

## TEST REPORT

Applicant	LINGDONG TECHNOLOGY (BEIJING) CO. LTD
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Manufacturer or Supplier	LINGDONG TECHNOLOGY (BEIJING) CO. LTD
Address	1601-29, Floor 16, Linghang Building, No.68 Zhichun Road, Haidian District, Beijing
Product	OVIS
Brand Name	FORWARDX
Model	OVIS-01
Additional Model & Model Difference	N/A
Date of tests	Mar. 04, 2019 ~ Jul. 12, 2019

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

**FCC Part 15, Subpart F, Section 15.519**

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

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Approved by Glyn He  
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Date: Jul. 17, 2019

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**BUREAU**  
**VERITAS**

Test Report No.: RF190304N040-2

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF190304N040-2	Original release	Jul. 17, 2019



# 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart F(Section 15.519)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	N/A	Powered by Battery
15.519(a)(1)	Shutoff Timing Requirements	PASS	Meet the requirement of limit.
15.503(d) 15.519(b)	UWB bandwidth	PASS	Meet the requirement of limit.
15.519(c)/ 15.209 15.519(d)	Radiated Emissions	PASS	Meet the requirement of limit.
15.519(e)	Peak Level of the Emission	PASS	Meet the requirement of limit.
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	2.90dB
	30MHz ~ 1GMHz	3.83dB
	1GHz ~ 18GHz	4.93dB
	18GHz ~ 40GHz	4.80dB

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

<b>PRODUCT</b>	OVIS
<b>BRAND NAME</b>	FORWARDX
<b>MODEL NO.</b>	OVIS-01
<b>ADDITIONAL NO.</b>	N/A
<b>FCC ID</b>	2AR7B-OVIS-01
<b>NOMINAL VOLTAGE</b>	DC 18V Supplied by Li-ion Battery, DC 21V Charged by the Adapter
<b>MODULATION TYPE</b>	BPM/BPSK
<b>OPERATING FREQUENCY</b>	6240MHz ~6739.2MHz for UWB
<b>DECLARED AVERAGE OUTPUT POWER</b>	-41.3dBm
<b>ANTENNA TYPE</b>	Integral PCB Antenna, with 3.85dBi gain
<b>I/O PORTS</b>	Refer to user's manual
<b>CABLE SUPPLIED</b>	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. When the EUT charging that wireless function can't working, the charging mode was tested in the FCC Part 15B (SDoc) report.
4. The EUT uses following adapter:

<b>Adapter :</b>	
Brand	XinSPower
Model	A481-2102000I
Input Power	AC 100-240V, 50/60Hz 1.5A Max
Output Power	DC 21V, 2A
DC Line	Unshielded, Non-detachable, 1.85m.



### 3.2 DESCRIPTION OF TEST MODES

CHANNEL	FREQUENCY
1	6489.6MHz

#### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photographs of the test configuration for reference.

#### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on X axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

EUT CONFIGURE MODE	APPLICABLE TO						DESCRIPTION
	RE ≥ 1G	RE < 1G	PLC	BW	PL	STR	
-	√	√	-	√	√	√	DC 18V from Fully Battery

Where **RE ≥ 1G**: Radiated Emission above 1GHz      **RE < 1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission      **BW**: 10dB Bandwidth measurement  
**PL**: Peak Level of the Emission      **STR**: Shutoff Timing Requirements

**NOTE:** No need to concern of Conducted Emission due to the EUT's wireless function is powered by battery.

#### RADIATED EMISSION TEST (BELOW 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	UWB	1	1	BPM/BPSK

#### RADIATED EMISSION TEST (ABOVE 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	UWB	1	1	BPM/BPSK



**UWB BANDWIDTH MEASUREMENT:**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	UWB	1	1	BPM/BPSK

**PEAK LEVEL OF THE EMISSION**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	UWB	1	1	BPM/BPSK

**SHUTOFF TIMING REQUIREMENTS:**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	UWB	1	1	BPM/BPSK

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	23deg. C, 53%RH	DC 18V from Fully Battery	Eric Fang
RE≥1G	23deg. C, 53%RH	DC 18V from Fully Battery	Eric Fang
PLC	N/A	N/A	N/A
BW	20deg. C, 55%RH	DC 18V from Fully Battery	Eric Fang
PL	23deg. C, 53%RH	DC 18V from Fully Battery	Eric Fang
STR	23deg. C, 53%RH	DC 18V from Fully Battery	Eric Fang





**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 F, Section 15.519**

**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

**3.4 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.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	N/A	N/A	N/A	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A



## 4 TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

(a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209:

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

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

(b) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

(c) In addition to the radiated emission limits specified in the table in paragraph (a)(b) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3



### 4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 12,19	Mar. 11,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Aug. 02,18	Aug. 01,19
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	May 04,19	May 03,20
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Apr. 18,19	Apr. 18,20
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Aug. 11, 18	Aug. 10, 19
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jul. 21, 18	Jul. 20, 19
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	May 05,19	May 04,20
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Feb. 10,19	Feb. 09,20
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 18,19	Apr. 18,20
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 09,18	Nov. 08,19
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

**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, 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

1. The EUT was placed on the top of a rotating table 0.8 meters (below 960MHz) and 1.5 meters (above 960MHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna is a broadband antenna, and its height 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.
4. 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.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. For below 30MHz, a loop antenna with its vertical plane is placed 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.
7. 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 performed using fresh batteries. The turntable was rotated to maximize the emission level.

#### **NOTE:**

1. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Quasi-peak detection at frequency below 960MHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Average detection at frequency above 960MHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1KHz and the video bandwidth is 3KHz for Average detection at frequency range from 1164-1240MHz & 1559-1610MHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes, the worst-case test configuration was reported on the file test setup photo.

