

*FCC PART 15, SUBPART B and C
TEST REPORT**for***MINILINK WIRELESS
ETHERNET SYSTEM****MODEL: MINILINK 5.8WES**

Prepared for

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DATE: JUNE 3, 2005

	REPORT BODY	APPENDICES					TOTAL
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	
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LIST OF FIGURES

FIGURE	TITLE
1	Conducted Emissions Test Setup
2	Plot Map and Layout of 3 Meter Radiated Site
3	Plot Map and Layout of 10 Meter Radiated Site

GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST, or any other agency of the U.S. Government.

Device Tested: Minilink Wireless Ethernet System
Model: Minilink 5.8WES
S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was not modified during the testing.

Manufacturer: Microtek Electronics, Inc.
25691 Atlantic Ocean Drive, Suite B3
Lake Forest, California 92630

Test Dates: March 28, 29, 30, 31; April 1; and June 3, 2005

Test Specifications: EMI requirements
Limits: **Class A** and **Class B** of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247

Test Procedure: ANSI C63.4: 2003

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz – 30 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.207
2	Spurious Radiated RF Emissions from the Digital Portion, 30 MHz – 1000 MHz	Complies with the Class A limits of CFR Title 47, Part 15, Subpart B
3	Spurious Radiated RF Emissions from the Transmitter and Receiver Portions, 10 kHz – 1000 MHz and 1000 MHz – 40000 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, section 15.247(d)
4	Fundamental and Emissions produced by the intentional radiator in non-restricted bands, 10 kHz – 40 GHz	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(d)
5	Emissions produced by the intentional radiator in restricted bands, 10 kHz – 40 GHz	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209(a), and section 15.247 (d)
6	6 dB Bandwidth	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(a)(2)
7	Peak Power Output	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(b)(3)
8	RF Conducted Antenna Test	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(d)
9	Peak Power Spectral Density Conducted from the Intentional Radiator to the Antenna Port	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247 (e)

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Minilink Wireless Ethernet System Model: Minilink 5.8WES. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2003. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class B** limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247.

The digital portion from 30 MHz to 1000 MHz was within the **Class A** limits of CFR Title 47, Part 15, Subpart B.

Note: The 5725 MHz to 5850 MHz band is applicable to this report; the other band of operation (5250 MHz to 5350 MHz) is documented in the Compatible Electronics, Inc. report number **B50401D2**.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests of the testing described herein were performed at the test facility of Compatible Electronics at the following location:

114 Olinda Drive, Brea, California 92823

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Microtek Electronics, Inc.

Michael Henkoski President

Compatible Electronics, Inc.

Benigno Chavez Test Technician

Kyle Fujimoto Test Engineer

Michael Christensen Lab Manager

2.4 Date Test Sample was Received

The test sample was received on March 28, 2005.

2.5 Disposition of the Test Sample

The sample has not been returned to Microtek Electronics, Inc. as of April 5, 2005.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
CFR	Code of Federal Regulations

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart C	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.4 2003	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
FCC Title 47, Part 15 Subpart B	FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The Minilink Wireless Ethernet System Model: Minilink 5.8WES (EUT) was connected to a power injector via its ethernet port. The power injector was also connected to a laptop and AC Adapter via its ethernet and power ports, respectively. The EUT was continuously transmitting and receiving via a wireless link to another computer located 50 feet away from the test site.

The computer located 50 feet away from the test site was connected to a power injector, keyboard, monitor and mouse via its ethernet, keyboard, video, and mouse ports, respectively. The power injector was also connected to an accessory Minilink Wireless Ethernet System and AC Adapter via its ethernet and power ports, respectively.

The low, middle, and high channels were investigated in normal mode. Both channels were investigated for turbo mode.

Three antennas were tested. A small antenna, a patch antenna, and a dish antenna.

The readings from 30 MHz to 1000 MHz coming from the digital portion were verified by turning off the transmitter and investigating to see that the emission coming from the digital portion did not decrease in amplitude.

