

FCC TEST REPORT

for
Inkel Corporation

Bluetooth speaker
Model No.: EXM-30

Prepared for : Inkel Corporation
Address : 3-8, CheongCheon-Dong, Bupyeong-Gu, Incheon, 403-853,
South Korea

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited
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Report Number : 201308860F
Date of Test : Aug. 23~ 29, 2013
Date of Report : Aug. 29, 2013

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APPENDIX I (External Photos) (2 Pages)

APPENDIX II (Internal Photos) (3 Pages)

TEST REPORT

Applicant : Inkel Corporation
Manufacturer : DigiFi., Co. LTD.
EUT : Bluetooth speaker
Model No. : EXM-30
Serial No. : N.A.
Rating : DC 5V, 1A
Trade Mark : N.A.

Measurement Procedure Used:

FCC Part15 Subpart C, Paragraph 15.207, 15.249 & 15.209

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited

Date of Test :

Aug. 23~ 29, 2013



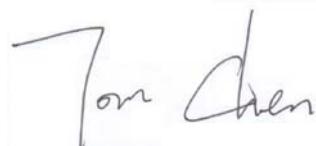
Prepared by :

(Engineer / Rock Zeng)



Reviewer :

(Project Manager/Amy Ding)



Approved & Authorized Signer :

(Manager/Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Bluetooth speaker

Model Number : EXM-30

Test Power Supply : DC 5V, 1A

Frequency : 2402~2480MHz

Antenna Specification : Printed Antenna:1.87dBi

Applicant Address : Inkel Corporation
: 3-8, CheongCheon-Dong, Bupyeong-Gu, Incheon, 403-853, South Korea

Manufacturer Address : DigiFi Co., LTD.
: GS 3F Changynyong-daero 151 beon-gil, Jangan-gu, Suwon-si, Gyeonggi-do, South Korea

Date of receiver : Aug. 23, 2013

Date of Test : Aug. 23~ 29, 2013

1.2. Auxiliary Equipment Used during Test

N/A

1.3. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS - LAB Code: L3503

Shenzhen Anbotek Compliance Laboratory Limited., Laboratory has been assessed and in compliance with CNAS/CL01: 2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, 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 752021, Jul. 10, 2013.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A-1, February 22, 2013.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.4. Measurement Uncertainty

Radiation Uncertainty : Ur = 4.3dB

Conduction Uncertainty : Uc = 3.4dB

2. Test Procedure

GENERAL: This report shall NOT be reproduced except in full without the written approval of Shenzhen Anbotek Compliance Laboratory Limited. The EUT was transmitting a test signal during the testing.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2009 using a spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the EUT was 74.3oF with a humidity of 69%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF = FS
20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

ANSI STANDARD C63.4-2009 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

3. Conducted Limits

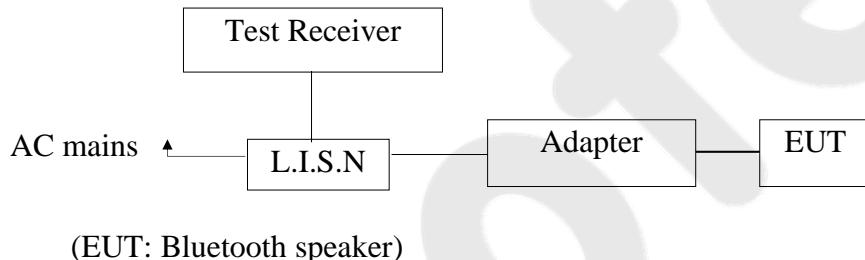
Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	10055	Apr. 23, 2013	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Apr. 23, 2013	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Apr. 23, 2013	1 Year

 Conduction Uncertainty : $U_c = 3.4\text{dB}$

3.1. Block Diagram of Test Setup

3.1.1. Block diagram of connection between the EUT and simulators



3.2. Power Line Conducted Emission Measurement Limits (15.207)

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

EUT : Bluetooth speaker
 Model Number : EXM-30
 Applicant : Inkel Corporation

3.4. Operating Condition of EUT

- 3.4.1. Setup the EUT and simulator as shown as Section 3.1.
- 3.4.2. Turn on the power of all equipment.
- 3.4.3. Let the EUT work in test mode (Charging) and measure it.

3.5. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.4-2003 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test results are reported on Section 3.6.

3.6. Power Line Conducted Emission Measurement Results

PASS.

The frequency range from 150KHz to 30 MHz is investigated.

