



Date: 2009-11-23  
No.: 60.870.9.018.01F

## TEST REPORT

**Applicant:** Atom Industrial Limited.  
RM 609, 6/F., Kwong Sang Hong Centre,  
No.151-153 Hoi Bun Road, Kwun Tong,  
Kowloon, Hong Kong.

**Description of Samples:** Model name: Wireless Headphone System  
Brand name: Nil  
Model no.: AWD204 (Transmitter)  
FCCID: NOY-AWD204TX


**Date Samples Received:** 2009-11-09


**Date Tested:** 2009-11-10 to 2009-11-18

**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:   
Prudence Poon  
Project Manager  
Telecom department

Approved by:-   
Victor Kwan  
Manager  
Telecom department

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## **1.0**    **General Details**

### **1.1**    **Test Laboratory**

Hong Kong Productivity Council  
HKPC Building, 78 Tat Chee Avenue, Kowloon Tong,  
Hong Kong

Registration Number: 90656

### **1.2**    **Applicant Details** **Applicant**

**Atom Industrial Ltd.**  
RM 609, 6/F., Kwong Sang Hong Centre,  
No.151-153 Hoi Bun Road, Kwun Tong,  
Kowloon, Hong Kong.

#### **Manufacturer**

**Atom Industrial Ltd.**  
RM 609, 6/F., Kwong Sang Hong Centre,  
No.151-153 Hoi Bun Road, Kwun Tong,  
Kowloon, Hong Kong.

### 1.3 Equipment Under Test [EUT]

#### Description of EUT

Model Name:	Wireless Headphone System
Brand Name:	Nil
Model Number:	AWD204 (Transmitter)
FCCID:	NOY-AWD204TX
Rating:	12.0 VDC, 200mA ( AC/DC Adaptor )
Antenna Type:	Integral
Operated Frequency:	912-914MHz
No. of Channel:	3
Accessories and Auxiliary Equipment:	None
EUT Exercising Software:	None

#### General Operation of EUT

The Equipment Under Test (EUT) is an audio transmitter operated at 912 - 914 MHz which transmits the audio signal to its associated receiver.

### 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**

<b>EMISSION Results Summary</b>				
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: 90656.

#### **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:

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

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.

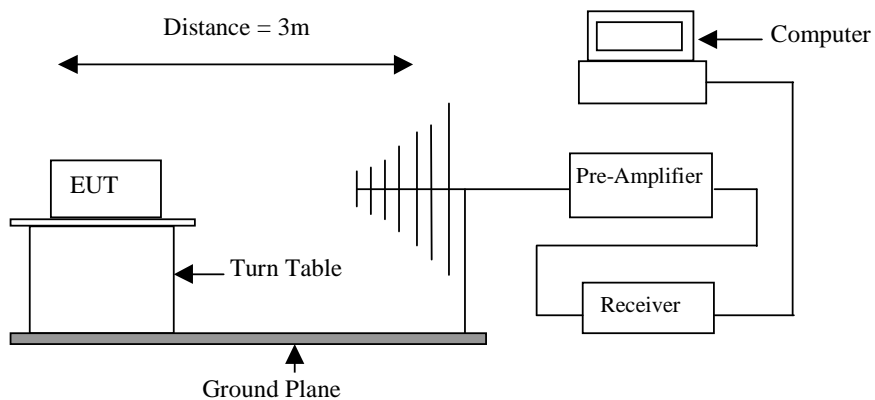
Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

## **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:	2009-11-16
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 $\mu$ V/m	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m	
1	QP	912.50	V	64.13	23.97	88.10	94	-5.90	Fund.
1	QP	912.50	H	59.43	23.97	83.40	94	-10.60	Fund.
3	QP	913.50	V	64.52	23.98	88.50	94	-5.50	Fund.
3	QP	913.50	H	59.32	23.98	83.30	94	-10.70	Fund.
1	AV	1825.00	V	37.85	-5.05	32.80	54	-21.20	Harmonic
	PK	1825.00		44.05	-5.05	39.00	74	-35.00	Harmonic
1	AV	2737.50*	H	39.41	-1.71	37.70	54	-16.30	Harmonic
	PK	2737.50*		45.11	-1.71	43.40	74	-30.60	Harmonic
1	AV	3650.00*	V	32.88	0.92	33.80	54	-20.20	Harmonic
	PK	3650.00*		43.48	0.92	44.40	74	-29.60	Harmonic
3	AV	1827.00	V	37.85	-5.05	32.80	54	-21.20	Harmonic
	PK	1827.00		43.75	-5.05	38.70	74	-35.30	Harmonic
3	AV	2740.50*	V	39.61	-1.71	37.90	54	-16.10	Harmonic
	PK	2740.50*		44.51	-1.71	42.80	74	-31.20	Harmonic
3	AV	3654.00*	H	32.68	0.92	33.60	54	-20.40	Harmonic
	PK	3654.00*		43.18	0.92	44.10	74	-29.90	Harmonic

Note : - Result data graphs are shown at P.12 - 19 for reference.

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

- Calculated measurement uncertainty:  $\pm 5.0$ 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 $\mu$ V/m]	[ $\mu$ V/m]	[dB $\mu$ V/m]
902 - 928	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 [ $\mu$ V/m]	Field Strength [dB $\mu$ V/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

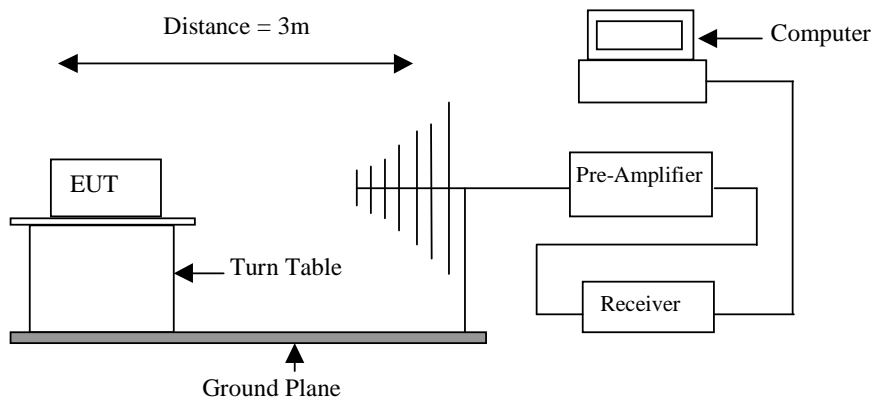
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

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:	2009-11-16
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**

<b>Spurious Radiated Emissions</b>								
Channel	Value	Emissions Frequency	E-Field Polarity	Reading	System Factor	Field Strength at 3m	Limit	Delta to Limit
		<b>MHz</b>		<b>dBμV/m</b>	<b>dB</b>	<b>dBμV/m</b>	<b>dBμV/m</b>	<b>dBμV/m</b>
1	QP	108.00*	V	20.05	10.55	30.60	43.50	-12.90
1	QP	135.00*	V	14.33	12.07	26.40	43.50	-17.10
1	QP	288.00	V	6.71	13.99	20.70	46.00	-25.30
1	QP	948.00	V	14.36	24.04	38.40	46.00	-7.60
1	QP	108.00*	H	20.75	10.55	31.30	43.50	-12.20
3	QP	108.00*	V	18.45	10.55	29.00	43.50	-14.50
3	QP	153.00*	V	15.33	12.07	27.40	43.50	-16.10
3	QP	949.60	V	13.77	24.03	37.80	46.00	-8.20
3	QP	108.00*	H	20.25	10.55	30.80	43.50	-12.70

Note: - No further spurious emissions found between 30MHz and lowest internal used / generated frequency.  
- Result data graphs are shown at P.12 - 19 for reference.

