EMC
TEST REPORT

Report No.: **160300094TWN-001**
Model No.: **PLTN-RB1V1**
Issued Date: **Apr. 18, 2016**

Applicant: **Peloton Interactive LLC**
158 West 27th Street Fourth Floor New York, NY 10001

Test Method/ Standard: **47 CFR FCC Part 15.249 & ANSI C63.10 2013**

Test By: **Intertek Testing Services Taiwan Ltd.**
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0597

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Summary of Tests

Test	Reference	Results
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	Pass
20dB Bandwidth	15.215(c)	Pass

1. General information

1.1 Identification of the EUT

Product:	Peloton Console
Model No.:	PLTN-RB1V1
FCC ID.:	2AA3N-RB1V1
Frequency Range:	2402MHz ~ 2480MHz
Channel Number:	79 Channels
Frequency of Each Channel:	2402MHz+1k, k=0~78
Type of Modulation:	GFSK
Rated Power:	DC 12 V from adapter
Power Cord:	N/A
Sample Received:	Mar. 04, 2016
Sample condition:	Workable
Test Date(s):	Mar. 07, 2016 ~ Mar. 18, 2016
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 Additional information about the EUT

The EUT is a Peloton Console, and was defined as information technology equipment.

Product SW version :	eng.RUBY.211
Product HW version :	FP
Radio SW version :	eng.RUBY.211
Radio HW version :	FP
Test SW Version :	eng.RUBY.211

For more detail features, please refer to user's Manual.

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain	: -3.76 dBi
Antenna Type	: PIFA Antenna
Connector Type	: I-PEX

1.4 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Brand	Model no.	Specification
Adapter	ADAPTER TECH.	ATS050T-P121	I/P: 100-240V~, 50-60Hz, 1.2A O/P: 12V, 4.2A

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT is supplied with DC 12 V from adapter (Test voltage: 120Vac, 60Hz).

TX-MODE is based on “ANTwareII” and the program can select different frequency and modulation.

The signal is maximized through rotation and placement in the three orthogonal axes.

X axis

Y axis

Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at Y axis. The final test data was executed under this configuration.

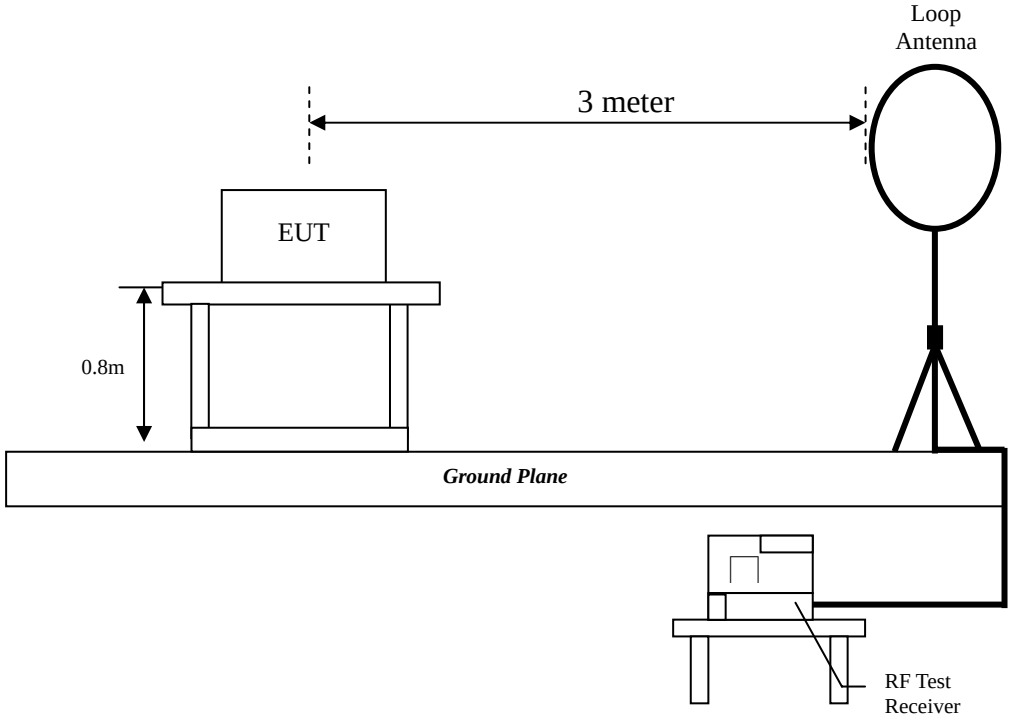
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

