



BUREAU
VERITAS

Test Report No.: RF200611N013



Certificate # 2951.01

TEST REPORT

Applicant	Grandex International Development Ltd
Address	Unit 2401, 24/F, Million Fortune Industrial Ctr., No.34-36 Chai Wan Kok Street, Tsuen Wan, Hong Kong

Manufacturer or Supplier	Grandex International Development Ltd
Address	Unit 2401, 24/F, Million Fortune Industrial Ctr., No.34-36 Chai Wan Kok Street, Tsuen Wan, Hong Kong
Product	R/C Vehicle
Brand Name	N/A
Model	61248
Additional Model & Model Difference	N/A
Date of tests	Apr. 11, 2020 ~ Jun. 22, 2020

the tests have been carried out according to the requirements of the following standard:

☒ FCC Part 15, Subpart C, Section 15.235

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Andy Zhu
Project Engineer / EMC Department

Approved by Glyn He
Assistant Manager / EMC Department

Date: Jun. 30, 2020

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TABLE OF CONTENTS

RELEASE CONTROL RECORD	3
1 SUMMARY OF TEST RESULTS	4
2 MEASUREMENT UNCERTAINTY.....	4
3 GENERAL INFORMATION	5
3.1 GENERAL DESCRIPTION OF EUT	5
3.2 DESCRIPTION OF TEST MODES	6
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	6
3.4 DESCRIPTION OF SUPPORT UNITS	6
4. TEST TYPES AND RESULTS	7
4.1 RADIATED EMISSION MEASUREMENT	7
4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT	7
4.1.2 TEST INSTRUMENTS.....	8
4.1.3 TEST PROCEDURES	9
4.1.4 DEVIATION FROM TEST STANDARD	9
4.1.5 TEST SETUP	10
4.1.6 EUT OPERATING CONDITIONS	11
4.1.7 TEST RESULTS	11
4.2 BANDWIDTH MEASUREMENT	15
4.2.1 LIMITS OF BANDWIDTH MEASUREMENT	15
4.2.2 TEST INSTRUMENTS.....	15
4.2.3 TEST PROCEDURE.....	16
4.2.4 DEVIATION FROM TEST STANDARD	16
4.2.5 TEST SETUP	16
4.2.6 EUT OPERATING CONDITIONS	16
4.2.7 TEST RESULTS	17
5 PHOTOGRAPHS OF THE TEST CONFIGURATION.....	18
6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	19



Test Report No.: RF200611N013

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF200611N013	Original release	Jun. 30, 2020



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.235)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
§15.207 (a)	Conducted Emission	N/A	EUT is powered by battery
§15.209 §15.235(a)	Radiated Emission	PASS	Compliant
§15.235(b) §15.215(c)	Measured Bandwidth	PASS	Compliant
§15.203	Antenna Requirement	PASS	No antenna connector is used

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Radiated emissions	9KHz ~ 30MHz	2.16dB
	30MHz ~ 1GHz	3.99dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	R/C Vehicle
MODEL NO.	61248
ADDITIONAL MODEL	N/A
FCC ID	VC961248149
NOMINAL VOLTAGE	DC 3V (1.5V*AA*2) from Battery
MODULATION TYPE	FSK
OPERATING FREQUENCY	49.86MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Wire Antenna, with 0dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.:200611N013) for detailed product photo.



3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and packet type. The worst case was found when the EUT was positioned on Y axis for radiated emission. The EUT was tested under the following mode.

FREQUENCY	TEST MODE
49.86MHz	Transmitting

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C, 15.235

ANSI C63.10-2013

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit without any other necessary accessories or support units.



4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/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

According to §15.235(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Peak] [μV/m]	Field Strength of Fundamental Emission [Average] [μV/m]
49.82 – 49.90	100,000 (100 dBμV/m)	10,000 (80 dBμV/m)

NOTES:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 18,20	Mar. 17,21
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	May 22,20	May 21,21
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	May 28,20	May 27,21
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Mar. 15,20	Mar. 14,21
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Jun. 23,19	Jun. 22,20
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jun. 23,19	Jun. 22,20
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170147	Jun. 23,19	Jun. 22,20
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 21,20	Apr. 20,21
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 21,20	Apr. 20,21
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Mar. 04,20	Mar. 03,21
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	May 20,20	May 19,21

NOTES:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 749762.