Remark : - ( \* ) Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).  
- Calculated measurement uncertainty:  $\pm 5.0\text{dB}$ .

#### **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.

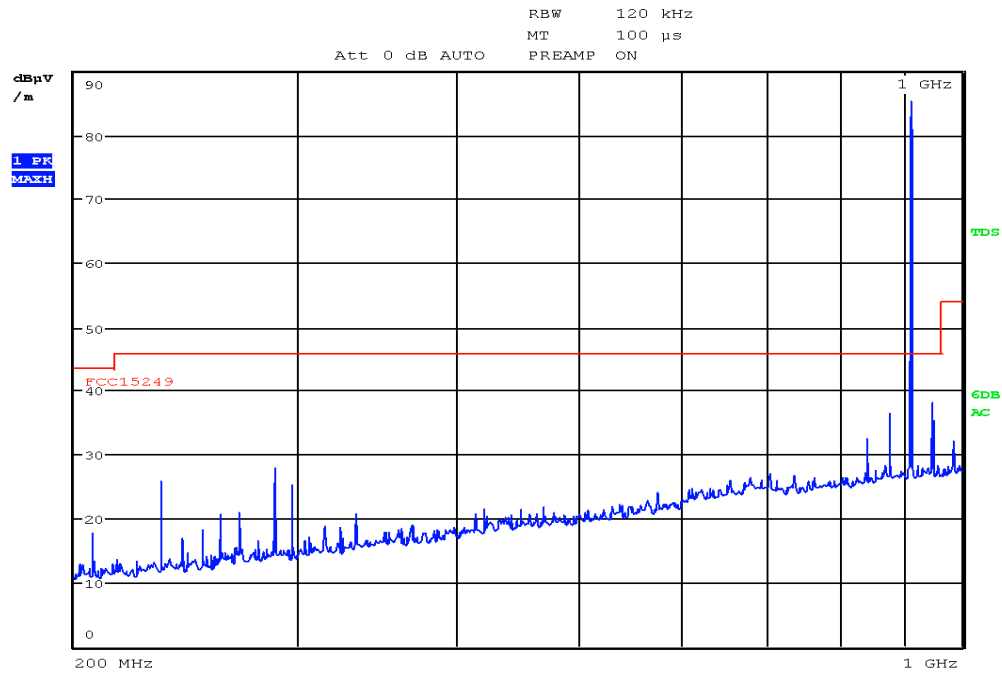
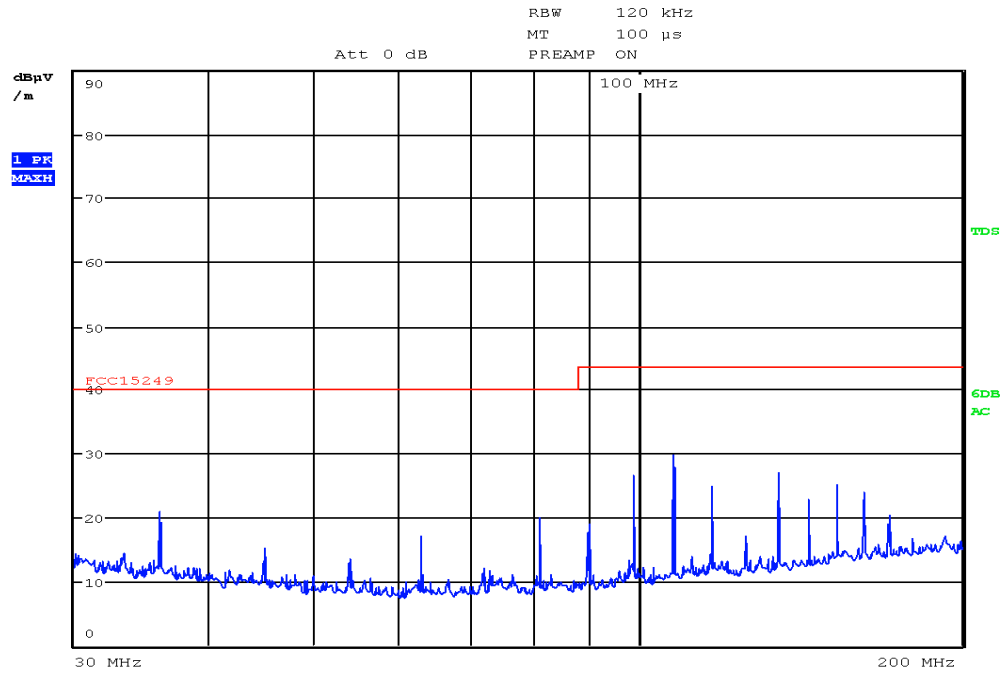
#### **Limit for Radiated Emission [ Section 15.209 ]:**

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

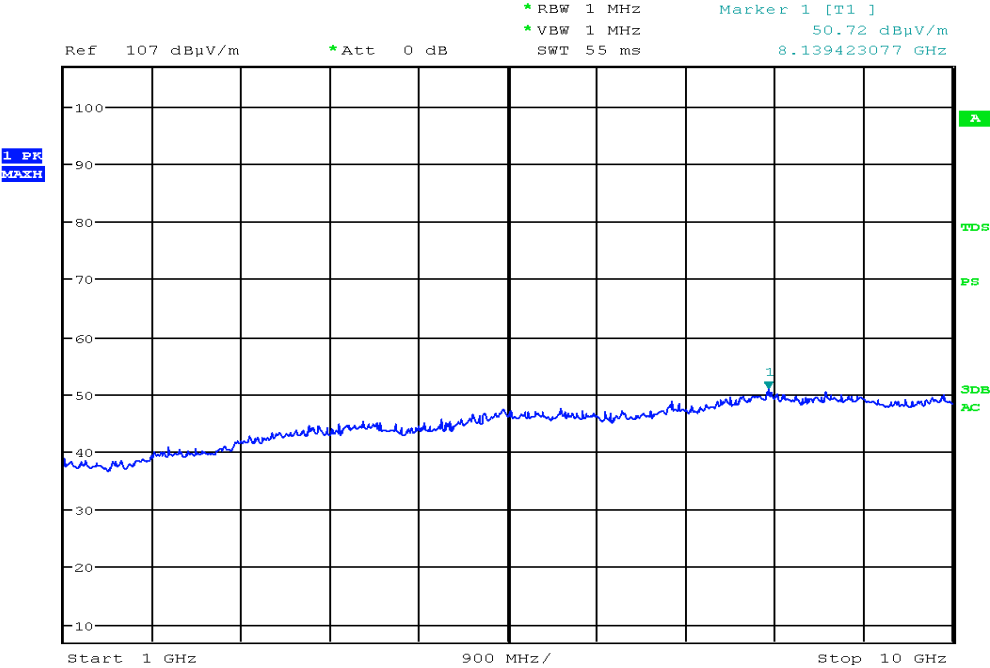
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

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.

