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: MCLAIRMPI350DE

2003-07-15

This Report Concerns:	**Equipment Type:**
☒ Original Report	Wireless MiniPCI Card

Test Engineer:	Ling Zhang
Report No.:	R0305081
Test Date:	2003-07-09, 2003-07-16
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: *AIR-MPI350DE* or the "EUT" as referred to in this report is a wireless MiniPCI Card.

The mini PCI card wireless LAN card provides RF modem functionality utilizing direct sequence spread spectrum technology for client applications in the ISM 2.4GHz RF frequency band. Supporting a Type IIIA mini PCI from factor, this product provides industry-standard PHY/MAC functionality per the standard of IEEE 802.11b at 1, 2, 5.5 & 11 Mb/s data rates. The design is based on the Intersil Prism 2.5 chipset. This product will be PCI 2.2 compliant, and will provide a standard Mini PCI Card Interface through the industry-standard 124-pin connector. The product interface utilizes bus mastering DMA for all packet data transfers across the system bus.

The EUT provides the following feature(s):

- Compatible with IEEE 802.11b high rate standard to provide wireless Ethernet speeds of 11Mbps data rate
- Modulation BPSK-1 Mbps, QPSK-2 Mbps, CCK 5.5 and 11 Mbps
- Allow auto fallback data rate for optimized reliability, throughput and transmission range
- Supporrts wireless data encryption with 128-bit WEP standard for security, EAP and LEAP security is addresses with WEP (up to 1024 bit) and other security management provisions as enabled by the firmware and the host driver.
- Dual diversity antenna connectors supported for the multi-path environment
- Frequency 2400-2500MHz, useable 2412-2484 MHz in 1 MHz steps
- External ON/OFF switch & indicator LEDs
- It is a bus mastering PCI interface with full support for power management including ACPI power states D0-D3, CAM, MaxPSP and Fast PSP.
- 4M flash was designed to allow for the PXE code (remote boot), which is a BIOS extension.

The EUT was installed in 7 different notebooks with 7 corresponding different antennas. The notebook and antenna list is as follows:

D800 NEWEB	CA0-C
D800 HITACHI	HFT04-DL01
D600 NEWEB	CA5-Q
D600 Hitachi	HFT01-DL01
D400 Neweb	CAB-A
C400 Neweb	PPO3L
C640 Foxonn	BM2-CABLE-ME (?)

* The test data in this test report was good for the test sample only. It may have deviation for other test samples.

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.

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 Submittal(s)/Grant(s).

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	2004-06-28
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
See Section 1.10	Notebook	ZI2	N/A	DOC
HP	Printer	2225C	N/A	DOC

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Shielded Printer Cable	2.0	Parallel Port/Notebook PC	Printer

1.9 Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	AC Adapter/ Battery Pack	AA22850	B3865604AF01B	DOC

1.10 Host PC Configurations

#1

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	D800	N/A	DOC
Neweb	Wireless LAN Antenna	CA0-C	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

#2

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	D800	N/A	DOC
Hitachi	Wireless LAN Antenna	HFt04-DL01	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

#3

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	D600	N/A	DOC
Neweb	Wireless LAN Antenna	CA5-Q	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

#4

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	D600	N/A	DOC
Hitachi	Wireless LAN Antenna	HFT01-DL01	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

#5

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	D400	N/A	DOC
Neweb	Wireless LAN Antenna	CAB-A	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

#6

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	C400	N/A	DOC
Neweb	Wireless LAN Antenna	CZ3-A	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

#7

Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Laptop Computer	C640	N/A	DOC
Foxonn	Wireless LAN Antenna	BM2-CABLE-ME	N/A	DOC
Intel	CPU	Pentium 4	N/A	N/A
MSI Microstar International	Motherboard	MS-6391VER.1	N/A	DOC
Teac	Floppy drive	FD2335HF	N/A	N/A

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.

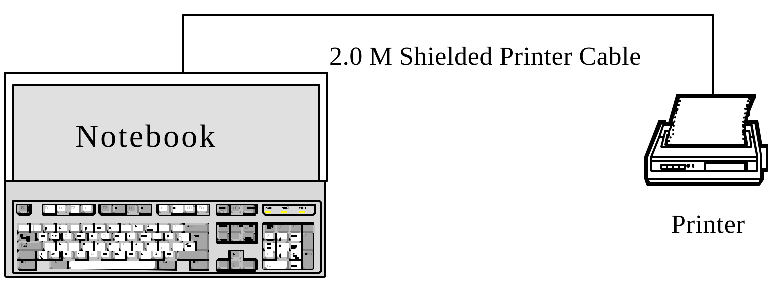
2.4 Schematics / Block Diagram

Please refer to Appendix A.

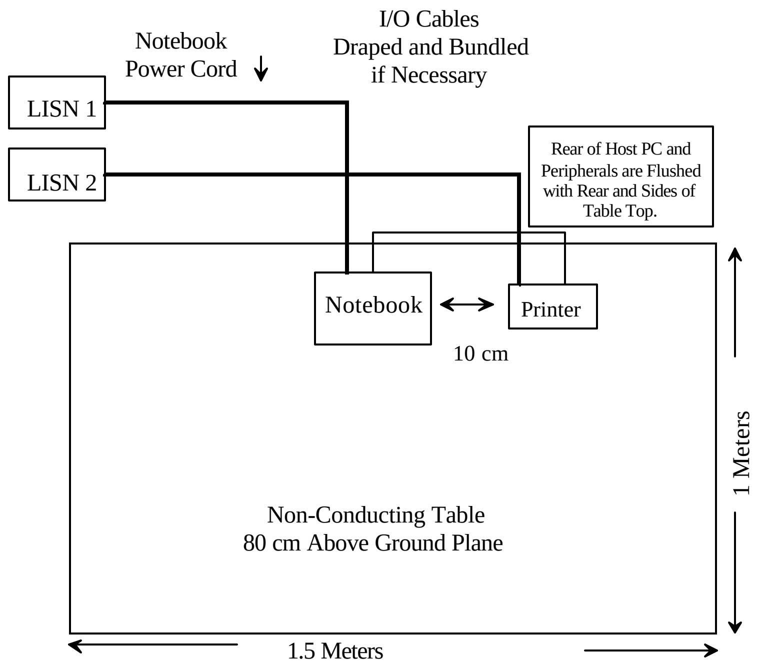
2.5 Equipment Modifications

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.

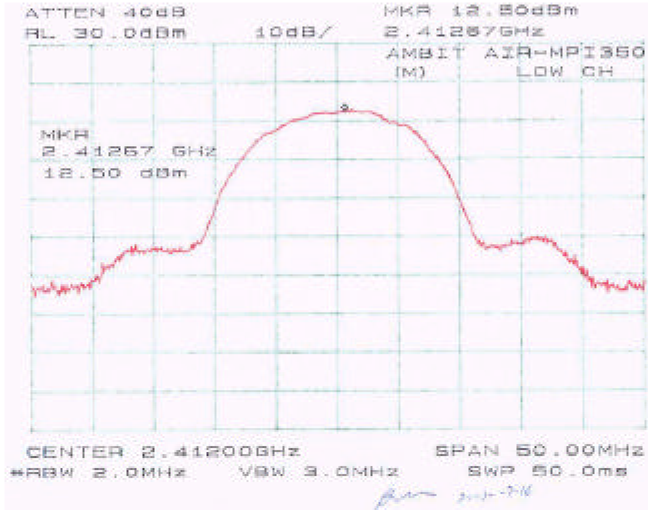
4.3 Test Equipment

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

4.4 Measurement Result

Antenna	Frequency (MHz)	Peak Output Power (dBm)	Correction Factor (dBm)	Corrected Factor (dBm)	Output Power (W)	Standard (W)	Result
Main	2412	12.50	8.0	20.50	112.20	≤ 1 W	Compliant
	2437	12.67	8.0	20.67	116.68	≤ 1 W	Compliant
	2462	12.33	8.0	20.33	107.89	≤ 1 W	Compliant
Auxiliary	2412	12.17	8.0	20.17	103.99	≤ 1 W	Compliant
	2437	12.67	8.0	20.67	116.68	≤ 1 W	Compliant
	2462	12.50	8.0	20.50	112.20	≤ 1 W	Compliant

