RADIO TEST REPORT
FCC Part 90

Client Information:

Applicant:	Shenzhen Weiguo Times Technology Co.,Ltd
Applicant add.:	8th Floor,Block C, Wanguo City Pingi Avenue Nanwan Street, Longgang District Shenzhen 518000 China
Manufacturer:	Shenzhen Todakj Co., Ltd.
Manufacturer add.:	No. 40 Huan Dong Road, Tie Gang Industrial District, Baoan, Shenzhen, China

Product Information:

Product Name:	Wireless Intercom System
Model No./ HVIN:	C800
Brand Name:	Chtoocy
FCC ID:	2AZ6O-C800A

Prepared By:

Dongguan Yaxu (AiT) Technology Limited

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Date of Receipt:	2022.11.23	Date of Test:	2022.11.23~2023.03.22
Date of Issue:	2023.03.22	Test Result:	Pass

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Reviewed by: Simba Huang Simba Huang **Approved by:** Seal.chen Seal.chen

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 90 :2017: PRIVATE LAND MOBILE RADIO SERVICES.

ANSI C63.26:2015: American National Standard of procedures for compliance testing of transmitters used in licensed radio services.

FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

2 SUMMARY

2.1 PRODUCT DESCRIPTION

Name of EUT:	Wireless Intercom System
Model Number:	C800
Power supply:	DC 5V 1000mA
Adapter information:	Model: JHD-AP006U-050100BB-2 Output: DC 5V 1000mA
Hardware version:	V1.0
Software version:	V1.0
Frequency Range:	From 420.25 to 438.80MHz
Modilation Type:	GMSK
Channel No.	20
Rated Output Power:	1 Watts(30dBm)
Antenna Type:	ROD antenna
Antenna Gain:	1.0dBi
Sample ID:	AIT22112201-1

2.2 DESCRIPTION OF TEST MODES AND TEST FREQUENCY

The EUT has been tested under typical operating condition. As, test modes selected as below by the technical parameters of the EUT:

Operation Mode No.	Channel Separation	Condition
	12.5KHz	TX
1	☒	☒

Operation Frequency list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	420.2500	11	429.8000
02	421.0000	12	430.5000
03	422.0000	13	431.5000
04	423.2500	14	432.2500
05	424.0000	15	433.2500
06	424.8000	16	434.2500
07	425.8000	17	435.8000
08	427.0000	18	436.8000
09	428.0000	19	437.8000
10	429.0000	20	438.8000

Test Frequency list:

Modulation Type	Test Channel	Test Frequency (MHz)
GMSK	Ch01	420.250
	Ch10	429.000
	Ch20	438.800

2.3 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended to comply with FCC Part 90 Rules and RSS-119.

2.4 MODIFICATIONS

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 TEST FACILITY

The test facility is recognized, certified or accredited by the following organizations:

CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2017 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on Aug.04, 2020

FCC-Registration No.: 703111 Designation Number: CN1313

Dongguan Yaxu (AiT) technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 6819A CAB identifier: CN0122

The 3m Semi-anechoic chamber of Dongguan Yaxu (AiT) technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 6819A

A2LA-Lab Cert. No.: 6317.01

Dongguan Yaxu (AiT) technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

3.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y ± 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** %.

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	0.009MHz-30MHz	3.10dB	(1)
Radiated Emission	30MHz-1GHz	3.75dB	(1)
Radiated Emission	1GHz-18GHz	3.88dB	(1)
Radiated Emission	18GHz-40GHz	3.88dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	1.20dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

3.3 SUMMARY OF MEASUREMENT RESULTS

Description of Test Item	Standard clause	Verdict
Maximum Transmitter Power	FCC Part 90.205/RSS-119 Issue 12	PASS
Modulation Characteristic	FCC Part 90.207/RSS-119 Issue 12	N/A[note1]
Occupied Bandwidth	FCC Part 90.209/RSS-119 Issue 12	PASS
Emission Mask	FCC Part 90.210/RSS-119 Issue 12	PASS
Frequency Stability	FCC Part 90.213/RSS-119 Issue 12	PASS
Transmitter Frequency Behavior	FCC Part 90.214/RSS-119 Issue 12	PASS
Transmitter Radiated Spurious Emssion	FCC Part 90.210/RSS-119 Issue 12	PASS
Spurious Emssion On Antenna Port	FCC Part 90.210/RSS-119 Issue 12	PASS

Remark:

1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

3.4 EQUIPMENTS USED DURING THE TEST

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2022.09.02	2023.09.01
2	EMI Measuring Receiver	R&S	ESR	101660	2022.09.02	2023.09.01
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2022.09.02	2023.09.01
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2022.09.02	2023.09.01
5	Passive Loop	ETS	6512	00165355	2022.09.04	2024.09.03
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2020.11.24	2023.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2022.09.02	2023.09.01
10	LISN	Kyoritsu	KNW-242	8-837-4	2022.09.02	2023.09.01
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2022.09.02	2023.09.01
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2022.09.02	2023.09.01
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
14	Signal Generator	Agilent	N5182A	MY501430009	2022.09.02	2023.09.01
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2022.09.02	2023.09.01
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01

17	Signal Analyzer	Agilent	N9020A	9011796	2022.09.02	2023.09.01
18	Digital Phosphor Oscilloscope	Tektronix	TDS3012	B021220	2022.09.02	2023.09.01
19	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
20	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
21	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
22	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A
23	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A

4 TEST CONDITIONS AND RESULTS

4.1 MAXIMUM TRANSMITTER POWER

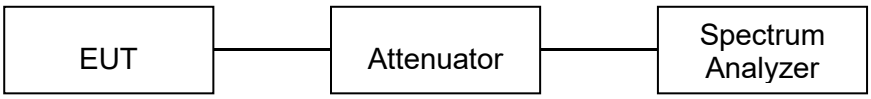
TEST APPLICABLE

Per FCC Part 2.1046 and Part 90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.
RSS 119: The 406.1-430MHz and 450-470MHz is 110W

TEST PROCEDURE

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted bellow:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

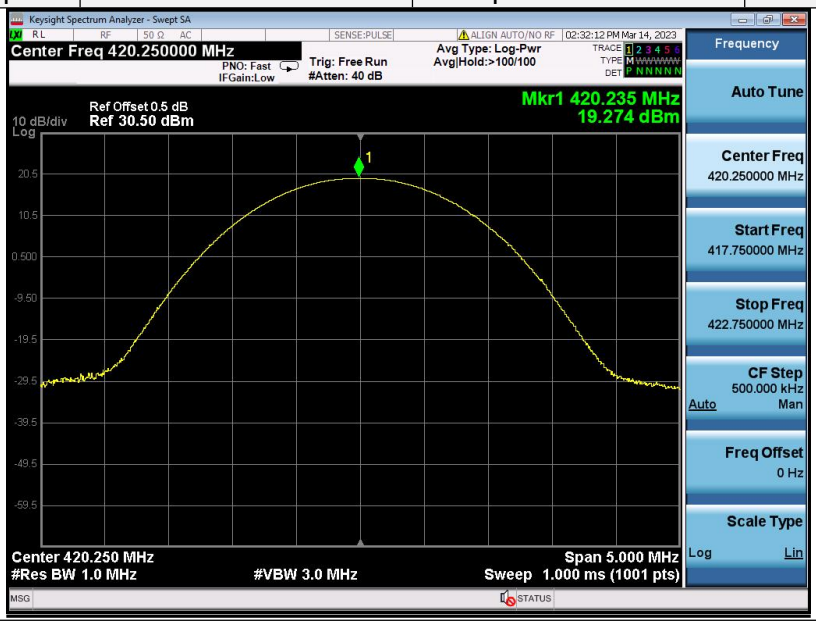
TEST CONFIGURATION



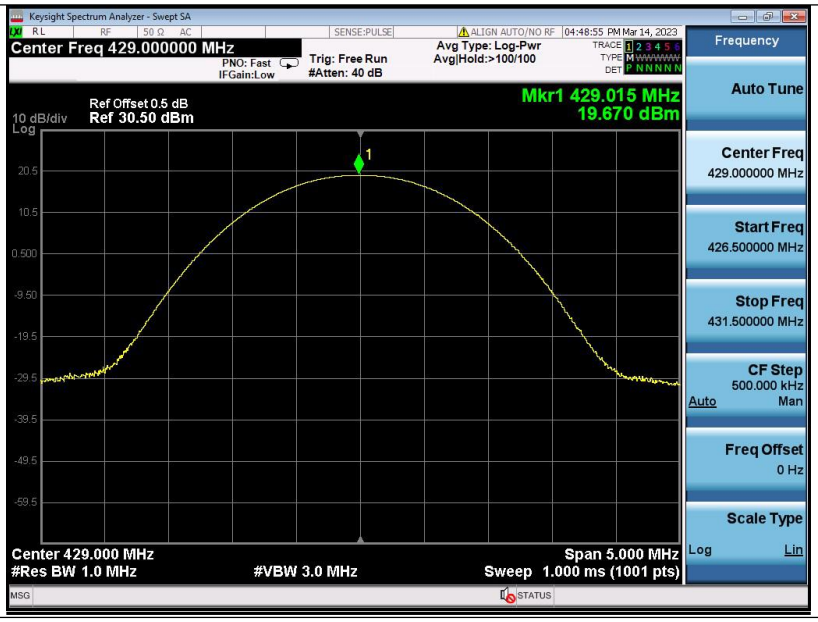
TEST RESULTS

Modulation Type	Test Channel	Test Frequency (MHz)	Test Results (dBm)
GMSK	Ch01	420.250	19.274
	Ch10	429.000	19.670
	Ch20	438.800	19.435