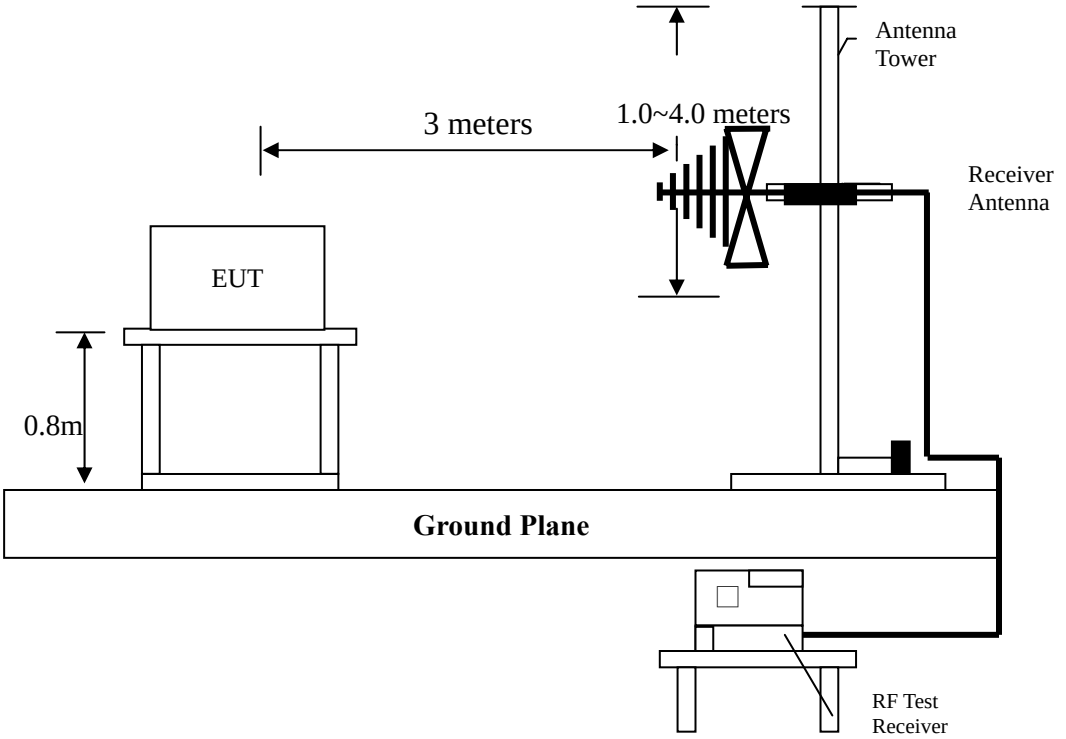
Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa
Test date:	Mar. 18, 2016	

