



RADIO TEST REPORT

Report No.: STS2201149W08

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:	2AZCK-MINER3002
IC:	27477-MINER3002
Test Standard:	FCC Part 15.247 RSS-Gen Issue 5, Amendment 2, February 2021

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**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, Amendment 2, February 2021
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.

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Date of Test.....:

Date of receipt of test item.....: 20 Jan. 2022
Date (s) of performance of tests.: 20 Jan. 2022 ~ 11 Feb. 2022
Date of Issue: 11 Feb. 2022
Test Result: Pass

Testing Engineer :

(Chris Chen)

Technical Manager :

(Sean she)

Authorized Signatory :

(Vita Li)





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**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	11 Feb. 2022	STS2201149W08	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	N/A	--
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 expended 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	$\pm 0.87\text{dB}$
2	Unwanted Emissions, conducted	$\pm 2.895\text{dB}$
3	All emissions, radiated 9K-30MHz	$\pm 3.80\text{dB}$
4	All emissions, radiated 30M-1GHz	$\pm 4.09\text{dB}$
5	All emissions, radiated 1G-6GHz	$\pm 4.92\text{dB}$
6	All emissions, radiated >6G	$\pm 5.49\text{dB}$
7	Conducted Emission (9KHz-30MHz)	$\pm 2.73\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name/PMN	Bobcat IoT hotspot
Trade Name	BOBCAT
Model Name	Bobcat Miner 300
HVIN	MINER3002
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 2.
Frequency	902.3 – 915.1MHz(200KHz)
Modulation Type	FSK
Antenna	Please refer to the Note 3.
Adapter	Model: A938-120100W-US1 Input: 100-240V~ 50/60Hz, 0.35A Output: DC 12V 1A Model: PS120W1000U Input: 100-240V~ 50/60Hz, 0.5A Output: DC 12V 1A
Battery	Rated Voltage: 3V Capacity: 40mAh
Hardware version number	V01B
Software version number/FVIN	2021.11.09.01.00
Serial Numbers	G295U1AJ215200008
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	LongFi 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/FSK
Mode 2	TX CH32	1Mbps/FSK
Mode 3	TX CH65	1Mbps/FSK
Mode 4	Hopping	FSK

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

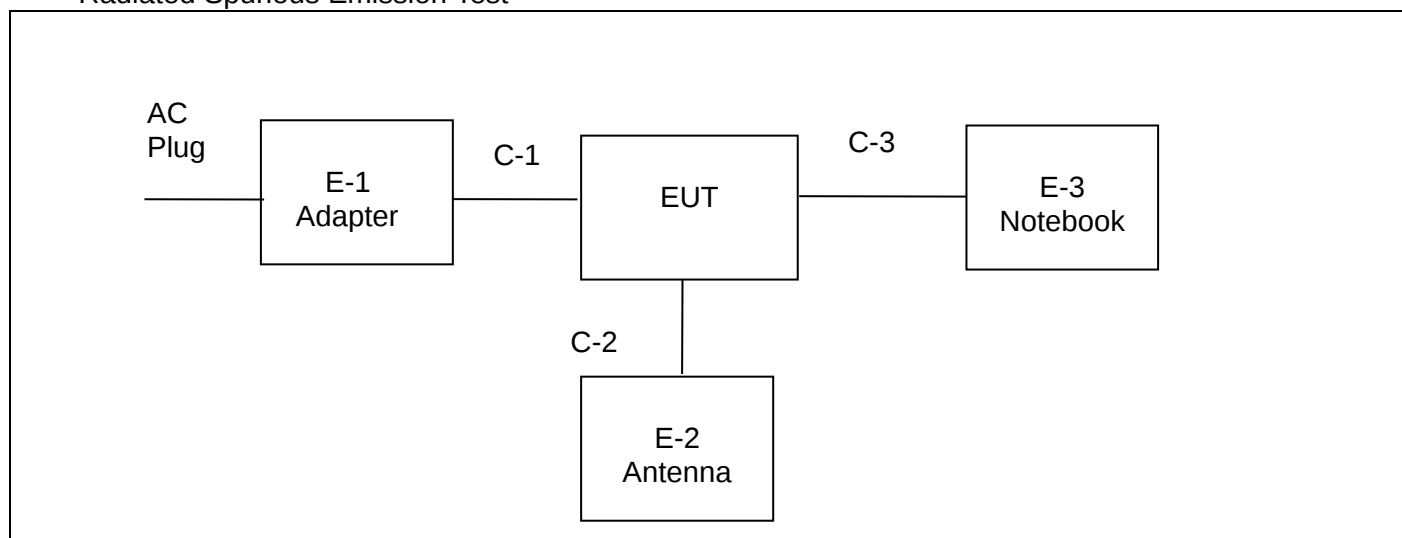
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final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

RF Function	Type	Mode Or Modulation type	Ant Gain (dBi)	Power Class	Software For Testing
LongFi 125KHz	902M-928M	FSK	4	0	CMD

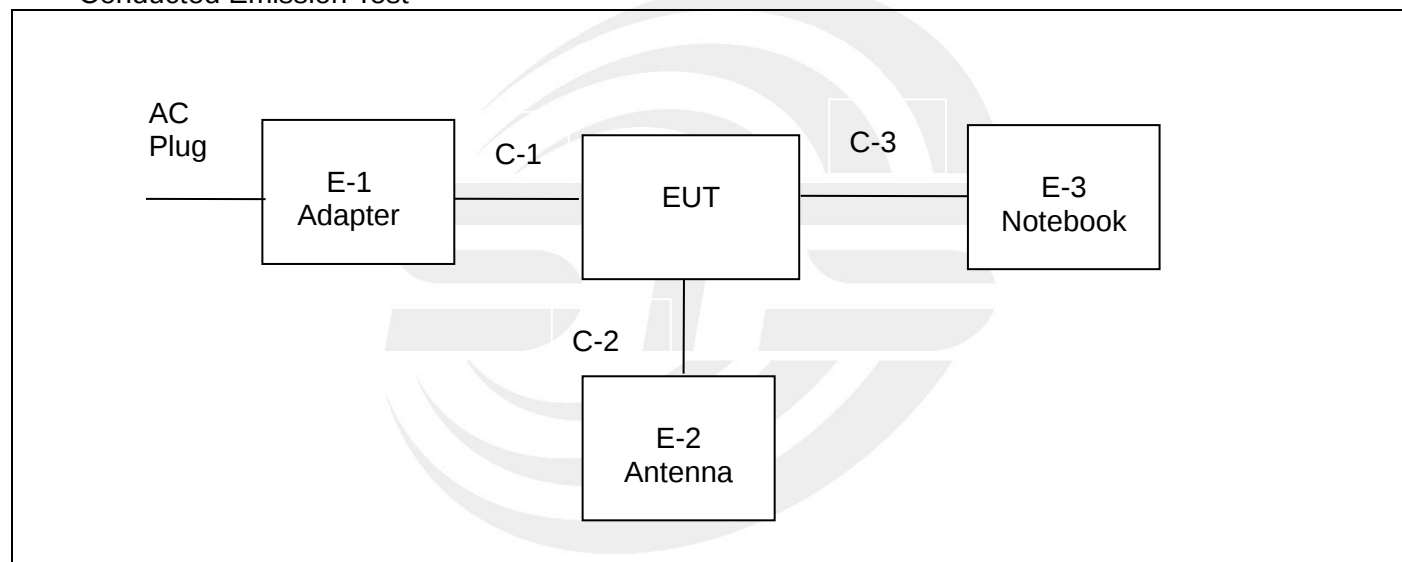


2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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	A938-120100W-US1	N/A	N/A
E-2	Antenna	N/A	N/A	N/A	N/A
C-1	DC Cable	N/A	N/A	150cm	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	2021.09.30	2022.09.29
Signal Analyzer	R&S	FSV 40-N	101823	2021.09.30	2022.09.29
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	2021.10.11	2023.10.10
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	2021.10.08	2022.10.07
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2021.09.30	2022.09.29
Pre-Amplifier (18G-40GHz)	SKET	LNPA-1840-50	SK2018101801	2021.09.28	2022.09.27
Temperature & Humidity	HH660	Mieo	N/A	2021.10.09	2022.10.08
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	2021.09.30	2022.09.29
LISN	R&S	ENV216	101242	2021.09.30	2022.09.29
LISN	EMCO	3810/2NM	23625	2021.09.30	2022.09.29
Temperature & Humidity	HH660	Mieo	N/A	2021.10.09	2022.10.08
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	2021.09.30	2022.09.29
			MY55520006	2021.09.30	2022.09.29
			MY56120038	2021.09.30	2022.09.29
			MY56280002	2021.09.30	2022.09.29
Signal Analyzer	Agilent	N9020A	MY51110105	2021.03.04	2022.03.03
Temperature & Humidity	HH660	Mieo	N/A	2021.10.09	2022.10.08
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 Emission limit (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.

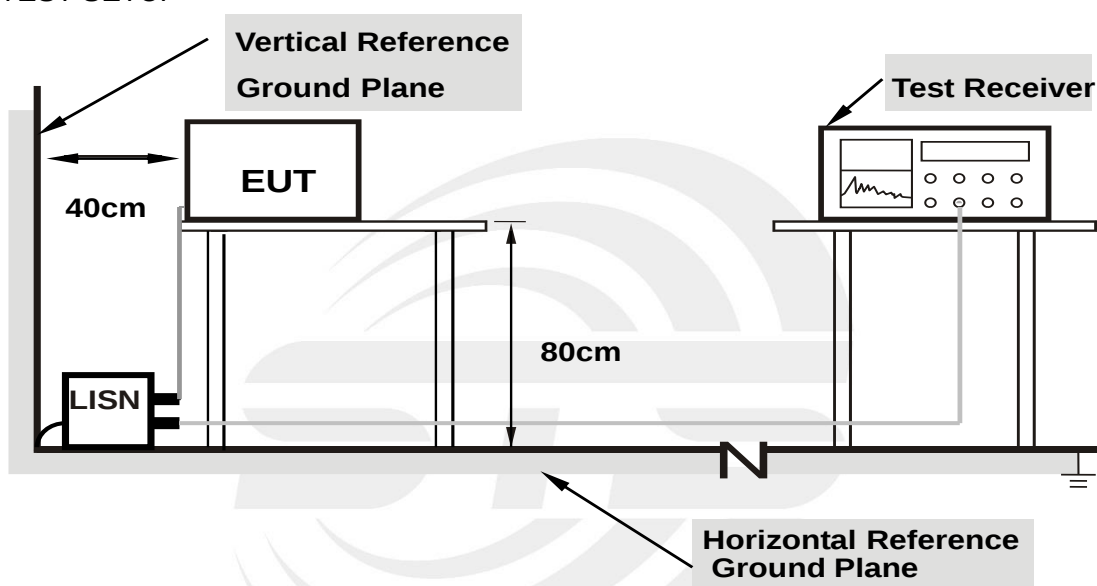
The following table is the setting of the receiver

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

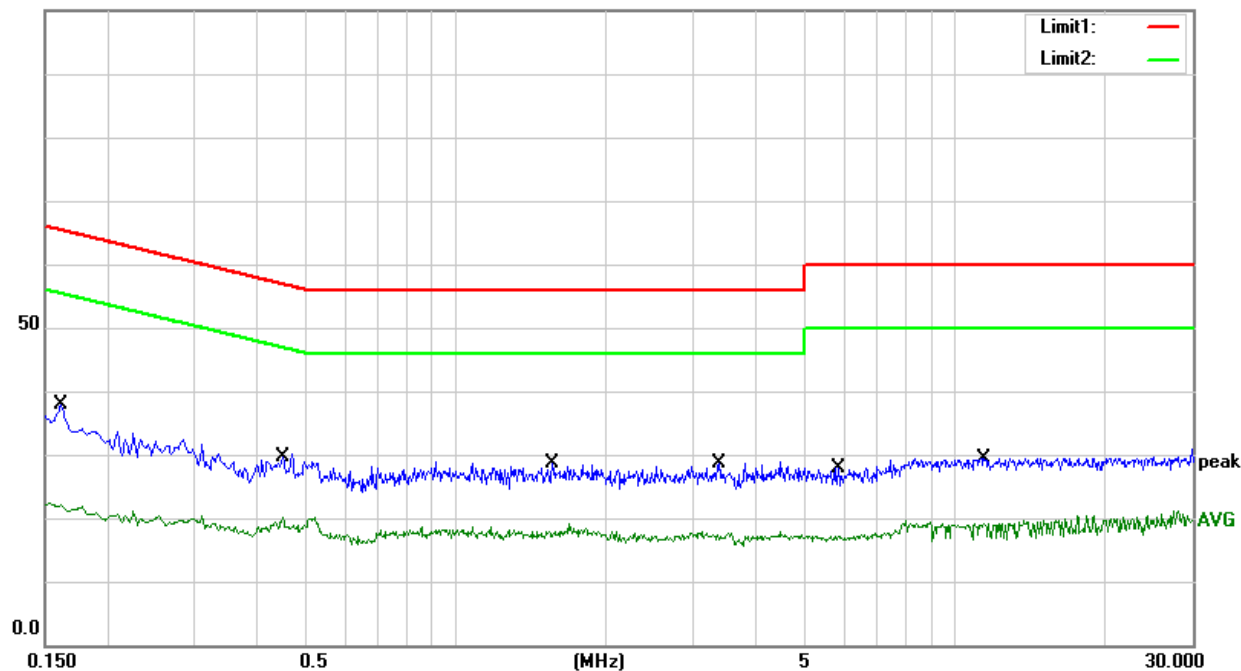
Temperature:	25.3(C)	Relative Humidity:	45%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 5		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1620	17.60	20.33	37.93	65.36	-27.43	QP
2	0.1620	0.75	20.33	21.08	55.36	-34.28	AVG
3	0.4500	9.02	20.54	29.56	56.88	-27.32	QP
4	0.4500	-0.45	20.54	20.09	46.88	-26.79	AVG
5	1.5660	8.20	20.30	28.50	56.00	-27.50	QP
6	1.5660	-1.58	20.30	18.72	46.00	-27.28	AVG
7	3.3740	8.31	20.37	28.68	56.00	-27.32	QP
8	3.3740	-2.50	20.37	17.87	46.00	-28.13	AVG
9	5.8620	7.43	20.51	27.94	60.00	-32.06	QP
10	5.8620	-2.68	20.51	17.83	50.00	-32.17	AVG
11	11.4620	8.09	21.36	29.45	60.00	-30.55	QP
12	11.4620	-2.18	21.36	19.18	50.00	-30.82	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





