

# ENGINEERING TEST REPORT



**Fingerprint Reader**  
**Model No.: 4GFXLSO**  
**FCC ID: QC4-4GFXLSO**

*Applicant:*

**Bioscrypt, Inc.**  
50 Acadia Avenue, Suite 200  
Markham, Ontario  
Canada L3R 0B3

*In Accordance With*

**Federal Communications Commission (FCC)**  
**Part 15, Subpart C**  
**Unlicensed Low Power Transmitter Operating in the Band 13.110-14.010 MHz**

**UltraTech's File No.: MYT-173F15C225**

This Test report is Issued under the Authority of  
Tri M. Luu  
Vice President of Engineering  
UltraTech Group of Labs

Date: June 7, 2011

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: June 7, 2011

Test Dates: May 2 ~ 16, 2011

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

## UltraTech

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FCC

91038



1309



Approved Test Facility

46390-2049



NVLap Lab Code 200093-0



SL2-IN-E-1119R



CA2049

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## EXHIBIT 1. INTRODUCTION

### 1.1. SCOPE

<b>Reference:</b>	FCC Part 15, Subpart C, Sec. 15.225 - Operation within the band 13.110 – 14.010 MHz.
<b>Title:</b>	Code of Federal Regulations (CFR), Title 47 Telecommunication, Part 15, Subpart C - Intentional Radiators
<b>Purpose of Test:</b>	To gain FCC Certification Authorization for Section 15.225 - Operation within the Band 13.110 - 14.010 MHz.
<b>Test Procedures:</b>	American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
<b>Environmental Classification:</b>	Commercial, industrial or business environment

### 1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

### 1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2010	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2003 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances

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## ULTRATECH GROUP OF LABS

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File #: MYT-173F15C225

June 7, 2011

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

## EXHIBIT 2. PERFORMANCE ASSESSMENT

### 2.1. CLIENT INFORMATION

APPLICANT	
<b>Name:</b>	Bioscrypt, Inc.
<b>Address:</b>	50 Acadia Avenue, Suite 200 Markham, Ontario Canada L3R 0B3
<b>Contact Person:</b>	Shiraz Kapadia Phone #: 905-940-7750 Fax #: 905-940-7642 Email Address: SKapadia@L1ID.com

MANUFACTURER	
<b>Name:</b>	Knight Wah Technology Ltd.
<b>Address:</b>	Unit 16 - 19, 3/F Tower B, Regent Centre, 63-73 Wo Yi Hop Road, Kwai Chung, N. T. Hong Kong
<b>Contact Person:</b>	Y.H. Chan Phone #: (852) 2619 0162 Fax #: (852) 2619 0132 Email Address: yhchan@knightwah.com

### 2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

<b>Brand Name:</b>	Bioscrypt, Inc.
<b>Product Name:</b>	Fingerprint Reader
<b>Model Name or Number:</b>	4GFXL50
<b>Serial Number:</b>	Test sample
<b>Type of Equipment:</b>	Low Power Communication Device Transmitter
<b>Input Power Supply Type:</b>	12 VDC to 24 VDC
<b>Primary User Functions of EUT:</b>	Enroll, verification, communication output

**2.3. EUT’S TECHNICAL SPECIFICATIONS**

<b>Transmitter</b>	
<b>Equipment Type:</b>	Mobile
<b>Intended Operating Environment:</b>	Commercial, light industry & heavy industry
<b>Power Supply Requirement:</b>	4.25-5.75 VDC (HID)
<b>Field Strength:</b>	41.07 dBµV/m at 10 m
<b>Operating Frequency Range:</b>	13.56 MHz
<b>RF Output Impedance:</b>	50 Ω
<b>20 dB Bandwidth:</b>	3.89 kHz
<b>Modulation Type:</b>	ASK
<b>Oscillator Frequencies:</b>	13.56 MHz
<b>Antenna Connector Type:</b>	Integral

**2.4. LIST OF EUT’S PORTS**

Port Number	EUT’s Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Ethernet 100-Base TX	1	Header	Non shielded
2	Host RS-485	1	Header	Non shielded
3	Power	1	Header	Non shielded
4	Wiegand I/O (5 Lines)	1	Header	Non shielded
5	General Purpose I/O (2 Inputs & 2 Outputs)	1	Header	Non shielded
6	Relay Control (NC, NO & COM)	1	Header	Non shielded
7	*USB OTG ( Auxiliary Port)	1	USB-Micro-AB	Shielded

\* Used for service by administrator only and secured by a security door.

