



RADIO TEST REPORT

Report No.: STS2106180W09

Issued for

Chengdu Just Do It Information and Technology Co., Ltd.
Rm 604&605, Unit 1, Building 2, No. 1, Section 1, Huafu Avenue, Huayang Street, Tianfu New District, Chengdu, China.

Product Name:	Bobcat IoT hotspot
Brand Name:	BOBCAT
Model Name:	Bobcat Miner 300
Series Model:	N/A
FCC ID:	2AZCKMINER300
IC:	27477-MINER300
Test Standard:	FCC Part 15.247 RSS-247 Issue 2, February 2017 RSS-Gen Issue 5 ,March 2019

Any reproduction of this document must be done in full. No single part of this document may be reproduced without permission from STS, all test data presented in this report is only applicable to presented test sample.



**TEST RESULT CERTIFICATION**

Applicant's Name: Chengdu Just Do It Information and Technology Co., Ltd.
Address: Rm 604&605, Unit 1, Building 2, No. 1, Section 1, Huafu Avenue,
Huayang Street, Tianfu New District, Chengdu, China.
Manufacturer's Name: Chengdu Just Do It Information and Technology Co., Ltd.
Address: Rm 604&605, Unit 1, Building 2, No. 1, Section 1, Huafu Avenue,
Huayang Street, Tianfu New District, Chengdu, China.

Product Description

Product Name: Bobcat IoT hotspot
Brand Name: BOBCAT
Model Name: Bobcat Miner 300
Series Model: N/A
Test Standards: FCC Part15.247
RSS-247 Issue 2, February 2017
RSS-Gen Issue 5, March 2019
Test Procedure: ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC/IC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of STS, this document may be altered or revised by STS, personal only, and shall be noted in the revision of the document.

Date of Test.....:

Date of receipt of test item.....: 25 June 2021
Date (s) of performance of tests.: 25 June 2021 ~ 26 July 2021
Date of Issue: 26 July 2021
Test Result: Pass

Testing Engineer :

(Chris Chen)

Technical Manager :

(Sean she)

Authorized Signatory :

(Vita Li)





Table of Contents	Page
1. SUMMARY OF TEST RESULTS	6
1.1 TEST FACTORY	7
1.2 MEASUREMENT UNCERTAINTY	7
2. GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF THE EUT	8
2.2 DESCRIPTION OF THE TEST MODES	10
2.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING	10
2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.6 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS	12
2.7 EQUIPMENTS LIST	13
3. EMC EMISSION TEST	15
3.1 CONDUCTED EMISSION MEASUREMENT	15
3.2 RADIATED EMISSION MEASUREMENT	19
4. CONDUCTED SPURIOUS & BAND EDGE EMISSION	32
4.1 LIMIT	32
4.2 TEST PROCEDURE	32
4.3 TEST SETUP	33
4.4 EUT OPERATION CONDITIONS	33
4.5 TEST RESULTS	34
5. NUMBER OF HOPPING CHANNEL	39
5.1 LIMIT	39
5.2 TEST PROCEDURE	39
5.3 TEST SETUP	39
5.4 EUT OPERATION CONDITIONS	39
5.5 TEST RESULTS	40
6. AVERAGE TIME OF OCCUPANCY	41
6.1 LIMIT	41
6.2 TEST PROCEDURE	41
6.3 TEST SETUP	41
6.4 EUT OPERATION CONDITIONS	41
6.5 TEST RESULTS	42
7. HOPPING CHANNEL SEPARATION MEASUREMENT	46
7.1 LIMIT	46



Table of Contents	Page
7.2 TEST PROCEDURE	46
7.3 TEST SETUP	46
7.4 EUT OPERATION CONDITIONS	46
7.5 TEST RESULTS	47
8. BANDWIDTH TEST	49
8.1 LIMIT	49
8.2 TEST PROCEDURE	49
8.3 TEST SETUP	49
8.4 EUT OPERATION CONDITIONS	49
8.5 TEST RESULTS	50
9. OUTPUT POWER TEST	52
9.1 LIMIT	52
9.2 TEST PROCEDURE	52
9.3 TEST SETUP	53
9.4 EUT OPERATION CONDITIONS	53
9.5 TEST RESULTS	54
10. ANTENNA REQUIREMENT	55
10.1 STANDARD REQUIREMENT	55
10.2 EUT ANTENNA	55
11. FREQUENCY STABILITY	56
11.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT	56
11.2 TEST PROCEDURE	56
11.3 TEST RESULT	56

**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	26 July 2021	STS2106180W09	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02.

FCC Part 15.247, Subpart C RSS-247 Issue 2			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen (8.8&7.2)	Conducted Emission	PASS	--
15.247(a)(1) RSS-247 (5.1)	Hopping Channel Separation	PASS	--
15.247 (b)(2) RSS-247 (5.4)	Output Power	PASS	--
15.209 RSS-247 (5.5)	Radiated Spurious Emission	PASS	--
15.247(d) RSS-247 (5.5)	Conducted Spurious & Band Edge Emission	PASS	--
15.247(a)(1)(i) RSS-247 (5.1)	Number of Hopping Frequency	PASS	--
15.247(a)(1)(i) RSS-247 (5.1)	Dwell Time	PASS	--
15.247(a)(1) RSS-247 (5.1) RSS-Gen (6.7)	20dB Bandwidth 99% Bandwidth	PASS	--
15.205 RSS-Gen (8.9&8.10)	Restricted bands of operation	PASS	--
Part 15.247(d)/part 15.209(a) RSS-247 (5.5)	Band Edge Emission	PASS	--
15.203 RSS-Gen (6.8)	Antenna Requirement	PASS	--
RSS-Gen (6.11&8.11)	Frequency Stability	PASS	--

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report.
- (2) All tests are according to ANSI C63.10-2013.



1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

No.	Item	Uncertainty
1	RF output power, conducted	$\pm 0.68\text{dB}$
2	Unwanted Emissions, conducted	$\pm 2.988\text{dB}$
3	All emissions, radiated 9K-30MHz	$\pm 2.84\text{dB}$
4	All emissions, radiated 30M-1GHz	$\pm 4.39\text{dB}$
5	All emissions, radiated 1G-6GHz	$\pm 5.10\text{dB}$
6	All emissions, radiated >6G	$\pm 5.48\text{dB}$
7	Conducted Emission (9KHz-150KHz)	$\pm 2.79\text{dB}$
8	Conducted Emission (150KHz-30MHz)	$\pm 2.80\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name/PMN	Bobcat IoT hotspot
Trade Name	BOBCAT
Model Name/HVIN	Bobcat Miner 300
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 2.
Frequency	902.3 – 915.1MHz(200KHz)
Modulation Type	LongFi
Antenna	Please refer to the Note 3.
Adapter	Model: AD012A120100UV Input: 100-240V~ 50/60Hz 0.4A Max Output: DC 12V 1A Model: PS120W1000U Input: 100-240V~ 50/60Hz 0.5A Max Output: DC 12V 1A
Battery	Rated Voltage: 3V Capacity: 40mAh
Hardware version number	G285-V1.0
Software version number/FVIN	2019.11.06.0
Serial Numbers	285US915U212800001
Connecting I/O Port(s)	Please refer to the Note 1.

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.



2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	902.3	23	906.7	45	911.1
02	902.5	24	906.9	46	911.3
03	902.7	25	907.1	47	911.5
04	902.9	26	907.3	48	911.7
05	903.1	27	907.5	49	911.9
06	903.3	28	907.7	50	912.1
07	903.5	29	907.9	51	912.3
08	903.7	30	908.1	52	912.5
09	903.9	31	908.3	53	912.7
10	904.1	32	908.5	54	912.9
11	904.3	33	908.7	55	913.1
12	904.5	34	908.9	56	913.3
13	904.7	35	909.1	57	913.5
14	904.9	36	909.3	58	913.7
15	905.1	37	909.5	59	913.9
16	905.3	38	909.7	60	914.1
17	905.5	39	909.9	61	914.3
18	905.7	40	910.1	62	914.5
19	905.9	41	910.3	63	914.7
20	906.1	42	910.5	64	914.9
21	906.3	43	910.7	65	915.1
22	906.5	44	910.9		

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	BOBCAT	Bobcat Miner 300	External	N/A	4dBi	BT Antenna

Note: The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report.



2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate/Modulation
Mode 1	TX CH01	1Mbps/LongFi
Mode 2	TX CH32	1Mbps/LongFi
Mode 3	TX CH65	1Mbps/LongFi
Mode 4	Hopping	LongFi

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

(2) We have been tested for all available U.S. voltage and frequencies (For 120V, 50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/60Hz is shown in the report.

(3) The battery is fully-charged during the radiated and RF conducted test.

For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 5: Keeping TX

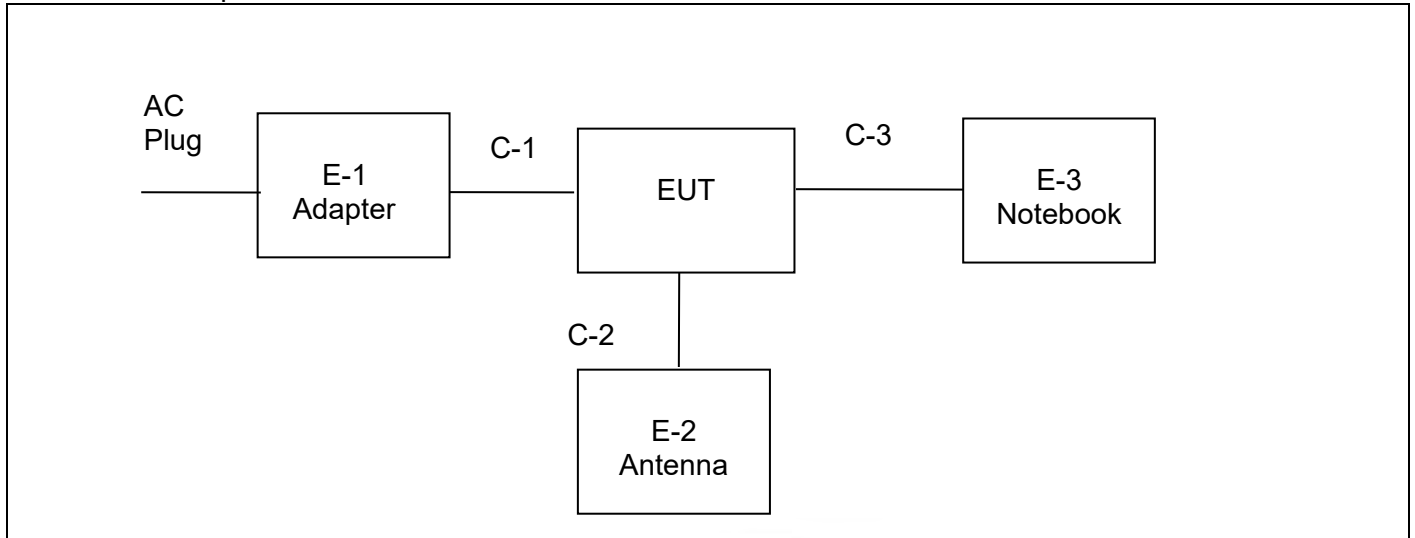
2.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

