TEST REPORT

Date: 2010-07-13
Report No.: 60.870.10.012.01F

Applicant:	Acoustics 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: 900MHz Wireless Speaker System (Transmitter) Brand name: ONX™ Model no.: AS0720B/ iF108 FCCID: VHC-AAI-AS0720-00
Date Samples Received:	2010-06-07
Date Tested:	2010-06-07 to 2010-07-09
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:	----

Tested and Checked by:

Nicolas Cheng
Assistant Project Manager
Wireless & Telecom department

Approved by:-

Victor Kwan
Manager
Wireless & Telecom department

CONTENT:

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

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:	900MHz Wireless Speaker System (Transmitter)
Brand Name:	ONX^{TM}
Model Number:	AS0720B/ iF108
FCCID:	VHC-AAI-AS0720-00
Rating:	4 X 1.5V “AAA” size batteries or DC 6V 300mA adaptor
Antenna Type:	Integral
Operated Frequency:	912-914MHz
No. of Channel:	3
Accessories and Auxiliary Equipment:	Cassette Player
EUT Exercising Software:	None

General Operation of EUT

The Equipment Under Test (EUT) is a transmitter of wireless speaker system operated at 912 to 914 MHz.

As per Client Declaration, the circuit design, PCB Layout, shielding and interface of AS0720B and iF108 are identical, only the cosmetic are different. So we use AS0720B as a representative model to perform all testing.

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)	☒	☐	☐
Spurious Radiated Emission	Part 15.249 (d) Part 15.209 Part 15.205	☒	☐	☐
Out of Band Emissions	Part 15.249 (d)	☒	☐	☐
Bandwidth Measurement	Part 15.215 (c)	☒	☐	☐
Conducted Emission	Part 15.207	☒	☐	☐

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:

FS = R + System Factor
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 place 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.

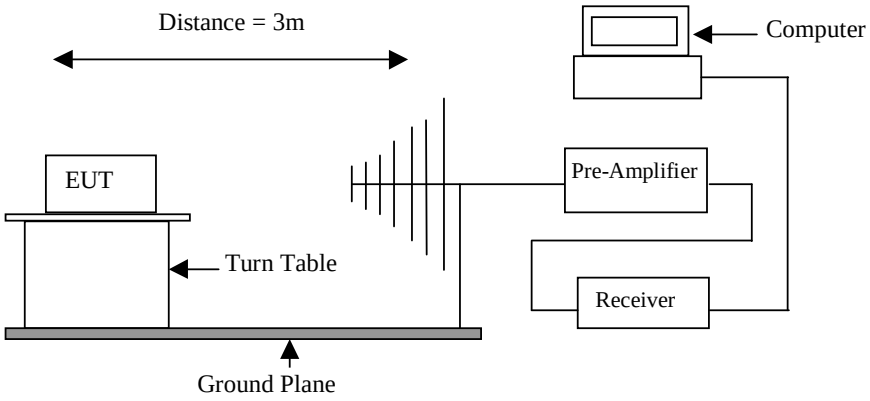
Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

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:	2010-06-11
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 **MHz**	E-Field Polarity	Reading **dBµV/m**	System Factor **dB**	Field Strength at 3m **dBµV/m**	Limit **dBµV/m**	Delta to Limit **dBµV/m**	Remarks
1	QP	912.50	V	52.83	23.97	76.80	94	-17.20	Fund.
1	QP	912.50	H	54.93	23.97	78.90	94	-15.10	Fund.
3	QP	913.50	V	55.52	23.98	79.50	94	-14.50	Fund.
3	QP	913.50	H	56.22	23.98	80.20	94	-13.80	Fund.
1	AV	1824.00	V	39.85	-5.05	34.80	54	-19.20	Harmonic
	PK	1824.00		46.45	-5.05	41.40	74	-32.60	Harmonic
1	AV	*2735.00	V	37.81	-1.71	36.10	54	-17.90	Harmonic
	PK	*2735.00		43.81	-1.71	42.10	74	-31.90	Harmonic
1	AV	1825.00	H	38.25	-5.05	33.20	54	-20.80	Harmonic
	PK	1825.00		43.25	-5.05	38.20	74	-35.80	Harmonic
1	AV	*2737.00	H	37.21	-1.71	35.50	54	-18.50	Harmonic
	PK	*2737.00		42.21	-1.71	40.50	74	-33.50	Harmonic
3	AV	1827.00	V	38.85	-5.05	33.80	54	-20.20	Harmonic
	PK	1827.00		43.85	-5.05	38.80	74	-35.20	Harmonic
3	AV	*2740.00	V	38.31	-1.71	36.60	54	-17.40	Harmonic
	PK	*2740.00		43.01	-1.71	41.30	74	-32.70	Harmonic
3	AV	1826.00	H	39.95	-5.05	34.90	54	-19.10	Harmonic
	PK	1826.00		45.05	-5.05	40.00	74	-34.00	Harmonic
3	AV	*2740.00	H	41.45	-5.05	36.40	54	-17.60	Harmonic
	PK	*2740.00		45.55	-5.05	40.50	74	-33.50	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: ±5.0dB

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

Fundamental Frequency	Field Strength of Fundamental		Field Strength of Harmonics	
[MHz]	[mV/m]	[dBμV/m]	[μV/m]	[dBμV/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 [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

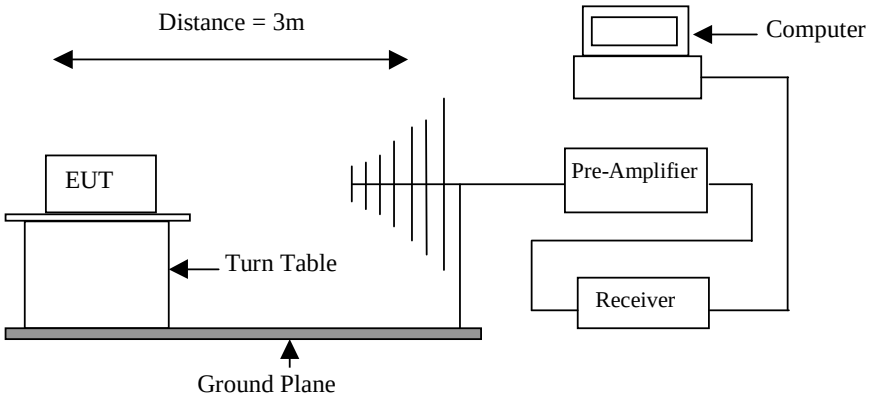
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

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.