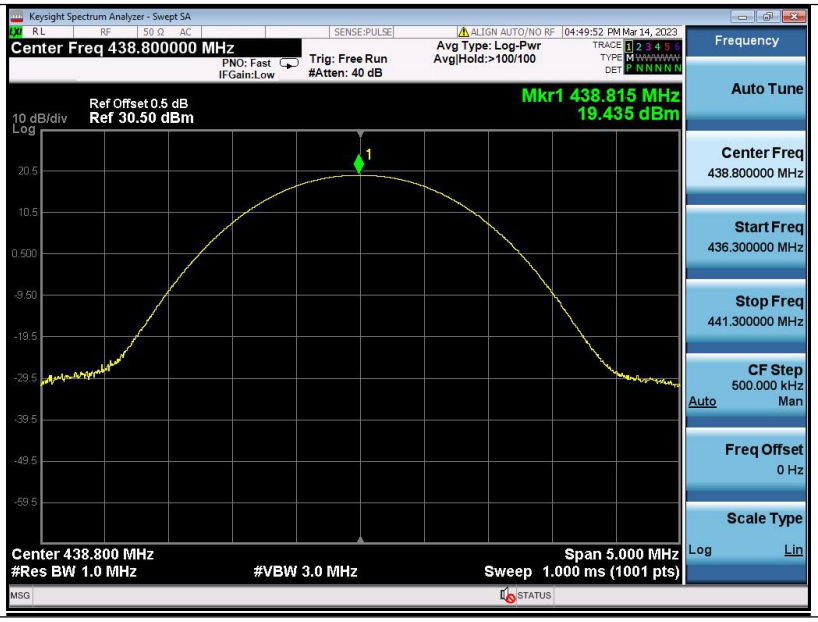
Modulation Type:	GMSK	Operation Mode:	TX



Ch1


Keysight Spectrum Analyzer - Swept SA
Center Freq 429.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:48:55 PM Mar 14, 2023
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.50 dBm
Mkr1 429.015 MHz
19.670 dBm
Center 429.000 MHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
429.000000 MHz
Start Freq
426.500000 MHz
Stop Freq
431.500000 MHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

Ch10


Keysight Spectrum Analyzer - Swept SA
Center Freq 438.800000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:49:52 PM Mar 14, 2023
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.50 dBm
Mkr1 438.815 MHz
19.435 dBm
Center 438.800 MHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
438.800000 MHz
Start Freq
436.300000 MHz
Stop Freq
441.300000 MHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

Ch20

4.2 OCCUPIED BANDWIDTH AND EMISSION MASK TEST

TEST APPLICABLE

(a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.

(b). Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

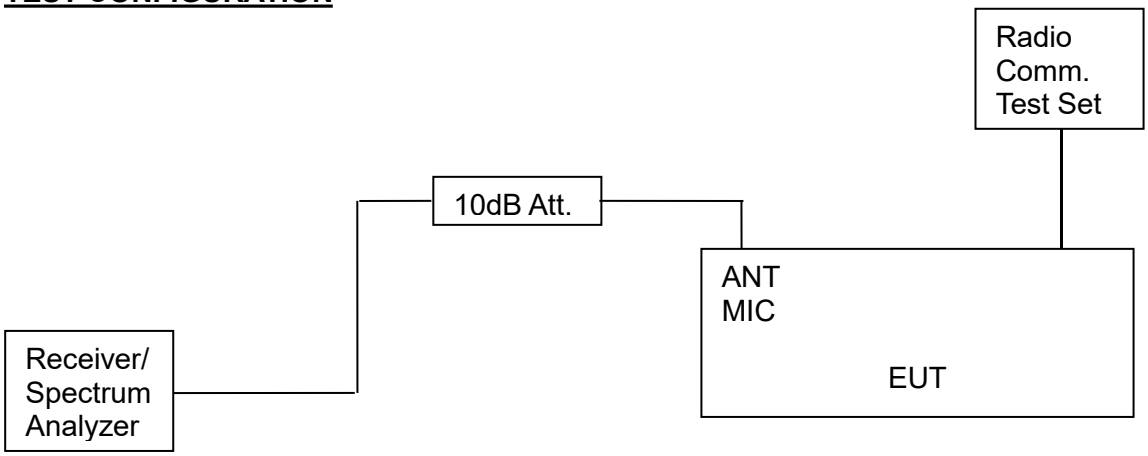
(c). Emission Mask D, 12.5 kHz channel bandwidth equipment: For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd -2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

TEST CONFIGURATION



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.

2 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing) and 5 kHz (25 kHz channel spacing).

3 Set EUT as normal operation.

4 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.

5 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

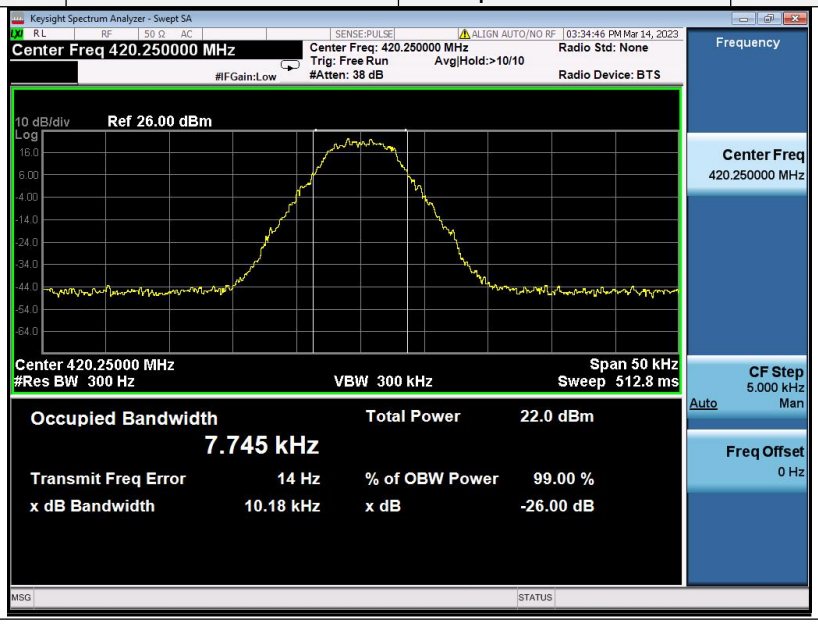
6 Set SPA Center Frequency=fundamental frequency, set =300Hz, VBW=1 KHz, span=50 KHz for 12.5 channel spacing.

