

TEST REPORT

Report Number: 3108751MPK015-2

Project Number: 3108751

December 21, 2006

Testing performed on the

LE1700 Tablet PC

Model Number: T006

FCC ID: Q3QAWM7519ABG

IC ID: 4587A-A7519ABG

to

FCC Part 15 Subpart C (15.247) for 5 GHz Band Only

FCC Part 15 Subpart E (15.407)

for

Motion Computing Inc.



A2LA Certificate Number: 1755-01

Test Performed by:

Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Test Authorized by:

Motion Computing Inc.
8601 Ranch Road 2222
Austin, TX 78730 USA

Prepared by:

A handwritten signature in blue ink that reads 'Krishna K Vemuri'.

Krishna K Vemuri

Date: December 21, 2006

Reviewed by:

A handwritten signature in blue ink that reads 'David Chernomordik'.

David Chernomordik,
EMC Technical Manager

Date: December 21, 2006

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1.0 Introduction

This report is intended to show of compliance of the LE1700 Tablet PC, model: T006 to the rules of FCC Part 15, Subparts C and E.

As declared by the Applicant, the transmitter module, used in the model T006, is identical to the module which has been certified for Atheros Communications, Inc. (FCC ID: PPD-AR5BXB6-M, Model: WM7519A) except antenna. The antenna used in T006 model has less gain than the antenna in the certified WM7519A model. The output power is also reduced through software to comply with RF exposure requirements.

The following test results, related to antenna conducted measurements, are not expected to be changed with reduced power setting. Therefore, these test results from the original Application are applicable to the model: T006.

TEST	REFERENCE	RESULTS
6 dB Bandwidth	15.247(a)(2)	Complies
Power Density	15.247(d), 15.407(a)	Complies
Peak Excursion	15.407(a)(6)	Complies
Out of Band Antenna Conducted Emission	15.247(c), 15.407(b)	Complies

The following tests are required to ensure compliance of the Model T006:

- Conducted output power
- Radiated Emissions in Restricted Bands
- AC Line Conducted Emission

2.0 Summary of Tests

FCC ID: Q3QAWM7519ABG
IC ID: 4587A-A7519ABG

TEST	REFERENCE	RESULTS
Conducted output power	15.247(b), 15.407(a)	Complies
Radiated Emission in Restricted Bands	15.247(c), 15.209, 15.205	Complies
AC Line Conducted Emission	15.207	Complies

EUT receive date: November 28, 2006

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: November 28, 2006

Test completion date: December 19, 2006

The test results in this report pertain only to the item tested.

3.0 General Description

3.1 Product Description

The model T006 is an LE1700 Tablet PC using windows XP for office and home environment. It provides a wireless interface IEEE 802.11a/b/g operating at 2.4 GHz and 5 GHz bands and one 10/100BASE-T Ethernet interface.

Overview of the Equipment under Test:

Applicant	Motion Computing Inc.
Model No.	T006
Wireless Interface under test	IEEE 802.11a
FCC Identifier/ IC Identifier	FCC ID: Q3QAWM7519ABG IC ID: 4587A-A7519ABG
Use of Product	LE1700 Tablet PC
Manufacturer & FCC ID of Transmitter Module	Atheros Communications, Inc. (FCC ID: PPD-AR5BXB6-M)
Type of Transmission	IEEE 802.11a
Frequency Ranges	5745 – 5825 MHz (FCC Part 15 Subpart C) 5180 – 5320 MHz (FCC Part 15 Subpart E) 5500 – 5700 MHz (FCC Part 15 Subpart E)
Rated RF Output Power *	12 dBm – for 5745 – 5825 MHz (FCC Part 15C) from 15 dBm to 11.5 dBm – for 5180 – 5320 MHz (FCC Part 15E) from 9 dBm to 11.5 dBm – for 5500 – 5700 MHz (FCC Part 15E)
Antenna	Integrated antenna, max gain 1 dBi
Manufacturer Name & Address	Motion Computing Inc. 8601 Ranch Road 2222 Austin, TX 78730 USA

* As declared by the Applicant, actual production units will be calibrated to these power levels. The SAR test and the tests performed in this Test Report were performed with slightly higher power levels. The stated Rated RF Output Power of production units will be set lower than the power used during testing to ensure compliance.

3.2 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

3.3 Test Facility

The test facility is located at 1365 Adams Court, Menlo Park, California, 94025. The test site for radiated emission measurements is 10-m semi-anechoic chamber. This test facility and site measurement data have been fully placed on file with the FCC and is A2LA accredited.

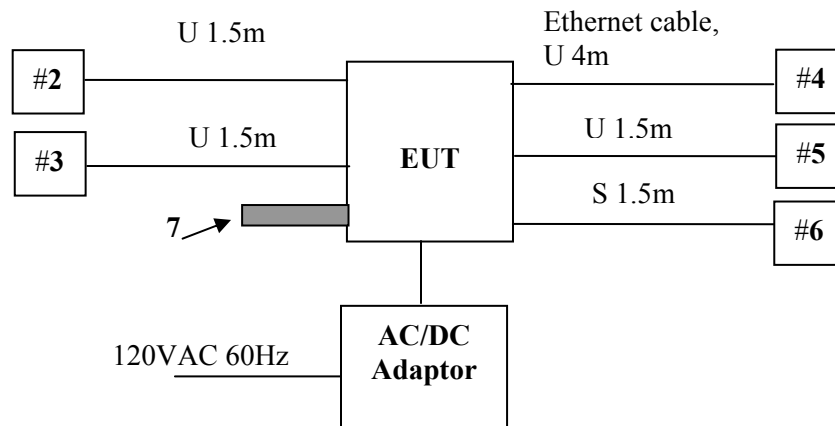
4.0 Test Configuration

4.1 Support Equipment

Item #	Description	Model No.	Serial No.
1	Dual Wireless A+G Broadband Router	WRT55AG	MDJ106700080
2	Speakers	SP-12	Not Labeled
3	RCA Headphones	---	---
4	Netgear 5 port 10/100/1000 Mbs Gigabit switch	GS605	GS19147DB002667
5	Motion Computing DVD+/- RW Drive	EDW085	CN-042020006-00381-69E-00A8
6	Philips Monitor	107S11/74	32131535
7	USB Flash Drive	---	Not Labeled

