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June 28, 2010

System Planning Corporation
3601 Wilson Blvd.
Arlington, VA 22201

Dear Drew Boudreau,

Enclosed is the EMC Wireless test report for compliance testing of the System Planning Corporation, GT Lite as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B for a Class B Digital Device and FCC Part 15 Subpart C for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\System Planning Corporation\EMC29362A-FCC247 Rev 1)

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Electromagnetic Compatibility Criteria Test Report

for the

**System Planning Corporation
GT Lite**

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B
for Class B Digital Devices
&
15.247 Subpart C for Intentional Radiators

MET Report: EMC29362A-FCC247 Rev. 1

June 28, 2010

Prepared For:

**System Planning Corporation
3601 Wilson Blvd.
Arlington, VA 22201**

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21230

Electromagnetic Compatibility Criteria Test Report

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**System Planning Corporation
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Title 47 of the CFR, Parts 15 Subpart B
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&
15.247 Subpart C for Intentional Radiators



Ankur Vaseashta, Project Engineer
Electromagnetic Compatibility Lab



Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Parts 15B, 15.247 under normal use and maintenance.



Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

| Revision | Report Date | Reason for Revision |
|----------|---------------|------------------------|
| Ø | June 21, 2010 | Initial Issue. |
| 1 | June 28, 2010 | Editorial Corrections. |

Table of Contents

| | | |
|-------------|---|-----------|
| I. | Executive Summary | 1 |
| | A. Purpose of Test | 2 |
| | B. Executive Summary | 2 |
| II. | Equipment Configuration | 3 |
| | A. Overview | 4 |
| | B. References | 5 |
| | C. Test Site | 5 |
| | D. Description of Test Sample | 5 |
| | E. Equipment Configuration | 7 |
| | F. Support Equipment | 7 |
| | G. Ports and Cabling Information | 7 |
| | H. Mode of Operation | 7 |
| | I. Method of Monitoring EUT Operation | 8 |
| | J. Modifications | 9 |
| | a) Modifications to EUT | 9 |
| | b) Modifications to Test Standard | 9 |
| | K. Disposition of EUT | 9 |
| III. | Electromagnetic Compatibility Criteria for Unintentional Radiators | 10 |
| | § 15.107(a) Conducted Emissions Limits | 11 |
| | § 15.109(a) Radiated Emissions Limits | 15 |
| IV. | Electromagnetic Compatibility Criteria for Intentional Radiators | 20 |
| | § 15.203 Antenna Requirement | 21 |
| | § 15.207(a) Conducted Emissions Limits | 22 |
| | § 15.247(a) 6 dB and 99% Bandwidth | 23 |
| | § 15.247(b) Peak Power Output and RF Exposure | 24 |
| | § 15.247(d) Radiated Spurious Emissions Requirements and Band Edge | 25 |
| | § 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge | 27 |
| | § 15.247(e) Peak Power Spectral Density | 28 |
| V. | Test Equipment | 29 |
| VI. | Certification & User's Manual Information | 31 |
| | A. Certification Information | 32 |
| | B. Label and User's Manual Information | 36 |

List of Tables

| | |
|---|----|
| Table 1. Executive Summary of EMC Part 15.247 Compliance Testing | 2 |
| Table 2. EUT Summary Table..... | 4 |
| Table 3. References | 5 |
| Table 4. Equipment Configuration | 7 |
| Table 5. Ports and Cabling Information | 7 |
| Table 6. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a) | 11 |
| Table 7. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)..... | 12 |
| Table 8. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)..... | 13 |
| Table 9. Radiated Emissions Limits calculated from FCC Part 15, § 15.109 (a) (b) | 15 |
| Table 10. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits | 16 |
| Table 11. Radiated Emissions Limits, Test Results, ICES-003 Limits | 18 |
| Table 12. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a) | 22 |
| Table 13. Output Power Requirements from § 15.247 | 24 |
| Table 14. Restricted Bands of Operation..... | 25 |
| Table 15. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a) | 26 |
| Table 16. Test Equipment List | 30 |

List of Plots

| | |
|--|----|
| Plot 1. Conducted Emission, Phase Line Plot | 12 |
| Plot 2. Conducted Emission, Neutral Line Plot..... | 13 |
| Plot 3. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits | 17 |

List of Figures

| | |
|--|---|
| Figure 1. Photograph of GT Lite Unit | 6 |
|--|---|

List of Photographs

| | |
|---|----|
| Photograph 1. System Planning Corporation GT Lite | 6 |
| Photograph 2. Conducted Emissions, Test Setup | 14 |
| Photograph 3. Radiated Emission, Test Setup..... | 19 |

List of Terms and Abbreviations

| | |
|------------------------------|--|
| AC | Alternating Current |
| ACF | Antenna Correction Factor |
| Cal | Calibration |
| <i>d</i> | Measurement Distance |
| dB | Decibels |
| dBμA | Decibels above one microamp |
| dBμV | Decibels above one microvolt |
| dBμA/m | Decibels above one microamp per meter |
| dBμV/m | Decibels above one microvolt per meter |
| DC | Direct Current |
| E | Electric Field |
| DSL | Digital Subscriber Line |
| ESD | Electrostatic Discharge |
| EUT | Equipment Under Test |
| <i>f</i> | Frequency |
| FCC | Federal Communications Commission |
| GRP | Ground Reference Plane |
| H | Magnetic Field |
| HCP | Horizontal Coupling Plane |
| Hz | Hertz |
| IEC | International Electrotechnical Commission |
| kHz | kilohertz |
| kPa | kilopascal |
| kV | kilovolt |
| LISN | Line Impedance Stabilization Network |
| MHz | Megahertz |
| μH | microhenry |
| μ | microfarad |
| μs | microseconds |
| NEBS | Network Equipment-Building System |
| PRF | Pulse Repetition Frequency |
| RF | Radio Frequency |
| RMS | Root-Mean-Square |
| TWT | Traveling Wave Tube |
| V/m | Volts per meter |
| VCP | Vertical Coupling Plane |

