



CURTIS-STRAUS

Test Report

Report No ES1365-2

Client Powercast Corporation
Dan Harrist

Address 620 Alpha Drive
Pittsburgh, PA 15238

Phone (412) 436-4077

Items tested TX91503 (with new power supply)
FCC ID YESTX91503
IC ID 8985A-TX91503
FRN 0019814789

FCC/IC Rule Parts 47 CFR 15.247, RSS 210 issue 7 and RSS GEN issue 2

Test Dates 5/10/18 to 5/22/18

Results As detailed within this report

Prepared by 
Zac Johnson Test Engineer

Authorized by 
Yunus Faziloklu – EMC Supervisor

Issue Date 8/20/2018

Conditions of Issue This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 40 of this report.

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Form Final Report REV 7-20-07 (DW)



Summary

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247 and RSS-210. The product model TX91503 and which transmits at 915MHz.

Previously certified model TX91503 was modified by adding a new power supply as documented below:

We found that the product met the above requirements without additional modification (see *Modifications Required for Compliance* section on page **Error! Bookmark not defined.**). The test sample was received in good condition.

Test Methodology

Radiated emission and AC Line conducted testing was performed according to the procedures specified in ANSI C63.4 (2003) and RSS-GEN. Radiated Emissions were maximized by rotating the device around three orthogonal axes as well as varying the test antenna’s height and polarity.

The EUT operating voltage is 120V/60Hz.

The following bandwidths were used during radiated spurious and line conducted emissions.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-25GHz	1MHz	3MHz

Release Control Record		
Issue No.	Reason for change	Date Issued
1	Original Release	August 20, 2018



Product Tested - Configuration Documentation

EUT Configuration										
Work Order:	S1365									
Company:	Powercast Corporation									
Company Address:	620 Alpha Dr Pittsburgh, PA, 15238									
Contact:	Dan Harrist									
	MN			PN			SN			
EUT:	Powercast Transmitter TX91503						Sample 1			
EUT Description:	915MHz Transmitter									
EUT Max Frequency:	915 MHz									
EUT Min Frequency:	915 MHz									
	MN			SN						
EUT Components	CUI Inc AC Adapter			SWI5-5-N-I38			Sample 1			
Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment
AC Mains	Power AC	1	1	Power AC	No	No	1	in	yes	
Software Operating Mode Description:										
The product is an intentional transmitter that sends data and power to a tag. The transmitter can send commands and identification data to the tag. The tag converts the RF energy into operational power and can extract the data. The RF signal is O-QPSK, and data is included using OOK modulation. The variable data rates are 8.33kbps, 16.67kbps, and CW.										
Performance Criteria:										
EMI only										

Clock Frequencies	
frequencies (MHz)	915

Statement of Conformity

The TX91503 has been found to conform to the following parts of 47 CFR and RSS 210 as detailed below:

RSS-GEN	RSS 210	Part 15	Comments
5.3		15.15(b)	There are no controls accessible to the user that varies the output power.
5.2		15.19	The label is shown in the label exhibit.
7.1.5		15.21	Information to the user is shown in the instruction manual exhibit.
		15.27	No special accessories are required for compliance.
		15.31	The EUT was tested in accordance with the measurement standards in this section.
		15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
		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.
7.1.4		15.203	The antenna for this device is hardwired to the PCB.
	2.6	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.
7.2.2		15.207	EUT meets the AC Line conducted emissions requirements of 15.207.
	Annex 8	15.247	The unit complies with the requirements of 15.247
4.6.1			Occupied Bandwidth measurements were made.

Test Results

Radiated Spurious Emissions

LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

[15.247(d)]

MEASUREMENTS / RESULTS

Radiated Emissions Table										
Date: 10-May-18		Company: Powercast			Work Order: S1365					
Engineer: Chris Bramley		EUT Desc: 915MHz Transmitter			EUT Operating Voltage/Frequency: 120V/60Hz					
Temp: 23.5°C		Humidity: 31%			Pressure: 1033mBar					
Frequency Range: 915MHz					Measurement Distance: 3 m					
Notes: Worst Orientation at Fundamental CW Mode										
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)				
X Orientation										
H	915.0	124.7	30.1	22.7	2.2	119.5				
V	915.0	118.1	30.1	22.7	2.2	112.9				
Y Orientation										
H	915.0	125.0	30.1	22.7	2.2	119.8				
V	915.0	119.6	30.1	22.7	2.2	114.4				
Z Orientation										
H	915.0	118.0	30.1	22.7	2.2	112.8				
V	915.0	124.9	30.1	22.7	2.2	119.7				
Table Result: --- by --- dB Worst Freq: --- MHz										
Test Site: EMI Chamber 2		Cable 1: Asset #2458			Cable 2: Asset #2459		Cable 3: Asset #2467			
Analyzer: Rental SA#1		Preamp: Asset #2311			Antenna: Red-Black		Preselector: ---			
CSsoft Radiated Emissions Calculator v 1.017.203										
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor										
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Worst Case and Fundamental

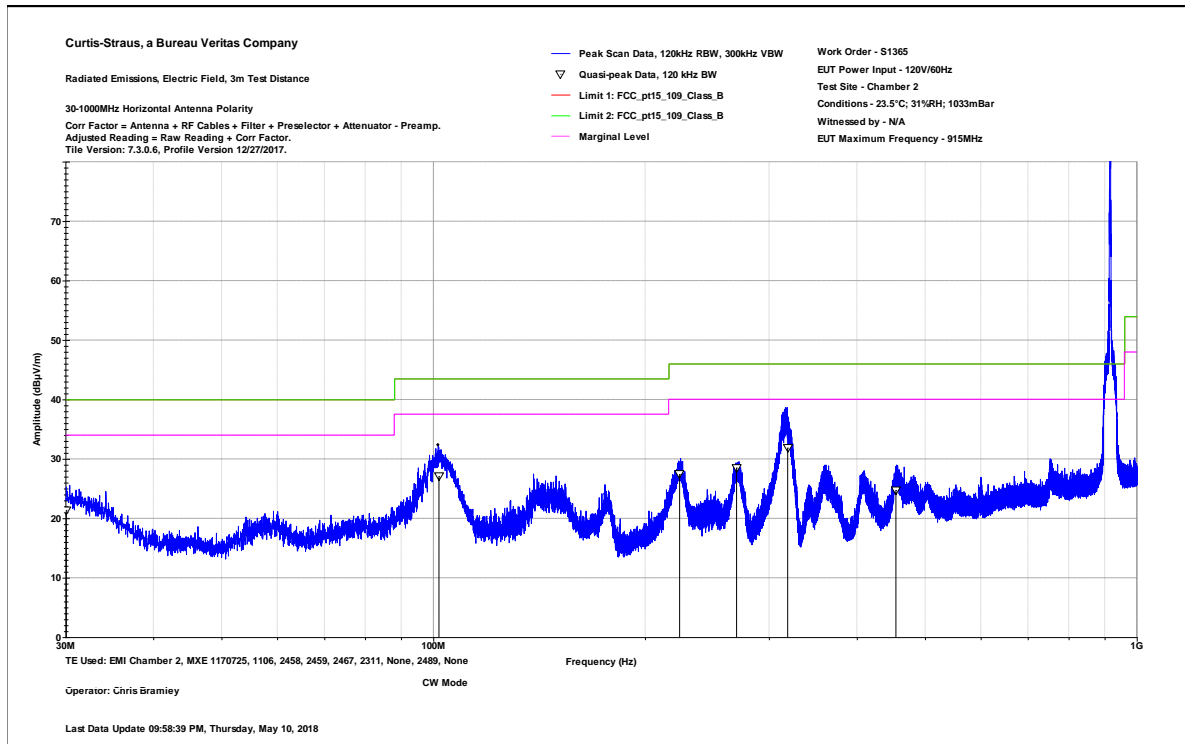


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 30-1000MHz Horizontal Data
 Operator: Chris Bramley
 Notes:
 CW Mode

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 2
 Conditions - 23.5°C; 31%RH; 1033mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 09:58:39 PM, Thursday, May 10, 2018

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_1 09_Class_B (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Lim2: FCC_pt15_1 09_Class_B (dBµV/m)	Margin to Lim2 (dB)	Test Results Lim2 (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.082	29.1	-7.7	21.4	40	-18.6	PASS		40	-18.6	PASS		125	280
101.864	44.8	-17.7	27.1	43.5	-16.5	PASS		43.5	-16.5	PASS		224	108
223.921	44.9	-17.4	27.4	46	-18.6	PASS		46	-18.6	PASS		131	142
269.756	43.5	-15	28.5	46	-17.5	PASS		46	-17.5	PASS		100	255
318.923	46	-14.1	31.9	46	-14.2	PASS	-14.2	46	-14.2	PASS	-14.2	141	117
454.414	35.1	-10.4	24.8	46	-21.3	PASS		46	-21.3	PASS		129	142

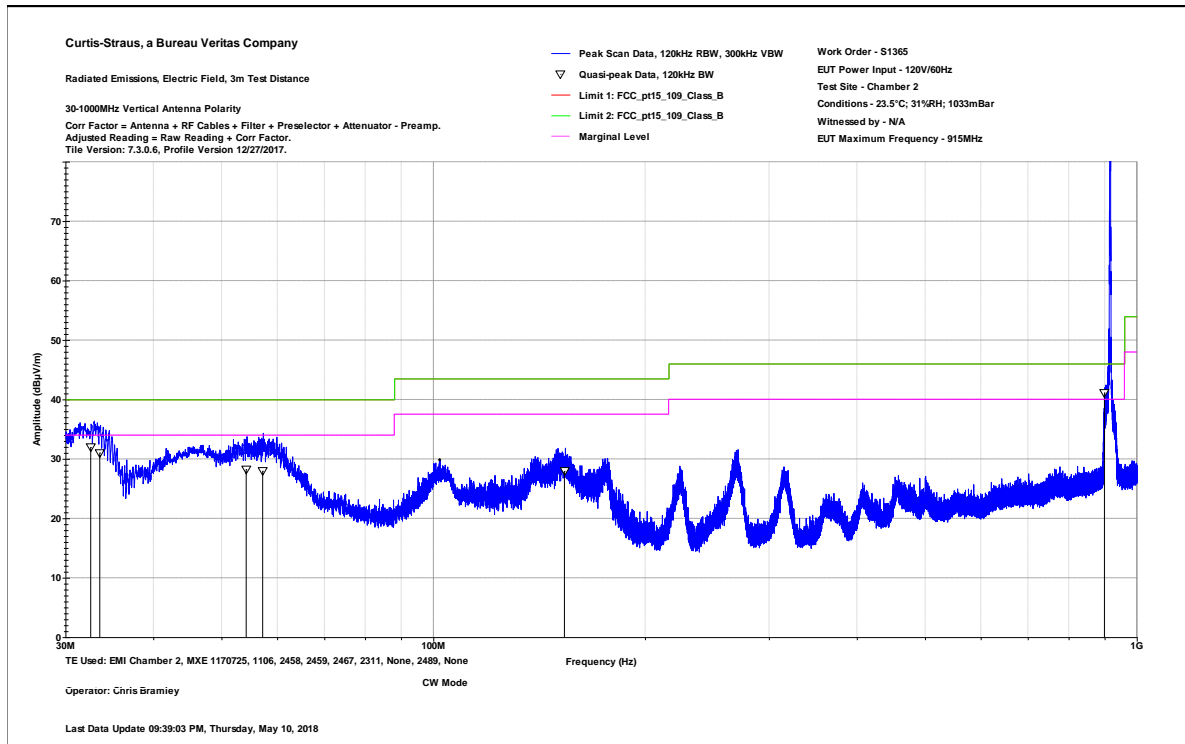


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 30-1000MHz Vertical Data
 Operator: Chris Bramley
 Notes:
 CW Mode

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 2
 Conditions - 23.5°C; 31%RH; 1033mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 09:58:39 PM, Thursday, May 10, 2018

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_1 09_Class_B (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Lim2: FCC_pt15_1 09_Class_B (dBµV/m)	Margin to Lim2 (dB)	Test Results Lim2 (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
32.581	41.7	-9.8	32	40	-8	PASS		40	-8	PASS		125	65
33.562	41.5	-10.4	31	40	-9	PASS		40	-9	PASS		133	277
54.196	50.2	-21.9	28.2	40	-11.8	PASS		40	-11.8	PASS		100	149
57.21	49.9	-21.9	28	40	-12	PASS		40	-12	PASS		201	8
153.571	44.1	-16.1	28	43.5	-15.6	PASS		43.5	-15.6	PASS		104	284
899.253	44.1	-2.9	41.1	46	-4.9	PASS	-4.9	46	-4.9	PASS	-4.9	106	248



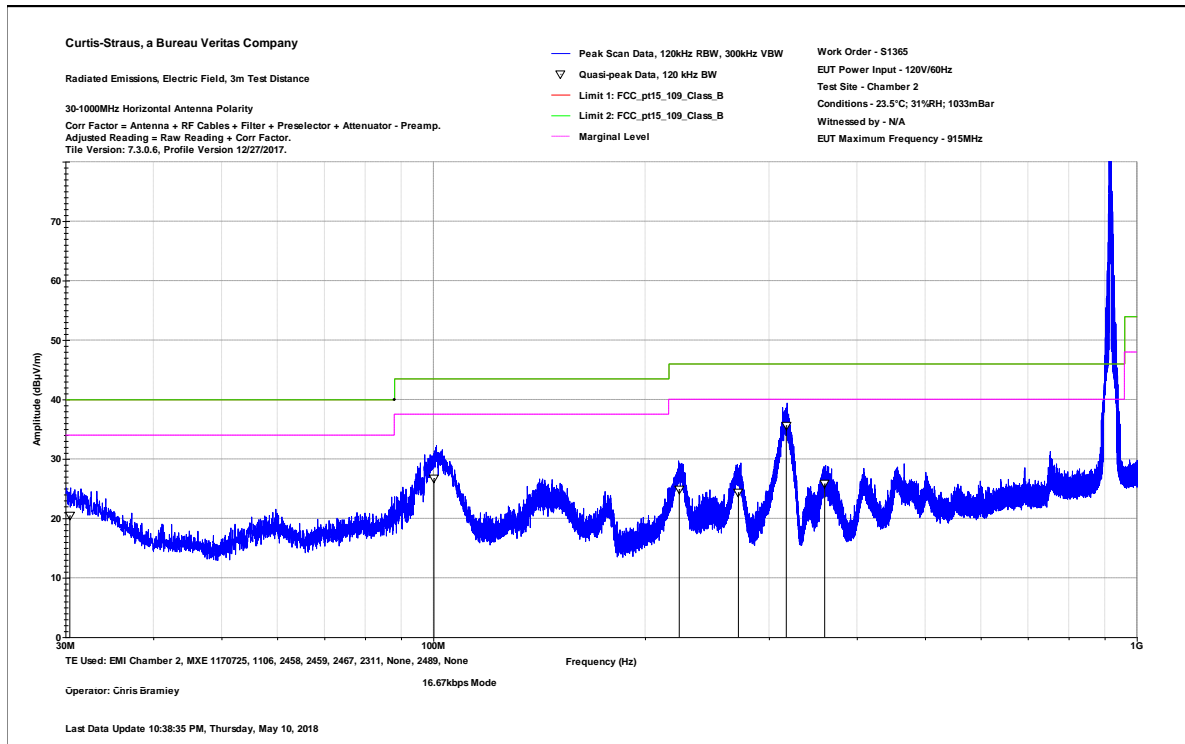
30-1000MHz CW Mode

Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 30-1000MHz Horizontal Data
 Operator: Chris Bramley
 Notes:
 16.67kbps Mode

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 2
 Conditions - 23.5°C; 31%RH; 1033mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 10:57:53 PM, Thursday, May 10, 2018

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_1 09_Class_B (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Lim2: FCC_pt15_1 09_Class_B (dBµV/m)	Margin to Lim2 (dB)	Test Results Lim2 (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.431	28.5	-8.1	20.4	40	-19.6	PASS		40	-19.6	PASS		364	84
100.192	45	-18.3	26.7	43.5	-16.8	PASS		43.5	-16.8	PASS		199	310
223.605	42.4	-17.5	24.9	46	-21.1	PASS		46	-21.1	PASS		174	285
271.428	39.3	-14.9	24.4	46	-21.7	PASS		46	-21.7	PASS		266	159
317.445	49.8	-14.1	35.6	46	-10.4	PASS	-10.4	46	-10.4	PASS	-10.4	118	194
359.96	38.7	-12.9	25.8	46	-20.2	PASS		46	-20.2	PASS		105	165

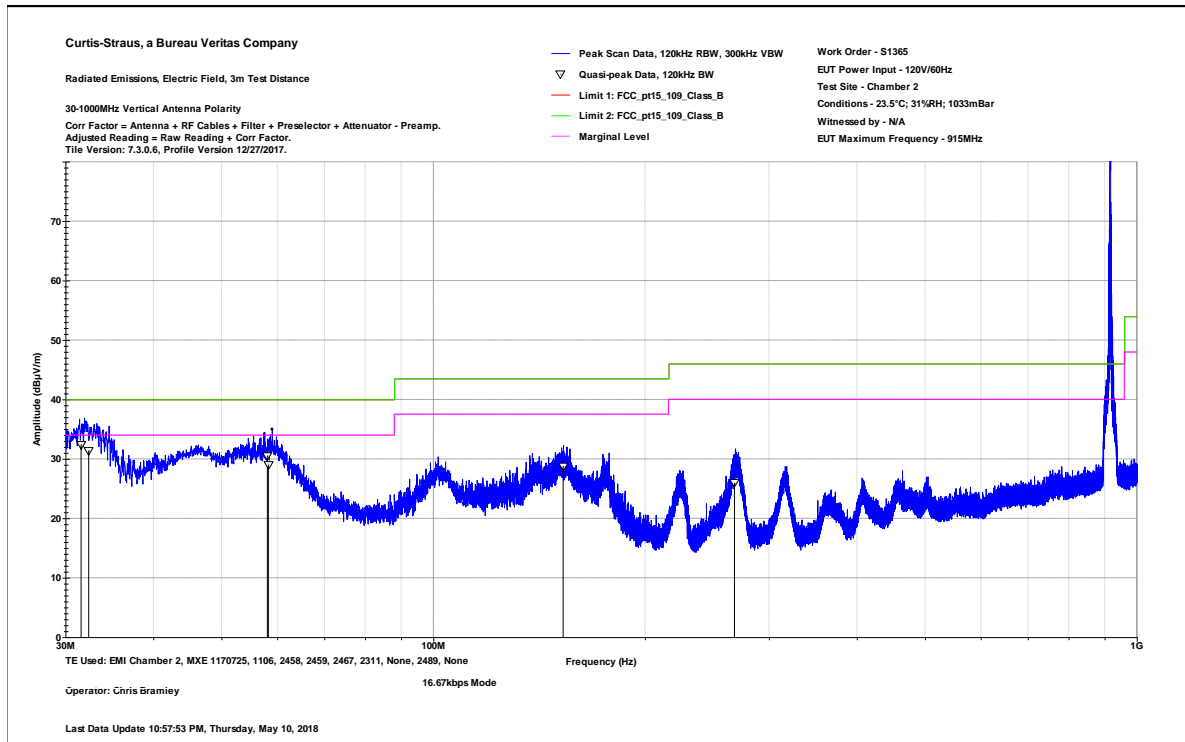


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 30-1000MHz Vertical Data
 Operator: Chris Bramley
 Notes:
 16.67kbps Mode

