

# EMC TEST REPORT

For

Wireless Voting Unit

Model Number: HCS-4390A, HCS-4390AK

FCC ID: WGV4390

Report Number : WT088002069

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## TEST REPORT DECLARATION

Applicant : TAIDEN INDUSTRIAL CO.,LTD.  
Address : 23/F, POLY BUILDING, NANSHAN DISTRICT, SHENZHEN, CHINA  
Manufacturer : TAIDEN INDUSTRIAL CO.,LTD.  
Address : 23/F, POLY BUILDING, NANSHAN DISTRICT, SHENZHEN, CHINA  
EUT Description : Wireless Voting Unit  
Model Number : HCS-4390A, HCS-4390AK  
FCC ID Number : WGV4390

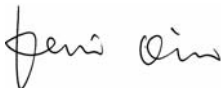
Test Standards:

### FCC Part 15 15.231

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Tested by:



(Kevin Qiu)

Date:

2009.04.15

Checked by:



(Dewelly Yang)

Date:

2009.04.15

Approved by:



(Peter Lin)

Date:

2009.04.15

## 1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	FCC Rules	Test Results
Conducted Disturbance	15.207	N/A
Radiated disturbance	15.231	Pass
20dB Occupied Bandwidth	15.231	Pass
Switch off time	15.231	Pass
Antenna Requirement	15.203	Pass

## 2. GENERAL INFORMATION

### 2.1. Report information

- 2.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.
- 2.1.2. The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 2.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

### 2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Committee for Laboratories (**CNAS**) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is L0579.

The Laboratory is listed in the United States of American Federal Communications Commission (**FCC**), and the registration number are **97379**(open area test site) and **274801**(semi anechoic chamber).

The Laboratory is listed in Voluntary Control Council for Interference by Information Technology Equipment (**VCCI**), and the registration number are **R-1974**(open area test site), **R-1966**(semi anechoic chamber), **C-2117**(mains ports conducted interference measurement) and **T-180**(telecommunication ports conducted interference measurement).

The Laboratory is registered to perform emission tests with Industry Canada (**IC**), and the registration number is **IC4174**.

**TUV Rhineland** accredits the Laboratory for conformance to IEC and EN standards, the registration number is **E2024086Z02**.

### 2.3. Measurement Uncertainty

Conducted Disturbance : 9kHz~30MHz 3.5dB

Radiated Disturbance: 30MHz~1000MHz 4.5dB  
1GHz~18GHz 4.6dB

## 3. PRODUCT DESCRIPTION

### 3.1. EUT Description

Description	: Wireless Voting Unit
Manufacturer	: TAIDEN INDUSTRIAL CO.,LTD.
Model Number	: HCS-4390A, HCS-4390AK
Input Power	: DC3.0V Battery Size AA 1.5V*2
Operate Frequency	: 430MHz -434.6MHz
Channels	: 24 channels, channel space: 0.2MHz
Bandwidth	: 0.2MHz
Modulation	GFSK
Antenna Designation	: integrated

Remark: HCS-4390A and HCS-4390AK are handset Wireless Voting Unit with sign in and voting functions used as a Wireless Voting Conference system slaver. HCS-4390A and HCS-4390AK employ a wireless RF transceiving range of 100M (frequency optional). Master polling the slaver with this ID. HCS-4390A and HCS-4390AK must be authorized by operator before uses. Only authorized slaver is activated. HCS-4390A and HCS-4390AK received data by timing, data of device ID matched is activated, otherwise data is discarded and they goes into standby mode.

The difference between HCS-4390A, HCS-4390AK is that HCS-4390AK has a IC card socket, however HCS-4390A has not. They are identical in all other parts. HCS-4390AK has been tested the worst case. All test data are given with the worst result.

### 3.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: WGV4390 filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

### 3.3. Block Diagram of EUT Configuration



Test mode

### 3.4. Operating Condition of EUT

Mode 1: CH0 (430.0MHz) TX

Mode 2: CH23 (434.6MHz) TX

### 3.5. Special Accessories

Not available for this EUT intended for grant.

### 3.6. Equipment Modifications

Not available for this EUT intended for grant.

### 3.7. Support Equipment List

----

### 3.8. Test Conditions

Date of test: Mar12.-Apr.15, 2009

Date of EUT Receive: Sep.12, 2008

Temperature: 19°C

Relative Humidity: 52%

## 4. TEST EQUIPMENT USED

### 4.1. Test Equipment Used to Measure Conducted Disturbance

Table 2 Conducted Disturbance Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB2603	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jan.23, 2009	1 Year
SB3321	AMN	Rohde & Schwarz	ESH2-Z5	Jan.23, 2009	1 Year
SB2604	AMN	Rohde & Schwarz	ESH3-Z5	Jan.23, 2009	1 Year

### 4.2. Test Equipment Used to Measure Radiated Disturbance and bandwidth

Table 3 Radiated Disturbance Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB3436	EMI Test Receiver	Rohde & Schwarz	ESI26	Jan.23, 2009	1 Year
SB3440	Bilog Antenna	Chase	CBL6112B	Jan.23, 2009	1 Year
SB3435	Horn Antenna	Rohde & Schwarz	HF906	Jan.23, 2009	1 Year
SB3435/ 01	Amplifier(1-18GHz)	Rohde & Schwarz	---	Jan.23, 2009	1 Year



## 5. CONDUCTED DISTURBANCE TEST

### 5.1. Test Standard and Limit

#### 5.1.1. Test Standard

FCC Part 15 15.207

#### 5.1.2. Test Limit

Table 4 Conducted Disturbance Test Limit (Class B)

Frequency	Maximum RF Line Voltage (dB $\mu$ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

- Decreasing linearly with logarithm of the frequency
- The lower limit shall apply at the transition frequency.

### 5.2. Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver (R&S Test Receiver ESCS30) is used to test the emissions form both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

### 5.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

### 5.4. Test Data

The device is powered by battery, the test don't need.

## 6. RADIATED DISTURBANCE TEST

### 6.1. Test Standard and Limit

#### 6.1.1. Test Standard

FCC Part 15 15.231, 15.209

#### 6.1.2. Test Limit

μ

Table 2 Radiated Disturbance Test Limit (15.209)

FREQUENCY MHz	FIELD STRENGTHS LIMITS (μV/m)	FIELD STRENGTHS LIMITS dB (μV/m)
Fundamental	50000	94.0
Harmonics	500	54.0
30 ~ 88	100	40.0
88 ~ 216	150	43.5
216 ~ 960	200	46.0
960 ~	500	54.0

\* The lower limit shall apply at the transition frequency.

\* The test distance is 3m.

Table 6 Radiated Disturbance Test Limit (15.231)

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [μV/m]	Field Strength of Spurious Emission [μV/m]
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750 **	125-375 **
174-260	3750	375
260-470	3750-12500 **	375-1250 **
Above 470	12500	1250

\*\* linear interpolations

## **6.2. Test Procedure**

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

Radiated test was performed on the frequency range from 30MHz to 25GHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz,  $VBW \geq RBW$ . All readings above 1 GHz are AV and PK values.  $RBW=1\text{MHz}$  and  $VBW=10\text{Hz}$  for AV value,  $RBW=1\text{MHz}$  and  $VBW \geq RBW$  for peak value.

Measurements were made at 3 meters

## **6.3. Test Arrangement**

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

The EUT shall be measured in the XYZ three positions, and the test data which was shown in the follow was the worst case.

## **6.4. Test Data**

Test data refer to next page.

