Test Report

Bureau Veritas Consumer Products Services, Inc.

Report No	EU0806-1
Client	LumiraDx
Address	221 Crescent ST, Suite 502 Waltham, MA 02453
Phone	978-479-7459
Items tested FCC ID	LumiraDx POC Instrument 2AV6APOC
FRN	0029449600
Equipment Type Equipment Code	Part 15 Low Power Communication Device Transmitter DXX
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 9 Annex B.6
Test Dates	April 14 – April 15, 2020
Results	As detailed within this report
Prepared by	Anna Vancheva – EMC Engineer
Authorized by	Arik Zwirner- Senior EMC Engineer
Issue Date	4/15/2020
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 23 of this report.

Bureau Veritas Consumer Products Services, Inc.is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.

ACCREDITED Cert No. 1627-01

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Form Final Report REV 12-07-15

Summary and Test Methodology

On April 14 and April 15, 2020 we tested the LumiraDx POC Instrument, which contains the iDTRONIC Embedded HF RFID Reader M9000 series (Model: SPEC 30199 Rev1) for compliance with the following requirements:

CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 9 Annex B.6

EUT transmits at 13.56MHz. Emissions were measured with the EUT in its intended upright installation orientation.

EUT includes a certified Bluetooth module (FCC ID: 2AI9JRFM).

Radiated emission testing was performed according to the procedures specified in ANSI C63.10-2013 and RSS-Gen Issue 5.

AC mains conducted emission testing was performed for 12VDC configuration.

Following bandwidths were used during radiated and conducted spurious emissions testing.

Frequency	RBW	VBW
9kHz-150kHz	200Hz	1kHz
150kHz-30MHz	9kHz	30kHz
30MHz-1GHz	120kHz	1MHz

The test sample was received in good condition on April 13th 2020.

Product Tested - Configuration Documentation

EUT Configuration			
Work Order:	U0806		
Company:	LumiraDx		
Company Address:	221 Crescent Street		
	Waltham, MA 02453		
Contact:	Dave Goodall		
	Product Marketing Name	Model Number	**SN**
EUT:	LumiraDx POC Instrument	SPEC 30199 Rev1	
EUT Description:	POC Instrument, contains the iDTRONIC Embedded HF RFID Reader M9000 series		
EUT Tx Frequency:	13.56MHz (HF RFID)		

Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment
Ethernet Door	Ethernet	2	2	Ethernet	No	No	2.5	in	no	
Power DC	Power DC	1	1	Power DC	No	Yes	1.4	in	yes	

Software Operating Mode Description:

NFC transmits continuously. Commands provided by client..

Compliance Statement

RSS-GEN	RSP-100	RSS 210	Part 15	Comments
6.4			15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
	3.1		15.19	The label is shown in the label exhibit.
	3.2		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	See "Modifications Required for Compliance" section below.
3.2			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13.2			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
6.13.1			15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
6.8			15.203	EUT has an internal NFC antenna
8.10			15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable
8.8			15.207	EUT meets the AC Line conducted emissions requirements of this section.
			15.225	The unit complies with the requirements of 15.225
		Annex B.6		The unit complies with the requirements of RSS-210 Annex B.6
6.7				99% emissions bandwidth plot is provided.

Modifications Required for Compliance

We found that the product met the above requirements with no modification.

Test Results

Fundamental Reading

(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.

MEASUREMENTS / RESULTS

Date: 15-Apr-20 **Company:** LumiraDx **Work Order:** U0806
Engineer: AV **EUT Desc:** POC Instrument **EUT Operating Voltage/Frequency:** 12VDC
Temp: 24.7ºC **Humidity:** 40% **Pressure:** 1004mbar
Frequency Range: Fundamental Reading at 13.56MHz **Measurement Distance:** 3 m
Notes: DUT trasmitting contiiously **EUT Max Freq:** 13.56MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	'FCC 15.209(a) Limit (dBµV/m)	'FCC 15.209(a) Margin (dB)	'FCC 15.209(a) Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
			---	---	---	---	---	---	---	---	---	---
Parallel:	13.56	47.9	0.0	10.9	0.2	59.1	69.5	-10.5	PASS	---	---	---
			---	---	---	---	---	---	---	---	---	---
			---	---	---	---	---	---	---	---	---	---
Perpendicular:	13.56	46.3	0.0	10.9	0.2	57.4	69.5	-12.1	PASS	---	---	---
			---	---	---	---	---	---	---	---	---	---
			---	---	---	---	---	---	---	---	---	---
Horizontal:	13.56	36.5	0.0	10.9	0.2	47.6	69.5	-21.9	PASS	---	---	---
			---	---	---	---	---	---	---	---	---	---