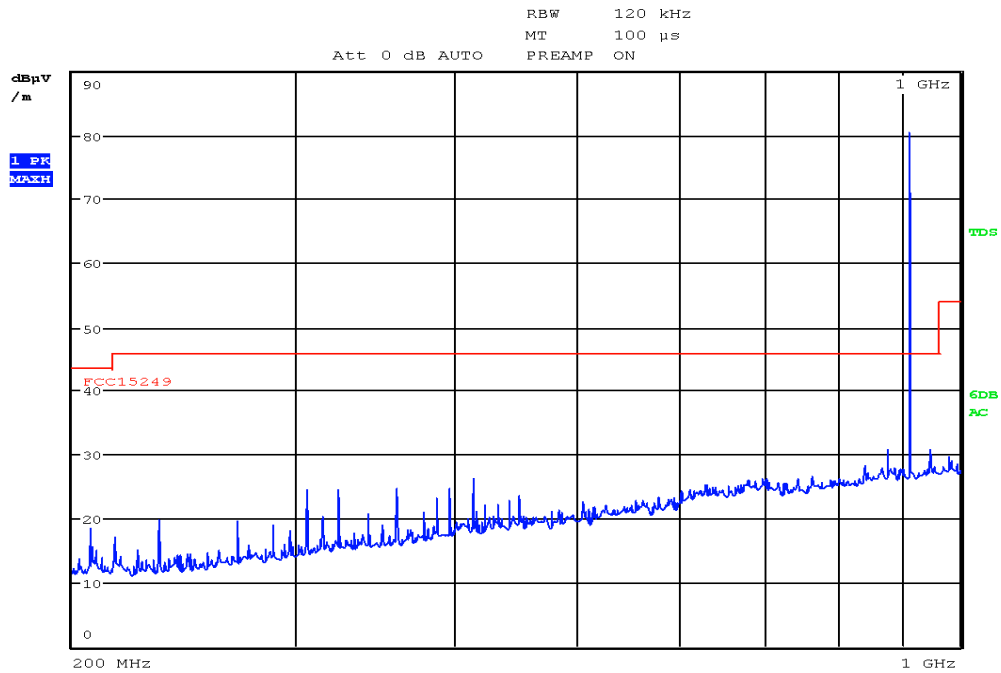
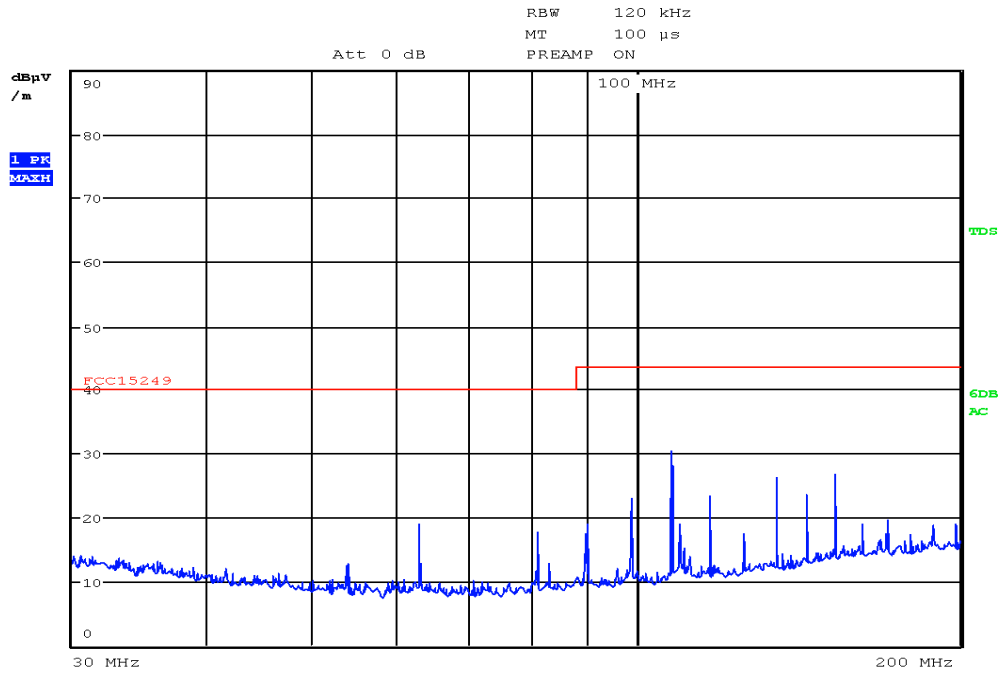
# **Vertical Channel 1**