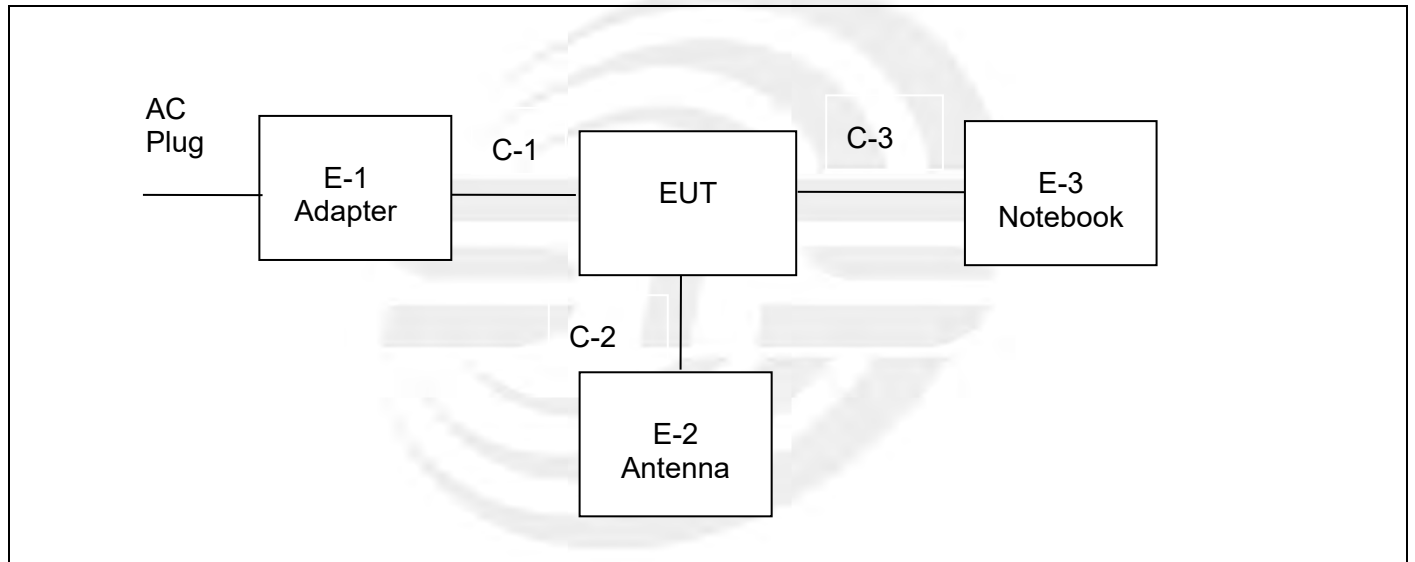
RF Function	Type	Mode Or Modulation type	Ant Gain (dBi)	Power Class	Software For Testing
Other SRD	902M-928M	LongFi	4	Default	SecureCRTPortable

2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test





2.6 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
E-1	Adapter	N/A	AD012A120100UV	N/A	N/A
E-2	Antenna	N/A	N/A	N/A	N/A
C-1	DC Cable	N/A	N/A	155cm	NO
C-2`	Signal Cable	N/A	N/A	100CM	NO

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
E-3	Notebook	LENOVO	ThinkPad E470	N/A	N/A
C-3	USB Cable	N/A	N/A	80cm	NO

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (2) “YES” is means “with core”; “NO” is means “without core”.



2.7 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11
Signal Analyzer	R&S	FSV 40-N	101823	2020.10.10	2021.10.09
Active loop Antenna	ZHINAN	ZN30900C	16035	2021.04.11	2023.04.10
Bilog Antenna	TESEQ	CBL6111D	34678	2020.10.12	2022.10.11
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2019.10.15	2021.10.14
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2020.10.12	2022.10.11
Pre-Amplifier (0.1M-3GHz)	EM	EM330	060665	2020.10.12	2021.10.11
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2020.10.12	2021.10.11
Pre-Amplifier (18G-40GHz)	SKET	LNPA-1840-50	SK2018101801	2020.10.10	2021.10.09
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11
LISN	R&S	ENV216	101242	2020.10.12	2021.10.11
LISN	EMCO	3810/2NM	23625	2020.10.12	2021.10.11
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 CE)			



RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Power Sensor	Keysight	U2021XA	MY55520005	2020.10.10	2021.10.09
			MY55520006	2020.10.10	2021.10.09
			MY56120038	2020.10.10	2021.10.09
			MY56280002	2020.10.10	2021.10.09
Signal Analyzer	Agilent	N9020A	MY51110105	2021.03.04	2022.03.03
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			





3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

FREQUENCY (MHz)	Conducted Emissionlimit (dBUV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of “ * ” marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

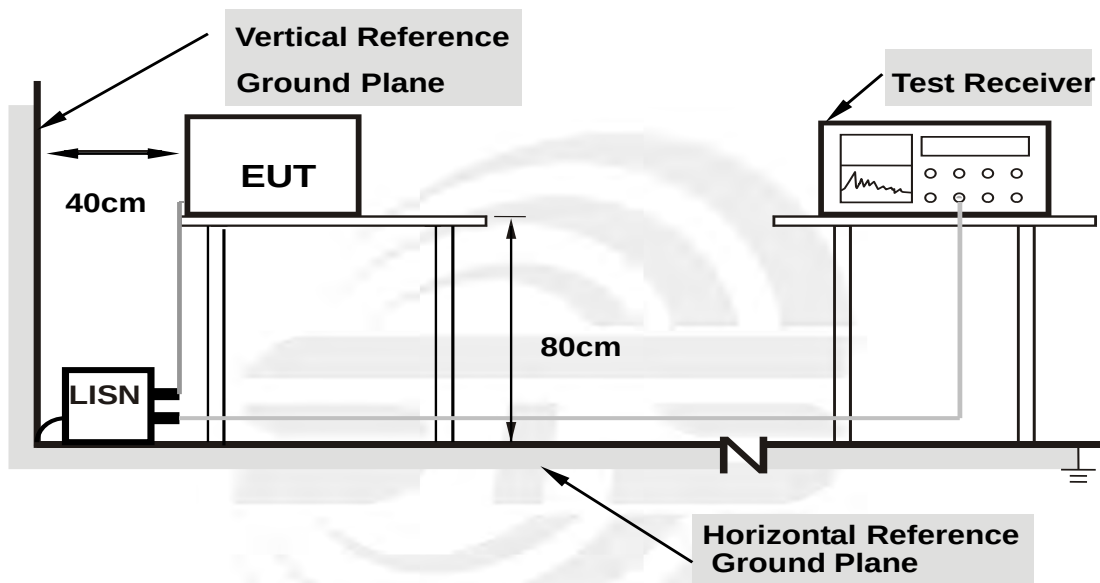
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN is at least 80 cm from the nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

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 support units.

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



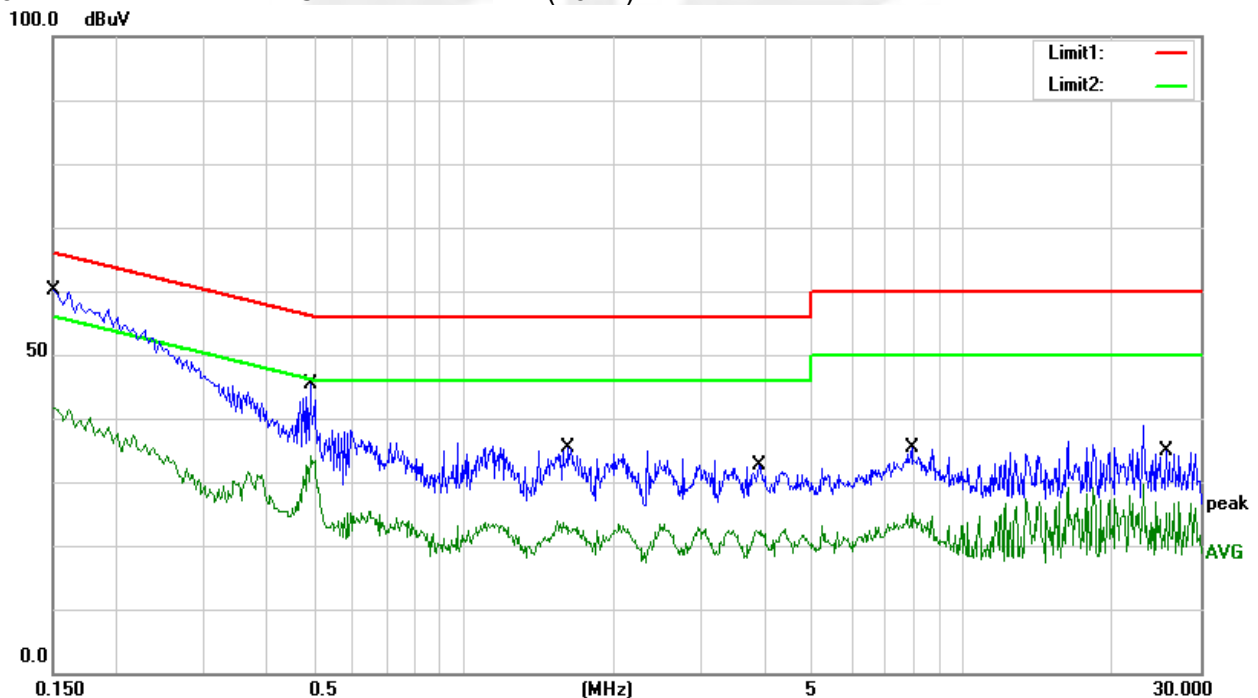
3.1.5 TEST RESULT

Temperature:	26.2(C)	Relative Humidity:	53%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 5		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	39.90	20.33	60.23	66.00	-5.77	QP
2	0.1500	21.37	20.33	41.70	56.00	-14.30	AVG
3	0.4940	24.73	20.54	45.27	56.10	-10.83	QP
4	0.4940	13.50	20.54	34.04	46.10	-12.06	AVG
5	1.6220	15.02	20.30	35.32	56.00	-20.68	QP
6	1.6220	2.74	20.30	23.04	46.00	-22.96	AVG
7	3.9140	12.20	20.40	32.60	56.00	-23.40	QP
8	3.9140	2.02	20.40	22.42	46.00	-23.58	AVG
9	7.9260	14.66	20.78	35.44	60.00	-24.56	QP
10	7.9260	4.29	20.78	25.07	50.00	-24.93	AVG
11	25.6940	12.19	22.65	34.84	60.00	-25.16	QP
12	25.6940	2.42	22.65	25.07	50.00	-24.93	AVG

Remark:

1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result = Reading + Factor)-Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)





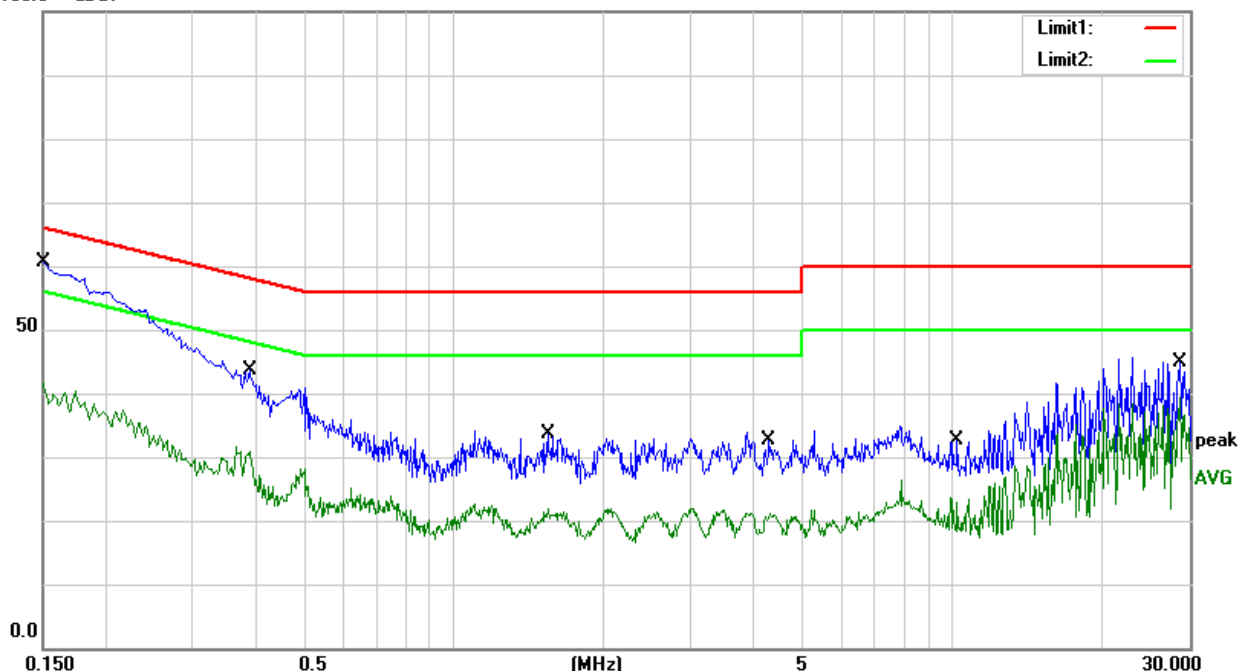
Temperature:	26.2(C)	Relative Humidity:	53%RH
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 5		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	40.40	20.33	60.73	66.00	-5.27	QP
2	0.1500	21.36	20.33	41.69	56.00	-14.31	AVG
3	0.3900	22.95	20.56	43.51	58.06	-14.55	QP
4	0.3900	9.82	20.56	30.38	48.06	-17.68	AVG
5	1.5500	13.34	20.30	33.64	56.00	-22.36	QP
6	1.5500	0.19	20.30	20.49	46.00	-25.51	AVG
7	4.3140	12.31	20.42	32.73	56.00	-23.27	QP
8	4.3140	0.24	20.42	20.66	46.00	-25.34	AVG
9	10.2460	11.36	21.23	32.59	60.00	-27.41	QP
10	10.2460	1.69	21.23	22.92	50.00	-27.08	AVG
11	28.6860	22.03	22.85	44.88	60.00	-15.12	QP
12	28.6860	3.47	22.85	26.32	50.00	-23.68	AVG