Note: Correction Factor = 10 log (BW6dB/RBW) = 10 log (17/2.0) = 9.3 dBm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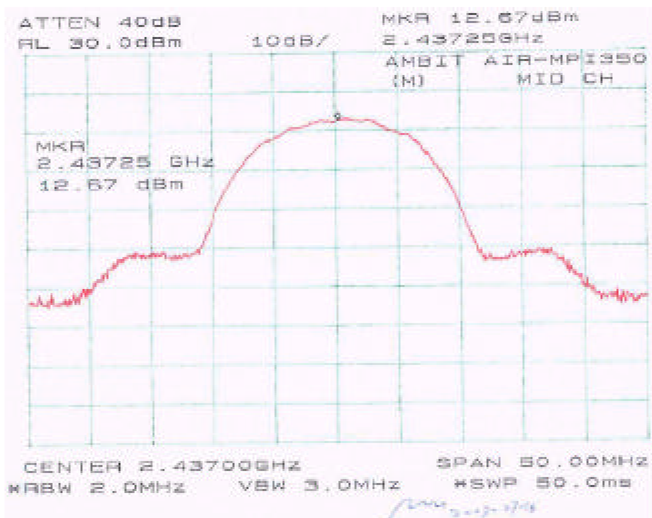
10dB/
MKR 12.50dBm
2.41267GHz
AMBIT AIR-MPI350
(M)
LOW CH
MKR
2.41267 GHz
12.50 dBm
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms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(M)
MID CH
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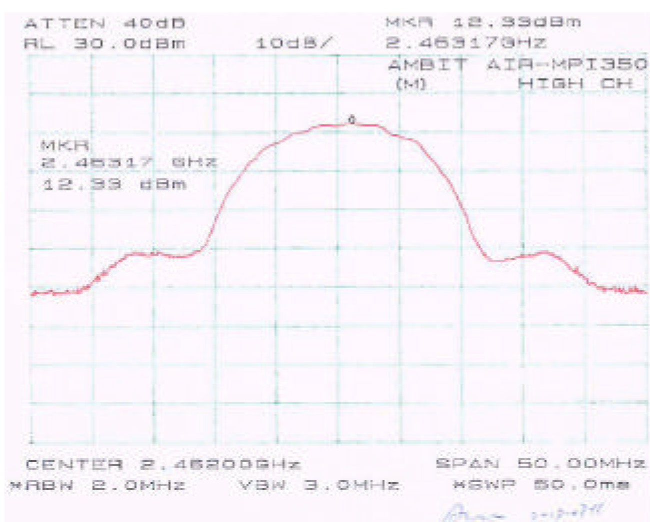
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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10dB/
MKR 12.33dBm
2.46317GHz
AMBIT AIR-MPI350
(M)
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MKR
2.46317 GHz
12.33 dBm
CENTER 2.46200GHz
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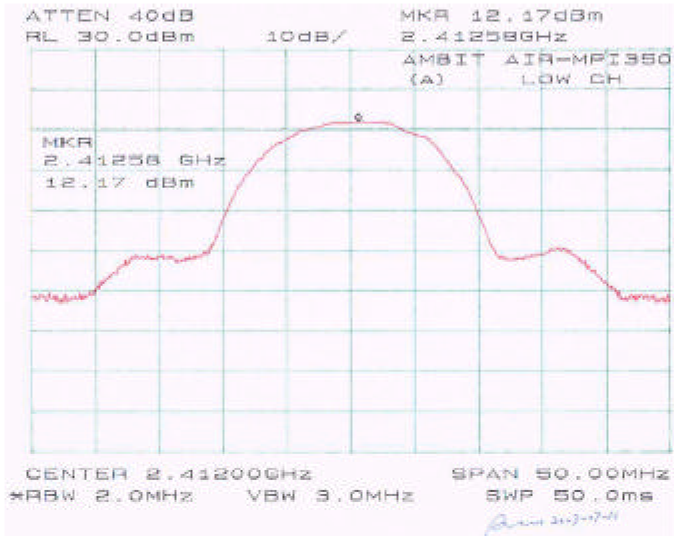
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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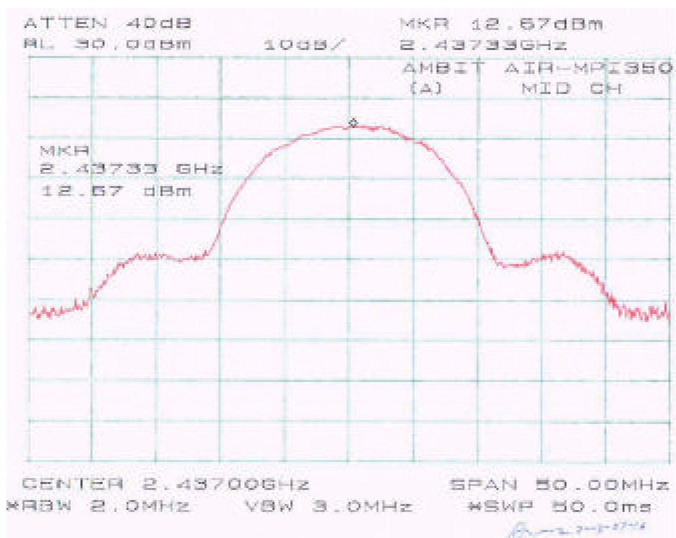
MKR
2.41258 GHz
12.17 dBm
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms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2.43733GHz
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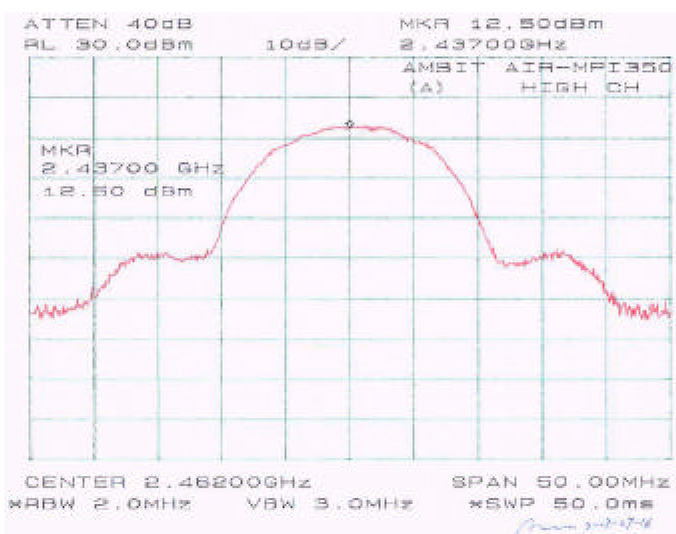
(A) MID CH
MKR
2.43733 GHz
12.67 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms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10dB/
MKR 12.50dBm
2.43700GHz
AMBIT AIR-MPI350
(A) HIGH CH
MKR
2.43700 GHz
12.50 dBm
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 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.

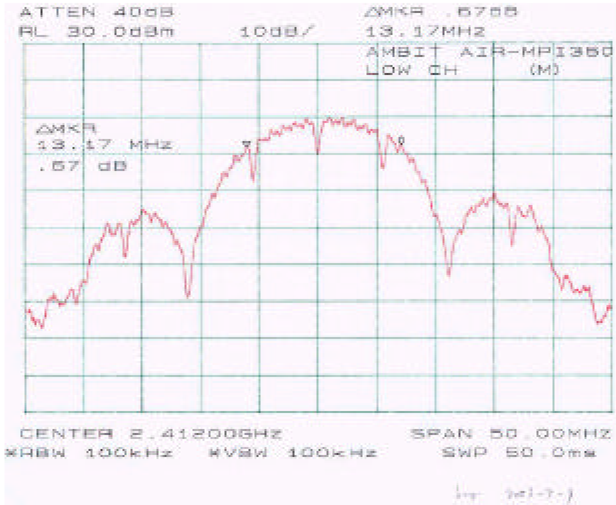
5.3 Test Equipment

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.