TEST RESULTS

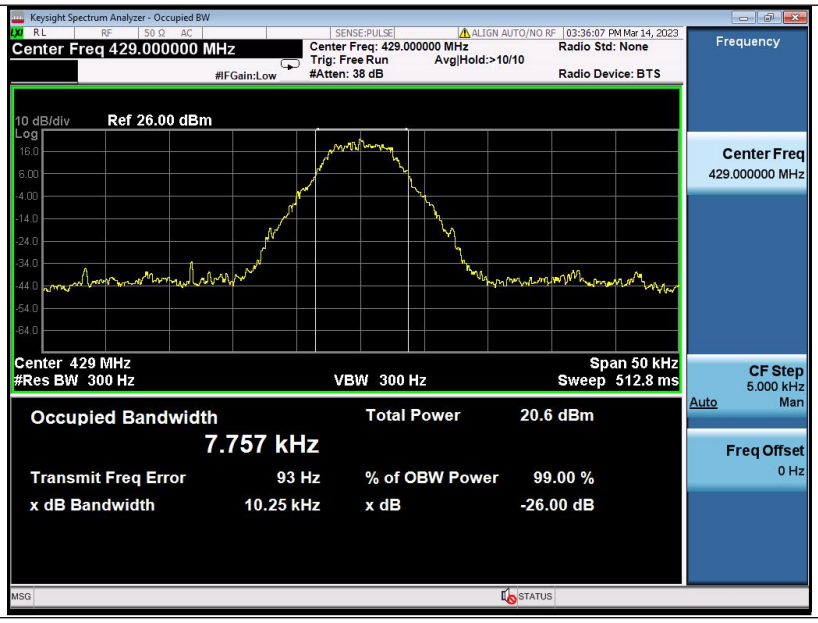
Occupied Bandwidth

Modulation Type	Frequency (MHz)	99% OBW (kHz)	26dB bandwidth (kHz)	Limit (KHz)	Test result
GMSK	420.250	7.745	10.18	11.25	Pass
	429.000	7.757	10.25		Pass
	438.800	7.334	10.22		Pass

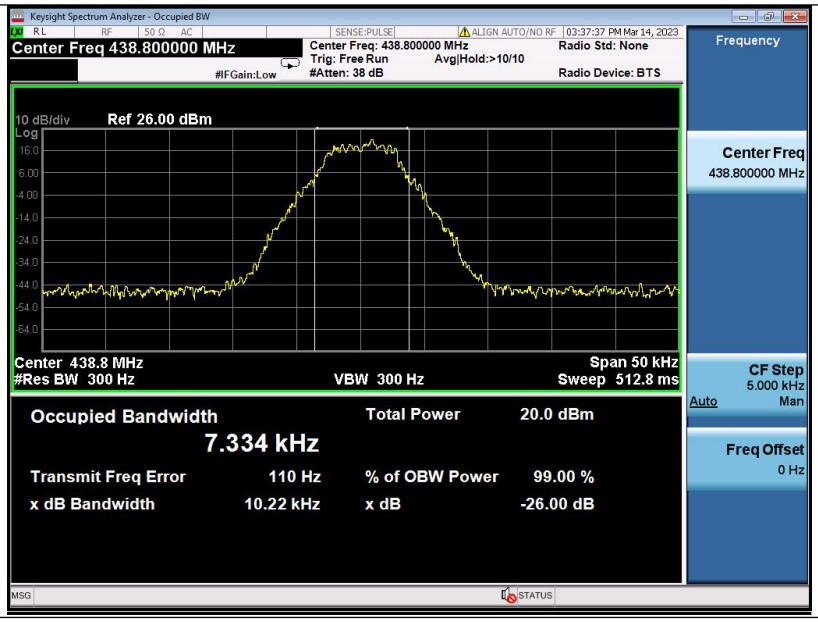
Modulation Type:	GMSK	Operation Mode:	TX



Ch01



Ch10

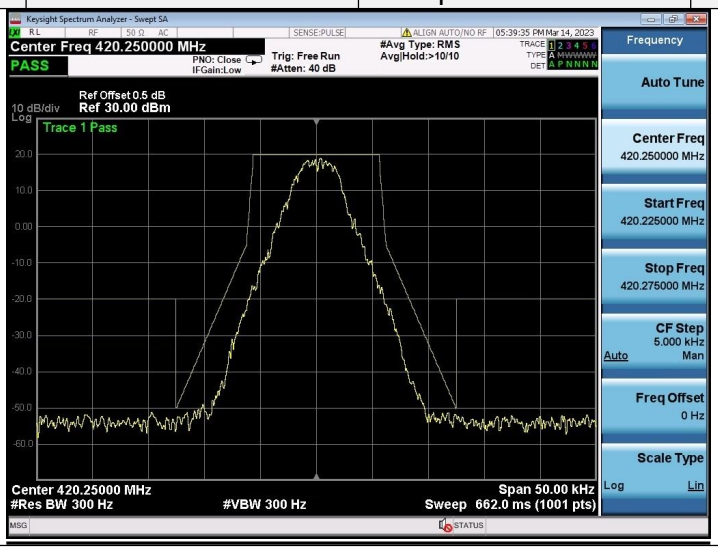

Keysight Spectrum Analyzer - Occupied BW
Center Freq 438.800000 MHz
Center Freq: 438.800000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 38 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
03:37:37 PM Mar 14, 2023
Frequency
10 dB/div
Log
Ref 26.00 dBm
16.0
6.00
-4.00
-14.0
-24.0
-34.0
-44.0
-54.0
-64.0
Center Freq
438.800000 MHz
Center 438.8 MHz
#Res BW 300 Hz
VBW 300 Hz
Span 50 kHz
Sweep 512.8 ms
CF Step
5.000 kHz
Auto
Man
Occupied Bandwidth
7.334 kHz
Total Power
20.0 dBm
Transmit Freq Error
110 Hz
% of OBW Power
99.00 %
x dB Bandwidth
10.22 kHz
x dB
-26.00 dB
Freq Offset
0 Hz
MSG
STATUS

Ch20

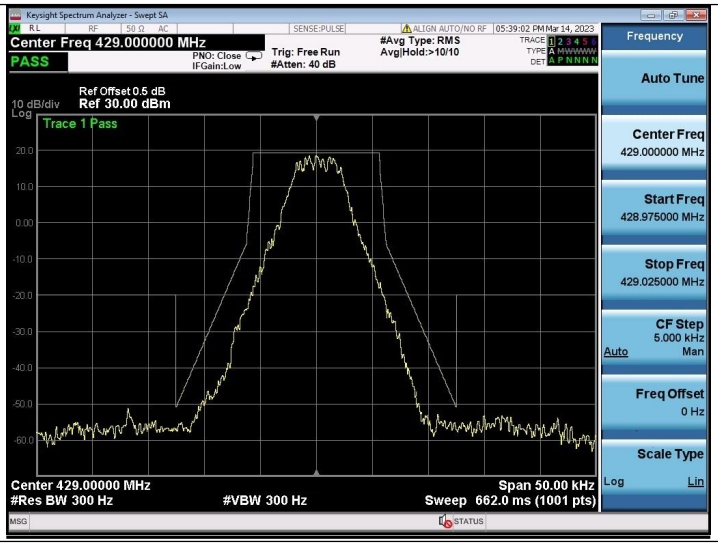
Emission Mask

Modulation Type	Test Channel	Frequency (MHz)	Applicable Mask	RBW (Hz)
GMSK	Ch01	420.250	D	300
	Ch10	429.000	D	300
	Ch20	438.800	D	300

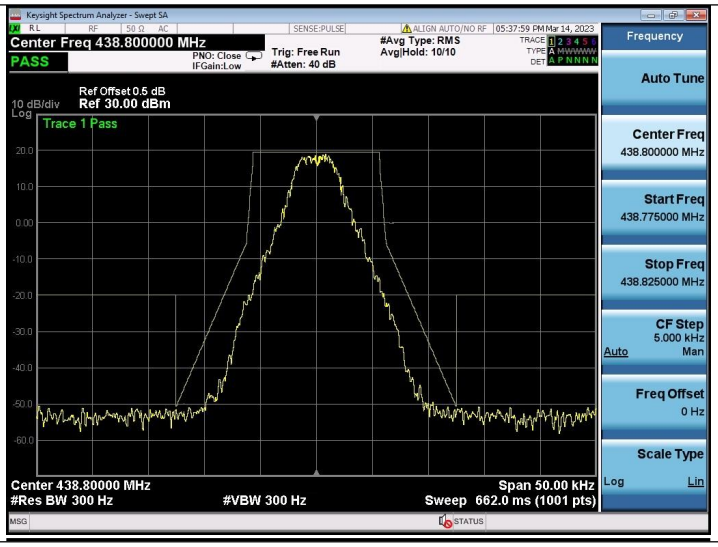
Modulation Type:	GMSK	Operation Mode:	TX



Ch1



Ch10


Keysight Spectrum Analyzer - Swept SA
Center Freq 438.800000 MHz
PASS
PNO: Close
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 10/10
05:37:59 PM Mar 14, 2023
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.00 dBm
Trace 1 Pass
Center 438.80000 MHz
#Res BW 300 Hz
#VBW 300 Hz
Span 50.00 kHz
Sweep 662.0 ms (1001 pts)
Frequency
Auto Tune
Center Freq
438.800000 MHz
Start Freq
438.775000 MHz
Stop Freq
438.825000 MHz
CF Step
5.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

Ch20

4.3 TRANSMITTER RADIATED SPURIOUS EMISSIONS

TEST APPLICABLE

According to the RSS GEN ,ANSI C63.26 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB

2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB

3 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

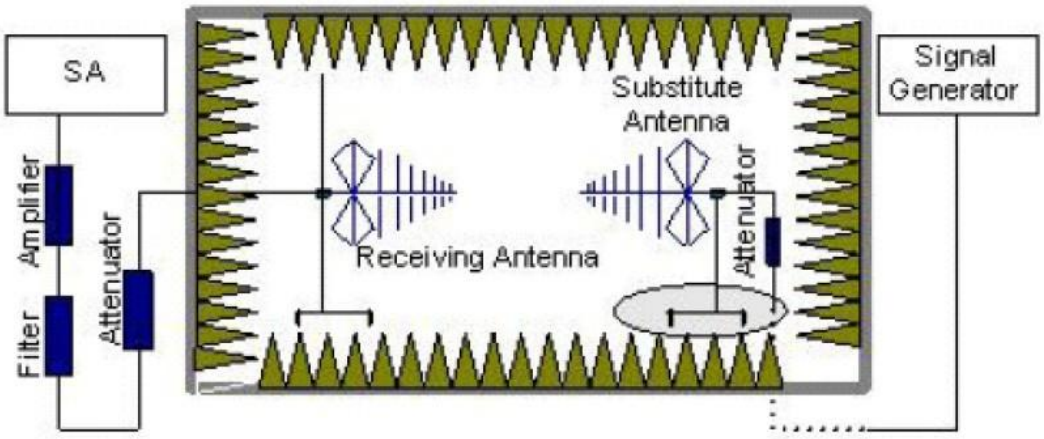
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

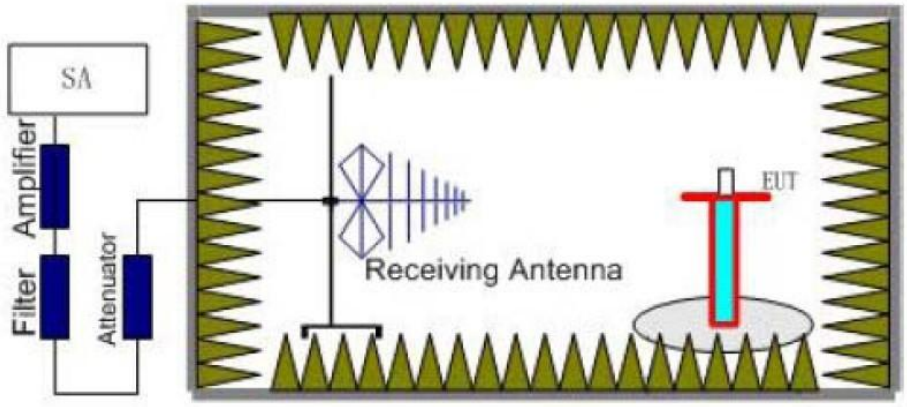
1 On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.

2 On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth: At least 35 dB.

3 On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43+10Log (P) dB.

TEST CONFIGURATION





TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100KHz,VBW=300KHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} - G_a
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power

Amplifier for substituation test; The measurement results are amend as described below: Power(EIRP)=P_{Mea}- P_{cl} - G_a

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

Limit

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (12.5 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:
Low: 50 + 10 log (Pwatts) = 50 + 10 log (28.12) =64.49 dB
High: 50 + 10 log (Pwatts) = 50 + 10 log (29.85) =64.75 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 43.98 dBm.
Limit (dBm) =43.98-50-10log10 (29.85) = -20 dBm

TEST RESULTS

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 5 GHz.
3. *** means that the emission level is too low to be measured or at least 20 dB down than the limit.

Test Frequency (MHz)	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain (dBd/dBi)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Pol.
420.250	840.50	-35.70	1.41	3	7.08	-32.19	-20	-12.19	V
	1260.75	-34.50	1.08	3	10.66	-27.07	-20	-7.07	V
	1681.00	-48.63	1.42	3	11.36	-40.84	-20	-20.84	V
	--	--	--	--	--	--	--	--	--
	840.50	-36.73	1.62	3	7.25	-33.25	-20	-13.25	H
	1260.75	-35.49	1.92	3	10.26	-29.29	-20	-9.29	H
	1681.00	-50.36	2.10	3	12.15	-42.46	-20	-22.46	H
	--	--	--	--	--	--	--	--	--
429.000	858.00	-36.33	1.73	3	7.27	-32.94	-20	-12.94	V
	1287.00	-35.00	1.90	3	11.03	-28.02	-20	-8.02	V
	1716.00	-47.72	1.19	3	12.13	-38.93	-20	-18.93	V
	--	--	--	--	--	--	--	--	--
	858.00	-36.98	1.72	3	6.81	-34.04	-20	-14.04	H
	1287.00	-36.32	1.50	3	10.81	-29.16	-20	-9.16	H
	1716.00	-49.17	1.93	3	11.58	-41.68	-20	-21.68	H
	--	--	--	--	--	--	--	--	--
438.800	877.60	-37.95	1.60	3	7.31	-34.39	-20	-14.39	V
	1316.40	-36.81	1.18	3	11.34	-28.79	-20	-8.79	V
	1755.20	-50.60	1.99	3	11.83	-42.91	-20	-22.91	V
	--	--	--	--	--	--	--	--	--
	877.60	-39.39	1.77	3	6.94	-36.37	-20	-16.37	H
	1316.40	-38.29	1.29	3	11.60	-30.13	-20	-10.13	H
	1755.20	-51.65	1.25	3	12.33	-42.72	-20	-22.72	H
	--	--	--	--	--	--	--	--	--

Remark:

1. *$EIRP=P_{Mea}(dBm)-P_{cl}(dB)+G_a(dBi)$*
2. *-- Means other points for values lower than limits and not recorded.*
3. *Margin = Limit – EIRP*

4.4 SPURIOUS EMISSIONS ON ANTENNA PORT

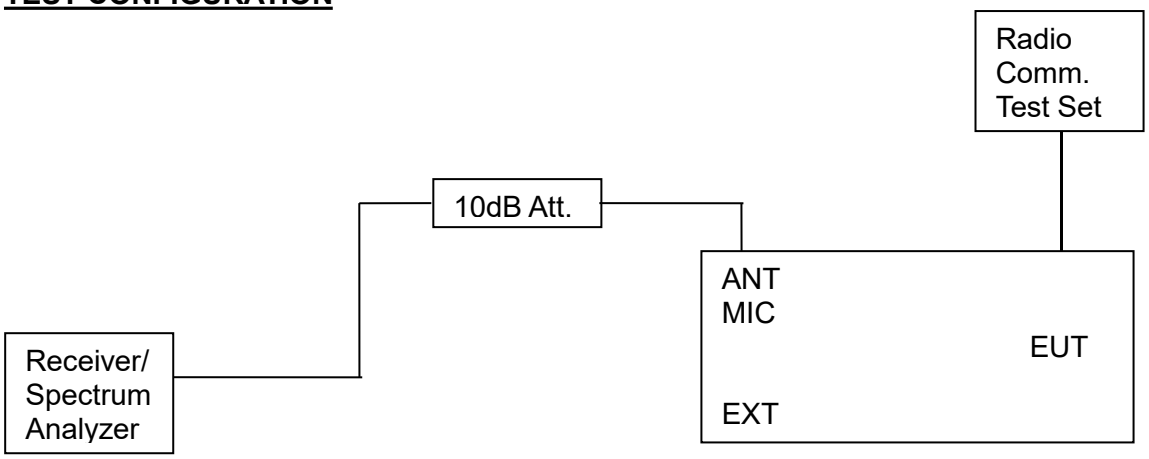
TEST APPLICABLE

The same as Section 4.3

TEST PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10^{th} Harmonic.
The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST CONFIGURATION



Limit

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (12.5 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:
Low: 50 + 10 log (Pwatts) = 50 + 10 log (28.12) =64.49 dB
High: 50 + 10 log (Pwatts) = 50 + 10 log (29.85) =64.75 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-50-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 43.98 dBm.
Limit (dBm) =43.98-50-10log10 (29.85) = -20 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2.The measurement frequency range from 30 MHz to 5GHz.

TEST RESULTS

Not Application
Note: The antenna of this product is not removable.

4.5 FREQUENCY STABILITY TEST

TEST APPLICABLE

1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +60℃ centigrade.

