FCC PART 15.247

EMI Measurement and TEST REPORT

For

Lionda Technology Company Limited

Block 2 Laodong 2nd Industrial Area, Xixian, Baoan,
Shenzhen, Guangdong, China 518102

FCC ID: O63GH5850HDLD03

2003-12-01

This Report Concerns:	**Equipment Type:**
☒ Original Report	2.4GHz and 5.8GHz Cordless Phone, H/S Unit

Test Engineer:	Benjamin Jing /
Report No.:	R0308046
Test Date:	2003-08-20
Reviewed By:	Ling Zhang /
Prepared By:	Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Lionda Technology Company Limited's product, FCC ID: O63GH5850HDLD03, Model No.: *GH5850* or the "EUT" as referred to in this report is a 2.4GHz and 5.8GHz Cordless Telephone, handset unit. The EUT measures approximately 6.5"L x 2.0" W x 1.1" H. The EUT operates in the frequency range of 2402.304 - 2481.152 MHz (max power 0.0482W) and 5729.280 - 5808.128 MHz (max power 0.0369W).

** The test data gathered are from typical production sample serial number B0005 provided by the manufacturer.*

1.2 Objective

This type approval report is prepared on behalf of *Lionda Technology Company Limited* in accordance with Part 2, Subpart J, Part 15, Subparts A , C, and E of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emission and Conducted and Spurious Radiated Emission.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2001.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method – 47 CFR Part – Digital Devices, CISPER 22: 1997: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment test methods.

1.6 Local Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
Southern Telecom	Telephone	None	None	DOC
Teltone Corp	Simulator	TLS-3B-01	80071	DOC

1.7 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
None-Shielded RJ-11 Cable	1.8	RJ-11 Port/EUT	Simulator RJ11Port
Headset Cable	N/A	Headset /EUT	Base /EUT

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

The host system was configured for testing according ANSI C63.4-2001.

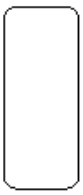
The EUT was tested in the normal (native) operating mode to represent worst-case results during the final qualification test.

Handset being tested: The Cordless Telephone - Handset, Model GH5850, FCC ID: O63GH5850HDLD03 was placed on the wooden table and tested in three orthogonal axis. The Low, middle, and high channels were tested. The handset was transmitting to and receiving from the base unit. The EUT was investigated for emissions while off hook. The radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.3.

2.2 Equipment Modifications

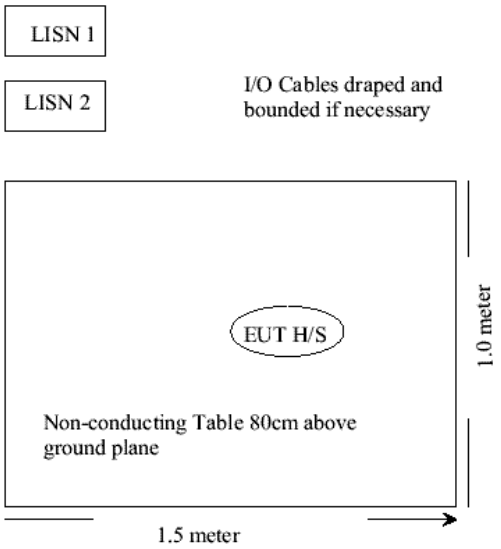
No modifications were to the EUT.

2.3 Configuration of Test System



Handset

2.4 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT	REFERENCE
§15.203	Antenna Requirement	Compliant	Section 9
§ 15.205	Restricted Bands	Compliant	Section 10
§15.209 (a)	Radiated Emission	Compliant	Section 10
§15.209 (f)	Spurious Emission	Compliant	Section 8
§15.247 (a)(2)	6 dB Bandwidth	Compliant	Section 5
§15.247 (b)(3)	Maximum Peak Output Power	Compliant	Section 4
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant	Section 7
§15.247 (d)	Peak Power Spectral Density	Compliant	Section 6

4 - PEAK OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

According to §15.247(b) (3), for systems using digital modulation in 2400-2483.5 MHz and 5725-5850 MHz: 1 Watt

4.2 Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

4.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

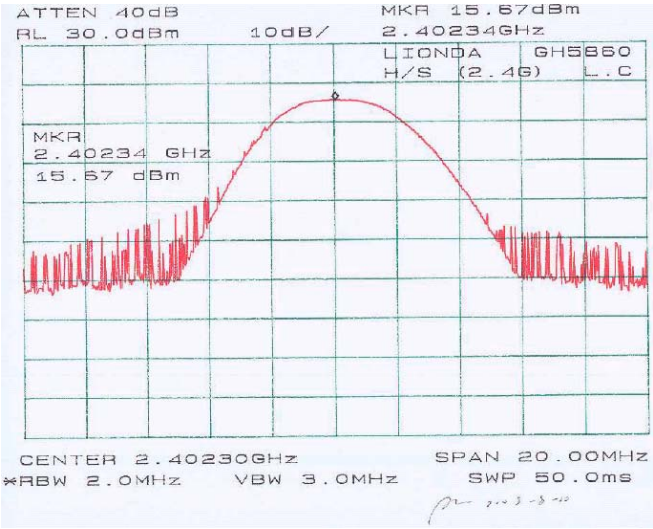
4.4 Measurement Result

4.4.1 Conducted Output Power at 2.4GHz

Unit	Channel	Frequency	Output Power (dBm)	Output Power (W)	Standard (W)	Result
Handset	Low	2402	15.67	0.0369	≤ 1W	Compliant
Handset	Mid	2441	16.83	0.0482	≤ 1W	Compliant
Handset	High	2480	14.17	0.0261	≤ 1W	Compliant

4.4.2 Conducted Output Power at 5.8GHz

Unit	Channel	Frequency	Output Power (dBm)	Output Power (W)	Standard (W)	Result
Handset	Low	5729	15.17	0.0329	≤ 1W	Compliant
Handset	Mid	5768	15.33	0.0341	≤ 1W	Compliant
Handset	High	5808	15.67	0.0369	≤ 1W	Compliant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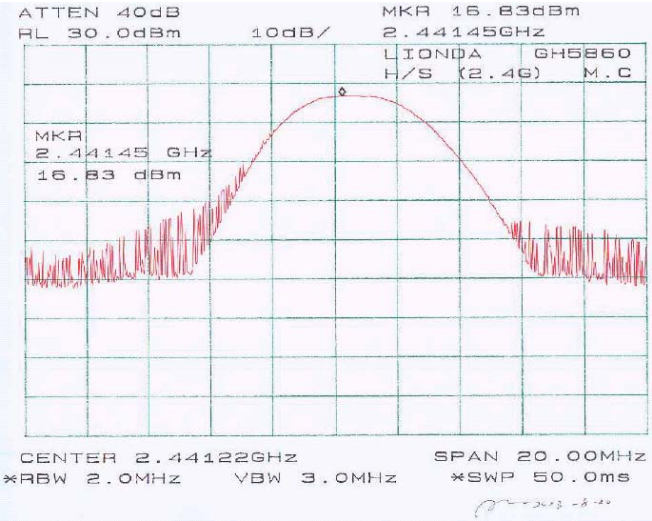
RL 30.0dBm
10dB/
MKR 15.67dBm
2.40234GHz
LIONDA GH5860
H/S (2.4G) L.C
MKR
2.40234 GHz
15.67 dBm
CENTER 2.40230GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms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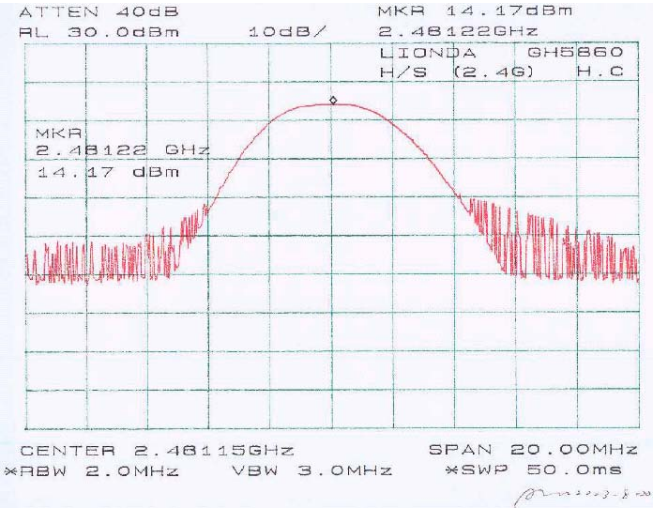
RL 30.0dBm
10dB/
MKR 16.83dBm
2.44145GHz
LIONDA GH5860
H/S (2.4G) M.C
MKR
2.44145 GHz
16.83 dBm
CENTER 2.44122GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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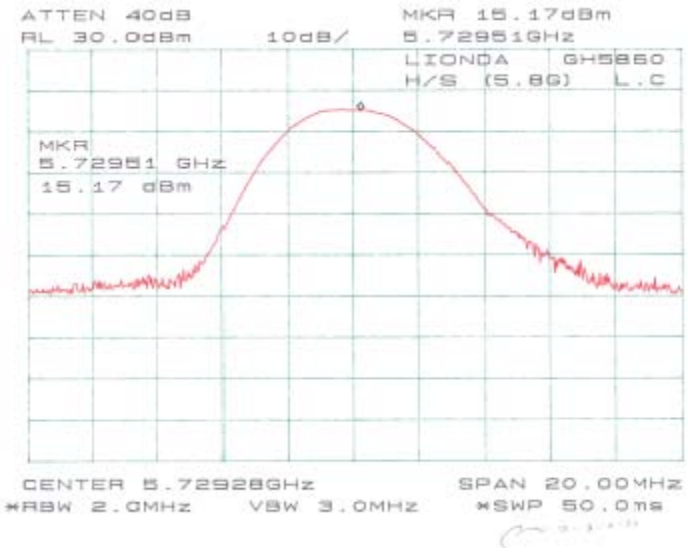
10dB/
MKR 14.17dBm
2.48122GHz
LIONDA GH5860
H/S (2.4G) H.C
MKR
2.48122 GHz
14.17 dBm
CENTER 2.48115GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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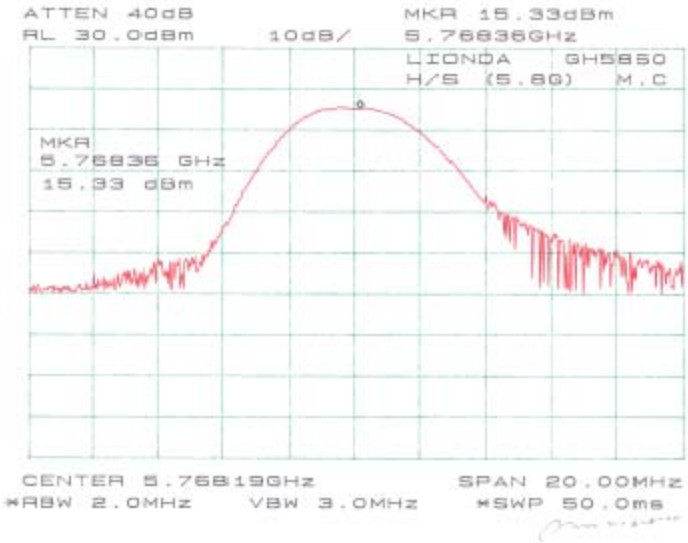
RL 30.0dBm
10dB/
MKR 15.17dBm
5.72951GHz
LIONDA GH5850
H/S (5.8G) L.C
MKR
5.72951 GHz
15.17 dBm
CENTER 5.72928GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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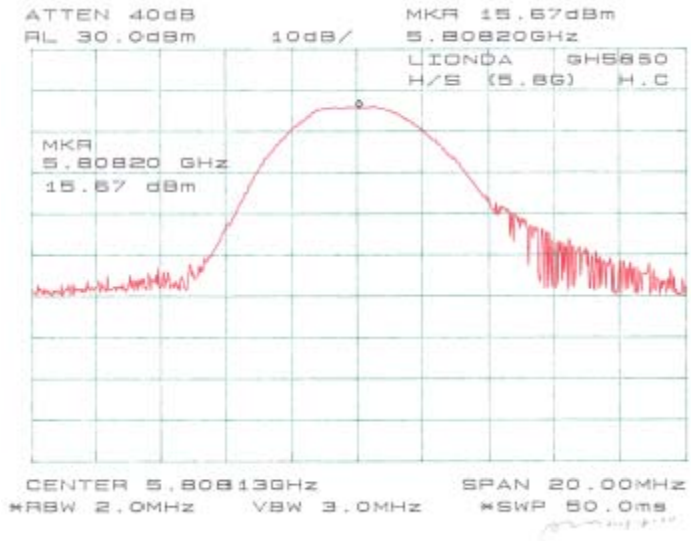
RL 30.0dBm
10dB/
MKR 15.33dBm
5.76836GHz
LIONDA GH5850
H/S (5.8G) M.C
MKR
5.76836 GHz
15.33 dBm
CENTER 5.76819GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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RL 30.0dBm
10dB/
MKR 15.67dBm
5.80820GHz
LIONDA GH5850
H/S (5.8G) H.C
MKR
5.80820 GHz
15.67 dBm
CENTER 5.80813GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms

5 – 6 DB BANDWIDTH

5.1 Standard Applicable

According to §15.247(a)(2), the minimum 6dB bandwidth shall be at least 500 kHz.

5.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

5.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

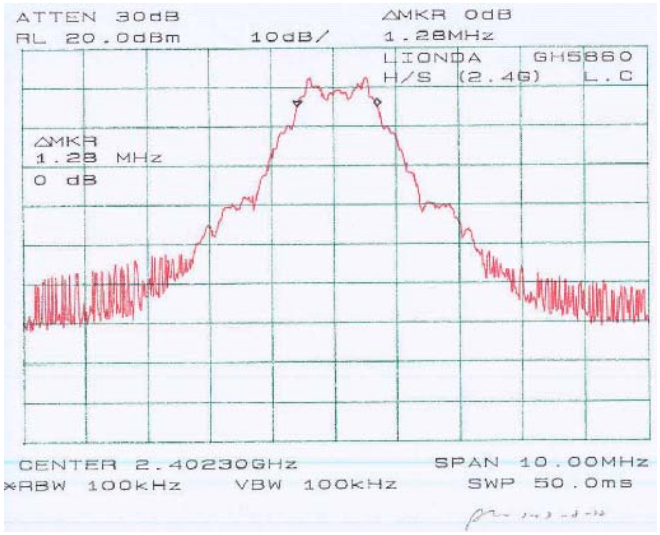
5.4 Measurement Result

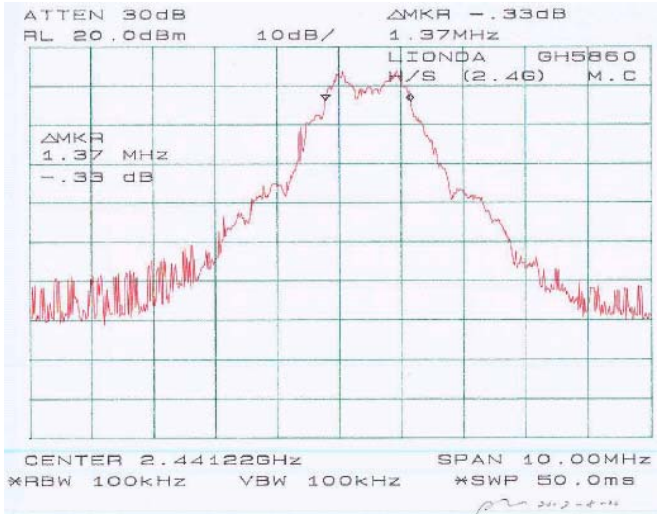
5.3.1 Test Result for 2.4GHz Band

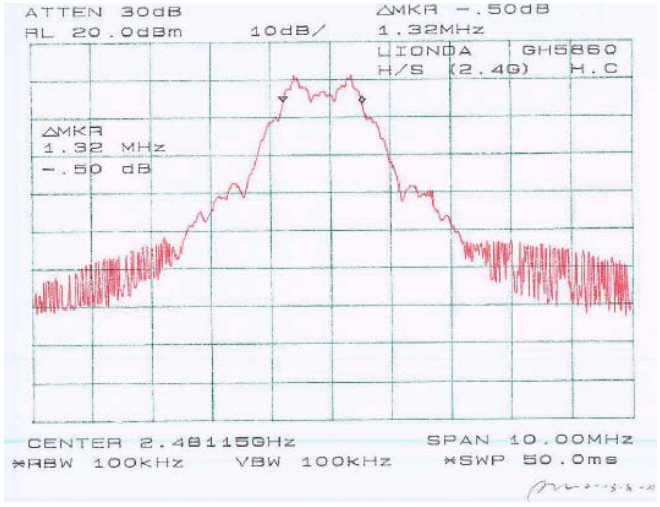
Unit	Frequency	Measured	Standard (kHz)	Result
Handset	Low	1.28 MHz	≥ 500	Compliant
	Mid	1.37 MHz	≥ 500	Compliant
	High	1.32 MHz	≥ 500	Compliant

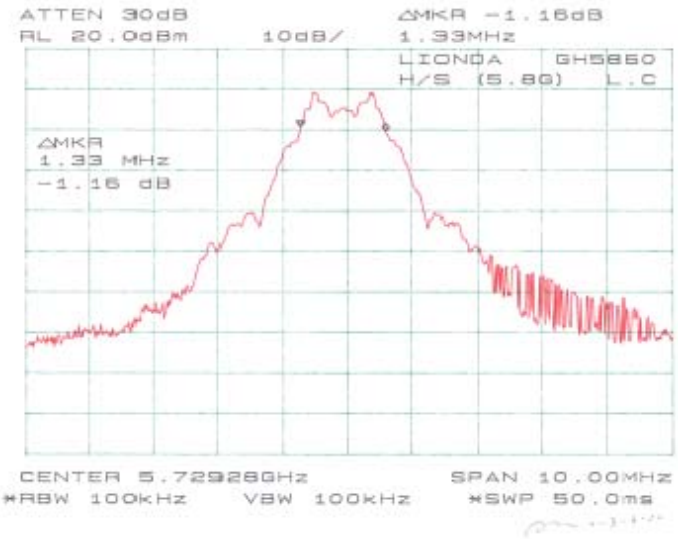
5.3.2 Test Result for 5.8 GHz Band

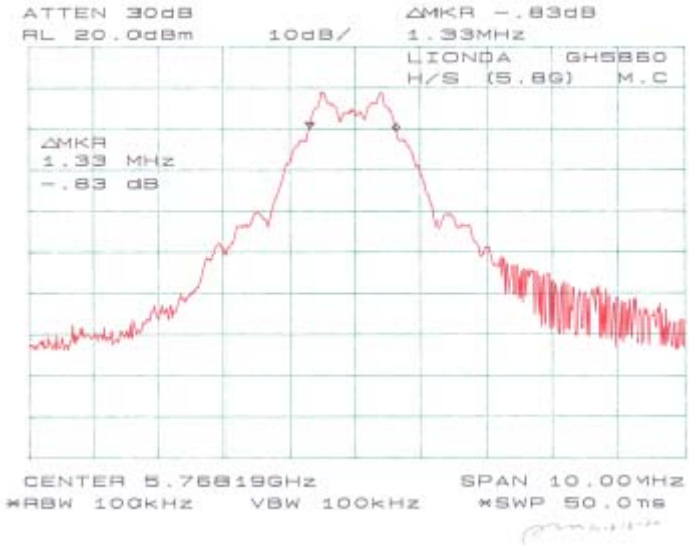
Unit	Frequency	Measured	Standard (kHz)	Result
Handset	Low	1.33 MHz	≥ 500	Compliant
	Mid	1.33 MHz	≥ 500	Compliant
	High	1.35 MHz	≥ 500	Compliant

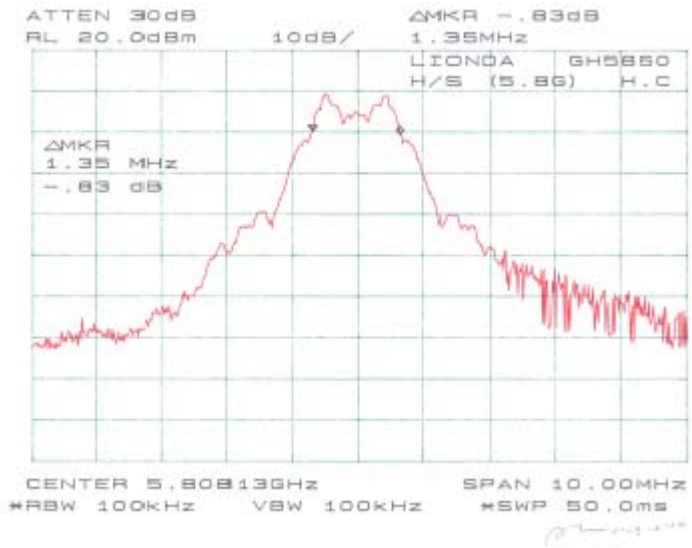

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 0dB
1.28MHz
LIONDA GH5860
H/S (2.4G) L.C
ΔMKR
1.28 MHz
0 dB
CENTER 2.40230GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.33dB
1.37MHz
LIONDA GH5860
H/S (2.4G) M.C
ΔMKR
1.37 MHz
-.33 dB
CENTER 2.44122GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.50dB
1.32MHz
LIONDA GH5860
H/S (2.4G) H.C
ΔMKR
1.32 MHz
-.50 dB
CENTER 2.48115GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -1.16dB
1.33MHz
LIONDA GH5850
H/S (5.8G) L.C
ΔMKR
1.33 MHz
-1.16 dB
CENTER 5.729280GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.83dB
1.33MHz
LIONDA GH5850
H/S (5.8G) M.C
ΔMKR
1.33 MHz
-.83 dB
CENTER 5.768190GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.83dB
1.35MHz
LIONDA GH5850
H/S (5.8G) H.C
ΔMKR
1.35 MHz
-.83 dB
CENTER 5.808130GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms

6 - POWER SPECTRAL DENSITY

6.1 Standard Applicable

According to §15.247 (d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 6MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.

