8 - 100 KHZ BANDWIDTH OF BAND EDGES

8.1 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)).

8.2 Measurement Procedure

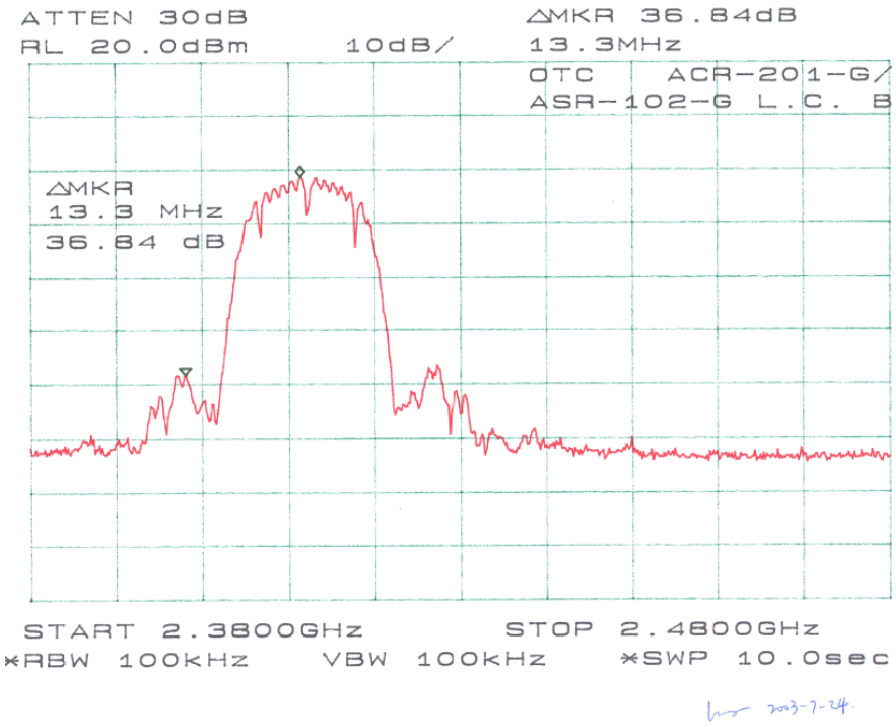
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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.

8.3 Test Equipment

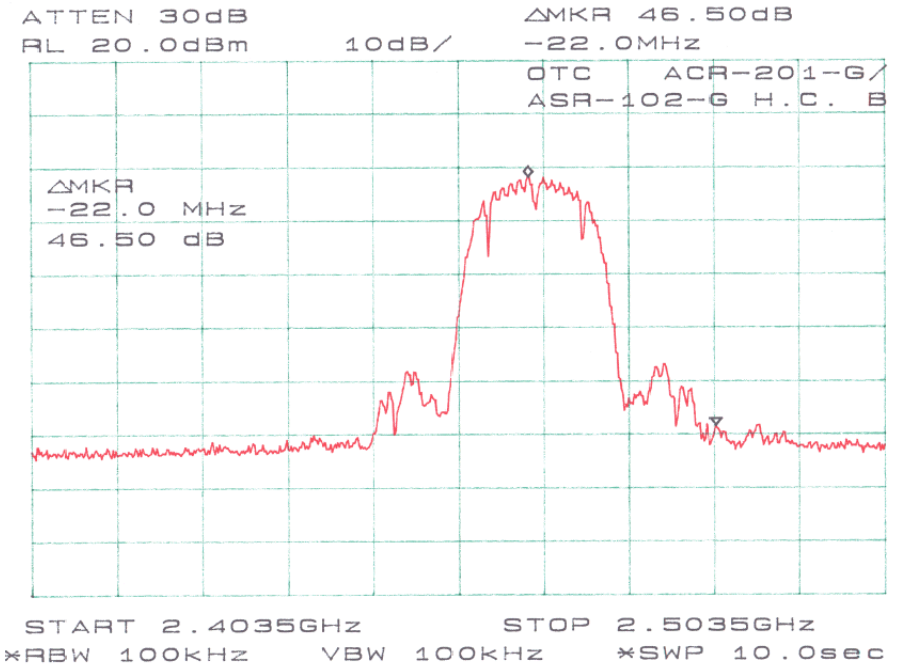
Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

