Test Report

Bureau Veritas Consumer Products Services

Report No	ET1639-5
Client	ASSA ABLOY Inc.
Address	110 Sargent Drive New Haven, CT 06511
Phone	203-821-5724
Items tested	IN-BIKP (Model BLE9117K)
FCC ID	U4A-MODBLE9117K
IC	6982A-MODBLE9117K
FRN	0016550824
Equipment Type	Digital Transmission System
Equipment Code	DTS
Emission Designator	1M85F1D
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2
Test Dates	Apr 2 - Aug 5, 2019
Results	As detailed within this report
Prepared by	Anna Vancheva Anna Vancheva – EMC Engineer
Authorized by	Yunus Fazlioglu – Sr. Engineer
Issue Date	9/232019
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 33 of this report.

Bureau Veritas Consumer Products Services 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 7-20-07 (DW)

Summary and Test Methodology

Between Apr 2 and Aug 5, 2019 we tested the IN-BIKP (Model BLE9117K) for compliance with the following requirements:

CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2.

EUT transmits in the 2402-2480MHz frequency range. Emissions were measured with the EUT in its intended upright installation orientation. EUT has an internal detachable PCB antenna with -3.1dBi gain.

All testing was performed according to the following rules/procedures/documents;

CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2, ISED Canada RSS-Gen Issue 5, FCC KDB 558074 D01 15.247 Measurement Guidance v05r01 and ANSI C63.10-2013.

AC mains conducted emission testing was performed for both 24VDC and PoE(48VDC) configurations.

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
1GHz-25GHz	1MHz	3MHz

We found that the product met the above requirements with modification. See “Modifications Required for Compliance” section of this report. The test sample was received in good condition.

Product Tested - Configuration Documentation

EUT Configuration			
Work Order:	S1639		
Company:	Assa Abloy		
Company Address:	110 Sargent Drive		
	New Haven, CT 06511		
Contact:	Dave DeBiase		
	Product Marketing Name	Model Number	**SN**
EUT:	IN-BIKP	BLE9117K	1,2
EUT Description:	Lock Controller		
EUT Tx Frequency:	125kHz (LF RFID), 13.56MHz (HF RFID), 2402-2480MHz (BLE)		

Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment
Ethernet Door	Ethernet	1	1	Ethernet	No	Yes	1.5	in	yes	
Power DC	Power DC	1	1	Power DC	No	No	5	in	yes	
Ethernet frame	Ethernet	1	1	Ethernet	Yes	No	4.5	in	yes	
Power AC	Power AC	1	1	Power DC	No	yes	5	in	yes	

Software Operating Mode Description:

All radios are transmitting during testing.

Statement of Conformity

RSS-GEN	RSP-100	RSS 247	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 detachable PCB antenna with 3.1dBi gain.
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.
			15.247	The unit complies with the requirements of 15.247
		RSS 247		The unit complies with the requirements of RSS-247
6.7				Occupied Bandwidth measurements were made.

Modifications Required for Compliance

PoE configuration for radiated emissions was tested with ferrite Laird 28B0473-200 on all four Ethernet pairs.

Test Results

DTS (6dB) Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz. [15.247(a) (2)]

MEASUREMENTS / RESULTS

6dB Bandwidth

Date: 4/12/2019 **Work Order:** T1639
Engineer: CCH **Operating Voltage/Frequency:** Battery
Temp: 20°C **Humidity:** 32% **Pressure:** 1001mBar
Measurement Type: Conducted
Notes:

Frequency (MHz)	Reading (kHz)	6dB Bandwidth Limit (kHz)	6dB Bandwidth Result (Pass/Fail)
2402	745.4	≥500	Pass
2440	786.4	≥500	Pass
2480	740.1	≥500	Pass

Test Site: CEMI-2 **Cable:** none **Attenuator:** Asset #2121
Analyzer: 1118472

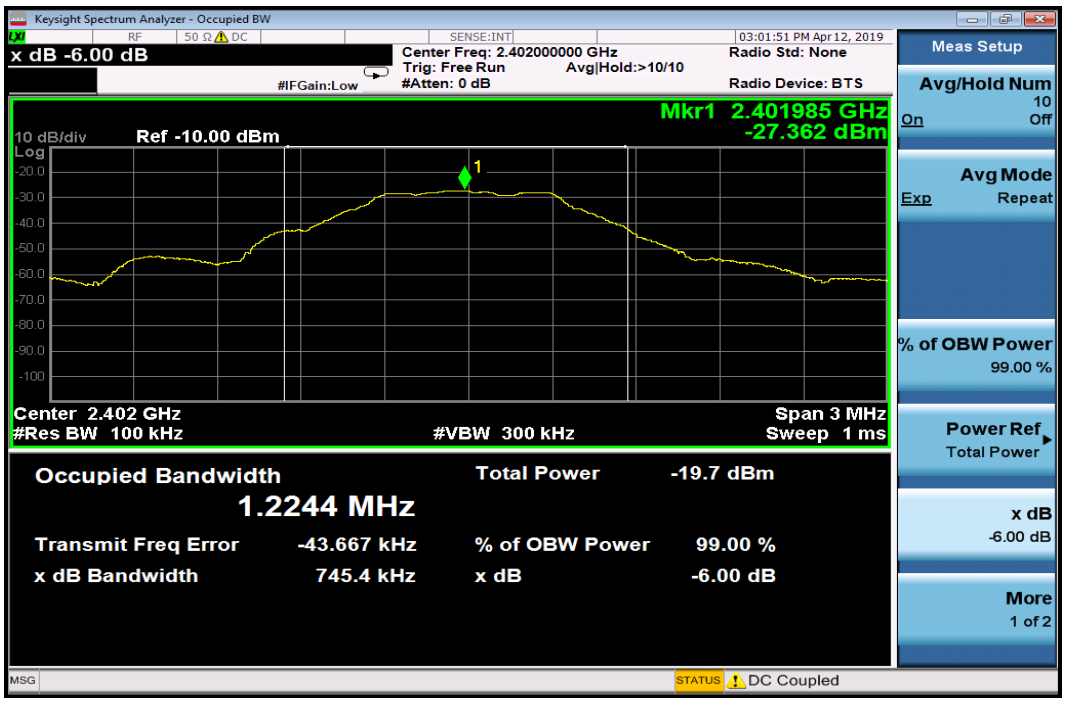
Rev. 7/30/2019

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1118472)	9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	8/10/2019	8/10/2018