Table 3 Radiated Disturbance Test Data

Model number: HCS-4390AK								
Mode:1								
Frequency (MHz)	Polarization	Reading Value (dBμV)	Correction Factor (dB)	Antenna Factor (dB/m)	Emission Level (dBμV/m)	Limits dB (μV/m)	EUT axes	Note
430.017	H	52.6	3.3	16.84	69.4	80.7	X	QP
430.017	V	43.6	3.3	16.84	63.7	80.7	X	QP
860.025	H	15.5	5	20.67	41.2	60.7	X	QP
860.025	V	14.4	5	20.67	40.1	60.7	X	QP
3010.005	H	58.2	-37.8	29.9	50.3	80.7	X	PK
3010.005	H	55.8	-37.8	29.9	47.9	60.7	X	AV
3010.001	V	55.1	-37.8	29.9	47.2	80.7	X	PK
3010.001	V	52.4	-37.8	29.9	44.5	60.7	X	AV

Note: 1. Emission level(dBuV/m)=Reading Value(dBuV) + Correction Factor(dB)+Antenna Factor (dB/m)

2. Correction Factor(dB) = Cable Factor (dB)+Amplifier Factor(dB)

3. The other emission levels were less than the limit 20dB

4.fundamental limit (dBuV/m) at 3 meters= $41.6667 \times F - 708.3333 = 41.6667 \times 430.017 - 708.3333 = 10834.056 \mu V/m = 80.7 \text{ dBuV/m}$

5. Spurious emission limit (dBuV/m) at 3 meters = $4.1667 \times F - 708.3333 = 4.1667 \times 430.017 - 708.3333 = 1083.4056 \mu V/m = 60.7 \text{ dBuV/m}$

Table 8 Radiated Disturbance Test Data

Model number: HCS-4390AK								
Mode:2								
Frequency (MHz)	Polarization	Reading Value (dBμV)	Correction Factor (dB)	Antenna Factor (dB/m)	Emission Level (dBμV/m)	Limits dB (μV/m)	EUT axes	Note
434.592	H	51.9	3.3	16.84	68.7	80.8	X	QP
434.592	V	44.4	3.3	16.84	64.5	80.8	X	QP
869.200	H	16.4	5	20.67	42.1	60.8	X	QP
869.200	V	13.8	5	20.67	39.5	60.8	X	QP
3042.183	H	55.1	-37.8	29.9	47.2	80.8	X	PK
3042.183	H	51.2	-37.8	29.9	43.3	60.8	X	AV
3042.183	V	53.0	-37.8	29.9	45.1	80.8	X	PK
3042.183	V	50.5	-37.8	29.9	42.6	60.8	X	AV

Note: 1. Emission level(dBuV/m)=Reading Value(dBuV) + Correction Factor(dB)+Antenna Factor (dB/m)

2. Correction Factor(dB) = Cable Factor (dB)+Amplifier Factor(dB)

3. The other emission levels were less than the limit 20dB

4.fundamental limit (dBuV/m) at 3 meters= $41.6667 \cdot F - 7083.3333 = 41.6667 \cdot 434.592 - 7083.3333 = 11024.6811 \mu V/m = 80.8 \text{ dBuV/m}$

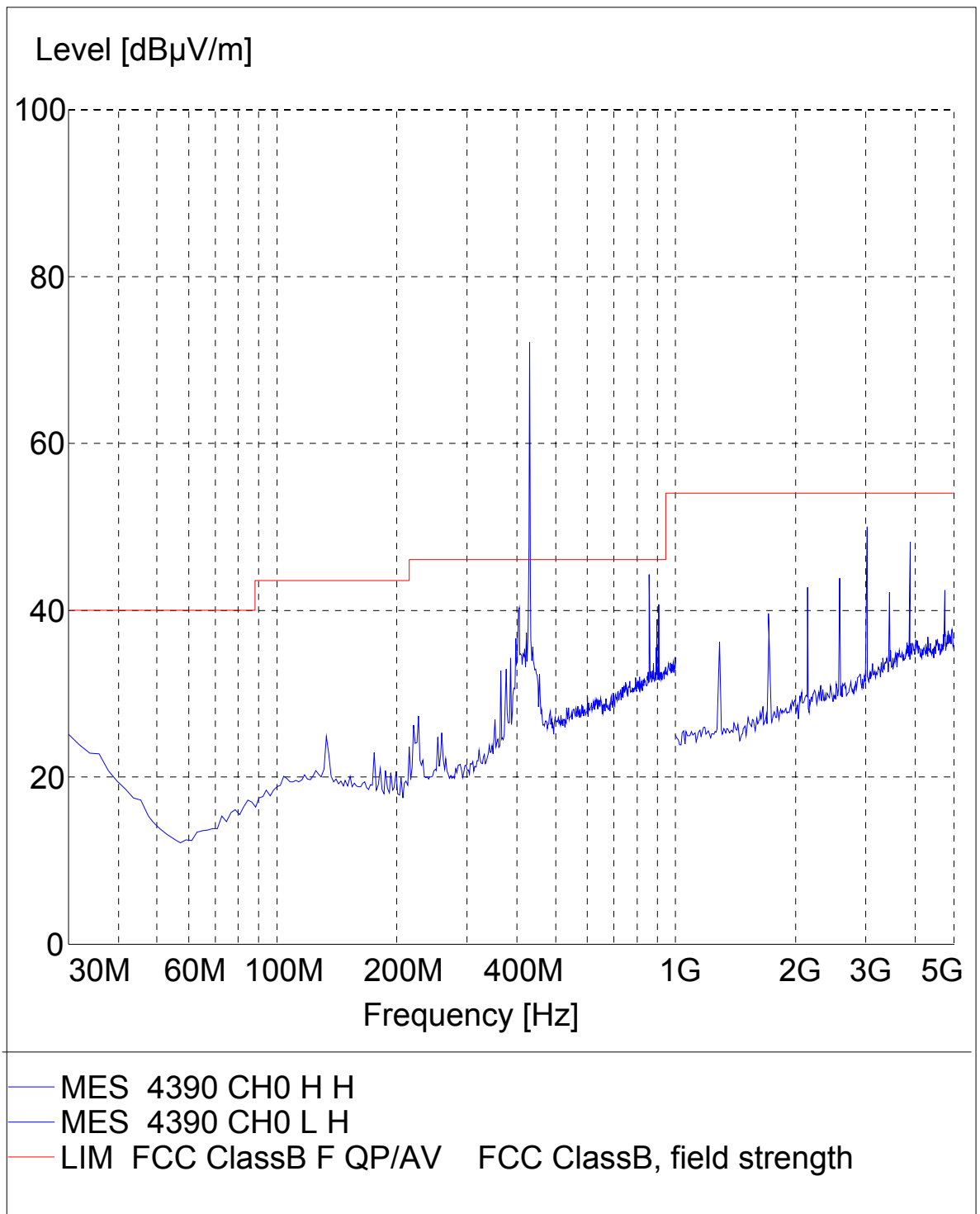
5. Spurious emission limit (dBuV/m) at 3 meters= $4.1667 \cdot F - 708.3333 = 4.1667 \cdot 434.592 - 708.3333 = 1102.4681 \mu V/m = 60.8 \text{ dBuV/m}$

