TEST REPORT

Reference No.	:	WTU16S0549470E
FCC ID	:	2AIIH-OHDB14CN
Applicant	:	Optiqo Sweden AB
Address	:	Roxtorpsgatan 16B, Linkoeping 58273, Sweden.
Manufacturer	:	Magnificent Cleaning Equipment Co.,Ltd.
Address	:	778 Ping'an Road, Linhu Town, Wuzhong District, Suzhou 215105, China.
Product Name	:	Optiqo Hygiene Display - Basic
Model No	:	OHDB-14CN
Standards	:	FCC CFR47 Part 15.209: 2016
Date of Receipt sample	:	May 03, 2016
Date of Test	:	May 12 - May 18, 2016
Date of Issue	:	Dec. 02, 2016
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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Compiled by:

Zero Zhou / Test Engineer

Approved by:

Philo Zhong / Manager

2 Contents

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTU16S0549470E	May 03, 2016	May 12 - May 18, 2016	May 20, 2016	original	-	Replaced
WTU16S0549470E	May 03, 2016	May 12 - May 18, 2016	Dec, 02, 2016	Revision1	Updated Equipment's List and Added Bandwidth Measurement	Valid

4 General Information

4.1 General Description of E.U.T.

Product Name:	Optiqo Hygiene Display - Basic
Model No.:	OHDB-14CN
Model Difference:	N/A
Type of Modulation:	ASK
Frequency Range:	125KHz
The Lowest Oscillator:	125KHz
Antenna installation:	Loop Antenna

4.2 Details of E.U.T.

Technical Data: DC 4.5V by battery

4.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Table 2 Tests carried out under FCC part 15.209

Test Item	Test Mode
Radiated Emissions	transmitting

4.4 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

  Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, October 15, 2015

- **FCC Test Site 1#– Registration No.: 880581**

  Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, April 29, 2014.

- **FCC Test Site 2#– Registration No.: 328995**

  Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 328995, December 3, 2014.

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	Sep.14,2015	Sep.13,2016
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Sep.14,2015	Sep.13,2016
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	0703	Sep.14,2015	Sep.13,2016
4	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Sep.14,2015	Sep.13,2016
5	Amplifier	ANRITSU	MH648A	M43381	Sep.14,2015	Sep.13,2016
6	Cable	HUBER+SUHNER	CBL2	525178	Sep.14,2015	Sep.13,2016
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	Sep.12, 2015	Sep.11, 2016
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.12, 2015	Sep.11, 2016
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.12, 2015	Sep.11, 2016

5.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiated Spurious Emissions	9KHz~30MHz	±3.03dB	(1)
Radiated Spurious Emissions	30MHz~1GHz	±5.03dB	(1)

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

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Spurious Emissions	15.205(a) 15.209	C
Bandwidth Measurement	15.205(a) 15.215(c)	C
Antenna Requirement	15.203	C
Note: C=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Radiated Spurious Emissions

Test Requirement: FCC Part15 Paragraph 15.209

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

FCC Part15 Paragraph 15.209

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

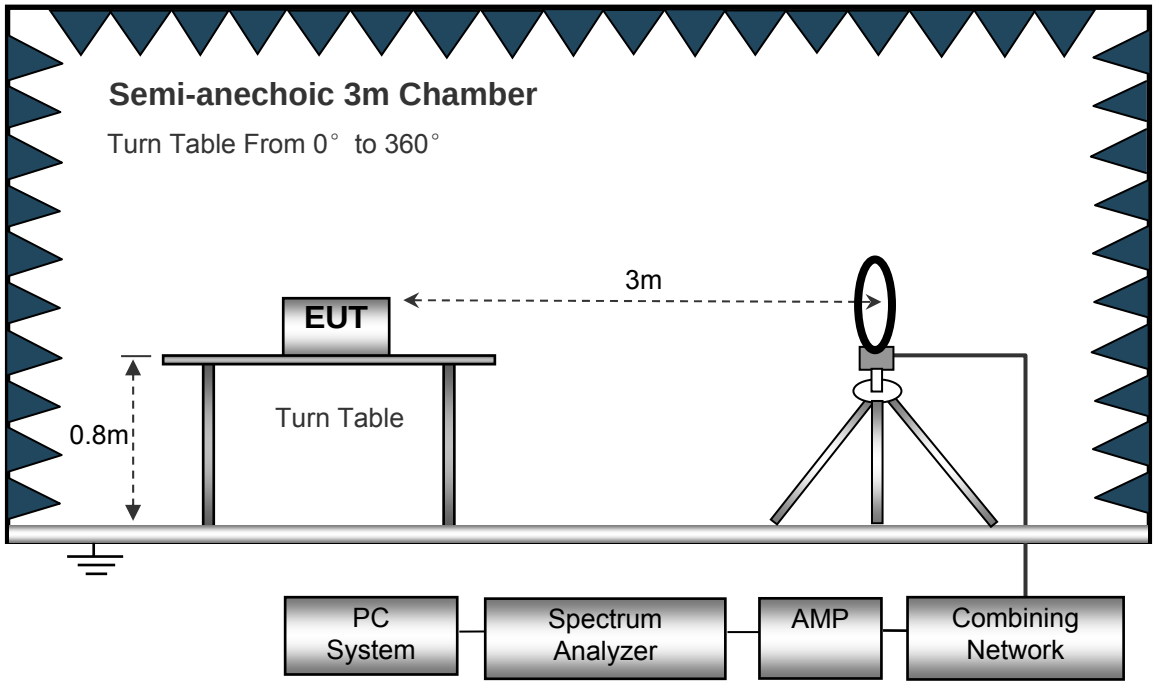
EUT Operation **:**

The test was performed in Transmitting mode, the test data were shown in the report.

