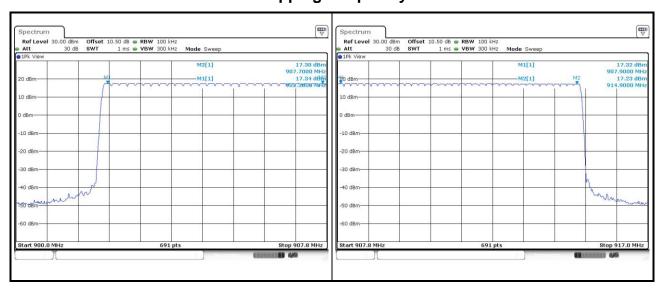
3.5.2 Test Procedures

- 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



Report No.: FR730201-04 Page: 36 of 50



3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

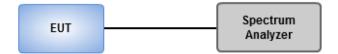
20dB Bandwidth

- 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

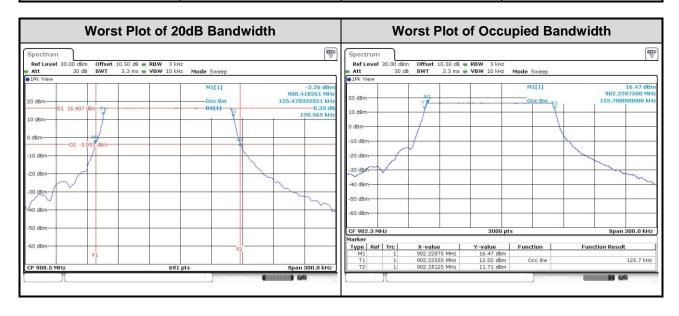


Report No.: FR730201-04 Page: 37 of 50



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



Report No.: FR730201-04 Page: 38 of 50



3.7 Channel Separation

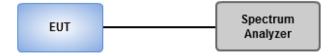
3.7.1 Limit of Channel Separation

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

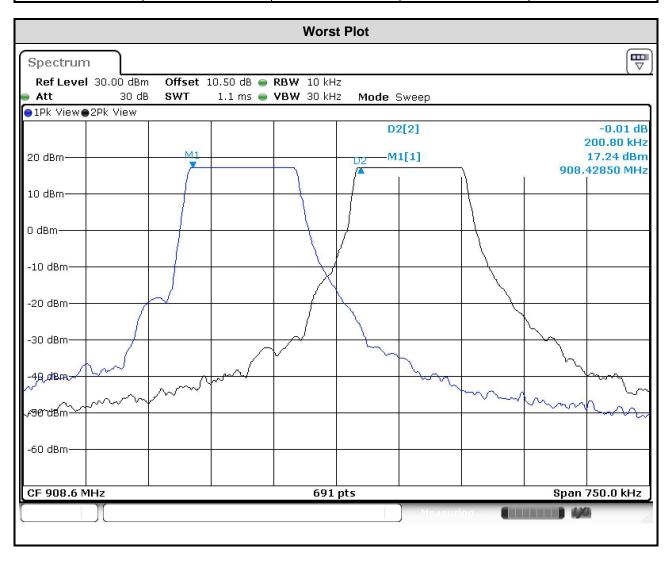


Report No.: FR730201-04 Page: 39 of 50



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



Report No.: FR730201-04 Page: 40 of 50



3.8 Number of Dwell Time

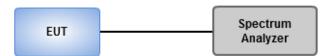
3.8.1 Limit of Dwell time

	Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems					
\boxtimes	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				
		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

