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FCC TEST REPORT

Report No:STS1805310W01

Issued for

Shenzhen Fanyin Technology Co., Ltd

Room 1722A, Block 11, Tiedong Logistics Park, China South
City, Fuan Avenue, Pinghu Street, Longgang District,
Shenzhen, China.

Product Name:	Wireless transmitter
Brand Name:	N/A
Model Name:	COMMANDER
Series Model:	IT-1, IT-2, CT-1, CT-2, HT-1, HT-2, IT-3, IT-4, CT-3, CT-4, HT-3, HT-4 UM-210, UM-220, CK-100, UM-100, K11, K22, CK-210, CK-220, GK1, GK2, TG1, TG2, M20TX, M30TX
FCC ID:	2AQAD-COMPACT
Test Standard:	FCC Part 15.249

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**TEST RESULT CERTIFICATION**

Applicant's name : Shenzhen Fanyin Technology Co., Ltd
Room 1722A, Block 11, Tiedong Logistics Park, China South
City, Fuan Avenue, Pinghu Street, Longgang District, Shenzhen,
China.

Manufacture's Name : Shenzhen Fanyin Technology Co., Ltd
Room 1722A, Block 11, Tiedong Logistics Park, China South
City, Fuan Avenue, Pinghu Street, Longgang District, Shenzhen,
China.

Product description

Product Name: Wireless transmitter
Brand Name: N/A
Model Name: COMMANDER
Series Model : IT-1, IT-2, CT-1, CT-2, HT-1, HT-2, IT-3, IT-4, CT-3, CT-4, HT-3,
HT-4, UM-210, UM-220, CK-100, UM-100, K11, K22, CK-210,
CK-220, GK1, GK2, TG1, TG2, M20TX, M30TX

Test Standards.....: FCC Part15.249
Test procedure : ANSI C63.4-2014 and ANSI C63.10-2013

This device described above has been tested by STS, 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.

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Date of Test :
Date of performance of tests : 31 May 2018 ~13 June 2018
Date of Issue : 14 June 2018
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	14 June 2018	STS1805310W01	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

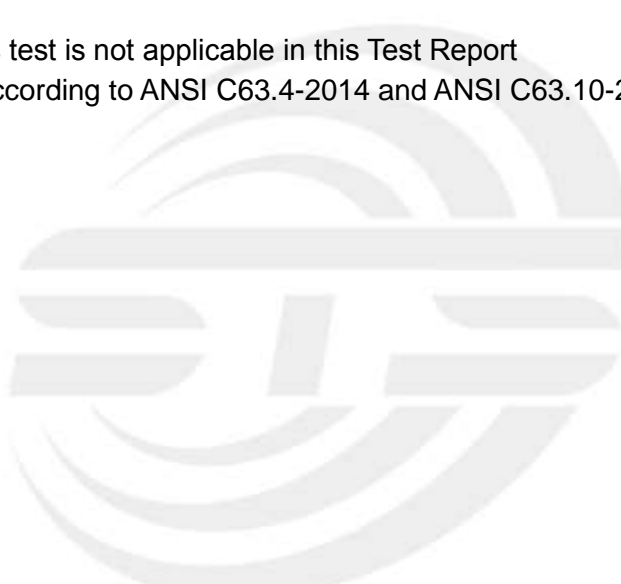
Test procedures according to the technical standards:

FCC Part 15.249,Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	
15.203	Antenna Requirement	Pass	
15.249	Radiated Emission	Pass	
15.249	20dB Bandwidth	Pass	

NOTE:

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

(2)All tests are according to ANSI C63.4-2014 and ANSI C63.10-2013





1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

CNAS Registration No.: L7649; FCC Registration No.: 625569

IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.71\text{dB}$
4	Spurious emissions,conducted	$\pm 0.63\text{dB}$
5	All emissions,radiated (9KHz-30MHz)	$\pm 3.02\text{dB}$
6	All emissions,radiated (30MHz-200MHz)	$\pm 3.80\text{dB}$
7	All emissions,radiated (200MHz-1000MHz)	$\pm 3.97\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Wireless transmitter	
Trade Name	N/A	
Model Name	COMMANDER	
Series Model	IT-1, IT-2, CT-1, CT-2, HT-1, HT-2, IT-3, IT-4, CT-3, CT-4, HT-3, HT-4, UM-210, UM-220, CK-100, UM-100, K11, K22, CK-210, CK-220, GK1, GK2, TG1, TG2, M20TX, M30TX	
Model Difference	Only different in model name	
Product Description	The EUT is a Wireless transmitter	
	Operation Frequency:	903MHz
	Modulation Type:	DQPSK
	Antenna Designation:	Helical antenna
	Antenna Gain(Peak)	-2.4 dBi
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.	
Power Rating	DC 3V	
Hardware Version	CK201805	
Software Version	SV201805	

Note:

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

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	COMMANDER	Helical antenna	NA	-2.4	Antenna

The EUT antenna is spring loaded Antenna. No antenna other than that furnished by the responsible party shall be used with the device.