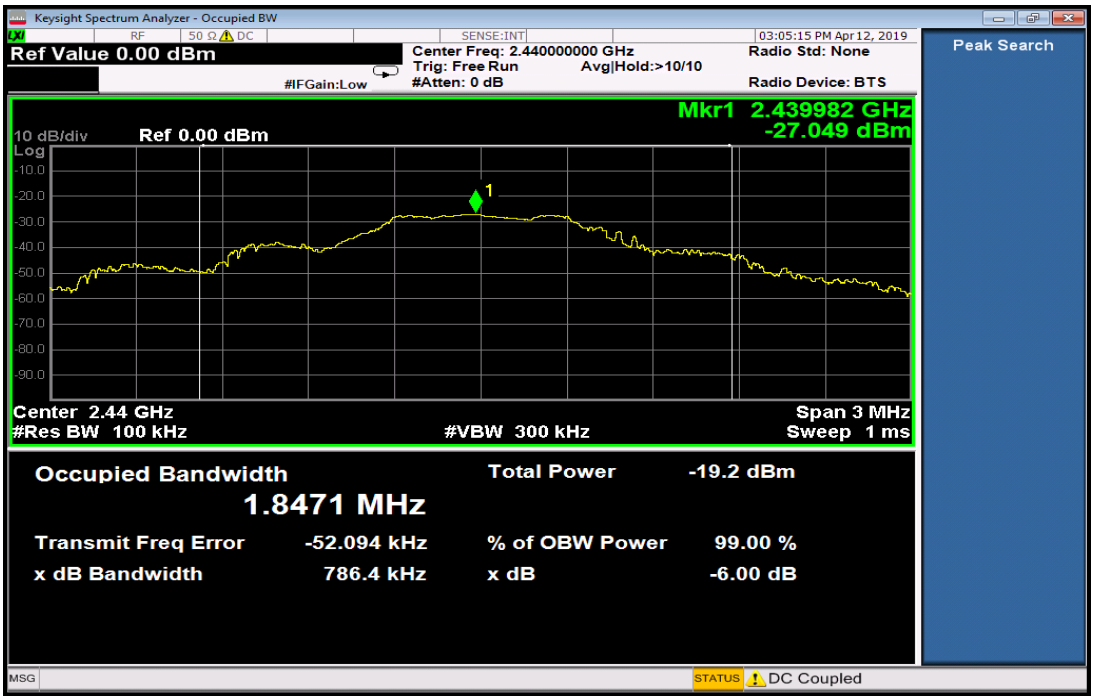
Conducted Test Sites (Mains / Telco)	FCC Code	VCCI Code	Cat	Calibration Due	Calibrated on
CEMI 2	719150	A-0015	III	NA	N/A

Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
API - 30dB 20W Attenuator	9KHz-40GHz	89-30-11	API Weinschel	703	2121	II	3/23/2020	3/23/2019

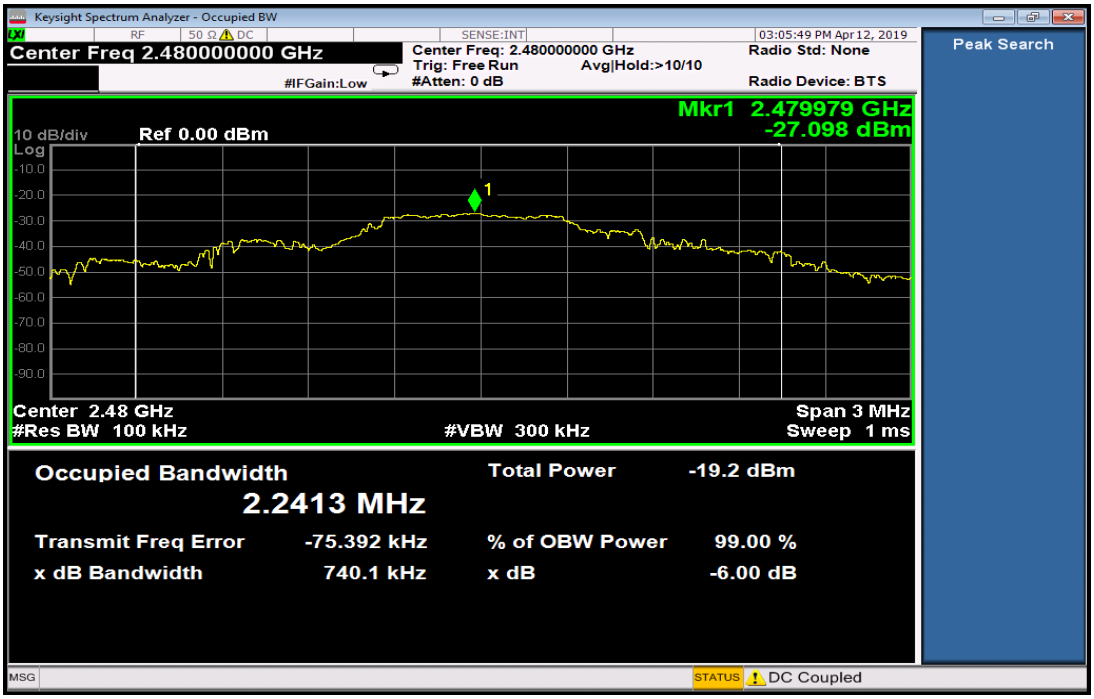
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



Low channel 6dB bandwidth



Middle channel 6dB bandwidth



High channel 6dB bandwidth

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 Issue 5 Section 6.7]

MEASUREMENTS / RESULTS

99% Occupied Bandwidth

Date: 4/12/2019 **Work Order:** T1639
Engineer: CCH **Operating Voltage/Frequency:** Battery
Temp: 20°C **Humidity:** 32% **Pressure:** 1001mBar
Measurement Type: Conducted
Notes:

Frequency (MHz)	99% OBW (MHz)
2402	1.0762
2440	1.5250
2480	1.8494

Test Site: CEMI-2 **Cable:** none **Attenuator:** Asset #2121
Analyzer: 1118472

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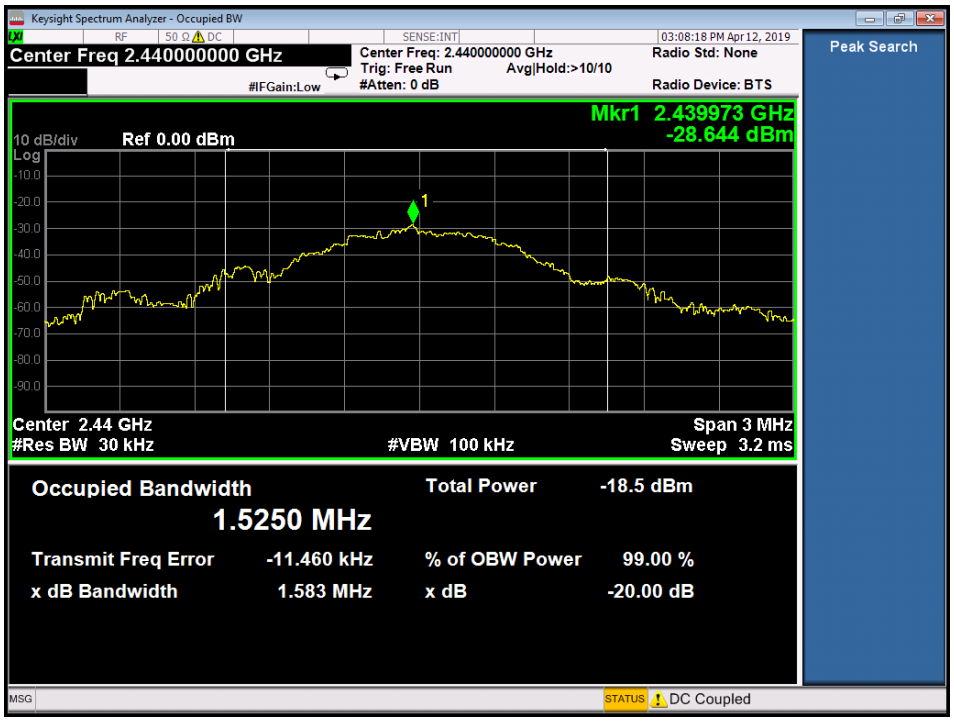
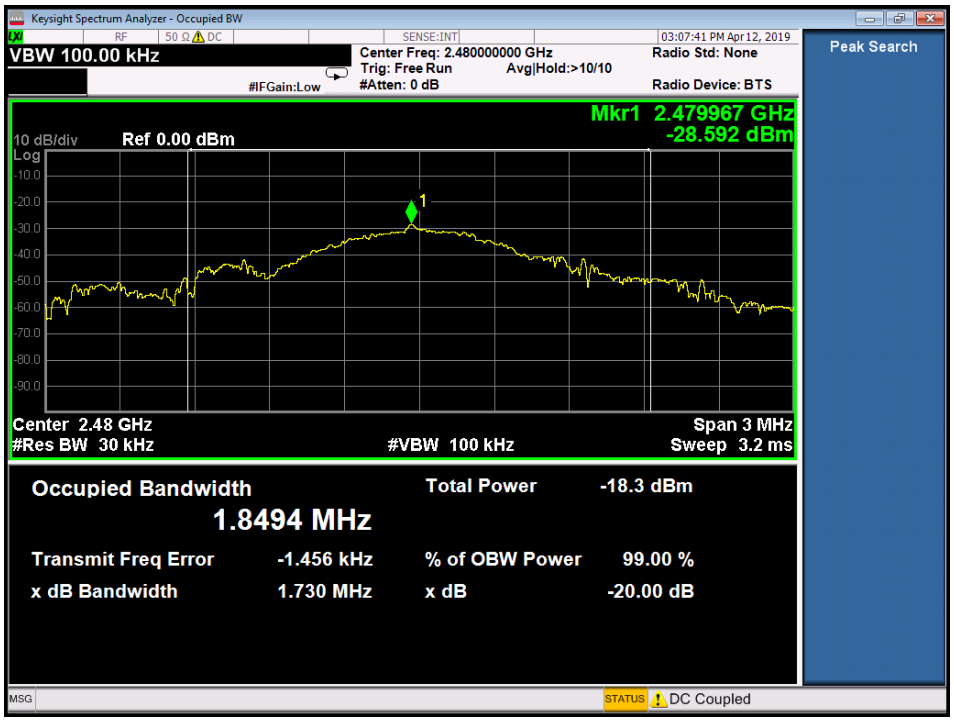
Low channel 99% OBW