4.2 Spurious Radiated Emission

Test Requirement:	FCC part 15 section 15.249(d),15.209
Test Method:	ANSI C63.4:2003
Test Date:	2010-06-11
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								
Channel	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**
1	QP	45.60	V	5.43	10.37	15.80	40.00	-24.20
1	QP	72.18	V	7.83	8.45	16.28	40.00	-23.72
1	PK	*8067.00	V	43.84	7.15	50.99	74.00	-23.01
	AV		V	32.75	7.15	39.90	54.00	-14.10
1	QP	91.20	H	8.41	9.40	17.81	43.50	-25.69
1	QP	345.59	H	11.57	15.43	27.00	46.00	-19.00
1	PK	7937.00	H	43.40	7.10	50.50	74.00	-23.50
1	AV		H	32.90	7.10	40.00	54.00	-14.00
3	QP	45.60	V	7.24	10.37	17.61	40.00	-22.39
3	QP	72.21	V	7.17	8.45	15.62	40.00	-24.38
3	QP	*268.82	V	11.65	13.15	24.80	46.00	-21.20
3	PK	*8038.00	V	43.05	8.00	51.05	74.00	-22.95
	AV		V	32.00	8.00	40.00	54.00	-14.00
3	QP	91.20	H	7.74	9.40	17.14	43.50	-26.36
3	QP	232.43	H	-0.25	12.25	12.00	46.00	-34.00
3	PK	8009.00	H	42.26	7.14	49.40	74.00	-24.60
	AV		H	32.66	7.14	39.80	54.00	-14.20

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: ±5.0dB.

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

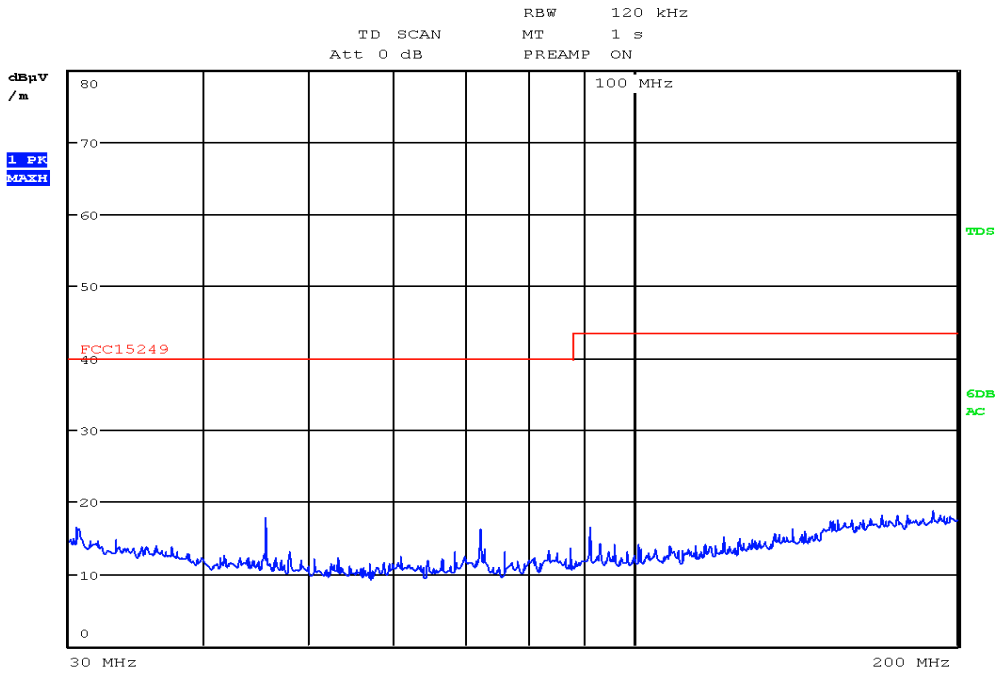
Limit for Radiated Emission [Section 15.209]:

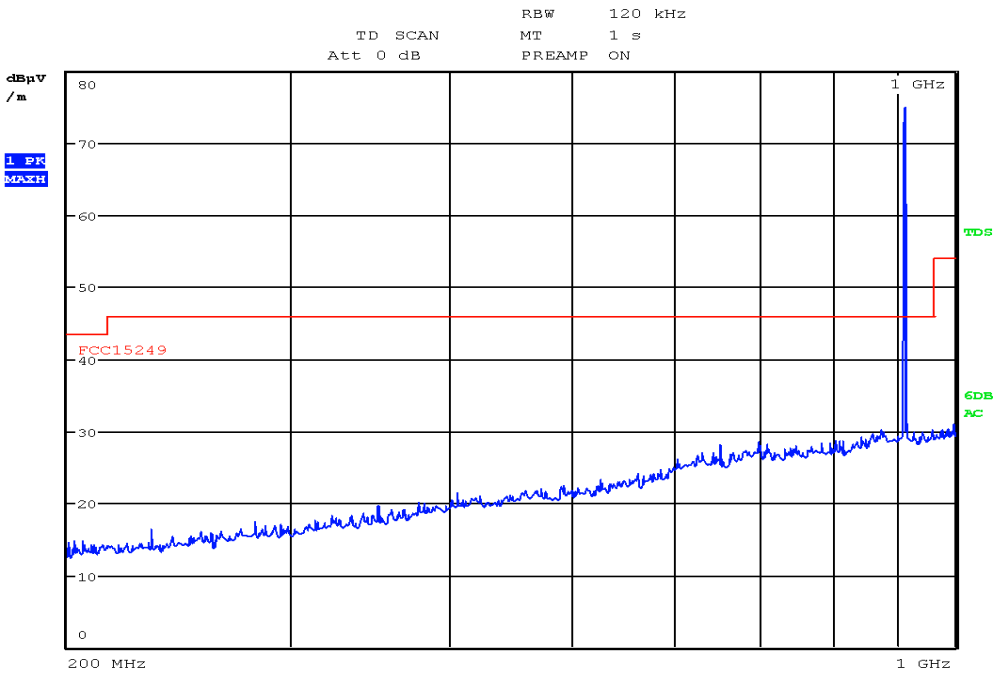
Frequency (MHz)	Field Strength [µV/m]	Field Strength [dBµV/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

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.

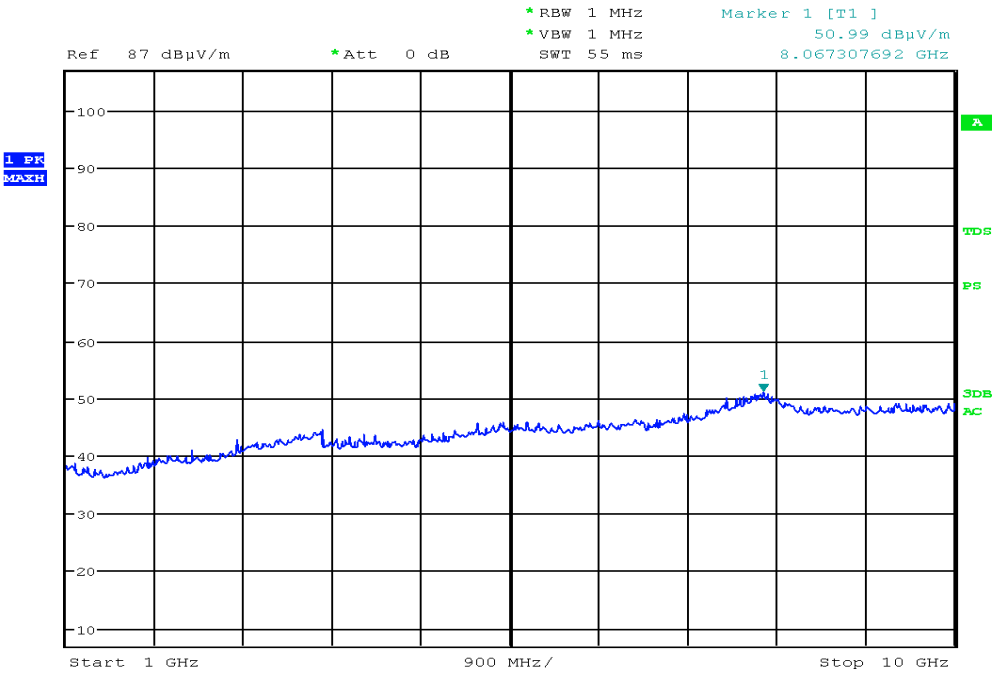
The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Vertical Channel 1