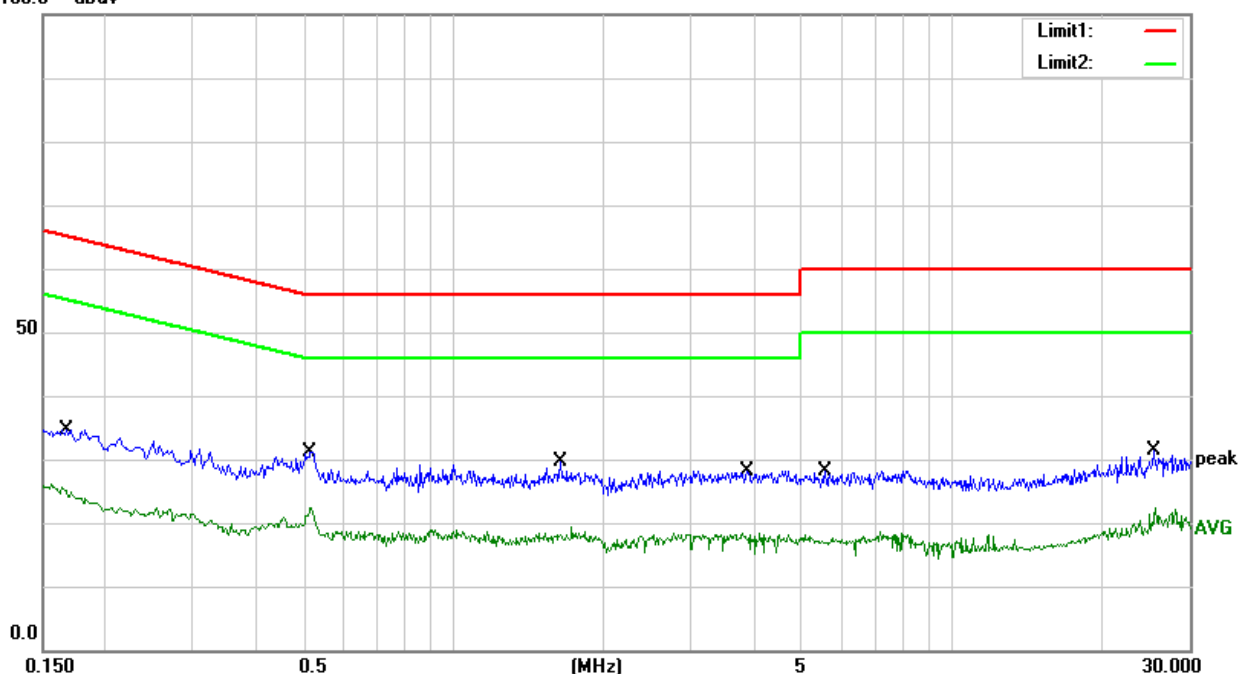
Temperature:	25.3(C)	Relative Humidity:	45%RH
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 5		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1660	14.38	20.33	34.71	65.16	-30.45	QP
2	0.1660	4.75	20.33	25.08	55.16	-30.08	AVG
3	0.5180	10.62	20.52	31.14	56.00	-24.86	QP
4	0.5180	1.80	20.52	22.32	46.00	-23.68	AVG
5	1.6420	9.21	20.30	29.51	56.00	-26.49	QP
6	1.6420	-1.04	20.30	19.26	46.00	-26.74	AVG
7	3.8820	7.77	20.40	28.17	56.00	-27.83	QP
8	3.8820	-1.95	20.40	18.45	46.00	-27.55	AVG
9	5.5860	7.68	20.50	28.18	60.00	-31.82	QP
10	5.5860	-1.87	20.50	18.63	50.00	-31.37	AVG
11	25.3340	8.65	22.63	31.28	60.00	-28.72	QP
12	25.3340	-0.24	22.63	22.39	50.00	-27.61	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:

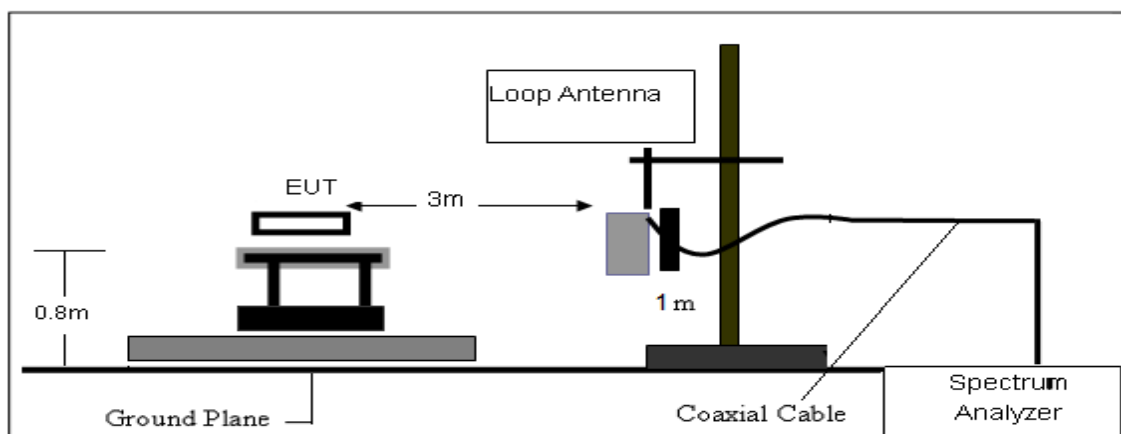
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.3 DEVIATION FROM TEST STANDARD

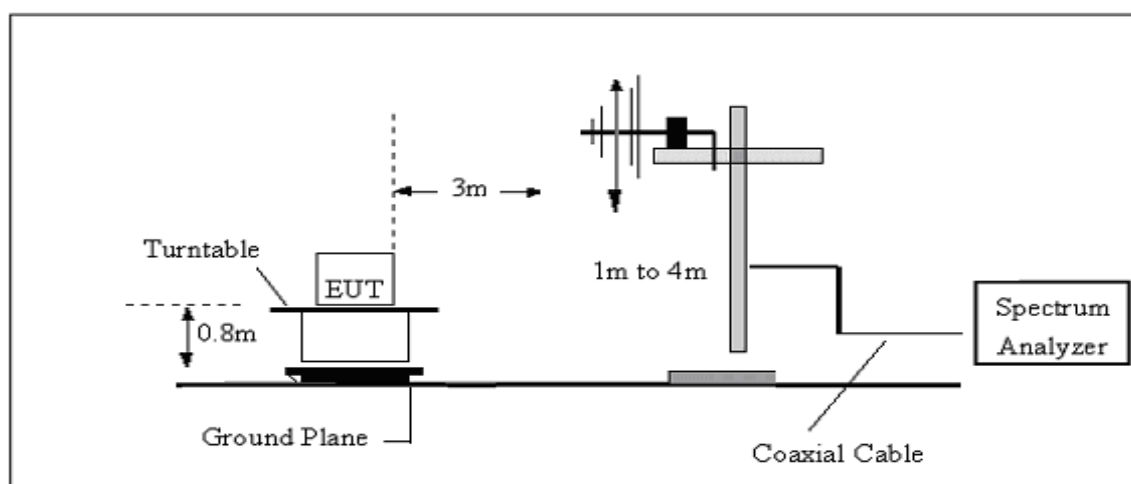
No deviation.

3.2.4 TESTSETUP

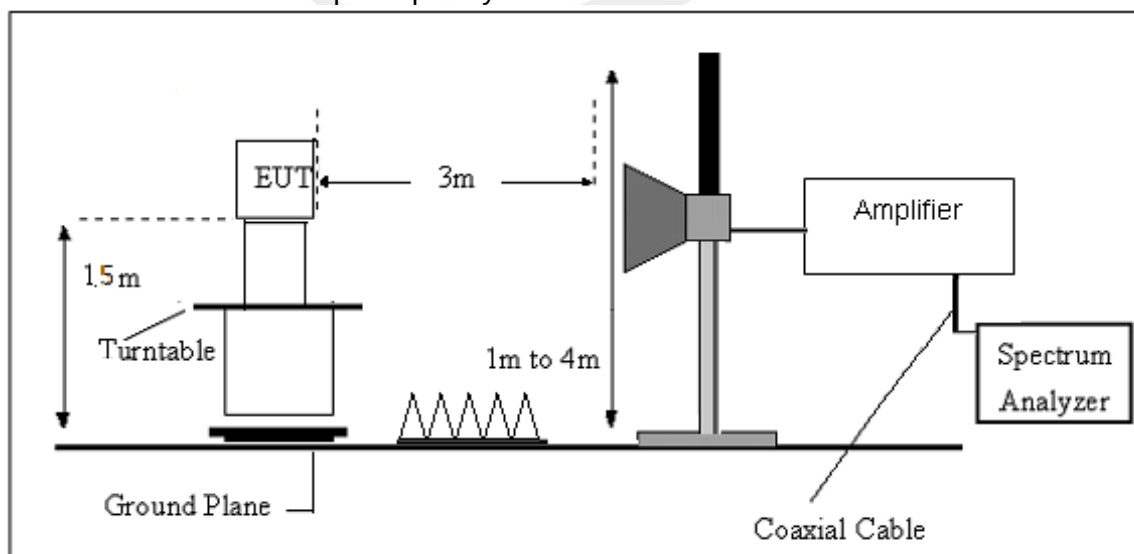
(A) Radiated Emission Test-Up Frequency Below 30MHz



(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:	AC 120V/60Hz	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 = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

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



(30MHz-1000MHz)

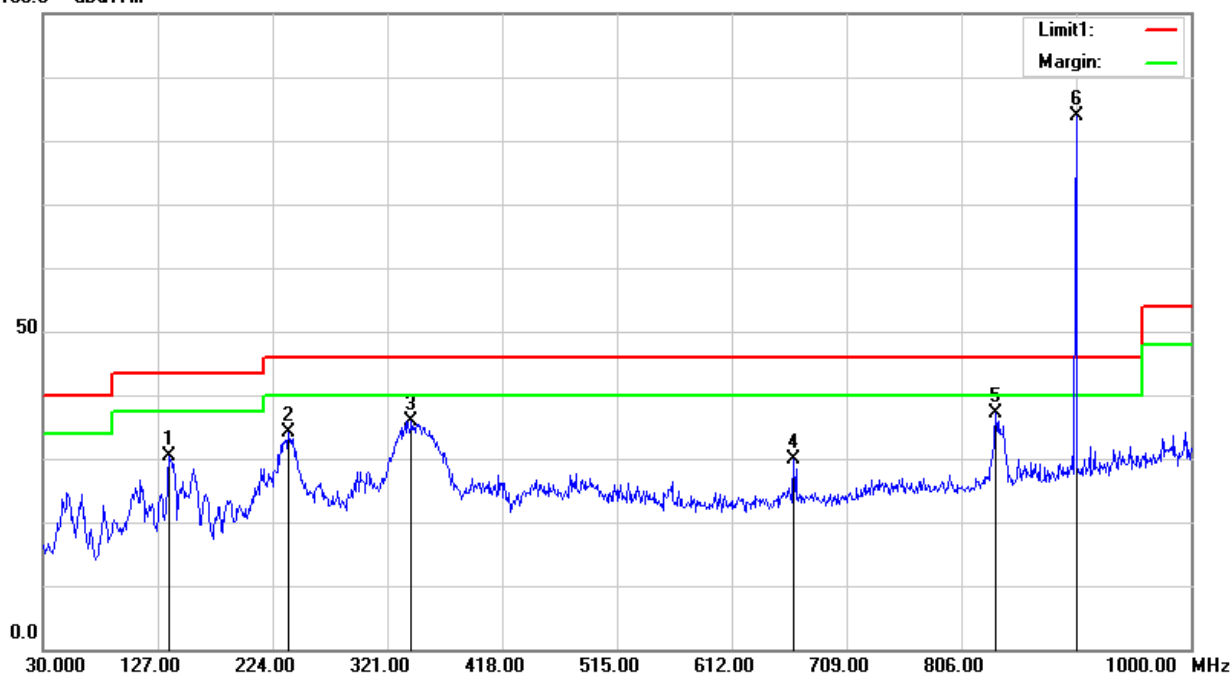
Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal
Test Mode:	Mode 1		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	136.7000	48.33	-18.07	30.26	43.50	-13.24	peak
2	237.5800	52.59	-18.35	34.24	46.00	-11.76	peak
3	341.3700	49.30	-13.36	35.94	46.00	-10.06	peak
4	664.3800	34.61	-4.71	29.90	46.00	-16.10	peak
5	835.1000	37.55	-0.54	37.01	46.00	-8.99	peak
6	902.3000	84.32	-0.37	83.95	N/A	N/A	Fundamental

