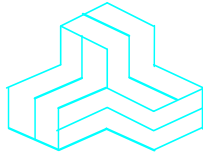


ENGINEERING TEST REPORT



Onsight Rugged Smart Camera
Model: 5000HD
FCC ID: T78-5000HD

Applicant:

Librestream Technologies Inc.
Suite 110, 895 Waverley St.
Winnipeg, MB
Canada R3T 5P4

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.: 17LIBT073_FCC15C225

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

Date: March 6, 2017

Report Prepared by: Dan Huynh

Tested by: Wei Wu

Issued Date: March 6, 2017

Test Date(s): January 24-27, 2017
February 2 & March 3, 2017

- *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 any agency of the US Government.*
- *This test report shall not be reproduced, except in full, without a written approval from UltraTech*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com



91038



1309



46390-2049



AT-1945



SL2-IN-E-1119R



Korea
KCC-RRR
CA2049

TABLE OF CONTENTS

EXHIBIT 1.	INTRODUCTION.....	1
1.1.	SCOPE	1
1.2.	RELATED SUBMITTAL(S)/GRANT(S)	1
1.3.	NORMATIVE REFERENCES	1
EXHIBIT 2.	PERFORMANCE ASSESSMENT.....	2
2.1.	CLIENT INFORMATION	2
2.2.	EQUIPMENT UNDER TEST (EUT) INFORMATION	2
2.3.	EUT'S TECHNICAL SPECIFICATIONS.....	3
2.4.	LIST OF EUT'S PORTS.....	3
2.5.	ANCILLARY EQUIPMENT	4
2.6.	GENERAL TEST SETUP	5
EXHIBIT 3.	EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS.....	7
3.2.	CLIMATE TEST CONDITIONS	7
3.3.	OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS	7
EXHIBIT 4.	SUMMARY OF TEST RESULTS	8
4.1.	LOCATION OF TESTS	8
4.2.	APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS	8
4.3.	MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES.....	8
EXHIBIT 5.	TEST DATA	9
5.1.	POWER LINE CONDUCTED EMISSIONS [§15.207(a)].....	9
5.2.	EMISSION BANDWIDTH.....	14
5.3.	FIELD STRENGTH OF EMISSIONS WITHIN & OUTSIDE THE PERMITTED BAND 13.110-14.010 MHz [47 CFR 15.225 (a) to (d)].....	19
5.4.	FREQUENCY STABILITY [47 CFR 15.225(e)]	21
EXHIBIT 6.	TEST EQUIPMENT LIST	22
EXHIBIT 7.	MEASUREMENT UNCERTAINTY	23
7.1.	LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY	23
7.2.	RADIATED EMISSION MEASUREMENT UNCERTAINTY	23

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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225

March 6, 2017

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

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Sec. 15.225 - Operation within the band 13.110 – 14.010 MHz.
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication, Part 15, Subpart C - Intentional Radiators
Purpose of Test:	Equipment Certification for FCC Part 15C.
Test Procedures:	ANSI C63.4 and ANSI C63.10
Environmental Classification:	<ul style="list-style-type: none">• Residential• Commercial, industrial or business environment

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

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC 47 CFR 15	2017	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
ANSI C63.4	2014	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	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	Librestream Technologies Inc.
Address:	Suite 110, 895 Waverley St. Winnipeg MB Canada R3T 5P4
Contact Person:	Gilles Aminot Phone #: 204-487-0612 ext 218 Fax #: 204-487-0914 Email Address: gilles.aminot@librestream.com

Manufacturer	
Name:	Librestream Technologies Inc.
Address:	Suite 110, 895 Waverley St. Winnipeg MB Canada R3T 5P4
Contact Person:	Gilles Aminot Phone #: 204-487-0612 ext 218 Fax #: 204-487-0914 Email Address: gilles.aminot@librestream.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.

Brand Name:	Librestream Technologies Inc.
Product Name:	Onsight Rugged Smart Camera
Model Name or Number:	5000HD
Serial Number:	Test sample
Type of Equipment:	Part 15 Low Power Communication Device Transmitter
Input Power Supply Type:	External DC 5 VDC Battery, 3.2 - 4.2 VDC, 3.7 VDC nominal
Primary User Functions of EUT:	The Onsight mobile collaboration devices are used to communicate with an Onsight Expert user (or multiple Onsight Expert users) over an Onsight System network. The Onsight device can fully collaborate from a remote site.

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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225
March 6, 2017

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

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Intended Operating Environment:	<ul style="list-style-type: none">ResidentialCommercial, industrial or business environment
Power Supply Requirement:	Battery 3.2 - 4.2 VDC, 3.7 VDC nominal
Field Strength:	45.55 dB μ V/m at 10 m
Operating Frequency Range:	13.56 MHz
RF Output Impedance:	50 Ω
20 dB Bandwidth:	918.27 kHz
Modulation Type:	ASK
Oscillator Frequencies:	24.0000MHz, 28.63636MHz, 32.768KHz, 27.12MHz
Antenna Connector Type:	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 2.0 OTG Port	1	USB	Shielded
2	USB 2.0 Host Port	1	USB	Shielded
3	HDMI	1	HDMI	Shielded
4	DC IN	1	Power Jack	Non-shielded
5	Headphone	1	Headphone Jack	Non-shielded

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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225
March 6, 2017

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

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:

Ancillary Equipment # 1	
Description:	ITE Power Supply AC Adapter
Brand name:	CUI INC
Model Name or Number:	SMI18-5
Connected to EUT's Port:	Power Port

Ancillary Equipment # 2	
Description:	Headphone
Brand name:	Eartec
Model Name or Number:	N/A
Connected to EUT's Port:	Earphone

Ancillary Equipment # 3	
Description:	Mouse
Brand name:	Dell
Model Name or Number:	P/N: 04P608
Connected to EUT's Port:	USB