Remark:

1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result = Reading + Factor) - Limit
3. Factor = LISN factor + Cable loss + Limiter (10dB)

100.0 dBuV





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205 (a)&209(a), RSS-Gen Issue 5 and RSS-247 Issue 2, February 2017 (5.5) limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

FCC:

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			



IC:

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		



For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AV
Start Frequency	9 KHz/150KHz(Peak/QP/AV)
Stop Frequency	150KHz/30MHz(Peak/QP/AV)
RB / VB (emission in restricted band)	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz); 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz(Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted band)	120 KHz / 300 KHz

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

For Radited Band edge

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 890 to 905 MHz Upper Band Edge: 910 to 940 MHz
RB / VB	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)



Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

- The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m (above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.
- If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

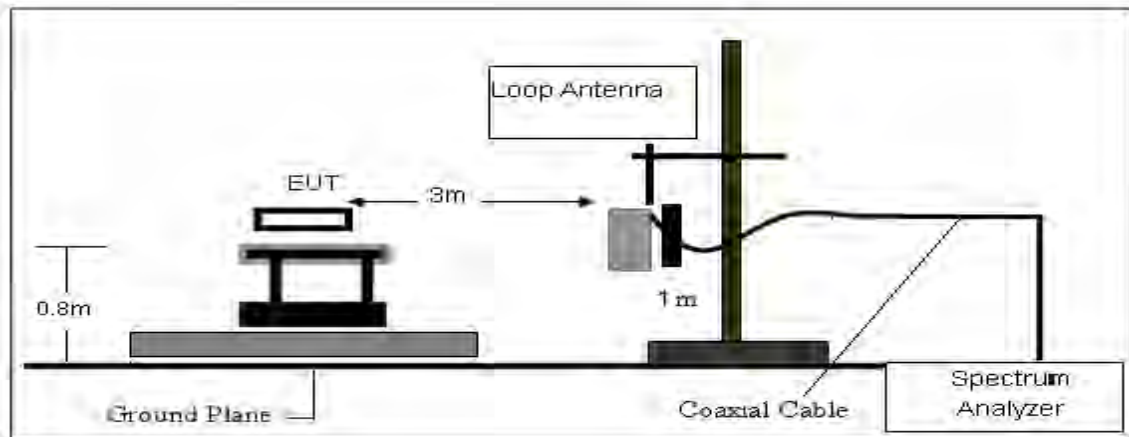
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.3 DEVIATION FROM TEST STANDARD

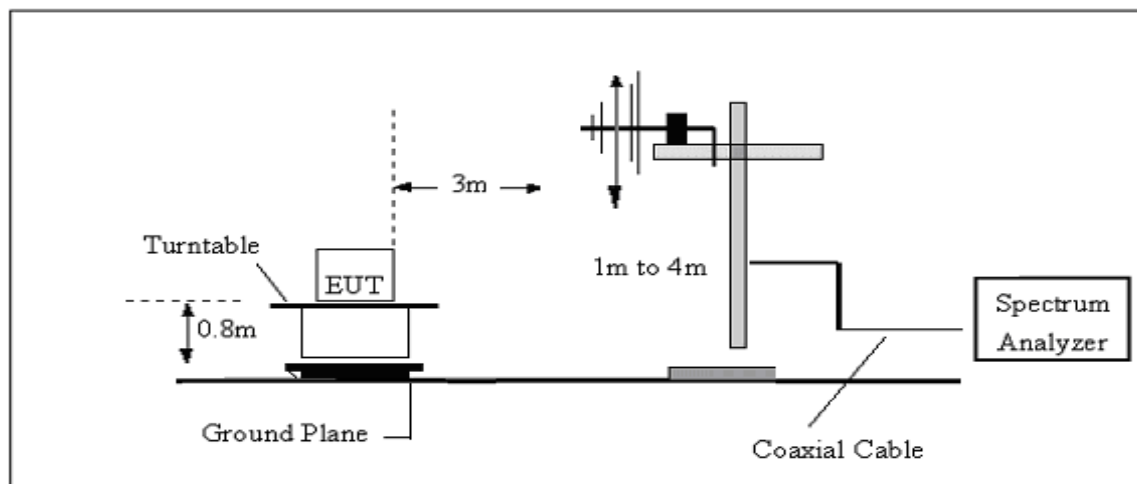
No deviation.

3.2.4 TESTSETUP

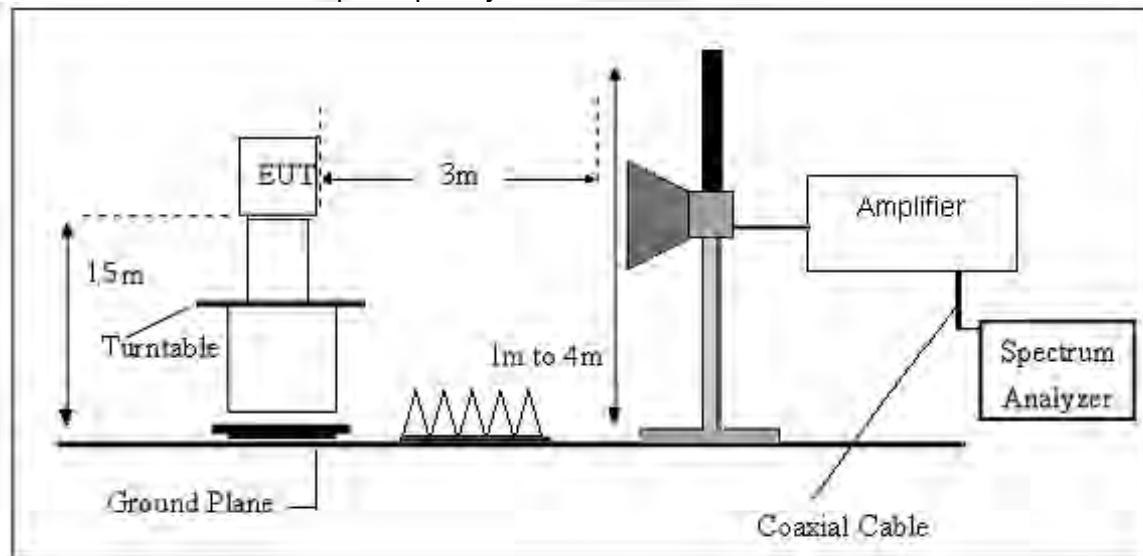
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$



3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	DC 12V	Test Mode:	TX Mode

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	
--	--	--	--	--	PASS
--	--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.



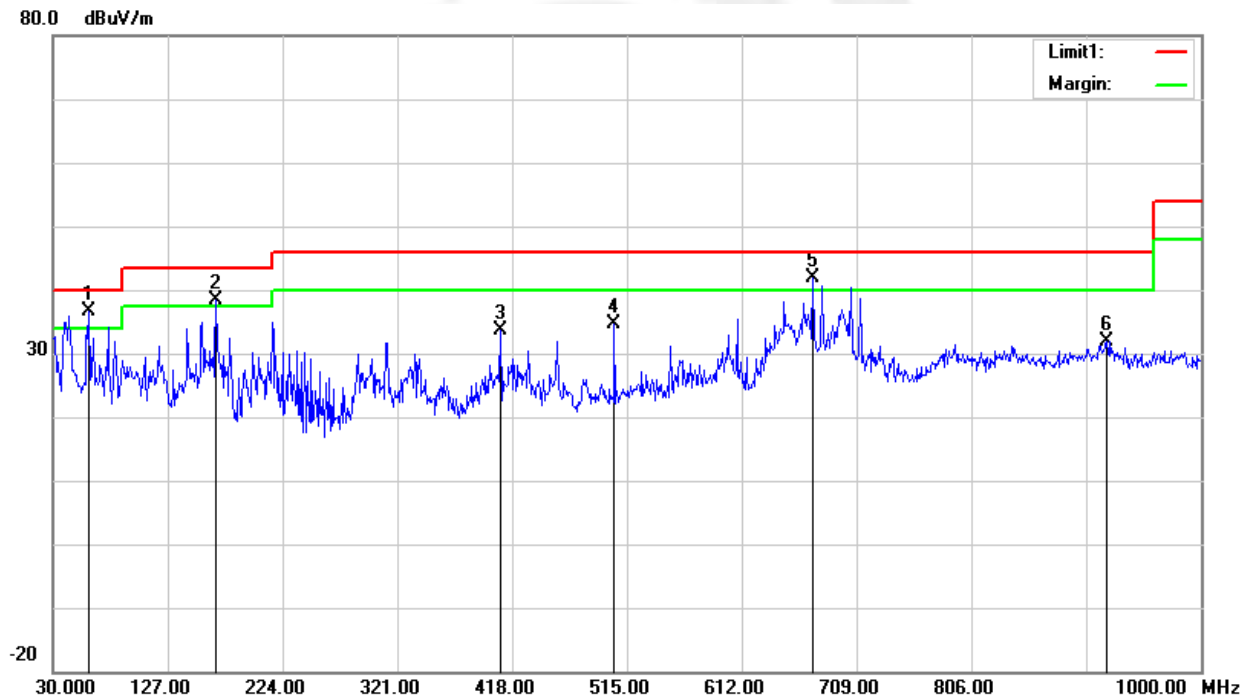
(30MHz-1000MHz)

Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	DC 12V	Phase:	Horizontal
Test Mode:	Mode 1/2/3 (Mode 2 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	60.0700	62.51	-25.86	36.65	40.00	-3.35	QP
2	167.7400	57.97	-19.58	38.39	43.50	-5.11	QP
3	408.3000	44.38	-10.66	33.72	46.00	-12.28	QP
4	504.3300	42.49	-7.98	34.51	46.00	-11.49	QP
5	672.1400	46.40	-4.52	41.88	46.00	-4.12	QP
6	920.4600	31.91	0.00	31.91	46.00	-14.09	QP

Remark:

- Margin = Result (Result = Reading + Factor) - Limit
- Factor = Antenna factor + Cable attenuation factor (cable loss) - Amplifier gain





Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	DC 12V	Phase:	Vertical
Test Mode:	Mode 1/2/3 (Mode 2 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	60.0700	61.15	-25.86	35.29	40.00	-4.71	QP
2	119.2400	48.19	-18.38	29.81	43.50	-13.69	QP
3	299.6600	51.12	-14.82	36.30	46.00	-9.70	QP
4	593.5700	41.73	-5.83	35.90	46.00	-10.10	QP
5	650.8000	43.48	-4.90	38.58	46.00	-7.42	QP
6	986.4200	30.52	2.27	32.79	54.00	-21.21	QP