4.2 Block Diagram of Test Setup

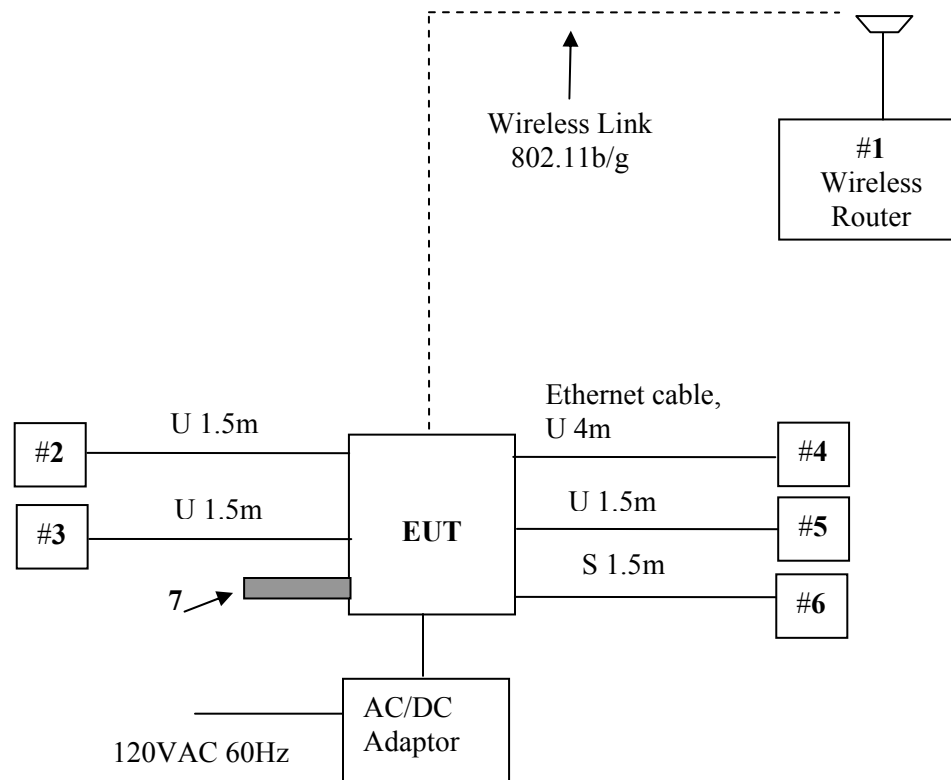
For Radiated Measurements:



AC/DC Adaptor: Delta Electronics, ADP-50HH Rev. B, SI no. KOW0641001371

S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters

For AC Line-conducted Measurements:



AC/DC Adaptor: Delta Electronics, ADP-50HH Rev. B, Sl no. KOW0641001371

S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters

4.3 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

4.4 Software Exercise Program

A test signal with different modulations was generated by the test mode software (Atheros Communications ART software).

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4.5 Mode of Operation During Test

For the transmitter testing, the EUT was setup in the test mode to transmit continuously a modulated signal at lowest, middle and highest channels (frequencies). The worst case settings as per Atheros Communications were used for the tests: data rate of 6 Mbps.

For AC line-conducted measurement, a wireless link was established to a Linksys AG Access Point in 802.11a wireless interface and streaming the video over wireless link. The video & I/O ports functionality was tested using proprietary EMI exerciser software.

4.6 Modifications Required for Compliance

Intertek installed no modifications during compliance testing in order to bring the product into compliance (Please note that this does not include changes made specifically by Motion Computing Inc. prior to compliance testing)

4.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusions from the standard were made.

5.0 Measurement Results

5.1 Conducted output power

Procedure

For conducted power measurement for FCC Part 15C testing, the procedure “**Measurement of Digital Transmission Systems Operating under Section 15.247**” is used. In particular – the **Power Output Option 2, Method #1**, - spectral trace averaging and sum the power across the 26-dB bandwidth of the signal.

For conducted power measurement for FCC Part 15E testing, the procedure described in the **Public Notice DA 02-2138** is used. In particular – the **Method #1**, - spectral trace averaging and sum the power across the 26-dB bandwidth of the signal.

The 26-dB bandwidth was measured and recorded as 21 MHz – in 802.11a mode. Then the average power was measured by using a spectrum analyzer build-in facility for “channel power” measurement.

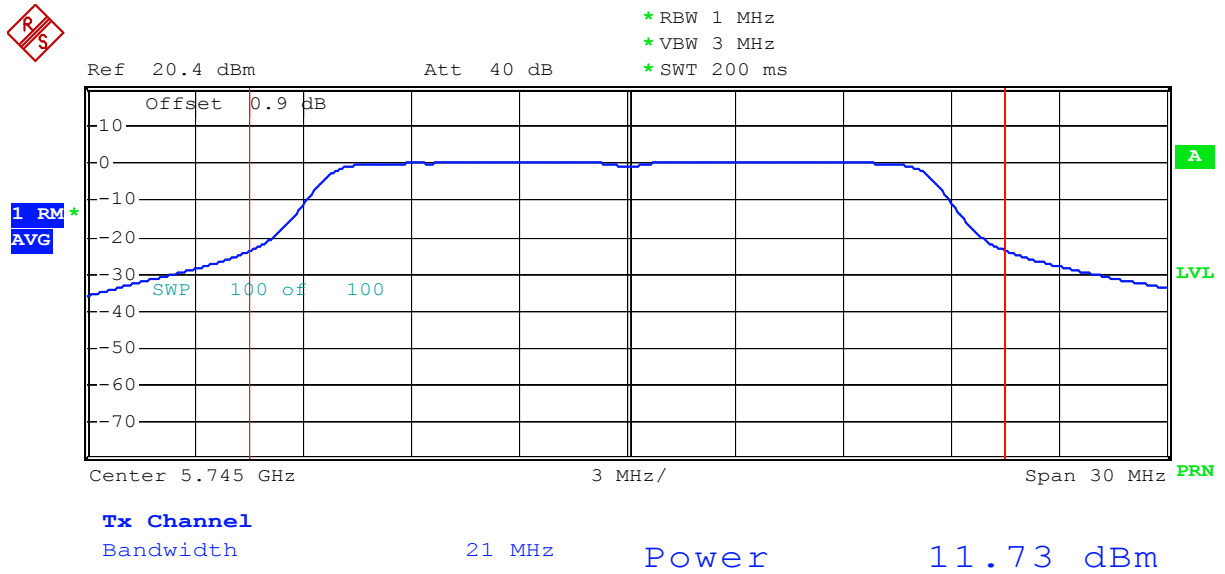
Note: The measured conducted output power levels are the same (+/-0.5 dB) as the levels measured during SAR testing. As declared by the Applicant, actual production units will be calibrated to the stated Rated RF Output Power listed in section 3.1 of this test report. The testing was performed with slightly higher power levels. The stated Rated RF Output Power of production units will be set lower than the power used during testing to ensure compliance.

Test Result

The results are presented on the following plots 1.1 – 1.9 and summarized in the table below.