3.2 Test setup & procedure

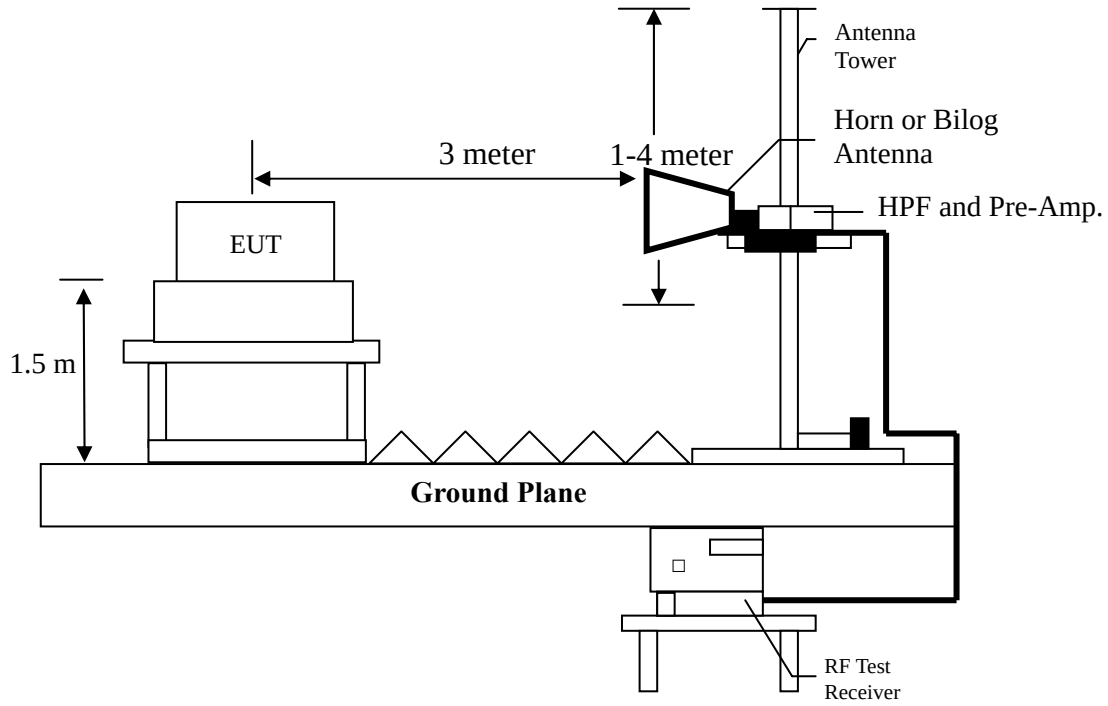
Radiated emission from 9 kHz to 30 MHz uses Loop Antenna:



Radiated emission from 30 MHz to 1 GHz uses Bilog Antenna:



Radiated emission above 1 GHz uses Horn Antenna:



Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.
The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refers to the “Spurious set-up photo.pdf”.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

3.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dB μV/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequency range from 9 kHz to 30 MHz

Polarity (circle)	Frequency (MHz)	Detection value	factor (dB/m)	Reading (dBµV)	Value (dBµV/m)	Limit @ 3m (dBµV/m)	Tolerance (dB)
Plane	0.03	QP	20.86	6.98	27.84	118.06	-90.22
Plane	12.85	QP	22.28	12.88	35.16	69.54	-34.38
Plane	27.48	QP	22.19	13.56	35.75	69.54	-33.79

Remark: Corr. Factor = Antenna Factor + Cable Loss - PreAmplifier Gain

3.4.2 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under GFSK continuously transmitting mode. Low, Middle, High Channel were verified. The worst case occurred at GFSK TX Middle Channel

EUT: PLTN-RB1V1
Worst case: Tx at Middle Channel

Antenna Polarized (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	31.94	QP	18.56	15.30	33.86	40.00	-6.14
V	92.08	QP	9.79	13.75.	23.54	43.50	-19.96
V	117.30	QP	12.21	9.77	21.98	43.50	-21.52
V	185.20	QP	11.01	8.46	19.47	43.50	-24.03
V	239.52	QP	13.35	7.47	20.81	46.00	-25.19
V	515.00	QP	20.93	3.71	24.63	46.00	-21.37
H	90.14	QP	9.56	9.14	18.70	43.50	-24.80
H	123.12	QP	12.61	16.21	28.81	43.50	-14.69
H	167.74	QP	12.44	6.41	18.85	43.50	-24.65
H	185.20	QP	11.01	8.28	19.29	43.50	-24.21
H	251.16	QP	15.05	2.28	17.33	46.00	-28.67
H	513.06	QP	20.88	2.74	23.62	46.00	-22.38