Remark:

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

100.0 dBuV/m



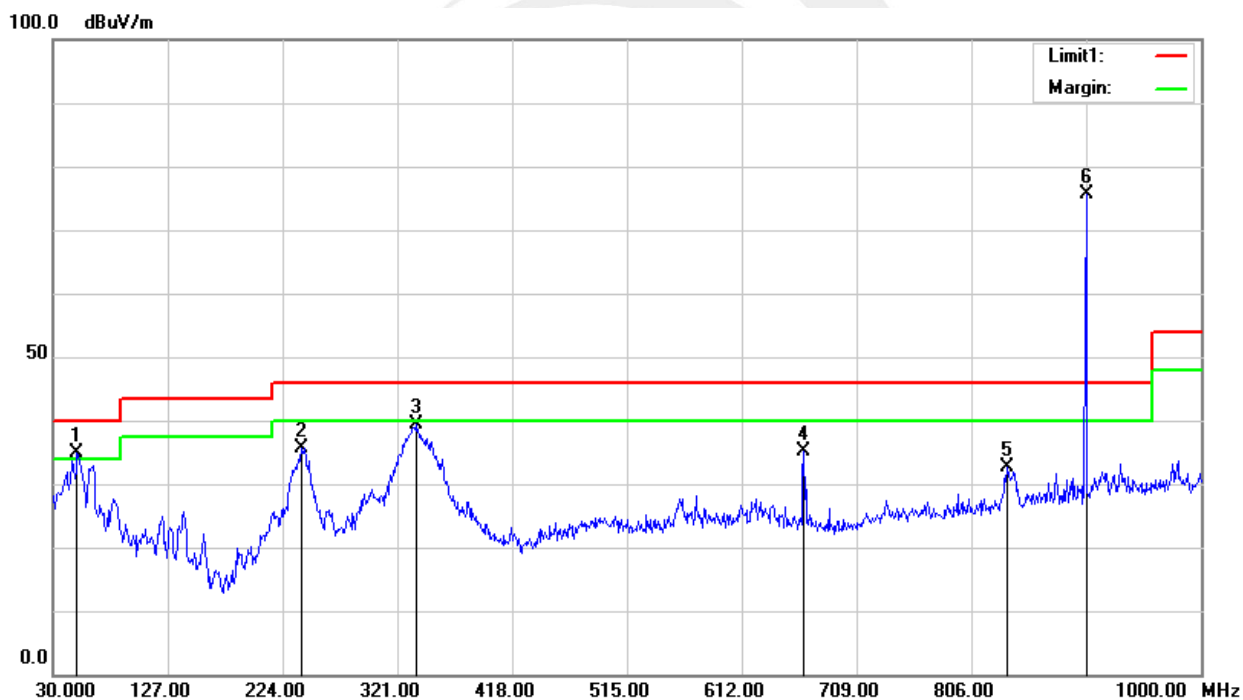


Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Vertical
Test Mode:	Mode 1		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	50.3700	58.33	-23.42	34.91	40.00	-5.09	peak
2	239.5200	53.76	-18.10	35.66	46.00	-10.34	peak
3	337.4900	52.76	-13.49	39.27	46.00	-6.73	peak
4	664.3800	39.86	-4.71	35.15	46.00	-10.85	peak
5	836.0700	33.19	-0.50	32.69	46.00	-13.31	peak
6	902.3000	75.99	-0.37	75.62	N/A	N/A	Fundamental

Remark:

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





Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal
Test Mode:	Mode 2		

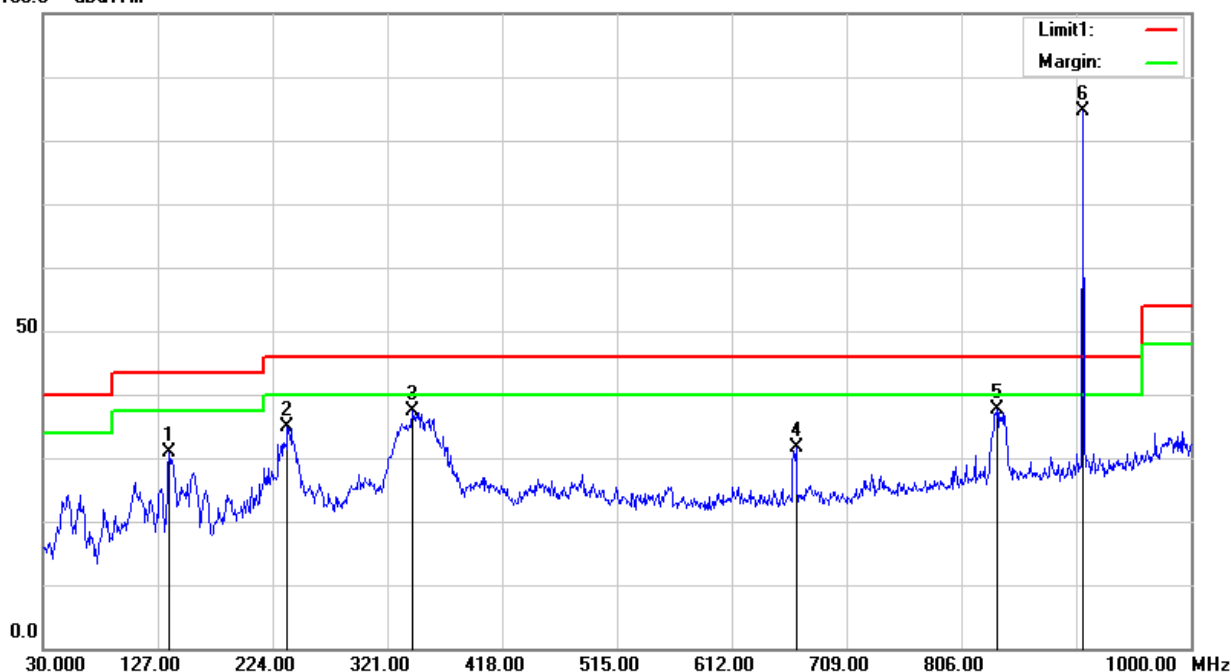
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	136.7000	48.98	-18.07	30.91	43.50	-12.59	peak
2	236.6100	53.34	-18.48	34.86	46.00	-11.14	peak
3	342.3400	50.71	-13.33	37.38	46.00	-8.62	peak
4	666.3200	36.33	-4.66	31.67	46.00	-14.33	peak
5	836.0700	38.04	-0.50	37.54	46.00	-8.46	peak
6	908.5000	84.81	-0.22	84.59	N/A	N/A	Fundamental

Remark:

3. Margin = Result (Result =Reading + Factor)-Limit

4. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain

100.0 dBuV/m





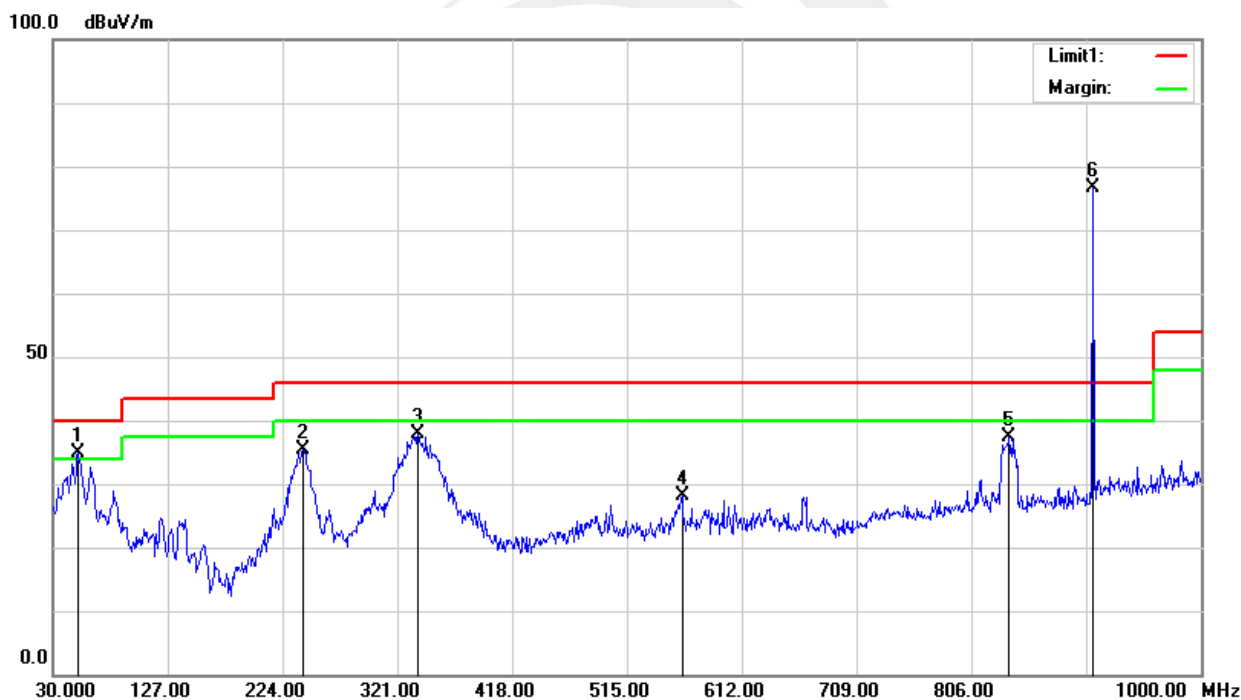
Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Vertical
Test Mode:	Mode 2		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	51.3400	58.59	-23.82	34.77	40.00	-5.23	peak
2	241.4600	53.22	-17.73	35.49	46.00	-10.51	peak
3	338.4600	51.34	-13.46	37.88	46.00	-8.12	peak
4	561.5600	33.67	-5.51	28.16	46.00	-17.84	peak
5	838.0100	37.69	-0.42	37.27	46.00	-8.73	peak
6	908.5000	76.91	-0.22	76.69	N/A	N/A	Fundamental

Remark:

3. $\text{Margin} = \text{Result} (\text{Result} = \text{Reading} + \text{Factor}) - \text{Limit}$

4. $\text{Factor} = \text{Antenna factor} + \text{Cable attenuation factor (cable loss)} - \text{Amplifier gain}$





Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal
Test Mode:	Mode 3		

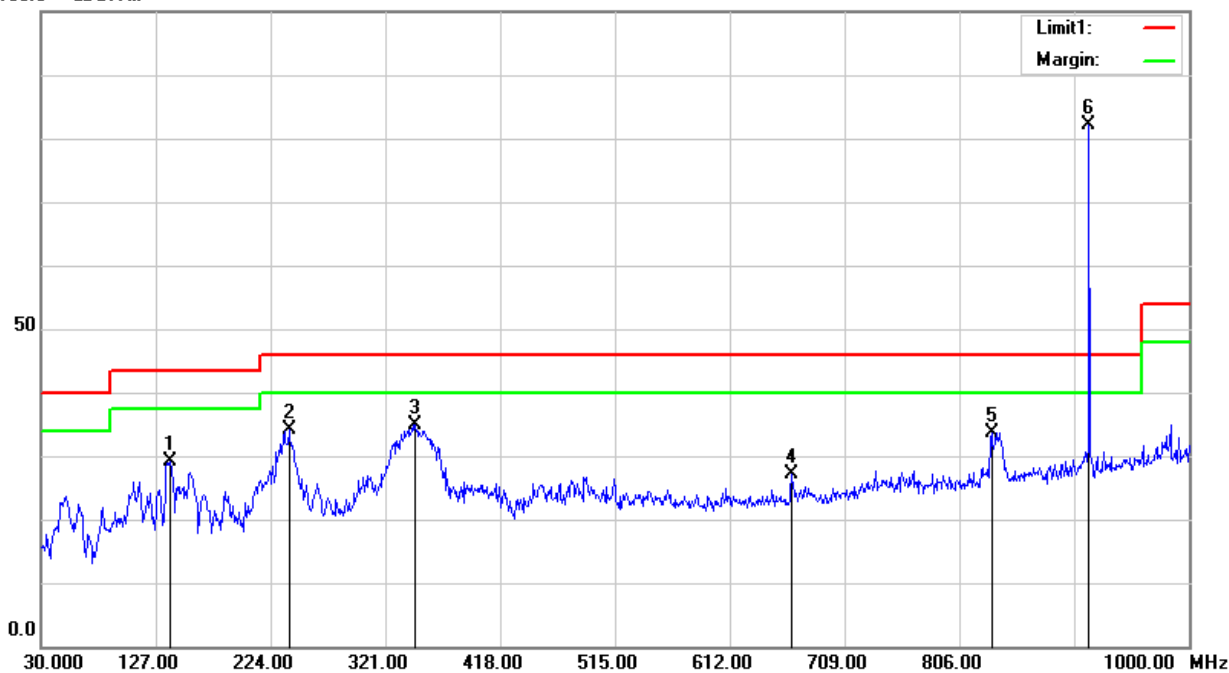
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	138.6400	47.14	-18.05	29.09	43.50	-14.41	peak
2	239.5200	52.11	-18.10	34.01	46.00	-11.99	peak
3	346.2200	48.18	-13.19	34.99	46.00	-11.01	peak
4	664.3800	31.81	-4.71	27.10	46.00	-18.90	peak
5	833.1600	34.36	-0.62	33.74	46.00	-12.26	peak
6	915.1000	82.25	-0.09	82.16	N/A	N/A	Fundamental