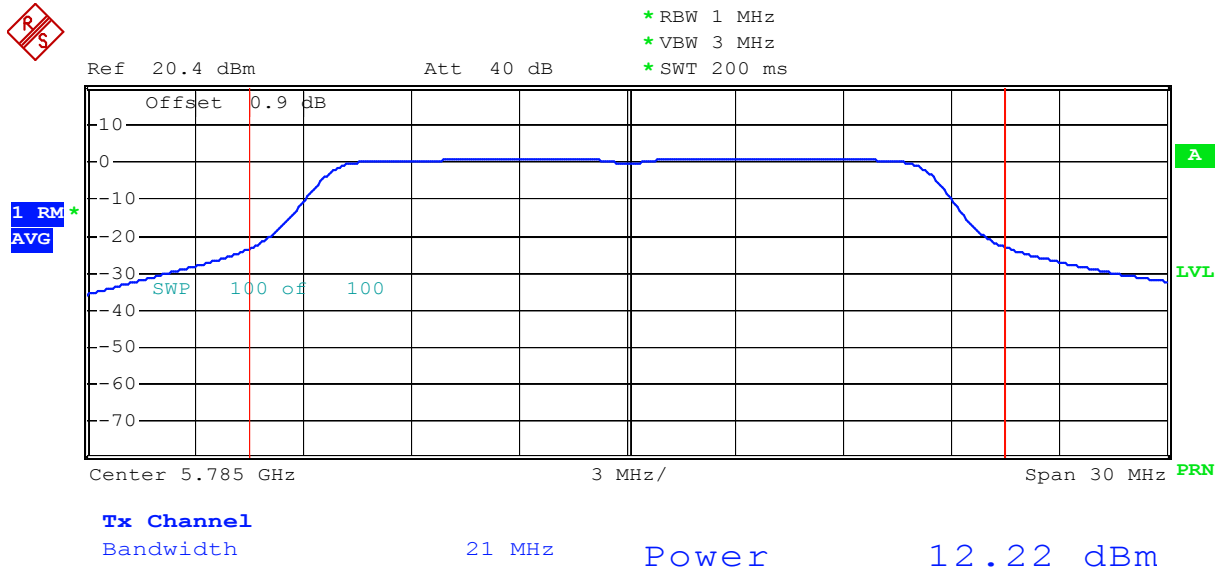
FCC Rule	Frequency MHz	Standard	Data rate Mbps	Conducted power (average) dBm	Conducted power Limit dBm	Margin dB	Plot
Part 15C	5745	802.11a	6	11.7	30.0	-18.3	1.1
Part 15C	5785	802.11a	6	12.2	30.0	-17.8	1.2
Part 15C	5825	802.11a	6	11.9	30.0	-18.1	1.3
Part 15E	5180	802.11a	6	15.1	17.0	-1.9	1.4
Part 15E	5260	802.11a	6	14.3	24.0	-9.3	1.5
Part 15E	5320	802.11a	6	12.8	24.0	-11.2	1.6
Part 15E	5500	802.11a	6	11.3	24.0	-12.7	1.7
Part 15E	5600	802.11a	6	12.8	24.0	-11.2	1.8
Part 15E	5700	802.11a	6	12.4	24.0	-11.6	1.9

Plot 1.1



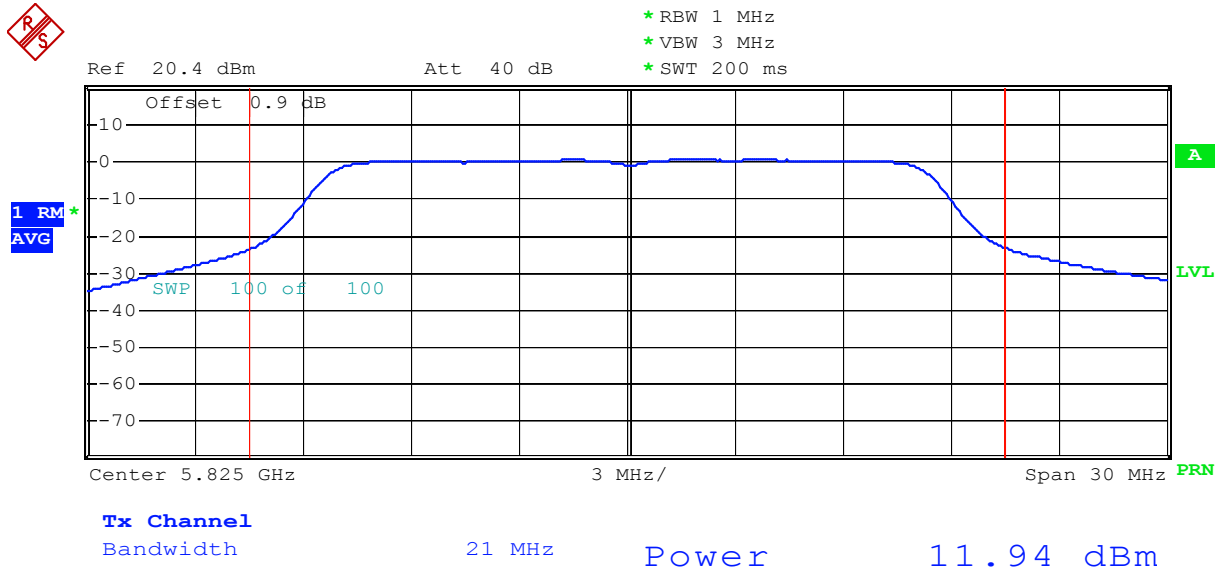
Comment: Power, 5745 MHz, 802.11a, 6 Mbps
Date: 10.JAN.2007 15:59:37

Plot 1.2



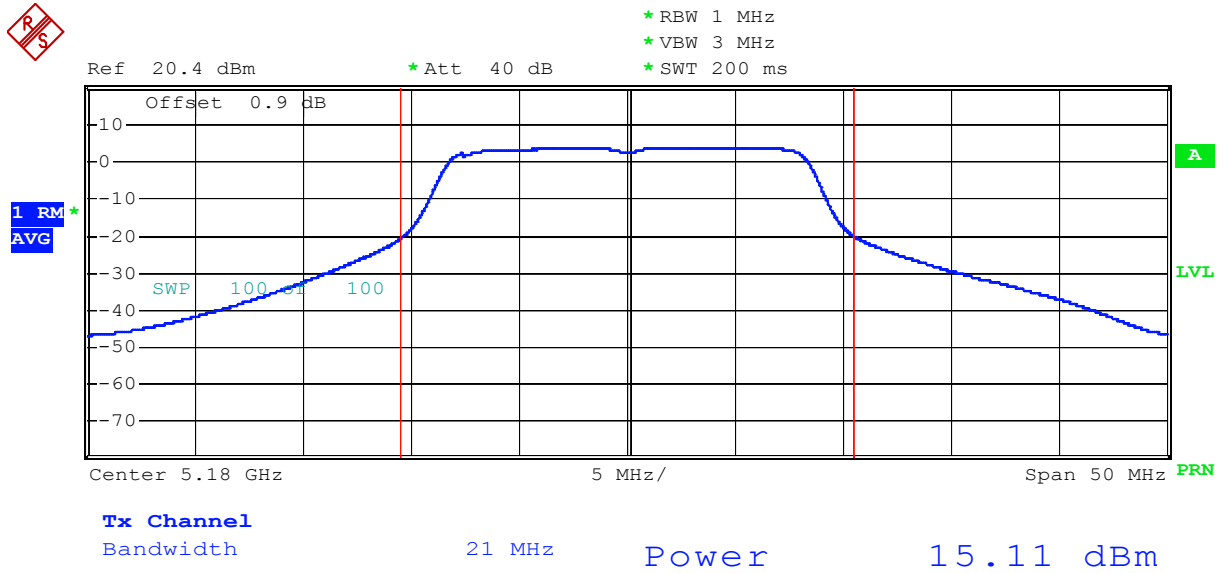
Comment: Power, 5785 MHz, 802.11a, 6 Mbps
Date: 10.JAN.2007 15:56:43

