FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

Ambit Microsystems Corporation

4-1, Ming Shen Street, Tu Chen Industrial District.
Tu Chen, Taipei Hsien 236, Taiwan, R.O.C.

FCC ID: MCLT60M665

2003-10-10

This Report Concerns:	**Equipment Type:**
☒ Class II Permissive Change	Notebook PC with Bluetooth Wireless Card

Test Engineer:	Ling Zhang
Report No.:	R0309231
Test Date:	2003-10-02
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 *Ambit Microsystems Corporation*'s Model: *T60M665* or the "EUT" as referred to in this report is a Wireless Card & Antenna installed in the ACER notebook PC. During the test the EUT was connected to the HannStar Electronics Antenna. The wireless card measures approximately 2.4" L x 1.7" W x 0.1"H.

** 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 *Ambit Microsystems Corporation* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commissions rules.

This is a PCII application. The original application was granted on 3/19/03. The difference between the original device and the current one is the EUT was connected with a new antenna manufactured by HannStar Electronics Corporation. Please see the Antenna Specification for the detailed information.

The objective of the manufacturer is to demonstrate compliance with FCC rules Conducted and Spurious Radiated Emission.

1.3 Related Submittal(s)/Grant(s)

The PCII application was originally granted on 3/19/03. Please refer to BACL report R0301173 for the details of the original application.

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 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 C63.4-2001.

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 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2517A01610	2003-10-30
HP	Amplifier	8447E	2944A07030	2004-06-28
HP	Quasi-Peak Adapter	85650A	2521A00718	2004-03-08
Com-Power	Biconical Antenna	AB-100	14012	2004-09-05
Com-Power	Log Periodic Antenna	AL-100	16005	2004-08-23
Com-Power	Log Periodic Antenna	AB-900	15049	2004-05-01
Agilent	Spectrum Analyzer (9KHz – 40GHz)	8564E	3943A01781	2004-08-01
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 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
ACER	Notebook PC	TravelMate C300	N/A	DOC

1.8 Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
DELTA	AC Adapter	ADO-60DH	QZT0220032112	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 exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, bluetest, provided by the customer, is started the Windows 98 terminal program under the Windows 98 operating system. Once started, select USB from “choose a protocol”, select TXDATA1 from “bluetest” then click execute. The process is continuous throughout all tests.

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.

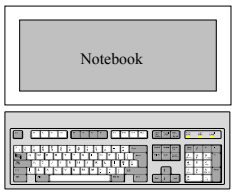
2.4 Schematics / Block Diagram

Please refer to Appendix A.