Ancillary Equipment # 4	
Description:	LCD Monitor
Brand name:	Dell
Model Name or Number:	2408WFPB
Connected to EUT's Port:	HDMI

Ancillary Equipment # 5	
Description:	USB cable connected to load
Brand name:	Generic
Model Name or Number:	N/A
Connected to EUT's Port:	USB

ULTRATECH GROUP OF LABS

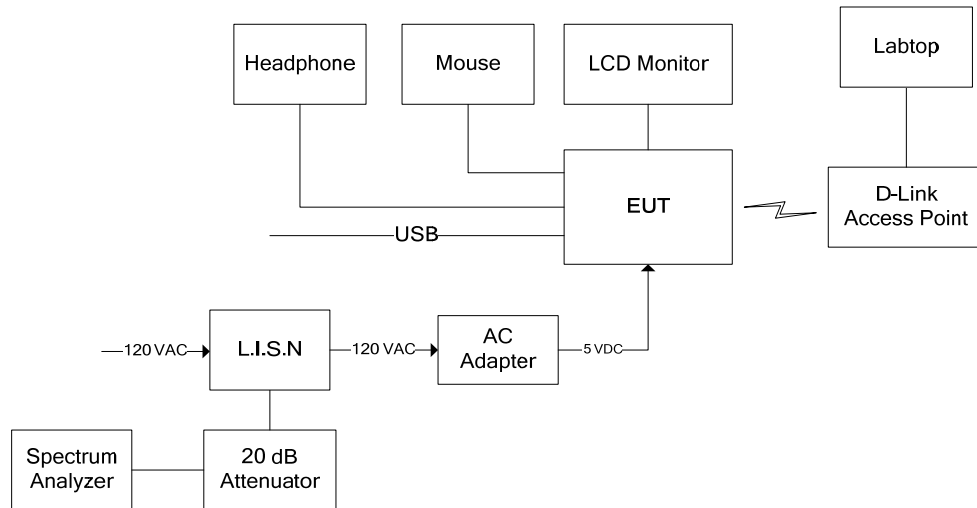
3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225
March 6, 2017

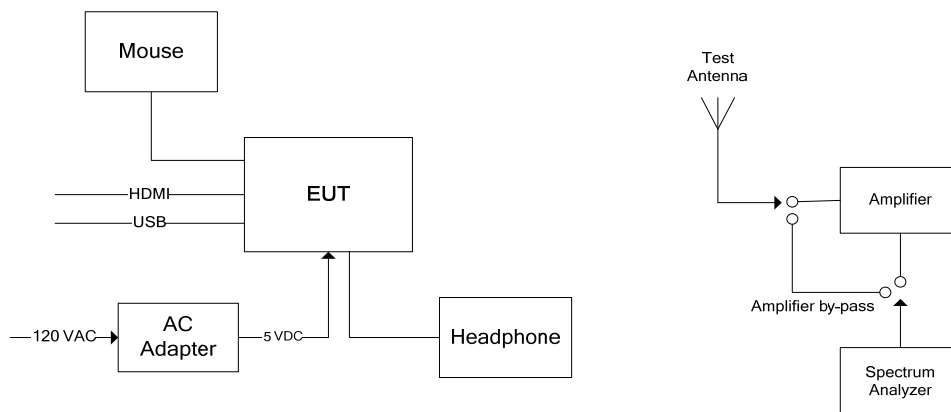
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

2.6. GENERAL TEST SETUP

Power Line Conducted Emission



Transmitter Radiated Emission



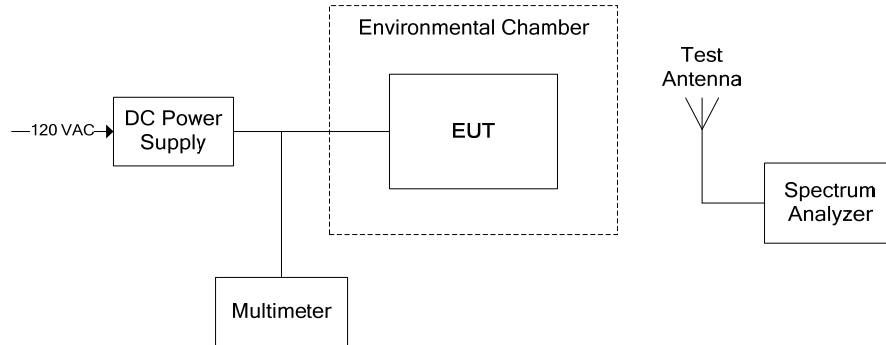
ULTRATECH GROUP OF LABS

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

File #: 17LIBT073_FCC15C225
March 6, 2017

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

Frequency Stability



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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225

March 6, 2017

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

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1.1. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.2. 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:	3.2 - 4.2 VDC

3.3. OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

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

Transmitter Test Signals:	
Frequency Band(s):	13.56 MHz
Test Frequency(ies):	13.56 MHz
Transmitter Wanted Output Test Signals:	
▪ RF Power Output (measured maximum output power):	45.55 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: 2017-04-02.