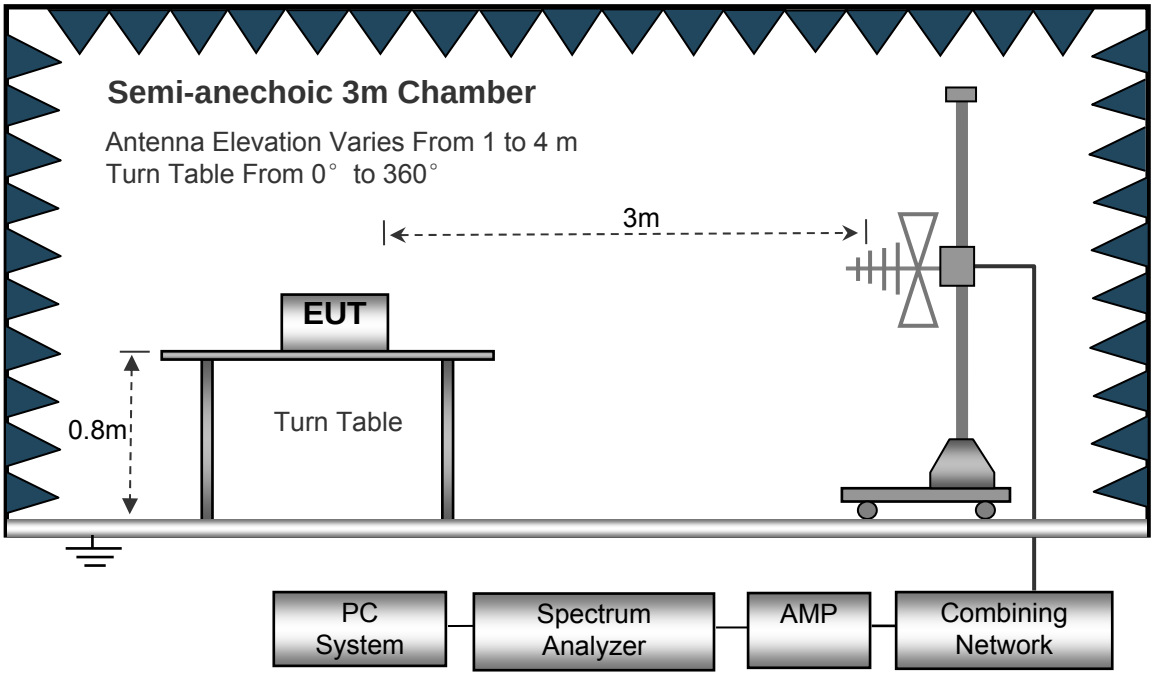
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10

The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed	Auto
IF Bandwidth	10kHz
Video Bandwidth	10kHz
Resolution Bandwidth	10kHz

30MHz ~ 1GHz

Sweep Speed	Auto
Detector	PK
Resolution Bandwidth	100kHz
Video Bandwidth	300kHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
8. New battery was used during test.

7.5 Summary of Test Results

Test Frequency: 9 KHz ~ 30 MHz Note: Correct factor = Cable loss + Antenna factor

Frequency	Receiver Reading (PK)	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude (PK)	FCC Part 15.209	
			Height	Polar			Limit	Margin
(MHz)	(dBμV@3m)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)@3m	(dB)
0.125	55.47	114	2.0	H	19.58	75.05	105.67	-30.62
0.125	28.65	341	1.6	V	29.73	58.38	105.67	-47.29

Frequency (MHz)	Receiver Reading	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	FCC Part 15.209	
						Limits	Margin
	dBμV@3m	QP	dB/m	dB	dBμV/m @3m	dBμV/m @3m	dB
0.120	39.63	QP	20.74	80.00	-19.63	25.33	-44.96
3.620	21.98	QP	20.20	40.00	2.18	29.54	-27.36
10.340	22.54	QP	19.90	40.00	2.44	29.54	-27.10

Test Frequency: 30 MHz ~ 1 GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.209	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	QP	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
34.22	33.96	QP	299	2.0	H	-14.30	19.66	40.00	-20.34
34.22	35.01	QP	140	1.1	V	-14.30	20.71	40.00	-19.29
220.34	34.81	QP	6	1.7	H	-13.58	21.23	46.50	-25.27
220.34	40.79	QP	322	2.2	V	-13.58	27.21	46.50	-19.29
519.67	36.44	QP	54	2.1	H	-5.63	30.81	46.50	-15.69
519.67	37.68	QP	297	1.4	V	-5.63	32.05	46.50	-14.45

8 Bandwidth Measurement

Test Requirement: FCC Part15.215(C), Part15.205 (a)

