Excellence in Compliance Solutions

Limited Modular Approval Certification Test Report

FCC ID: 2AB7YDPBTLE24
IC: 20699-DPBTLE24

FCC Rule Part: 15.247
ISED Canada Radio Standards Specification: RSS-247

ACS Report Number: 16-3030.W06.1A

Manufacturer: Viper Design, LLC
Model: DPBTLE24D

Test Begin Date: May 5, 2016
Test End Date: May 27, 2016

Report Issue Date: November 10, 2016

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code AT-1921

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, ANSI, or any agency of the Federal Government.

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This report contains 22 pages

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1 GENERAL

1.1 Purpose

The purpose of this modular approval report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and ISED Canada Radio Standards Specification: RSS-247 Certification.

1.2 Product Description

The DPBTLE24 is a Bluetooth Low Energy device capable of sending and receiving data from a multitude of Bluetooth enabled devices including smart phones, tablets, and computers. The module is intended to be installed on or inside another product in order to receive power and signals required for operation. The RF circuitry and radio is completely controlled from within the module.

Technical Information:

Detail	Description
Frequency Range	2402 to 2480 MHz
Number of Channels	3 advertising 37 data
Modulation Format	GFSK (F1D)
Data Rates	To 1 Mbps
Number of Inputs/Outputs	1 Input / 1 Output
Operating Voltage	120VAC/60Hz
Antenna Type / Gain	Meandering / 0 dBi

Manufacturer Information:
Viper Design, LLC
125 Glancy St.
Goodlettsville, TN 37072

EUT Serial Numbers: ACS 1 for RF Conducted Measurements and ACS 5 for Radiated Measurements

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

For radiated and powerline conducted emissions, the EUT was tested inside of 3 different host battery chargers. The three battery chargers were models 4815, 3625OB, and 2425OBLIFT manufactured by Pro Charging Systems, LLC. The orientation of the EUT was determined by host.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
2320 Presidential Drive, Suite 101
Durham, NC 27703
Phone: (919) 381-4235

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1921 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

FCC Registered Test Site Number: 637011
ISED Test Site Registration Number: 20446

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 18' x 28' x 18' shielded enclosure. The chamber is lined with Samwha Electronics Co. LTD Ferrite Absorber, model number SFA300 (HSN-1). The ferrite tile is 10cm x 10 cm and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. On top of the ferrite tiles is DMAS HT-45 (Dutch Microwave Absorber Solutions) hybrid absorber on all walls except the wall behind the antenna mast which has a shorter DMAS HT-25 absorber.

The turntable is 1.50m in diameter and is located 150cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using short #6 copper wire. The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the turntable. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane.

Behind the turntable is a 2' x 6' x 1.5' deep shielded pit used for support equipment if necessary. The pit is equipped with 2 - 4" PVC chase from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

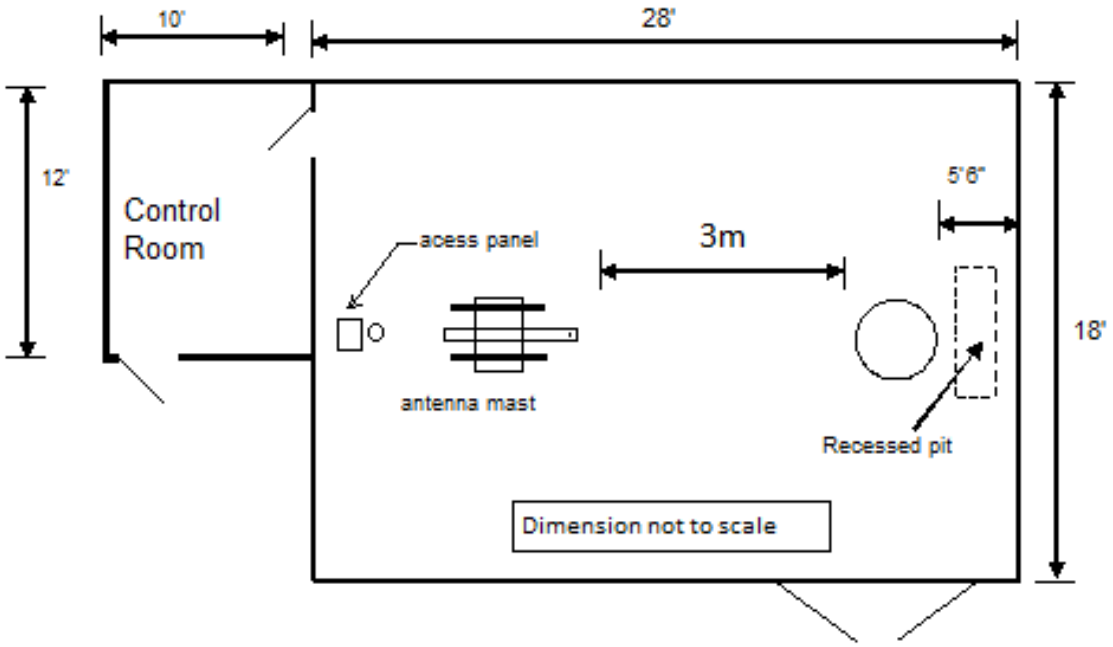

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 10' sheet galvanized steel horizontal ground reference plane (GRP) bonded every 6" to an 8' X 8' aluminum vertical ground plane.