Plot 1.3



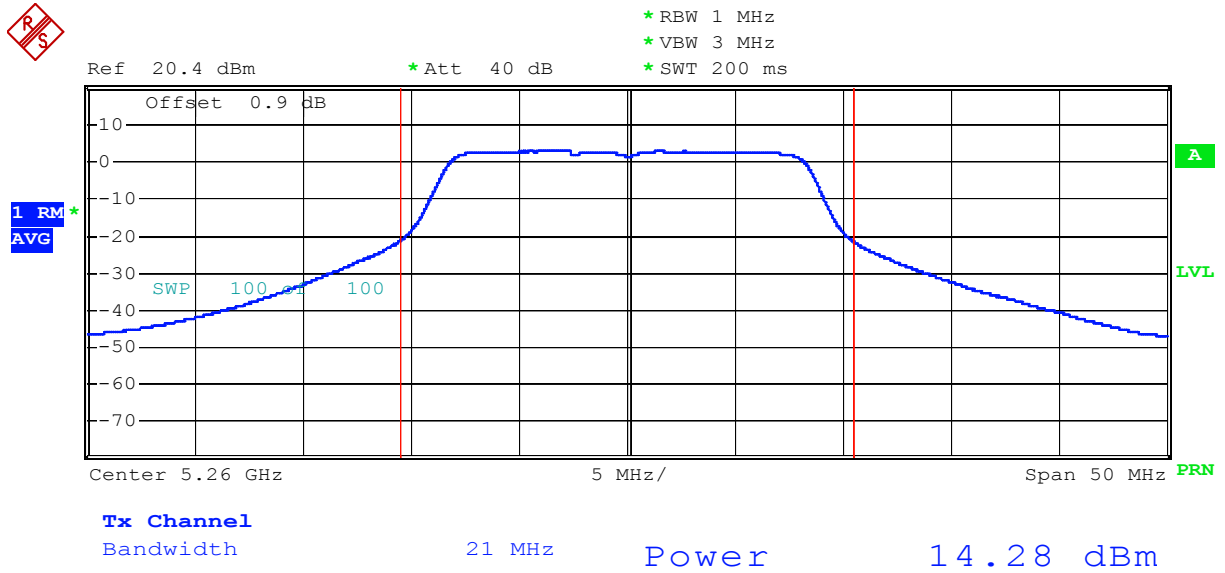
Comment: Power, 5825 MHz, 802.11a, 6 Mbps
Date: 10.JAN.2007 15:55:37

Plot 1.4



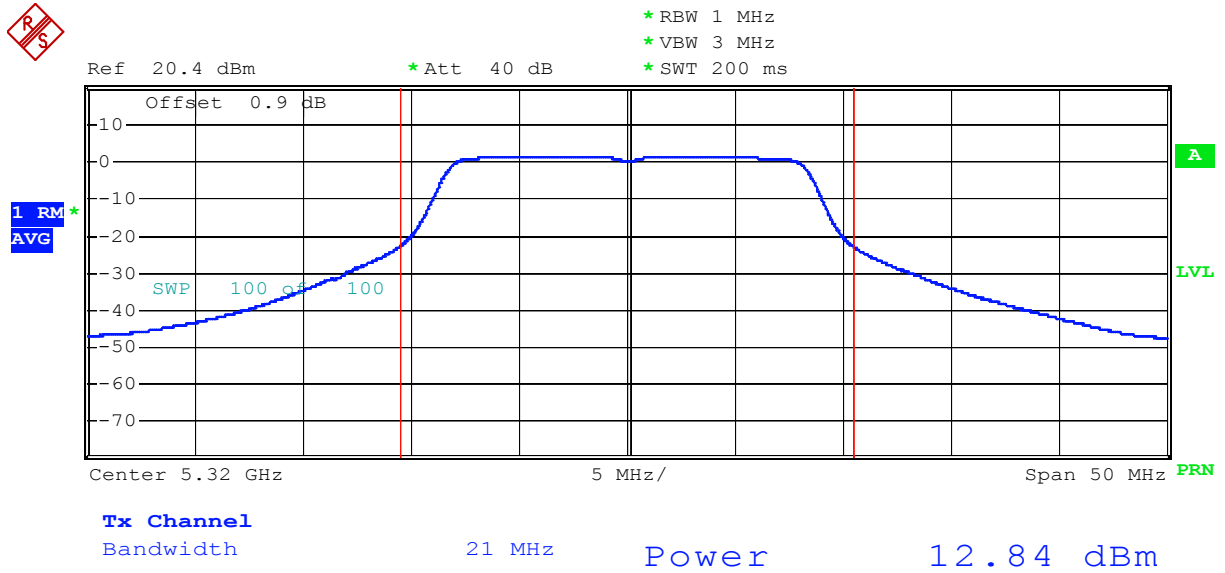
Comment: Power, 5180 MHz, 802.11a, 6 Mbps
 Date: 15.JAN.2007 14:07:18

Plot 1.5



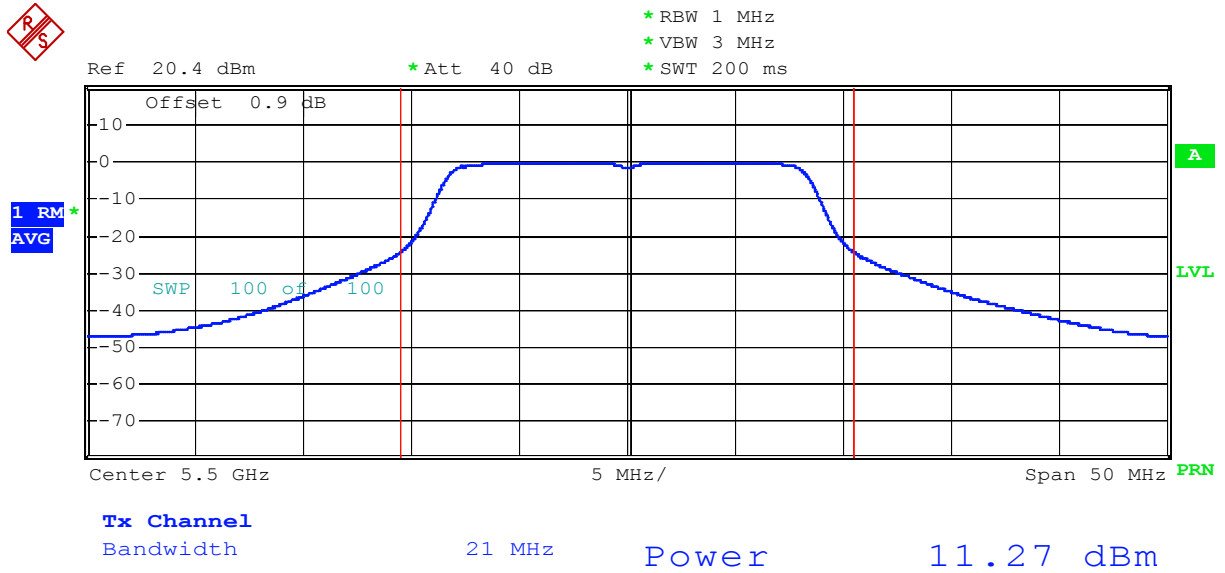
Comment: Power, 5260 MHz, 802.11a, 6 Mbps
 Date: 15.JAN.2007 14:03:43