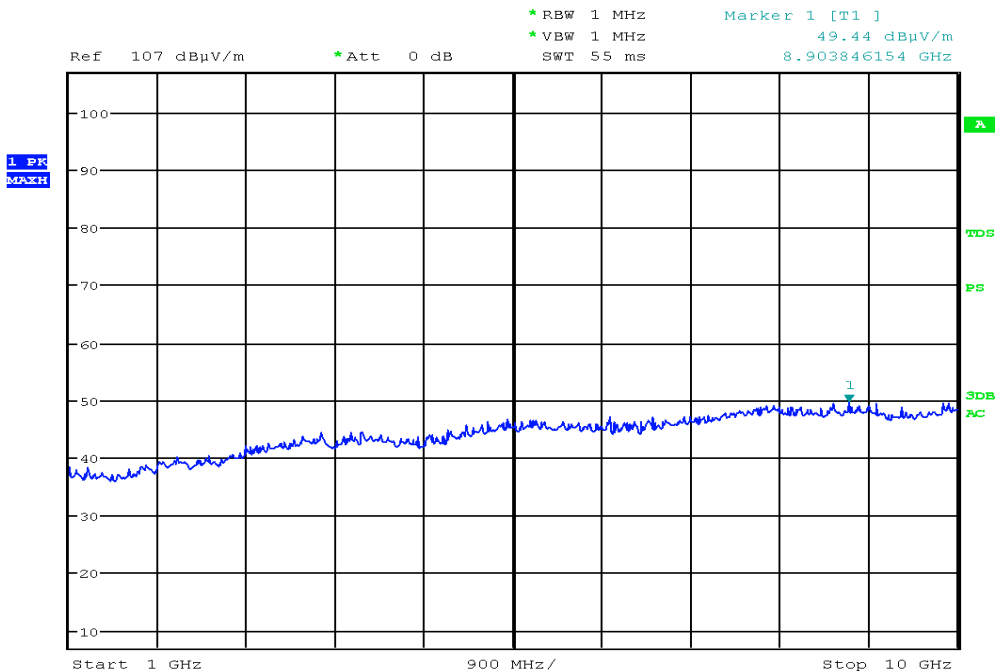
Vertical Channel 1



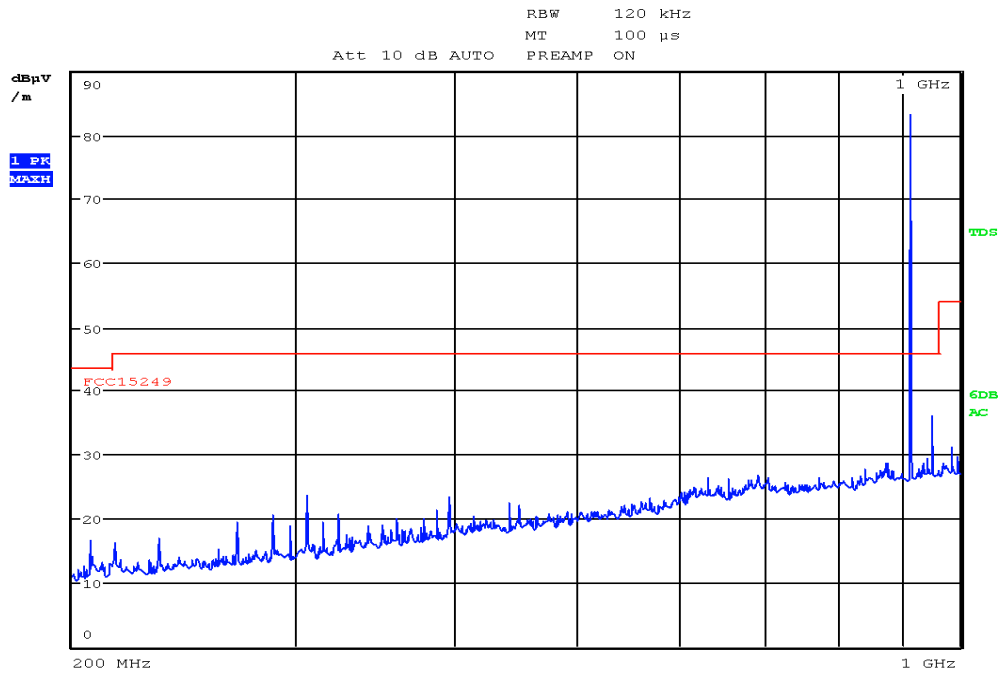
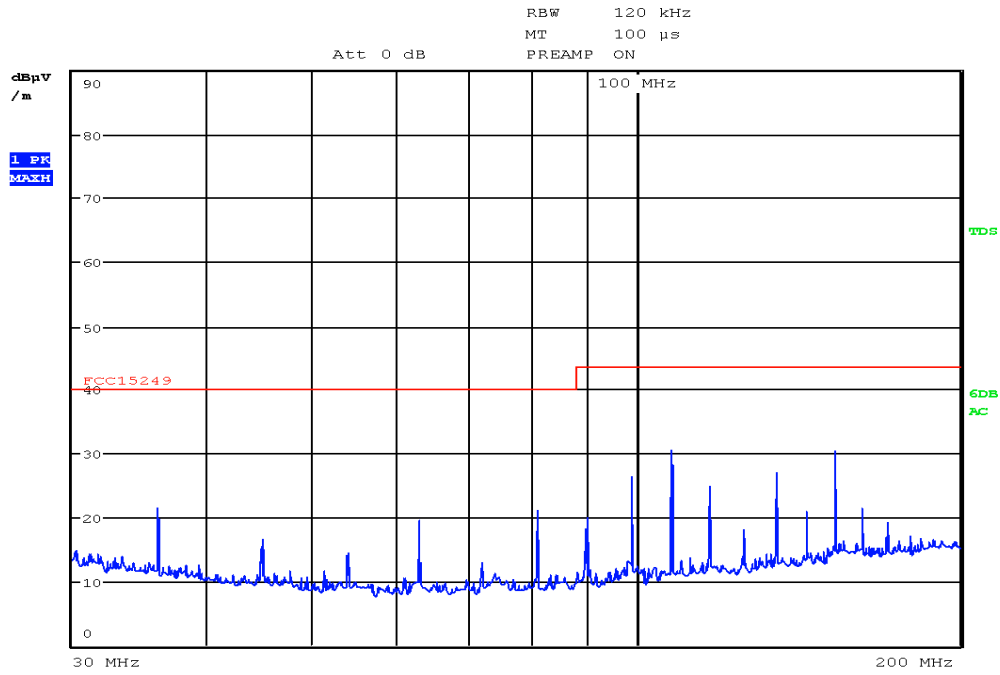
# Horizontal Channel 1