Remark:

1. Margin = Result (Result = Reading + Factor) - Limit
2. Factor = Antenna factor + Cable attenuation factor (cable loss) - Amplifier gain





(1GHz~25GHz) Spurious emission Requirements

Frequency	Meter Reading	Amplifier	Loss	Antenna Factor	Corrected Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBμV)	(dB)	(dB)	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	
Low Channel (LongFi/902.3 MHz)										
3258.67	61.79	44.70	6.70	28.20	-9.80	51.99	74.00	-22.01	PK	Vertical
3258.67	50.33	44.70	6.70	28.20	-9.80	40.53	54.00	-13.47	AV	Vertical
3258.62	62.09	44.70	6.70	28.20	-9.80	52.29	74.00	-21.71	PK	Horizontal
3258.62	51.30	44.70	6.70	28.20	-9.80	41.50	54.00	-12.50	AV	Horizontal
4795.36	59.27	44.20	9.04	31.60	-3.56	55.71	74.00	-18.29	PK	Vertical
4795.36	49.55	44.20	9.04	31.60	-3.56	45.99	54.00	-8.01	AV	Vertical
4795.38	58.66	44.20	9.04	31.60	-3.56	55.10	74.00	-18.90	PK	Horizontal
4795.38	49.32	44.20	9.04	31.60	-3.56	45.76	54.00	-8.24	AV	Horizontal
5349.59	49.29	44.20	9.86	32.00	-2.34	46.95	74.00	-27.05	PK	Vertical
5349.59	39.79	44.20	9.86	32.00	-2.34	37.45	54.00	-16.55	AV	Vertical
5349.54	47.79	44.20	9.86	32.00	-2.34	45.45	74.00	-28.55	PK	Horizontal
5349.54	38.81	44.20	9.86	32.00	-2.34	36.47	54.00	-17.53	AV	Horizontal
7192.21	54.34	43.50	11.40	35.50	3.40	57.74	74.00	-16.26	PK	Vertical
7192.21	44.78	43.50	11.40	35.50	3.40	48.18	54.00	-5.82	AV	Vertical
7192.16	54.81	43.50	11.40	35.50	3.40	58.21	74.00	-15.79	PK	Horizontal
7192.16	43.78	43.50	11.40	35.50	3.40	47.18	54.00	-6.82	AV	Horizontal
Middle Channel (LongFi/908.5 MHz)										
3280.93	61.64	44.70	6.70	28.20	-9.80	51.84	74.00	-22.16	PK	Vertical
3280.93	51.12	44.70	6.70	28.20	-9.80	41.32	54.00	-12.68	AV	Vertical
3281.03	61.96	44.70	6.70	28.20	-9.80	52.16	74.00	-21.84	PK	Horizontal
3281.03	51.06	44.70	6.70	28.20	-9.80	41.26	54.00	-12.74	AV	Horizontal
4906.69	59.50	44.20	9.04	31.60	-3.56	55.94	74.00	-18.06	PK	Vertical
4906.69	50.24	44.20	9.04	31.60	-3.56	46.68	54.00	-7.32	AV	Vertical
4906.90	58.57	44.20	9.04	31.60	-3.56	55.01	74.00	-18.99	PK	Horizontal
4906.90	49.58	44.20	9.04	31.60	-3.56	46.02	54.00	-7.98	AV	Horizontal
5386.50	49.14	44.20	9.86	32.00	-2.34	46.80	74.00	-27.20	PK	Vertical
5386.50	40.30	44.20	9.86	32.00	-2.34	37.96	54.00	-16.04	AV	Vertical
5386.53	47.28	44.20	9.86	32.00	-2.34	44.94	74.00	-29.06	PK	Horizontal
5386.53	39.45	44.20	9.86	32.00	-2.34	37.11	54.00	-16.89	AV	Horizontal
7360.43	53.90	43.50	11.40	35.50	3.40	57.30	74.00	-16.70	PK	Vertical
7360.43	44.07	43.50	11.40	35.50	3.40	47.47	54.00	-6.53	AV	Vertical
7360.41	54.25	43.50	11.40	35.50	3.40	57.65	74.00	-16.35	PK	Horizontal
7360.41	44.06	43.50	11.40	35.50	3.40	47.46	54.00	-6.54	AV	Horizontal



High Channel (LongFi/915.1 MHz)										
3304.96	62.24	44.70	6.70	28.20	-9.80	52.44	74.00	-21.56	PK	Vertical
3304.96	51.52	44.70	6.70	28.20	-9.80	41.72	54.00	-12.28	AV	Vertical
3304.81	61.83	44.70	6.70	28.20	-9.80	52.03	74.00	-21.97	PK	Horizontal
3304.81	51.28	44.70	6.70	28.20	-9.80	41.48	54.00	-12.52	AV	Horizontal
5021.45	58.55	44.20	9.04	31.60	-3.56	54.99	74.00	-19.01	PK	Vertical
5021.45	49.70	44.20	9.04	31.60	-3.56	46.14	54.00	-7.86	AV	Vertical
5021.45	59.55	44.20	9.04	31.60	-3.56	55.99	74.00	-18.01	PK	Horizontal
5021.45	50.59	44.20	9.04	31.60	-3.56	47.03	54.00	-6.97	AV	Horizontal
5425.46	48.51	44.20	9.86	32.00	-2.34	46.17	74.00	-27.83	PK	Vertical
5425.46	39.26	44.20	9.86	32.00	-2.34	36.92	54.00	-17.08	AV	Vertical
5425.67	48.27	44.20	9.86	32.00	-2.34	45.93	74.00	-28.07	PK	Horizontal
5425.67	39.46	44.20	9.86	32.00	-2.34	37.12	54.00	-16.88	AV	Horizontal
7531.23	53.71	43.50	11.40	35.50	3.40	57.11	74.00	-16.89	PK	Vertical
7531.23	44.37	43.50	11.40	35.50	3.40	47.77	54.00	-6.23	AV	Vertical
7531.18	54.32	43.50	11.40	35.50	3.40	57.72	74.00	-16.28	PK	Horizontal
7531.18	43.91	43.50	11.40	35.50	3.40	47.31	54.00	-6.69	AV	Horizontal

Note:

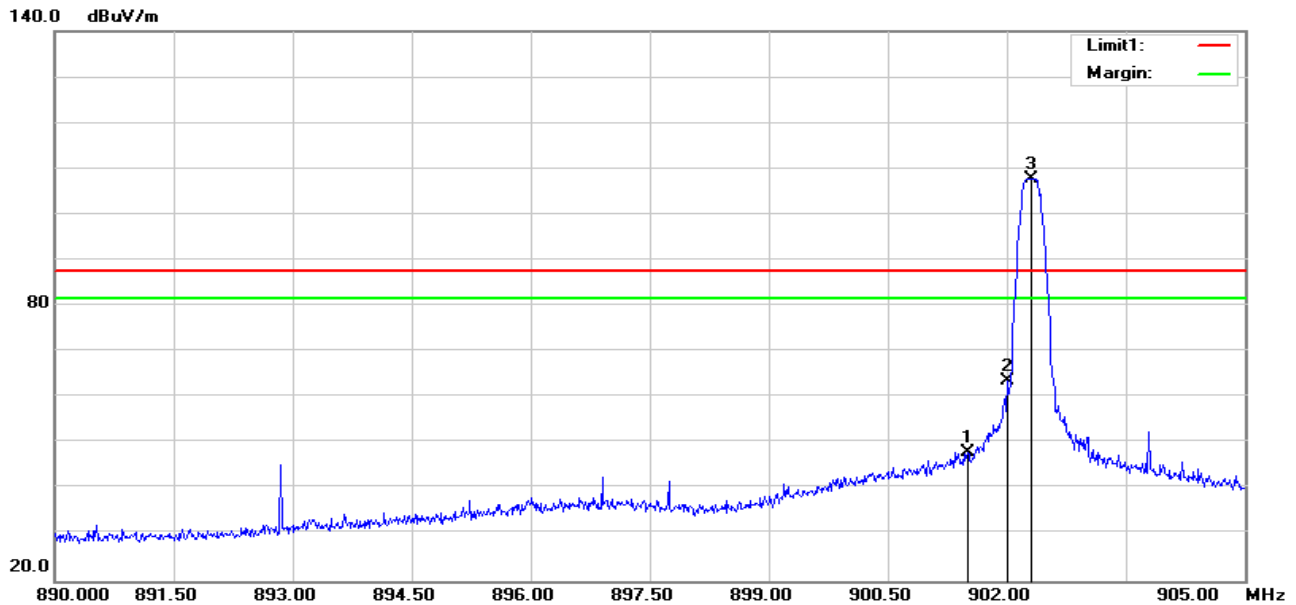
1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

2) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

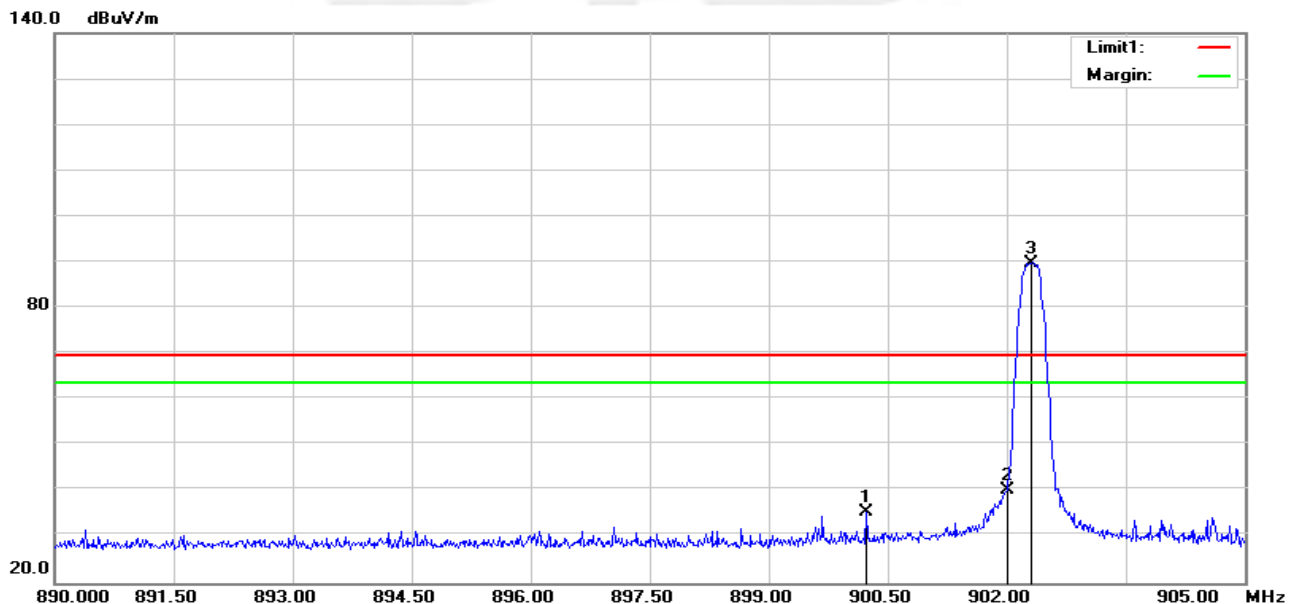


Radited Band edge Requirements

Low
Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	901.5050	48.53	-0.41	48.12	87.64	-39.52	peak
2	902.0000	64.17	-0.40	63.77	87.64	-23.87	peak
3	902.3000	108.03	-0.39	107.64	/	/	peak

