



Test Report No.: RF151030N027



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## TEST REPORT

Applicant	MI Technologies, Inc.
Address	2215 Paseo De Las Americas #30 San Diego, CA 92154, United States.

Manufacturer or Supplier	MI Technologies, Inc.
Address	2215 Paseo De Las Americas #30 San Diego, CA 92154, United States.
Product	Tracer Overlord Remote Control Truck- Red
Brand Name	N/A
Model	138253 (817473014164)
Additional Model & Model Difference	138254 (817473014171), 138255 (817473014188), 138256 (817473014195), 138257 (817473014201), 138258 (817473014218), 138259 (817473014225), 138260 (817473014232), 138261 (817473014249), 138262 (817473014256), 138263 (817473014263), 139021 (817473018414), 139022 (817473018421), 139023 (817473018438), 139024 (817473018445), 139025 (817473018469), 139026 (817473018476), 139027 (817473018483), 139028 (817473018490)
Date of tests	Dec. 01, 2015 ~ Dec. 10, 2015

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 Heise Chen Project Engineer / EMC Department	Approved by Chris Chen Assistant Manager / EMC Department

Date: Dec. 10, 2015

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification



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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF151030N027	Original release	Dec. 10, 2015



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## 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)	Measured Bandwidth	PASS	Compliant

## 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	2.74dB
	30MHz ~ 1GHz	3.55dB
	1GHz ~ 18GHz	4.84dB
	18GHz ~ 40GHz	4.84dB

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



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### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Tracer Overlord Remote Control Truck- Red
MODEL NO.	138253 (817473014164)
ADDITIONAL MODELS	138254 (817473014171), 138255 (817473014188), 138256 (817473014195), 138257 (817473014201), 138258 (817473014218), 138259 (817473014225), 138260 (817473014232), 138261 (817473014249), 138262 (817473014256), 138263 (817473014263), 139021 (817473018414), 139022 (817473018421), 139023 (817473018438), 139024 (817473018445), 139025 (817473018469), 139026 (817473018476), 139027 (817473018483), 139028 (817473018490)
FCC ID	2AAHO-MITLTSTB49B
NOMINAL VOLTAGE	DC 9V From Battery
MODULATION TYPE	ASK
OPERATING FREQUENCY	49.86MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Integral Antenna with 0dBi
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

#### NOTE:

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.: 151030N027) for detailed product photo.
4. Additional model(s)138254(817473014171), 138255(817473014188), 138256(817473014195), 138257(817473014201), 138258(817473014218), 138259(817473014225), 138260(817473014232), 138261(817473014249), 138262(817473014256), 138263(817473014263), 139021(817473018414), 139022(817473018421), 139023(817473018438), 139024(817473018445), 139025(817473018469), 139026(817473018476), 139027(817473018483), 139028(817473018490) are identical with the test model 138253 (817473014164) except the trade name and model number for marketing purpose



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### 3.2 DESCRIPTION OF TEST MODES

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**

All test items have been performed and recorded as per the above standards. This is a single application for certification of a transmitter. The receiver for this transmitter is authorized by Declaration of Conformity procedure

### 3.4 DESCRIPTION OF SUPPORT UNITS

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



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## 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] [ $\mu$ V/m]	Field Strength of Fundamental Emission [Average] [ $\mu$ V/m]
49.82 – 49.90	100,000 (100 dB $\mu$ V/m)	10,000 (80 dB $\mu$ V/m)

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB $\mu$ V/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.



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#### 4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Apr. 27,15	Apr. 26,16
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Apr. 23,15	Apr. 22,16
Bilog Antenna	Teseq	CBL 6111D	30643	Jul. 16, 15	Jul. 15, 16
Horn Antenna	ETS-Lindgren	3117	00062558	May 30,14	May 29,16
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Mar. 04,15	Mar. 03, 16
Pre-Amplifier (0.5~18GHz)	SCHWARZBECK	BBV 9718	9718-266	Mar 26,14	Mar 25,16
GPS Generator+ Antenna	TOJOIN	GNSS-5000A	E1-010119	Aug. 08, 14	Aug. 07, 16
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 19,14	Apr. 18,16
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170147	Jan. 21,14	Jan. 20,17
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 20,15	Nov. 19,16

**NOTE:**

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRRG/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 494399.



#### 4.1.3 TEST PROCEDURES

The basic test procedure was in accordance with ANSI C63.4 (section 12).

- a. The EUT was placed on the top of a rotating table 1.5 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. 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.

