FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

AlphaSmart Inc.

973 University Ave.
Los Gatos, CA 95032

FCC ID: K2VDANA002

2003-06-26

This Report Concerns:	**Equipment Type:**
☒ Original Report	Wireless Keyboard

Test Engineer:	Ling Zhang
Report No.:	R0306181
Test Date:	2003-06-18
Reviewed By:	Hans Mellberg
Prepared By:	Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *AlphaSmart Inc.'s*, model: *DANA WIRELESS*, or the "EUT" as referred to in this report is a wireless keyboard which measures approximately 1.7"L x 1.2"W x 0.12"H. The EUT will operate at the frequency range of 2412 – 2462 MHz, with the maximum conducted output power of 19.95dBm (98.7mW)

** The test data gathered are from typical production samples provided by the manufacturer.*

1.2 Objective

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

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

1.3 Related Submittal(s)/Grant(s)

No related submittals or grants.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, 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 and FCC97114 for Direct Sequence SS.

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 C63.4-1992.

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 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2517A01610	2003-10-30
HP	Amplifier	8447E	2944A07030	2003-06-28
HP	Quasi-Peak Adapter	85650A	2521A00718	2004-03-08
Com-Power	Biconical Antenna	AB-100	14012	2003-09-05
Com-Power	Log Periodic Antenna	AL-100	16005	2003-08-23
Com-Power	Log Periodic Antenna	AB-900	15049	2004-05-01
Agilent	Spectrum Analyzer (9KHz – 40GHz)	8564E	3943A01781	2003-08-01
Agilent	Spectrum Analyzer (9KHz – 50GHz)	8565EC	3946A00131	2004-05-03
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	2004-03-14
A.H.System	Horn Antenna (700MHz-18GHz)	SAS-200/571	261	2004-05-31

*** Statement of Traceability: Bay Area Compliance Laboratory Corp.** certifies that all calibration has been performed using suitable standards traceable to the NIST.

1.7 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
SMILE INT'L	Moniter	CA1716DS	ALKKU65431034	GBVCA1716DS
HP	Computer	Pavilion 8660c	Us00412593	DOC
Key Tronics	keyboard	J9813	E0301QCMTPS2C	DOC
Logitech	mouse	m-s34	LZB95225500	DOC
HP	printer	C8415a	MYCOLO140Y7	DOC
ALPHA SMART	PDA host	N/A	N/A	DOC

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Non-shielded monitor Cable	1	monitor	PC
Non-shielded keyboard Cable	1	keyboard	PC
Non-shielded mouse Cable	1	mouse	PC
Non-Shielded USB Cable	1	PC	EUT
Non-Shielded printer cable	1	PRINTER	EUT

1.9 Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
ALPHA SMART	AC/DC ADAPTER	41-7.5-500D	N/A	DOC

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing in a typical fashion (as normally used by a typical user).

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

2.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the system components in a manner similar to a typical use. The test software, provided by the customer, is started the Windows terminal program under the Windows 98/2000/ME/XP operating system.

Once loaded, set the Tx channel to low, mid and high for testing.

2.3 Special Accessories

As shown in section 2.7, all interface cables used for compliance testing are shielded. The notebook and the peripherals featured shielded metal connectors.

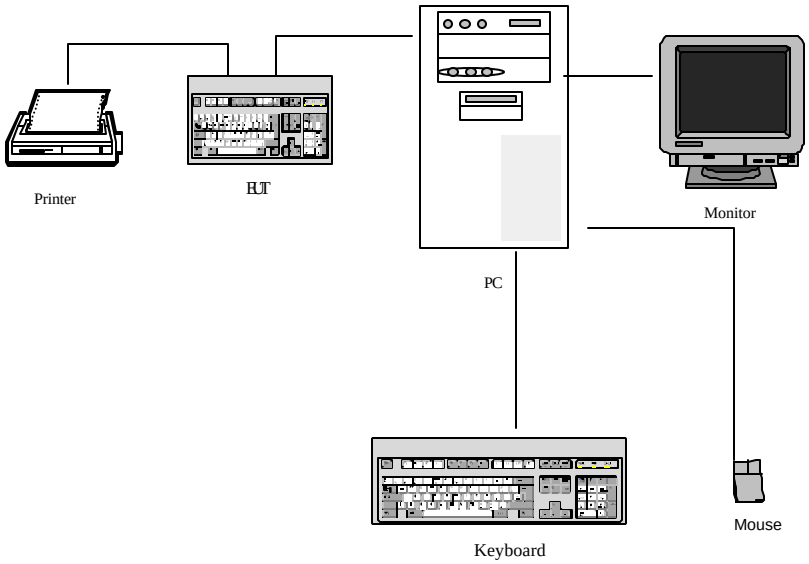
2.4 Schematics / Block Diagram

Please refer to Appendix A.

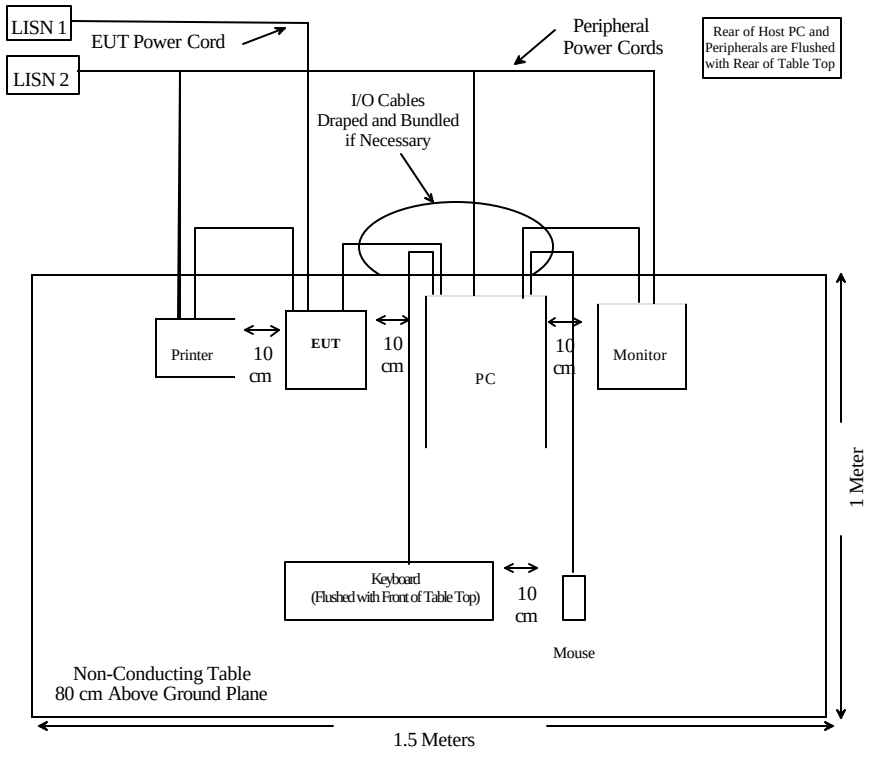
2.5 Equipment Modifications

No modifications were made by BACL to ensure the EUT to comply with the applicable limits and requirements.

2.6 Configuration of Test System



2.7 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
§15.207 (a)	Conducted Emission	Compliant	Section 11
§15.209 (a)	Radiated Emission	Compliant	Section 10
§15.209 (a)	Spurious Emission	Compliant	Section 6
§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 8
§15.247 (d)	Peak Power Spectral Density	Compliant	Section 7

4 - CONDUCTED OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

According to §15.247(b) (3), for systems using digital modulation in 2400-2483.5 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.
3. The peak power will be obtained by adding the bandwidth correction factor, 10log(BW 6dB / RBW) to the peak power reading at RBW = 2.0 MHz of the spectrum analyzer.