Horizontal Channel 1

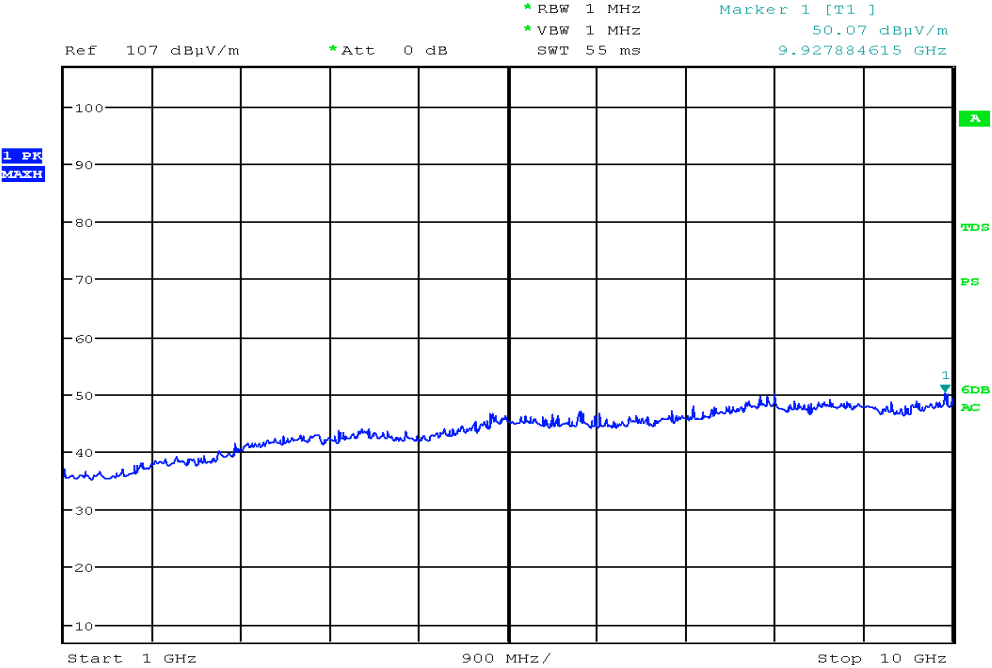


### Vertical Channel 3

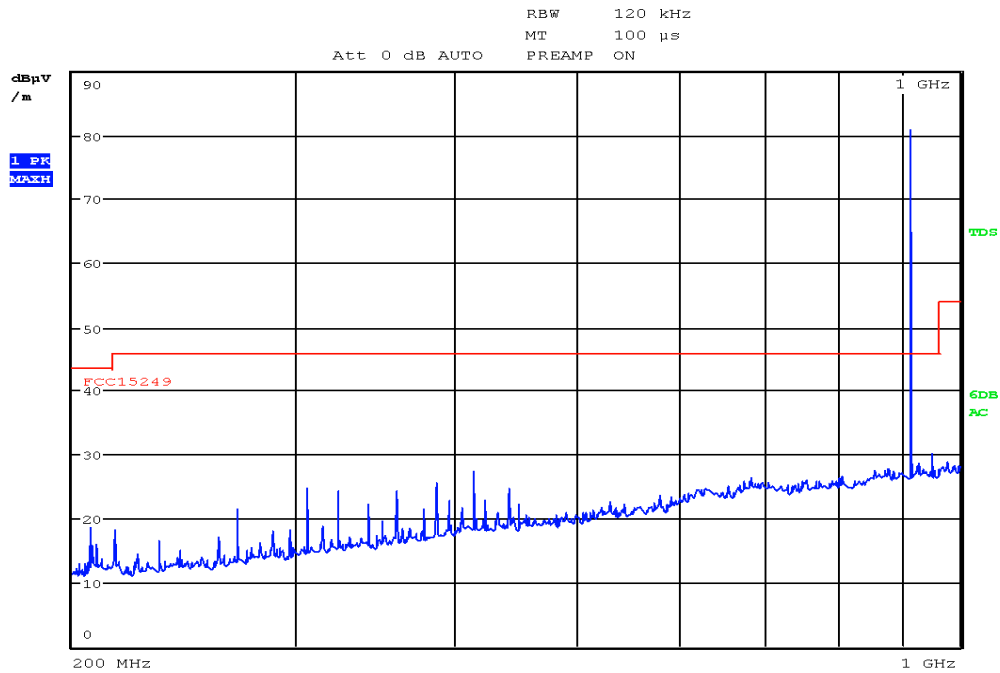
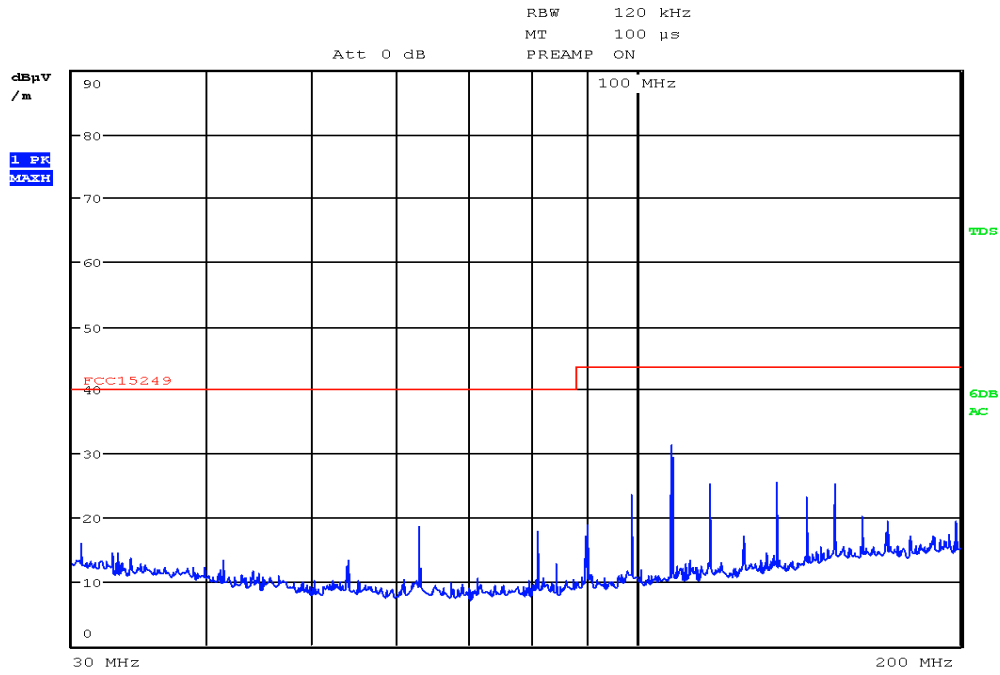




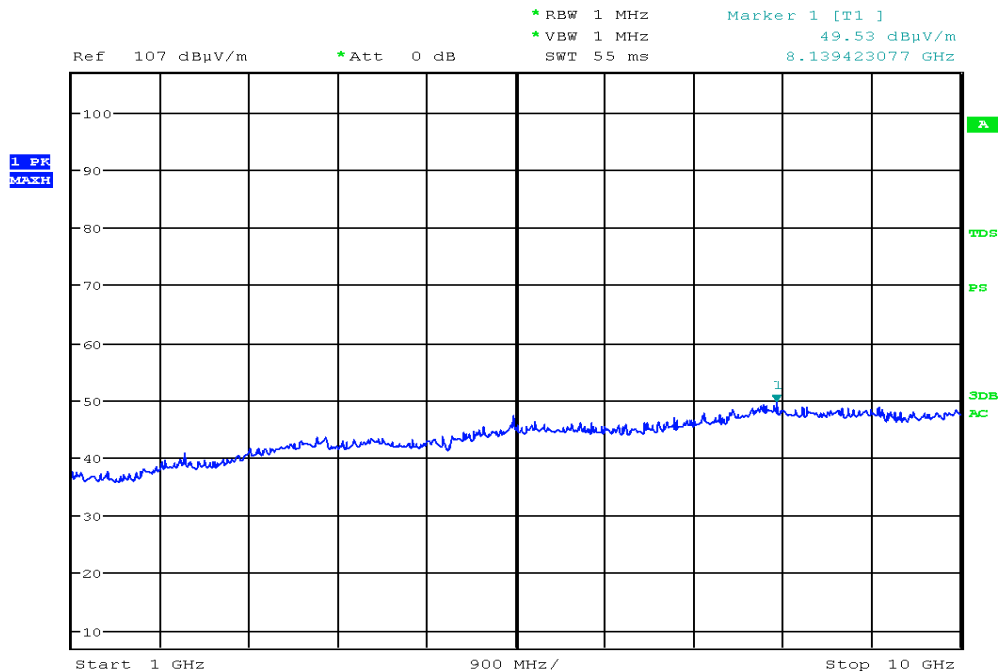
Vertical Channel 3



### Horizontal Channel 3



Horizontal Channel 3



#### 4.3 Out of Band Emissions

Test Requirement:	FCC part 15 section 15.249 (d)
Test Method:	ANSI C63.4:2003
Test Date:	2009-11-16
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