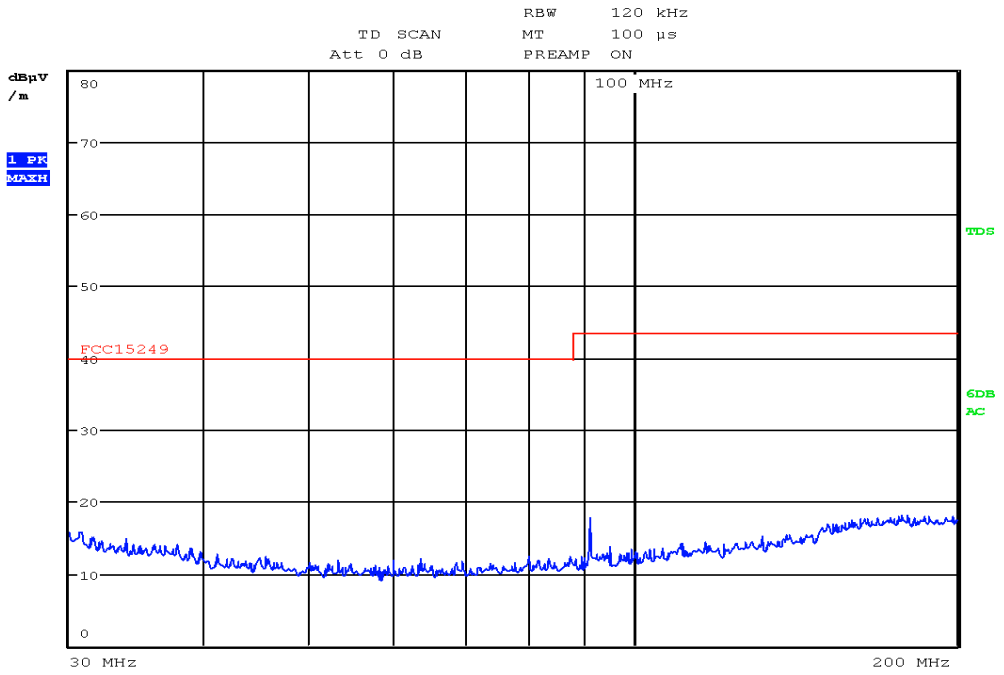


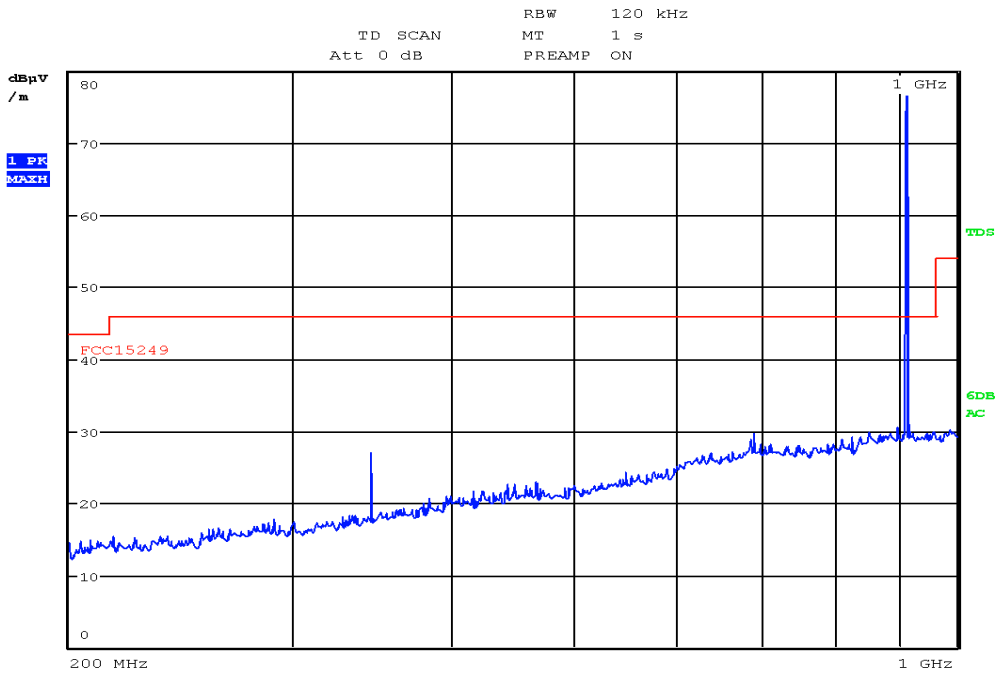


Vertical Channel 1

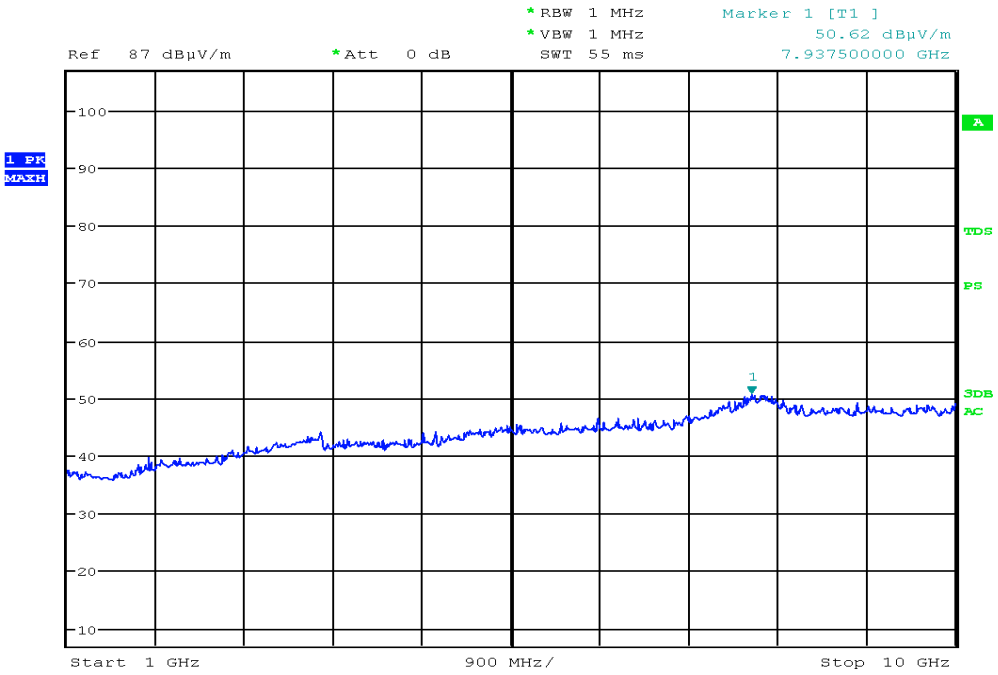


Horizontal Channel 1

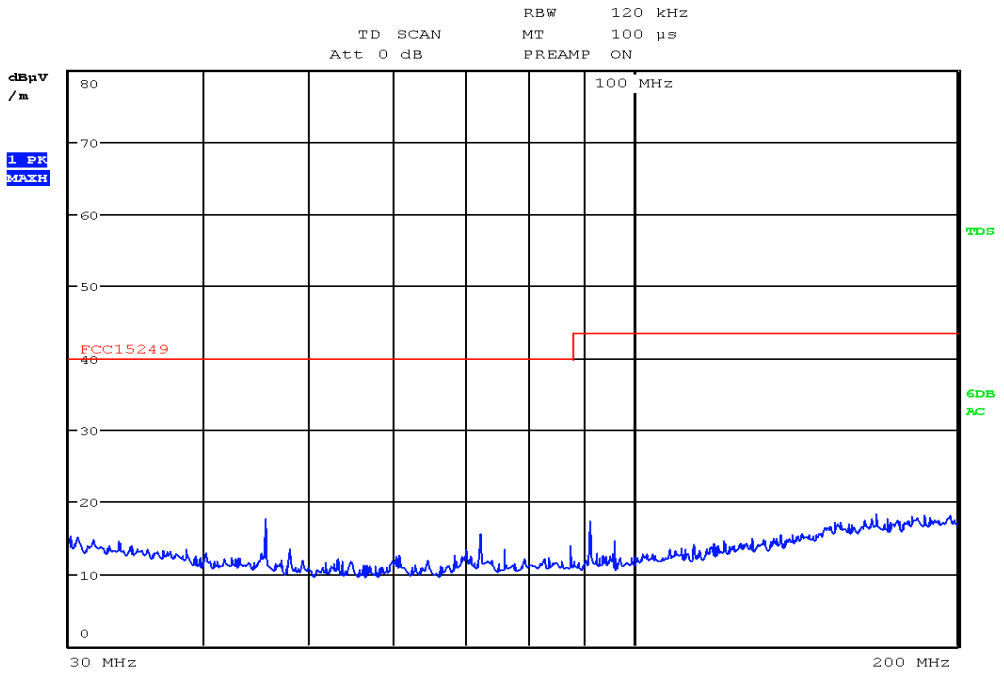