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*
15.207(a)	Power Line Conducted Emissions	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

* The EUT complies with the requirement; it employs integral antenna.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

Frequency of emission (MHz)	Conducted Limits (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases linearly with the logarithm of the frequency

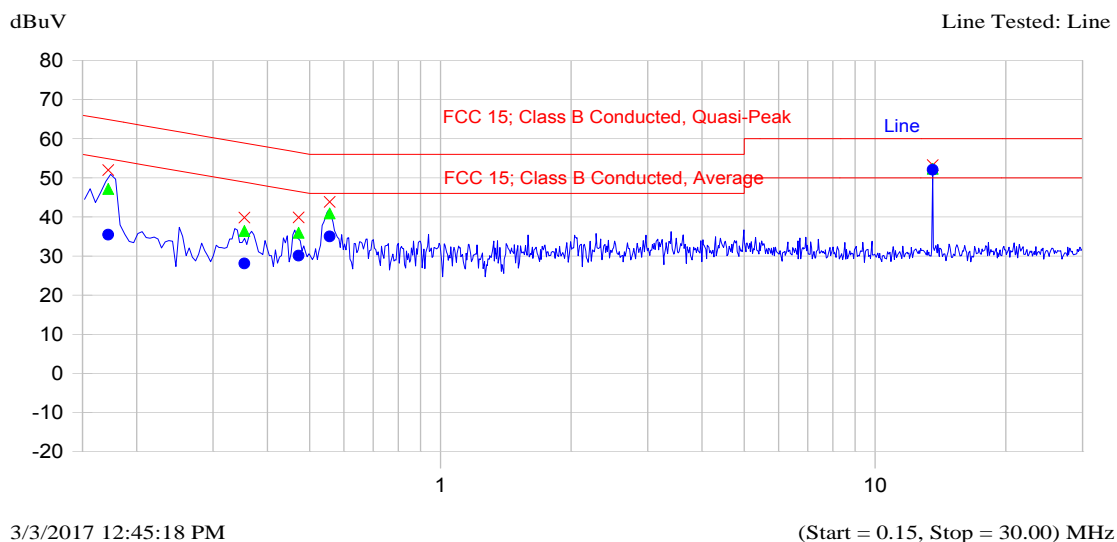
5.1.2. Method of Measurements

ANSI C63.4-2014

5.1.3. Test Data

Plot 5.1.3.1. Power Line Conducted Emissions
Test Configuration 1: EUT without shielding
Line Tested: Line

Current Graph

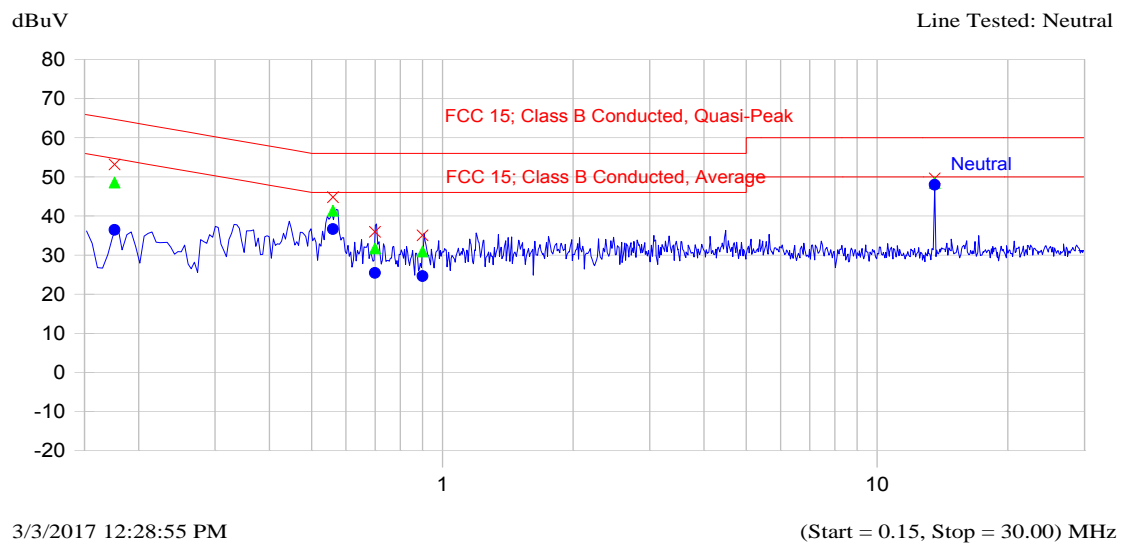


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.172	52.0	47.2	-17.7	35.4	-19.4	Line
0.556	43.8	40.9	-15.1	35.0	-11.0	Line
0.354	39.8	36.4	-22.5	28.1	-20.8	Line
0.472	39.9	35.9	-20.6	30.1	-16.4	Line
13.560	53.2	52.3	-7.7	52.0	2.0	Line

Plot 5.1.3.2. Power Line Conducted Emissions
Test Configuration 1: EUT without shielding
Line Tested: Neutral

Current Graph



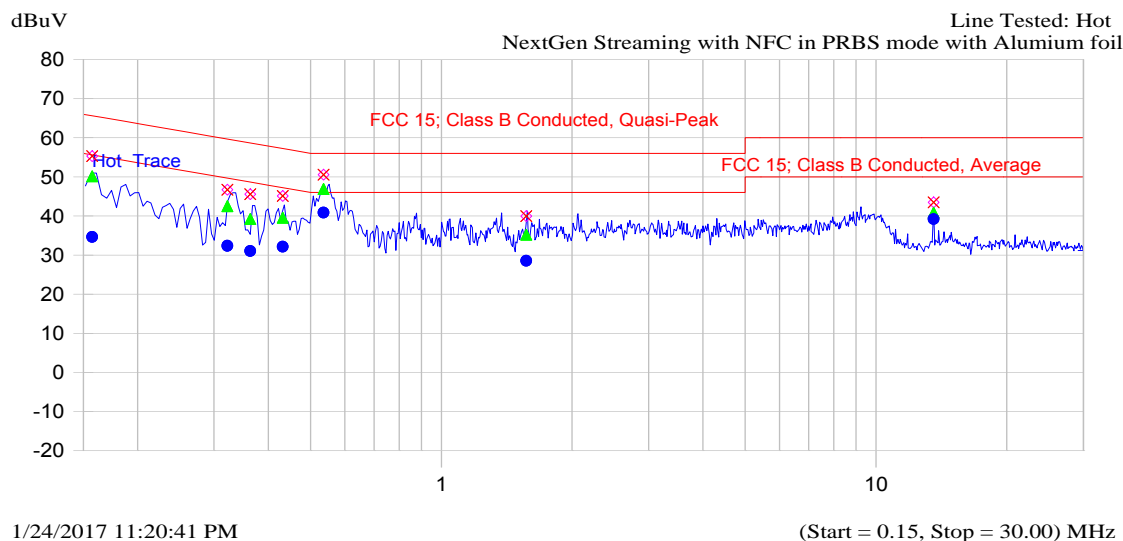
Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.176	53.2	48.5	-16.1	36.4	-18.2	Neutral
0.560	44.8	41.4	-14.6	36.6	-9.4	Neutral
0.700	35.9	31.7	-24.3	25.4	-20.6	Neutral
0.900	35.0	30.9	-25.1	24.6	-21.4	Neutral
13.561	49.6	48.4	-11.6	48.0	-2.0	Neutral

