

## FCC RADIO TEST REPORT

**Report Reference No.** ..... : NTEK-2011NT0919188E

**Compiled by (+ signature)** ..... : Tom Zhang



**Approved by (+ signature)** ..... : Bovey Yang



**Applicant's name** ..... : FTR System (Shanghai), Inc.

**Address**..... : #500, Suite 108, Bi-Bo Rd, Hi-Tech Park, Pudong, Shanghai, 201203 China

**Manufacture's Name** ..... : FTR System (Shanghai), Inc.

**Address**..... : #500, Suite 108, Bi-Bo Rd, Hi-Tech Park, Pudong, Shanghai, 201203 China

**Test specification:**

**Standard** ..... : FCC Part15.249

**Test procedure** ..... : ANSI C63.4-2003

**Test item description**

**Product name** ..... : Intelligent Tracking Robot Handset

**FCC ID** ..... : Z26CT-2000-HS

**Trademark** ..... : N/A

**Model and/or type reference** : CT-2000-HS,CT2000-HS, CT2000-AA-HS,CT2000-AB-HS, CT2000-AC-HS, CT2000-BA-HS,CT2000-BB-HS, CT2000-BC-HS, CT2000-CA-HS,CT2000-LJ-HS, CT2000-MJ-HS

**Rating(s)** ..... : DC 3.7V

**Testing Laboratory information:**

**Testing Laboratory Name** ..... : NTEK Testing Technology Co., Ltd

**Address** ..... : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao ' an District, Shenzhen P.R. China.

This device described above has been tested by NTEK Testing Technology Co., Ltd, 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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**Testing** ..... :

**Date of receipt of test item** ..... : 20 Sep. 2011

**Date (s) of performance of tests** ..... : 20 Sep. 2011 ~23 Sep. 2011

**Date of Issue**..... : 23 Sep. 2011

**Test Result**..... : **Pass**

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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C (15.249)			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	Pass	
15.203	Antenna Requirement	Pass	
15.249	Radiated Spurious Emission	Pass	
15.249	Occupied Bandwidth	Pass	

NOTE:

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

## 1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

FCC FRN Registration Nombre:238937; IC Registration Nombre:9270A-1

## 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 Test	$\pm 1.38\text{dB}$
2	Radiated Emission Test	$\pm 3.17\text{dB}$
3	RF power,conducted	$\pm 0.16\text{dB}$
4	Spurious emissions,conducted	$\pm 0.21\text{dB}$
5	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
6	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Intelligent Tracking Robot Handset	
Trade Name	N/A	
Model Name	CT-2000-HS,CT2000-HS, CT2000-AA-HS, CT2000-AB-HS,CT2000-AC-HS, CT2000-BA-HS, CT2000-BB-HS, CT2000-BC-HS, CT2000-CA-HS, CT2000-LJ-HS, CT2000-MJ-HS	
OEM Brand/Model Name	N/A	
Model Difference	All the model are the same circuit and RF module, except the appearance and colour .	
Product Description	The EUT is a Intelligent Tracking Robot Handset	
	Operation Frequency:	2450 MHz
	Modulation Type:	QPSK
	Antenna Designation:	Printed ANT
	Antenna Gain(Peak)	1.0 dBi
	Output Power	0.23dBm
Channel List	Only one channel	
Power Source	DC Voltage supplied from battery	
Power Rating	DC 3.7V by battery	
	DC5V by adapter(charge)	
Connecting I/O Port(s)	USB port only used to charge, Please refer to the User's Manual	
Products Covered	N/A	
EUT Modification(s)	N/A	

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	N/A	Printed Antenna	NA	1.0	Antenna

## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode
Mode 2	Charge mode

For Conducted Emission	
Final Test Mode	Description
Mode 2	Charge mode

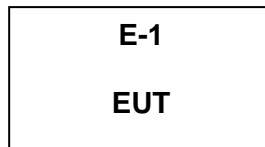
For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode

Note:

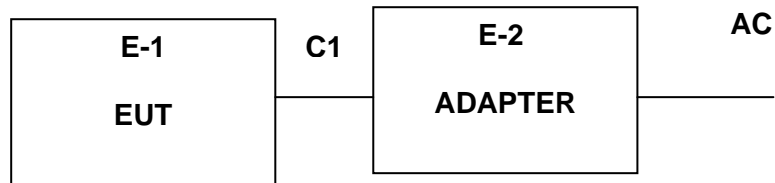
(1) The EUT use new battery.

