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PRODUCT DESCRIPTION

The ATLINKS USA, Inc. Model 25110XXX-A is a 2.4GHz single line, frequency hopping spread spectrum, cordless telephone with caller ID, wireless headset and charger unit that operates from 2401.056 to 2482.272 MHz. The antenna used for the base and the handset are permanently attached to the EUT.

Refer to Exhibit A(5) for complete frequency list.

NOTE: The base uses **95** Channels. The handset and headset use **19** Channels.

15.107 (a) POWER LINE CONDUCTED INTERFERENCE

Requirements:

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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 C63.4-2003 using a 50 μ H 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:

Base Unit

The highest emission read for PHASE was **24.78 dB μ V@ 0.15 MHz.**

The highest emission read for NEUTRAL was **23.11 dB μ V@ 0.15 MHz.**

Handset/Headset Charger Unit

The highest emission read for PHASE was **25.31 dB μ V@ 0.15 MHz.**

The highest emission read for NEUTRAL was **21.89 dB μ V@ 0.15 MHz.**

Refer to Appendix 1 to 4 for the graphs.

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 C63.4-2003 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 54dB μ V/m.

Test Data:

Refer to Exhibits A(3)-3 to -10

15.205(c)/15.209

FIELD STRENGTH OF RADIATED EMISSIONS INCLUDING RESTRICTED BANDS**BASE UNIT (ANT0)**

Frequency Band MHz	Meter Reading (Peak) @3m dB μ V/M	Meter Reading (Average) @3m dB μ V/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dB μ V/M	Average F. S. dB μ V/M	FCC Limit dB μ V/M	Margin dB
Channel 1								
2401.056	82.00	45.00	Horn V	33.08	115.08	—	—	—
2094.05	24.00	1.00	Horn V	30.05	54.05	31.05	54	-22.95
4802.112	22.00	7.00	Horn V	38.36	60.36	45.36	54	-8.64
7203.168	19.00	3.00	Horn H	44.02	63.02	47.02	54	-6.98
9604.224	27.00	—	Horn H	46.98	73.98	—	95.08 (dbc)	-21.10
12005.280	17.00	3.00	Horn H	47.90	64.90	50.90	54	-3.10
Channel 48								
2441.664	81.00	45.00	Horn V	33.20	114.20	—	—	—
2136.600	19.00	2.00	Horn V	30.05	49.05	32.05	54	-21.95
4883.328	22.00	7.00	Horn V	38.61	60.61	45.61	54	-8.39
7324.992	17.00	3.00	Horn H	44.23	61.23	47.23	54	-6.77
9766.656	25.00	—	Horn H	47.14	72.14	—	94.2 (dbc)	-22.06
12208.320	17.00	3.00	Horn H	48.30	65.30	51.30	54	-2.70

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 dB μ V/M	Meter Reading (Average) @3m dB μ V/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dB μ V/M	Average F. S. dB μ V/M	FCC Limit dB μ V/M	Margin dB
Channel 1								
2401.056	81.00	45.00	Horn H	33.16	114.16	—	—	—
2252.00	22.00	4.00	Horn H	33.62	55.62	37.62	54	-16.38
4802.112	22.00	7.00	Horn V	38.36	60.36	45.36	54	-8.64
7203.168	19.00	3.00	Horn H	44.02	63.02	47.02	54	-6.98
9604.224	28.00	—	Horn H	46.98	74.98	—	94.16 (dbc)	-19.18
12005.280	17.00	4.00	Horn H	47.90	64.90	51.90	54	-2.10
Channel 48								
2441.664	80.00	45.00	Horn H	33.21	113.21	—	—	—
1875.750	22.00	3.00	Horn H	33.62	55.62	36.62	54	-17.38
4883.328	22.00	7.00	Horn H	38.74	60.74	45.74	54	-8.26
7324.992	19.00	3.00	Horn H	44.23	63.23	47.23	54	-6.77
9766.656	29.00	—	Horn H	47.14	76.14	—	93.21 (dbc)	-17.07
12208.320	18.00	4.00	Horn H	48.30	66.30	52.30	54	-1.70