Plot 5.1.3.3. Power Line Conducted Emissions

Test Configuration 2: EUT with shielding from aluminum foil was used since testing with a dummy load was not possible
Line Voltage: 120 VAC; Line Tested: Hot

Current Graph



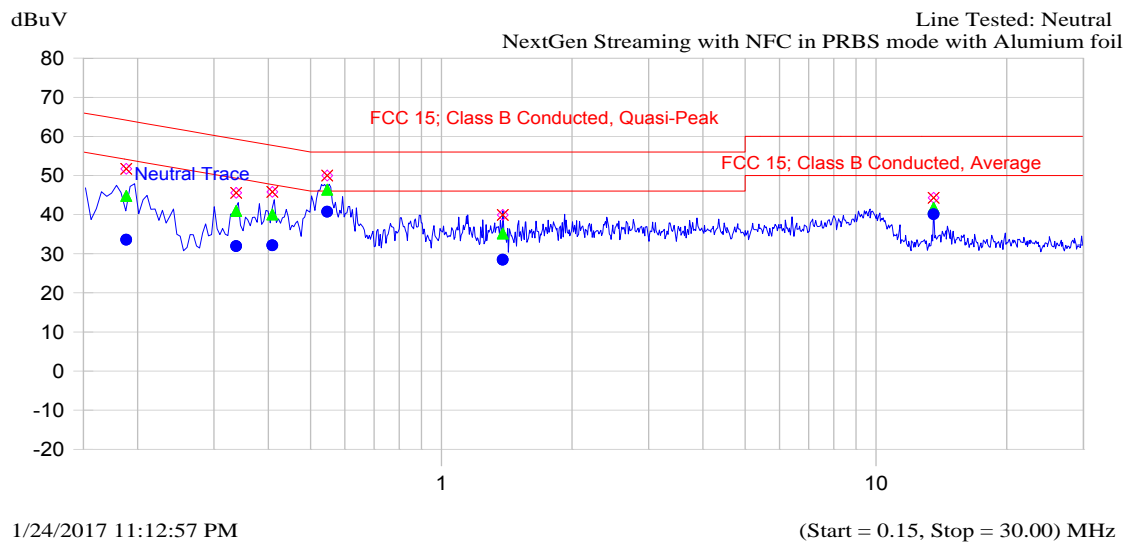
Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.157	55.3	50.1	-15.5	34.7	-21.0	Hot Trace
0.322	46.7	42.5	-17.1	32.4	-17.3	Hot Trace
0.363	45.6	39.2	-19.4	31.0	-17.6	Hot Trace
0.432	45.1	39.5	-17.7	32.1	-15.1	Hot Trace
0.536	50.5	46.9	-9.1	40.8	-5.2	Hot Trace
1.568	40.0	35.2	-20.8	28.5	-17.5	Hot Trace
13.562	43.5	40.9	-19.1	39.2	-10.8	Hot Trace

Plot 5.1.3.4. Power Line Conducted Emissions

Test Configuration 2: EUT with shielding from aluminum foil was used since testing with a dummy load was not possible
Line Tested: Neutral

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.188	51.7	44.8	-19.3	33.5	-20.6	Neutral Trace
0.337	45.6	40.9	-18.4	31.9	-17.3	Neutral Trace
0.408	45.8	40.0	-17.6	32.1	-15.6	Neutral Trace
0.546	50.0	46.4	-9.6	40.7	-5.3	Neutral Trace

