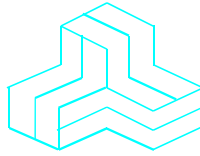


ENGINEERING TEST REPORT



Ayre Relay
Model: 02132001
FCC ID: VFC132001

Applicant:

Etratech Inc.
1047 Cooke Boulevard
Burlington, Ontario
Canada L7T 4A8

In Accordance With
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.209

UltraTech's File No.: 15ETR082_FCC15C209

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

Date: January 5, 2015

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: January 5, 2015

Test Dates: November 7 & 12, 2014
December 16, 2014

- 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
Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com



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NVLAP LAB
CODE 200093-0



SL2-IN-E-
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CA2049



TL363_B



TPTDP
DA1300

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C
Title:	Code of Federal Regulations (CFR), Title 47, Telecommunication - Part 15
Purpose of Test:	Equipment Certification for FCC Part 15C.
Test Procedures:	ANSI C63.4 and ANSI C63.10
Environmental Classification:	Residential

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

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC 47 CFR 15	2014	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	
Name:	Etratech Inc.
Address:	1047 Cooke Boulevard Burlington, ON Canada L7T 4A8
Contact Person:	Wilson Shedden Phone #: 905-681-7544 ext. 229 Fax #: 905-681-7606 Email Address: wshedden@etratesh.com

Manufacturer	
Name:	Etratech Inc.
Address:	1047 Cooke Boulevard Burlington, ON Canada L7T 4A8
Contact Person:	Mike Renneboog Phone #: 905-681-7544 ext. 285 Fax #: 905-681-7606 Email Address: mrenneboog@etratesh.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:	Etratech Inc.
Product Name:	Ayre Relay
Model Name or Number:	02132001
Serial Number:	Test sample
Type of Equipment:	Part 15 Low Power Communication Device Transmitter
Input Power Supply Type:	3.5 to 4.2 V Lithium-Polymer Battery/5 VDC from AC adapter
Primary User Functions of EUT:	1. Remote control of the user's hearing aids (program selection & volume control). 2. Wireless audio streaming to the user's hearing aids, from an audio source such as a smartphone, MP3 player or TV. 3. Hands free operation of the user's cellphone, with incoming audio streamed directly to their hearing aids, and a microphone on the Relay to pick up the user's voice.

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 #: 15ETR082_FCC15C209
January 5, 2015

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	
Equipment Type:	Portable
Intended Operating Environment:	Residential
Power Supply Requirement:	Lithium-Polymer Battery, Voltage Regulated to 3.3VDC
RF Output Power Rating:	42.61 dBμV/m peak at 10m distance
Operating Frequency Range:	10.579 MHz
20 dB Bandwidth:	405.45 kHz
Modulation Type:	CPFSK (Continuous Phase Frequency Shift Keying)
Oscillator Frequencies:	24.734 MHz
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	Battery charger	1	USB – micro B	1 meter non-shielded
2	Audio Input	1	Stereo Audio Jack	1 meter non-shielded

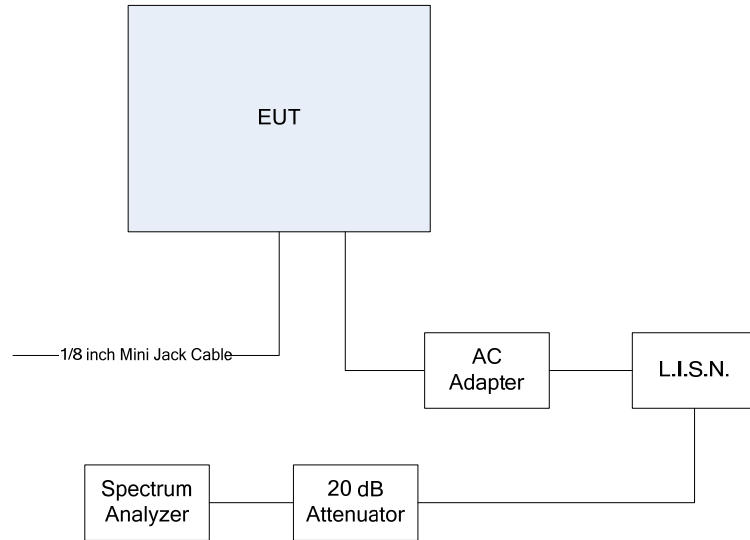
2.5. ANCILLARY EQUIPMENT

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

Ancillary Equipment # 1	
Description:	AC Adapter
Brand Name:	Hon-Kwang
Model Name or Number:	HK-AU-050A100-US
Serial Number:	N/A
Cable Length & Type:	1 meter non-shielded
Connected to EUT's Port:	Battery charger