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

**Mode 1:**



**Mode 2:**





## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.	Series No.	Note
E-1	Intelligent Tracking Robot Handset	FTR System (Shanghai), Inc.	CT-2000-HS	N/A	E-1
E-2	Adapter	ZTE	STC-A220501700 USBA-Z	N/A	E-2

Item	Shielded Type	Ferrite Core	Length	Note
C1	NO	NO	1M	

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

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	160400005	Jul. 06. 2012
2	Test Receiver	R&S	ESPI	101318	Jul. 06. 2012
3	Bilog Antenna	TESEQ	CBL6111D	31216	Jul. 06. 2012
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	Jul. 06. 2012
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	Jul. 06. 2012
6	Horn Antenna	EM	EM-AH-10180	2011071402	Jul. 06. 2012
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	Jul. 06. 2012
8	Amplifier	EM	EM-30180	060538	Jul. 06. 2012
9	Loop Antenna	ARA	PLA-1030/B	1029	Jul. 06. 2012
10	Power Meter	R&S	NRVS	100696	Jul. 06. 2012

### Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Test Receiver	R&S	ESCI	101160	Jul. 06. 2012
2	LISN	R&S	ENV216	101313	Jul. 06. 2012
3	LISN	EMCO	3816/2	00042990	Jul. 06. 2012
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	Jul. 06. 2012
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	Jul. 06. 2012
6	Absorbing clamp	R&S	MOS-21	100423	Jul. 06. 2012

### **3. TEST RESULT**

#### **3.1 ANTENNA REQUIREMENT**

##### **3.1.1 STANDARD REQUIREMENT**

15.203 requirement: For intentional device, according to 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.

##### **3.1.2 EUT ANTENNA**

The EUT antenna is Printed Antenna. It comply with the standard requirement.

### 3.2 CONDUCTED EMISSION MEASUREMENT

#### 3.2.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5			66 - 56 *	56 - 46 *	CISPR
0.50 -5.0			56.00	46.00	CISPR
5.0 -30.0			60.00	50.00	CISPR

0.15 -0.5			66 - 56 *	56 - 46 *	LP002.
0.50 -5.0			56.00	46.00	LP002.
5.0 -30.0			60.00	50.00	LP002.

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

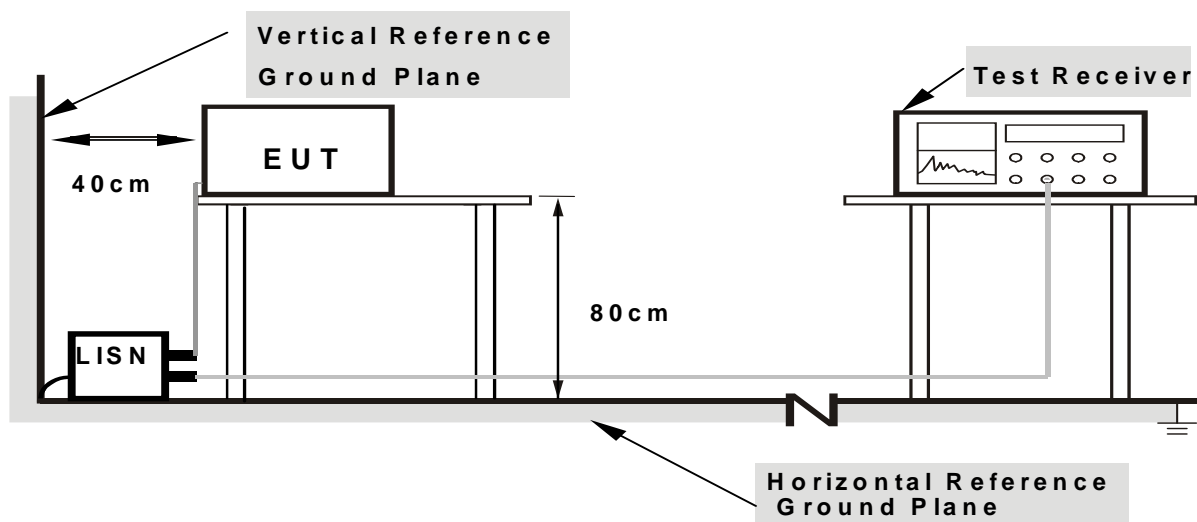
### 3.2.2 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal 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.

### 3.2.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.2.4 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 cm from other units and other metal planes