5.2. EMISSION BANDWIDTH

5.2.1. Limit(s)

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

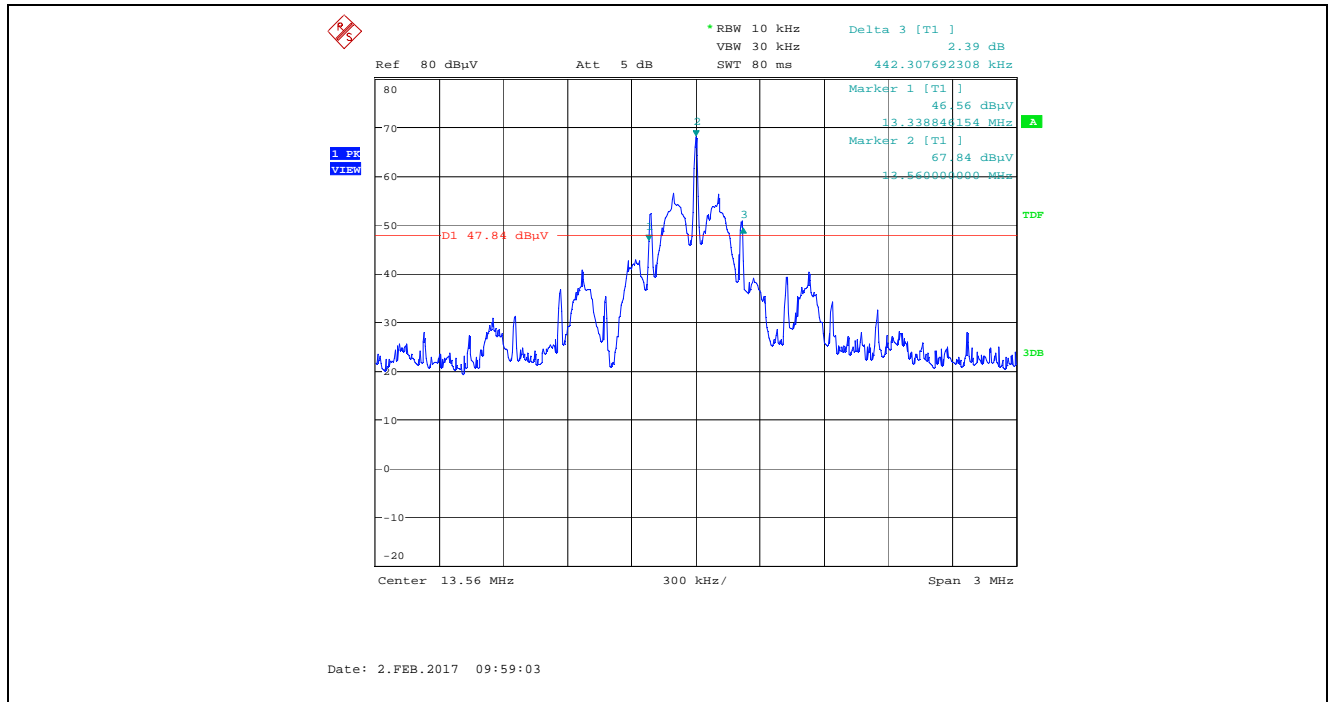
5.2.2. Method of Measurements

ANSI C63.4.

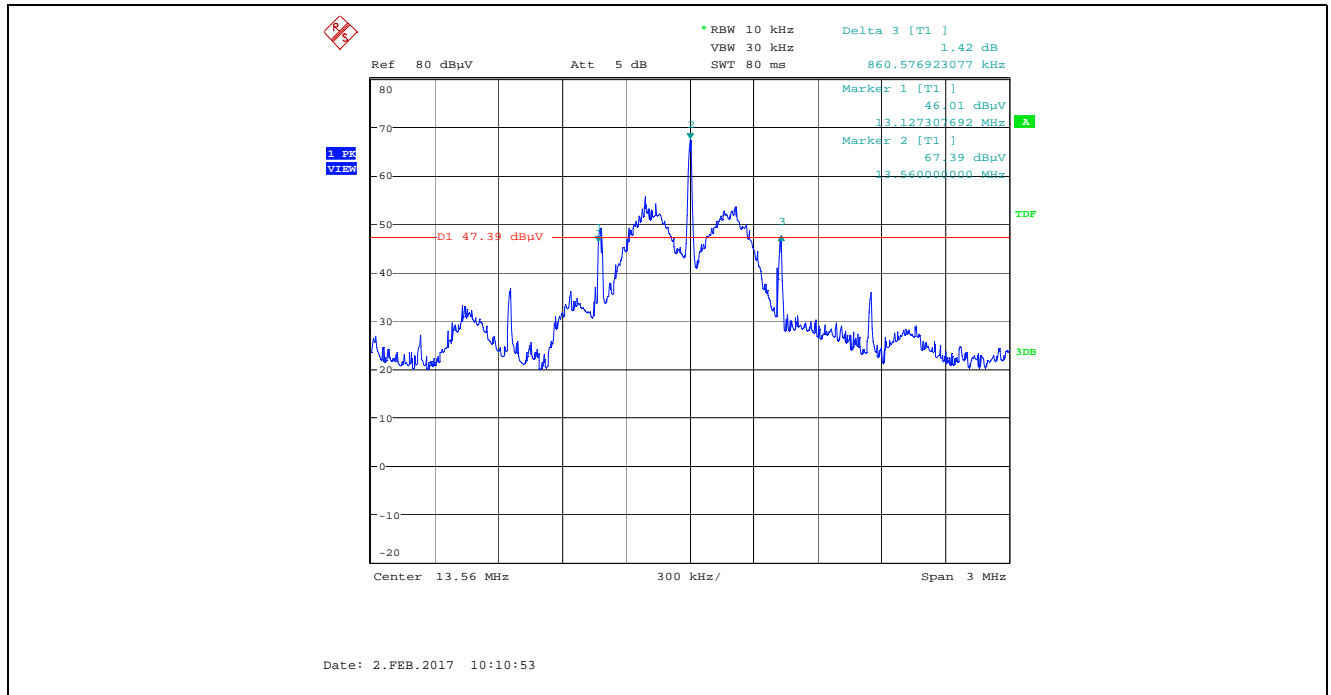
5.2.3. Test Data

Test Frequency (MHz)	Technology	Bit Rate	20 dB Occupied Bandwidth (kHz)
13.56	A	106	442.31
		212	860.58
		424	754.81
		848	33.65
	B	106	35.26
		212	33.65
		424	33.65
		848	33.33