Remark:

5. $\text{Margin} = \text{Result} (\text{Result} = \text{Reading} + \text{Factor}) - \text{Limit}$

6. $\text{Factor} = \text{Antenna factor} + \text{Cable attenuation factor} (\text{cable loss}) - \text{Amplifier gain}$

100.0 dBuV/m





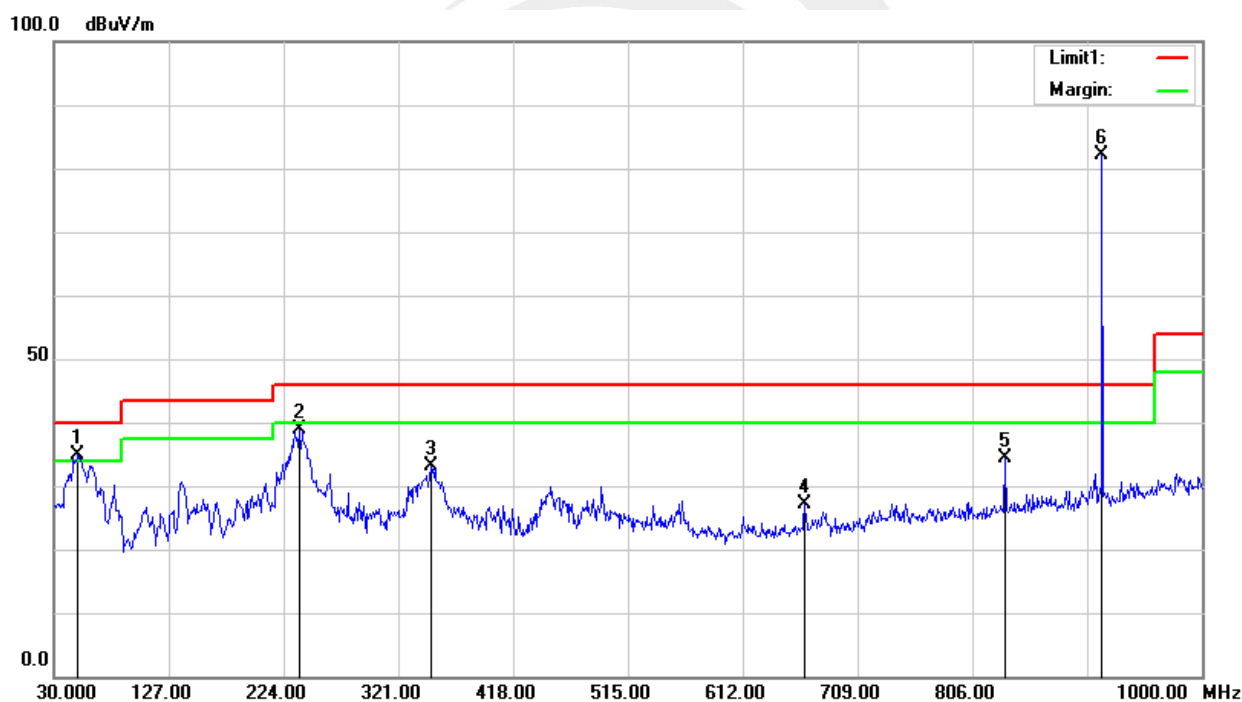
Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Vertical
Test Mode:	Mode 3		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	50.3700	58.28	-23.42	34.86	40.00	-5.14	peak
2	237.5800	57.22	-18.35	38.87	46.00	-7.13	peak
3	348.1600	46.26	-13.13	33.13	46.00	-12.87	peak
4	664.3800	31.87	-4.71	27.16	46.00	-18.84	peak
5	833.1600	34.96	-0.62	34.34	46.00	-11.66	peak
6	915.1000	82.24	-0.09	82.15	N/A	N/A	Fundamental

Remark:

5. $\text{Margin} = \text{Result} (\text{Result} = \text{Reading} + \text{Factor}) - \text{Limit}$

6. $\text{Factor} = \text{Antenna factor} + \text{Cable attenuation factor (cable loss)} - \text{Amplifier gain}$





Above 1G Spurious emission Requirements

FSK

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (FSK/902.3 MHz)										
1099.31	68.00	46.30	3.70	24.30	-18.30	49.70	74.00	-24.30	Pk	Vertical
1099.31	57.42	46.30	3.70	24.30	-18.30	39.12	54.00	-14.88	AV	Vertical
1099.60	67.50	46.30	3.70	24.30	-18.30	49.20	74.00	-24.80	Pk	Horizontal
1099.60	56.29	46.30	3.70	24.30	-18.30	37.99	54.00	-16.01	AV	Horizontal
1516.03	64.92	44.90	4.19	25.00	-15.71	49.21	74.00	-24.79	Pk	Vertical
1516.03	57.18	44.90	4.19	25.00	-15.71	41.46	54.00	-12.54	AV	Vertical
1516.21	65.07	44.90	4.19	25.00	-15.71	49.36	74.00	-24.64	Pk	Horizontal
1516.21	57.89	44.90	4.19	25.00	-15.71	42.18	54.00	-11.82	AV	Horizontal
1804.38	65.50	44.10	5.30	25.00	-13.80	51.70	74.00	-22.30	Pk	Vertical
1804.38	55.27	44.10	5.30	25.00	-13.80	41.47	54.00	-12.53	AV	Vertical
1804.03	65.29	44.10	5.30	25.00	-13.80	51.49	74.00	-22.51	Pk	Horizontal
1804.03	53.97	44.10	5.30	25.00	-13.80	40.17	54.00	-13.83	AV	Horizontal
2143.74	62.38	43.80	5.40	25.90	-12.50	49.89	74.00	-24.11	Pk	Vertical
2143.74	52.82	43.80	5.40	25.90	-12.50	40.32	54.00	-13.68	AV	Vertical
2143.96	63.08	43.80	5.40	25.90	-12.50	50.58	74.00	-23.42	Pk	Horizontal
2143.96	49.19	43.80	5.40	25.90	-12.50	36.69	54.00	-17.31	AV	Horizontal
2706.47	67.68	44.40	6.20	27.60	-10.60	57.08	74.00	-16.92	Pk	Vertical
2706.47	50.32	44.40	6.20	27.60	-10.60	39.72	54.00	-14.28	AV	Vertical
2706.52	65.08	44.40	6.20	27.60	-10.60	54.48	74.00	-19.52	Pk	Horizontal
2706.52	51.35	44.40	6.20	27.60	-10.60	40.75	54.00	-13.25	AV	Horizontal
3263.44	63.60	44.70	6.70	28.20	-9.80	53.80	74.00	-20.20	Pk	Vertical
3263.44	50.28	44.70	6.70	28.20	-9.80	40.48	54.00	-13.52	AV	Vertical
3263.32	63.25	44.70	6.70	28.20	-9.80	53.45	74.00	-20.55	Pk	Horizontal
3263.32	50.54	44.70	6.70	28.20	-9.80	40.74	54.00	-13.26	AV	Horizontal
3997.99	65.47	44.20	7.90	29.70	-6.60	58.87	74.00	-15.13	Pk	Vertical
3997.99	48.17	44.20	7.90	29.70	-6.60	41.57	54.00	-12.43	AV	Vertical
3998.07	68.03	44.20	7.90	29.70	-6.60	61.43	74.00	-12.57	Pk	Horizontal
3998.07	49.01	44.20	7.90	29.70	-6.60	42.41	54.00	-11.59	AV	Horizontal
7218.44	55.60	43.50	11.40	35.50	3.40	59.00	74.00	-15.00	Pk	Vertical
7218.44	38.18	43.50	11.40	35.50	3.40	41.58	54.00	-12.42	AV	Vertical
7218.57	55.32	43.50	11.40	35.50	3.40	58.72	74.00	-15.28	Pk	Horizontal
7218.57	38.01	43.50	11.40	35.50	3.40	41.41	54.00	-12.59	AV	Horizontal
8120.20	54.37	44.20	12.00	37.00	4.80	59.17	74.00	-14.83	Pk	Vertical
8120.20	37.67	44.20	12.00	37.00	4.80	42.47	54.00	-11.53	AV	Vertical
8120.02	54.56	44.20	12.00	37.00	4.80	59.36	74.00	-14.64	Pk	Horizontal
8120.02	37.48	44.20	12.00	37.00	4.80	42.28	54.00	-11.72	AV	Horizontal
9100.29	53.38	45.00	12.57	37.40	4.97	58.35	74.00	-15.65	Pk	Vertical
9100.29	40.85	45.00	12.57	37.40	4.97	45.82	54.00	-8.18	AV	Vertical
9100.44	52.67	45.00	12.57	37.40	4.97	57.64	74.00	-16.36	Pk	Horizontal
9100.44	38.61	45.00	12.57	37.40	4.97	43.58	54.00	-10.42	AV	Horizontal
9925.19	48.31	43.60	14.33	39.50	10.20	58.51	74.00	-15.49	Pk	Vertical
9925.19	34.31	43.60	14.33	39.50	10.20	44.51	54.00	-9.49	AV	Vertical
9925.00	51.19	43.60	14.33	39.50	10.20	61.39	74.00	-12.61	Pk	Horizontal
9925.00	36.46	43.60	14.33	39.50	10.20	46.66	54.00	-7.34	AV	Horizontal