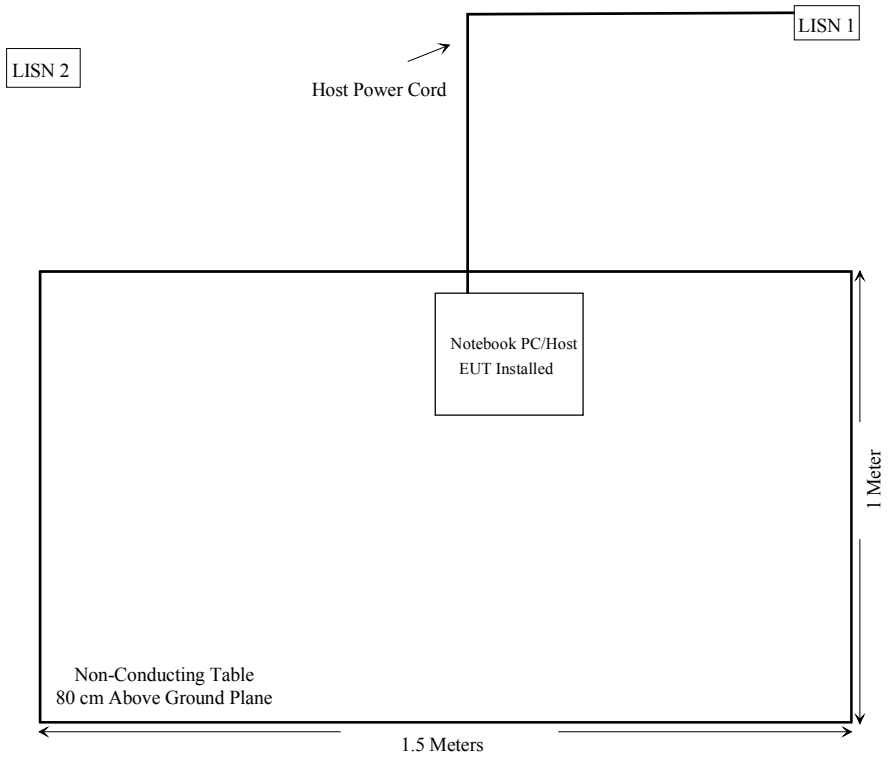
2.5 Equipment Modifications

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 - ANTENNA REQUIREMENT

3.1 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.

3.2 Antenna Connected Construction

The directional gain of the antenna used for transmitting is 3.17 dBi. The antenna is installed by OET integrator.

4 - SPURIOUS RADIATED EMISSION

4.1 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.

4.2 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 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.

4.3 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

4.4 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.

4.5 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

4.6 Test Equipment

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

4.7 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:

-11.9 dB at **7206.00.00 MHz** in the **Vertical** polarization, Low Channel

-12.0 dB at **7323.00 MHz** in the **Vertical** polarization, Middle Channel

-11.9 dB at **7440.00 MHz** in the **Vertical** polarization, High Channel

-9.5 dB at **122.26 MHz** in the **Vertical** polarization, Unintentional Emission

4.7.1 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											
2402.00	89.0	Fund/Peak	45	1.8	v	28.1	3.4	35.2	85.3		
2402.00	85.8	Fund/Peak	300	2.0	h	28.1	3.4	35.2	82.1		
2402.00	88.7	Fund/Ave	45	1.8	v	28.1	3.4	35.2	84.9		
2402.00	85.0	Fund/Ave	300	2.0	h	28.1	3.4	35.2	81.3		
7206.00	34.9	Ave	180	1.6	v	35.1	5.6	33.5	42.1	54	-11.9
7206.00	34.8	Ave	90	2.0	h	35.1	5.6	33.5	42.0	54	-12.0
4804.00	32.0	Ave	30	1.6	v	32.5	4.9	33.0	36.4	54	-17.6