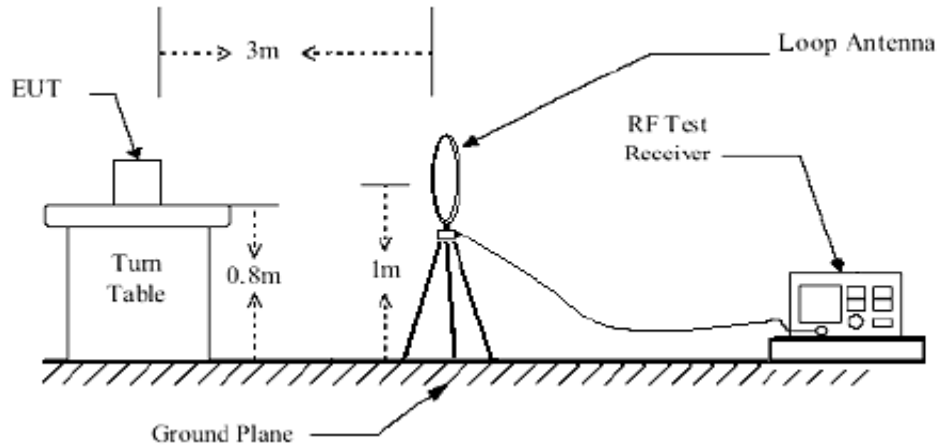
### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

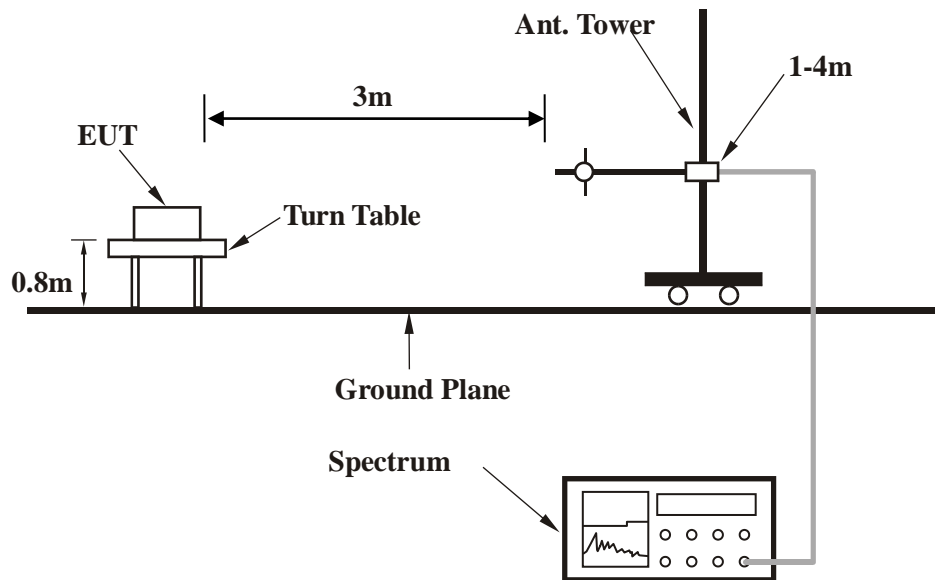


#### 4.1.5 TEST SETUP

##### Below 30MHz test setup

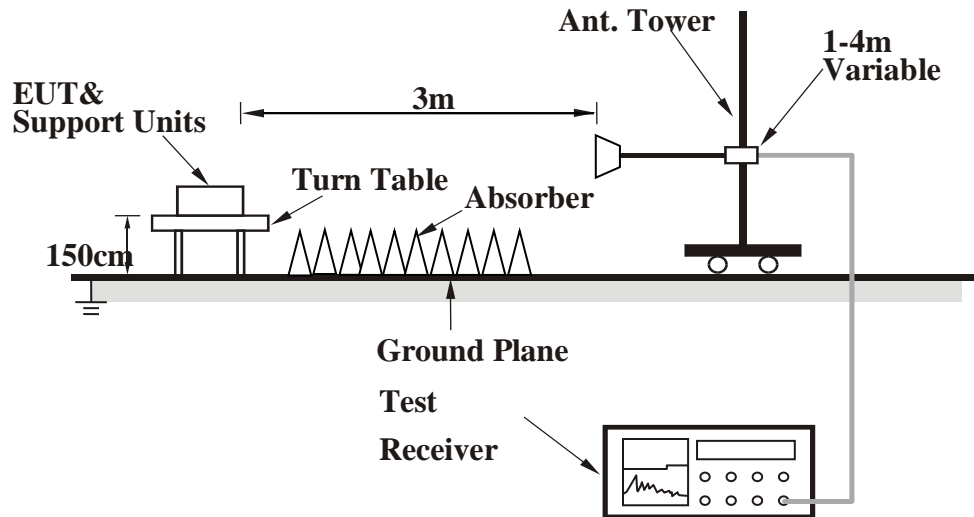


##### Below 960MHz test setup



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

### Above 960MHz test setup



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

#### 4.1.6 EUT OPERATING CONDITIONS

- a. Placed the EUT on a testing table.
- b. Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the EUT in full functions.