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

3.4.3 Measurement results: frequency above 1GHz

EUT : PLTN-RB1V1
Test Condition : Tx at Low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polarized (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4804	PK	V	-0.10	39.46	39.36	54.00	-14.64
4804	PK	H	-0.10	39.00	38.90	54.00	-15.10

Remark:
1. Correction Factor = Antenna Factor + Cable Loss + Power Amplifier
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : PLTN-RB1V1
Test Condition : Tx at Middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polarized (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4880	PK	V	0.15	39.46	39.61	54.00	-14.39
4880	PK	H	0.15	39.14	39.29	54.00	-14.71

Remark:
1. Correction Factor = Antenna Factor + Cable Loss + Power Amplifier
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : PLTN-RB1V1
Test Condition : Tx at High channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polarized (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960	PK	V	0.41	38.18	38.59	54.00	-15.41
4960	PK	H	0.41	38.67	39.08	54.00	-14.92

Remark:

1. Correction Factor = Antenna Factor + Cable Loss + Power Amplifier
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

3.4.4 Measurement results: Fundamental and harmonics emission

EUT : PLTN-RB1V1
Test Condition : Tx at Low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polarized (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2402	PK	V	105.85	-4.38	101.47	114	-12.53
2402	AV	V	64.67	3.37	68.04	94	-25.96
2402	PK	H	105.83	-5.32	100.51	114	-13.49
2402	AV	H	63.94	6.26	70.20	94	-23.80

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : PLTN-RB1V1
Test Condition : Tx at Middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polarized (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2440	PK	V	106.41	-7.53	98.88	114	-15.12
2440	AV	V	65.99	0.51	66.50	94	-27.50
2440	PK	H	99.52	-0.62	98.90	114	-15.10
2440	AV	H	62.18	2.74	64.92	94	-29.08

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : PLTN-RB1V1
Test Condition : Tx at High channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polarized (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2480	PK	V	104.62	-5.62	99.00	114	-15.00
2480	AV	V	65.44	0.53	65.97	94	-28.03
2480	PK	H	103.44	-5.30	98.14	114	-15.86
2480	AV	H	62.57	2.42	64.99	94	-29.01

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

4. Radiated emission on the band edge FCC 15.249(d)

4.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa
Test date:	Mar. 18, 2016	

4.2 Radiated emission on the band edge test data

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (2414~2470MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
2387.40	PK	V	33.84	26.60	60.44	74	-13.56	2310~2390
2390.00	AV	V	33.85	14.78	48.63	54	-5.37	
2383.50	PK	V	33.82	36.17	69.99	74	-4.01	2483.5~2500
2483.50	AV	V	34.30	13.50	47.80	54	-6.20	

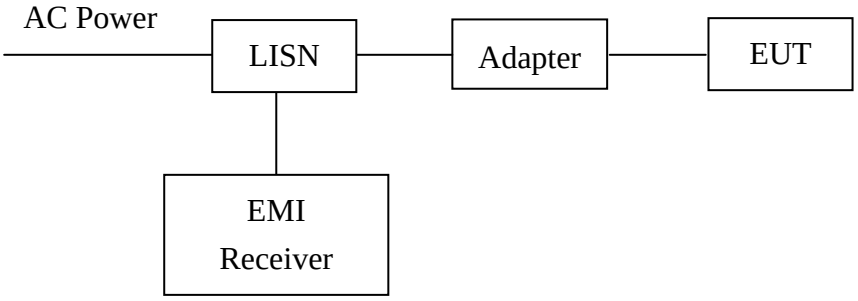
Remark: Correction Factor = Antenna Factor + Cable Loss

5. Conducted emission test FCC 15.207

5.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa
Test date:	Mar. 07, 2016	

5.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCI 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