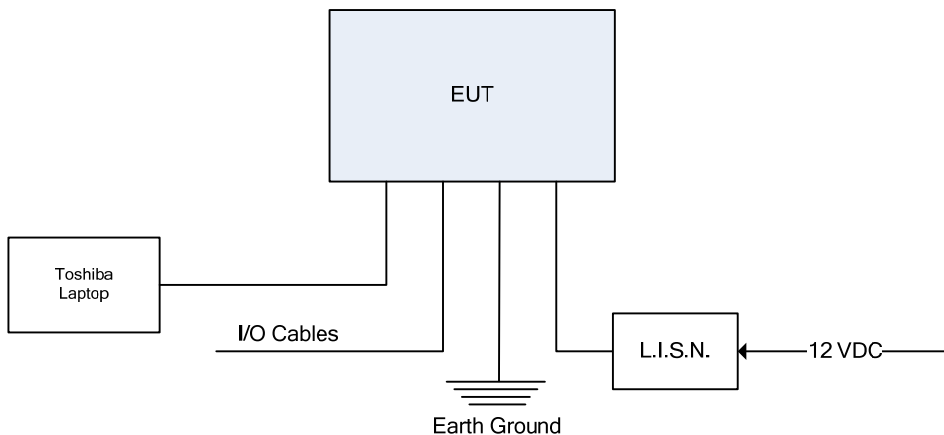
**2.5. ANCILLARY EQUIPMENT**

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

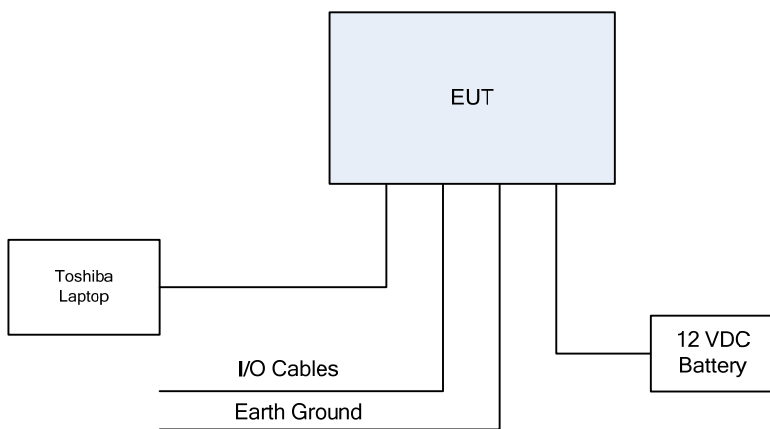
<b>Ancillary Equipment # 1</b>	
Description:	Laptop
Brand Name:	Toshiba
Model Name or Number:	SATELLITE
Serial Number:	1027387 CU
Cable Length & Type:	> 3 m, Non-shielded
Connected to EUT’s Port:	Ethernet

## 2.6. GENERAL TEST SETUP

### 2.6.1. Power Line Conducted Emission Test Setup



### 2.6.2. Radiated Emission Test Setup



**EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS**

**3.1. CLIMATE TEST CONDITIONS**

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	12 VDC

**3.2. OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS**

<b>Operating Modes:</b>	The EUT was configured for continuous transmission for the duration of testing.
<b>Special Test Software:</b>	N/A
<b>Special Hardware Used:</b>	N/A
<b>Transmitter Test Antenna:</b>	The EUT was tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

<b>Transmitter Test Signals:</b>	
<b>Frequency:</b>	13.56 MHz
<b>Transmitter Wanted Output Test Signals:</b>	
▪ RF Power Output (measured maximum output power):	41.07 dBµV/m at 10 m
▪ Normal Test Modulation:	ASK
▪ Modulating signal source:	Internal

## EXHIBIT 4. SUMMARY OF TEST RESULTS

### 4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2014-04-04.

### 4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Regulations	Test Requirements	Compliance (Yes/No)
15.203 & 15.204	The transmitter shall use a transmitting antenna that is an integral part of the device	Yes
15.215(c)	Emission Bandwidth	Yes
15.225(a) – (d)	Field Strength of Emissions Inside and Outside the Permitted Band 13.110 - 14.010 MHz	Yes
15.225(e)	Frequency Stability	Yes
15.107 & 15.207	Class B - Power Line Conducted Emissions	Yes

### 4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

#### Ferrite material added outside device on cables:

4G V-Flex Lite required the addition of a Steward Ferrite P/N: 28A2432-0A2, requiring 3 turns on the Ethernet lines.



## EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

### 5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4-2003 and ULTR-P001-2004.

### 5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement. Refer to Exhibit 7 for Measurement Uncertainties.

### 5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4-2003 and CISPR 16-1-1.

### 5.4. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	
15.203	<p>Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.</p> <p>The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed:</p> <ul style="list-style-type: none"><li>• The application (or intended use) of the EUT</li><li>• The installation requirements of the EUT</li><li>• The method by which the EUT will be marketed</li></ul>	Integral PCB antenna
15.204	<p>Provided the information for every antenna proposed for use with the EUT:</p> <p>(a) type (e.g. Yagi, patch, grid, dish, etc...), (b) manufacturer and model number (c) gain with reference to an isotropic radiator</p>	Only furnished integral antenna will be used in the EUT.

**5.5. EMISSION BANDWIDTH**

**5.5.1. Limits**

The 20 dB bandwidth of the emission shall be contained within the band 13.110–14.010 MHz.

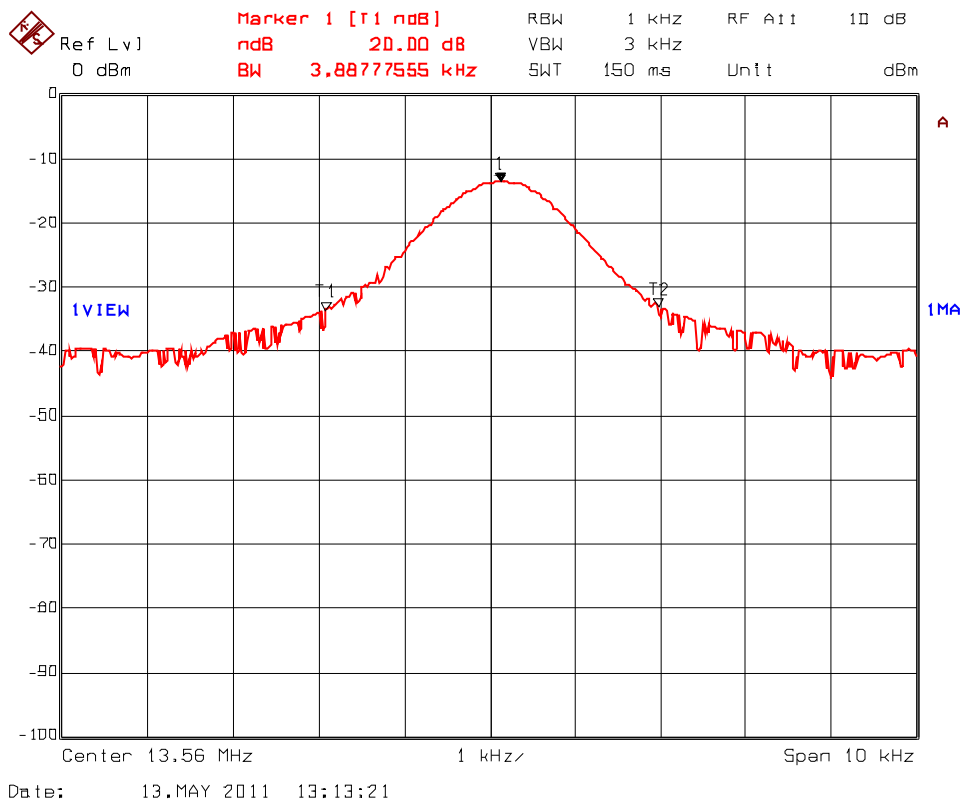
**5.5.2. Method of Measurements**

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4-2003 for measurement methods