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 2
 Conditions - 23.5°C; 31%RH; 1033mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 10:57:53 PM, Thursday, May 10, 2018

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_109_Class_B (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Lim2: FCC_pt15_109_Class_B (dBµV/m)	Margin to Lim2 (dB)	Test Results Lim2 (Pass/Fail)	Worst Margin Lim2 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
31.572	41.4	-9	32.4	40	-7.6	PASS	-7.6	40	-7.6	PASS	-7.6	134	223
32.372	41	-9.6	31.4	40	-8.6	PASS		40	-8.6	PASS		100	176
58.278	50.8	-21.8	29	40	-11	PASS		40	-11	PASS		150	108
58.086	52.3	-21.8	30.5	40	-9.5	PASS		40	-9.5	PASS		100	60
152.908	44.9	-16.1	28.7	43.5	-14.8	PASS		43.5	-14.8	PASS		100	262
267.896	41.1	-15.2	25.9	46	-20.1	PASS		46	-20.1	PASS		246	25

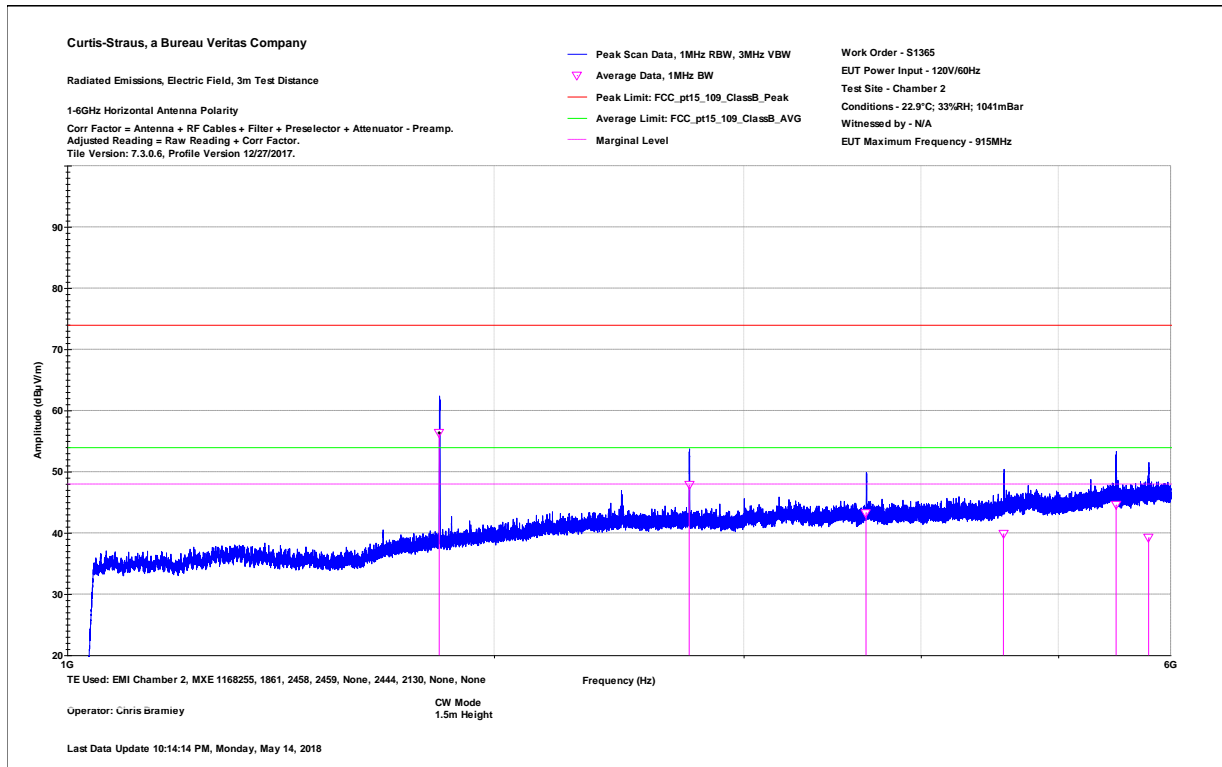


30-1000MHz 16.67kbps

Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 1-6GHz Horizontal Data
 Operator: Chris Bramley
 Notes:
 CW Mode
 1.5m Height
 *Updated 2nd Harmonic limit to 30dB below fundamental
 Data Taken at 10:30:57 PM, Monday, May 14, 2018

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 2
 Conditions - 22.9°C; 33%RH; 1041mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1829.7	54.3	48.9	7.4	61.7	89.8	-28.1	PASS		56.3	89.8	-33.5	PASS		200	25
2745.7	43.4	37	10.8	54.2	74	-19.8	PASS	-19.8	47.8	54	-6.2	PASS	-6.2	125	180
3658.9	38	31	12.3	50.3	74	-23.7	PASS		43.3	54	-10.7	PASS		175	62
4574	35.6	27	12.8	48.4	74	-25.5	PASS		39.9	54	-14.1	PASS		107	121
5491.9	39.5	30.2	14.3	53.9	74	-20.1	PASS		44.6	54	-9.4	PASS		106	128
5790.2	33.8	24.7	14.5	48.3	74	-25.7	PASS		39.2	54	-14.8	PASS		125	0

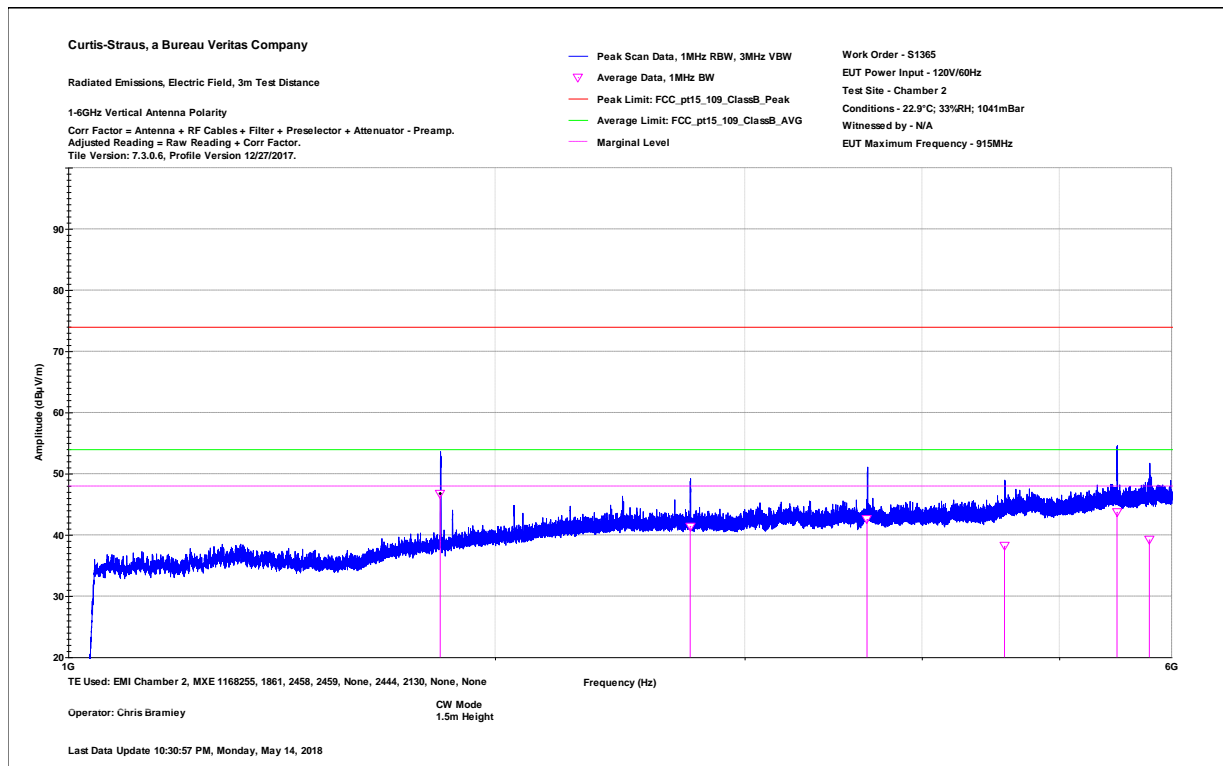


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 1-6GHz Vertical Data
 Operator: Chris Bramley
 Notes:
 CW Mode
 1.5m Height

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 2
 Conditions - 22.9°C; 33%RH; 1041mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 10:30:57 PM, Monday, May 14, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1829.6	46.5	39.3	7.4	53.9	74	-20.1	PASS	-20.1	46.8	54	-7.2	PASS	-7.2	290	289
2745.7	38.5	30.6	10.8	49.3	74	-24.7	PASS		41.4	54	-12.6	PASS		117	143
3659	39.4	30.3	12.3	51.7	74	-22.3	PASS		42.6	54	-11.4	PASS		125	50
4574.7	33.7	25.3	12.8	46.6	74	-27.4	PASS		38.2	54	-15.8	PASS		182	244
5491.6	39.3	29.4	14.4	53.6	74	-20.4	PASS		43.7	54	-10.3	PASS		125	179
5787.6	34.4	24.7	14.5	48.9	74	-25.1	PASS		39.2	54	-14.8	PASS		107	65



1-6GHz CW Mode

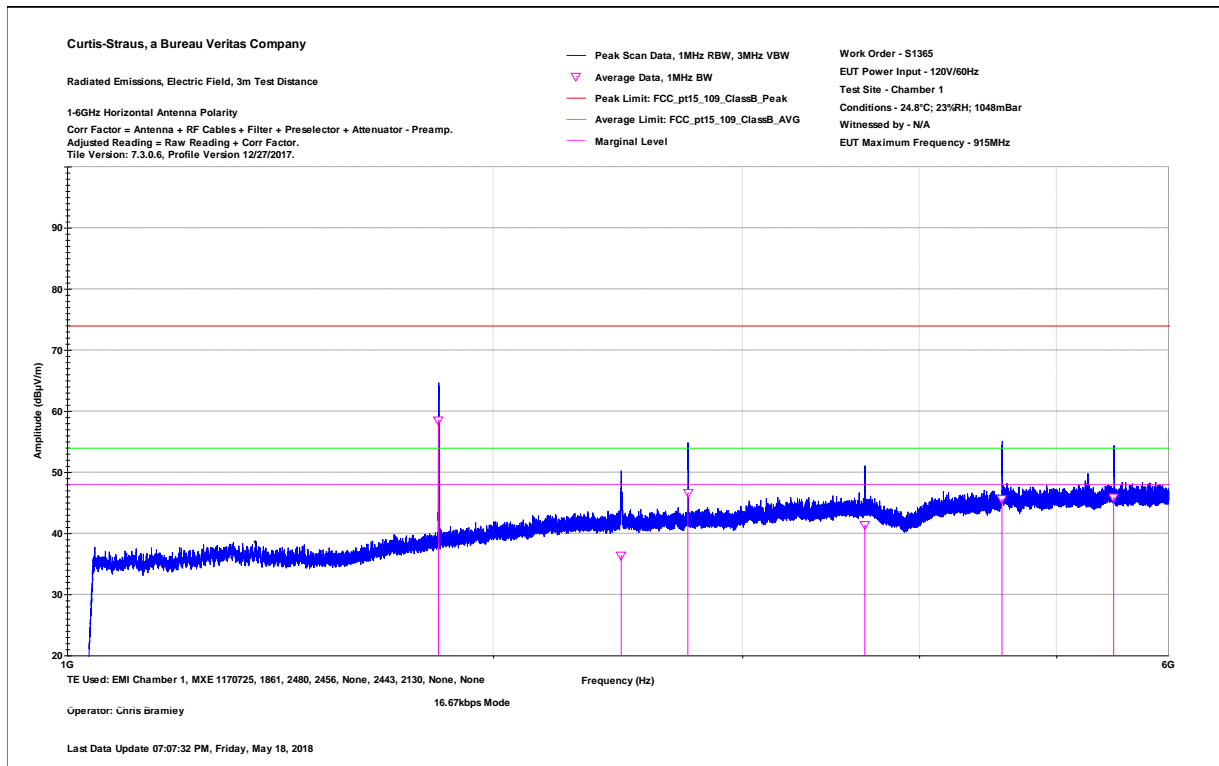


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 1-6GHz Horizontal Data
 Operator: Chris Bramley
 Notes:
 16.67kbps Mode
 *Updated 2nd Harmonic limit to 30dB below fundamental

Work Order - S1365
 EUT Power Input - 120W/60Hz
 Test Site - Chamber 1
 Conditions - 24.8°C; 23%RH; 1048mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 07:23:43 PM, Friday, May 18, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1829.4	57	50.9	7.7	64.7	89.8	-25.1	PASS		58.5	89.8	-31.3	PASS		182	30
2463.2	34.4	25.8	10.6	45	74	-28.9	PASS		36.4	54	-17.6	PASS		184	83
2745.5	43.6	35.8	10.8	54.4	74	-19.6	PASS		46.6	54	-7.3	PASS	-7.3	125	198
3661.2	36.8	28.3	13	49.8	74	-24.2	PASS		41.3	54	-12.7	PASS		225	34
4576.3	41.5	32.2	13.4	54.9	74	-19.1	PASS		45.6	54	-8.4	PASS		217	241
5488.7	41.1	31.9	14	55.1	74	-18.9	PASS	-18.9	45.9	54	-8.1	PASS		180	242

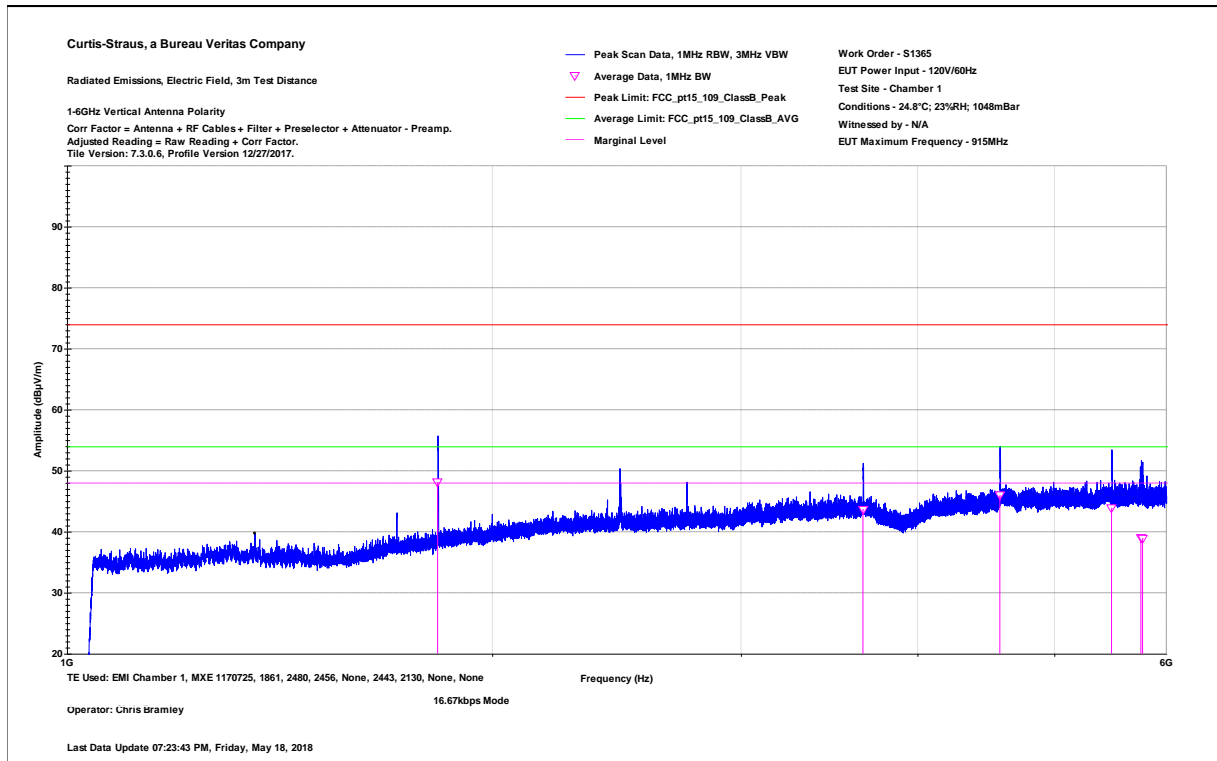


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 3m Distance
 1-6GHz Vertical Data
 Operator: Chris Bramley
 Notes:
 16.67kbps Mode