2.6. TEST SETUP BLOCK DIAGRAM

2.6.1. Power Line Conducted Emission Test Setup



2.6.2. Radiated Emission Test Setup

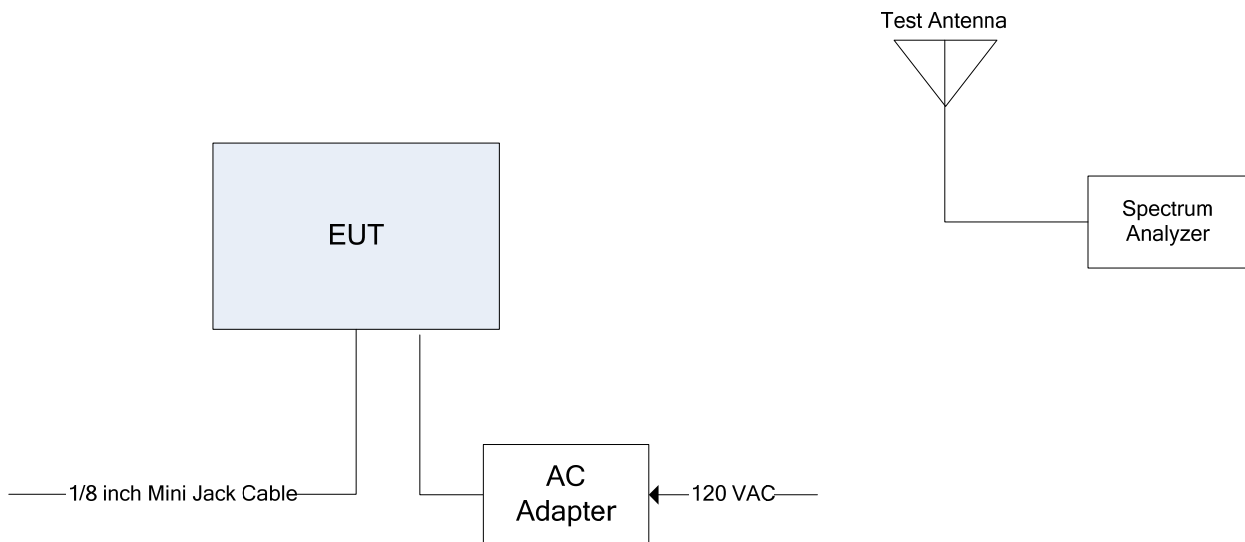


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

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:	5 VDC from AC adapter

3.2. OPERATIONAL 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):	10.579 MHz
Test Frequency(ies):	10.579 MHz
RF Power Output:	42.61 dBμV/m peak at 10m distance
Normal Test Modulation:	CPFSK
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 Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna Requirement	Yes
15.207(a)	Power Line Conducted Emissions	Yes
15.209(a)	20 dB Bandwidth	Yes
15.209	Transmitter Radiated Emissions - Fundamental, Harmonic and Spurious Emissions	Yes
NOTE: The EUT is a composite device consisting of a 10.579 MHz transceiver and a certified portable Bluetooth module (FCC ID: QOQWT32I). The co-location of these radios does not affect the original filing RF exposure condition of the Bluetooth module, thus, RF exposure evaluation are not address in this filing under Part 15.209.		

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWERLINE CONDUCTED EMISSION [47 CFR 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