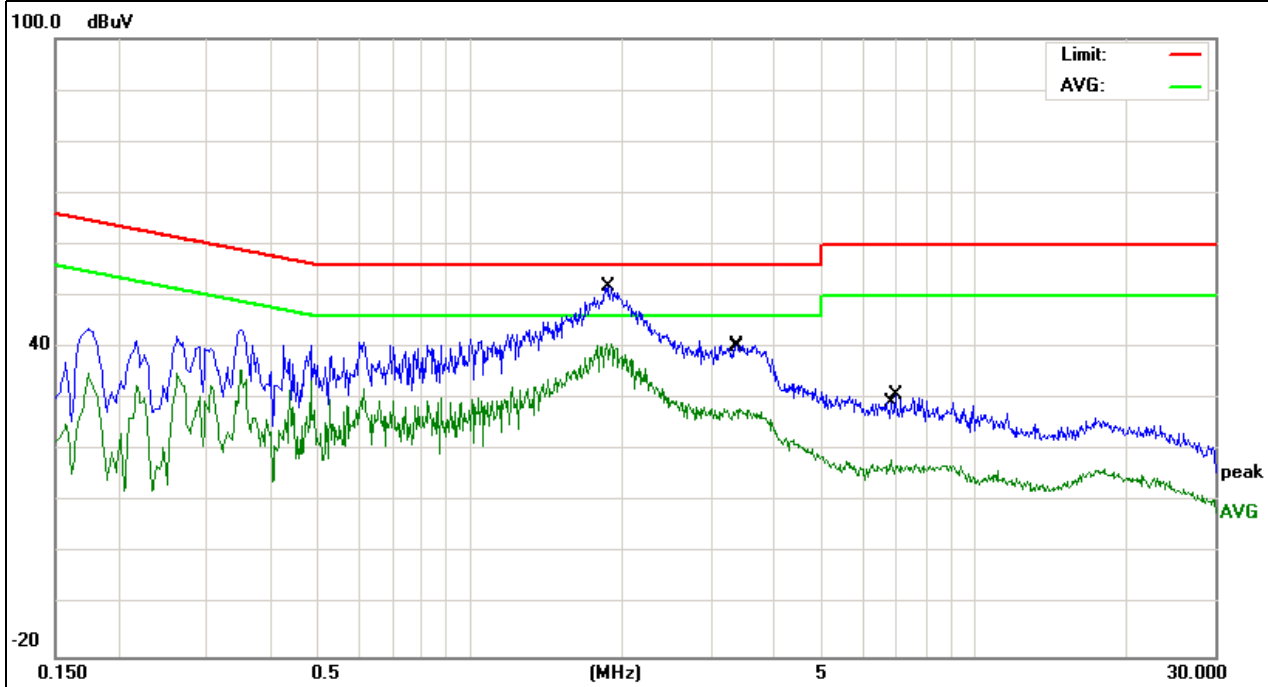
### 3.2.5 TEST RESULT

EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Test Date :	2011-9-21
Test Mode :	Running	Phase :	Line
Test Voltage :	DC 3.7V from adapter AC 120V/60Hz		

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
1.862	30.41	10.44	40.85	46	-5.15	AVG
*1.882	41.31	10.44	51.75	56	-4.25	QP
3.37	29.99	10.59	40.58	56	-15.42	QP
3.426	17.49	10.62	28.11	46	-17.89	AVG
6.83	7.48	10.68	18.16	50	-31.84	AVG
6.966	20.04	10.68	30.72	60	-29.28	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. '\*' means the worst case

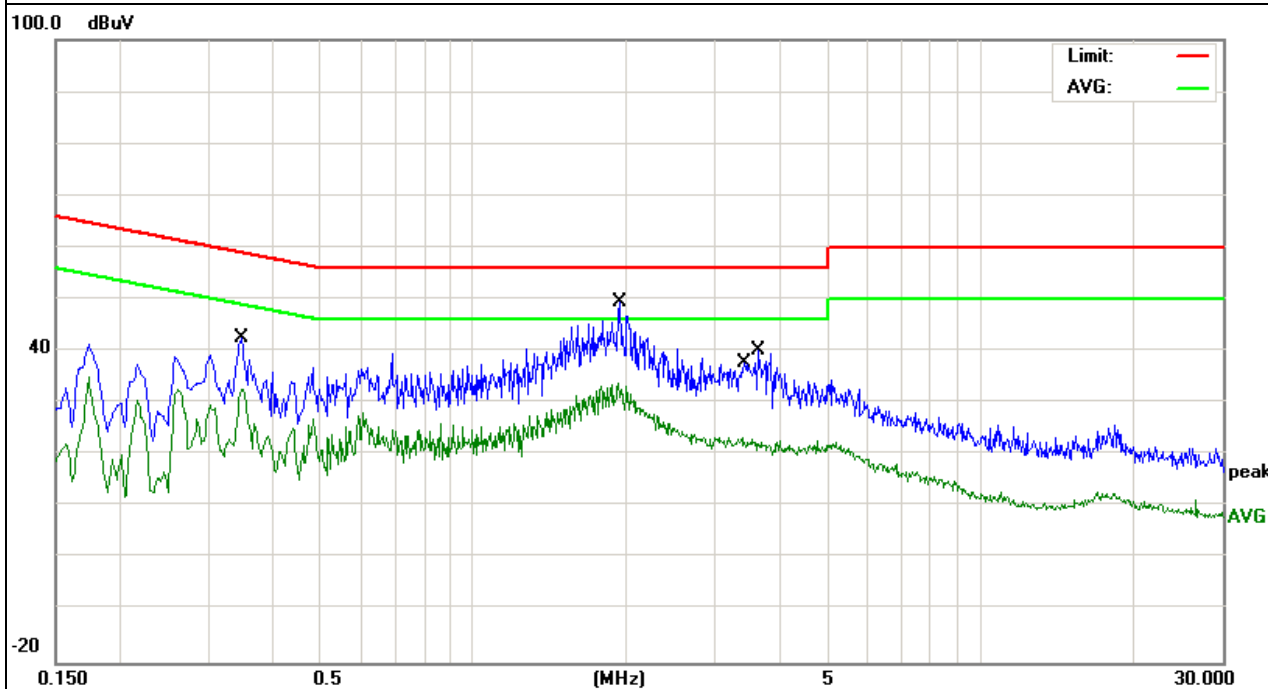


EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Test Date :	2011-9-21
Test Mode :	Running	Phase :	Neutral
Test Voltage :	DC 3.7V from adapter AC 120V/60Hz		

