



Date: 2009-12-18
No.: 60.870.9.016.01F

TEST REPORT

Applicant: Acoustic Arc International Ltd.
Unit 207, 2/F, Photonics Centre, No.2, Science
Park East Avenue, Hong Kong Science Park,
Shatin, N.T. Hong Kong.

Description of Samples: Model name: Solar Power Bluetooth Car Kit
Brand name: aai
Model no.: BT0820, BT-500
FCCID: VHC-AAI-BT0820-00

Date Samples Received: 2009-11-19

Date Tested: 2009-12-02 to 2009-12-16

Investigation Requested: FCC Part 15 Subpart C, Section 15.249

Conclusions: The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remarks: ----

Checked by:

Approved by:-

Prudence Poon
Project Manager
Telecom department

Victor Kwan
Manager
Telecom department

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1.0 General Details

1.1 Test Laboratory

EMC Laboratory registered by FCC with
FCC Registration Number: 607756

1.2 Applicant Details Applicant

Acoustic Arc International Ltd.
Unit 207, 2/F, Photonics Centre, No.2, Science
Park East Avenue, Hong Kong Science Park,
Shatin N.T. Hong Kong.

Manufacturer

Acoustic Arc International Ltd.
Unit 207, 2/F, Photonics Centre, No.2, Science
Park East Avenue, Hong Kong Science Park,
Shatin N.T. Hong Kong.

1.3 Equipment Under Test [EUT]

Description of EUT

Model Name:	Solar Power Bluetooth Car Kit
Brand Name:	Nil
Model Number:	BT0820, BT-500
FCCID:	VHC-AAI-BT0820-00
Rating:	5Vdc
Antenna Type:	Integral
Operated Frequency:	2402 - 2480MHz
No. of Channel:	79
Accessories and Auxiliary Equipment:	Cigarette car power charger
EUT Exercising Software:	None

As per Client Declaration, circuit design, PCB Layout, shielding and interface of BT0820 and BT-500 are identical, only the cosmetic is different. So, BT0820 is selected to be a representative model to perform all testing.

General Operation of EUT

The Equipment Under Test (EUT) is a solar wireless speaker operated at 2400 – 2483.5MHz.

It can be powered by the sun (solar), by the USB cable or by the car charger. The USB port of EUT is only for internal battery charging purpose, it cannot be communicated with computer. The BT0820 is a wireless, solar powered, hands-free device that uses Bluetooth technology to support the hands-free Bluetooth profiles.

Frequency Table (MHz)

2402.0	2403.0	2404.0	2405.0	2406.0	2407.0	2408.0
2409.0	2410.0	2411.0	2412.0	2413.0	2414.0	2415.0
2416.0	2417.0	2418.0	2419.0	2420.0	2421.0	2422.0
2423.0	2424.0	2425.0	2426.0	2427.0	2428.0	2429.0
2430.0	2431.0	2432.0	2432.0	2433.0	2434.0	2435.0
2437.0	2438.0	2439.0	2440.0	2441.0	2442.0	2443.0
2444.0	2445.0	2446.0	2447.0	2448.0	2449.0	2450.0
2451.0	2452.0	2453.0	2454.0	2455.0	2456.0	2457.0
2458.0	2459.0	2460.0	2461.0	2462.0	2463.0	2464.0
2465.0	2466.0	2467.0	2468.0	2469.0	2470.0	2471.0
2472.0	2473.0	2474.0	2475.0	2476.0	2477.0	2478.0
2479.0	2480.0					

1.4 Equipment Modification

No modification was made to the tested unit by TÜV SÜD Hong Kong Ltd.

1.5 Related Submittal(s) Grants

This is a single application of certification for this transmitter.

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2008 and ANSI C63.4: 2003 for FCC Verification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary				
Test Condition	FCC Test Requirement	Test Result		
		Pass	Failed	N/A
Field Strength of Fundamental and Harmonics	Part 15.249 (a),(e)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spurious Radiated Emission	Part 15.249 (d) Part 15.209 Part 15.205	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Out of Band Emissions	Part 15.249 (d)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bandwidth Measurement	Part 15.215 (c)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducted Emission	Part 15.207	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A - Not Applicable

3.0 Test Methodology

3.1 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. 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, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

3.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + \text{System Factor}$$
$$\text{System Factor} = AF + CF + FA - PA$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

3.3 Conducted Emissions

The EUT was placed on a non-metallic table 0.8m above the horizontal metal reference plane and 0.4m from a vertical ground plane which is connected to the horizontal metal ground plane. Meanwhile, the AC main of EUT was connected to the distance of 0.8m line impedance stabilization network (LISN) during measurement.