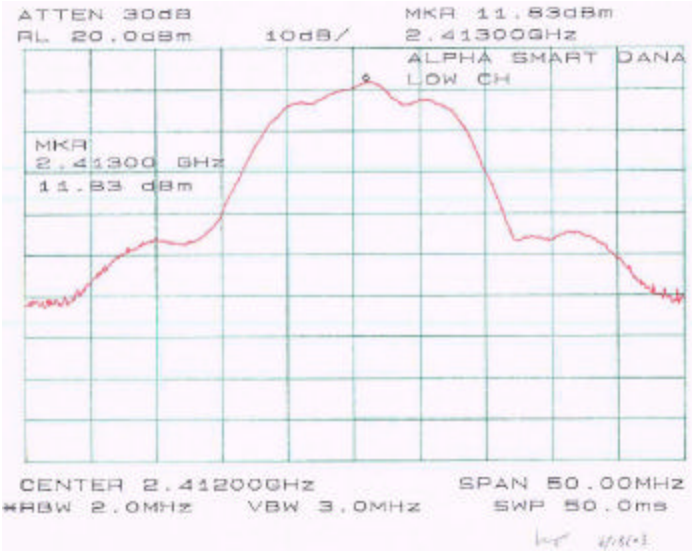
4.3 Test Equipment

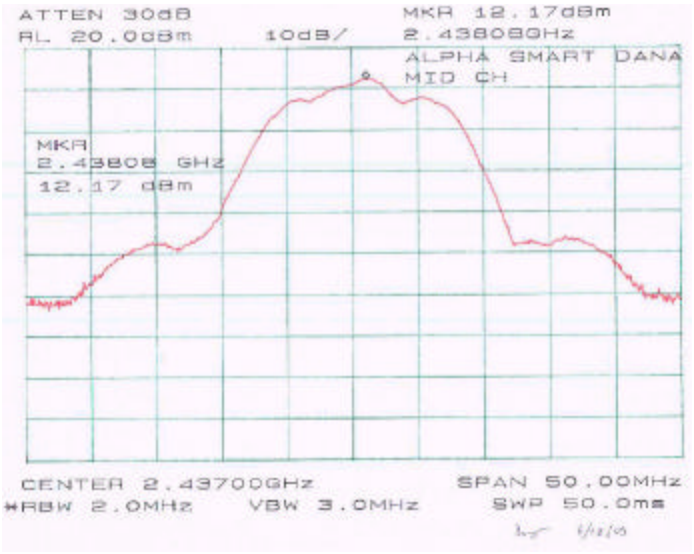
Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

4.4 Measurement Result

Frequency (MHz)	Peak Output Power (dBm)	Correction Factor (dBm)	Corrected Factor (dBm)	Output Power (W)	Standard (W)	Result
2412	11.83	7.78	19.61	0.0914	$\leq$ 1 W	Compliant
2437	12.17	7.78	19.95	0.0987	$\leq$ 1 W	Compliant
2462	12.17	7.75	19.92	0.0982	$\leq$ 1 W	Compliant

Note: Correction Factor = 10 log (BW6dB/RBW)


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 11.83dBm
2.41300GHz
ALPHA SMART DANA
LOW CH
MKR
2.41300 GHz
11.83 dBm
CENTER 2.41200GHz
SPAN 50.00MHz
#RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms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10dB/
MKR 12.17dBm
2.43809GHz
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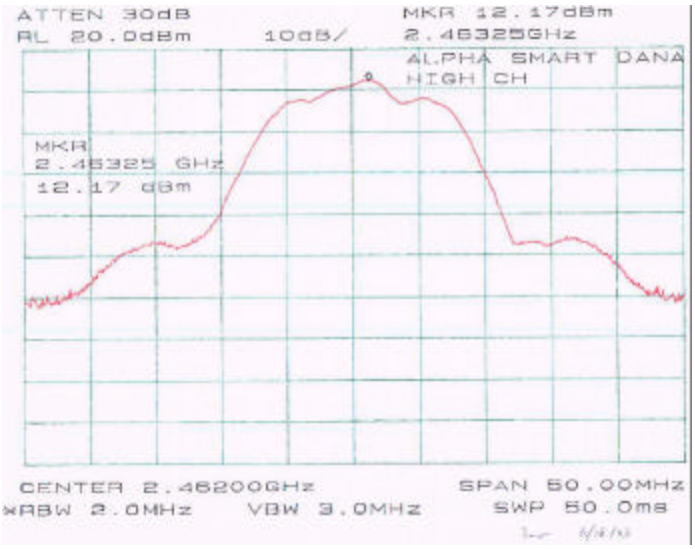
MID CH
MKR
2.43808 GHz
12.17 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
#RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms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RL 20.0dBm
10dB/
MKR 12.17dBm
2.46325GHz
ALPHA SMART DANA
HIGH CH
MKR
2.46325 GHz
12.17 dBm
CENTER 2.46200GHz
SPAN 50.00MHz
#RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms

5 – 6 DB BANDWIDTH

5.1 Standard Applicable

According to §15.247(a)(2), for systems using digital modulation techniques operate in 2400 – 2483.5MHz, 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.

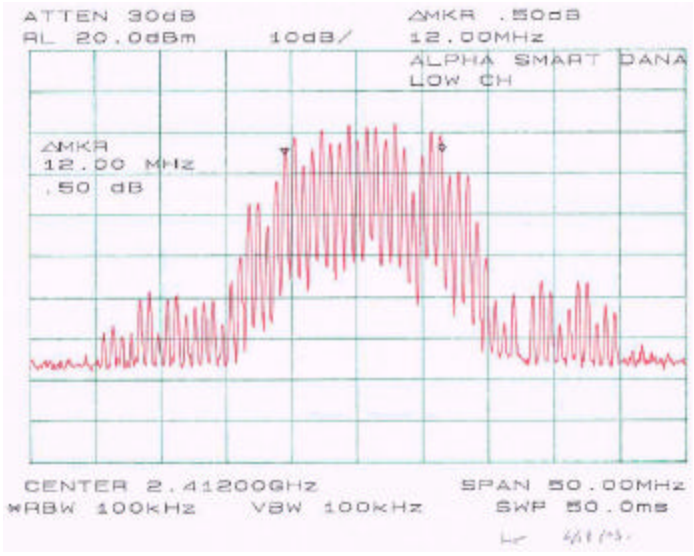
5.3 Test Equipment

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

5.4 Measurement Result

Please refer to following pages for plots of 6 dB Bandwidth.

Frequency (MHz)	Measured (MHz)	Standard (kHz)	Result
2412	12.00	≥ 500	Compliant
2437	12.00	≥ 500	Compliant
2462	11.92	≥ 500	Compliant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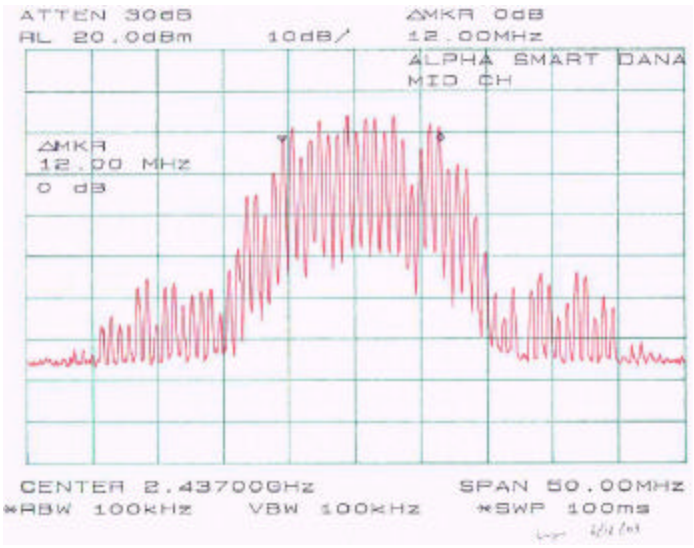
RL 20.0dBm
10dB/
ΔMKR .50dB
12.00MHz
ALPHA SMART DANA
LOW CH
ΔMKR
12.00 MHz
.50 dB
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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10dB/
ΔMKR 0dB
12.00MHz
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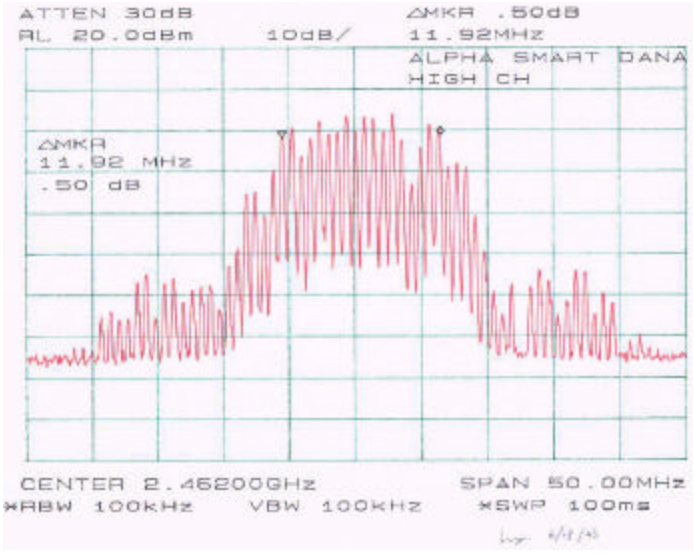
MID CH
ΔMKR
12.00 MHz
0 dB
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 100ms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RL 20.0dBm
10dB/
ΔMKR .50dB
11.92MHz
ALPHA SMART DANA
HIGH CH
ΔMKR
11.92 MHz
.50 dB
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 100ms

6 - SPURIOUS EMISSION AT ANTENNA TERMINAL

6.1 Standard Applicable

According to §15.209 (a), except as provided elsewhere in the subpart of 15.209, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