The different antennas are considered integral as the antennas are part of the unit. The antenna that comes with the system is dependent on what the customer specifies the range he or she wants (i.e. 2500 feet, 2 to 4 miles, or 30 miles).

The final radiated as well as the conducted data was taken in the mode above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

- Cable 1** This is a 2 meter unshielded cable connecting the EUT to Power Injector #1. The cable has an RJ-45 connector at each end. .
- Cable 2** This is a 50 foot unshielded cable connecting Power Injector #1 to the laptop. The cable has an RJ-45 connector at each end.
- Cable 3** This is a 6 foot unshielded cable connecting Power Injector #1 to the AC Adapter. The cable has a 5.5 mm power connector at the laptop end and is hard wired into the AC Adapter.
- Cable 4** This is a 2 meter unshielded cable connecting the accessory Minilink Wireless Ethernet System to Power Injector #2. The cable has an RJ-45 connector at each end.
- Cable 5** This is a 2 meter unshielded cable connecting Power Injector #2 to the computer. The cable has an RJ-45 connector at each end..
- Cable 6** This is a 6 foot unshielded cable connecting Power Injector #2 to the AC Adapter. The cable has a 5.5 mm power connector at the laptop end and is hard wired into the AC Adapter.
- Cable 7** This is a 4 foot foil shielded cable connecting the keyboard to the computer. The cable has a metallic 6 pin Mini DIN connector at the computer end and is hard wired into the keyboard. The shield of the cable was grounded to the chassis via the connector.
- Cable 8** This is a 6 foot foil shielded cable connecting the mouse to the computer. The cable has a metallic 6 pin Mini DIN connector at the computer end and is hard wired into the mouse. The shield of the cable was grounded to the chassis via the connector.
- Cable 9** This is a 2 meter braid and foil shielded cable connecting the computer to the monitor. The cable has a high density D-15 pin metallic connector at the computer end and is hard wired into the monitor. The shield of the cable was grounded to the chassis via the connector.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
MINILINK WIRELESS ETHERNET SYSTEM (EUT)	MICROTEK ELECTRONICS, INC.	MINILINK 5.8WES	N/A	JRRWES
POWER INJECTOR #1	MICROTEK ELECTRONICS, INC.	MINILINK 5.8WES	N/A	N/A
POWER INJECTOR #2	MICROTEK ELECTRONICS, INC.	MINILINK 5.8WES	N/A	N/A
AC ADAPTER #1 FOR POWER INJECTOR	CONDOR	P/N: D12500	N/A	N/A
AC ADAPTER #2 FOR POWER INJECTOR	CONDOR	P/N: D12500	N/A	N/A
LAPTOP	N/A	A535	94F27W0003Q4 3500407	DoC
COMPUTER	GATEWAY	GP6-350	0010682602	DoC
MONITOR	COMPAQ	610	CM1300	A3KM062
KEYBOARD	DELL	SK-1000RE	M9502099932	GUR10SK
MOUSE	LOGITECH	M-CW47	LZC02051352	DZL211108
ACCESSORY MINILINK WIRELESS ETHERNET SYSTEM	MICROTEK ELECTRONICS, INC.	MINILINK 5.8WES	N/A	JRRWES
SINGLE PATCH (Small) ANTENNA	MICROTEK ELECTRONICS, INC.	N/A	N/A	N/A
PLANAR PATCH (6' x 6') ANTENNA	MICROTEK ELECTRONICS, INC.	N/A	N/A	N/A
DISH ANTENNA	MICROTEK ELECTRONICS, INC.	N/A	N/A	N/A