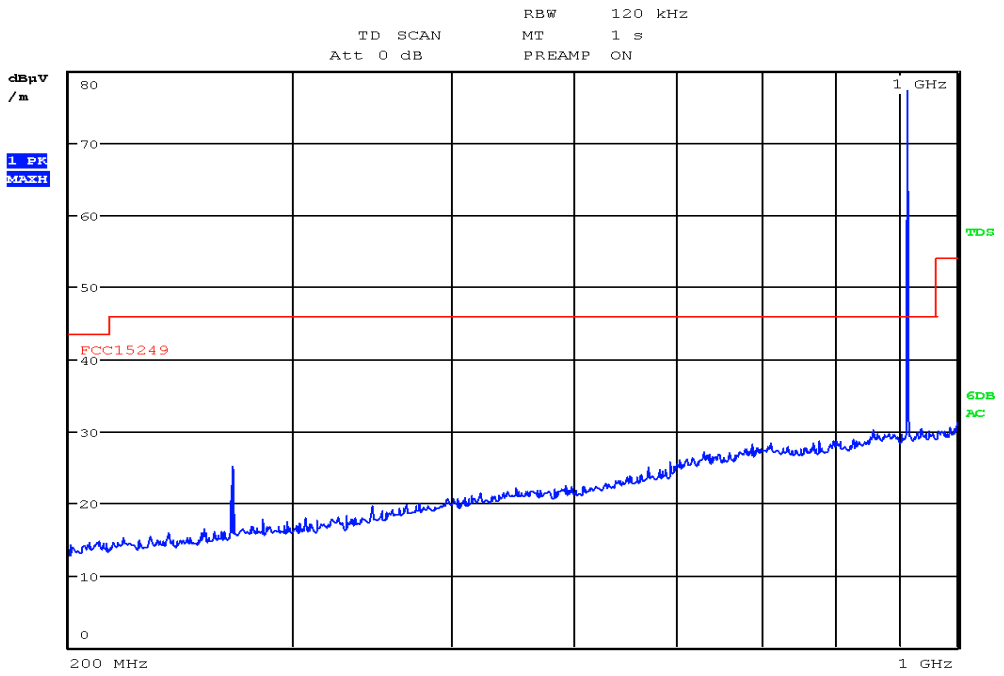


Horizontal Channel 1

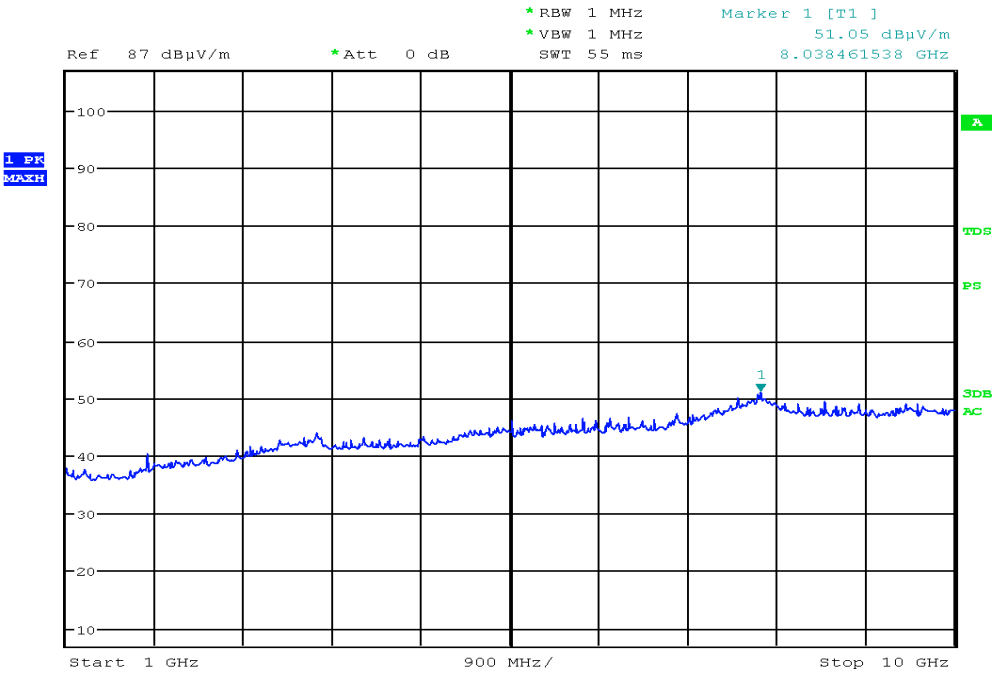


Vertical Channel 3

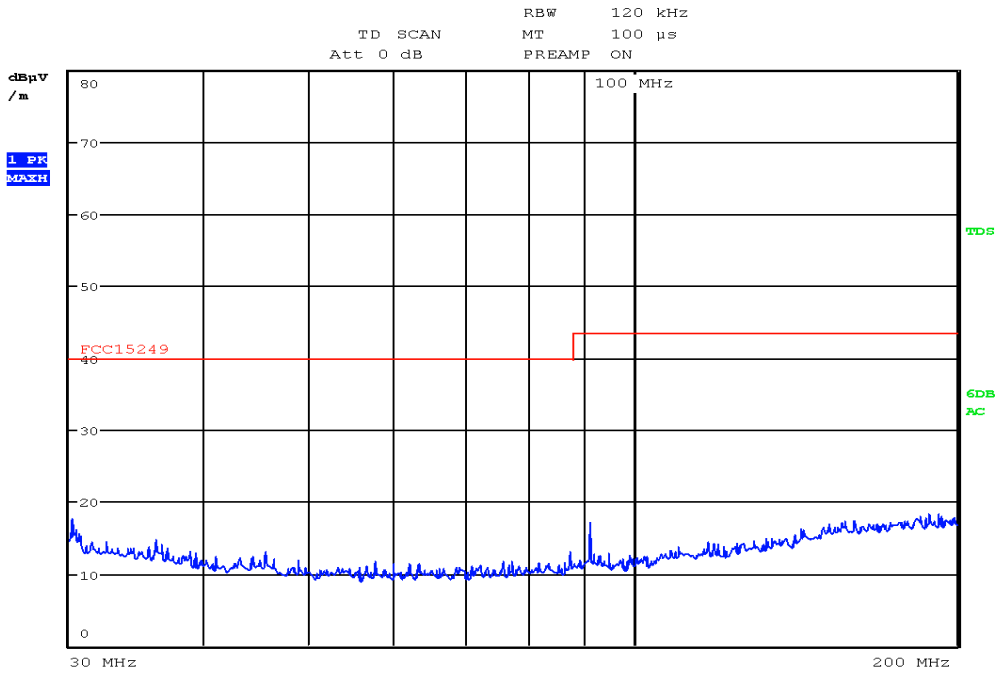


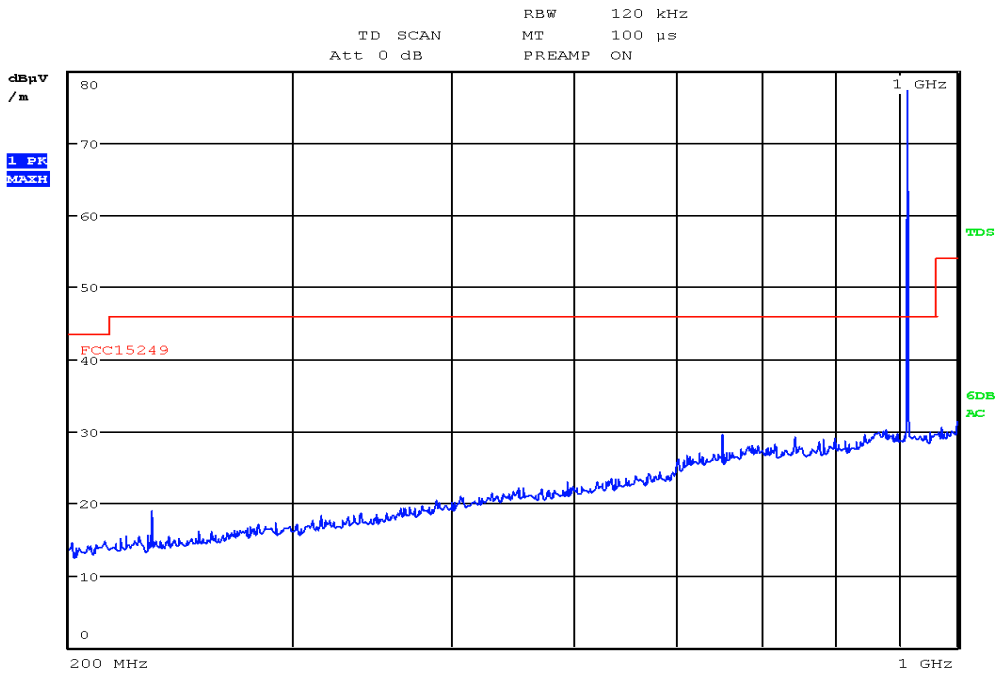