6.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

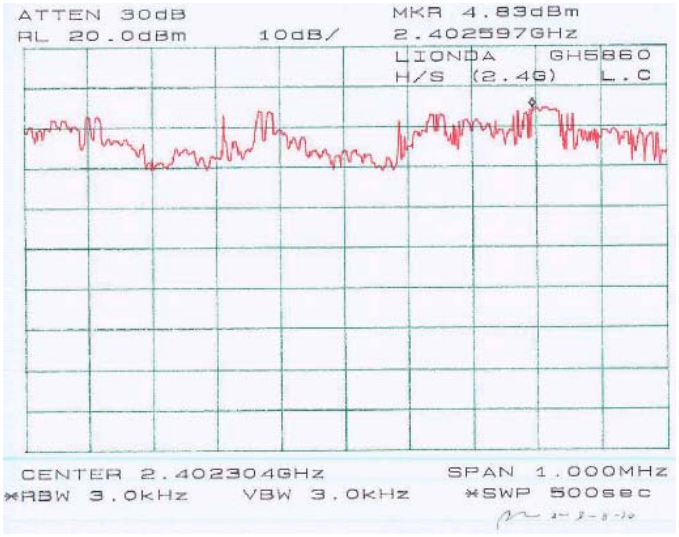
6.4 Measurement Results

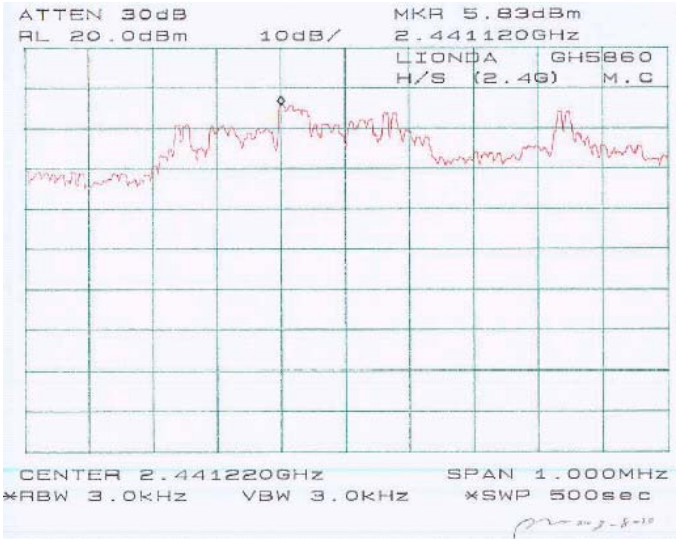
6.4.1 Test Result for 2.4GHz Band

Unit	Frequency	Peak Power Spectral Density (dBm)	Standard (dBm)	Result
Handset	Low	4.83	≤ 8	Compliant
	Mid	5.83	≤ 8	Compliant
	High	3.00	≤ 8	Compliant

6.4.2 Test Result for 5.8GHz Band

Unit	Frequency	Peak Power Spectral Density (dBm)	Standard (dBm)	Result
Handset	Low	-0.33	≤ 8	Compliant
	Mid	0.67	≤ 8	Compliant
	High	0.33	≤ 8	Compliant


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 4.83dBm
2.402597GHz
LIONDA GH5860
H/S (2.4G) L.C
CENTER 2.402304GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec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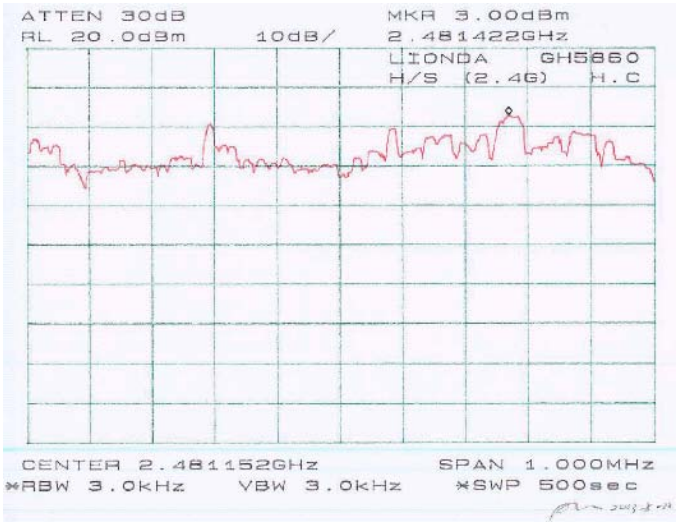
10dB/
MKR 5.83dBm
2.441120GHz
LIONDA GH5860
H/S (2.4G) M.C
CENTER 2.441220GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec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10dB/
MKR 3.00dBm
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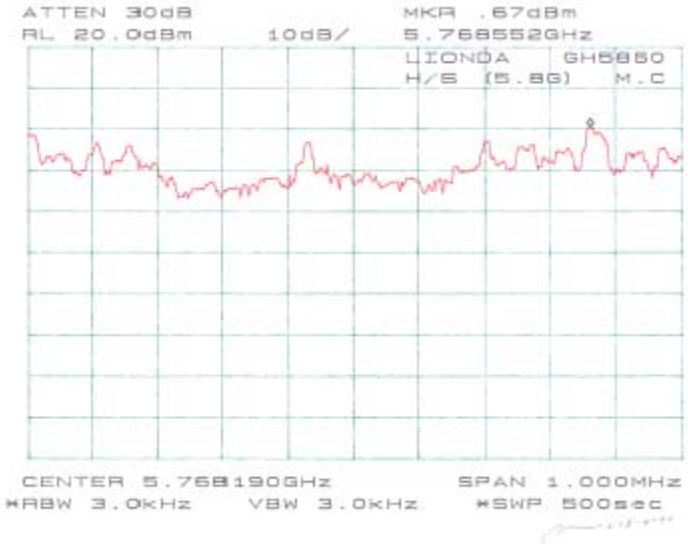
LIONDA GH5860
H/S (2.4G) H.C
CENTER 2.481152GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -.33dBm
5.729628GHz
LIONDA GH5850
H/S (5.8G) L.C
CENTER 5.729280GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR .67dBm
5.768552GHz
LIONDA GH5850
H/S (5.8G) M.C
CENTER 5.768190GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR .33dBm
5.808497GHz
LIONDA GH5850
H/S (5.8G) H.C
CENTER 5.808130GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec

7 - 100 KHZ BANDWIDTH OF BAND EDGES

7.1 Standard Applicable

According to §15.247(c), in *any* 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) see §15.205(c)).

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

7.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

7.4 Measurement Results

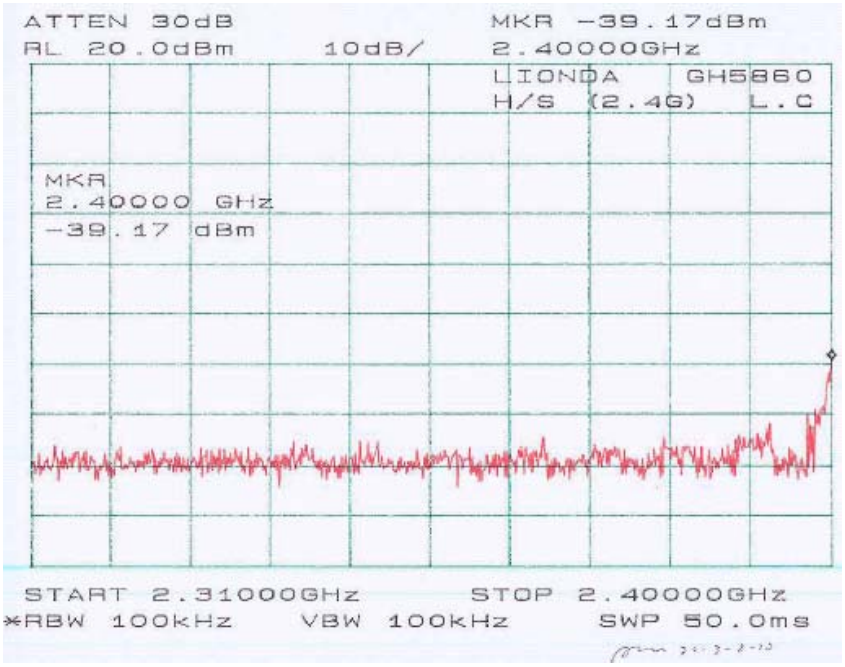
7.3.1 Test Result for 2.4GHz Band

Unit	Frequency	Standard (dBm)	Result
Handset	Low	≤ 20	Compliant
	Mid	≤ 20	Compliant
	High	≤ 20	Compliant

7.3.2 Test Result for 5.8GHz Band

Unit	Frequency	Standard (dBm)	Result
Handset	Low	≤ 20	Compliant
	Mid	≤ 20	Compliant
	High	≤ 20	Compliant