Plot 5.2.3.1. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 106



Plot 5.2.3.2. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 212



ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

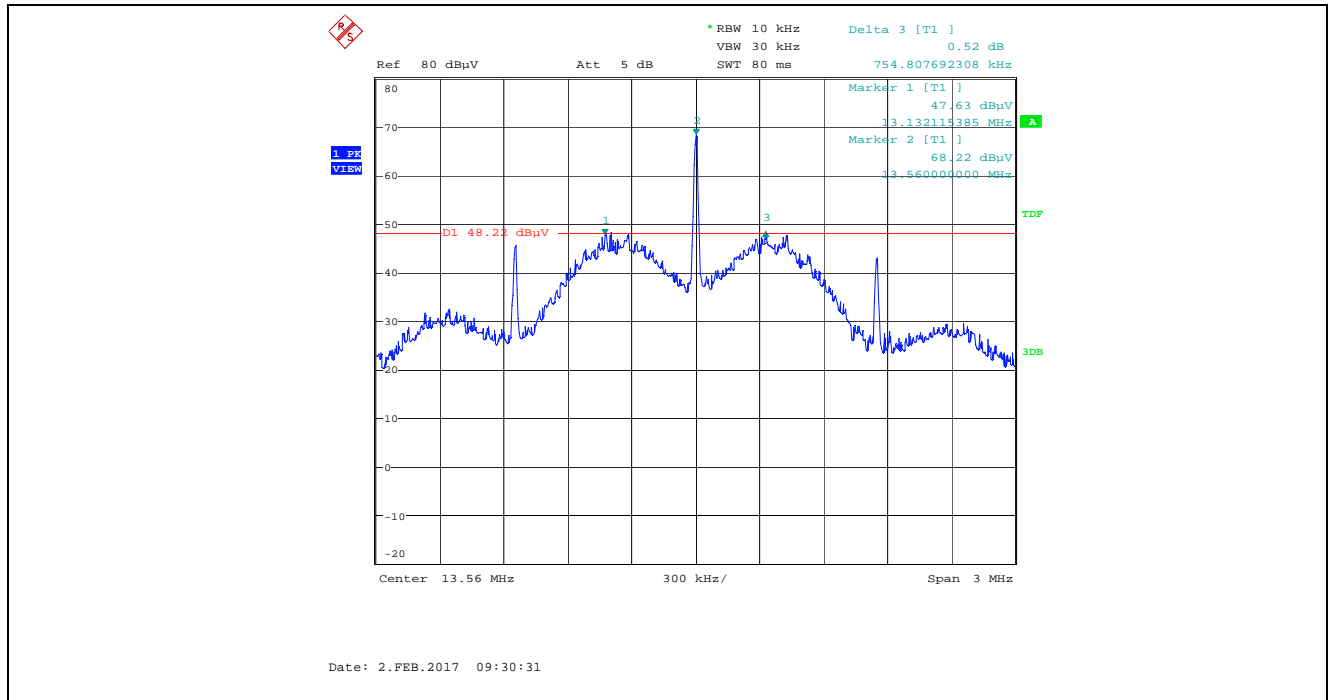
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225

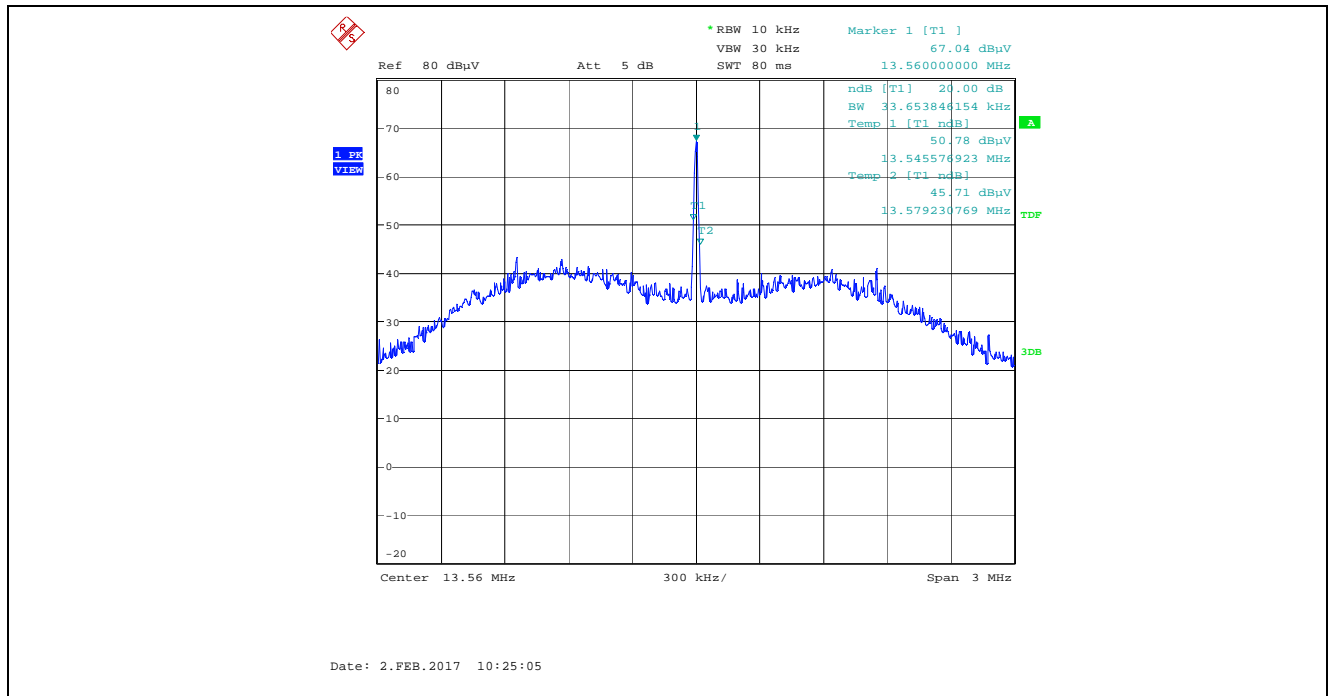
March 6, 2017

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

Plot 5.2.3.3. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 424



Plot 5.2.3.4. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 848



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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225