Vertical Channel 3

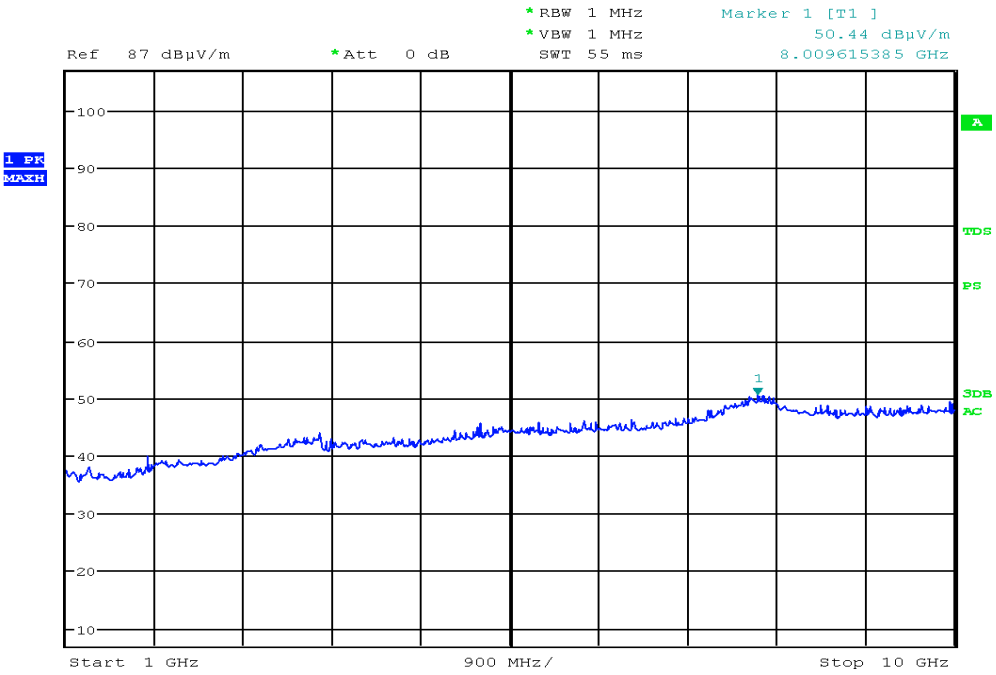


Horizontal Channel 3





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:	2010-06-11
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