Middle Channel (FSK/908.5 MHz)										
1092.51	67.30	46.30	3.70	24.30	-18.30	49.00	74.00	-25.00	Pk	Vertical
1092.51	56.95	46.30	3.70	24.30	-18.30	38.65	54.00	-15.35	AV	Vertical
1092.64	67.62	46.30	3.70	24.30	-18.30	49.32	74.00	-24.68	Pk	Horizontal
1092.64	56.71	46.30	3.70	24.30	-18.30	38.41	54.00	-15.59	AV	Horizontal
1506.47	65.29	44.90	4.19	25.00	-15.71	49.58	74.00	-24.42	Pk	Vertical
1506.47	56.94	44.90	4.19	25.00	-15.71	41.22	54.00	-12.78	AV	Vertical
1506.79	65.45	44.90	4.19	25.00	-15.71	49.74	74.00	-24.26	Pk	Horizontal
1506.79	58.19	44.90	4.19	25.00	-15.71	42.47	54.00	-11.53	AV	Horizontal
1816.75	64.35	44.10	5.30	25.00	-13.80	50.55	74.00	-23.45	Pk	Vertical
1816.75	55.09	44.10	5.30	25.00	-13.80	41.29	54.00	-12.71	AV	Vertical
1816.29	65.18	44.10	5.30	25.00	-13.80	51.38	74.00	-22.62	Pk	Horizontal
1816.29	53.92	44.10	5.30	25.00	-13.80	40.12	54.00	-13.88	AV	Horizontal
2130.20	63.33	43.80	5.40	25.90	-12.50	50.84	74.00	-23.16	Pk	Vertical
2130.20	52.31	43.80	5.40	25.90	-12.50	39.82	54.00	-14.18	AV	Vertical
2130.49	63.01	43.80	5.40	25.90	-12.50	50.51	74.00	-23.49	Pk	Horizontal
2130.49	50.05	43.80	5.40	25.90	-12.50	37.55	54.00	-16.45	AV	Horizontal
2725.11	66.31	44.40	6.20	27.60	-10.60	55.71	74.00	-18.29	Pk	Vertical
2725.11	50.31	44.40	6.20	27.60	-10.60	39.71	54.00	-14.29	AV	Vertical
2725.16	65.38	44.40	6.20	27.60	-10.60	54.78	74.00	-19.22	Pk	Horizontal
2725.16	50.24	44.40	6.20	27.60	-10.60	39.64	54.00	-14.36	AV	Horizontal
3242.59	62.29	44.70	6.70	28.20	-9.80	52.49	74.00	-21.51	Pk	Vertical
3242.59	51.06	44.70	6.70	28.20	-9.80	41.26	54.00	-12.74	AV	Vertical
3242.65	62.87	44.70	6.70	28.20	-9.80	53.07	74.00	-20.93	Pk	Horizontal
3242.65	51.12	44.70	6.70	28.20	-9.80	41.32	54.00	-12.68	AV	Horizontal
3972.64	65.33	44.20	7.90	29.70	-6.60	58.73	74.00	-15.27	Pk	Vertical
3972.64	48.02	44.20	7.90	29.70	-6.60	41.42	54.00	-12.58	AV	Vertical
3972.62	68.16	44.20	7.90	29.70	-6.60	61.56	74.00	-12.44	Pk	Horizontal
3972.62	48.73	44.20	7.90	29.70	-6.60	42.13	54.00	-11.87	AV	Horizontal
7268.13	55.53	43.50	11.40	35.50	3.40	58.93	74.00	-15.07	Pk	Vertical
7268.13	39.19	43.50	11.40	35.50	3.40	42.59	54.00	-11.41	AV	Vertical
7268.14	55.42	43.50	11.40	35.50	3.40	58.82	74.00	-15.18	Pk	Horizontal
7268.14	38.54	43.50	11.40	35.50	3.40	41.94	54.00	-12.06	AV	Horizontal
8068.53	54.10	44.20	12.00	37.00	4.80	58.90	74.00	-15.10	Pk	Vertical
8068.53	38.16	44.20	12.00	37.00	4.80	42.96	54.00	-11.04	AV	Vertical
8068.68	53.64	44.20	12.00	37.00	4.80	58.44	74.00	-15.56	Pk	Horizontal
8068.68	37.99	44.20	12.00	37.00	4.80	42.79	54.00	-11.21	AV	Horizontal
9084.31	52.86	45.00	12.57	37.40	4.97	57.82	74.00	-16.18	Pk	Vertical
9084.31	41.13	45.00	12.57	37.40	4.97	46.10	54.00	-7.90	AV	Vertical
9084.47	52.87	45.00	12.57	37.40	4.97	57.84	74.00	-16.16	Pk	Horizontal
9084.47	38.94	45.00	12.57	37.40	4.97	43.91	54.00	-10.09	AV	Horizontal
9862.09	49.53	43.60	14.33	39.50	10.20	59.73	74.00	-14.27	Pk	Vertical
9862.09	34.52	43.60	14.33	39.50	10.20	44.72	54.00	-9.28	AV	Vertical
9862.39	51.61	43.60	14.33	39.50	10.20	61.81	74.00	-12.19	Pk	Horizontal
9862.39	35.28	43.60	14.33	39.50	10.20	45.48	54.00	-8.52	AV	Horizontal



High Channel (FSK/915.7 MHz)										
1084.76	67.78	46.30	3.70	24.30	-18.30	49.48	74.00	-24.52	Pk	Vertical
1084.76	57.03	46.30	3.70	24.30	-18.30	38.73	54.00	-15.27	AV	Vertical
1085.15	68.26	46.30	3.70	24.30	-18.30	49.96	74.00	-24.04	Pk	Horizontal
1085.15	57.27	46.30	3.70	24.30	-18.30	38.97	54.00	-15.03	AV	Horizontal
1496.09	66.23	44.90	4.19	25.00	-15.71	50.52	74.00	-23.48	Pk	Vertical
1496.09	56.20	44.90	4.19	25.00	-15.71	40.49	54.00	-13.51	AV	Vertical
1496.30	64.92	44.90	4.19	25.00	-15.71	49.21	74.00	-24.79	Pk	Horizontal
1496.30	57.02	44.90	4.19	25.00	-15.71	41.30	54.00	-12.70	AV	Horizontal
1829.80	65.62	44.10	5.30	25.00	-13.80	51.82	74.00	-22.18	Pk	Vertical
1829.80	54.91	44.10	5.30	25.00	-13.80	41.11	54.00	-12.89	AV	Vertical
1829.58	65.62	44.10	5.30	25.00	-13.80	51.82	74.00	-22.18	Pk	Horizontal
1829.58	53.20	44.10	5.30	25.00	-13.80	39.40	54.00	-14.60	AV	Horizontal
2115.75	62.95	43.80	5.40	25.90	-12.50	50.45	74.00	-23.55	Pk	Vertical
2115.75	53.61	43.80	5.40	25.90	-12.50	41.12	54.00	-12.88	AV	Vertical
2115.81	63.43	43.80	5.40	25.90	-12.50	50.93	74.00	-23.07	Pk	Horizontal
2115.81	49.69	43.80	5.40	25.90	-12.50	37.19	54.00	-16.81	AV	Horizontal
2744.82	67.47	44.40	6.20	27.60	-10.60	56.87	74.00	-17.13	Pk	Vertical
2744.82	50.54	44.40	6.20	27.60	-10.60	39.94	54.00	-14.06	AV	Vertical
2745.03	65.16	44.40	6.20	27.60	-10.60	54.56	74.00	-19.44	Pk	Horizontal
2745.03	50.85	44.40	6.20	27.60	-10.60	40.25	54.00	-13.75	AV	Horizontal
3220.41	62.95	44.70	6.70	28.20	-9.80	53.15	74.00	-20.85	Pk	Vertical
3220.41	51.29	44.70	6.70	28.20	-9.80	41.49	54.00	-12.51	AV	Vertical
3220.47	63.49	44.70	6.70	28.20	-9.80	53.69	74.00	-20.31	Pk	Horizontal
3220.47	50.41	44.70	6.70	28.20	-9.80	40.61	54.00	-13.39	AV	Horizontal
3945.35	65.35	44.20	7.90	29.70	-6.60	58.75	74.00	-15.25	Pk	Vertical
3945.35	47.18	44.20	7.90	29.70	-6.60	40.58	54.00	-13.42	AV	Vertical
3945.26	67.85	44.20	7.90	29.70	-6.60	61.25	74.00	-12.75	Pk	Horizontal
3945.26	49.31	44.20	7.90	29.70	-6.60	42.71	54.00	-11.29	AV	Horizontal
7320.82	55.49	43.50	11.40	35.50	3.40	58.89	74.00	-15.11	Pk	Vertical
7320.82	38.73	43.50	11.40	35.50	3.40	42.13	54.00	-11.87	AV	Vertical
7320.85	55.71	43.50	11.40	35.50	3.40	59.11	74.00	-14.89	Pk	Horizontal
7320.85	38.77	43.50	11.40	35.50	3.40	42.17	54.00	-11.83	AV	Horizontal
8013.49	54.24	44.20	12.00	37.00	4.80	59.04	74.00	-14.96	Pk	Vertical
8013.49	38.12	44.20	12.00	37.00	4.80	42.92	54.00	-11.08	AV	Vertical
8013.27	53.77	44.20	12.00	37.00	4.80	58.57	74.00	-15.43	Pk	Horizontal
8013.27	37.69	44.20	12.00	37.00	4.80	42.49	54.00	-11.51	AV	Horizontal
9150.45	53.37	45.00	12.57	37.40	4.97	58.34	74.00	-15.66	Pk	Vertical
9150.45	40.18	45.00	12.57	37.40	4.97	45.15	54.00	-8.85	AV	Vertical
9150.37	52.82	45.00	12.57	37.40	4.97	57.78	74.00	-16.22	Pk	Horizontal
9150.37	38.64	45.00	12.57	37.40	4.97	43.60	54.00	-10.40	AV	Horizontal
9794.72	49.41	43.60	14.33	39.50	10.20	59.61	74.00	-14.39	Pk	Vertical
9794.72	33.84	43.60	14.33	39.50	10.20	44.04	54.00	-9.96	AV	Vertical
9794.75	51.95	43.60	14.33	39.50	10.20	62.15	74.00	-11.85	Pk	Horizontal
9794.75	36.16	43.60	14.33	39.50	10.20	46.36	54.00	-7.64	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

Note: The main frequency is too far away from the restricted band and does not require testing.





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

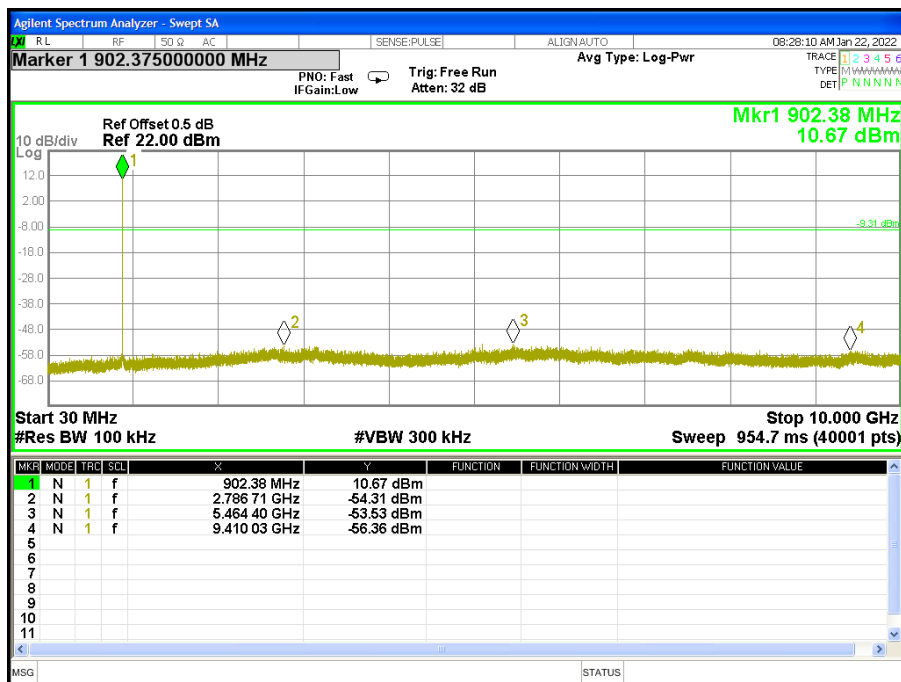
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



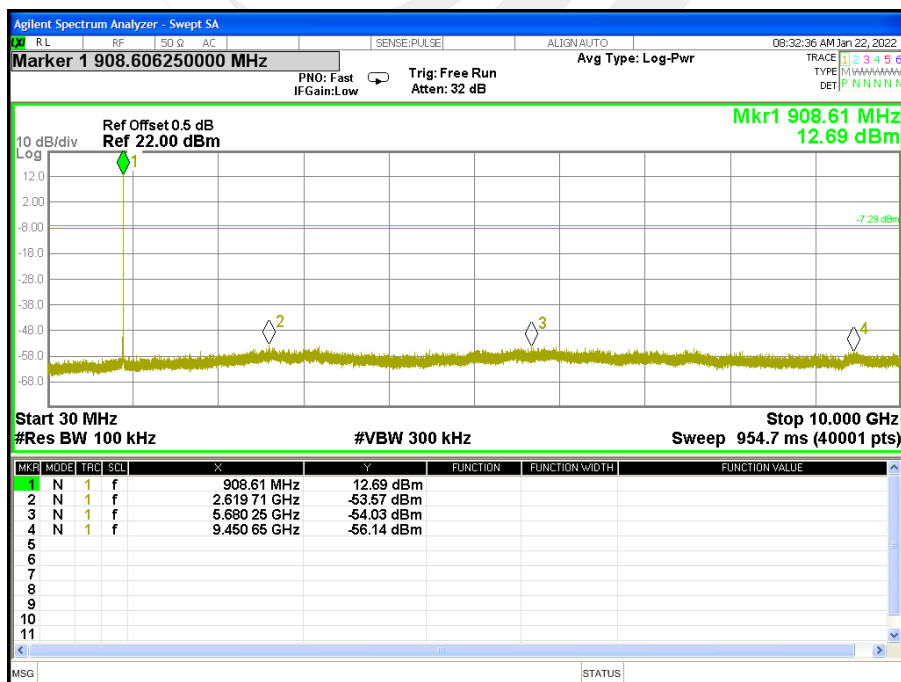
4.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	FSK(1Mbps)-01/32/65 CH	Test Voltage:	AC 120V/60Hz