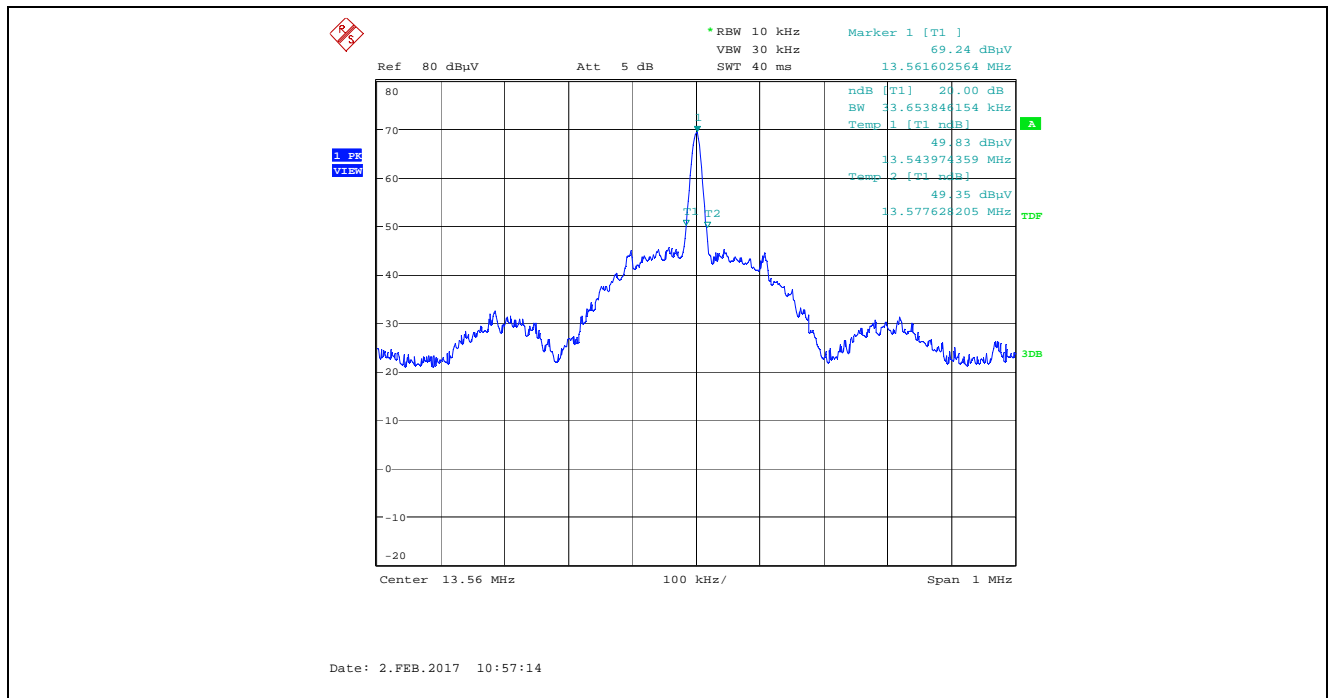
March 6, 2017

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

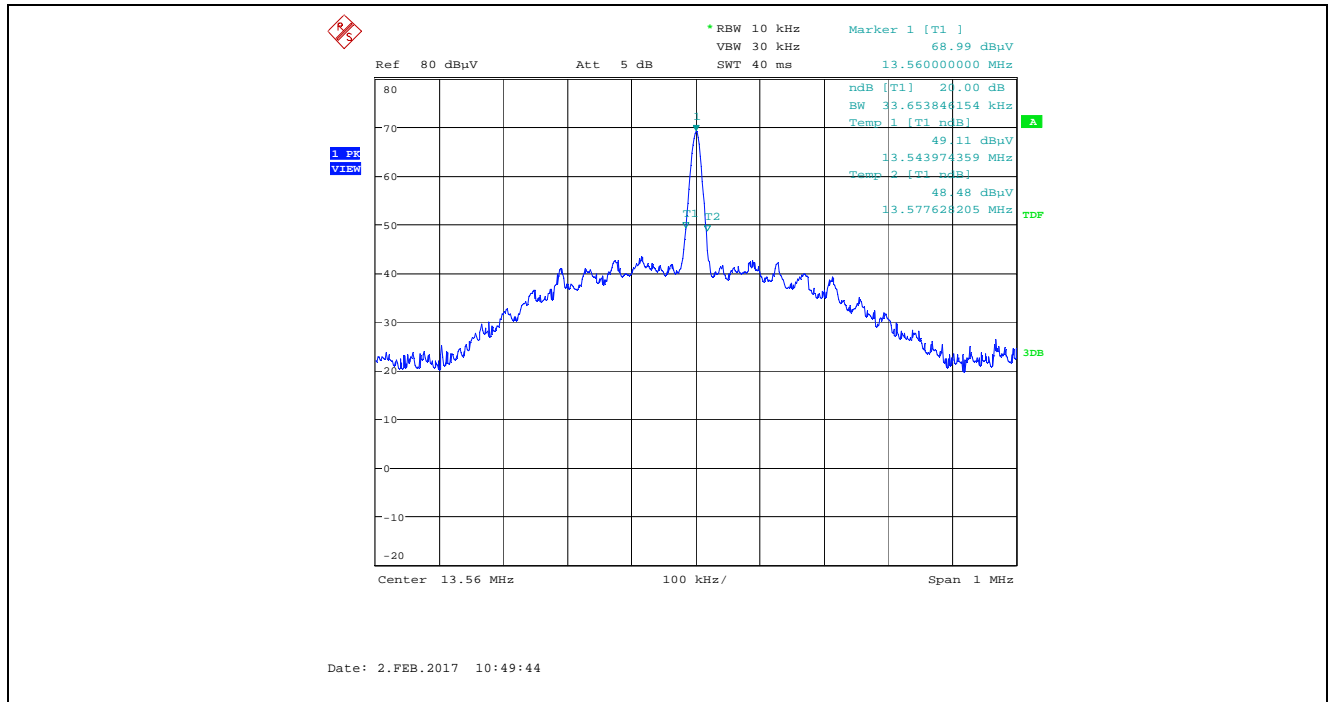
Plot 5.2.3.5. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 106