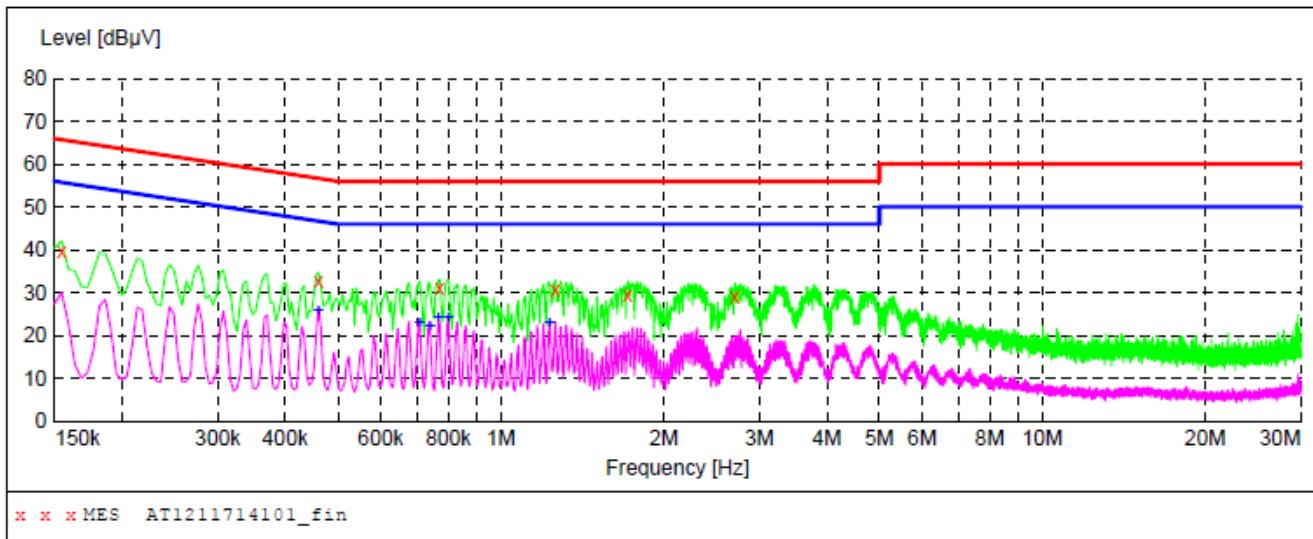
Please refer the following pages.

CONDUCTED EMISSION TEST DATA

EUT: Bluetooth speaker M/N: EXM-30
 Operating Condition: Charging
 Test Site: 1# Shielded Room
 Operator: Rock Zeng
 Test Specification: AC 120V/60Hz
 Comment: Live Line
 Tem:25°C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "AT1211714101_fin"

8/26/2013 9:50AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.154500	39.50	20.1	66	26.3	QP	L1	GND
0.460500	32.90	20.1	57	23.8	QP	L1	GND
0.771000	31.20	20.1	56	24.8	QP	L1	GND
1.261000	30.90	20.2	56	25.1	QP	L1	GND
1.715500	29.30	20.3	56	26.7	QP	L1	GND
2.705500	29.00	20.4	56	27.0	QP	L1	GND

MEASUREMENT RESULT: "AT1211714101_fin2"

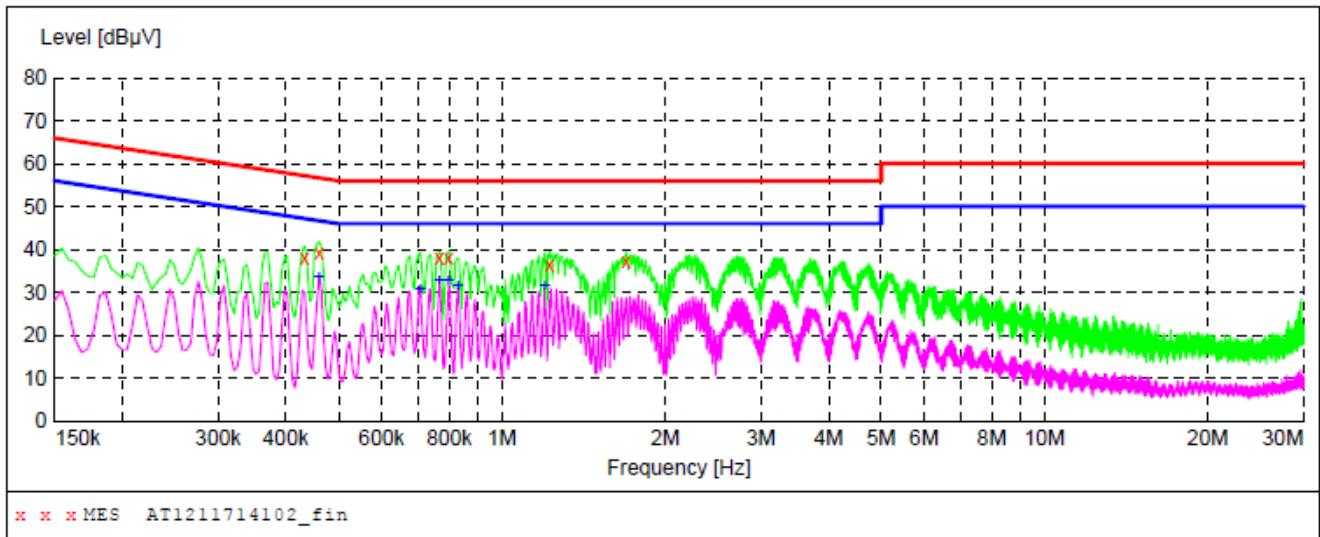
8/26/2013 9:50AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.460500	26.00	20.1	47	20.7	AV	L1	GND
0.708000	23.00	20.1	46	23.0	AV	L1	GND
0.739500	22.20	20.1	46	23.8	AV	L1	GND
0.766500	24.30	20.1	46	21.7	AV	L1	GND
0.798000	24.20	20.1	46	21.8	AV	L1	GND
1.229500	23.00	20.2	46	23.0	AV	L1	GND