4.1.3 TEST PROCEDURES

The basic test procedure was in accordance with ANSI C63.10 (section 6).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using new battery. The turntable was rotated to maximize the emission level.

.NOTES:

1. The resolution bandwidth of test receiver/spectrum analyzer is 100kHz for peak detection (PK) at fundamental frequency below 1GHz; The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at radiated spurious emission frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
4. Margin value = Emission level – Limit value.
5. Fundamental AV value =PK Emission +AV factor.

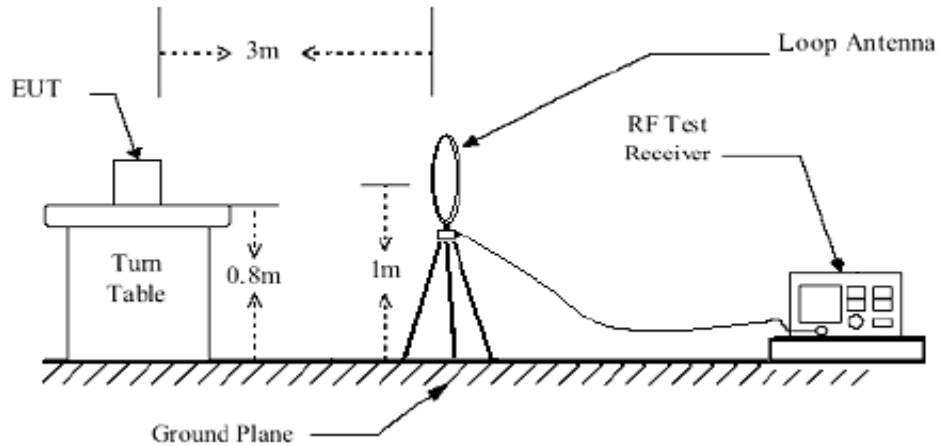
4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

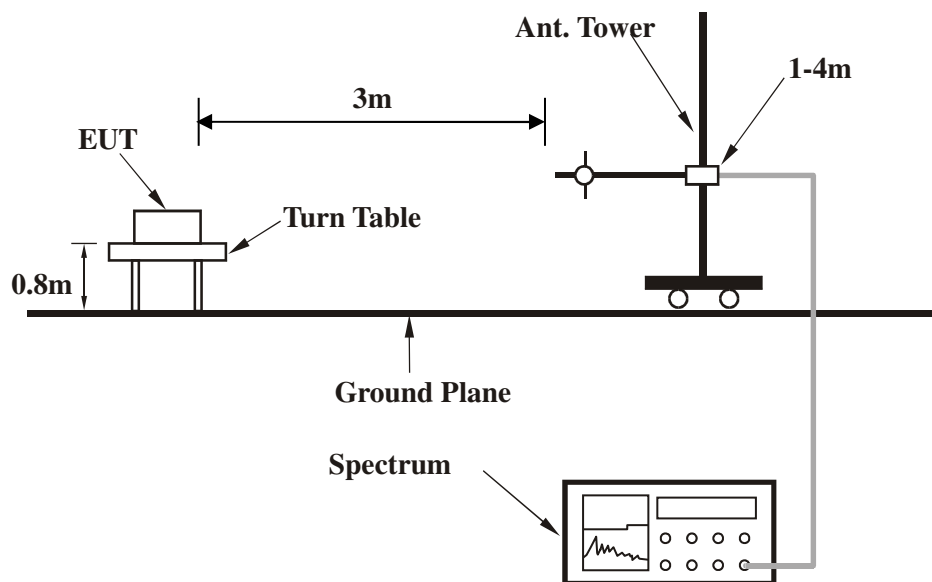


4.1.5 TEST SETUP

Below 30MHz



30MHz~1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).