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.35	32	10.42	42.42	58.96	-16.54	QP
0.35	22.38	10.42	32.8	48.96	-16.16	AVG
1.93	23.55	10.42	33.97	46	-12.03	AVG
*1.946	38.93	10.42	49.35	56	-6.65	QP
3.394	12.65	10.59	23.24	46	-22.76	AVG
3.654	29.47	10.62	40.09	56	-15.91	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. '\*' means the worst case



### 3.3 RADIATED EMISSION MEASUREMENT

#### 3.3.1 Radiated Emission Limits ( FCC 15.209 )

Frequencies (MHz)	Field Strength (micorvolts/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

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

#### LIMITS OF RADIATED EMISSION MEASUREMENT ( FCC 15.249)

Frequency of Emission (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
2400 - 2483.5	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
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



### 3.3.2 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 3m 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.
- 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, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

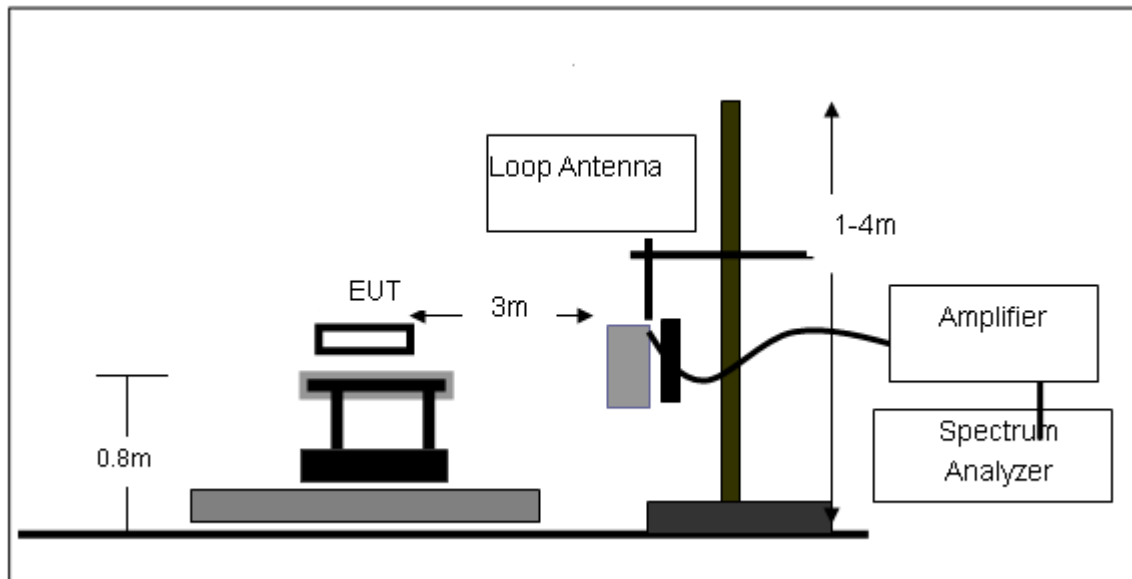
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.3.3 DEVIATION FROM TEST STANDARD