8.4 Measure Results

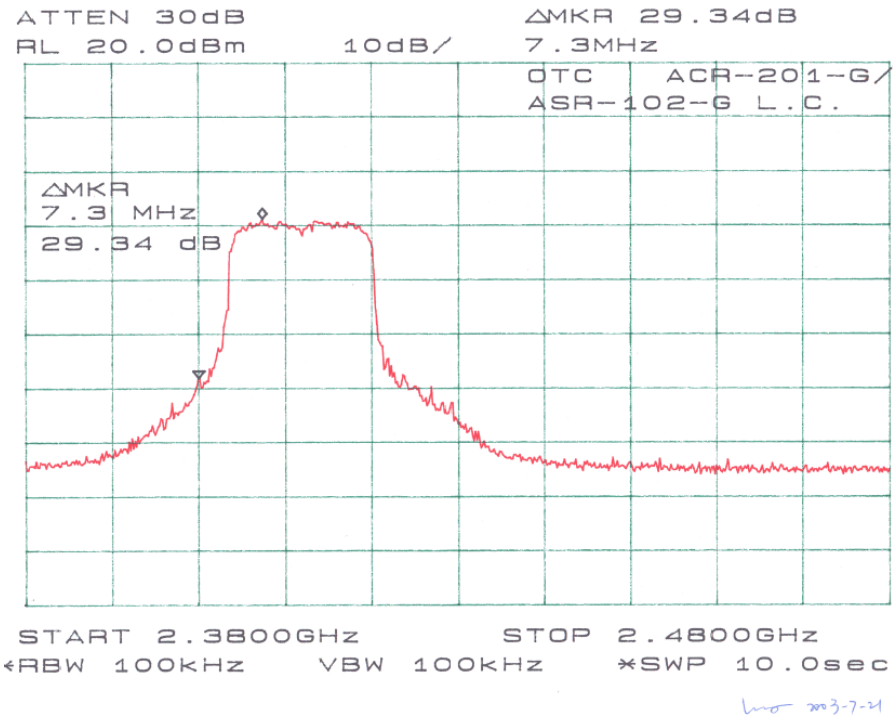
Please refer to following pages for plots of band edge.

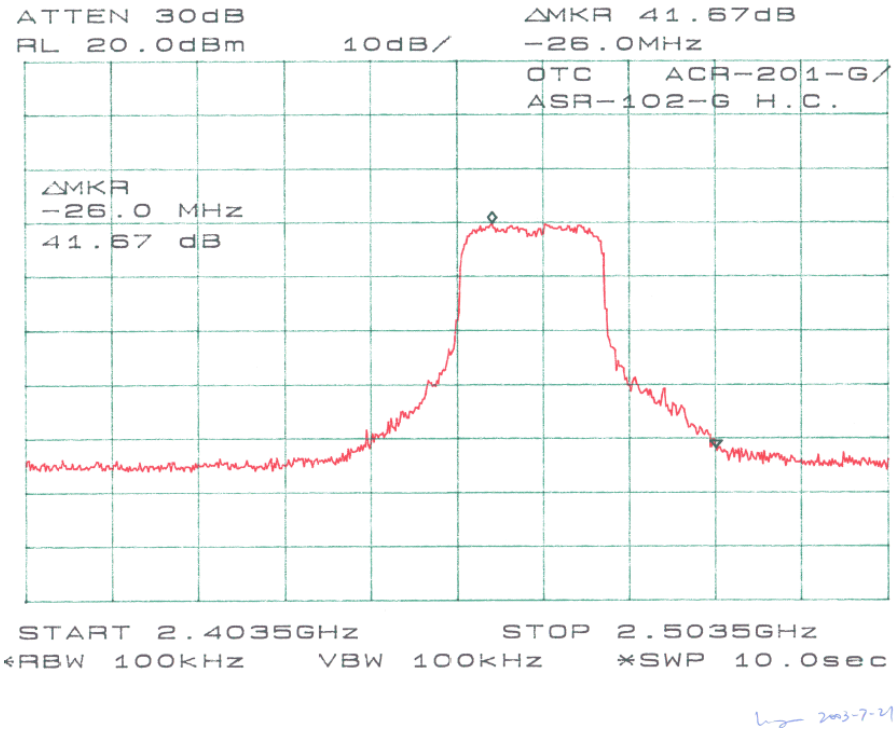


2003-7-24.



2003-7-24


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 29.34dB
7.3MHz
OTC ACR-201-G/
ASR-102-G L.C.
ΔMKR
7.3 MHz
29.34 dB
START 2.3800GHz
STOP 2.4800GHz
RBW 100kHz
VBW 100kHz
SWP 10.0sec
2003-7-21


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 41.67dB
-26.0MHz
OTC ACR-201-G/
ASR-102-G H.C.
ΔMKR
-26.0 MHz
41.67 dB
START 2.4035GHz
STOP 2.5035GHz
RBW 100kHz
VBW 100kHz
SWP 10.0sec
2003-7-21

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 gain of dipole antenna used for transmitting is 2 dBi, and the antenna connector is uniquely designed with no consideration of replacement.

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 ±4.0 dB.

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 C63.4-1992. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with 120Vac/60Hz power source.

10.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25GHz.

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 Procedure

For the radiated emissions test, the Host PC system power cord was connected to the AC floor outlet since the power supply used in the EUT did not provide an accessory power outlet.

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.

