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Engineering & Administrative
CERTIFICATED UL 40 ENG
Testing For FCC Submissions/Verifications
Industry Canada Approved Test Facility
Qualified

TEST REPORT

REPORT DATE:	03 March 2004	REPORT NO:	23411D
CONTENTS:	See Table of Contents		
SUBMITTOR:	ATLINKS USA, Inc. 101 West 103rd Street Indianapolis, IN 46290-1102 USA		
SUBJECT:	Model No: **21008XXX-B**		
	FCC ID: G9H2-1008B		
TEST SPECIFICATION	FCC CFR 47 Part 15 FCC DA 00-705 "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems." NOTE: Tests Conducted Are "Type" Tests.		
DATE SAMPLE RECEIVED:	15 December 2003	DATE TESTED:	24 December 2003; 09, 16, & 19 Jan. 2004; and 25 & 27 February 2004
RESULTS:	Equipment tested complies with referenced specifications.		
ALTERATIONS	None		
Tested by:	Ed. Chang	Approved by:	Ed. Chang
	Edward Chang	Date:	Robert G. Marshall, P. Eng. 22 March 2004

TECHNICAL REPORT - FCC 2.1033(b)

Applicant

ATLINKS USA, Inc.
101 West 103rd Street
Indianapolis, IN
46290-1102 USA

FCC Identifier

G9H2-1008B

Manufacturer

Huiyang CCT Telecommunications Products Co. Ltd.
CCT Technology Park, San He Economic Experimental Zone
Huiyang City, Guangdong Province
P. R. of China

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EXHIBIT D

[FCC Ref. 2.1033(b)(6)]

"Report of Measurements"

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TEST REPORT CONTAINING:

PRODUCT DESCRIPTION

The ATLINKS USA, Inc. Model 21008XXX-B is a 2.4GHz single line, frequency hopping spread spectrum, cordless telephone with caller ID and dual handsets that operates from 2401.808452 to 2479.401229 MHz. The antenna used for the base and the handset are permanently attached to the EUT.

Refer to Exhibit D(6) for complete frequency list.

NOTE: The base uses from **75 to 88** channels. The handset uses **75** channels.

15.107 (a) POWER LINE CONDUCTED INTERFERENCE

Requirements:

Frequency of Emission (MHZ)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Test Procedure:

ANSI STANDARD C63.4-1992. using a 50uH LISN. Both lines were observed with the EUT transmitting. The bandwidth of the spectrum analyzer was 9KHz QP with an appropriate sweep speed. The ambient temperature of the EUT was 24°C with a humidity of 60%.

The spectrum was scanned from 0.15 to 30MHz.

Test Data:

The highest emission read for PHASE was 36.83 dBμV@ 0.15 MHz.
The highest emission read for NEUTRAL was 35.87 dBμV@ 0.15 MHz.

The graphs on Appendix 1 and 2 represent the emissions taken for this device.

Test Results:

Both lines were observed. The measurements indicate that the unit DOES appear to meet the FCC requirements for this class of equipment.

15.205(c)/15.209 **SPURIOUS RADIATED EMISSIONS IN RESTRICTED BANDS**

Procedure

The test procedure used was ANSI STANDARD C63.4-1992 and DA-00-705 using an appropriate spectrum analyzer, as listed in the Test Equipment List. The bandwidth (RBW) of the spectrum analyzer was 100KHz/120KHz up to 1GHz with an appropriate sweep speed. The RBW above 1.0GHz was = 1.0MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the EUT was 24°C with a humidity of 60%.

Requirements:

Emissions that fall in the restricted bands (15.205) must be less than 54dBμV/m

Test Data:

Refer to Exhibits D(3)-3 to D(3)-5

15.205(c)/15.209 **FIELD STRENGTH OF RADIATED EMISSIONS INCLUDING RESTRICTED BANDS**

BASE UNIT (ANT0)