Table Result: Pass by -10.5 dB ***Worst Freq:*** 13.56 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2585 **Cable 2:** Asset #2456 **Cable 3:** ---
Analyzer: Asset #2093 **Preamp:** --- **Antenna:** Asset 2615 Loop **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.215
Copyright Curtis-Straus LLC 2000
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Test Equipment Used

Rev. 4/9/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	5/30/2020	5/30/2019

Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	10/30/2020	10/30/2018

Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Asset #2658		1235C97	Control Company	181683808	2658	I	10/3/2020	4/3/2019

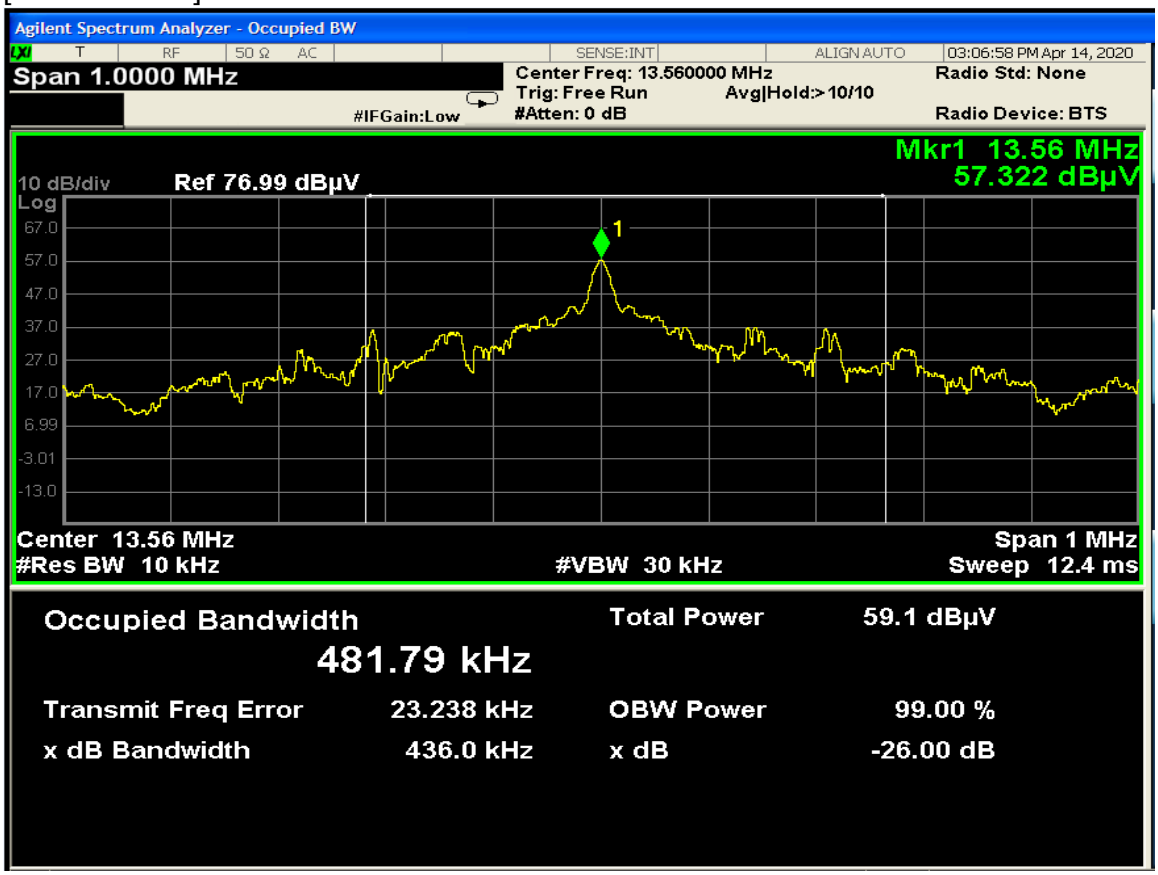
Cables	Range	Mfr	Cat	Calibration Due	Calibrated on
Asset #2456	9KHz-18GHz	MegaPhase	II	11/2/2020	11/2/2019
Asset #2468	9KHz-18GHz	MegaPhase	II	11/2/2020	11/2/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

