TEST REPORT

Report No.: HK11100126-1

Lightspeed Technologies Inc.

Application
For
Certification
(Original Grant)
(FCC ID: ORV-FCHRC)
(IC: 1732B-FCHRC)

Transceiver

Prepared and Checked by:

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Date: November 30, 2011

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GENERAL INFORMATION

Lightspeed Technologies Inc.

BRAND NAME: Lightspeed, MODEL: FCHRC

FCC ID: ORV-FCHRC
IC: 1732B-FCHRC

Grantee:	Lightspeed Technologies Inc.
Grantee Address:	11509 SW Herman Rd., Tualatin, OR 97062, USA.
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Manufacturer:	Lightspeed Technologies Inc.
Manufacturer Address:	11509 SW Herman Rd., Tualatin, OR 97062, USA.
Brand Name:	Lightspeed
Model:	FCHRC
Type of EUT:	Transceiver
Description of EUT:	FLEXCAT Handheld Remote Control
Serial Number:	N/A
FCC ID / IC	ORV-FCHRC / 1732B-FCHRC
Date of Sample Submitted:	October 04, 2011
Date of Test:	October 11, 2011
Report No.:	HK11100126-1
Report Date:	November 30, 2011
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

Lightspeed Technologies Inc.

BRAND NAME: Lightspeed, MODEL: FCHRC

FCC ID: ORV-FCHRC
IC: 1732B-FCHRC

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	Pass
6 dB Bandwidth	15.247(a)(2) / RSS-210 A8.2	Pass
Maximum Power Density	15.247(e) / RSS-210 A8.2	Pass
Out of Band Antenna Conducted Emission	15.247(d) / RSS-210 A8.5	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	Pass
Antenna Requirement	15.203	Pass (See Note 1)
Receiver Radiated Emissions	RSS-210 2.5	Pass

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the previsions of this section.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment under test is a IEEE802.15.4 ZigBee RF4CE transceiver for a Handheld remote control which is operating at 2425MHz, 2450MHz & 2475MHz. Once any button is pressed, it can send a RF signal to the corresponding Base station for RF data transfer.

The key specifications:
Wireless communication with Base Station: RF4CE
Controls: Group speaker selection 1-6; All speaker selection; Microphone mute; Earpiece volume
Registration: push button and LED for registration with base station

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants .

The Certification procedure of transceiver for this transceiver (with FCC ID: ORV-FCCB and IC: 1732B-FCCB) is being processed as the same time of this application.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC and IC.

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The device was powered by a 2.5V NiMH rechargeable battery pack.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The set-up configuration is according to the client's instruction for testing.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by Lightspeed Technologies Inc. will be incorporated in each production model sold/leased in the United States and Canada.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

N/A.

3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

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

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 4950.000 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 3.4 dB

4.0 **Measurement Results**

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

Test Setup:
The antenna power of the EUT was connected to the input of a spectrum analyzer. Cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).

Frequency (MHz)	Maximum Antenna Gain = 2.8 dBi	
	Output in dBm	Output in mWatt
Lowest Channel: 2425.000	-1.73	0.671
Middle Channel: 2450.000	-2.34	0.583
Highest Channel: 2475.000	-3.01	0.500

EUT dBm max. output level = -1.73 dBm (+30 dBm or less)

Cable loss: 0.3 dB

Limit: = 30 dBm

Refer to the following plots for Conducted Output Power.

Plot H1A: Lowest Channel Output Power
Plot H1B: Middle Channel Output Power
Plot H1C: Highest Channel Output Power

For electronic filing, the above plots are saved with filename: maxop.pdf.

For RF Safety, the information is saved with filename: RF exposure.pdf.

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	6 dB Bandwidth (kHz)
2425.000	1616
2450.000	1648
2475.000	1648

Cable loss: 0.3 dB

Limit: at least 500kHz

Refer to the following plots for 6dB bandwidth sharp.