**Radiated Emission**

**EUT:**

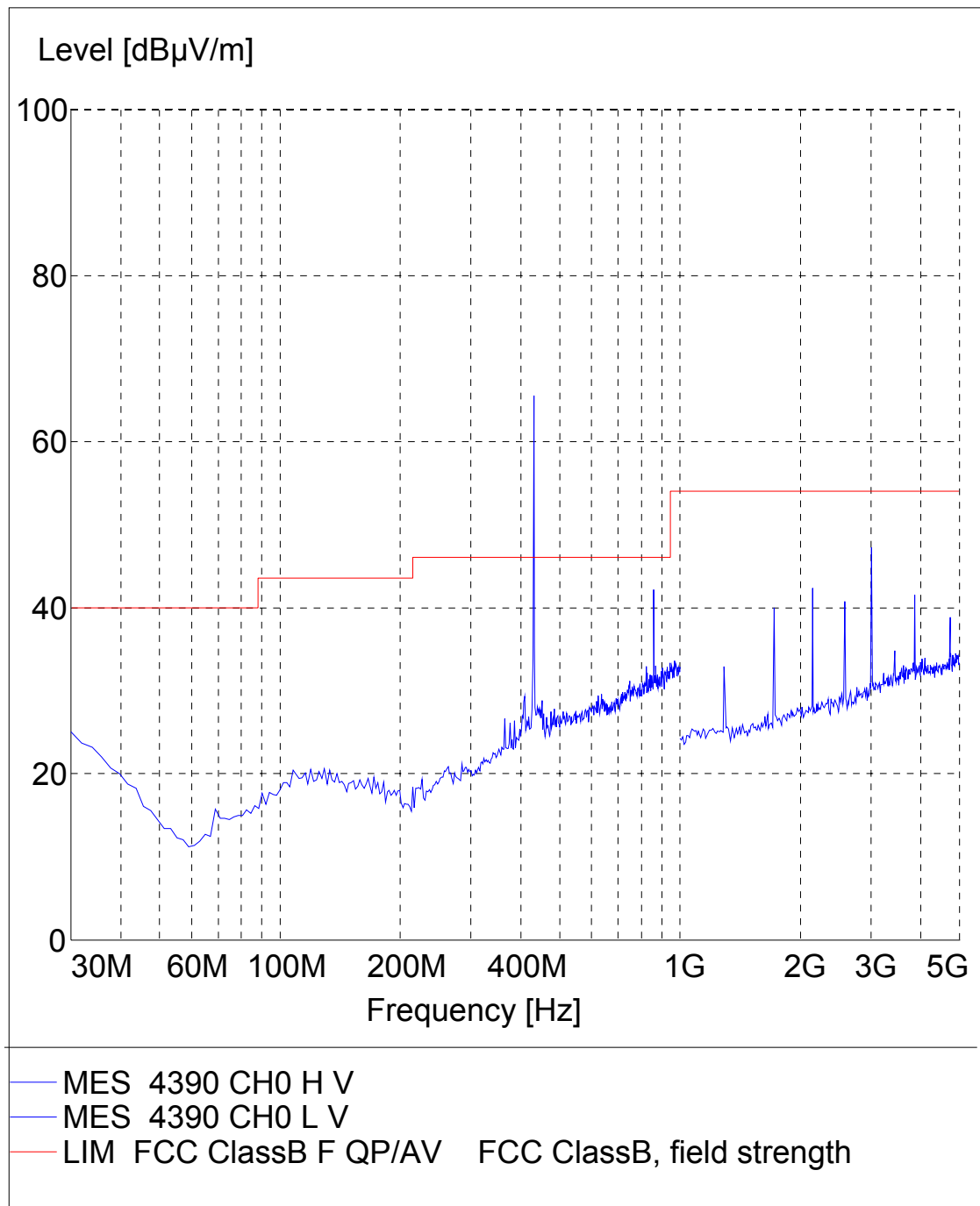
**HCS-4390AK**

**Operating Condition:** CH0 TX  
**Test Site:** SMQ EMC lab SAC  
**Operator:**  
**Test Specification:** Horizontal



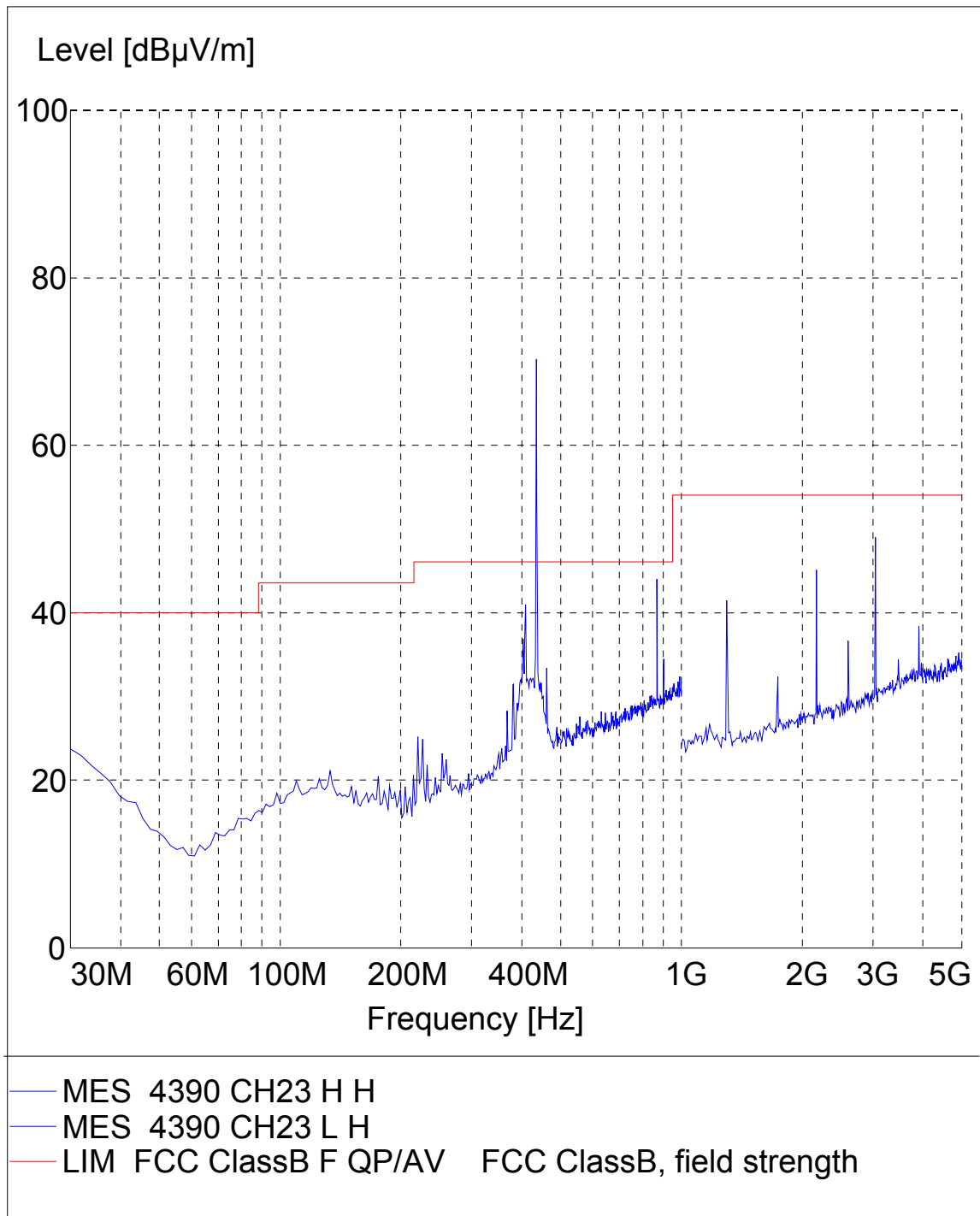
**Radiated Emission**  
**EUT:** HCS-4390AK