#### Results: PASS

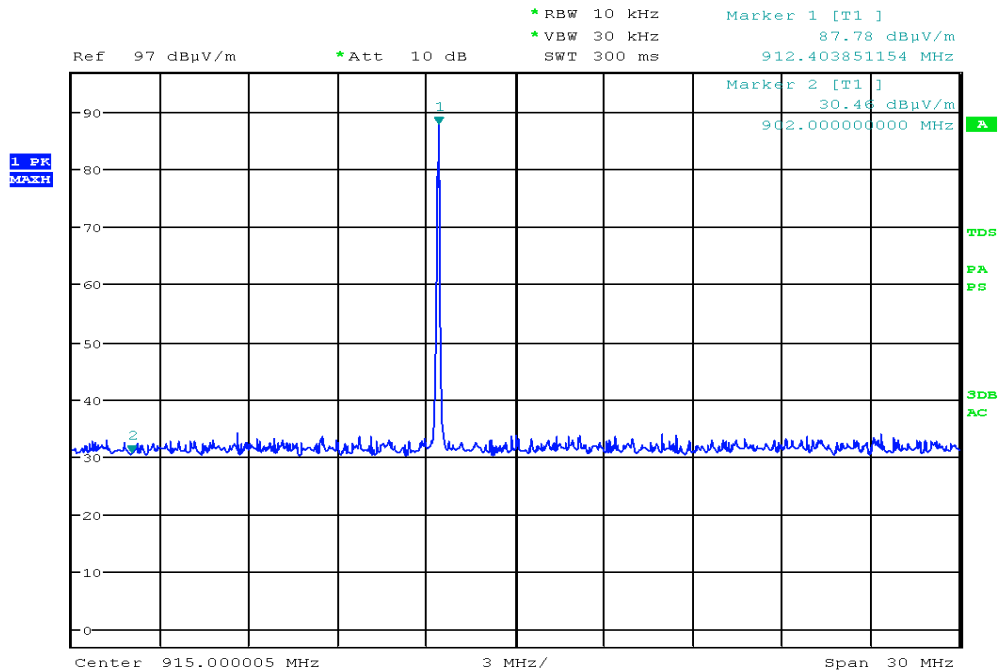
Refer to the data graph, the lower and higher edge of the specified frequency bands fulfill the general radiated emission limits in section 15.209. Therefore, the EUT meets the requirement of section 15.249 (d).

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

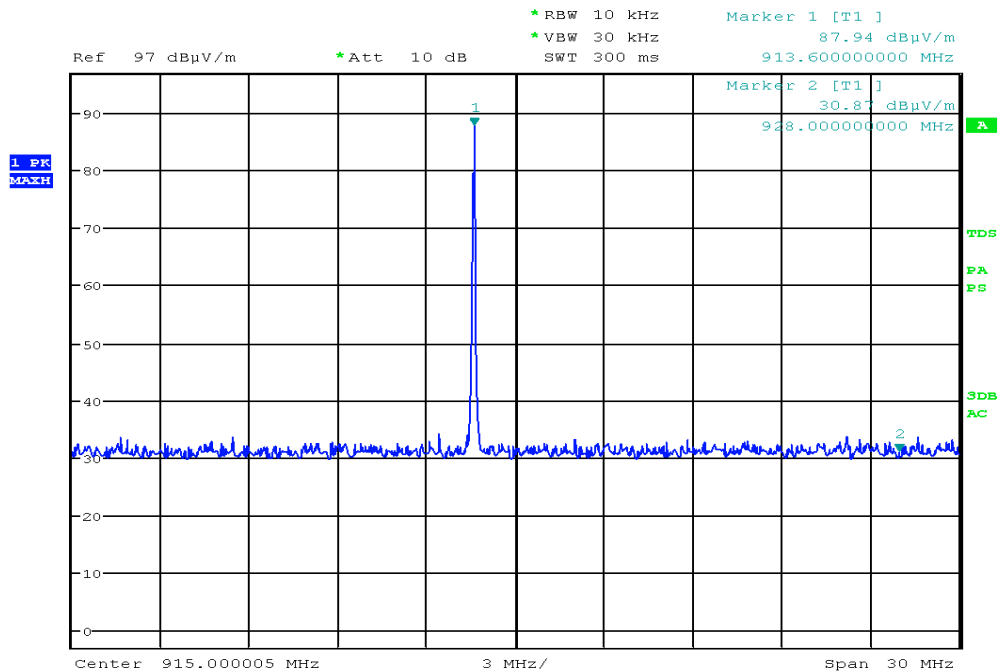
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

**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:	2009-11-18
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

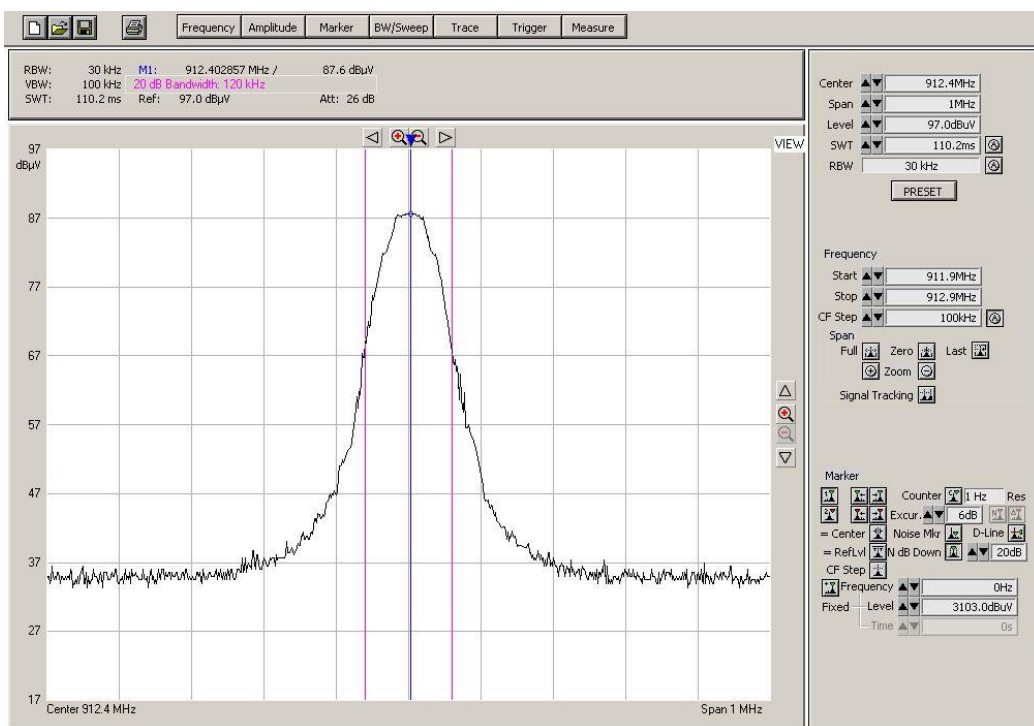
#### Results: PASS

Refer to the data graph, the 20dB points of Channel 1, Channel 2 and Channel 3 are 120kHz, 125.7kHz and 130kHz. All channels within the operation bandwidth when equipment is operated. Therefore, the EUT meets the requirement of section 15.215(c).