4804.00	32.0	Ave	0	1.8	h	32.5	4.9	33.0	36.4	54	-17.6
7206.00	46.6	Peak	180	1.6	v	35.1	5.6	33.5	53.8	74	-20.2
7206.00	46.2	Peak	90	2.0	h	35.1	5.6	33.5	53.4	74	-20.6
4804.00	44.2	Peak	30	1.6	v	32.5	4.9	33.0	48.6	74	-25.4
4804.00	44.1	Peak	0	1.8	h	32.5	4.9	33.0	48.5	74	-25.5
Middle Channel											
2441.00	89.8	Fund/Peak	0	1.6	v	28.1	3.4	35.2	86.1		
2441.00	86.3	Fund/Peak	270	1.5	h	28.1	3.4	35.2	82.6		
2441.00	89.3	Fund/Ave	0	1.6	v	28.1	3.4	35.2	85.6		
2441.00	85.7	Fund/Ave	270	1.5	h	28.1	3.4	35.2	81.9		
7323.00	34.8	Ave	60	1.4	v	35.1	5.6	33.5	42.0	54	-12.0
7323.00	34.7	Ave	150	1.2	h	35.1	5.6	33.5	41.9	54	-12.1
4882.00	32.1	Ave	300	1.5	v	32.5	4.9	33.0	36.5	54	-17.5
4882.00	32.0	Ave	180	1.4	h	32.5	4.9	33.0	36.4	54	-17.6
7323.00	46.5	Peak	60	1.4	v	35.1	5.6	33.5	53.7	74	-20.3
7323.00	46.3	Peak	150	1.2	h	35.1	5.6	33.5	53.6	74	-20.4
4882.00	44.3	Peak	300	1.5	v	32.5	4.9	33.0	48.7	74	-25.3
4882.00	44.0	Peak	180	1.4	h	32.5	4.9	33.0	48.4	74	-25.6
High Channel											
2480.00	91.3	Fund/Peak	45	1.6	v	28.1	3.4	35.2	87.6		
2480.00	88.8	Fund/Peak	45	1.5	h	28.1	3.4	35.2	85.1		
2480.00	90.7	Fund/Ave	45	1.6	v	28.1	3.4	35.2	86.9		
2480.00	88.0	Fund/Ave	45	1.5	h	28.1	3.4	35.2	84.3		
7440.00	34.9	Ave	90	1.4	v	35.1	5.6	33.5	42.1	54	-11.9
7440.00	34.6	Ave	270	1.5	h	35.1	5.6	33.5	41.8	54	-12.2
4960.00	32.4	Ave	30	1.8	v	32.5	4.9	33.0	36.8	54	-17.2
4960.00	32.2	Ave	250	1.4	h	32.5	4.9	33.0	36.6	54	-17.4
7440.00	46.6	Peak	90	1.4	v	35.1	5.6	33.5	53.8	74	-20.2
7440.00	46.1	Peak	270	1.5	h	35.1	5.6	33.5	53.3	74	-20.7
4960.00	45.0	Peak	30	1.8	v	32.5	4.9	33.0	49.4	74	-24.6
4960.00	44.4	Peak	250	1.4	h	32.5	4.9	33.0	48.8	74	-25.2