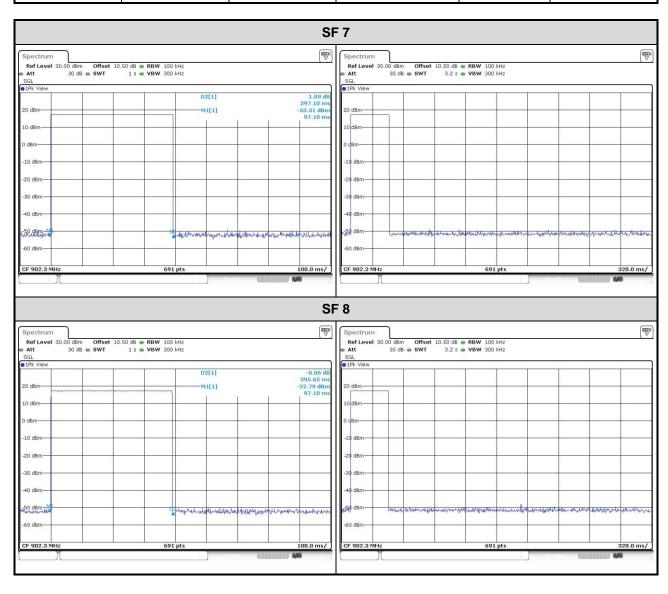


Report No.: FR730201-04 Page: 41 of 50



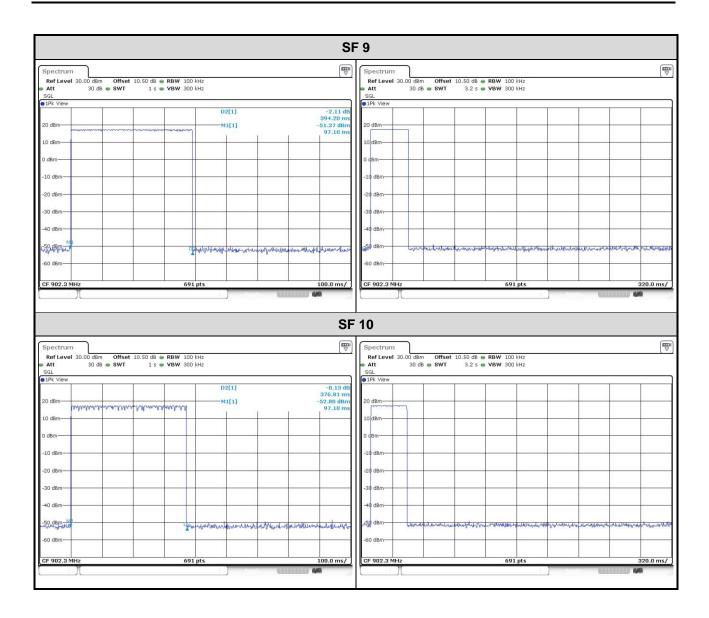
3.8.4 Test Result of Dwell Time

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



Report No.: FR730201-04 Page: 42 of 50

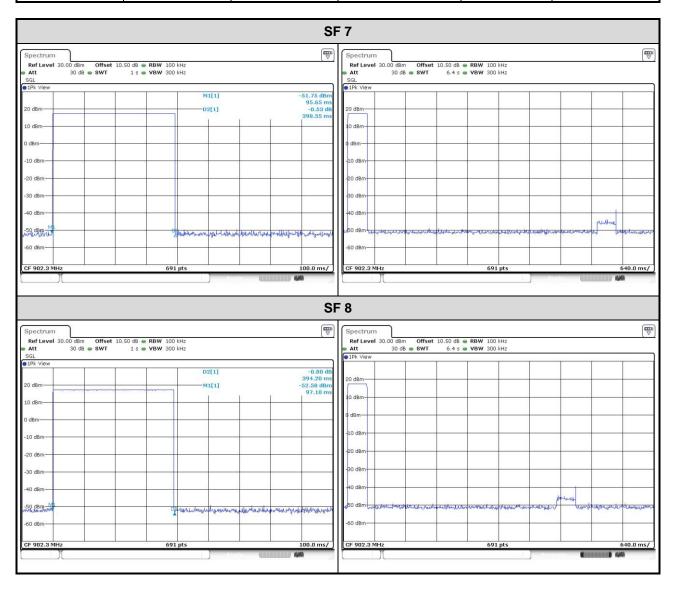




Report No.: FR730201-04 Page: 43 of 50

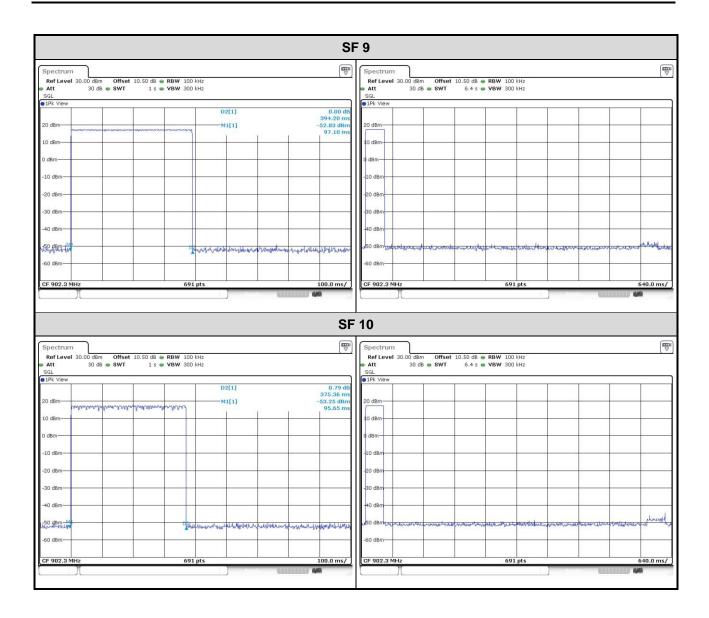


Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 6.4 s (16 Hopping*0.4s)	Result (s)	Limit (s)
CSS/7	902.3	0.398550	1	0.399	0.4
CSS/8	902.3	0.394200	1	0.394	0.4
CSS/9	902.3	0.934200	1	0.934	0.4
CSS / 10	902.3	0.375360	1	0.375	0.4



Report No.: FR730201-04 Page: 44 of 50

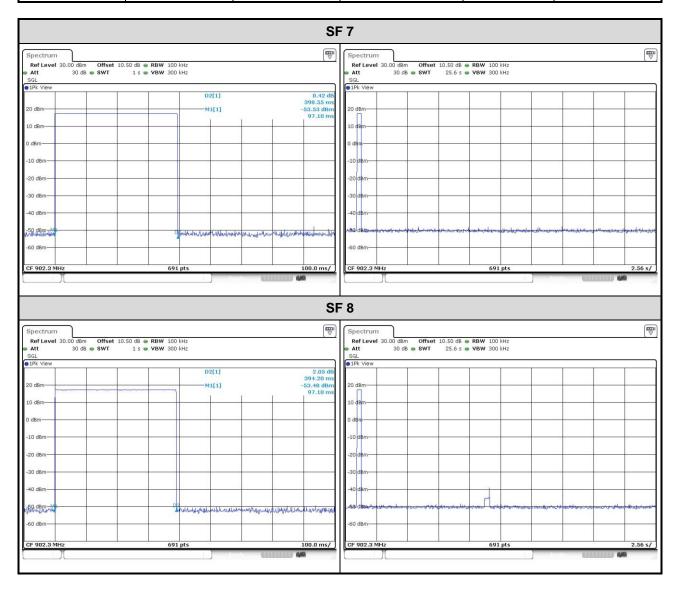




Report No.: FR730201-04 Page: 45 of 50

