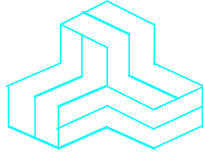


# ENGINEERING TEST REPORT



**NOIRE510**  
**Model: NOIRE510C**  
**FCC ID: COL-NOIRE510C**

*Applicant:*

**NBS Payment Solutions Inc.**  
703 Evans Ave., Suite 400  
Toronto, Ontario  
Canada M9C 5E9

***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.: MIS-103F15C225**

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

Date: November 1, 2013

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: November 1, 2013

Test Dates: August 9 -13, 2013

- *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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Tel.: (905) 829-1570 Fax.: (905) 829-8050

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FCC

91038



1309



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, Section 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>	Equipment Certification for Devices in 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	2013	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	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

## EXHIBIT 2. PERFORMANCE ASSESSMENT

### 2.1. CLIENT INFORMATION

APPLICANT	
<b>Name:</b>	NBS Payment Solutions Inc.
<b>Address:</b>	703 Evans Ave., Suite 400 Toronto, ON Canada M9C 5E9
<b>Contact Person:</b>	Mr. Eric Babbit Phone #: 416-621-7410 x567 Fax #: 416-621-2450 Email Address: ebabbitt@nbsps.com

MANUFACTURER	
<b>Name:</b>	NBS Payment Solutions Inc.
<b>Address:</b>	703 Evans Ave., Suite 400 Toronto, ON Canada M9C 5E9
<b>Contact Person:</b>	Mr. Eric Babbit Phone #: 416-621-7410 x567 Fax #: 416-621-2450 Email Address: ebabbitt@nbsps.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>	NBS Payment Solutions Inc.
<b>Product Name:</b>	NOIRE510
<b>Model Name or Number:</b>	NOIRE510C
<b>Serial Number:</b>	Test sample
<b>Type of Equipment:</b>	Low Power Communication Device Transmitter
<b>Input Power Supply Type:</b>	9 VDC from AC/DC adapter
<b>Primary User Functions of EUT:</b>	Point of Sale credit/debit financial transactions

**2.3. EUT’S TECHNICAL SPECIFICATIONS**

<b>Transmitter</b>	
<b>Equipment Type:</b>	Portable
<b>Intended Operating Environment:</b>	Commercial, light industry & heavy industry
<b>Power Supply Requirement:</b>	9VDC/5A
<b>Field Strength:</b>	57.14 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>	1.35 kHz
<b>Modulation Type:</b>	ASK
<b>Oscillator Frequencies:</b>	27.12 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	USB	1	PCB	Shielded

**2.5. ANCILLARY EQUIPMENT**

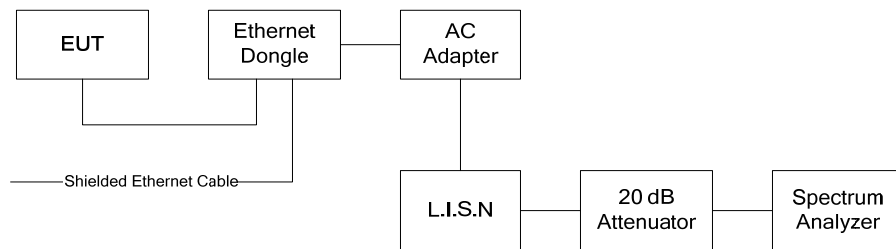
The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

<b>Ancillary Equipment # 1</b>	
Description:	AC/DC Power Adapter
Brand name:	FSP Group Inc.
Model Name or Number:	FSP040-DGAA2
Connected to EUT’s Port:	Dongle Power Port