Antenna	Frequency (MHz)	Measured (MHz)	Standard (kHz)	Result
Main	2412	13.17	≥ 500	Compliant
	2437	12.42	≥ 500	Compliant
	2462	12.50	≥ 500	Compliant
Auxiliary	2412	12.50	≥ 500	Compliant
	2437	12.50	≥ 500	Compliant
	2462	12.33	≥ 500	Compliant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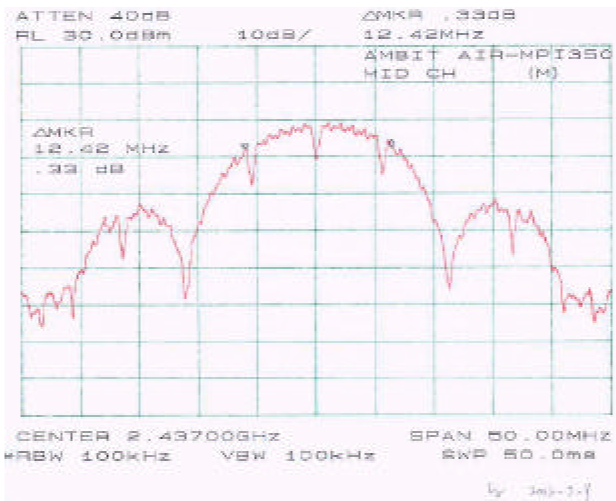
ΔMKR .67dB
13.17MHz
AMBIT AIR-MPI350
LOW CH (M)
ΔMKR
13.17 MHz
.67 dB
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 100kHz *VBW 100kHz
SWP 50.0ms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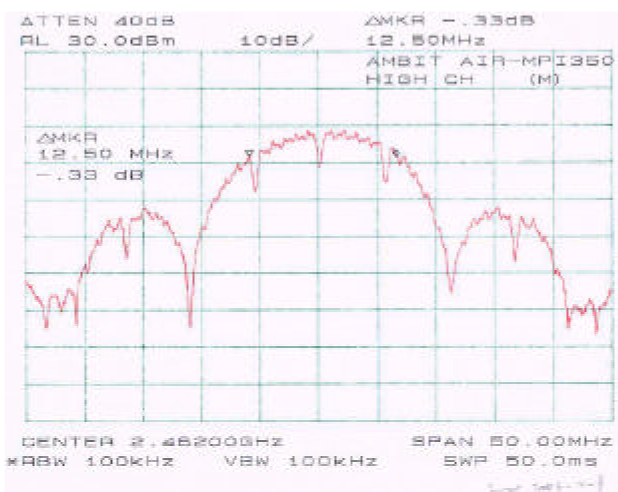
ΔMKR .33dB
12.42MHz
AMBIT AIR-MPI350
MID CH (M)
ΔMKR
12.42 MHz
.33 dB
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 100kHz VBW 100kHz
SWP 50.0ms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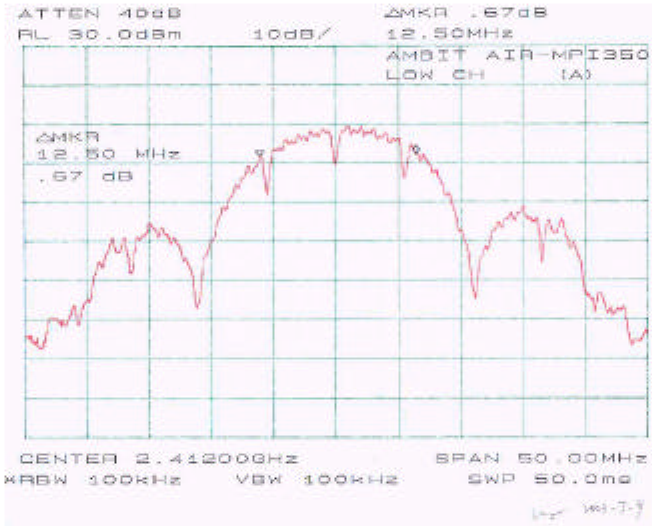
RL 30.0dBm 10dB/
ΔMKR -.33dB
12.50MHz
AMBIT AIR-MPI350
HIGH CH (M)
ΔMKR
12.50 MHz
-.33 dB
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 100kHz VBW 100kHz
SWP 50.0ms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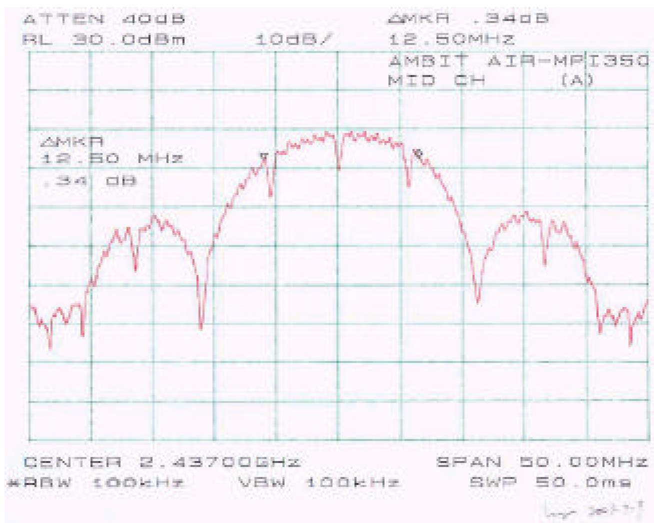
ΔMKR .67dB
12.50MHz
AMBIT AIR-MPI350
LOW CH (A)
ΔMKR
12.50 MHz
.67 dB
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 100kHz VBW 100kHz
SWP 50.0ms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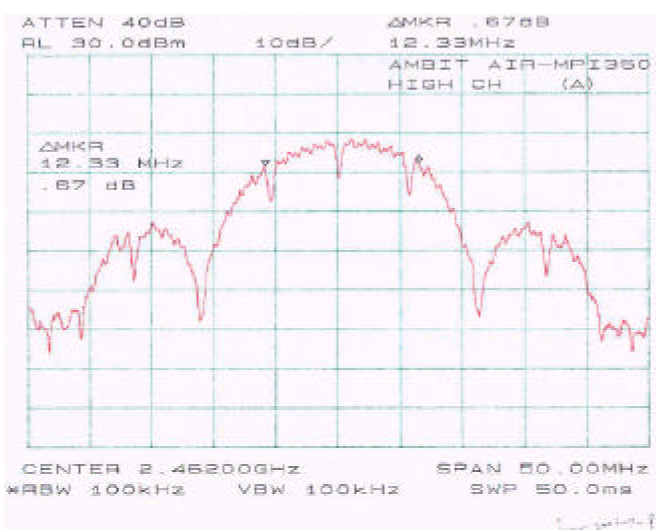
ΔMKR .34dB
12.50MHz
AMBIT AIR-MPI350
MID CH (A)
ΔMKR
12.50 MHz
.34 dB
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 100kHz VBW 100kHz
SWP 50.0ms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ΔMKR .67dB
12.33MHz
AMBIT AIR-MPI350
HIGH CH (A)
ΔMKR
12.33 MHz
.67 dB
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 100kHz VBW 100kHz
SWP 50.0ms