CONDUCTED EMISSION TEST DATA

EUT: Bluetooth speaker M/N: EXM-30
 Operating Condition: Charging
 Test Site: 1# Shielded Room
 Operator: Rock Zeng
 Test Specification: AC 120V/60Hz
 Comment: Neutral Line
 Tem:25°C Hum:50%

SCAN TABLE: "Voltage (150K~30M) FIN"
 Short Description: 150K-30M Disturbance Voltages



MEASUREMENT RESULT: "AT1211714102_fin"

8/26/2013 9:53AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.433500	38.20	20.1	57	19.0	QP	N	GND
0.460500	39.40	20.1	57	17.3	QP	N	GND
0.766500	37.90	20.1	56	18.1	QP	N	GND
0.798000	38.10	20.1	56	17.9	QP	N	GND
1.225000	36.30	20.2	56	19.7	QP	N	GND
1.693000	37.20	20.3	56	18.8	QP	N	GND

MEASUREMENT RESULT: "AT1211714102_fin2"

8/26/2013 9:53AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.460500	33.60	20.1	47	13.1	AV	N	GND
0.708000	30.50	20.1	46	15.5	AV	N	GND
0.766500	32.60	20.1	46	13.4	AV	N	GND
0.798000	32.60	20.1	46	13.4	AV	N	GND
0.829500	31.40	20.1	46	14.6	AV	N	GND
1.198000	31.50	20.2	46	14.5	AV	N	GND

4. Radiation Interference

4.1. Requirements (15.249, 15.209):

FIELD STRENGTH of Fundamental: 902-928 MHZ 2.4-2.4835 GHz 94 dB μ V/m @3m	FIELD STRENGTH of Harmonics 54 dB μ V/m @3m	S15.209 30 - 88 MHz 88 - 216 MHz 216 - 960 MHz ABOVE 960 MHz	40 dB μ V/m @3M 43.5 46 54dB μ V/m
---	---	--	---

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 15.209, whichever is the lesser attenuation.

4.2 Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

All readings from 30MHz to 1GHz are quasi-peak values with a resolution bandwidth of 120kHz. All reading are above 1GHz, peak & average values with a resolution bandwidth of 1MHz. The EUT is tested in 9*6*6 Chamber.

The test results are listed in Section 4.3.

Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 23, 2013	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 23, 2013	1 Year
3.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year

Radiation Uncertainty : Ur = 4.3dB

4.3 Test Results

PASS.

Please refer the following pages.

Data:

Horizontal
CH Low(2402MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
239.98	1.58	13.50	38.90	57.45	33.65	46.00	-12.35	QP
2402.00	2.17	31.21	35.30	86.56	89.64	114.0	-24.36	Peak
2402.00	2.17	31.21	35.30	84.71	87.79	94.0	-4.21	AV
4804.10	2.56	34.01	34.71	41.15	43.01	74.0	-30.99	Peak
4804.10	2.56	34.01	34.71	38.26	40.12	54.0	-13.88	AV
7207.97	2.98	36.16	35.15	38.33	42.32	74.0	-31.68	Peak
7207.97	2.98	36.16	35.15	35.50	39.49	54.0	-14.51	AV
9608.00	---	---	---	---	---	---	---	---
12010.00	---	---	---	---	---	---	---	---
14412.00	---	---	---	---	---	---	---	---
16814.00	---	---	---	---	---	---	---	---
19216.00	---	---	---	---	---	---	---	---
21618.00	---	---	---	---	---	---	---	---
24020.00	---	---	---	---	---	---	---	---