2.2 DESCRIPTION OF TEST MODES

For conducted test items and radiated spurious emissions

Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively..

Worst Mode	Description	Data/Modulation
Mode 1	TX CH01	1 MHz/DQPSK

Note:

(1) All above mode have been measurement, only worst data was reported.

(2) New Battery is used during all test.

(3) We have be tested for all avaiable 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,50/60Hz is shown in the report

(4) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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

Radiated Spurious Emission Test

E-1
EUT



2.4 DESCRIPTION OF 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.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
N/A	N/A	N/A	N/A	N/A

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.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESCI	102086	2017.10.15	2018.10.14
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2018.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2017.10.27	2018.10.26
Passive Loop (9K--30MHz)	ZHNAN	ZN3090C	16035	2018.03.11	2019.03.10
Pre-mpifier (0.1M-3GHz)	EM	EM330	60538	2018.03.11	2019.03.10
PreAmplifier	Agilent	8449B	60538	2017.10.15	2018.10.14
USB RF power sensor	DARE	RPR3006W	15I00041SNO0 3	2017.10.15	2018.10.14
Semi-anechoic chamber	Changling	966	N/A	2017.10.15	2018.10.14

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2017.10.15	2018.10.14
LISN	R&S	ENV216	101242	2017.10.15	2018.10.14
conduction Cable	EM	C01	N/A	2018.03.11	2019.03.10
Temperature & Humidity	Mieo	HH660	N/A	2017.10.15	2018.10.14



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 15.249 limit in the table below has to be followed.

FREQUENCY (MHz)	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.

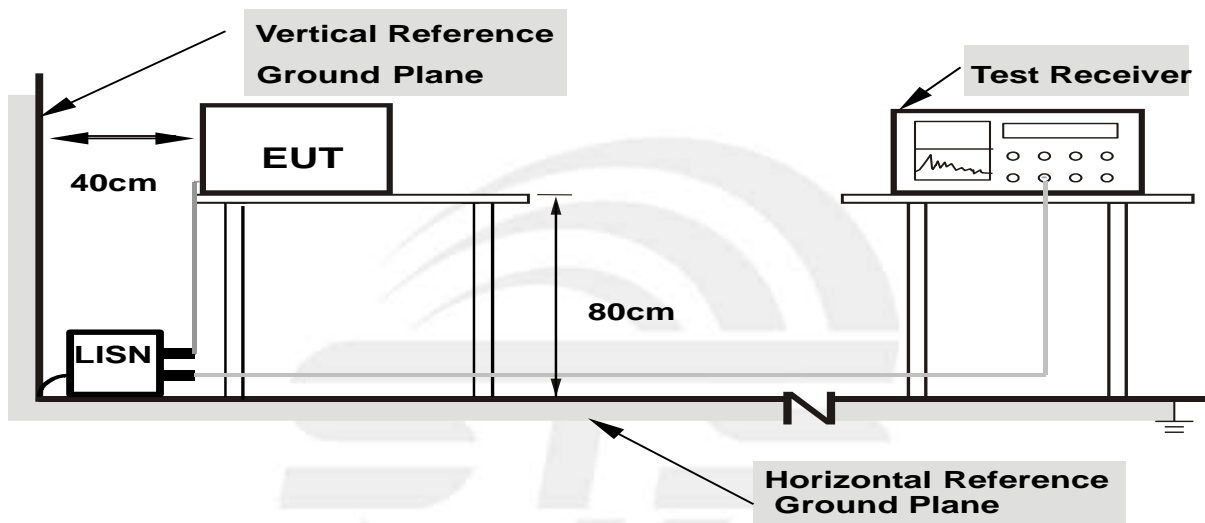
The following table is the setting of the receiver

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 was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical 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.