Middle channel 99% OBW



High channel 99% OBW

Peak Output Power

LIMIT

1 Watt [15.247(b) (3)]

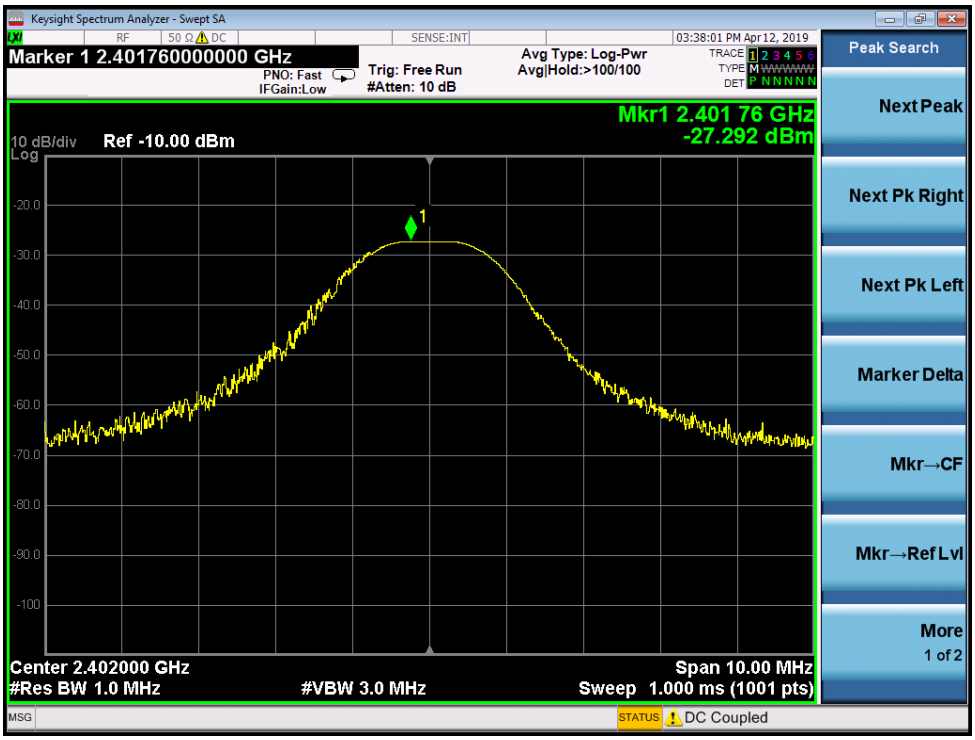
MEASUREMENTS / RESULTS

Peak Output Power

Date: 4/12/2019 **Work Order:** T1639
Engineer: CCH **Operating Voltage/Frequency:** Battery
Temp: 20°C **Humidity:** 32% **Pressure:** 1001mBar
Measurement Type: Conducted
Notes:

Frequency (MHz)	Peak Reading (dBm)	Cable Loss (dB)	Attenuator Loss (dB)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)	Result (Pass/Fail)
2402	-27.29	0.00	29.61	2.32	30.0	-27.68	Pass
2440	-27.06	0.00	29.61	2.55	30.0	-27.45	Pass
2480	-26.94	0.00	29.61	2.67	30.0	-27.33	Pass

Test Site: CEMI-2 **Cable:** none **Attenuator:** Asset #2121
Analyzer: 1118472
Peak Output Power (dBm)= Peak Reading (dBm) + Cable Loss (dB) + Attenuator Loss (dB)



Low channel peak output power

Middle channel peak output power

High channel peak output power

Peak Power Spectral Density

LIMIT

…the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. [15.247(e)]

MEASUREMENTS / RESULTS

Peak Power Spectral Density

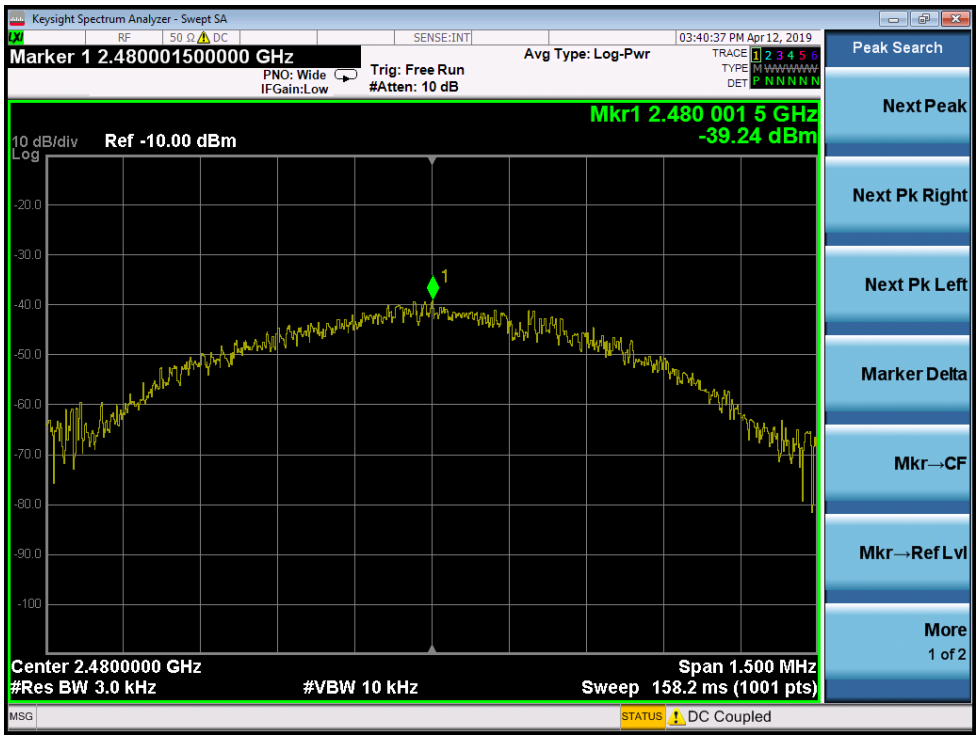
Date: 4/12/2019 **Work Order:** T1639
Engineer: CCH **Operating Voltage/Frequency:** Battery
Temp: 20°C **Humidity:** 32% **Pressure:** 1001mBar
Measurement Type: Conducted
Notes:

Frequency (MHz)	Peak Reading (dBm)	Cable Loss (dB)	Attenuator Loss (dB)	Peak PSD (dBm)	Limit (dBm)	Margin (dB)	Result
2402	-39.02	0.00	29.61	-9.41	8.0	-17.41	Pass
2440	-39.44	0.00	29.61	-9.83	8.0	-17.83	Pass
2480	-39.24	0.00	29.61	-9.63	8.0	-17.63	Pass

Test Site: CEMI-2 **Cable:** none **Attenuator:** Asset #2121
Analyzer: 1118472
PSD(dBm) = Reading (dBm) + Cable Loss (dB) + Attenuator Loss (dB)

Low channel Power Spectral Density

Middle channel Power Spectral Density



High channel Power Spectral Density

Conducted Bandedges

Bandedges must be more than 20dB below the value of the fundamental.