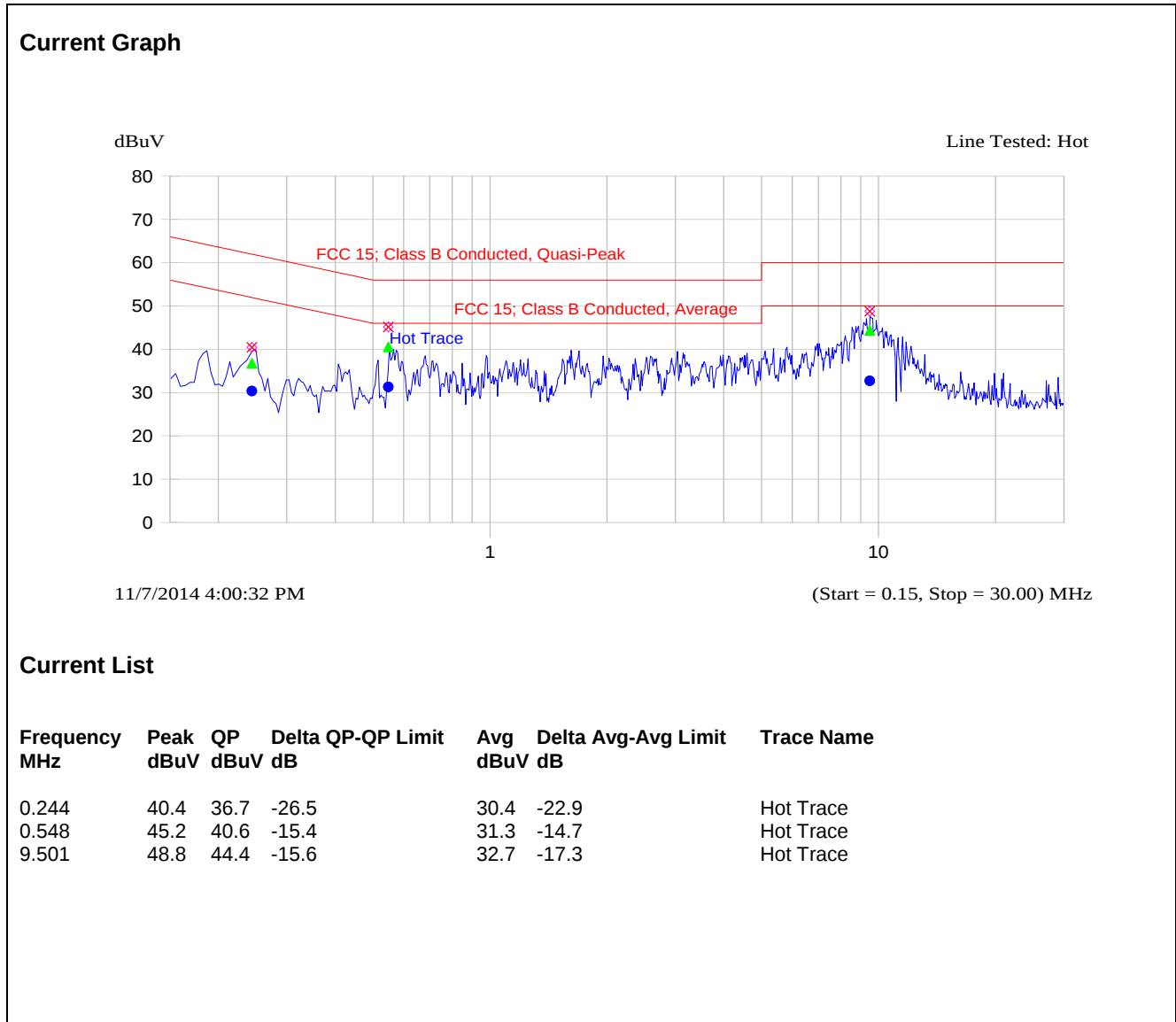
*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

Refer to ANSI C63.4.

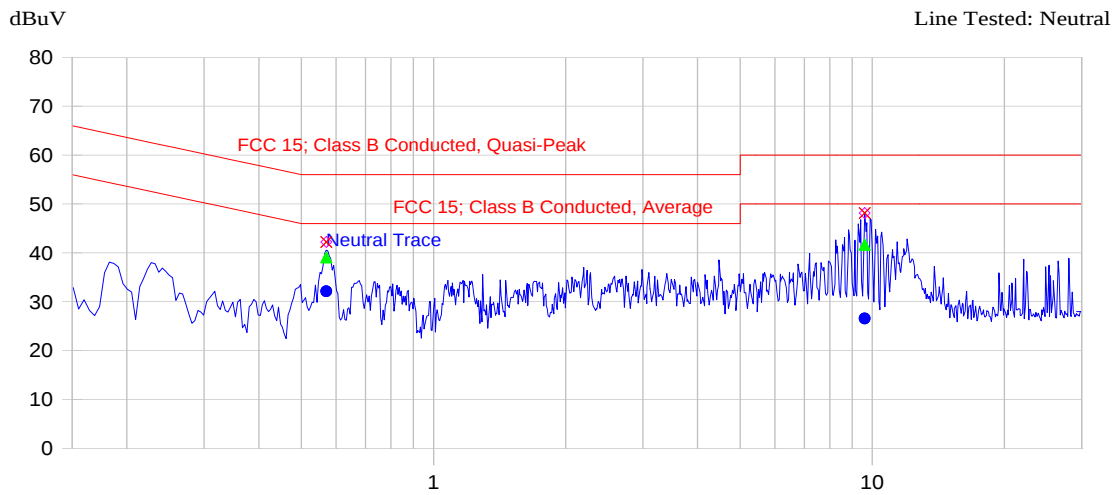
5.1.3. Test Data

Plot 5.1.3.1. Power Line Conducted Emissions
Line Voltage: 120 VAC; Line Tested: Hot