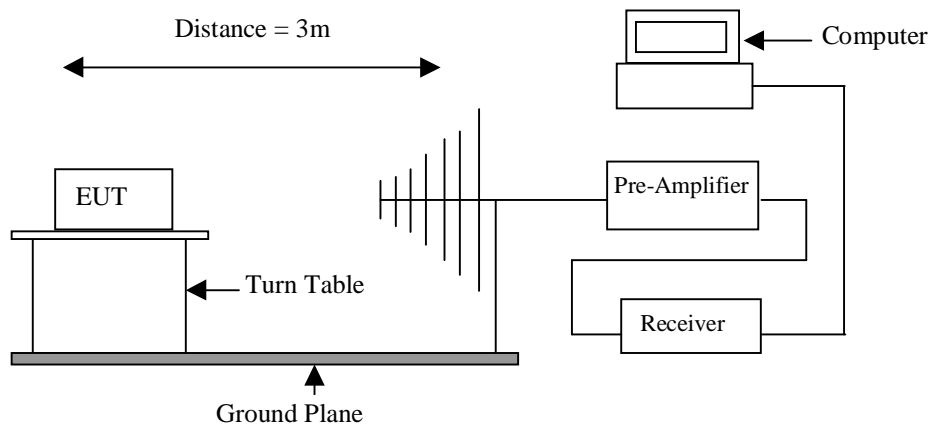
Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

4.0 Test Results

4.1 Field Strength of Fundamental and Harmonics

Test Requirement:	FCC part 15 section 15.249(a)(e)
Test Method:	ANSI C63.4:2003
Test Date:	2009-12-16
Mode of Operation:	Transmitting mode.
Detector Function:	Quasi-peak (Below 1000 MHz) Average and Peak (Above 1000 MHz)
Measurement BW:	120 kHz (Below 1000 MHz) 1 MHz (Above 1000 MHz)

Test Setup:



Results: PASS

Field Strength of Fundamental and Harmonics									
Channel	Value	Emissions Frequency	E-Field Polarity	Reading	System Factor	Field Strength at 3m	Limit	Delta to Limit	Remarks
		MHz		dB μ V/m	dB	dB μ V/m	dB μ V/m	dB μ V/m	
Lowest	PK	2402.00	H	62.00	29.30	91.30	114.0	-22.70	Fund.
	AV	2402.00		21.30	29.30	50.60	94.0	-43.40	Fund.
Middle	PK	2441.00	H	60.60	29.50	90.10	114.0	-23.90	Fund.
	AV	2441.00		19.40	29.50	48.90	94.0	-45.10	Fund.
Highest	PK	2480.00	H	61.20	29.70	90.90	114.0	-23.10	Fund.
	AV	2480.00		20.70	29.70	50.40	94.0	-43.60	Fund.
Lowest	AV	4805.00	H	0.30	34.80	35.10	54.0	-18.90	Harmonic
Middle	AV	4880.00	H	0.70	35.00	35.70	54.0	-18.30	Harmonic
Highest	AV	4958.00	H	0.70	35.20	35.90	54.0	-18.10	Harmonic

Note : - Result data graphs are shown at P.12 - 13 for reference.

Remark : - (*) Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).

- Calculated measurement uncertainty: ± 5.0 dB

Limits of Field Strength for Fundamental and Harmonics Frequency [Section 15.249 (a)]:

Fundamental Frequency [MHz]	Field Strength of Fundamental		Field Strength of Harmonics	
	[mV/m]	[dB μ V/m]	[μ V/m]	[dB μ V/m]
2400 – 2483.5	50	94	500	54

Compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

Limit Requirement under Section 15.249 (e) :

According to section 15.249 (e), for frequencies above 1000MHz, the above field strength limits is based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Limit for Radiated Emission [Section 15.209]:

Frequency (MHz)	Field Strength [μ V/m]	Field Strength [dB μ V/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

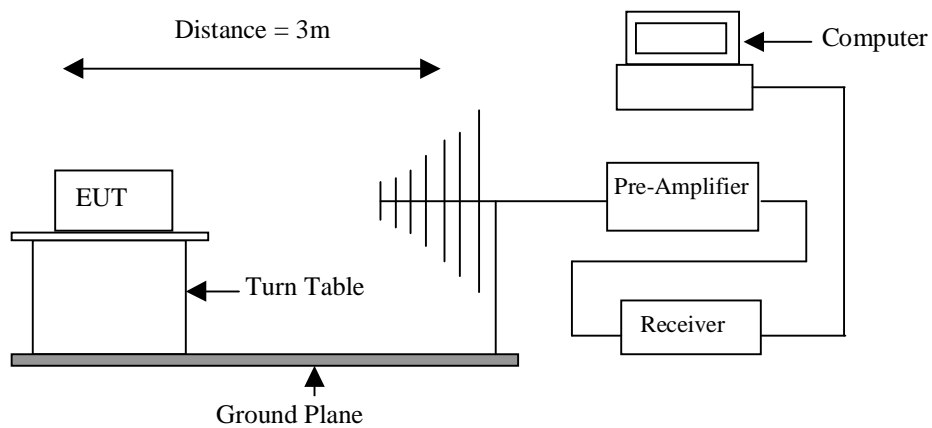
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

4.2 Spurious Radiated Emission

Test Requirement:	FCC part 15 section 15.249(d), 15.209
Test Method:	ANSI C63.4:2003
Test Date:	2009-12-16
Mode of Operation:	Transmitting mode.
Detector Function:	Quasi-peak (Below 1000 MHz) Average and Peak (Above 1000 MHz)
Measurement BW:	120 kHz (Below 1000 MHz) 1 MHz (Above 1000 MHz)