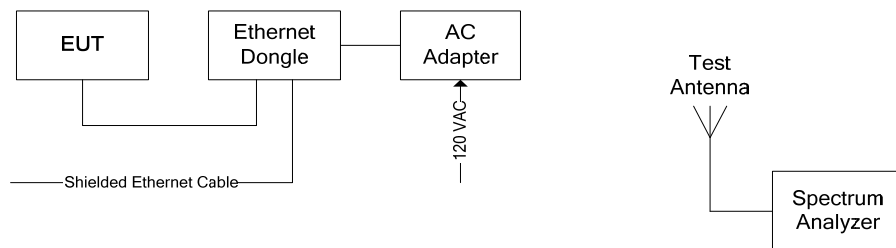
<b>Ancillary Equipment # 2</b>	
Description:	1-Port Ethernet Dongle (NBS)
Brand name:	NBS Payment Solutions Inc.
Model Name or Number:	NOIRE020E
Connected to EUT’s Port:	USB port

## 2.6. TEST SETUP

### Power Line Conducted Emission



### Radiated Emission



### 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 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	9 VDC from AC adapter

#### 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):	57.14 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.

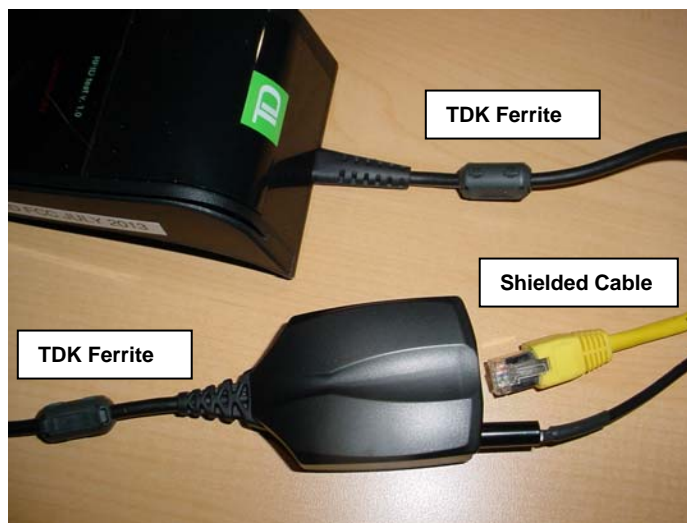
- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI 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

- 1) TDK Ferrite Part number ZCAT13250530 shall be clamped on dongle cable at both ends.
- 2) Shielded Ethernet cable shall be used.



## ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4  
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: [vic@ultratech-labs.com](mailto:vic@ultratech-labs.com), Website: <http://www.ultratech-labs.com>