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 from other units and other metal planes

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 RESULTS

Temperature:	26 °C	Relative Humidity:	60%
Test Voltage:	DC 3V	Phase:	L/N
Test Mode:	Mode 1		

Note: EUT is only power by battery, So it is not applicable for this test.





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 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 Part 15.205(a), then the Part 15.209(a) and Part 15.231(b) limit in the table below has to be followed.

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

Frequencies (MHz)	Field Strength (micovolts/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
30~40.66	100	3
40.70~70	100	3

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.249)

Frequency of Emission (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
902-928	50	500

Notes:

- (1) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	RB>20BW,VB=20xRB

Receiver Parameter	Setting
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK-AV
	90kHz~110kHz / RB 200Hz for QP
	110kHz~490KHz / RB 9kHz for PK-AV
	490kHz~30MHz / RB 9kHz for QP
	30MHz~1000MHz / RB 100kHz for QP-PK



3.2.2 TEST PROCEDURE

- a. 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.
- b. 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.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; 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.
- d. 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.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit,
- f. 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

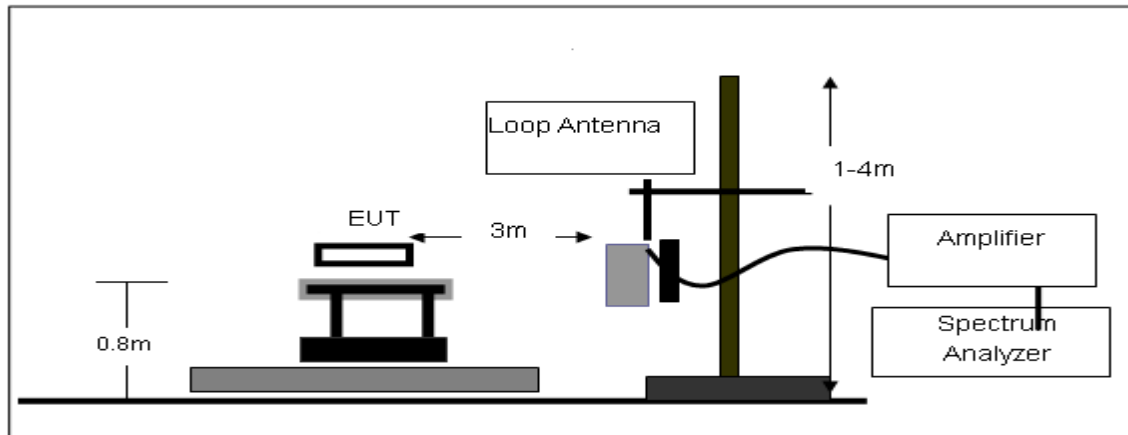
3.2.3 DEVIATION FROM TEST STANDARD

No deviation

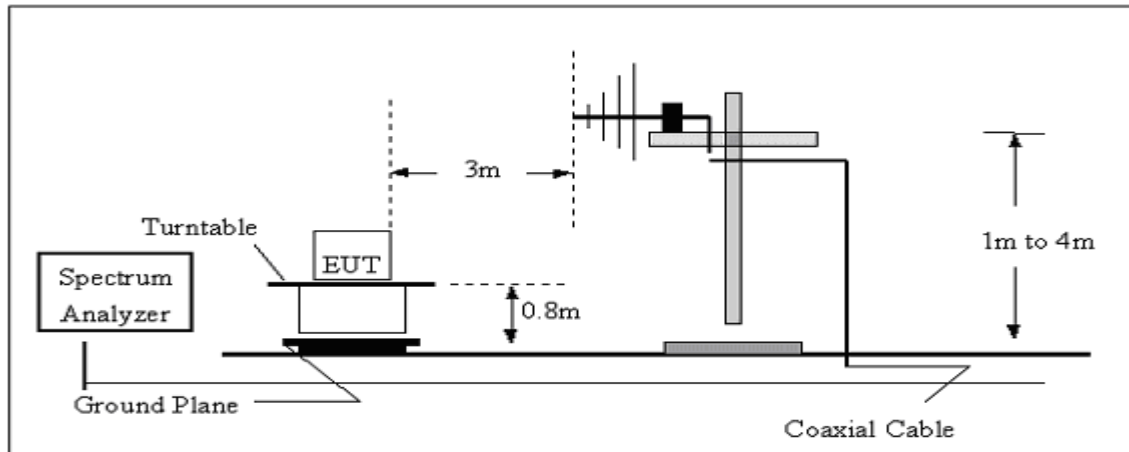


3.2.4 TEST SETUP

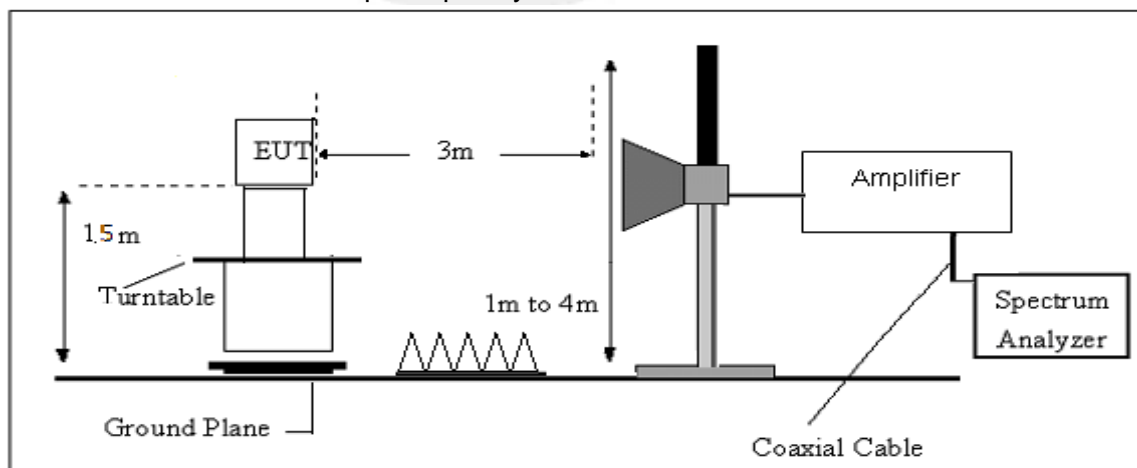
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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





3.2.5 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)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

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





3.2.6 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.

Below 30 MHz

Temperature:	26 °C	Relative Humidity:	60%
Test Voltage:	DC 3V	Polarization:	---
Test 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 = $40 \log (\text{specific distance/test distance})$ (dB);

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



Between 30MHz – 1000 MHz Radiation Spurious

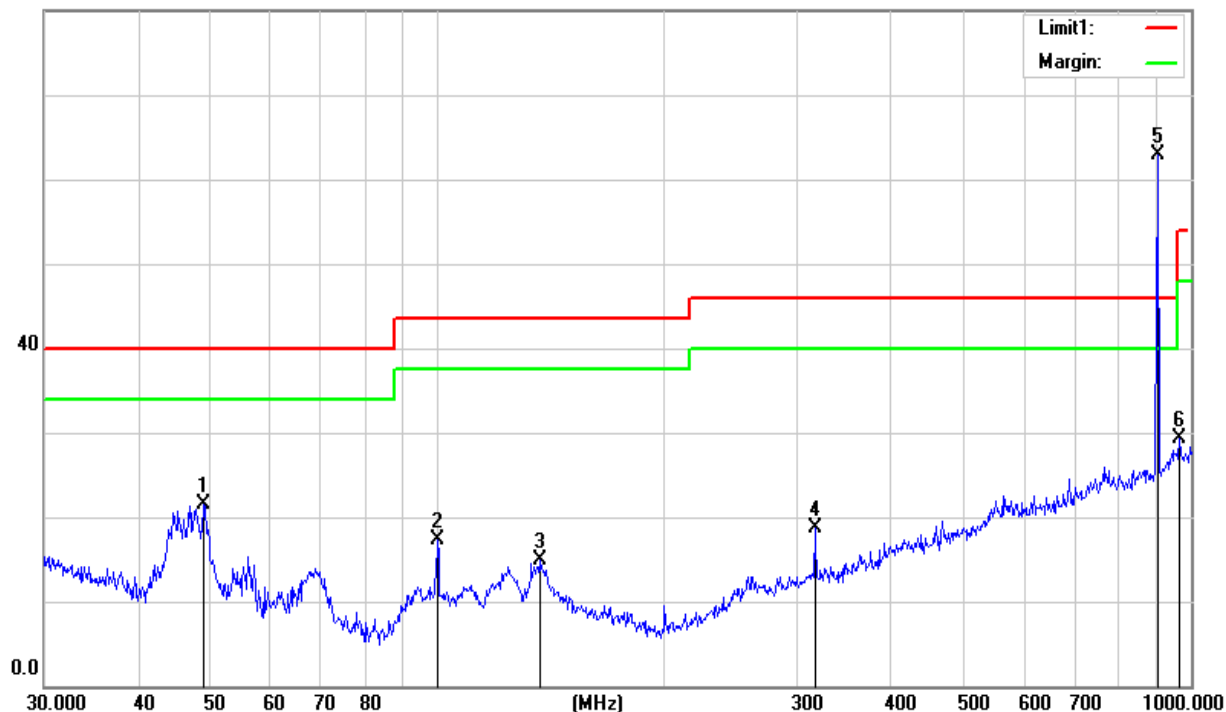
Temperature:	27.1 °C	Relative Humidity:	59%
Test Voltage:	DC 3V	Phase:	Horizontal
Test Mode:	Model 1		