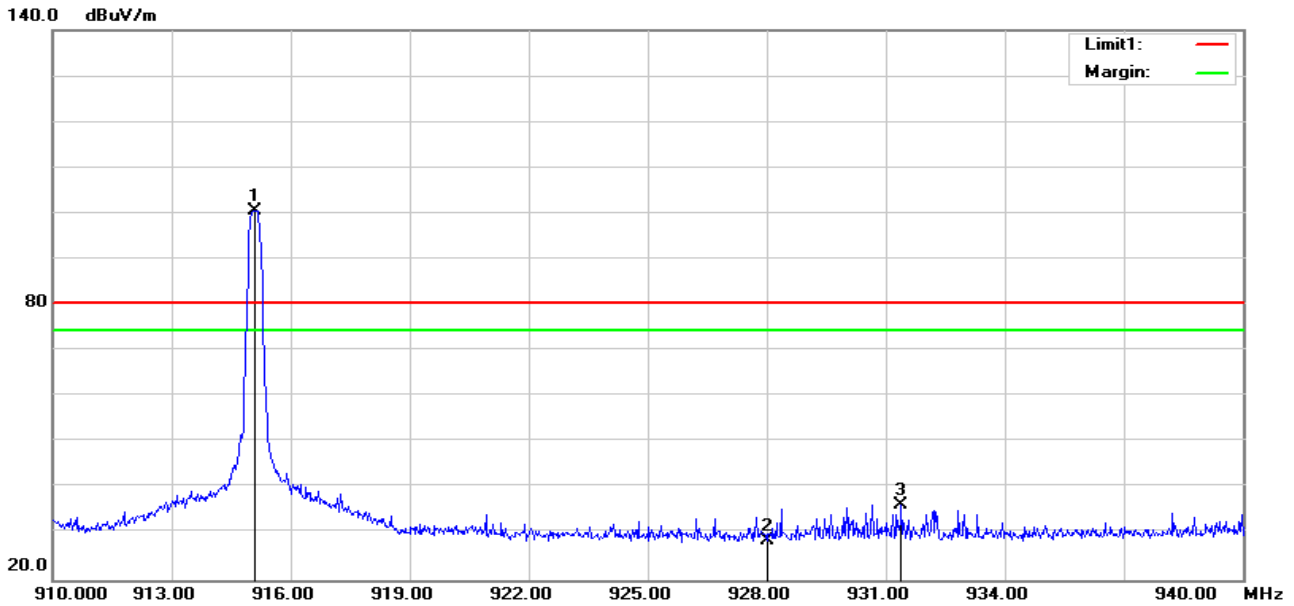
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	900.2300	35.93	-0.44	35.49	69.65	-34.16	peak
2	902.0000	40.64	-0.40	40.24	69.65	-29.41	peak
3	902.3000	90.04	-0.39	89.65	/	/	peak

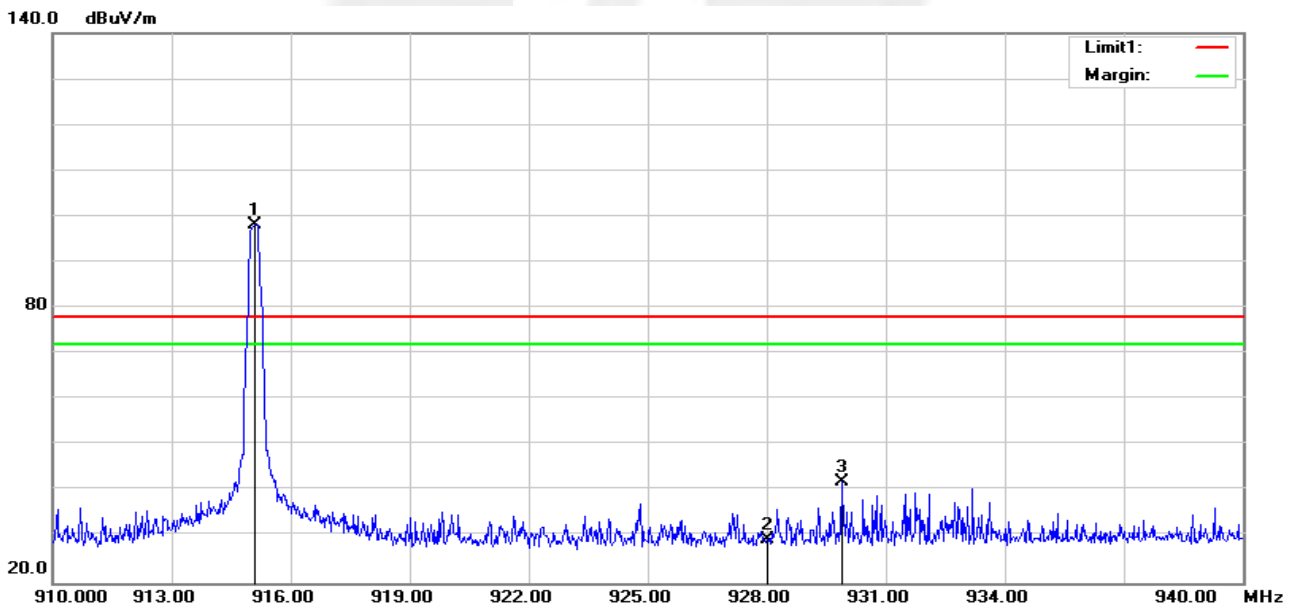


High Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	915.1000	100.62	-0.10	100.52	/	/	peak
2	928.0000	28.17	0.43	28.60	80.52	-51.92	peak
3	931.3900	35.71	0.67	36.38	80.52	-44.14	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	915.1000	98.18	-0.10	98.08	/	/	peak
2	928.0000	29.15	0.43	29.58	78.08	-48.50	peak
3	929.8900	41.49	0.53	42.02	78.08	-36.06	peak

Note: LongFi of the nohopping and hopping mode all have been test, the worst case is LongFi of the nohopping mode, this report only show the worst case.



4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 LIMIT

According to FCC section 15.247(d)&RSS-247 Issue 2, February 2017 (5.5), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 880 – 910 MHz Upper Band Edge: 910 – 940 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Hopping Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 900– 915 MHz Upper Band Edge: 925 – 950 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

4.3 TEST SETUP



The EUT is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

4.4 EUT OPERATION CONDITIONS

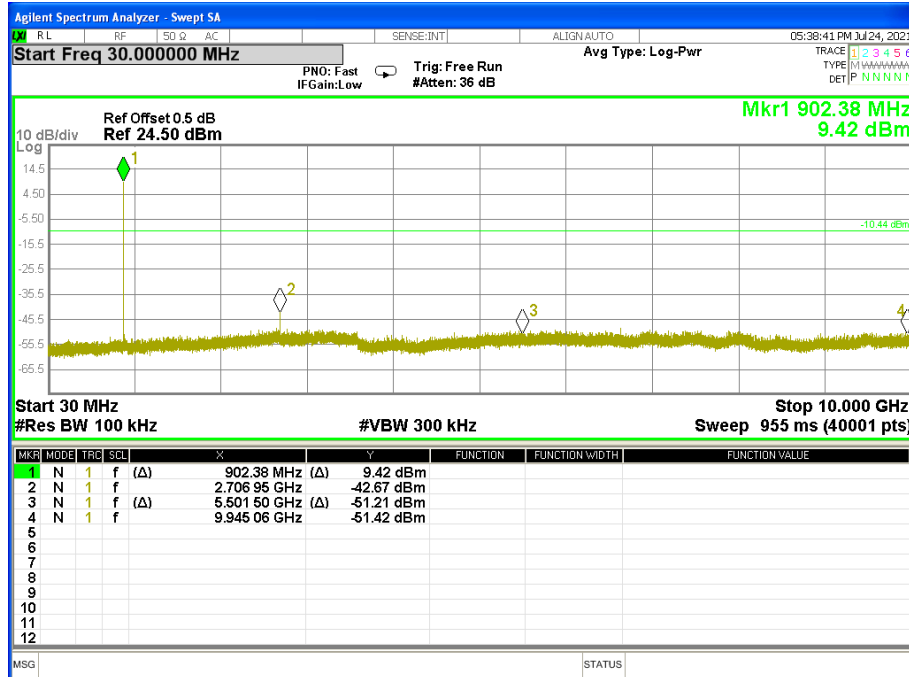
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



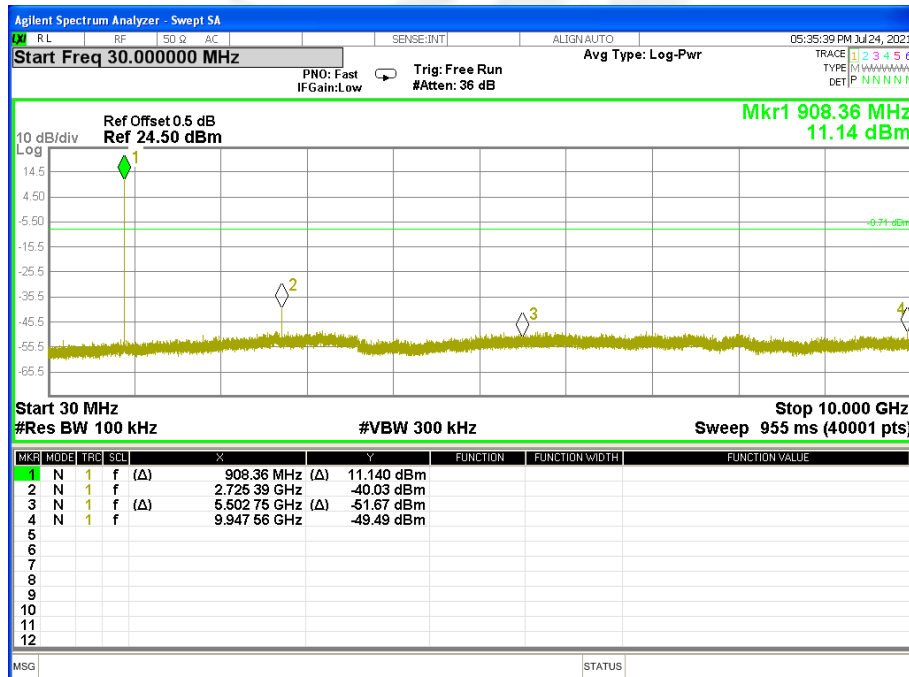
4.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	LongFi(1Mbps)-01/35/65 CH	Test Voltage:	DC 12V