Please refer to following pages for plots of band edge.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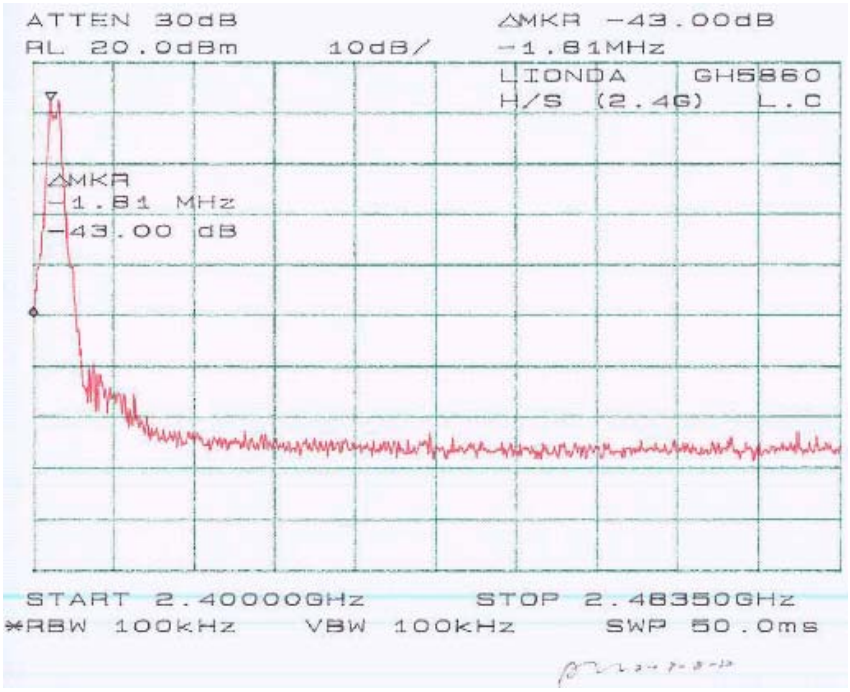
RL 20.0dBm
10dB/
MKR -39.17dBm
2.40000GHz
LIONDA GH5860
H/S (2.4G) L.C
MKR
2.40000 GHz
-39.17 dBm
START 2.31000GHz
STOP 2.40000GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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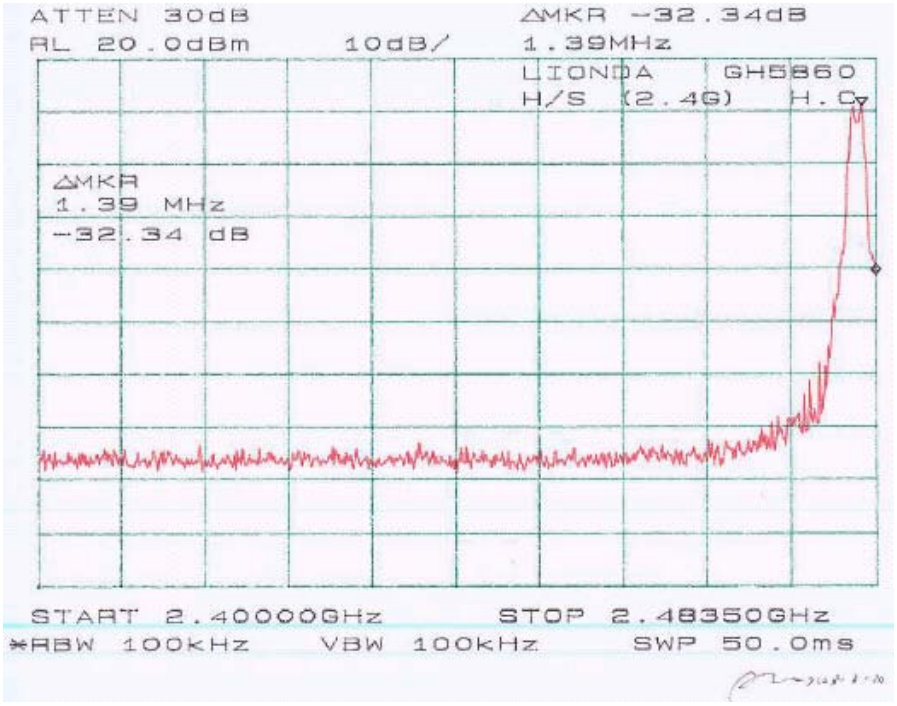
RL 20.0dBm
10dB/
△MKR -43.00dB
-1.81MHz
LIONDA GH5860
H/S (2.4G) L.C
△MKR
-1.81 MHz
-43.00 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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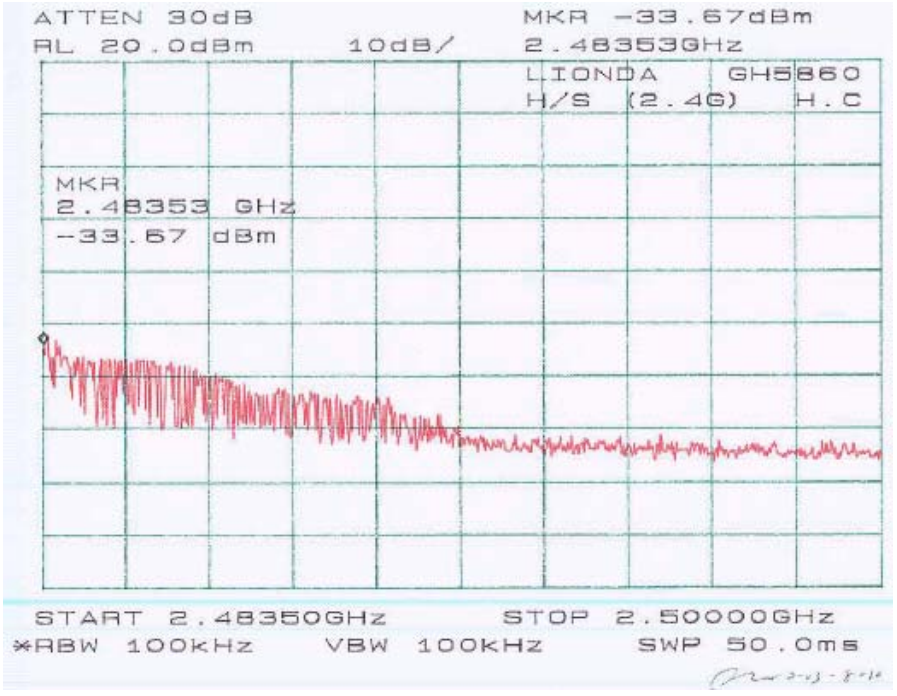
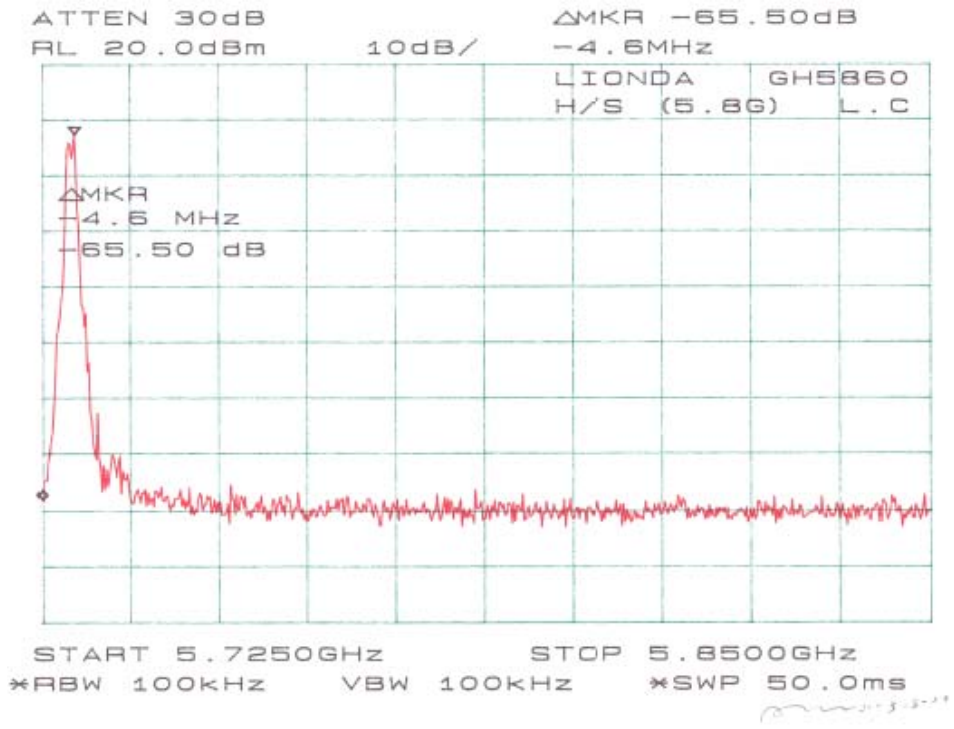
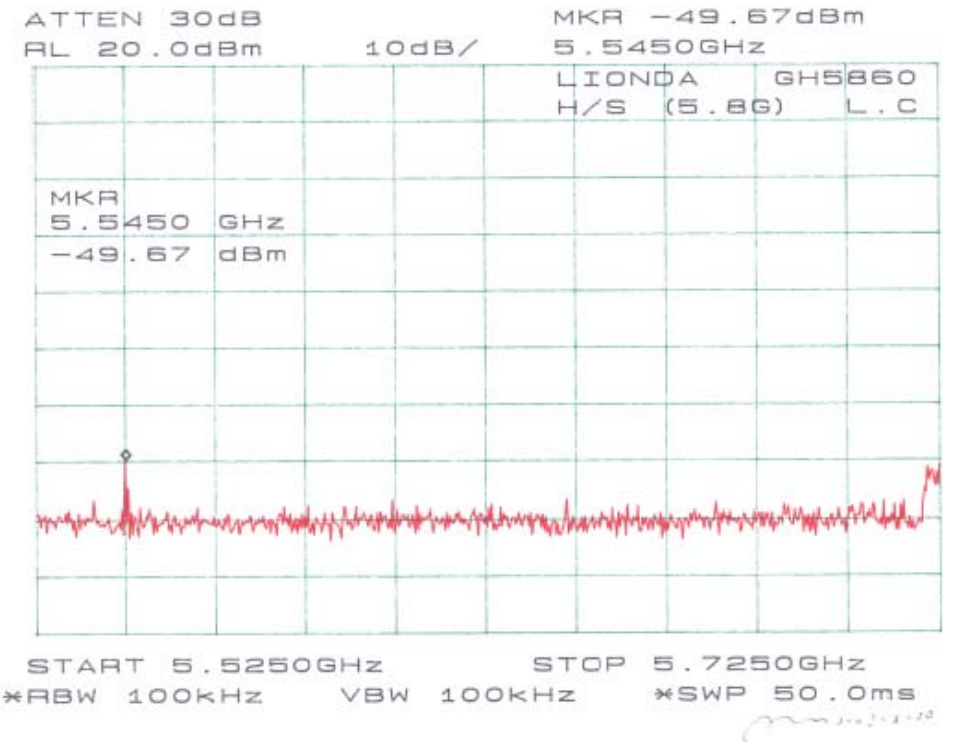
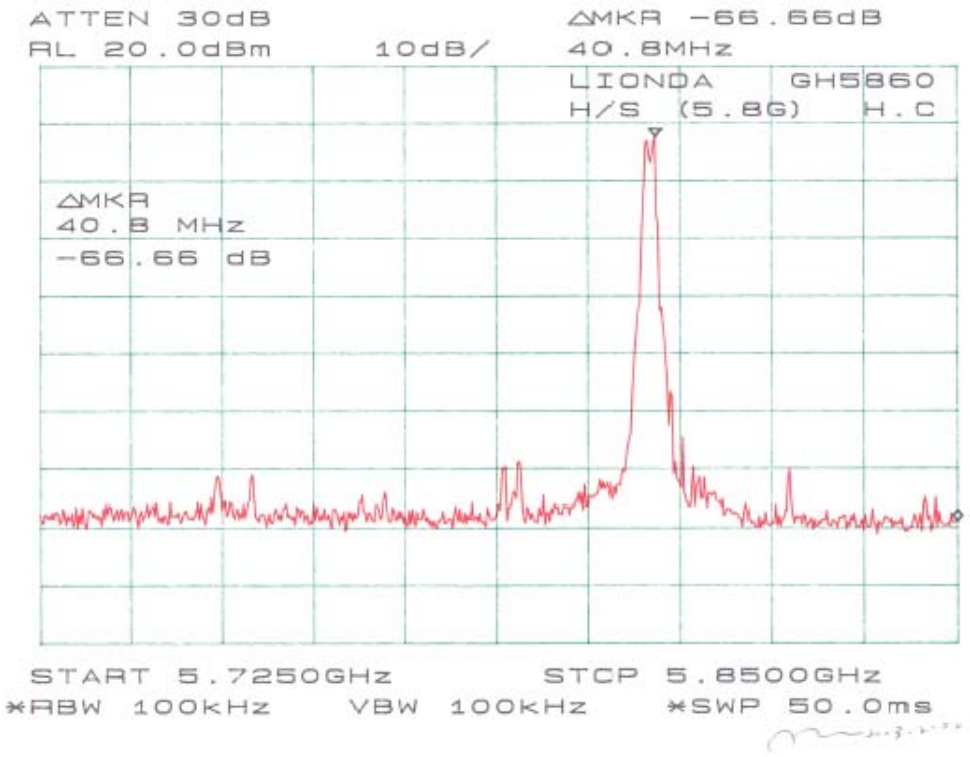
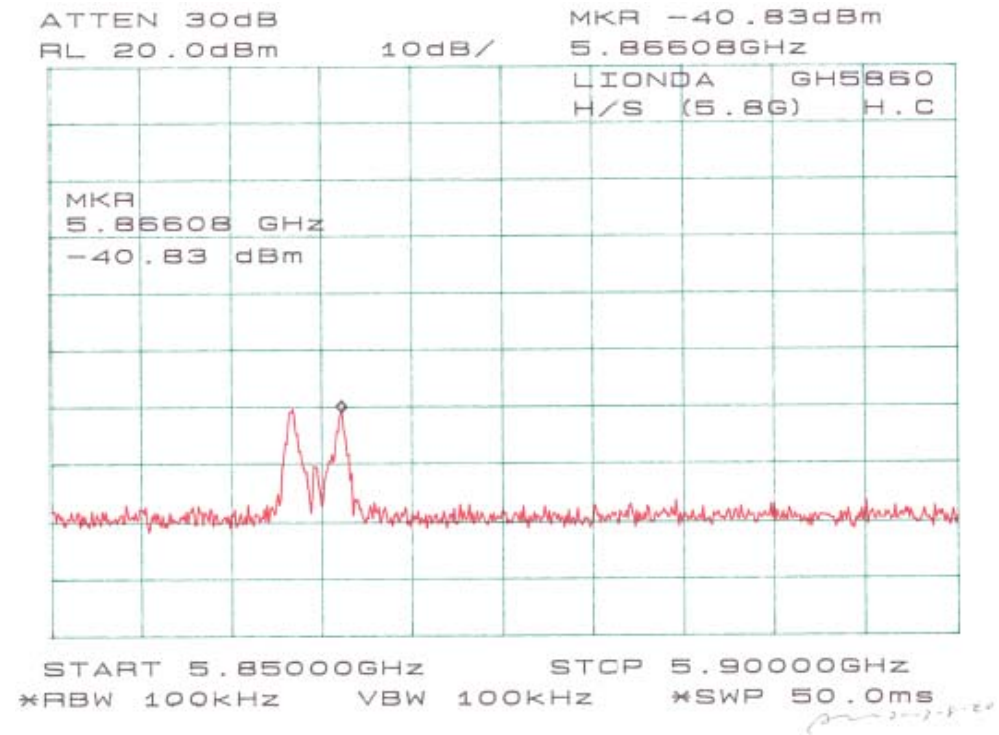
RL 20.0dBm
10dB/
ΔMKR -32.34dB
1.39MHz
LIONDA GH5860
H/S (2.4G) H.C
ΔMKR
1.39 MHz
-32.34 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -33.67dBm
2.48353GHz
LIONDA GH5860
H/S (2.4G) H.C
MKR
2.48353 GHz
-33.67 dBm
START 2.48350GHz
STOP 2.50000GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -65.50dB
-4.6MHz
LIONDA GH5860
H/S (5.8G) L.C
ΔMKR
-4.6 MHz
-65.50 dB
START 5.7250GHz
STOP 5.8500GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -49.67dBm
5.5450GHz
LIONDA GH5860
H/S (5.8G) L.C
MKR
5.5450 GHz
-49.67 dBm
START 5.5250GHz
STOP 5.7250GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -66.66dB
40.8MHz
LIONDA GH5860
H/S (5.8G) H.C
ΔMKR
40.8 MHz
-66.66 dB
START 5.7250GHz
STOP 5.8500GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -40.83dBm
5.86608GHz
LIONDA GH5860
H/S (5.8G) H.C
MKR
5.86608 GHz
-40.83 dBm
START 5.85000GHz
STOP 5.90000GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms

8 - SPURIOUS EMISSION AT ANTENNA TERMINNAL

8.1 Standard Applicable

Requirements: CFR 47, §2.1051.

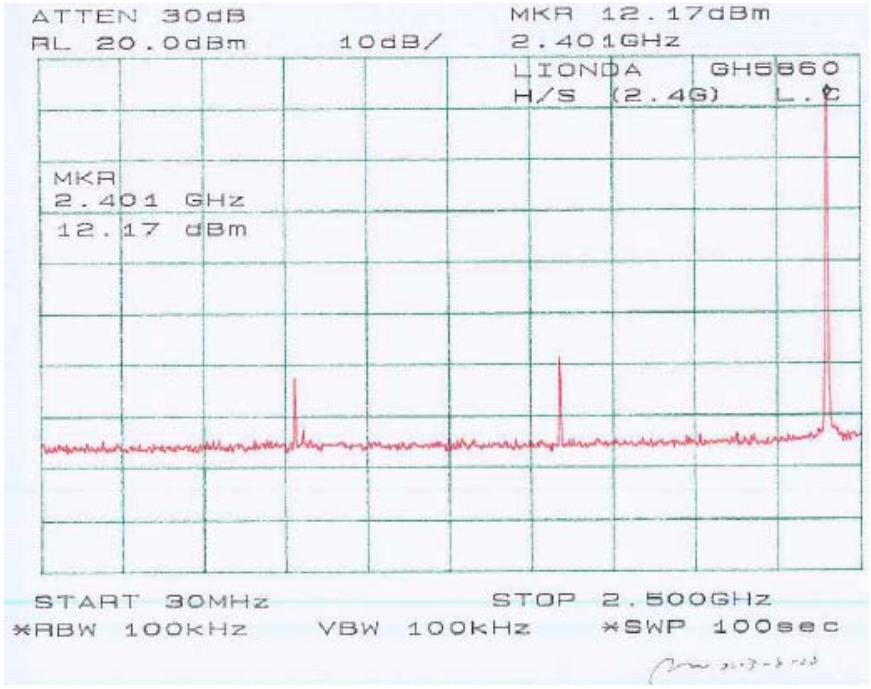
The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1057.

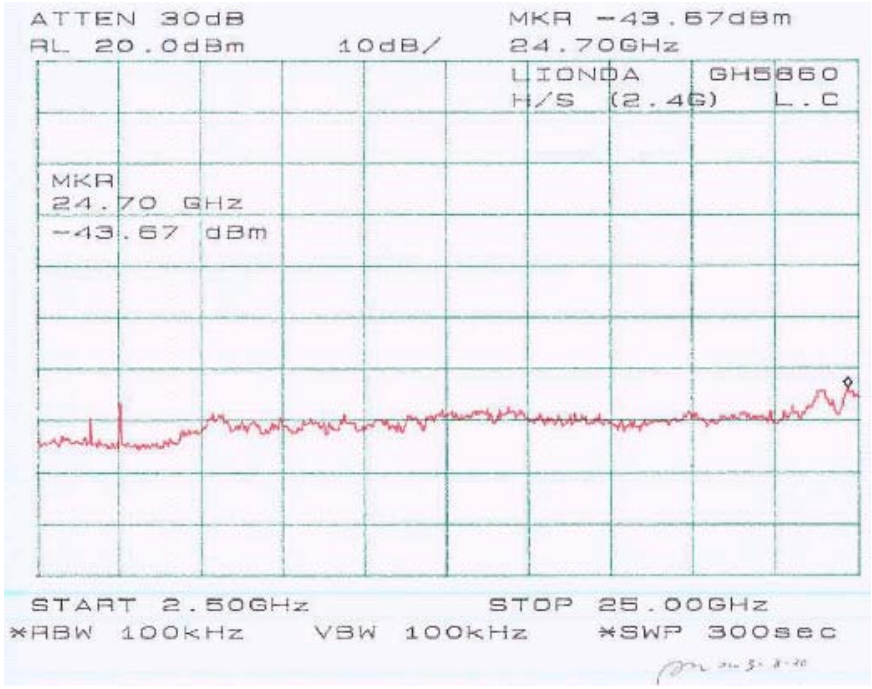
8.2 Measurement Procedure

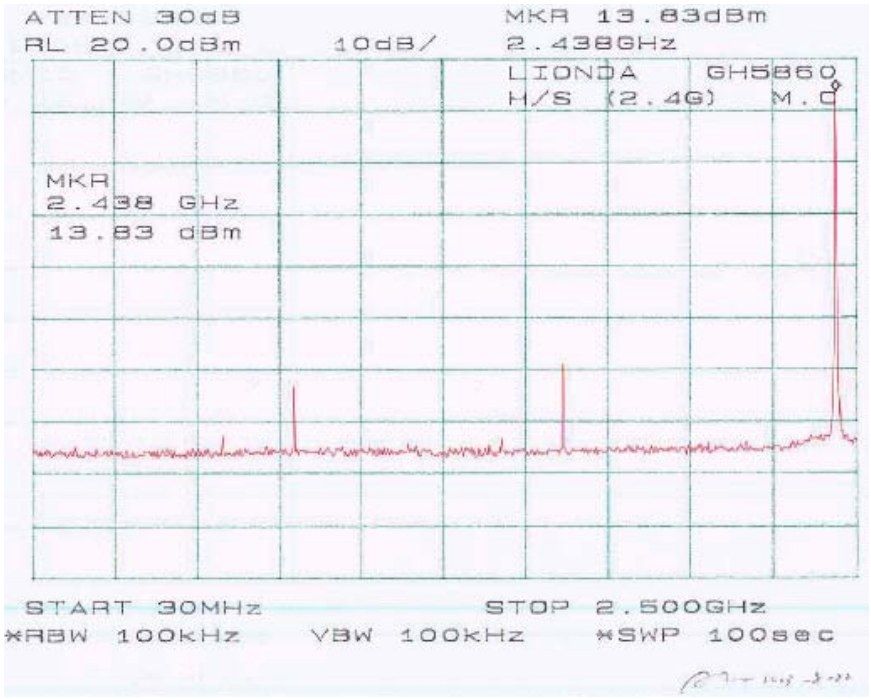
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