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
48.8430	42.34	-20.89	21.45	40.00	-18.55	QP
99.8777	36.41	-19.20	17.21	43.50	-26.29	QP
136.4598	32.35	-17.52	14.83	43.50	-28.67	QP
316.5890	33.05	-14.28	18.77	46.00	-27.23	QP
903.0000	65.06	-2.14	62.92	92.00	-29.08	peak
965.5421	29.50	-0.14	29.36	54.00	-24.64	QP

Remark:

1. Margin = Result (Result =Reading + Factor)–Limit

80.0 dBuV/m





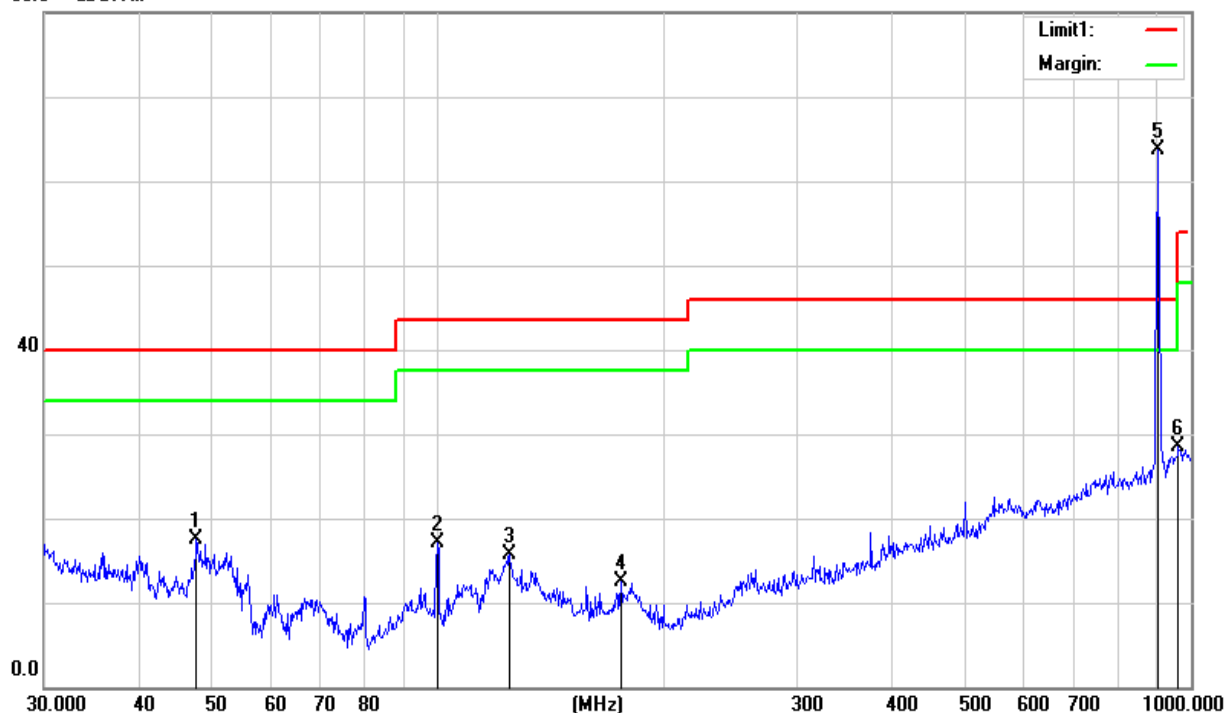
Temperature:	27.1 °C	Relative Humidity:	59%
Test Voltage:	DC 3V	Phase:	Vertical
Test Mode:	Model 1		