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the System Planning Corporation GT Lite, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the GT Lite. System Planning Corporation should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the GT Lite, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with System Planning Corporation, purchase order number 58597. All tests were conducted using measurement procedure ANSI C63.4-2003.

| FCC Reference 47 CFR Part 15.247:2005 | Description | Compliance |
|--|--|------------------------|
| 47 CFR Part 15.107 (a) | Conducted Emission Limits for a Class B Digital Device | Compliant |
| 47 CFR Part 15.109 (a) | Radiated Emission Limits for a Class B Digital Device | Compliant |
| Title 47 of the CFR, Part 15 §15.203 | Antenna Requirement | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.207(a) | Conducted Emission Voltage | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.247(a)(1) | Occupied Bandwidth | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.247(b) | RF Output Power | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.209, §15.247(d) | Radiated Spurious Emissions | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.205 | Emissions at Restricted Band | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.209, §15.247(d) | Conducted Spurious Emissions | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15; §15.247(e) | Power Spectral Density | See FCC ID: XDYZIGBEE. |
| Title 47 of the CFR, Part 15 §15.247(i) | Maximum Permissible Exposure | See FCC ID: XDYZIGBEE. |

Table 1. Executive Summary of EMC Part 15.247 Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by System Planning Corporation to perform testing on the GT Lite, under System Planning Corporation's purchase order number 58597.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the System Planning Corporation, GT Lite.

The results obtained relate only to the item(s) tested.

| | | |
|---------------------------------------|---|-----------------|
| Model(s) Tested: | GT Lite | |
| Model(s) Covered: | GT Lite | |
| EUT Specifications: | Primary Power: 120 VAC, 60 Hz | |
| | FCC ID: XDY-GTLITEV3 | |
| | EUT Frequency Ranges: | 2405 – 2480 MHz |
| Analysis: | The results obtained relate only to the item(s) tested. | |
| Environmental Test Conditions: | Temperature: 15-35° C | |
| | Relative Humidity: 30-60% | |
| | Barometric Pressure: 860-1060 mbar | |
| Evaluated by: | Ankur Vaseashta | |
| Report Date(s): | June 28, 2010 | |

Table 2. EUT Summary Table

B. References

| | |
|--|---|
| CFR 47, Part 15, Subpart C | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies |
| RSS-210, Issue 7, June 2007 | Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment |
| CFR 47, Part 15, Subpart B | Electromagnetic Compatibility: Criteria for Radio Frequency Devices |
| ICES-003, Issue 4 February 2004 | Electromagnetic Compatibility: Criteria for Radio Frequency Devices |
| ANSI C63.4:2003 | Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz |
| ANSI/NCSL Z540-1-1994 | Calibration Laboratories and Measuring and Test Equipment - General Requirements |
| ANSI/ISO/IEC 17025:2000 | General Requirements for the Competence of Testing and Calibration Laboratories |
| ANSI C63.10-2009 | American National Standard for Testing Unlicensed Wireless Devices |

Table 3. References

C. Test Site

Digital emission testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The System Planning Corporation GT Lite, Equipment Under Test (EUT), provides local control for Remote Installations. The EUT also communicates over public GSM networks to internet software and provides position information via GPS and local wireless control of local networks via Zigbee.



Photograph 1. System Planning Corporation GT Lite



Figure 1. Photograph of GT Lite Unit

Ports are shown in this figure. Switch port (reference ID #1) is shown on the left. It has two positions (on/off). Momentary LEDs will indicate activity in the “on” position. Default configuration is to provide a report to the remote user every 15 minutes. The other port (reference ID #2) is the “External Data” and is shown to the right of the switch port with its associated dust cap. It is not used in the Main Configuration.

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

| Ref. ID | Name / Description | Model Number | Part Number | Serial Number | Revision |
|---------|--------------------|--------------|-------------|---------------|----------|
| A | GT Lite | N/A | 202964 | L00010885572 | N/A |

Table 4. Equipment Configuration

F. Support Equipment

Support Equipment was not required.

G. Ports and Cabling Information

| Ref. ID | Port Name on EUT | Cable Description | Qty. | Length (m) | Shielded (Y/N) | Termination Point |
|---------|------------------|--------------------------------|------|------------|----------------|-------------------|
| 1 | External Data | Not used in Main Configuration | 1 | N/A | N/A | N/A |
| 2 | Key Switch | Turn Key to operate | 1 | N/A | N/A | N/A |

Table 5. Ports and Cabling Information

H. Mode of Operation

Unit reports via cell connection on regular selected intervals and when interrupted from a sleep mode via external sensors. While there are several configurations, the main configuration is without external sensors. Unit is active on power up and remains in default configuration unless programmed for other operation either remotely.

Other modes of operation which are not part of the current test:

1. Interaction with wireless external sensors connected via Zigbee
2. Interaction with wired external sensors via available connector
3. Provide control of local machines as directed remotely using either wireless or wired means and with or without local external power.

I. Method of Monitoring EUT Operation

Performance is monitored via two separate methods.