99% Occupied Bandwidth

REQUIREMENT

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is its 99% emission bandwidth, as calculated or measured. [RSS-GEN 6.7]



Test Equipment Used

Rev. 4/9/2020

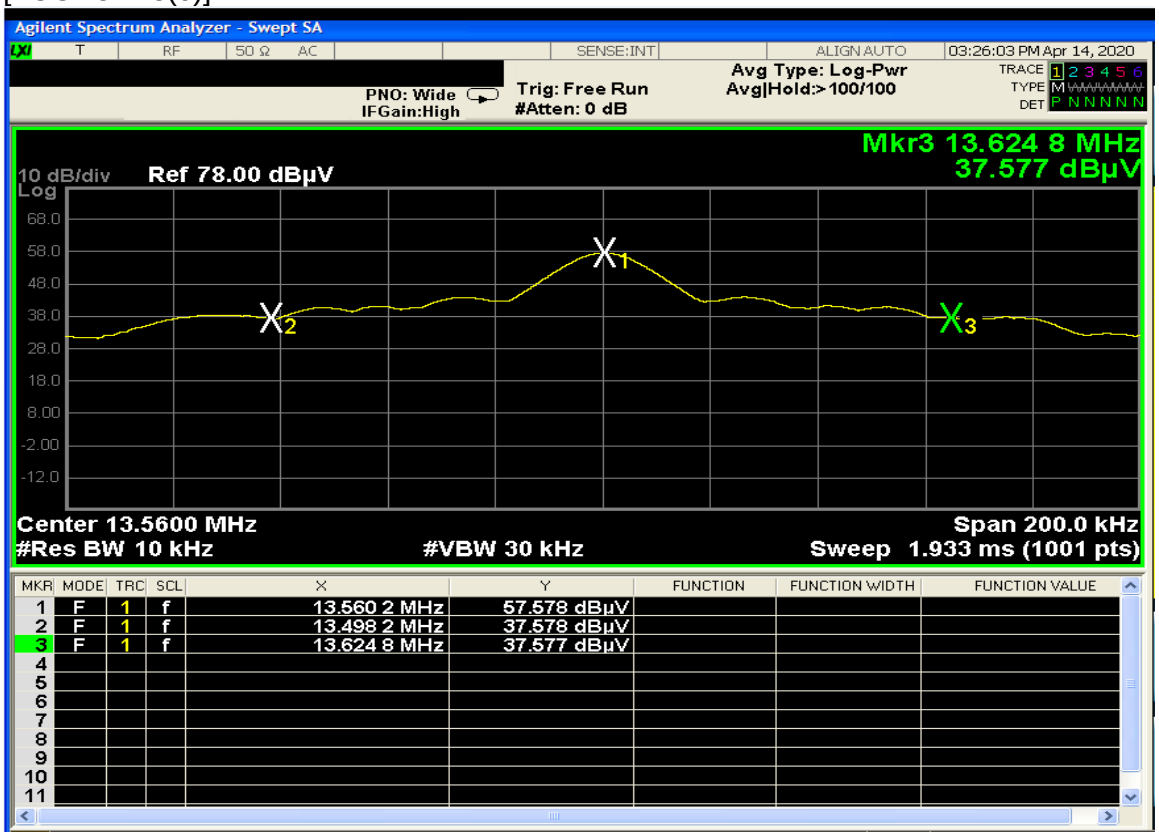
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	5/30/2020	5/30/2019
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	10/30/2020	10/30/2018
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Asset #2658		1235C97	Control Company	181683808	2658	I	10/3/2020	4/3/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2456	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2468	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Occupied Bandwidth

REQUIREMENT

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Section 15.217 through 15.255,and in subpart E of this part, must be designed to ensure that the 20dB bandwidth of the emission is contained within the frequency band designated in the rule.
[FCC 15.215(c)]



Test Equipment Used

Rev. 4/9/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	5/30/2020	5/30/2019
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	10/30/2020	10/30/2018
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Asset #2658		1235C97	Control Company	181683808	2658	I	10/3/2020	4/3/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2456	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2468	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Emission Mask

(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.

MEASUREMENTS / RESULTS

POC Instrument complied with the emission mask requirements without testing since the peak field strength at the fundamental frequency was measured to be below the FCC 15.209 limits. See data tables for Fundamental Emission.