5.2 EMI Test Equipment for Brea Facility – Part 1

EQUIPMENT TYPE	MANU- FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Radiated Emissions Manual Test – Radiated	Compatible Electronics	N/A	N/A	N/A	N/A
Conducted Emissions Test Program	Compatible Electronics	N/A	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	3638A08768	June 24, 2004	June 24, 2005
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	3701A22262	June 24, 2004	June 24, 2005
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01363	June 24, 2004	June 24, 2005
Preamplifier	Com Power	PA-102	1017	January 5, 2005	Jan. 5, 2006
Biconical Antenna	Com Power	AB-100	1548	September 29, 2004	Sept. 29, 2005
Log Periodic Antenna	Com Power	AL-100	16060	September 27, 2004	Sept. 27, 2005
Computer	Hewlett Packard	D5251A 888	US74458128	N/A	N/A
Monitor	Hewlett Packard	D5258A	DK74889705	N/A	N/A
LISN	Com Power	LI-215	12078	October 28, 2004	Oct. 28, 2005
LISN	Com Power	LI-215	12082	October 28, 2004	Oct. 28, 2005
Transient Limiter	Seaward	252A910	N/A	September 20, 2004	Sept. 20, 2005

5.3 EMI Test Equipment for Brea Facility – Part 2

EQUIPMENT TYPE	MANU- FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
EMI Receiver	Rohde & Schwarz	ESIB40	100172	October 28, 2004	Oct. 28, 2005
Loop Antenna	Com-Power	AL-130	17089	September 3, 2004	Sept. 3, 2005
Horn Antenna	Com-Power	AH826	0071957	November 5, 2003	Nov. 5, 2005
Horn Antenna	Antenna Research	MWH-2640/B	1011	November 5, 2003	Nov. 5, 2005
Horn Antenna	Antenna Research	DRG-118/A	1053	January 16, 2004	Jan. 16, 2006
Microwave Preamplifier	Com Power	PA-122	25195	February 25, 2005	Feb. 25, 2006
Microwave Preamplifier	Com Power	PA-840	711013	February 25, 2005	Feb. 25, 2006
RF Peak Power Meter / Analyzer	Boonton Electronics Corp.	4500A-01-30	1282	February 23, 2004	Feb. 23, 2006
Peak Power Sensor	Boonton Electronics Corp.	57318	3723	February 23, 2004	Feb. 23, 2006

6. TEST SITE DESCRIPTION

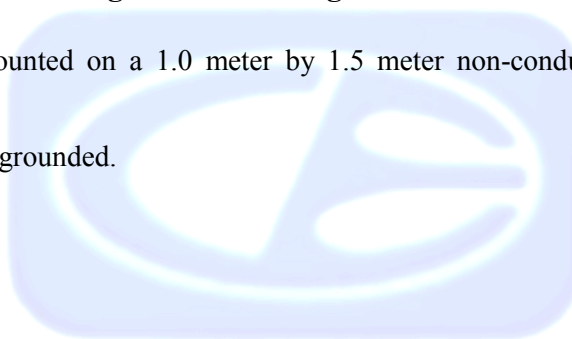
6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 meter by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



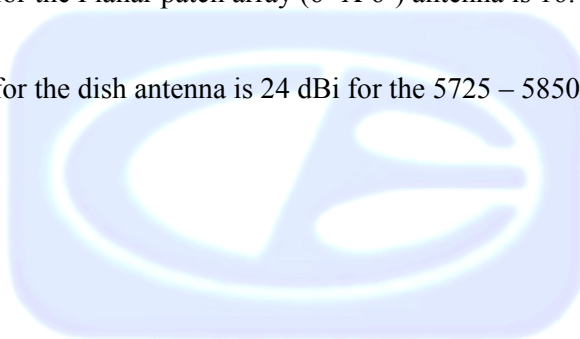
7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Antenna Gain

The antenna gain for the Single patch (small) is 7.8 dBi for the 5725 MHz – 5850 MHz band.

The antenna gain for the Planar patch array (6' X 6') antenna is 16.7 dBi for the 5725 MHz – 5850 MHz band.

The antenna gain for the dish antenna is 24 dBi for the 5725 – 5850 MHz band.



8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 2003. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics conducted emissions software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, Section 15.207 for conducted emissions.

8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI Receiver was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, the Com-Power Microwave Preamplifier Model: PA-122 was used for frequencies from 1 GHz to 18 GHz, and the Com Power Microwave Preamplifier Model: PA-840 was used for frequencies from 18 GHz to 40 GHz. The EMI Receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI Receiver records the highest measured reading over all the sweeps.