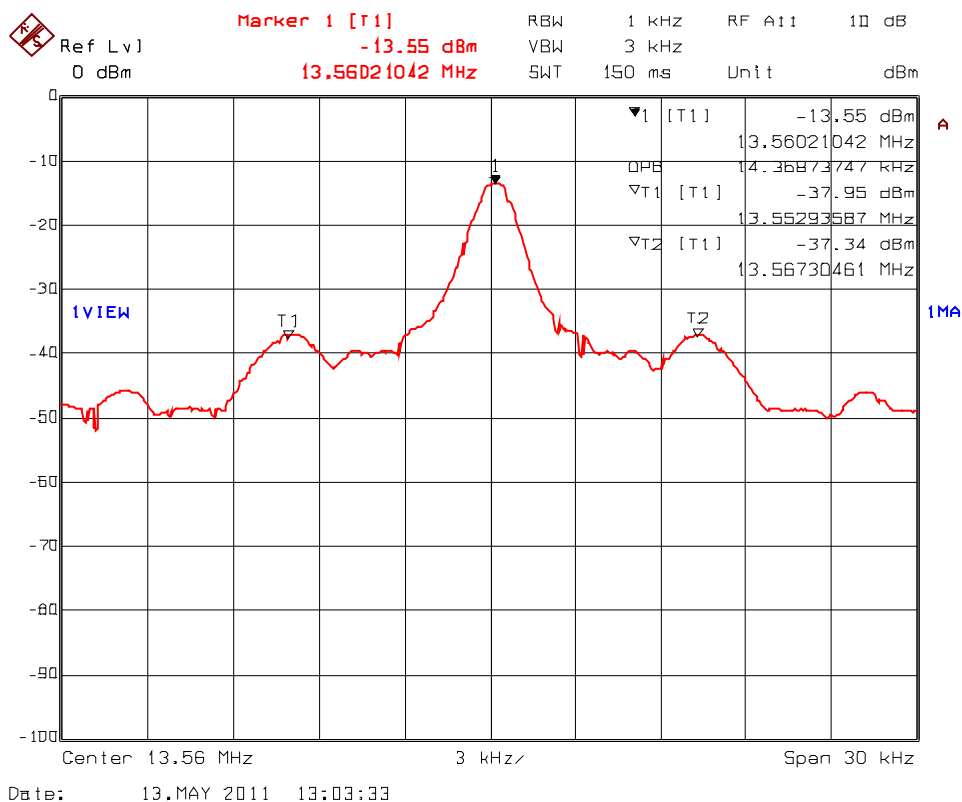
**5.5.3. Test Data**

Test Frequency (MHz)	Occupied Bandwidth (kHz)	
	20 dB BW	99 % BW
13.56	3.89	14.37

**Plot 5.5.3.1. 20 dB Bandwidth**  
 Test Frequency: 13.56 MHz



**Plot 5.5.3.2 99% Occupied Bandwidth**  
 Test Frequency: 13.56 MHz



**5.6. FIELD STRENGTH OF EMISSIONS WITHIN & OUTSIDE THE PERMITTED BAND 13.110-14.010 MHz [47 CFR 15.225 (a) to (d)]**

**5.6.1. Limits**

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

**47 CFR 15.209(a) – Radiated Emission Limits; general requirements**

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

**5.6.2. Method of Measurements**

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4-2003 for measurement methods

**5.6.3. Test Data**

**Remarks:**

- Radiated spurious emissions measurements were performed at a measuring distance of 10 m (for frequencies below 30 MHz) and 3 m (for frequencies at or above 30 MHz), from 10 kHz – 10<sup>th</sup> harmonic of the fundamental and all spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- For frequencies below 30 MHz, the results measured at 10 m distance shall be extrapolated to the specified distance using an extrapolation factor of 40 dB/decade for determining compliance.

**5.6.3.1. Field Strength of Emissions Within the Permitted Band at 10 m**

Frequency (MHz)	Measured Field Strength @ 10 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m)	§ 15.225 Field Strength Limits (dBµV/m)	Margin (dB)
13.56	41.07	Peak	V	22.0	84.0	-62.0
13.56	32.91	Peak	H	13.8	84.0	-70.2

**5.6.3.2. Field Strength of Emissions Outside the Permitted Band Below 30 MHz at 10 m**

Frequency (MHz)	Measured Field Strength @ 10 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
All spurious emissions are more than 20 dB below the specified limit.						

**5.6.3.3. Field Strength of Emissions Outside the Permitted Band at or Above 30 MHz at 3 m**

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
40.68	24.31	Peak	V	40.0	-15.7
54.24	22.80	Peak	V	40.0	-17.2
67.80	21.25	Peak	V	40.0	-18.8
81.36	22.75	Peak	V	40.0	-17.3
122.04	28.17	Peak	V	43.5	-15.3
135.60	32.32	Peak	V	43.5	-11.2

**5.7. FREQUENCY STABILITY [47 CFR 15.225(e)]**

**5.7.1. Limits**

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**5.7.2. Method of Measurements**

ANSI C63.4-2003.