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 1
 Conditions - 24.8°C; 23%RH; 1048mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 07:23:43 PM, Friday, May 18, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1829.7	47.1	40.4	7.7	54.8	74	-19.2	PASS	-19.2	48.1	54	-5.9	PASS	-5.9	125	157
3659.5	39.2	30.6	13	52.2	74	-21.8	PASS		43.6	54	-10.3	PASS		107	264
4574	40.3	32.5	13.4	53.7	74	-20.3	PASS		45.9	54	-8.1	PASS		115	263
5488.2	39.3	29.9	14	53.3	74	-20.7	PASS		43.9	54	-10.1	PASS		106	256
5756.9	33.2	25.2	13.8	47	74	-27	PASS		39	54	-15	PASS		100	221
5772.8	35	25.1	13.8	48.8	74	-25.2	PASS		38.9	54	-15.1	PASS		113	206



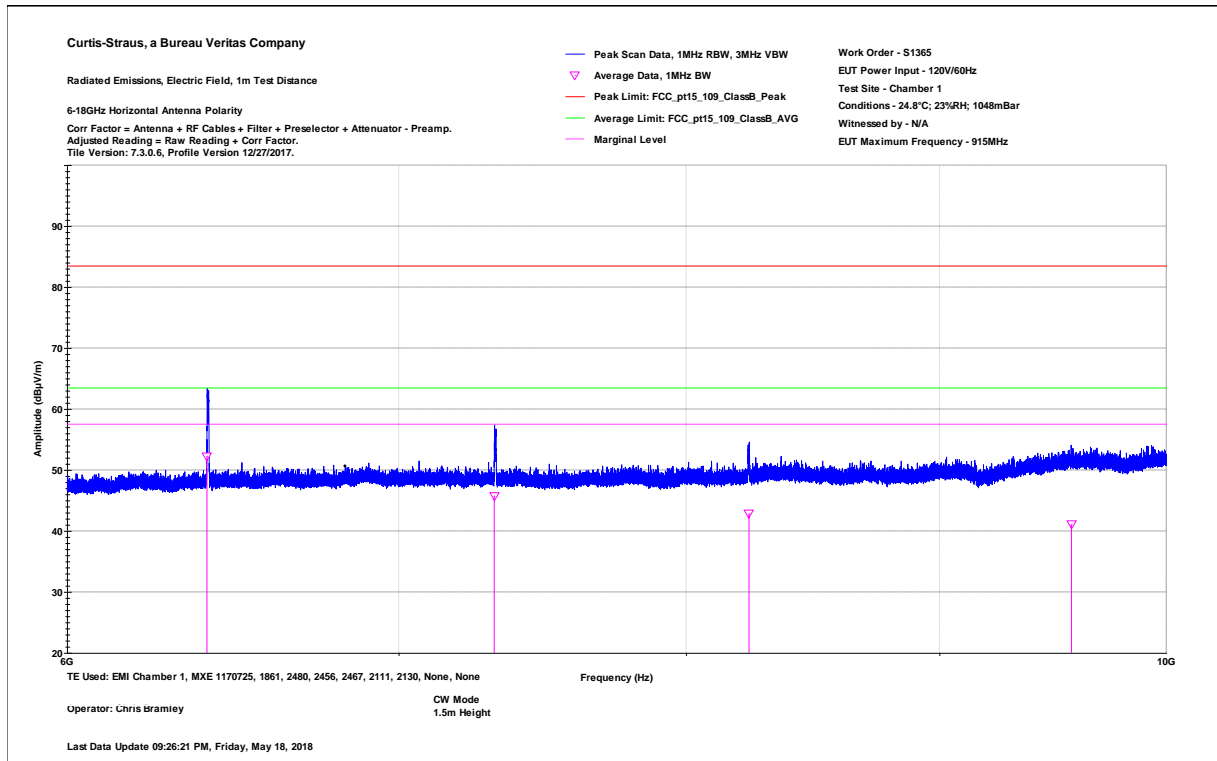
1-6GHz 16.67kbps

Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 1m Distance
 6-18GHz Horizontal Data
 Operator: Chris Bramley
 Notes:
 CW Mode
 1.5m Height

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 1
 Conditions - 24.8°C; 23%RH; 1048mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 09:40:59 PM, Friday, May 18, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
6403.1	55.3	45.6	6.7	62	83.5	-21.5	PASS	-21.5	52.3	63.5	-11.2	PASS	-11.2	165	8
7317.7	48.8	39.2	6.6	55.4	83.5	-28.1	PASS		45.8	63.5	-17.7	PASS		162	314
8237.7	45.9	35.5	7.3	53.2	83.5	-30.3	PASS		42.8	63.5	-20.7	PASS		160	274
9569.3	41.7	31.8	9.3	51	83.5	-32.5	PASS		41.1	63.5	-22.4	PASS		166	248

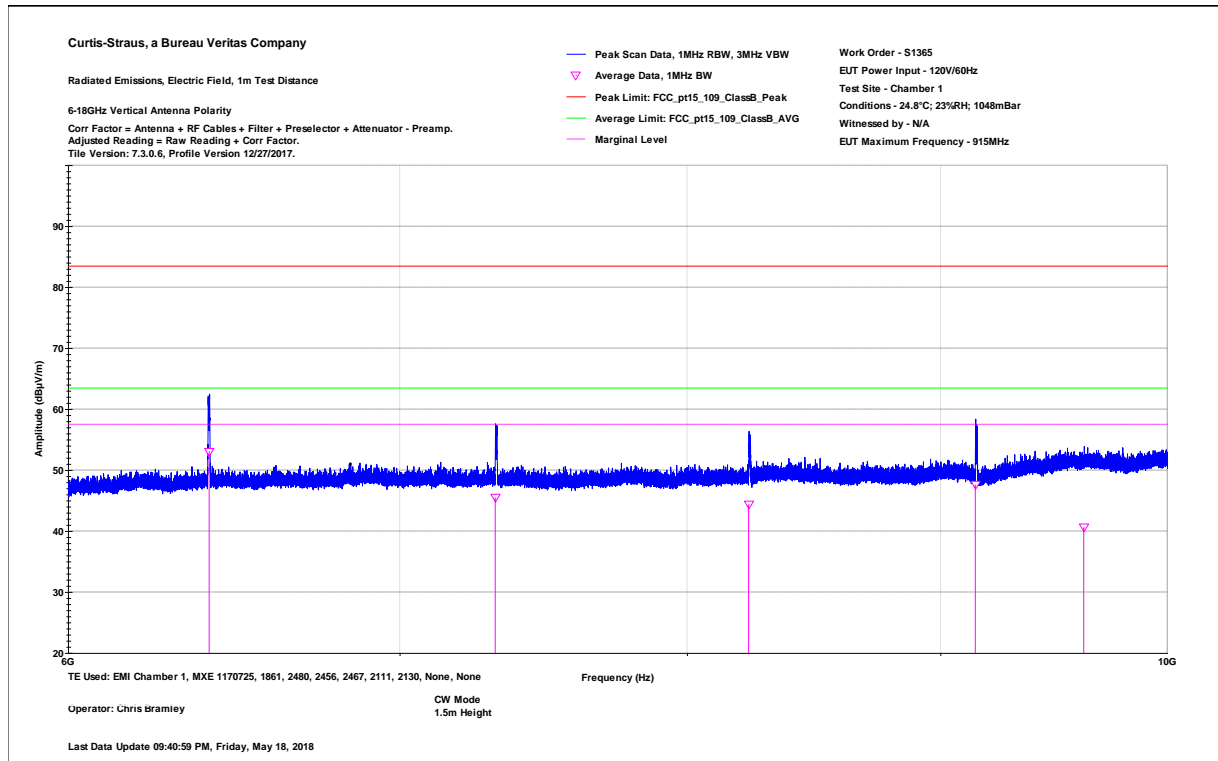


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 1m Distance
 6-18GHz Vertical Data
 Operator: Chris Bramley
 Notes:
 CW Mode
 1.5m Height

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 1
 Conditions - 24.8°C; 23%RH; 1048mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 09:40:59 PM, Friday, May 18, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
6406.9	54.9	46.3	6.7	61.6	83.5	-21.9	PASS	-21.9	53	63.5	-10.5	PASS	-10.5	200	309
7317.6	49	38.9	6.6	55.5	83.5	-28	PASS		45.4	63.5	-18.1	PASS		100	49
8232.4	46.9	37	7.3	54.2	83.5	-29.3	PASS		44.3	63.5	-19.2	PASS		171	177
9147	51.6	40.3	7.2	58.8	83.5	-24.7	PASS		47.6	63.5	-15.9	PASS		155	158
9619.5	39.8	31.1	9.4	49.3	83.5	-34.2	PASS		40.6	63.5	-22.9	PASS		144	97



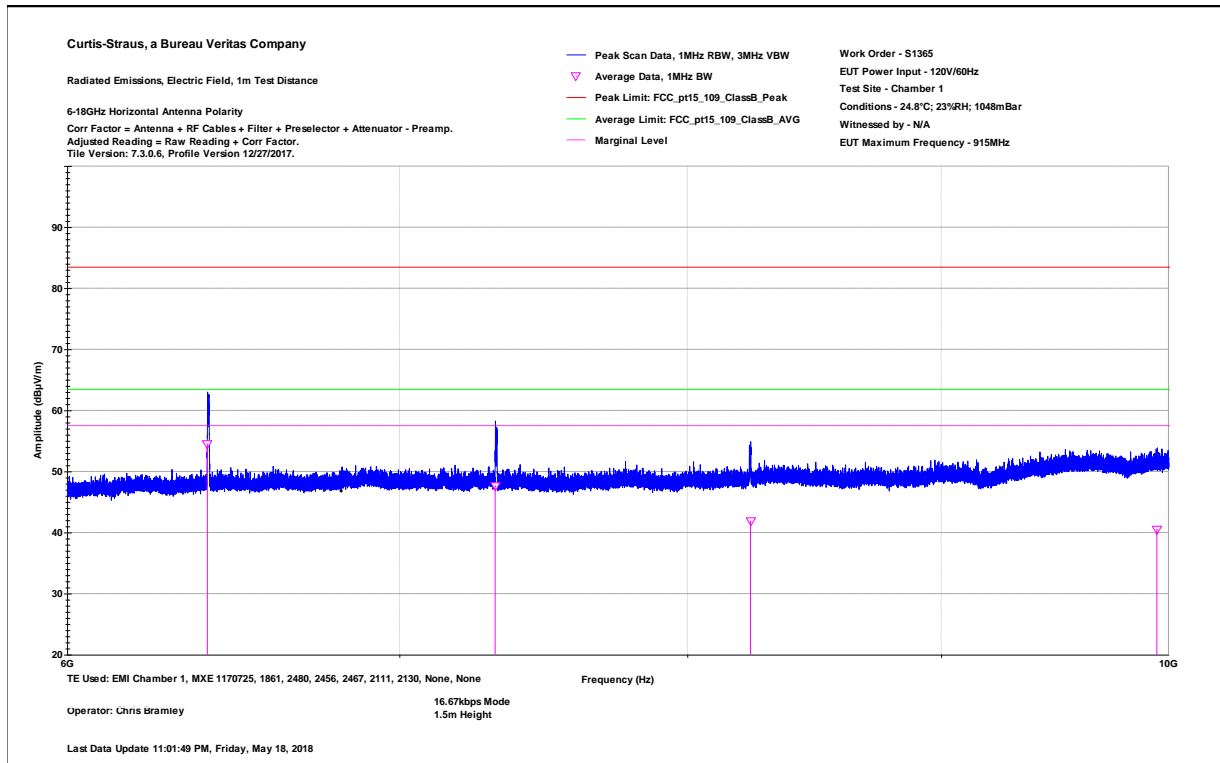
6-10GHz CW Mode

Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 1m Distance
 6-18GHz Horizontal Data
 Operator: Chris Bramley
 Notes:
 16.67kbps Mode
 1.5m Height

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 1
 Conditions - 24.8°C; 23%RH; 1048mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

Data Taken at 11:15:11 PM, Friday, May 18, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
6403.1	57.7	47.8	6.7	64.4	83.5	-19.1	PASS	-19.1	54.5	63.5	-9	PASS	-9	167	12
7317.8	50.3	41.1	6.6	56.9	83.5	-26.6	PASS		47.7	63.5	-15.8	PASS		161	321
8237.8	43.2	34.6	7.3	50.5	83.5	-33	PASS		41.9	63.5	-21.6	PASS		173	269
9946.8	39.4	31.1	9.4	48.8	83.5	-34.7	PASS		40.5	63.5	-23	PASS		175	227

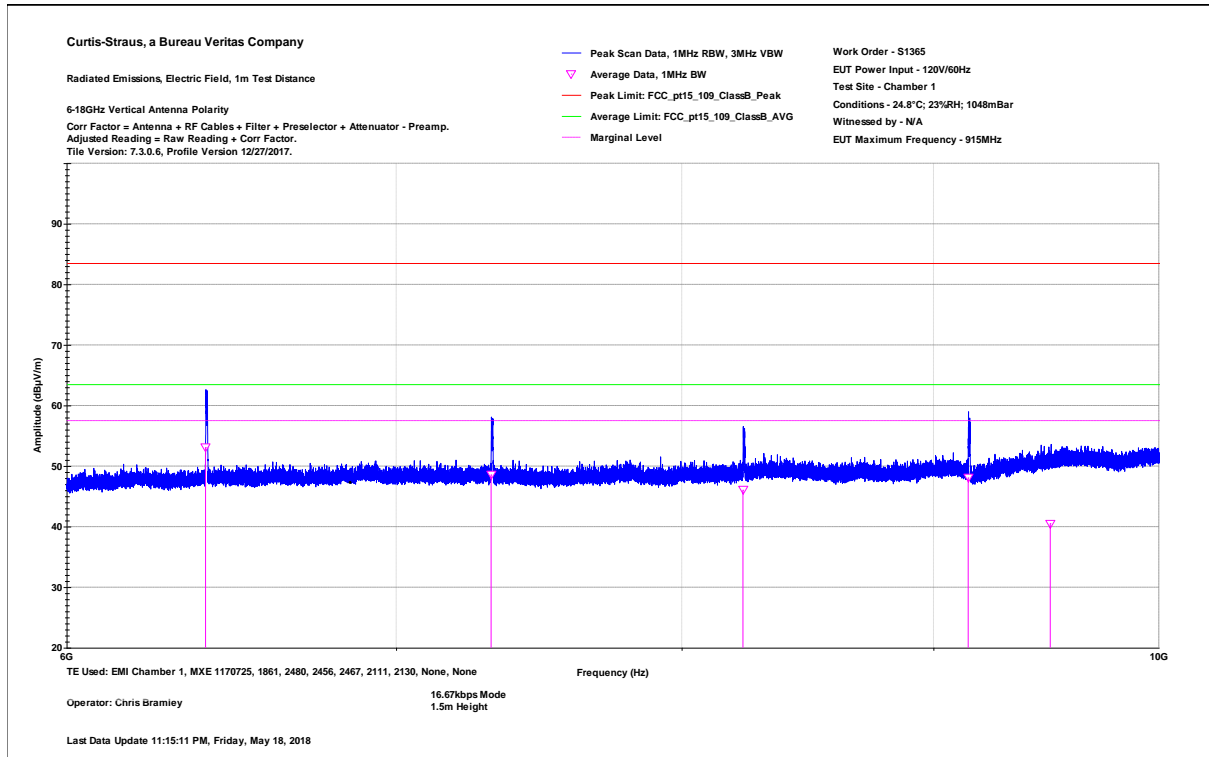


Curtis Straus - a Bureau Veritas Company
 Radiated Emissions Electric Field 1m Distance
 6-18GHz Vertical Data
 Operator: Chris Bramley
 Notes:
 16.67kbps Mode
 1.5m Height

Work Order - S1365
 EUT Power Input - 120V/60Hz
 Test Site - Chamber 1
 Conditions - 24.8°C; 23%RH; 1048mBar
 Witnessed by - N/A
 EUT Maximum Frequency - 915MHz

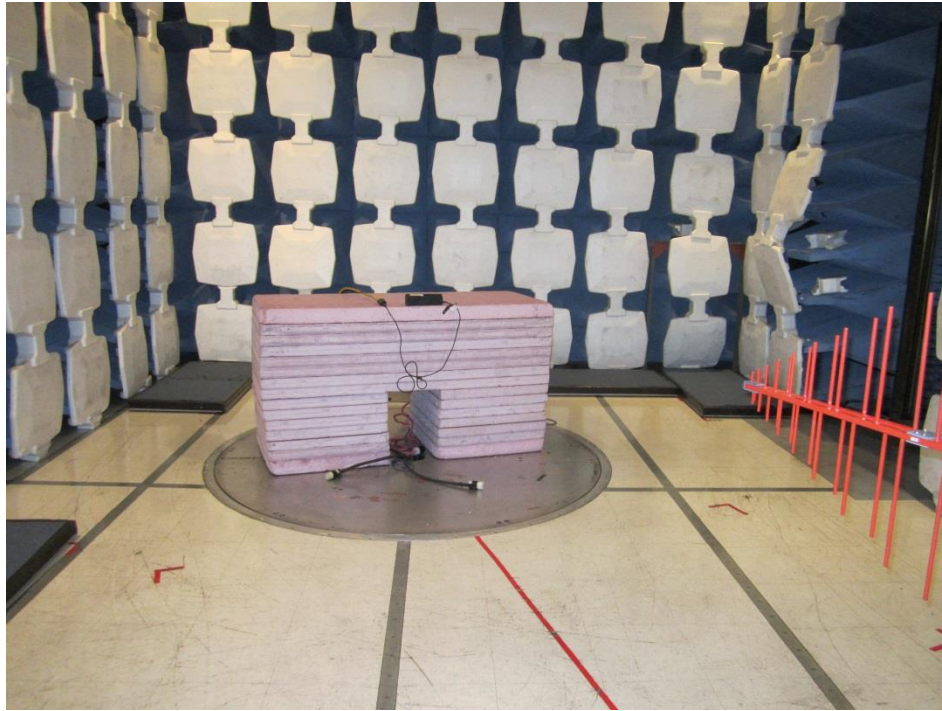
Data Taken at 11:15:11 PM, Friday, May 18, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_109_ClassB_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_109_ClassB_AVG (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
6402.9	55.8	46.4	6.7	62.5	83.5	-21	PASS	-21	53.1	63.5	-10.4	PASS	-10.4	200	311
7317.9	51.6	42	6.6	58.1	83.5	-25.4	PASS		48.6	63.5	-14.9	PASS		200	310
8232.7	48.6	38.7	7.3	55.9	83.5	-27.6	PASS		46.1	63.5	-17.4	PASS		132	157
9147.2	51.5	40.9	7.2	58.7	83.5	-24.8	PASS		48.1	63.5	-15.4	PASS		161	158
9505.2	41	31.4	9.1	50.1	83.5	-33.4	PASS		40.6	63.5	-22.9	PASS		144	157