**Operating Condition:** CH0 TX  
**Test Site:** SMQ EMC lab SAC  
**Operator:**  
**Test Specification:** Vertical



**Radiated Emission**  
**EUT:** HCS-4390AK

**Operating Condition:** CH23 TX  
**Test Site:** SMQ EMC lab SAC  
**Operator:**  
**Test Specification:** Horizontal



**Radiated Emission**  
**EUT:** HCS-4390AK



**Operating Condition:** CH23 TX  
**Test Site:** SMQ EMC lab SAC  
**Operator:**  
**Test Specification:** Vertical

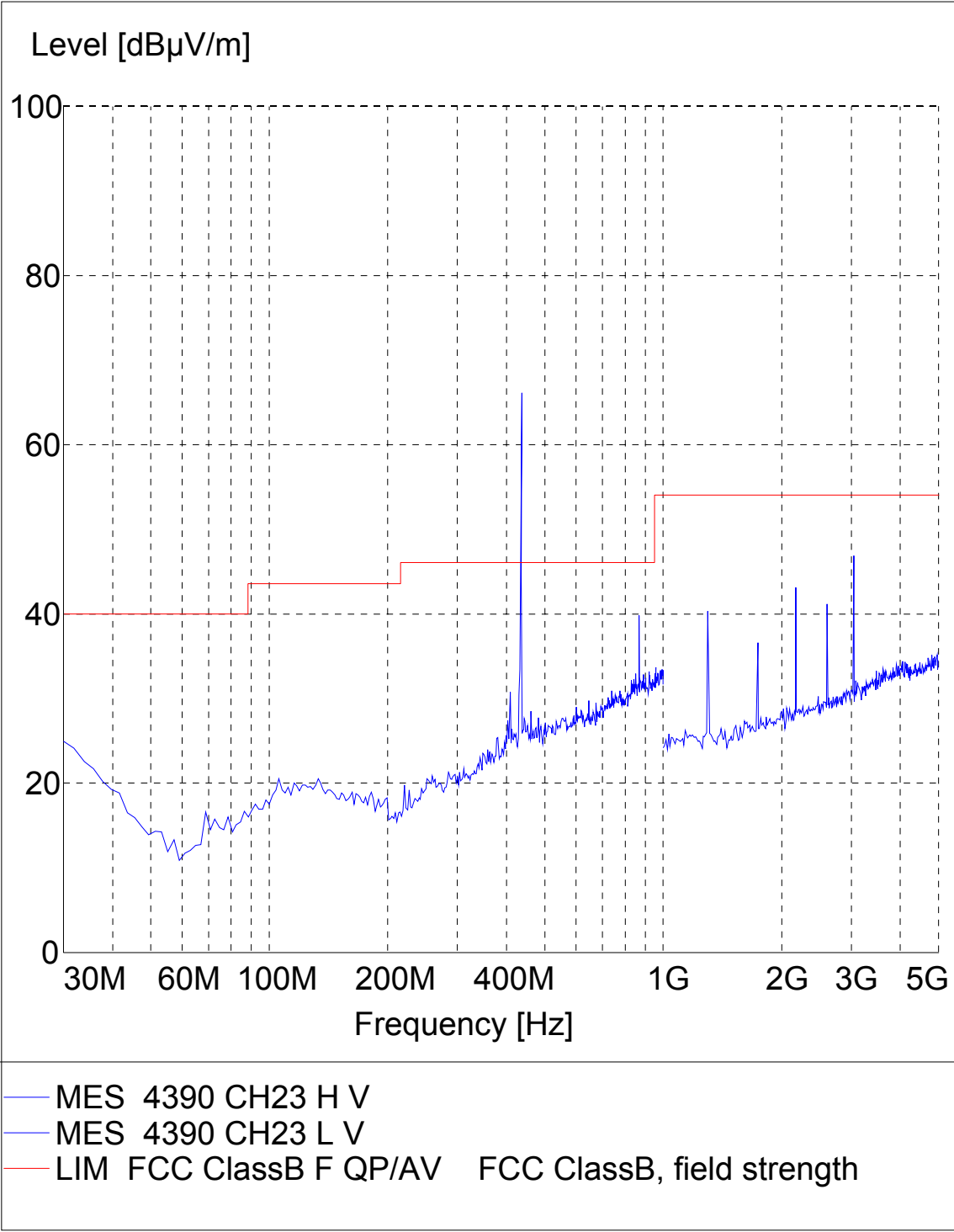


Table 9 Restricted Band Radiated Emission Data

MHz	MHz	MHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410
0.495 - 0.505	16.69475 - 16.69525	608 - 614
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240
4.125 - 4.128	25.5 - 25.67	1300 - 1427
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2
6.31175 - 6.31225	123 - 138	2200 - 2300
8.291 - 8.294	149.9 - 150.05	2310 - 2390
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267
12.29 - 12.293	167.72 - 173.2	3332 - 3339
12.51975 -	240 - 285	3345.8 - 3358
12.52025	322 - 335.4	3600 - 4400
12.57675 -		
12.57725		
13.36 - 13.41		

All the emissions of the above band are 20dB less than the limit.

## **7. 20DB OCCUPIED BANDWIDTH**

### **7.1. Test Standard and Limit**

#### 7.1.1. Test Standard

FCC Part 15 15.231

#### 7.1.2. limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz

### **7.2. Test Procedure**

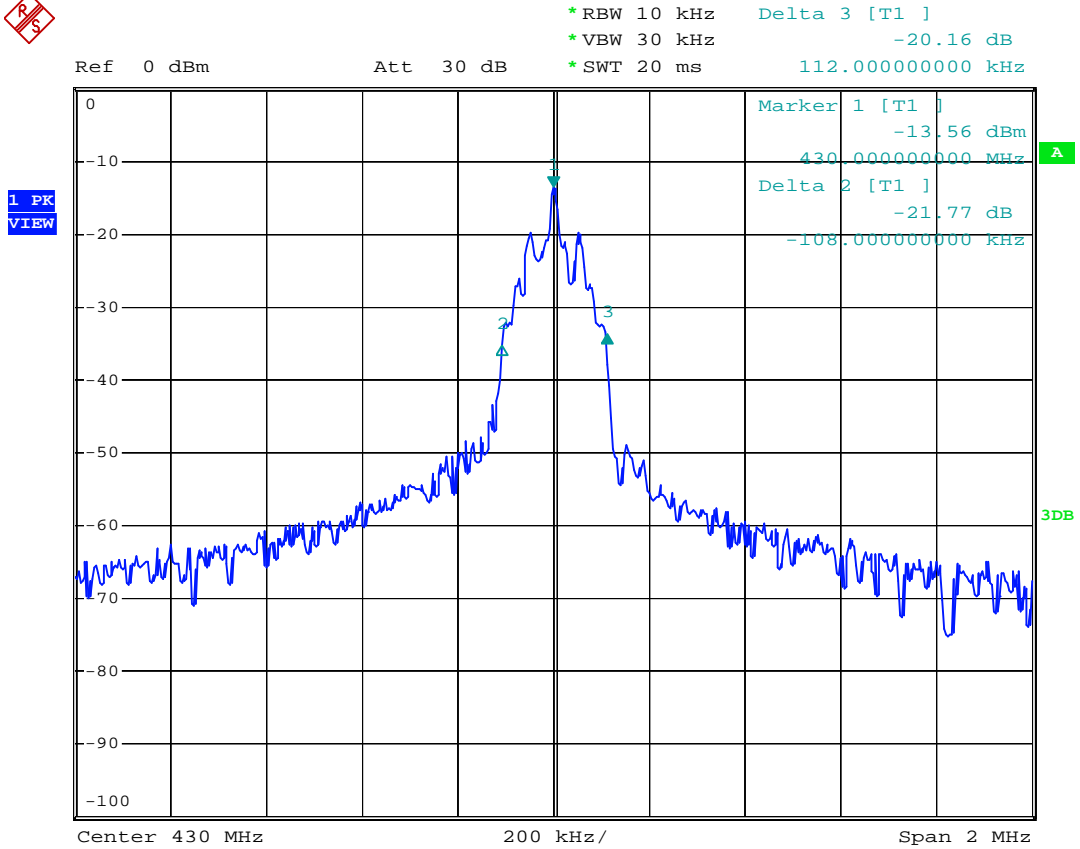
1. Set EUT as normal operation
2. Set EMI test receiver (ESIB26) Center Frequency = fundamental frequency,
3.  $RBW \geq 1\%$  bandwidth,  $VBW \geq RBW$ .
4. Set EMI test receiver (ESIB26) to maxhold mode, mark the points 20dB down from the modulated carrier