Plot H2A: Lowest Channel 6dB RF bandwidth
Plot H2B: Middle Channel 6dB RF bandwidth
Plot H3C: Highest Channel 6dB RF bandwidth

For electronic filing, the above plots are saved with filename: 6dB.pdf

4.3 Maximum Power Density Reading, FCC Rule 15.247(e)

The spectrum analyzer RES BW was set to 3kHz. In order to look for a peak, the START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs.

Frequency Span = 1.5 MHz

Sweep Time = 500 seconds

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are added to the analyzer raw readings.

Frequency (MHz)	Power Density (dBm/3kHz)
2425.000	-15.45
2450.000	-16.58
2475.000	-16.89

Peak Power Density = -15.45 dBm/3kHz

Cable loss: 0.3 dB

Limit: 8dBm/ 3kHz

Refer to the following plots for Power density data.

Plot H3A: Lowest Channel Power Density
Plot H3B: Middle Channel Power Density
Plot H3C: Highest Channel Power Density

For electronic filing, the above plots are saved with filename: maxpd.pdf

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

The plots showed all spurious emission up to the tenth harmonic. They were found to be at least 20 dB below the highest level of the desired power in the passband.

Refer to the following plots for out of band conducted emissions data:

Plot H4A1 – H4A2: Lowest Channel Emissions
Plot H4B1 – H4B2: Middle Channel Emissions
Plot H4C1 – H4C2: Highest Channel Emissions
Plot H4D1 – H4D2: Modulation Product Emissions

For the electronic filing, the above plots are saved with filename: obantcon.pdf

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The following data list the significant emission frequencies, the limit and the margin of compliance.

Frequency (MHz)	OATS radiated field strength at carrier frequency measured at 3m (dBμV/m)	Attenuation (dBc)	Calculated radiated field strength at the bandage (dBμV/m)
2483.5	Peak		Peak
	98.6	52.37	46.23

Limit:
The average radiated field strength at bandedge should be smaller that 54 dBμV/m and the peak radiated field strength at bandedge should be smaller that 74 dBμV/m. Therefore, the resultant field strength meets the general radiated emission limit in section 15.209.

4.7 Radiated Spurious Emissions

Applicant: Lightspeed Technologies Inc. Date of Test: October 11, 2011
Model: FCHRC
Worst-Case Operating Mode: Tx

Table 1
Radiated Emissions
Pursuant to FCC Part 15 Section 15.247: Emissions Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	4850.000	48.5	33	34.9	50.4	0	50.4	54.0	-3.6
H	7275.000	44.7	33	37.9	49.6	0	49.6	54.0	-4.4
H	9700.000	42.4	33	40.4	49.8	0	49.8	54.0	-4.2
H	12125.000	41.7	33	40.5	49.2	0	49.2	54.0	-4.8
H	14550.000	43.2	33	38.4	48.6	0	48.6	54.0	-5.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	4850.000	48.5	33	34.9	50.4	74.0	-23.6
H	7275.000	44.7	33	37.9	49.6	74.0	-24.4
H	9700.000	42.4	33	40.4	49.8	74.0	-24.2
H	12125.000	41.7	33	40.5	49.2	74.0	-24.8
H	14550.000	43.2	33	38.4	48.6	74.0	-25.4

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000MHz and average limit for frequencies over 1000MHz.

Applicant: Lightspeed Technologies Inc. Date of Test: October 11, 2011
Model: FCHRC
Worst-Case Operating Mode: Tx

Table 2
Radiated Emissions
Pursuant to FCC Part 15 Section 15.247: Emissions Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	4900.000	48.5	33	34.9	50.4	0	50.4	54.0	-3.6
H	7350.000	44.6	33	37.9	49.5	0	49.5	54.0	-4.5
H	9800.000	42.2	33	40.4	49.6	0	49.6	54.0	-4.4
H	12250.000	41.7	33	40.5	49.2	0	49.2	54.0	-4.8
H	14700.000	43.1	33	38.4	48.5	0	48.5	54.0	-5.5

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	4900.000	48.5	33	34.9	50.4	74.0	-23.6
H	7350.000	44.6	33	37.9	49.5	74.0	-24.5
H	9800.000	42.2	33	40.4	49.6	74.0	-24.4
H	12250.000	41.7	33	40.5	49.2	74.0	-24.8
H	14700.000	43.1	33	38.4	48.5	74.0	-25.5

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000MHz and average limit for frequencies over 1000MHz.