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
122.26	45.7	60	1.2	v	11.7	1.6	25.0	34.0	43.5	-9.5
480.10	40.1	45	1.4	v	18.3	3.1	25.0	36.5	46	-9.5
240.67	44.3	270	1.5	v	13.8	2.2	25.0	35.3	46	-10.7
252.02	44.2	200	1.8	v	13.3	2.2	25.0	34.6	46	-11.4
192.03	41.2	250	1.2	h	13.7	2.1	25.0	32.0	43.6	-11.6
72.07	38.5	270	1.4	h	9.2	1.2	25.0	23.9	40	-16.1
60.15	37.8	120	1.5	h	9.4	1.3	25.0	23.5	40	-16.5

Note:

AVG = average

5 - CONDUCTED EMISSIONS

5.1 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.

5.2 EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-2001 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.

5.3 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

5.4 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**".

5.5 Test Equipment

Manufacturer	Description	Serial No.	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	1147 8007 07	2003-12-03

5.6 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:

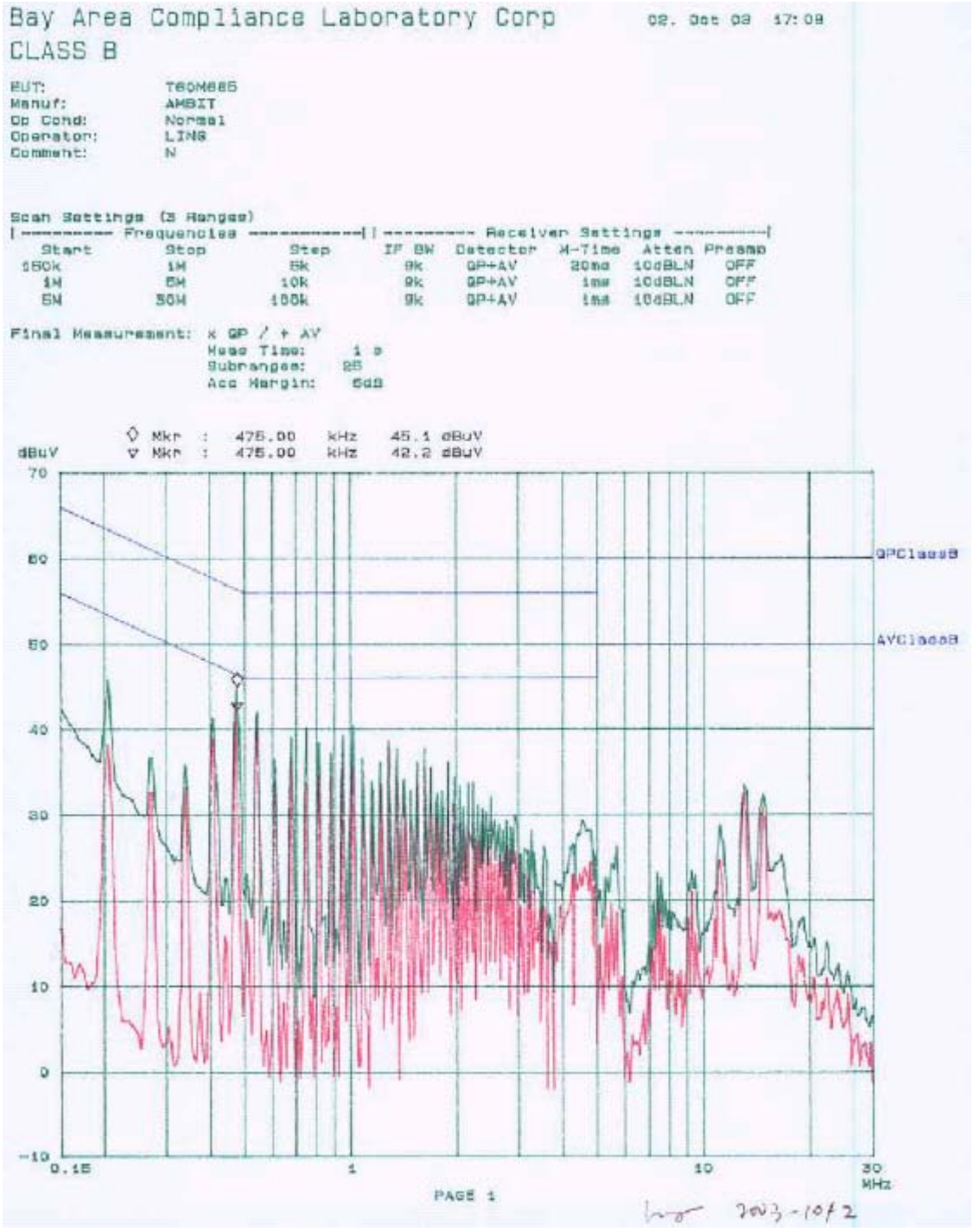
-3.7 dBμV at 0.475 MHz in the Neutral mode

5.7 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
0.475	42.3	AVG	Neutral	46.5	-4.2
0.475	41.2	AVG	Line	46.5	-5.3
0.545	39.8	AVG	Neutral	46	-6.2
0.545	39.1	AVG	Line	46	-6.9
0.475	45.1	QP	Neutral	56	-10.9
0.475	45.0	QP	Line	56	-11.0
0.545	42.0	QP	Neutral	56	-14.0
0.545	41.8	QP	Line	56	-14.2
0.205	38.3	AVG	Line	53	-14.7
0.205	38.1	AVG	Neutral	53	-14.9
0.205	46.7	QP	Line	63	-16.3
0.205	45.8	QP	Neutral	63	-17.2