2 According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.

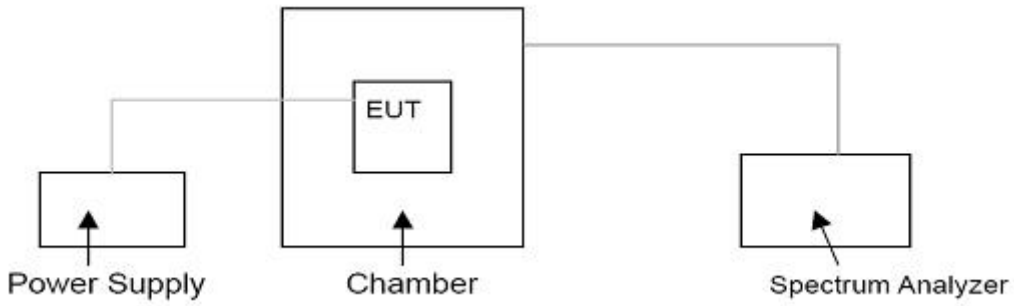
3 Vary primary supply voltage from 85 to 115 percent of the nominal value.

4 According to §90.213, the frequency stability limit is 1.5 ppm for 12.5KHz channel separation

TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer ESI 26. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST CONFIGURATION



TEST LIMITS

According to 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

Frequency Range (MHz)	Channel Bandwidth (KHz)	Frequency Tolerance (ppm)		
		Fixed and Base Stations	Mobile Stations	
			> 2 W	≤ 2 W
150-174 MHz	6.25 12.5 25	1.0 2.5 5.0	2.0 5.0 5.0	2.0 5.0 50.0*
421-512 MHz	6.25 12.5 25	0.5 1.5 2.5	1.0 2.5 5.0	1.0 2.5 5.0

- Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

TEST RESULTS

Operation Mode	Channel Separation	Test conditions		Frequency error (ppm)		
		Voltage(V)	Temp(℃)	420.250	429.000	438.800
TX	12.5KHz	120	-30	0.82	0.41	0.50
			-20	0.09	0.56	0.10
			-10	0.12	0.53	0.09
			0	0.41	0.10	0.52
			10	0.38	0.13	0.31
			20	0.28	0.02	0.10
			30	0.33	0.80	0.56
			40	0.89	0.77	0.49
			50	0.35	0.20	0.04
		102(85% Rated)	20	0.59	0.37	0.73
		138(115% Rated)	20	0.79	0.04	0.20
Limit			2.5 ppm			
Test Results			PASS			

4.6 TRANSMITTER FREQUENCY BEHAVIOUR

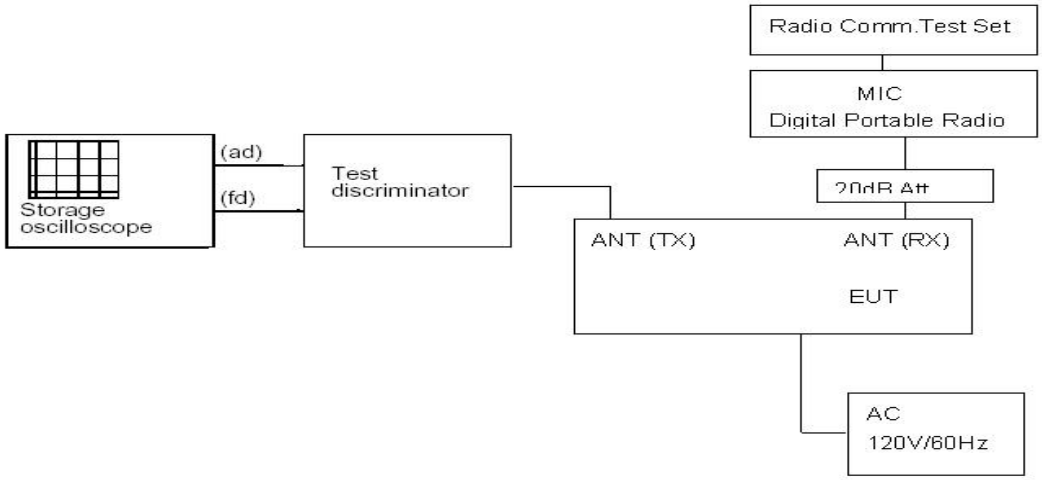
TEST APPLICABLE

Section 90.214
Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t_1 [4]	± 25.0 KHz	5.0 ms	10.0 ms
t_2	± 12.5 KHz	20.0 ms	25.0 ms
t_3 [4]	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels			
t_1 [4]	± 12.5 KHz	5.0 ms	10.0 ms
t_2	± 6.25 KHz	20.0 ms	25.0 ms
t_3 [4]	± 12.5 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels			
t_1 [4]	±6.25 KHz	5.0 ms	10.0 ms
t_2	±3.125 KHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 KHz	5.0 ms	10.0 ms

1. t_{on} is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
   t_1 is the time period immediately following t_{on}.
   t_2 is the time period immediately following t_1.
   t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
   t_{off} is the instant when the 1 KHz test signal starts to rise.
2. During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

TEST CONFIGURATION



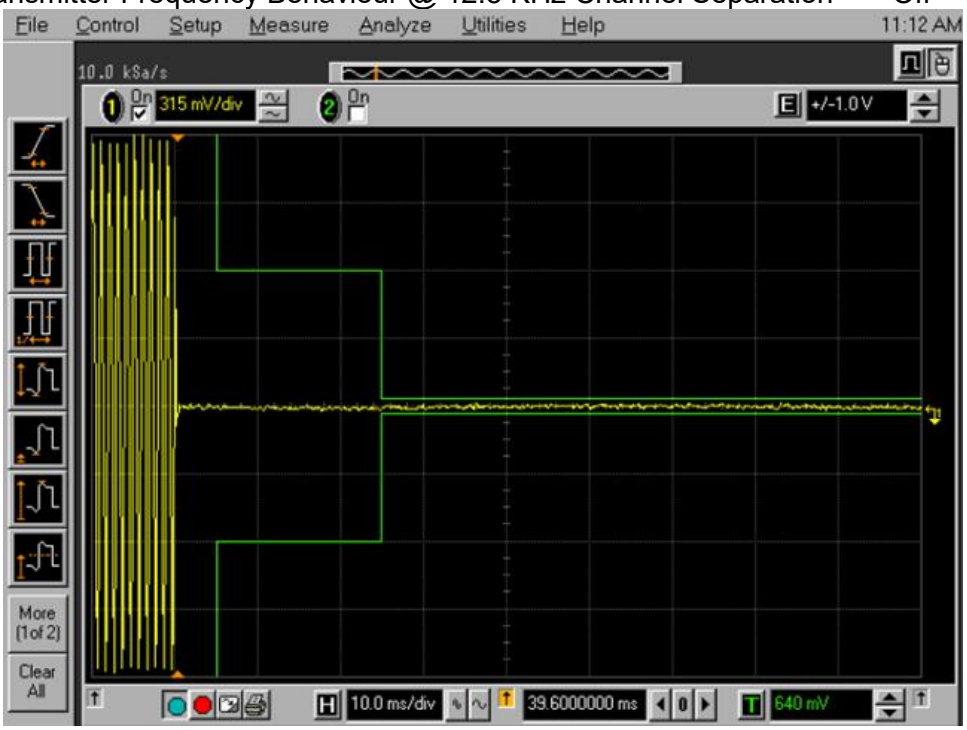
TEST PROCEDURE

1. Connect the EUT and test equipment as shown in the test configuration.
2. Set Spectrum Analyzer to measure FM deviation, and tune the RF frequency to transmitter assigned frequency.
3. Set the signal generator to the assigned transmitter frequency and modulate it with a 1KHz tone at ±12.5Khz deviation and set its output level to -100dBm.
4. Turn on the transmitter.
5. Supply sufficient attenuation via RF attenuator to provide an input level to the Spectrum Analyzer that is 40dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on Spectrum Analyzer as P_0.
6. Turn off the transmitter.
7. Adjust the RF level of the signal generator to provide RF power equal to P_0. This signal generator RF level shall be maintained throughout the rest of the measurement.
8. Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30dB when the transmitter is turned on.
9. Adjust the vertical amplitude control of the spectrum analyzer to display the 1000Hz at ±4 divisions vertically centered on display. Set trigger mode of the Spectrum Analyzer to “Video”, and tune the “trigger level” on suitable level. Then set the “trigger offset” to -10ms for turn on and -15ms for turn off.
10. Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 KHz test signal is completely suppressed is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t_1 and t_2.
11. Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3.