### **7.3. Test Arrangement**

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

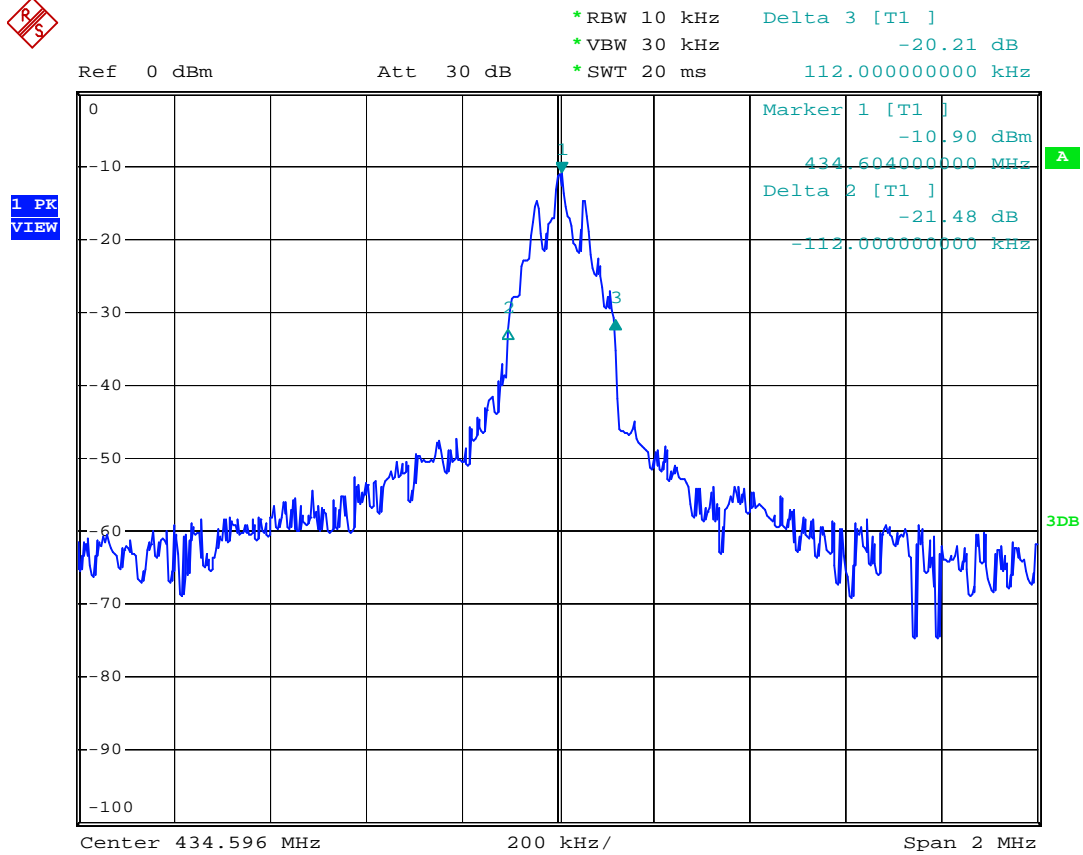
### **7.4. Test Data**

20dB bandwidth is 230.0 kHz  
Limit=430.0\*0.25%=1.075MHz



Date: 5.APR.2009 22:49:59

20dB bandwidth is 224.0 kHz  
Limit=434.6\*0.25%=1.0865MHz



Date: 5.APR.2009 23:05:03

## 8. SWITCH OFF TIME

### 8.1. Test Standard and Limit

#### 8.1.1. Test Standard

FCC Part 15 Section 15.231(a) (1) A

#### 8.1.2. Limit

manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### 8.2. Test Procedure

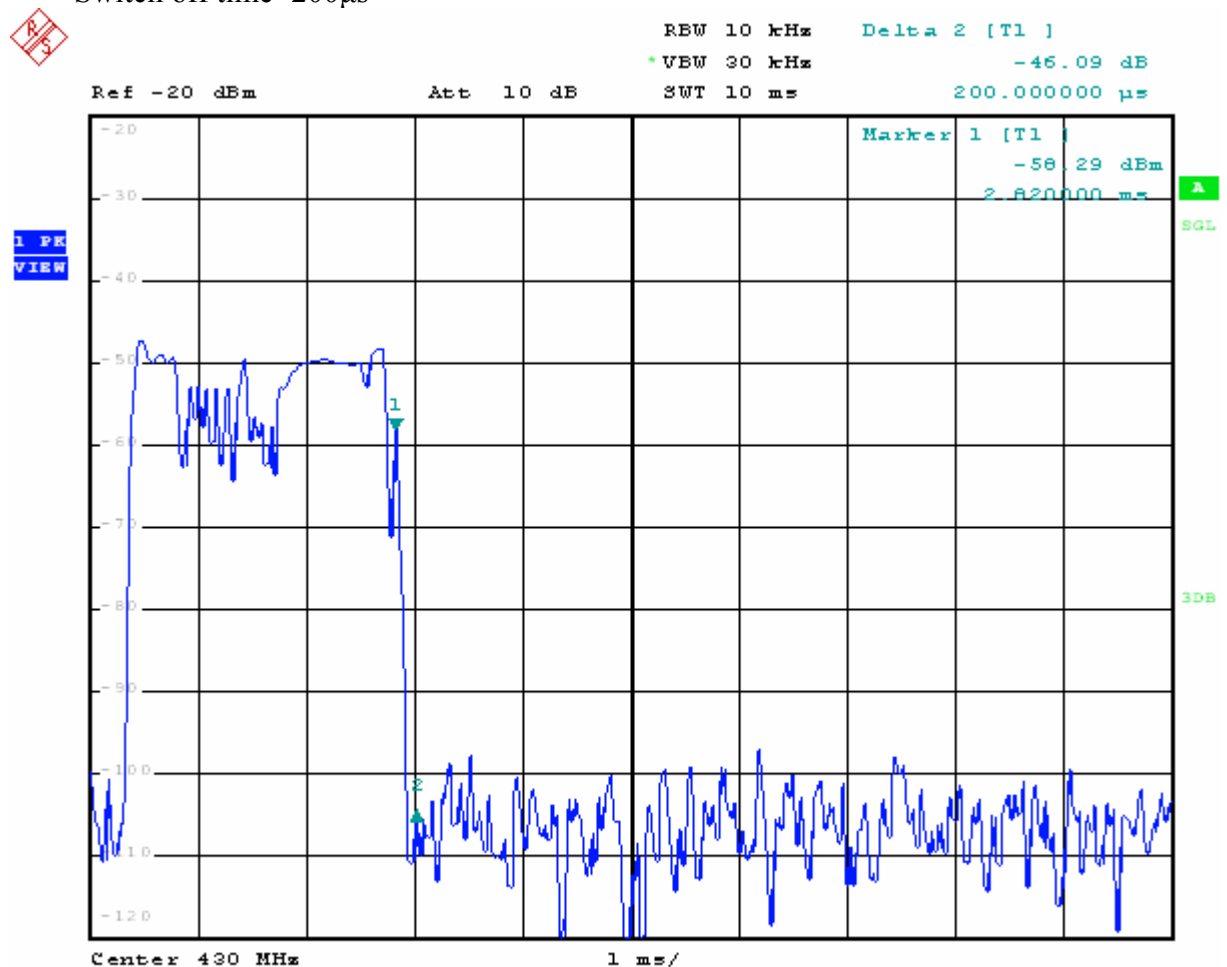
8.2.1. Set SPA Center Frequency = Fundamental frequency, RBW = 10kHz, VBW = 30kHz, Span = 0Hz. Sweep time = 10s.