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
47.8260	37.82	-20.36	17.46	40.00	-22.54	QP
99.8777	36.39	-19.20	17.19	43.50	-26.31	QP
124.5690	33.25	-17.63	15.62	43.50	-27.88	QP
175.0368	31.95	-19.38	12.57	43.50	-30.93	QP
903.0000	65.90	-2.14	63.76	94.00	-30.24	peak
962.1622	28.67	-0.12	28.55	54.00	-25.45	QP

Remark:

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

80.0 dBuV/m





Above 1G Radiation Spurious

Frequency (MHz)	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
903 MHz										
1085.40	57.22	46.30	3.70	24.30	-18.30	38.92	74	-35.08	PK	Horizontal
1085.40	49.73	46.30	3.70	24.30	-18.30	31.43	54	-22.57	AV	Horizontal
1085.81	56.84	46.30	3.70	24.30	-18.30	38.54	74	-35.46	PK	Vertical
1085.81	49.74	46.30	3.70	24.30	-18.30	31.44	54	-22.56	AV	Vertical
1806.00	53.23	44.10	5.30	25.00	-13.80	39.43	74	-34.57	PK	Horizontal
1806.00	47.09	44.10	5.30	25.00	-13.80	33.29	54	-20.71	AV	Horizontal
1806.00	60.37	44.10	5.30	25.00	-13.80	46.57	74	-27.43	PK	Vertical
1806.00	50.20	44.10	5.30	25.00	-13.80	36.40	54	-17.60	AV	Vertical
2758.21	52.64	44.40	6.20	27.60	-10.60	42.04	74	-31.96	PK	Horizontal
2758.21	43.02	44.40	6.20	27.60	-10.60	32.42	54	-21.58	AV	Horizontal
2757.69	51.48	44.40	6.20	27.60	-10.60	40.88	74	-33.12	PK	Vertical
2757.69	40.09	44.40	6.20	27.60	-10.60	29.49	54	-24.51	AV	Vertical
4112.38	53.59	44.20	7.90	29.70	-6.60	46.99	74	-27.01	PK	Horizontal
4112.38	43.08	44.20	7.90	29.70	-6.60	36.48	54	-17.52	AV	Horizontal
4112.95	51.78	44.20	7.90	29.70	-6.60	45.18	74	-28.82	PK	Vertical
4112.95	41.59	44.20	7.90	29.70	-6.60	34.99	54	-19.01	AV	Vertical
7243.41	44.99	43.50	11.40	35.50	3.40	48.39	74	-25.61	PK	Horizontal
7243.41	37.06	43.50	11.40	35.50	3.40	40.46	54	-13.54	AV	Horizontal
7242.67	44.91	43.50	11.40	35.50	3.40	48.31	74	-25.69	Pk	Vertical
7242.67	36.58	43.50	11.40	35.50	3.40	39.98	54	-14.02	AV	Vertical

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 below the limit,
the frequency emission is mainly from the environment noise.