TEST RESULTS

Modulation Type: GMSK

Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------Off – On



Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------On – Off

5 AC LINE CONDUCTED EMISSIONS LIMITS

5.1 PROVISIONS APPLICABLE

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the, the radio frequency voltage that is conducted back onto the AC power line on any frequencies within the band 150 KHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50uH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit(dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

5.2 PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

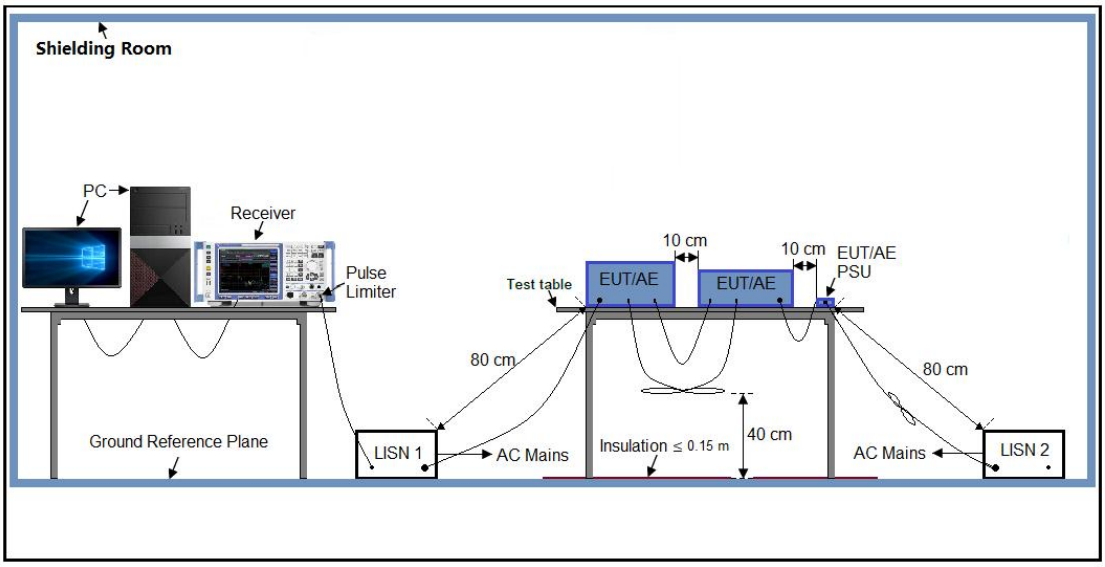
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

5.3 FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

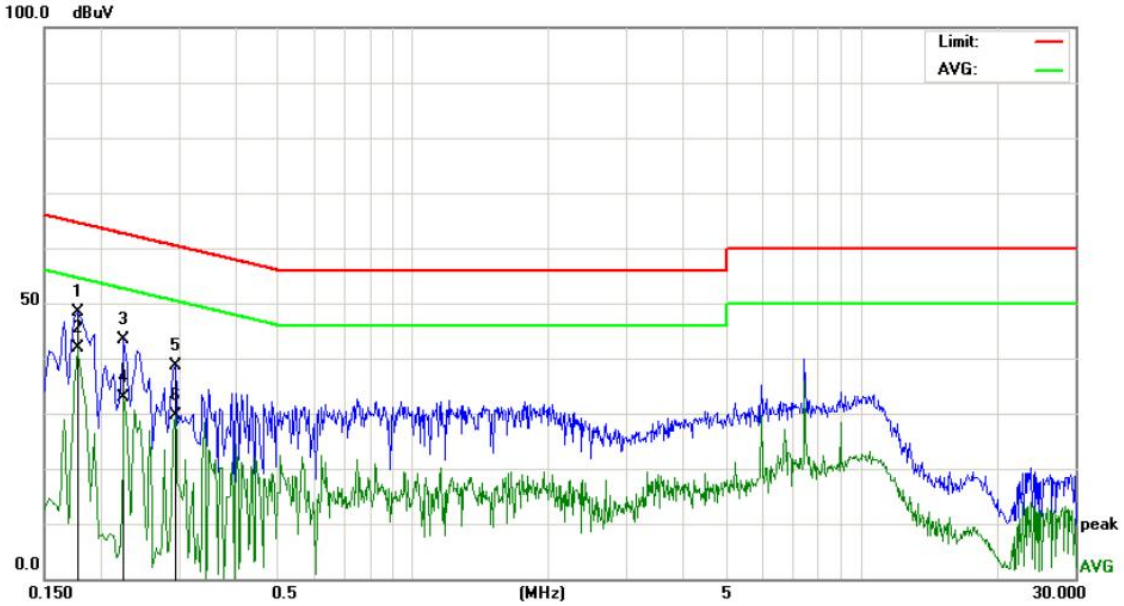
1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions.
3. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
4. The test data of the worst case condition(s) was reported on the Summary Data page.

5.4 MEASUREMENT SETUP



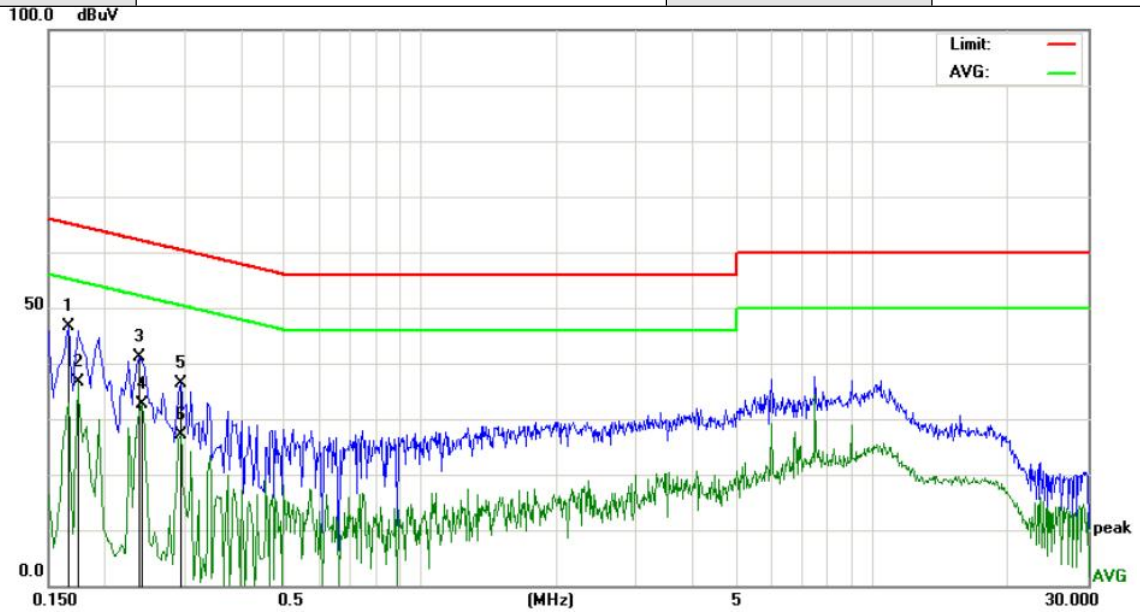
5.5 MEASUREMENT RESULT

LINE CONDUCTED EMISSION TEST			
Test Mode	C800	LISN line	Hot Side



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1780	47.61	0.84	48.45	64.57	-16.12	QP
2	*	0.1780	41.09	0.84	41.93	54.57	-12.64	AVG
3		0.2260	42.46	0.83	43.29	62.59	-19.30	QP
4		0.2260	32.02	0.83	32.85	52.59	-19.74	AVG
5		0.2940	37.91	0.83	38.74	60.41	-21.67	QP
6		0.2940	28.80	0.83	29.63	50.41	-20.78	AVG

LINE CONDUCTED EMISSION TEST			
Test Mode	C800	LISN line	Neutral Side



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1660	45.73	0.84	46.57	65.15	-18.58	QP
2	*	0.1740	35.68	0.84	36.52	54.76	-18.24	AVG
3		0.2380	40.37	0.83	41.20	62.16	-20.96	QP
4		0.2420	31.78	0.83	32.61	52.02	-19.41	AVG
5		0.2940	35.46	0.83	36.29	60.41	-24.12	QP
6		0.2940	26.35	0.83	27.18	50.41	-23.23	AVG

6 RECEIVER RADIATED EMISSIONS LIMITS

6.1 PROVISIONS APPLICABLE

RSS-GEN Section 7.3:

Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

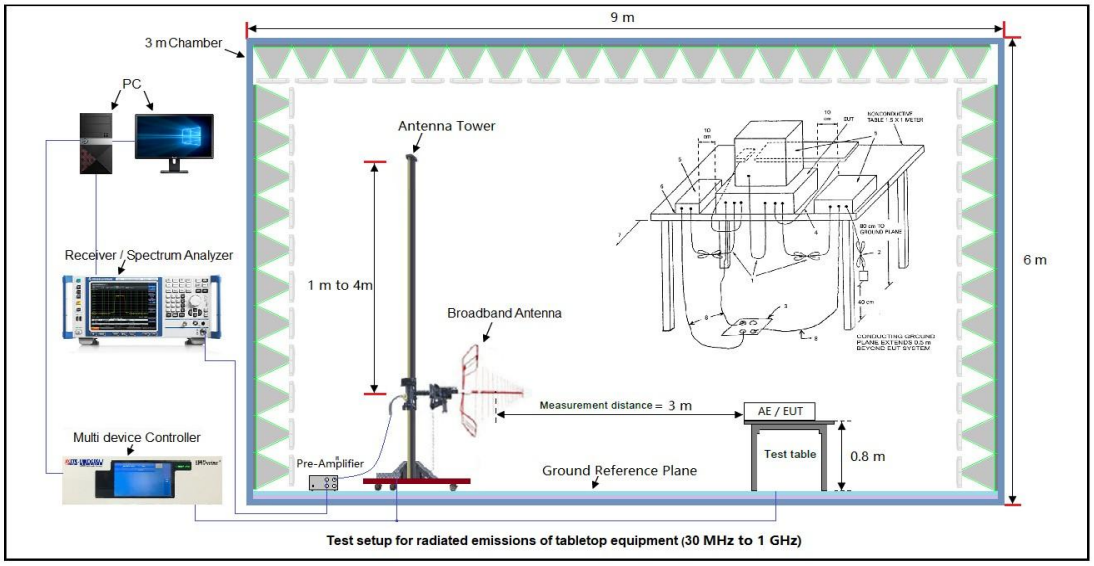
6.2 MEASUREMENT METHOD

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.4.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4. The EUT received power by AC 120V/60Hz.
5. The antenna was placed at 3 meter away from the EUT as stated in FCC Part 15. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
6. The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
7. The test mode(s) were scanned during the test:
8. Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P./Peak reading is presented. For emissions below 1GHz, use 120KHz RBW and VBW>=3RBW for QP reading.
9. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
10. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which

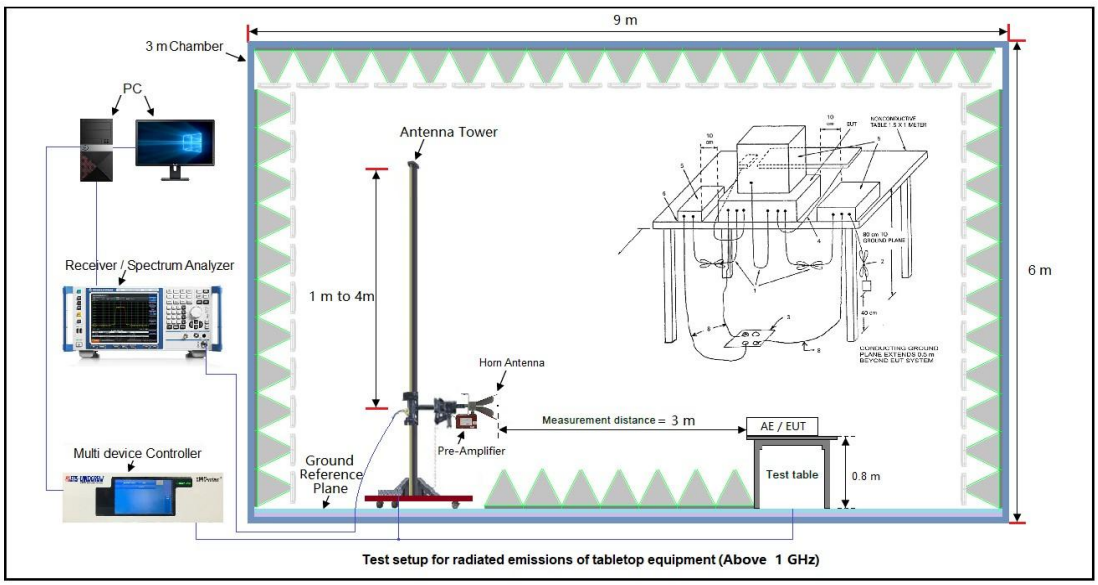
the field strength is at its maximum values.

11. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
12. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
13. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.
14. The test data of the worst case condition was reported on the following Data page.

6.3 MEASUREMENT SETUP



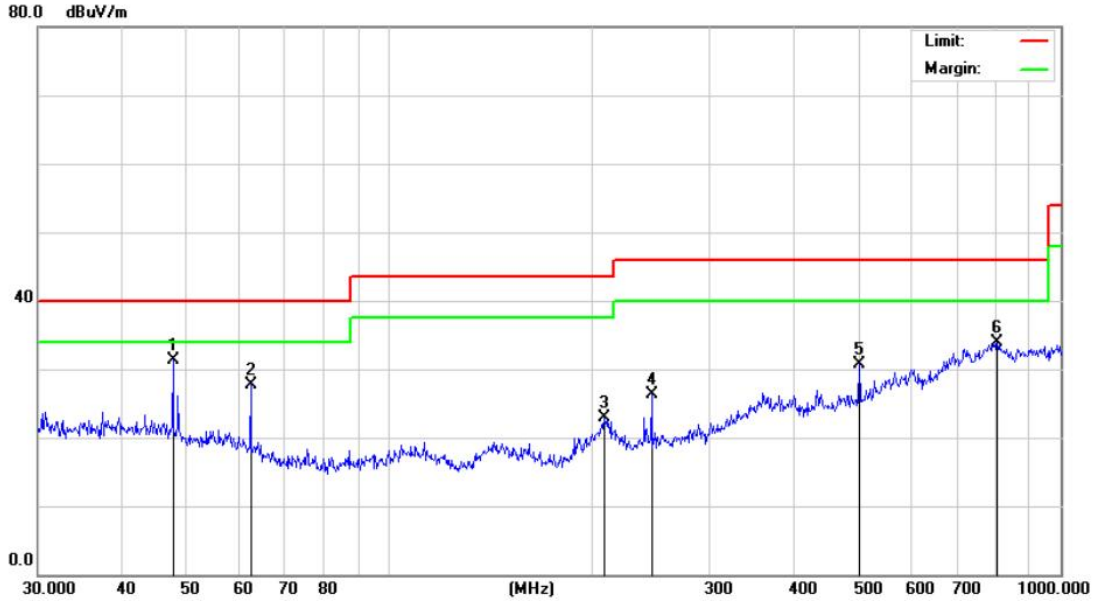
Test setup for radiated emissions of tabletop equipment (30 MHz to 1 GHz)



Test setup for radiated emissions of tabletop equipment (Above 1 GHz)