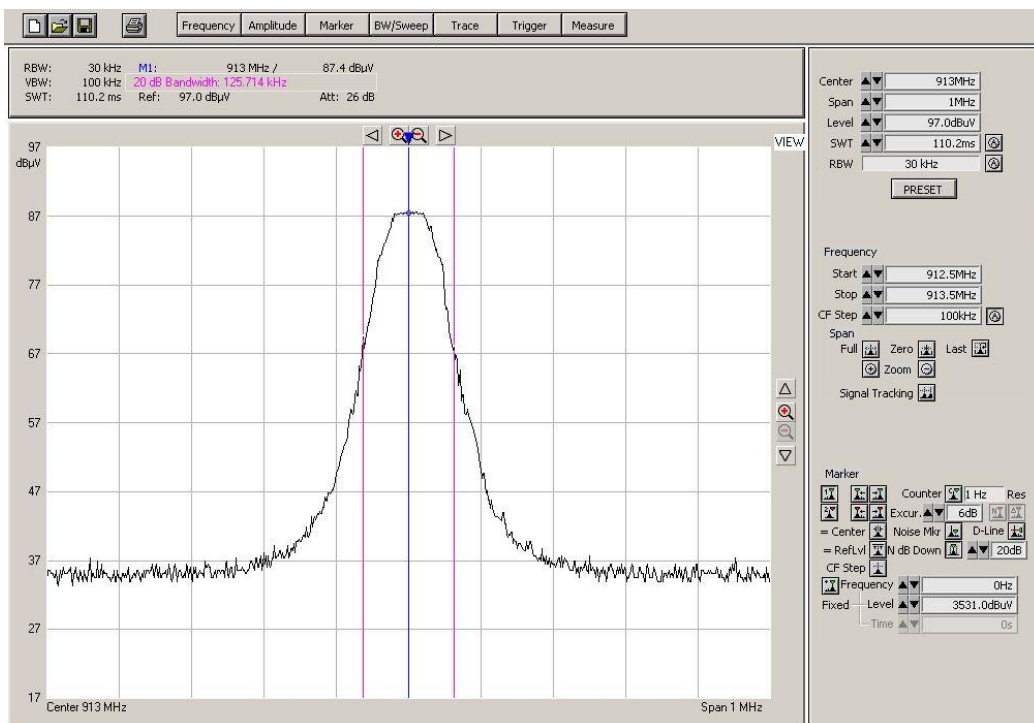
#### Limit for Bandwidth [ Section 15.215 (c) ]

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

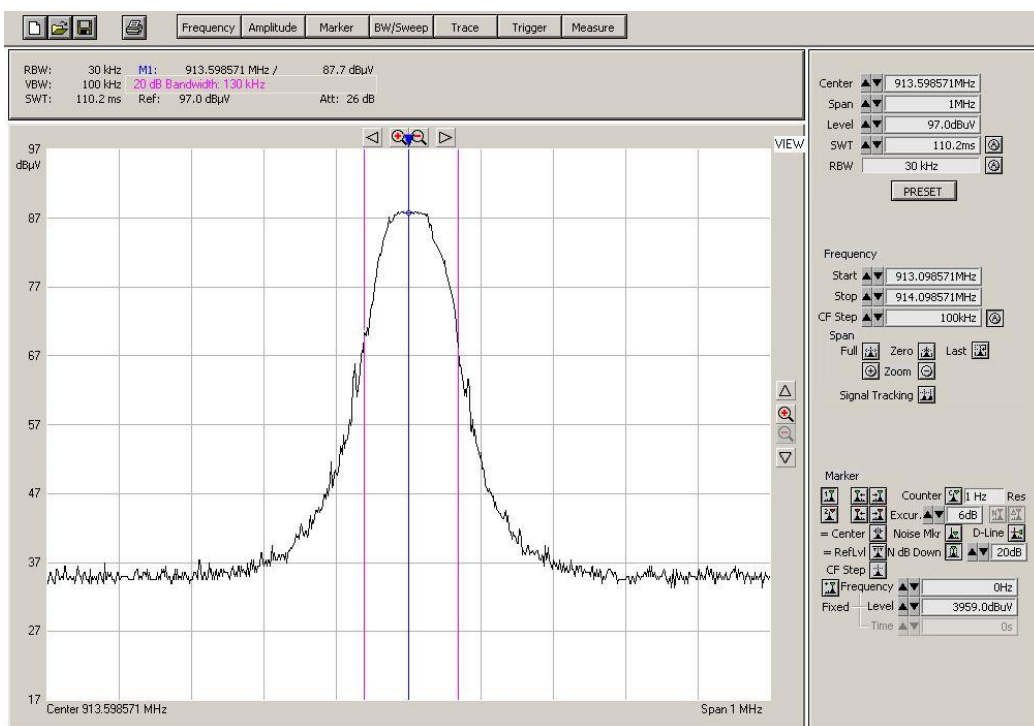
**Test Result:** Result data graph is shown at the next pages for reference.



Channel 1 – 20 dB point, Bandwidth 120 kHz



Channel 2 – 20 dB point, Bandwidth 125.7 kHz



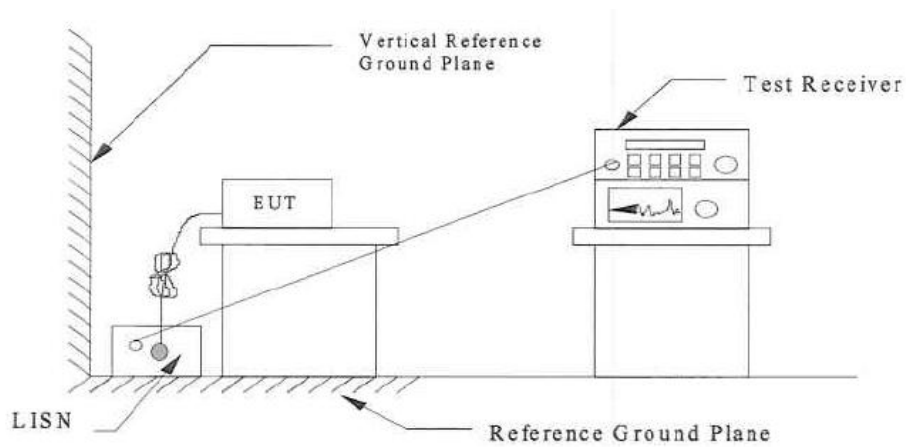
Channel 3 – 20 dB point, Bandwidth 130 kHz



#### 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:	2009-11-16
Mode of Operation:	Transmitting with Charging mode.
Detector Function:	Quasi-peak, average
Measurement BW:	9 kHz