Applicant: Lightspeed Technologies Inc. Date of Test: October 11, 2011
Model: FCHRC
Worst-Case Operating Mode: Tx

Table 3
Radiated Emissions
Pursuant to FCC Part 15 Section 15.247: Emissions Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	4950.000	48.7	33	34.9	50.6	0	50.6	54.0	-3.4
H	7425.000	44.3	33	37.9	49.2	0	49.2	54.0	-4.8
H	9900.000	42.1	33	40.4	49.5	0	49.5	54.0	-4.5
H	12375.000	41.8	33	40.5	49.3	0	49.3	54.0	-4.7
H	14850.000	43.0	33	38.4	48.4	0	48.4	54.0	-5.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	4950.000	48.7	33	34.9	50.6	74.0	-23.4
H	7425.000	44.3	33	37.9	49.2	74.0	-24.8
H	9900.000	42.1	33	40.4	49.5	74.0	-24.5
H	12375.000	41.8	33	40.5	49.3	74.0	-24.7
H	14850.000	43.0	33	38.4	48.4	74.0	-25.6

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000MHz and average limit for frequencies over 1000MHz.

Applicant: Lightspeed Technologies Inc. Date of Test: October 11, 2011
Model: FCHRC
Worst-Case Operating Mode: Rx

Table 4
Radiated Emissions
Pursuant to RSS210 Emissions Requirement

Lowest Channel

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2425.000	44.4	33	29.4	40.8	54.0	-13.2
V	4850.000	38.3	33	34.9	40.2	54.0	-13.8
V	7275.000	35.1	33	37.9	40.0	54.0	-14.0
V	9700.000	32.4	33	40.4	39.8	54.0	-14.2
V	12125.000	32.1	33	40.5	39.6	54.0	-14.4

Middle Channel

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2450.000	44.2	33	29.4	40.6	54.0	-13.4
V	4900.000	38.5	33	34.9	40.4	54.0	-13.6
V	7350.000	35.1	33	37.9	40.0	54.0	-14.0
V	9800.000	32.2	33	40.4	39.6	54.0	-14.4
V	12250.000	31.7	33	40.5	39.2	54.0	-14.8

Highest Channel

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2475.000	44.4	33	29.4	40.8	54.0	-13.2
V	4950.000	38.3	33	34.9	40.2	54.0	-13.8
V	7425.000	35.2	33	37.9	40.1	54.0	-13.9
V	9900.000	32.4	33	40.4	39.8	54.0	-14.2
V	12375.000	32.0	33	40.5	39.5	54.0	-14.5

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

6.0 Product Labelling

For electronics filing, the FCC ID and IC label artwork and the label location are saved with filename: label.pdf.

7.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States and Canada.

9.0 Discussion Pulse Desensitivity

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

9.1 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

9.2 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003. A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

9.2 **Emissions Test Procedures (cont'd)**

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

10.0 **Confidentiality Request**

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

11.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2500	EW-0954	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Jan. 25, 2011	Apr. 14, 2010	Apr. 26, 2010
Calibration Due Date	Jan. 25, 2012	Oct. 14, 2011	Oct. 26, 2011

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2253	EW-1133
Manufacturer	R&S	EMCO
Model No.	FSP40	3115
Calibration Date	Nov. 23, 2010	Mar. 02, 2011
Calibration Due Date	Nov. 23, 2011	Sep. 02, 2012

2) Bandedge Measurement

Equipment	Spectrum Analyzer 30GHz
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Oct. 22, 2010
Calibration Due Date	Oct. 22, 2011