Radiated Spurious Emissions

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.
[15.225(d)]

9-150 kHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Parallel 9-150kHz
Notes:
Radio under test 13.56MHz.BT off.

Work Order - U0806
EUT Power Input - 120V
Test Site - Ch1
Conditions - 24.2°C;31.5 %RH; 1004mBar
Test Engineer - AV

Data Taken at 10:19:06 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.023675	48.7	13.8	62.5	120.1	-57.7	PASS		270
0.045593	50.4	11.5	61.9	114.5	-52.6	PASS	-52.6	240
0.068273	46	10.7	56.8	110.9	-54.2	PASS		225
0.091118	40.9	10.6	51.5	108.4	-57	PASS		345
0.106618	37.2	10.2	47.4	107.1	-59.7	PASS		255
0.127941	35.5	10.2	45.7	105.5	-59.8	PASS		210

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Perpendicular 9-150kHz
Notes:
Radio under test 13.56MHz.BT off.

Work Order - U0806
EUT Power Input - 120V
Test Site - Ch1
Conditions - 24.2°C;31.5 %RH; 1004mBar
Test Engineer - AV

Data Taken at 10:11:15 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.022201	48.8	13.9	62.7	120.7	-58	PASS		300
0.0445	46.8	11.6	58.4	114.7	-56.3	PASS		300
0.071075	45.1	10.7	55.8	110.6	-54.8	PASS	-54.8	285
0.091337	40.5	10.6	51.1	108.4	-57.3	PASS		300
0.111059	36.3	10.2	46.5	106.7	-60.2	PASS		315
0.129957	35.4	10.2	45.6	105.3	-59.8	PASS		300

150 – 1000 kHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Parallel 150-1000kHz
Notes:
Radio under test 13.56MHz.BT off.

Work Order - U0806
EUT Power Input - 120V
Test Site - Ch1
Conditions - 24.2°C;31.5 %RH; 1004mBar
Test Engineer - AV

Data Taken at 10:29:41 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.517	41	10.2	51.2	73.4	-22.2	PASS		285
0.57	38.8	10.3	49.1	72.5	-23.4	PASS		15
0.632	38	10.3	48.3	71.6	-23.3	PASS		105
0.733	37	10.4	47.4	70.3	-22.9	PASS		270
0.816	36.8	10.5	47.3	69.4	-22.1	PASS	-22.1	300
0.96	33.6	10.6	44.2	68	-23.7	PASS		315

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Perpendicular 150-1000kHz
Notes:
Radio under test 13.56MHz.BT off.

Work Order - U0806
EUT Power Input - 120V
Test Site - Ch1
Conditions - 24.2°C;31.5 %RH; 1004mBar
Test Engineer - AV

Data Taken at 10:36:52 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.521	40.1	10.2	50.3	73.3	-23	PASS	-23	60
0.595	38.5	10.3	48.8	72.1	-23.3	PASS		285
0.66	37.2	10.4	47.6	71.2	-23.6	PASS		105
0.816	35.2	10.5	45.7	69.4	-23.7	PASS		165
0.907	34.2	10.6	44.9	68.5	-23.6	PASS		285
0.958	32.6	10.6	43.2	68	-24.8	PASS		240

1-30 MHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Perpendicular 1-30MHz
Notes:
Radio under test 13.56MHz.BT off.

Work Order - U0806
EUT Power Input - 120V
Test Site - Ch1
Conditions - 24.2°C;31.5 %RH; 1004mBar
Test Engineer - AV

Data Taken at 10:54:40 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
1.065	30.6	10.6	41.3	67.1	-25.8	PASS		30
2.087	25.5	10.5	36	69.5	-33.5	PASS		345
3.124	22.1	10.6	32.8	69.5	-36.8	PASS		315
3.735	20.4	10.7	31.1	69.5	-38.4	PASS		285
13.56	45.2	11.2	56.4	69.5	-13.1	PASS	-13.1	330
30	12.9	8.2	21.2	40	-18.8	PASS		270

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Parallel 1-30MHz
Notes:
Radio under test 13.56MHz.BT off.

Work Order - U0806
EUT Power Input - 120V
Test Site - Ch1
Conditions - 24.2°C;31.5 %RH; 1004mBar
Test Engineer - AV

Data Taken at 11:01:32 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
1.26	30.3	10.6	40.9	65.6	-24.7	PASS		285
1.771	24.8	10.6	35.4	69.5	-34.1	PASS		75
2.445	23	10.7	33.6	69.5	-35.9	PASS		285
3.137	20.7	10.6	31.3	69.5	-38.3	PASS		60
13.561	46	11.2	57.2	69.5	-12.3	PASS	-12.3	45
30	11.8	8.2	20	40	-20	PASS		165

In 9kHz-30MHz range, no emissions were found in receive loop antenna's "ground-parallel" orientation.