Frequency Band MHz	Meter Reading (Peak) @3m dBμV/M	Meter Reading (Average) @3m dBμV/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dBμV/M	Average F. S dBuV/M	Average FCC Limit	Margin dB
Low Channel								
2401.808	**84.00**	—	**Horn V**	**33.08**	**117.08**	—	—	—
4803.616	22.00	7.00	Horn V	38.53	60.53	45.53	54	-8.47
7205.424	17.00	5.00	Horn V	43.84	60.84	48.84	54	-5.16
Mid Channel								
2440.156	**83.00**	—	**Horn V**	**33.20**	**116.20**	—	—	—
4880.312	20.00	6.00	Horn V	38.61	58.61	44.61	54	-9.39
7320.468	17.00	5.00	Horn V	44.06	61.06	49.06	54	-4.94
High Channel								
2479.398	**83.00**	—	**Horn V**	**33.23**	**116.23**	—	—	—
2483.5	31.00	8.00	Horn V	33.89	64.89	41.89	54	-12.11
4958.796	20.00	6.00	Horn V	38.85	58.85	44.85	54	-9.15
7438.194	17.00	3.00	Horn V	44.28	61.28	47.28	54	-6.72

1. If the peak meets the average limit, nothing further is required.
2. If the peak exceeds the average limit, then an average measurement is required (may be calculated) and must be below the average limit and also:
3. The peak measurement cannot exceed the average limit +20dB.

15.205(c)/15.209 **FIELD STRENGTH OF RADIATED EMISSIONS INCLUDING RESTRICTED BANDS**

BASE UNIT (ANT1)

Frequency Band MHz	Meter Reading (Peak) @3m dBµV/M	Meter Reading (Average) @3m dBµV/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dBµV/M	Average F. S dBuV/M	Average FCC Limit	Margin dB
Low Channel								
2401.808	**83.00**	—	**Horn V**	**33.08**	**116.08**	—	—	—
4803.616	19.00	6.00	Horn V	38.53	57.53	44.53	54	-9.47
7205.424	17.00	5.00	Horn V	43.84	60.84	48.84	54	-5.16
Mid Channel								
2440.156	**83.00**	—	**Horn V**	**33.20**	**116.20**	—	—	—
4880.312	20.00	6.00	Horn V	38.61	58.61	44.61	54	-9.39
7320.468	17.00	5.00	Horn V	44.06	61.06	49.06	54	-4.94
High Channel								
2479.398	**83.00**	—	**Horn V**	**33.23**	**116.23**	—	—	—
2483.5	30.00	8.00	Horn V	33.89	63.89	41.89	54	-12.11
4958.796	20.00	6.00	Horn V	38.85	58.85	44.85	54	-9.15
7438.194	17.00	3.00	Horn V	44.28	61.28	47.28	54	-6.72

1. If the peak meets the average limit, nothing further is required.
2. If the peak exceeds the average limit, then an average measurement is required (may be calculated) and must be below the average limit and also:
3. The peak measurement cannot exceed the average limit +20dB.

15.205(c)/15.209 **FIELD STRENGTH OF RADIATED EMISSIONS INCLUDING RESTRICTED BANDS**

HANDSET UNIT

Frequency Band MHz	Meter Reading (Peak) @3m dBμV/M	Meter Reading (Average) @3m dBμV/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dBμV/M	Average F. S dBuV/M	Average FCC Limit	Margin dB
Low Channel								
2401.808	**83.00**	—	**Horn V**	**33.08**	**116.08**	—	—	—
4803.616	21.00	3.00	Horn H	38.28	59.28	41.28	54	-12.72
7205.424	20.00	1.00	Horn H	43.94	63.94	44.94	54	-9.06
Mid Channel								
2440.156	**83.00**	—	**Horn V**	**33.20**	**116.20**	—	—	—
4880.312	19.00	2.00	Horn H	38.47	57.47	40.47	54	-13.53
7320.468	18.00	1.00	Horn H	44.06	62.06	45.06	54	-8.94
High Channel								
2479.398	**83.00**	—	**Horn V**	**33.23**	**116.23**	—	—	—
2483.5	29.00	6.00	Horn H	33.89	62.89	39.89	54	-14.11
4958.796	20.00	2.00	Horn H	40.30	60.30	42.30	54	-11.70
7438.194	16.00	0.00	Horn H	44.38	60.38	44.38	54	-9.62

1. If the peak meets the average limit, nothing further is required.
2. If the peak exceeds the average limit, then an average measurement is required (may be calculated) and must be below the average limit and also:
3. The peak measurement cannot exceed the average limit +20dB.

15.247(a)(1) HOPPING CHANNEL SEPARATION

Requirements:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Frequency hopping systems in the 2.4GHz band may have hopping channel carrier frequencies separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems employ fewer than 75 hopping channels and operate with an output power no greater than 125 mW.

Measurement Procedure

1. Position the EUT without connection to the Spectrum Analyzer (SA). Turn on the EUT and connect it to the SA. Then set it to any one convenient frequency within its operating range.