5.8 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.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02. Oct 09 17:09
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Manuf: AMBIT
Op Cond: Normal
Operator: LING
Comment: N
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Frequencies
Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 1M 5k 9k QP+AV 20ms 10dBLN OFF
1M 5M 10k 9k QP+AV 1ms 10dBLN OFF
5M 30M 100k 9k QP+AV 1ms 10dBLN OFF
Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB
◊ Mkr : 475.00 kHz 45.1 dBuV
▽ Mkr : 475.00 kHz 42.2 dBuV
dBuV
70
60
50
40
30
20
10
0
-10
0.15
1
10
30
MHz
QPClassB
AVClassB
PAGE 1
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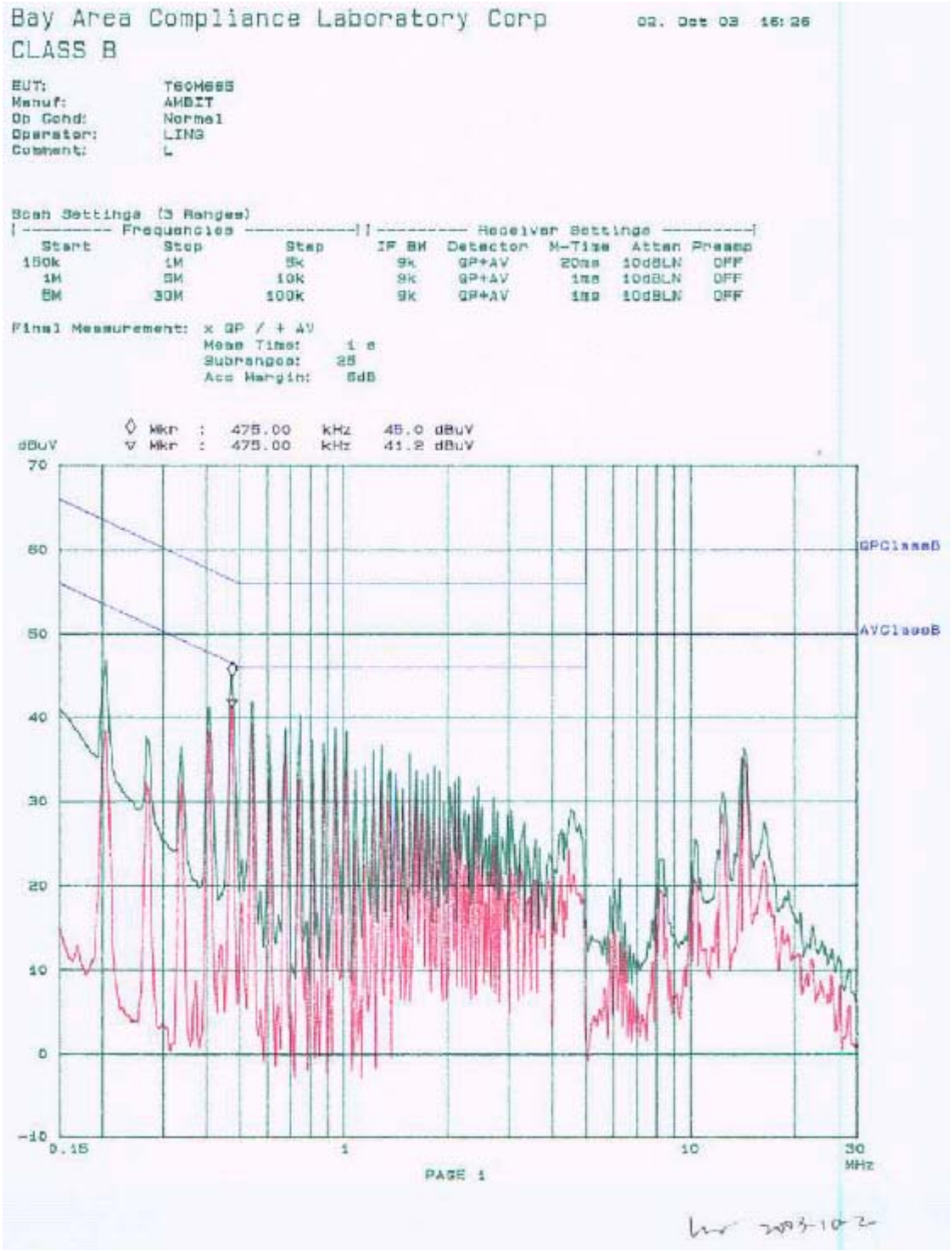
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CLASS B
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Manuf: AMBIT
Op Cond: Normal
Operator: LIN3
Comment: L
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Frequencies
Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 1M 5k 9k QP+AV 20ms 10dBLN OFF
1M 8M 10k 9k QP+AV 1ms 10dBLN OFF
8M 30M 100k 9k QP+AV 1ms 10dBLN OFF
Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB
◊ Mkr : 475.00 kHz 45.0 dBuV
▽ Mkr : 475.00 kHz 41.2 dBuV
dBuV
70
60
50
40
30
20
10
0
-10
0.15
1
10
30
MHz
QPClassB
AVClassB
PAGE 1