File #: MIS-103F15C225  
November 1, 2013

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



**EXHIBIT 5. TEST DATA**

**5.1. EMISSION BANDWIDTH [§15.215(c)]**

**5.1.1. Limits**

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

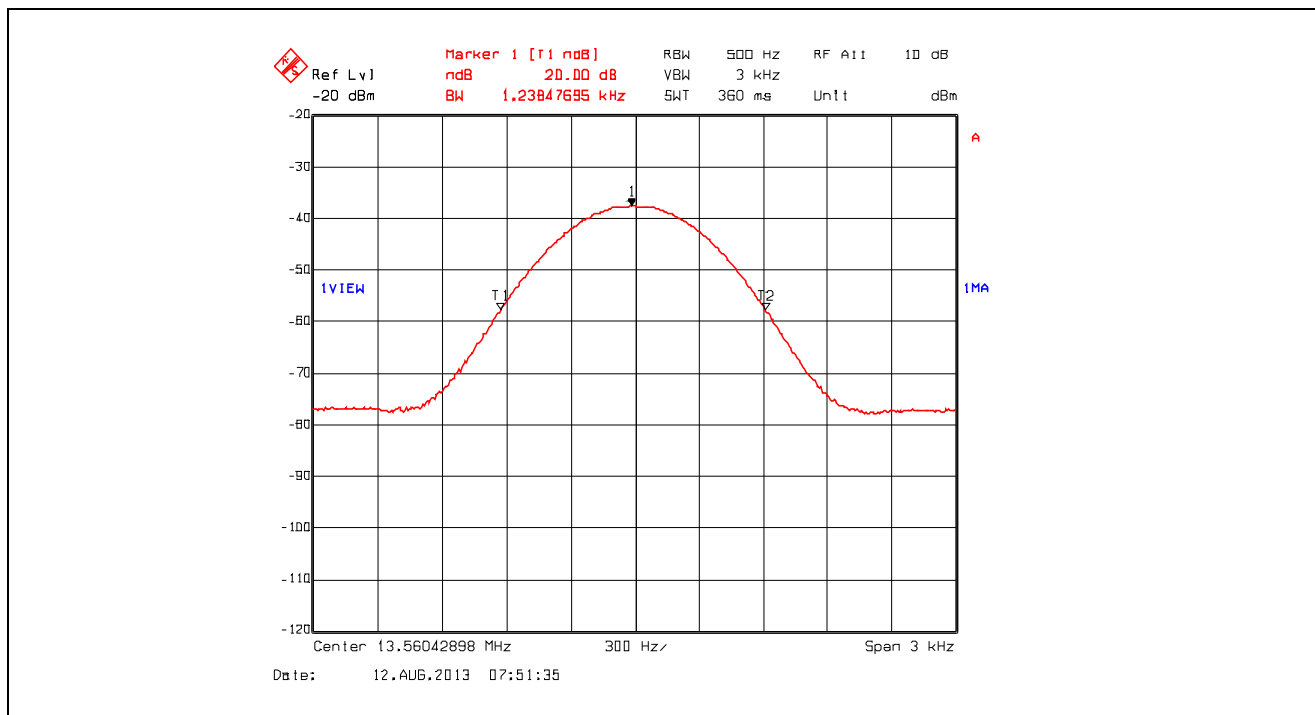
**5.1.2. Method of Measurements**

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