30-1000MHz

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Notes:
BT off. Radio under test 13.56MHz.

Work Order - LumiraDx
EUT Power Input - 120VAC 60Hz
Test Site - CH1
Conditions - 23.9°C; 35.2%RH; 1007mBar

Data Taken at 10:08:29 AM, Tuesday, April 14, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
120.016	52.3	-20.4	31.9	43.5	-11.6	PASS		100	315
300	59	-20.3	38.7	46	-7.3	PASS	-7.3	150	315
311.906	54.1	-19.8	34.3	46	-11.7	PASS		150	135
462.45	48.5	-15.8	32.8	46	-13.2	PASS		150	90
500.062	51.5	-14.9	36.6	46	-9.4	PASS		100	270
700.125	46.4	-11.7	34.7	46	-11.3	PASS		200	315

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Notes:
BT off. Radio under test 13.56MHz.

Work Order - LumiraDx
EUT Power Input - 120VAC 60Hz
Test Site - CH1
Conditions - 23.9°C; 35.2%RH; 1007mBar

Data Taken at 10:08:30 AM, Tuesday, April 14, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
299.951	62.9	-20.3	42.6	46	-3.4	PASS	-3.4	100	45
312.052	60.4	-19.8	40.5	46	-5.5	PASS		100	0
360.067	55.4	-18.4	37	46	-9	PASS		100	90
461.044	53.3	-15.8	37.6	46	-8.4	PASS		150	0
499.965	55.4	-14.9	40.5	46	-5.5	PASS		150	270
772.923	44.6	-10.3	34.3	46	-11.7	PASS		100	0

Test Equipment Used

Rev. 4/9/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	5/30/2020	5/30/2019
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	12/7/2020	12/7/2018
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/14/2020	10/14/2019
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Red-Black Bilog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	4/26/2021	4/26/2019
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	10/30/2020	10/30/2018
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Asset #2658		1235C97	Control Company	181683808	2658	I	10/3/2020	4/3/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2456	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2468	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Temperature Stability

Limit: 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.
[FCC 15.225]

MEASUREMENTS / RESULTS

13.56MHz * 0.01% = 1356Hz Allowable tolerance

Frequency Stability				
Date:	15-Apr-20		**Work Order:**	U0806
Engineer:	Anna Vancheva			
Notes:	Power Supply Cui INC, Model: SMM30-12-RV-C			
Temperature	**Frequency Delta**	**Limit**	**Result**	
°C	**(Hz)**	**(Hz)**	**----------**	
-20	55	± 1356	Pass	
-10	47	± 1356	Pass	
0	52	± 1356	Pass	
10	55	± 1356	Pass	
20	0	± 1356	Pass	
30	0	± 1356	Pass	
40	-16	± 1356	Pass	
50	-22	± 1356	Pass	
Test Site:	WTS Chamber 18	**Analyzer:**	101551	
Antenna:	Loop 2615	**Cable:**	2593	

Frequency Stability			
Date:	15-Apr-20	**Work Order:**	U0806
Engineer:	Anna Vancheva		
Notes:	Voltage variation (Power Supply KPS3010D DC)		
Temperature	**20°C**		
Rated V min	11.3	85% V Min	9.6
Rated V max	12.7	115% V Max	14.6
Voltage	**Frequency Delta**	**Limit**	**Result**
(Volts)	**(Hz)**	**(Hz)**	**--------**
9.6	2	± 1356	Pass
11.3	REF	± 1356	Pass
12.7	REF	± 1356	Pass
14.6	3	± 1356	Pass
Test Site:	WTS Chamber 18	**Analyzer:**	101551
Antenna:	Loop 2615	**Cable:**	2593

Test Equipment Used

Rev. 4/16/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
FSV40 Signal/Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	10/16/2020	10/16/2019

Cables	Range		Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
DUT1	30MHz-40GHz		Micro-Coax	UFB142A-1-0787-200200	2593	I	3/7/2021	3/7/2020

Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	1/3/2021	1/3/2020
Weather Clock (Pressure only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018

Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	10/30/2020	10/30/2018

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

AC Line Conducted Emissions

LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBµV)	Average limit (dBµV)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

MEASUREMENTS / RESULTS

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Quasi-peak Detector Data
Notes:
EUT Line tested: Line
EUT Mode of Operation:NFC 13.56MHz

Work Order # - U0806
EUT Power Input - 120VAC/60 Hz
Test Site - CEMI-3
Conditions: - °24C; 32.8%RH; 1004 mBar
Test Engineer - AV

Data Taken at 07:56:02 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB)	Adjusted QP Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.151	29.837	19.7	49.6	66	-16.4	PASS	
0.164	27.429	19.7	47.2	65.3	-18.1	PASS	
0.239	22.588	19.7	42.3	62.1	-19.8	PASS	
0.306	19.096	19.7	38.8	60.1	-21.3	PASS	
0.355	20.51	19.7	40.2	58.8	-18.6	PASS	
0.402	27.014	19.7	46.7	57.8	-11.1	PASS	-11.1

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Final Average Detector Data
Notes:
EUT Line tested: Line
EUT Mode of Operation:NFC 13.56MHz

Work Order # - U0806
EUT Power Input - 120VAC/60 Hz
Test Site - CEMI-3
Conditions: - °24C; 32.8%RH; 1004 mBar
Test Engineer - AV

Data Taken at 08:05:18 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.15	15.9	19.7	35.6	56	-20.4	PASS	
0.15	15.9	19.7	35.6	56	-20.3	PASS	
0.154	15.8	19.7	35.6	55.8	-20.2	PASS	
0.232	15.2	19.7	34.9	52.4	-17.5	PASS	
0.25	14	19.7	33.7	51.8	-18.1	PASS	
0.397	18.1	19.7	37.8	47.9	-10.1	PASS	-10.1

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Quasi-peak Detector Data
Notes:
EUT Line tested: Neutral
EUT Mode of Operation:NFC 13.56MHz

Work Order # - U0806
EUT Power Input - 120VAC/60 Hz
Test Site - CEMI-3
Conditions: - °24C; 32.8%RH; 1004 mBar
Test Engineer - AV

Data Taken at 08:16:29 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB)	Adjusted QP Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.16	26.749	19.7	46.5	65.5	-19	PASS	
0.401	26.01	19.7	45.7	57.8	-12.1	PASS	-12.1
2.727	17.418	19.8	37.2	56	-18.8	PASS	
3.055	15.228	19.8	35	56	-21	PASS	
3.134	15.636	19.8	35.4	56	-20.6	PASS	
3.185	15.329	19.8	35.1	56	-20.9	PASS	

Frequency ((MHz))
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Final Average Detector Data
Notes:
EUT Line tested: Neutral
EUT Mode of Operation:NFC 13.56MHz

Work Order # - U0806
EUT Power Input - 120VAC/60 Hz
Test Site - CEMI-3
Conditions: - °24C; 32.8%RH; 1004 mBar
Test Engineer - AV

Data Taken at 08:31:31 AM, Wednesday, April 15, 2020

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.15	-5.6						
0.151	10	19.7	29.7	55.9	-26.2	PASS	
0.153	10.1	19.7	29.8	55.8	-26	PASS	
0.393	19.2	19.7	38.9	48	-9.1	PASS	-9.1
0.395	19.1	19.7	38.7	48	-9.2	PASS	
0.644	9.2	19.7	28.9	46	-17.1	PASS	
2.69	8	19.8	27.7	46	-18.3	PASS	

Test Equipment Used

Rev. 4/16/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
FSV40 Signal/Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	10/16/2020	10/16/2019
Cables	**Range**		**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
DUT1	30MHz-40GHz		Micro-Coax	UFB142A-1-0787-200200	2593	I	3/7/2021	3/7/2020
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	1/3/2021	1/3/2020
Weather Clock (Pressure only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	10/30/2020	10/30/2018

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz) NIST CISPR	 5.6dB 4.6dB	 N/A 5.2dB (Ucispr)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions NIST CISPR	 3.9dB 3.6dB	 N/A 3.6dB (Ucispr)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: • Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	 3.4% 0.3dB	 5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		

Conditions of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS", "MTL", "ACTS", "MTL-ACTS" and CURTIS-STRAUS** (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.
14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B)NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE , OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations he reunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachu setts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any procee ding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterc laim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Curtis-Straus may use to delegate the performance of work can be provided upon request.

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