A diagram of the room is shown below in figure 2.4-1:

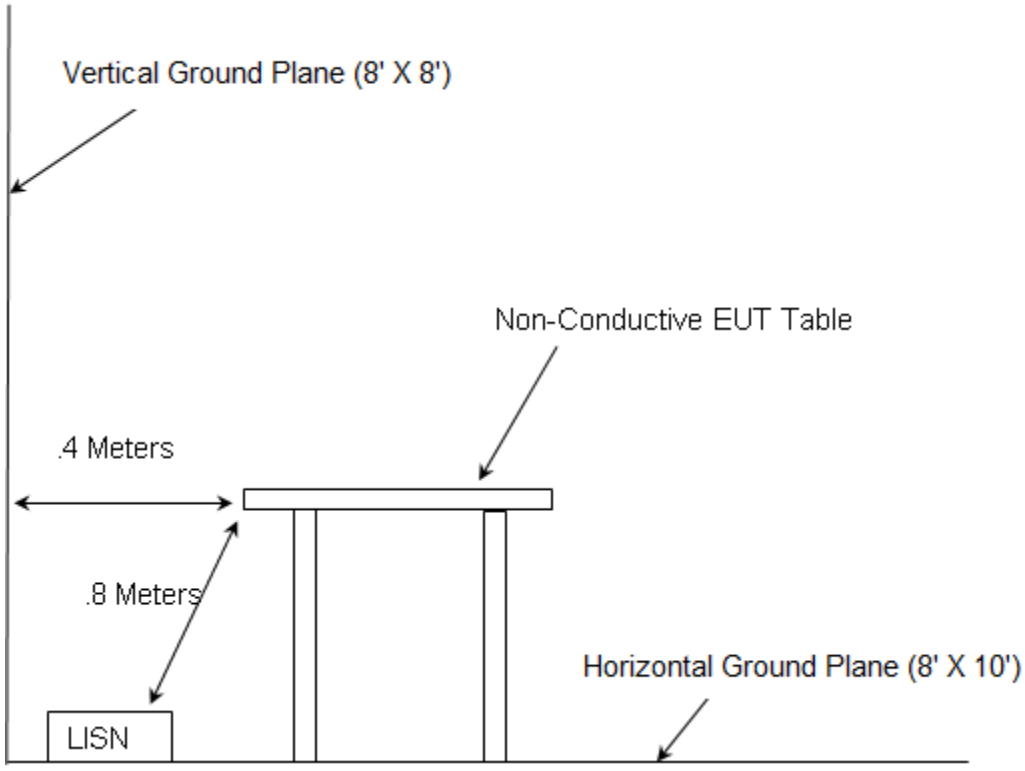

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2014 - American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40 GHz.
- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2016
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2016
- FCC KDB 558074 D01 DTS Meas Guidance v03r05 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 8, 2016
- ISED Canada Radio Standards Specification: RSS-247, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices, Issue 1, May 2015
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, Nov 2014

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
277	Emco	93146	Antennas	9904-5199	9/2/2014	9/2/2016
626	EMCO	3110B	Antennas	9411-1945	2/29/2016	2/28/2017
3002	Rohde & Schwarz	ESU40	Receiver	100346	1/8/2016	1/8/2017
3006	Rohde & Schwarz	TS-PR18	Amplifiers	122006	6/29/2015	12/29/2016
3007	Rohde & Schwarz	TS-PR26	Amplifiers	100051	6/29/2015	12/29/2016
3008	Rohde & Schwarz	NRP2	Meter	103131	1/28/2016	1/28/2017
3009	Rohde & Schwarz	NRP-Z81	Meter	102397	1/28/2016	1/28/2017
3011	Rohde & Schwarz	ENV216	LISN	3011	7/10/2015	1/10/2017
3012	Rohde & Schwarz	EMC32-EB	Software	100731	2/2/2016	8/2/2016
3016	Fei Teng Wireless Technology	HA-07M18G-NF	Antennas	2013120203	1/26/2016	1/26/2018
3027	Micro-Tronics	BRM50702	Filter	175	12/21/2015	12/21/2016
3033	Hasco, Inc.	HLL142-S1-S1-36	Cables	1435	1/7/2016	1/7/2017
3038	Florida RF Labs	NMSE-290AW-60.0-NMSE	Cable Set	1448	12/22/2015	12/22/2016
3045	Aeroflex Inmet	18N10W-20	Attenuator	1437	1/8/2016	1/8/2017
3051	Mountain View Cable	BMS-RG400-264.0-BMS	Cables	3051	12/30/2015	12/30/2016
3055	Rohde & Schwarz	3005	Cables	3055	12/30/2015	12/30/2016
3057	Advanced Technical Materials	42-441-6/BR	Antennas	R110602	NCR	NCR

DMAS MT-25 RF absorber material was used on the floor for all final measurements above 1 GHz.
NCR = No Calibration Required
Firmware Version: 4.73 SP4
Software Version: EMC32-B is 9.15

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	Host Battery Charger	Pro Charging Systems, LLC	4815 (48VDC Version)	ACS 2
1	Host Battery Charger	Pro Charging Systems, LLC	3625OB (36VDC Version)	ACS 3
1	Host Battery Charger	Pro Charging Systems, LLC	2425OBLIFT (24VDC Version)	ACS 1
2	EUT	Viper Design LLC	VDLC52DP	ACS 5

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

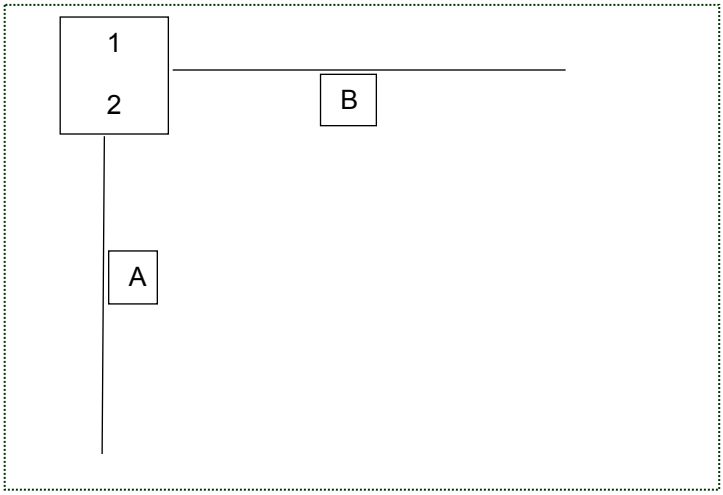

Figure 6-1: Test Setup Block Diagram

Table 6-1: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power	180cm	No	EUT to Power
B	Charger Cord	235cm	No	EUT to Load

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC 15.203

The antenna is integral to the device and cannot be removed or replaced by the end user. The peak gain of the antenna is 0 dBi.