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

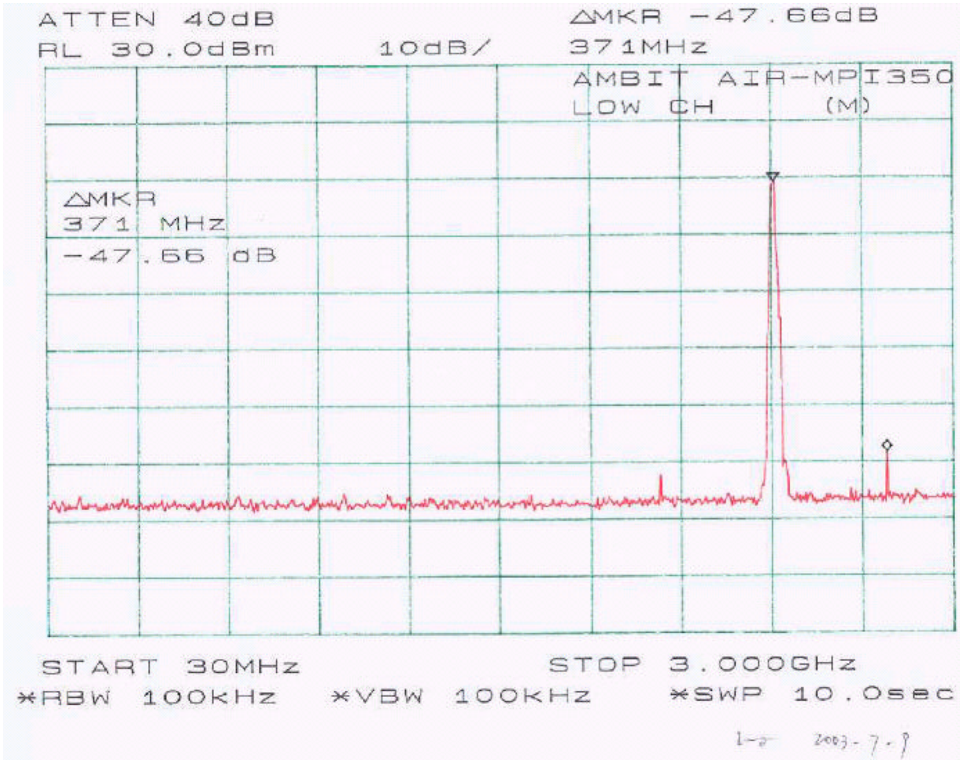
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument 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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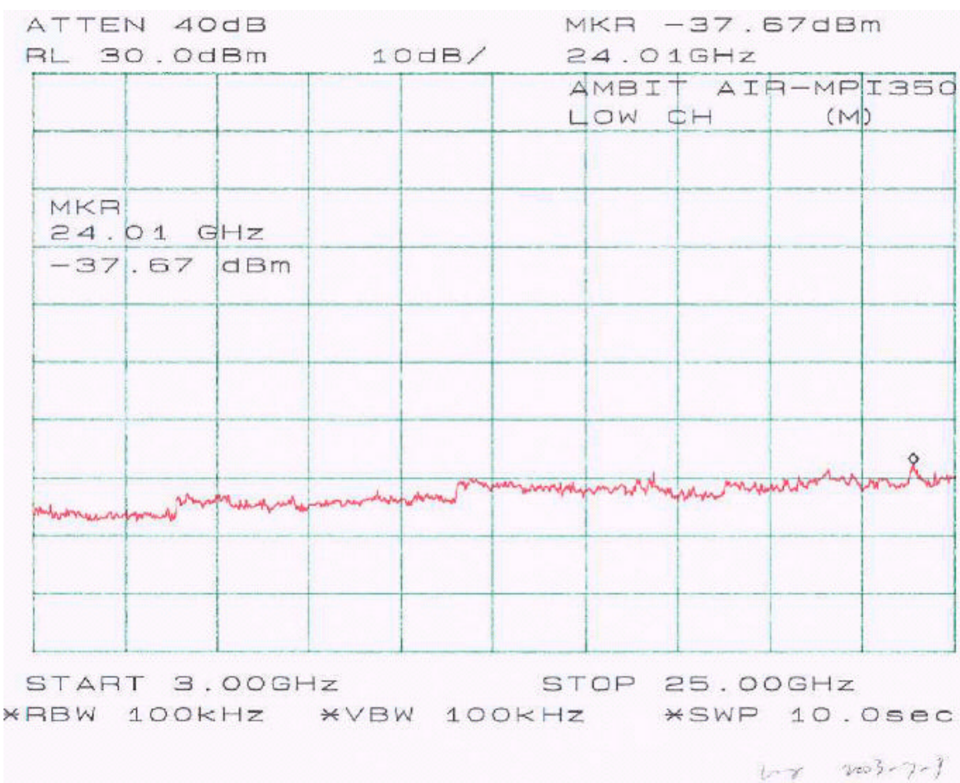
10dB/
ΔMKR -47.66dB
371MHz
AMBIT AIR-MPI350
LOW CH (M)
ΔMKR
371 MHz
-47.66 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
*VBW 100kHz
*SWP 10.0sec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10dB/
MKR -37.67dBm
24.01GHz
AMBIT AIR-MPI350
LOW CH (M)
MKR
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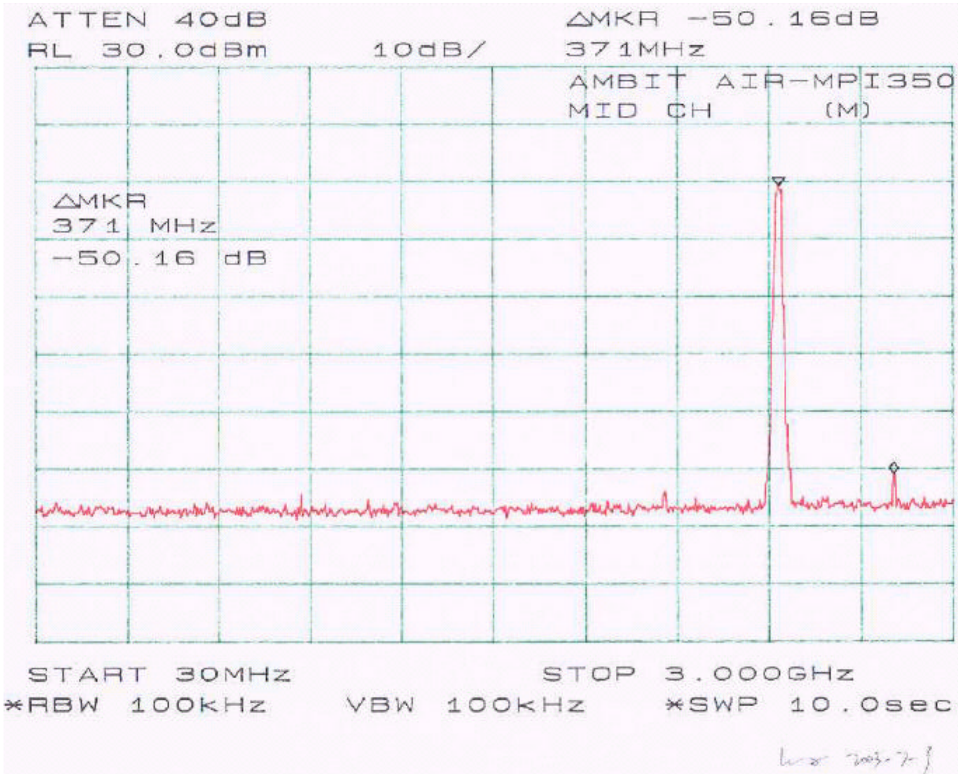
-37.67 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
*VBW 100kHz
*SWP 10.0sec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RL 30.0dBm
10dB/
371MHz
AMBIT AIR−MPI350
MID CH (M)
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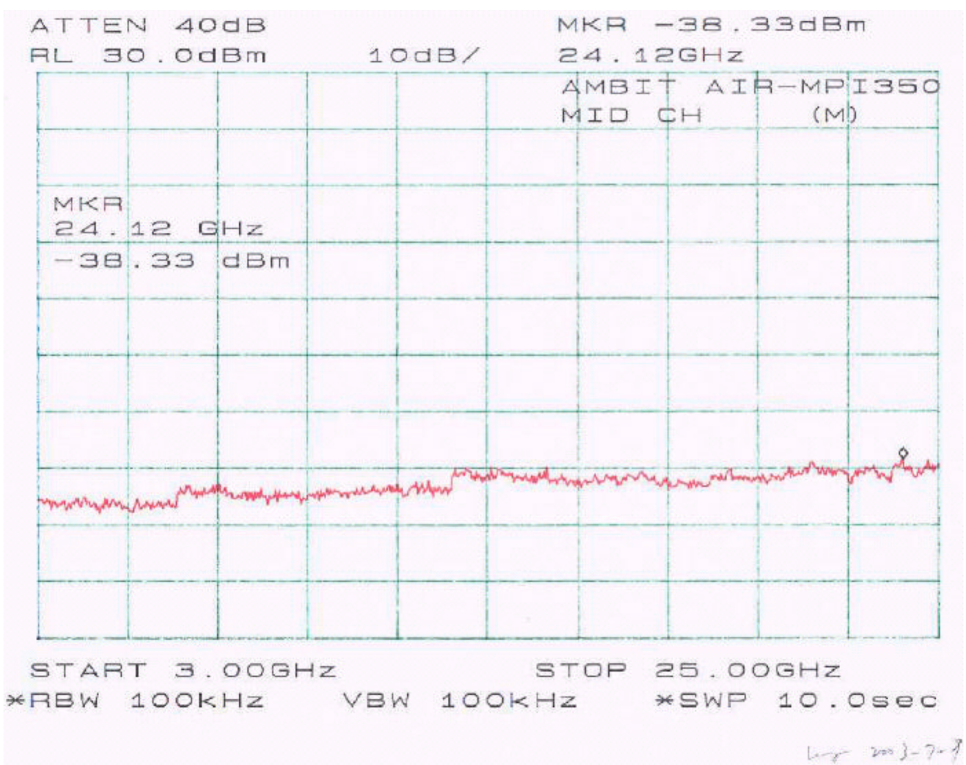
371 MHz
−50.16 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec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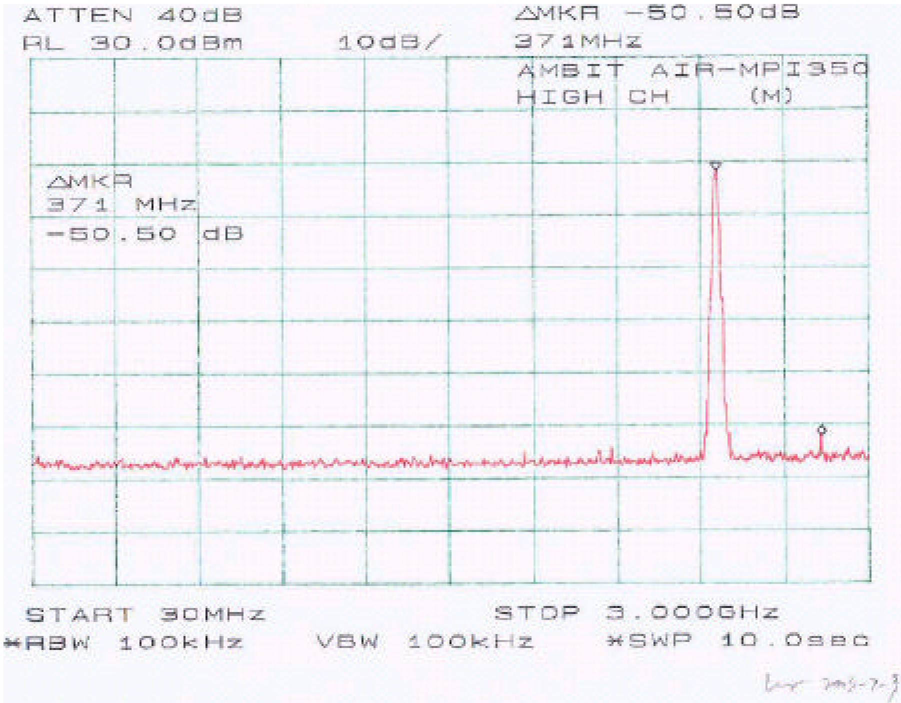
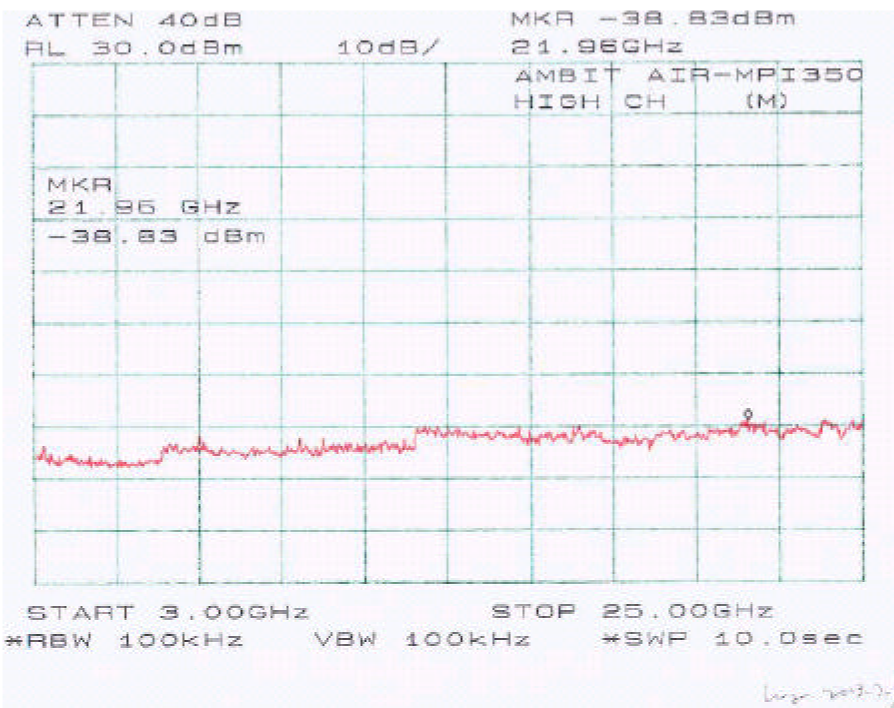
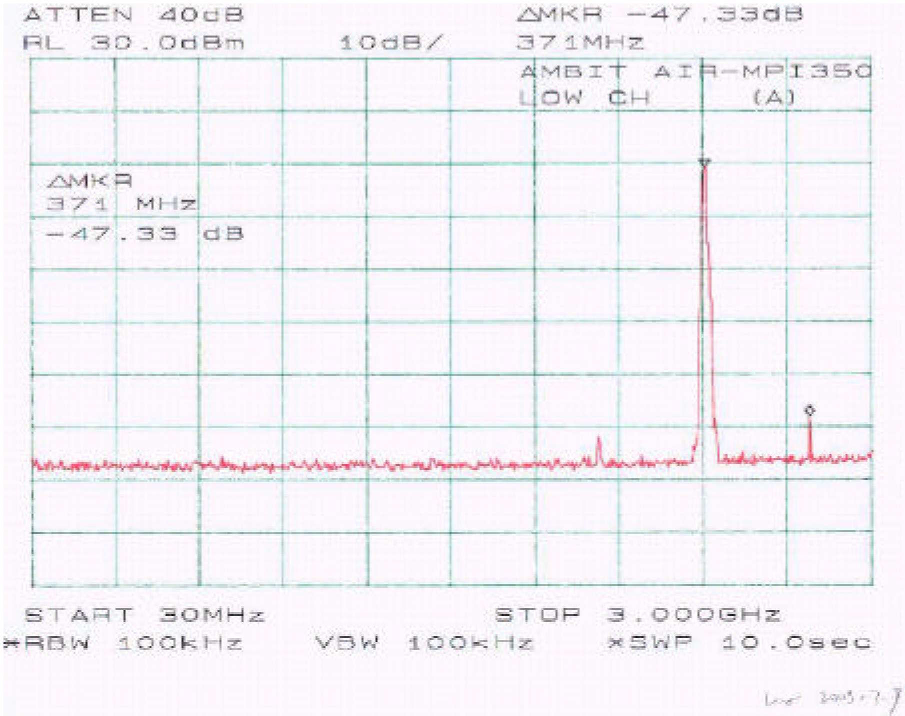
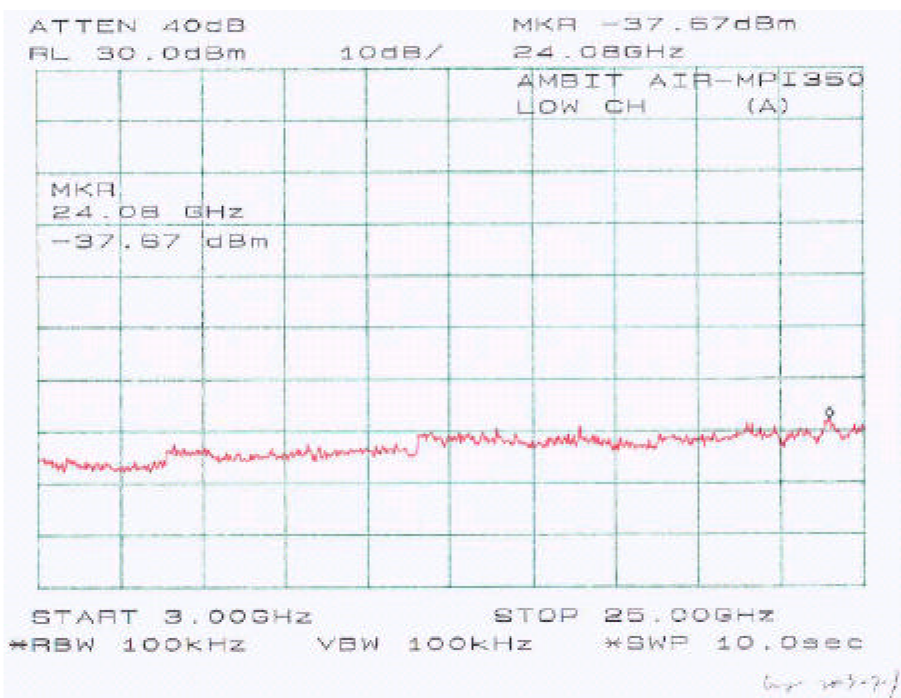
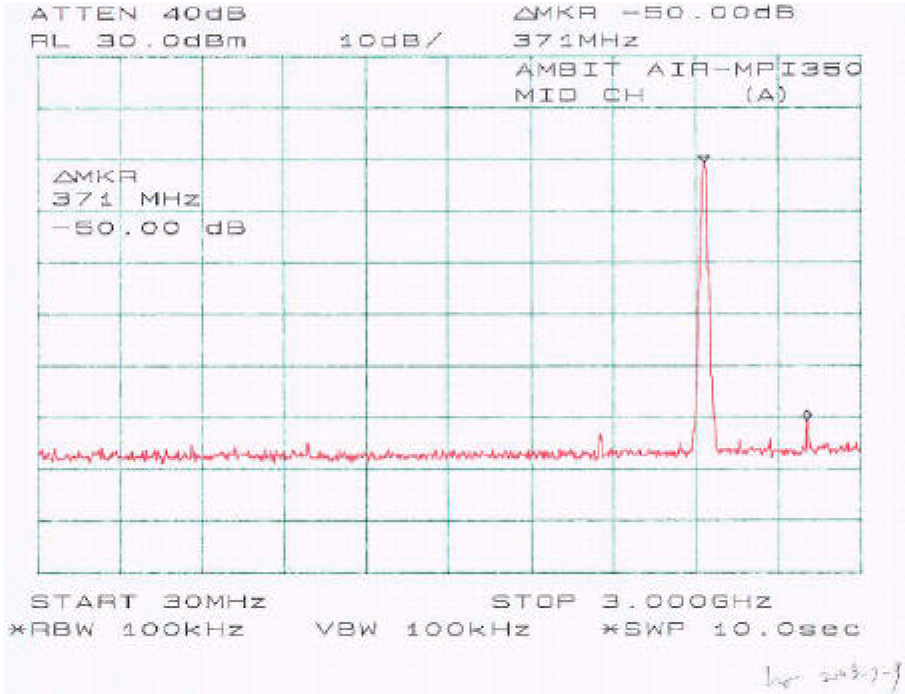
10dB/
24.12GHz
AMBIT AIR−MPI350
MID CH (M)
MKR
24.12 GHz
−38.33 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