1. Unit provides momentary LED indicators of operation. These indicators are momentary due to the self contained power source conservation. The indicators are:
 - 1) Use
 - 2) Charging
 - 3) GSM
 - 4) Activity
 - 5) Optic Sensor



USB: The USB LED indicates when the USB diagnostic interface is connected to a computer. The LED will illuminate green when connected and dark when not.

Charging: The Charging LED indicates the status of the battery charger. While charging, the LED will illuminate red. When charging is complete, the LED will turn off.

GSM: The GSM LED indicates the status of the GSM connection. When searching for a GSM network, the LED will illuminate solid green. When a network is found, the LED will blink green. When there is no GSM activity or the device is sleeping, the LED will turn off.

Activity: The activity LED indicates the overall status of the device. While sleeping, the LED will be off. While awake, the LED will blink according to the code below (Note: this LED is currently disabled).

Dot = 0.5s on

Dash = 1.0s on

Space = 0.5s off

The blink codes are repeated continuously until another condition is met.

| Condition | Blink Code |
|-------------------------------|-------------------|
| Boot | Dash Dash |
| Acquiring GPS | Dash Dash Dot |
| Successful GSP Fix (2D or 3D) | Dot Dot Dash Dash |
| Unsuccessful GPS Fix | Dash Dash |
| Successful transmission | Dot Dot |
| Unsuccessful transmission | Dash Dash |

2. The GT Lite device is configured to send a message via cellular communication every x minutes. This message is transmitted to the GlobalTrak Information Management Bureau (IMB) software application. During testing by Metlabs, and email can be sent to the test technician every time a message is received by the IMB. This email is an indication that the device has operated properly in the last wake/transmit cycle. If cellular signal is unavailable during the transmit attempt, the message is stored until the next transmit interval.

J. Modifications

- a) **Modifications to EUT**
No modifications were made to the EUT.
- b) **Modifications to Test Standard**
No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to System Planning Corporation upon completion of testing.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 6. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 6. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

15.207(a), Except as shown in paragraphs (b) and (c) of this section*, charging, AC adapters or battery eliminators the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the Table 6, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

| Frequency range (MHz) | Class A Conducted Limits (dB μ V) | | *Class B Conducted Limits (dB μ V) | |
|---|--|---------|---|---------|
| | Quasi-Peak | Average | Quasi-Peak | Average |
| * 0.15- 0.45 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.45 - 0.5 | 79 | 66 | 56 | 46 |
| 0.5 - 30 | 73 | 60 | 60 | 50 |
| Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz. * -- Limits per Subsection 15.207(a). | | | | |