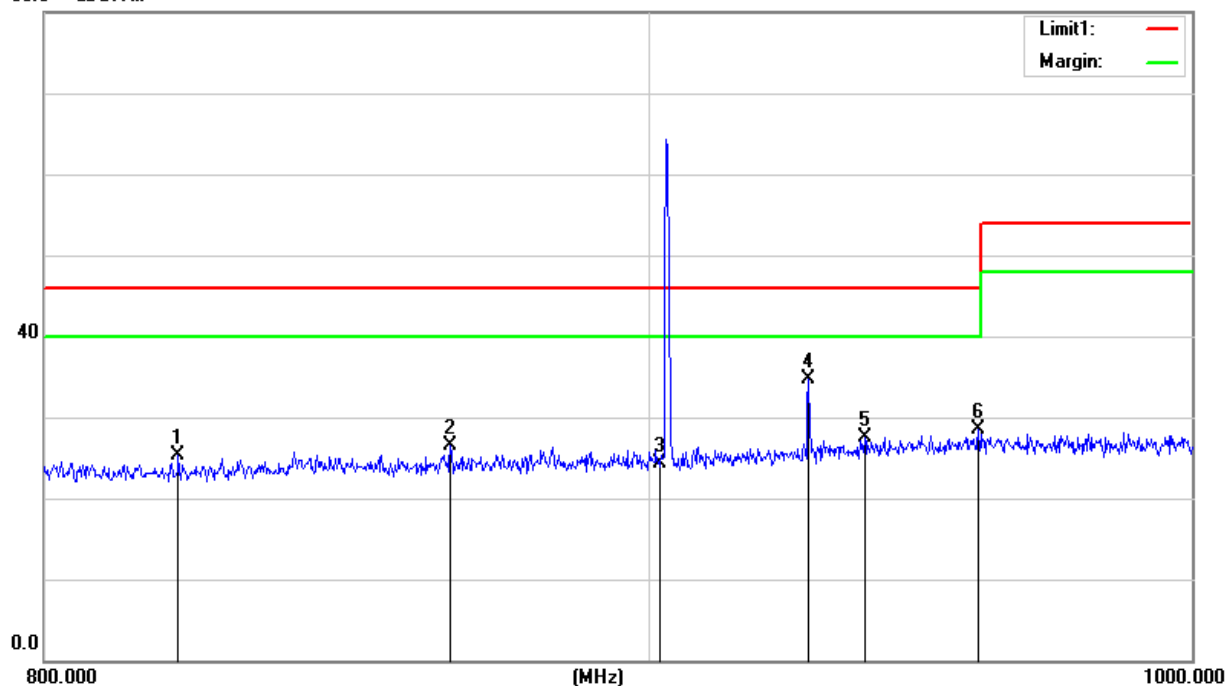


(Radiation Band edge)

Temperature:	27.1℃	Relative Humidity:	59%
Test Voltage:	DC 3V	Phase:	Horizontal
Test Mode:	Model 1		

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
821.2000	28.74	-3.48	25.26	46.00	-20.74	QP
865.8000	29.09	-2.64	26.45	46.00	-19.55	QP
902.0000	26.53	-2.20	24.33	46.00	-21.67	QP
928.0000	35.88	-1.23	34.65	46.00	-11.35	QP
938.4000	28.25	-0.77	27.48	46.00	-18.52	QP
959.4000	28.74	-0.15	28.59	46.00	-17.41	QP

80.0 dBuV/m

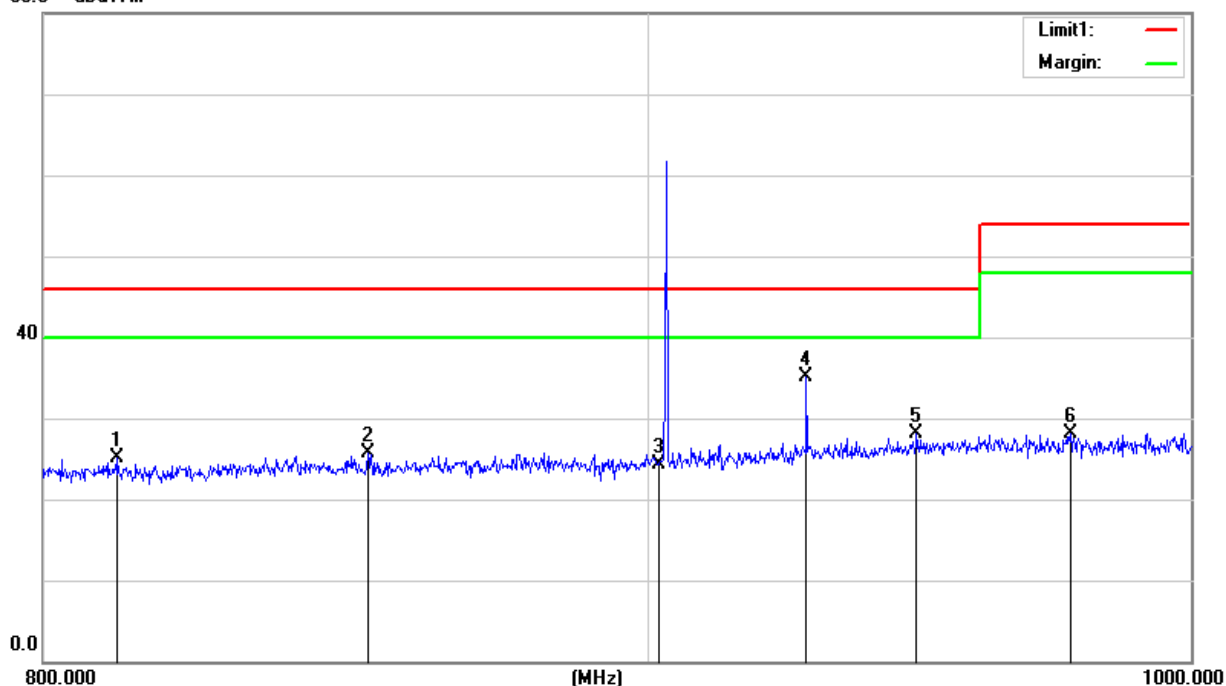




Temperature:	25.5 °C	Relative Humidity:	62%
Test Voltage:	DC 3V	Phase:	Vertical
Test Mode:	Model 1		

