



FCC TEST REPORT

FCC ID:2A6BU-HCG003

Report Number..... : ZKT-2501171532E-2

Date of Test..... Jan. 17, 2025 to Mar. 10, 2025

Date of issue..... : Mar. 10, 2025

Total number of pages 31

Test Result : PASS

Testing Laboratory..... : Shenzhen ZKT Technology Co., Ltd.

Address 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name : NINGBO HANCI ELECTRICAL CO., LTD.

Address No. 127-129 Dexing Road, Ninghai Industrial Zone, Ningbo City, China. 315600

Manufacturer's name : NINGBO HANCI ELECTRICAL CO., LTD.

Address No. 127-129 Dexing Road, Ninghai Industrial Zone, Ningbo City, China. 315600

Test specification:

Standard..... FCC CFR Title 47 Part 15 Subpart C Section 15.231
ANSI C63.10:2013

Test procedure..... : /

Non-standard test method : N/A

Test Report Form No. : /

Test Report Form(s) Originator : ZKT Testing

Master TRF : Dated: 2020-01-06

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

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Product name..... : Sub-GHz Gateway

Trademark : N/A

Model/Type reference : HCG-003

Ratings: Input: 100-240V~, 50/60Hz, 1W



Testing procedure and testing location:

Testing Laboratory : Shenzhen ZKT Technology Co., Ltd.

Address : 1/F, No. 101, Building B, No. 6, Tangwei Community
Industrial Avenue, Fuhai Street, Bao'an District,
Shenzhen, China

Tested by (name + signature) : Jim Liu

Reviewer (name + signature)..... : Jeff Fu

Approved (name + signature) : Lake Xie





Table of Contents

Page

1. VERSION	5
2. SUMMARY OF TEST RESULTS.....	6
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
3. GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 DESCRIPTION OF TEST MODES.....	9
3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	9
3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE).....	9
3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS.....	10
4. EMC EMISSION TEST	10
4.1 CONDUCTED EMISSION MEASUREMENT	12
4.1.1 POWER LINE CONDUCTED EMISSION LIMITS	12
4.1.2 TEST PROCEDURE	13
4.1.3 DEVIATION FROM TEST STANDARD	13
4.1.4 TEST SETUP	13
4.1.5 EUT OPERATING CONDITIONS	13
4.1.6 TEST RESULTS.....	13
4.2 RADIATED EMISSION MEASUREMENT.....	16
4.2.1 RADIATED EMISSION LIMITS.....	16
4.2.2 TEST PROCEDURE	18
4.2.3 TEST SETUP	19
4.2.4 EUT OPERATING CONDITIONS	20
4.2.5 TEST RESULTS.....	20
5.1 APPLIED PROCEDURES / LIMIT	25
5.2 TEST PROCEDURE	25
5.3 DEVIATION FROM STANDARD	25
5.4 TEST SETUP	25
5.5 EUT OPERATION CONDITIONS	25
5.6 TEST RESULTS.....	26
6. CALCULATION OF AVERAGE FACTOR	27
7. DWELL TIME	28
7.1 APPLICABLE STANDARD	28
7.2 TEST PROCEDURE	28
7.5 EUT OPERATION CONDITIONS.....	28
7.6 TEST RESULTS	29



Table of Contents

Page

8. ANTENNA REQUIREMENT.....	30
9. TEST SETUP PHOTO.....	31
10. EUT CONSTRUCTIONAL DETAILS.....	31



1. VERSION

Report No.	Version	Description	Approved
ZKT-2501171532E-2	Rev.01	Initial issue of report	Mar. 10, 2025



2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.231) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.209,15.231e	Fundamental &Radiated Spurious Emission Measurement	PASS	
15.231c	Occupy Bandwidth	PASS	
15.231e	Dwell time	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report



2.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.
Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street,
Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225
Designation Number: CN1299
IC Registered No.: 27033
CAB identifier: CN0110

2.2 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	3m chamber Radiated spurious emission(9KHz-30MHz)	U=4.5dB
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8MHz
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59°C



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Sub-GHz Gateway
Trade Name	N/A
Model Name	HCG-003
Serial Model	N/A
Model Difference	N/A
Hardware version	N/A
Software version	N/A
Operation Frequency:	433.92MHz
Modulation Type:	FSK
Antenna Type:	Spring Antenna
Antenna Gain:	0 dBi
Ratings:	Sub-GHz Gateway: 100-240V~, 50/60Hz, 1W



3.2 DESCRIPTION OF TEST MODES

For All Emission	
Final Test Mode	Description
Transmitting mode	Keep the EUT in continuously transmitting mode

Note:

- (1) Fully-charged battery is used during the test

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission



3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Sub-GHz Gateway	N/A	HCG-003	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	N/A	Sep. 30, 2024	Sep. 29, 2025
2	LISN	CYBERTEK	EM5040A	E1850400149	N/A	Sep. 30, 2024	Sep. 29, 2025
3	Test Cable	N/A	C-01	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025
4	EMI Test Receiver	R&S	ESCI3	101393	4.42 SP3	Sep. 29, 2024	Sep. 28, 2025
5	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\

Radiation Emissions & Radiation Spurious Emissions Test

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	N9020A	MY55370835	A.17.05	Sep. 29, 2024	Sep. 28, 2025
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Sep. 30, 2024	Sep. 29, 2025
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	100969	4.32	Sep. 29, 2024	Sep. 28, 2025
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	00877	N/A	Sep. 30, 2024	Sep. 29, 2025
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Sep. 30, 2024	Sep. 29, 2025
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Sep. 30, 2024	Sep. 29, 2025
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Oct. 11, 2024	Oct. 10, 2025
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	60747	N/A	Sep. 29, 2024	Sep. 28, 2025
9	Amplifier (1GHz-26.5GHz)	HuiPu	8449B	3008A00315	N/A	Sep. 29, 2024	Sep. 28, 2025
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Sep. 30, 2024	Sep. 29, 2025
11	Test Cable	N/A	R-01	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025
12	Test Cable	N/A	R-02	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025
13	Test Cable	N/A	R-03	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025
14	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
15	EMC Software	Frad	EZ-EMC	Ver.EMC-CO N 3A1.1	N/A	\	\
16	Turntable	MF	MF-7802BS	N/A	N/A	\	\
17	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\