10.5 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

10.6 Test Equipment

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

10.7 Summary of Test Results

According to the data in section 10.8, 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:

For802.11b:

-12.6 dB at **7236.00 MHz** in the **Vertical** polarization, Low Channel

-12.9 dB at **7311.00 MHz** in the **Vertical** polarization, Middle Channel

-13.1 dB at **7386.00 MHz** in the **Vertical** polarization, High Channel

-2.1 dB at **480.02 MHz** in the **Vertical** polarization, Unintentional Emission

For 802.11g:

-13.1 dB at **7236.00 MHz** in the **Vertical** polarization, Low Channel

-13.2 dB at **7311.00 MHz** in the **Vertical** polarization, Middle Channel

-13.1 dB at **7386.00 MHz** in the **Horizontal** polarization, High Channel

-3.4 dB at **531.45 MHz** in the **Vertical** polarization, Unintentional Emission

10.8.1 Final test data for 802.11b, 1 – 25 GHz

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											
2412.00	99.8	FUND/PEAK	0	1.6	V	28.1	3.4	35.2	96.1		
2412.00	97.5	FUND/PEAK	90	1.5	H	28.1	3.4	35.2	93.8		
2412.00	95.5	FUND/AVE	0	1.6	V	28.1	3.4	35.2	91.8		
2412.00	92.5	FUND/AVE	90	1.5	H	28.1	3.4	35.2	88.8		
7236.00	34.2	AVE	30	1.8	V	35.1	5.6	33.5	41.4	54	-12.6
7236.00	33.8	AVE	270	1.5	H	35.1	5.6	33.5	41.0	54	-13.0
4824.00	31.5	AVE	0	1.5	V	32.5	4.9	33.0	35.9	54	-18.1
4824.00	31.5	AVE	90	1.2	H	32.5	4.9	33.0	35.9	54	-18.1
7236.00	46.3	PEAK	30	1.8	V	35.1	5.6	33.5	53.6	74	-20.4
7236.00	46.2	PEAK	270	1.5	H	35.1	5.6	33.5	53.4	74	-20.6
4824.00	43.5	PEAK	90	1.2	H	32.5	4.9	33.0	47.9	74	-26.1
4824.00	43.3	PEAK	0	1.5	V	32.5	4.9	33.0	47.7	74	-26.3
Middle Channel											
2437.00	98.5	FUND/PEAK	180	1.4	V	28.1	3.4	35.2	94.8		
2437.00	99.8	FUND/PEAK	270	1.6	H	28.1	3.4	35.2	96.1		
2437.00	93.5	FUND/AVE	180	1.4	V	28.1	3.4	35.2	89.8		
2437.00	95.3	FUND/AVE	270	1.6	H	28.1	3.4	35.2	91.6		
7311.00	33.8	AVE	15	1.5	V	35.1	5.6	33.5	41.1	54	-12.9
7311.00	33.7	AVE	60	1.2	H	35.1	5.6	33.5	40.9	54	-13.1
4874.00	31.7	AVE	300	1.8	H	32.5	4.9	33.0	36.1	54	-17.9
4874.00	31.5	AVE	0	1.6	V	32.5	4.9	33.0	35.9	54	-18.1
7311.00	45.2	PEAK	15	1.5	V	35.1	5.6	33.5	52.4	74	-21.6
7311.00	45.0	PEAK	60	1.2	H	35.1	5.6	33.5	52.2	74	-21.8
4874.00	43.7	PEAK	300	1.8	H	32.5	4.9	33.0	48.1	74	-25.9
4874.00	43.5	PEAK	0	1.6	V	32.5	4.9	33.0	47.9	74	-26.1
High Channel											
2462.00	99.5	FUND/PEAK	180	1.5	V	28.1	3.4	35.2	95.8		
2462.00	98.2	FUND/PEAK	90	1.4	H	28.1	3.4	35.2	94.4		
2462.00	95.2	FUND/AVE	180	1.5	V	28.1	3.4	35.2	91.4		
2462.00	93.5	FUND/AVE	90	1.4	H	28.1	3.4	35.2	89.8		
7386.00	33.7	AVE	0	1.2	V	35.1	5.6	33.5	40.9	54	-13.1
7386.00	33.5	AVE	90	1.5	H	35.1	5.6	33.5	40.7	54	-13.3
4924.00	31.5	AVE	30	1.6	V	32.5	4.9	33.0	35.9	54	-18.1
4924.00	31.3	AVE	270	1.5	H	32.5	4.9	33.0	35.7	54	-18.3
7386.00	45.5	PEAK	0	1.2	V	35.1	5.6	33.5	52.7	74	-21.3
7386.00	45.0	PEAK	90	1.5	H	35.1	5.6	33.5	52.2	74	-21.8
4924.00	44.0	PEAK	30	1.6	V	32.5	4.9	33.0	48.4	74	-25.6
4924.00	43.8	PEAK	270	1.5	H	32.5	4.9	33.0	48.2	74	-25.8