01 CH

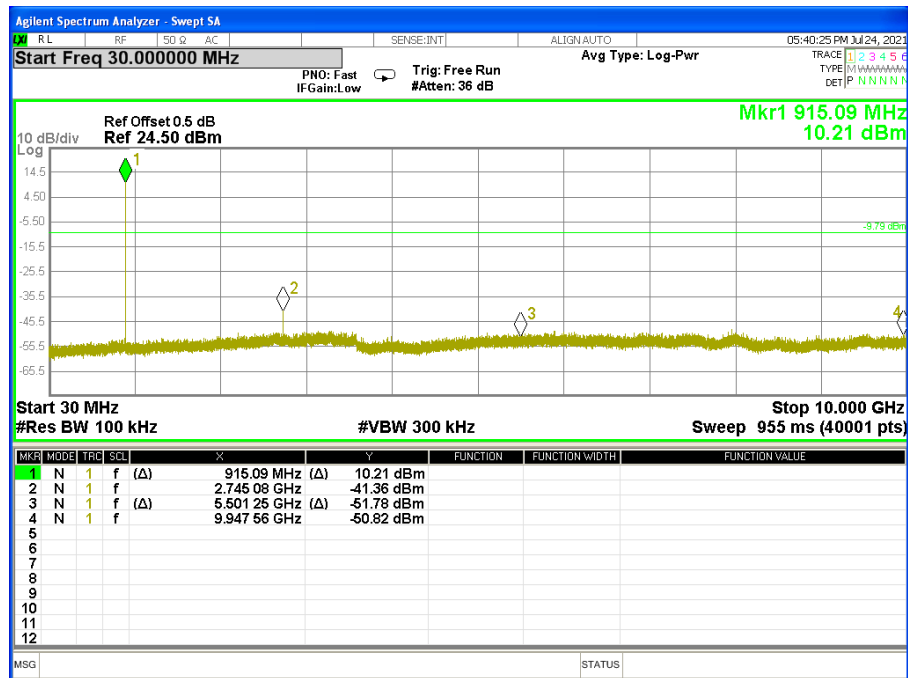


32 CH





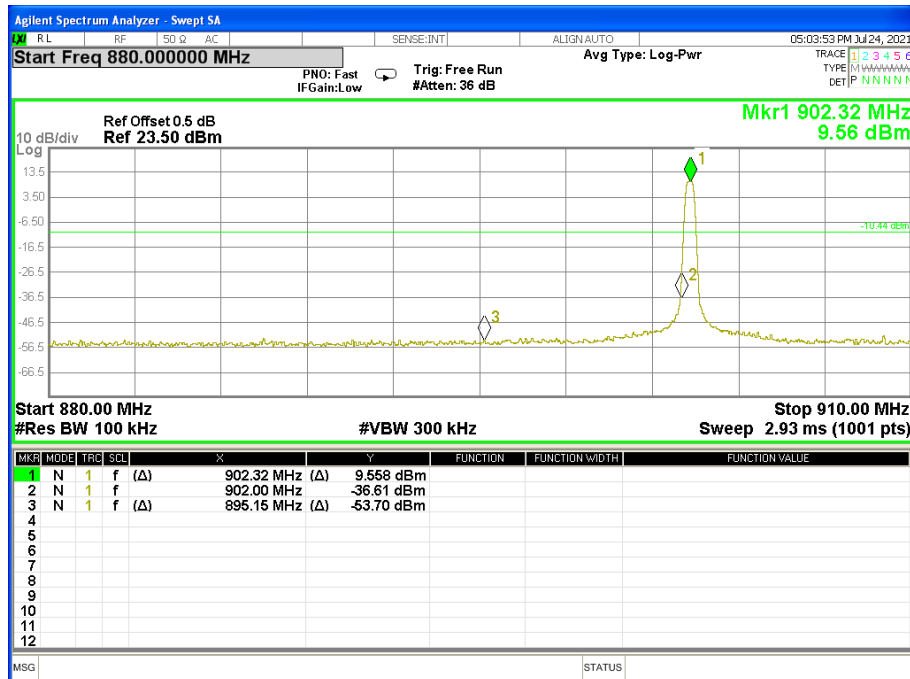
65 CH



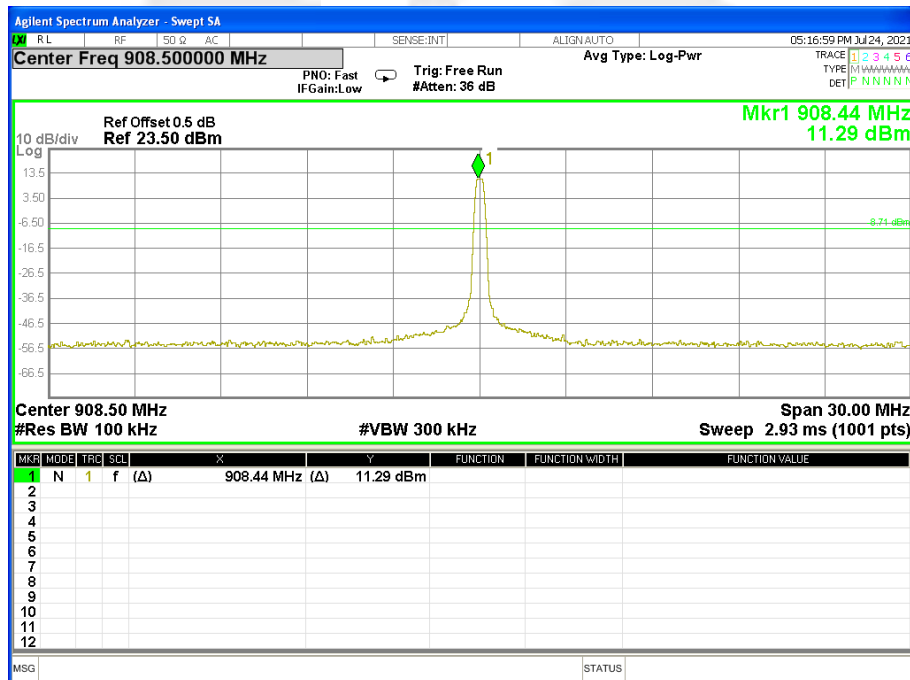


For Band edge(it's also the reference level for conducted spurious emission)

01 CH



32 CH

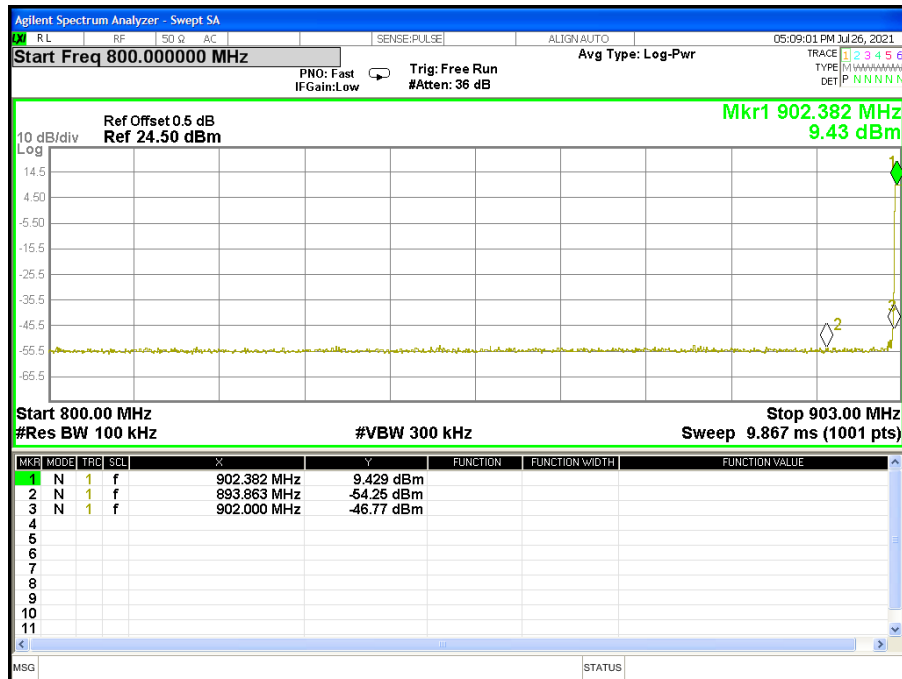


Page 37 of 57



For Hopping Band edge

01 CH



65 CH





5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100KHz
VB	300KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



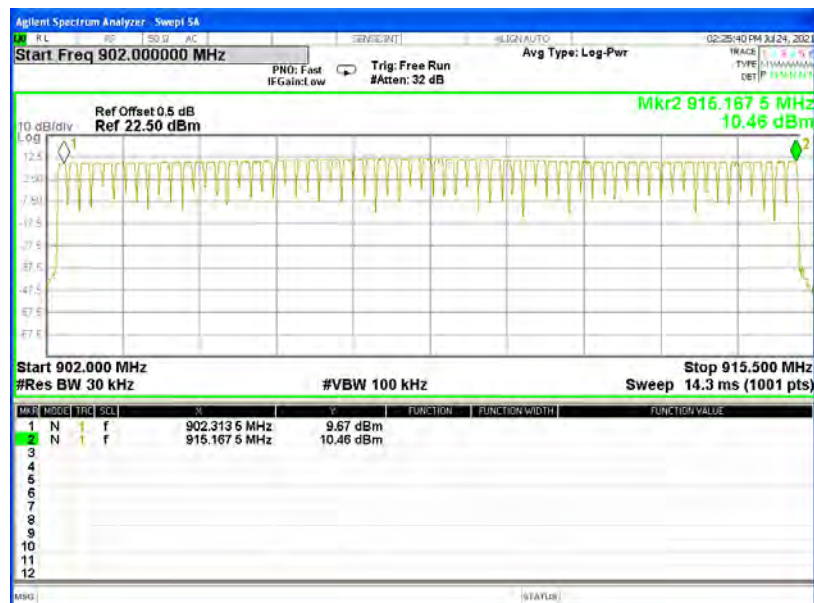
5.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Mode:	Hopping Mode -LongFi Mode	Test Voltage:	DC 12V

Number of Hopping Channel

65

Hopping channel



6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

6.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW =68KHz/VBW =200KHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is $0.4 \times \text{channel number}$.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



6.5 TEST RESULTS

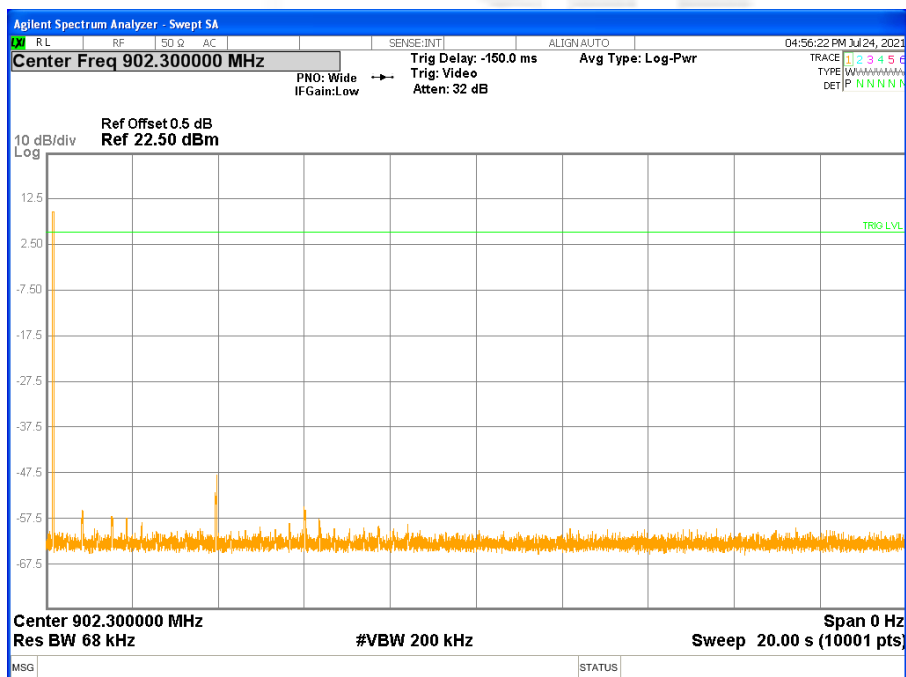
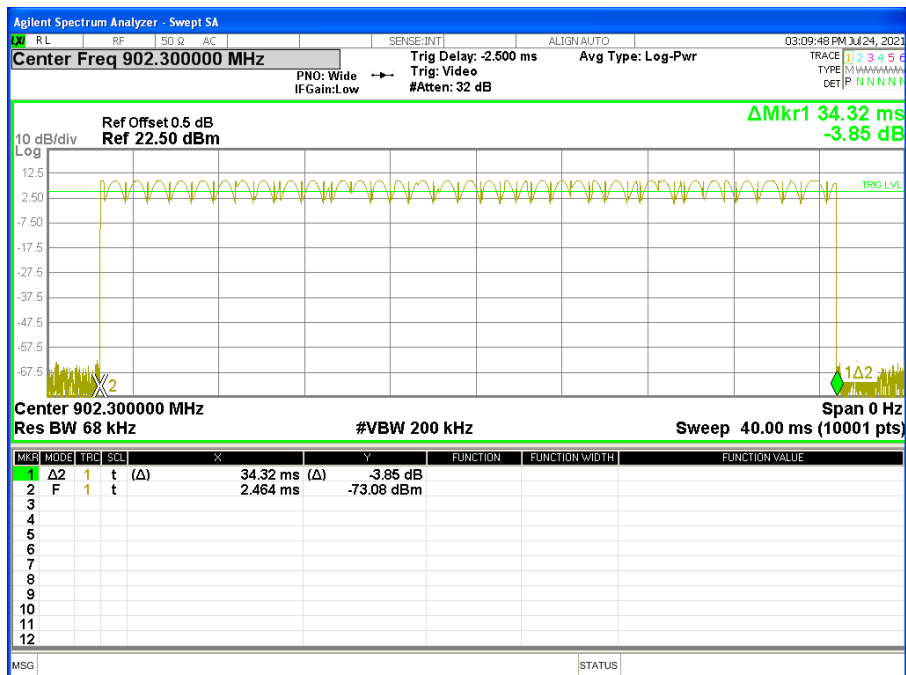
Temperature:	25℃	Relative Humidity:	50%
Test Mode:	LongFi	Test Voltage:	DC 12V