### 4.1.7 TEST RESULTS

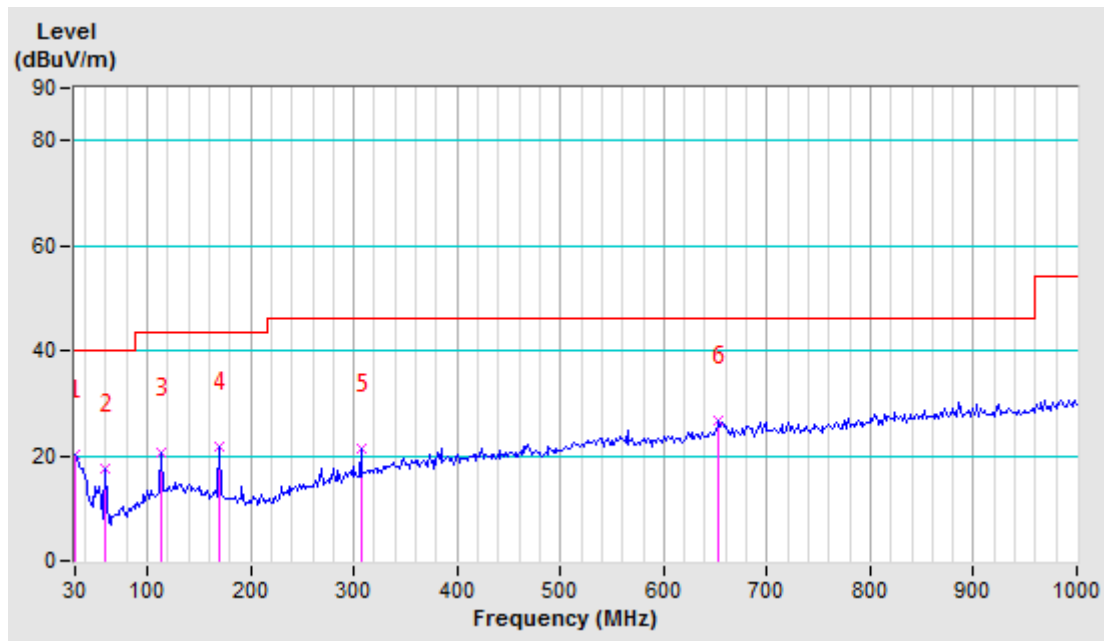
#### Radiated Emissions Test Data Below 960 MHz:

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9KHz ~ 960MHz		

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	30.00	20.27 QP	40.00	-19.73	2.00 H	147	30.37	-10.10
2	59.54	17.65 QP	40.00	-22.35	2.00 H	55	41.75	-24.10
3	113.94	20.61 QP	43.50	-22.89	2.00 H	57	37.56	-16.95
4	169.90	21.75 QP	43.50	-21.75	2.00 H	35	38.88	-17.13
5	306.70	21.37 QP	46.00	-24.63	2.00 H	116	33.73	-12.36
6	653.35	26.57 QP	46.00	-19.43	2.00 H	238	31.24	-4.67

**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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



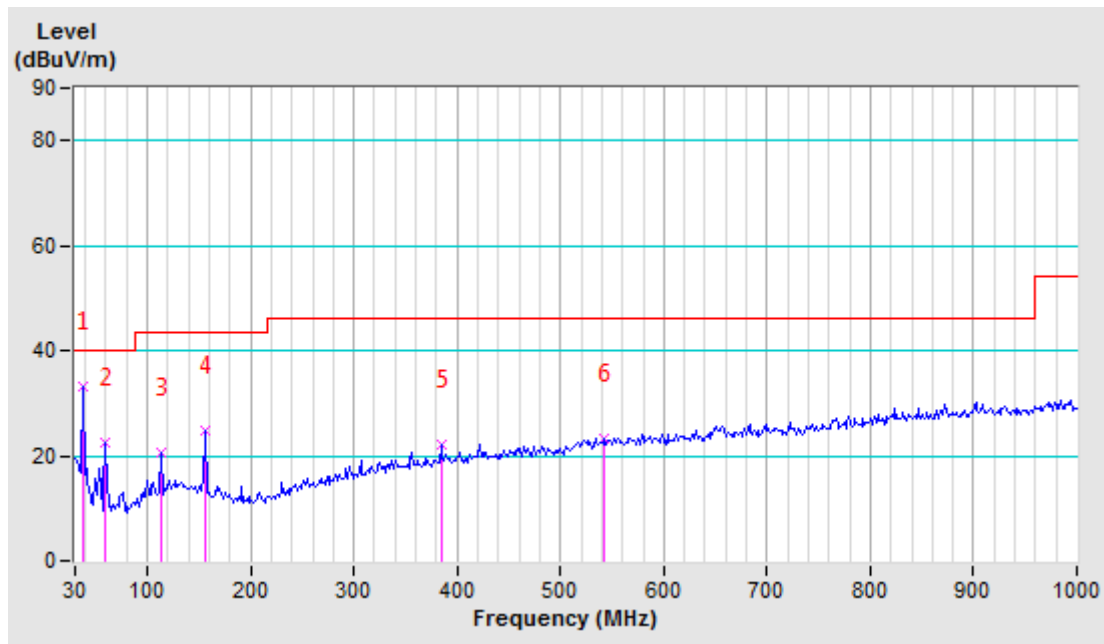


<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9KHz ~ 960MHz		

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	37.77	33.25 QP	40.00	-6.75	1.00 V	152	47.82	-14.57
2	59.54	22.54 QP	40.00	-17.46	1.00 V	325	46.64	-24.10
3	113.94	20.46 QP	43.50	-23.04	1.00 V	251	37.41	-16.95
4	155.91	24.92 QP	43.50	-18.58	1.00 V	85	41.33	-16.41
5	384.42	22.08 QP	46.00	-23.92	1.00 V	112	31.81	-9.73
6	542.98	23.14 QP	46.00	-22.86	1.00 V	164	29.44	-6.30

**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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.







**Radiated Emissions above 960 MHz:**

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Average (AV)
<b>FREQUENCY RANGE</b>	960MHz ~ 8GHz		

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	1300.53	-81.25 AV	-75.30	-5.95	2.00 H	33
2	1660.33	-80.93 AV	-63.30	-17.63	2.00 H	54
3	3089.97	-75.32 AV	-61.30	-14.02	2.00 H	45
4	3493.17	-73.38 AV	-41.30	-32.08	1.00 H	158
5	5480.70	-71.82 AV	-41.30	-30.52	1.50 H	133
6	6205.67	-53.04 AV	-41.30	-11.74	1.50 H	135
7	6418.93	-45.97 AV	-41.30	-4.67	1.50 H	168
8	6502.47	-46.21 AV	-41.30	-4.91	1.50 H	280
9	6636.17	-49.44 AV	-41.30	-8.14	1.50 H	354
10	6725.53	-51.89 AV	-41.30	-10.59	1.50 H	15
11	6805.1	-54.47 AV	-41.30	-13.17	1.50 H	45
12	7368.37	-68.82 AV	-41.30	-27.52	1.50 H	247
13	7834.33	-71.06 AV	-41.30	-29.76	1.50 H	165