5.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

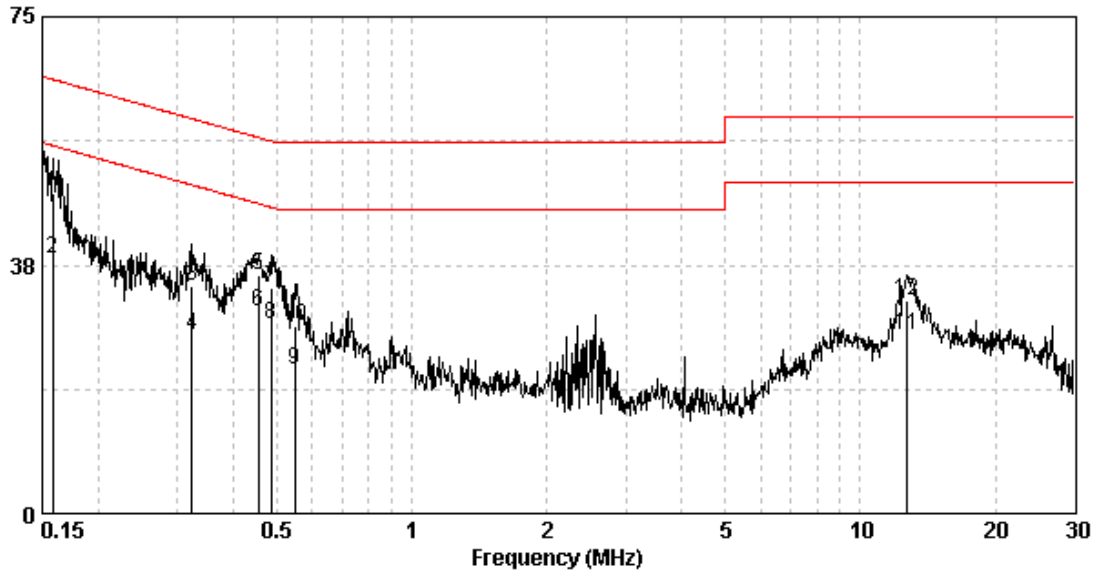
*Decreases with the logarithm of the frequency.

5.4 Conducted emission data FCC 15.207

Phase: Live Line
Model No.: PLTN-RB1V1
Test Condition: Normal mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.158	9.74	48.46	65.56	38.34	55.56	-17.10	-17.22
0.323	9.73	34.28	59.62	26.80	49.62	-25.33	-22.82
0.454	9.73	35.99	56.80	30.55	46.80	-20.81	-16.26
0.486	9.73	34.09	56.23	28.65	46.23	-22.14	-17.58
0.549	9.75	28.33	56.00	21.59	46.00	-27.67	-24.41
12.649	9.89	32.20	60.00	26.79	50.00	-27.80	-23.21

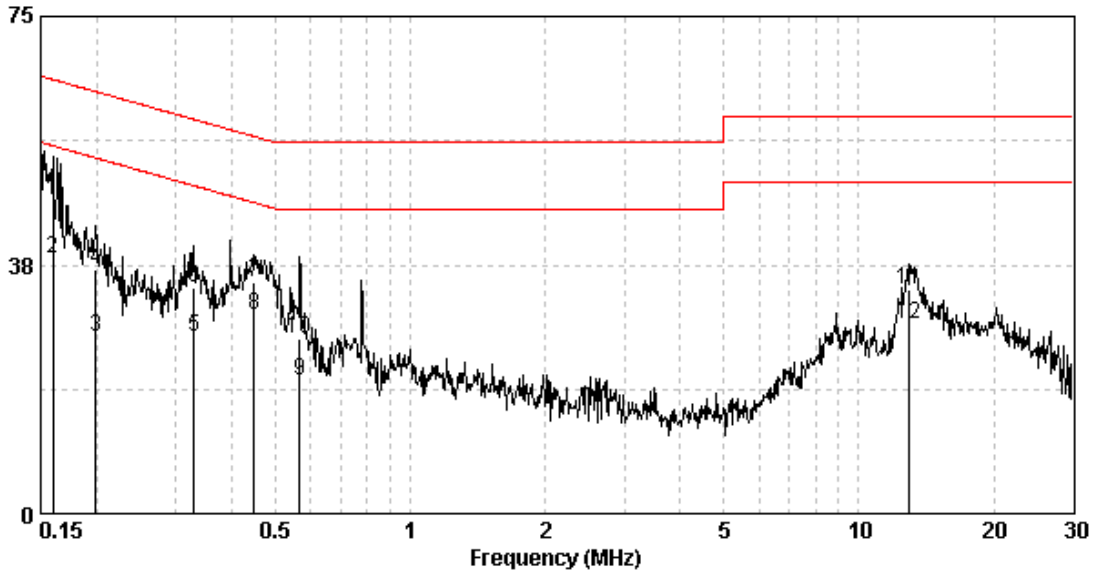
Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral Line
Model No.: PLTN-RB1V1
Test Condition: Normal mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.160	9.74	47.34	65.47	38.39	55.47	-18.13	-17.08
0.199	9.74	36.83	63.67	26.64	53.67	-26.84	-27.02
0.330	9.73	34.01	59.44	26.74	49.44	-25.43	-22.70
0.449	9.73	34.91	56.89	30.03	46.89	-21.98	-16.86
0.567	9.75	26.35	56.00	19.96	46.00	-29.65	-26.04
12.920	9.92	33.85	60.00	28.46	50.00	-26.15	-21.54