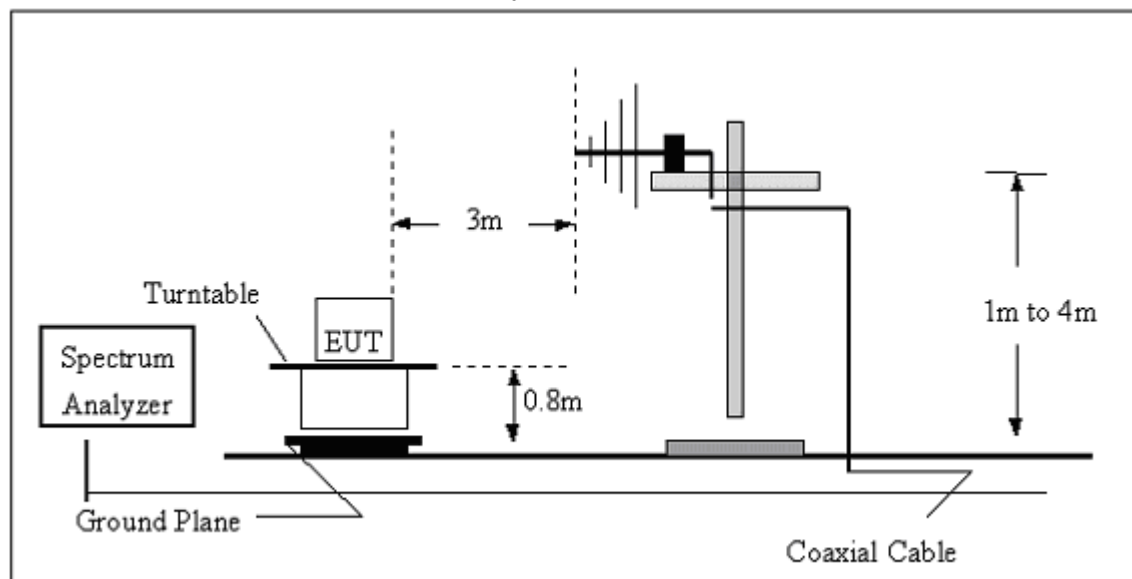
No deviation

### 3.3.4 TEST SETUP

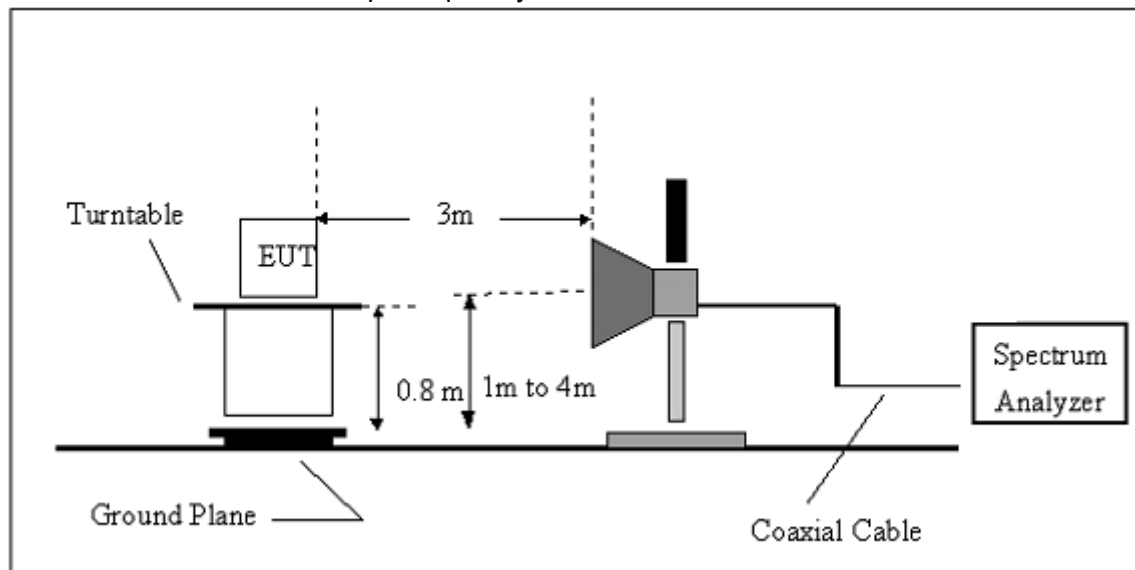
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



### 3.3.5 TEST RESULTS (BLOW 30MHz)

EUT :	Intelligent Tracking Robot Handset	Model Name. :	CT-2000-HS
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC3.7V by battery
Test Mode :	DC 3.7V	Polarization :	--

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 =  $20 \log (\text{specific distance}/\text{test distance})$ (dB);

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

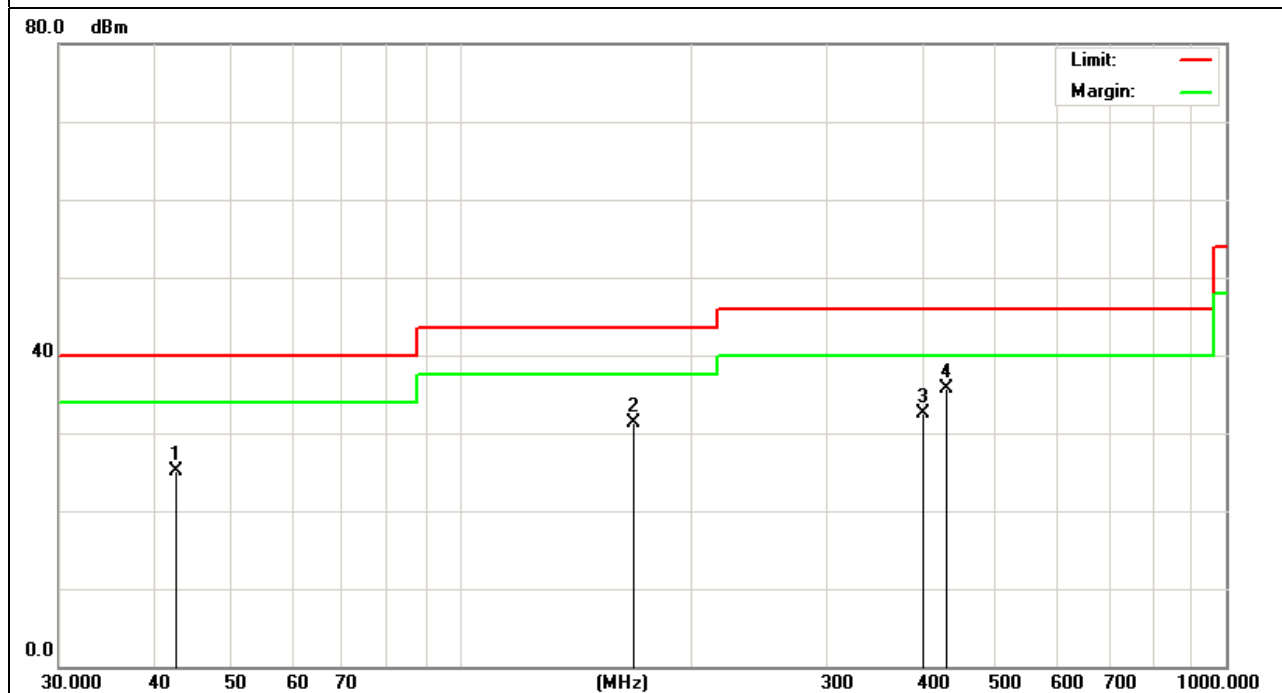
### 3.3.6 TEST RESULTS (BETWEEN 30 – 1000 MHZ)

EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-9-21
Test Mode :	TX	Polarization :	Horizontal
Test Power :	DC 3.7V		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
42.31	13.12	12.05	25.17	40	-14.83	Quasi-Peak
168.32	21.09	10.16	31.25	43.5	-12.25	Quasi-Peak
400.32	15.33	17.21	32.54	46	-13.46	Quasi-Peak
428.09	17.98	17.75	35.73	46	-10.27	Quasi-Peak

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

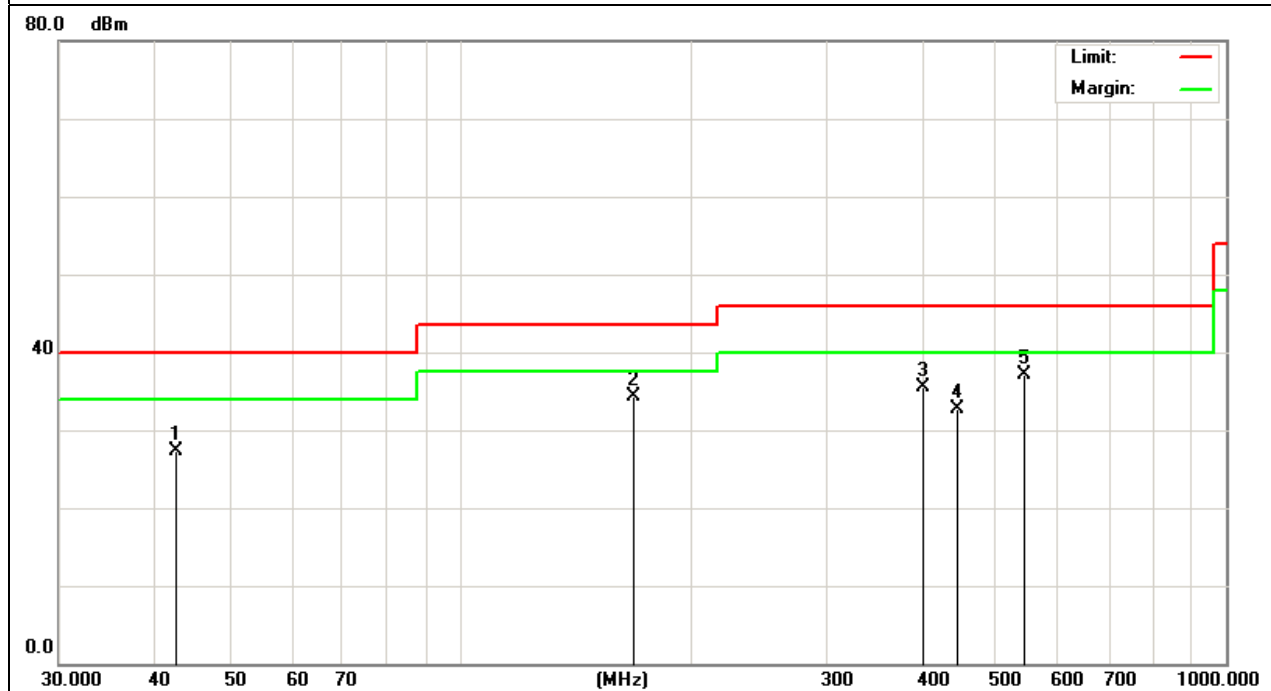


EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-9-21
Test Mode :	TX	Polarization :	Vertical
Test Power :	DC 3.7V		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
42.31	15.34	12.05	27.39	40	-12.61	Quasi-Peak
168.32	24.22	10.16	34.38	43.5	-9.12	Quasi-Peak
400.32	18.21	17.21	35.42	46	-10.58	Quasi-Peak
445.56	14.63	18.1	32.73	46	-13.27	Quasi-Peak
543.76	13.55	23.47	37.02	46	-8.98	Quasi-Peak