7.2 Power Line Conducted Emissions – FCC 15.207, ISED Canada: RSS-Gen 8.8

7.2.1 Measurement Procedure

ANSI C63.10-2013 section 6 was the guiding document for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Measurement Results

Table 7.2.2-1: Conducted EMI Results – Line 1 – 48VDC Charger Host

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
17.896000	---	8.58	50.00	41.42	2000.0	9.000	L1	OFF	10.0
17.896000	15.25	---	60.00	44.75	2000.0	9.000	L1	OFF	10.0
18.304000	---	10.86	50.00	39.14	2000.0	9.000	L1	OFF	10.0
18.304000	17.44	---	60.00	42.56	2000.0	9.000	L1	OFF	10.0
20.528000	---	17.04	50.00	32.96	2000.0	9.000	L1	OFF	10.0
20.528000	24.85	---	60.00	35.15	2000.0	9.000	L1	OFF	10.0
21.036000	---	19.21	50.00	30.79	2000.0	9.000	L1	OFF	10.0
21.036000	26.89	---	60.00	33.11	2000.0	9.000	L1	OFF	10.0
21.540000	---	19.80	50.00	30.20	2000.0	9.000	L1	OFF	10.0
21.540000	27.99	---	60.00	32.01	2000.0	9.000	L1	OFF	10.0
22.136000	---	19.81	50.00	30.19	2000.0	9.000	L1	OFF	10.0
22.136000	26.88	---	60.00	33.12	2000.0	9.000	L1	OFF	10.0
22.180000	---	18.69	50.00	31.31	2000.0	9.000	L1	OFF	10.0
22.180000	25.81	---	60.00	34.19	2000.0	9.000	L1	OFF	10.0
24.768000	---	12.58	50.00	37.42	2000.0	9.000	L1	OFF	10.0
24.768000	19.85	---	60.00	40.15	2000.0	9.000	L1	OFF	10.0
24.888000	---	12.78	50.00	37.22	2000.0	9.000	L1	OFF	10.0
24.888000	19.84	---	60.00	40.16	2000.0	9.000	L1	OFF	10.0
25.764000	---	11.00	50.00	39.00	2000.0	9.000	L1	OFF	10.0
25.764000	18.89	---	60.00	41.11	2000.0	9.000	L1	OFF	10.0
26.368000	---	14.46	50.00	35.54	2000.0	9.000	L1	OFF	10.0
26.368000	22.66	---	60.00	37.34	2000.0	9.000	L1	OFF	10.0
26.588000	---	14.19	50.00	35.81	2000.0	9.000	L1	OFF	10.0
26.588000	22.17	---	60.00	37.83	2000.0	9.000	L1	OFF	10.0
28.112000	---	7.94	50.00	42.06	2000.0	9.000	L1	OFF	10.0
28.112000	15.53	---	60.00	44.47	2000.0	9.000	L1	OFF	10.0
28.164000	---	7.98	50.00	42.02	2000.0	9.000	L1	OFF	10.0
28.164000	15.74	---	60.00	44.26	2000.0	9.000	L1	OFF	10.0
28.324000	---	7.69	50.00	42.31	2000.0	9.000	L1	OFF	10.0
28.324000	15.42	---	60.00	44.58	2000.0	9.000	L1	OFF	10.0

Table 7.2.2-2: Conducted EMI Results – Neutral - 48VDC Charger Host

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
19.980000	---	15.90	50.00	34.10	2000.0	9.000	N	OFF	10.4
19.980000	23.08	---	60.00	36.92	2000.0	9.000	N	OFF	10.4
20.344000	---	18.20	50.00	31.80	2000.0	9.000	N	OFF	10.4
20.344000	25.46	---	60.00	34.54	2000.0	9.000	N	OFF	10.4
21.092000	---	21.26	50.00	28.74	2000.0	9.000	N	OFF	10.4
21.092000	29.32	---	60.00	30.68	2000.0	9.000	N	OFF	10.4
21.424000	---	22.13	50.00	27.87	2000.0	9.000	N	OFF	10.4
21.424000	29.98	---	60.00	30.02	2000.0	9.000	N	OFF	10.4
21.728000	---	23.48	50.00	26.52	2000.0	9.000	N	OFF	10.4
21.728000	30.75	---	60.00	29.25	2000.0	9.000	N	OFF	10.4
21.964000	---	21.70	50.00	28.30	2000.0	9.000	N	OFF	10.5
21.964000	29.44	---	60.00	30.56	2000.0	9.000	N	OFF	10.5
25.012000	---	12.62	50.00	37.38	2000.0	9.000	N	OFF	10.6
25.012000	20.26	---	60.00	39.74	2000.0	9.000	N	OFF	10.6
25.188000	---	12.06	50.00	37.94	2000.0	9.000	N	OFF	10.6
25.188000	19.16	---	60.00	40.84	2000.0	9.000	N	OFF	10.6
26.112000	---	13.73	50.00	36.27	2000.0	9.000	N	OFF	10.6
26.112000	21.62	---	60.00	38.38	2000.0	9.000	N	OFF	10.6
26.496000	---	15.30	50.00	34.70	2000.0	9.000	N	OFF	10.6
26.496000	22.99	---	60.00	37.01	2000.0	9.000	N	OFF	10.6