Low channel

High channel

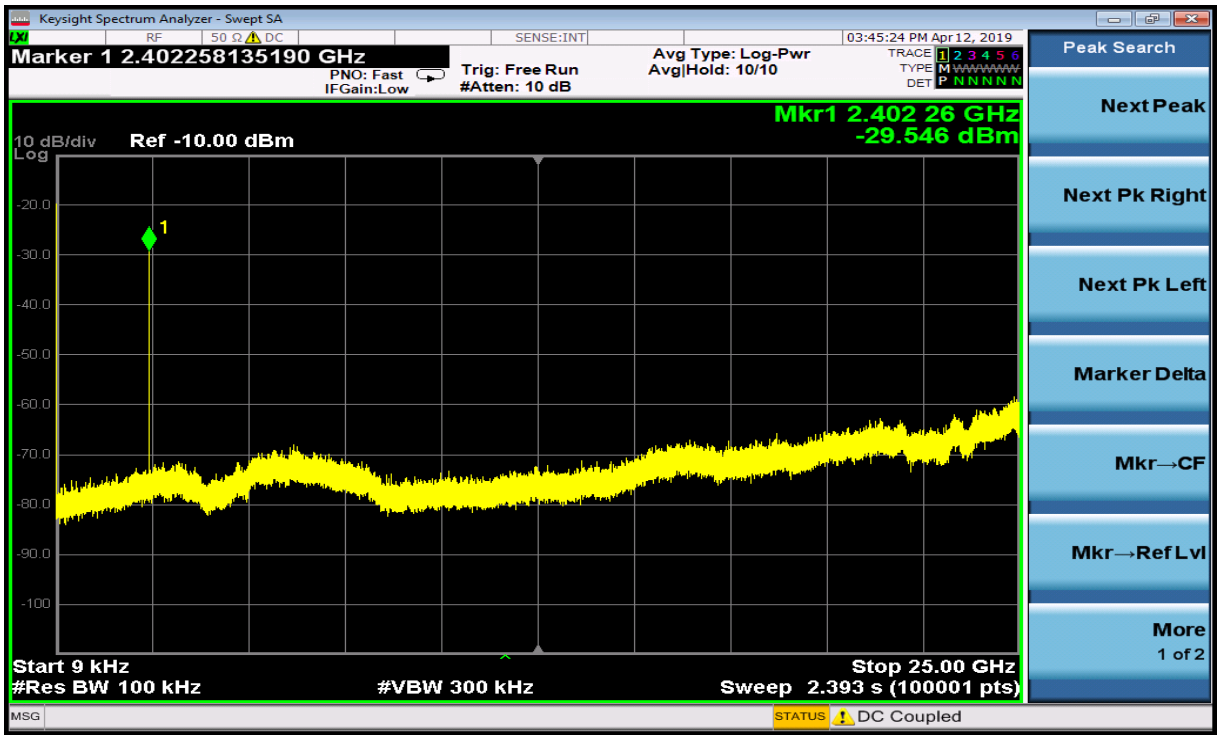
Conducted Spurious Emissions

LIMITS

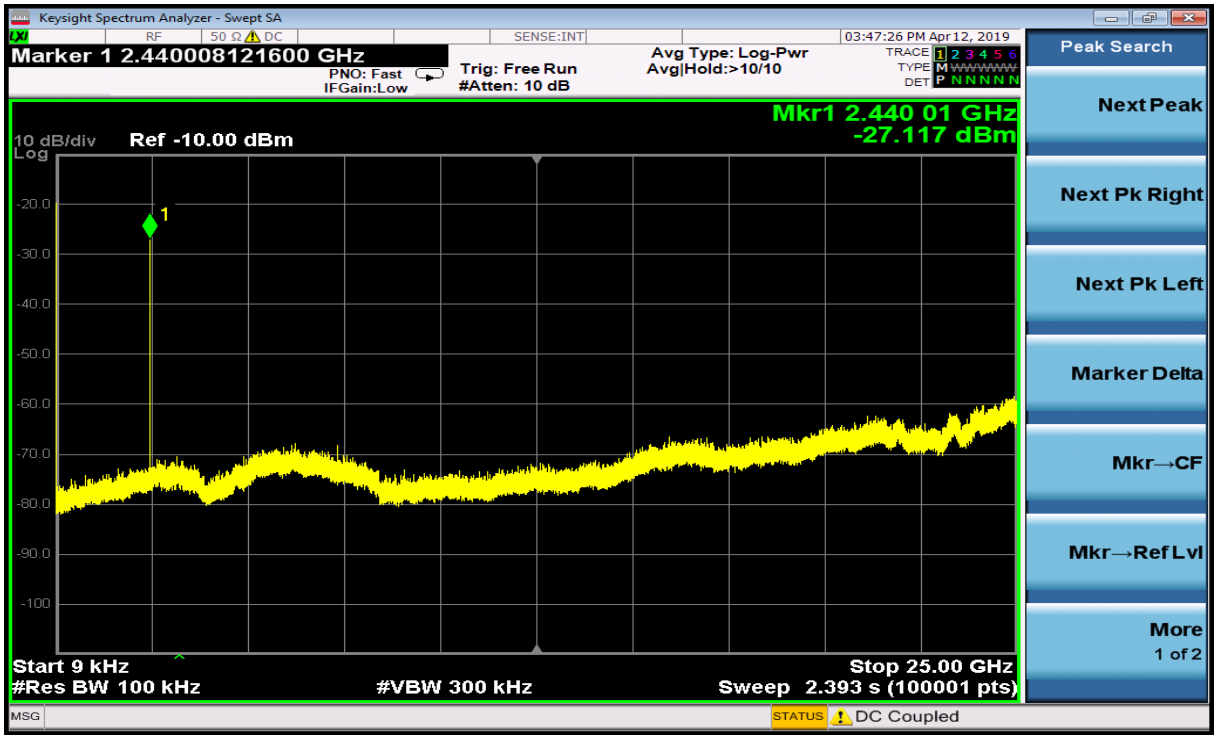
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth that contains the highest level of desired power based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB …
[15.247(d)]

Conducted spurious emissions at the antenna port were measured in accordance with ANSI C63.10-2013 Section 11.11.