The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets.

The frequencies above 1 GHz were averaged manually by narrowing the video filter down to 10 Hz and putting the sweep time on AUTO on the EMI Receiver to keep the amplitude reading calibrated.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 40 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2003. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT by the Radiated Emission Manual Test software. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

Radiated Emissions (Spurious and Harmonics) Test (con't)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final data, except from 30 MHz to 1000 MHz for the digital portion.

For the digital portion from 30 MHz to 1000 MHz, the EUT was tested at a 10 meter test distance to obtain final data.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.247 (d). The EUT also complies with the **Class A** limits of CFR Title 47, Part 15, Subpart B for the digital portion. Please see the data sheets located in Appendix E.

8.2 6 dB and 20 dB Bandwidth

The 6 dB and 20 dB bandwidths were measured using the EMI Receiver. The bandwidth was measured using a direct connection from the RF out on the EUT. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz.

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (a)(2).

8.3 Peak Output Power

The Peak Output Power was measured using the power meter and power sensor. The EUT was directly connected to the power sensor, which was directly connected to the power meter. The Peak Output Power was then measured

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (b)(3).

8.4 RF Antenna Conducted Test

The RF antenna conducted test was performed using the EMI Receiver. The RF antenna conducted test was measured using a direct connection from the RF out on the EUT into the input of the analyzer. The resolution bandwidth was 100 kHz, and the video bandwidth 300 kHz. The spans were wide enough to include all the harmonics and emissions that were produced by the intentional radiator.

Test Results:

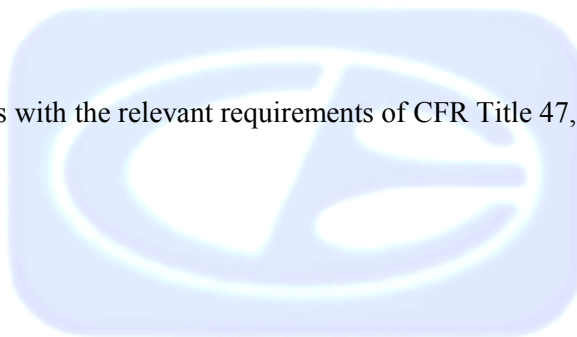
The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (d).

8.5 Spectral Density Output

The spectral density output was measured using the EMI Receiver. The spectral density output was measured using a direct connection from the RF out on the EUT into the input of the EMI Receiver. The resolution bandwidth was 3 kHz, and the video bandwidth was 10 kHz. The highest 4.5 MHz of the signal was used as the frequency span with the sweep rate being 1 second for every 3 kHz of span.

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (e).

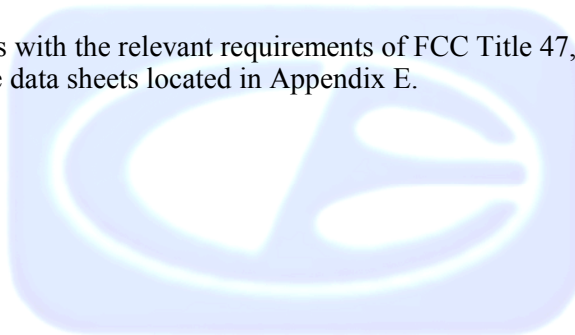


8.6 RF Band Edges

The RF band edges were measured at the start and end of the allocated band (5725 MHz and 5850 MHz) to insure that the emission outside of the band was at least 20 dB lower from the maximized fundamental.

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d). Please see the data sheets located in Appendix E.



9. CONCLUSIONS

The Minilink Wireless Ethernet System Model: Minilink 5.8WES meets all of the **Class B** limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247.

The digital portion from 30 MHz to 1000 MHz was within the **Class A** limits of CFR Title 47, Part 15, Subpart B.

Note: The 5725 MHz to 5850 MHz band is applicable to this report; the other band of operation (5250 MHz to 5350 MHz) is documented in the Compatible Electronics, Inc. report number **B50401D2**.