Table 7.2.2-3: Conducted EMI Results – Line 1 – 36VDC Charger Host

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.178000	38.14	---	64.48	26.34	2000.0	9.000	L1	OFF	9.5
0.178000	---	13.76	54.46	40.70	2000.0	9.000	L1	OFF	9.5
0.180000	---	13.71	54.36	40.65	2000.0	9.000	L1	OFF	9.5
0.180000	37.97	---	64.38	26.41	2000.0	9.000	L1	OFF	9.5
0.182000	---	14.06	54.26	40.20	2000.0	9.000	L1	OFF	9.5
0.182000	38.43	---	64.28	25.85	2000.0	9.000	L1	OFF	9.5
0.184000	38.23	---	64.19	25.96	2000.0	9.000	L1	OFF	9.5
0.184000	---	13.91	54.16	40.25	2000.0	9.000	L1	OFF	9.5
0.212000	---	13.07	52.92	39.85	2000.0	9.000	L1	OFF	9.5
0.212000	36.45	---	62.96	26.51	2000.0	9.000	L1	OFF	9.5
0.256000	33.65	---	61.36	27.71	2000.0	9.000	L1	OFF	9.6
0.256000	---	11.42	51.32	39.90	2000.0	9.000	L1	OFF	9.6
0.264000	33.62	---	61.10	27.48	2000.0	9.000	L1	OFF	9.5
0.264000	---	11.40	51.06	39.66	2000.0	9.000	L1	OFF	9.5
0.268000	---	11.37	50.93	39.56	2000.0	9.000	L1	OFF	9.5
0.268000	33.24	---	60.97	27.73	2000.0	9.000	L1	OFF	9.5
0.304000	---	10.30	49.90	39.60	2000.0	9.000	L1	OFF	9.5
0.304000	30.62	---	59.93	29.31	2000.0	9.000	L1	OFF	9.5
0.328000	---	10.25	49.28	39.03	2000.0	9.000	L1	OFF	9.6
0.328000	29.22	---	59.32	30.10	2000.0	9.000	L1	OFF	9.6
20.704000	---	22.22	50.00	27.78	2000.0	9.000	L1	OFF	10.0
20.704000	29.78	---	60.00	30.22	2000.0	9.000	L1	OFF	10.0

Table 7.2.2-4: Conducted EMI Results – Neutral – 36 VDC Charger Host

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.186000	---	13.67	54.07	40.40	2000.0	9.000	N	OFF	9.7
0.186000	37.41	---	64.09	26.68	2000.0	9.000	N	OFF	9.7
0.188000	---	13.66	53.97	40.31	2000.0	9.000	N	OFF	9.7
0.188000	37.44	---	64.00	26.56	2000.0	9.000	N	OFF	9.7
0.192000	---	13.74	53.79	40.05	2000.0	9.000	N	OFF	9.7
0.192000	37.60	---	63.81	26.21	2000.0	9.000	N	OFF	9.7
0.220000	---	12.70	52.60	39.90	2000.0	9.000	N	OFF	9.7
0.220000	35.59	---	62.64	27.05	2000.0	9.000	N	OFF	9.7
0.228000	---	12.05	52.30	40.25	2000.0	9.000	N	OFF	9.7
0.228000	34.61	---	62.33	27.72	2000.0	9.000	N	OFF	9.7
0.272000	---	11.29	50.81	39.52	2000.0	9.000	N	OFF	9.7
0.272000	32.63	---	60.85	28.22	2000.0	9.000	N	OFF	9.7
20.804000	---	25.04	50.00	24.96	2000.0	9.000	N	OFF	10.4
20.804000	32.08	---	60.00	27.92	2000.0	9.000	N	OFF	10.4
21.172000	---	23.09	50.00	26.91	2000.0	9.000	N	OFF	10.4
21.172000	30.44	---	60.00	29.56	2000.0	9.000	N	OFF	10.4

Table 7.2.2-5: Conducted EMI Results – Line 1 – 24VDC Charger Host

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
16.668000	---	11.35	50.00	38.65	2000.0	9.000	L1	OFF	10.0
16.668000	19.20	---	60.00	40.80	2000.0	9.000	L1	OFF	10.0
16.884000	---	12.44	50.00	37.56	2000.0	9.000	L1	OFF	10.0
16.884000	19.96	---	60.00	40.04	2000.0	9.000	L1	OFF	10.0
17.144000	---	13.27	50.00	36.73	2000.0	9.000	L1	OFF	10.0
17.144000	20.35	---	60.00	39.65	2000.0	9.000	L1	OFF	10.0
17.664000	---	13.56	50.00	36.44	2000.0	9.000	L1	OFF	10.0
17.664000	21.19	---	60.00	38.81	2000.0	9.000	L1	OFF	10.0
17.844000	---	13.84	50.00	36.16	2000.0	9.000	L1	OFF	10.0
17.844000	21.22	---	60.00	38.78	2000.0	9.000	L1	OFF	10.0
19.324000	---	21.25	50.00	28.75	2000.0	9.000	L1	OFF	10.0
19.324000	28.35	---	60.00	31.65	2000.0	9.000	L1	OFF	10.0
19.376000	---	20.99	50.00	29.01	2000.0	9.000	L1	OFF	10.0
19.376000	28.05	---	60.00	31.95	2000.0	9.000	L1	OFF	10.0
19.516000	27.91	---	60.00	32.09	2000.0	9.000	L1	OFF	10.0
19.516000	---	20.92	50.00	29.08	2000.0	9.000	L1	OFF	10.0
19.588000	28.89	---	60.00	31.11	2000.0	9.000	L1	OFF	10.0
19.588000	---	22.10	50.00	27.90	2000.0	9.000	L1	OFF	10.0
19.708000	---	22.95	50.00	27.05	2000.0	9.000	L1	OFF	10.0
19.708000	29.41	---	60.00	30.59	2000.0	9.000	L1	OFF	10.0
20.460000	---	23.60	50.00	26.40	2000.0	9.000	L1	OFF	10.0
20.460000	30.71	---	60.00	29.29	2000.0	9.000	L1	OFF	10.0
21.224000	---	21.53	50.00	28.47	2000.0	9.000	L1	OFF	10.0
21.224000	29.13	---	60.00	30.87	2000.0	9.000	L1	OFF	10.0
26.040000	---	10.65	50.00	39.35	2000.0	9.000	L1	OFF	10.0
26.040000	18.23	---	60.00	41.77	2000.0	9.000	L1	OFF	10.0
26.512000	---	12.82	50.00	37.18	2000.0	9.000	L1	OFF	10.0
26.512000	20.23	---	60.00	39.77	2000.0	9.000	L1	OFF	10.0
26.516000	---	13.02	50.00	36.98	2000.0	9.000	L1	OFF	10.0
26.516000	20.87	---	60.00	39.13	2000.0	9.000	L1	OFF	10.0