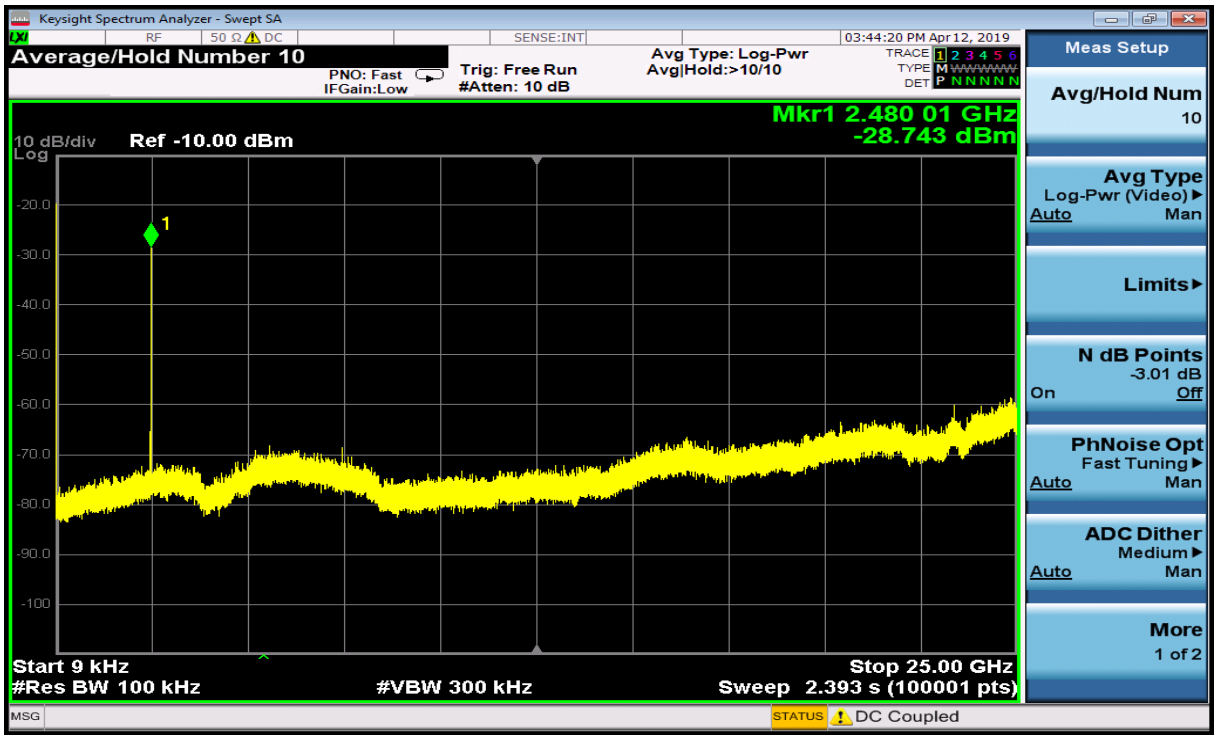
Frequency range up to 25GHz was investigated for all 3 channels (low, middle and high) at the EUT antenna port. No emissions within 20dB of their corresponding fundamental were found.



Low channel conducted spurious emissions



Middle channel conducted spurious emissions



High channel conducted spurious emissions

Radiated Band Edges

Radiated Emissions Table

Date: 05-Apr-19 **Work Order:** T1639
Engineer: Chris Hamel **EUT Operating Voltage/Frequency:** Battery
Temp: 21.1°C **Humidity:** 22% **Pressure:** 1012mBar
Measurement Distance: 3 m
Notes: BLE band edges

Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak Limit (dBµV/m)	FCC Class B High Frequency - Peak Margin (dB)	FCC Class B High Frequency - Peak Result (Pass/Fail)	FCC Class B High Frequency - Average Limit (dBµV/m)	FCC Class B High Frequency - Average Margin (dB)	FCC Class B High Frequency - Average Result (Pass/Fail)
Low														
V	2390.0	16.1	16.1	0.0	28.5	3.1	47.7	47.7	74.0	-26.3	Pass	54.0	-6.3	Pass
V	2387.0	20.5	4.8	0.0	28.5	3.1	52.1	36.4	74.0	-21.9	Pass	54.0	-17.6	Pass
V	2331.0	21.0	4.8	0.0	28.2	3.0	52.2	36.0	74.0	-21.8	Pass	54.0	-18.0	Pass
High														
V	2483.5	18.4	5.1	0.0	28.6	3.2	50.2	36.9	74.0	-23.8	Pass	54.0	-17.1	Pass
V	2491.2	20.4	6.1	0.0	28.6	3.2	52.2	37.9	74.0	-21.8	Pass	54.0	-16.1	Pass

Table Result: Pass by -6.3 dB ***Worst Freq:*** 2390.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2606 **Cable 2:** Asset #2456 **Cable 3:** ---
Analyzer: Asset # 1170725 **Preamp:** None **Antenna:** Black Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.214
Copyright Curtis-Straus LLC 2000
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Test Equipment Used

Rev. 4/2/2019							
Spectrum Analyzers / Receivers /Preselectors	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	4/10/2019
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/7/2020
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
Black Horn	1-18GHz	3115	EMCO	9703-5148	56	I	9/6/2020
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020
TH A#2084		HTC-1	HDE		2084	II	4/23/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**
Asset #2456	9KHz-18GHz		MegaPhase			II	10/31/2019
Asset #2606	9KHz-18GHz		MegaPhase			II	4/2/2020
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.							

Radiated Spurious Emissions

LIMITS

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
[15.247(d)]

MEASUREMENTS / RESULTS

Curtis Straus - a Bureau Veritas Company — Work Order - T1639
Radiated Emissions Electric Field 3m Distance — EUT Power Input - Battery
Top Peaks Horizontal 30-1000MHz — Test Site - CH-1
Operator: AKZ — Conditions - 24°C; 17%RH; 1016mBar
Notes:
BLE low channel

Data Taken at April 04, 2019

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)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
31.116	25	3	28	40	-12	PASS		40	-12	PASS		250	225
393.241	33.5	-1.5	32	46	-14	PASS		46	-14	PASS		100	0
420.352	35.6	-1	34.7	46	-11.3	PASS		46	-11.4	PASS		200	180
433.908	33	-1	32	46	-14	PASS		46	-14	PASS		200	0
447.464	34	-0.6	33.4	46	-12.6	PASS		46	-12.6	PASS		200	135
930.014	30.3	6.6	37	46	-9	PASS	-9	46	-9.1	PASS	-9.1	250	45

Curtis Straus - a Bureau Veritas Company — Work Order - T1639
Radiated Emissions Electric Field 3m Distance — EUT Power Input - Battery
Top Peaks Vertical 30-1000MHz — Test Site - CH-1
Operator: AKZ — Conditions - 24°C; 17%RH; 1016mBar
Notes:
BLE low channel

Data Taken at April 04, 2019

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)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
30.145	24.7	3.6	28.4	40	-11.6	PASS	-11.6	40	-11.6	PASS	-11.6	200	315
40.694	30.8	-4.5	26.3	40	-13.7	PASS		40	-13.7	PASS		100	90
267.965	36.7	-4.5	32.2	46	-13.8	PASS		46	-13.8	PASS		200	90
268.984	36.8	-4.4	32.4	46	-13.6	PASS		46	-13.7	PASS		200	90
271.942	36.1	-4.2	31.9	46	-14.1	PASS		46	-14.2	PASS		200	90
924.728	26.9	6.7	33.7	46	-12.3	PASS		46	-12.4	PASS		100	315