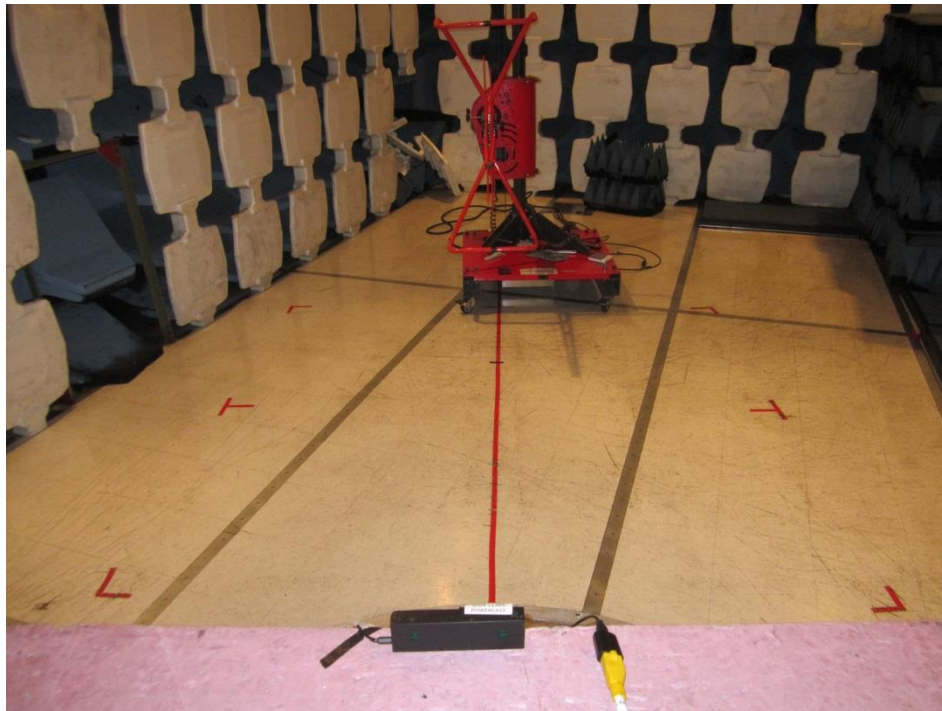


6-10GHz 16.67kbps

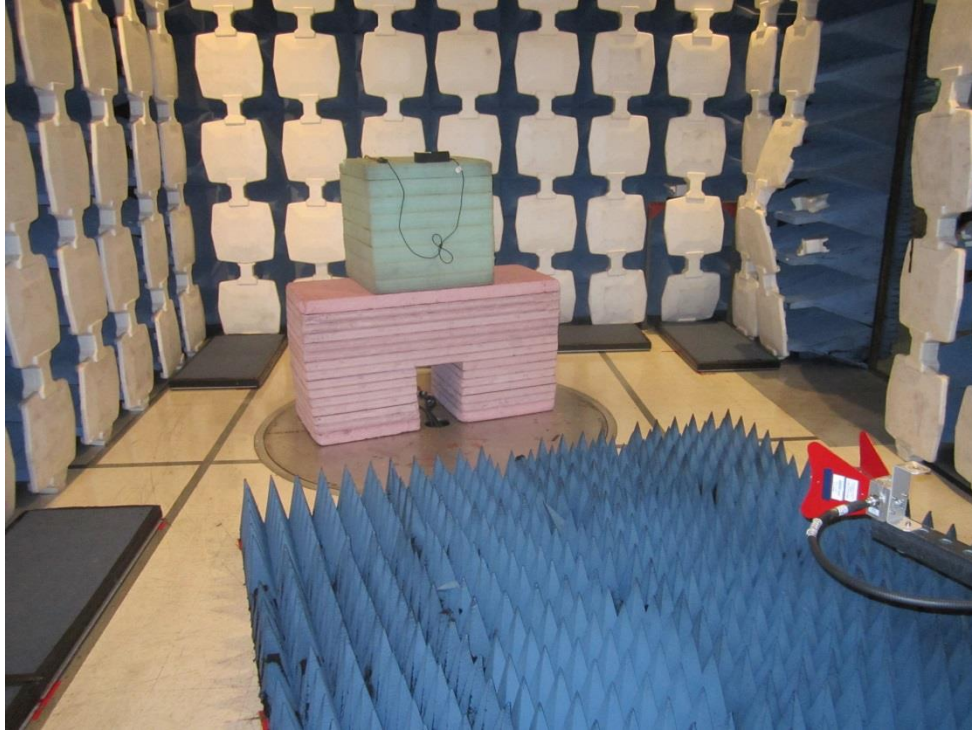
SETUP PHOTOGRAPHS



30-1000MHz – Front



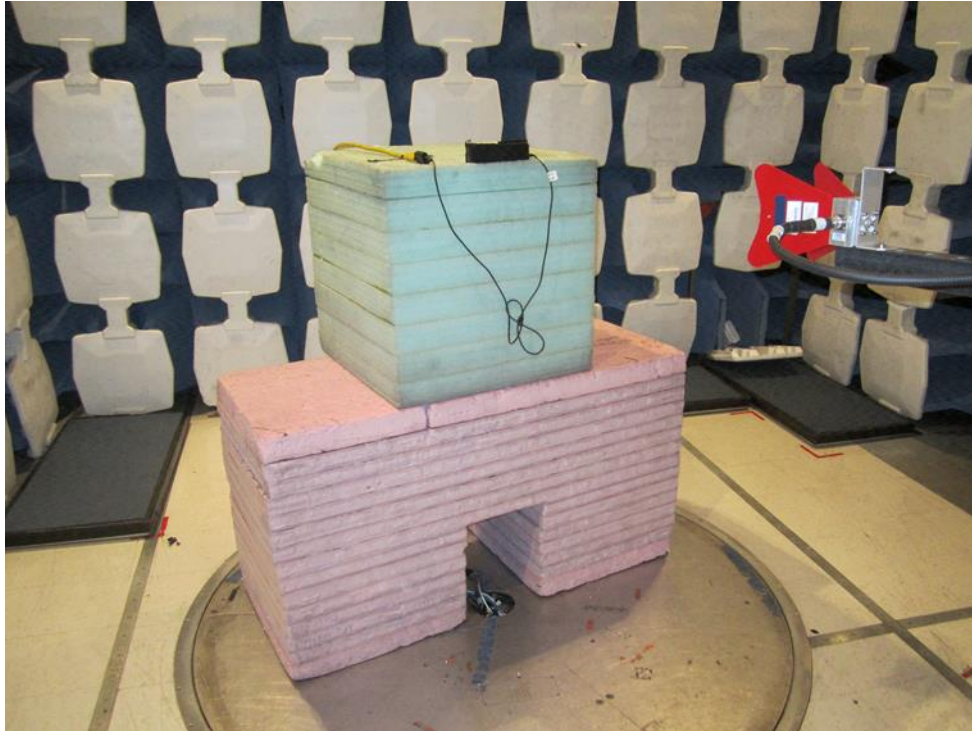
30-1000MHz – Rear



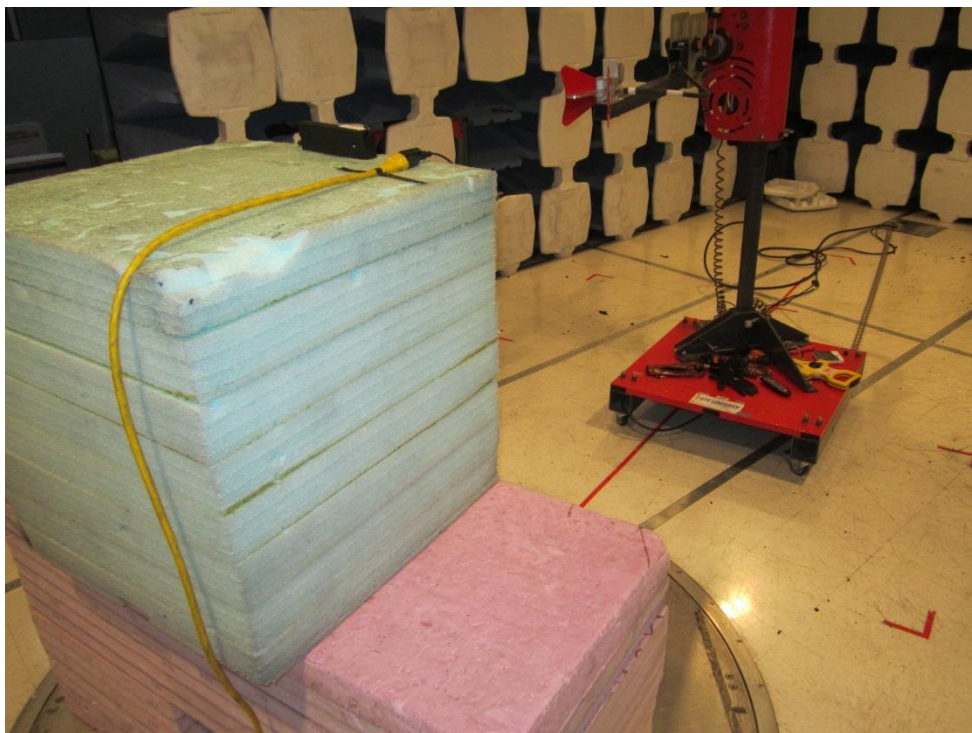
1-6GHz – Front



1-6GHz – Rear



6-10GHz – Front



6-10GHz – Rear

Test Equipment Used – REMI

Rev. 5/9/2018

Spectrum Analyzers / Receivers / Preselectors									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	4/10/2019	4/10/2018		
Rental MXE EMI Receiver(1170725)									
Radiated Emissions Sites									
FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on		
719150	2762A-7	A-0015	30-1000MHz	1686	I	12/21/2018	12/21/2016		
EMI Chamber 2									
Preamps / Couplers Attenuators / Filters									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/29/2018	10/29/2017		
2311 PA									
Antennas									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
30-2000MHz	JB1	Sunol	A091604-2	1106	I	2/28/2019	2/28/2017		
Red-Black Bilog									
Meteorological Meters/Chambers									
MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on			
HTC-1	HDE	2080	2080	II	3/22/2019	3/22/2018			
5396-0321	Monarch Instruments	4000215	2265	I	11/22/2018	11/22/2016			
TH A#2080									
Barometric A#2265									
Cables									
Range	Mfr	Cat	Calibration Due	Calibrated on					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
9KHz-18GHz	MegaPhase	II	11/27/2018	11/27/2017					
Asset #2458									
Asset #2459									
Asset #2467									
2489(6dB)									

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

30-1000MHz

Rev. 5/9/2018

Spectrum Analyzers / Receivers / Preselectors									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/15/2018	8/15/2017		
Rental MXE EMI Receiver(1168255)									
Radiated Emissions Sites									
FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on		
719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018	12/21/2016		
EMI Chamber 2									
Preamps / Couplers Attenuators / Filters									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
9KHz-6GHz	BBV9744	SCWARZBECK	67	2444	I	2/5/2019	2/5/2018		
9KHz-10GHz	BRM18770	Micro-Tronics	1	2130	II	1/10/2019	1/10/2018		
2444 PA									
2130 BRF									
Antennas									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
1-18GHz	3117	ETS	157647	1861	I	2/14/2019	2/14/2017		
Blue Horn									
Meteorological Meters/Chambers									
MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on			
HTC-1	HDE	2080	2080	II	3/22/2019	3/22/2018			
5396-0321	Monarch Instruments	4000060	2160	I	4/13/2019	4/13/2017			
TH A#2080									
Barometric A#2160									
Cables									
Range	Mfr	Cat	Calibration Due	Calibrated on					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
Asset #2458									
Asset #2459									

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

1-6GHz

Rev. 5/9/2018

Spectrum Analyzers / Receivers / Preselectors									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	4/10/2019	4/10/2018		
Rental MXE EMI Receiver(1170725)									
Radiated Emissions Sites									
FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on		
719150	2762A-6	A-0015	1-18GHz	1685	I	12/21/2018	12/21/2016		
EMI Chamber 1									
Preamps / Couplers Attenuators / Filters									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
0.5-18GHz	PAM-118A	COM-POWER	551063	2111	II	11/19/2018	11/19/2017		
2111 HF Preamp									
Antennas									
Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
1-18GHz	3117	ETS	157647	1861	I	2/14/2019	2/14/2017		
Blue Horn									
Meteorological Meters/Chambers									
MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on			
HTC-1	HDE	2084	2084	II	3/22/2019	3/22/2018			
5396-0321	Monarch Instruments	4000060	2160	I	4/13/2019	4/13/2017			
TH A#2084									
Barometric A#2160									
Cables									
Range	Mfr	Cat	Calibration Due	Calibrated on					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
9KHz-18GHz	MegaPhase	II	10/29/2018	10/29/2017					
Asset #2456									
Asset #2467									
Asset #2480									

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

6-10GHz



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)]

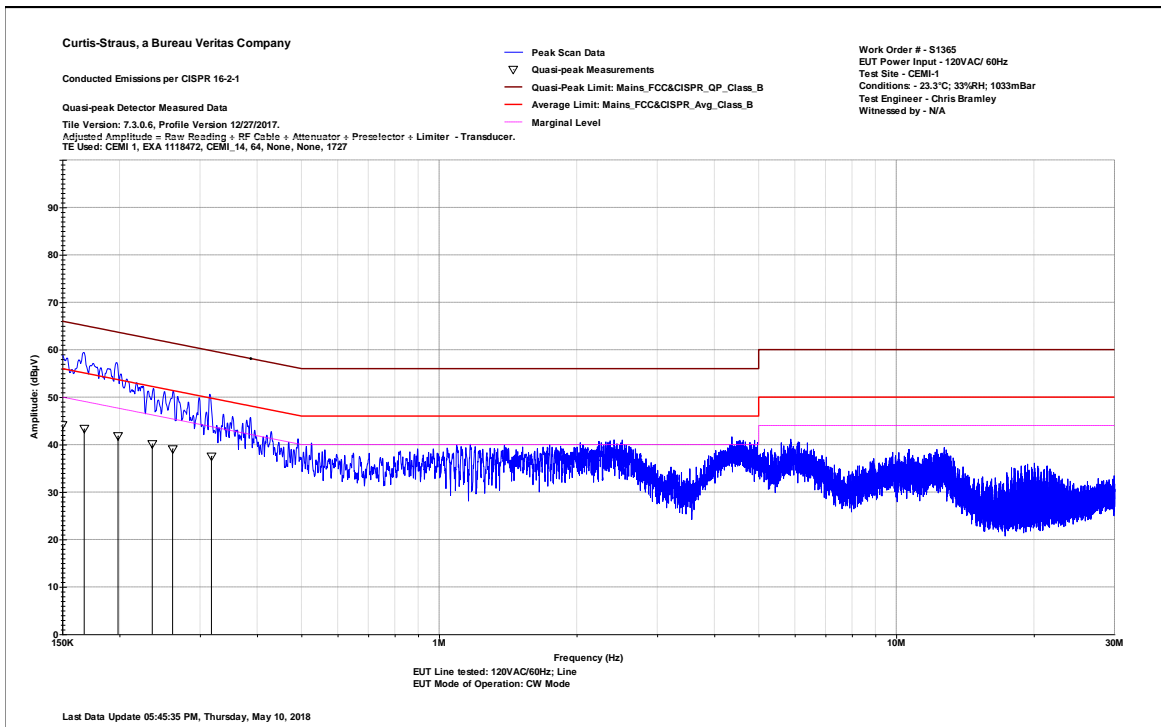
MEASUREMENTS / RESULTS

Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1
 Quasi-peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line
 EUT Mode of Operation: CW Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 05:53:44 PM, Thursday, May 10, 2018

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)
0.15	23.362	20.9	44.2	66	-21.8	PASS	-21.8
0.167	22.442	20.9	43.3	65.1	-21.8	PASS	
0.199	20.967	20.9	41.8	63.7	-21.8	PASS	
0.236	19.275	20.9	40.1	62.2	-22.1	PASS	
0.261	18.265	20.9	39.1	61.4	-22.3	PASS	
0.318	16.76	20.8	37.6	59.8	-22.2	PASS	