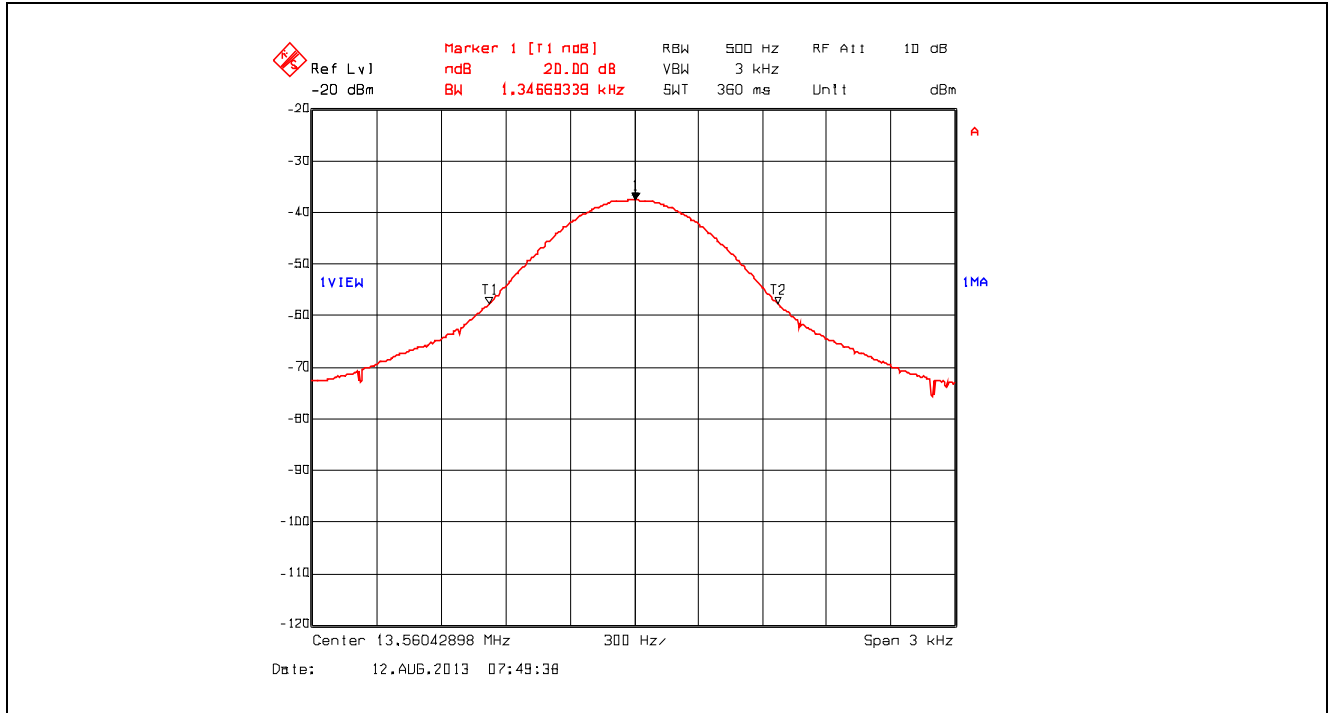
**5.1.3. Test Data**

Test Frequency (MHz)	Modulation Type	Occupied Bandwidth (kHz)	
		20 dB BW	99 % BW
13.56	ISO14443A (AM, 100%)	1.24	1.05
13.56	ISO14443B (AM, 10%)	1.35	1.20

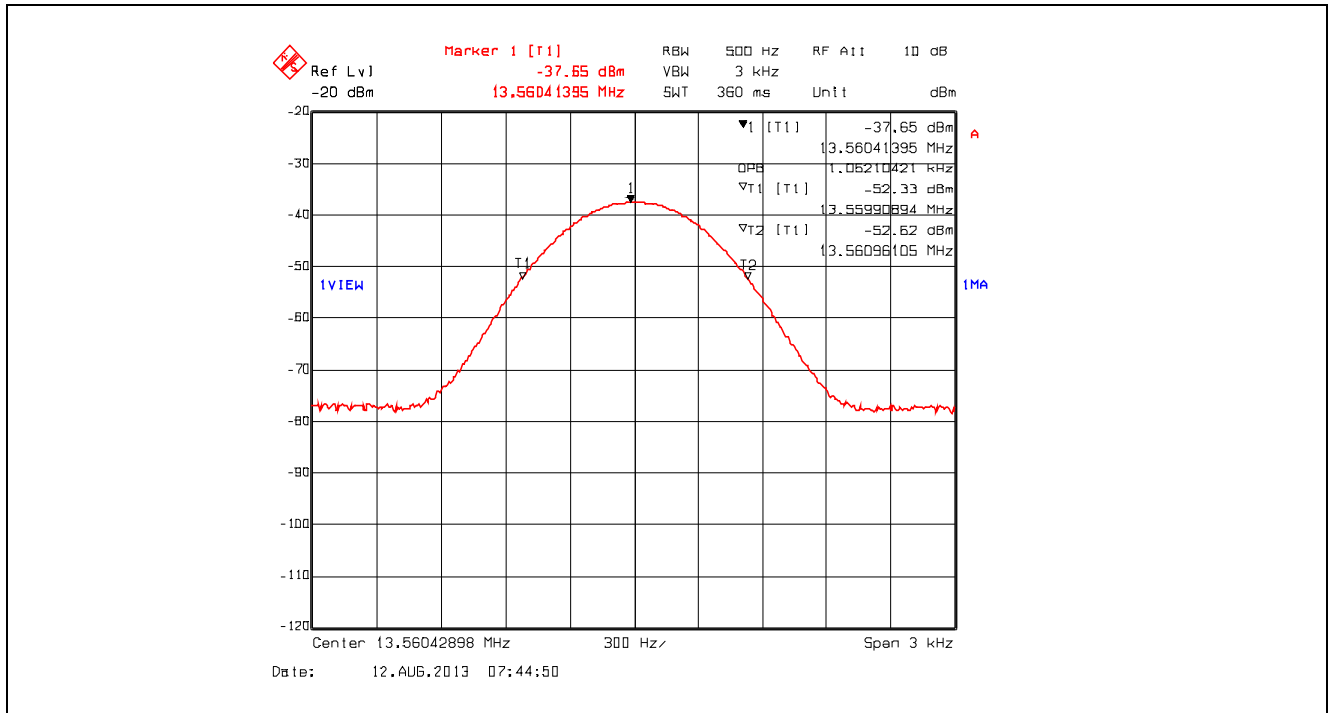
**Plot 5.1.3.1.** 20 dB Emission Bandwidth, 13.56 MHz, Modulation: ISO14443A (AM, 100%)