CH Middle(2441MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
312.18	1.60	13.52	38.82	56.40	32.70	46.00	-13.30	QP
2441.00	2.19	31.22	34.60	85.32	88.13	114.0	-25.87	Peak
2441.00	2.19	31.22	34.60	83.55	84.36	94.0	-9.64	AV
4882.08	2.57	35.00	34.58	39.61	42.62	74.0	-31.38	Peak
4882.08	2.57	35.00	34.58	37.47	40.46	54.0	-13.54	AV
7323.05	3.00	36.17	35.14	38.80	42.83	74.0	-31.17	Peak
7323.05	3.00	36.17	35.14	36.08	40.11	54.0	-13.89	AV
9764.00	---	---	---	---	---	---	---	---
12205.00	---	---	---	---	---	---	---	---
14646.00	---	---	---	---	---	---	---	---
17087.00	---	---	---	---	---	---	---	---
19528.00	---	---	---	---	---	---	---	---
21969.00	---	---	---	---	---	---	---	---
24410.00	---	---	---	---	---	---	---	---

CH High(2480MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
312.18	1.60	13.52	38.82	53.20	29.50	46.00	-16.50	QP
2480.00	2.20	31.65	36.00	92.78	90.63	114.0	-23.37	Peak
2480.00	2.20	31.65	36.00	89.51	87.36	94.0	-6.64	AV
4960.05	2.58	35.06	34.79	41.76	44.61	74.0	-29.39	Peak
4960.05	2.58	35.06	34.79	39.28	42.13	54.0	-11.87	AV
7439.97	3.02	36.19	34.90	39.53	43.84	74.0	-30.16	Peak
7439.97	3.02	36.20	35.20	37.40	41.42	54.0	-12.58	AV
9920.00	---	---	---	---	---	---	---	---
12400.00	---	---	---	---	---	---	---	---
14880.00	---	---	---	---	---	---	---	---
17360.00	---	---	---	---	---	---	---	---
19840.00	---	---	---	---	---	---	---	---
22320.00	---	---	---	---	---	---	---	---
24800.00	---	---	---	---	---	---	---	---

 Vertical
 CH Low(2402MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
30.42	1.43	12.13	38.45	53.52	28.63	40.00	-11.37	QP
2402.00	2.17	31.21	35.30	84.23	89.31	114.0	-24.69	Peak
2402.00	2.17	31.21	35.30	81.84	87.92	94.0	-6.08	AV
4804.10	2.56	34.01	34.71	41.05	42.91	74.0	-31.09	Peak
4804.10	2.56	34.01	34.71	38.61	40.47	54.0	-13.53	AV
7207.93	2.98	36.16	35.15	37.46	41.45	74.0	-32.55	Peak
7207.93	2.98	36.16	35.15	34.50	38.49	54.0	-15.51	AV
9608.00	---	---	---	---	---	---	---	---
12010.00	---	---	---	---	---	---	---	---
14412.00	---	---	---	---	---	---	---	---
16814.00	---	---	---	---	---	---	---	---
19216.00	---	---	---	---	---	---	---	---
21618.00	---	---	---	---	---	---	---	---
24020.00	---	---	---	---	---	---	---	---

CH Middle(2441MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
143.82	1.50	13.40	38.89	53.90	29.91	43.50	-13.59	QP
2441.01	2.19	31.22	34.60	82.34	88.15	114.0	-25.85	Peak
2441.01	2.19	31.22	34.60	81.01	87.82	94.0	-6.18	AV
4882.11	2.57	35.00	34.58	40.15	43.14	74.0	-30.86	Peak
4882.11	2.57	35.00	34.58	37.86	40.85	54.0	-13.15	AV
7323.05	3.00	36.17	35.14	38.70	42.73	74.0	-31.27	Peak
7323.05	3.00	36.17	35.14	36.00	40.03	54.0	-13.97	AV
9764.00	---	---	---	---	---	---	---	---
12205.00	---	---	---	---	---	---	---	---
14646.00	---	---	---	---	---	---	---	---
17087.00	---	---	---	---	---	---	---	---
19528.00	---	---	---	---	---	---	---	---
21969.00	---	---	---	---	---	---	---	---
24410.00	---	---	---	---	---	---	---	---

CH High(2480MHz)

Frequency MHz	Cable Loss dB	Ant Factor dB/m	Preamp Factor dB	Read Level dB μ V	Level dB μ V/m	Limit dB μ V/m	Over Limit dB	Remark
408.80	1.62	13.54	38.45	51.18	27.83	46.00	-18.17	QP
2480.00	2.20	31.65	36.00	83.52	89.37	114.0	-24.63	Peak
2480.00	2.20	31.65	36.00	82.03	87.88	94.0	-6.12	AV
4960.10	2.58	35.06	34.79	40.08	42.93	74.0	-31.07	Peak
4960.10	2.58	35.06	34.79	38.10	40.95	54.0	-13.05	AV
7439.97	3.02	36.19	34.90	38.58	42.89	74.0	-31.11	Peak
7439.97	3.02	36.20	35.20	36.34	40.36	54.0	-13.64	AV
9920.00	---	---	---	---	---	---	---	---
12400.00	---	---	---	---	---	---	---	---
14880.00	---	---	---	---	---	---	---	---
17360.00	---	---	---	---	---	---	---	---
19840.00	---	---	---	---	---	---	---	---
22320.00	---	---	---	---	---	---	---	---
24800.00	---	---	---	---	---	---	---	---

NOTE: “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5. Occupied Bandwidth

5.1. Requirements (15.249):

The field strength of any emissions appearing outside the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.249.