**5.7.3. Test Data**

<b>Frequency Band:</b>	13.56 MHz
<b>Center Frequency:</b>	13.56 MHz
<b>Frequency Tolerance Limit:</b>	± 0.01% (±1356 Hz)
<b>Max. Frequency Tolerance Measured:</b>	+443 Hz
<b>Input Voltage Rating:</b>	12-24 VDC on DC input

Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 12 VDC	Supply Voltage (85 % of Nominal) 10.2 VDC	Supply Voltage (115% of Nominal) 27.6 VDC
-30	-125	--	--
-20	-105	--	--
-10	-95	--	--
0	-60	--	--
+10	-40	--	--
+20	0	0	0
+30	+40	--	--
+40	+180	--	--
+50	+313	--	--
+60	+443	--	--

**5.8. POWER LINE CONDUCTED EMISSIONS [47 CFR 15.107(a) & 15.207]**

**5.8.1. Limits**

The equipment shall meet the limits of the following table:

Test Frequency Range (MHz)	Class B Limits (dBµV)		Measuring Bandwidth
	Quasi-Peak	Average	
0.15 to 0.5	66 to 56*	56 to 46*	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
0.5 to 5	56	46	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
5 to 30	60	50	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average

\* Decreasing linearly with logarithm of frequency

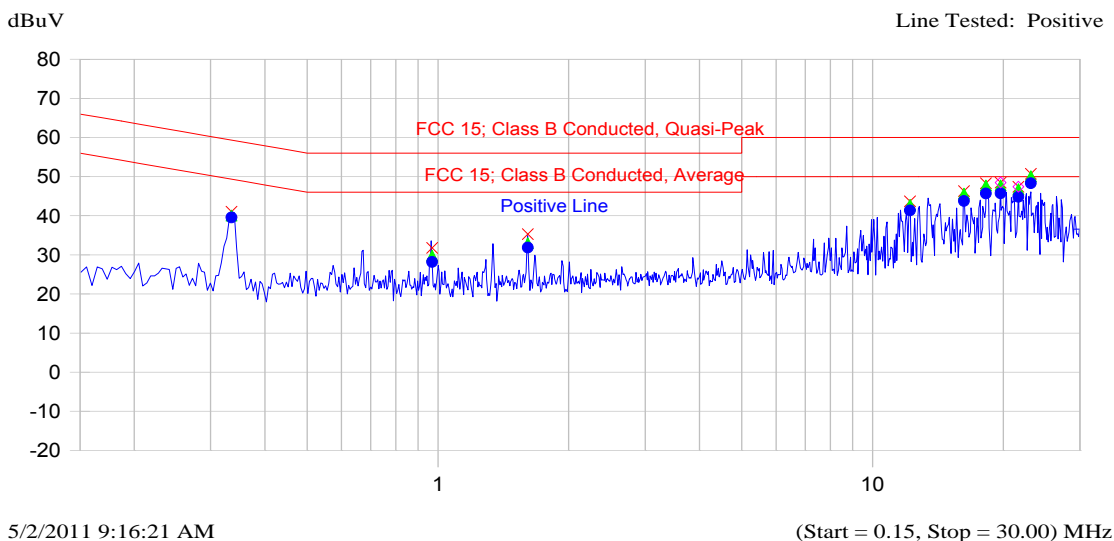
**5.8.2. Method of Measurements**

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4-2003 for measurement methods