Test Method: ANSI C63.10: 2013

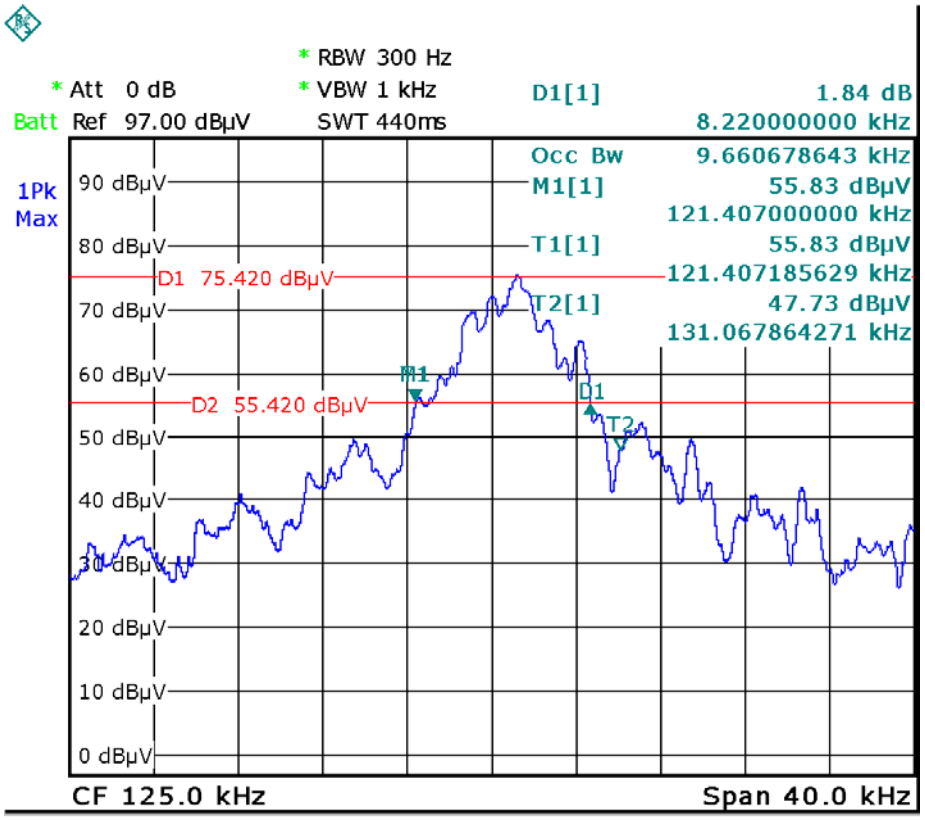
8.1 Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
2. Bandwidth Measure the resolution bandwidth of 300 Hz and the video bandwidth of 1 KHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier and 99% Bandwidth.

8.2 Test Result

Frequency(KHz)	20dB Bandwidth Emission(KHz)	99% Bandwidth Emission(KHz)
125	8.22	9.66

Test Plot



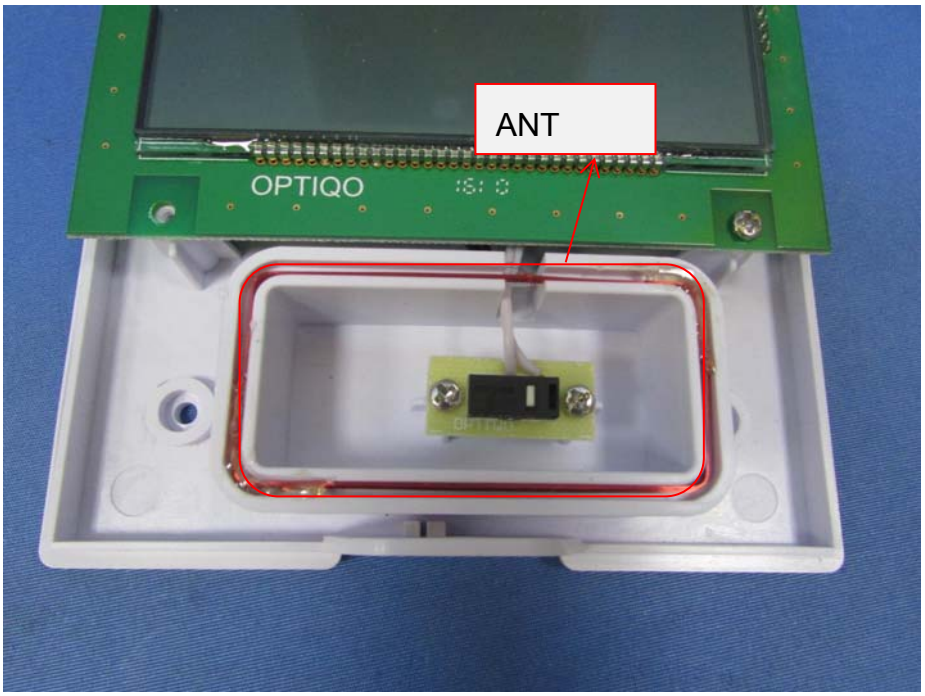
9 Antenna Requirement

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 use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 15 CFR 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.

Result:

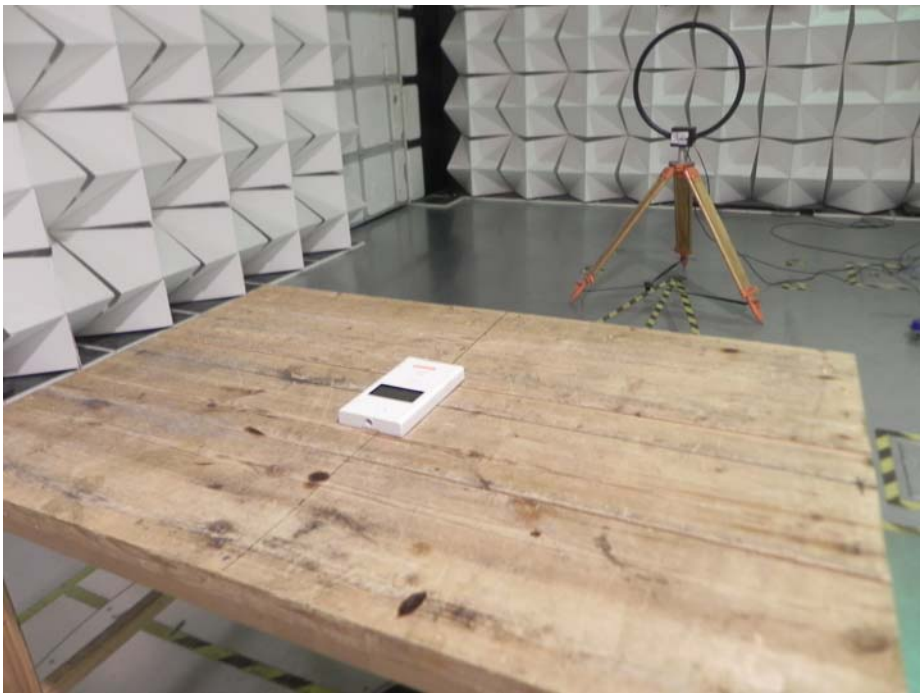
The EUT has oneLoop antenna, Meets the requirements of FCC 15.203.