Plot 1.6



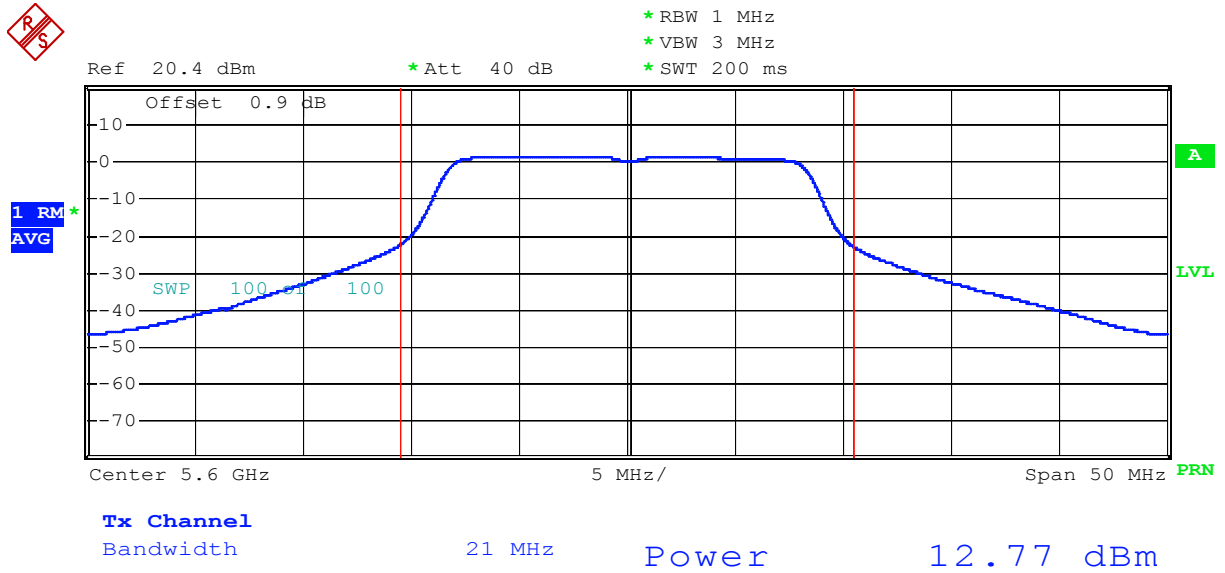
Comment: Power, 5320 MHz, 802.11a, 6 Mbps
 Date: 15.JAN.2007 14:09:59

Plot 1.7



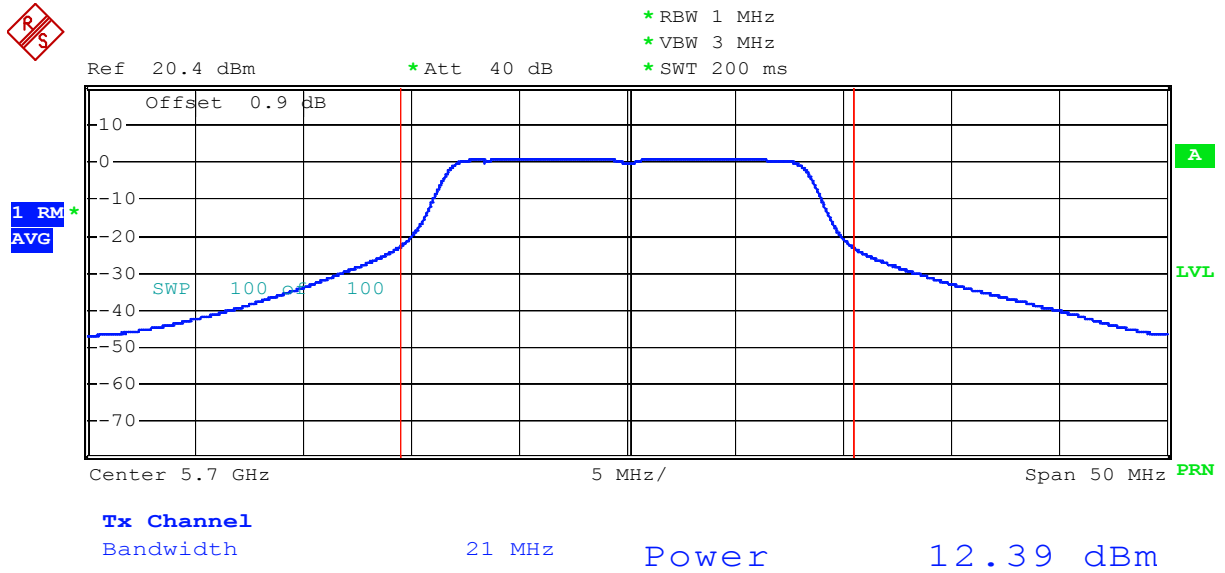
Comment: Power, 5500 MHz, 802.11a, 6 Mbps
 Date: 15.JAN.2007 14:00:44

Plot 1.8



Comment: Power, 5600 MHz, 802.11a, 6 Mbps
 Date: 15.JAN.2007 13:56:45

Plot 1.9



Comment: Power, 5700 MHz, 802.11a, 6 Mbps
 Date: 15.JAN.2007 13:53:36

5.2 Transmitter Radiated Emissions in Restricted Bands FCC Rule 15.247(c), 15.209, 15.205

Procedure

Radiated emission measurements were performed from 30 MHz to 40 GHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on a non-conductive table. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions.

The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels).

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB(μ V); AF = Antenna Factor in dB(1/m)

CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μ V) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μ V/m). This value in dB(μ V/m) was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(1/\text{m})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 52.0 + 7.4 + 1.6 - 29.0 = 32 \text{ dB}(\mu\text{V}/\text{m})$$

$$\text{Level in } \mu\text{V}/\text{m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V}/\text{m})/20] = 39.8 \mu\text{V}/\text{m}$$

Test Result

The data on the following pages lists the significant emission frequencies, the limit and the margin of compliance for the worst-case configuration.

The EUT passed the test by 12.7 dB.

Temperature: 20.0 C	Company: Motion Computing Inc.
Humidity: 51.0 %	Model: T006
Date: December 19, 2006	

Frequency	Polarity	Detector	SA reading	AG**	Ant factor	Field Strength	Limit	Margin
MHz			dB (uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB
Lowest Ch: 5745 MHz								
11490	V	Pk	39.4	26.0	39.4	52.8	74.0	-21.2
11490	V	Av	25.3	26.0	39.4	38.7	54.0	-15.3
22980*	V	Pk	45.1	38.4	40.4	47.1	74.0	-26.9
22980*	V	Av	31.8	38.4	40.4	33.8	54.0	-20.2
Middle Ch: 5785 MHz								
11570	V	Pk	40.6	26.0	39.4	54.0	74.0	-20.0
11570	V	Av	26.3	26.0	39.4	39.7	54.0	-14.3
Highest Ch: 5825 MHz								
11650	V	Pk	42.3	26.0	39.4	55.7	74.0	-18.3
11650	V	Av	27.9	26.0	39.4	41.3	54.0	-12.7

Frequency	Polarity	Detector	SA reading	Cable Factor	Ant factor	Field Strength	Limit	Margin
MHz			dB (uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB
1066.0	V	Pk	27.4	1.9	24.6	53.9	74.0	-20.1
1066.0	V	Av	13.7	1.9	24.6	40.2	54.0	-13.8

*Noise floor

**AG – Amplifier Gain includes Cable Attenuation Factor.

All other emissions not reported are at least 6 dB below the limit.