Plot 5.1.3.2. Power Line Conducted Emissions
 Line Voltage: 120 VAC; Line Tested: Neutral

Current Graph



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(Start = 0.15, Stop = 30.00) MHz

Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.570	42.2	39.1	-16.9	32.1	-13.9	Neutral Trace
9.609	48.1	41.7	-18.3	26.6	-23.4	Neutral Trace

5.2. TRANSMITTER RADIATED EMISSIONS [47 CFR §§ 15.209 & 15.205]

5.2.1. Limit(s)

§ 15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with § 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in § 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in § 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the

intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in § 15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

5.2.2. Method of Measurements

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

5.2.3. Test Data

Remarks:

- The measuring receiver shall be tuned over the frequency range 10 kHz to 1 GHz.
- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- Tests are conducted at 10m (for frequencies ≤ 30 MHz) and/or 3m (for frequencies > 30 MHz) distance, the value measured will be extrapolated as applicable to compare with limit and measurement distance specified in section 15.209(a).
- Extrapolation factor of 40dB/decade shall be used for frequencies below 30 MHz.

5.2.3.1. Fundamental Emissions

Remarks: • Field strength limit of the fundamental 10.579 MHz at 30m distance is $20 \cdot \log(30) = 29.5$ dBμV/m • For frequency band 1.705 - 30.0 MHz, the measured E-Field at 10m (column 2) will be extrapolated to 30m E-Field Level (column 3) using the extrapolation factor of $40 \cdot \log(10/30) = -19.08$ dB					
Frequency (MHz)	Peak E-Field @ 10m (dB μ V/m)	Extrapolated E-Field Level (dB μ V/m)	Antenna Plane (H/V)	§ 15.209 (a) Limits @ 30m (dB μ V/m)	Margin (dB)
10.579	42.61	23.53	V	29.5	-6.0
10.579	29.60	10.52	H	29.5	-19.0

5.2.3.2. Harmonic/Spurious Emissions for Frequencies Below 30 MHz at 10 m

Remarks: - For frequency band 0.009- 0.490 MHz, the measured E-Field at 10m (column 2) will be extrapolated to 300m E-Field Level (column 3) using the extrapolation factor of $40 \cdot \log(10/300) = -59.08$ dB - For frequency bands 0.490-1.705 MHz and 1.705-30.0 MHz, the measured E-Field at 10m (column 2) will be extrapolated to 30m E-Field Level (column 3) using the extrapolation factor of $40 \cdot \log(10/30) = -19.08$ dB					
Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Extrapolated E-Field Level (dBµV/m)	Antenna Plane (H/V)	§ 15.209 (a) Limits (dBµV/m)	Margin (dB)
0.009 - 0.490	*	*	H / V	25.7	*
0.490 - 1.705	*	*	H / V	45.7	*
1.705 - 30.0	*	*	H / V	29.5	*

* No emissions or harmonics were detected within 20 dB of the limit.

5.2.3.3. Harmonic/Spurious Emissions for Frequencies Above 30 MHz at 3 m

Frequency (MHz)	E-Field @ 3m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	§ 15.209 (a) Limits (dBµV/m)	Margin (dB)
30-88	*	Peak	H / V	40.0	*
88-216	*	Peak	H / V	43.5	*
216-960	*	Peak	H / V	46.0	*
Above 960	*	Peak	H / V	54.0	*

* No emissions or harmonics were detected within 20 dB of the limit.

5.3. 20 dB BANDWIDTH [47 CFR 15.209 (a)]

5.3.1. Limit(s)

Emission bandwidth shall not be located in the restricted bands in 15.205 and the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

5.3.2. Method of Measurements

The measurements were performed in accordance with Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4:2009.

5.3.3. Test Data

Channel Frequency	20 dB Bandwidth
10.579 MHz	405.45 kHz

See the following plot for details.