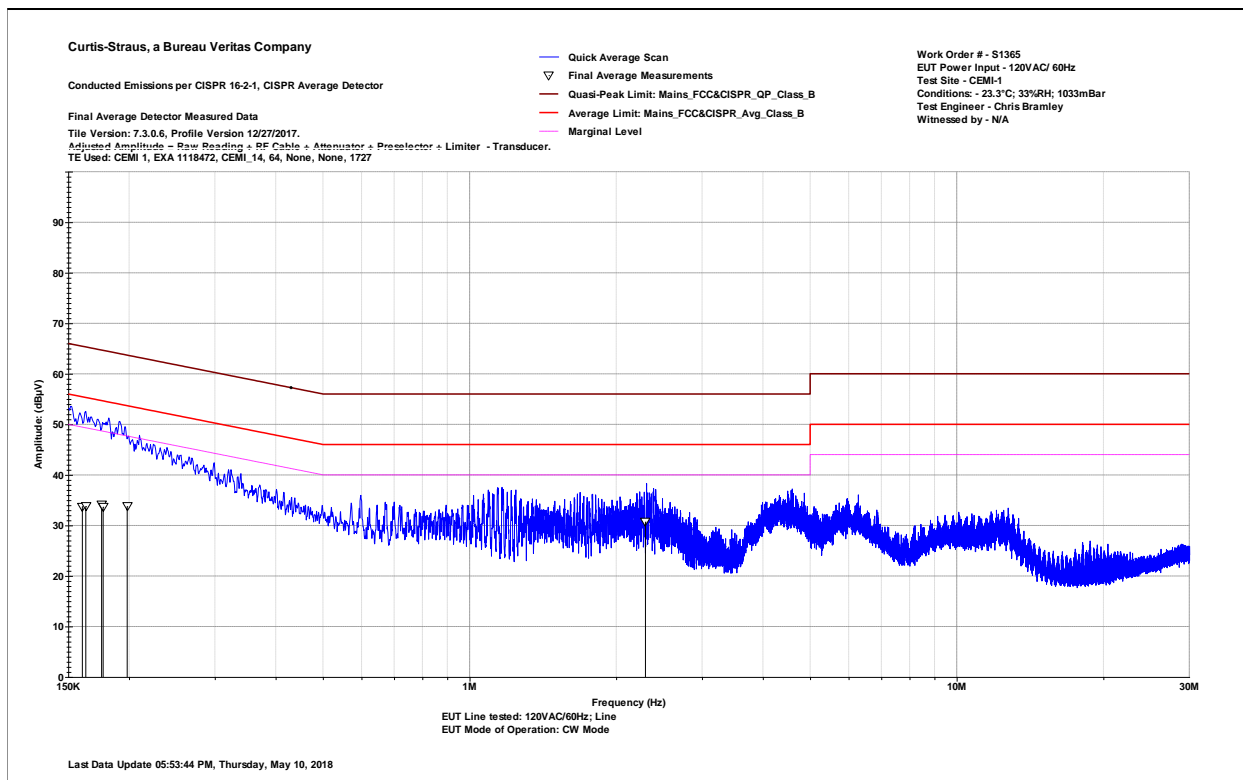


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
 Final Average Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line
 EUT Mode of Operation: CW Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 05:53:44 PM, Thursday, May 10, 2018

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)
0.16	12.9	20.9	33.8	55.4	-21.7	PASS	
0.163	12.9	20.9	33.8	55.3	-21.5	PASS	
0.176	13.3	20.8	34.1	54.7	-20.6	PASS	
0.177	12.9	20.8	33.7	54.6	-21	PASS	
0.198	12.9	20.9	33.8	53.7	-19.9	PASS	
2.296	9.9	20.8	30.7	46	-15.3	PASS	-15.3

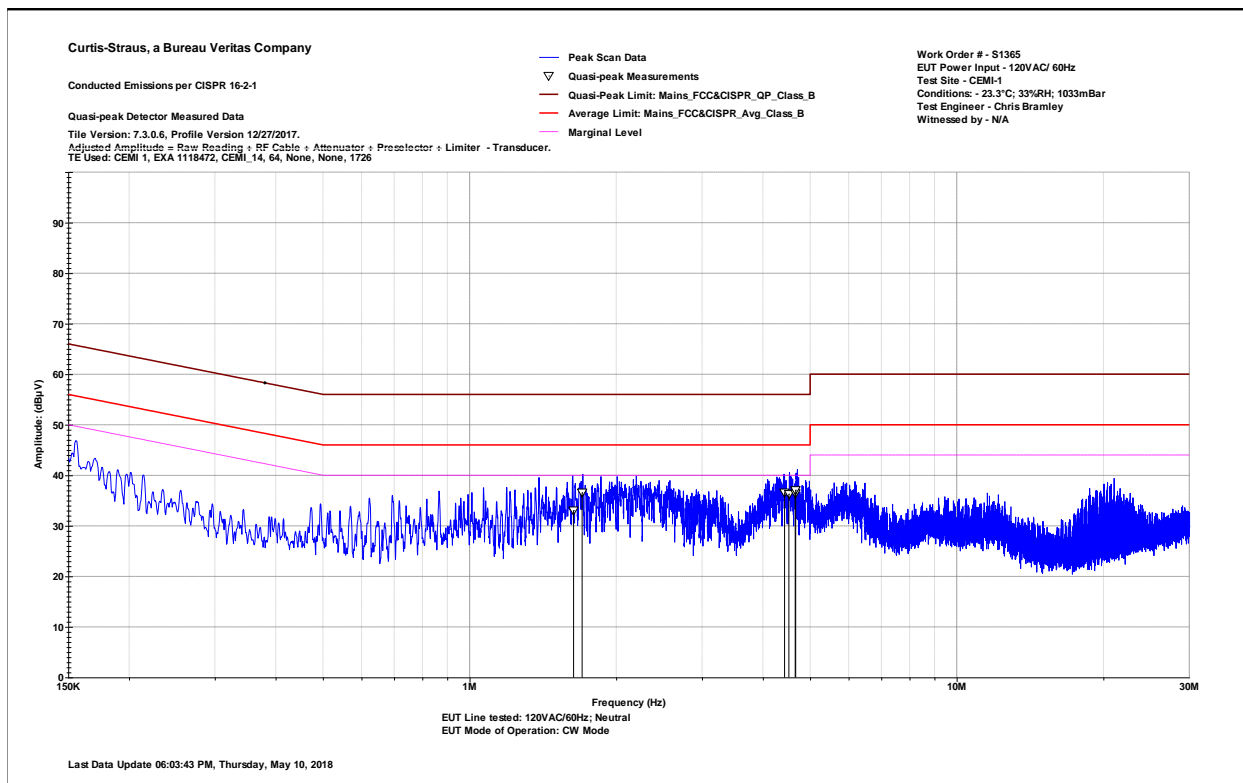


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1
 Quasi-peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral
 EUT Mode of Operation: CW Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 06:11:53 PM, Thursday, May 10, 2018

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)
1.635	12.228	20.9	33.1	56	-22.9	PASS	
1.702	15.791	20.8	36.6	56	-19.4	PASS	
4.431	15.727	20.9	36.6	56	-19.4	PASS	
4.523	15.472	20.9	36.3	56	-19.7	PASS	
4.66	15.633	20.9	36.5	56	-19.5	PASS	
4.671	16.257	20.9	37.1	56	-18.9	PASS	-18.9

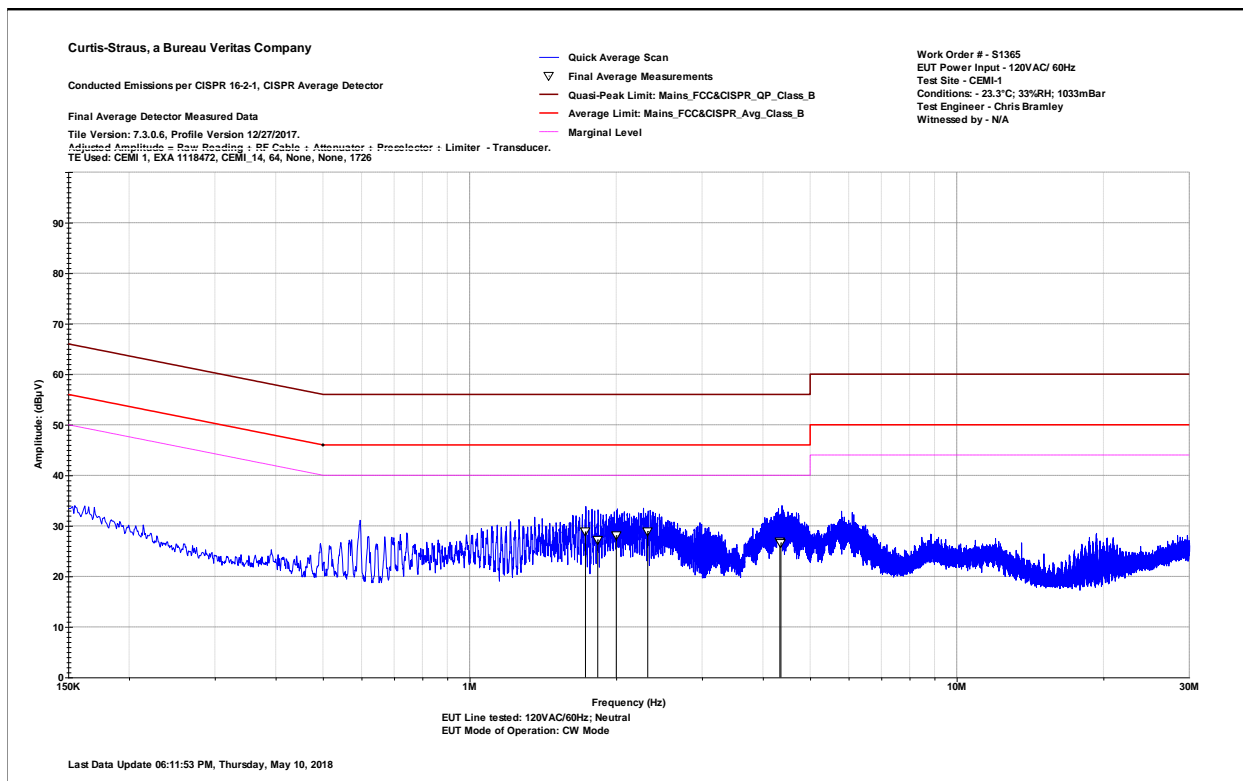


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
 Final Average Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral
 EUT Mode of Operation: CW Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 06:11:53 PM, Thursday, May 10, 2018

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)
1.729	8	20.8	28.8	46	-17.2	PASS	
1.832	6.4	20.8	27.2	46	-18.8	PASS	
2.001	7.3	20.8	28.1	46	-17.9	PASS	
2.321	8.1	20.8	29	46	-17	PASS	-17
4.334	6.1	20.9	26.9	46	-19.1	PASS	
4.355	5.8	20.9	26.7	46	-19.3	PASS	

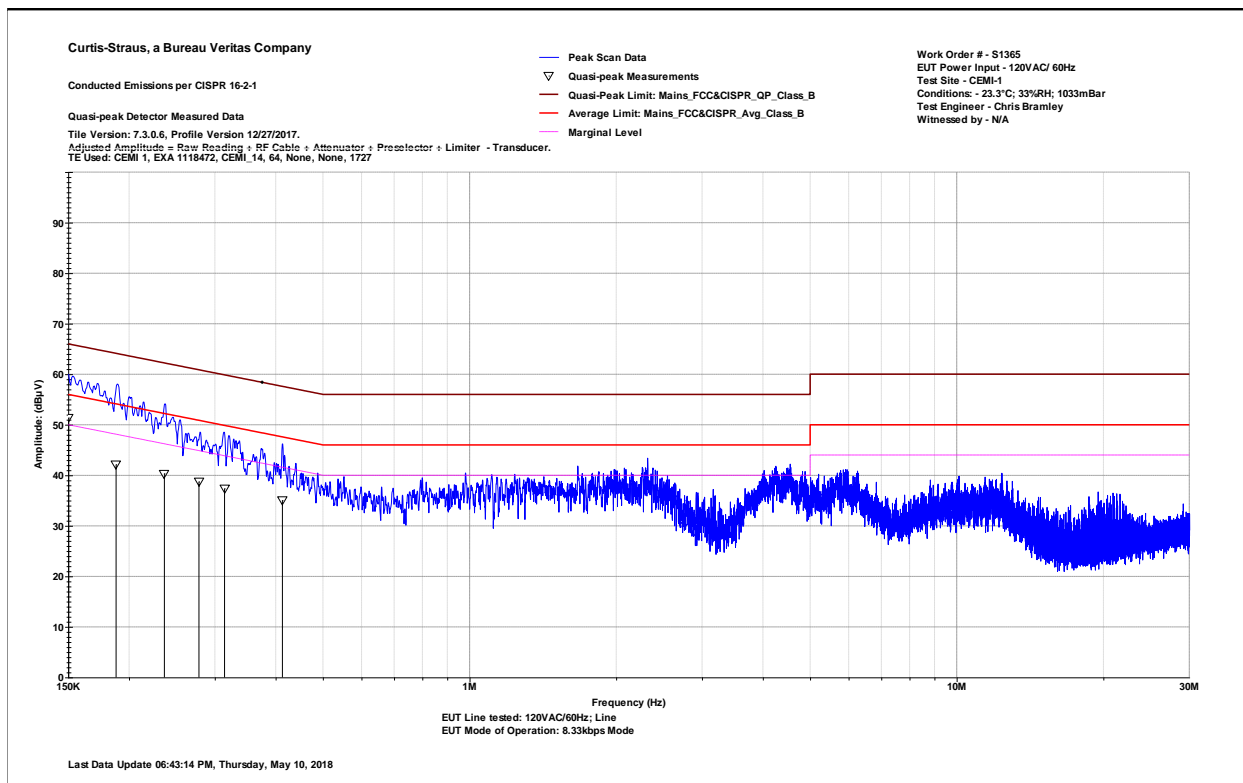


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1
 Quasi-peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line
 EUT Mode of Operation: 8.33kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 06:51:22 PM, Thursday, May 10, 2018

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)
0.15	30.531	20.9	51.4	66	-14.6	PASS	-14.6
0.188	21.341	20.8	42.1	64.1	-22	PASS	
0.236	19.486	20.9	40.4	62.2	-21.9	PASS	
0.278	17.902	20.8	38.7	60.9	-22.1	PASS	
0.314	16.564	20.8	37.4	59.9	-22.5	PASS	
0.413	14.206	20.9	35.1	57.6	-22.5	PASS	

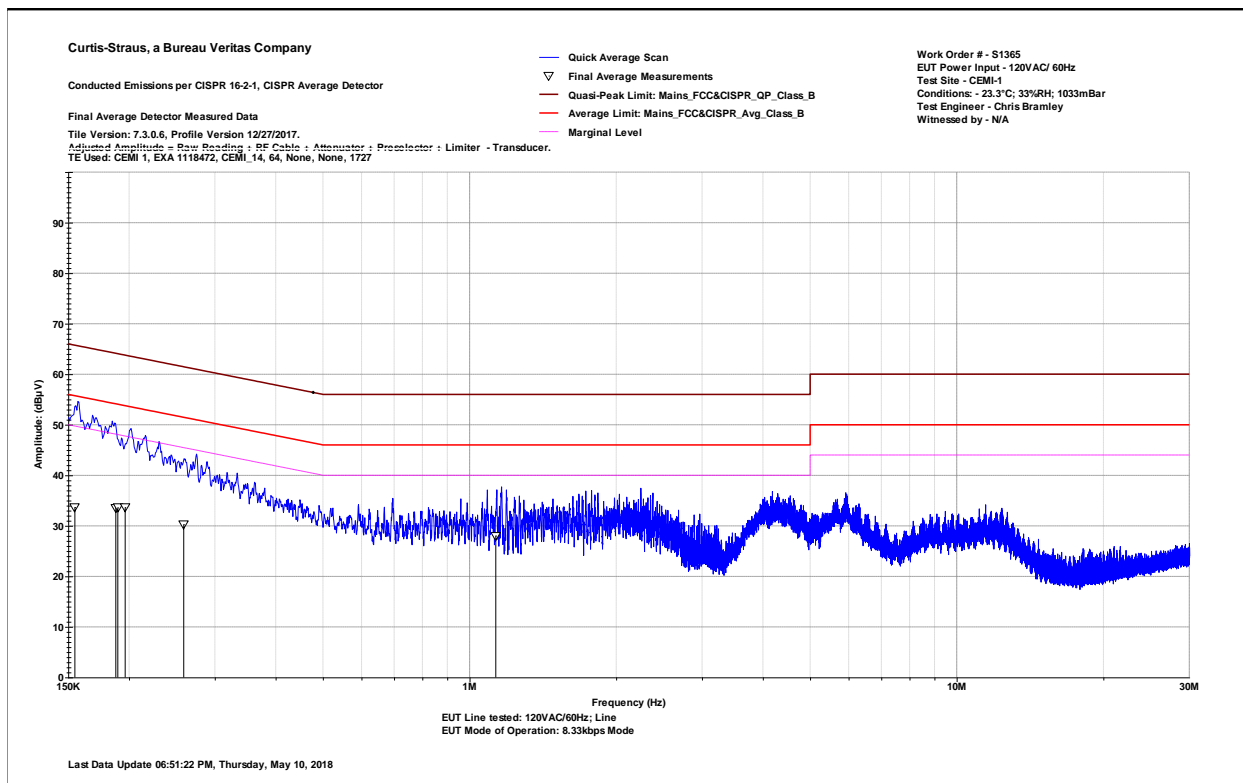


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
 Final Average Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line
 EUT Mode of Operation: 8.33kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 06:51:22 PM, Thursday, May 10, 2018

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)
0.155	12.8	20.9	33.7	55.7	-22.1	PASS	
0.188	12.8	20.8	33.6	54.1	-20.6	PASS	
0.19	12.8	20.8	33.6	54.1	-20.4	PASS	
0.196	12.8	20.9	33.7	53.8	-20.1	PASS	
0.259	9.4	20.9	30.3	51.5	-21.2	PASS	
1.132	7.2	20.8	28.1	46	-17.9	PASS	-17.9