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: CCH
Notes:
BLE low channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)
1725.5	43.9	36.2	-8.5	35.4	74	-38.6	PASS		27.8	54	-26.2	PASS	
2103	43.5	35.6	-5.2	38.4	74	-35.6	PASS		30.4	54	-23.6	PASS	
3334.3	44.2	34.8	-3	41.2	74	-32.8	PASS		31.8	54	-22.2	PASS	
4803.6	53.6	47.2	-1.8	51.9	74	-22.1	PASS	-22.1	45.5	54	-8.5	PASS	-8.5
5658.1	42.9	34	0.7	43.6	74	-30.4	PASS		34.7	54	-19.3	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: CCH
Notes:
BLE low channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
1406.3	45	36.1	-9.4	35.6	74	-38.4	PASS		26.8	54	-27.2	PASS	
2106.6	44.5	35.7	-5.2	39.3	74	-34.7	PASS		30.6	54	-23.4	PASS	
4108.7	42.3	34	-1.9	40.4	74	-33.6	PASS		32.1	54	-21.9	PASS	
4803.5	47.3	38.6	-1.8	45.6	74	-28.4	PASS	-28.4	36.9	54	-17.1	PASS	-17.1
5696.3	43.3	34.1	0.7	44.1	74	-29.9	PASS		34.9	54	-19.1	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: CCH
Notes:
BLE low channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)
9608.8	48.3	39.6	6.1	54.3	83.5	-29.2	PASS		45.7	63.5	-17.8	PASS	
12274.2	44.9	34.4	9.4	54.2	83.5	-29.3	PASS		43.7	63.5	-19.8	PASS	
17848.4	45.1	35.4	14	59	83.5	-24.5	PASS	-24.5	49.3	63.5	-14.2	PASS	-14.2

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: CCH
Notes:
BLE low channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at 'April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
7206.1	43.6	36.7	4	47.5	83.5	-36	PASS		40.6	63.5	-22.9	PASS	
9607.8	44.3	36.2	6.1	50.3	83.5	-33.2	PASS		42.3	63.5	-21.2	PASS	
12698.6	44	34.1	10.2	54.2	83.5	-29.3	PASS		44.2	63.5	-19.3	PASS	
17853	45.6	35.3	14	59.6	83.5	-23.9	PASS	-23.9	49.3	63.5	-14.2	PASS	-14.2

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: AKZ
Notes:
BLE mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1016mBar

Data Taken at April 04, 2019

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)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.218	25.5	3.6	29	40	-11	PASS		40	-11	PASS		150	270
230.499	37.4	-6	31.4	46	-14.6	PASS		46	-14.7	PASS		100	135
393.241	34	-1.5	32.6	46	-13.4	PASS		46	-13.4	PASS		100	135
420.352	32.4	-1	31.4	46	-14.6	PASS		46	-14.6	PASS		200	180
447.464	35.3	-0.6	34.6	46	-11.4	PASS		46	-11.4	PASS		200	135
930.014	32.7	6.6	39.3	46	-6.7	PASS	-6.7	46	-6.7	PASS	-6.7	100	45

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: AKZ
Notes:
BLE mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1016mBar

Data Taken at April 04, 2019

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)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
31.552	25.2	2.6	27.8	40	-12.2	PASS		40	-12.2	PASS		200	270
40.694	31.5	-4.5	27	40	-13	PASS		40	-13	PASS		100	270
270.026	36.3	-4.3	32	46	-14	PASS		46	-14	PASS		200	90
309.772	35.3	-3.4	31.9	46	-14.1	PASS		46	-14.2	PASS		150	225
766.739	27.8	5.4	33.2	46	-12.8	PASS		46	-12.8	PASS		200	90
953.416	27.5	6.7	34.2	46	-11.8	PASS	-11.8	46	-11.9	PASS	-11.9	150	0

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: CCH
Notes:
BLE mid channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)
1730.1	45.5	35.6	-8.5	37	74	-37	PASS		27.1	54	-26.9	PASS	
2184.5	44.1	34.7	-5	39.1	74	-34.9	PASS		29.7	54	-24.3	PASS	
4880.4	53.4	46.5	-0.9	52.4	74	-21.6	PASS	-21.6	45.5	54	-8.5	PASS	-8.5
5337.2	40.2	33	1.2	41.4	74	-32.6	PASS		34.2	54	-19.8	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: CCH
Notes:
BLE mid channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
1728.1	43.7	35.7	-8.5	35.3	74	-38.7	PASS		27.2	54	-26.8	PASS	
2139.8	46.3	35.5	-5.1	41.2	74	-32.8	PASS		30.4	54	-23.6	PASS	
3162.3	44	34.2	-2.3	41.7	74	-32.3	PASS		31.9	54	-22.1	PASS	
4103	43.3	33.8	-1.9	41.5	74	-32.5	PASS		32	54	-22	PASS	
4879.4	47.9	41.4	-1	47	74	-27	PASS	-27	40.4	54	-13.6	PASS	-13.6
5995.2	42.5	33.8	1	43.5	74	-30.5	PASS		34.9	54	-19.1	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: CCH
Notes:
BLE mid channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)
12726.5	42.9	34	10	52.9	83.5	-30.6	PASS		44.1	63.5	-19.4	PASS	
16083.4	45.5	35.4	11.5	57	83.5	-26.5	PASS		46.9	63.5	-16.6	PASS	
17967.4	43.7	35.1	14	57.7	83.5	-25.8	PASS	-25.8	49.1	63.5	-14.4	PASS	-14.4

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: CCH
Notes:
BLE mid channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
7320.7	47.4	37.1	3.5	50.9	83.5	-32.6	PASS		40.7	63.5	-22.8	PASS	
12221.1	42.9	34.3	9.5	52.3	83.5	-31.2	PASS		43.8	63.5	-19.7	PASS	
14920.7	44.1	34.3	11.3	55.4	83.5	-28.1	PASS		45.6	63.5	-17.9	PASS	
17989.8	44.2	35	13.9	58.1	83.5	-25.4	PASS	-25.4	48.9	63.5	-14.6	PASS	-14.6

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: AKZ
Notes:
BLE high channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1016mBar

Data Taken at April 04, 2019

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)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.558	25.1	3.3	28.4	40	-11.6	PASS	-11.6	40	-11.6	PASS	-11.6	200	135
244.079	37.3	-5.4	31.8	46	-14.2	PASS		46	-14.2	PASS		100	135
393.216	33.5	-1.5	32.1	46	-13.9	PASS		46	-14	PASS		250	315
420.352	34.5	-1	33.5	46	-12.5	PASS		46	-12.5	PASS		100	180
447.464	34.2	-0.6	33.6	46	-12.4	PASS		46	-12.4	PASS		200	0
876.81	27.6	5.7	33.3	46	-12.7	PASS		46	-12.7	PASS		100	135

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: AKZ
Notes:
BLE high channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1016mBar

Data Taken at April 04, 2019

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)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
30.34	25.4	3.5	28.9	40	-11.1	PASS	-11.1	40	-11.1	PASS	-11.1	100	0
264.91	36.3	-4.9	31.4	46	-14.6	PASS		46	-14.6	PASS		200	135
268.111	36.4	-4.5	31.9	46	-14.1	PASS		46	-14.2	PASS		200	135
269.784	36	-4.3	31.7	46	-14.3	PASS		46	-14.3	PASS		200	135
271.797	36.6	-4.2	32.4	46	-13.6	PASS		46	-13.7	PASS		200	135
890.196	27.5	6.1	33.6	46	-12.4	PASS		46	-12.5	PASS		150	225

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: CCH
Notes:
BLE high channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)
2130.6	43.7	35.5	-5	38.6	74	-35.4	PASS		30.5	54	-23.5	PASS	
3305.8	43.9	34.8	-2.9	41	74	-33	PASS		31.9	54	-22.1	PASS	
4138.5	42	33.9	-1.9	40.1	74	-33.9	PASS		32	54	-22	PASS	
4880.6	53.5	48.3	-0.9	52.6	74	-21.4	PASS	-21.4	47.4	54	-6.6	PASS	-6.6
5599.7	42.6	34	0.9	43.5	74	-30.5	PASS		34.9	54	-19.1	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: CCH
Notes:
BLE high channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
1726.6	43.9	36.7	-8.5	35.5	74	-38.5	PASS		28.3	54	-25.7	PASS	
2109.9	44.5	35.4	-5.1	39.4	74	-34.6	PASS		30.2	54	-23.8	PASS	
3796.2	43	33.6	-1.8	41.1	74	-32.9	PASS		31.8	54	-22.2	PASS	
4880.4	47.9	40.2	-0.9	46.9	74	-27.1	PASS	-27.1	39.2	54	-14.8	PASS	-14.8
5463.1	42.5	33.6	1.4	43.9	74	-30.1	PASS		35	54	-19	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: CCH
Notes:
BLE high channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)
12773.2	43.3	33.6	10.1	53.4	83.5	-30.1	PASS		43.8	63.5	-19.7	PASS	
17902.7	45.2	34.8	14.1	59.3	83.5	-24.2	PASS	-24.2	48.9	63.5	-14.6	PASS	-14.6