Test Setup:



Results: PASS

Spurious Radiated Emissions							
Value	Emissions Frequency	E-Field Polarity	Reading	System Factor	Field Strength at 3m	Limit	Delta to Limit
	MHz		dBμV/m	dB	dBμV/m	dBμV/m	dBμV/m
QP	75.98	V	20.05	8.55	28.60	40.00	-11.40
QP	108.64	V	15.85	10.55	26.40	43.50	-17.10
QP	923.12	V	0.40	30.10	30.50	46.00	-15.50
QP	146.93	H	10.85	12.65	23.50	43.50	-20.00
QP	327.83	H	7.45	14.95	22.40	46.00	-23.60
QP	935.74	H	-0.50	30.90	30.40	46.00	-15.60

Note: - No further spurious emissions found between 30MHz and lowest internal used / generated frequency.
- Result data graphs are shown at P.12 - 13 for reference.

Remark : - (*) Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).
- Calculated measurement uncertainty: ± 5.0 dB.

Limit of Outside of the Specified Bands [Section 15.249 (d)]

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.

Limit for Radiated Emission [Section 15.209]:

Frequency (MHz)	Field Strength [μ V/m]	Field Strength [dB μ V/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

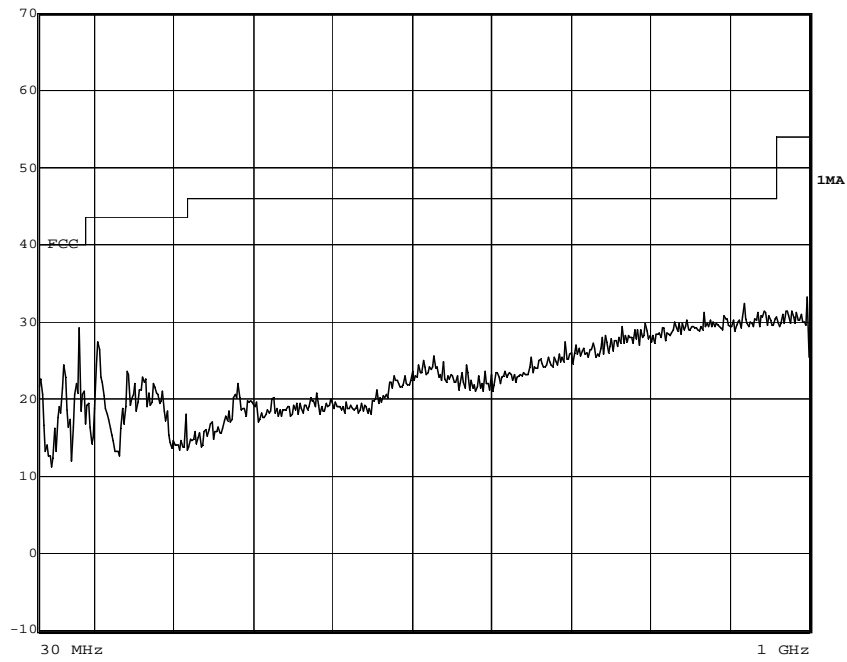
The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Vertical