6.2 Measurement Procedure

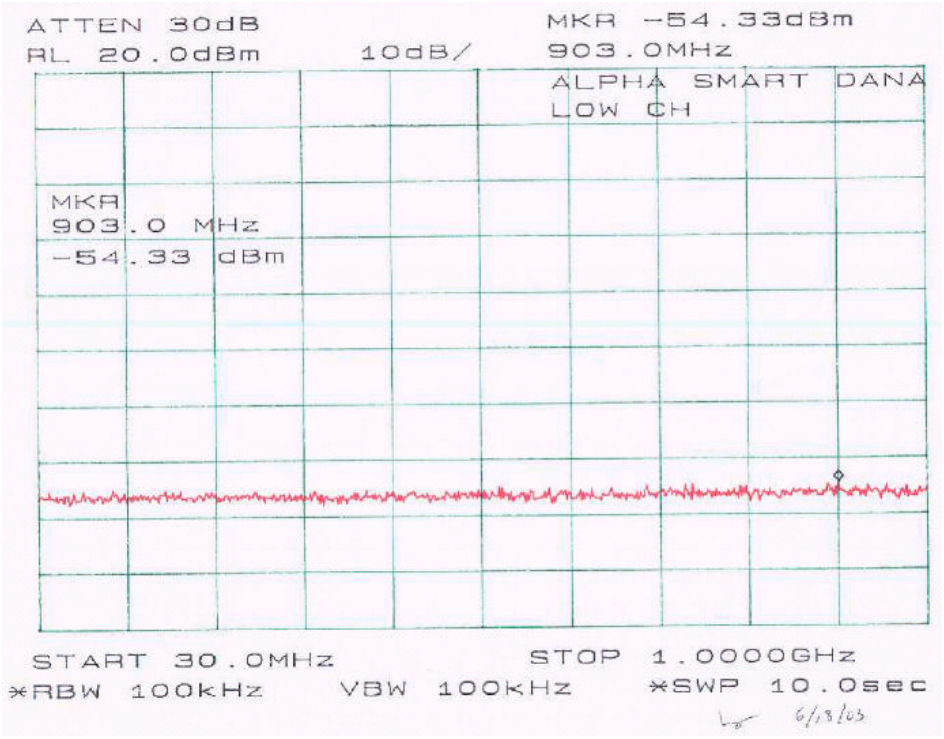
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument 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.