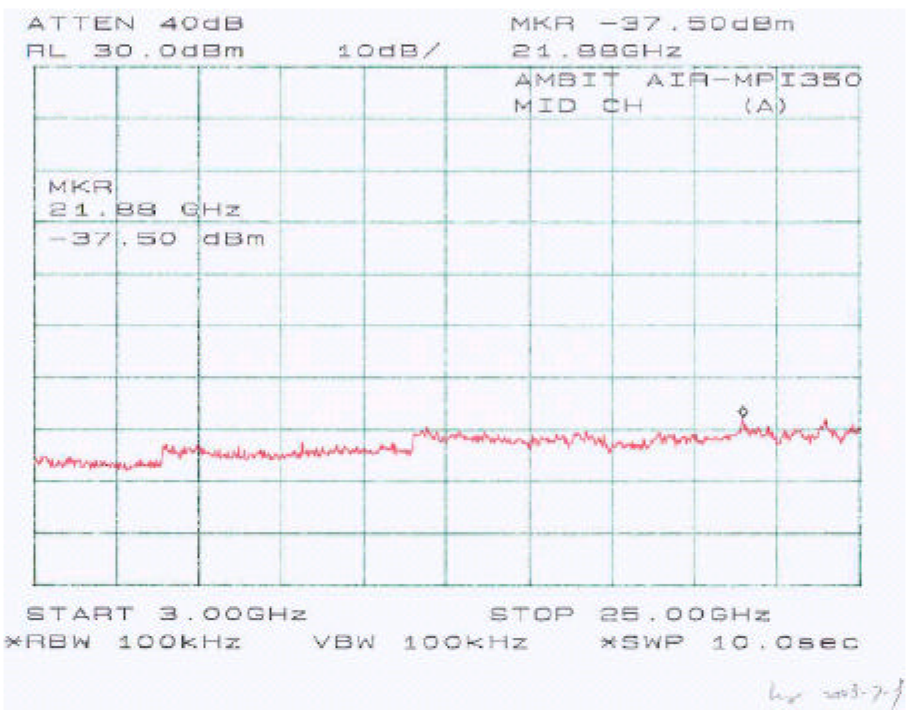

ATTEN 40dB
RL 30.0dBm 10dB/
ΔMKR -50.50dB
371MHz
AMBIT AIR-MPI350
HIGH CH (M)
ΔMKR
371 MHz
-50.50 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz VBW 100kHz *SWP 10.0sec

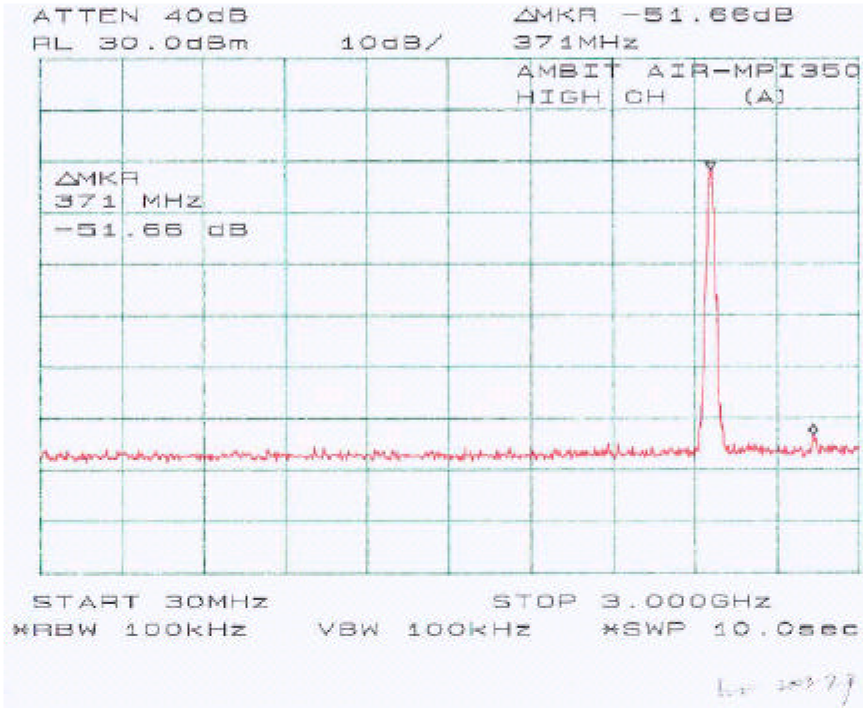

ATTEN 40dB
RL 30.0dBm 10dB/
MKR -38.83dBm
21.96GHz
AMBIT AIR-MPI350
HIGH CH (M)
MKR
21.96 GHz
-38.83 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz VBW 100kHz *SWP 10.0sec