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



6. 20dB Bandwidth test

6.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1008	hPa
Test date:	Mar. 07, 2016	

6.2 Test setup & procedure

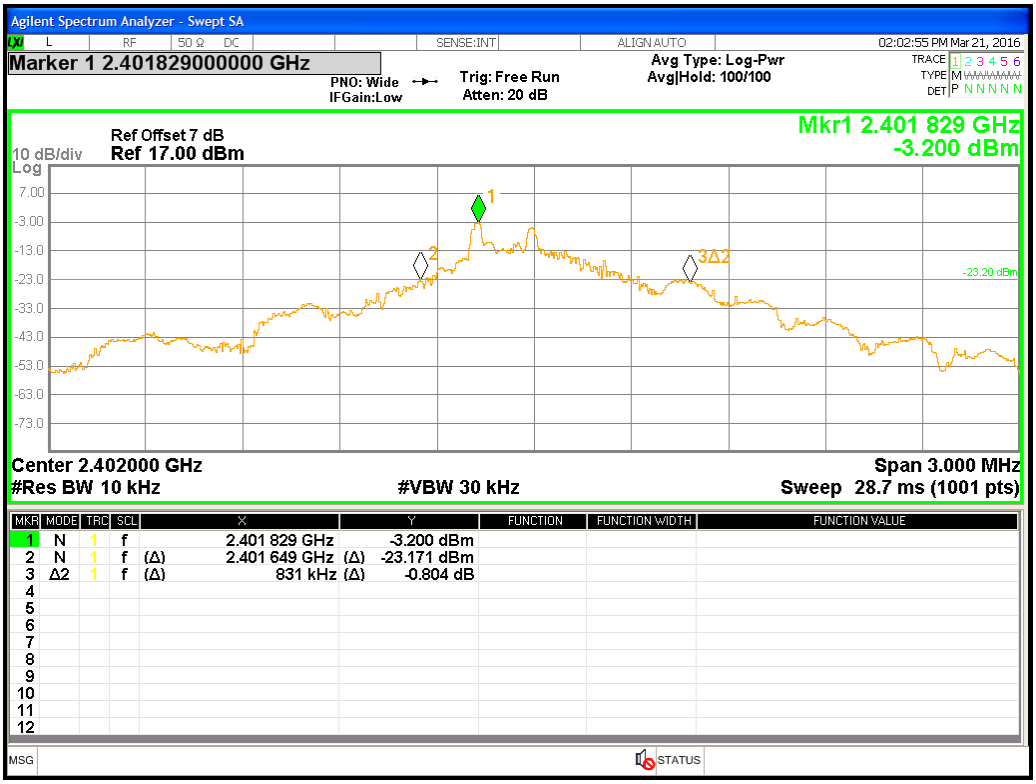
Step 1: The 20dB bandwidth was measured using a 50 ohm spectrum analyzer
Step 2: The span range for the SA display shall be between two times and five times the OBW.
Step 3: The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.
Step 4: The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