Att 0 dB AUTO
Preamp INPUT 2

Det MA/QP Trd 3142B-V
ResBW 120 kHz
Meas T 100 ms Unit dBμV

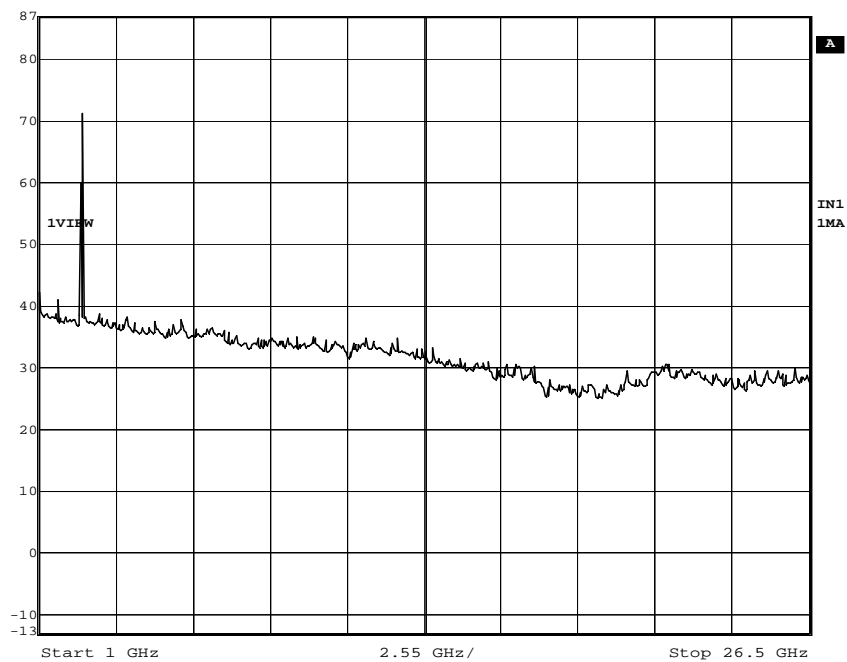


Date: 16.DEC.2009 15:42:50



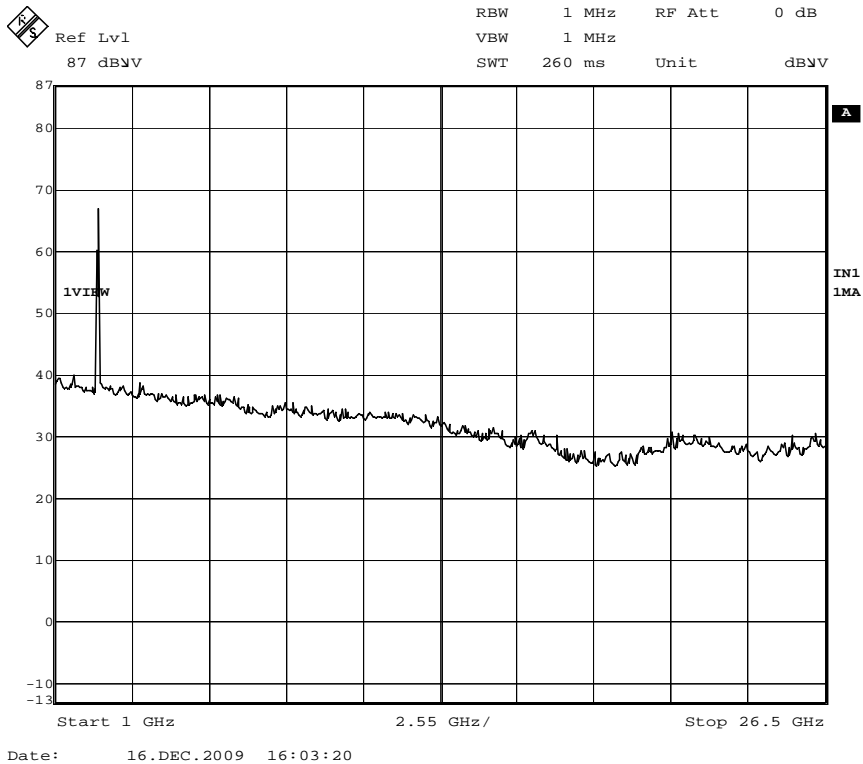
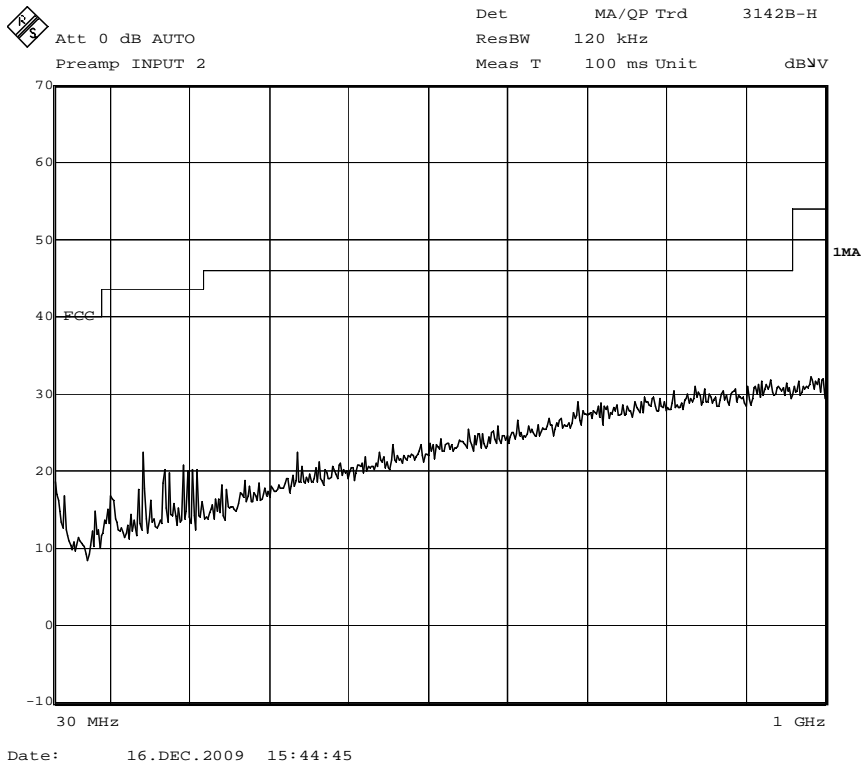
Ref Lvl
87 dBμV

RBW 1 MHz RF Att 0 dB
VBW 1 MHz
SWT 260 ms Unit dBμV



Date: 16.DEC.2009 16:02:20

Horizontal



4.3 Out of Band Emissions

Test Requirement:	FCC part 15 section 15.249 (d)
Test Method:	ANSI C63.4:2003
Test Date:	2009-12-04
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