Table 6. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

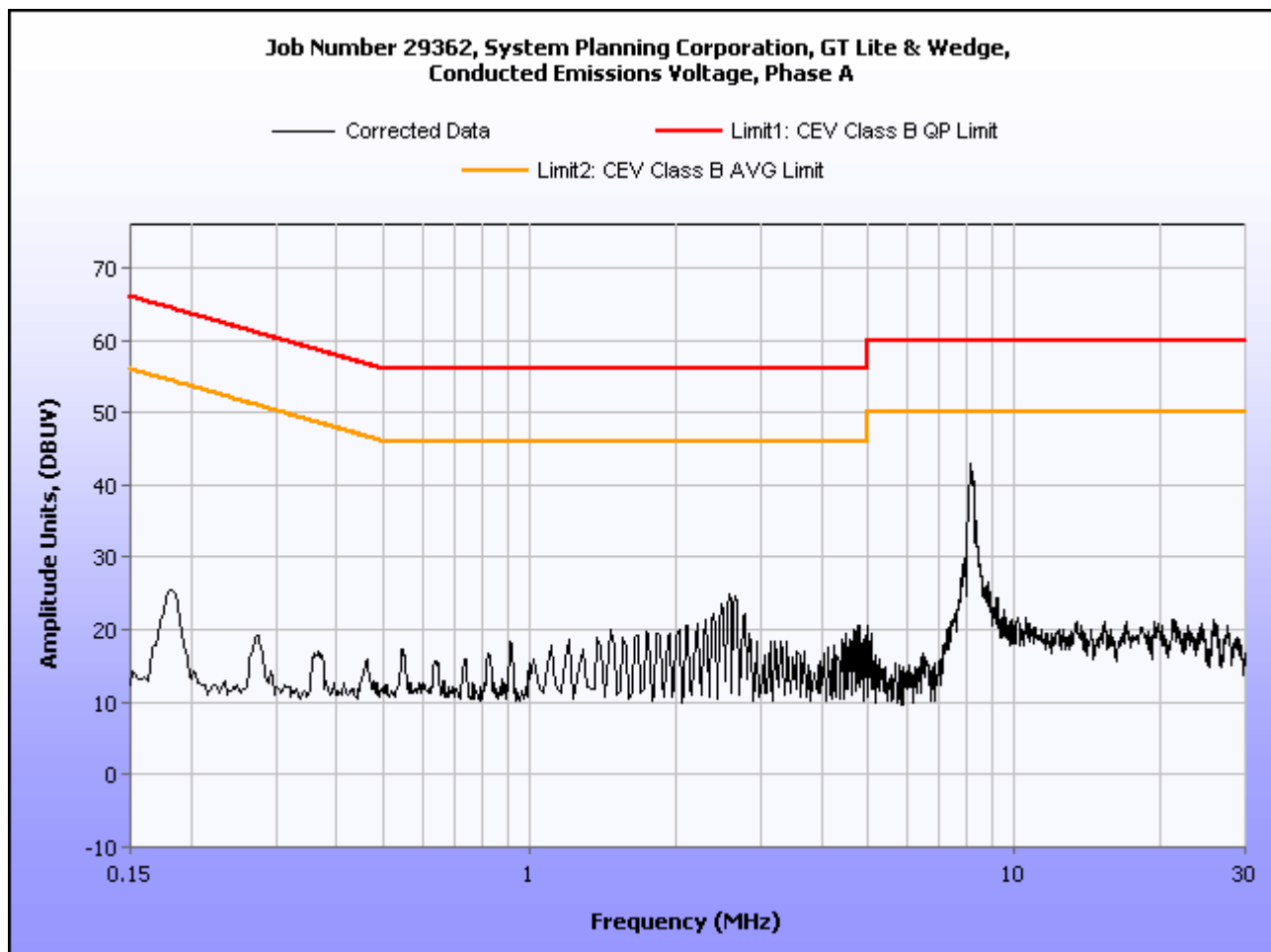
Test Engineer(s): Ankur Vaseashta

Test Date(s): 06/04/10

Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

| Frequency (MHz) | Uncorrected Meter Reading (dBuV) QP | Cable Loss (dB) | Corrected Measurement (dBuV) QP | Limit (dBuV) QP | Margin (dB) QP | Uncorrected Meter Reading (dBuV) Avg. | Cable Loss (dB) | Corrected Measurement (dBuV) AVG | Limit (dBuV) AVG | Margin (dB) AVG |
|-----------------|-------------------------------------|-----------------|---------------------------------|-----------------|----------------|---------------------------------------|-----------------|----------------------------------|------------------|-----------------|
| 0.15 | 9.99 | 0 | 9.99 | 66 | -56.01 | 8.79 | 0 | 9.99 | 56 | -47.21 |
| 0.245 | 18.6 | 0 | 18.6 | 61.93 | -43.33 | 15 | 0 | 18.6 | 51.93 | -36.93 |
| 0.36 | 18.66 | 0 | 18.66 | 58.73 | -40.07 | 14.33 | 0 | 18.66 | 48.73 | -34.4 |
| 3.5 | 16.2 | 0.01 | 16.21 | 56 | -39.79 | 14.4 | 0.01 | 16.21 | 46 | -31.59 |
| 8.23 | 24.6 | 0.04 | 24.64 | 60 | -35.36 | 22.3 | 0.04 | 24.64 | 50 | -27.66 |
| 8.45 | 18.3 | 0.05 | 18.35 | 60 | -41.65 | 17.3 | 0.05 | 18.35 | 50 | -32.65 |