6.3 Measured data of modulated bandwidth test results

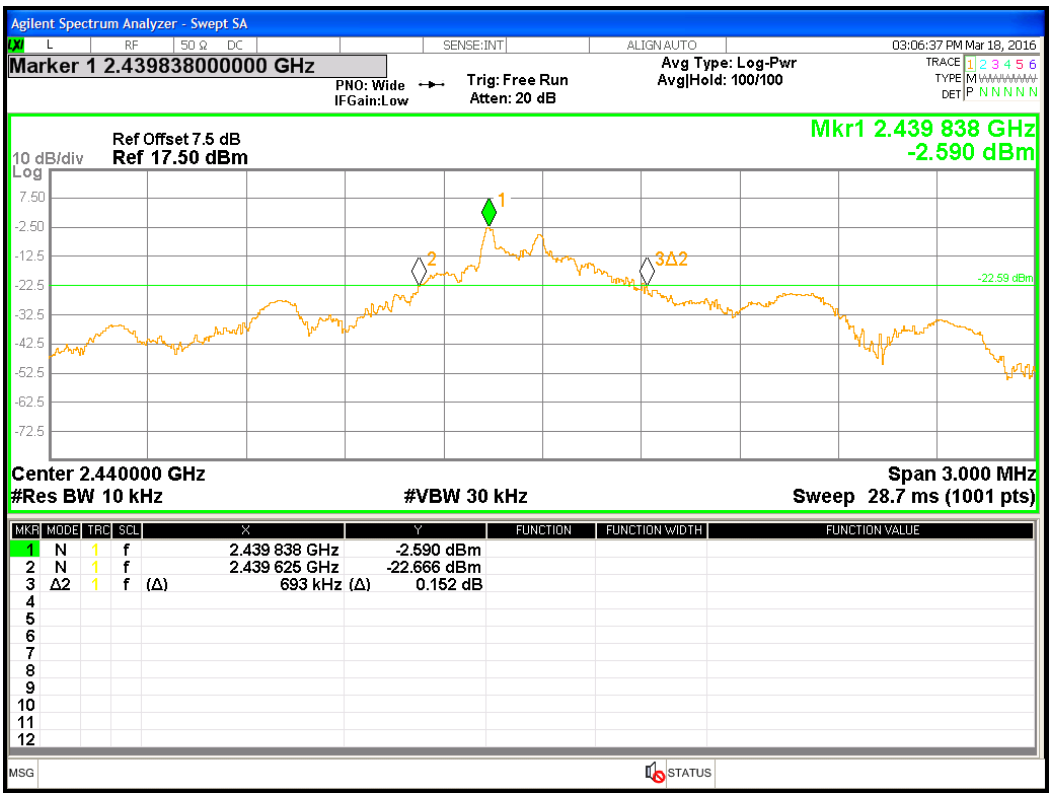
Mode	Channel	Frequency (MHz)	20dB Bandwidth(MHz)
GFSK	Low	2402	0.831
	Middle	2440	0.693
	High	2480	0.780

Please see the plot below.