RF Conducted Test

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	N9020A	MY55370835	A.17.05	Sep. 29, 2024	Sep. 28, 2025
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Sep. 30, 2024	Sep. 29, 2025
3	Test Cable	N/A	RF-01	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025



4	Test Cable	N/A	RF-02	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025
5	Test Cable	N/A	RF-03	N/A	N/A	Sep. 30, 2024	Sep. 29, 2025
6	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Sep. 29, 2024	Sep. 28, 2025
7	Signal Generator	Agilent	N5182A	N/A	A.01.87	Sep. 29, 2024	Sep. 28, 2025
8	Magnetic Field Probe Tester	Narda	ELT-400	0-0344	N/A	Nov. 16, 2023	Nov. 15, 2024
9	Van der Hoofden measuring head	Schwarzbeck Mess-elektronik	VDHH 9502	9502-039	N/A	Sep. 30, 2024	Sep. 29, 2025
10	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Sep. 30, 2024	Sep. 29, 2025
11	MWRF Power Meter Test system	MW	MW100-RF CB	N/A	N/A	Sep. 29, 2024	Sep. 28, 2025
12	D.C. Power Supply	LongWei	TPR-6405 D	N/A	N/A	\	\
13	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\



4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

4.1.1 POWER LINE CONDUCTED EMISSION LIMITS

(Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

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



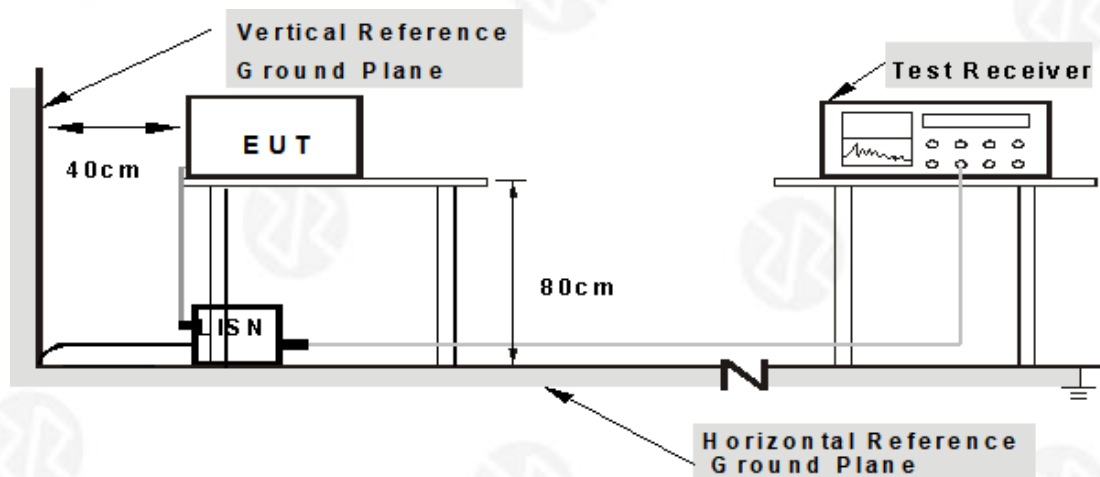
4.1.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 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 at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 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
from other units and other metal planes**