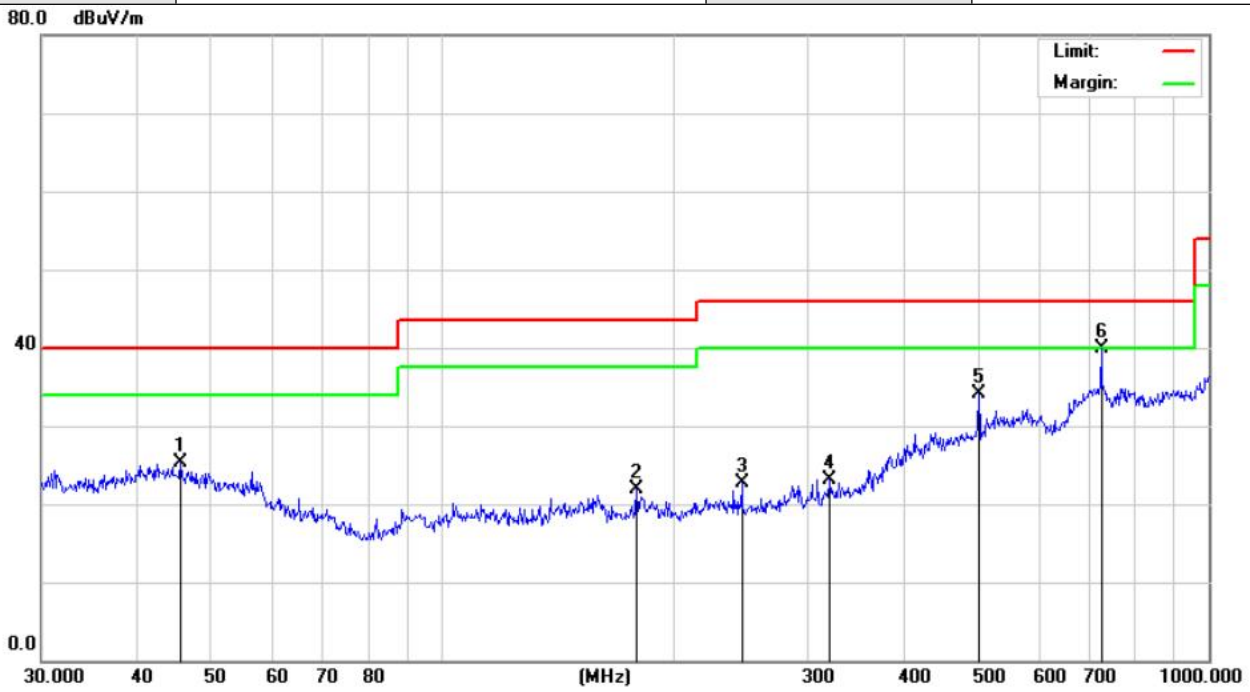
6.4 MEASUREMENT RESULT

Radiated Emission 30MHz-1GHz Test Result			
Test Mode	C800	Polarity:	Vertical



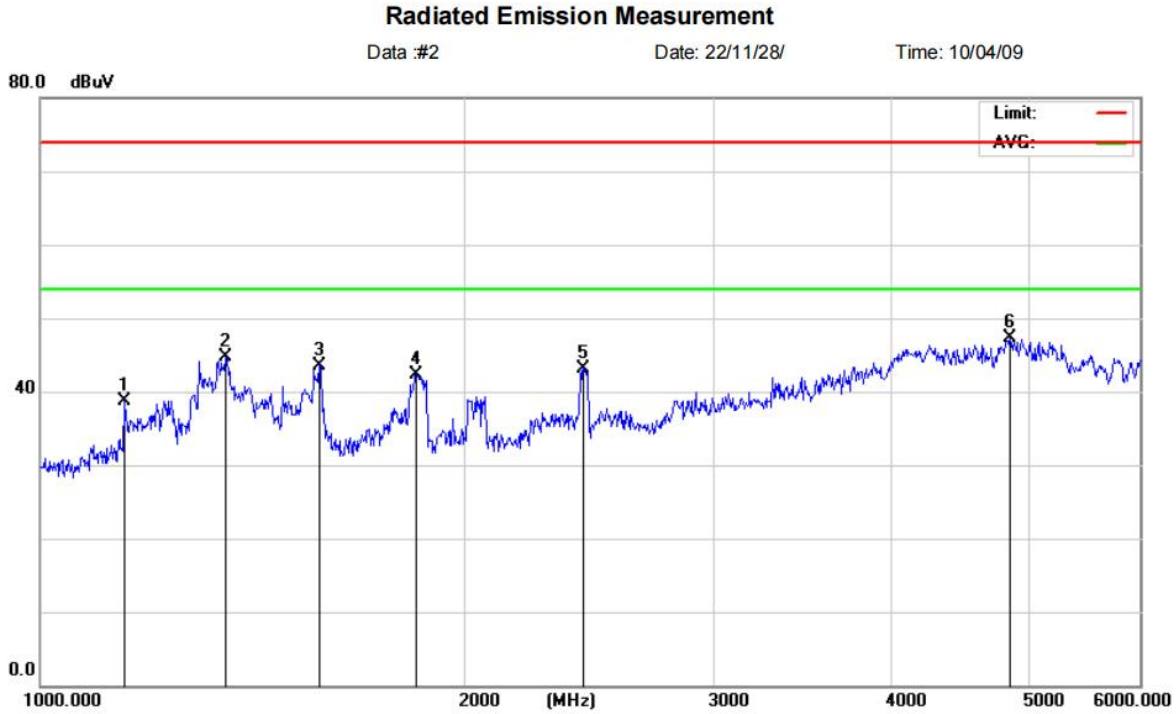
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	47.6586	36.63	-5.36	31.27	40.00	-8.73	QP
2		62.2128	35.87	-8.10	27.77	40.00	-12.23	QP
3		209.3129	27.02	-4.14	22.88	43.50	-20.62	QP
4		245.9509	32.92	-6.68	26.24	46.00	-19.76	QP
5		501.1790	31.79	-1.01	30.78	46.00	-15.22	QP
6		804.6028	27.16	6.76	33.92	46.00	-12.08	QP

Radiated Emission 30MHz-1GHz Test Result			
Test Mode	C800	Polarity:	Horizontal



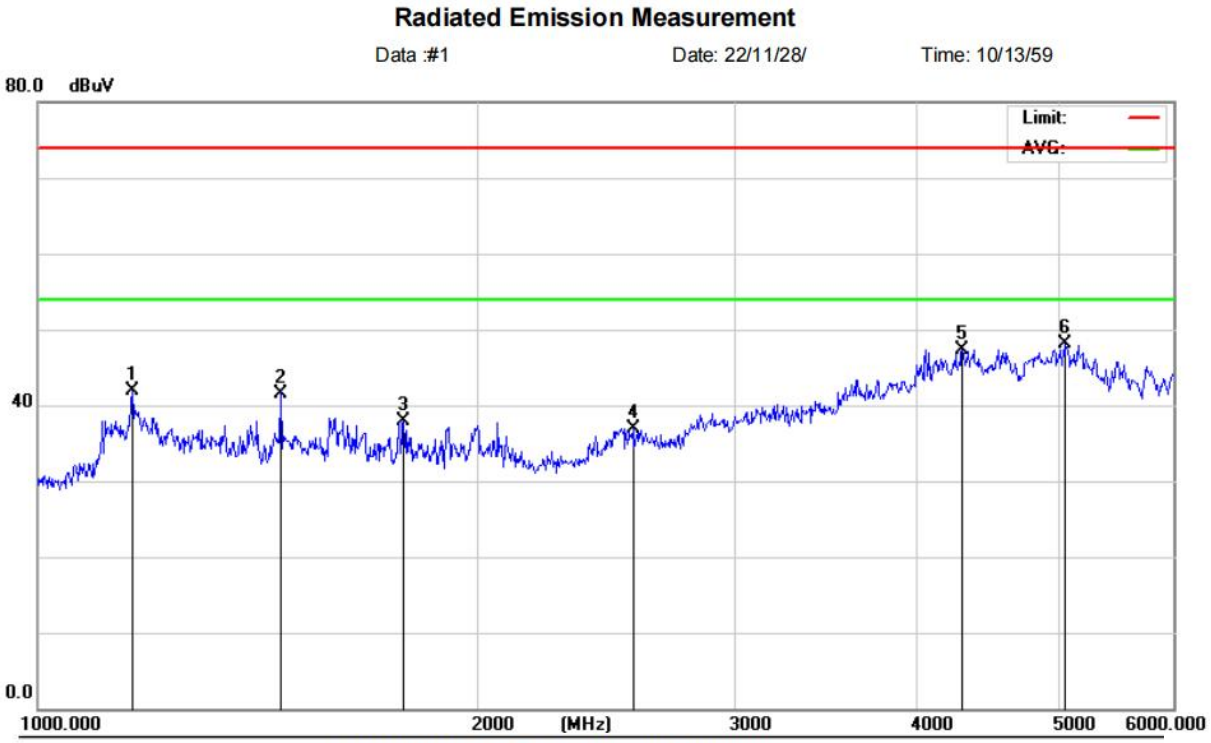
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		45.5348	27.74	-2.36	25.38	40.00	-14.62	QP
2		179.3863	28.64	-6.71	21.93	43.50	-21.57	QP
3		245.9509	29.42	-6.68	22.74	46.00	-23.26	QP
4		319.9370	27.15	-3.98	23.17	46.00	-22.83	QP
5		501.1790	31.60	2.54	34.14	46.00	-11.86	QP
6	*	724.2611	33.35	6.50	39.85	46.00	-6.15	QP

Radiated Emission Above1GHz Test Result			
Test Mode	C800	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		1145.881	49.43	-10.73	38.70	74.00	-35.30	peak
2		1353.654	55.09	-10.29	44.80	74.00	-29.20	peak
3		1576.342	53.48	-9.88	43.60	74.00	-30.40	peak
4		1845.558	51.82	-9.42	42.40	74.00	-31.60	peak
5		2423.297	48.70	-5.50	43.20	74.00	-30.80	peak
6	*	4856.567	42.20	5.11	47.31	74.00	-26.69	peak

Radiated Emission Above1GHz Test Result			
Test Mode	C800	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		1160.343	52.59	-10.69	41.90	74.00	-32.10	peak
2		1467.318	51.60	-10.00	41.60	74.00	-32.40	peak
3		1780.593	47.29	-9.39	37.90	74.00	-36.10	peak
4		2557.121	41.29	-4.46	36.83	74.00	-37.17	peak
5		4299.472	43.07	4.33	47.40	74.00	-26.60	peak
6	*	5060.890	42.94	5.07	48.01	74.00	-25.99	peak

APPENDIX I: PHOTOGRAPHS OF TEST SETUP

Refer to the Report No.: Test Setup Photo

APPENDIX II: PHOTOGRAPHS OF TEST EUT

Refer to the Report No.: EUT Photo

-----END OF REPORT-----