Unintentional Emissions

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
480.02	47.5	90	2.0	V	18.3	3.1	25.0	43.9	46	-2.1
528.15	45.5	0	1.8	V	18.8	3.0	25.0	42.3	46	-3.7
597.71	40.8	90	1.3	V	20.0	3.2	25.0	39.1	46	-6.9
279.10	45.2	220	1.5	V	13.3	2.2	25.0	35.7	46	-10.3
351.06	40.5	60	1.8	H	15.5	2.3	25.0	33.3	46	-12.7
177.10	39.5	270	1.2	H	13.1	1.9	25.0	29.5	43.5	-14.0

Note:

AVG = average

10.8.2 Final test data for 802.11b, 1 – 25 GHz

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											
2412.00	98.3	FUND/PEAK	180	1.5	V	28.1	3.4	35.2	94.6		
2412.00	96.3	FUND/PEAK	300	1.5	H	28.1	3.4	35.2	92.6		
2412.00	88.2	FUND/AVE	180	1.5	V	28.1	3.4	35.2	84.4		
2412.00	86.3	FUND/AVE	300	1.5	H	28.1	3.4	35.2	82.6		
7236.00	33.7	AVE	0	1.2	V	35.1	5.6	33.5	40.9	54	-13.1
7236.00	33.6	AVE	270	1.4	H	35.1	5.6	33.5	40.8	54	-13.2
4824.00	31.7	AVE	90	1.5	H	32.5	4.9	33.0	36.1	54	-17.9
4824.00	31.5	AVE	150	1.8	V	32.5	4.9	33.0	35.9	54	-18.1
7236.00	45.7	PEAK	0	1.2	V	35.1	5.6	33.5	52.9	74	-21.1
7236.00	45.3	PEAK	270	1.4	H	35.1	5.6	33.5	52.6	74	-21.4
4824.00	43.7	PEAK	150	1.8	V	32.5	4.9	33.0	48.1	74	-25.9
4824.00	43.3	PEAK	90	1.5	H	32.5	4.9	33.0	47.7	74	-26.3
Middle Channel											
2437.00	98.8	FUND/PEAK	0	1.5	V	28.1	3.4	35.2	95.1		
2437.00	98.7	FUND/PEAK	90	1.8	H	28.1	3.4	35.2	94.9		
2437.00	89.3	FUND/AVE	0	1.5	V	28.1	3.4	35.2	85.6		
2437.00	87.7	FUND/AVE	90	1.8	H	28.1	3.4	35.2	83.9		
7311.00	33.6	AVE	180	1.4	V	35.1	5.6	33.5	40.8	54	-13.2
7311.00	33.3	AVE	90	1.8	H	35.1	5.6	33.5	40.5	54	-13.5
4874.00	31.5	AVE	30	1.4	V	32.5	4.9	33.0	35.9	54	-18.1
4874.00	31.3	AVE	270	1.6	H	32.5	4.9	33.0	35.7	54	-18.3
7311.00	45.8	PEAK	180	1.4	V	35.1	5.6	33.5	53.1	74	-20.9
7311.00	45.4	PEAK	90	1.8	H	35.1	5.6	33.5	52.6	74	-21.4
4874.00	44.1	PEAK	30	1.4	V	32.5	4.9	33.0	48.5	74	-25.5
4874.00	43.8	PEAK	270	1.6	H	32.5	4.9	33.0	48.2	74	-25.8
High Channel											
2462.00	99.0	FUND/PEAK	330	1.5	V	28.1	3.4	35.2	95.3		
2462.00	99.7	FUND/PEAK	90	2.0	H	28.1	3.4	35.2	95.9		
2462.00	88.7	FUND/AVE	330	1.5	V	28.1	3.4	35.2	84.9		
2462.00	90.3	FUND/AVE	90	2.0	H	28.1	3.4	35.2	86.6		
7386.00	33.7	AVE	270	1.5	H	35.1	5.6	33.5	40.9	54	-13.1
7386.00	33.5	AVE	30	1.3	V	35.1	5.6	33.5	40.7	54	-13.3
4924.00	31.7	AVE	0	1.6	V	32.5	4.9	33.0	36.1	54	-17.9
4924.00	31.6	AVE	90	1.8	H	32.5	4.9	33.0	36.0	54	-18.0
7386.00	45.8	PEAK	270	1.5	H	35.1	5.6	33.5	53.0	74	-21.0
7386.00	45.5	PEAK	30	1.3	V	35.1	5.6	33.5	52.7	74	-21.3
4924.00	43.8	PEAK	0	1.6	V	32.5	4.9	33.0	48.2	74	-25.8

4924.00	43.5	PEAK	90	1.8	H	32.5	4.9	33.0	47.9	74	-26.1

Unintentional Emissions

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart B	
Frequency MHz	Ampl. dBμV/m	Direction Degree	Height Meter	Polar H/V	Antenna dBμV/m	Cable Loss dBμV/m	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
531.45	45.3	90	1.5	V	19.3	3.0	25.0	42.6	46	-3.4
161.00	41.8	180	2.0	H	12.9	1.8	25.0	31.5	43.5	-12.0
201.50	43.5	180	1.2	V	11.5	2.2	25.0	32.2	46	-13.8
280.01	40.3	150	1.2	V	13.4	2.3	25.0	31.0	46	-15.0
177.00	38.7	0	1.8	H	13.1	1.9	25.0	28.7	46	-17.3

Note:

AVG = average

11 - CONDUCTED EMISSIONS

11.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

11.2 EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-1992 measurement procedure. The specification used was FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with 120Vac/60Hz power source.