2. By using the Max Hold function record the separation of two adjacent channels.

3. Measure the frequency difference of these two adjacent channels by SA MARK function and then plot the result on the SA screen.

4. Repeat above procedures until all frequencies measured were complete.

Measurement Data - Refer Appendix 3 to 11 for plotted data

Base (ANT0)

Low Channel:	Adjacent Hopping Channel Separation is **890** kHz.
Mid Channel:	Adjacent Hopping Channel Separation is **894** kHz.
High Channel:	Adjacent Hopping Channel Separation is **889** kHz.

Base (ANT1)

Low Channel:	Adjacent Hopping Channel Separation is **890** kHz.
Mid Channel:	Adjacent Hopping Channel Separation is **894** kHz.
High Channel:	Adjacent Hopping Channel Separation is **889** kHz.

Handset Unit

Low Channel:	Adjacent Hopping Channel Separation is **890** kHz.
Mid Channel:	Adjacent Hopping Channel Separation is **894** kHz.
High Channel:	Adjacent Hopping Channel Separation is **889** kHz.

15.247(a)(1) FREQUENCY HOPPING SYSTEMS

NUMBER OF HOPPING FREQUENCIES USED

Requirements:

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

Measurement Procedure

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.
2. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all of the signals from each channel until each one has been recorded.
3. Set the SA on View mode and plot the results on SA screen.
4. Repeat the above procedures until all frequencies measured are complete.

Measurement Data

The base has from **75 to 88** hopping frequencies and the handset has **75** hopping frequencies. **Refer Appendix 12 to 15 for plotted data.**

CHANNEL BANDWIDTH [15.247(a)]

Requirements:

The 20dB bandwidth of the hopping channel is less than 1 MHz.

Measurement Procedure

1. Position the EUT without connection to the Spectrum Analyzer (SA). Turn on the EUT and connect it to the SA. Then set it to any one convenient frequency within its operating range. Set a reference level on the SA equal to the highest peak value.
2. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
3. Repeat above procedures until all frequencies measured were complete.

Measurement Data - **Refer Appendix 16 to 24 for plotted data**

Base (ANT0)	Low Channel:	Channel Bandwidth is **686** kHz.
	Mid Channel:	Channel Bandwidth is **692** kHz.
	High Channel:	Channel Bandwidth is **713** kHz.
Base (ANT1)	Low Channel:	Channel Bandwidth is **666** kHz.
	Mid Channel:	Channel Bandwidth is **685** kHz.
	High Channel:	Channel Bandwidth is **693** kHz.
Handset Unit	Low Channel:	Channel Bandwidth is **674** kHz.
	Mid Channel:	Channel Bandwidth is **705** kHz
	High Channel:	Channel Bandwidth is **717** kHz

15.247(a)(1) FREQUENCY HOPPING SYSTEMS (continued)

DWELL TIME ON EACH CHANNEL

Requirements:

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a **(0.4 x 75) 30** second period.

Measurement Procedure

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.

2. Adjust the centre frequency of SA on any frequency to be measured and set SA to zero span mode. Set RBW and VBW of SA to proper value.

3. Measure the time duration of one transmission on the measured frequency and then plot the result with the time difference of this time duration.

4. Repeat the above procedures until all frequencies measured were complete.

Measurement Data - Refer Appendix 25 to 29 for plotted data.

Base (ANT0)
The dwell time is (1.06 mS x 4) x 40 = **169.6 mS**

The maximum time of occupancy for a particular channel is **169.6 mS** in any 30 second period.

Base (ANT1)
The dwell time is (1.06 mS x 4) x 40 = **169.6 mS**

The maximum time of occupancy for a particular channel is **169.6 mS** in any 30 second period.

Handset Unit
The dwell time is (1.05 mS x 1) x 40 = **42 mS**

The maximum time of occupancy for a particular channel is **42 mS** in any 30 second period.

15.247(b) (1) MAXIMUM PEAK OUTPUT POWER [ERP]

Requirements:

For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHZ band: 1 Watt. For all other frequency hopping systems in the 2400-2483.5 band: 0.125 Watt. 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.

Measurement Procedure

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.

2. Set RBW of SA to 5MHz and VBW to NONE.

3. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.