Table 7. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

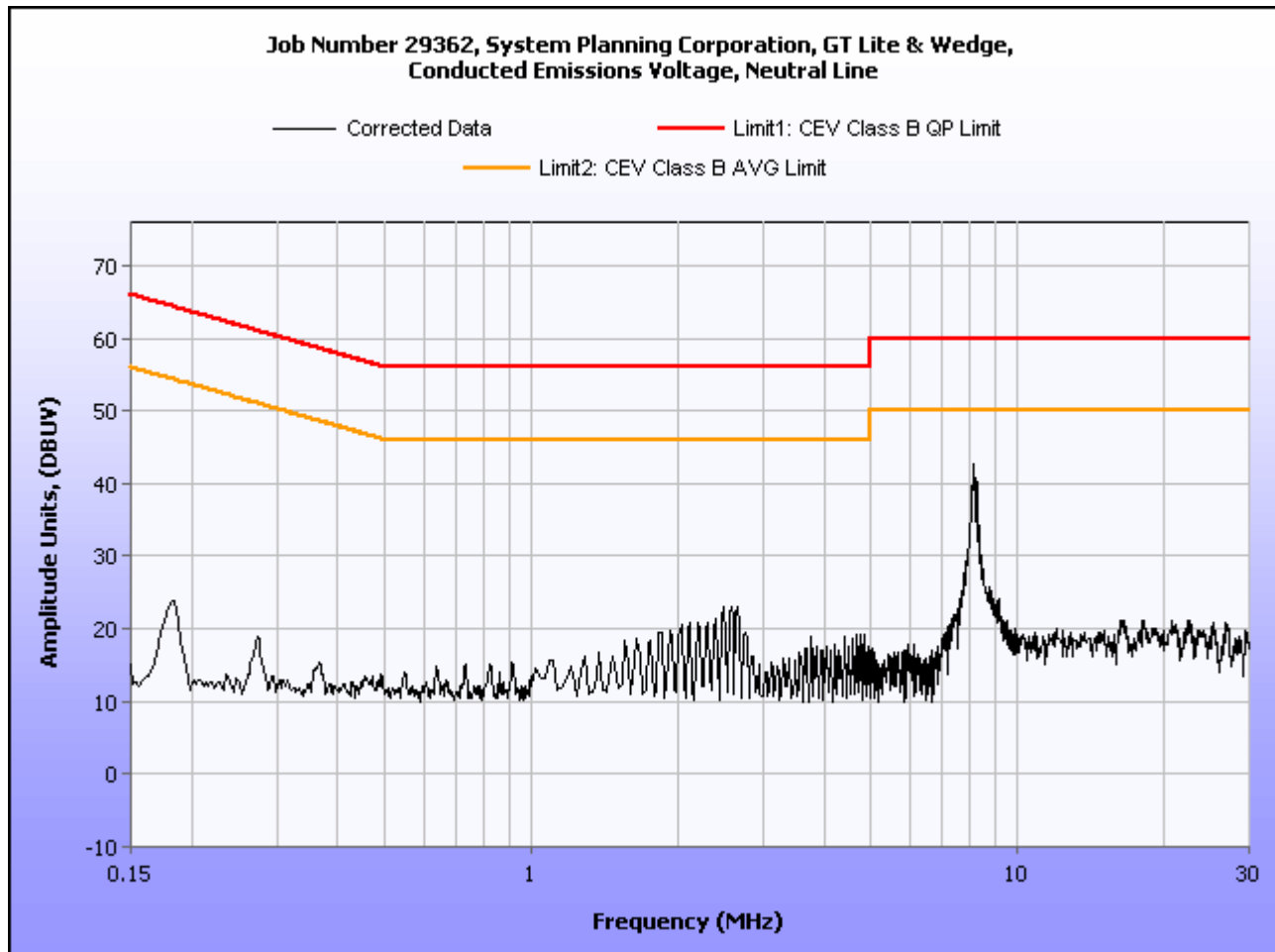


Plot 1. Conducted Emission, Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

| Frequency (MHz) | Uncorrected Meter Reading (dBuV) QP | Cable Loss (dB) | Corrected Measurement (dBuV) QP | Limit (dBuV) QP | Margin (dB) QP | Uncorrected Meter Reading (dBuV) Avg. | Cable Loss (dB) | Corrected Measurement (dBuV) AVG | Limit (dBuV) AVG | Margin (dB) AVG |
|-----------------|-------------------------------------|-----------------|---------------------------------|-----------------|----------------|---------------------------------------|-----------------|----------------------------------|------------------|-----------------|
| 0.22 | 33.1 | 0.01 | 33.11 | 62.82 | -29.71 | 29.11 | 0.01 | 33.11 | 52.82 | -23.7 |
| 1.2 | 16 | 0 | 16 | 56 | 15.55 | 14.02 | 0 | 16 | 46 | -31.98 |
| 6 | 13.3 | 0.06 | 13.36 | 60 | -46.64 | 11.11 | 0.06 | 13.36 | 50 | -38.83 |
| 7.91 | 43.3 | 0.03 | 43.33 | 60 | -16.67 | 42 | 0.03 | 43.33 | 50 | -7.97 |
| 7.916 | 40.45 | 0.03 | 40.48 | 60 | -19.52 | 38.3 | 0.03 | 40.48 | 50 | -11.67 |
| 15.07 | 31.2 | 0.05 | 31.25 | 60 | -28.75 | 30 | 0.05 | 31.25 | 50 | -19.95 |

Table 8. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 2. Conducted Emission, Neutral Line Plot

Conducted Emission Limits Test Setup



Photograph 2. Conducted Emissions, Test Setup

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 9.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 9.

| Frequency (MHz) | Field Strength (dBμV/m) | |
|-----------------|--|---|
| | §15.109 (b), Class A Limit (dBμV) @ 10m | §15.109 (a), Class B Limit (dBμV) @ 3m |
| 30 - 88 | 39.00 | 40.00 |
| 88 - 216 | 43.50 | 43.50 |
| 216 - 960 | 46.40 | 46.00 |
| Above 960 | 49.50 | 54.00 |