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



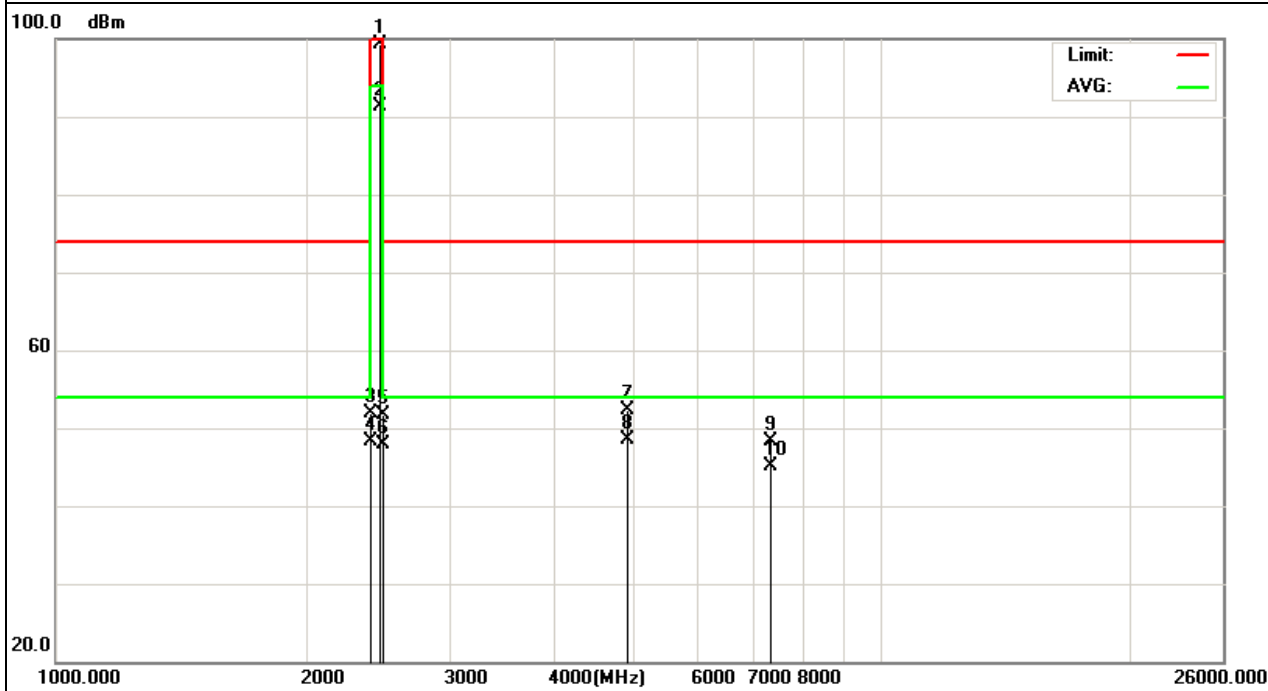
### 3.3.7 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-9-21
Test Mode :	TX	Polarization :	Horizontal
Test Power :	DC 3.7V		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2450.00	73.22	23.02	96.24	114	-17.76	peak
2450.00	67.22	23.02	90.24	94	-3.76	AVG
2400.00	29.33	22.65	51.98	74	-22.02	peak
2400.00	25.66	22.65	48.31	54	-5.69	AVG
2483.50	28.34	23.27	51.61	74	-22.39	peak
2483.50	24.67	23.27	47.94	54	-6.06	AVG
4900.00	18.13	34.09	52.22	74	-21.78	peak
4900.00	14.43	34.09	48.52	54	-5.48	AVG
7350.00	10.14	38.14	48.28	74	-25.72	peak
7350.00	6.87	38.14	45.01	54	-8.99	AVG

Remark:

- Factor = Antenna Factor + Cable Loss – Pre-amplifier.