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 dB μ V/M	Meter Reading (Average) @3m dB μ V/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dB μ V/M	Average F. S. dB μ V/M	FCC Limit dB μ V/M	Margin dB
Channel 1								
2401.056	78.00	35.00	Horn V	33.08	111.08	—	—	—
4802.112	34.00	4.00	Horn H	38.48	72.48	42.48	54	-11.52
7203.168	13.00	1.00	Horn H	44.02	57.02	45.02	54	-8.98
9604.224	21.00	3.00	Horn H	46.98	67.98	—	91.08 (dbc)	-23.10
Channel 48								
2441.664	78.00	35.00	Horn V	33.20	111.20	—	—	—
4883.328	34.00	4.00	Horn H	38.74	72.74	42.74	54	-11.26
7324.992	13.00	1.00	Horn H	44.23	57.23	45.23	54	-8.77
9766.656	21.00	3.00	Horn H	47.14	68.14	—	91.20 (dbc)	-23.06
Channel 95								
2482.272	78.00	35.00	Horn V	33.23	111.23	68.23	—	—
2485.5	26.00	5.00	Horn V	33.57	59.57	38.57	54	-15.43
4964.544	34.00	4.00	Horn H	39.00	73.00	43.00	54	-11.00
7446.816	13.00	1.00	Horn H	44.45	57.45	45.45	54	-8.55
9929.088	19.00	2.00	Horn H	47.22	66.22	—	91.23 (dbc)	-25.01

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**HEADSET UNIT**

Frequency Band MHz	Meter Reading (Peak) @3m dB μ V/M	Meter Reading (Average) @3m dB μ V/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dB μ V/M	Average F. S. dB μ V/M	FCC Limit dB μ V/M	Margin dB
Channel 1								
2401.056	83.00	37.00	Horn V	33.08	116.08	—	—	—
4802.112	25.00	4.00	Horn V	38.36	63.36	42.36	54	-11.64
7203.168	—							
9604.224	21.00	3.00	Horn H	46.98	67.98	—	96.08 (dbc)	-28.10
Channel 48								
2441.664	83.00	37.00	Horn V	33.20	116.20	—	—	—
4883.328	24.00	3.00	Horn V	38.61	62.61	41.61	54	-12.39
7324.992	—							
9766.656	20.00	3.00	Horn H	47.14	67.14	—	96.20 (dbc)	-29.06
Channel 95								
2482.272	84.00	37.00	Horn V	33.23	117.23	70.23	—	—
2486.600	31.00	4.00	Horn V	33.57	64.57	37.57	54	-16.43
4964.544	25.00	4.00	Horn V	38.85	63.85	42.85	54	-11.15
7446.816	—							
9929.088	17.00	1.00	Horn H	47.22	64.22	—	97.23 (dbc)	-33.01

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 IN RESTRICTED BANDS AT 2483.5 MHz**

Marker Delta Method

1. The in-band field strength is shown below:

	<u>Peak</u>	<u>Average</u>
Base (ANT0):	114.23 dB μ V/M	78.23 dB μ V/M
Base (ANT1):	114.31 dB μ V/M	79.31 dB μ V/M
Handset:	111.23 dB μ V/M	68.23 dB μ V/M
Headset:	117.23 dB μ V/M	70.23 dB μ V/M

2. The Delta amplitude in peak hold mode is shown as follows:

Base (ANT0):	45.93 dB	[Refer to Appendix 39]
Base (ANT1):	47.18 dB	[Refer to Appendix 41]
Handset:	51.87 dB	[Refer to Appendix 43]
Headset:	49.99 dB	[Refer to Appendix 45]

3. The band edge emissions are therefore as follows:

	<u>Peak</u>		
Base (ANT0):	114.23	45.93 =	68.30 dB μ V/M
Base (ANT1):	114.31	47.18 =	67.13 dB μ V/M
Handset:	111.23	51.87 =	59.36 dB μ V/M
Headset:	117.23	49.99 =	67.24 dB μ V/M

	<u>Average</u>		
Base (ANT0):	78.23	45.93 =	32.30 dB μ V/M
Base (ANT1):	79.31	47.18 =	32.13 dB μ V/M
Handset:	68.23	51.87 =	16.36 dB μ V/M
Headset:	70.23	49.99 =	20.24 dB μ V/M

15.205(c)/15.209

FIELD STRENGTH OF RADIATED EMISSIONS IN RESTRICTED BANDS AT 2483.5 MHz

Frequency Band MHz	Peak F. S. dBμV/M	Average F. S. dBμV/M	Peak F. S. dBc	Average F. S. dBc
<u>Base (ANT0)</u>				
Channel 95				
2482.272	114.23	78.23		
2483.5			68.30	32.30
<u>Base (ANT1)</u>				
Channel 95				
2482.272	114.31	79.31		
2483.5			67.13	32.13
<u>Handset</u>				
Channel 95				
2482.272	111.23	68.23		
2483.5			59.36	16.36
<u>Headset</u>				
Channel 95				
2482.272	117.23	70.23		
2483.5			67.24	20.24

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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

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 5 to 16 for plotted data

Base (ANT0)

Channel 1 & 2:	Adjacent Hopping Channel Separation is 871 kHz .
Channel 47 & 48:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 94 & 95:	Adjacent Hopping Channel Separation is 864 kHz .