4. Repeat the above procedures until all frequencies measured were complete.

Measurement Data -

Base (ANT0)
Low Channel: Output Peak Power is **93.4 mW [ERP]**.
Mid Channel: Output Peak Power is **76.2 mW [ERP]**.
High Channel: Output Peak Power is **77.1 mW [ERP]**.

Base (ANT1)
Low Channel: Output Peak Power is **74.1 mW [ERP]**.
Mid Channel: Output Peak Power is **76.2 mW [ERP]**.
High Channel: Output Peak Power is **76.8 mW [ERP]**.

Handset Unit
Low Channel: Output Peak Power is **74.1 mW [ERP]**.
Mid Channel: Output Peak Power is **76.2 mW [ERP]**.
High Channel: Output Peak Power is **76.6 mW [ERP]**.

15.247(c) BANDWIDTH OF BAND EDGE MEASUREMENT

Requirements:

In any 100 kHz bandwidth outside these frequency bands, 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.

Measurement Procedure

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.

2. Set RBW to 120 kHz and suitable frequency span 500 KHz or 1000 kHz; VBW = none.

3. 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.

4. Repeat the above procedures until all frequencies measured were complete.

5. Note: Measurements made with hopping and modulation.

Measurement Data - Refer Appendix 30 to 35 for plotted data

Base (ANT0)
Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **50.30** dB.
Channel 88: All emissions in this 100 kHz bandwidth are attenuated more than **50.31** dB.

Base (ANT1)
Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **49.37** dB.
Channel 88: All emissions in this 100 kHz bandwidth are attenuated more than **49.36** dB.

Handset Unit
Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **51.55** dB.
Channel 75: All emissions in this 100 kHz bandwidth are attenuated more than **50.62** dB.

Part 15.247(g): Exhibit B(3)-17 to -18 provides information on how the system is designed while the transmitter is presented with a continuous voice stream and a description of the system transmitting short bursts.

Part 15.247(h): Exhibit B(3)-18 provides information concerning the avoidance of simultaneous occupancy of hopping frequencies by multiple transmitters, system synchronization procedure, frequency hopping algorithm, hopping tables, and dual slot diversity.

TEST FACILITY AND EQUIPMENT LIST

FACILITIES:

Radiated — ANSI C63.4 (FCC OET/55) open field 3 metre test range. This test range is protected from the cold and moisture by a non-conductive enclosure.

Conducted — 2.5m Anechoic Chamber

EQUIPMENT:

Anritsu 2601A Spectrum Analyzer
Advantest R3261A Spectrum Analyzer
Hewlett-Packard RF generator # 8640 B with an 002 doubler
A.H. Systems biconical antenna; ..... 20 MHz to 330 MHz
A.H. Systems log periodic antenna; ..... 300 MHz to 1.8 GHz
Compliance Design P950 Preamp (16 dB) ... 25 MHz to 1.0 GHz

NOTE:

The Anritsu 2601A Spectrum Analyzer and the Advantest R3261A Spectrum Analyzer are calibrated annually, and that calibration is directly traceable to the National Research Council of Canada. (NRC) This equipment is only used by qualified technicians and only for the purpose of EMI measurements. The three metre test range has been carefully evaluated to the ANSI document C63.4 and will be remeasured for reflections and losses every three years.

ADDITIONAL TEST EQUIPMENT LIST

1. Spectrum Analyzer: HP 8591EM, S/N 3639A00995, (9KHz - 1.8GHz), Calibrated April 2003
2. Spectrum Analyzer: ANRITSU 2601A, S/N MT64544, (10KHz - 2.2GHz), Calibrated May 2003
3. Spectrum Analyzer: IFR AN940, S/N 635001039, (9KHz - 26.5GHz), Calibrated March 2003
4. Preamp: HP 8449B, S/N 3008A00378, (1 - 26.5GHz), Calibrated August 2003
5. Horn Antenna: Q-PAR 6878/24, S/N 1721, (1.5-18GHz)
6. Horn Antenna: A. H. Systems SAS 572, S/N 164 (18 - 26.5GHz)
7. Line Impedance Stabilization Network.: Marstech, Cal. July 2003
8. Horn Antenna: Radar System (Flange 3/4" Square) MIL F 3922/68 (26.5 - 40GHz)
9. OML Mixer: M28HWD, S/N Ka31114-1 (26.5 - 40GHz), Calibration Due Nov. 10, 2004
10. OML Diplexer: DPL.313A (Unit plugs into M28HWD)
11. Semflex Cable: Used with M28HWD and DPL.313A