Plot 5.3.3.1. 20 dB Bandwidth, Fc: 10.579 MHz

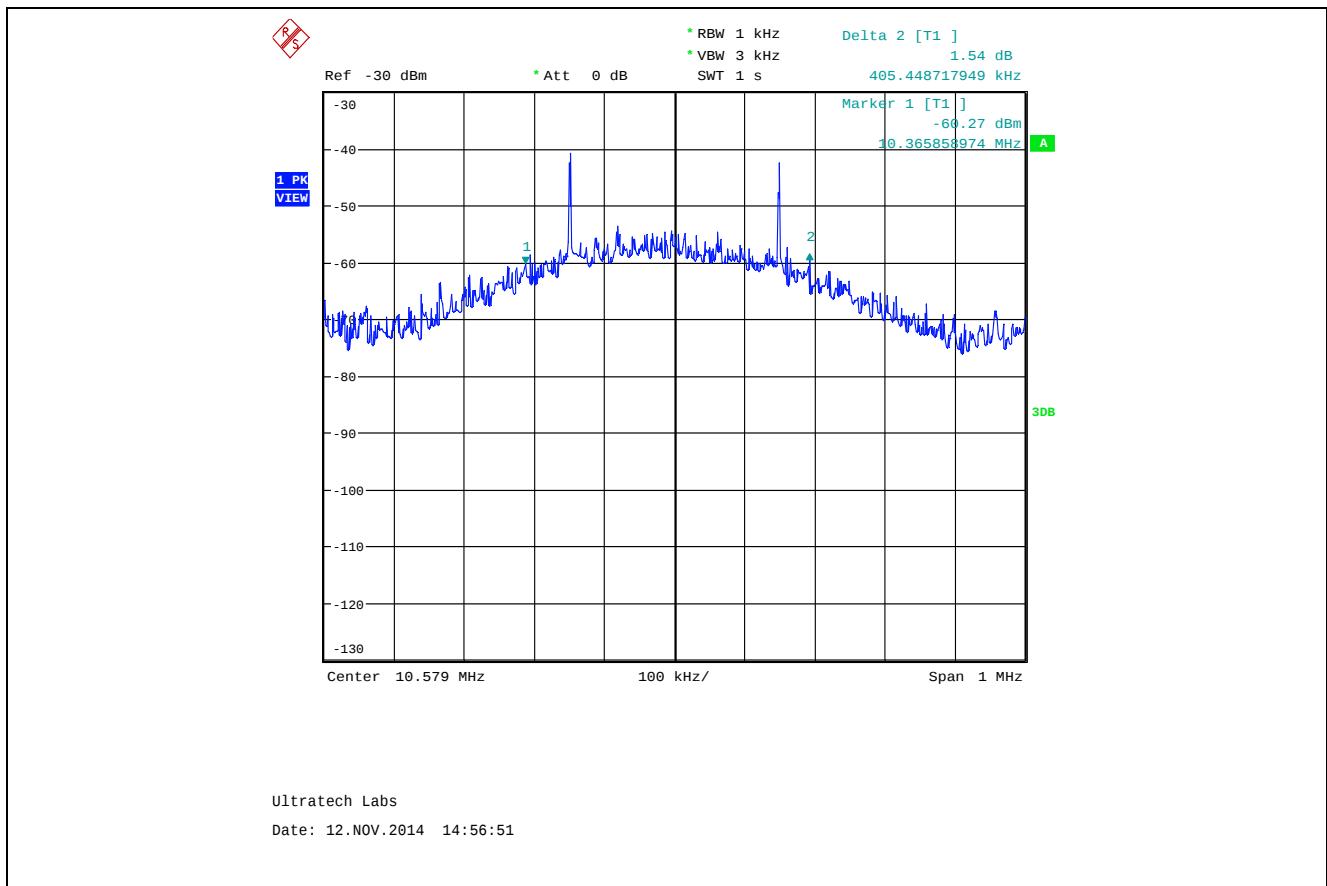


EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	05 Apr 2015
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20 Hz – 26.5 GHz	Jul 14, 2015
Biconi-Log Antenna	EMCO	3142C	00026873	26 – 3000 MHz	14 Apr 2015
Loop Antenna	EMCO	6502	9104-2611	10 kHz – 30 MHz	27 Aug 2015
Spectrum Analyzer	Agilent	E7401A	US40240432	9 kHz – 1.5 GHz	14 Mar 2015
Attenuator	Pasternack	PE7010-20	-	DC–2 GHz	02 Jan 2015
L.I.S.N	EMCO	3825/2	8907-1531	0.01 -100 MHz	03 Sep 2015

ULTRATECH GROUP OF LABS

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File #: 15ETR082_FCC15C209
January 5, 2015

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