5.8.3. Test Data

**Plot 5.8.3.1. Power Line Conducted Emission**  
 Line Voltage: 12 VDC  
 Line Tested: Positive

Current Graph



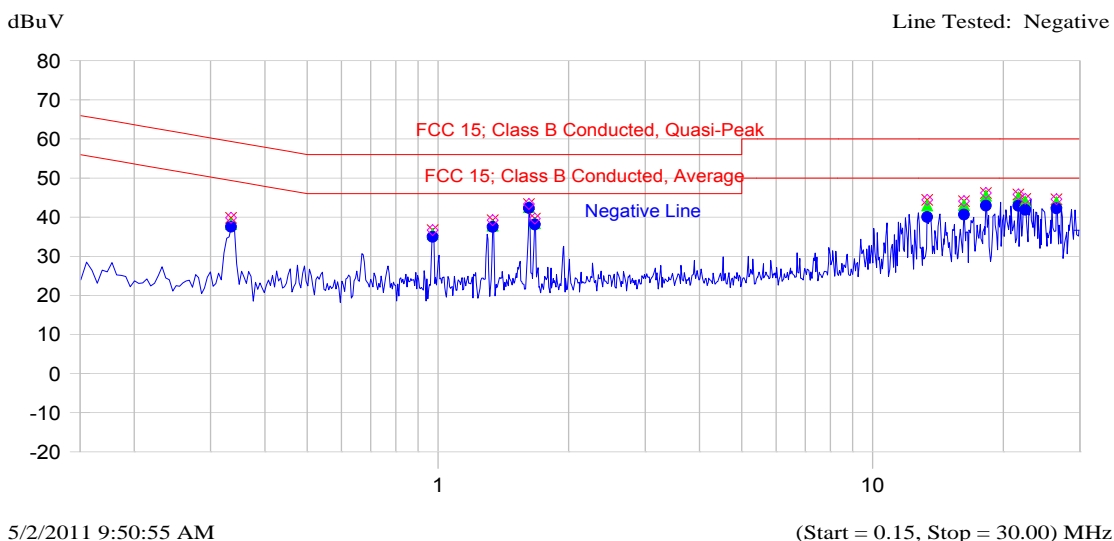
Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.335	41.0	40.1	-20.6	39.5	-11.1	Positive Line
0.969	31.8	29.8	-26.2	28.2	-17.8	Positive Line
1.609	35.3	32.9	-23.1	31.8	-14.2	Positive Line
12.197	43.7	42.8	-17.2	41.3	-8.7	Positive Line
16.226	46.3	45.6	-14.4	43.7	-6.3	Positive Line
18.242	48.3	47.7	-12.3	45.7	-4.3	Positive Line
23.127	50.7	50.1	-9.9	48.3	-1.7	Positive Line
19.708	48.4	47.8	-12.2	45.7	-4.3	Positive Line
21.662	47.4	46.8	-13.2	44.8	-5.2	Positive Line



**Plot 5.8.3.2. Power Line Conducted Emission**  
 Line Voltage: 12 VDC  
 Line Tested: Negative

**Current Graph**



**Current List**

Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.334	39.8	38.2	-22.4	37.5	-13.1	Negative Line
0.973	36.7	35.7	-20.3	35.0	-11.0	Negative Line
1.337	39.2	37.8	-18.2	37.5	-8.5	Negative Line
1.620	43.4	42.6	-13.4	42.3	-3.7	Negative Line
1.671	39.6	38.4	-17.6	38.1	-7.9	Negative Line
13.357	44.4	43.0	-17.0	40.1	-9.9	Negative Line
16.228	44.1	43.1	-16.9	40.6	-9.4	Negative Line
18.243	46.2	45.5	-14.5	42.9	-7.1	Negative Line
21.661	45.8	45.1	-14.9	42.9	-7.1	Negative Line
22.456	44.7	44.0	-16.0	41.9	-8.1	Negative Line
26.485	44.6	43.8	-16.2	42.3	-7.7	Negative Line

**EXHIBIT 6. TEST EQUIPMENT LIST**

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Agilent	E7401A	US40240432	9 kHz – 1.5 GHz	10 Jan 2012
L.I.S.N.	EMCO	3825/2R	1165	10 kHz – 30 MHz	08 Apr 2012
Transient Limiter	Pasternack	PE7010-20	--	DC – 2 GHz 20 dB attenuation	18 Jan 2012
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	15 Mar 2012
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	15 Mar 2012
Horn Antenna	EMCO	3115	5955	1 – 18 GHz	09 Jan 2012
Biconi-Log Antenna	EMCO	3142C	00026873	26 – 3000 MHz	26 Apr 2012
Loop Antenna	EMCO	6502	9104-2611	10 kHz – 30 MHz	08 Aug 2011
Semi-Anechoic Chamber	TDK	FCC: 91038 IC: 2049A-3	--	--	04 Apr 2014
Temperature & Humidity Chamber	Tenney	T5	9723B	-40°C - +80°C range	13 Sep 2011

**ULTRATECH GROUP OF LABS**

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File #: MYT-173F15C225  
June 7, 2011

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

**EXHIBIT 7. MEASUREMENT UNCERTAINTY**

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

**7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY**

	Line Conducted Emission Measurement Uncertainty (150 kHz – 30 MHz):	Measured	Limit
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	<b>± 1.57</b>	<b>± 1.8</b>
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	<b>± 3.14</b>	<b>± 3.6</b>

**7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY**

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured	Limit
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	<b>± 2.15</b>	<b>± 2.6</b>
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	<b>± 4.30</b>	<b>± 5.2</b>

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured	Limit
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	<b>± 2.39</b>	<b>± 2.6</b>
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	<b>± 4.78</b>	<b>± 5.2</b>

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured	Limit
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	<b>± 1.87</b>	Under consideration
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	<b>± 3.75</b>	Under consideration