Table 7.2.2-6: Conducted EMI Results – Neutral – 24 VDC Charger Host

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
17.792000	---	13.12	50.00	36.88	2000.0	9.000	N	OFF	10.3
17.792000	20.52	---	60.00	39.48	2000.0	9.000	N	OFF	10.3
20.084000	---	21.70	50.00	28.30	2000.0	9.000	N	OFF	10.4
20.084000	29.20	---	60.00	30.80	2000.0	9.000	N	OFF	10.4
20.420000	---	23.10	50.00	26.90	2000.0	9.000	N	OFF	10.4
20.420000	30.77	---	60.00	29.23	2000.0	9.000	N	OFF	10.4
20.912000	---	22.45	50.00	27.55	2000.0	9.000	N	OFF	10.4
20.912000	30.09	---	60.00	29.91	2000.0	9.000	N	OFF	10.4
21.048000	---	22.09	50.00	27.91	2000.0	9.000	N	OFF	10.4
21.048000	30.00	---	60.00	30.00	2000.0	9.000	N	OFF	10.4
21.276000	---	20.87	50.00	29.13	2000.0	9.000	N	OFF	10.4
21.276000	28.77	---	60.00	31.23	2000.0	9.000	N	OFF	10.4
21.396000	---	19.67	50.00	30.33	2000.0	9.000	N	OFF	10.4
21.396000	27.40	---	60.00	32.60	2000.0	9.000	N	OFF	10.4
26.624000	---	13.78	50.00	36.22	2000.0	9.000	N	OFF	10.6
26.624000	21.59	---	60.00	38.41	2000.0	9.000	N	OFF	10.6
26.896000	---	13.58	50.00	36.42	2000.0	9.000	N	OFF	10.6
26.896000	21.44	---	60.00	38.56	2000.0	9.000	N	OFF	10.6
26.968000	---	13.38	50.00	36.62	2000.0	9.000	N	OFF	10.6
26.968000	21.24	---	60.00	38.76	2000.0	9.000	N	OFF	10.6

7.3 6dB / 99% Bandwidth – FCC 15.247(a)(2), ISED Canada: RSS-247 5.2(1)

7.3.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 3 times the RBW. The trace was set to max hold with a peak detector active. The marker-delta function of the spectrum analyzer was utilized to determine the 6 dB bandwidth of the emission.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth.

7.3.2 Measurement Results

Table 7.3.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [kHz]	99% Bandwidth [MHz]
2402	694.70	1.058
2440	694.10	1.055
2480	697.11	1.060