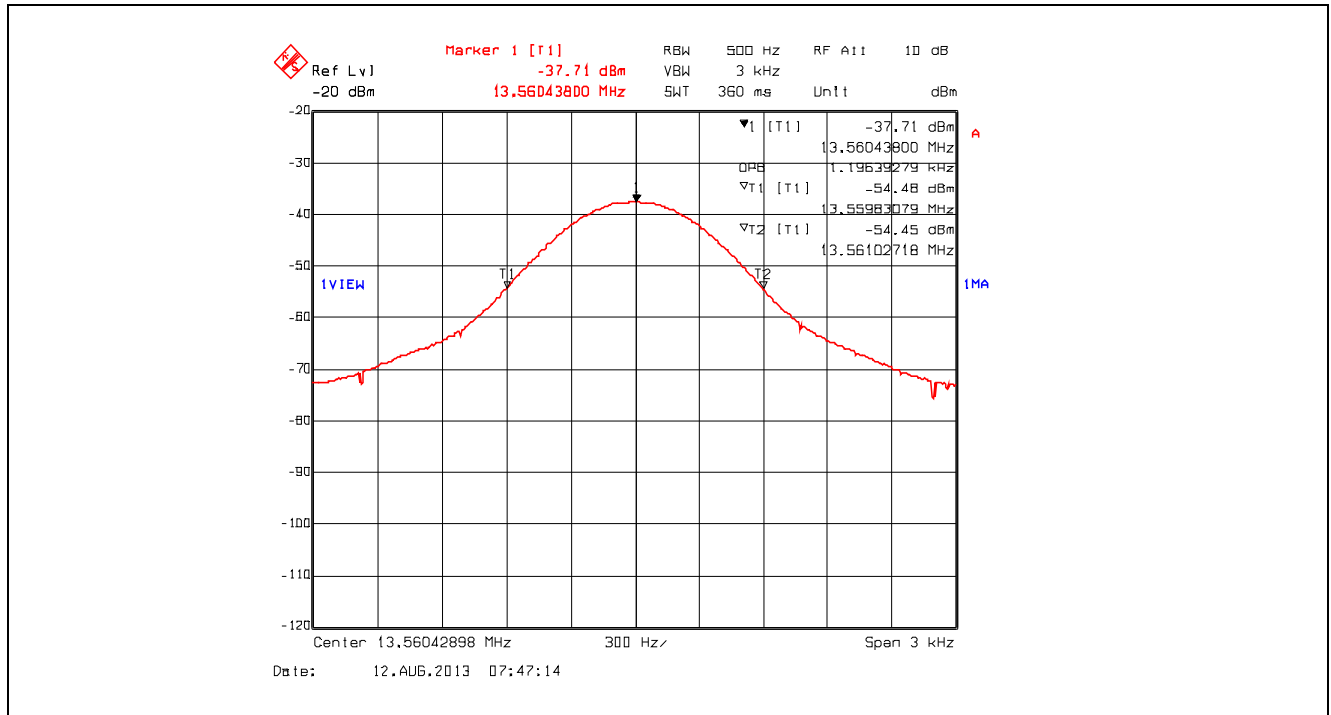
Plot 5.1.3.2. 20 dB Emission Bandwidth, 13.56 MHz, Modulation: ISO14443B (AM, 10%)



Plot 5.1.3.3. 99% Occupied Bandwidth, 13.56 MHz, Modulation: ISO14443A (AM, 100%)



Plot 5.1.3.4. 99% Occupied Bandwidth, 13.56 MHz, Modulation: ISO14443B (AM, 10%)



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

**5.2.1. 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

**5.2.2. Method of Measurements**

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

**5.2.3. 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 or the range applicable to the digital device, whichever is the higher frequency range 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.