6.3 Test Equipment

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

6.4 Measurement Result

Please refer to following pages for plots of spurious emission.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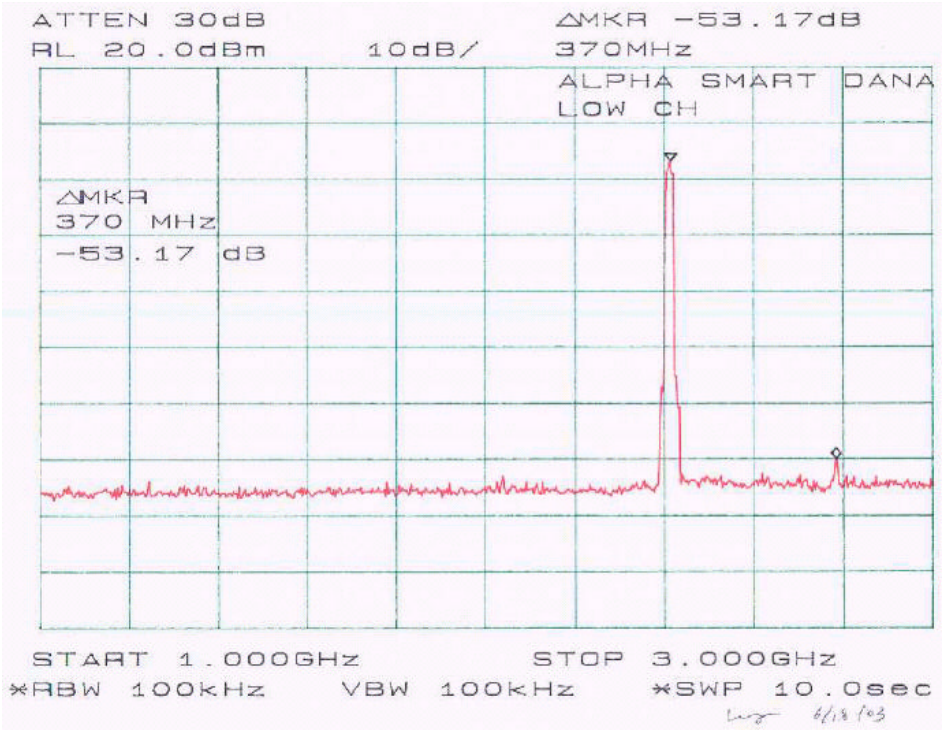
RL 20.0dBm
10dB/
MKR -54.33dBm
903.0MHz
ALPHA SMART DANA
LOW CH
MKR
903.0 MHz
-54.33 dBm
START 30.0MHz
STOP 1.0000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec
6/18/03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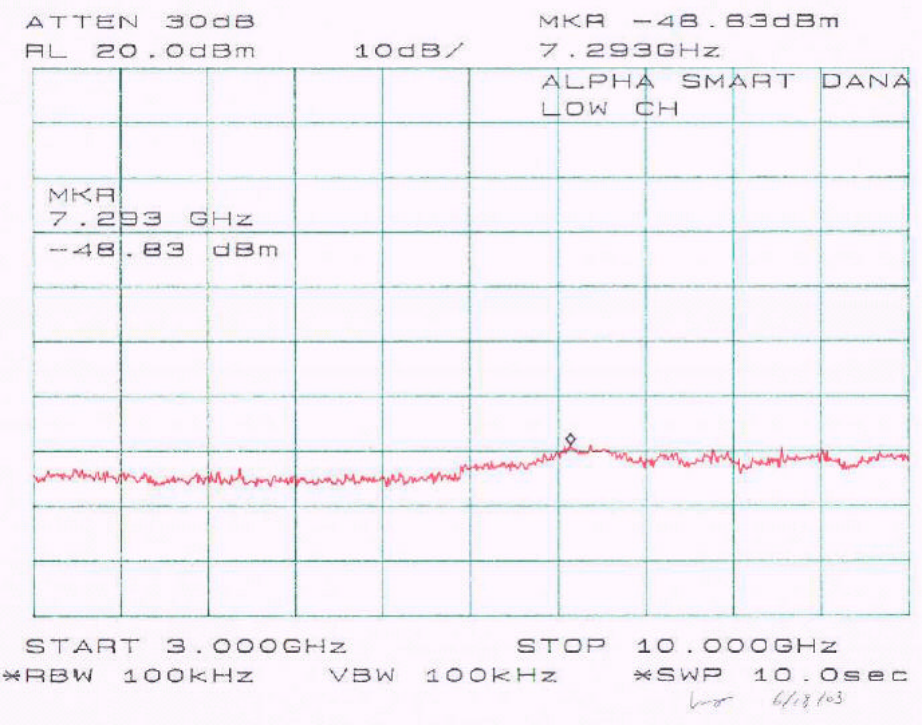
RL 20.0dBm
10dB/
ΔMKR -53.17dB
370MHz
ALPHA SMART DANA
LOW CH
ΔMKR
370 MHz
-53.17 dB
START 1.000GHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec
6/18/03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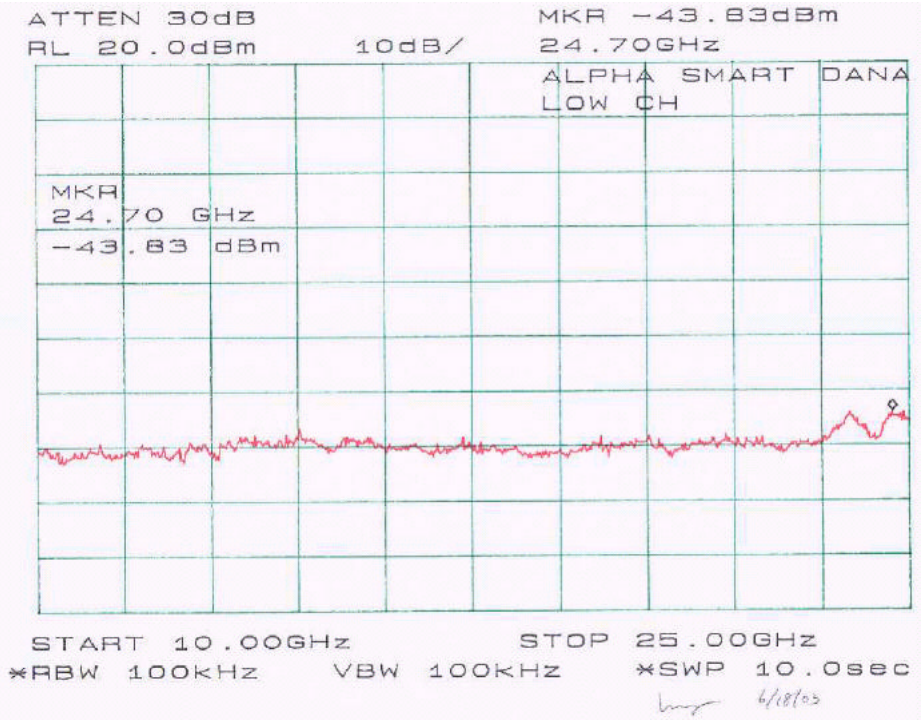
10dB/
MKR -48.83dBm
7.293GHz
ALPHA SMART DANA
LOW CH
MKR
7.293 GHz
-48.83 dBm
START 3.000GHz
STOP 10.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec
6/18/03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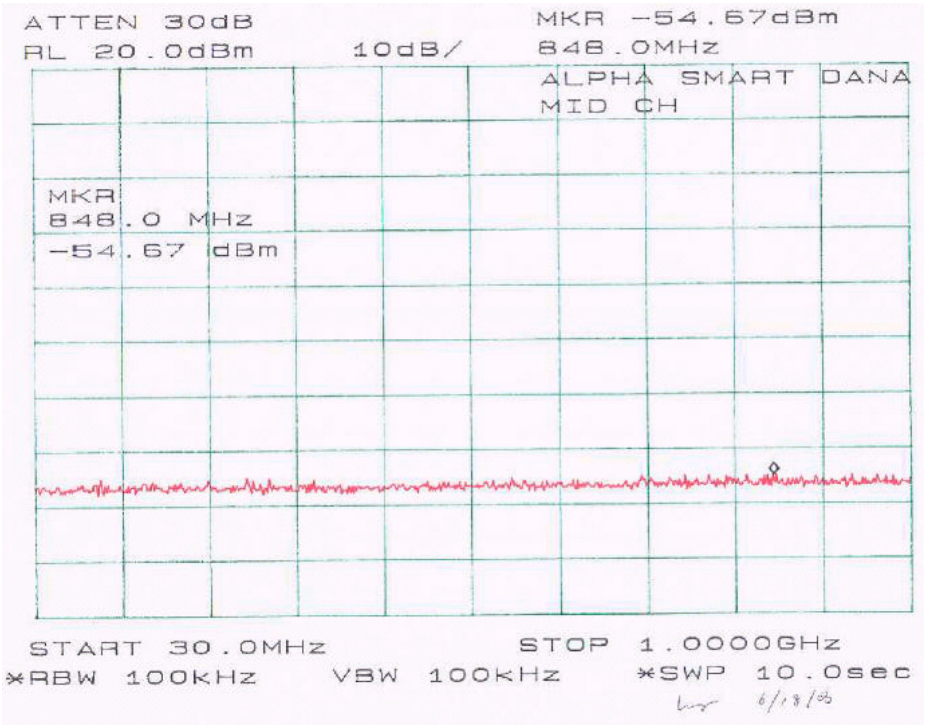
10dB/
MKR -43.83dBm
24.70GHz
ALPHA SMART DANA
LOW CH
MKR
24.70 GHz
-43.83 dBm
START 10.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec
6/18/03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10dB/
MKR -54.67dBm
848.0MHz
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MID CH
MKR
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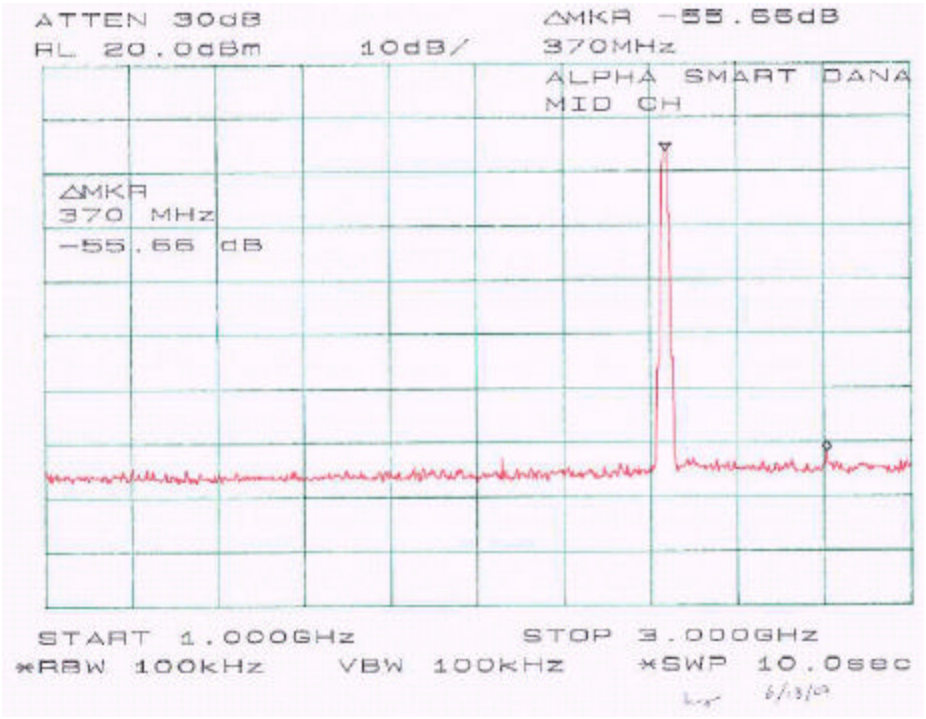
-54.67 dBm
START 30.0MHz
STOP 1.0000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec
6/18/05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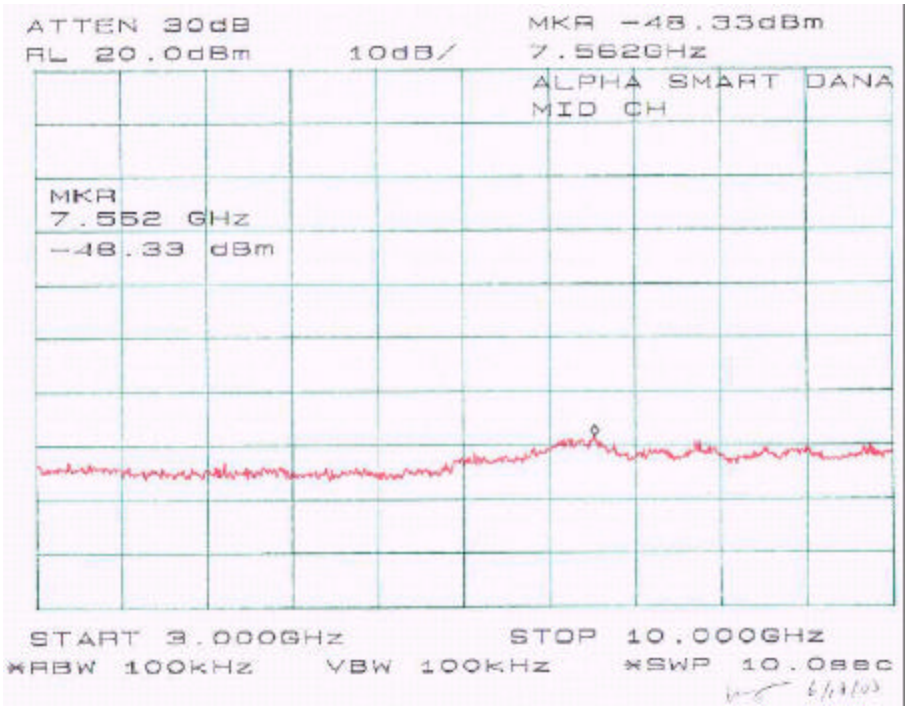