8.2.2. Set EUT as normal operation and press Transmitter button.

8.2.3. Set SPA View. Delta Mark time.

### 8.3. Test Data

Switch off time=200 $\mu$ s



Date: 6.APR.2009 02:46:08



RBW 10 kHz Delta 2 [T1 ]  
VBW 30 kHz -51.29 dB  
SWT 10 s 5.000000 s

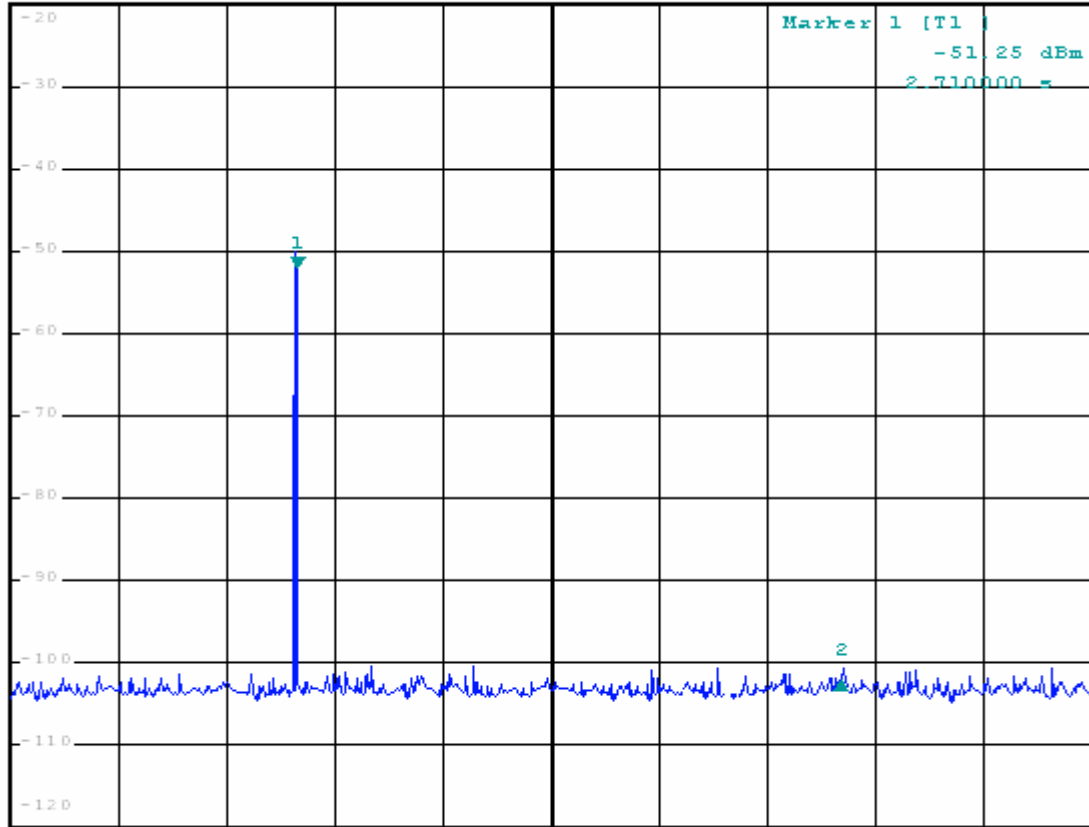
Ref -20 dBm

Att 10 dB

SWT 10 s

5.000000 s

1 PK  
VIEW



Center 430 MHz

1 s/

Date: 15.APR.2009 08:40:46

## **9. ANTENNA REQUIREMENT**

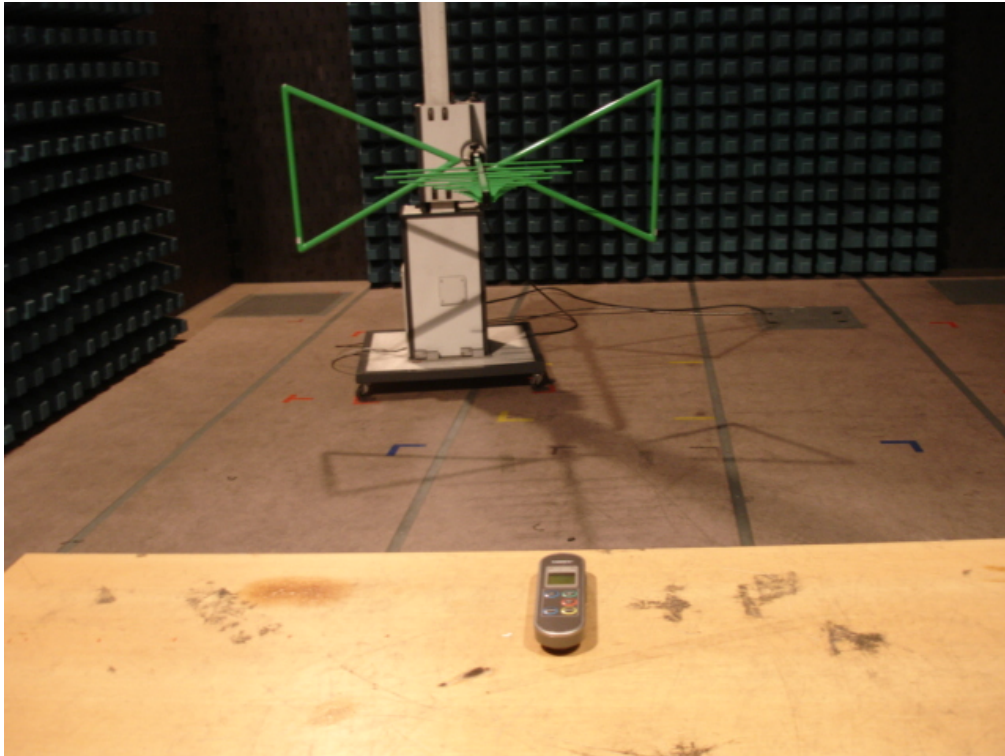
According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The EUT has a built in antenna which is integrated on the PCB, this is permanently attached antenna and meets the requirements of this section.