Results: PASS

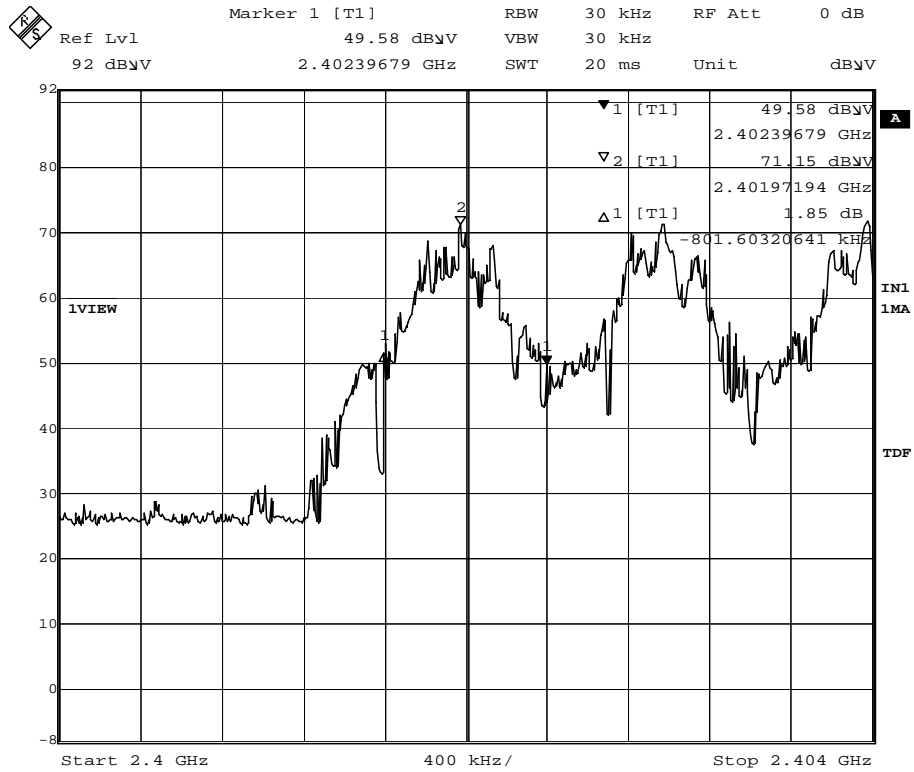
Refer to the data graph, the lower and higher edge of the specified frequency bands fulfill the general radiated emission limits in section 15.209. Therefore, the EUT meets the requirement of section 15.249 (d).

Limit for Out of Band Emissions [Section 15.249 (d)]

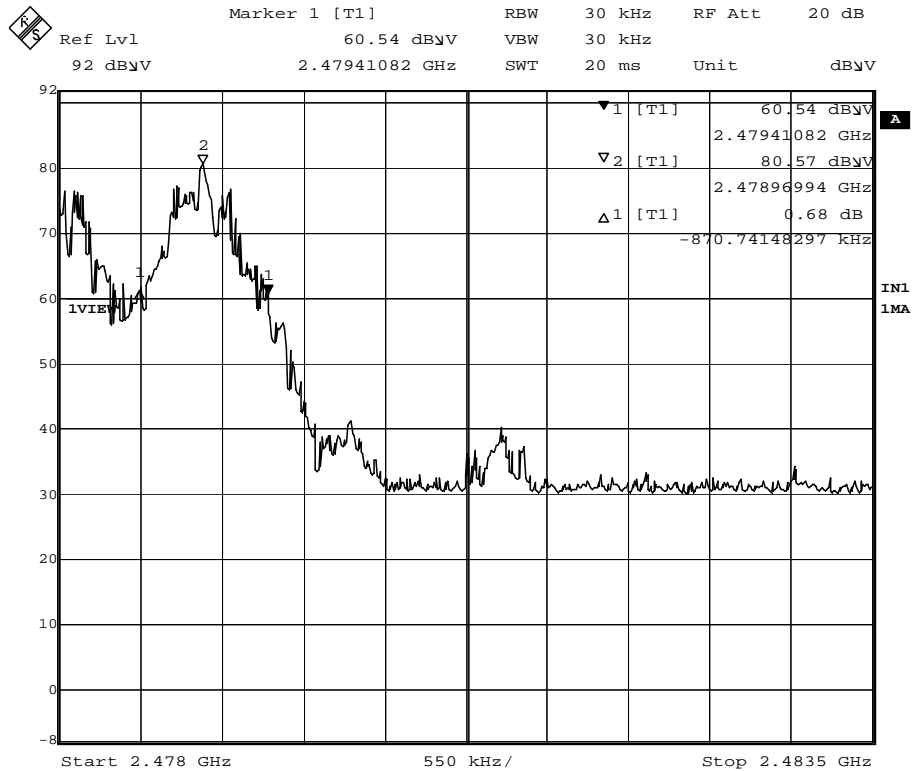
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

Test Result: Result data graph is shown at the next pages for reference.