Base (ANT1)

Channel 1 & 2:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 47 & 48:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 94 & 95:	Adjacent Hopping Channel Separation is 864 kHz .

Handset Unit

Channel 1 & 2:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 47 & 48:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 94 & 95:	Adjacent Hopping Channel Separation is 872 kHz .

Headset Unit

Channel 1 & 2:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 47 & 48:	Adjacent Hopping Channel Separation is 864 kHz .
Channel 94 & 95:	Adjacent Hopping Channel Separation is 864 kHz .

15.247(a)(1) FREQUENCY HOPPING SYSTEMS

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NUMBER OF HOPPING FREQUENCIES USED

Requirements:

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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 may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 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 **95** hopping frequencies. The handset and headset have **19** hopping frequencies.

Refer to Appendix 17 to 19 for plotted data.

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

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CHANNEL BANDWIDTH

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 20 to 31 for plotted data

<u>Base (ANT0)</u>	Channel 1:	Channel Bandwidth is 645 kHz.
	Channel 48:	Channel Bandwidth is 646 kHz.
	Channel 95:	Channel Bandwidth is 650 kHz.
<u>Base (ANT1)</u>	Channel 1:	Channel Bandwidth is 647 kHz.
	Channel 48:	Channel Bandwidth is 650 kHz.
	Channel 95:	Channel Bandwidth is 650 kHz.
<u>Handset Unit</u>	Channel 1:	Channel Bandwidth is 662 kHz.
	Channel 48:	Channel Bandwidth is 660 kHz.
	Channel 95:	Channel Bandwidth is 660 kHz.
<u>Headset Unit</u>	Channel 1:	Channel Bandwidth is 650 kHz.
	Channel 48:	Channel Bandwidth is 650 kHz.
	Channel 95:	Channel Bandwidth is 649 kHz.

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

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DWELL TIME ON EACH CHANNEL

Requirements:

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.

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 32 to 37 for plotted data.

Base (ANT0 and ANT1)

The dwell time is $(0.84 \text{ mS} \times 3) \times 40 = 100.8 \text{ mS}$

The maximum time of occupancy for a particular channel is **100.8 mS** in any 30 second period.

Handset Unit

The dwell time is $(0.84 \text{ mS} \times 1) \times 40 = 33.6 \text{ mS}$

The maximum time of occupancy for a particular channel is **33.6 mS** in any 30 second period.

Headset Unit:

The dwell time is $(0.84 \text{ mS} \times 1) \times 40 = 33.6 \text{ mS}$

The maximum time of occupancy for a particular channel is **33.6 mS** in any 30 second period.

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

Requirements:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping 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**.

Measurement Data -

Base (ANT0)

Channel 1:	Output Peak Power is 0.097 W.	[EIRP]
Channel 48:	Output Peak Power is 0.079 W.	[EIRP]
Channel 95:	Output Peak Power is 0.079 W.	[EIRP]

Base (ANT1)

Channel 1:	Output Peak Power is 0.078 W.	[EIRP]
Channel 48:	Output Peak Power is 0.063 W.	[EIRP]
Channel 95:	Output Peak Power is 0.081 W.	[EIRP]

Handset Unit

Channel 1:	Output Peak Power is 0.038 W.	[EIRP]
Channel 48:	Output Peak Power is 0.040 W.	[EIRP]
Channel 95:	Output Peak Power is 0.040 W.	[EIRP]

Headset Unit

Channel 1:	Output Peak Power is 0.122 W.	[EIRP]
Channel 48:	Output Peak Power is 0.125 W.	[EIRP]
Channel 95:	Output Peak Power is 0.158 W.	[EIRP]

15.247(d) BANDWIDTH OF BAND EDGE MEASUREMENT

Requirements:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

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 38 to 45 for plotted data

Base (ANT0)

Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **45.31 dB**.
Channel 95: All emissions in this 100 kHz bandwidth are attenuated more than **45.93 dB**.

Base (ANT1)

Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **45.30 dB**.
Channel 95: All emissions in this 100 kHz bandwidth are attenuated more than **47.18 dB**.

Handset Unit

Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **46.55 dB**.
Channel 95: All emissions in this 100 kHz bandwidth are attenuated more than **51.87 dB**.

Headset Unit

Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than **46.87 dB**.
Channel 95: All emissions in this 100 kHz bandwidth are attenuated more than **49.99 dB**.

Part 15.247(g): Exhibit B(2)-5 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(2)-5 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.