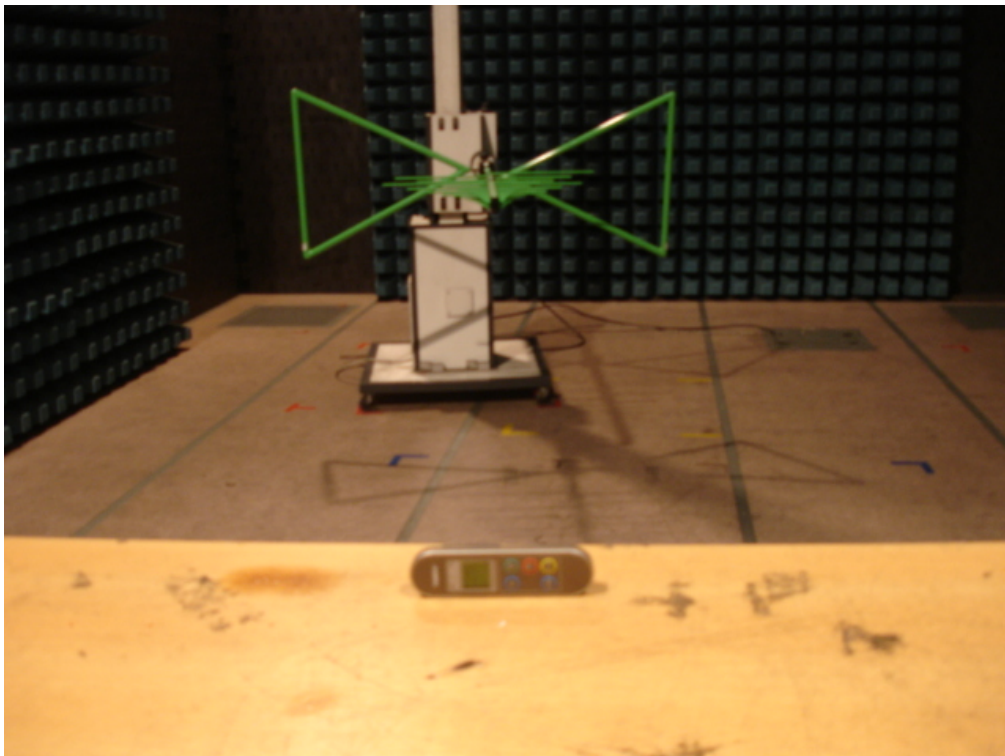


## **APPENDIX I TEST PHOTO**

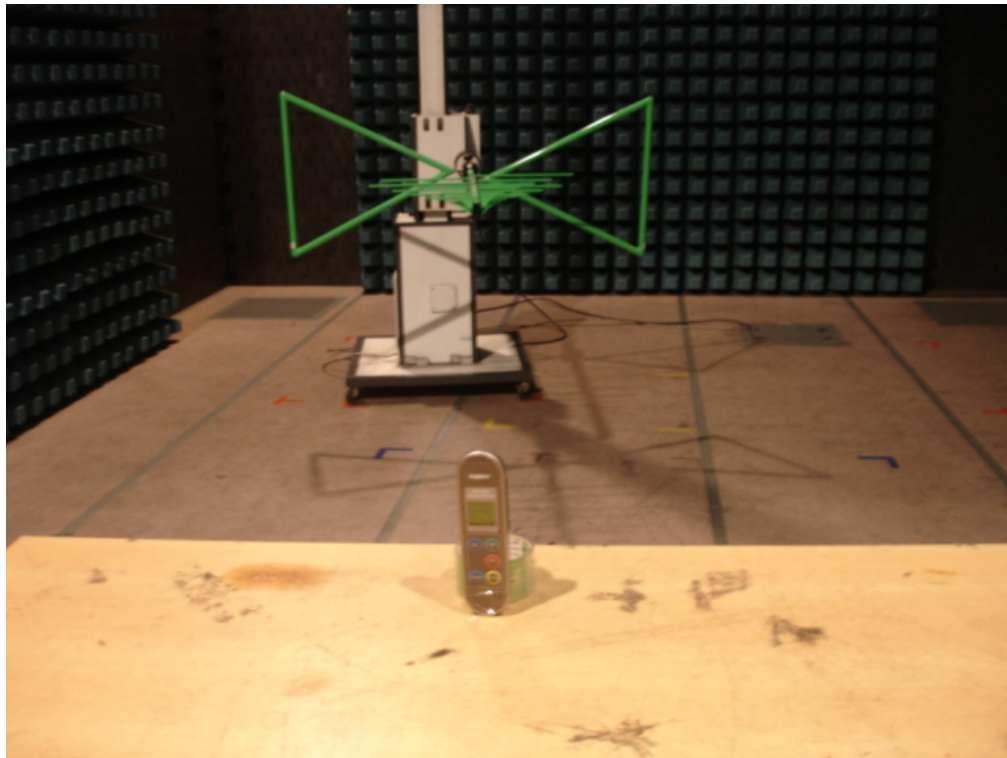
**Photo 1 Radiated Emission Test (X position)**