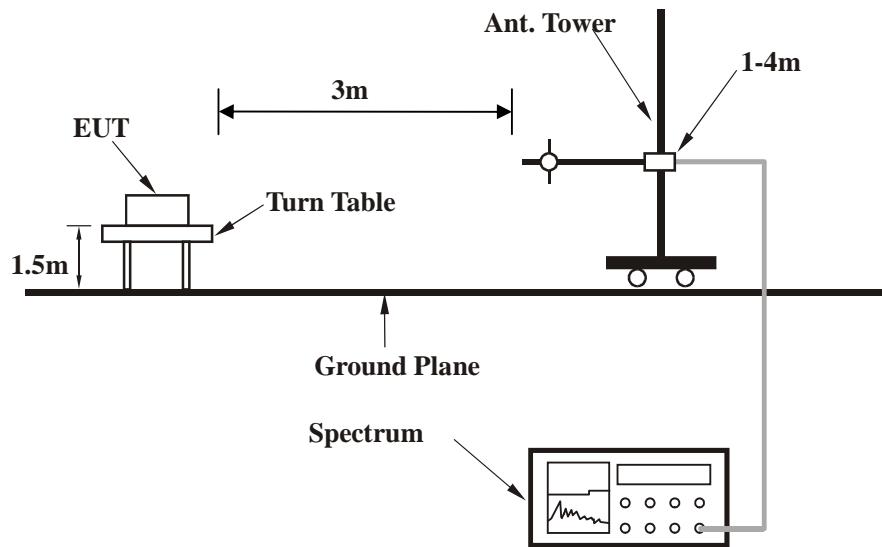
**.NOTE:**

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at 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



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.



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#### 4.1.7 TEST RESULTS

##### FIELD STRENGTH OF FUNDAMENTAL

###### ANTENNA POLARITY: 0°

No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*	49.68(PK)	-22.20	73.02	50.82	100	-49.18
*	49.68(AV)	-5.31	-	45.51	80	-34.49

###### ANTENNA POLARITY: 90°

No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*	49.68(PK)	-22.20	89.40	67.20	100	-32.80
*	49.68(AV)	-5.31	-	61.89	80	-18.11

- 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 other emission levels were very low against the limit.
  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 (54.26%) = -5.31dB, Please see page 12~13 for plotted duty.



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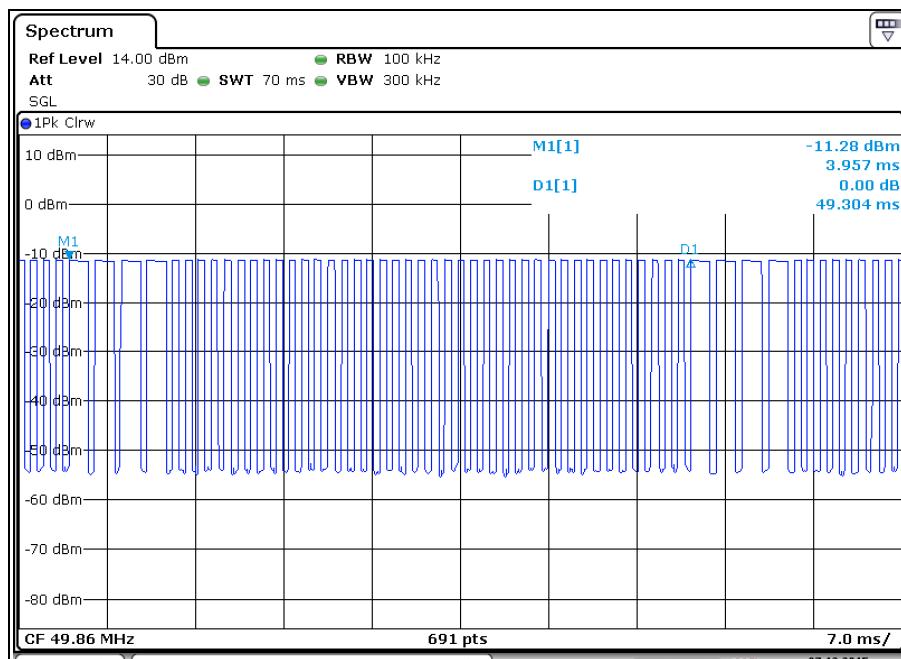
## Duty Cycle:

Tp = 49.304ms

Ton = Ton1 \* Number + Ton2 \* Number =  $1.5435 * 4 + 0.5145 * 40 = 26.754\text{ms}$