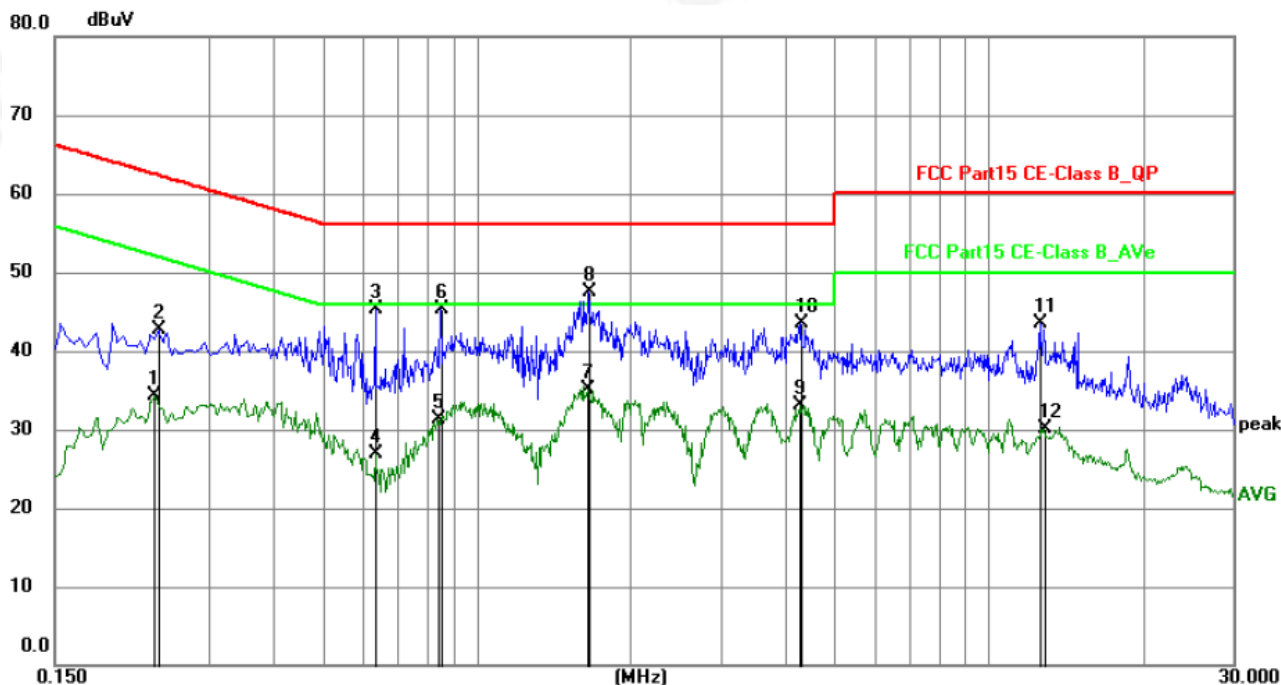
4.1.5 EUT OPERATING CONDITIONS

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.

4.1.6 TEST RESULTS



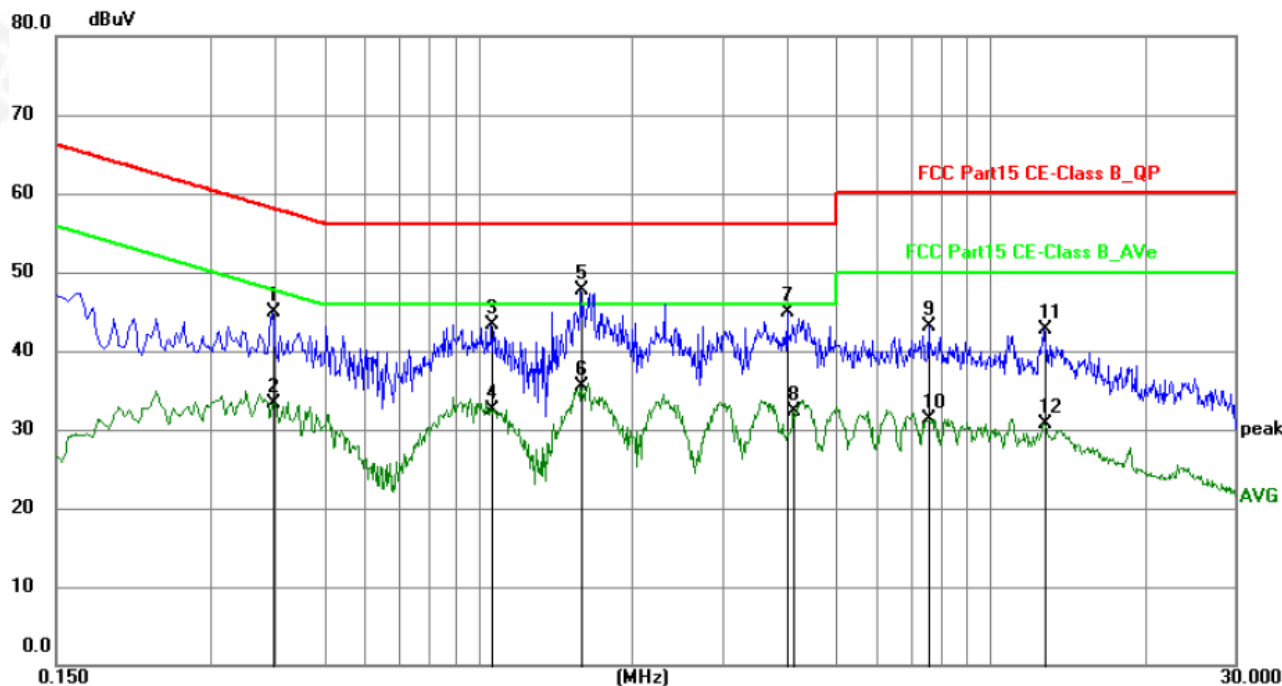
Temperature:	26°C	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	L
Test Voltage:	AC 120V/60Hz	Test Mode:	TX mode



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2353	14.00	20.37	34.37	52.26	-17.89	AVG	P
2	0.2400	22.29	20.37	42.66	62.10	-19.44	QP	P
3	0.6359	24.95	20.29	45.24	56.00	-10.76	QP	P
4	0.6359	6.52	20.29	26.81	46.00	-19.19	AVG	P
5	0.8427	11.05	20.30	31.35	46.00	-14.65	AVG	P
6	0.8518	24.98	20.30	45.28	56.00	-10.72	QP	P
7	1.6484	14.76	20.30	35.06	46.00	-10.94	AVG	P
8	1.6572	27.24	20.30	47.54	56.00	-8.46	QP	P
9	4.2808	12.72	20.35	33.07	46.00	-12.93	AVG	P
10	4.3079	23.20	20.35	43.55	56.00	-12.45	QP	P
11	12.6240	22.94	20.47	43.41	60.00	-16.59	QP	P
12	12.7949	9.66	20.47	30.13	50.00	-19.87	AVG	P



Temperature:	26°C	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	N
Test Voltage:	AC 120V/60Hz	Test Mode:	TX mode



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.3975	24.49	20.32	44.81	57.91	-13.10	QP	P
2	0.3975	13.01	20.32	33.33	47.91	-14.58	AVG	P
3	1.0632	23.06	20.30	43.36	56.00	-12.64	QP	P
4	1.0632	12.30	20.30	32.60	46.00	-13.40	AVG	P
5	1.5900	27.49	20.30	47.79	56.00	-8.21	QP	P
6	1.5900	15.11	20.30	35.41	46.00	-10.59	AVG	P
7	4.0109	24.65	20.33	44.98	56.00	-11.02	QP	P
8	4.1189	11.93	20.34	32.27	46.00	-13.73	AVG	P
9	7.5975	22.71	20.42	43.13	60.00	-16.87	QP	P
10	7.5975	10.97	20.42	31.39	50.00	-18.61	AVG	P
11	12.7590	22.26	20.49	42.75	60.00	-17.25	QP	P
12	12.7590	10.29	20.49	30.78	50.00	-19.22	AVG	P

Notes:

- 1.An initial pre-scan was performed on the line and neutral lines with peak detector.
- 2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- 3.Measurement Level = Reading level + Correct Factor



Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor.