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
811.8000	28.57	-3.50	25.07	46.00	-20.93	QP
852.2000	28.46	-2.71	25.75	46.00	-20.25	QP
902.0000	26.56	-2.20	24.36	46.00	-21.64	QP
928.0000	36.28	-1.23	35.05	46.00	-10.95	QP
948.2000	28.59	-0.46	28.13	46.00	-17.87	QP
977.0000	28.23	-0.14	28.09	54.00	-25.91	QP

80.0 dBuV/m



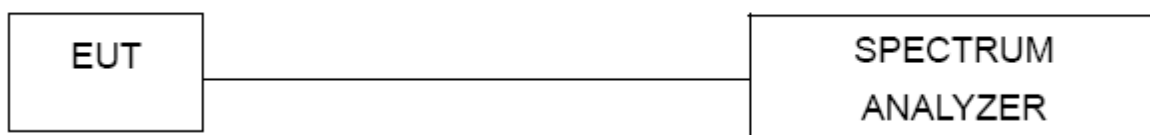


4. BANDWIDTH TEST

4.1 TEST PROCEDURE

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

4.2 TEST SETUP



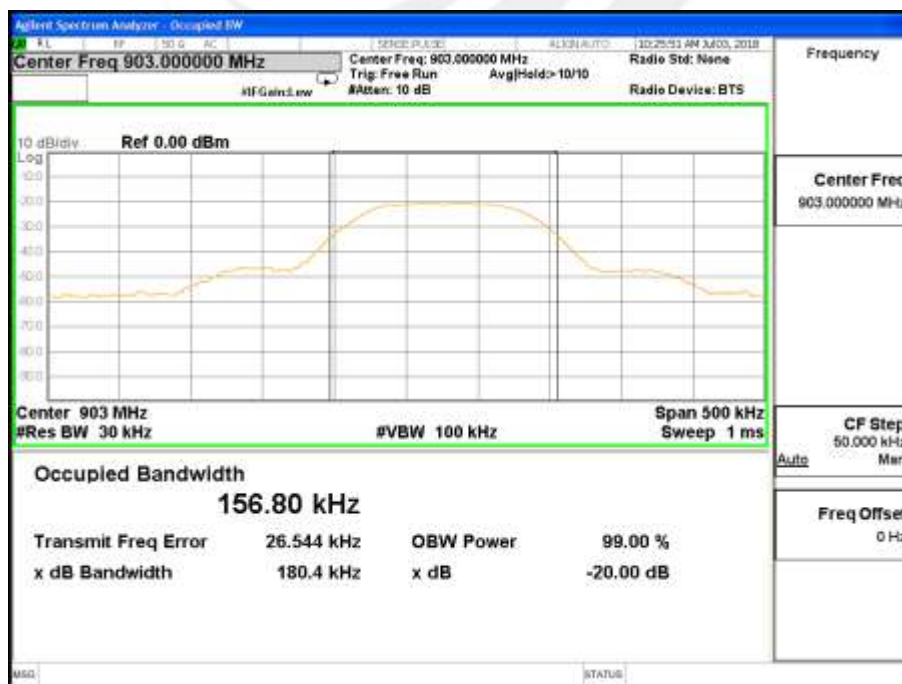
4.3 EUT OPERATION CONDITIONS

TX mode.

4.4 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	50%
Test Voltage:	DC 3V		
Test Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
CH01	903	180.4	156.80

CH01





5. ANTENNA REQUIREMENT

5.1 STANDARD REQUIREMENT

According to the FCC Part 15 Paragraph 15.203, 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.

5.2 EUT ANTENNA

The EUT antenna is Helical Antenna. It conforms to the standard requirements.



APPENDIX I- PHOTOS OF TEST SETUP**Radiated Measurement Photos**

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