5.2. Test Procedure

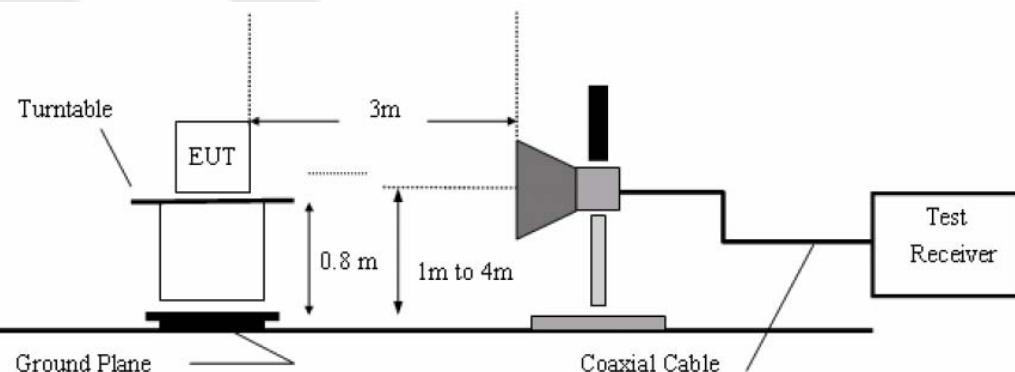
The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Apr. 23, 2013	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Apr. 23, 2013	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	101604	Apr. 23, 2013	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Apr. 23, 2013	1 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 23, 2013	1 Year
6.	Pre-amplifier	SONOMA	310N	186860	Apr. 23, 2013	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A