4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of equipment.
- b. Hold down the TX of button, and then the EUT was operating.
- c. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

4.1.7 TEST RESULTS

FIELD STRENGTH OF FUNDAMENTAL

No.	Freq. (MHz)	Antenna Polarization	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*	49.86(PK)	V	-20.98	88.54	67.56	100	-32.44
*	49.86(AV)	V	-4.4	-	63.16	80	-16.84
*	49.86(PK)	H	-20.97	71.45	50.48	100	-49.52
*	49.86(AV)	H	-4.4	-	46.08	80	-33.92

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The emission levels of other frequencies were greater than 20dB margin.
 4. Margin value = Emission level – Limit value.
 5. “*”: Fundamental frequency.
 6. The average value of fundamental frequency is: Average value = Peak value +AV factor, where the AV factor is calculated from following formula: AV factor=20 log (Duty cycle) = 20 log (60.24%) = -4.4dB.



$$T_p = 18.0435\text{ms}$$

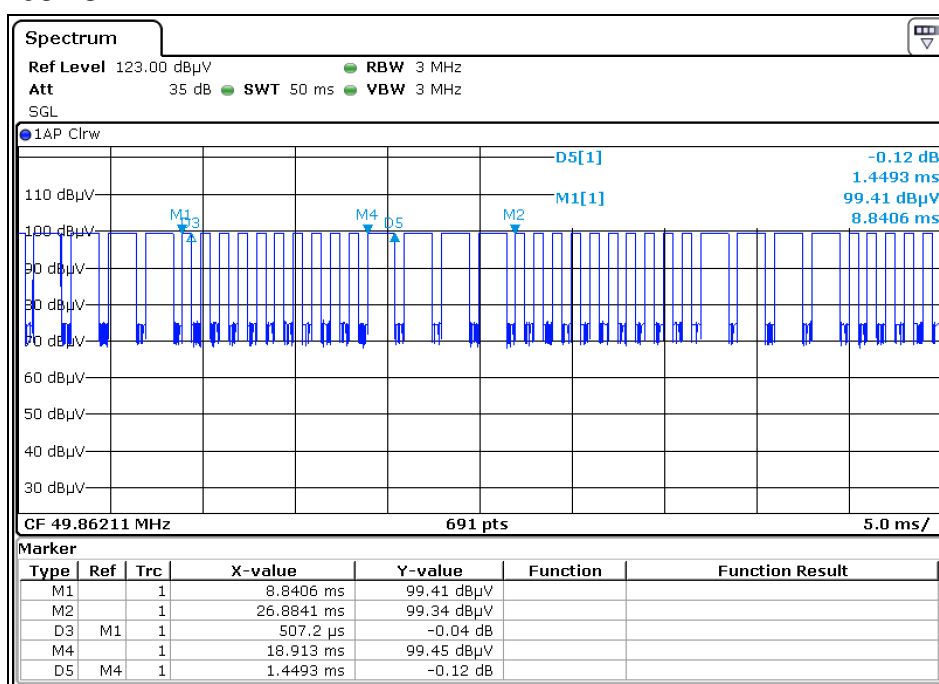
$$T_{on} = T_{on1} * \text{Number} + T_{on2} * \text{Number} = 0.5072 * 10 + 1.4493 * 4 = 10.8692\text{ms}$$