11.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction test:

Start Frequency..... 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed..... Auto
IF Bandwidth..... 10 kHz
Video Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth ..... 9 kHz
Quasi-Peak Adapter Mode..... Normal

11.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

11.5 Test Equipment

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

11.6 Summary of Test Results

According to the data in section 11.7, the EUT complies with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

-8.7 dBμV at 0.225 MHz in the Line mode, AK II Power Supply

-14.0 dBμV at 1.72 MHz in the Neutral mode, DELTA Power Supply

11.7 Conducted Emissions Test Data

AK II Power Supply

LINE CONDUCTED EMISSIONS				FCC PART 15 CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.225	43.3	AVG	Line	52	-8.7
0.230	42.8	AVG	Neutral	52	-9.2
0.685	36.6	AVG	Neutral	46	-9.4
0.685	36.1	AVG	Line	46	-9.9
0.910	34.5	AVG	Line	46	-11.5
0.225	50.3	QP	Line	62	-11.7
0.230	49.8	QP	Neutral	62	-12.2
0.685	43.7	QP	Neutral	56	-12.3
0.685	43.4	QP	Line	56	-12.6
0.915	40.9	QP	Neutral	56	-15.1
0.910	40.5	QP	Line	56	-15.5
0.925	28.8	AVG	Neutral	46	-17.2

DELTA Powe Supply

LINE CONDUCTED EMISSIONS				FCC PART 15 CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
1.720	32.0	AVG	Neutral	46	-14.0
1.695	30.9	AVG	Line	46	-15.1
1.720	40.6	QP	Neutral	56	-15.4
1.710	40.1	QP	Line	56	-15.9
23.130	33.5	AVG	Line	50	-16.5
23.130	33.2	AVG	Neutral	50	-16.8
0.265	32.7	AVG	Line	51	-18.3
0.150	44.6	QP	Neutral	66	-21.4
0.265	38.1	QP	Line	61	-22.9
23.130	33.6	QP	Line	60	-26.4
23.130	33.2	QP	Neutral	60	-26.8
0.150	19.2	AVG	Neutral	56	-36.8

11.8 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.