Radiation Uncertainty : Ur = 4.3dB

5.3. Test Configuration:

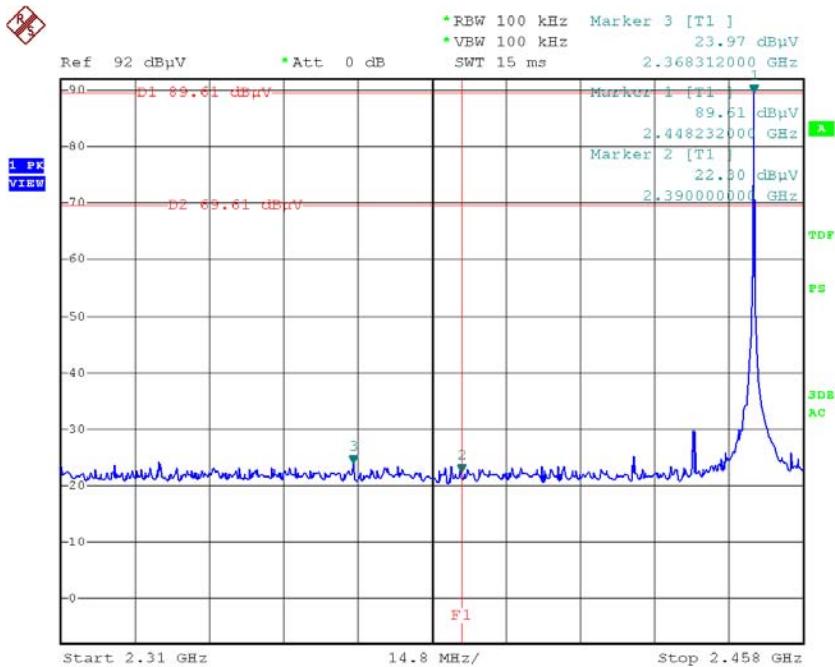


5.4. Test Results

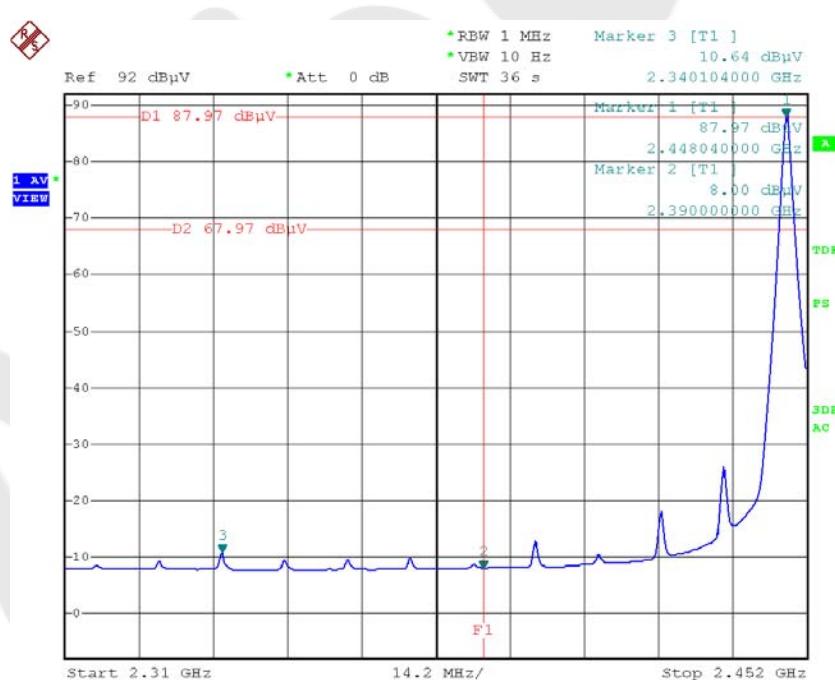
Pass.

Please refer the following plot.

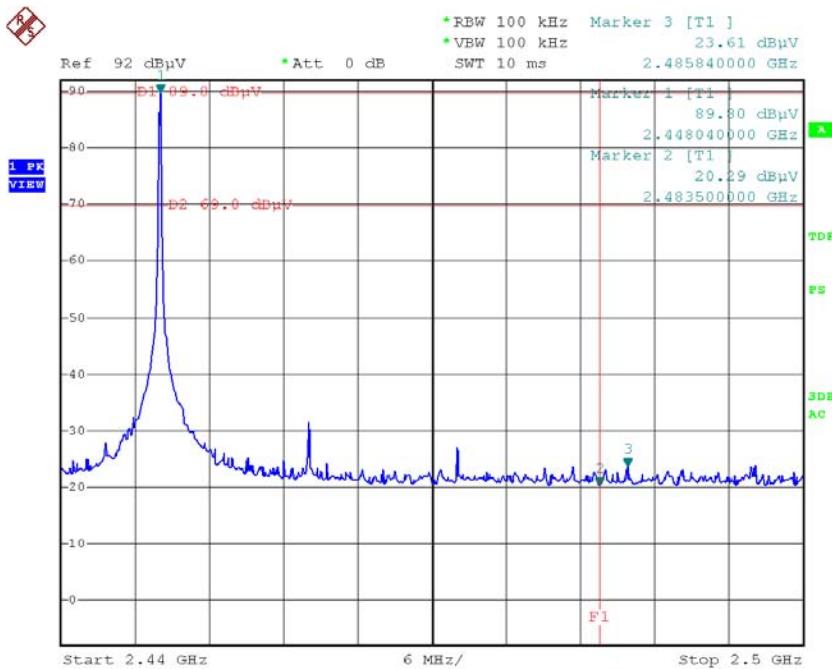
(Note: Marker 3 means the highest value in 2.39GHz~2.4GHz or 2.4835~2.5GHz)