Lowest Channel



Highest Channel



4.4 Bandwidth Measurement

Test Requirement:	FCC part 15 section 15.215 (c)
Test Method:	ANSI C63.4:2003
Test Date:	2009-12-04
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

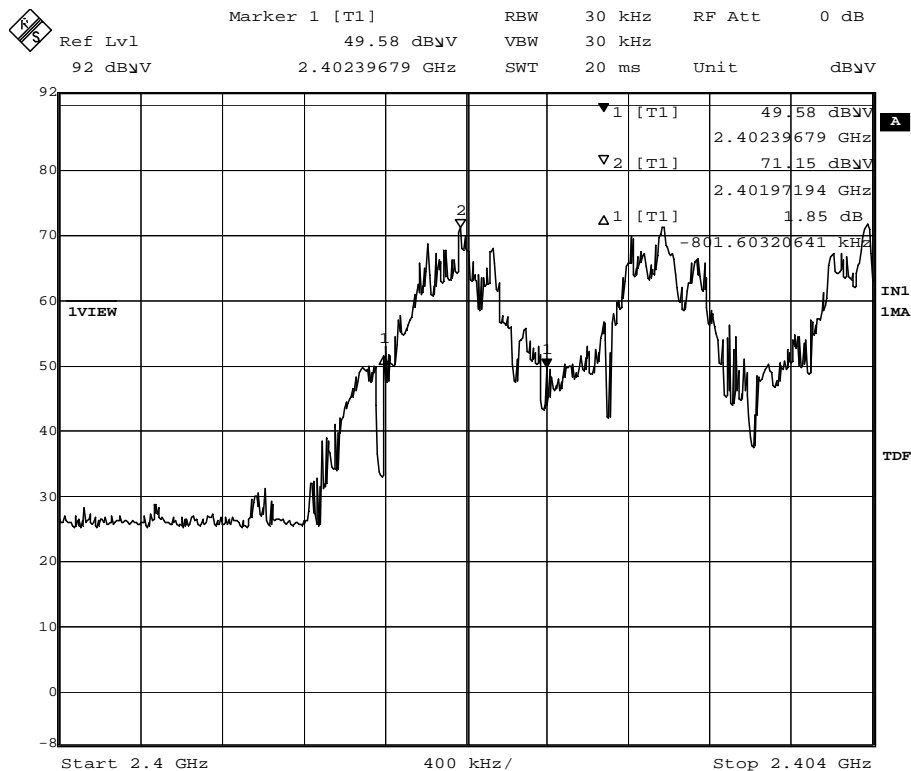
Results: PASS

Refer to the data graph, the 20dB points of Lowest Channel, Middle Channel and Highest Channel are 801kHz, 861kHz and 870kHz. All channels within the operation bandwidth when equipment is operated. Therefore, the EUT meets the requirement of section 15.215(c).

Limit for Bandwidth [Section 15.215 (c)]

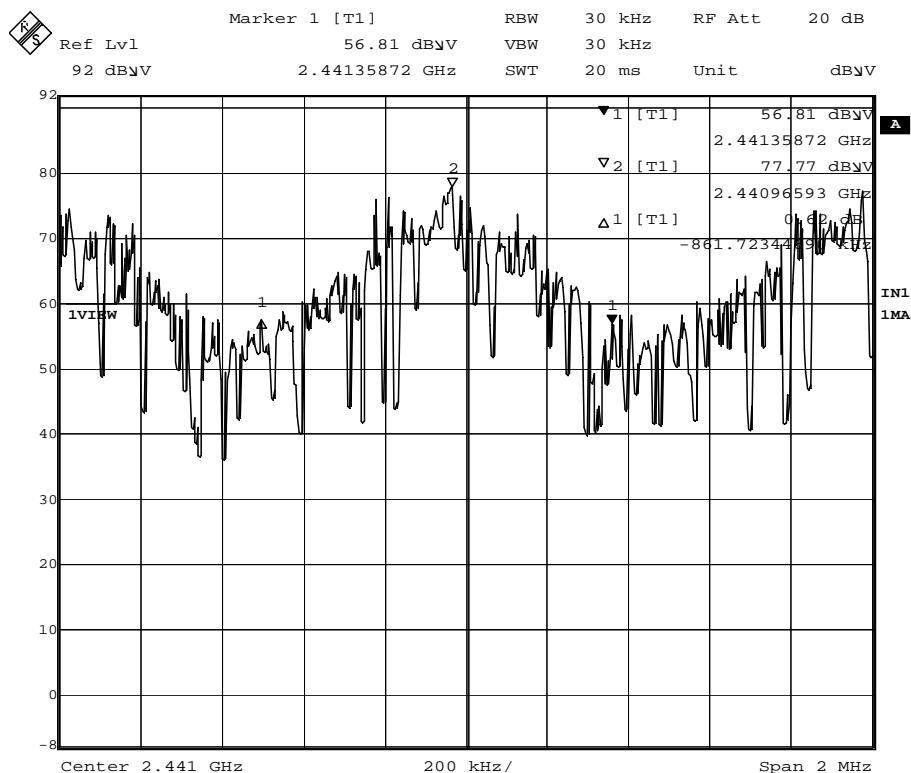
The 20dB bandwidth of the emission shall be within the frequency band designated in the rule section under which the equipment is operated.

Test Result: Result data graph is shown at the next pages for reference.