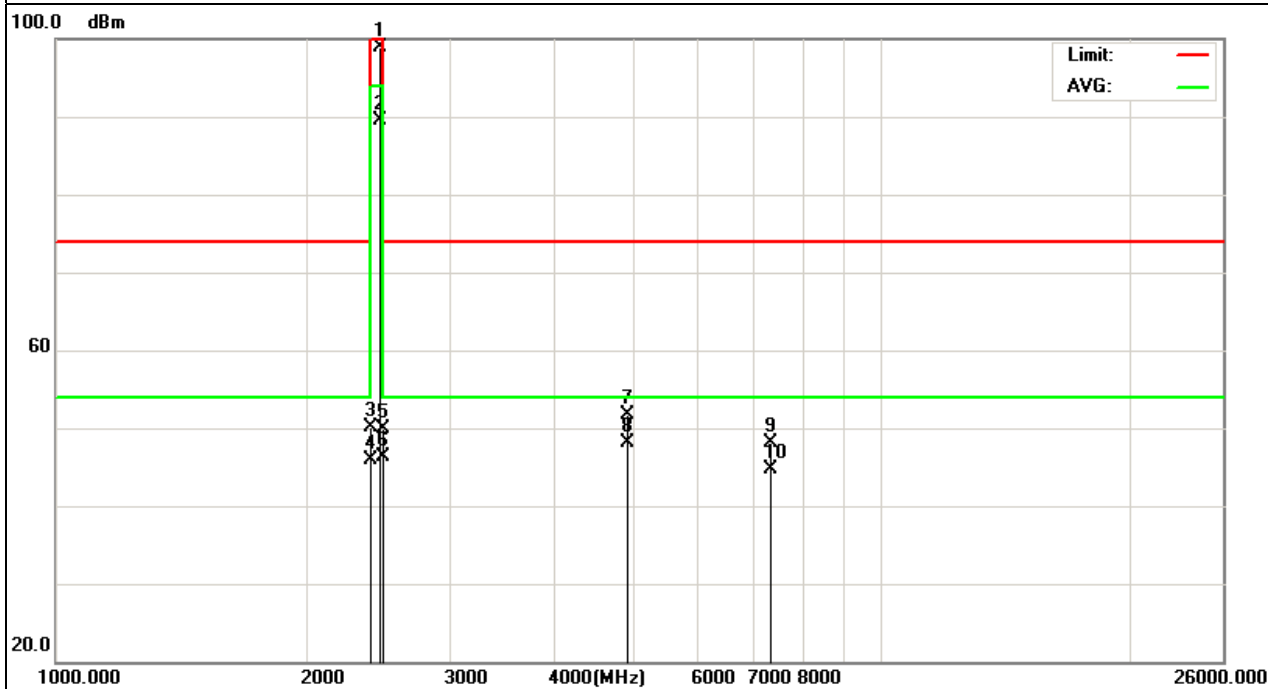


EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-9-21
Test Mode :	TX	Polarization :	Vertical
Test Power :	DC 3.7V		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2450.00	72.88	23.02	95.9	114	-18.1	peak
2450.00	66.45	23.02	89.47	94	-4.53	AVG
2400.00	27.45	22.65	50.1	74	-23.9	peak
2400.00	23.33	22.65	45.98	54	-8.02	AVG
2483.50	26.65	23.27	49.92	74	-24.08	peak
2483.50	23.12	23.27	46.39	54	-7.61	AVG
4900.00	17.67	34.09	51.76	74	-22.24	peak
4900.00	13.99	34.09	48.08	54	-5.92	AVG
7350.00	9.98	38.14	48.12	74	-25.88	peak
7350.00	6.62	38.14	44.76	54	-9.24	AVG

#### Remark:

- Factor = Antenna Factor + Cable Loss – Pre-amplifier.
- No emission detected above 18GHz.





#### 4. BANDWIDTH TEST

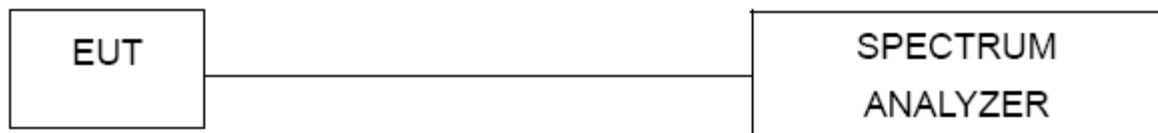
##### 4.1 TEST PROCEDURE

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

##### 4.2 DEVIATION FROM STANDARD

No deviation.

##### 4.3 TEST SETUP

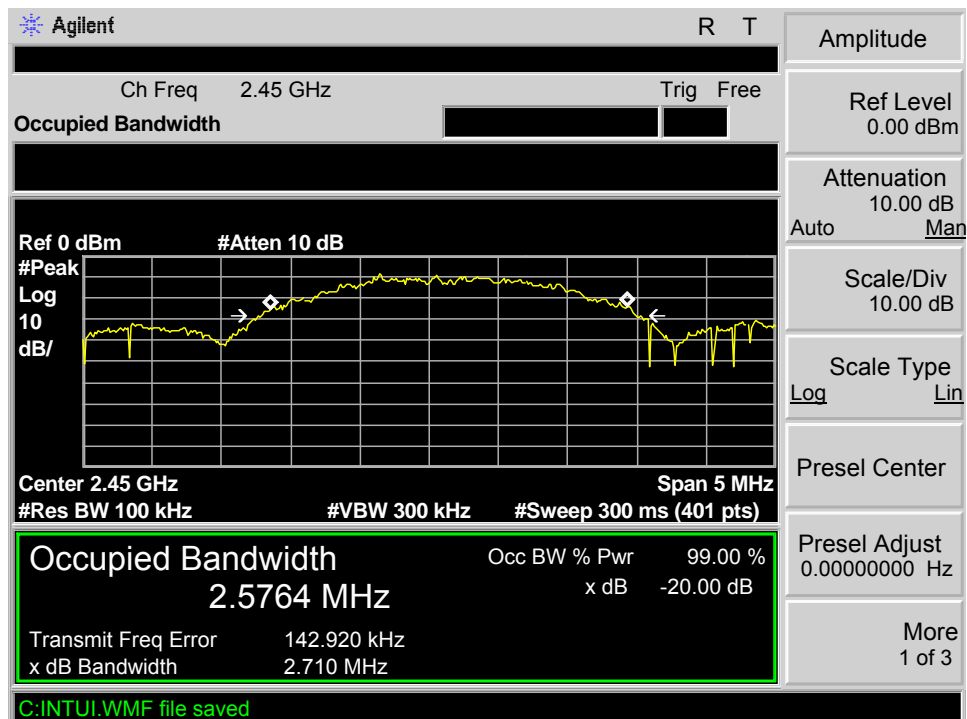


#### 4.4 TEST RESULTS

EUT :	Intelligent Tracking Robot Handset	Model Name :	CT-2000-HS
Temperature :	26 °C	Relative Humidity :	53%
Pressure :	1020 hPa	Test Power :	DC 3.7V
Test Mode :	TX		

Frequency (MHz)	20 dBc Bandwidth (MHz)	99% Bandwidth (MHz)
2450	2.71	2.57

#### The Channel:2450MHz



## 5. EUT TEST PHOTO

**Radiated Measurement Photos**