**5.2.3.1. 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	57.14	Peak	V	38.1	84.0	-45.9
13.56	51.24	Peak	H	32.2	84.0	-51.8

**5.2.3.2. 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.						

**5.2.3.3. 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	36.03	Peak	V	40.0	-4.0
40.68	25.88	Peak	H	40.0	-14.1
54.24	29.48	Peak	V	40.0	-10.5
67.80	28.20	Peak	V	40.0	-11.8
67.80	20.16	Peak	H	40.0	-19.8
108.48	33.22	Peak	V	43.5	-10.3
135.60	32.28	Peak	V	43.5	-11.2
135.60	30.02	Peak	H	43.5	-13.5

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

**5.3.1. 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.

**5.3.2. Method of Measurements**

ANSI C63.4.

**5.3.3. 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>	-110 Hz
<b>Input Voltage Rating:</b>	120 VAC

Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage 120 VAC	Supply Voltage 100 VAC	Supply Voltage 240 VAC
-30	-50	N/A	N/A
-20	-10	N/A	N/A
-10	10	N/A	N/A
0	20	N/A	N/A
10	-10	N/A	N/A
20	0	0	-30
30	-50	N/A	N/A
40	-110	N/A	N/A
50	-110	N/A	N/A

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

**5.4.1. Limits**

The equipment shall meet the limits of the following table:

Frequency of emission (MHz)	Class B Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....	66 to 56* .....	56 to 46*
0.5–5 .....	56 .....	46
5–30 .....	60 .....	50