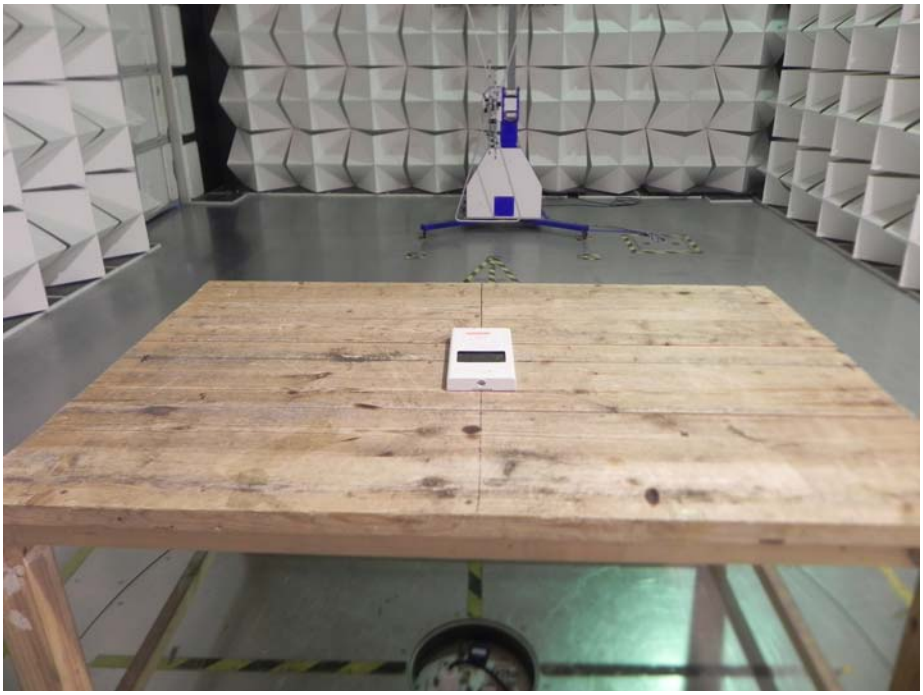
10 Model OHDB-14CN Photographs of Testing