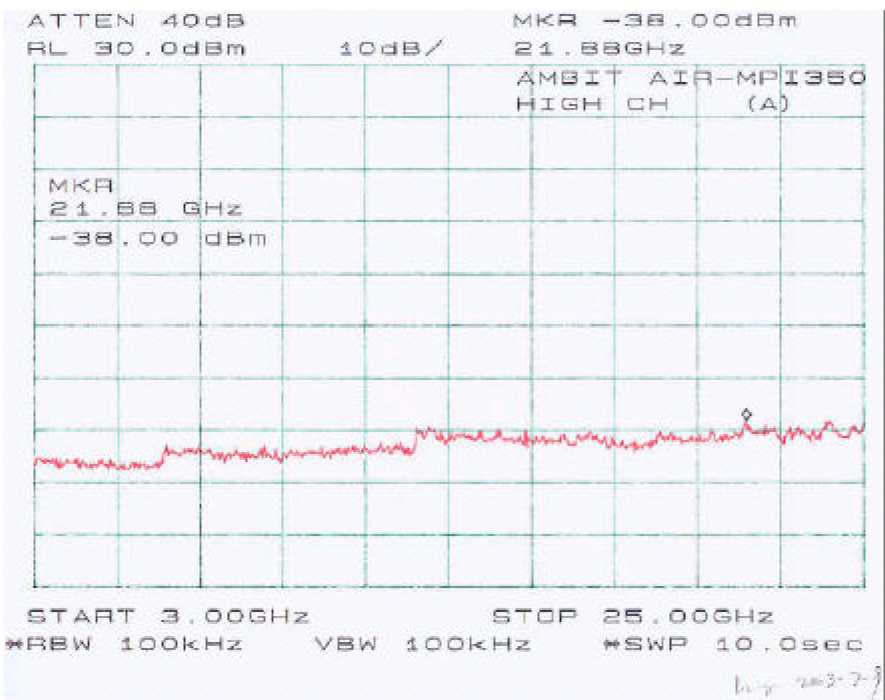

ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -47.33dB
371MHz
AMBIT AIR-MPI350
LOW CH
(A)
ΔMKR
371 MHz
-47.33 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -37.67dBm
24.08GHz
AMBIT AIR-MPI350
LOW CH
(A)
MKR
24.08 GHz
-37.67 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -50.00dB
371MHz
AMBIT AIR-MPI350
MID CH (A)
ΔMKR
371 MHz
-50.00 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -37.50dBm
21.88GHz
AMBIT AIR-MPI350
MID CH (A)
MKR
21.88 GHz
-37.50 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -51.66dB
371MHz
AMBIT AIR-MPI350
HIGH CH (A)
ΔMKR
371 MHz
-51.66 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -38.00dBm
21.88GHz
AMBIT AIR-MPI350
HIGH CH (A)
MKR
21.88 GHz
-38.00 dBm
START 3.00GHz
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

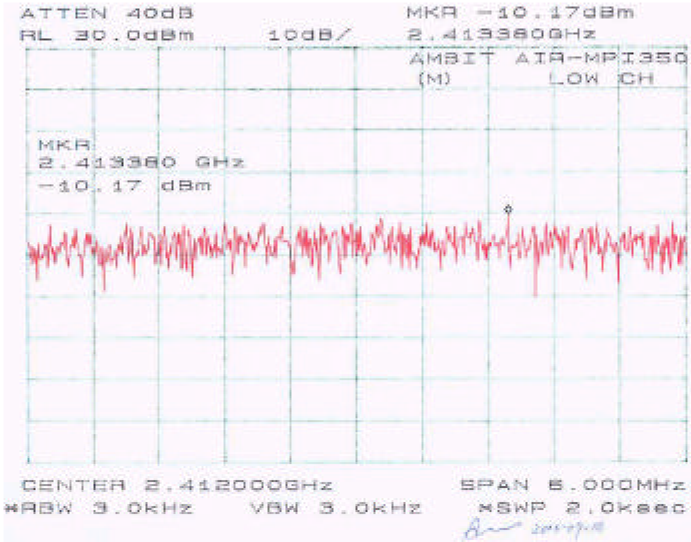
Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

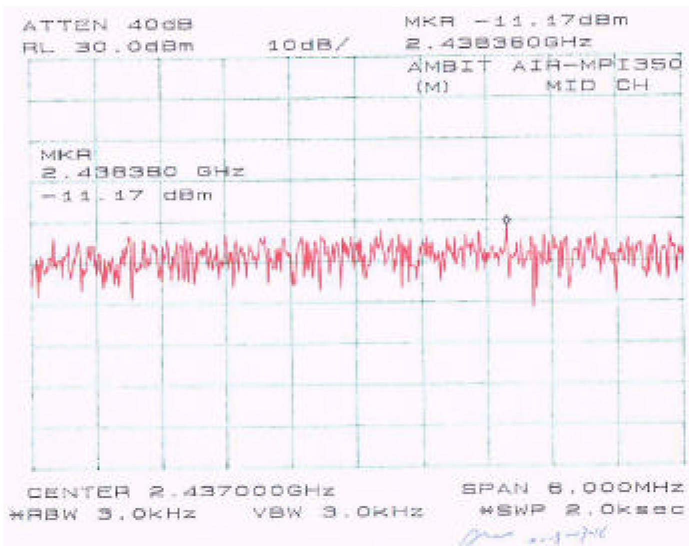
7.4 Measurement Results

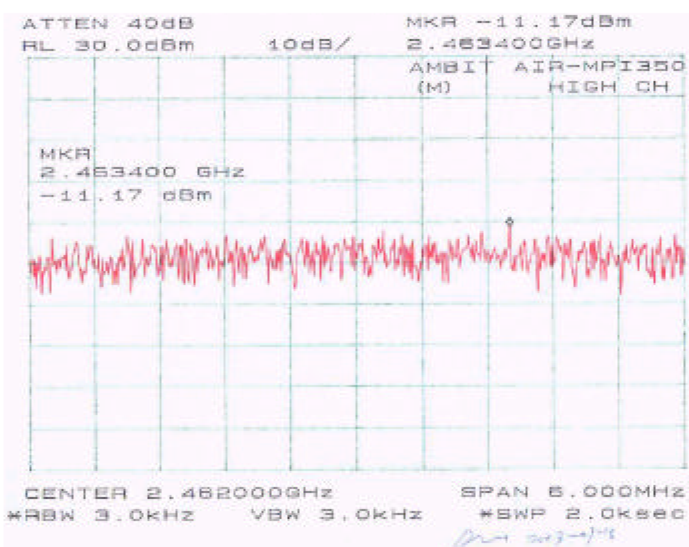
	Frequency (MHz)	Peak Power Spectral Density	Standard (dBm)	Result
J1 Port	2412	-6.17	≤ 8	Compliant
	2442	-8.67	≤ 8	Compliant
	2462	-9.17	≤ 8	Compliant
J2 Port	2412	-24.50	≤ 8	Compliant
	2442	-28.00	≤ 8	Compliant
	2462	-26.83	≤ 8	Compliant

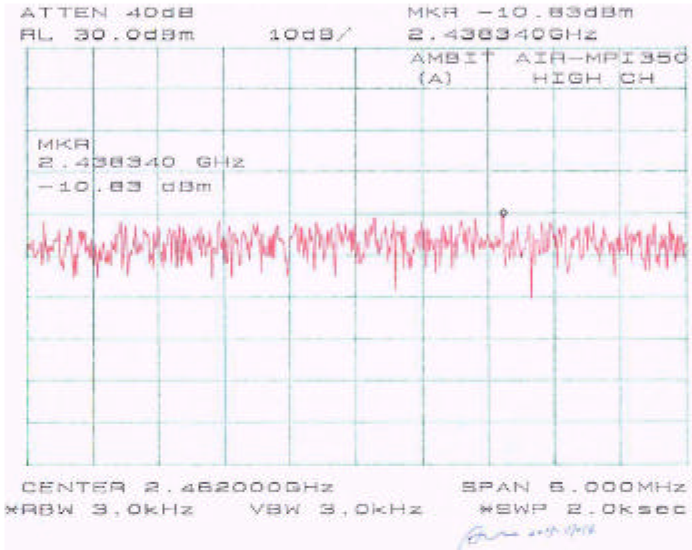
7.5 Plot of Peak Power Spectral Density

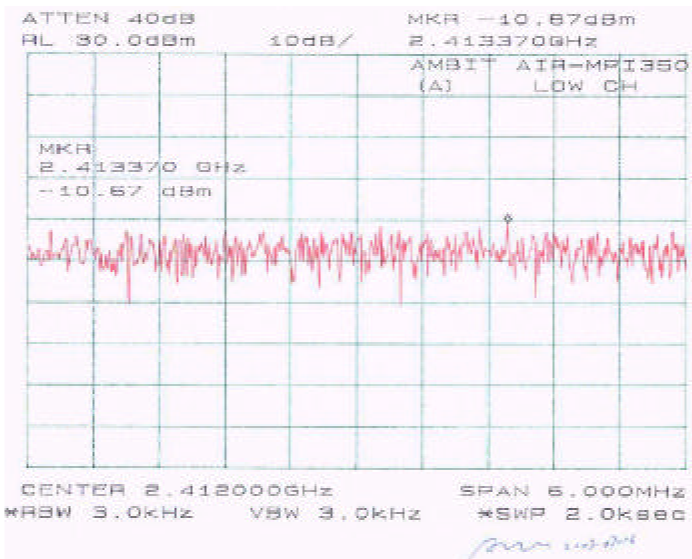
Please refer to following pages for plots of peak power spectral density.