01 CH

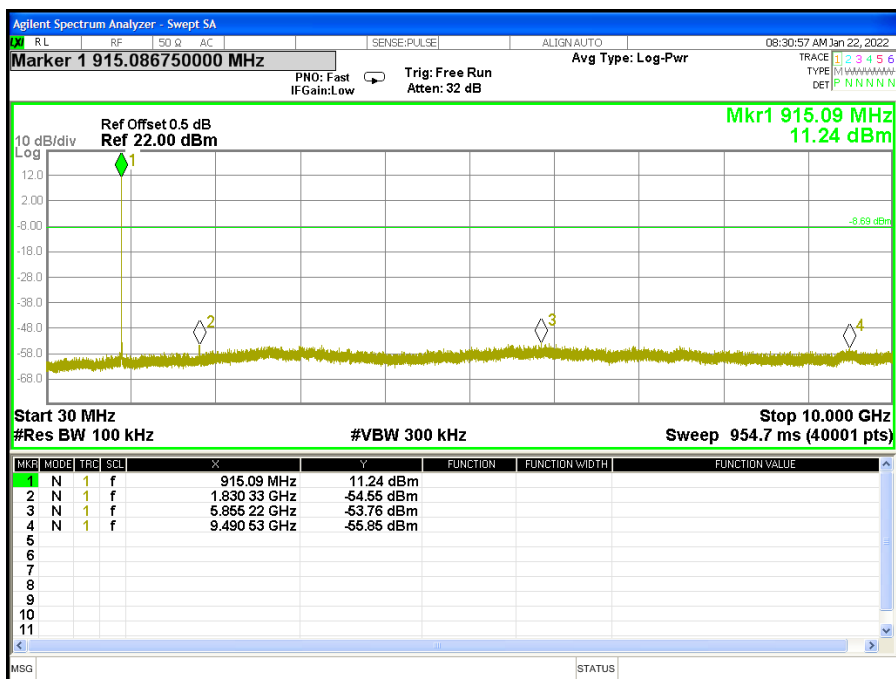


32 CH





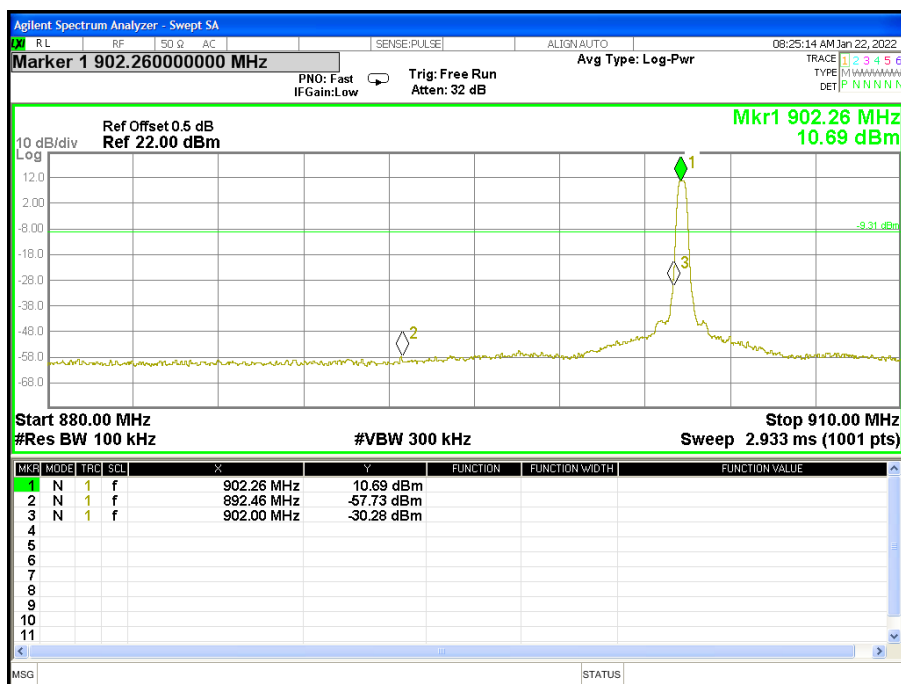
65 CH



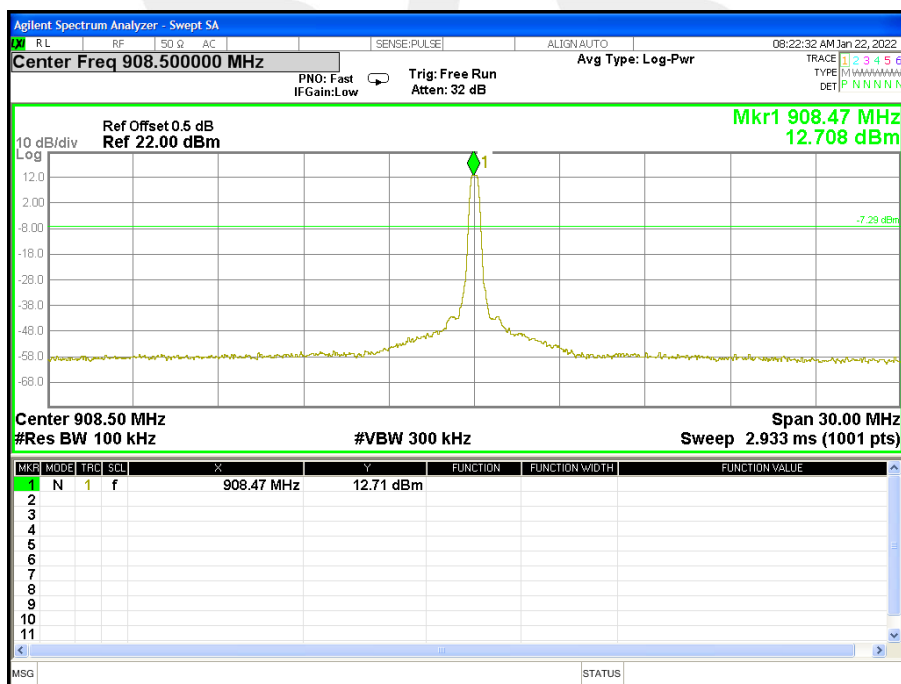


For Band edge(it's also the reference level for conducted spurious emission)

01 CH

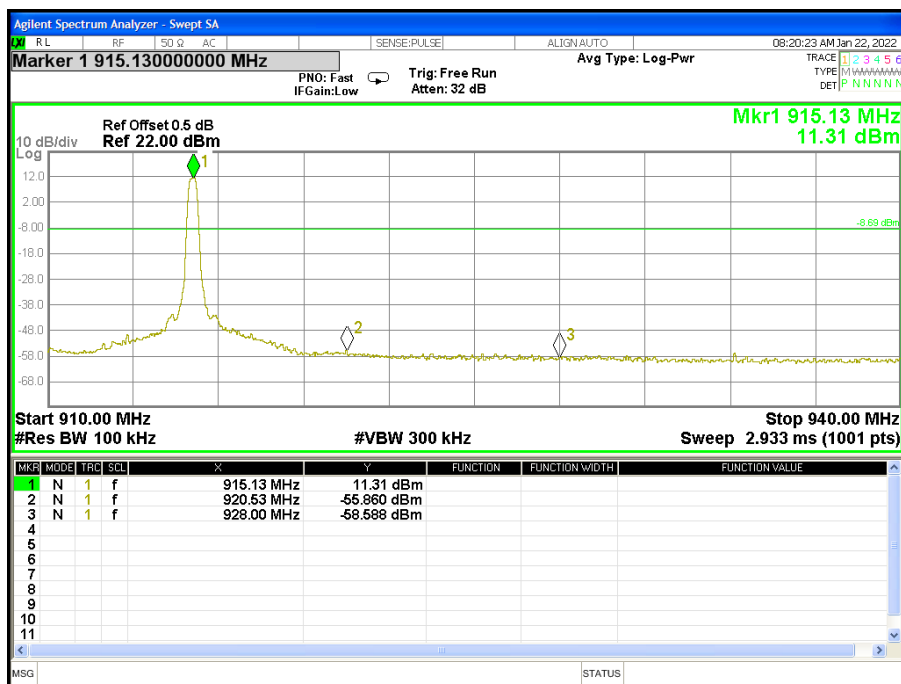


32 CH





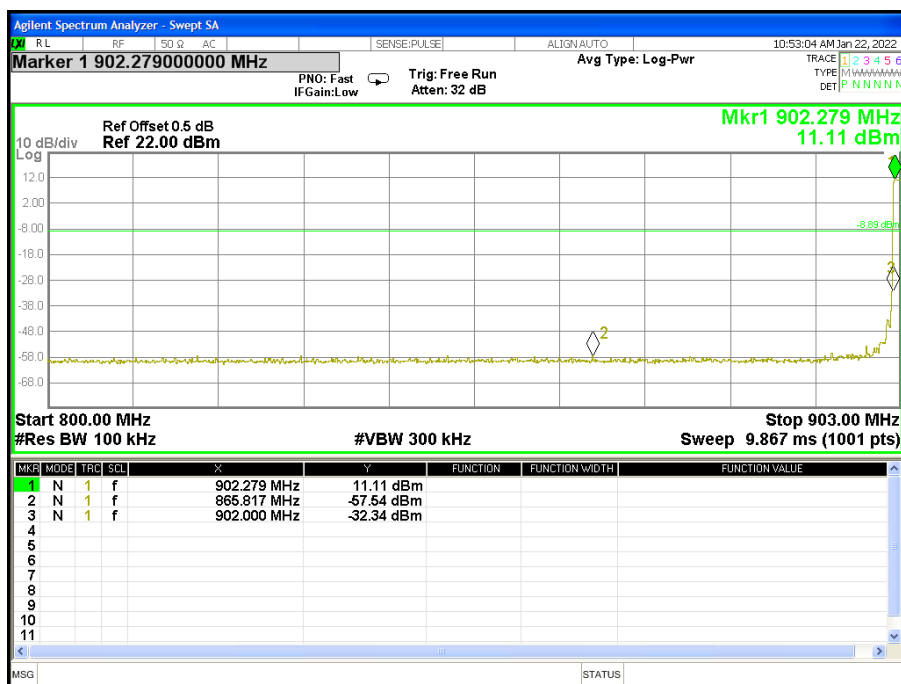
65 CH



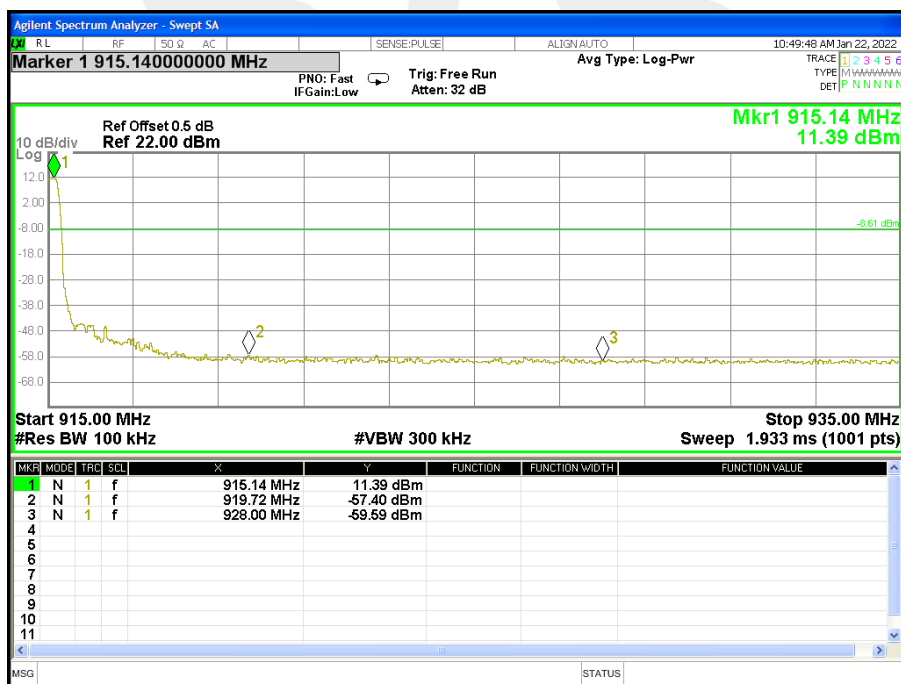


For Hopping Band edge

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	30KHz
VB	100KHz
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= 30KHz, VBW=100KHz, 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.