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	1264.60	-79.68 AV	-75.30	-4.38	2.00 V	105
2	1798.23	-79.23 AV	-63.30	-15.93	2.00 V	148
3	2532.30	-76.39 AV	-61.30	-15.09	2.00 V	152
4	3189.13	-71.97 AV	-41.30	-30.67	2.00 V	105
5	5082.87	-71.87 AV	-41.30	-30.57	1.50 V	117
6	5418.17	-69.69 AV	-41.30	-28.39	1.50 V	132
7	6279.4	-46.93 AV	-41.30	-5.63	1.50 V	36
8	6391.4	-44.85 AV	-41.30	-3.55	1.50 V	189
9	6474.93	-45.42 AV	-41.30	-4.12	1.50 V	256
10	6660.67	-44.26 AV	-41.30	-2.96	1.50 V	69
11	6719.7	-49.48 AV	-41.30	-8.18	1.50 V	174
12	7410.60	-67.87 AV	-41.30	-26.57	1.50 V	156
13	7793.03	-69.03 AV	-41.30	-27.73	1.50 V	98

**REMARKS:**

1. The emission levels of other frequencies were less than 20dB margin against the limit.
2. Margin value = Emission level – Limit value.



<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Average (AV)
<b>FREQUENCY RANGE</b>	8GHz ~ 40GHz		

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	8049.00	-82.31 AV	-41.30	-41.01	1.50 H	48
2	9554.67	-81.97 AV	-41.30	-40.67	1.50 H	56
3	10533.00	-79.20 AV	-41.30	-37.90	1.50 H	117
4	11215.33	-74.29 AV	-61.30	-12.99	1.00 H	135
5	11746.00	-73.89 AV	-61.30	-12.59	1.50 H	168
6	13394.00	-72.29 AV	-61.30	-10.99	1.50 H	127
7	13796.00	-74.31 AV	-61.30	-13.01	1.50 H	153
8	14838.67	-72.78 AV	-61.30	-11.48	1.50 H	190
9	15765.67	-71.67 AV	-61.30	-10.37	1.50 H	247
10	16846.33	-68.65 AV	-61.30	-7.35	1.50 H	38
11	17079.67	-68.03 AV	-61.30	-6.73	1.50 H	59
12	17419.33	-66.13 AV	-61.30	-4.83	1.50 H	135
13	17891.67	-67.23 AV	-61.30	-5.93	1.50 H	186

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	9159.33	-81.17 AV	-41.30	-39.87	1.50 V	196
2	10448.67	-80.02 AV	-41.30	-38.72	1.50 V	188
3	11035.33	-78.39 AV	-61.30	-17.09	1.50 V	136
4	11355.33	-77.40 AV	-61.30	-16.10	1.50 V	175
5	12315.67	-76.52 AV	-61.30	-15.22	1.50 V	263
6	12680.67	-74.80 AV	-61.30	-13.50	1.50 V	247
7	13605.67	-73.86 AV	-61.30	-12.56	1.50 V	85
8	14357.33	-72.84 AV	-61.30	-11.54	1.50 V	126
9	14733.33	-71.73 AV	-61.30	-10.43	1.50 V	48
10	15107.67	-73.13 AV	-61.30	-11.83	1.50 V	54
11	16217.00	-69.24 AV	-61.30	-7.94	1.50 V	87
12	17013.33	-68.09 AV	-61.30	-6.79	1.50 V	287
13	17524.33	-65.93 AV	-61.30	-4.63	1.50 V	45

**REMARKS:**

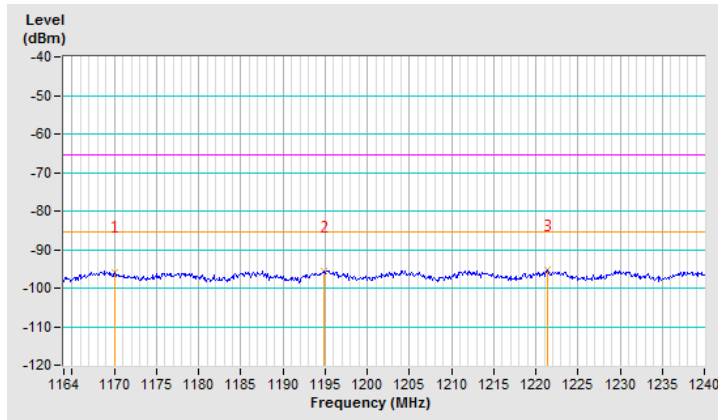
1. The emission levels of other frequencies were less than 20dB margin against the limit.
2. Margin value = Emission level – Limit value.



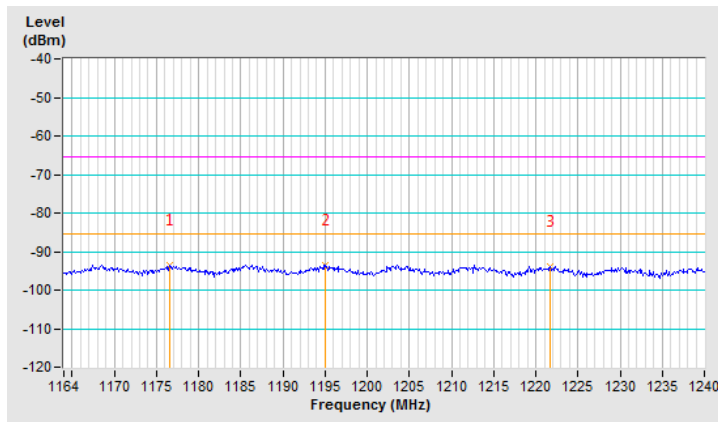
Radiated Emissions Test Data in The GPS Bands:

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Average (AV)
FREQUENCY RANGE	1164 – 1240 MHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	1170.09	-96.00 AV	-85.30	-10.70	2.00 H	35
2	1194.94	-95.76 AV	-85.30	-10.46	2.00 H	47
3	1221.37	-95.39 AV	-85.30	-10.09	2.00 H	280



ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	1176.54	-93.45 AV	-85.30	-8.15	1.50 V	109
2	1195.06	-93.54 AV	-85.30	-8.24	1.50 V	133
3	1221.73	-93.98 AV	-85.30	-8.68	1.50 V	160



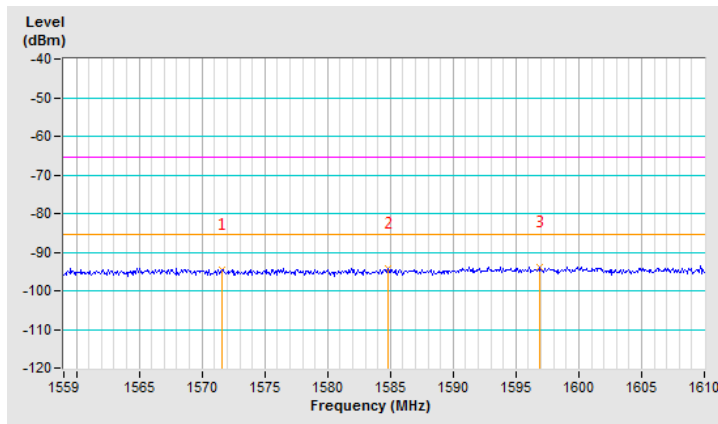
REMARKS:

1. Margin value = Emission level – Limit value.

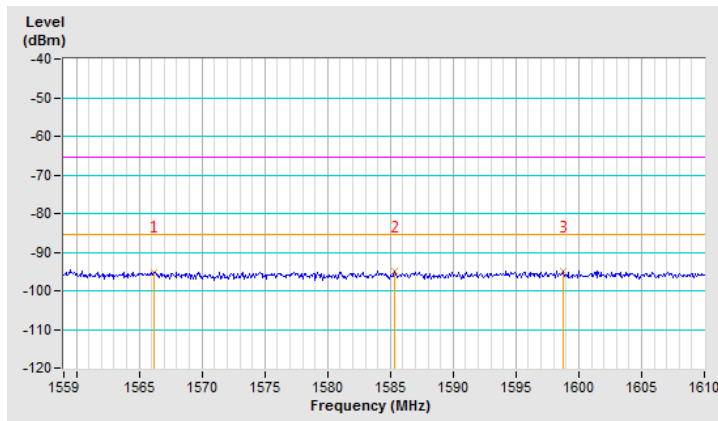


<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Average (AV)
<b>FREQUENCY RANGE</b>	1559- 1610 MHz		

<b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b>						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	1571.59	-94.58 AV	-85.30	-9.28	2.00 H	35
2	1584.83	-94.24 AV	-85.30	-8.94	2.00 H	183
3	1596.92	-93.98 AV	-85.30	-8.68	2.00 H	158



<b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b>						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	1566.19	-95.28 AV	-85.30	-9.98	1.50 V	188
2	1585.32	-95.07 AV	-85.30	-9.77	1.00 V	25
3	1598.80	-95.02 AV	-85.30	-9.72	1.00 V	98



**REMARKS:**

1. Margin value = Emission level – Limit value.



## 4.2 UWB BANDWIDTH

### 4.2.1 LIMITS OF UWB BANDWIDTH

FCC 15.503(d) Has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

FCC 15.519(3)(b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

### 4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Aug. 02,18	Aug. 01,19
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

**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.

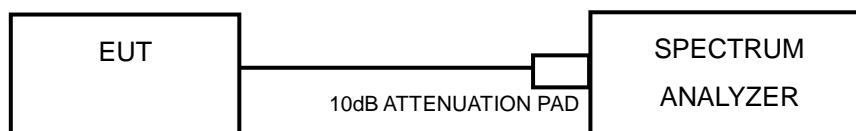
### 4.2.3 TEST PROCEDURES

1. Set the centre frequency of the channel under test
2. Set resolution bandwidth (RBW) = 1MHz
3. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 10 dB relative to the maximum level measured in the fundamental emission.

### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.2.5 TEST SETUP



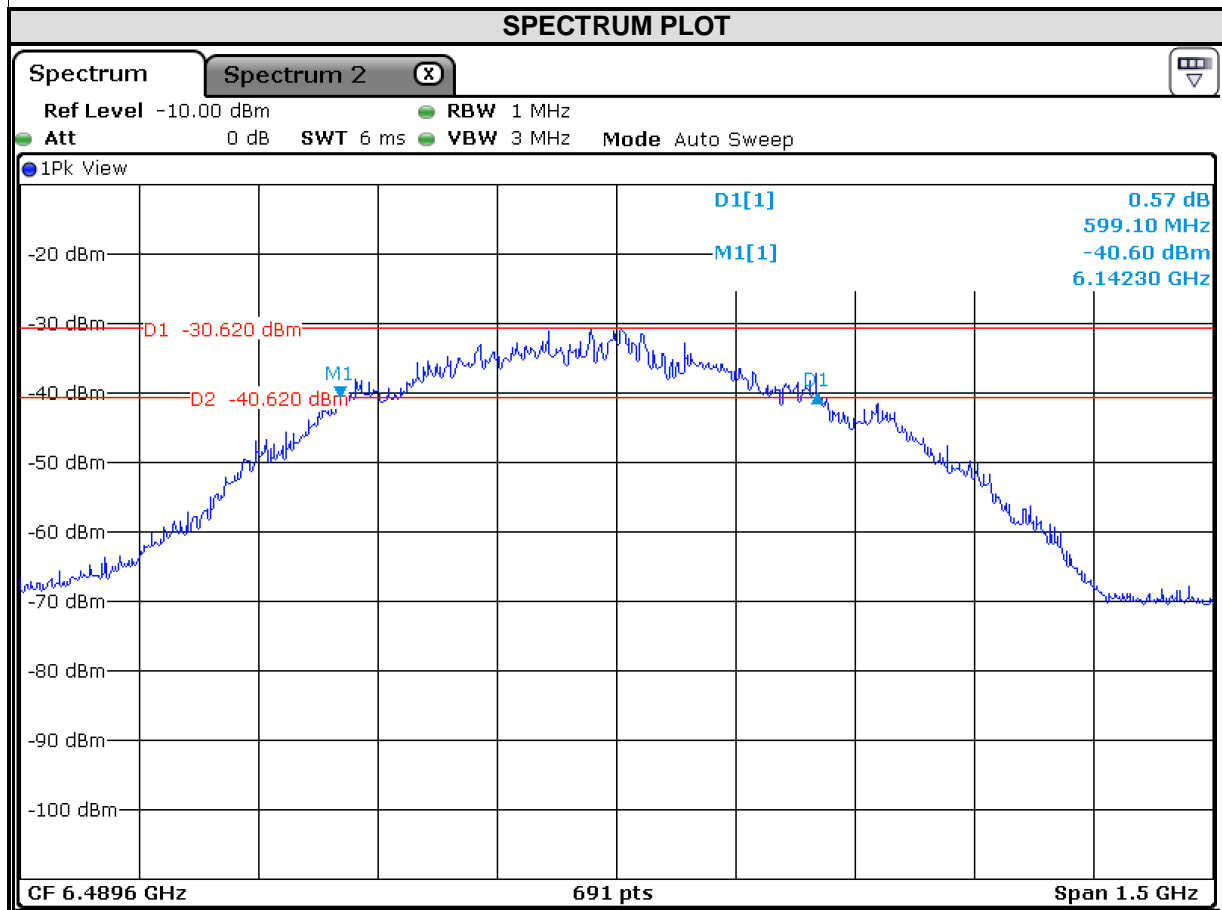


### 4.2.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously.

### 4.2.7 TEST RESULTS

Frequency(MHz)	Measured Frequencies		10dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
	FL (MHz)	FH (MHz)			
6489.6	6142.3	6741.4	599.1	FL > 3100 and FH < 10600	Pass





### 4.3 PEAK LEVEL OF THE EMISSION

#### 4.3.1 LIMITS OF PEAK LEVEL OF THE EMISSION

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP.

When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, fM. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using  $E(\text{dBuV/m}) = P(\text{dBm EIRP}) + 95.2$ .

When the test RBW=3MHz, the EIRP limit should be  $0+20\log(3/50)=-24.44\text{dBm}$

#### 4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 12,19	Mar. 11,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Aug. 02,18	Aug. 01,19
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jul. 21, 18	Jul. 20, 19
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Feb. 10,19	Feb. 09,20
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 18,19	Apr. 18,20
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

**NOTES:**

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, 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.



### 4.3.3 TEST PROCEDURES

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna is a broadband antenna, and its height 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.
4. 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.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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 fresh batteries. The turntable was rotated to maximize the emission level.

**NOTE:** The RBW=3MHz, VBW=3MHz, so the EIRP limit is  $0\text{dBm} + 20 \log(3/50) = -24.44\text{dBm}/3\text{MHz}$ .

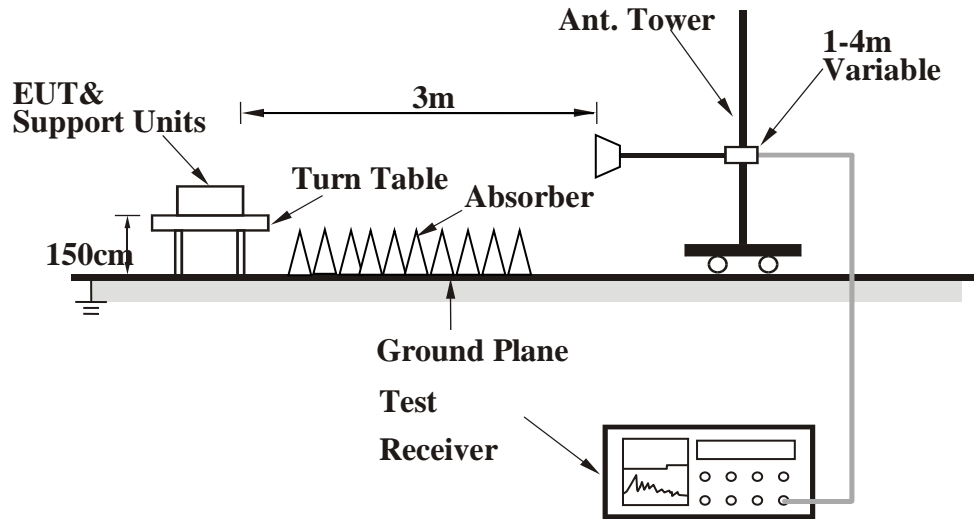
### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.