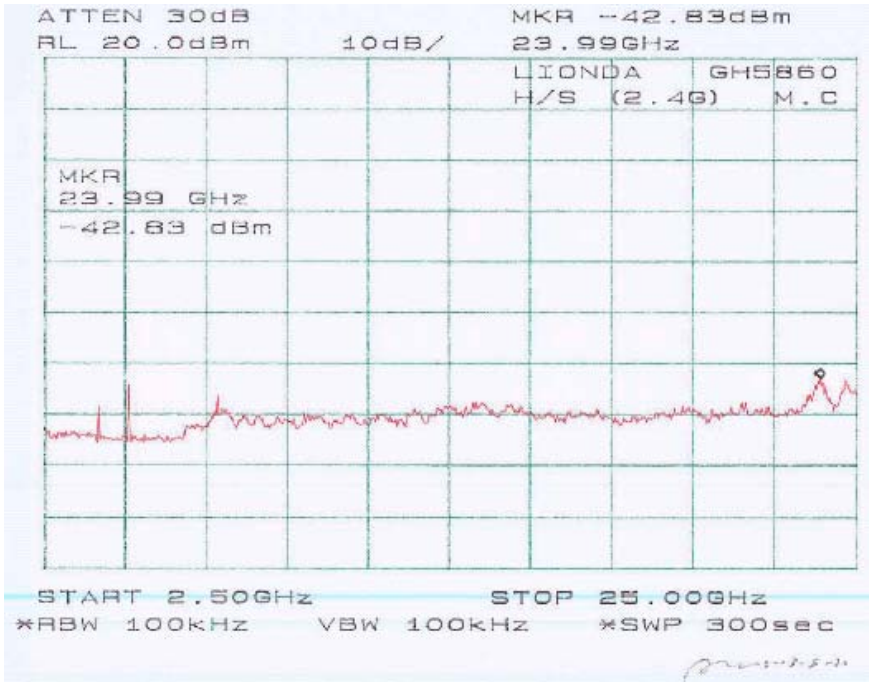
8.3 Measurement Result

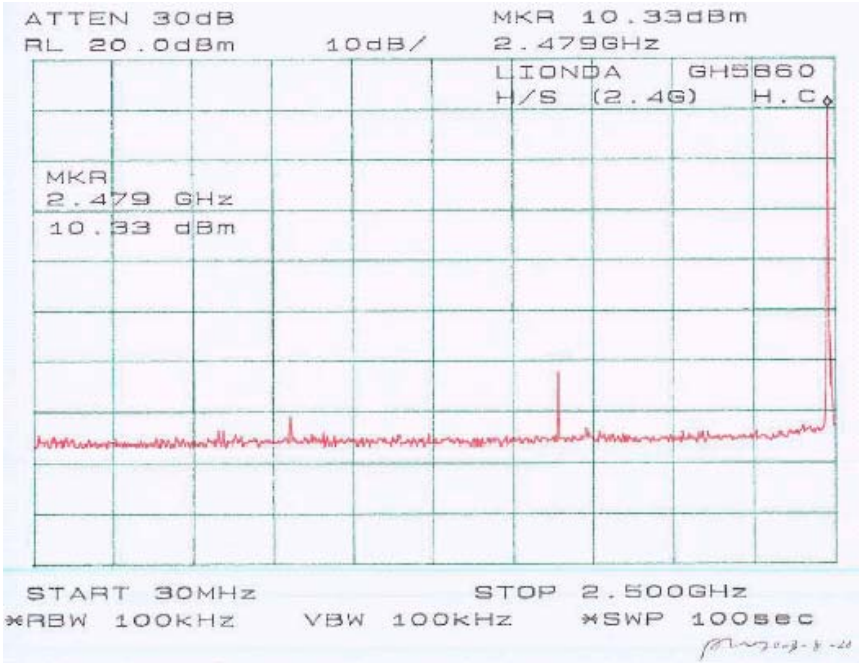
Please refer to following pages for plots of spurious emission.

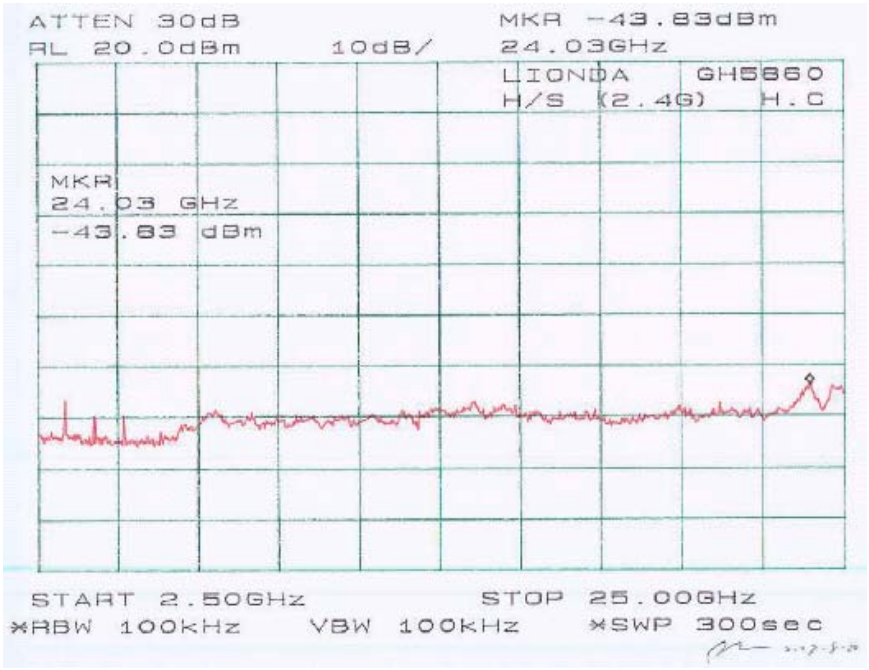

ATTEN 30dB
RL 20.0dBm
10dB/
MKR 12.17dBm
2.401GHz
LIONDA GH5860
H/S (2.4G) L.C
MKR
2.401 GHz
12.17 dBm
START 30MHz
STOP 2.500GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec

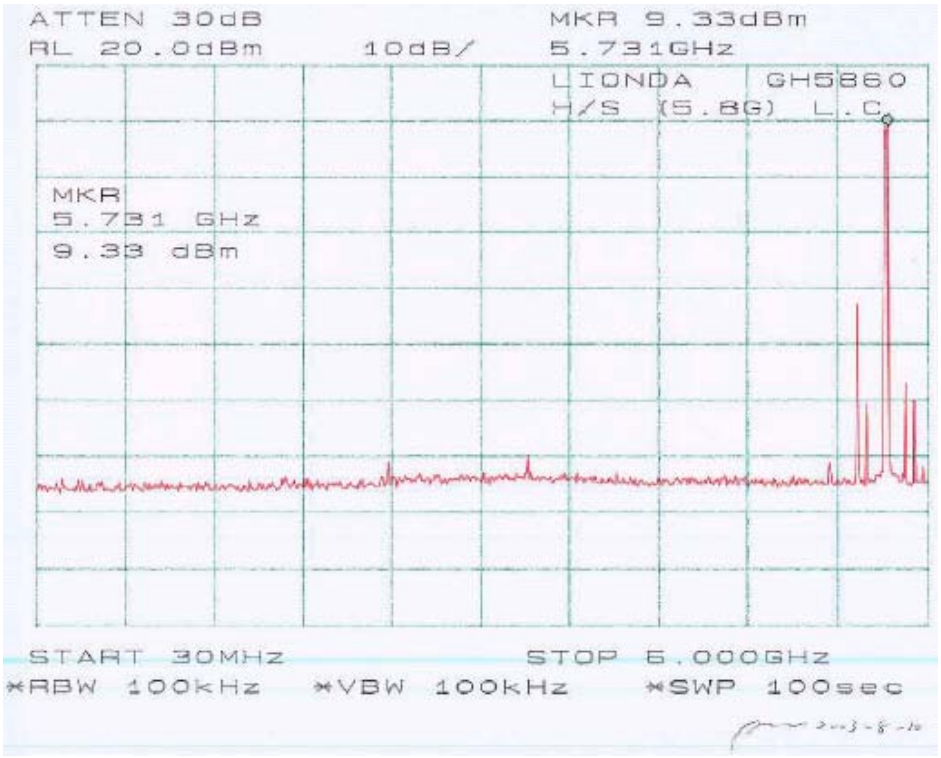

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -43.67dBm
24.70GHz
LIONDA GH5860
H/S (2.4G) L.C
MKR
24.70 GHz
-43.67 dBm
START 2.50GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec

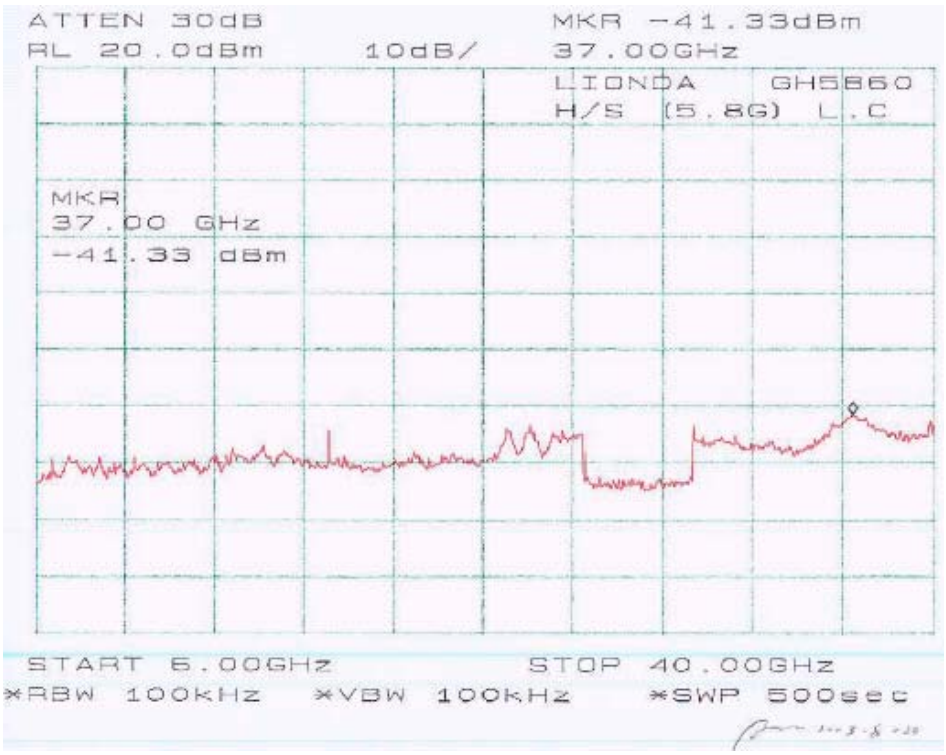

ATTEN 30dB
RL 20.0dBm
10dB/
MKR 13.83dBm
2.438GHz
LIONDA GH5860
H/S (2.4G) M.C
MKR
2.438 GHz
13.83 dBm
START 30MHz
STOP 2.500GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec

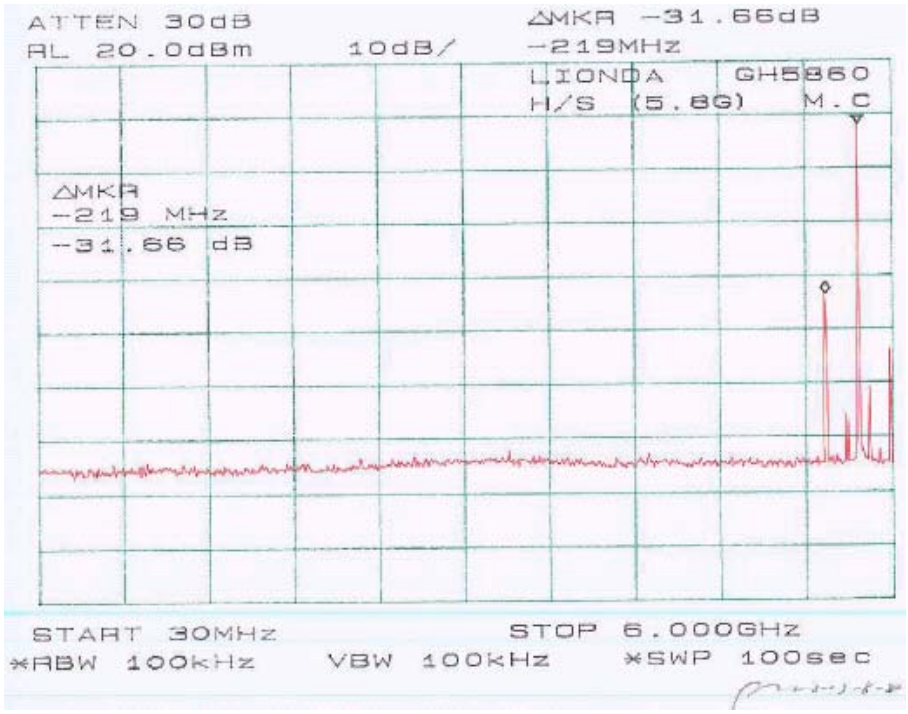

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -42.83dBm
23.99GHz
LIONDA GH5860
H/S (2.4G) M.C
MKR
23.99 GHz
-42.83 dBm
START 2.50GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec

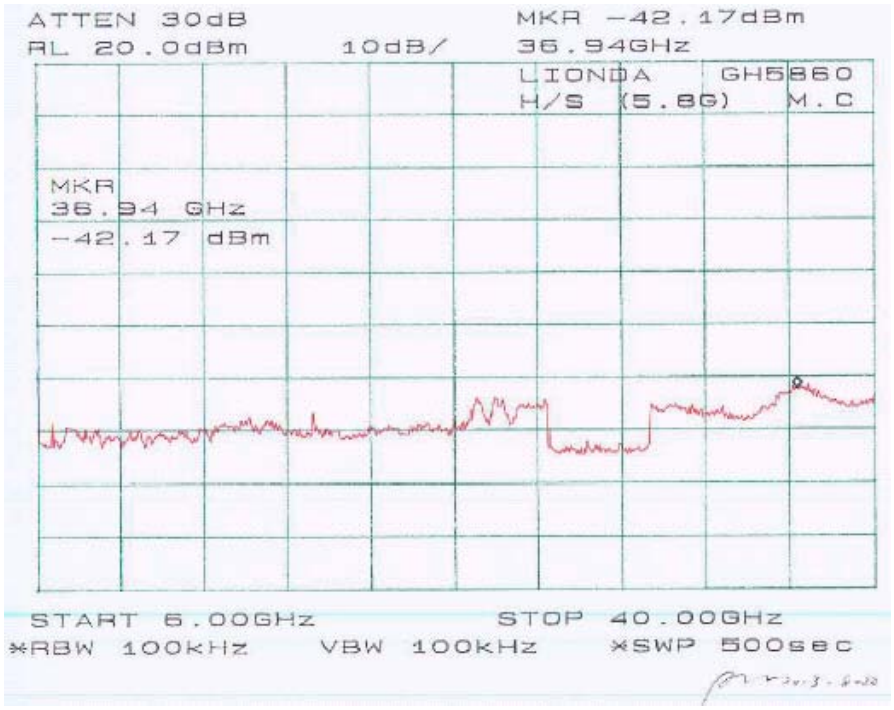

ATTEN 30dB
RL 20.0dBm
10dB/
MKR 10.33dBm
2.479GHz
LIONDA GH5860
H/S (2.4G) H.C
MKR
2.479 GHz
10.33 dBm
START 30MHz
STOP 2.500GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec

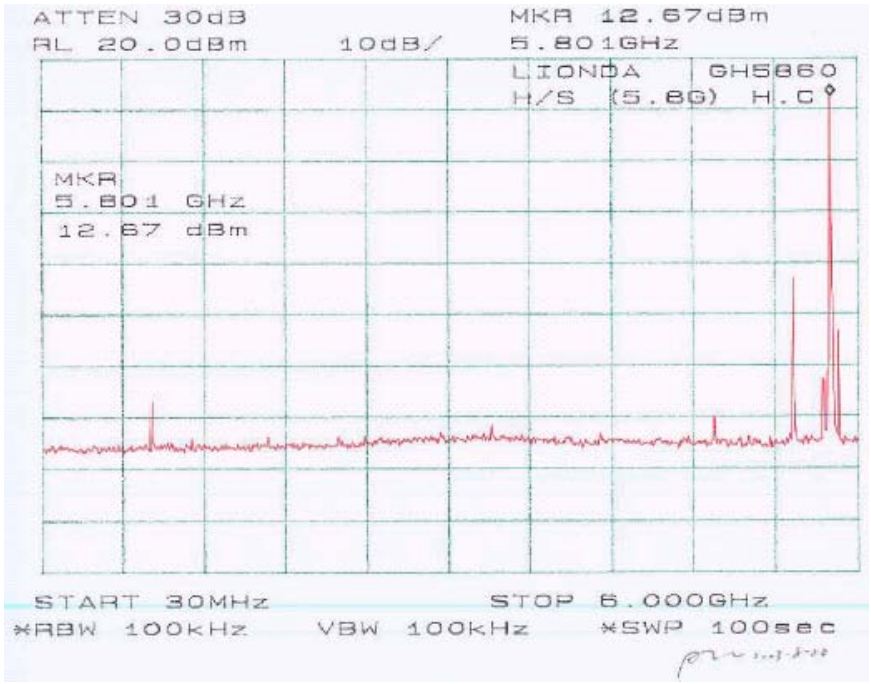

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -43.83dBm
24.03GHz
LIONDA GH5860
H/S (2.4G) H.C
MKR
24.03 GHz
-43.83 dBm
START 2.50GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec

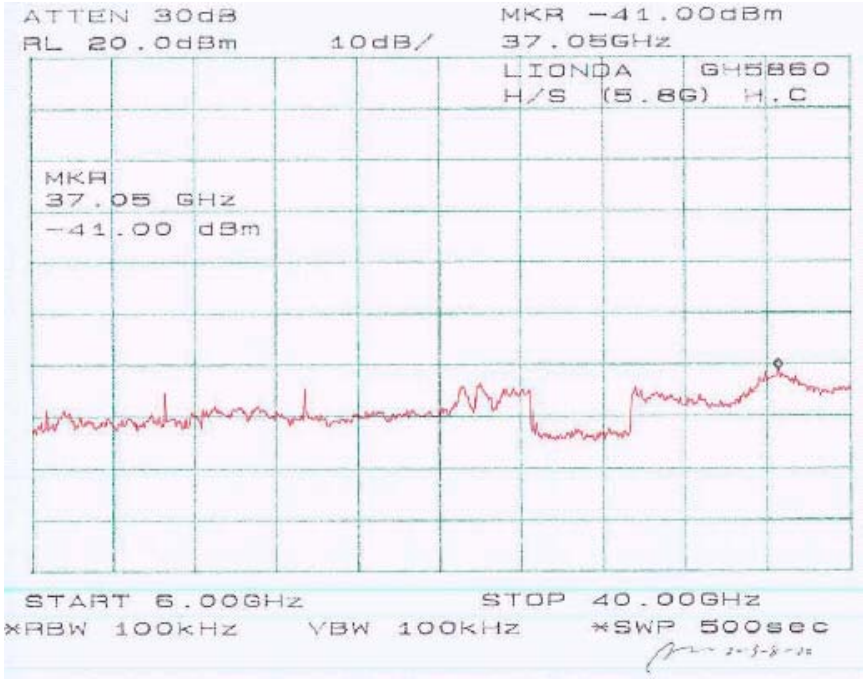

ATTEN 30dB
RL 20.0dBm
10dB/
MKR 9.33dBm
5.731GHz
LIONDA GH5860
H/S (5.8G) L.C
MKR
5.731 GHz
9.33 dBm
START 30MHz
STOP 6.000GHz
*RBW 100kHz
*VBW 100kHz
*SWP 100sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -41.33dBm
37.00GHz
LIONDA GH5860
H/S (5.8G) L.C
MKR
37.00 GHz
-41.33 dBm
START 6.00GHz
STOP 40.00GHz
*RBW 100kHz
*VBW 100kHz
*SWP 500sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -31.66dB
-219MHz
LIONDA GH5860
H/S (5.8G) M.C
ΔMKR
-219 MHz
-31.66 dB
START 30MHz
STOP 6.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -42.17dBm
36.94GHz
LIONDA GH5860
H/S (5.8G) M.C
MKR
36.94 GHz
-42.17 dBm
START 6.00GHz
STOP 40.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 500sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 12.67dBm
5.801GHz
LIONDA GH5860
H/S (5.8G) H.C
MKR
5.801 GHz
12.67 dBm
START 30MHz
STOP 6.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -41.00dBm
37.05GHz
LIONDA GH5860
H/S (5.8G) H.C
MKR
37.05 GHz
-41.00 dBm
START 6.00GHz
STOP 40.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 500sec

9 - ANTENNA REQUIREMENT

9.1 Standard Applicable

For intentional device, according to § 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.

And according to § 15.247 (1), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

9.2 Antenna Connected Construction

The directional gain of antenna used for transmitting is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

10 - SPURIOUS RADIATED EMISSION

10.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

According to §15.205, except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
[1]0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.57725	240 – 285	3345.8 – 3358	36.43 – 36.5
13.36 – 13.41	322 – 335.4	3600 – 4400	([2])

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510MHz
[2] Above 38.6

Except as provided in paragraph (d) and (e), the filed strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

According to §15.209, the device shall meet radiated emission general requirements.

Except for Class A device, the filed strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (Microvolts/meter)	dB (dBμV/meter)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

According to §15.247(c), attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the §15.209(a) limits.