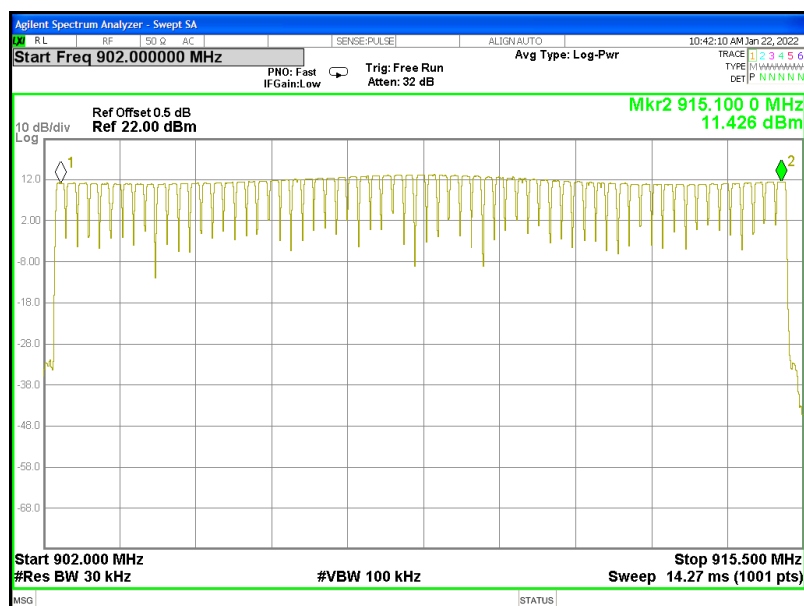
5.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Mode:	Hopping Mode -FSK Mode	Test Voltage:	AC 120V/60Hz

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

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

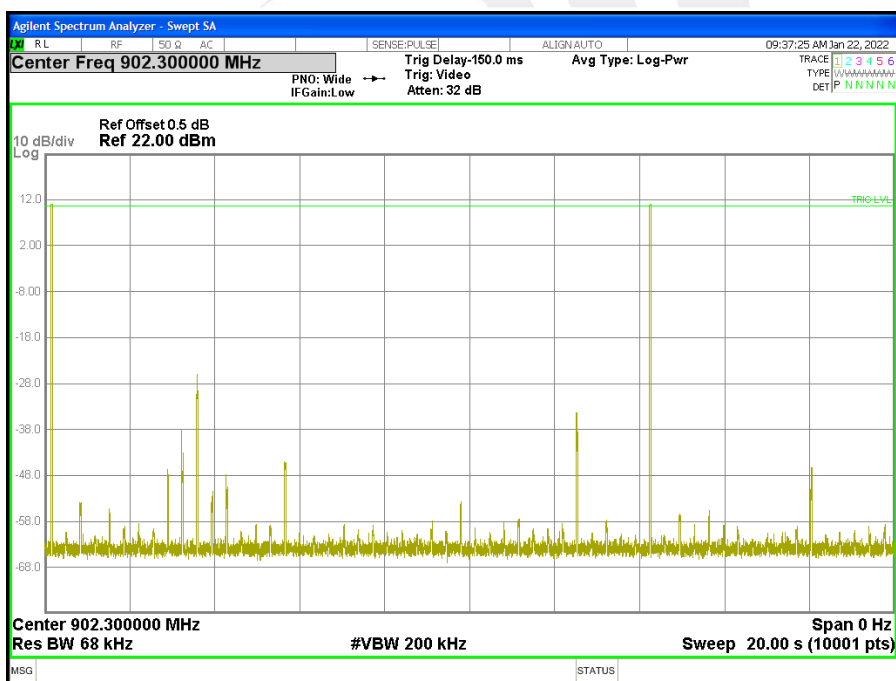
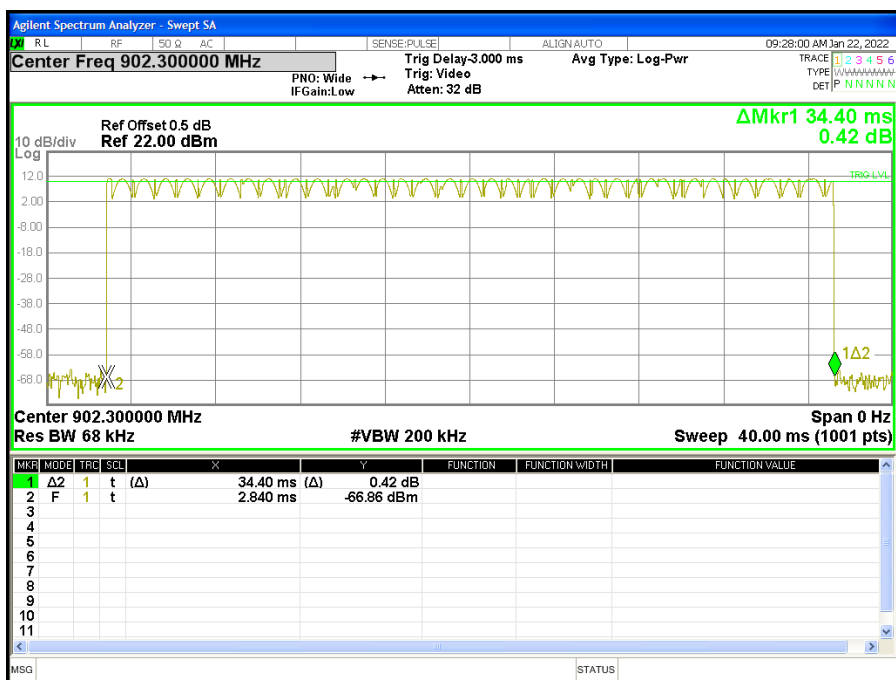
Temperature:	25℃	Relative Humidity:	50%
Test Mode:	FSK	Test Voltage:	AC 120V/60Hz

Modulation	Frequency (MHz)	Single Pulse Time(ms)	Number Of Pulses	Dwell Time(s)	Limit(s)	Result
FSK	902.3	34.400	2	0.06880	0.4	Pass
	908.5	34.400	1	0.03440	0.4	Pass
	915.1	34.400	1	0.03440	0.4	Pass



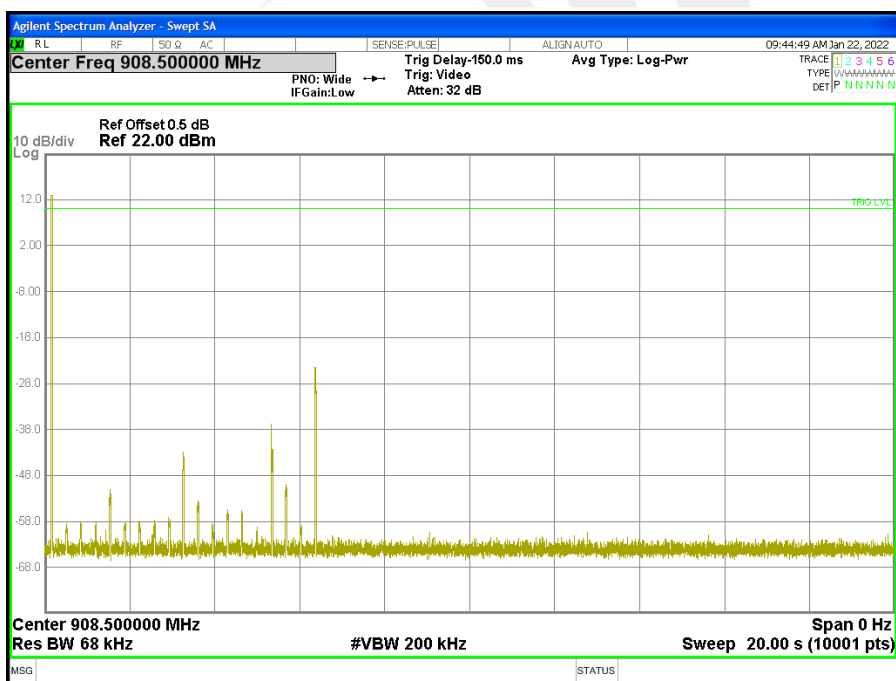
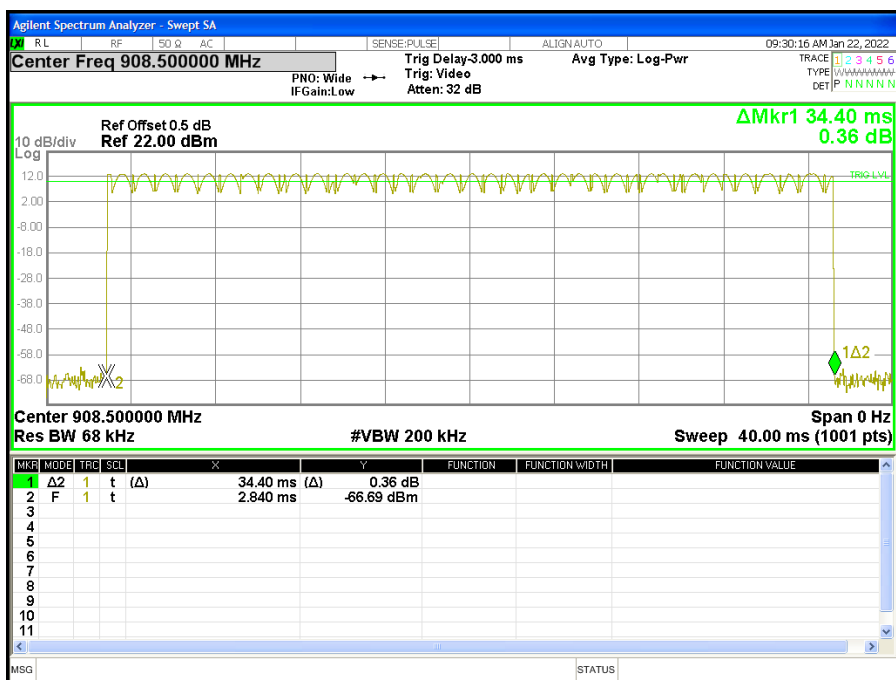


CH01



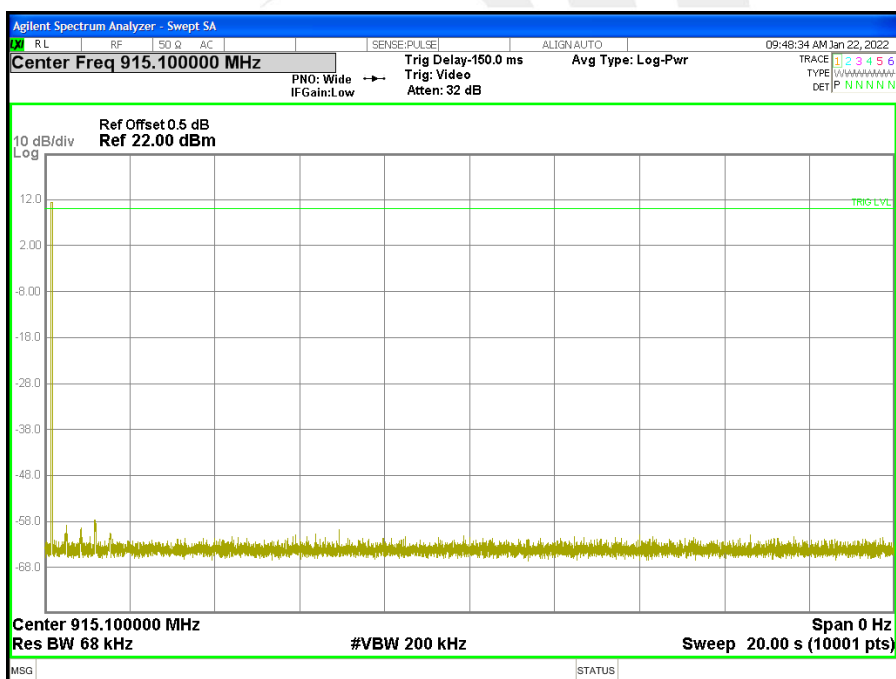


CH32





CH65





7. HOPPING CHANNEL SEPARATION MEASUREMENT

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.



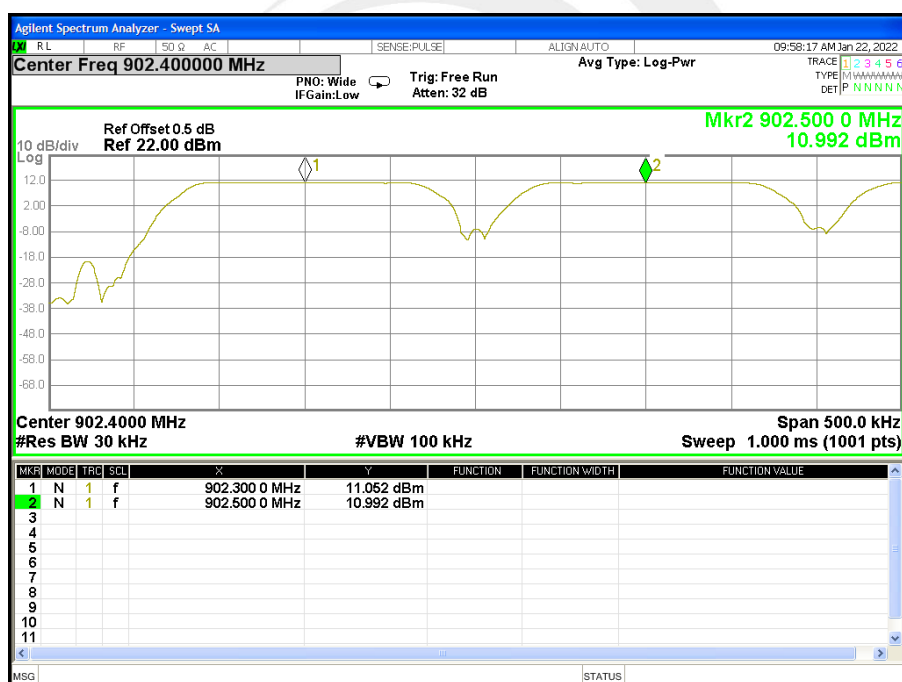
7.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	CH01 / CH32 / CH65 (FSK Mode)	Test Voltage:	AC 120V/60Hz