4.2 RADIATED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average

4.2.1 RADIATED EMISSION LIMITS

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.231(b) limit in the table below has to be followed.

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

FREQUENCY (MHz)	Limit (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).



FUNDAMENTAL AND HARMONICS EMISSION LIMITS

Table A2 — Reduced field strength limits for momentarily operated devices

Fundamental frequency (MHz), excluding restricted frequency bands specified in RSS-Gen	Field strength of the fundamental emissions ($\mu\text{V/m}$ at 3 m)
70-130	500
130-174	500 to 1,500*
174-260**	1,500
260-470**	1,500 to 5,000*
Above 470	5,000

* Linear interpolation with frequency, f , in MHz:

- For 130-174 MHz: Field Strength ($\mu\text{V/m}$) = $(22.73 \times f) - 2454.55$
- For 260-470 MHz: Field Strength ($\mu\text{V/m}$) = $(16.67 \times f) - 2833.33$

** Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

Frequency	Limit (dB $\mu\text{V/m}$ @3m)	Remark
433.92MHz	72.87	Average Value
	92.87	Peak Value

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
--------------------	---------



Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW setting	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations 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 then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

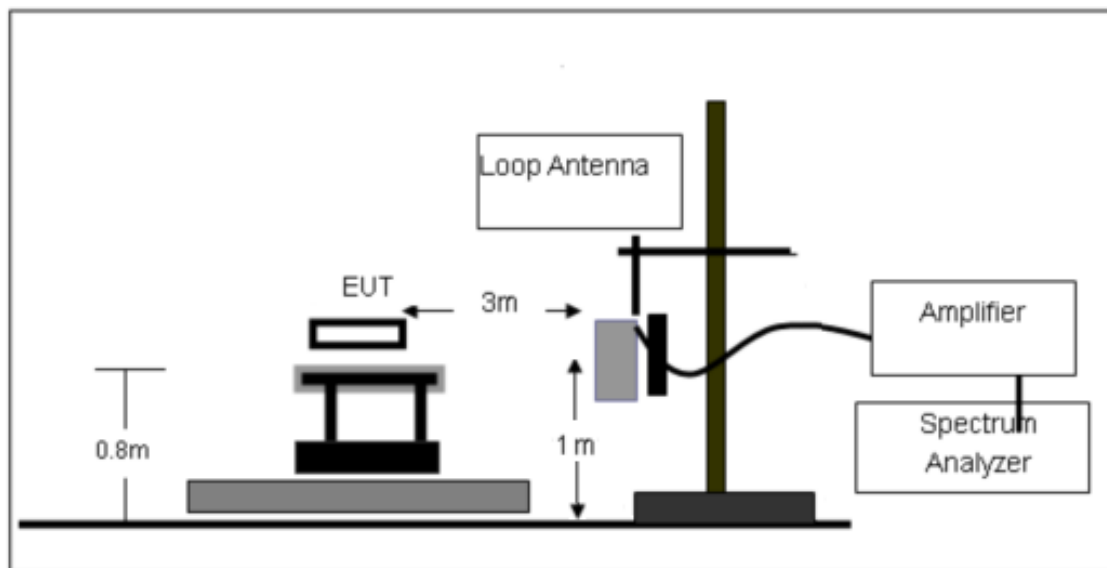
Note:

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

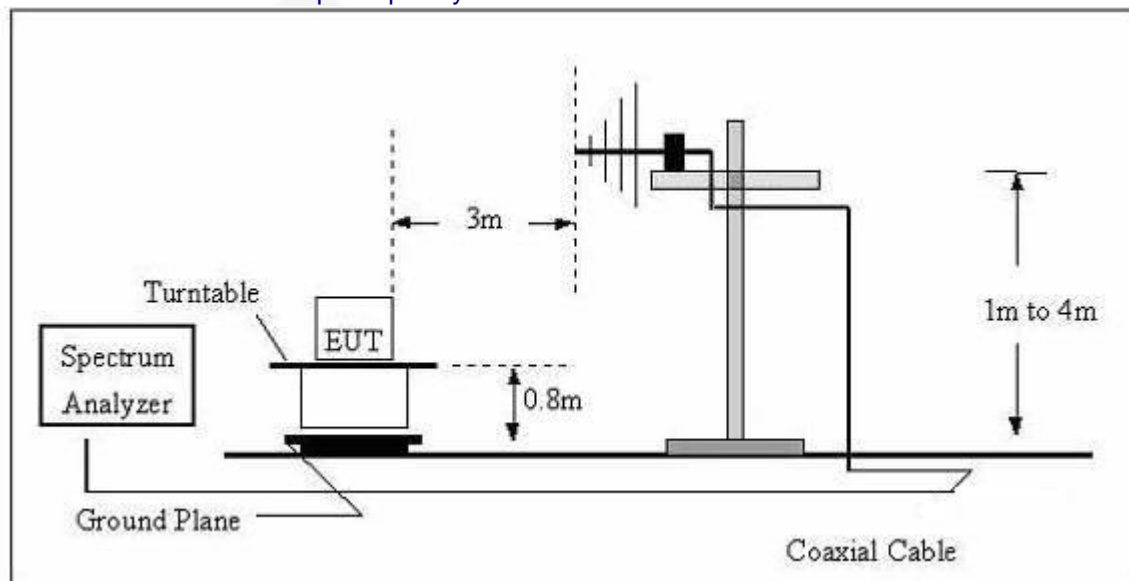


4.2.3 TEST SETUP

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

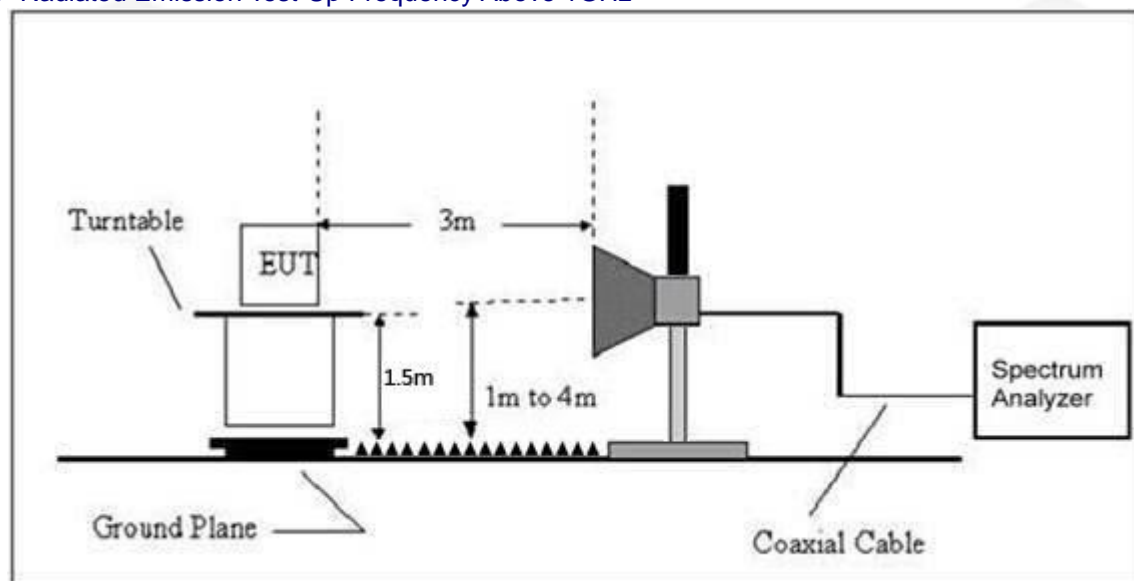


(B) Radiated Emission Test-Up Frequency 30MHz~1GHz





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



4.2.4 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.

4.2.5 TEST RESULTS

Radiated Spurious Emission (Below 9KHz – 30MHz)

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	---
Test Voltage :	AC 120V/60Hz		
Test Mode :	TX Mode		

Freq.	Reading	Limit	Margin	State
(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.

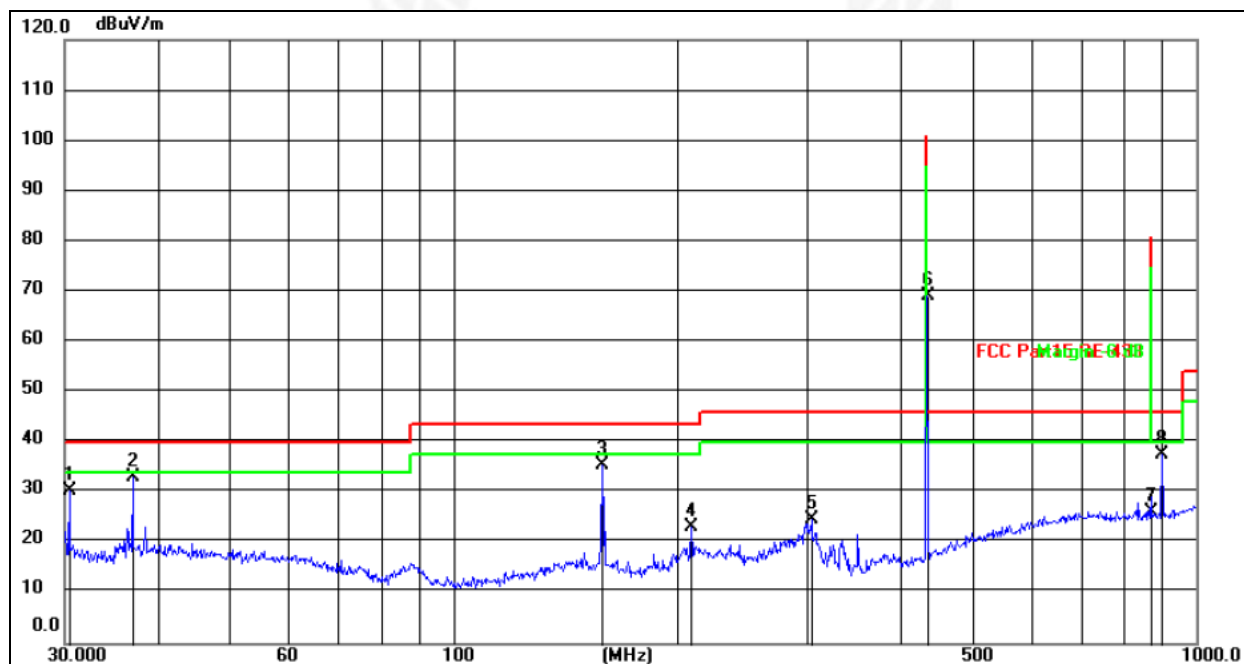
Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

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



Radiated Spurious Emission (Between 30MHz – 1GHz)