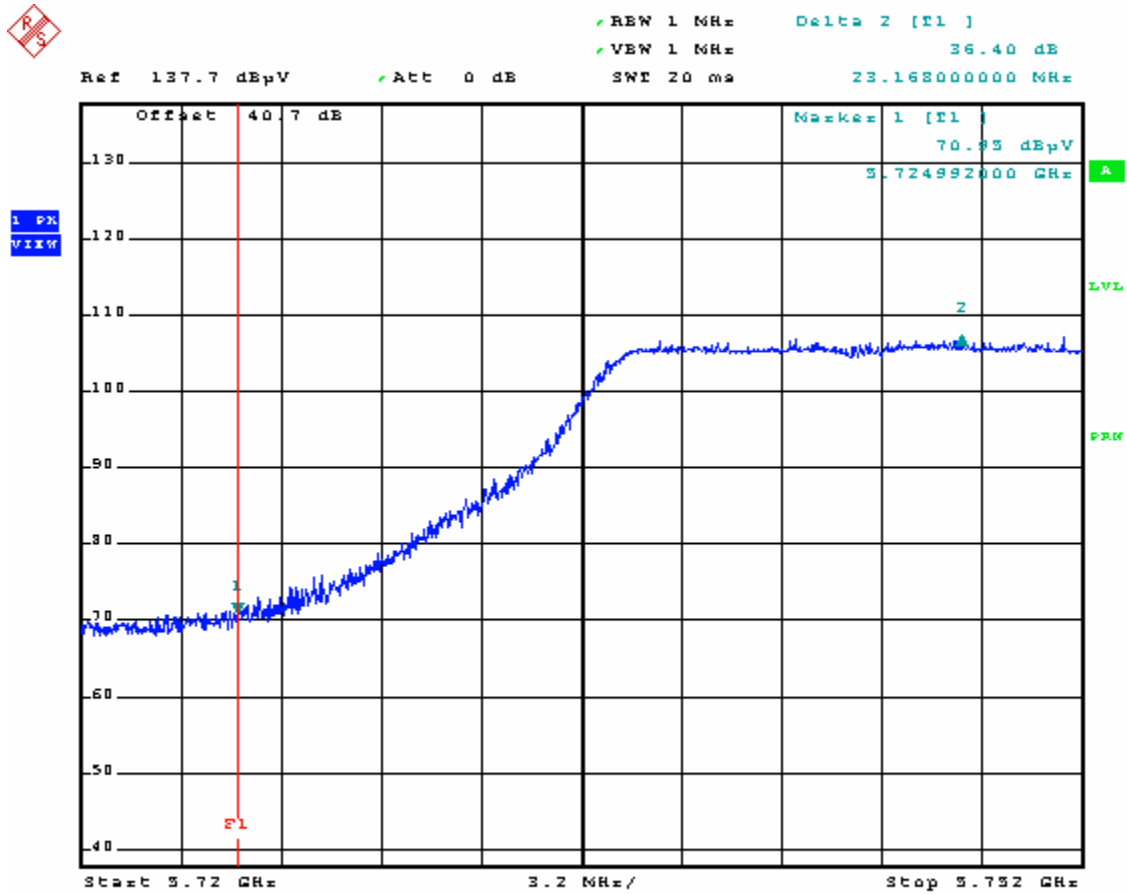
Radiated Emission at the band-edge frequencies
(measured using radiated method)

Band-edge frequency	Delta FS, dB (Compared to fundamental)	Delta FS Limit dB	Margin, dB	Plot
5725.0 MHz	36.4	30	-6.4	2.1
5850.0 MHz	36.4	30	-6.4	2.2

Note:

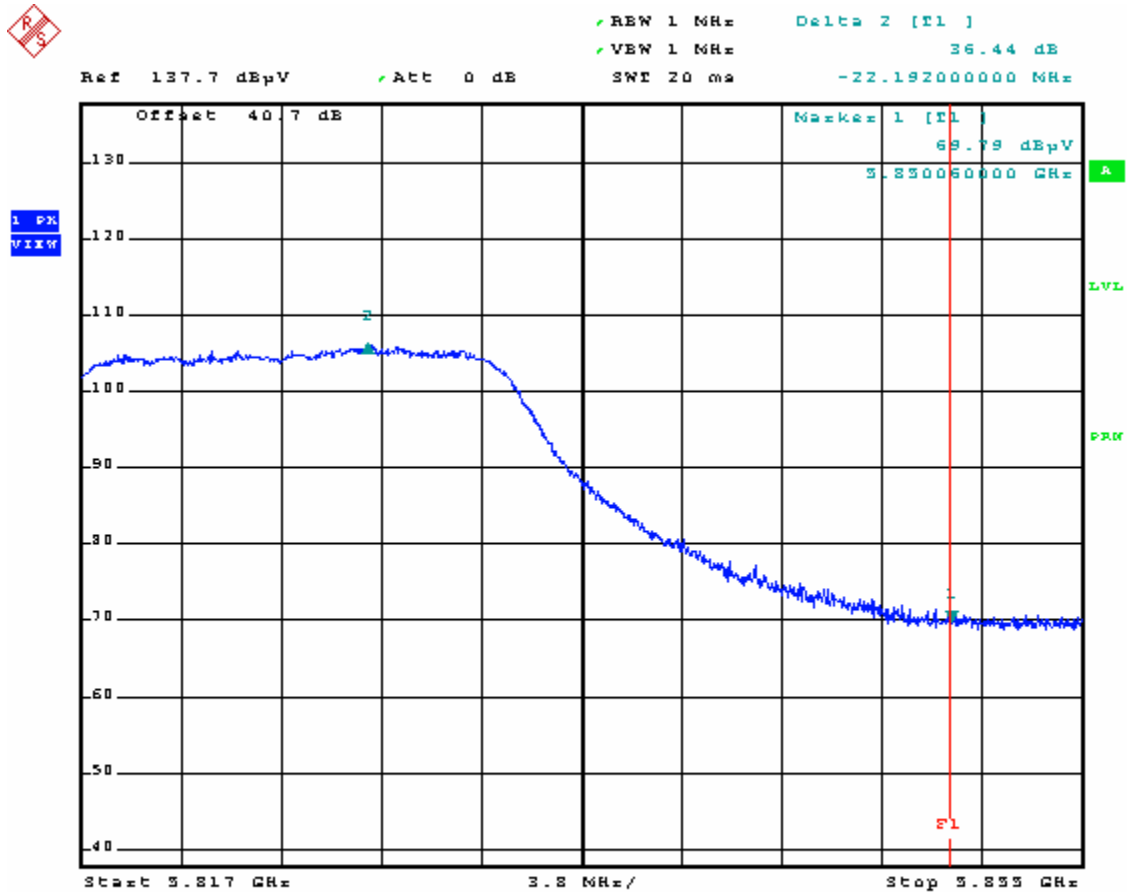
1. The antenna factor and cable loss are included in the spectrum analyzer OFFSET. Therefore “Marker 1” Reading is the peak value of the Field Strength at 5725 MHz and 5858 MHz.