Results: PASS

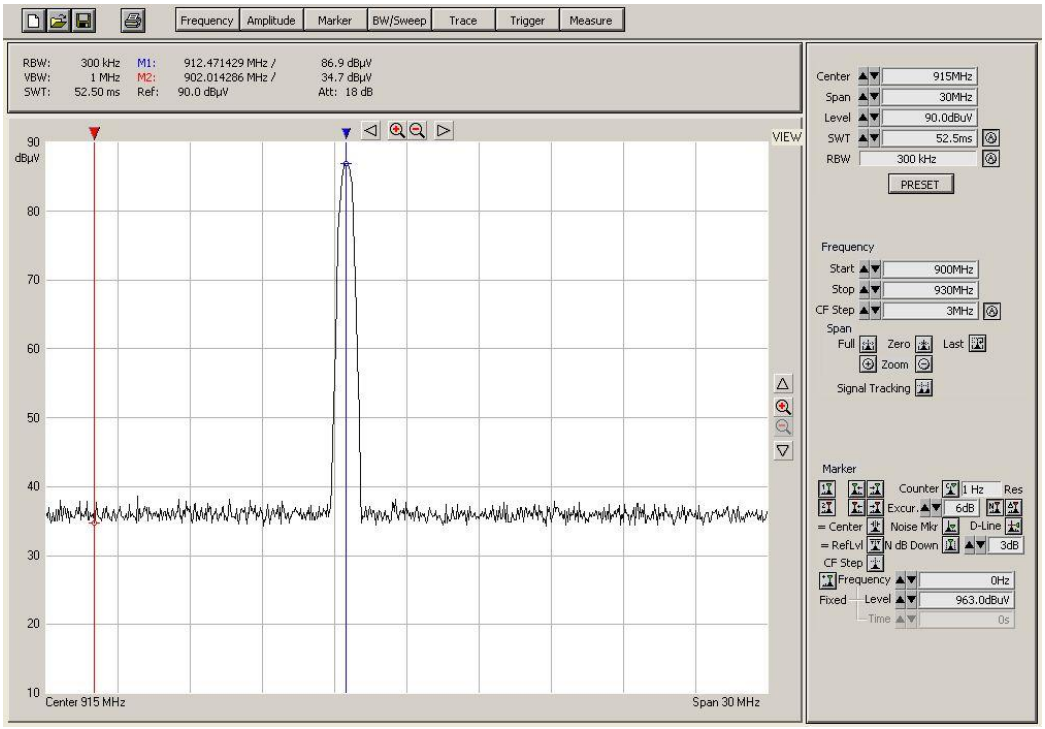
Refer to the data graph, the lower and higher edge of the specified frequency bands fulfill the general radiated emission limits in section 15.209. Therefore, the EUT meets the requirement of section 15.249 (d).

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

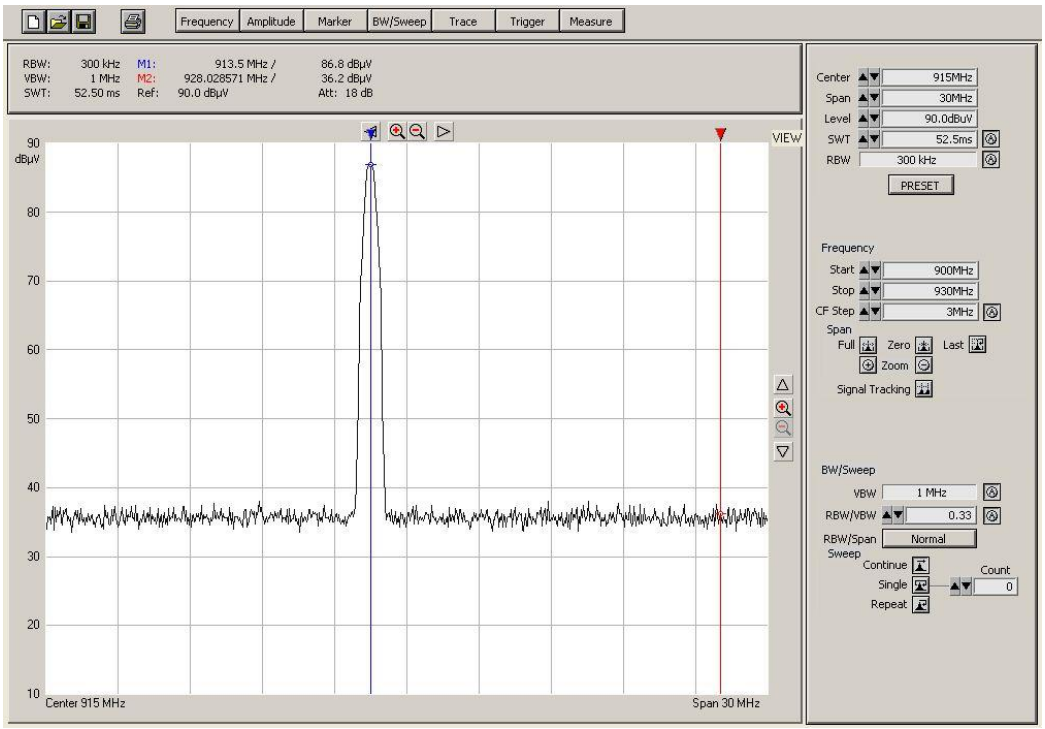
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

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:	2010-06-11
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

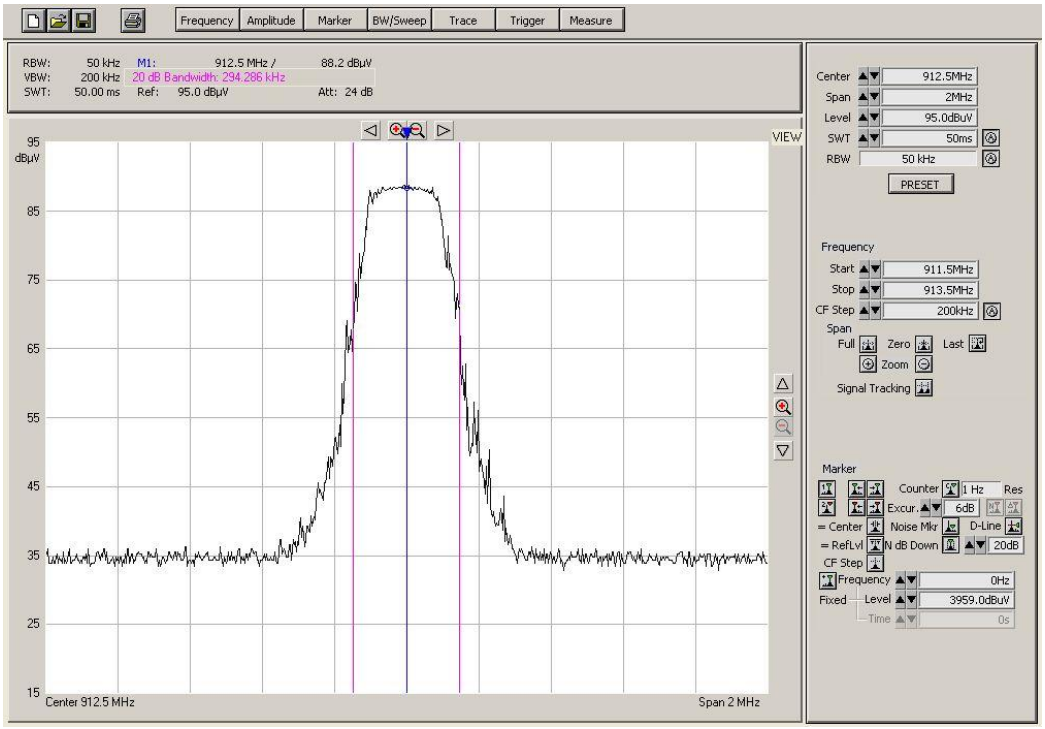
Results: PASS

Refer to the data graph, the 20dB points of Channel 1, Channel 2 and Channel 3 are 277.143kHz, 300kHz and 294.286kHz. All channels within the operation bandwidth when equipment is operated. Therefore, the EUT meets the requirement of section 15.215(c).