Modulation	Channel	pulse time(ms)	Burst Number	Dwell Time(s)	Limits(s)
LongFi	low	34.320	1	0.034	0.4
	middle	34.380	1	0.034	0.4
	high	34.360	1	0.034	0.4



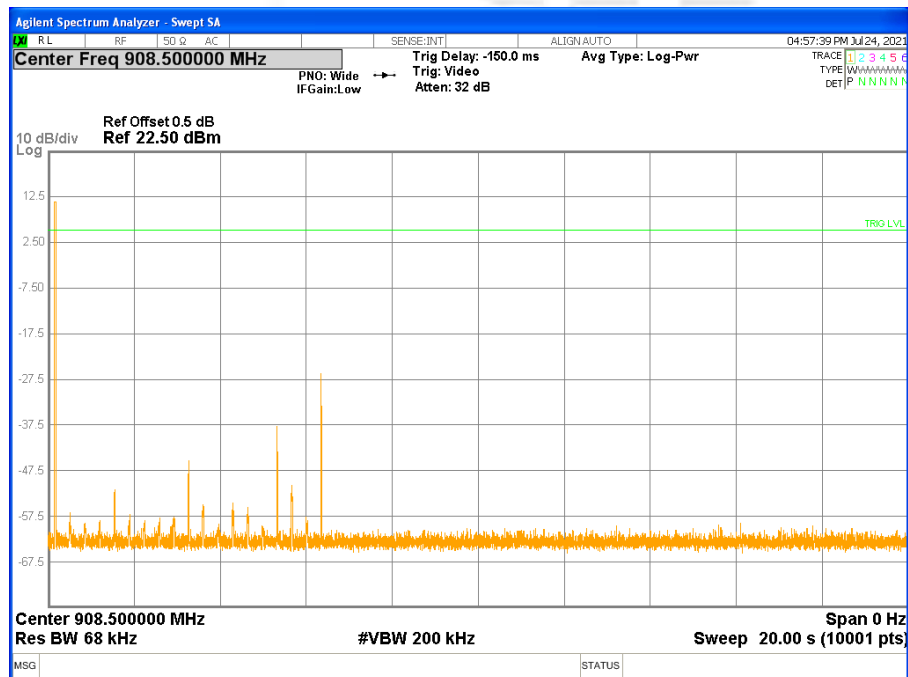
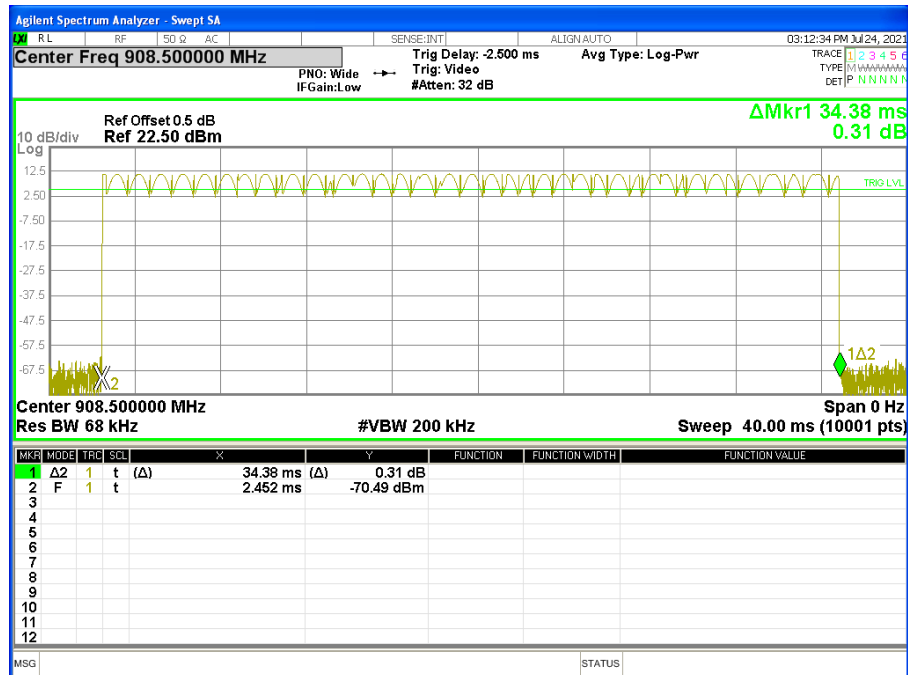


CH01



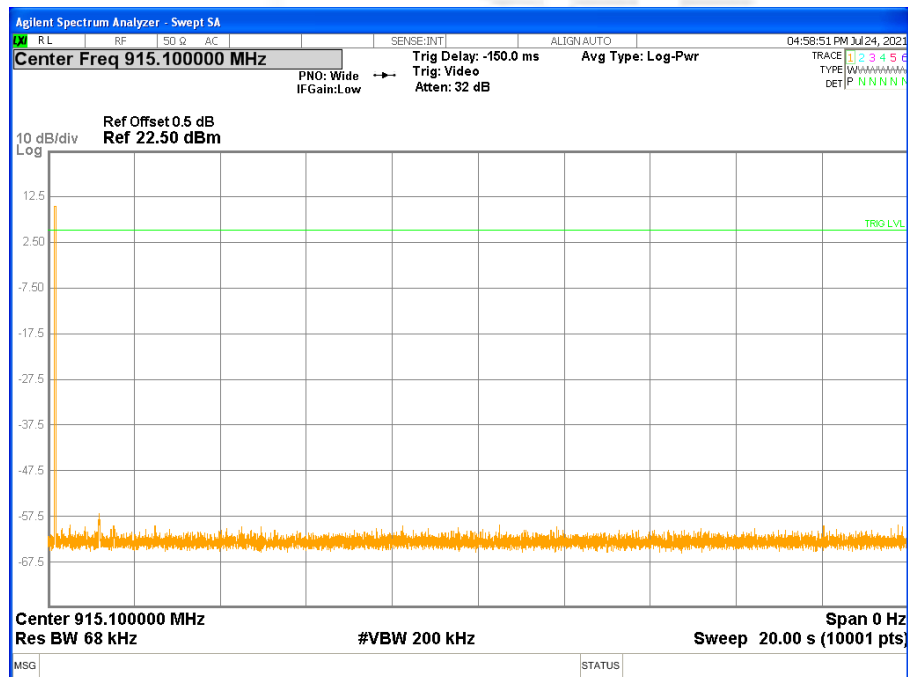


CH32





CH65





7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

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.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	500KHz
RB	30 KHz
VB	100 KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- Spectrum Setting: RBW= 30KHz, VBW= 100KHz, Sweep time = Auto.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

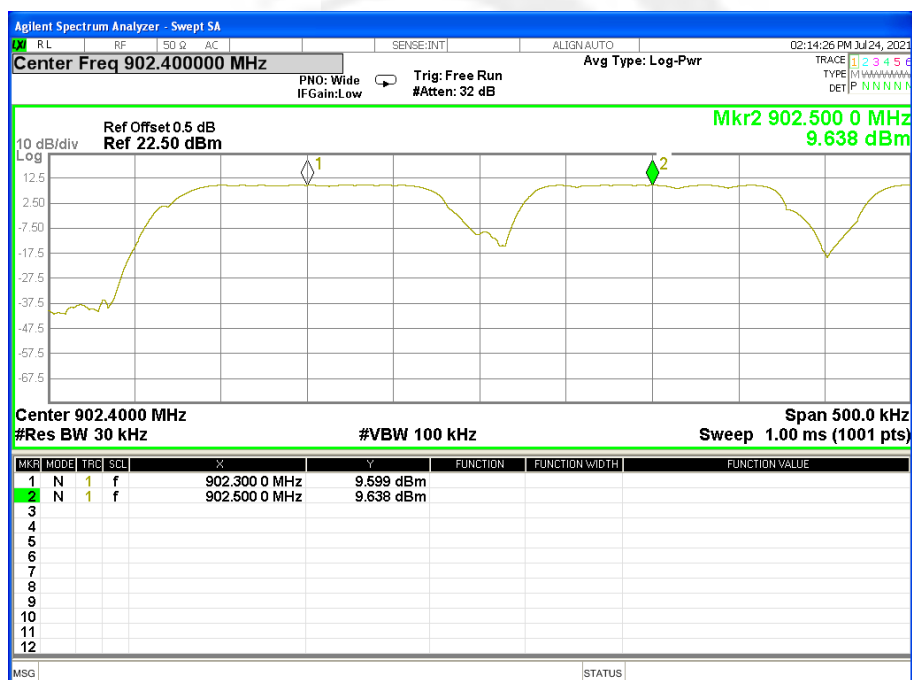
7.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	CH01 / CH35 / CH65 (LongFi Mode)	Test Voltage:	DC 12V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
902.3 MHz	902.300	902.500	0.200	0.134	Complies
908.5 MHz	908.500	908.700	0.200	0.135	Complies
915.1 MHz	914.900	915.100	0.200	0.134	Complies

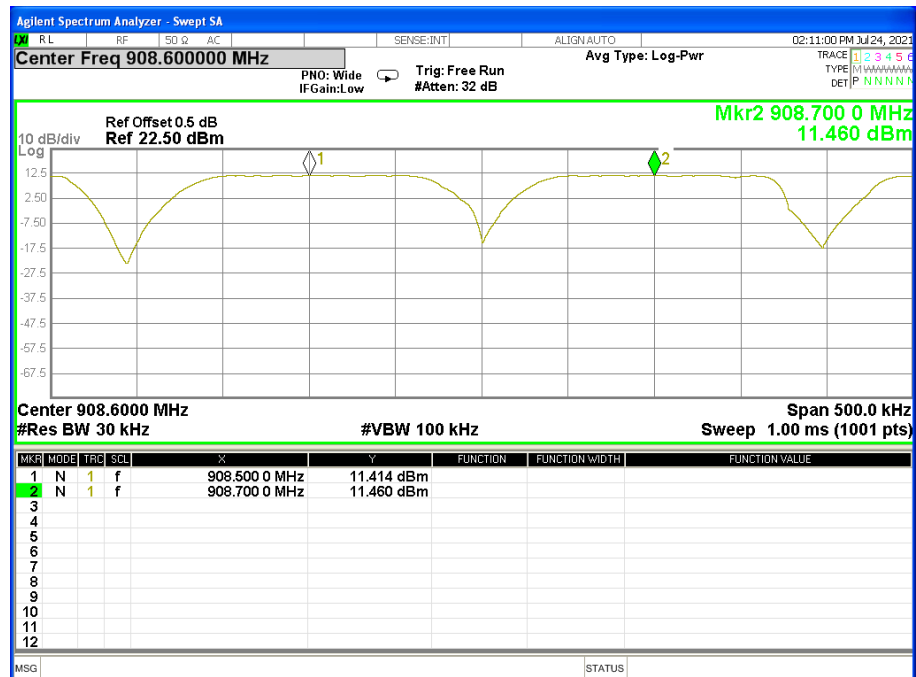
For LongFi: Ch. Separation Limits: > 20dB bandwidth