Table 9. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s): Ankur Vaseashta

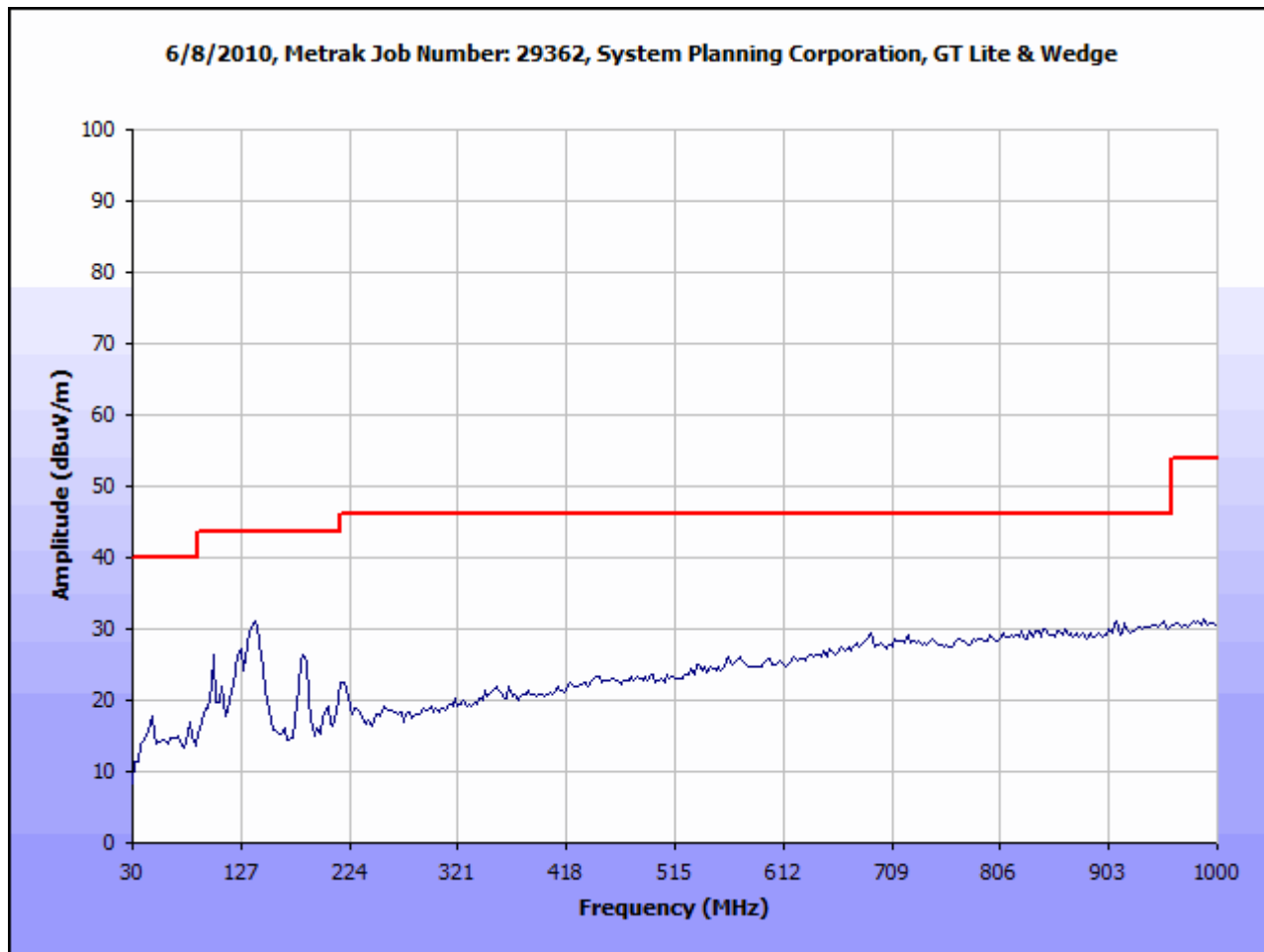
Test Date(s): 06/08/10

Radiated Emissions Limits Test Results, Class B

| Frequency (MHz) | EUT Azimuth (Degrees) | Antenna Polarity (H/V) | Antenna HEIGHT (m) | Uncorrected Amplitude (dBuV) | Antenna Correction Factor (dB) (+) | Cable Loss (dB) (+) | Distance Correction Factor (dB) (-) | Corrected Amplitude (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|-----------------------|------------------------|--------------------|------------------------------|------------------------------------|---------------------|-------------------------------------|------------------------------|----------------|-------------|
| 46.500 | 48 | H | 1.42 | 34.97 | 9.1 | -27.23 | 0.00 | 16.84 | 40.00 | -23.16 |
| 46.500 | 50 | V | 1.51 | 34.88 | 8.85 | -27.23 | 0.00 | 16.50 | 40.00 | -23.50 |
| 81.900 | 25 | H | 1.55 | 52.89 | 7.06 | -26.98 | 0.00 | 32.97 | 40.00 | -7.03 |
| 81.900 | 26 | V | 1.66 | 53.70 | 7.31 | -26.98 | 0.00 | 34.03 | 40.00 | -5.97 |
| 108.800 | 11 | H | 1.78 | 52.76 | 7.25 | -27.02 | 0.00 | 32.99 | 43.50 | -10.51 |
| 108.800 | 42 | V | 1.37 | 52.76 | 7.52 | -27.02 | 0.00 | 33.26 | 43.50 | -10.24 |
| 139.500 | 40 | H | 2.01 | 50.10 | 7.69 | -26.94 | 0.00 | 30.85 | 43.50 | -12.65 |
| 139.500 | 41 | V | 1.89 | 48.00 | 7.72 | -26.94 | 0.00 | 28.78 | 43.50 | -14.72 |
| 180.100 | 0 | H | 2.01 | 36.53 | 9.41 | -26.82 | 0.00 | 19.12 | 43.50 | -24.38 |
| 180.100 | 0 | V | 1.29 | 36.53 | 8.9 | -26.82 | 0.00 | 18.61 | 43.50 | -24.89 |
| 705.500 | 30 | H | 120.30 | 42.07 | 20.21 | -24.34 | 0.00 | 37.94 | 46.00 | -8.06 |
| 705.500 | 25 | V | 119.00 | 41.11 | 20.41 | -24.34 | 0.00 | 37.18 | 46.00 | -8.82 |

Table 10. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits

Note: The EUT was tested at 3 m.