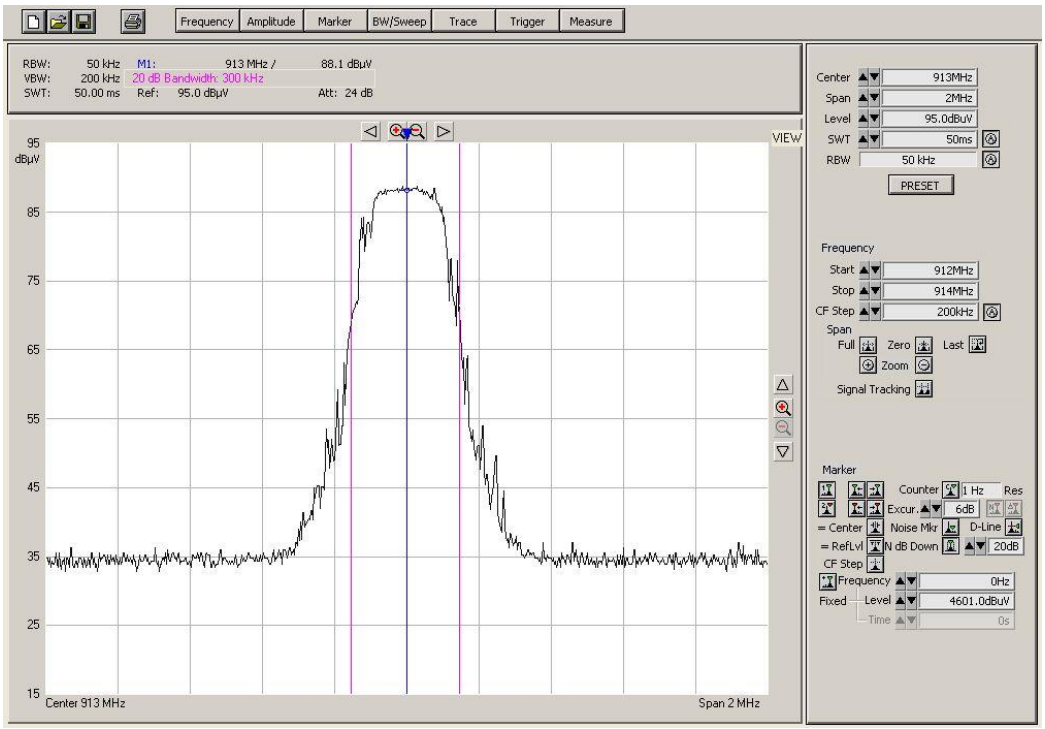
Limit for Bandwidth [Section 15.215 (c)]

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

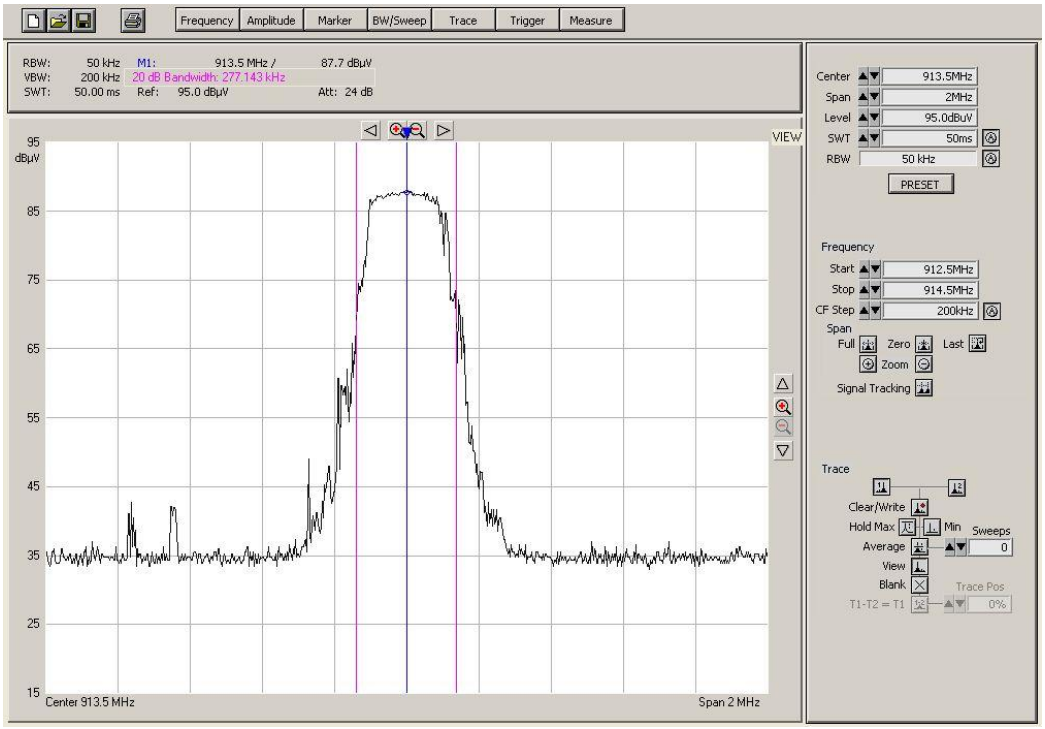
Test Result: Result data graph is shown at the next pages for reference.