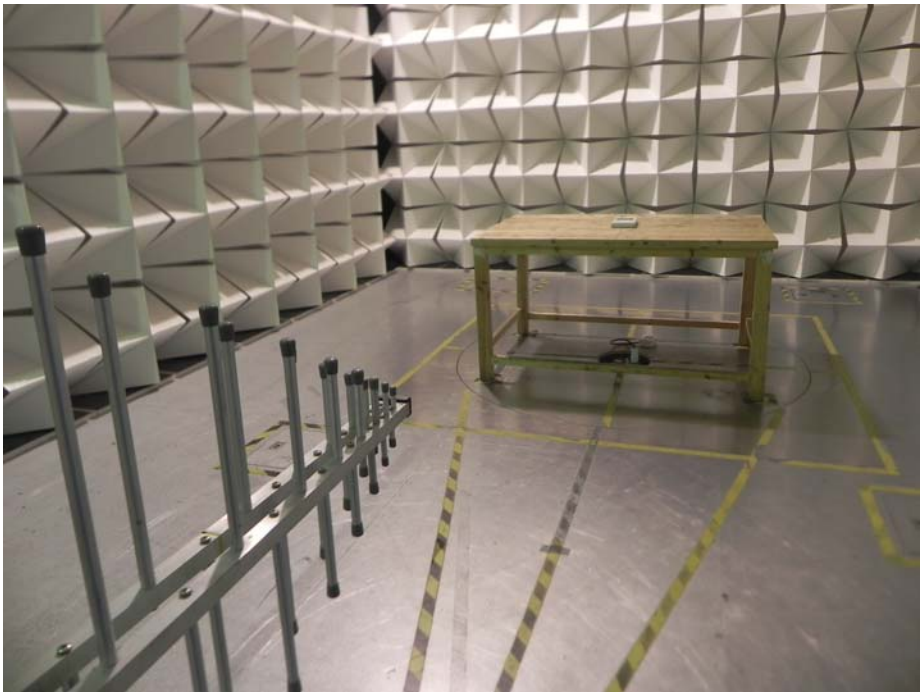
10.1 Radiation Emission Test Setup

9 KHz to 30 MHz



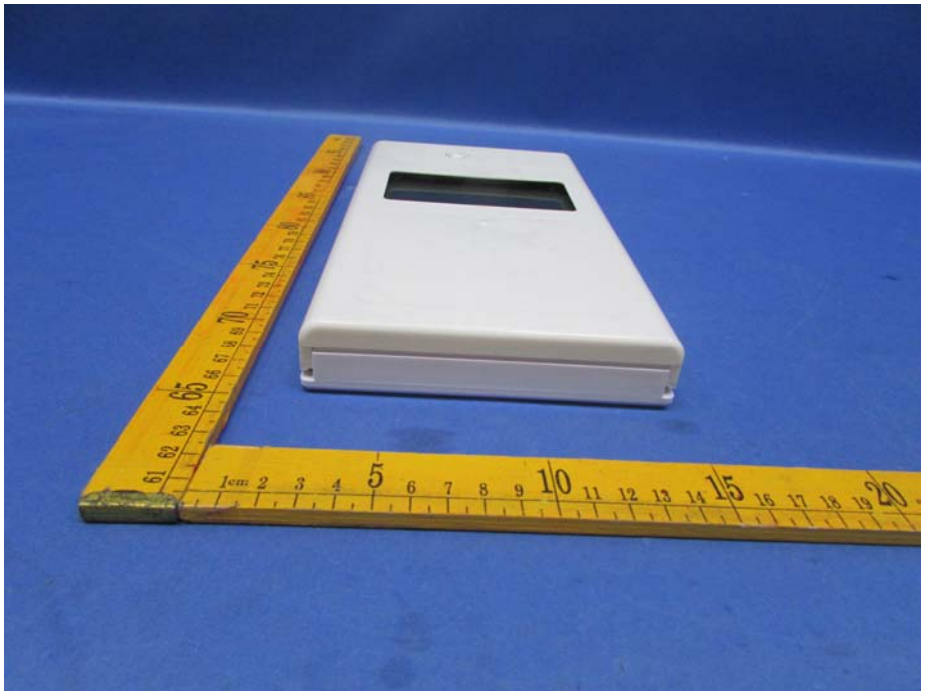
30MHz to 1GHz

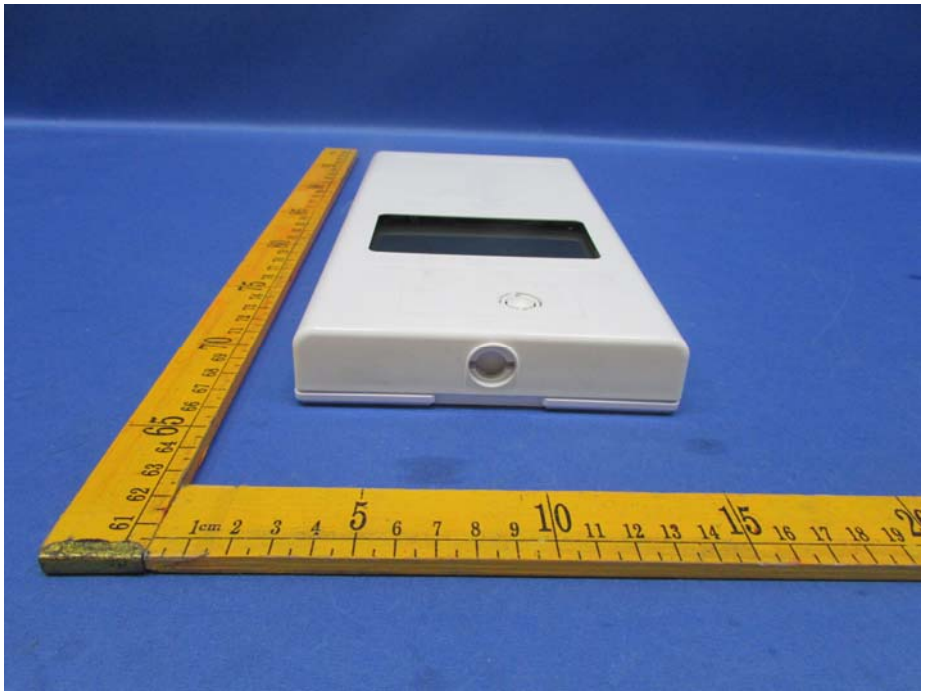


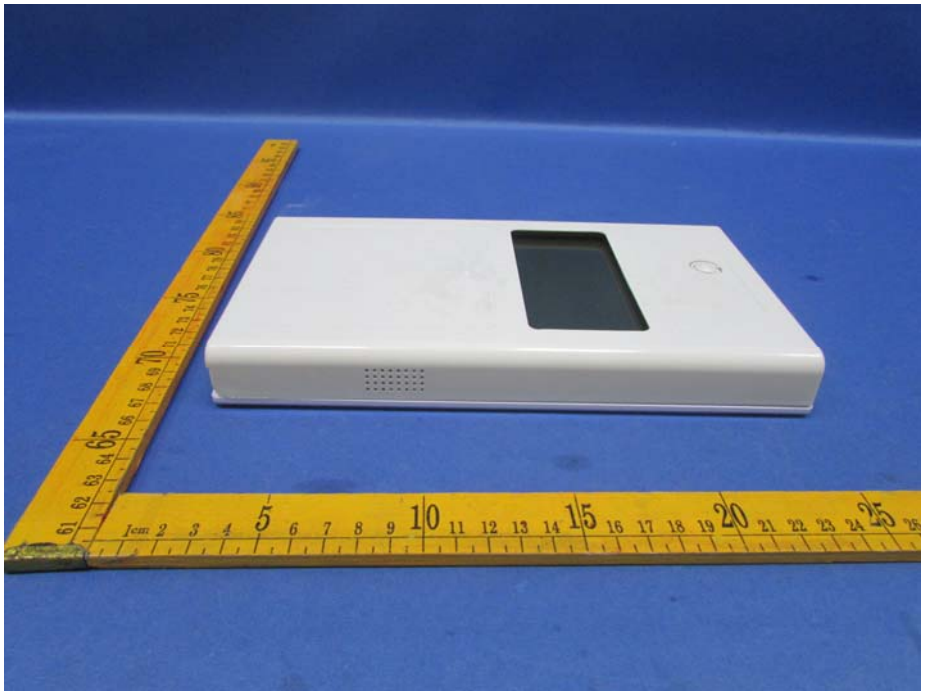