Plot 3. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits

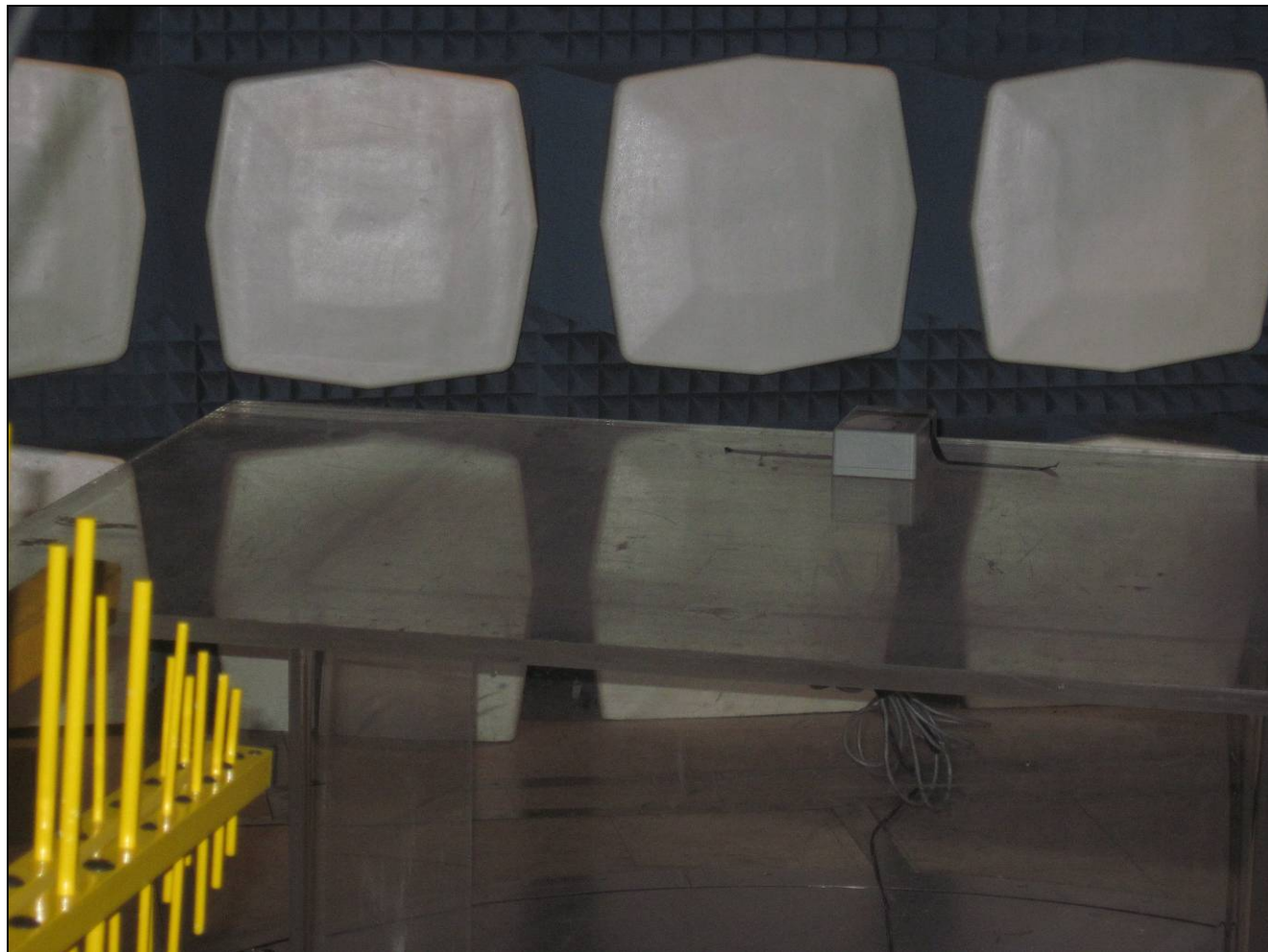
Radiated Emissions Limits Test Results, Class B

| Frequency (MHz) | EUT Azimuth (Degrees) | Antenna Polarity (H/V) | Antenna HEIGHT (m) | Uncorrected Amplitude (dBuV) | Antenna Correction Factor (dB) (+) | Cable Loss (dB) (+) | Distance Correction Factor (dB) (-) | Corrected Amplitude (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|-----------------------|------------------------|--------------------|------------------------------|------------------------------------|---------------------|-------------------------------------|------------------------------|----------------|-------------|
| 46.500 | 48 | H | 1.42 | 34.97 | 9.1 | -27.23 | 10.46 | 6.38 | 30.00 | -23.62 |
| 46.500 | 50 | V | 1.51 | 34.88 | 8.85 | -27.23 | 10.46 | 6.04 | 30.00 | -23.96 |
| 81.900 | 25 | H | 1.55 | 52.89 | 7.06 | -26.98 | 10.46 | 22.51 | 30.00 | -7.49 |
| 81.900 | 26 | V | 1.66 | 53.70 | 7.31 | -26.98 | 10.46 | 23.57 | 30.00 | -6.43 |
| 108.800 | 11 | H | 1.78 | 52.76 | 7.25 | -27.02 | 10.46 | 22.53 | 30.00 | -7.47 |
| 108.800 | 42 | V | 1.37 | 52.76 | 7.52 | -27.02 | 10.46 | 22.80 | 30.00 | -7.20 |
| 139.500 | 40 | H | 2.01 | 50.10 | 7.69 | -26.94 | 10.46 | 20.39 | 30.00 | -9.61 |
| 139.500 | 41 | V | 1.89 | 48.00 | 7.72 | -26.94 | 10.46 | 18.32 | 30.00 | -11.68 |
| 180.100 | 0 | H | 2.01 | 36.53 | 9.41 | -26.82 | 10.46 | 8.66 | 30.00 | -21.34 |
| 180.100 | 0 | V | 1.29 | 36.53 | 8.9 | -26.82 | 10.46 | 8.15 | 30.00 | -21.85 |
| 705.500 | 30 | H | 120.30 | 42.07 | 20.21 | -24.34 | 10.46 | 27.48 | 37.00 | -9.52 |
| 705.500 | 25 | V | 119.00 | 41.11 | 20.41 | -24.34 | 10.46 | 26.72 | 37.00 | -10.28 |

Table 11. Radiated Emissions Limits, Test Results, ICES-003 Limits

Note: The EUT was tested at 3 m.

Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission, Test Setup

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: Please refer to FCC ID: XDYZIGBEE.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 Conducted Emissions Limits

Test Requirement(s): § 15.207 (a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency range (MHz) | § 15.207(a), Conducted Limit (dB μ V) | |
|--------------------------|---|---------|
| | Quasi-Peak | Average |
| * 0.15- 0.45 | 66 - 56 | 56 - 46 |
| 0.45 - 0.5 | 56 | 46 |
| 0.5 - 30 | 60 | 50 |

Table 12. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Results: Please refer to FCC ID: XDYZIGBEE.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a) 6 dB and 99% Bandwidth

Test Requirements: § 15.247(a): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Results Please refer to FCC ID: XDYZIGBEE.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output and RF Exposure

Test Requirements: §15.247(b): The maximum peak output power of the intentional radiator shall not exceed the following:

| Digital Transmission Systems (MHz) | Output Limit (Watts) |
|---------------------------------------|-------------------------|
| 902-928 | 1.000 |
| 2400–2483.5 | 1.000 |
| 5725– 5850 | 1.000 |

Table 13. Output Power Requirements from §15.247

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 13, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band and using a point to point application may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

Test Results: Please refer to FCC ID: XDYZIGBEE.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: §15.247(d); §15.205: Emissions outside the frequency band.

§15.247(d): 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. Attenuation below the general limits specified in § 15.209(a) is not required. 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).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|-------------------------------|---------------------|----------------|------------------|
| 0.090–0.110----- | 16.42–16.423 | 399.9–410 | 4.5–5.15 |
| ¹ 0.495–0.505----- | 16.69475–16.69525 | 608–614 | 5.35–5.46 |
| 2.1735–2.1905----- | 16.80425–16.80475 | 960–1240 | 7.25–7.75 |
| 4.125–4.128----- | 25.5–25.67 | 1300–1427 | 8.025–8.5 |
| 4.17725–4.17775----- | 37.5–38.25 | 1435–1626.5 | 9.0–9.2 |
| 4.20725–4.20775----- | 73–74.6 | 1645.5–1646.5 | 9.3–9.5 |
| 6.215–6.218----- | 74.8–75.2 | 1660–1710 | 10.6–12.7 |
| 6.26775–6.26825----- | 108–121.94 | 1718.8–1722.2 | 13.25–13.4 |
| 6.31175–6.31225----- | 123–138 | 2200–2300 | 14.47–14.5 |
| 8.291–8.294----- | 149.9–150.05 | 2310–2390 | 15.35–16.2 |
| 8.362–8.366----- | 156.52475–156.52525 | 2483.5–2500 | 17.7–21.4 |
| 8.37625–8.38675----- | 156.7–156.9 | 2655–2900 | 22.01–23.12 |
| 8.41425–8.41475----- | 162.0125–167.17 | 3260–3267 | 23.6–24.0 |
| 12.29–12.293----- | 167.72–173.2 | 3332–3339 | 31.2–31.8 |
| 12.51975–12.52025----- | 240–285 | 3345.8–3358.36 | 43–36.5 |
| 12.57675–12.57725----- | 322–335.4 | 3600–4400 | (²) |

Table 14. Restricted Bands of Operation

¹ Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

² Above 38.6

Test Requirement(s): § 15.209 (a): Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 15.

| Frequency (MHz) | § 15.209(a), Radiated Emission Limits (dBµV) @ 3m |
|-----------------|--|
| 30 - 88 | 40.00 |
| 88 - 216 | 43.50 |
| 216 - 960 | 46.00 |
| Above 960 | 54.00 |

Table 15. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Results: Please refer to FCC ID: XDYZIGBEE.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge

Test Requirement: **15.247(d)** 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.

Test Results: Please refer to FCC ID: XDYZIGBEE.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Results: Please refer to FCC ID: XDYZIGBEE.

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

| MET Asset # | Equipment | Manufacturer | Model | Last Cal Date | Cal Due Date |
|-------------|--------------------------------|----------------------|------------------|---------------|--------------|
| 1T4316 | SPECTRUM ANALYZER | HEWLETT PACKARD | 8564E | 02/23/2010 | 02/23/2011 |
| 1T4563 | LISN (10 AMP) | SOLAR ELECTRONICS | 9322-50-R-10-BNC | 10/14/2009 | 10/14/2010 |
| 1T4502 | COMB GENERATOR | COM-POWER | CGC-255 | 09/23/2009 | 09/23/2010 |
| 1T4502 | COMB GENERATOR | COM-POWER | CGC-255 | 09/23/2009 | 09/23/2010 |
| 1T4620 | THERMO-HYGROMETER | CONTROL COMPANY | S6-627-9 | 10/09/2009 | 10/09/2011 |
| 1T4619 | THERMO-HYGROMETER | CONTROL COMPANY | S6-627-9 | 11/07/2008 | 11/07/2010 |
| 1T4568 | RADIATING NOISE SOURCE | MET LABORATORIES | N/A | SEE NOTE | |
| 1T3360 | AMPLIFIER | HEWLETT PACKARD | 8447F | SEE NOTE | |
| 1T4621 | ESA-E SERIES SPECTRUM ANALYZER | AGILENT | E4402B | 05/10/2010 | 05/10/2011 |
| 1T4300 | SEMI-ANECHOIC CHAMBER # 1 | EMC TEST SYSTEMS | NONE | 08/24/2007 | 08/24/2010 |
| 1T4303 | ANTENNA; BILOG | SCHAFNER - CHASE EMC | CBL6140A | 07/29/2009 | 07/29/2010 |

Table 16. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
 - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
 - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

- (e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:
- (i) *Compliance testing*;
 - (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
 - (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.
- (e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.
- (f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

- (a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.¹ *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.*
- (b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

¹ In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
 - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
 - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
 - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
 - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) *In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:*

- (1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

- (2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

- (3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- (4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.
- (5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

- (a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

- (b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

End of Report