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: CCH
Notes:
BLE high channel

Work Order - T1639
EUT Power Input - Batteries
Test Site - CH1
Conditions - 21.1°C; 22%RH; 1012mBar

Data Taken at April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
7440.6	43.4	35.1	4.1	47.5	83.5	-36	PASS		39.2	63.5	-24.3	PASS	
12100.1	42.3	34.3	9.2	51.5	83.5	-32	PASS		43.6	63.5	-19.9	PASS	
17956.8	44.1	35	14	58.1	83.5	-25.4	PASS	-25.4	49	63.5	-14.5	PASS	-14.5

Radiated Emissions Table

Date: 05-Apr-19 **Work Order:** T1639
Engineer: CCH **EUT Operating Voltage/Frequency:** Battery
Temp: 21°C **Humidity:** 22% **Pressure:** 1012mBar
Frequency Range: 18-26.5GHz **Measurement Distance:** 0.1 m
Notes: BLE all channels **EUT Max Freq:**
No emissions found

Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC 15.209 - Peak Limit (dBµV/m)	FCC 15.209 - Peak Margin (dB)	FCC 15.209 - Peak Result (Pass/Fail)	FCC 15.209 - Average Limit (dBµV/m)	FCC 15.209 - Average Margin (dB)	FCC 15.209 - Average Result (Pass/Fail)
				---	---	---	---	---	---	---	---	---	---	---
	No emissions found			---	---	---	---	---	---	---	---	---	---	---
				---	---	---	---	---	---	---	---	---	---	---
				---	---	---	---	---	---	---	---	---	---	---

Table Result: Pass by N/A dB ***Worst Freq:*** N/A MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2323 **Cable 2:** --- **Cable 3:** ---
Analyzer: Asset# 1170725 **Preamp:** 18-26.5GHz **Antenna:** 18-26.5GHz Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.214 Copyright Curtis-Straus LLC 2000
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

125kHz RFID, 13.56MHz RFID and BLE simultaneous transmission:

No emissions found in 9kHz-30MHz range.

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: AKZ
Notes:
All radios on, BLE at mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 23°C; 21%RH; 1023mBar

Data Taken at 04:12:27 PM, Tuesday, April 02, 2019

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_109_Class_B (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Lim2: FCC_pt15_209 (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.145	24.6	3.6	28.2	40	-11.8	PASS		40	-11.8	PASS		200	270
40.67	30.4	-4.5	26	40	-14	PASS		40	-14	PASS		150	0
54.226	33.9	-10.6	23.2	40	-16.8	PASS		40	-16.8	PASS		250	180
257.635	36.1	-5.2	30.9	46	-15.1	PASS		46	-15.1	PASS		100	315
352.549	30.3	-2	28.3	46	-17.7	PASS		46	-17.7	PASS		100	180
942.721	27.6	6.7	34.4	46	-11.7	PASS	-11.7	46	-11.6	PASS	-11.6	250	45

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: AKZ
Notes:
All radios on, BLE at mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 23°C; 21%RH; 1023mBar

Data Taken at 04:12:27 PM, Tuesday, April 02, 2019

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_109_Class_B (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Lim2: FCC_pt15_209 (dBµV/m)	Lim2 Margin (dB)	Lim2 Test Results (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
30.315	24.4	3.5	27.9	40	-12.1	PASS		40	-12.1	PASS		200	315
40.67	40.6	-4.5	36.1	40	-3.9	PASS	-3.9	40	-3.9	PASS	-3.9	100	90
54.226	39.8	-10.6	29.2	40	-10.8	PASS		40	-10.8	PASS		200	225
264.934	39.7	-4.9	34.8	46	-11.2	PASS		46	-11.2	PASS		200	45
266.947	39.5	-4.6	35	46	-11	PASS		46	-11	PASS		200	45
268.038	39.1	-4.5	34.6	46	-11.5	PASS		46	-11.4	PASS		200	45

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: AKZ
Notes:
All radios on, BLE at mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1020mBar

Data Taken at 11:51:06 AM, Friday, April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
4870.4	42.5	33.5	-0.4	42.1	74	-31.9	PASS		33.2	54	-20.8	PASS		275	243
4884.4	47.9	38.5	-0.1	47.7	74	-26.3	PASS	-26.3	38.3	54	-15.7	PASS	-15.7	210	31
5273.9	41.4	33.3	0.7	42.1	74	-31.9	PASS		34	54	-20	PASS		100	7
5323.1	41.3	33.4	1.1	42.5	74	-31.5	PASS		34.6	54	-19.4	PASS		288	23

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: AKZ
Notes:
All radios on, BLE at mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1020mBar

Data Taken at 11:51:06 AM, Friday, April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
5327.1	42.7	33.5	1.2	43.9	74	-30.1	PASS	-30.1	34.6	54	-19.4	PASS	-19.4	225	263

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: AKZ
Notes:
All radios on, BLE at mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1020mBar

Data Taken at 11:02:23 AM, Friday, April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
7326.6	54.5	47.7	3.3	57.8	83.5	-25.7	PASS		51	63.5	-12.5	PASS	-12.5	140	198
10533.4	53.7	34.4	7.2	60.9	83.5	-22.6	PASS	-22.6	41.6	63.5	-21.9	PASS		150	66
17898.2	43.9	35	14	57.8	83.5	-25.7	PASS		48.9	63.5	-14.6	PASS		199	94

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: AKZ
Notes:
All radios on, BLE at mid channel

Work Order - T1639
EUT Power Input - Battery
Test Site - CH-1
Conditions - 24°C; 17%RH; 1020mBar

Data Taken at 11:02:23 AM, Friday, April 05, 2019

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
7325.2	62.3	55.5	3.3	65.6	83.5	-17.9	PASS	-17.9	58.7	63.5	-4.8	PASS	-4.8	146	339
10532.1	49.2	34.5	7.2	56.4	83.5	-27.1	PASS		41.7	63.5	-21.8	PASS		200	309
17898.2	45.3	35	14	59.3	83.5	-24.2	PASS		49	63.5	-14.5	PASS		190	21

Radiated Emissions Table

Date: 05-Apr-19 **Work Order:** T1639
Engineer: AKZ **EUT Operating Voltage/Frequency:** Battery
Temp: 24°C **Humidity:** 17% **Pressure:** 1020mbar
Frequency Range: 18-25GHz **Measurement Distance:** 0.1 m
Notes: All radios on. BLE mid channel

Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC 15.209 High Frequency - Peak Limit (dBµV/m)	FCC 15.209 High Frequency - Peak Margin (dB)	FCC 15.209 High Frequency - Peak Result (Pass/Fail)	FCC 15.209 High Frequency - Average Limit (dBµV/m)	FCC 15.209 High Frequency - Average Margin (dB)	FCC 15.209 High Frequency - Average Result (Pass/Fail)
				---	---	---	---	---	---	---	---	---	---	---
No emissions were found in this range				---	---	---	---	---	---	---	---	---	---	---
				---	---	---	---	---	---	---	---	---	---	---

Test Site: EMI Chamber 1 **Cable 1:** Asset #2324 **Cable 2:** --- **Cable 3:** ---
Analyzer: --- **Preamp:** 18-26.5GHz **Antenna:** 18-26.5GHz Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.214
Copyright Curtis-Straus LLC 2000
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Test Equipment Used