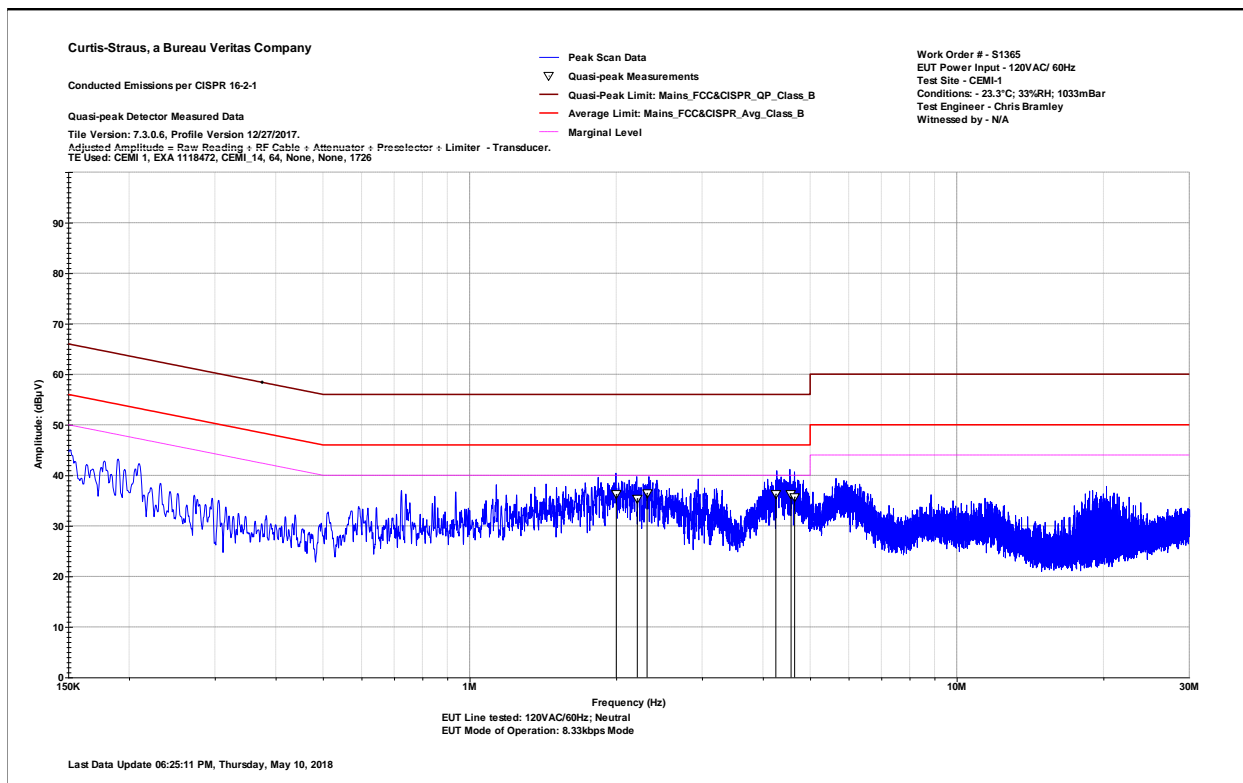


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1
 Quasi-peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral
 EUT Mode of Operation: 8.33kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 06:33:21 PM, Thursday, May 10, 2018

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)
2.001	15.447	20.8	36.3	56	-19.7	PASS	
2.209	14.54	20.9	35.4	56	-20.6	PASS	
2.314	15.649	20.8	36.5	56	-19.5	PASS	-19.5
4.251	15.477	20.9	36.3	56	-19.7	PASS	
4.57	15.494	20.9	36.3	56	-19.7	PASS	
4.648	14.888	20.9	35.7	56	-20.3	PASS	

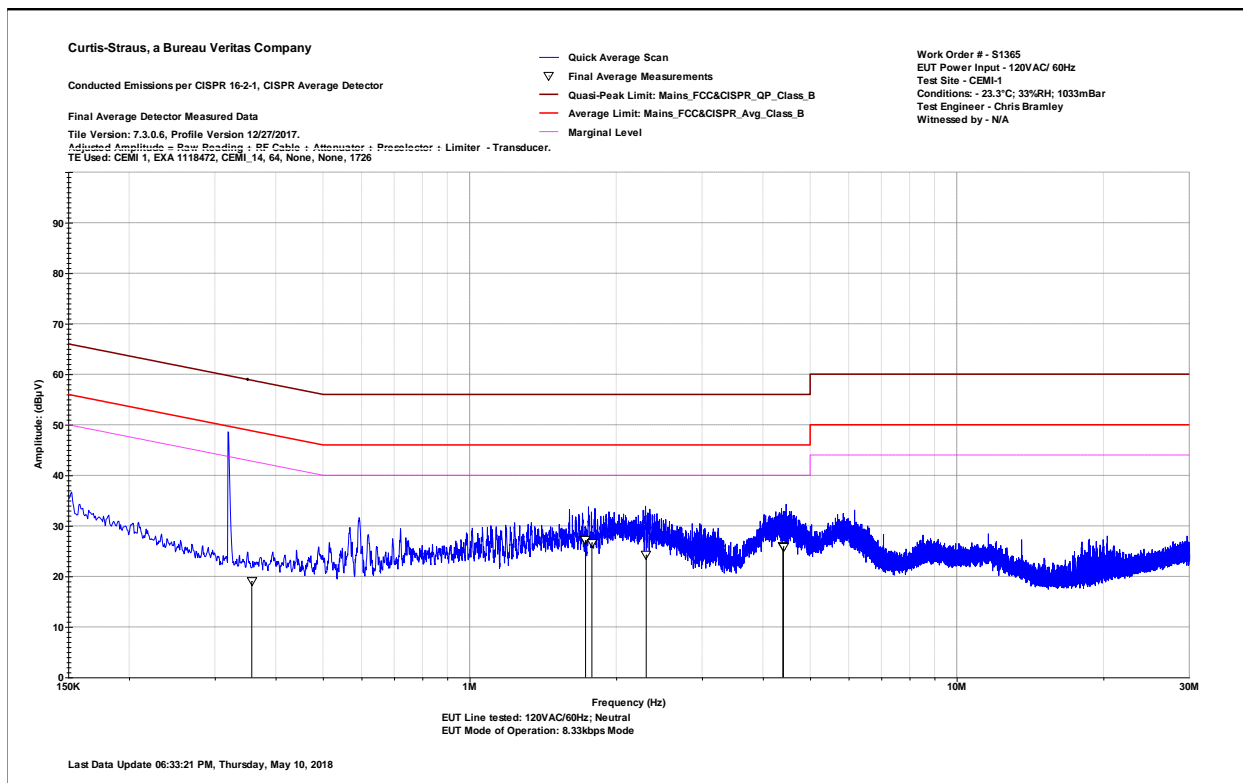


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
 Final Average Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral
 EUT Mode of Operation: 8.33kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 06:33:21 PM, Thursday, May 10, 2018

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)
0.357	-1.8	20.8	19	48.8	-29.8	PASS	
1.73	6.3	20.8	27.2	46	-18.8	PASS	-18.8
1.782	5.9	20.8	26.7	46	-19.3	PASS	
2.304	3.4	20.8	24.3	46	-21.7	PASS	
4.395	5.2	20.9	26	46	-20	PASS	
4.406	5	20.9	25.9	46	-20.1	PASS	

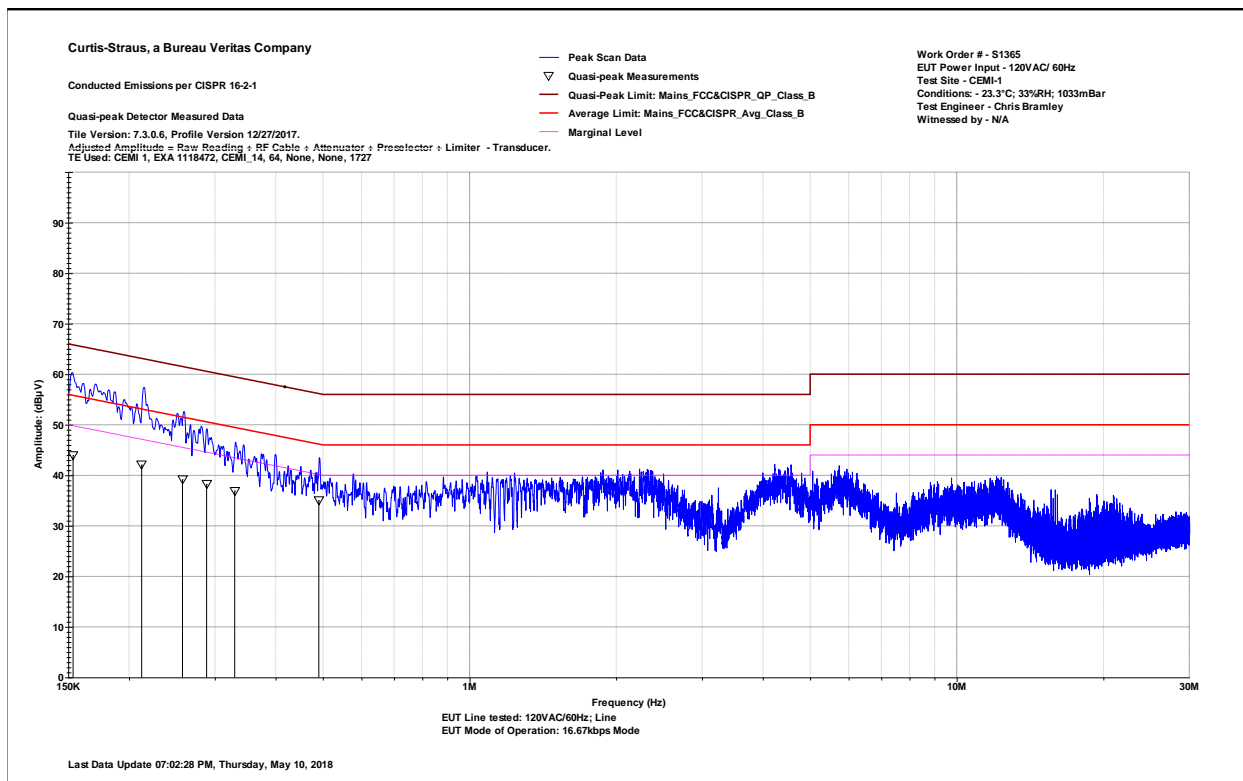


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1
 Quasi-peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line
 EUT Mode of Operation: 16.67kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 07:11:55 PM, Thursday, May 10, 2018

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)
0.153	23.108	20.9	44	65.8	-21.8	PASS	
0.212	21.234	20.9	42.1	63.1	-21	PASS	-21
0.257	18.327	20.9	39.2	61.5	-22.3	PASS	
0.289	17.396	20.8	38.2	60.6	-22.3	PASS	
0.329	16.139	20.8	36.9	59.5	-22.5	PASS	
0.49	14.256	20.8	35.1	56.2	-21.1	PASS	

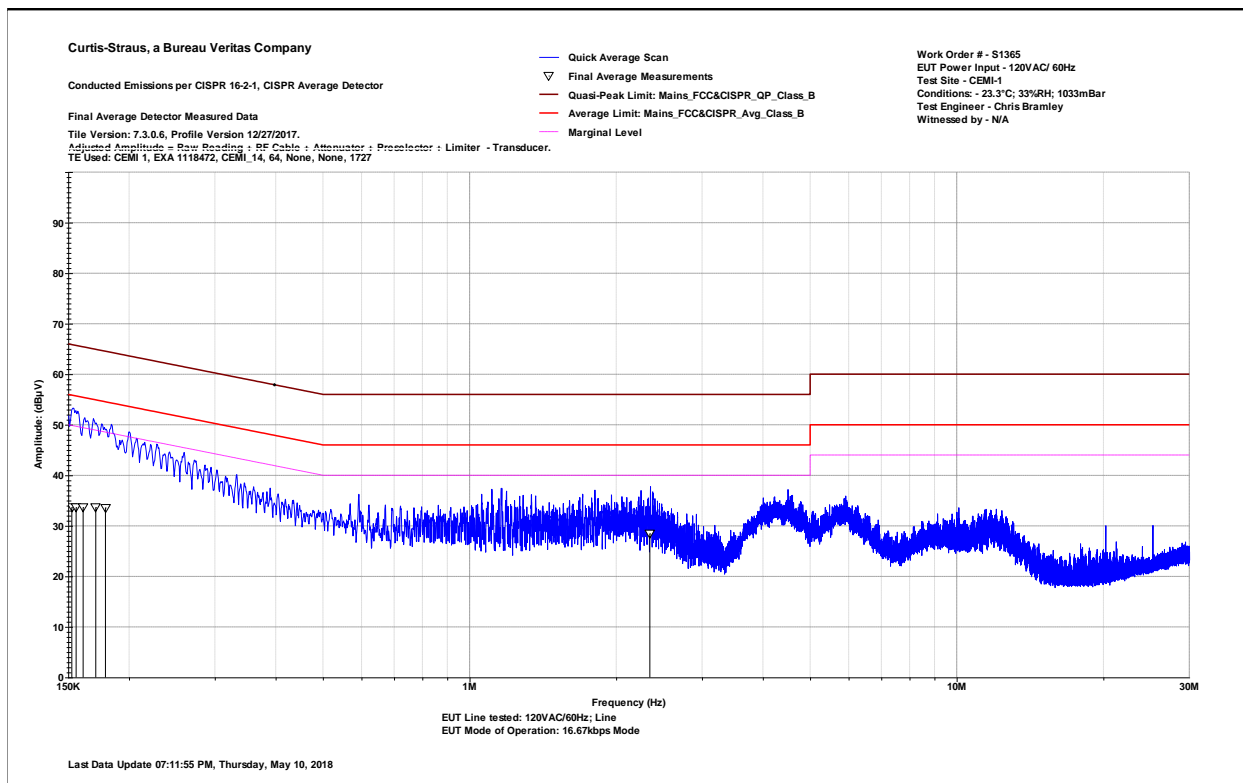


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
 Final Average Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line
 EUT Mode of Operation: 16.67kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 07:11:55 PM, Thursday, May 10, 2018

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)
0.153	12.8	20.8	33.6	55.9	-22.2	PASS	
0.156	12.8	20.9	33.6	55.7	-22	PASS	
0.161	12.8	20.9	33.7	55.4	-21.8	PASS	
0.171	12.8	20.8	33.6	54.9	-21.3	PASS	
0.179	12.8	20.8	33.6	54.5	-21	PASS	
2.344	7.6	20.8	28.5	46	-17.5	PASS	-17.5

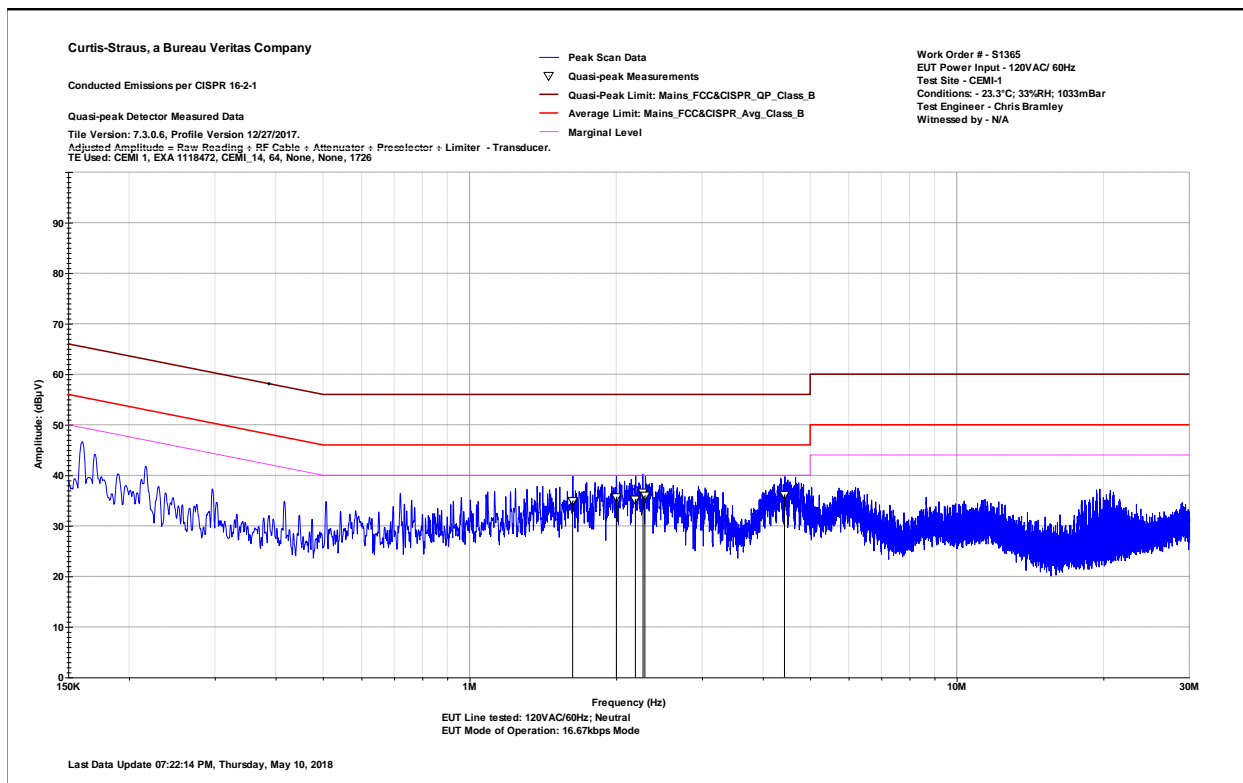


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1
 Quasi-peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral
 EUT Mode of Operation: 16.67kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 07:30:24 PM, Thursday, May 10, 2018

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)
1.627	14.081	20.9	34.9	56	-21.1	PASS	
2.002	14.884	20.8	35.7	56	-20.3	PASS	
2.189	14.41	20.9	35.3	56	-20.7	PASS	
2.27	15.69	20.9	36.5	56	-19.5	PASS	-19.5
2.289	15.114	20.8	36	56	-20	PASS	
4.429	15.305	20.9	36.2	56	-19.8	PASS	