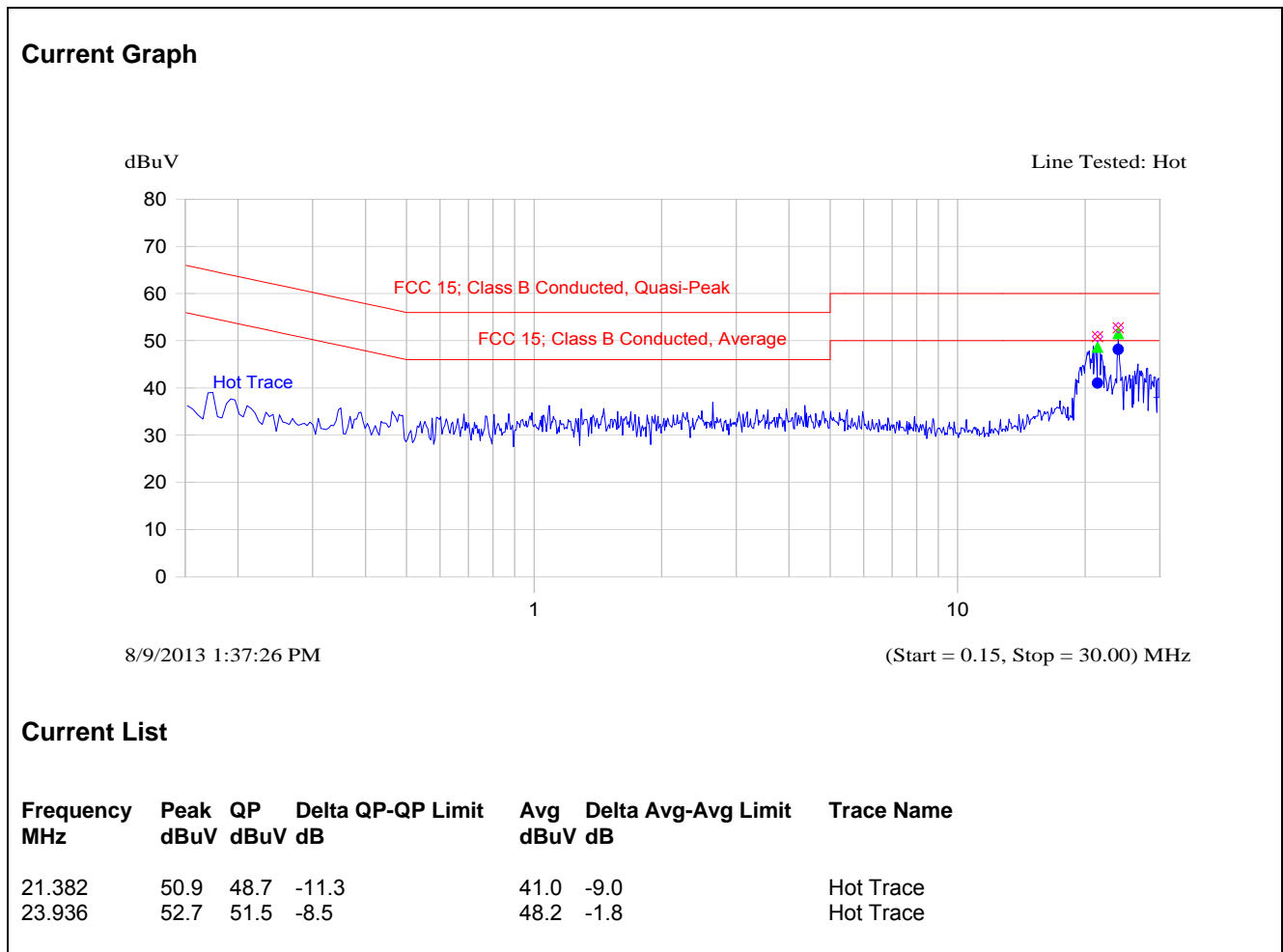
\* Decreases linearly with logarithm of the frequency