10.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-2001. The specification used was the FCC 15 Subpart C limits.

The EUT was connected to a 120 VAC / 60 Hz power source and it was placed on the back edge of the test table.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped along the edge of the test table and bundle when necessary.

The EUT was tested in 3 orthogonal positions.

10.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 40GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Range	***RBW***	***Video B/W***
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

10.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2601A02165	2004-01-07
HP	Amplifier	8447E	2944A10187	2004-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11

*** Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

10.5 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.

10.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Subpart C. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Subpart C Limit

10.7 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207 and 15.247, and had the worst margin of:

2.4GHz, Handset:

-12.5 dB at **7206.90 MHz** in the **Vertical** polarization, Low Channel

-12.6 dB at **7323.65 MHz** in the **Vertical** polarization, Middle Channel

-15.2 dB at **7443.45 MHz** in the **Vertical** polarization, High Channel

-4.9 dB at **110.23 MHz** in the **Vertical** polarization, Unwanted Emission

5.8GHz, Handset:

-13.7 dB at **11458.56 MHz** in the **Vertical** polarization, Low Channel

-13.8 dB at **11536.38 MHz** in the **Vertical** polarization, Middle Channel

-13.9 dB at **11616.26 MHz** in the **Vertical** polarization, High Channel

-9.3 dB at **571.62 MHz** in the **Vertical** polarization, Unwanted Emission

10.7.1 Final test data, 2.4GHz

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 SUBPART C	
Frequency MHz	Ampl. dBμV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBμV/m	Cable DB	Amp. DB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
Low Channel, 1-25GHz											
2402.30	105.4	Fund/Peak	30	1.5	v	28.1	3.4	35.2	101.7		
2402.30	104.9	Fund/Peak	0	1.5	h	28.1	3.4	35.2	101.2		
2402.30	101.3	Fund/Ave	30	1.5	v	28.1	3.4	35.2	97.6		
2402.30	101.2	Fund/Ave	0	1.5	h	28.1	3.4	35.2	97.5		
7206.90	34.3	Ave	180	1.5	v	35.1	5.6	33.5	41.5	54	-12.5
7206.90	32.1	Ave	250	1.3	h	35.1	5.6	33.5	39.3	54	-14.7
4804.60	32.6	Ave	180	1.5	v	32.5	4.9	33.0	37.0	54	-17.0
4804.60	32.2	Ave	210	1.6	h	32.5	4.9	33.0	36.6	54	-17.4
7206.90	44.7	Peak	180	1.5	v	35.1	5.6	33.5	51.9	74	-22.1
7206.90	43.8	Peak	250	1.3	h	35.1	5.6	33.5	51.0	74	-23.0
4804.60	45.2	Peak	180	1.5	v	32.5	4.9	33.0	49.6	74	-24.4
4804.60	44.9	Peak	210	1.6	h	32.5	4.9	33.0	49.3	74	-24.7
Middle Channel, 1-25GHz											
2441.22	102.6	Fund/Peak	270	1.2	v	28.1	3.4	35.2	98.9		
2441.22	104.6	Fund/Peak	330	1.5	h	28.1	3.4	35.2	100.9		
2441.22	98.3	Fund/Ave	270	1.2	v	28.1	3.4	35.2	94.6		
2441.22	101.5	Fund/Ave	330	1.5	h	28.1	3.4	35.2	97.8		
7323.65	34.2	Ave	90	1.5	v	35.1	5.6	33.5	41.4	54	-12.6
7323.65	31.1	Ave	60	1.2	h	35.1	5.6	33.5	38.3	54	-15.7
4882.43	32.5	Ave	30	1.2	v	32.5	4.9	33.0	36.9	54	-17.1
4882.43	32.1	Ave	270	1.5	h	32.5	4.9	33.0	36.5	54	-17.5
7323.65	44.6	Peak	90	1.5	v	35.1	5.6	33.5	51.8	74	-22.2
7323.65	43.7	Peak	60	1.2	h	35.1	5.6	33.5	50.9	74	-23.1
4882.43	45.1	Peak	30	1.2	v	32.5	4.9	33.0	49.5	74	-24.5
4882.43	44.7	Peak	270	1.5	h	32.5	4.9	33.0	49.1	74	-24.9

High Channel, 1-25GHz											
2481.15	101.2	Fund/Peak	270	1.5	v	28.1	3.4	35.2	97.5		
2481.15	104.5	Fund/Peak	0	1.5	h	28.1	3.4	35.2	100.8		
2481.15	97.5	Fund/Ave	270	1.5	v	28.1	3.4	35.2	93.8		
2481.15	100.3	Fund/Ave	0	1.5	h	28.1	3.4	35.2	96.6		
7443.45	31.6	Ave	30	1.5	v	35.1	5.6	33.5	38.8	54	-15.2
7443.45	30.6	Ave	330	1.5	h	35.1	5.6	33.5	37.8	54	-16.2
4962.30	32.4	Ave	0	1.4	v	32.5	4.9	33.0	36.8	54	-17.2
4962.30	32.0	Ave	150	1.4	h	32.5	4.9	33.0	36.4	54	-17.6
7443.45	44.5	Peak	30	1.5	v	35.1	5.6	33.5	51.7	74	-22.3
7443.45	44.1	Peak	330	1.5	h	35.1	5.6	33.5	51.3	74	-22.7
4962.30	44.9	Peak	0	1.4	v	32.5	4.9	33.0	49.3	74	-24.7
4962.30	44.6	Peak	150	1.4	h	32.5	4.9	33.0	49.0	74	-25.0

Unintentional Emission

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart B	
Frequency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB
110.23	50.8	160	1.5	v	11.3	1.5	25.0	38.6	43.5	-4.9
163.59	48.1	270	1.2	v	12.9	1.8	25.0	37.8	43.5	-5.7
174.28	47.7	230	1.5	h	13.0	1.9	25.0	37.6	43.5	-5.9
226.20	40.5	290	1.6	h	11.8	2.2	25.0	29.5	46	-16.5
255.46	41.3	90	1.5	v	13.3	2.2	25.0	31.8	46	-14.2
362.97	38.4	15	1.8	v	15.5	2.4	25.0	31.3	46	-14.7

Note:

FUND = Fundamental
AVG = average

10.7.2 Final test data, 5.8GHz

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 SUBPART C	
Frequency MHz	Ampl. dBμV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBμV/m	Cable DB	Amp. DB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
Low Channel, 1-25GHz											
5729.28	105.4	Fund/Peak	30	1.5	v	34.1	5.4	35.2	109.7		
5729.28	104.9	Fund/Peak	0	1.5	h	34.1	5.4	35.2	109.2		
5729.28	101.3	Fund/Ave	30	1.5	v	34.1	5.4	35.2	105.6		
5729.28	101.2	Fund/Ave	0	1.5	h	34.1	5.4	35.2	105.5		
11458.56	32.6	Ave	180	1.5	v	35.1	5.6	33.0	40.3	54	-13.7
11458.56	32.1	Ave	210	1.6	h	35.1	5.6	33.0	39.8	54	-14.2
17187.84	31.8	Ave	180	1.5	v	35.1	5.6	33.5	39.0	54	-15.0
17187.84	31.2	Ave	250	1.3	h	35.1	5.6	33.5	38.4	54	-15.6
11458.56	45.3	Peak	180	1.5	v	35.1	5.6	33.0	53.0	74	-21.0
11458.56	44.9	Peak	210	1.6	h	35.1	5.6	33.0	52.6	74	-21.4
17187.84	44.7	Peak	180	1.5	v	35.1	5.6	33.5	51.9	74	-22.1
17187.84	44.5	Peak	250	1.3	h	35.1	5.6	33.5	51.7	74	-22.3
Middle Channel, 1-25GHz											
5768.19	102.6	Fund/Peak	270	1.2	v	34.1	5.4	35.2	106.9		
5768.19	104.6	Fund/Peak	330	1.5	h	34.1	5.4	35.2	108.9		
5768.19	98.3	Fund/Ave	270	1.2	v	34.1	5.4	35.2	102.6		
5768.19	101.5	Fund/Ave	330	1.5	h	34.1	5.4	35.2	105.8		
11536.38	32.5	Ave	30	1.2	v	35.1	5.6	33.0	40.2	54	-13.8
11536.38	32.1	Ave	270	1.5	h	35.1	5.6	33.0	39.8	54	-14.2
17304.57	31.7	Ave	90	1.5	v	35.1	5.6	33.5	38.9	54	-15.1
17304.57	30.8	Ave	60	1.2	h	35.1	5.6	33.5	38.0	54	-16.0
11536.38	45.1	Peak	30	1.2	v	35.1	5.6	33.0	52.8	74	-21.2
11536.38	44.7	Peak	270	1.5	h	35.1	5.6	33.0	52.4	74	-21.6
17304.57	44.6	Peak	90	1.5	v	35.1	5.6	33.5	51.8	74	-22.2
17304.57	44.2	Peak	60	1.2	h	35.1	5.6	33.5	51.4	74	-22.6

High Channel, 1-25GHz											
5808.13	101.2	Fund/Peak	270	1.5	v	34.1	5.4	35.2	105.5		
5808.13	104.5	Fund/Peak	0	1.5	h	34.1	5.4	35.2	108.8		
5808.13	97.5	Fund/Ave	270	1.5	v	34.1	5.4	35.2	101.8		
5808.13	100.3	Fund/Ave	0	1.5	h	34.1	5.4	35.2	104.6		
11616.26	32.4	Ave	0	1.4	v	35.1	5.6	33.0	40.1	54	-13.9
11616.26	32.0	Ave	150	1.4	h	35.1	5.6	33.0	39.7	54	-14.3
17424.39	31.5	Ave	30	1.5	v	35.1	5.6	33.5	38.7	54	-15.3
17424.39	30.6	Ave	330	1.5	h	35.1	5.6	33.5	37.8	54	-16.2
11616.26	44.9	Peak	0	1.4	v	35.1	5.6	33.0	52.6	74	-21.4
11616.26	44.6	Peak	150	1.4	h	35.1	5.6	33.0	52.3	74	-21.7
17424.39	44.5	Peak	30	1.5	v	35.1	5.6	33.5	51.7	74	-22.3
17424.39	44.1	Peak	330	1.5	h	35.1	5.6	33.5	51.3	74	-22.7

Unintentional Emission

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart B	
Frequency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB
571.62	39.4	210	1.8	v	19.3	3.0	25.0	36.7	46	-9.3
109.24	43.5	120	1.5	h	11.0	1.5	25.0	31.0	43.5	-12.5
225.08	41.9	230	1.5	h	11.8	2.2	25.0	30.9	46	-15.1
326.44	37.3	150	1.2	v	15.5	2.3	25.0	30.1	46	-15.9
167.21	39.8	60	1.2	h	13.0	1.8	25.0	29.6	46	-16.4

Note:

FUND = Fundamental
AVG = average