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	AC 120V/60Hz		
Test Mode :	TX Mode		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.4238	44.76	-14.18	30.58	40.00	-9.42	QP
2	37.0248	47.71	-14.57	33.14	40.00	-6.86	QP
3	158.6677	51.56	-16.01	35.55	43.50	-7.95	QP
4	209.3129	41.16	-18.01	23.15	43.50	-20.35	QP
5	303.5437	41.31	-16.54	24.77	46.00	-21.23	QP
6	434.0651	83.54	-14.35	69.19	92.87	-23.68	peak
7	867.8352	32.91	-6.68	26.23	72.87	-46.64	peak
8	900.1474	44.39	-6.69	37.70	46.00	-8.30	QP

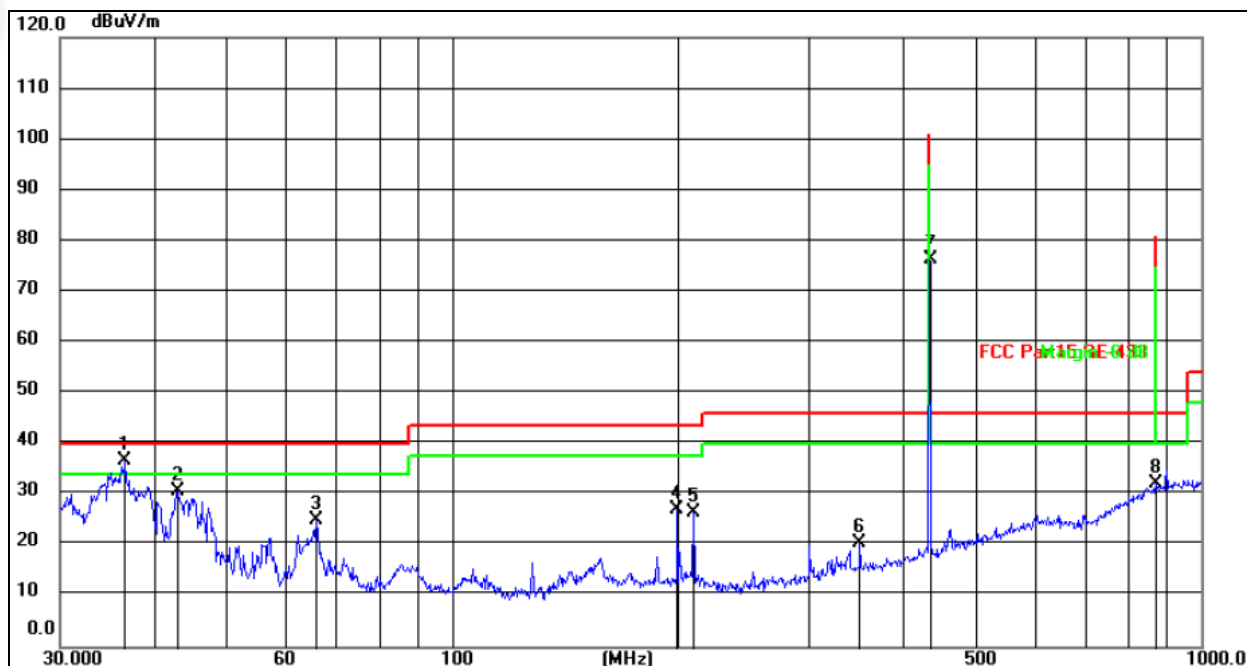
Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

2. The emission levels of other frequencies are very lower than the limit and not show in test report.



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Vertical
Test Voltage :	AC 120V/60Hz		
Test Mode :	TX Mode		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	36.6374	54.04	-17.25	36.79	40.00	-3.21	QP
2	43.0504	47.77	-16.89	30.88	40.00	-9.12	QP
3	65.8030	43.84	-18.80	25.04	40.00	-14.96	QP
4	199.9855	47.47	-20.40	27.07	43.50	-16.43	QP
5	210.0481	46.65	-20.23	26.42	43.50	-17.08	QP
6	350.4767	36.87	-16.20	20.67	46.00	-25.33	QP
7	434.0651	89.60	-13.32	76.28	92.87	-16.59	peak
8	867.9302	33.48	-1.36	32.12	72.87	-40.75	peak

Remarks:

- 1.Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- 2.The emission levels of other frequencies are very lower than the limit and not show in test report.



For average Emission

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	AverageLevel dBuV/m	Limit AV	Margin	Polarization
433.92	69.19	-10.26	58.93	72.87	-13.94	Horizontal
867.84	26.23	-10.26	15.97	52.87	-36.90	Horizontal

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
2. Duty cycle level please see clause 5.

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	AverageLevel dBuV/m	Limit AV	Margin	Polarization
433.92	76.28	-10.26	66.02	72.87	-6.85	Vertical
867.84	32.12	-10.26	21.86	52.87	-31.01	Vertical

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
2. Duty cycle level please see clause 5.

Radiated Spurious Emission (1GHz to 10th harmonics)

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin dB		Polarization
				PK	AV	PK	AV	
1301.76	51.64	-10.26	41.38	74.00	54.00	-22.36	-12.62	Vertical
1735.68	52.57	-10.26	42.31	72.87	52.87	-20.30	-10.56	Vertical
2603.52	51.85	-10.26	41.59	72.87	52.87	-21.02	-11.28	Vertical
3037.44	52.31	-10.26	42.05	72.87	52.87	-20.56	-10.82	Vertical
3471.36	50.25	-10.26	39.99	72.87	52.87	-22.62	-12.88	Vertical
3905.28	47.42	-10.26	37.16	74.00	54.00	-26.58	-16.84	Vertical
1301.76	47.84	-10.26	37.58	74.00	54.00	-26.16	-16.42	Horizontal
1735.68	47.96	-10.26	37.70	72.87	52.87	-24.91	-15.17	Horizontal
2603.52	49.57	-10.26	39.31	72.87	52.87	-23.30	-13.56	Horizontal
3037.44	49.18	-10.26	38.92	72.87	52.87	-23.69	-13.95	Horizontal
3471.36	47.03	-10.26	36.77	72.87	52.87	-25.84	-16.10	Horizontal
3905.28	48.29	-10.26	38.03	74.00	54.00	-25.71	-15.97	Horizontal

Notes: 1.Average emission Level = Peak Level + Duty cycle factor

2.Duty cycle level please see clause 6.