10dB/
ΔMKR -55.66dB
370MHz
ALPHA SMART DANA
MID CH
ΔMKR
370 MHz
-55.66 dB
START 1.000GHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec
6/13/05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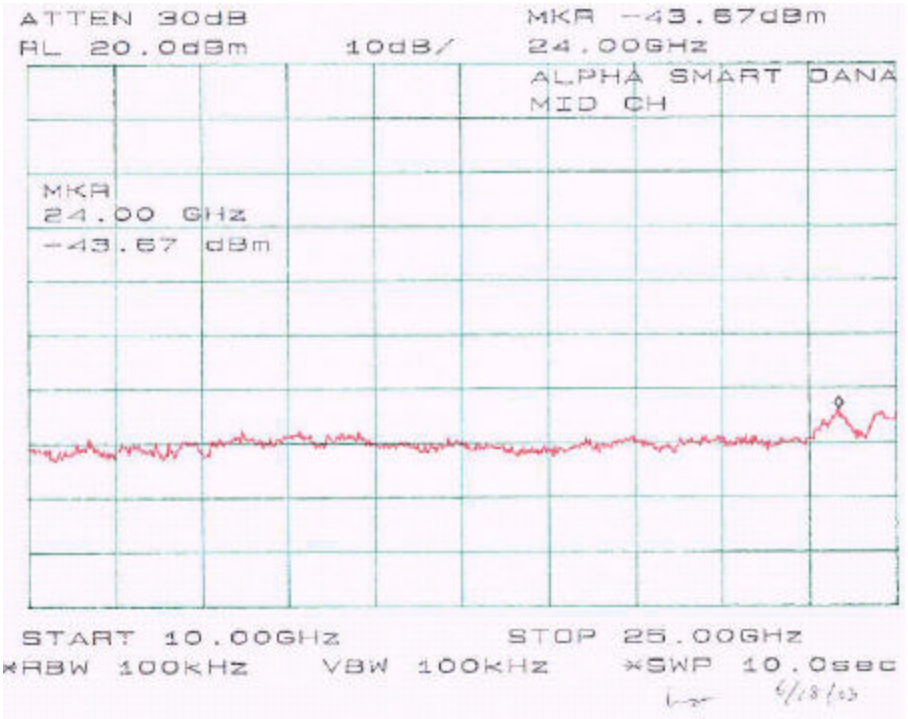
10dB/
MKR -48.33dBm
7.562GHz
ALPHA SMART DANA
MID CH
MKR
7.552 GHz
-48.33 dBm
START 3.000GHz
STOP 10.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec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10dB/
MKR -43.67dBm
24.00GHz
ALPHA SMART DANA
MID CH
MKR
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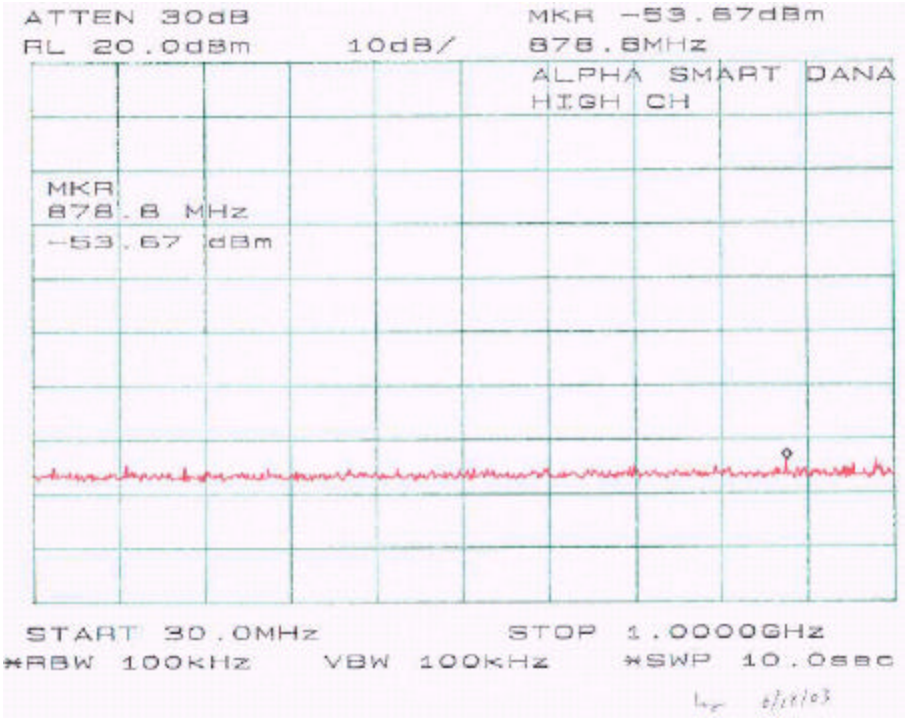
-43.67 dBm
START 10.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec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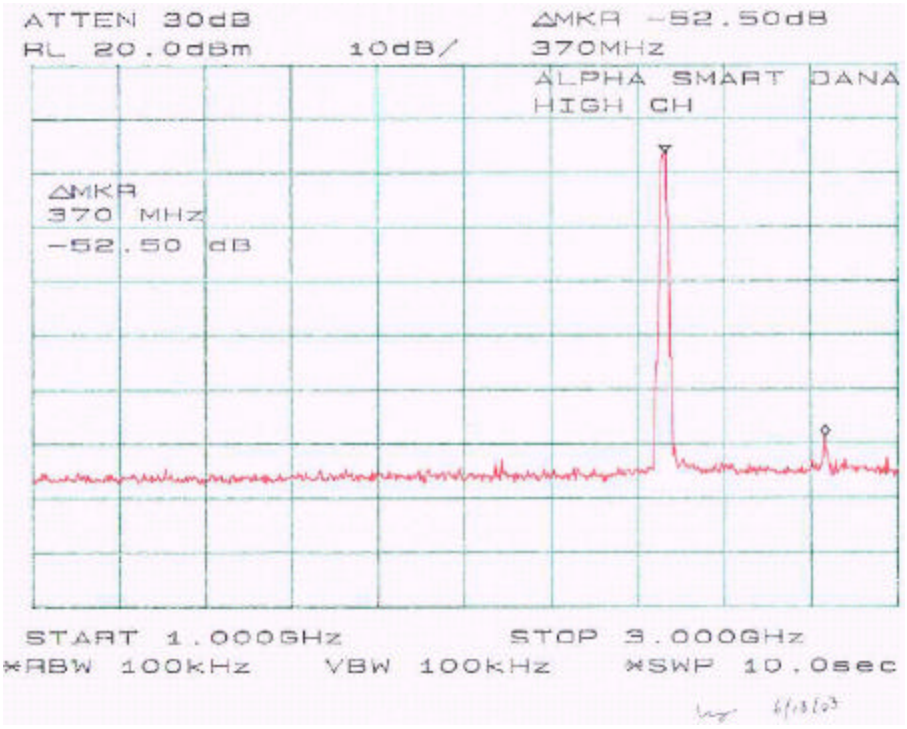
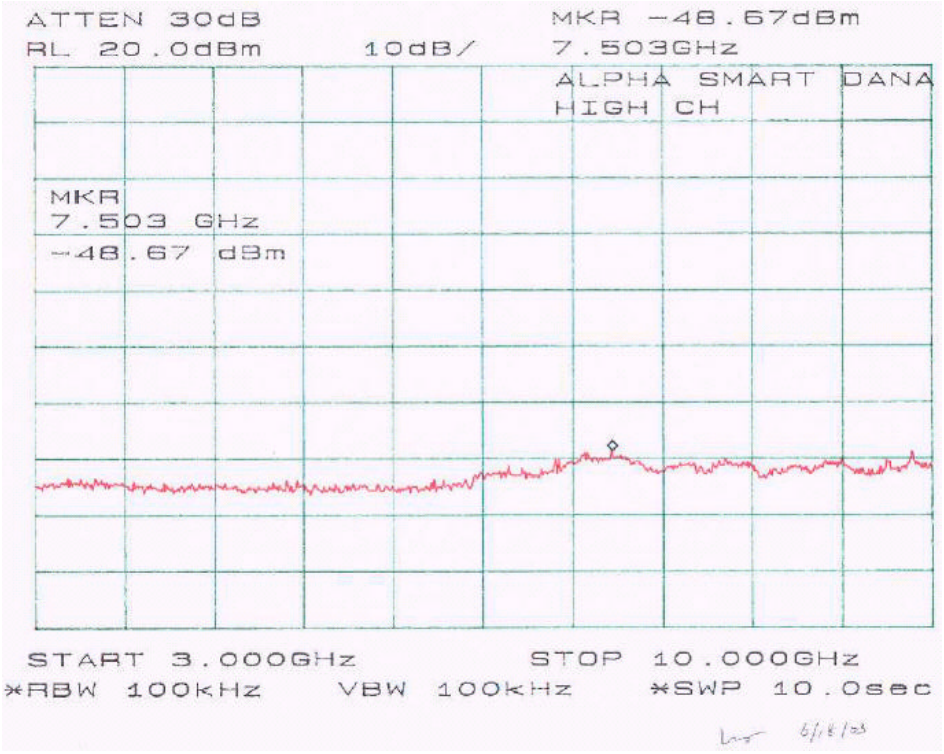
10dB/
MKR -53.67dBm
878.6MHz
ALPHA SMART DANA
HIGH CH
MKR
878.8 MHz
-53.67 dBm
START 30.0MHz
STOP 1.0000GHz
*RBW 100KHz
VBW 100KHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -52.50dB
370MHz
ALPHA SMART DANA
HIGH CH
ΔMKR
370 MHz
-52.50 dB
START 1.000GHz
STOP 3.000GHz
*RBW 100KHz
VBW 100KHz
*SWP 10.0sec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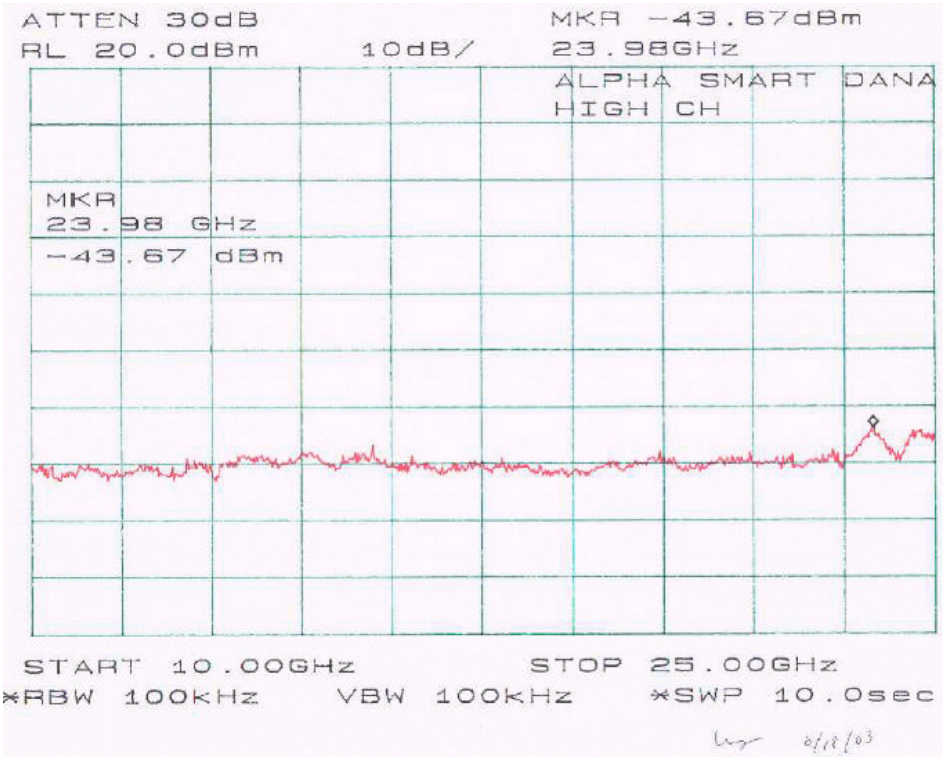
10dB/
MKR -48.67dBm
7.503GHz
ALPHA SMART DANA
HIGH CH
MKR
7.503 GHz
-48.67 dBm
START 3.000GHz
STOP 10.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec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10dB/
MKR -43.67dBm
23.98GHz
ALPHA SMART DANA
HIGH CH
MKR
23.98 GHz
-43.67 dBm
START 10.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