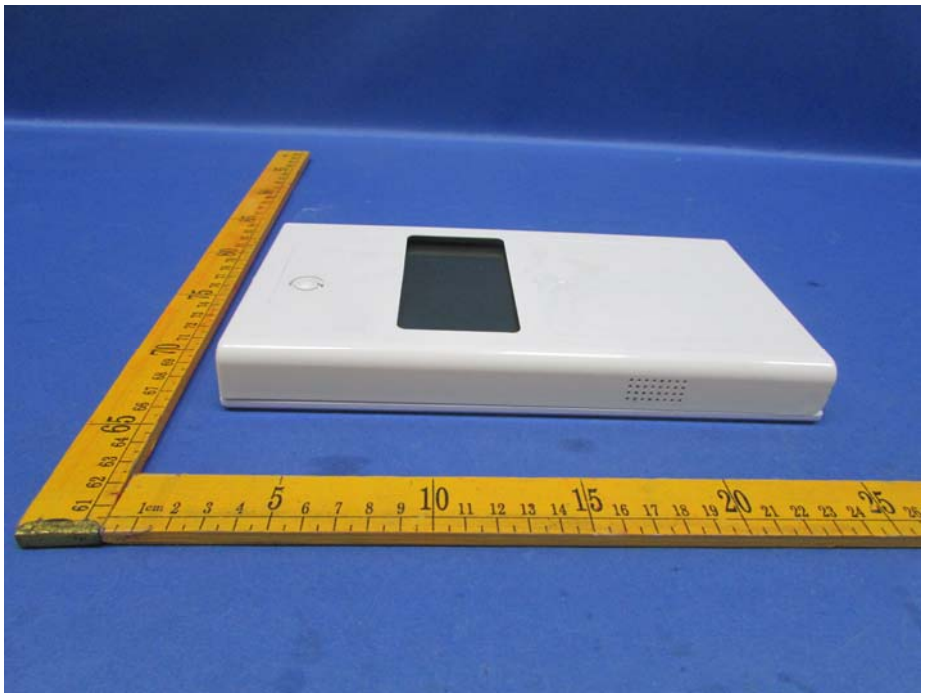
11 Photographs - Constructional Details

11.1 Model OHDB-14CN – External Photos

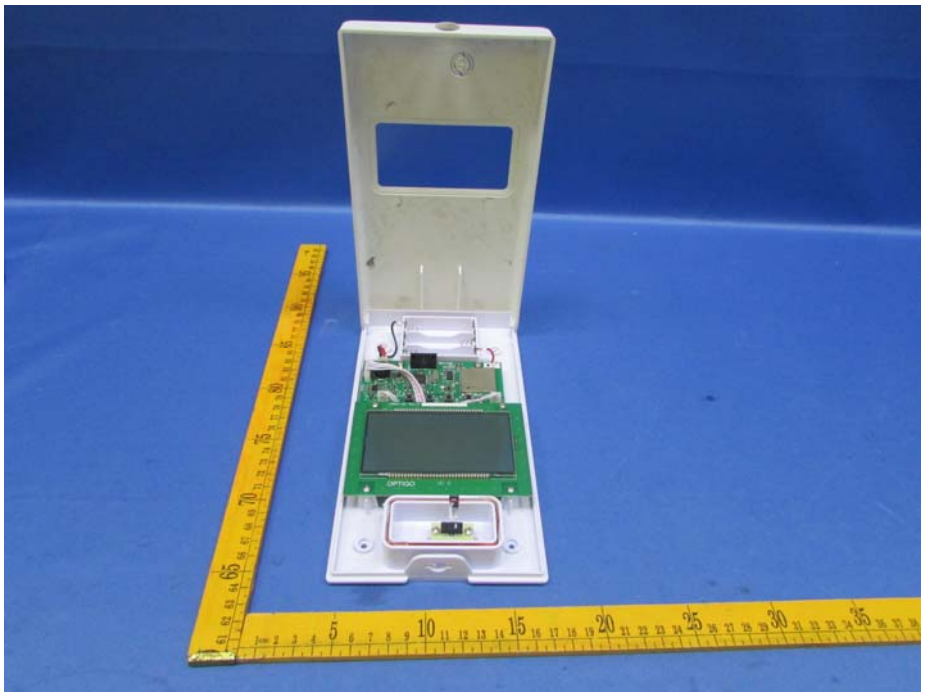


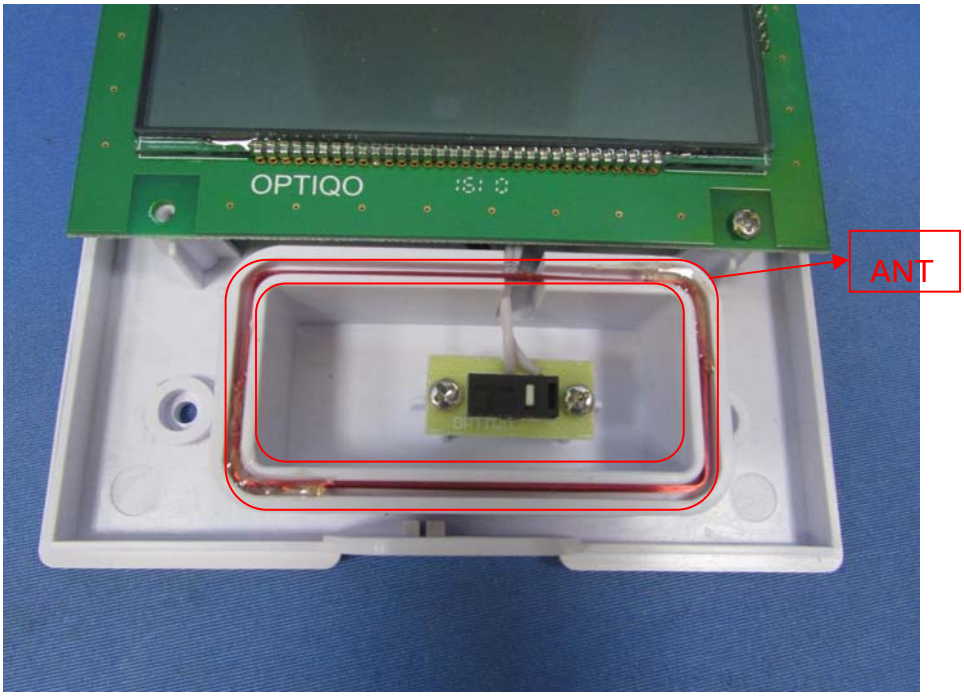