### 4.3.5 TEST SETUP



### 4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously.



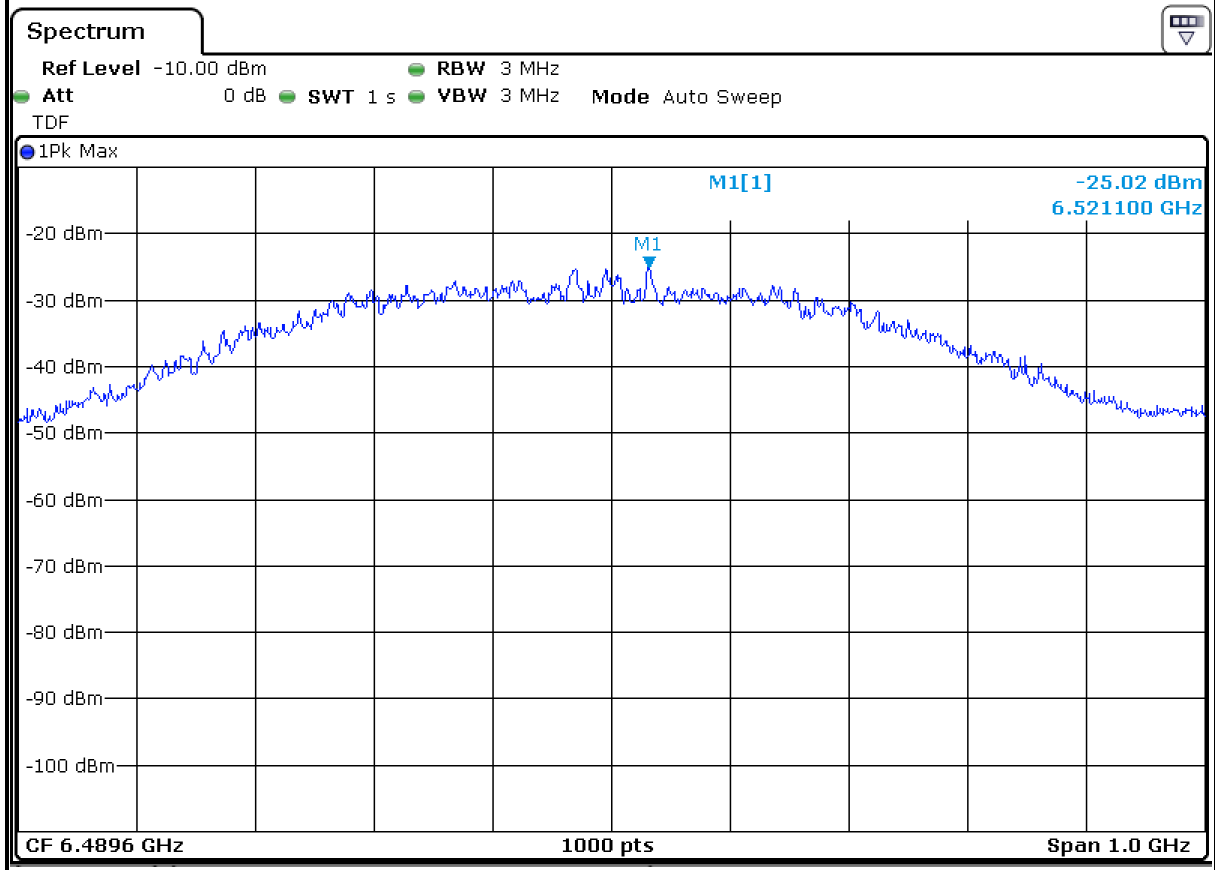
4.3.7 TEST RESULTS

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
TEST FREQUENCY	6489.6MHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			
Frequency (MHz)	Peak Value (dBm/3MHz)	EIRP Limit (dBm/3MHz)	Pass/Fail
6521.1	-25.02	-24.44	Pass