5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

According to FCC 15.231(c) requirement:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

$$\text{B.W (20dBc) Limit} = 0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1.0848\text{MHz}$$

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	1.5*OBW ~ 5*OBW
RB	1%-5%OBW
VB	3 RBW,
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= 2*OBW ~ 5*OBW, VBW \geq 3 RBW, Sweep time = Auto.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

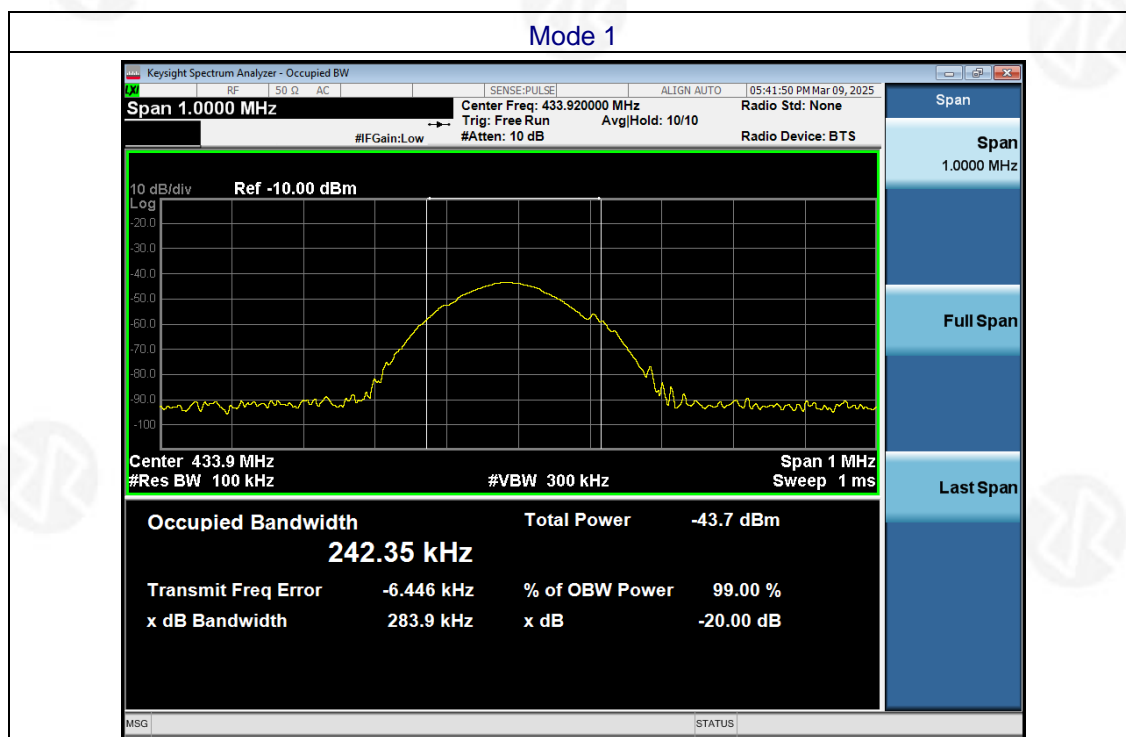
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



5.6 TEST RESULTS

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Mode		

Frequency MHz	20dB Bandwidth (kHz)	Limit (MHz)	Result
433.92	283.9	$0.25\% \times 433.92 = 1.0848$	PASS





6. CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 1MHz resolution bandwidth.

Averaging factor in dB = $20\log(\text{duty cycle})$

The duration of one cycle = 30.70ms

The duty cycle is simply the on-time divided the duration of one cycle

Duty Cycle = $30.70 / 100\text{ms}$

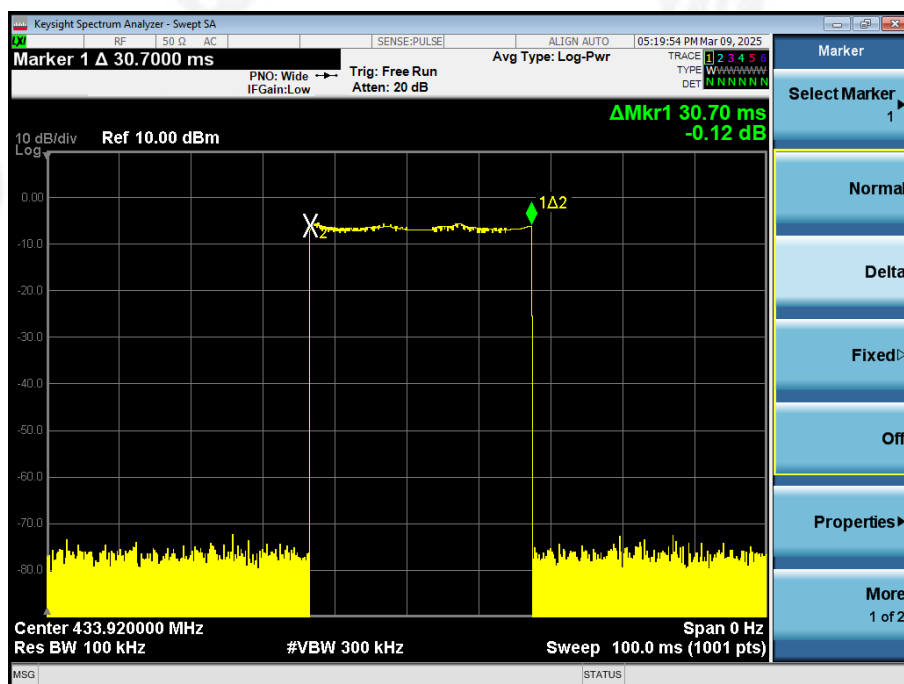
= 0.307

Therefore, the averaging factor is found by $20\log 0.307 = -10.26\text{dB}$

Test plot as follows:

Note: During the 100ms, the amount of pulse and on-time of pulse are the same for every pulse train.