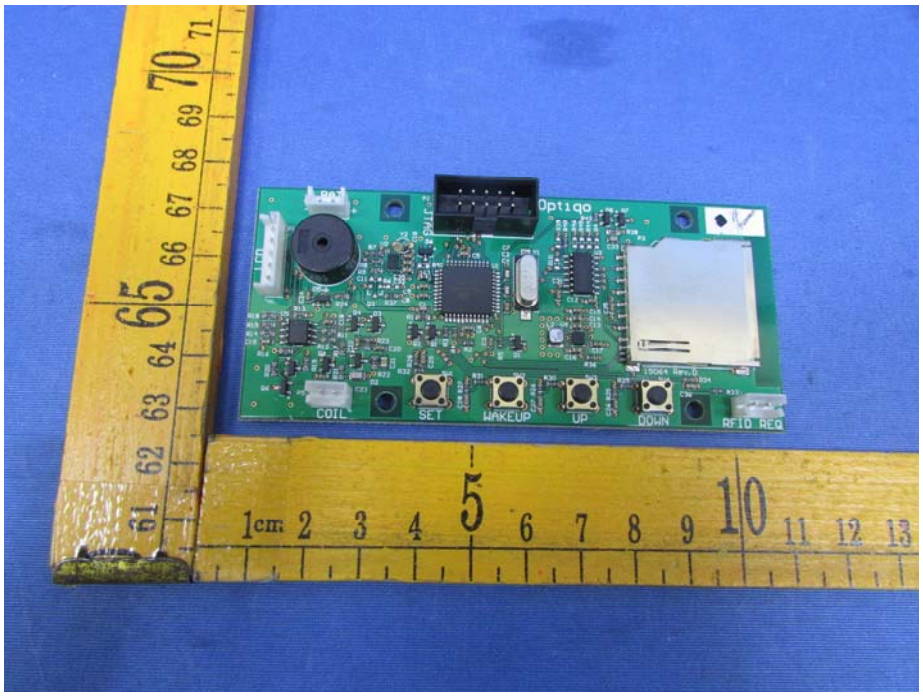


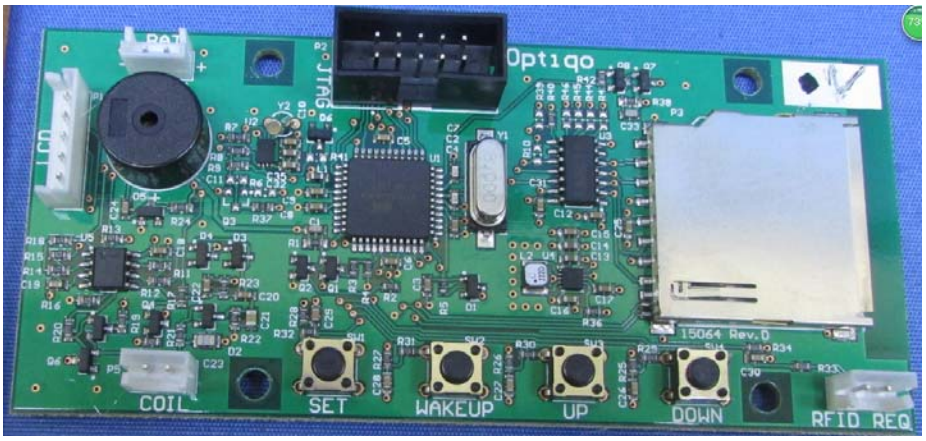


11.2 Model OHDB-14CN – Internal Photos






Optiqo
COIL
SET
WAKEUP
UP
DOWN
RFID REQ
1cm


Optiqo
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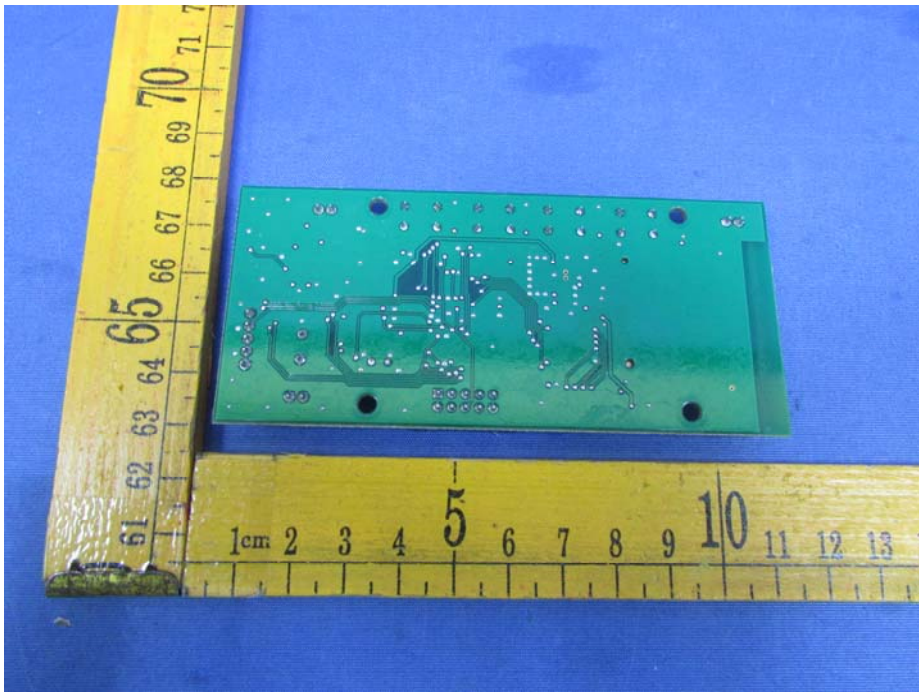