Duty Cycle = Ton / Tp \* 100% =  $26.754 / 49.304 = 54.26\%$

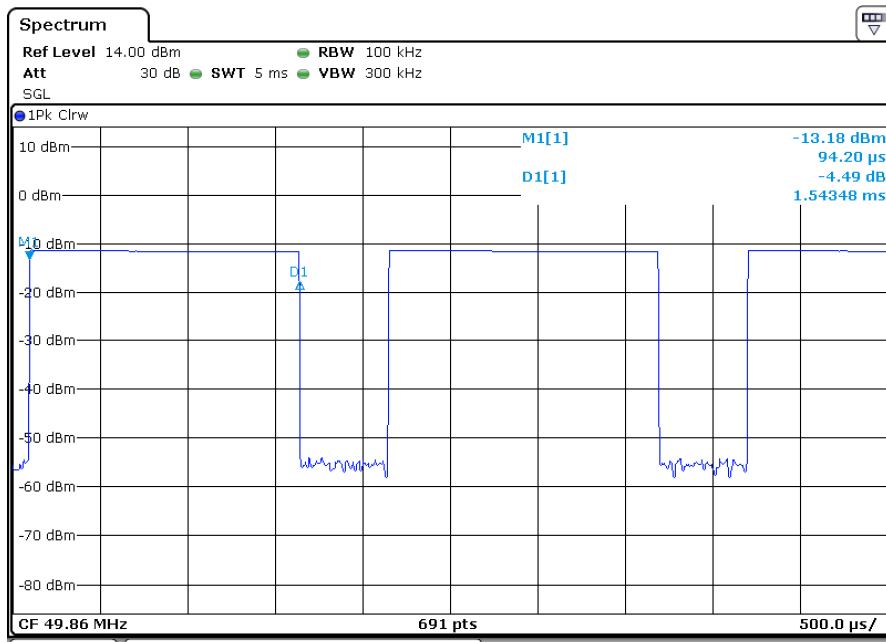
Tp=49.304ms



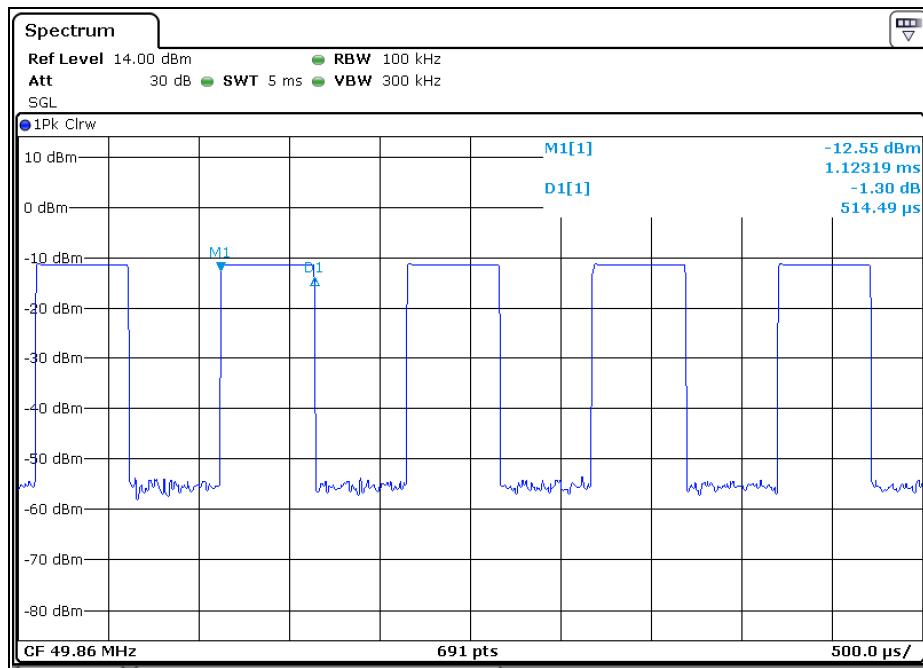


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**Ton1=1.5435ms**



**Ton2= 0.5145ms**





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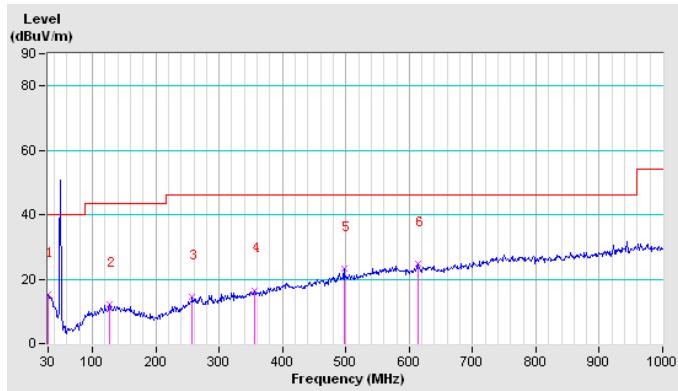
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FREQUENCY RANGE	30MHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	15.25	40.00	-24.75	100	0	27.59	-12.34
2	127.00	12.22	43.50	-31.28	100	0	30.17	-17.95
3	257.74	14.48	46.00	-31.52	100	0	29.73	-15.25
4	356.14	16.58	46.00	-29.42	100	0	29.54	-12.96
5	496.72	23.08	46.00	-22.92	100	0	31.25	-8.17
6	613.41	24.70	46.00	-21.30	100	0	30.08	-5.38