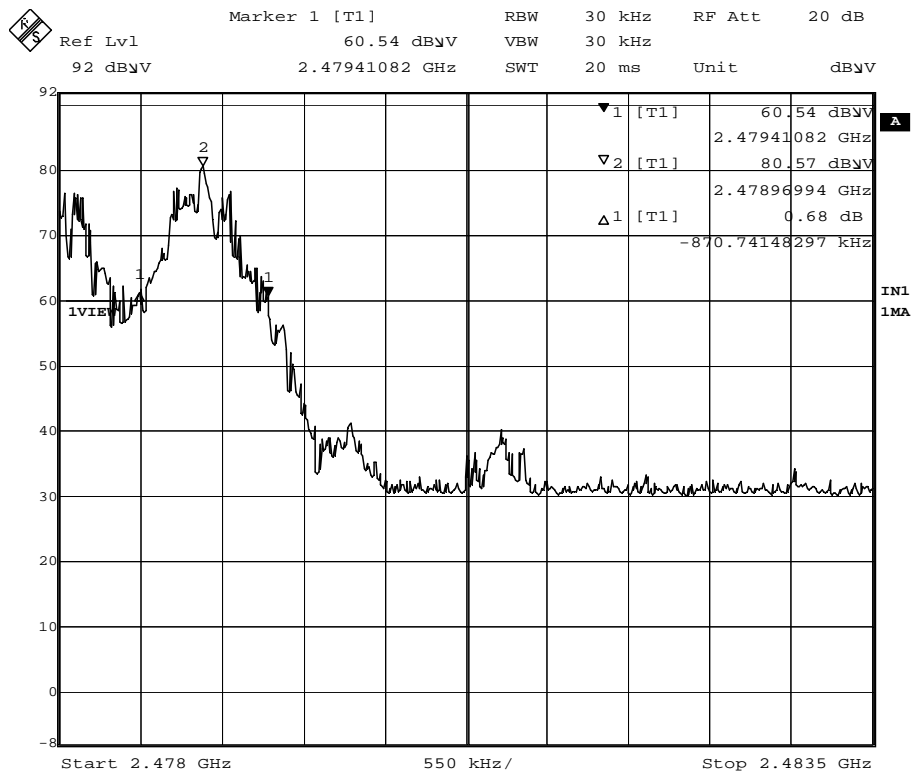
Date: 4.DEC.2009 12:02:37

Lowest Channel – 20 dB point, Bandwidth 801 kHz



Date: 4.DEC.2009 13:42:23

Middle Channel – 20 dB point, Bandwidth 861 kHz



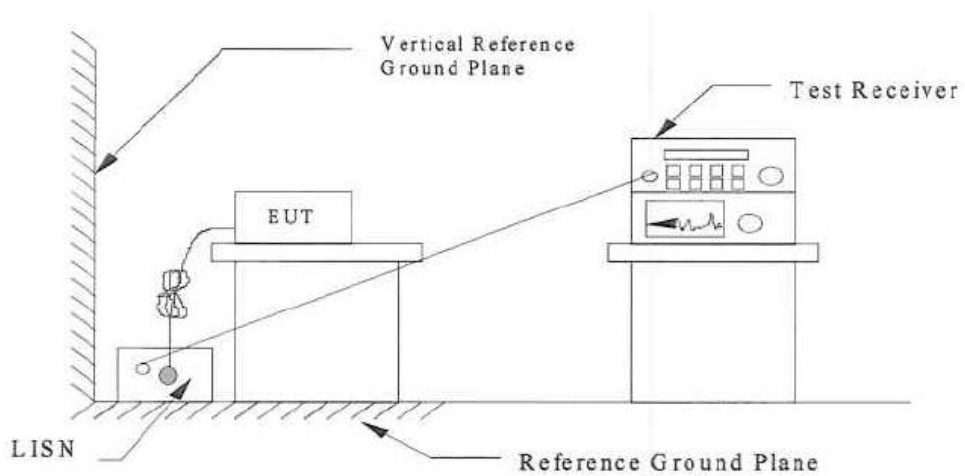
Date: 4.DEC.2009 13:52:28

Highest Channel – 20 dB point, Bandwidth 870 kHz

4.5 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC part 15 Section 15.207 Class B
Test Method:	ANSI C63.4:2003
Test Date:	2010-02-10
Mode of Operation:	Transmitting with Charging mode.
Detector Function:	Quasi-peak, average
Measurement BW:	9 kHz

Test Setup:



Results: PASS

Conducted Emissions					
Frequency (MHz)	Detector (QP/AV)	Phase	Result (dB μ V)	Limit (dB μ V)	Margin
0.160	QP	N	44.40	66.00	-21.60
0.310	QP	N	36.20	50.00	-13.80
0.450	QP	N	26.60	57.00	-30.40
1.955	QP	N	30.50	56.00	-25.50
2.415	QP	N	27.90	56.00	-28.10
10.435	QP	N	26.60	60.00	-33.40
18.175	QP	N	20.10	60.00	-39.90
1.245	QP	L	25.10	56.00	-30.90
4.765	QP	L	21.70	56.00	-34.30
8.980	QP	L	25.30	60.00	-34.70
1.915	AV	N	21.10	46.00	-24.90
2.415	AV	N	22.20	46.00	-23.80
3.980	AV	N	20.40	46.00	-25.60
10.440	AV	N	19.80	50.00	-30.20
18.330	AV	N	14.00	50.00	-36.00
0.160	AV	L	27.10	56.00	-28.90
0.340	AV	L	26.60	49.00	-22.40
0.730	AV	L	15.80	46.00	-30.20
1.180	AV	L	19.90	46.00	-26.10
8.980	AV	L	20.30	50.00	-29.70

Note : - Result data graph is attached at the next pages for reference.