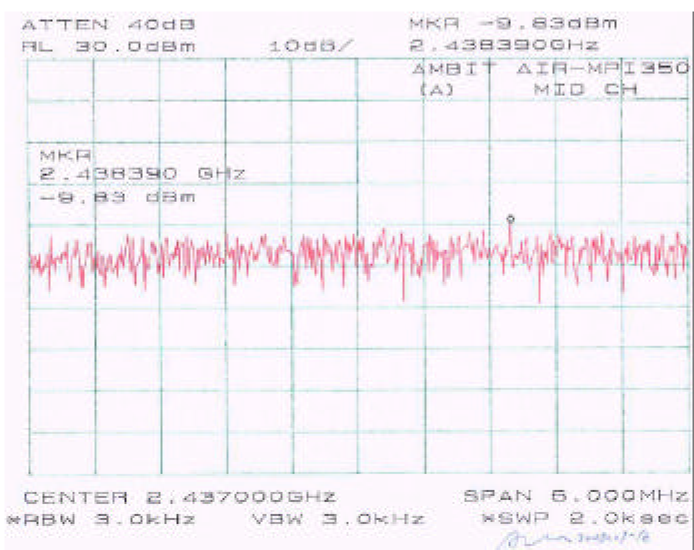

ATTEN 40dB
RL 30.0dBm 10dB/
MKR -10.17dBm
2.413380GHz
AMBIT AIR-MPI350
(M) LOW CH
MKR
2.413380 GHz
-10.17 dBm
CENTER 2.412000GHz
SPAN 6.000MHz
*RBW 3.0kHz VBW 3.0kHz *SWP 2.0ksec


ATTEN 40dB
RL 30.0dBm 10dB/
MKR -11.17dBm
2.438380GHz
AMBIT AIR-MPI350
(M) MID CH
MKR
2.438380 GHz
-11.17 dBm
CENTER 2.437000GHz
SPAN 6.000MHz
*RBW 3.0kHz VBW 3.0kHz *SWP 2.0ksec


ATTEN 40dB
RL 30.0dBm 10dB/
MKR -11.17dBm
2.463400GHz
AMBIT AIR-MPI350
(M) HIGH CH
MKR
2.463400 GHz
-11.17 dBm
CENTER 2.462000GHz
SPAN 6.000MHz
*RBW 3.0kHz VBW 3.0kHz *SWP 2.0ksec


ATTEN 40dB
MKR -10.83dBm
RL 30.0dBm
10dB/
2.438340GHz
AMBIT AIR-MPI350
(A) HIGH CH
MKR
2.438340 GHz
-10.83 dBm
CENTER 2.462000GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec


ATTEN 40dB
MKR -10.67dBm
RL 30.0dBm
10dB/
2.413370GHz
AMBIT AIR-MPI350
(A) LOW CH
MKR
2.413370 GHz
-10.67 dBm
CENTER 2.412000GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec


ATTEN 40dB
MKR -9.83dBm
RL 30.0dBm
10dB/
2.438390GHz
AMBIT AIR-MPI350
(A) MID CH
MKR
2.438390 GHz
-9.83 dBm
CENTER 2.437000GHz
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

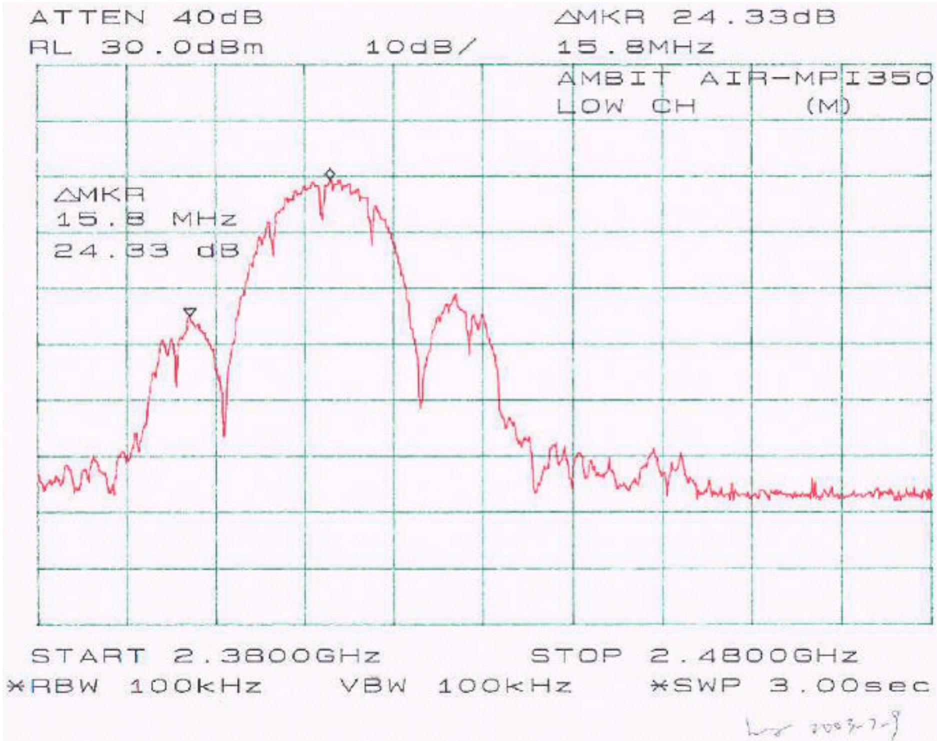
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

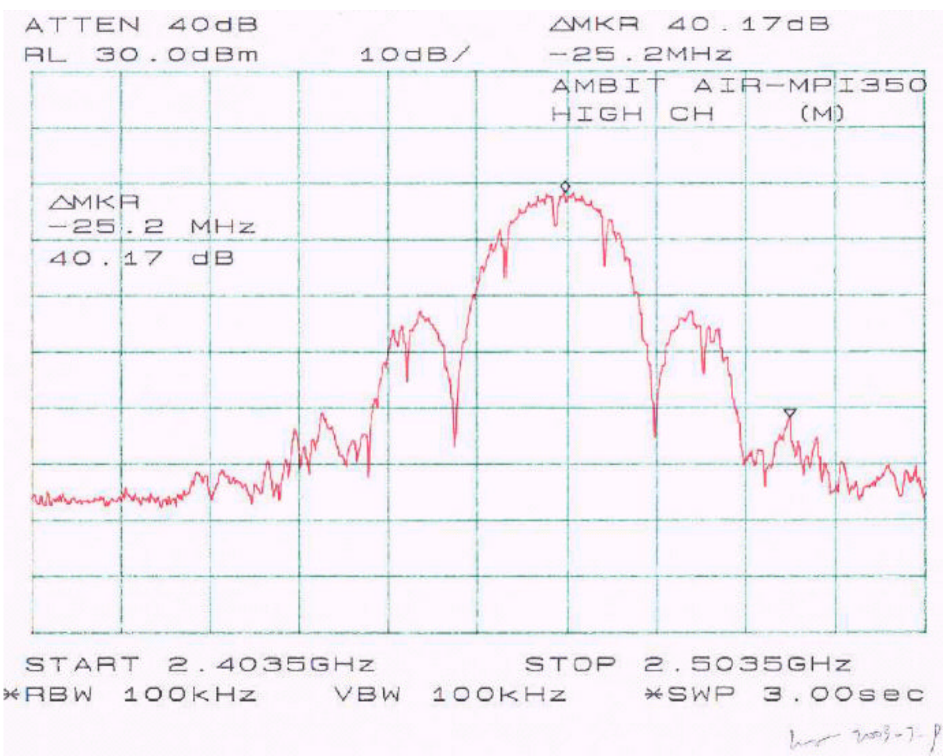
8.3 Test Equipment

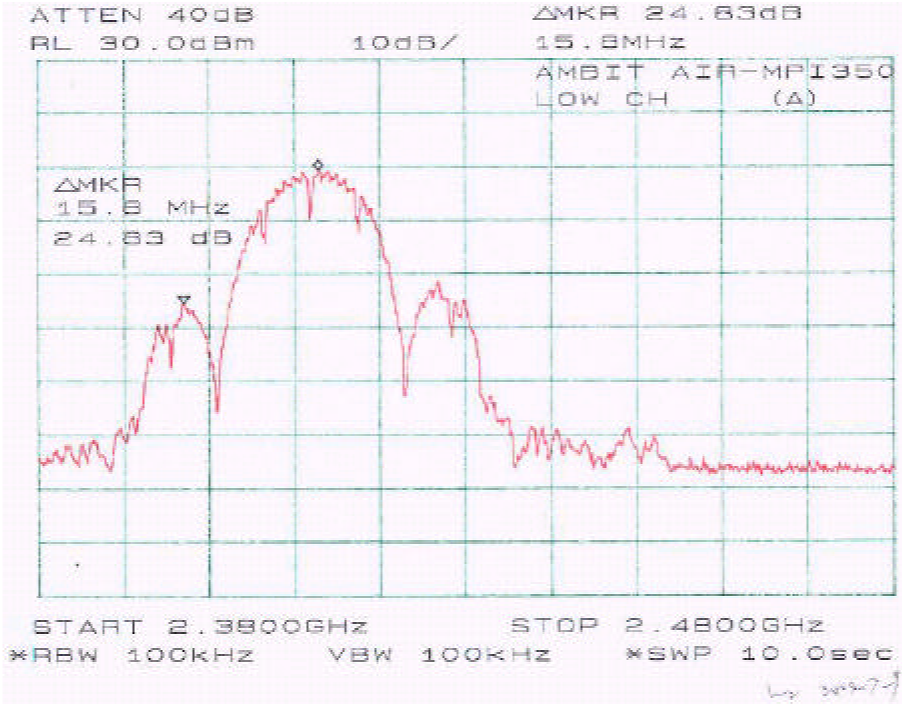
Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