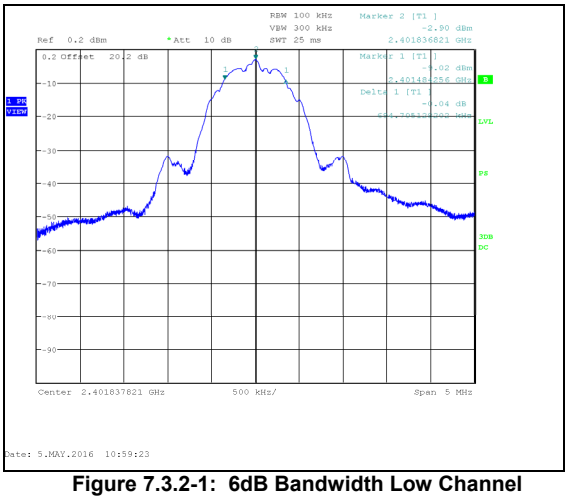

Figure 7.3.2-1: 6dB Bandwidth Low Channel

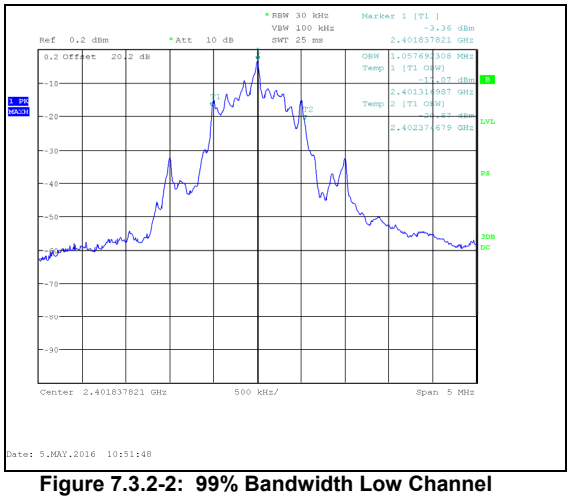

Figure 7.3.2-2: 99% Bandwidth Low Channel

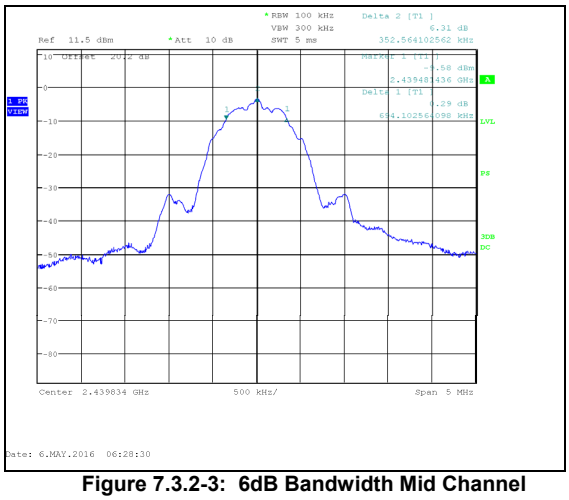

Figure 7.3.2-3: 6dB Bandwidth Mid Channel

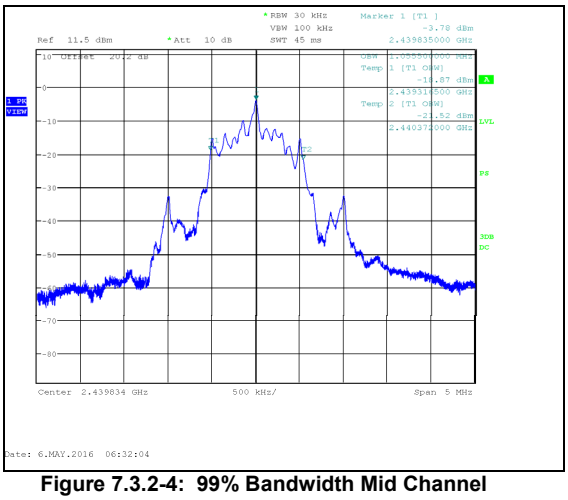

Figure 7.3.2-4: 99% Bandwidth Mid Channel

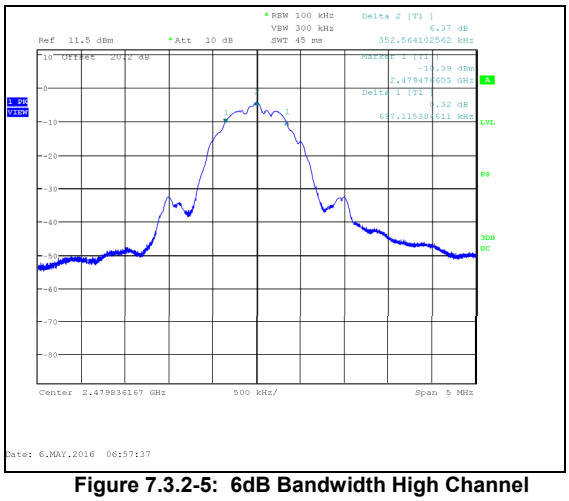

Figure 7.3.2-5: 6dB Bandwidth High Channel

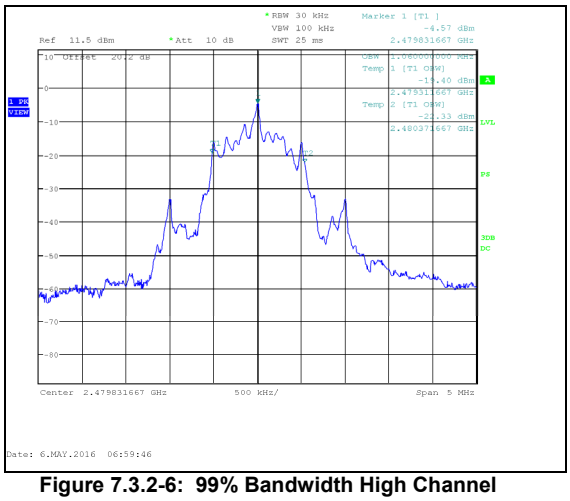

Figure 7.3.2-6: 99% Bandwidth High Channel

7.4 Fundamental Emission Output Power – FCC 15.247(b)(3), ISED Canada: RSS-247 5.4(4)

7.4.1 Measurement Procedure

The maximum peak conducted output power was measured in accordance with FCC KDB 558074 D01 DTS Measurement Guidance v03r05 utilizing the PKPM1 Peak power meter method. The RF output of the equipment under test was directly connected to the input of the peak power meter applying suitable attenuation.

7.4.2 Measurement Results

Table 7.4.2-1: Maximum Peak Conducted Output Power

Frequency (MHz)	Output Power (dBm)
2402	-4.62
2440	-5.32
2480	-6.07

7.5 Emission Levels – FCC 15.247(d), 15.205, 15.209; ISED Canada RSS-247 5.5, RSS-Gen 8.9/8.10

7.5.1 Emissions into Non-restricted Frequency Bands

7.5.1.1 Measurement Procedure

The unwanted emissions into non-restricted bands were measured conducted in accordance with FCC KDB 558074 D01 DTS Measurement Guidance v03r05. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to ≥ 300 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20 dBc limit. The spectrum span was then adjusted for the measurement of spurious emissions from 30 MHz to 25GHz, 10 times the highest fundamental frequency. Additionally a prescan was performed from 9 kHz or the lowest frequency generated to 30 MHz.

Band-edge compliance was determined using the conducted marker-delta method in which the radio frequency power that is produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