Cycle





7. DWELL TIME

7.1 APPLICABLE STANDARD

According to FCC 15.231(e) requirement:

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

7.2 TEST PROCEDURE

Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

- 1.Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 2.Set RBW to 100 KHz and VBW of spectrum analyzer to 300 KHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- 3.Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 4.Repeat above procedures until all measured frequencies were complete.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

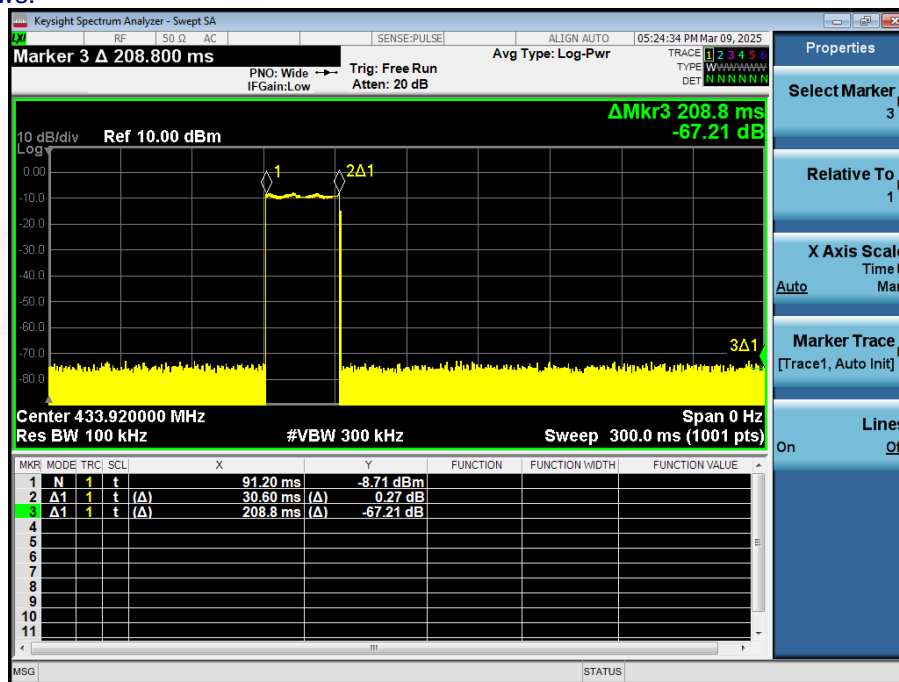
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



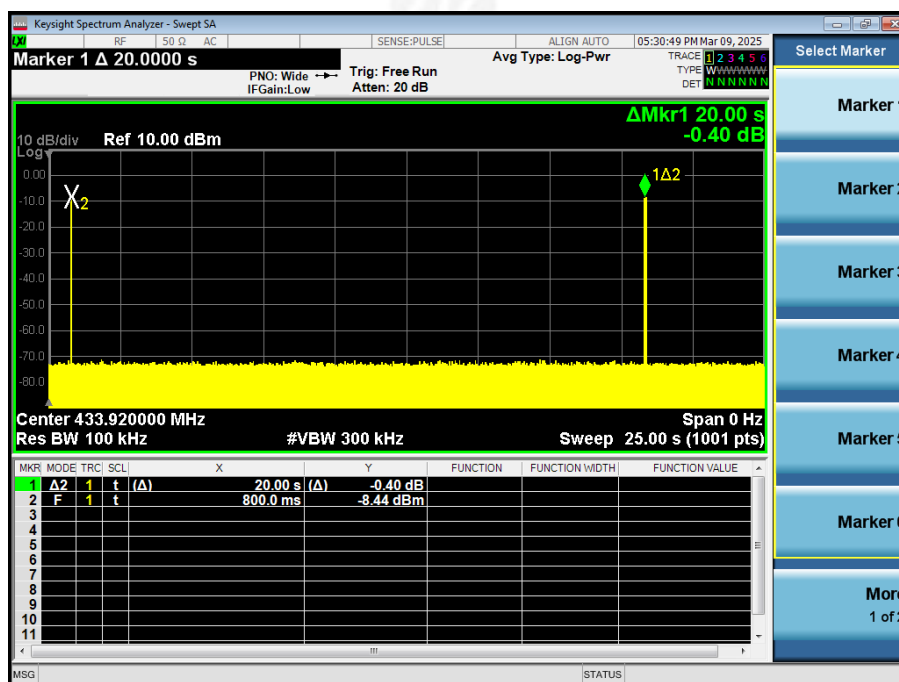
7.6 TEST RESULTS

Dwell time (second)	Limit (second)	Result
0.0306s	<1s	Pass

Test plot as follows:



Silent Period	Limit	Result
20.00S	>10s and > 30*0.0306S=0.918S	Pass





8. ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
EUT Antenna:	
The antenna is Spring Antenna, the best case gain of the antenna is 0dBi, reference to the appendix II for details	



9. TEST SETUP PHOTO

Reference to the appendix I for details.

10. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

***** END OF REPORT *****