Rev. 4/9/2019

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	4/10/2019

Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	12/7/2020
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/7/2020

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red	0.009-2000MHz	ZFL-1000-LN	CS	N/A	798	II	1/29/2020
2310 PA	1-1000MHz	PAM-103	COM-POWER	441175	2310	II	10/29/2019
8449B HF Preamp	1-18GHz	8449B	Agilent	1149055		II	11/26/2019
HF (Yellow)	18-26.5GHz	AFS4-18002650-60-8P-4	CS	467559	1266	II	10/24/2019

Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red-White Bilog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	8/21/2019
Black Horn	1-18GHz	3115	EMCO	9703-5148	56	I	9/6/2020
HF (White) Horn	18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	3/9/2021

Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020
Asset #2656		1235C97	Control Company	181683818	2656	I	10/23/2020

Cables	Range		Mfr			Cat	Calibration Due
Asset #2456	9KHz-18GHz		MegaPhase			II	10/31/2019
Asset #2467	9KHz-18GHz		MegaPhase			II	10/31/2019
Asset #2323	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/9/2019
Asset #2606	9KHz-18GHz		MegaPhase			II	4/2/2020

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
Peak Detector Data
Notes:
EUT Line tested: Line Phase
EUT Mode of Operation: 24 VDC

Work Order # - T1639
EUT Power Input - 24VDC
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 12:38:55 PM, Monday, August 05, 2019

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.158	38.8	20.2	59	65.6	-6.5	PASS	-6.5
0.194	34.3	20.2	54.4	63.9	-9.4	PASS	
0.219	35.1	20.2	55.3	62.8	-7.5	PASS	
0.247	32.2	20.3	52.4	61.9	-9.4	PASS	
0.375	28.4	20.1	48.5	58.4	-9.9	PASS	
13.559	30.4	20.5	50.9	60	-9.1	PASS	

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 Phase
EUT Mode of Operation: 24 VDC

Work Order # - T1639
EUT Power Input - 24VDC
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 12:38:55 PM, Monday, August 05, 2019

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)
0.149	2.4						
0.155	15.2	20.1	35.3	55.7	-20.4	PASS	
0.168	15.1	20.1	35.3	55	-19.8	PASS	
0.175	15.2	20.3	35.5	54.7	-19.2	PASS	
0.218	13.5	20.2	33.7	52.9	-19.2	PASS	
0.393	10.2	20	30.2	48	-17.8	PASS	-17.8
0.574	7.3	19.9	27.1	46	-18.9	PASS	

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT: Neutral
EUT Mode of Operation: 24V DC

Work Order # - T1639
EUT Power Input - 24VDC
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 12:19:42 PM, Monday, August 05, 2019

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.207	31.1	20.3	51.4	63.3	-11.9	PASS	
0.251	29.2	20.3	49.5	61.7	-12.2	PASS	
0.278	29.8	20.2	50	60.9	-10.8	PASS	
0.336	30.4	20.2	50.5	59.3	-8.8	PASS	-8.8
0.419	26.5	20.1	46.7	57.5	-10.8	PASS	
13.56	30.6	20.5	51.1	60	-8.9	PASS	

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Final Average Detector Data
Notes:
EUT: Neutral
EUT Mode of Operation: 24V DC

Work Order # - T1639
EUT Power Input - 24VDC
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 12:19:42 PM, Monday, August 05, 2019

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)
0.189	13.3	20.2	33.5	54.1	-20.6	PASS	
0.225	11.6	20.2	31.8	52.6	-20.8	PASS	
0.235	11.4	20.2	31.7	52.3	-20.6	PASS	
0.264	13.5	20.2	33.8	51.3	-17.6	PASS	
0.379	10.4	20	30.4	48.3	-17.9	PASS	
13.557	20.5	20.5	41	50	-9	PASS	-9

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUTBLE9117K: Line
EUT Mode of Operation: PoE

Work Order # - T1639
EUT Power Input - PoE (48VDC)
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 04:39:44 PM, Monday, August 05, 2019

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.184	37.3	20.3	57.5	64.3	-6.8	PASS	
0.213	34.9	20.2	55.1	63.1	-8	PASS	
0.269	29.3	20.2	49.5	61.2	-11.7	PASS	
0.629	26.8	20.2	47	56	-9	PASS	
0.734	26.6	19.9	46.5	56	-9.5	PASS	
Frequency (MHz)	**Raw QP Reading (dBµV)**	**Factor (dB)**	**Amplitude (dBµV)**	**Mains_FCC&CISP (dBµV)**	**Limit (dB)**	**QP Limit Results (Pass/Fail)**	**(QP Limit) (dB)**
10.975	18.271	20.5	38.8	60	-21.2	PASS	-21.2

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Final Average Detector Data
Notes:
EUTBLE9117K: Line
EUT Mode of Operation: PoE

Work Order # - T1639
EUT Power Input - PoE (48 VDC)
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 04:39:44 PM, Monday, August 05, 2019

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)
0.157	15.1	20.2	35.3	55.6	-20.4	PASS	
0.159	15.2	20.2	35.3	55.5	-20.2	PASS	
0.231	19.9	20.2	40.1	52.4	-12.3	PASS	
0.629	25.2	20.2	45.4	46	-0.6	PASS	-0.6
0.733	25.2	19.9	45.1	46	-0.9	PASS	
13.56	19.2	20.5	39.7	50	-10.3	PASS	

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT:BLE9117K Neutral
EUT Mode of Operation: PoE

Work Order # - T1639
EUT Power Input - PoE (48 VDC)
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 04:21:25 PM, Monday, August 05, 2019

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.157	33	20.2	53.2	65.6	-12.4	PASS	
0.419	27	20.1	47.2	57.5	-10.3	PASS	
0.522	30.9	20	50.9	56	-5.1	PASS	
0.73	29.7	20	49.7	56	-6.3	PASS	
0.837	23.3	20.2	43.5	56	-12.5	PASS	
Frequency (MHz)	**Raw QP Reading (dBµV)**	**Factor (dB)**	**Amplitude (dBµV)**	**Mains_FCC&CISP (dBµV)**	**Limit (dB)**	**QP Limit Results (Pass/Fail)**	**(QP Limit) (dB)**
0.63	24.738	20.2	44.9	56	-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:BLE9117K Neutral
EUT Mode of Operation: PoE

Work Order # - T1639
EUT Power Input - PoE (48 VDC)
Test Site - CEMI-2
Conditions: - 22.5°C; 48.8%RH; 1009mBar
Test Engineer - AV

Data Taken at 04:21:25 PM, Monday, August 05, 2019

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)
0.524	16.7	20	36.7	46	-9.3	PASS	
0.629	23.9	20.2	44.1	46	-1.9	PASS	-1.9
0.734	24.1	19.9	44	46	-2	PASS	

Test Equipment Used

Rev. 7/30/2019

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1168255)	20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/23/2019	8/23/2018
LISNs/Measurement Probes	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
LISN Asset 1732	150kHz-30MHz	LI-150A	Com-Power	201094	1732	I	3/19/2020	3/19/2019
LISN Asset 1733	150kHz-30MHz	LI-150A	Com-Power	201095	1733	I	3/19/2020	3/19/2019
Conducted Test Sites (Mains / Telco)	**FCC Code**		**VCCI Code**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI 2	719150		A-0015			III	NA	N/A
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 #2655		1235C97	Control Company	181683829	2655	I	4/3/2020	4/3/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI-02	9kHz - 2GHz		C-S			II	4/10/2020	4/10/2019

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 hereunder 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.

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 Massachusetts 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 proceeding 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 counterclaim 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.