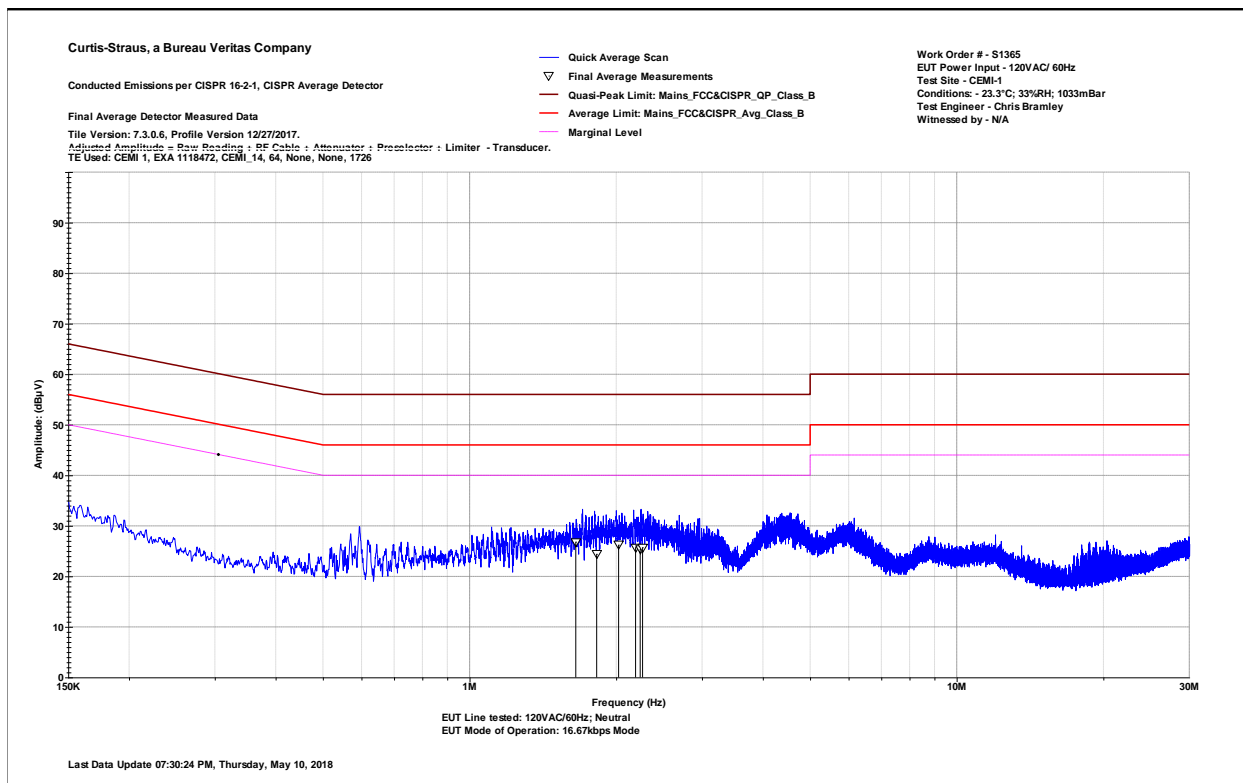


Curtis Straus - a Bureau Veritas Company
 Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
 Final Average Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral
 EUT Mode of Operation: 16.67kbps Mode

Work Order # - S1365
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 33%RH; 1033mBar
 Test Engineer - Chris Bramley
 Witnessed by - N/A

Data Taken at 07:30:24 PM, Thursday, May 10, 2018

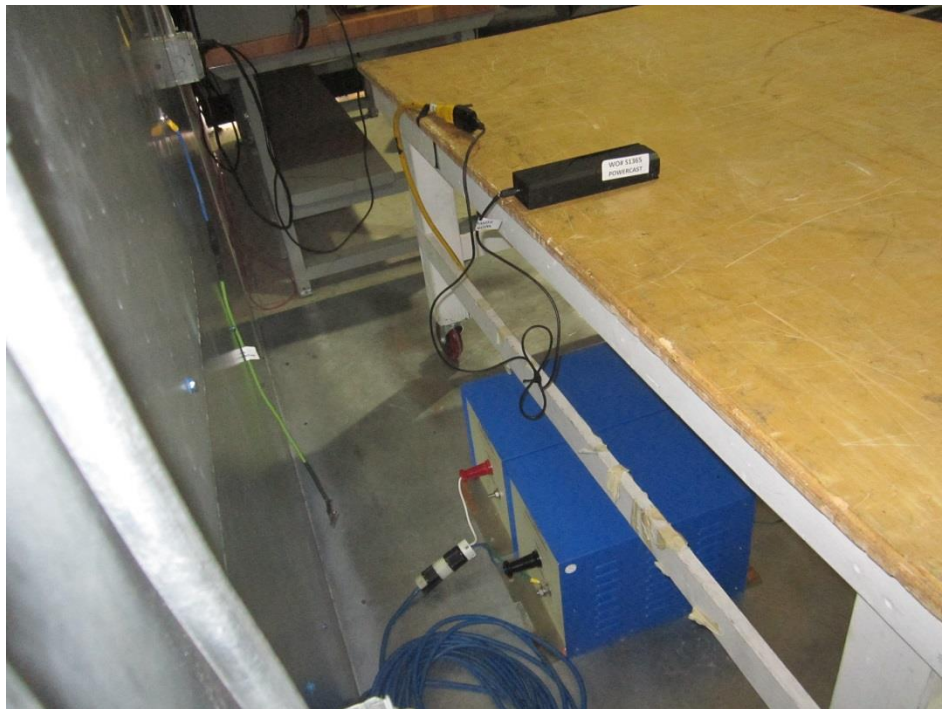
Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
1.652	6	20.9	26.8	46	-19.2	PASS	-19.2
1.823	3.6	20.8	24.4	46	-21.6	PASS	
2.023	5.4	20.8	26.2	46	-19.8	PASS	
2.191	4.9	20.9	25.7	46	-20.3	PASS	
2.239	4.5	20.9	25.4	46	-20.6	PASS	
2.264	4.9	20.9	25.7	46	-20.3	PASS	



SETUP PHOTOGRAPHS



CEMI 0.15-30MHz – Front



CEMI 0.15-30MHz – Rear

Test Equipment Used - CEMI

Rev. 5/9/2018

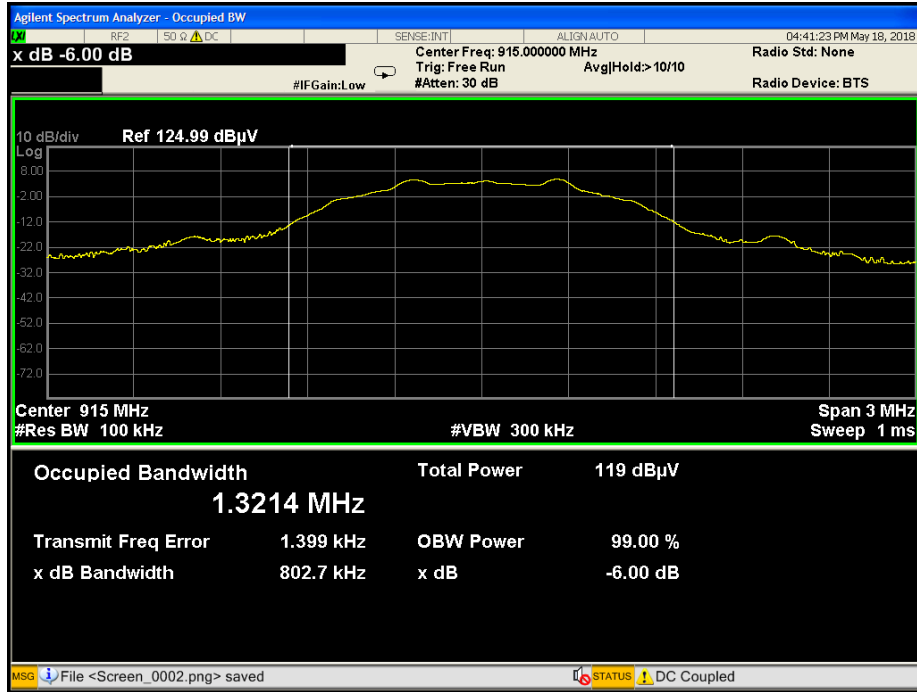
Spectrum Analyzers / Receivers/Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1118472)		9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	7/25/2018	7/25/2017
LISNs/Measurement Probes		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
LISN Asset 1726		150kHz-30MHz	LI-150A	Com-Power	201092	1726	I	3/23/2019	3/23/2018
LISN Asset 1727		150kHz-30MHz	LI-150A	Com-Power	201093	1727	I	3/23/2019	3/23/2018
Conducted Test Sites (Mains / Telco)		FCC Code	VCCI Code				Cat	Calibration Due	Calibrated on
CEMI 1		719150	A-0015				III	NA	N/A
Meteorological Meters/Chambers			MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
TH A#2083			HTC-1	HDE	2083		II	3/22/2019	3/22/2018
Barometric A#2265			5396-0321	Monarch Instruments	4000215	2265	I	11/22/2018	11/22/2016
Cables		Range		Mfr			Cat	Calibration Due	Calibrated on
CEMI-14		9kHz - 2GHz		C-S			II	10/2/2018	10/2/2017
Attenuators		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
20dB Attenuator-64		9kHz-2GHz			N/A		II	11/6/2018	11/8/2017

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

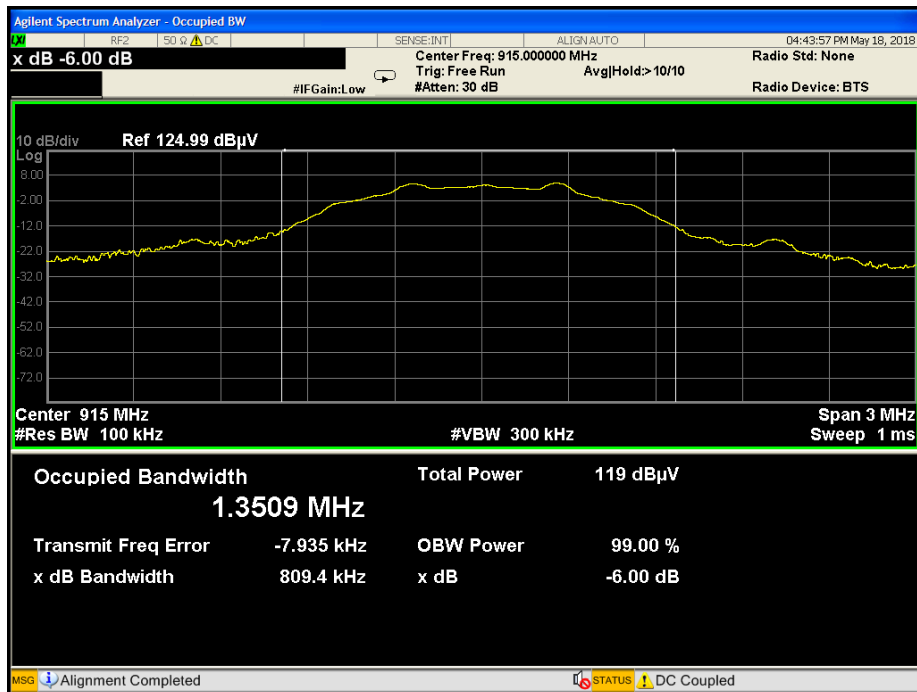
Occupied Bandwidth

MEASUREMENTS / RESULTS

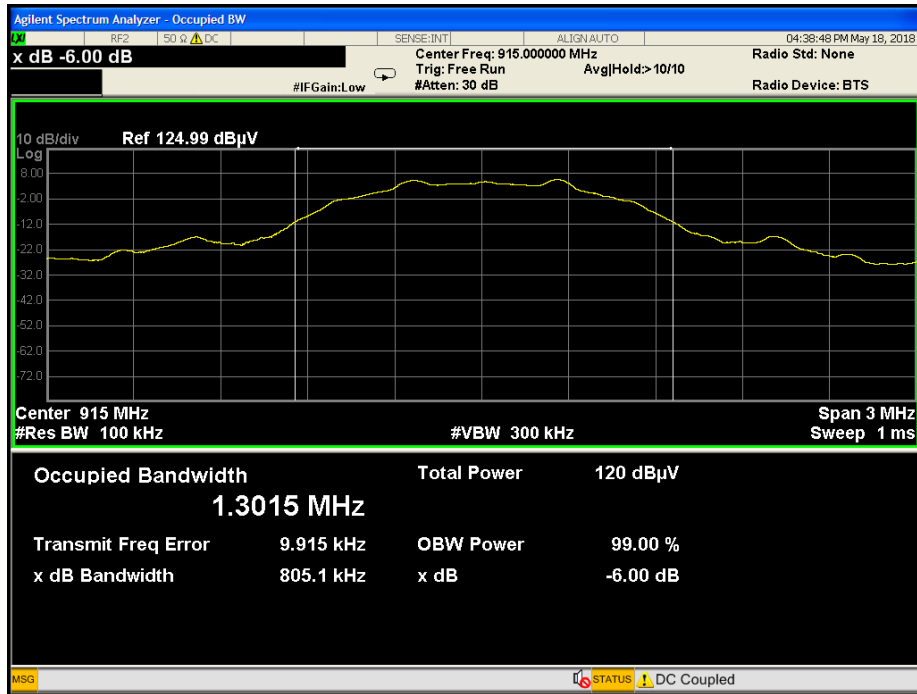
Plots



8.33kbps



16.67kbps



CW

Power Spectral Density

MEASUREMENTS / RESULTS

Radiated Emissions Table										
Date: 18-May-18			Company: Powercast				Work Order: S1365			
Engineer: Chris Bramley			EUT Desc: 915MHz Transmitter				EUT Operating Voltage/Frequency: 120V/60Hz			
Temp: 24.8°C			Humidity: 23%		Pressure: 1048mBar					
Frequency Range: 915MHz						Measurement Distance: 3 m				
Notes: PSD at Fundamental 100kHz RBW, 300kHz VBW, 1.5MHz Span, Peak Detector										
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBuV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBuV/m)				
CW Mode h	915.0	120.7	28.0	22.3	8.1	123.1				
8.33kbps Mode h	915.0	121.0	28.0	22.3	8.1	123.4				
16.67kbps Mode h	915.0	120.9	28.0	22.3	8.1	123.3				
Table Result:			--- by --- dB				Worst Freq: --- MHz			
Test Site: EMI Chamber 1			Cable 1: Asset #2480			Cable 2: Asset #2456		Cable 3: Asset #2488		
Analyzer: Rental SA#1			Preamp: Asset #2443			Antenna: Red-Brown				
CSsoft Radiated Emissions Calculator v 1.017.203						Copyright Curtis-Straus LLC 2000				
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor										

Fundamental

Radiated Emissions Table										
Date: 22-May-18			Company: Powercast				Work Order: S1365			
Engineer: Chris Bramley			EUT Desc: 915MHz Transmitter				EUT Operating Voltage/Frequency: 120V/60Hz			
Temp: 25.2°C			Humidity: 35%		Pressure: 1009mBar					
Frequency Range: 1830MHz						Measurement Distance: 3 m				
Notes: PSD at Second Harmonic with 900-930MHz RBF(Correction factor(0.3dB) added to Reading) 100kHz RBW, 300kHz VBW, 2.5MHz Span, Peak Detector										
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBuV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBuV/m)				
CW Mode h	1830.0	58.7	26.2	30.8	2.8	66.1				
8.33kbps Mode h	1830.0	56.8	26.2	30.8	2.8	64.2				
16.67kbps Mode h	1830.0	57.8	26.2	30.8	2.8	65.2				
Table Result:			--- by --- dB				Worst Freq: --- MHz			
Test Site: EMI Chamber 1			Cable 1: Asset #2480			Cable 2: Asset #2456		Cable 3: Asset #2488		
Analyzer: Rental SA#1			Preamp: Asset #2443			Antenna: Blue Horn				
CSsoft Radiated Emissions Calculator v 1.017.203						Copyright Curtis-Straus LLC 2000				
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor										

2nd Harmonic

****Included to show that 2nd Harmonic is more than 30dB below fundamental with same settings**



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 where 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.

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 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.