7 - PEAK POWER SPECTRAL DENSITY

7.1 Standard Applicable

According to §15.247 (d), digitally modulated 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.

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 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.

7.3 Test Equipment

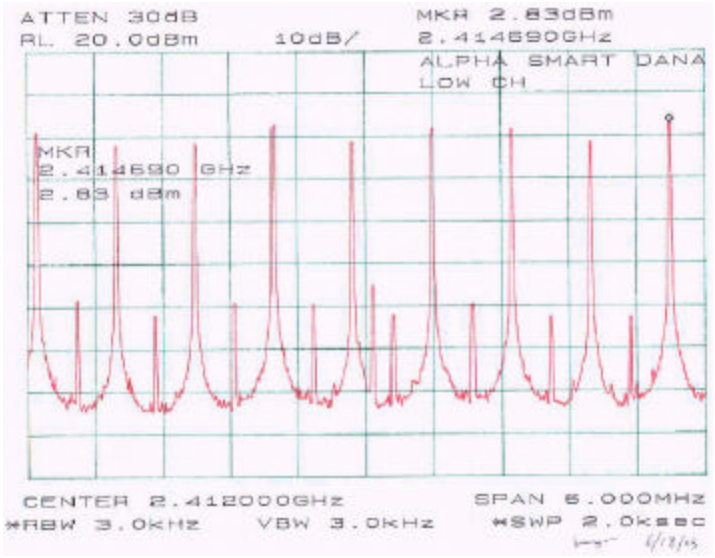
Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

7.4 Measurement Results

Frequency (MHz)	Peak Power Spectral Density (dBm)	Standard (dBm)	Result
2412	2.83	≤ 8	Compliant
2437	3.83	≤ 8	Compliant
2462	3.67	≤ 8	Compliant

7.5 Plot of Peak Power Spectral Density

Please refer to following pages for plots of peak power spectral density.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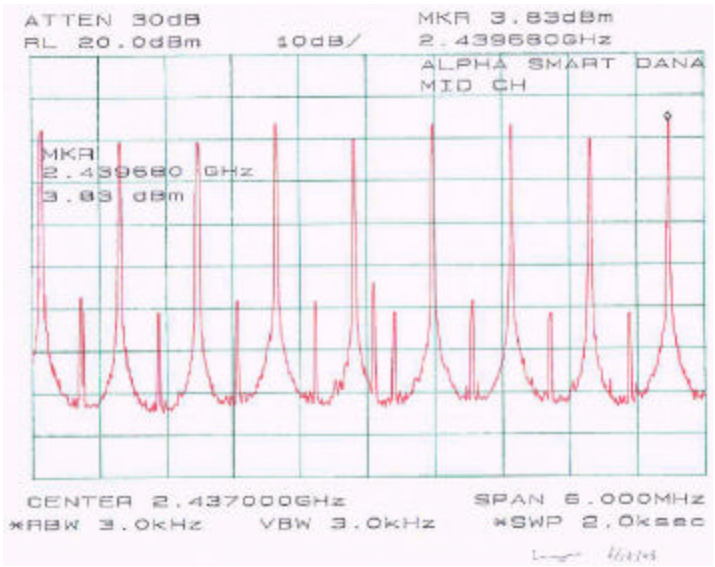
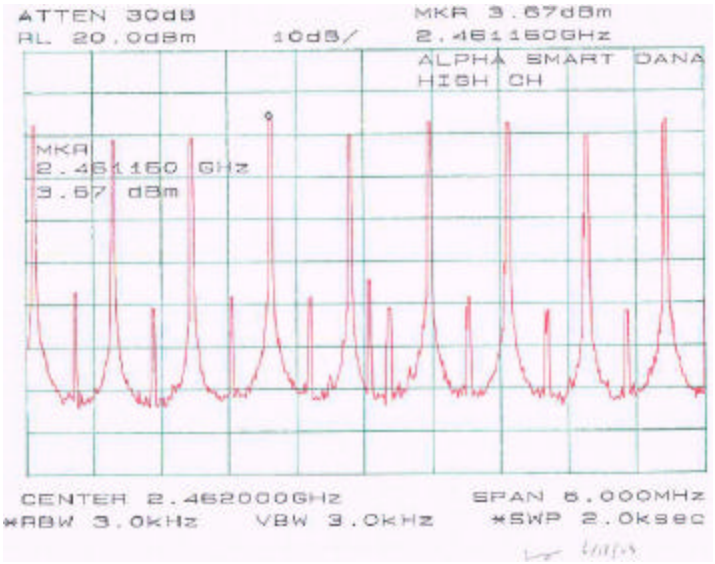
10dB/
MKR 2.83dBm
2.414690GHz
ALPHA SMART DANA
LOW CH
MKR
2.414690 GHz
2.83 dBm
CENTER 2.412000GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 3.83dBm
2.439680GHz
ALPHA SMART DANA
MID CH
MKR
2.439680 GHz
3.83 dBm
CENTER 2.437000GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 3.67dBm
2.461160GHz
ALPHA SMART DANA
HIGH CH
MKR
2.461160 GHz
3.67 dBm
CENTER 2.462000GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec

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

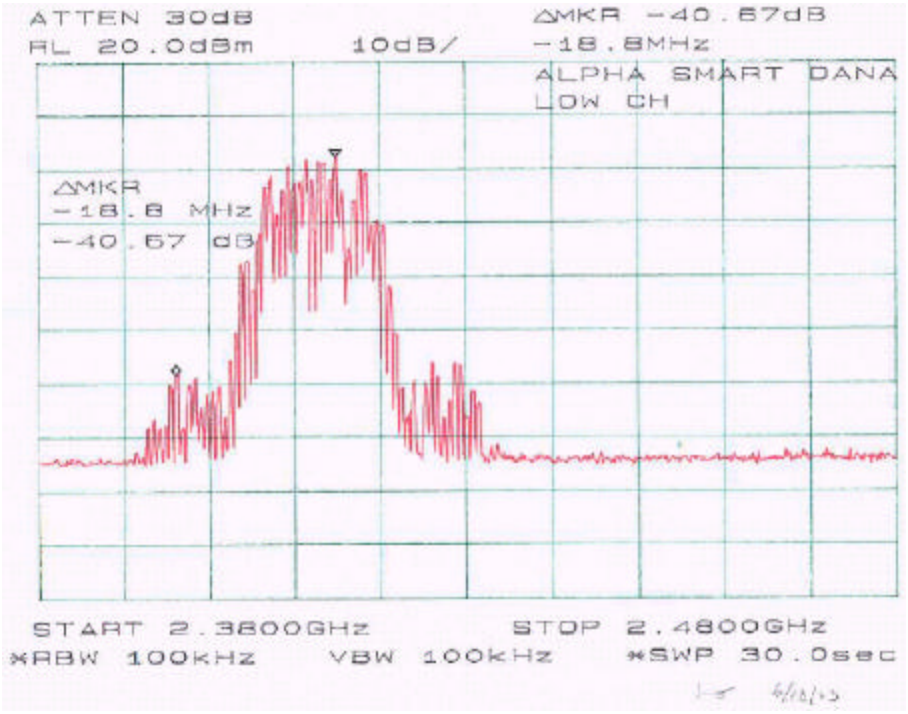
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