Plots for AKII Power Supply

Bay Area Compliance Laboratory Corp 21. Jul 03 17:39

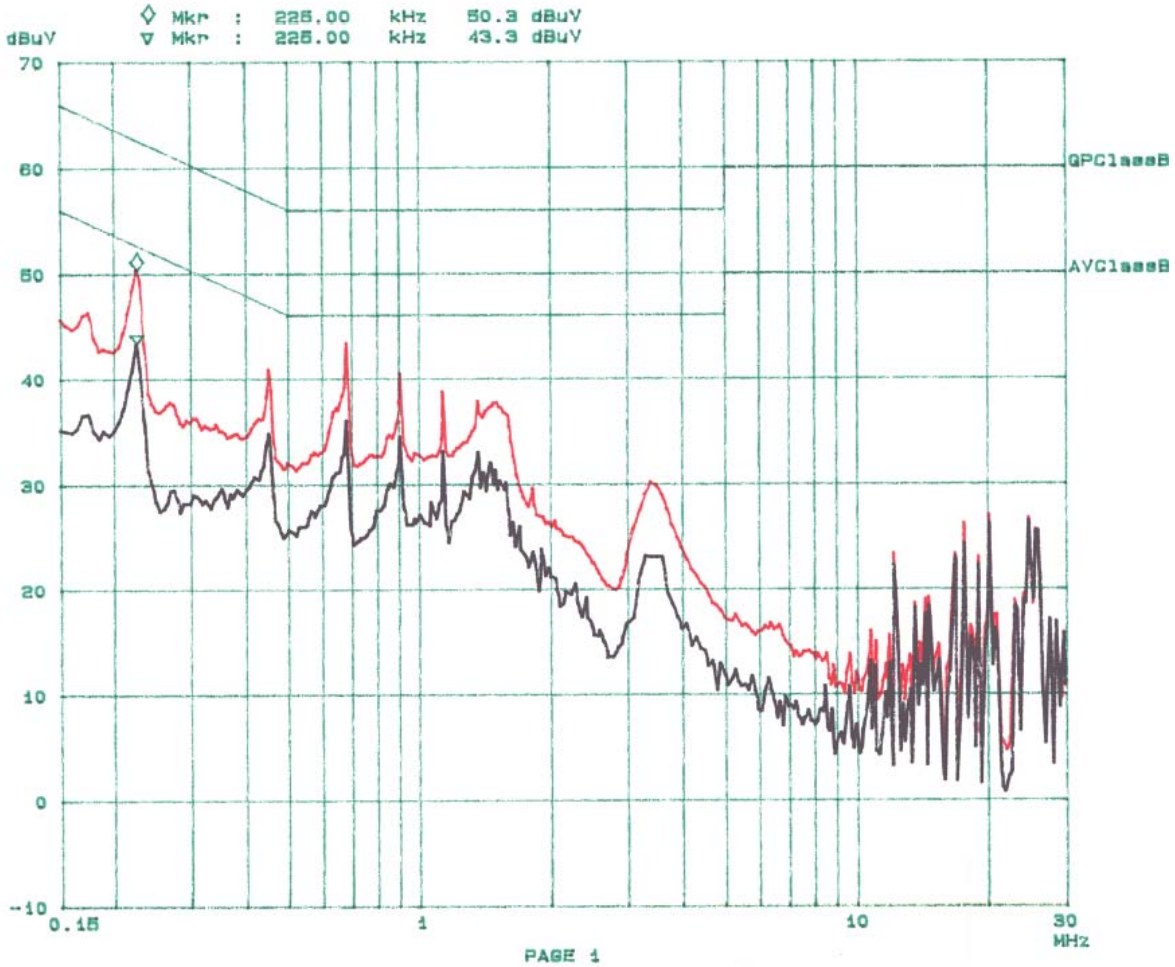
CLASS B

EUT: ACR-201-6/ASR-102-6
Manuf: OTC WIRELESS
Op Cond: Normal
Operator: LING
Comment: L

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	50ms	10dBLN	OFF
1M	3M	10k	9k	QP+AV	1ms	10dBLN	OFF
3M	30M	100k	9k	QP+AV	1ms	10dBLN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



2003-7-21

Bay Area Compliance Laboratory Corp 21. Jul 03 17:12

CLASS B

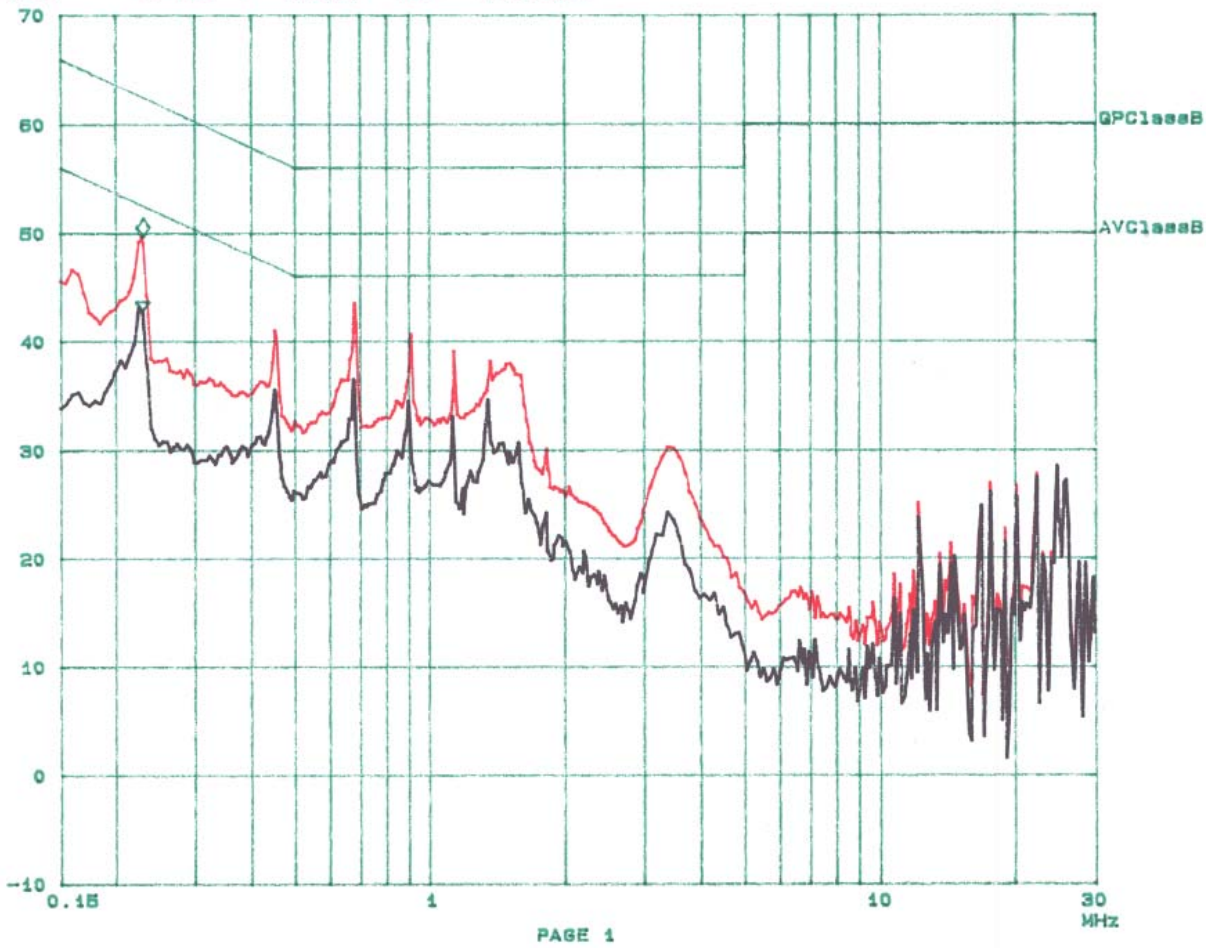
EUT: ACR-201-G/ASR-102-G
Manuf: OTC WIRELESS
Op Cond: Normal
Operator: LING
Comment: N