Remark: - The EUT is connected to AC/DC Adaptor during testing.

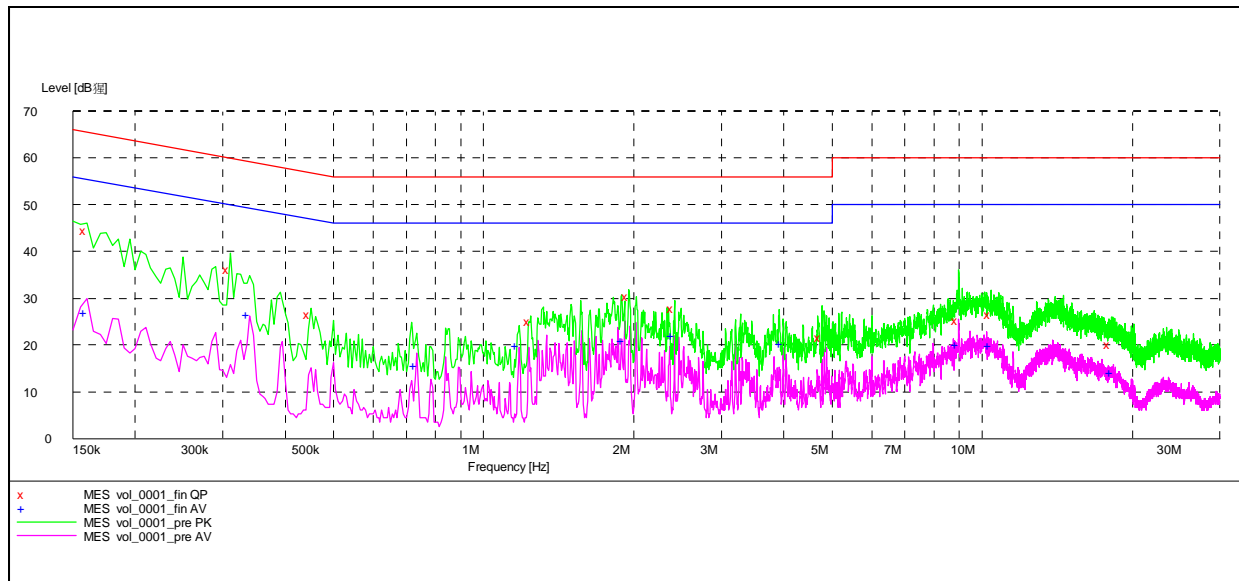
- Calculated measurement uncertainty: ± 2.8 dB.

Limits for Conducted Emission [Section 15.207]:

Frequency Range [MHz]	Quasi-Peak Limit [dB μ V]	Average Limit [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Conducted Emissions Result



Phase – L and N

5.0 List of Measurement Equipment

Radiated Emission, Bandwidth Measurement and Out of Band Emissions

Description	Manufacturer	Model no.	Serial no.	Last cal	Cal due
Anechoic Chamber	ETS-Linggren	FACT-3	N/A	01 Dec 08	01 Dec 11
Test Receiver	R & S	ESIB40	100248	27 Sep 09	27 Sep 10
Biconilog Antenna	EMCO	3142B	1671	24 Jan 08	24 Jan 11
Horn Antenna	EMCO	3115	4032	02 Sep 09	02 Sep 12
Loop Antenna	EMCO	6502	1189-2424	26 Jul 09	26 Jul 11

Conducted Emission

Description	Manufacturer	Model no.	Serial no.	Last cal	CAL due
Test Receiver	R & S	ESIB7	100072	29 Jun 09	29 Jun 10
LISN	EMCO	4825/2	1193	15 May 09	15 May 10

Ancillary Equipment

Description	Model no.	FCC ID	Remarks
DELL COMPUTER	DMC	N/A	N/A
DELL MONITOR	E551C	ARSCM356N	RESOLUTION:800x600(DURING TESTING) 1.0M UNSHIEDED POWER CORD CONNECTED TO THE COMPUTER 2.8M SHIEDED CABLE CONNECTED TO THE COMPUTER
AST KEYBOARD	KB-2923	N/A	1.8M SHIEDED COILED CABLE CONNECTED TO THE COMPUTER
LOGITECH MOUSE	M-SAW90A	N/A	2.4M UNSHIEDED CABLE CONNECTED TO THE COMPUTER
PARALLEL PRINTER	HP930c	N/A	1.8M UNSHIEDED POWER CORD 2.8M SHIEDED CABLE (BUNDLED TO 1M) CONNECTED TO THE COMPUTER

Remarks:

CM Corrective Maintenance
N/A Not Applicable or Not Available