CH01

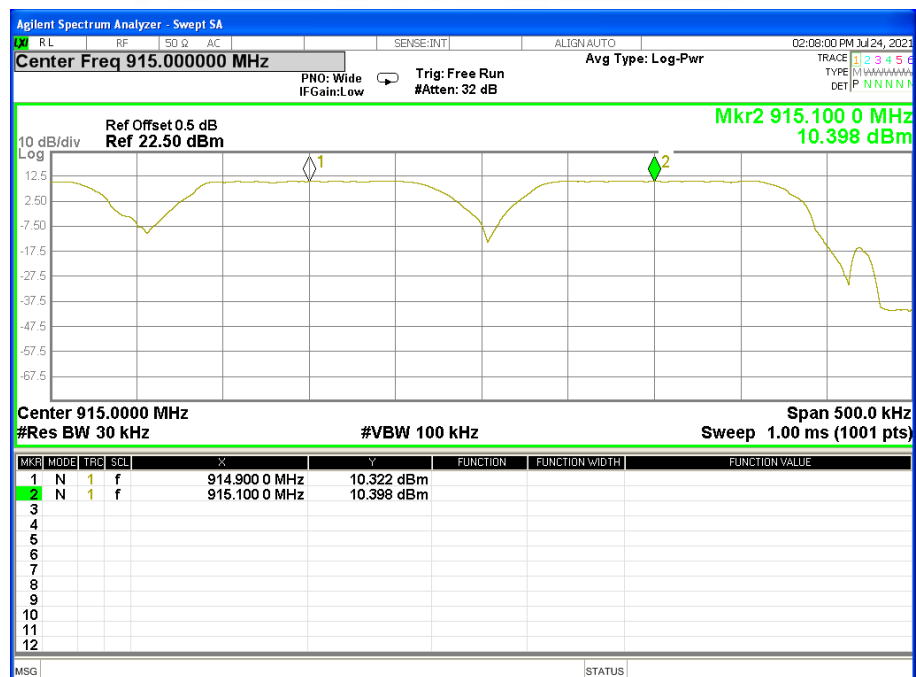




CH32



CH65





8. BANDWIDTH TEST

8.1 LIMIT

FCC Part15 15.247,Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247(a)(1)(i) RSS-247(5.1) RSS-Gen(6.7)	(20dB&99% bandwidth)	<250kHz	902-928	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	300 KHz
RB	3 kHz
VB	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 3KHz, VBW=10KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

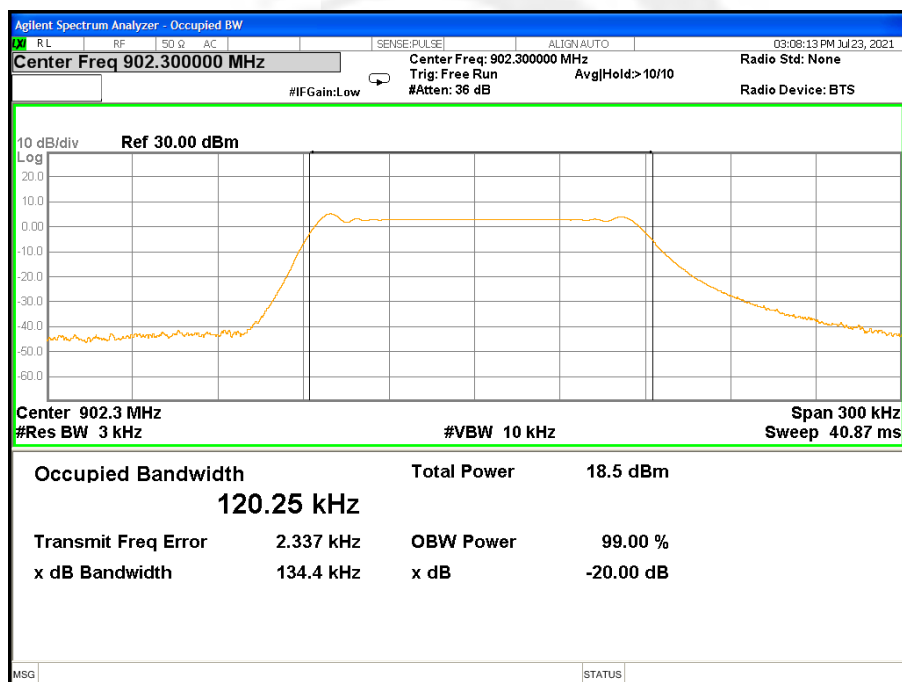


8.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	LongFi CH01/ CH35 / CH65	Test Voltage:	DC 12V

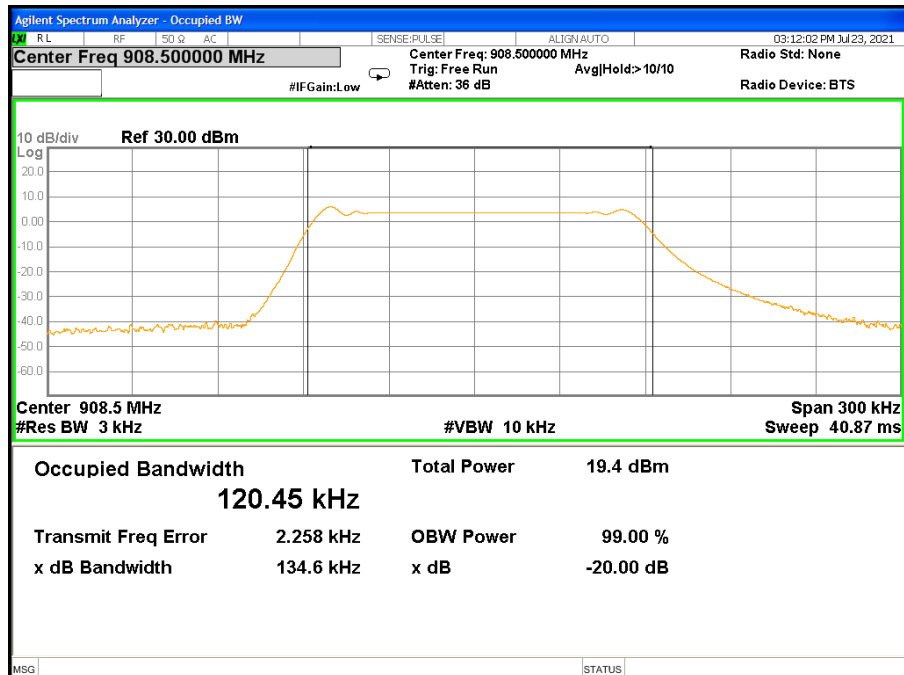
Frequency	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
902.3 MHz	0.1344	0.12025	PASS
908.5 MHz	0.1346	0.12045	PASS
915.1 MHz	0.1343	0.12020	PASS

CH01

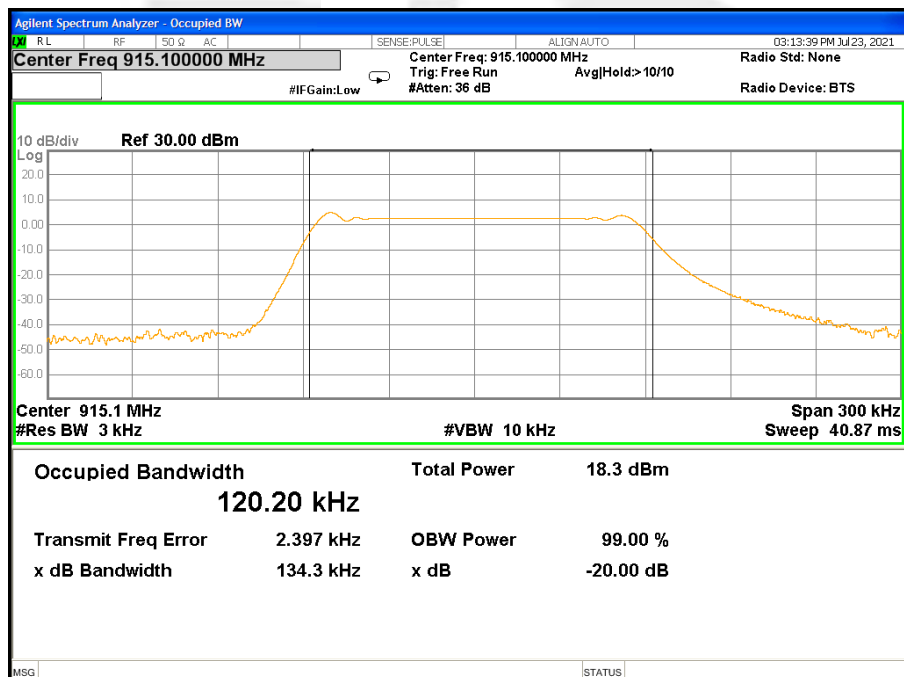




CH32



CH65





9. OUTPUT POWER TEST

9.1 LIMIT

FCC Part 15.247, Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(2) RSS-247	Output Power	1 W	902-928	PASS
RSS-247	EIRP	4W	902-928	PASS

9.2 TEST PROCEDURE

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.

2) RBW > 20 dB bandwidth of the emission being measured.

3) VBW $\geq$ RBW.

4) Sweep: Auto.

5) Detector function: Peak.

6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

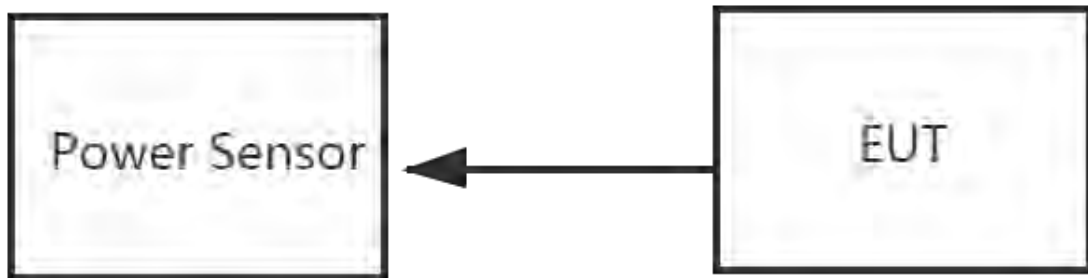
e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DSS bandwidth and shall use a fast-responding diode detector.

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.





9.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 12V		

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
LongFi	1	902.3	10.08	10.03	30.00
	32	908.5	11.78	11.74	30.00
	65	915.1	10.78	10.72	30.00

EIRP

Test Channe	Frequency	Peak Conducted Output Power	Antenna Gain	EIRP Power	LIMIT
	(MHz)	(dBm)	(dBi)	(dBm)	dBm
CH1	902.3 MHz	10.08	4.00	14.08	36.02
CH32	908.5 MHz	11.78	4.00	15.78	36.02
CH65	915.5 MHz	10.78	4.00	14.78	36.02

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203&RSS-Gen Issue 5 requirement: For intentional device, according to 15.203&RSS-Gen Issue 5: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

10.2 EUT ANTENNA

The EUT antenna is External Antenna. It comply with the standard requirement. The antenna is a non-standard SMA interface antenna, refer to below photo.

Antenna Photo





11. FREQUENCY STABILITY

11.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.02\%$ of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage, and for a variation in primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees.

11.2 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at $+20$ degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

11.3 TEST RESULT

Channel 32 (908.5MHz)

Voltage vs. Frequency Stability

Voltage(V)	Measurement Frequency(MHz)
13.8	908.5019
12	908.5015
10.2	908.5013
Max.Deviation(MHz)	0.0019
Max.Deviation(ppm)	2.09

Rated working voltage: DC 12V

Temperature vs. Frequency Stability

Temperature($^{\circ}$ C)	Measurement Frequency(MHz)
-30	908.5023
-20	908.5021
-10	908.5016
0	908.5014
10	908.5020
20	908.5015
30	908.5020
40	908.5018
50	908.5022
Max.Deviation(MHz)	0.0023
Max.Deviation(ppm)	2.53



APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※