**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 other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





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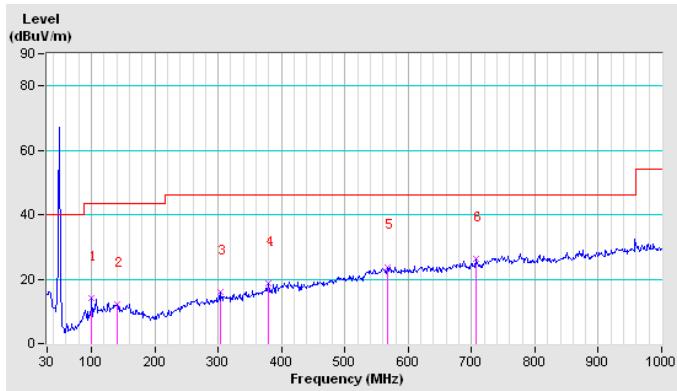
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<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	100.29	14.03	43.50	-29.47	100	0	33.77	-19.74
2	141.06	12.19	43.50	-31.31	100	0	30.02	-17.83
3	302.72	15.96	46.00	-30.04	100	0	30.49	-14.53
4	380.04	18.65	46.00	-27.35	100	0	30.82	-12.17
5	567.01	23.81	46.00	-22.19	100	0	29.50	-5.69
6	706.19	<b>26.30</b>	<b>46.00</b>	<b>-19.70</b>	<b>100</b>	<b>0</b>	<b>30.07</b>	<b>-3.77</b>

**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 other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





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## 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	Feb. 18,15	Feb. 17,16
Power Sensor	Keysight	U2021XA	MY55060018	Feb. 18,15	Feb. 17,16
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 12, 15	Oct.11, 16
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.07,15	Sep. 06,16
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 28,15	Nov. 27,16
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 05,15	Nov. 04,16
Signal Generator	Agilent	N5183A	MY50140980	Nov. 05,15	Nov. 04,16
ESG Vector Signal Generator	Agilent	E4438C	MY49072505	Apr. 22, 15	Apr. 21, 16
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Sep. 01,15	Aug. 31,16

#### NOTE:

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.



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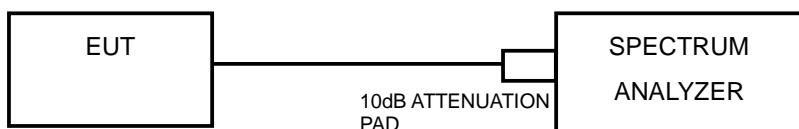
#### 4.2.3 TEST PROCEDURE

- 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

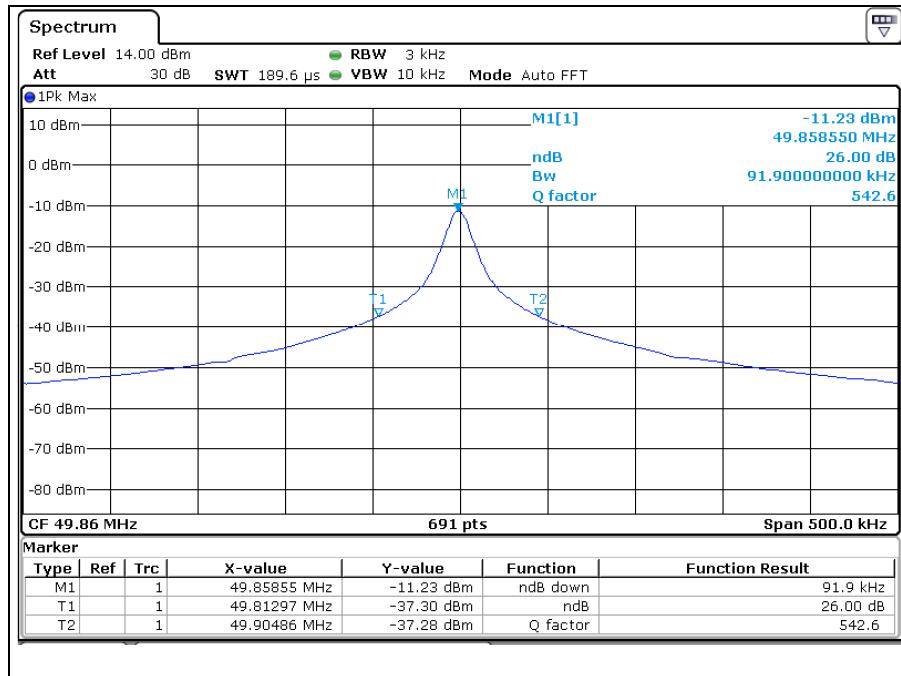


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#### 4.2.7 TEST RESULTS

Lower & Upper Test Frequency Point (MHz)	Test Frequency (MHz)	P/F
Lower	49.81297	PASS
Upper	49.90486	PASS





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## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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## 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---