$$\text{Duty Cycle} = T_{on} / T_p * 100\% = 10.8692 / 18.0435 = 60.24\%$$

$$T_p = 26.8841 - 8.8406 = 18.0435\text{ms}$$

$$T_{on1} = 0.5072\text{ms}$$

$$T_{on2} = 1.4493\text{ms}$$



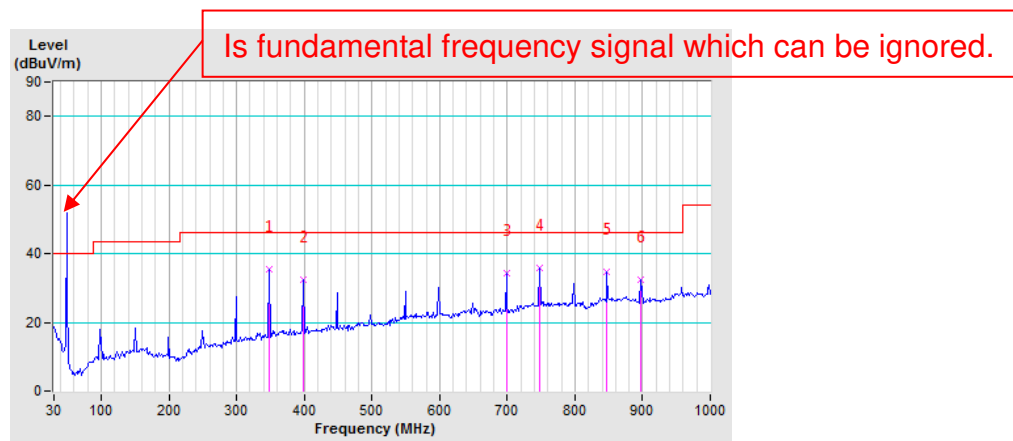


FREQUENCY RANGE	9KHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	348.67	35.54 QP	46.00	-10.46	1.00 H	0	48.40	-12.86
2	398.41	32.33 QP	46.00	-13.67	1.00 H	0	43.96	-11.63
3	698.43	34.27 QP	46.00	-11.73	1.00 H	32	39.84	-5.57
4	748.17	35.72 QP	46.00	-10.28	1.00 H	20	39.32	-3.60
5	847.66	34.55 QP	46.00	-11.45	1.00 H	6	36.88	-2.33
6	897.40	32.51 QP	46.00	-13.49	1.00 H	48	35.21	-2.70

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value.



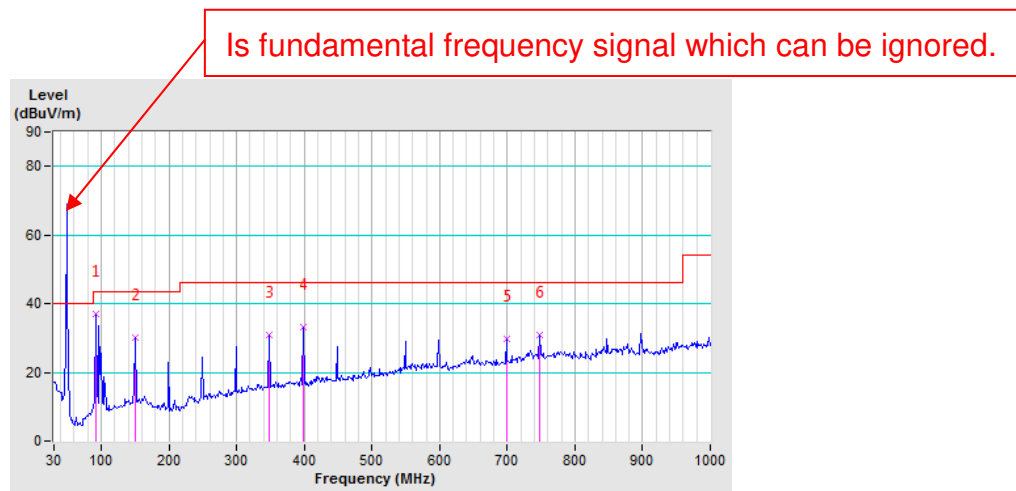


FREQUENCY RANGE	9KHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	92.18	36.92 QP	43.50	-6.58	1.00 V	270	57.66	-20.74
2	149.70	30.09 QP	43.50	-13.41	1.00 V	255	47.86	-17.77
3	348.67	30.75 QP	46.00	-15.25	1.00 V	198	43.61	-12.86
4	398.41	33.26 QP	46.00	-12.74	1.00 V	208	44.89	-11.63
5	698.43	29.76 QP	46.00	-16.24	1.00 V	219	35.33	-5.57
6	748.17	30.75 QP	46.00	-15.25	1.00 V	240	34.35	-3.60

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value.