Plot 2.1



Comment: Band Edge, Lowest channel, 5745 MHz
Date: 19.DEC.2006 13:13:22

Plot 2.2



Comment: Band Edge, Highest channel, 5825 MHz
Date: 19.DEC.2006 13:43:04

Configuration photographs



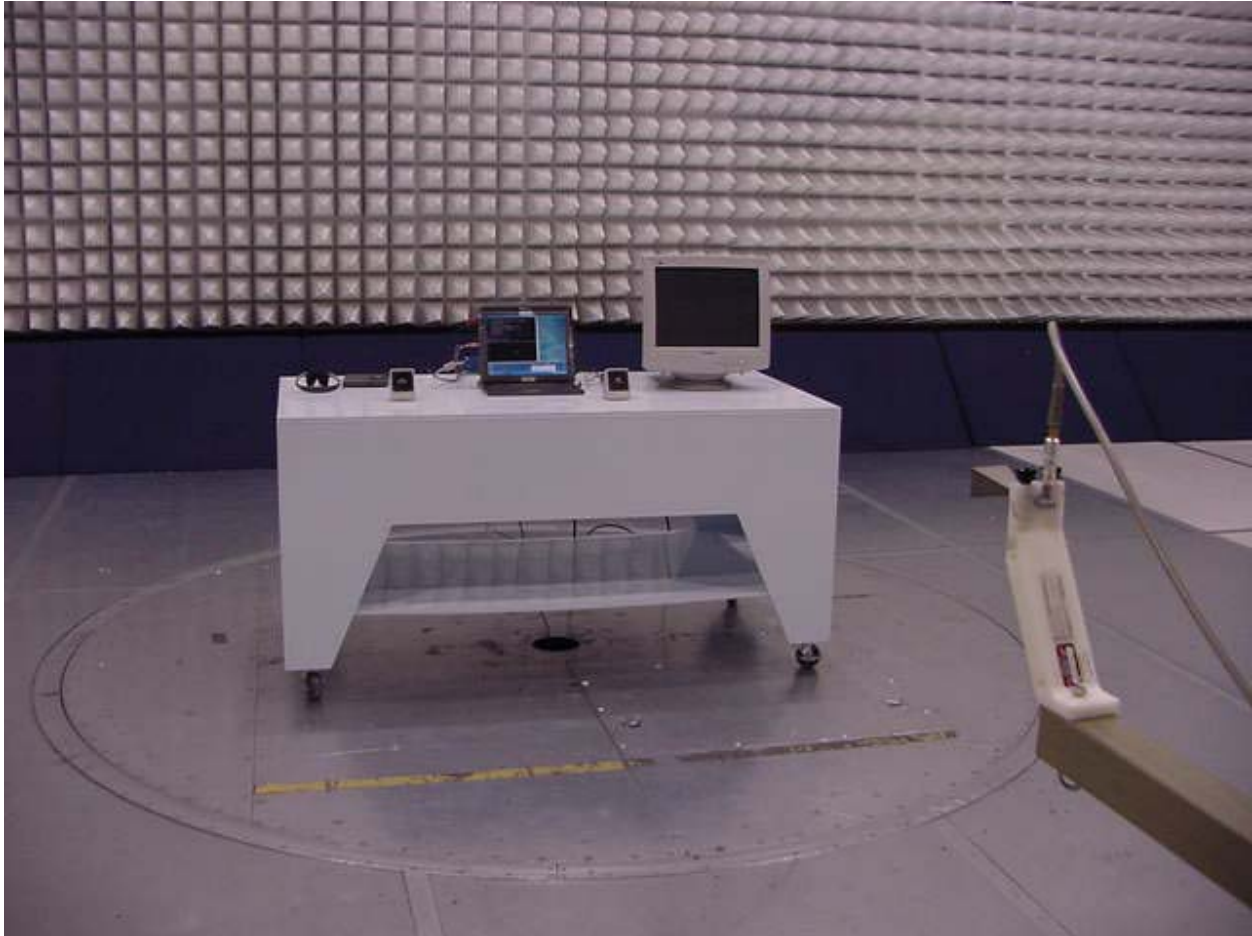
Configuration photographs-Continued



Configuration photographs-Continued



Configuration photographs-Continued



Configuration photographs-Continued



5.3 AC Line Conducted Emission
FCC Rule 15.207:

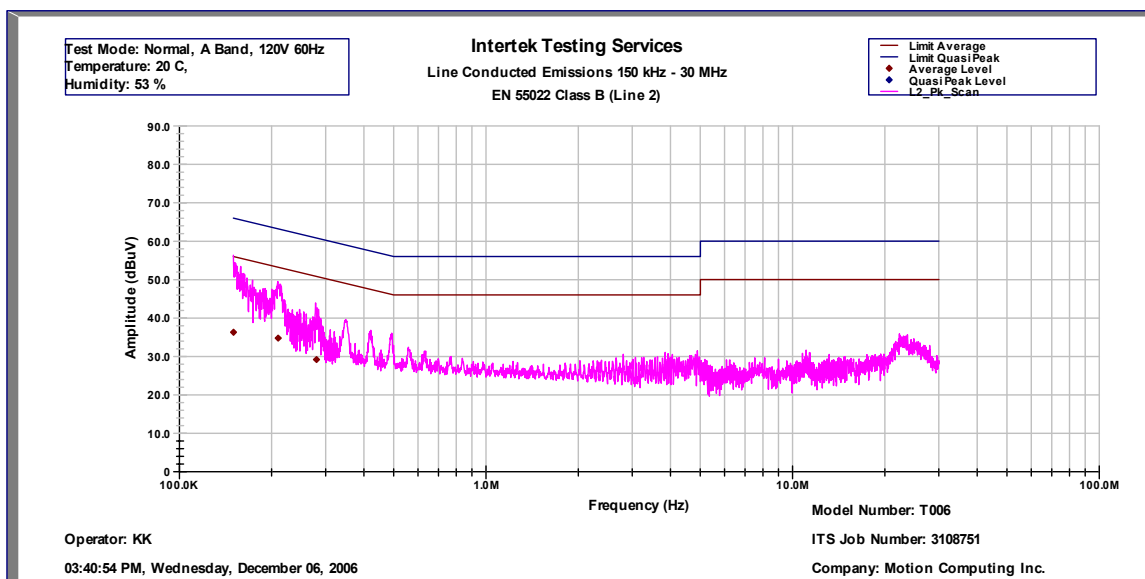
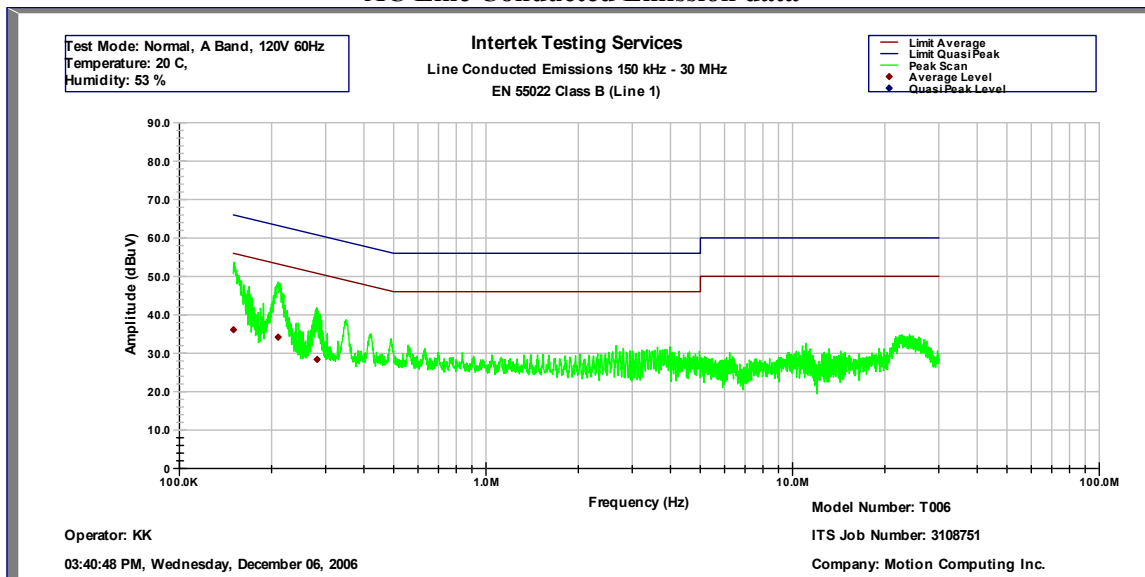
Procedure

AC line conducted emission test was performed according the ANSI C63.4 (2003) standard. The EUT was connected to the AC Line through the LISN.