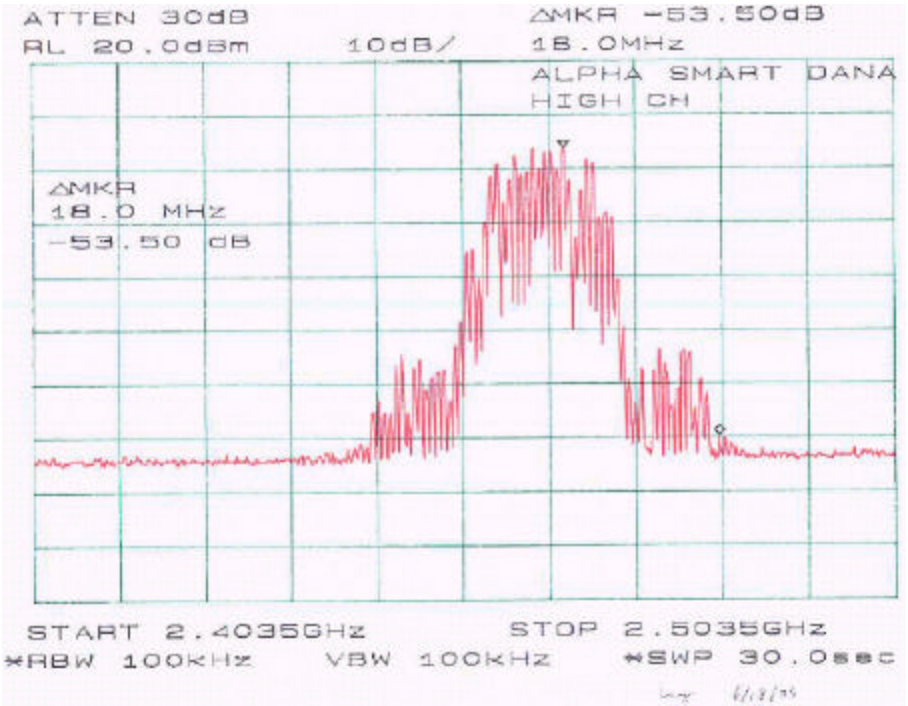
8.3 Test Equipment

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.


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -40.67dB
-18.8MHz
ALPHA SMART DANA
LOW CH
ΔMKR
-18.8 MHz
-40.67 dB
START 2.3800GHz
STOP 2.4800GHz
*RBW 100KHz
VBW 100KHz
*SWP 30.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -53.50dB
18.0MHz
ALPHA SMART DANA
HIGH CH
ΔMKR
18.0 MHz
-53.50 dB
START 2.4035GHz
STOP 2.5035GHz
*RBW 100KHz
VBW 100KHz
*SWP 30.0sec

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 –0.12 dBi, and the antenna connector is designed with permanent attachment and 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 host PC system 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:

-7.3 dB at **4824.00 MHz** in the **Vertical** polarization, Low Channel

-9.9 dB at **7311.00 MHz** in the **Vertical** polarization, Middle Channel

-10.2 dB at **7386.60 MHz** in the **Vertical** polarization, High Channel

-6.4 dB at **313.84 MHz** in the **Vertical** polarization, Unintentional Emission

10.8.1 Final test data, 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	108.7	Fund/Peak	250	1.4	v	28.1	3.4	35.2	104.9		
2412.00	109.5	Fund/Peak	200	1.4	h	28.1	3.4	35.2	105.8		
2412.00	103.5	Fund/Ave	250	1.4	v	28.1	3.4	35.2	99.8		
2412.00	104.5	Fund/Ave	200	1.4	h	28.1	3.4	35.2	100.8		
4824.00	42.3	Ave	250	1.5	v	32.5	4.9	33.0	46.7	54	-7.3
4824.00	39.7	Ave	150	1.5	h	32.5	4.9	33.0	44.1	54	-9.9
7236.00	36.7	Ave	180	1.2	v	35.1	5.6	33.5	43.9	54	-10.1
7236.00	36.7	Ave	150	1.4	h	35.1	5.6	33.5	43.9	54	-10.1
7236.00	49.7	Peak	180	1.2	v	35.1	5.6	33.5	56.9	74	-17.1
7236.00	49.3	Peak	150	1.4	h	35.1	5.6	33.5	56.6	74	-17.4
4824.00	52.0	Peak	250	1.5	v	32.5	4.9	33.0	56.4	74	-17.6
4824.00	50.7	Peak	150	1.5	h	32.5	4.9	33.0	55.1	74	-18.9
Middle Channel											
2437.00	107.5	Fund/Peak	220	1.0	v	28.1	3.4	35.2	103.8		
2437.00	107.2	Fund/Peak	160	2.0	h	28.1	3.4	35.2	103.4		
2437.00	103.0	Fund/Ave	220	1.0	v	28.1	3.4	35.2	99.3		
2437.00	102.8	Fund/Ave	160	2.0	h	28.1	3.4	35.2	99.1		
7311.00	36.8	Ave	180	1.8	v	35.1	5.6	33.5	44.1	54	-9.9
7311.00	36.4	Ave	150	1.3	h	35.1	5.6	33.5	43.6	54	-10.4
4874.00	36.2	Ave	150	1.6	v	32.5	4.9	33.0	40.6	54	-13.4
4874.00	36.0	Ave	150	1.8	h	32.5	4.9	33.0	40.4	54	-13.6
7311.00	49.7	Peak	180	1.8	v	35.1	5.6	33.5	56.9	74	-17.1
7311.00	49.5	Peak	150	1.3	h	35.1	5.6	33.5	56.7	74	-17.3
4874.00	49.0	Peak	150	1.6	v	32.5	4.9	33.0	53.4	74	-20.6
4874.00	49.0	Peak	150	1.8	h	32.5	4.9	33.0	53.4	74	-20.6
High Channel											
2462.00	107.8	Fund/Peak	90	2.0	v	28.1	3.4	35.2	104.1		
2462.00	107.2	Fund/Peak	150	1.4	h	28.1	3.4	35.2	103.4		
2462.00	103.7	Fund/Ave	90	2.0	v	28.1	3.4	35.2	99.9		
2462.00	102.5	Fund/Ave	150	1.4	h	28.1	3.4	36.2	97.8		
7386.00	36.6	Ave	120	1.8	v	35.1	5.6	33.5	43.8	54	-10.2
7386.00	36.5	Ave	150	1.5	h	35.1	5.6	33.5	43.7	54	-10.3
4924.00	37.5	Ave	150	1.4	v	32.5	4.9	33.0	41.9	54	-12.1
4924.00	37.2	Ave	180	1.6	h	32.5	4.9	33.0	41.6	54	-12.4
7386.00	49.5	Peak	120	1.8	v	35.1	5.6	33.5	56.7	74	-17.3
7386.00	49.2	Peak	150	1.5	h	35.1	5.6	33.5	56.4	74	-17.6
4924.00	49.0	Peak	150	1.4	v	32.5	4.9	33.0	53.4	74	-20.6
4924.00	48.8	Peak	180	1.6	h	32.5	4.9	33.0	53.4	74	-20.6

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
313.84	47.17	150	1.6	v	15.1	2.3	25.0	39.6	46	-6.4
308.18	47.00	150	1.6	v	14.4	2.3	25.0	38.7	46	-7.3
123.52	45.33	180	1.2	v	11.7	1.6	25.0	33.6	43.5	-9.9
170.74	38.83	180	1.0	h	13.0	1.9	25.0	28.7	43.5	-14.8
230.38	38.50	200	1.0	v	12.6	2.2	25.0	28.3	46	-17.7
226.46	37.50	120	1.5	v	11.8	2.2	25.0	26.5	46	-19.5

Note:

AVG = average
Fund = fundamental

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 $\pm$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 host PC system 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	Description	Serial No.	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	1147 8007 07	2003-12-03

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:

-12.8 dBµV at 0.44 MHz in the Neutral mode

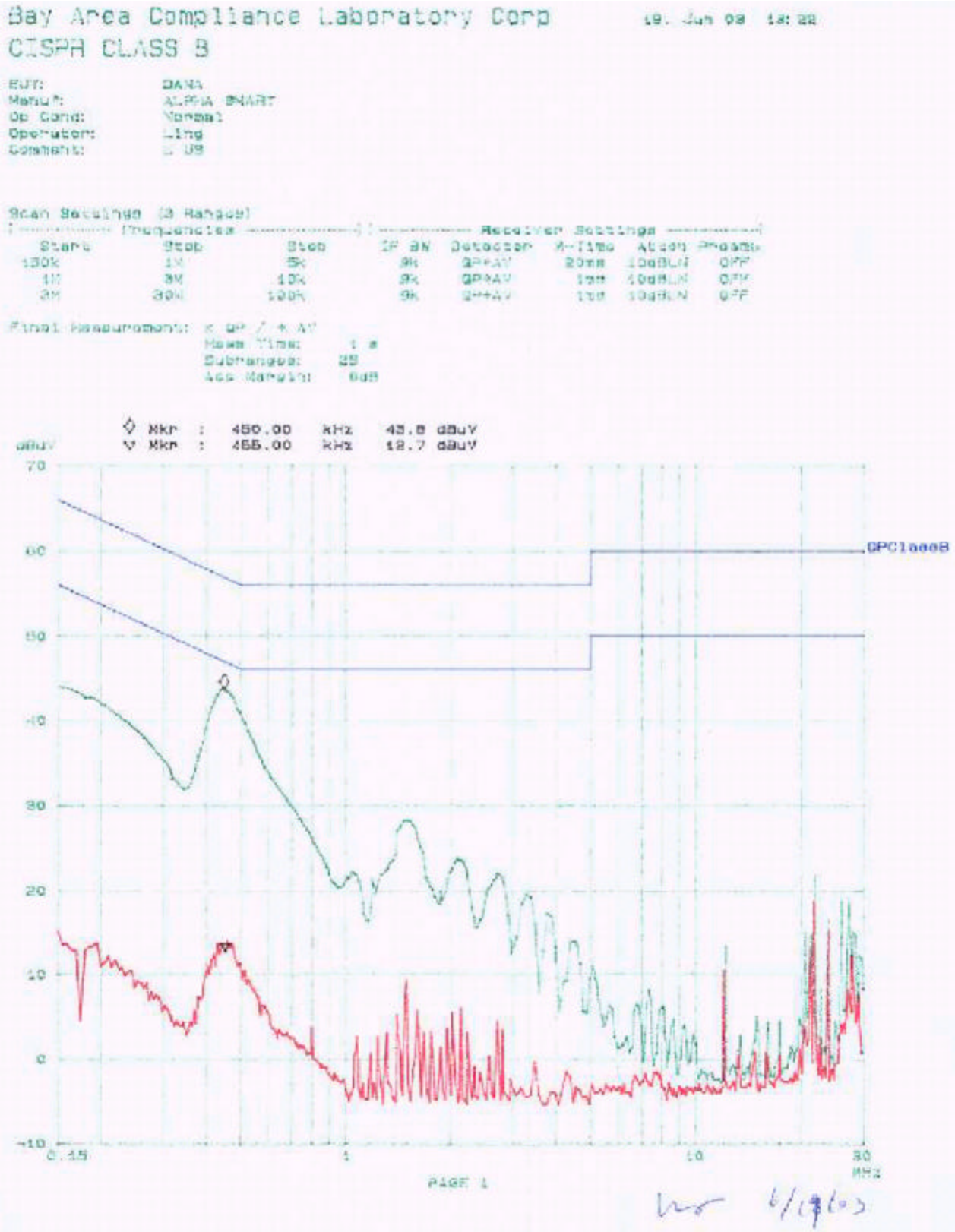
11.7 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC PART 15 CLASS B	
Frequency MHz	Amplitude dBµV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBµV	Margin dB
0.44	43.2	Qp	Neutral	56	-12.8
0.45	43.8	Qp	Line	57	-13.2
0.15	44.1	Qp	Line	66	-21.9
0.15	43.6	Qp	Neutral	66	-22.4
21.9	18.6	Ave	Line	50	-31.4
0.44	13.0	Ave	Neutral	46	-33.0
8.00	16.1	Ave	Neutral	50	-33.9
0.45	12.7	Ave	Line	47	-34.3
21.9	21.8	Qp	Line	60	-38.2
0.15	15.0	Ave	Neutral	56	-41.0
0.15	15	Ave	Line	56	-41.0
8.00	15.8	Qp	Neutral	60	-44.2

11.8 Plot of Conducted Emissions Test Data

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

Note: On page 33, the plot shows a sudden significant (20+dB) jump around 2.3 MHz. This abnormal status is from EUT itself. We have tried other same model AC adapters from Alpha Smart. They all appeared same kind of plots. And we have verified the test equipment by using different EUT from other manufacturer. There is no problem at this point.


Bay Area Compliance Laboratory Corp
CISPR CLASS B
EUT: DANA
Manufacturer: ALPHA SMART
Op Cond: Normal
Operator: Ling
Comment: L 09
Scan Settings (3 Ranges)
Frequencies
Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 1M 5k 9k QP+AV 20ms 10dB/N OFF
1M 3M 10k 9k QP+AV 1ms 10dB/N OFF
3M 30M 100k 9k QP+AV 1ms 10dB/N OFF
Final Measurement: + QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 0dB
Mkr : 450.00 kHz 45.8 dBuV
Mkr : 455.00 kHz 42.7 dBuV
dBuV
70
60
50
40
30
20
10
0
-10
0.15
1
10
30
MHz
QPClass B
PAGE 1

Bay Area Compliance Laboratory Corp se. Jul 03 16:58

CLASS B

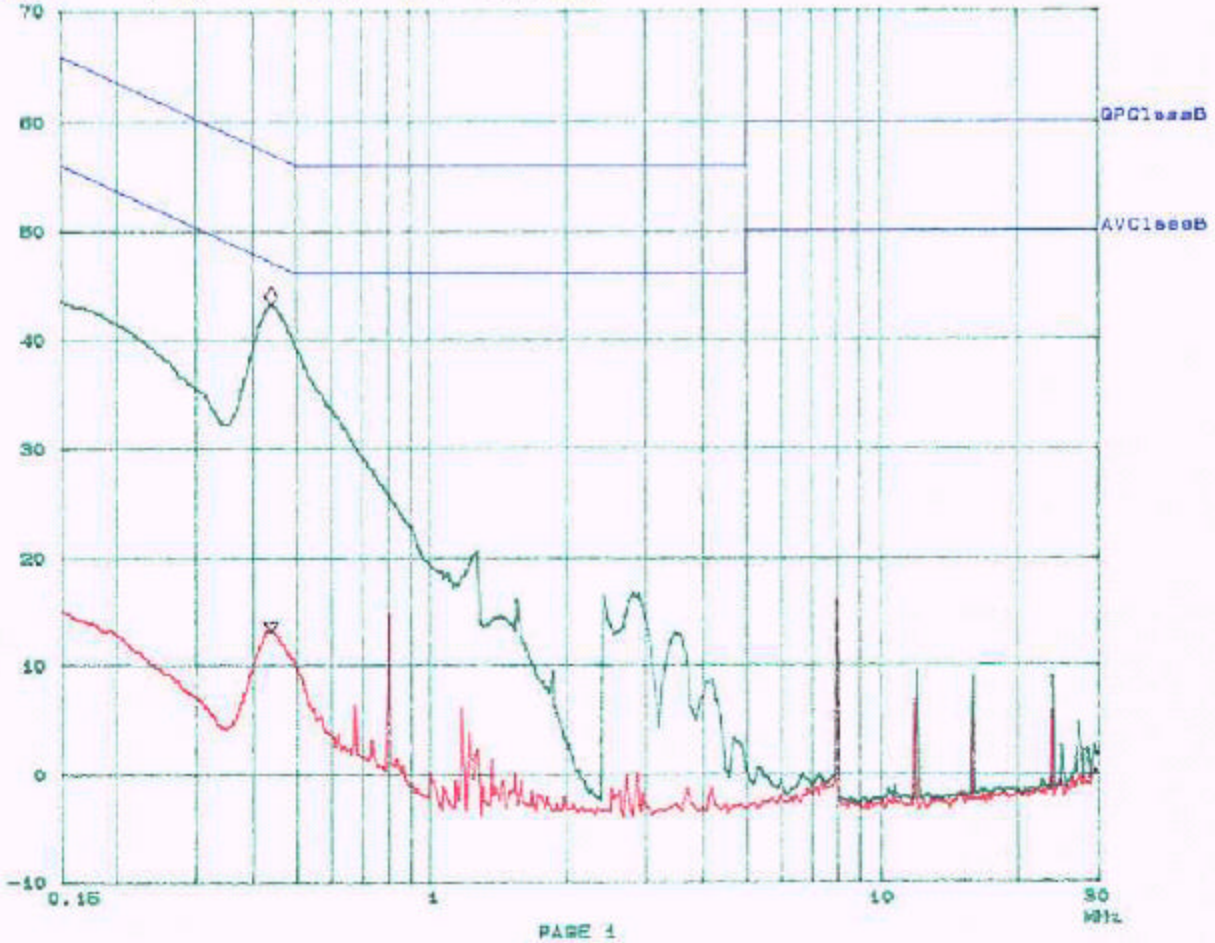
EUT: DANA
Manuf: ALPHA SMART
Op Cond: Normal
Operator: LING
Comment: N

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	9M	QP+AV	1ms	10dBLN	OFF

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

◊ Mkr : 440.00 kHz 43.2 dBuV
▽ Mkr : 440.00 kHz 13.0 dBuV



PAGE 1

2003-7-22