##### Test Setup:



**Results: PASS**

<b>Conducted Emissions</b>					
Frequency (MHz)	Detector (QP/AV)	Phase	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin
0.150	QP	L	41.40	66.00	-24.60
	AV	L	13.30	56.00	-42.70
0.486	QP	L	34.40	56.20	-21.80
	AV	L	5.20	46.20	-41.00
0.564	QP	L	34.80	56.00	-21.20
	AV	L	5.40	46.00	-40.60
1.182	QP	L	24.50	56.00	-31.50
	AV	L	2.20	46.00	-43.80
10.308	QP	L	17.80	60.00	-42.20
	AV	L	11.60	50.00	-38.40
18.000	QP	L	23.60	60.00	-36.40
	AV	L	22.60	50.00	-27.40
0.150	QP	N	42.90	66.00	-23.10
	AV	N	14.10	56.00	-41.90
0.348	QP	N	36.30	59.00	-22.70
	AV	N	5.40	49.00	-43.60
0.528	QP	N	38.20	56.00	-17.80
	AV	N	7.60	46.00	-38.40
0.996	QP	N	26.10	56.00	-29.90
	AV	N	2.20	46.00	-43.80
10.392	QP	N	17.30	60.00	-42.70
	AV	N	10.40	50.00	-39.60
18.000	QP	N	23.50	60.00	-36.50
	AV	N	22.50	50.00	-27.50

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

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

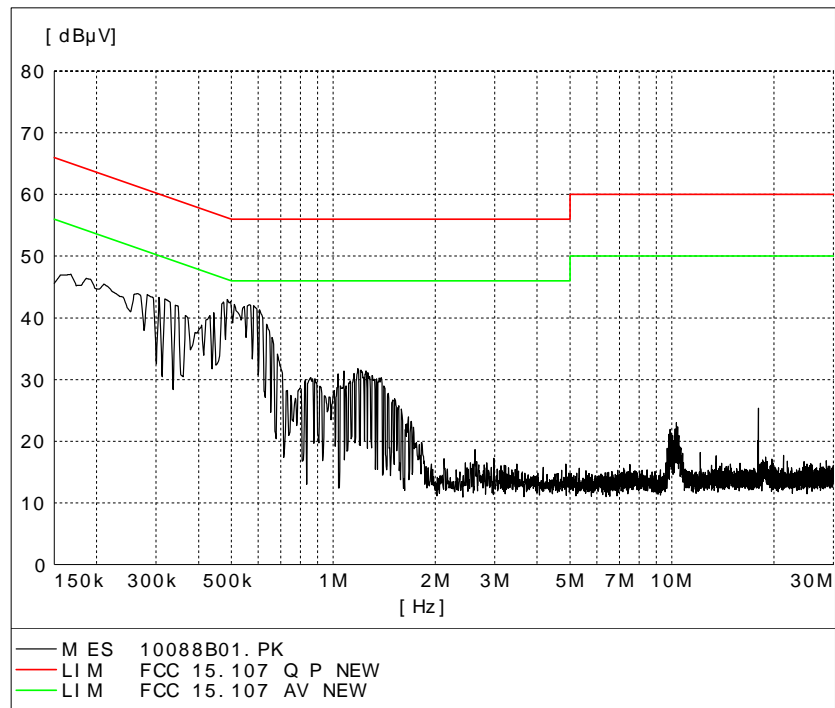
- Calculated measurement uncertainty:  $\pm 2.8$ dB

**Limits for Conducted Emission [ Section 15.207]:**

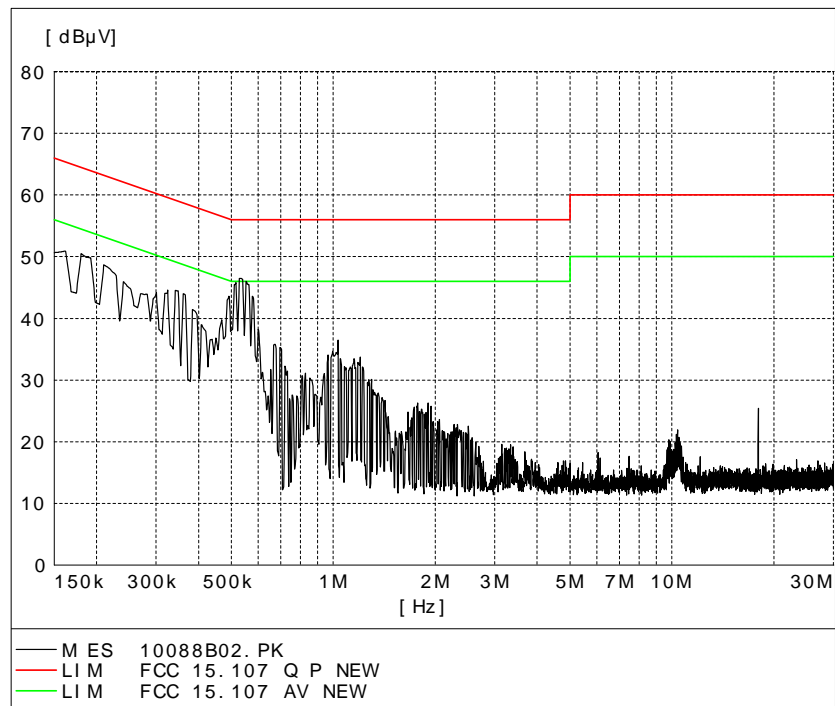
Frequency Range [MHz]	Quasi-Peak Limit [dB $\mu$ V]	Average Limit [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

## Conducted Emissions Result



Phase - L



Phase - N

## **5.0** **List of Measurement Equipment**

### **Radiated Emission and Out of Band Emissions**

<b>Description</b>	<b>Manufacturer</b>	<b>Model no.</b>	<b>Serial no.</b>	<b>Last cal</b>	<b>CAL due</b>
Semi-anechoic Chamber	Frankonia	N/A	N/A	27 Feb 09	27 Feb 10
Test Receiver	R & S	ESU26	100050	06 Aug 09	06 Aug 10
Bi-conical Antenna	R & S	HK116	841489/015	22 May 08	22 May 10
Log Periodic Antenna	R & S	HL223	841516/017	21 May 08	21 May 10
Horn Antenna	EMCO	3115	9002-3351	27 Feb 08	27 Feb 10
Active Loop Antenna	EMCO	6025	9107-2651	21 May 08	21 May 10
Coaxial Cable 50ohm	Rosenberger	RTK081-05S-10m	LA2-001-10M/002	15-May-09	15 May 10
RF Communications Test Set	HP	8920B	US36492628	12-Aug-09	12 Aug 11

### **Conducted Emission**

<b>Description</b>	<b>Manufacturer</b>	<b>Model no.</b>	<b>Serial no.</b>	<b>Last cal</b>	<b>CAL due</b>
Test Receiver	R & S	ESHS30	847115/005	24 Aug 09	24 Aug 10
LISN	R & S	ESH3-Z5	849876/027	24 Aug 09	24 Aug 10
RF Voltage Probe	Schwarzbeck	TK9416	N/A	13 Feb 09	13 Feb 10
Double Shield	Radiall	RG142	N/A	05 Jun -09	05 Jun 10
RF Communications Test Set	HP	8920B	US36492628	12 Aug 09	12 Aug 11

Remarks:

CM      Corrective Maintenance

N/A      Not Applicable or Not Available