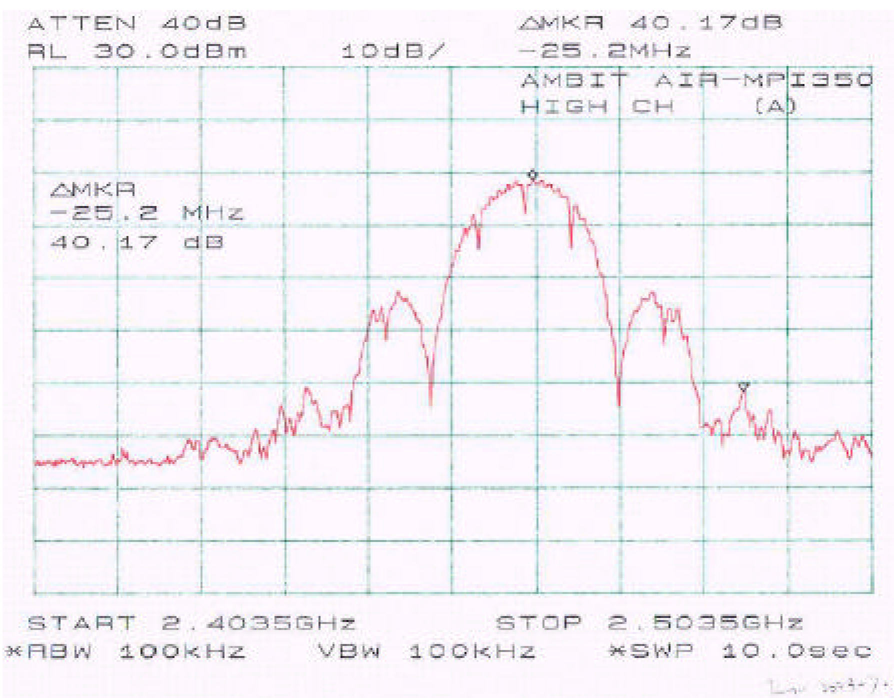
8.4 Measure Results

Please refer to following pages for plots of band edge.


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 24.33dB
15.8MHz
AMBIT AIR-MPI350
LOW CH (M)
ΔMKR
15.8 MHz
24.33 dB
START 2.3800GHz
STOP 2.4800GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 40.17dB
-25.2MHz
AMBIT AIR-MPI350
HIGH CH (M)
ΔMKR
-25.2 MHz
40.17 dB
START 2.4035GHz
STOP 2.5035GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 24.83dB
15.8MHz
AMBIT AIR-MPI350
LOW CH (A)
ΔMKR
15.8 MHz
24.83 dB
START 2.3800GHz
STOP 2.4800GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 40.17dB
-25.2MHz
AMBIT AIR-MPI350
HIGH CH (A)
ΔMKR
-25.2 MHz
40.17 dB
START 2.4035GHz
STOP 2.5035GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

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 gains of the 7 antennas used for transmitting are from –0.87dBi to 5.6 dBi, and the antenna connectors are 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:

D800 NEWEB:

-3.7 dB at **4824.00 MHz** in the **Vertical** polarization, Low Channel

-3.5 dB at **4874.00 MHz** in the **Vertical** polarization, Middle Channel

-3.5 dB at **4924.00 MHz** in the **Vertical** polarization, High Channel

-2.3 dB at **86.50 MHz** in the **Vertical** polarization, Unintentional Emission

D800 Hitachi:

-6.1 dB at **4824.00 MHz** in the **Vertical** polarization, Low Channel

-5.1 dB at **4874.00 MHz** in the **Vertical** polarization, Middle Channel

-4.7 dB at **4924.00 MHz** in the **Vertical** polarization, High Channel

-6.1 dB at **46.00 MHz** in the **Horizontal** polarization, Unintentional Emission

D600 NEWEB:

-7.6 dB at **4824.00 MHz** in the **Vertical** polarization, Low Channel

-3.8 dB at **4874.00 MHz** in the **Vertical** polarization, Middle Channel

-3.4 dB at **7386.00 MHz** in the **Vertical** polarization, High Channel

-2.7 dB at **46.50 MHz** in the **Vertical** polarization, Unintentional Emission

D600 Hitachi:

-3.4 dB at **4824.00 MHz** in the **Vertical** polarization, Low Channel

-8.1 dB at **4874.00 MHz** in the **Vertical** polarization, Middle Channel

-6.6 dB at **4924.00 MHz** in the **Vertical** polarization, High Channel

-4.1 dB at **131.80 MHz** in the **horizontal** polarization, Unintentional Emission

D400 NEWEB:

-2.6 dB at **4824.00 MHz** in the **Horizontal** polarization, Low Channel

-0.9 dB at **4874.00 MHz** in the **Horizontal** polarization, Middle Channel

-3.5 dB at **4924.00 MHz** in the **Horizontal** polarization, High Channel

-4.6 dB at **332.50 MHz** in the **Vertical** polarization, Unintentional Emission

C400 NEWEB:

-6.1 dB at **4824.00 MHz** in the **Horizontal** polarization, Low Channel

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

-8.1 dB at **4924.00 MHz** in the **Horizontal** polarization, High Channel

-2.3 dB at **86.50 MHz** in the **Vertical** polarization, Unintentional Emission

C640 NEWEB:

-9.9 dB at **7236.00 MHz** in the **Horizontal** polarization, Low Channel

-8.8 dB at **7311.00 MHz** in the **Horizontal** polarization, Middle Channel

-9.9 dB at **7386.00 MHz** in the **Horizontal** polarization, High Channel

-9.2 dB at **158.90 MHz** in the **Horizontal** polarization, Unintentional Emission

10.7.1 Test Data, D800 NEWEB, 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	104.6	Fund/Peak	90	1.5	v	28.1	3.4	35.2	100.9		
2412.00	104.1	Fund/Peak	210	1.2	h	28.1	3.4	35.2	100.4		
2412.00	97.5	Fund/Ave	90	1.5	v	28.1	3.4	35.2	93.8		
2412.00	96.7	Fund/Ave	210	1.2	h	28.1	3.4	35.2	93.0		
4824.00	45.9	Ave	280	1.5	h	32.5	4.9	33.0	50.3	54	-3.7
4824.00	44.7	Ave	100	1.3	v	32.5	4.9	33.0	49.1	54	-4.9
7236.00	36.2	Ave	115	1.2	v	35.1	5.6	33.5	43.4	54	-10.6
7236.00	36.0	Ave	185	1.0	h	35.1	5.6	33.5	43.2	54	-10.8
4824.00	52.1	Peak	280	1.5	h	32.5	4.9	33.0	56.5	74	-17.5
4824.00	51.9	Peak	100	1.3	v	32.5	4.9	33.0	56.3	74	-17.7
7236.00	46.2	Peak	115	1.2	v	35.1	5.6	33.5	53.4	74	-20.6
7236.00	45.5	Peak	185	1.0	h	35.1	5.6	33.5	52.7	74	-21.3
Middle Channel											
2437.00	105.3	Fund/Peak	340.00	1.5	v	28.1	3.4	35.2	101.6		
2437.00	104.2	Fund/Peak	290	1.5	h	28.1	3.4	35.2	101.6		
2437.00	98.3	Fund/Ave	340.00	1.5	v	28.1	3.4	35.2	100.5		
2437.00	96.3	Fund/Ave	290	1.5	h	28.1	3.4	35.2	94.6		
4874.00	46.1	Ave	270	1.6	h	32.5	4.9	33.0	50.5	54	-3.5
4874.00	43.2	Ave	110	1.4	v	32.5	4.9	33.0	47.6	54	-6.4
7311.00	36.8	Ave	120	1.0	v	35.1	5.6	33.5	44.1	54	-9.9
7311.00	36.8	Ave	135	1.2	h	35.1	5.6	33.5	44.1	54	-9.9
4874.00	53.4	Peak	270	1.6	h	32.5	4.9	33.0	57.8	74	-16.2
7311.00	48.3	Peak	120	1.0	v	35.1	5.6	33.5	55.6	74	-18.4
4874.00	50.5	Peak	110	1.4	v	32.5	4.9	33.0	54.9	74	-19.1
7311.00	46.5	Peak	135	1.2	h	35.1	5.6	33.5	53.7	74	-20.3
High Channel											
2462.00	104.9	Fund/Peak	270	1.5	v	28.1	3.4	35.2	102.0		
2462.00	105.7	Fund/Peak	210	1.5	h	28.1	3.4	35.2	93.5		
2462.00	97.2	Fund/Ave	270	1.5	v	28.1	3.4	35.2	94.6		
2462.00	98.3	Fund/Ave	210	1.5	h	28.1	3.4	35.2	93.5		
4924.00	46.1	Ave	275	1.5	h	32.5	4.9	33.0	50.5	54	-3.5
4924.00	45.2	Ave	110	1.4	v	32.5	4.9	33.0	49.6	54	-4.4
7386.00	36.8	Ave	135	1.2	h	35.1	5.6	33.5	44.1	54	-9.9
7386.00	36.5	Ave	115	1.0	v	35.1	5.6	33.5	43.7	54	-10.3
4924.00	53.6	Peak	275	1.5	h	32.5	4.9	33.0	58.0	74	-16.0
7386.00	50.5	Peak	135	1.2	h	35.1	5.6	33.5	57.7	74	-16.3
4924.00	52.2	Peak	110	1.4	v	32.5	4.9	33.0	56.6	74	-17.4
7386.00	47.2	Peak	115	1.0	v	35.1	5.6	33.5	54.4	74	-19.6