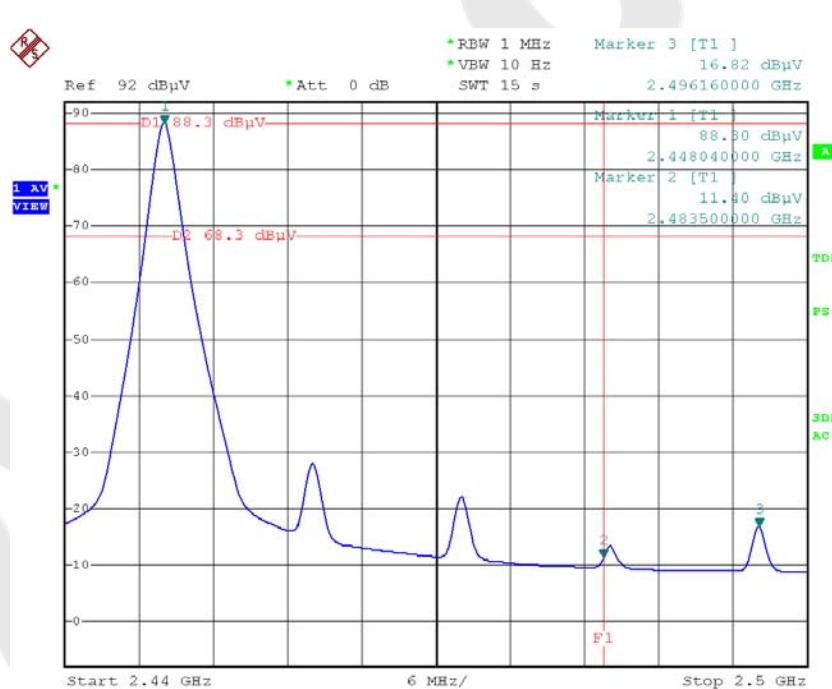
Band edges-fL



Band edges-fL-AV



Band edges-fH



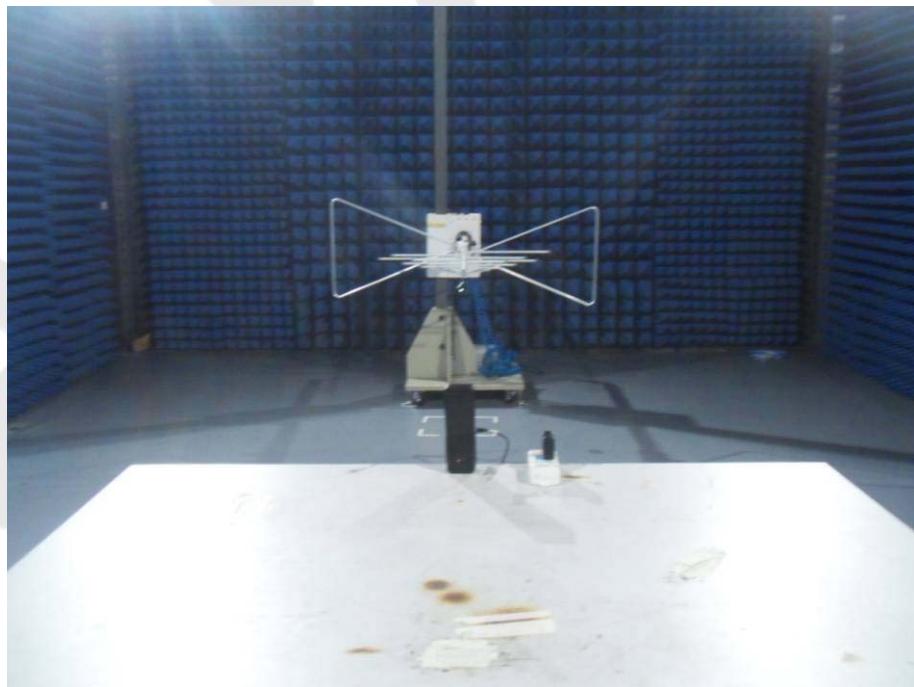
Band edges-fH-AV

6. PHOTOGRAPH

6.1. Photo of Power Line Conducted Emission Measurement



6.2. Photo of Radiation Emission Test





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APPENDIX I (External Photos)

Figure 1

The EUT-Overall View



Figure 2

The EUT-Back View



Figure 3
The EUT-Side View



Figure 4
The EUT-Side View



APPENDIX II (Internal Photos)