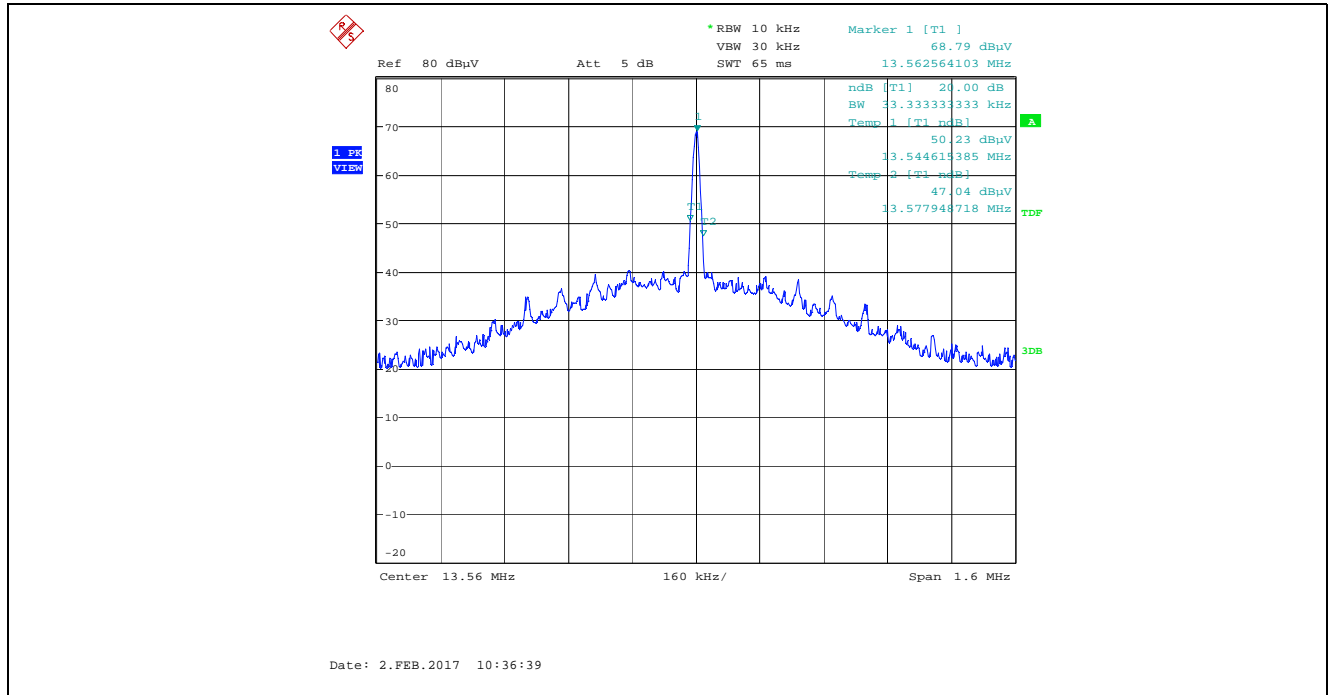
Plot 5.2.3.6. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 212



Plot 5.2.3.7. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 424



Plot 5.2.3.8. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 848



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

5.3.1. 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

5.3.2. Method of Measurements

ANSI C63.10 and ANSI C63.4 for measurement methods.

5.3.3. 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 – 10th 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.

5.3.3.1. 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	45.55	Peak	V	26.47	84.0	-57.5
13.56	38.95	Peak	H	19.87	84.0	-64.1

5.3.3.2. 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.						

5.3.3.3. 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)
81.36	34.30	Peak	V	40.0	-5.7
81.36	30.60	QP	H	40.0	-9.4
94.92	34.10	QP	V	43.5	-9.4
94.92	38.85	Peak	H	43.5	-4.7

5.4. FREQUENCY STABILITY [47 CFR 15.225(e)]

5.4.1. Limit(s)

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.

5.4.2. Method of Measurements

ANSI C63.10.

5.4.3. Test Data

Frequency Band:	13.56 MHz
Center Frequency:	13.56 MHz
Frequency Tolerance Limit:	$\pm 0.01\%$ (± 1356 Hz)
Max. Frequency Tolerance Measured:	+160 Hz
Input Voltage Rating:	3.2- 4.2 VDC, 3.7 VDC Nominal

Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 3.7VDC	Supply Voltage (85 % of Nominal) 3.2 VDC	Supply Voltage (115% of Nominal) 4.2 VDC
-20	+160	--	--
-10	+160	--	--
0	+160	--	--
+10	+160	--	--
+20	0	0	0
+30	+160	--	--
+40	+160	--	--
+50	+160	--	--
+60	+160	--	--

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Rhode & Schwarz	FSU	1100398	20Hz-26.5GHz	14 Sep 2017
Biconical Antenna	ETS	3110B	3379	20-200MHz	11 Sep 2017
Loop Antenna	EMCO	6502	9104-2611	10kHz-30MHz	5 Nov 2017
Preamplifier	Com-power	PA-103A	161243	10-1000MHz	4 Oct 2017
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 °C	2 Jun 2017
Spectrum Analyzer	Rhode & Schwarz	FSU	1100398	20Hz-26.5GHz	14 Sep 2017
Spectrum Analyzer	HP	8593EM	3412A00103	9kHz-26.5GHz	9 Apr 2017
LISN	EMCO	3825/2R	1165	10kHz-30MHz	11 Nov 2017
Attenuator	Pasternack	PE7010-20	7	DC-2GHz	26 Mar 2017
EMI Receiver	Rhode & Schwarz	ESU40	100037	20Hz-40GHz	8 May 2017
Biconical Antenna	EMCO	3142	9601-1005	26-2000MHz	12 May 2017
DC Power Supply	Tenma	726153	0001526	0-20 V, 0-10 A	Note 1
Multi-meter	Tenma	72-6202	02080027	Max: 1kV, 10A	20 Nov 2017
Note 1: Internal Verification/Calibration check					

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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225
March 6, 2017

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
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.44	± 1.8
U	Expanded uncertainty U: $U = 2u_c(y)$	± 2.89	± 3.6

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

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

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

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, Website: <http://www.ultratech-labs.com>

File #: 17LIBT073_FCC15C225
March 6, 2017

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