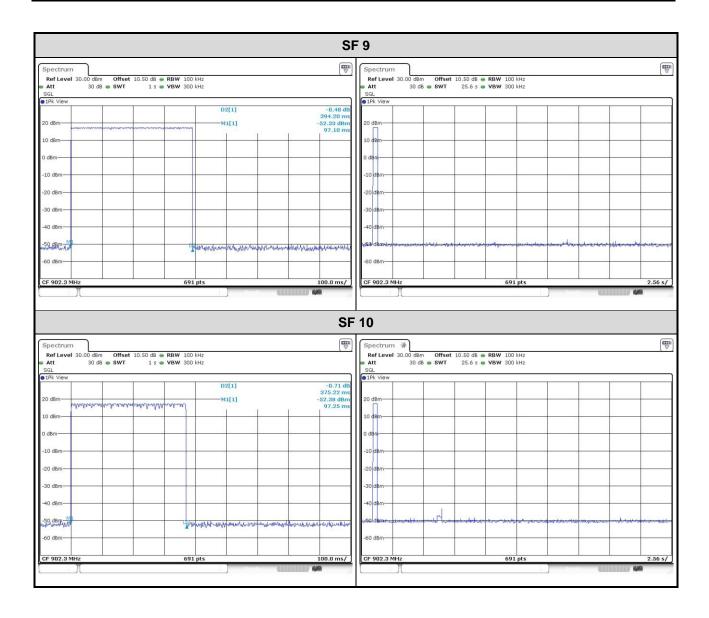


Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 25.6 s (64 Hopping*0.4s)	Result (s)	Limit (s)
CSS/7	902.3	0.398550	1	0.399	0.4
CSS/8	902.3	0.394200	1	0.394	0.4
CSS/9	902.3	0.394200	1	0.394	0.4
CSS / 10	902.3	0.375220	1	0.375	0.4



Report No.: FR730201-04 Page: 46 of 50





Report No.: FR730201-04 Page: 47 of 50



3.9 Power Spectral Density

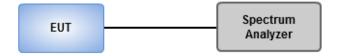
3.9.1 Limit of Power Spectral Density

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



Report No.: FR730201-04 Page: 48 of 50



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



Report No.: FR730201-04 Page: 49 of 50



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__

Report No.: FR730201-04 Page: 50 of 50