Figure 5

The EUT-Inside View



Figure 6

PCB of the EUT-Front View

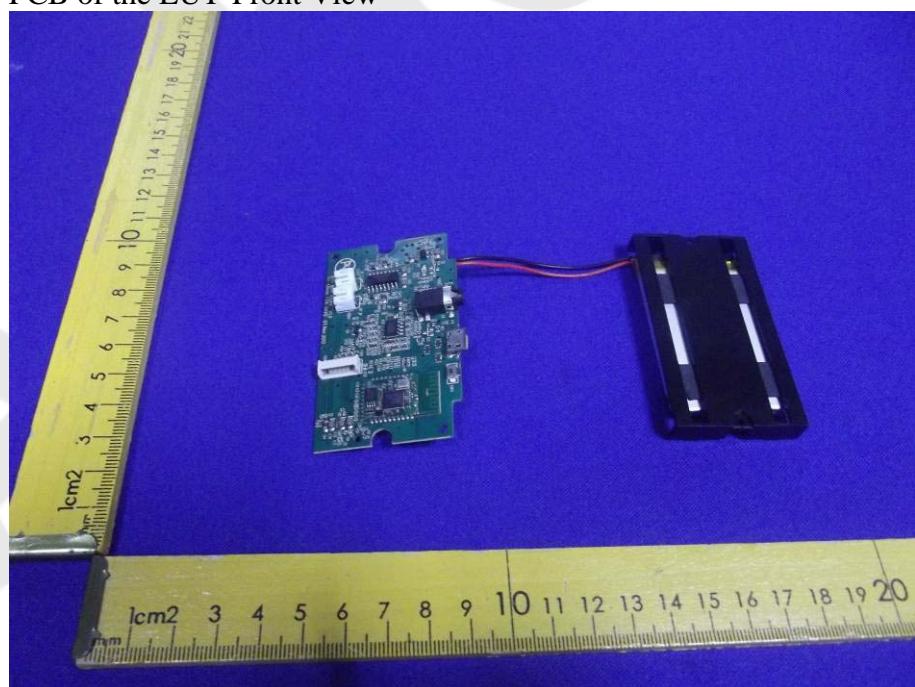


Figure 7
PCB of the EUT-Back View

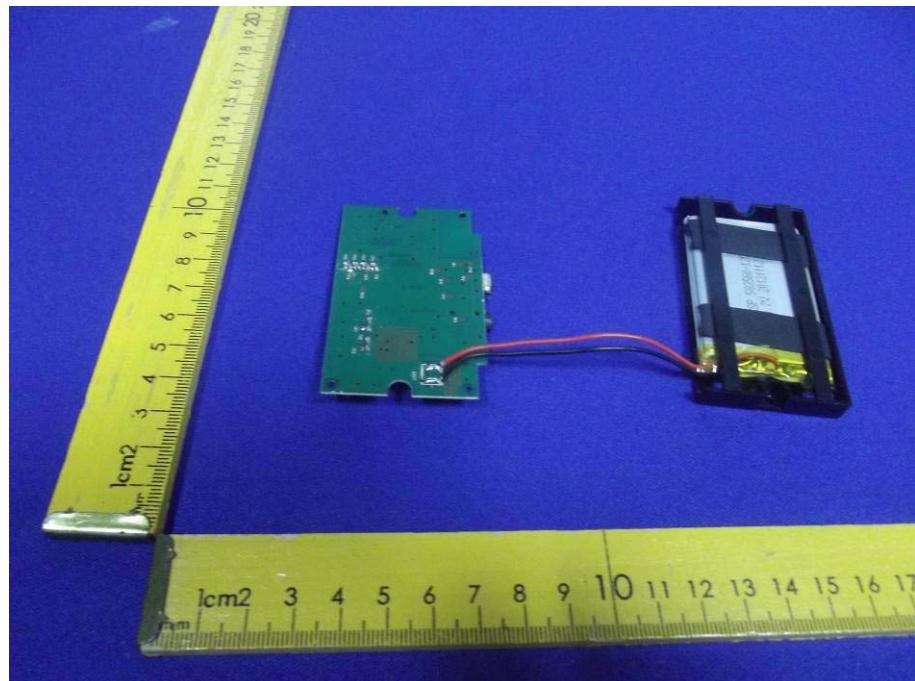


Figure 8
PCB of the EUT-Front View(BT module)

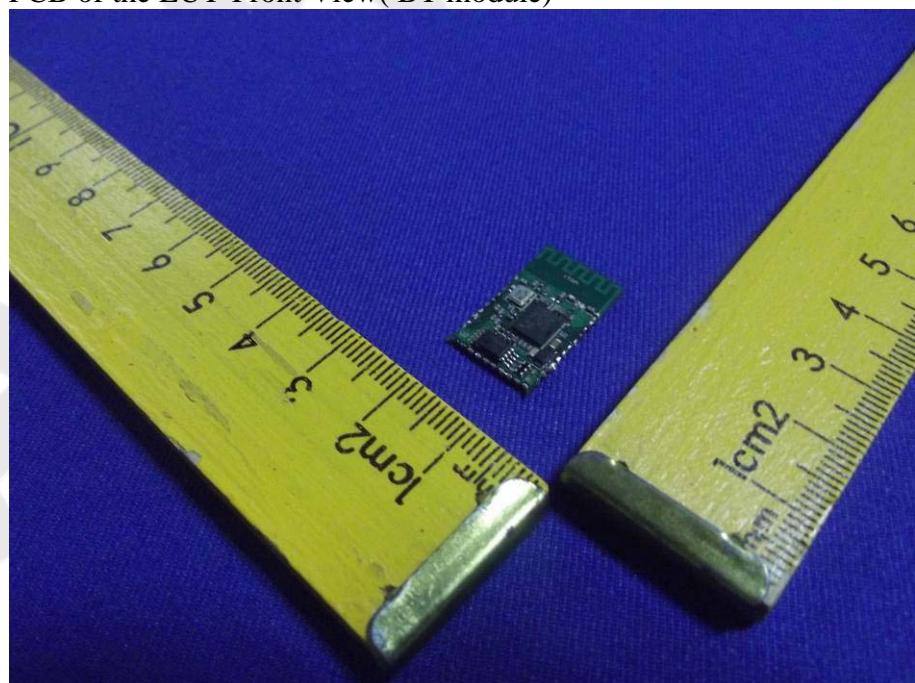


Figure 9
PCB of the EUT-Back View(BT module)