the EIRP limit is  $0\text{dBm} + 20 \log(3/50) = -24.44\text{dBm}/3\text{MHz}$

SPECTRUM PLOT



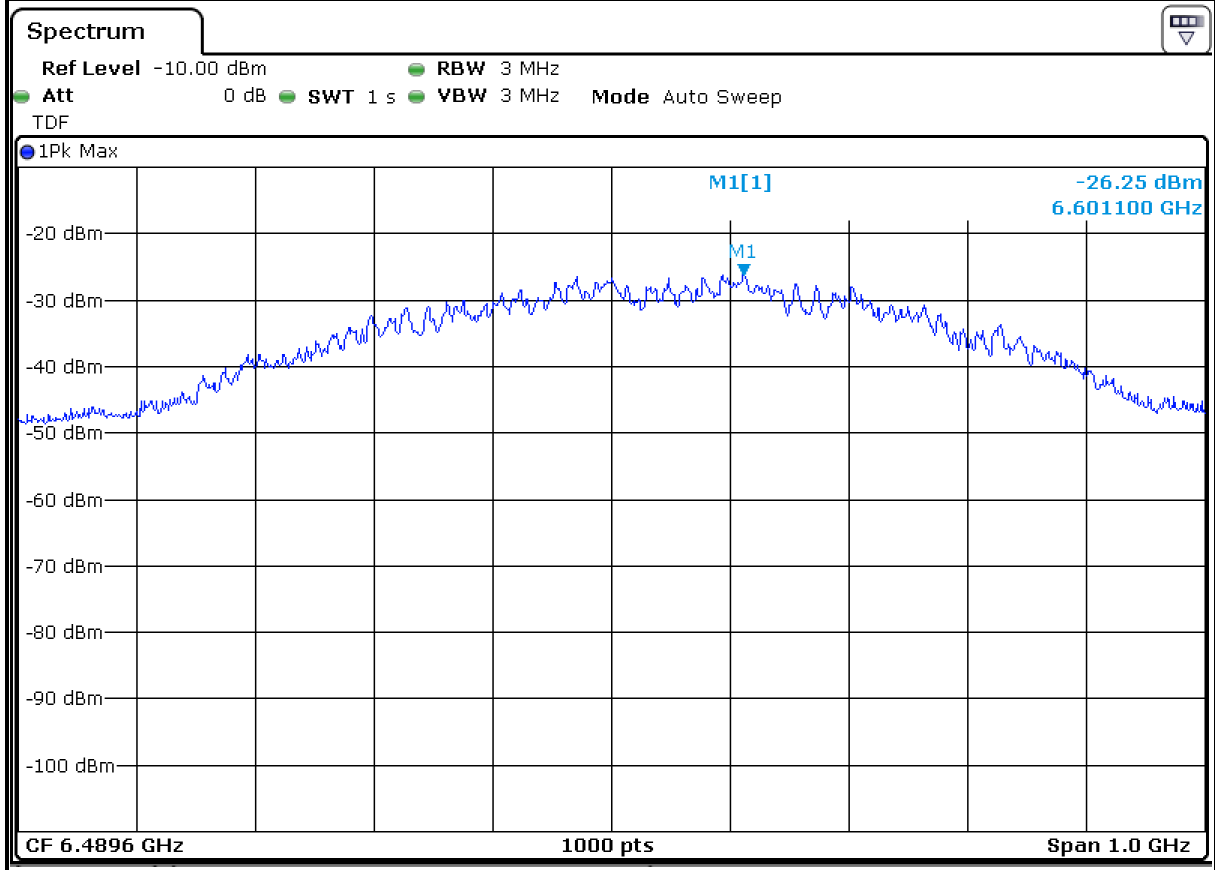


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
TEST FREQUENCY	6489.6MHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			
Frequency (MHz)	Peak Value (dBm/3MHz)	EIRP Limit (dBm/3MHz)	Pass/Fail
6601.1	-26.25	-24.44	Pass

the EIRP limit is  $0\text{dBm} + 20 \log(3/50) = -24.44\text{dBm}/3\text{MHz}$

SPECTRUM PLOT





#### 4.4 SHUTOFF TIMING REQUIREMENTS

##### 4.4.1 LIMITS OF SHUTOFF TIMING REQUIREMENTS

The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

##### 4.4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Aug. 02,18	Aug. 01,19
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

**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.

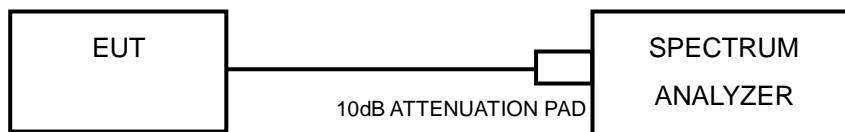
##### 4.4.3 TEST PROCEDURES

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer set the center frequency, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the transmission duration was measured and recorded.

##### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

##### 4.4.5 TEST SETUP



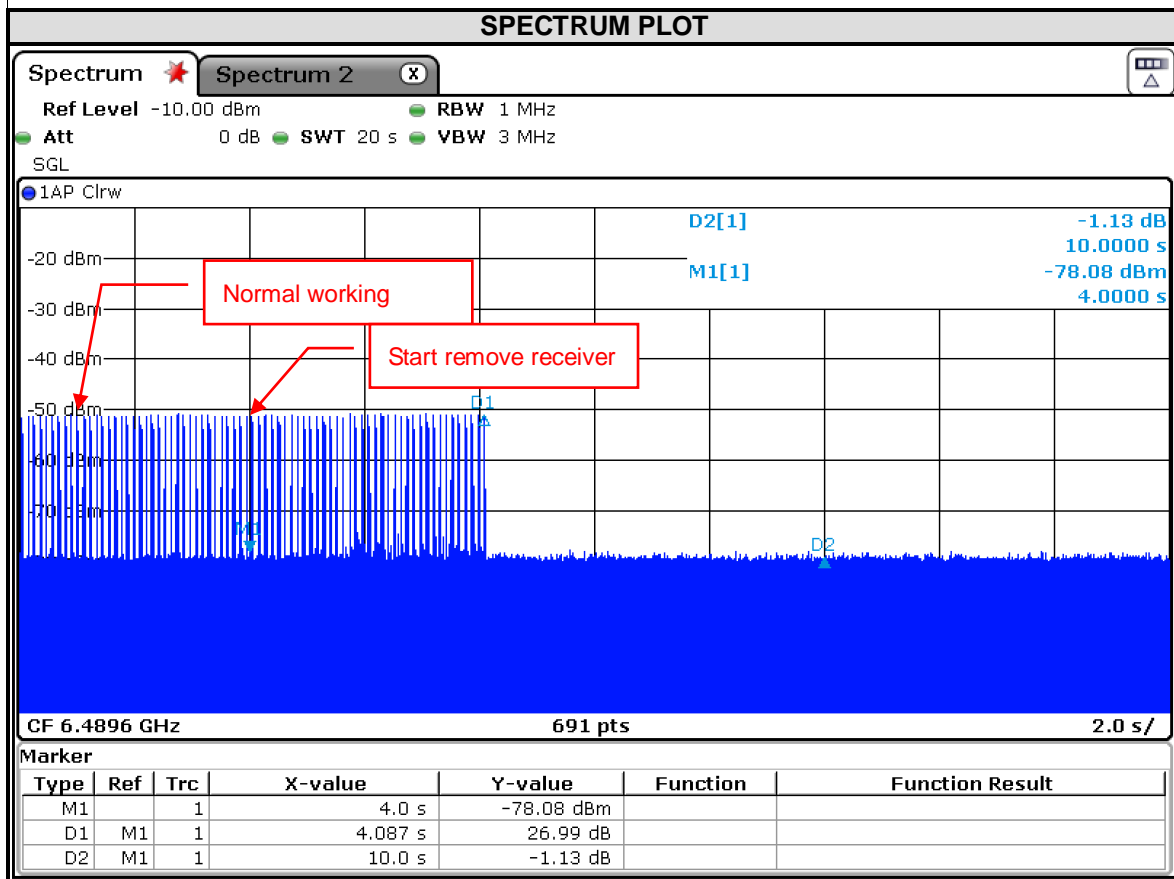


**4.4.6 EUT OPERATING CONDITIONS**

- a) Turned on the power of all equipment.
- b) EUT was operated according to the type used was description in manufacturer’s specifications or the User's Manual.

**4.4.7 TEST RESULTS**

FREQUENCY (MHz)	MEASUREMENT RESULT (sec)	MAXIMUM LIMIT (sec)	PASS/FAIL
6489.6	4.087	10	PASS





**BUREAU**  
**VERITAS**

Test Report No.: RF190304N040-2

## 4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## **5 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---**