Channel 1 – 20 dB point, Bandwidth 277.143 kHz



Channel 2 – 20 dB point, Bandwidth 300 kHz

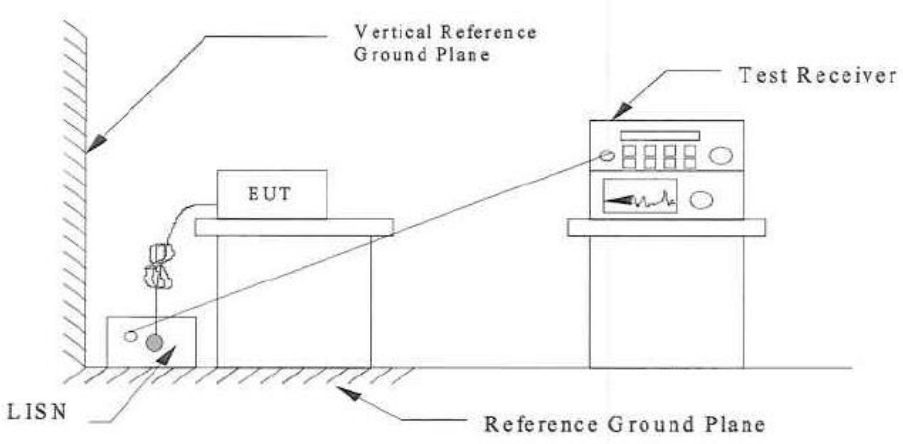


Channel 3 – 20 dB point, Bandwidth 294.286 kHz

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:	2010-07-09
Mode of Operation:	Transmitting mode.
Detector Function:	Quasi-peak, average
Measurement BW:	9 kHz

Test Setup:



Results: PASS

Conducted Emissions					
Frequency (MHz)	Detector (QP/AV)	Phase	Result (dBµV)	Limit (dBµV)	Margin
0.150	QP	L	13.40	66.00	-52.60
	AV	L	3.70	56.00	-52.30
0.186	QP	L	11.80	64.20	-52.40
	AV	L	2.90	54.20	-51.30
2.748	QP	L	5.60	56.00	-50.40
	AV	L	0.10	46.00	-45.90
15.330	QP	L	5.80	56.00	-50.20
	AV	L	0.10	46.00	-45.90
0.150	QP	N	13.50	66.00	-52.50
	AV	N	4.00	56.00	-52.00
0.240	QP	N	12.30	62.10	-49.80
	AV	N	0.10	52.10	-52.00
3.810	QP	N	4.50	56.00	-51.50
	AV	N	0.10	46.00	-45.90
15.360	QP	N	4.30	60.00	-55.70
	AV	N	0.10	50.00	-49.90

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

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

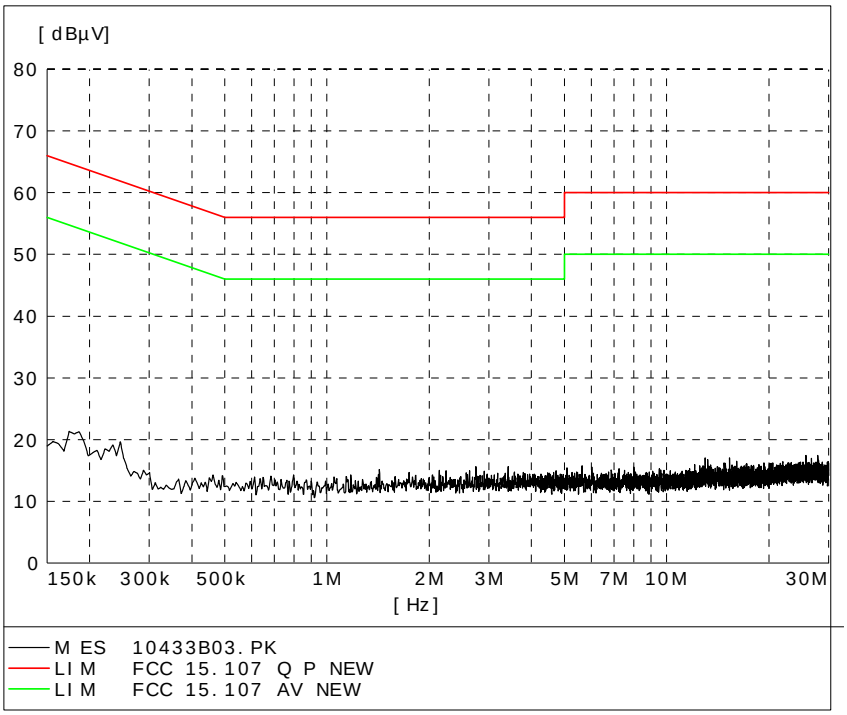
- Calculated measurement uncertainty: ±2.8dB

Limits for Conducted Emission [Section 15.207]:

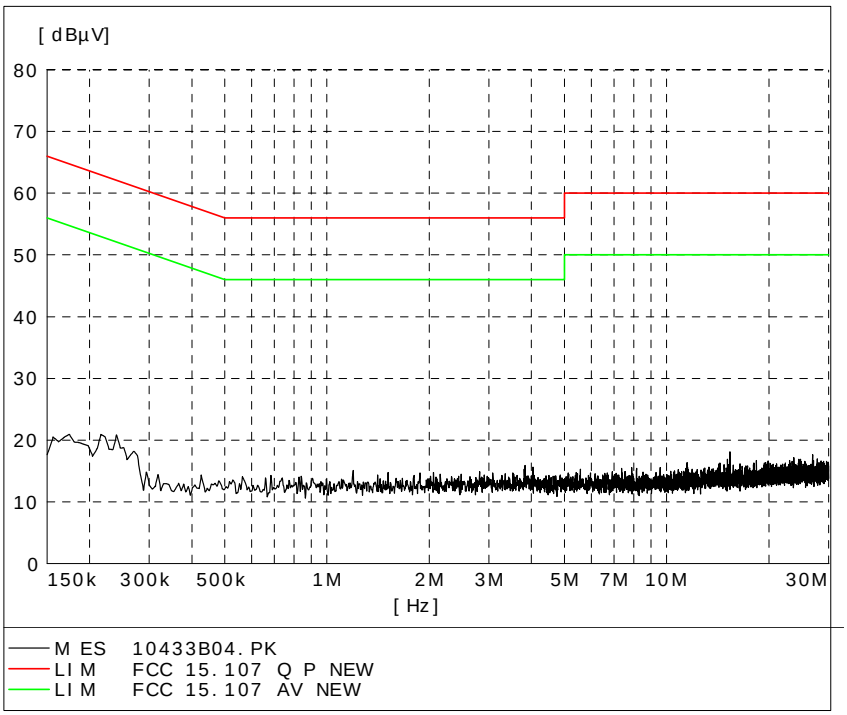
Frequency Range [MHz]	Quasi-Peak Limit [dBµV]	Average Limit [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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

Description	Manufacturer	Model no.	Serial no.	Last cal	CAL due
Semi-anechoic Chamber	Frankonia	N/A	N/A	27 Apr 10	27 Apr 11
Test Receiver	R & S	ESU26	100050	25 May 10	25 May 11
Bi-conical Antenna	R & S	HK116	100241	13 Apr 10	13 APR 12
Log Periodic Antenna	R & S	HL223	841516/020	13 Apr 10	13 APR 12
Horn Antenna	EMCO	3115	9002-3351	16 Apr 10	16 APR 12
Active Loop Antenna	EMCO	6025	9107-2651	06 Feb 10	06 Feb 11
Coaxial Cable 50ohm	Rosenberger	RTK081-05S-10m	LA2-001-10M/002	07 Dec 09	07 Dec 10
Spectrum Analyzer	R & S	FS300	101335	07 Jul 10	07 Jul 11

Conducted Emission

Description	Manufacturer	Model no.	Serial no.	Last cal	CAL due
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 10	13 Feb 11
Double Shield	Radiall	RG142	N/A	04 Jun 10	04 Jun 11

Remarks:
CM Corrective Maintenance
N/A Not Applicable or Not Available