7.5.1.2 Measurement Results

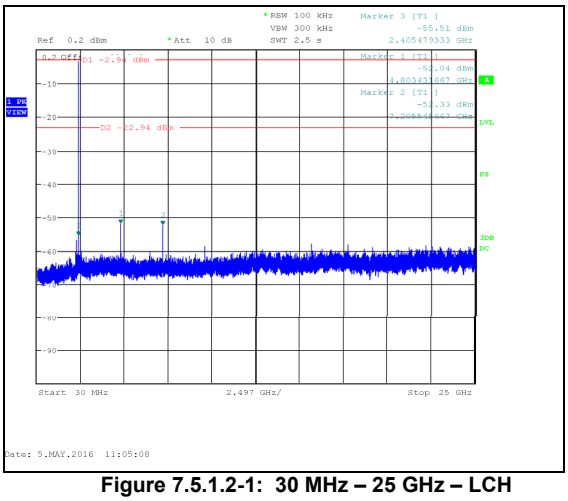

Figure 7.5.1.2-1: 30 MHz – 25 GHz – LCH

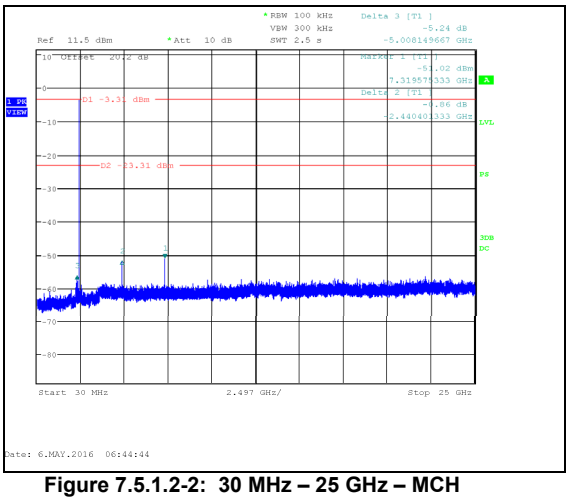

Figure 7.5.1.2-2: 30 MHz – 25 GHz – MCH

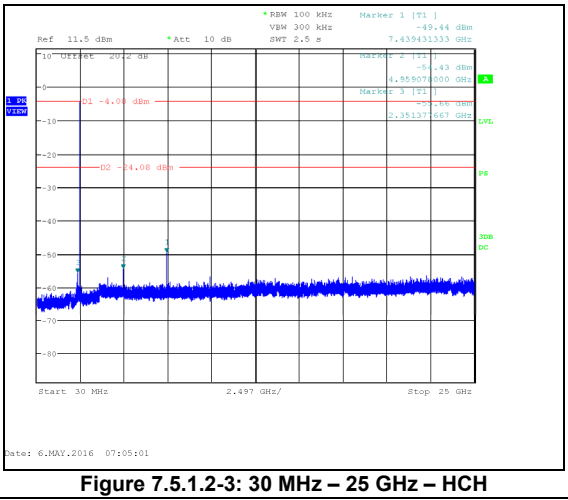

Figure 7.5.1.2-3: 30 MHz – 25 GHz – HCH

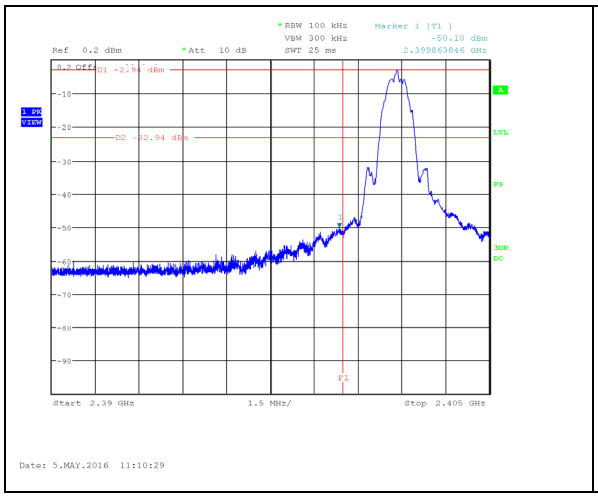

Figure 7.5.1.2-4: Lower Band-edge - LCH

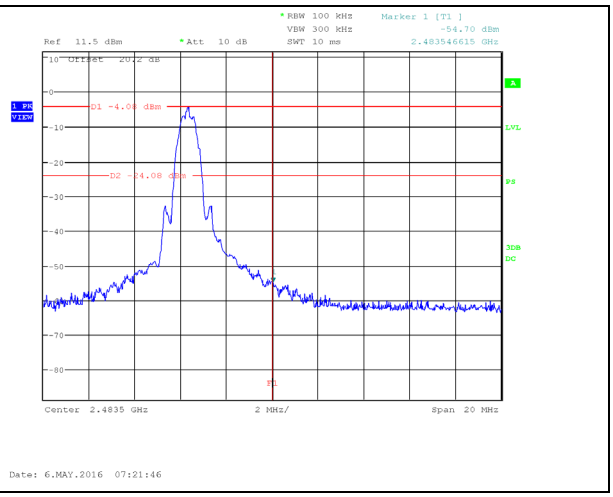

Figure 7.5.1.2-5: Upper Band-edge - HCH

7.5.2 Emissions into Restricted Frequency Bands

7.5.2.1 Measurement Procedure

The unwanted emissions into restricted bands were measured radiated over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a RBW of 120 kHz and a VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

7.5.2.2 Duty Cycle Correction

The Duty Cycle Correction was not required.

7.5.2.3 Measurement Results

Table 7.5.2.3-1: Radiated Spurious Emissions Tabulated Data – 24VDC Charger Host

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
4804	47.80	38.20	H	6.50	54.30	44.70	74.0	54.0	19.7	9.3
4804	48.50	39.50	V	6.50	55.00	46.00	74.0	54.0	19.0	8.0
Middle Channel										
4880	49.70	41.10	H	6.17	55.87	47.27	74.0	54.0	18.1	6.7
4880	45.90	34.50	V	6.17	52.07	40.67	74.0	54.0	21.9	13.3
7320	50.40	40.20	H	8.83	59.23	49.03	74.0	54.0	14.8	5.0
7320	47.10	35.80	V	8.83	55.93	44.63	74.0	54.0	18.1	9.4
High Channel										
4960	48.30	37.50	H	6.19	54.49	43.69	74.0	54.0	19.5	10.3
4960	46.80	36.60	V	6.19	52.99	42.79	74.0	54.0	21.0	11.2
7440	51.10	40.90	H	9.36	60.46	50.26	74.0	54.0	13.5	3.7
7440	48.80	37.60	V	9.36	58.16	46.96	74.0	54.0	15.8	7.0
2483.5	50.10	27.70	H	-1.47	48.63	26.23	74.0	54.0	25.4	27.8
2483.5	51.80	28.10	V	-1.47	50.33	26.63	74.0	54.0	23.7	27.4

Table 7.5.2.3-2: Radiated Spurious Emissions Tabulated Data – 48VDC Charger Host

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
4804	48.90	38.00	H	6.50	55.40	44.50	74.0	54.0	18.6	9.5
4804	51.20	42.80	V	6.50	57.70	49.30	74.0	54.0	16.3	4.7
Middle Channel										
4880	49.10	40.00	H	6.50	55.60	46.50	74.0	54.0	18.4	7.5
4880	51.70	43.20	V	6.50	58.20	49.70	74.0	54.0	15.8	4.3
7320	51.30	41.10	H	9.19	60.49	50.29	74.0	54.0	13.5	3.7
7320	50.70	40.50	V	9.19	59.89	49.69	74.0	54.0	14.1	4.3
12200	44.40	31.60	H	12.39	56.79	43.99	74.0	54.0	17.2	10.0
12200	43.40	30.60	V	12.39	55.79	42.99	74.0	54.0	18.2	11.0
High Channel										
4960	49.50	40.90	H	6.50	56.00	47.40	74.0	54.0	18.0	6.6
4960	50.40	42.00	V	6.50	56.90	48.50	74.0	54.0	17.1	5.5
7440	50.00	39.40	H	9.75	59.75	49.15	74.0	54.0	14.3	4.9
7440	52.00	42.10	V	9.75	61.75	51.85	74.0	54.0	12.3	2.2
12400	43.80	30.90	H	12.68	56.48	43.58	74.0	54.0	17.5	10.4
12400	43.40	30.70	V	12.68	56.08	43.38	74.0	54.0	17.9	10.6
2483.5	51.60	28.20	H	-1.47	50.13	26.73	74.0	54.0	23.9	27.3
2483.5	51.70	28.40	V	-1.47	50.23	26.93	74.0	54.0	23.8	27.1