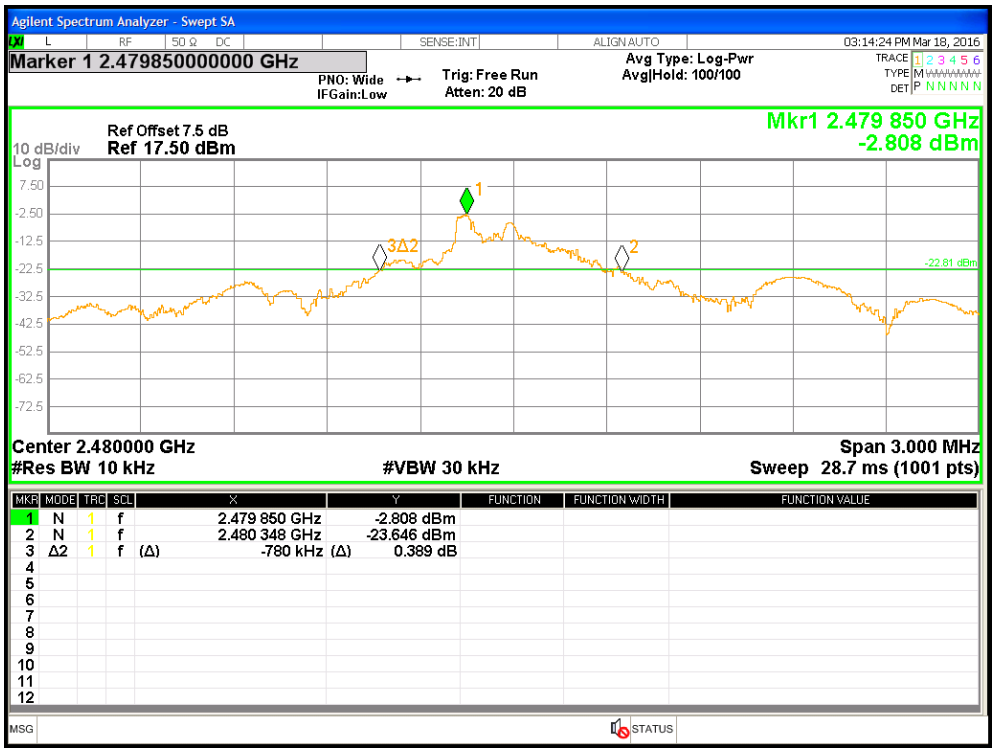
Chain0 : 20dB Occupied Bandwidth @ Ch low



Chain0 : 20dB Occupied Bandwidth @ Ch middle



Chain0 : 20dB Occupied Bandwidth @ Ch high



Appendix A: Test equipment list

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2015/12/02	2016/11/30
Spectrum Analyzer	Rohde & Schwarz	FSP30	100137	2015/08/18	2016/08/16
Horn Antenna (1-18G)	SHWARZBECK	BBHA 9120 D	9120D-456	2014/08/29	2017/08/27
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2014/09/16	2017/09/14
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2013/08/08	2016/08/06
Pre-Amplifier	EMC Co.	EMC12635SE	980205	2015/10/7	2016/10/05
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2015/09/15	2016/09/13
Power Meter	Anritsu	ML2495A	0844001	2015/11/11	2016/11/09
Power Sensor	Anritsu	MA2411B	0738452	2015/11/11	2016/11/09
Two-Line V-Network	Rohde & Schwarz	ENV216	101159	2015/06/08	2016/06/06
Artificial Mains Network (LISN)	Schaffner	MN2050D	1586	2015/05/27	2016/05/25
CON-1 Cable	SUHNER	BNC / RG-58	1521946	2015/05/09	2016/05/07
Test software	Audix	e3	4.2004-1-12k	NCR	NCR
Signal Analyzer	Agilent	N9030A	MY51380492	2015/09/21	2016/09/19
966-2(A) Cable 9kHz~26.5GHz	SUHNER	SMA / EX 100	N/A	2015/05/06	2016/05/05
966-2(B) Cable 9kHz~26.5GHz	SUHNER	SMA / SUCOFLEX 104P	CB0005	2015/05/06	2016/05/04

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
RF Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 102	CB0006	2015/05/06	2016/05/05
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2016/02/24	2017/02/22
Hight Pass Filter	Reactel	7HS-3G/18G-S11	N/A	2015/06/06	2016/06/04
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2016/03/03	2017/03/02
EMI Test Receiver	Rohde & Schwarz	ESR-7	101232	2015/12/02	2016/11/30
Test software	ADT	Radiated test system	7.5.14	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of *k*=2.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.14 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.22 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.7 dB
Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.7 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.53 dB
Emission on the Band Edge Test	3.64 dB
20dB Bandwidth	0.85 dB
AC Power Line Conducted Emission	2.47 dB