Test Result

For the test result, see the following pages.
The EUT passed by 9.9dB.

AC Line Conducted Emission data



AC Line Conducted Emission data

Intertek Testing Services							
Line Conducted Emissions 150 kHz - 30 MHz							
FCC Part 15B/EN 55022 Class B (Line 1)							
Operator: KK					Model Number: T006		
					ITS Job Number: 3108751		
03:40:48 PM, Wednesday, December 06, 2006					Company: Motion Computing Inc.		
Frequency	Pk Level	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
MHz	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
0.1502	53.7	36.1	-	56.0	66.0	-19.9	-12.3
0.2100	48.6	34.2	-	54.3	64.3	-20.1	-15.7
0.2813	41.8	28.4	-	52.2	62.2	-23.8	-20.4

Test Mode: Normal, 802.11a mode, 120V 60Hz

Temperature: 20 C,

Humidity: 53 %

Intertek Testing Services							
Line Conducted Emissions 150 kHz - 30 MHz							
FCC Part 15B/EN 55022 Class B (Line 2)							
Operator: KK					Model Number: T006		
					ITS Job Number: 3108751		
03:40:54 PM, Wednesday, December 06, 2006					Company: Motion Computing Inc.		
Frequency	Pk Level	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
MHz	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
0.1502	56.1	36.3	-	56.0	66.0	-19.7	-9.9
0.2100	49.4	34.8	-	54.3	64.3	-19.5	-14.9
0.2800	43.0	29.2	-	52.3	62.3	-23.1	-19.3

Test Mode: Normal, 802.11a mode, 120V 60Hz

Temperature: 20 C,

Humidity: 53 %

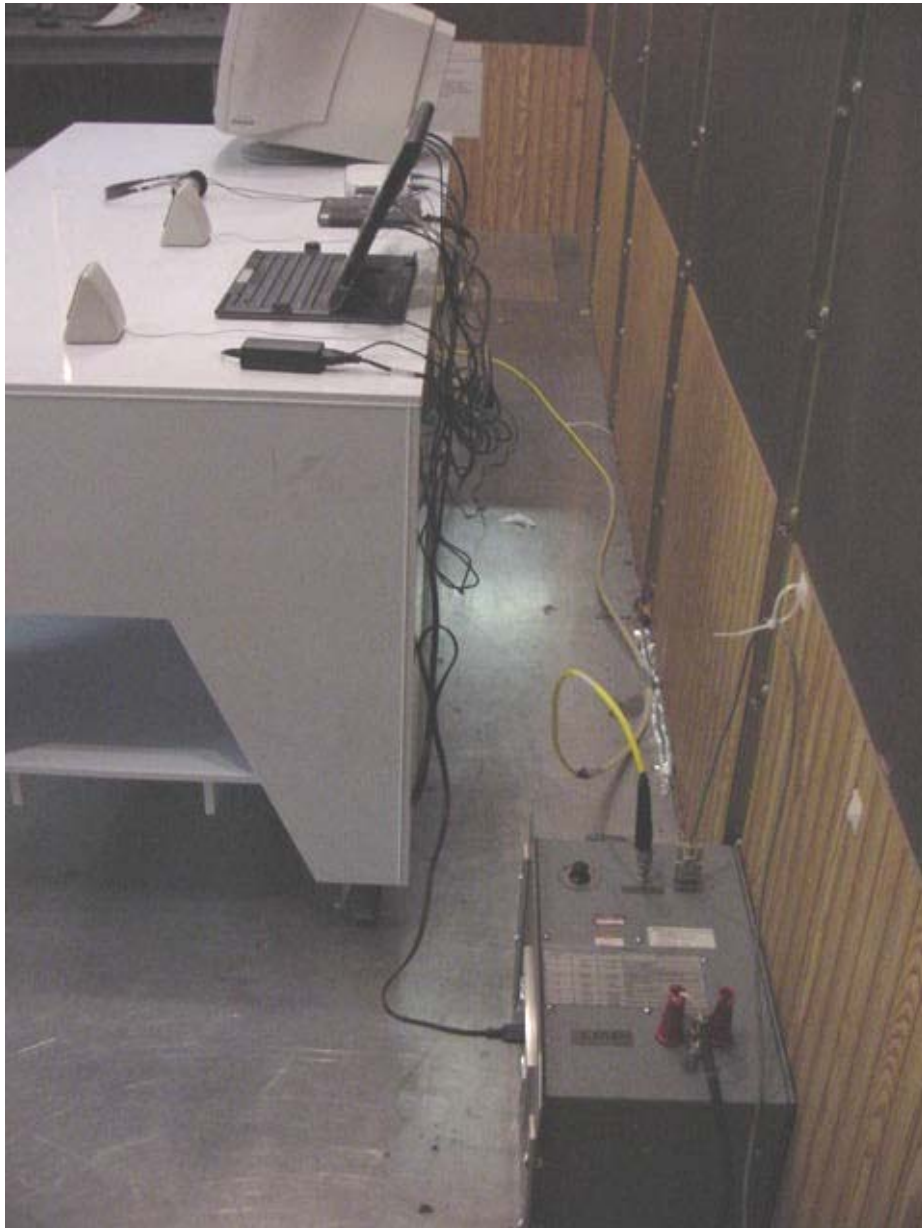
Configuration photograph



Configuration photographs-Continued



Configuration photographs-Continued



6.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. INTERVAL	CAL. DUE
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	9/11/07
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	9/11/07
Spectrum Analyzer	R & S	FSP40	036612004	12	7/12/07
BI-Log Antenna	ARA Inc.	1154	LPB-2513/A	12	8/29/07
Horn Antenna	EMCO	3115	9170-3712	12	7/26/07
Horn Antenna	EMCO	3160-09	9307-1017	#	#
Pre-Amplifier	Sonoma Inst.	310	185634	12	2/20/07
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	4/03/07
Pre-amplifier	CTT	ACO/400-8023	47526	#	#
Pre-Amplifier	Miteq	JS4-18004000	914867	#	#
High Pass Filter	RLC Elec	F-40-10.0-R	0623	#	#
LISN	FCC	FCC-LISN-50-50-M-H	2012	12	7/19/07
Spectrum Analyzer	Hewlett Packard	8591EM	3801A01250	12	9/13/07

Calibration performed by ITS prior to the test

7.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3108751	KK	December 21, 2006	Original document