Table 7.5.2.3-3: Radiated Spurious Emissions Tabulated Data – 36VDC Upright Unit

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
4804	41.70	31.00	H	6.16	47.86	37.16	74.0	54.0	26.1	16.8
4804	42.90	31.40	V	6.16	49.06	37.56	74.0	54.0	24.9	16.4
Middle Channel										
4880	43.40	33.00	H	6.17	49.57	39.17	74.0	54.0	24.4	14.8
4880	45.10	35.30	V	6.17	51.27	41.47	74.0	54.0	22.7	12.5
7320	40.90	29.90	H	8.83	49.73	38.73	74.0	54.0	24.3	15.3
7320	45.60	35.40	V	8.83	54.43	44.23	74.0	54.0	19.6	9.8
12200	37.50	24.50	V	12.19	49.69	36.69	74.0	54.0	24.3	17.3
High Channel										
4960	42.70	32.00	H	6.19	48.89	38.19	74.0	54.0	25.1	15.8
4960	45.30	35.40	V	6.19	51.49	41.59	74.0	54.0	22.5	12.4
7440	42.10	30.90	H	9.36	51.46	40.26	74.0	54.0	22.5	13.7
7440	44.60	33.60	V	9.36	53.96	42.96	74.0	54.0	20.0	11.0
12400	36.20	22.80	V	12.48	48.68	35.28	74.0	54.0	25.3	18.7
2483.5	53.90	27.40	H	-1.47	52.43	25.93	74.0	54.0	21.6	28.1
2483.5	56.90	29.30	V	-1.47	55.43	27.83	74.0	54.0	18.6	26.2

7.5.2.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: 41.70 + 6.16 = 47.86dBuV/m
Margin: 74dBuV/m – 47.86dBuV/m = 26.14dB

Example Calculation: Average

Corrected Level: 31.00 + 6.16 - 0 = 37.16dBuV
Margin: 54dBuV – 37.16dBuV = 16.84dB

7.6 Power Spectral Density – FCC 15.247(e) ISED Canada: RSS-247 5.2(2)

7.6.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB 558074 D01 DTS Meas Guidance v03r05 utilizing the PKPSD (peak PSD) method. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 3 kHz. The Video Bandwidth (VBW) was set to 10 kHz. Span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active.

7.6.2 Measurement Results

Table 7.6.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
2402	-4.16
2440	-4.54
2480	-5.32

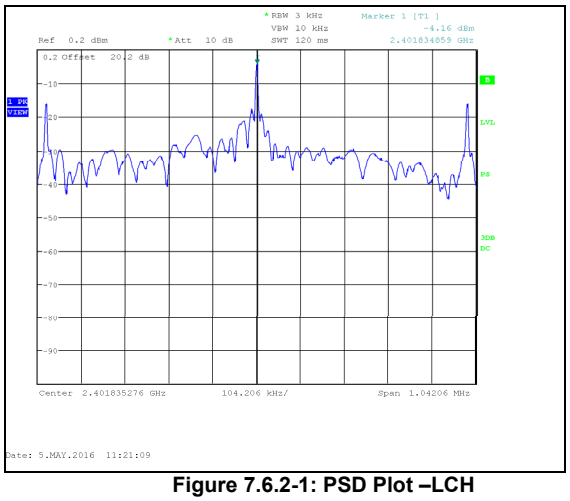

Figure 7.6.2-1: PSD Plot –LCH

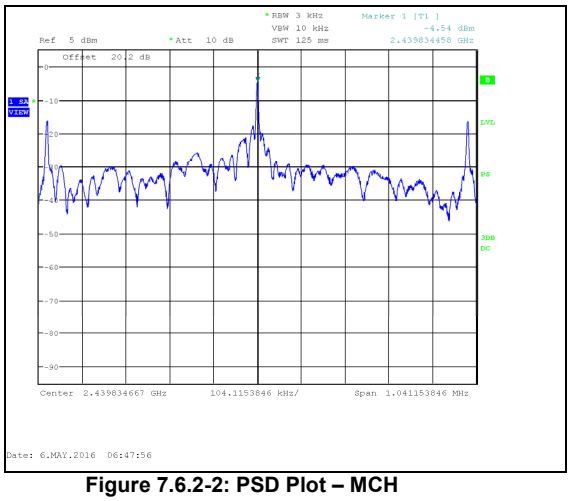

Figure 7.6.2-2: PSD Plot – MCH

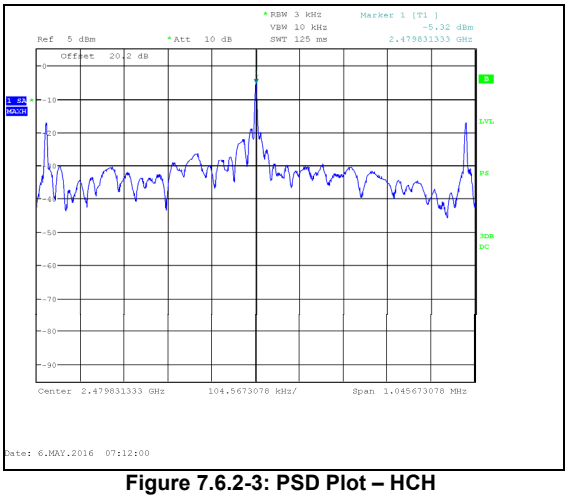

Figure 7.6.2-3: PSD Plot – HCH

8 CONCLUSION

In the opinion of ACS, Inc. the DPBTLE24D, manufactured by Viper Design, LLC meets the requirements of FCC Part 15 subpart C and ISED Canada Radio Standards Specification: RSS-247.

END REPORT