**5.4.2. Method of Measurements**

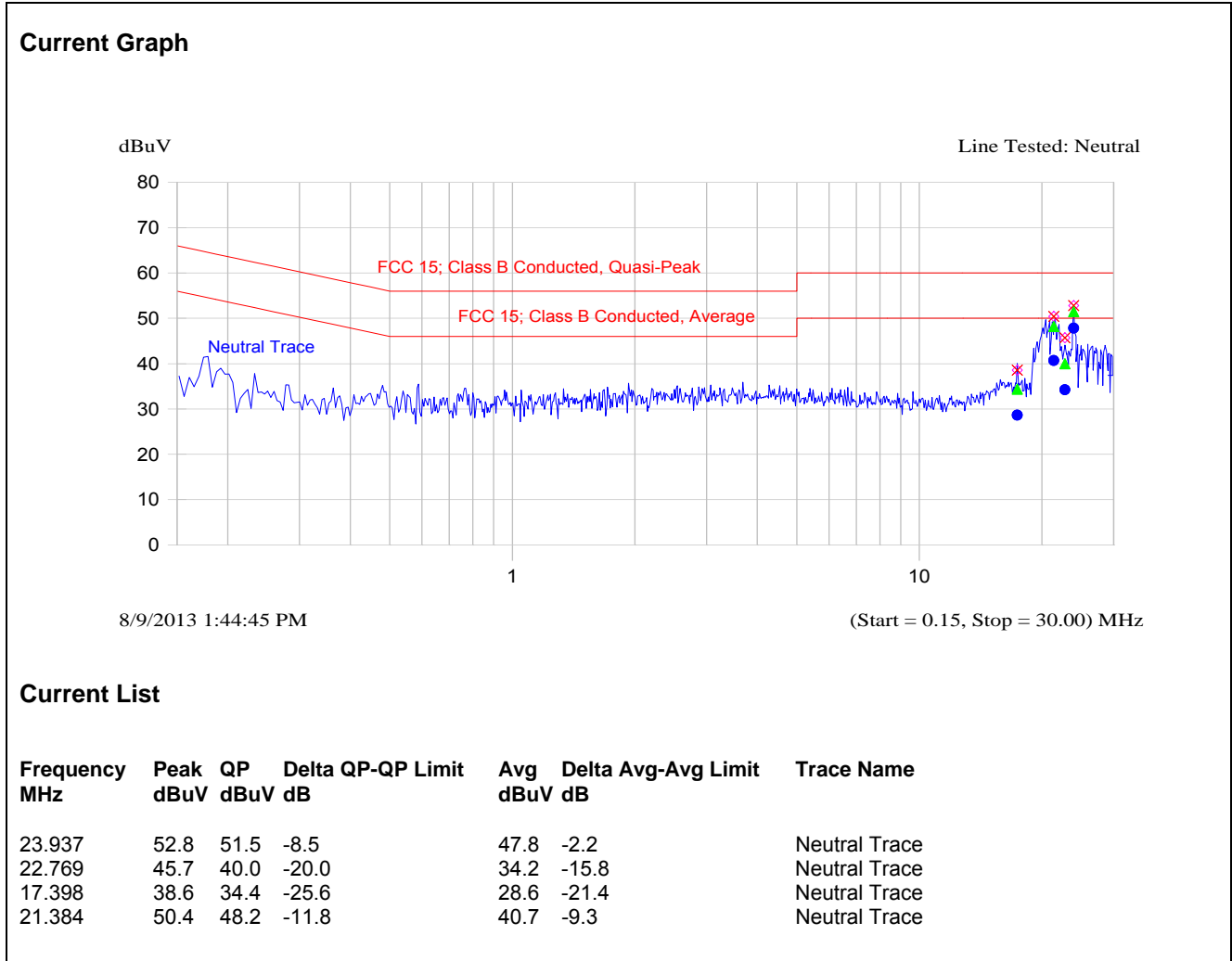
Refer to Ultratech Test Procedures, File # ULTR P001 and ANSI C63.4 for measurement methods

**5.4.3. Test Data**

**Plot 5.4.3.1.** Power Line Conducted Emissions, Voltage: 120 VAC, Line Tested: Hot



Plot 5.4.3.2. Power Line Conducted Emissions, Voltage: 120 VAC, Line Tested: Neutral





**EXHIBIT 6. TEST EQUIPMENT LIST**

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	02 Nov 2013
Loop Antenna	EMCO	6502	9104-2611	10 kHz – 30 MHz	26 Aug 2013
EMC Analyzer	Agilent	E7401A	US40240432	9KHz-1.5GHz	19 Jun 2014
Antenna	EMCO	6502	9104-2611	10KHz-30MHz	26 Aug 2013
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	07 Mar 2014
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	25 Mar 2014
Biconi-Log Antenna	ETS Lindgren	3142C	00034792	26 – 3000 MHz	26 Jun 2014
Horn Antenna	ETS Lindgren	3155	5955	1 – 18 GHz	07 Mar 2014
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 °C	16 Apr 2014
Spectrum Analyzer	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz	06 Feb 2014
Transient Limiter	Pasternack	PE7010-20	N/A	DC - 2 GHz	11 Jan 2014
LISN	EMCO	3825/2	8907-1531	10 kHz – 100 MHz	14 May 2014

**ULTRATECH GROUP OF LABS**

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File #: MIS-103F15C225  
November 1, 2013

*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 (9 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>± 1.44</b>	<b>± 1.8</b>
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	<b>± 2.89</b>	<b>± 3.6</b>

**7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY**

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
<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>± 4.79</b>	<b>± 5.2</b>

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
<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 (dB)	Limit (dB)
<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>	<b>Under consideration</b>
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	<b>± 3.75</b>	<b>Under consideration</b>