Rev.160009121(2)_#684340 v13CS

A2LA Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999	
CURTIS-STRAUS¹ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880 ELECTRICAL	
Valid until: July 31, 2007	Certificate Number: 1627.01
In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:	
Electromagnetic Compatibility (EMC) Radiated emissions testing (electric and magnetic fields)*; Conducted emissions testing (voltage and current)*; Electrostatic Discharge testing*; Electrical Fast Transient testing*; Radiated Immunity testing*; Conducted Immunity testing*; Lightning Immunity testing*; Voltage Dips*, Interrupts and Voltage Variations testing*; Magnetic Immunity testing*; RF Power measurements*; Frequency Stability Measurements*; Longitudinal Induction measurements*; Harmonic emissions testing*; Light flicker testing*; Low frequency disturbance voltage testing*; Disturbance Power measurements*; Power Cross Overvoltage testing*	
Test Type	Test Method(s)
Emissions	
Radiated and Conducted Emissions	FCC 47 CFR Parts 15 & 18; C63.4; CISPR 22; EN55022; SABS CISPR 22; AS/NZS CISPR 22; AS/NZS 3548; Canada ICES-003; CNS13438; KN 22 (RRL No. 2005-82, September 29, 2005); CISPR 11; EN 55011; SABS CISPR 11; AS/NZS CISPR 11; AS/NZS 2064; Canada ICES-001; CNS13803; CISPR 13; EN 55013; SABS CISPR 13; AS/NZS CISPR 13; AS/NZS 1053; CISPR 14-1; EN 55014-1; SABS CISPR 14; AS/NZS CISPR 14; AS/NZS 1044; CNS 13439; CISPR 15; EN 55015; GR-1089-CORE; CSA C108.8-M1983;
Harmonics	EN 61000-3-2; AS/NZS 61000.3.2
Flicker	EN 61000-3-3; AS/NZS 61000.3.3
1 Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460 and, for test types marked with an asterisk, at other sites as defined in "A2LA specific criteria for the accreditation of site testing and site calibration laboratories."	
(A2LA Cert. No. 1627.01) 3/27/06	Page 1 of 10

Immunity	RRL No. 2005-130 (December 27, 2005)
Electrostatic Discharge (ESD)	EN 61000-4-2; AS/NZS 61000.4.2; KN61000-4-2
Radiated Immunity (RFI)	EN 61000-4-3; AS/NZS 61000.4.3; KN61000-4-3
Electrical Fast Transient Bursts (EFT)	EN 61000-4-4; AS/NZS 61000.4.4; KN61000-4-4
Surge	EN 61000-4-5; AS/NZS 61000.4.5; KN61000-4-5
Conducted Immunity	EN 61000-4-6; AS/NZS 61000.4.6; KN61000-4-6
Magnetic Immunity	EN 61000-4-8; AS/NZS 61000.4.8; KN61000-4-8
Voltage Dips and Interrupts	EN 61000-4-11; KN61000-4-11
Low Frequency Conducted Disturbances	EN 61000-2-2
Family Product or Industry Specific Specifications including emissions and/or immunity	GR-1089-CORE; GR-78-CORE (ESD) EN50081-1; EN50081-2; EN50082-2; EN50082-1; EN 61000-6-1; EN 61000-6-2; EN 61000-6-3; EN 61000-6-4; EN 50091-2; EN 55024; CISPR 24 EN 55103-1; EN 55103-2; EN 61326; EN 61547; EN 50130-4; EN 50083-2; EN 60601-1-2; EN 60601-2-2; EN 60601-2-24; IEC 1800-3; EN 60601-2-32; EN 60601-2-38; EN 60601-2-47; IEC 1800-3; EN 61800-3; EN 55020; CISPR 20; EN 60555 Part 2; EN 60555 Part 3; ETS 300 386-1; EN 300 386-2; EN 300 386, ETS 300 132-1; ETS 300 132-2; EN 60669-2-1; AS/NZS 3200.1.2; CNS 13783-1; ETR 283; C62.41
Radiocommunications	
<i>EU R&TTE Radio Standards;</i>	EN 300 220-1; EN 300 220-3; EN 300 330-1; EN 300 330-2; EN 300 440-1; EN 300 440-2; EN 300 328; EN 300 385; EN 301 893
<i>EU R&TTE EMC Standards</i>	EN 300 339; EN 301 489-01; EN 301 489-03; EN 301 489-17
<i>Canada Radio Standards</i>	RSS-102; RSS-117; RSS-118; RSS-119; RSS-123; RSS-125; RSS-128; RSS-129; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-136; RSS-137; RSS-138; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-187; RSS-188; RSS-191; RSS-192; RSS-193; RSS-195; RSS-210; RSS-212; RSS-213; RSS-215; RSS-243; RSS-GEN; RSS-310; GL-36;
<i>Australia/New Zealand Radio Standards</i>	AS/NZS 4268; AS/NZS 4771; RFS29; Radiocommunications (Data Transmission Equipment Using Spread Spectrum Modulation Techniques); Radiocommunications (Spread Spectrum Devices); Radiocommunications (Short Range Devices); Radiocommunications (Low Interference Potential Devices);
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<i>Other Radio Standards</i>	RTTE 01 (DGT-Taiwan);
FCC Standards and Test methods Support TCB Status--	
<i>FCC Scope A - Unlicensed Radio Frequency Devices</i>	
A1	1. 47 CFR Parts 11, 15 and 18 2. FCC MP-5, 3. ANSI C63.4-2003,
A2	1. 47 CFR Part 15, 2. ANSI C63.4-2003,
A3	1. 47 CFR Part 15, 2. ANSI C63.17-1998, 3. ANSI C63.4-2003,
A4	1. 47 CFR Part 15, 2. ANSI C63.4-2003,
<i>FCC Scope B - Licensed Radio Service Equipment</i>	
B1	1. 47 CFR Parts 2, 22, 24, 25, and 27 2. ANSI/TIA-603-C (2004)
B2	1. 47 CFR Parts 2, 74, 90, 95, and 97 2. ANSI/TIA-603-C (2004)
B3	1. 47 CFR Parts 2, 80, and 87 2. ANSI/TIA-603-C (2004)
B4	1. 47 CFR Parts 2, 21, 74, and 101 2. ANSI/TIA-603-C (2004)
Country Specific Standards and Other	
<i>ITU EMC Standards</i>	K.20; K.21; K.41; K.44
<i>Swedish EMC Standards</i>	BAKOM 3336.3
<i>South African EMC Standards other than CISPR equivalents</i>	SABS 1718-1; SANS 211/SABS CISPR 11; SANS 224/SABS CISPR 24; SANS 213/SABS CISPR 13; SANS 2200; SANS214-1/SABS CISPR 14-1; SANS214-2/SABS CISPR 14-2; SANS 215/SABS CISPR 15; SANS 222/SABS CISPR 22
<i>Hong Kong EMC Standards</i>	HKTA 1006; HKTA 1007; HKTA 1008; HKTA 1010; HKTA 1015; HKTA 1026; HKTA 1035; HKTA 1039; HKTA 1041; HKTA 1042; HKTA 1045
<i>Singapore EMC Standards</i>	IDA TS SRD; IDA TS EMC
<i>Japanese VCCI Standards</i>	VCCI V-3, VCCI V-4
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Telecommunications	Telecommunications Registration; General test methods; Lightning surge*; Drop testing*; Balance testing*; Signal power (metallic and longitudinal)*; Frequency measurements*; Pulse templates*; Leakage testing*; Impedance testing*; Hearing Aid Compatibility testing (excluding volume control)*; Protocol analysis* and Jitter testing*.
Telecom Standards	Title
<i>North American standards</i>	
FCC 47 CFR Part 68 Telephone Terminal Equipment CS-03 Issue 9	Connection of terminal equipment to the telephone network. Analog and Digital Equipment. TCB Scope C1. Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.
TIA/EIA TSB31-B 1998	Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)
TIA-968-A, A1, A2, A3	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network
TI.TRQ.6-2001	Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry
<i>Australia standards</i>	
AS/ACIF S002-2001	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
AS/ACIF S016-2001	Requirements for Customer Equipment for connection to hierarchical digital interfaces
AS/ACIF S031-2001	Requirements for ISDN Basic Access Interface
AS/ACIF S038-2001	Requirements for ISDN Primary Rate Access Interface
AS/ACIF S043-2001	Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network — Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voice band
<i>International standards</i>	
ITU-T G.703	Physical/electrical characteristics of hierarchical Digital interfaces
<i>Hong Kong standards</i>	
HKTA 2011	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Direct Exchange Lines (DEL) of the Public Switched Telephone Network (PSTN) in Hong Kong
HKTA 2014	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using ISDN Basic Rate Access (BRA) based on ITU-T Recommendations
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<p><u>Telecom Standards</u></p> <p>HKTA 2028 Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s</p> <p>HKTA 2029 Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s</p> <p>HKTA 2030 Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits at nx64 kbit/s</p> <p>HKTA 2031 Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits below 64 kbit/s</p> <p>HKTA 2032 Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Networks in Hong Kong using Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.1</p> <p>HKTA 2033 Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Fixed Telecommunications Networks in Hong Kong using Splitterless Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.2</p> <p><u>European standards</u></p> <p>TBR 1: 1995 Attachment requirements for terminal equipment to be connected to circuit switched data networks and Leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 but operating at any data signaling rate up to, and including, 1 984 kbit/s</p> <p>TBR 2: 1997 Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signaling rates up to 1 920 kbit/s utilizing interfaces derived from CCITT Recommendations X.21 and X.21 bit Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface</p> <p>(A2LA Cert. No. 1627.01) 3/27/06</p>	<p><u>European standards (cont'd)</u></p> <p>TBR 21: 1998 Terminal Equipment (TE); Attachment requirements For pan-European approval for connection to the Analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling Business Telecommunications (BTC); 34 Mbit/s Digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for Terminal equipment interface</p> <p>TBR 24: 1997 Asymmetric Digital Subscriber Line Terminal Equipment and POTS Splitter Technical Specifications DS1 Equipment Type Approval Guidelines ISDN Terminal Equipment Technical Specifications Technical Specifications for Terminal Equipment for Connection to Public Switched Telephone Network</p> <p><u>Taiwan standards (DGT)</u></p> <p>ADSL01 Asymmetric Digital Subscriber Line Terminal Equipment and POTS Splitter Technical Specifications</p> <p>ID0002 DS1 Equipment Type Approval Guidelines</p> <p>IS6100 ISDN Terminal Equipment Technical Specifications</p> <p>PSTN01 (non-voice only) Technical Specifications for Terminal Equipment for Connection to Public Switched Telephone Network</p> <p><u>New Zealand standards</u></p> <p>PTC 200 (non-voice only) Requirements for Connection of Customer Equipment to Analogue Lines</p> <p>PTC 217 Requirements for Bandwidth Management Devices</p> <p>TNA 117 Telecom 2048 kbit/s Standard Network Interface</p> <p>PTC 270 Interim arrangements for ADSL CPE</p> <p><u>Singapore Standards</u></p> <p>IDA TS ADSL Type Approval Specification for Asymmetric Digital Subscriber Line (Full-rate ADSL) Modems</p> <p>IDA TS ADSL 2 Type Approval Specification for Asymmetric Digital Subscriber Line Splitterless (G-Lite) Modems</p> <p>IDA TS DLCN 1 Type Approval Specification for Digital Interfaces based on hierarchical bit rates of 2048 kbit/s, 34 368 kbit/s and 139 264 kbit/s</p> <p>IDA TS ISDN 1 Type Approval Specification for connection of Terminal Equipment to Integrated Services Digital Network (ISDN) Basic Access</p> <p>IDA TS ISDN 2 Type Approval Specification for connection of Terminal Equipment to Integrated Services Digital Network (ISDN) Primary Rate Access (PRA)</p> <p>IDA TS PSTN (non-voice only) Type Approval Specification for connection of Terminal Equipment to Public Switched Telephone Network (PSTN)</p> <p><u>South Africa standards</u></p> <p>TE-001 (non-voice only) Standard for Telecommunication Line Terminal Equipment (TLTE) for Connection to the Public Switched Telephone Network (PSTN)</p> <p>(A2LA Cert. 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<p><u>Product Safety</u></p> <p>General test methods: Power input*, Permanence of marking*, Accessibility*, Permissibly limits*, Energy hazard measurement*, SELV circuits*, TNV limits*, Limited current*, Capacitor Discharge / voltage limitation*, Ring signal*, Humidity conditioning*, Creepage / Clearance / Distance thru Insulation (excluding CTT)*, Limited power measurement*, Ground Bond/Earthing*, Ground continuity*, Temperature*, Stability*, Applied force*, Steel sphere impact*, Mold stress*, Battery reverse current*, Ball pressure*, Leakage current*, Component abnormal*, Electric strength*, Impulse*, Overvoltage*, Acoustic sound pressure*, 130mm / 20mm flame*, Needle flame*, Hot flaming oil*, Locked rotor/motor armature*, Vibration, Bump, Drop*, Strain relief*, Torque*, Insulation resistance*, Sound level*, Handle loading*, Liquid overflow*, Spillage*, Liquid leakage*, Transformer shorts/overloads*, Rain test*, Wall mount*, Laser radiation (excluding x-ray)*, Voltage surge*, Functionality*, Protective impedance abnormal*, Capacitor short circuit abnormal*, Output abnormal*, Multi-supply abnormal*, Cooling abnormal*, Heating device abnormal*, Interlock abnormal*, Rigidity*, Cleaning*</p> <p><u>Product Safety Standards</u></p> <p><u>Specific Product Safety Standards</u></p> <p>UL 60950 2000 Safety of information technology equipment</p> <p>IEC 60950 1999 Safety of information technology equipment</p> <p>EN 60950 2000 Safety of information technology equipment, including Electrical business equipment.</p> <p>IEC 60950-1 2001 Safety of information technology equipment, including Electrical business equipment.</p> <p>UL 60950-1 2003 Safety of information technology equipment, including Electrical business equipment.</p> <p>CSA C22.2 No. 60950-00 Safety of information technology equipment, including Electrical business equipment.</p> <p>CSA C22.2 No. 60950-1 03 Safety of information technology equipment, including Electrical business equipment.</p> <p>IEC 61010-1 1993, 2001 Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.</p> <p>IEC 61010-1 2001 Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.</p> <p>UL 61010B-1 2003 Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.</p> <p>CAN/CSA 1010-1 1999 (Including AM 2) Electrical equipment for laboratory use Part 1: General requirements.</p> <p>IEC 60601-1 1995 Medical electrical equipment, Part 1: General requirements for safety.</p> <p>EN 60601-1 1995 (Including AM 2) Medical electrical equipment</p> <p>UL 2601-1 1997 Medical electrical equipment, Part 1: General Requirements for safety.</p> <p>IEC 60065 1998, 2000 Audio, video and similar electronic apparatus – Safety requirements</p> <p>ANSI/UL 6500: 1998 Audio/video and musical instrument apparatus for Household, commercial and similar general use Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use</p> <p>Canadian C22.2 No. 1-94 (1-98) Audio, video and similar electronic equipment.</p> <p>1994, 1998 Consumer and commercial products</p> <p>EN 60065 1994 Safety requirements for main operated electronic and related apparatus for household and similar general use.</p> <p>IEC 60825 1990 Radiation safety of laser products, equipment</p> <p>EN 60825-1 1994 Classification, requirements and user's guide</p> <p>Safety of laser products Part 1: equipment</p> <p>(A2LA Cert. No. 1627.01) 3/27/06</p>	<p><u>Product Safety Standards</u></p> <p>IEC 60825-1 2001 Classification, requirements and user's guide.</p> <p>IEC 60825-2 2000-5 Safety of laser products – Part 2: Safety of optical communication systems</p> <p>IEC 60825-4 1997-11 Safety of laser products – Part 4: Laser guards</p> <p>21 CFR 1040.10 Performance standard for laser products</p> <p>IEC 60335-1 1995 Safety of household and similar electrical appliances</p> <p>(Including AM2 – 1997 & AM 12 – 1997) Part 1: General requirements</p> <p>EN 60335-1 2001 Safety of household and similar electrical appliances</p> <p>UL 60335-1 1998 Safety of household and similar electrical appliances</p> <p>CAN/CSA E335-1 1994 Safety of household and similar electrical appliances</p> <p>UL 61010A-1: 2002 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements</p> <p>EN 61010-1: 2001 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements</p> <p>AS/NZS 60950: 2000 Information Technology Equipment – Safety – Part 1: General Requirements</p> <p>EN 60950-1: 2001 Information Technology Equipment – Safety – Part 1: General Requirements</p> <p>AS/NZS 60950.1: 2003 Information Technology Equipment – Safety – General requirements</p> <p>UL 61010 -1: 2004 Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements</p> <p>UL 60601-1: 2003 Medical Electrical Equipment, Part 1: General Requirements for Safety</p> <p>IEC 60601-1-1: 2000 Medical Electrical Equipment - Part 1: General Requirements For Safety 1: Collateral Standard: Safety Requirements For Medical Electrical Systems</p> <p>EN 60601-1-1: 2001 Medical Electrical Equipment - Part 1: General Requirements For Safety – Section 1-1, Collateral Standard: Safety Requirements For Medical Electrical Systems</p> <p>UL 60065: 2003 Audio, Video and Similar Electronic Apparatus – Safety Requirements</p> <p>CSA 60065: 2003 Audio, Video and Similar Electronic Apparatus – Safety Requirements</p> <p>IEC 60065: 2001 Audio, Video and Similar Electronic Apparatus – Safety Requirements</p> <p>EN 60065: 2002 Audio, Video and Similar Electronic Apparatus – Safety Requirements</p> <p>EN 60204 -1: 1998 Safety of Machinery – Electrical Equipment of Machines – Part 1: Specification for General Requirements</p> <p>HKTA 2001 Compliance Test Specification – Safety and Electrical Protection Requirements for Subscriber Equipment Connected to the Public Telecommunications Networks In Hong Kong</p> <p>(A2LA Cert. No. 1627.01) 3/27/06</p>

<i>Environmental Simulation</i>		
<u>Test Technology</u>	<u>Test Standard</u>	<u>Supporting Standards</u>
Accessibility*	IEC 60529	IP-0x thru IP-6x
Acoustic Noise*	GR-63-CORE Sec 4.6	
Airborne Contaminants	GR-63-CORE Sec 4.5	MFG & Hygroscopic Dust
Altitude	GR-63-CORE Sec 4.1.3	
Cold Start*	ETS 300 019	IEC 60068-2-1
Drip	IEC 60529	IP-x1 & IP-x2
Drops*	ETS 300 019	IEC 60068-2-32
	GR-63-CORE Sec 4.3	
Dust	IEC 60529	IP-5x & IP-6x
Firearms Resistance Testing	GR-487	
Fire Resistance	ANSI-TL319	
	GR-63-CORE Sec 4.2	Fire & Needle Flame
Heat Dissipation*	GR-63-CORE Sec 4.1,4	
Illumination	GR-63-CORE Sec 4.7	
Operational Temperature & Humidity (OpTH)*	ETS 300 019	IEC 60068-2-1
		IEC 60068-2-2
		IEC 60068-2-14
		IEC 60068-2-56
Salt Fog & Spray	GR-63-CORE Sec 4.1.2	
Spatial*	ASTM B117	
Spraying-Splashing	GR-63-CORE Sec 2.0 & 3.0	IP-x3 & IP-x4
Storage (Temperature & Humidity)*	IEC 60529	IEC 60068-2-1
	ETS 300 019	IEC 60068-2-2
		IEC 60068-2-14
		IEC 60068-2-30
		IEC 60068-2-56
Vibration	GR-63-CORE Sec 4.1.1	
	ETS 300 019	IEC 60068-2-6
		IEC 60068-2-27
		IEC 60068-2-29
		IEC 60068-2-32
		IEC 60068-2-57
		IEC 60068-2-64
		Earthquake, Office & Transportation
Water Immersion	GR-63-CORE Sec 4.4	IP-x7 & IP-x8
Water Jet	IEC 60529	IP-x5 & IP-x6
	IEC 60529	

Note 1. For standards or methods listed on the scope of accreditation without a revision date, laboratories are expected to be competent in the use of the current version within one year of the date of publication of the standard test method or upon the date specified by the standard test method originator when the originator has implementation authority. When a superseded standard or method is required for an accredited test, the scope will include the superseded date/version. For those that support the TCB/CB status of the organization acting as a certifier on behalf of the FCC or IC the expectation is currency within 30 days of Federal Register publication of changes for FCC and 30 days after IC website update. This note shall not be construed as an Accreditation Body implication to adopt a more current standard than is required in a regulation or code (i.e. the legal requirement) which is adopted by the lab under their responsibility.

* On-site test service is available for this technology, test, or method.