**Photo 2 Radiated Emission Test (Y position)**



**Photo 2 Radiated Emission Test (Z position)**



## **APPENDIX II EUT PHOTO**

**Photo 1 Appearance of HCS-4390AK**

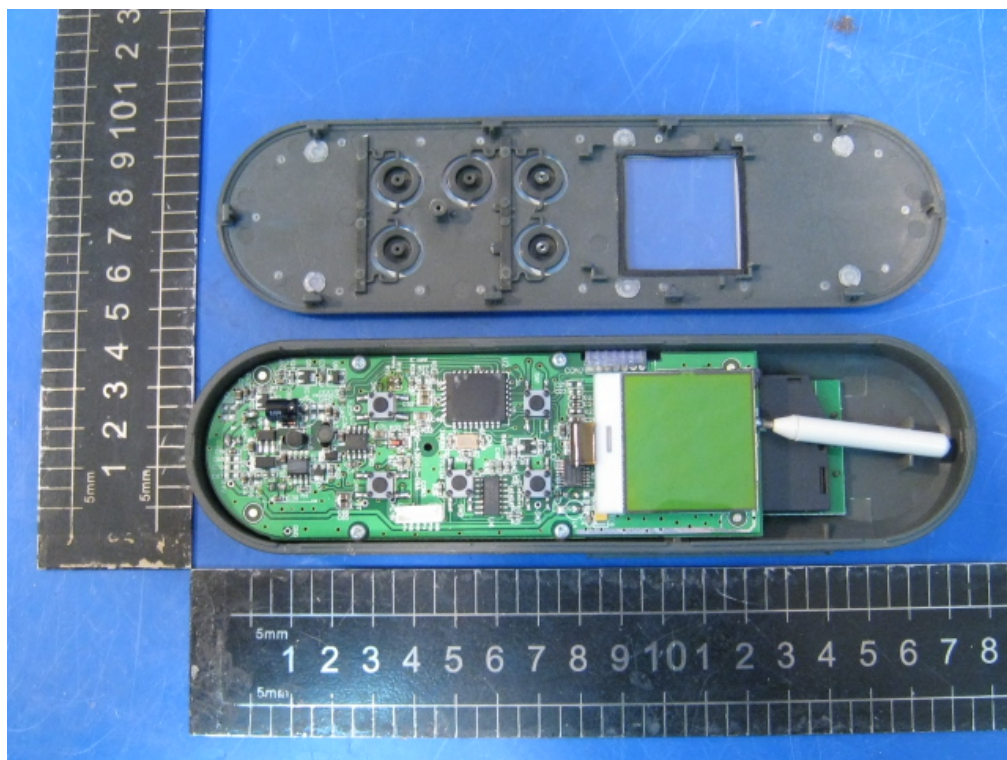


**Photo 2 Appearance of HCS-4390AK**

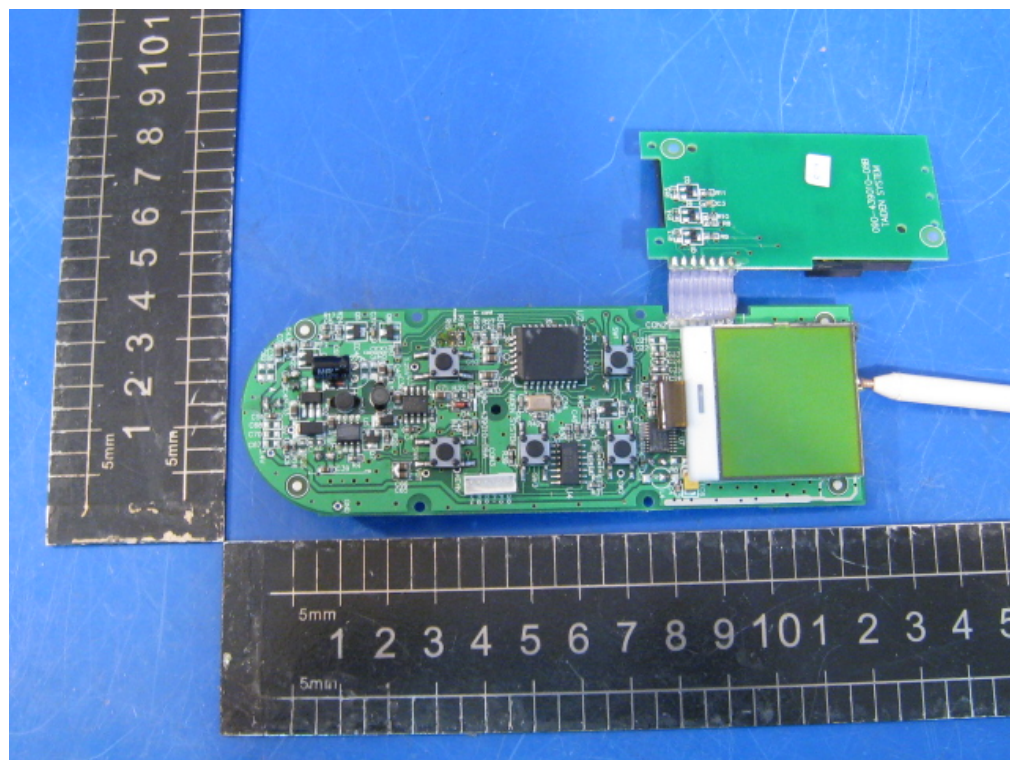




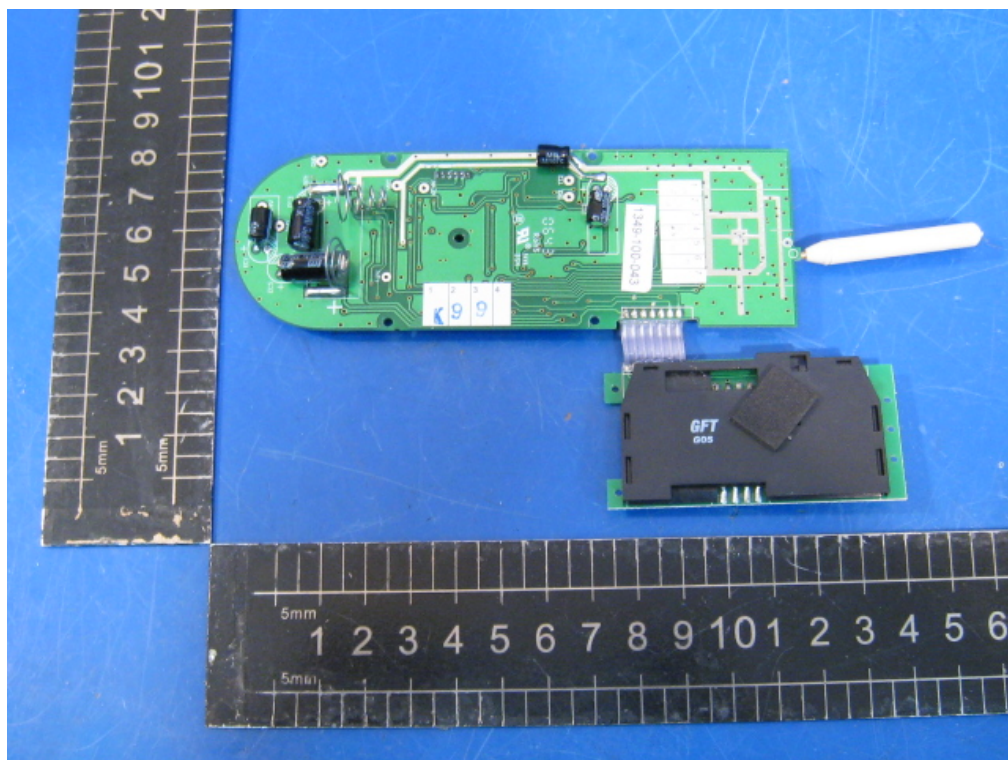
**Photo 3 Inside of HCS-4390AK**



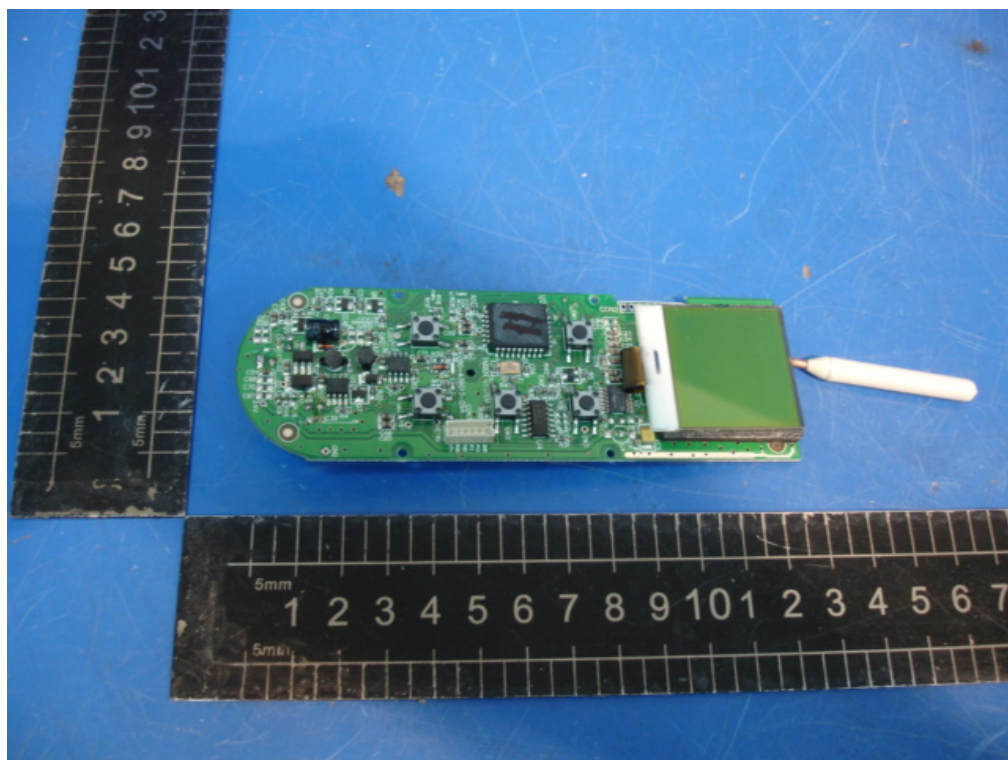
**Photo 4 Inside of HCS-4390AK**



**Photo 5 Inside of HCS-4390AK**



**Photo 6 Inside of HCS-4390A**





**Photo 7 Inside of HCS-4390A**