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	50ms	10dBLN	OFF
1M	3M	10k	9k	QP+AV	1ms	10dBLN	OFF
3M	30M	100k	9k	QP+AV	1ms	10dBLN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB

◊ Mkr : 230.00 kHz 49.8 dBuV
▽ Mkr : 230.00 kHz 42.8 dBuV



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Plots for DELTA Powre Supply

Bay Area Compliance Laboratory Corp 21. Aug 03 16:15

CLASS B

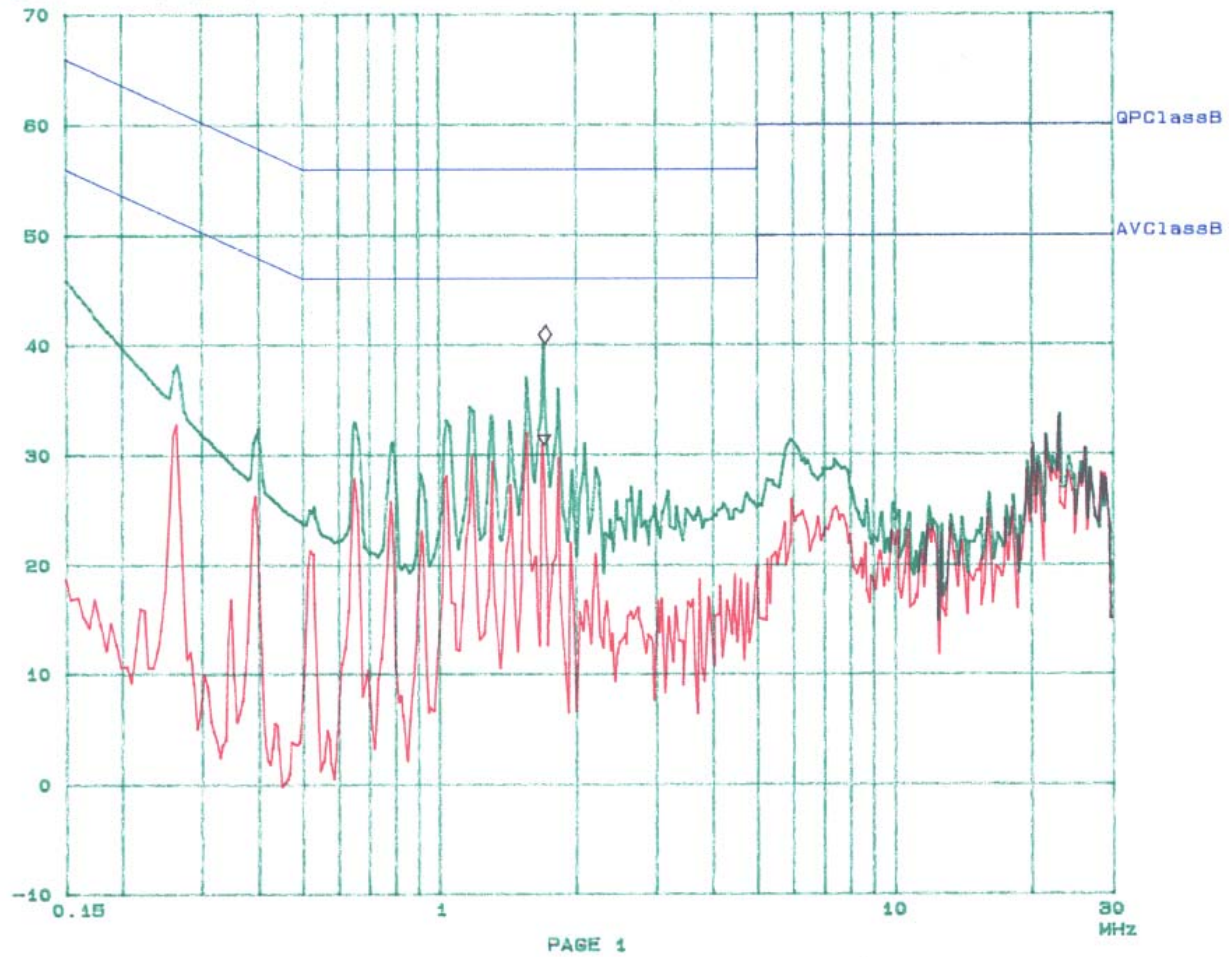
EUT: ACR-201-G/ASR-102-G
Manuf: OTC
Op Cond: Normal
Operator: LING
Comment: L