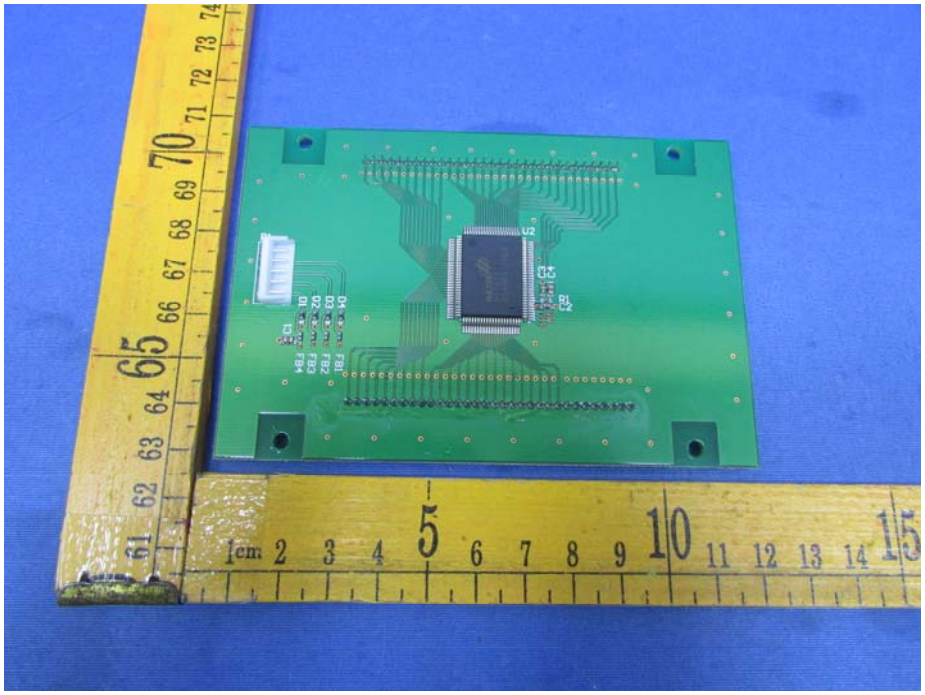
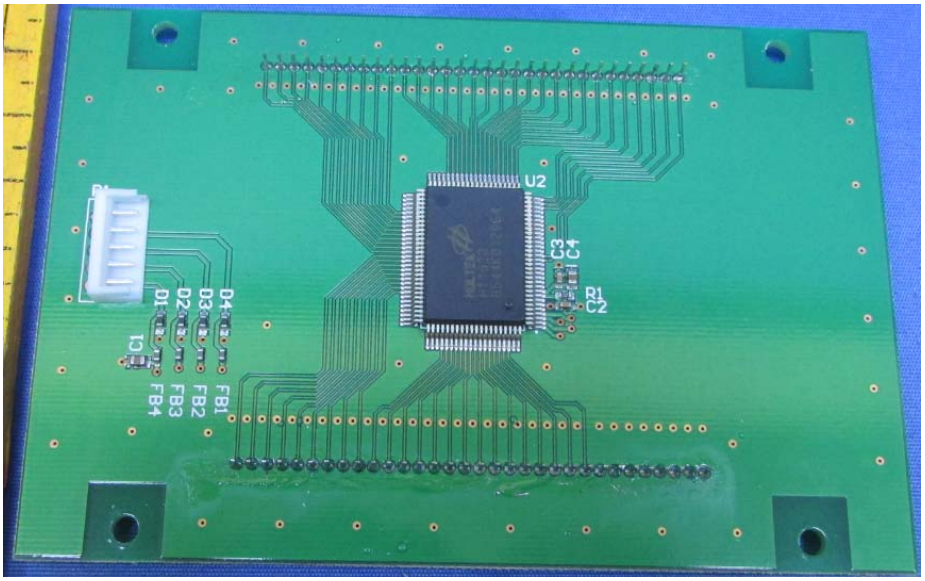
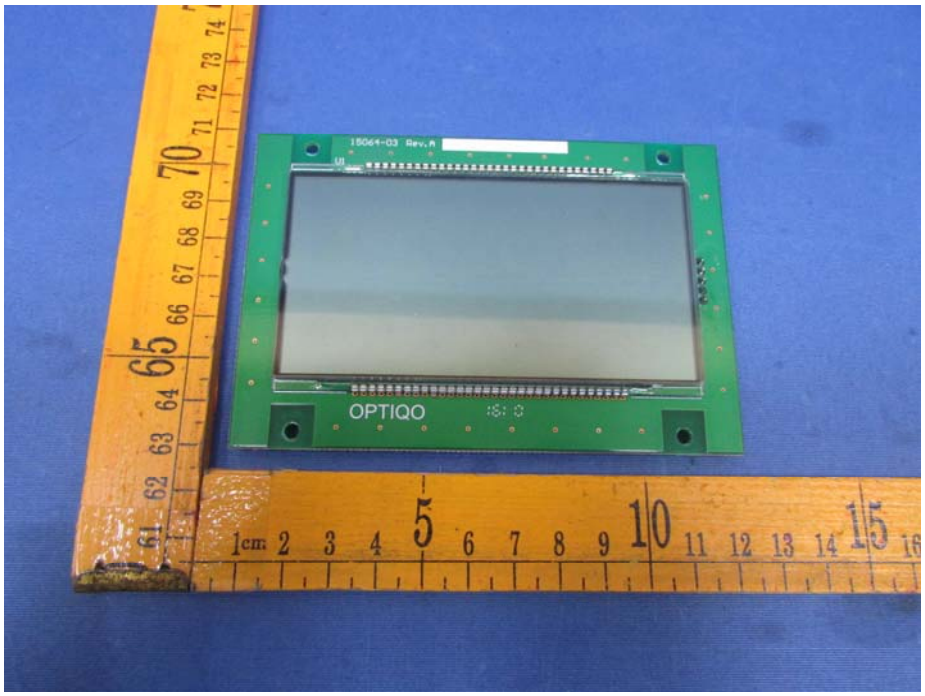
15064 Rev.0
COIL
SET
WAKEUP
UP
DOWN
RFID REQ









======End of Report======