Modulation	Frequency (MHz)	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Channel Separation (KHz)	Limit (KHz)	Result
FSK	902.3	902.300	902.500	200.000	133.40	Pass
	908.5	908.500	908.700	200.000	133.80	Pass
	915.1	914.900	915.100	200.000	135.10	Pass

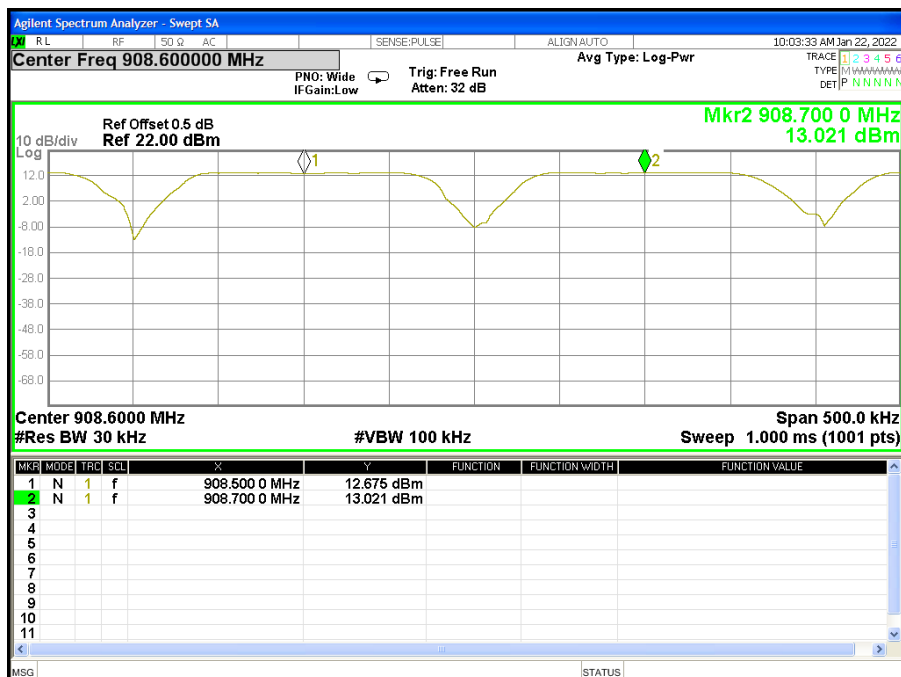
For LongFi: Ch. Separation Limits: > 20dB bandwidth

CH01

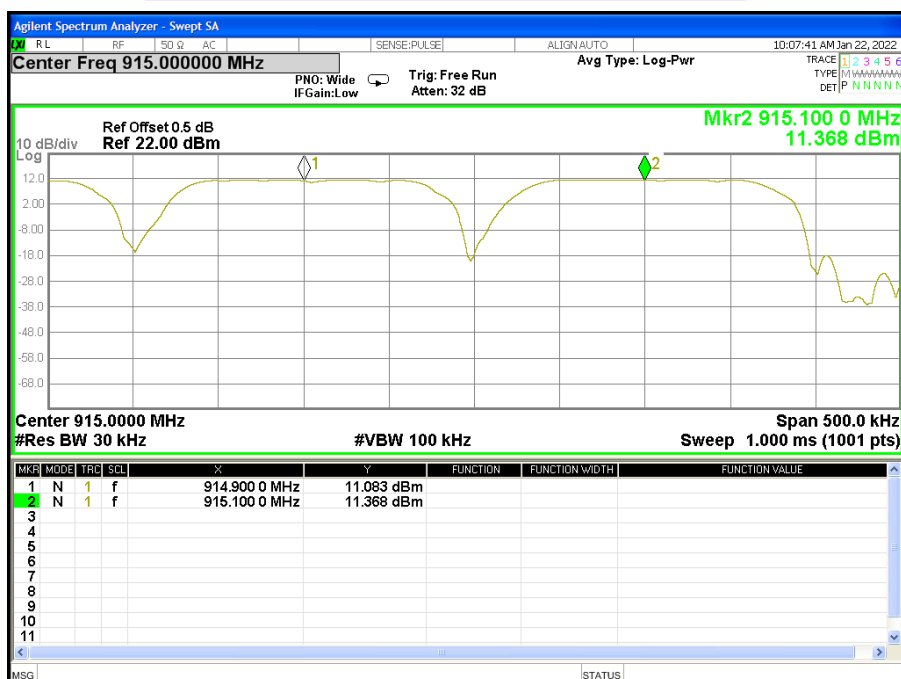




CH32



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.

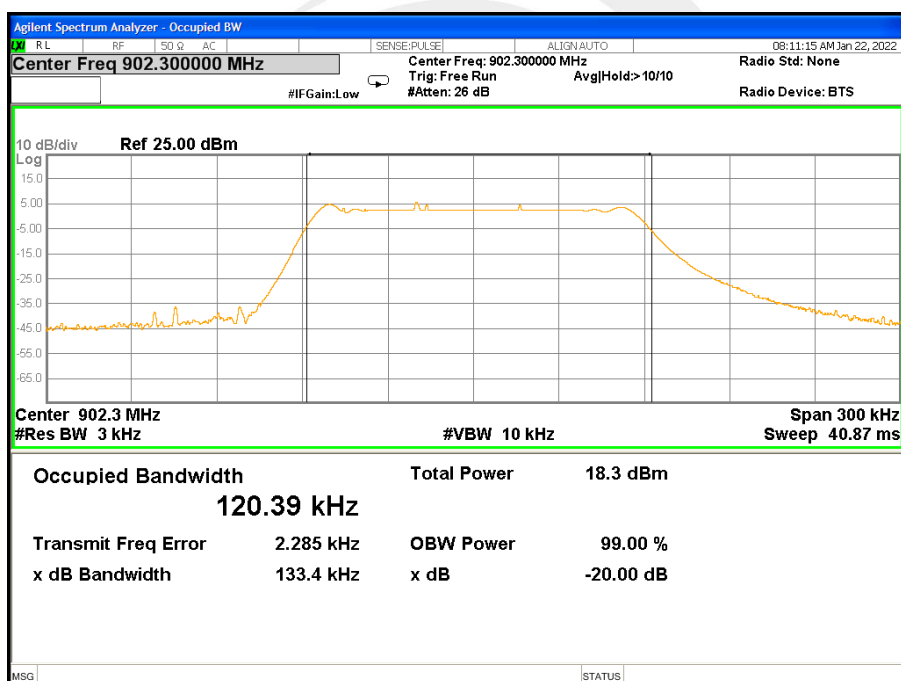


8.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	FSK CH01/ CH32 / CH65	Test Voltage:	AC 120V/60Hz

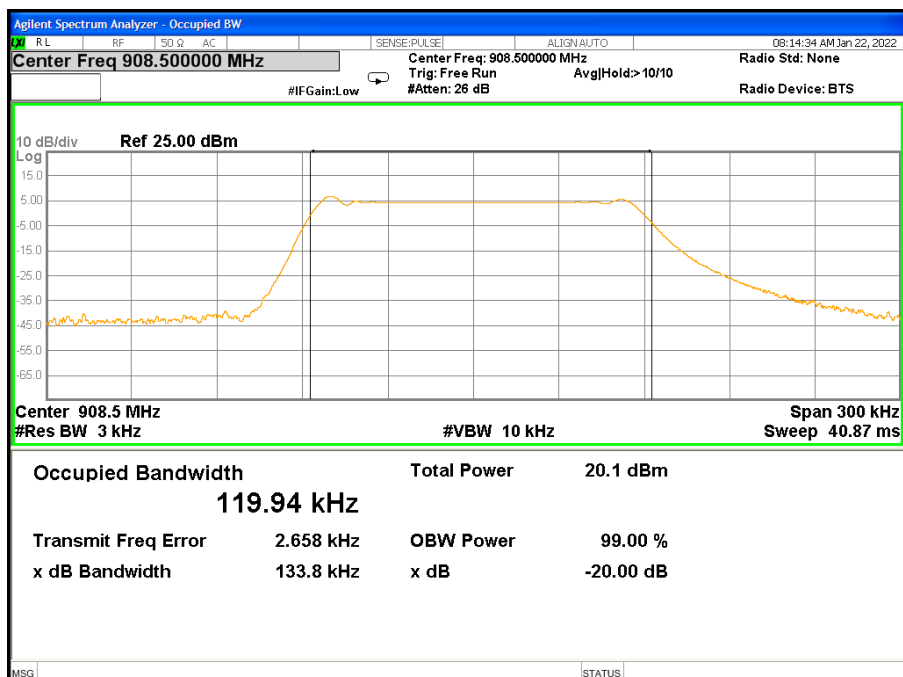
FSK			
Frequency	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Result
902.3 MHz	133.4	120.39	PASS
908.5 MHz	133.8	119.94	PASS
915.1 MHz	135.1	120.72	PASS

CH01

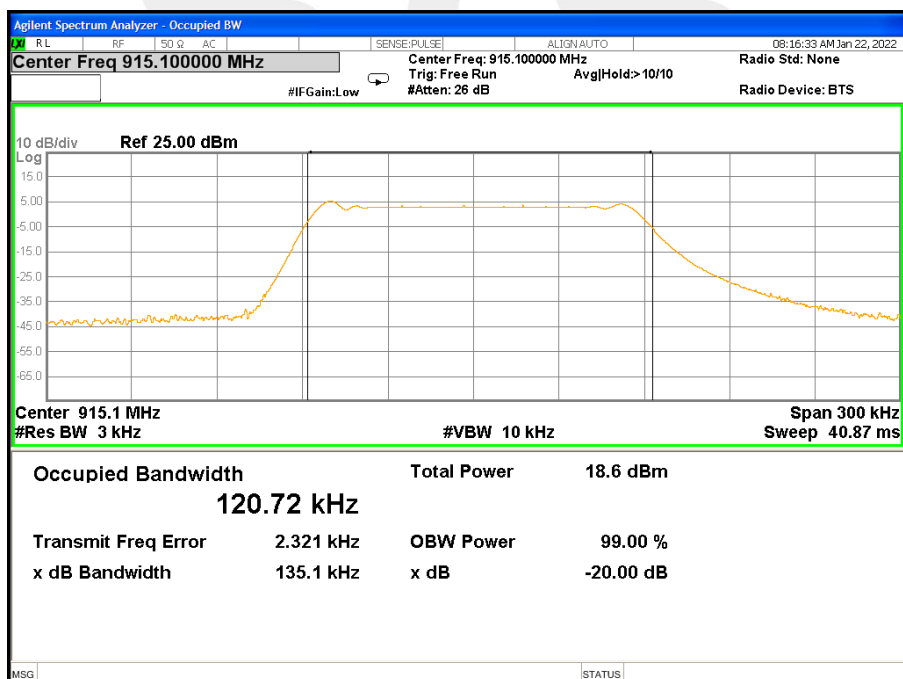




CH32



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.

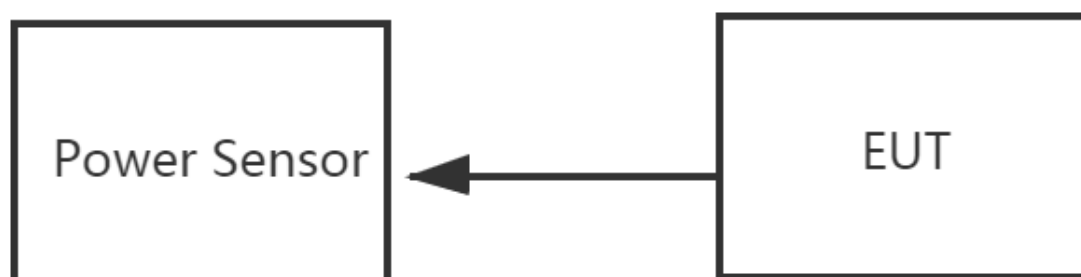
e) A plot of the test results and setup description shall be included in the test report.

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:	AC 120V/60Hz		

Modulation	Frequency (MHz)	Peak Power (dBm)	Average Power (dBm)	Limit (dBm)
FSK	902.3	11.35	11.30	30.00
	908.5	13.46	13.39	30.00
	915.1	11.95	11.88	30.00

EIRP

Mode	Channel Number	Frequency (MHz)	Peak Power	Antenna Gain	EIRP Power	Limit
			(dBm)	(dBi)	(dBm)	(dBm)
FSK	01	902.3	11.35	4.00	15.35	36.02
	32	908.5	13.46	4.00	17.46	36.02
	65	915.1	11.95	4.00	15.95	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)
138	908.5021
120	908.5014
102	908.5012
Max.Deviation(MHz)	0.0021
Max.Deviation(ppm)	2.31

Rated working voltage: AC 120V/60Hz

Temperature vs. Frequency Stability

Temperature($^{\circ}$ C)	Measurement Frequency(MHz)
-30	908.5028
-20	908.5026
-10	908.5020
0	908.5026
10	908.5022
20	908.5023
30	908.5022
40	908.5024
50	908.5026
Max.Deviation(MHz)	0.0028
Max.Deviation(ppm)	3.08



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※※※※※