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	10dBLN	OFF
1M	3M	5k	9k	QP+AV	1ms	10dBLN	OFF
3M	30M	5k	9k	QP+AV	1ms	10dBLN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB

◊ Mkr : 1.71000MHz 40.1 dBuV
▽ Mkr : 1.69500MHz 30.9 dBuV



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Bay Area Compliance Laboratory Corp 21. Aug 03 15:06

CLASS B

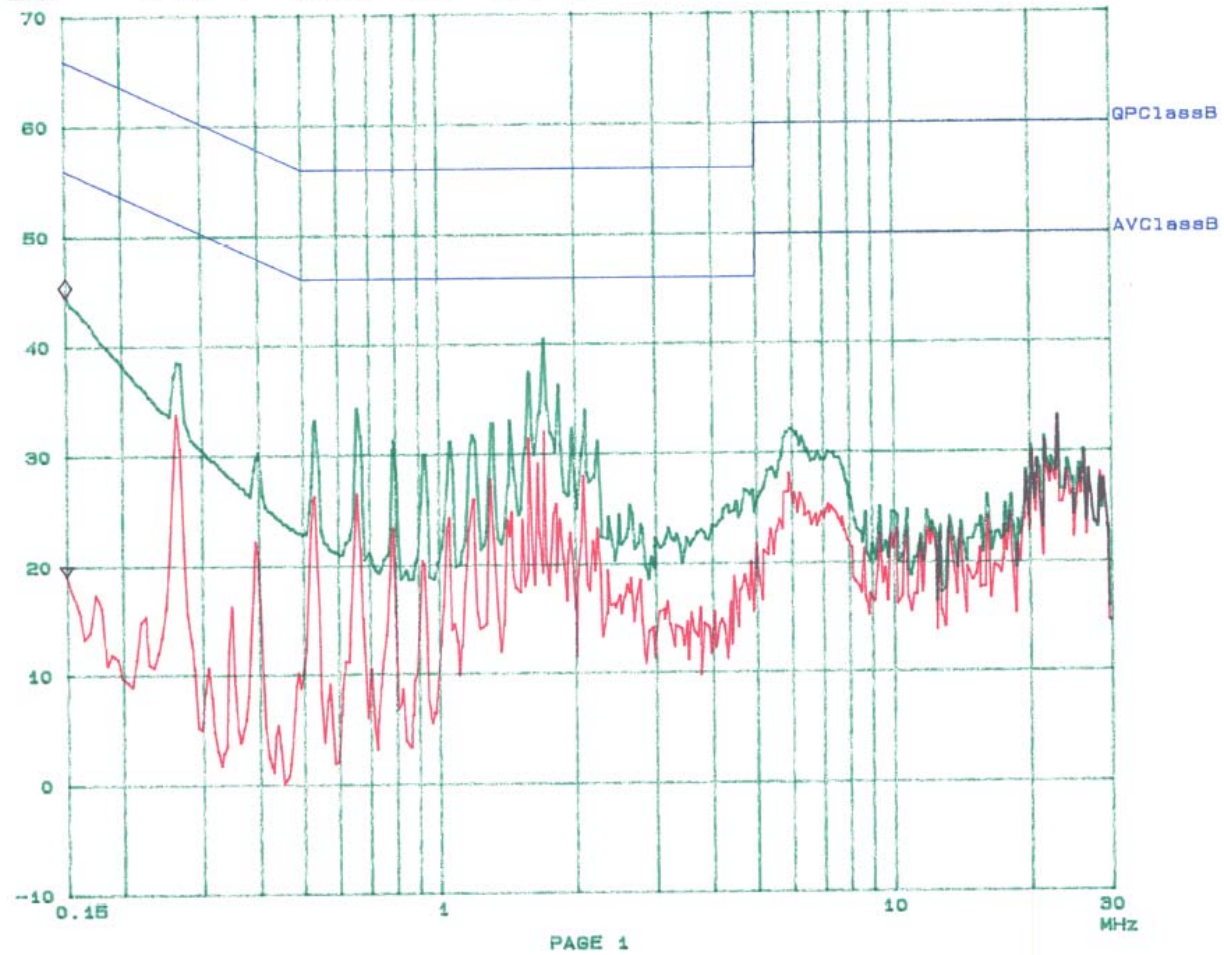
EUT: ACR-201-G/ASR-102-G
Manuf: OTC
Op Cond: Normal
Operator: LING
Comment: N

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	10dBLN	OFF
1M	3M	5k	9k	QP+AV	1ms	10dBLN	OFF
3M	30M	5k	9k	QP+AV	1ms	10dBLN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB

◊ Mkr : 150.00 kHz 44.5 dBuV
▽ Mkr : 150.00 kHz 19.1 dBuV



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