4.2 BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF BANDWIDTH MEASUREMENT

The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section 15.209.

FREQUENCY (MHz)	Limits
	[MHz]
49.86	within 49.81~49.91

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Sensor	Keysight	U2021XA	MY55060016	May 22,20	May 21,21
Power Sensor	Keysight	U2021XA	MY55060018	May 22,20	May 21,21
Power Meter	Anritsu	ML2495A	1139001	Mar. 18,20	Mar. 17,21
Power Sensor	Anritsu	MA2411B	1531155	Mar. 18,20	Mar. 17,21
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 17, 19	Oct.16, 20
Humid & Temp Programmable Tester	Haida	HD-225T	110807201	Oct.31,19	Oct. 30,20
Oscilloscope	Agilent	DSO9254A	MY51260160	Sep. 18,19	Sep. 17,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Mar. 18,20	Mar. 17,21
Signal Generator	Agilent	N5183A	MY50140980	Sep. 19,19	Sep. 18,20
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Sep. 12,19	Sep. 11,20
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

NOTES:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



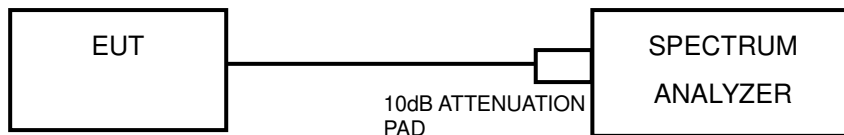
4.2.3 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 26dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



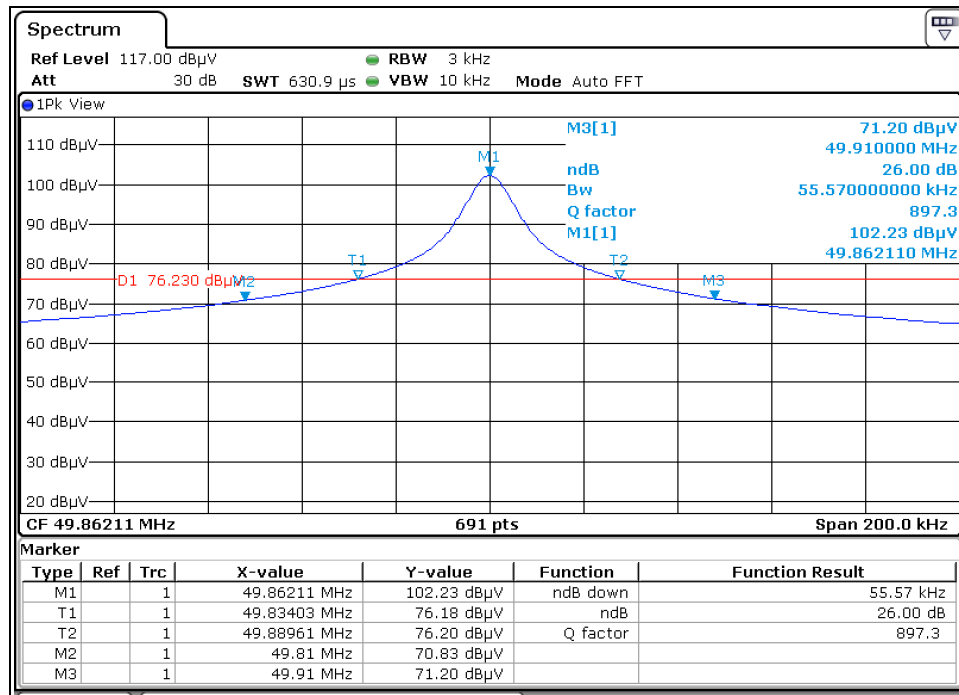
4.2.6 EUT OPERATING CONDITIONS

Same as item 4.1.6



4.2.7 TEST RESULTS

Lower & Upper Test Frequency Point (MHz)	Test Frequency (MHz)	P/F
Lower	49.83403	PASS
Upper	49.88961	PASS





Test Report No.: RF200611N013

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---