Excellence in Compliance Testing

Certification Test Report

FCC ID: 2AJXXCP16E0060
IC: 22151-CP16E0060

FCC Rule Part: 15.231
ISED Canada Radio Standards Specification: RSS-210

ACS Report Number: 16-2062.W06.1B

Manufacturer: Current Products Corp.
Model(s): CP16E0060

Test Begin Date: **November 3, 2016**
Test End Date: **January 11, 2017**

Report Issue Date: January 11, 2017

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

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.

Prepared by:

Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc.

Reviewed by:

Ryan McGann
Wireless Program Manager
Advanced Compliance Solutions, Inc.

This report contains 16 pages

TABLE OF CONTENTS

1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-210.

1.2 Product description

The Current Products Corp. SmartWand model CP16E0060 is an approximately 2ft long and 1/2in in diameter IoT window covering actuator. The device hangs by a metal hook onto a window covering and a "torque transfer" device snaps onto the SmartWand and is adhered to the window covering's header. The device includes a 433.92 MHz transceiver for remote communication to other SmartWand devices.

Technical Details
Frequency of Operation: 433.92 MHz
Number of Channels: 1
Modulation: 2-FSK
Data Rate: 9.6 kbps
Antenna / Gain: Whip Antenna / -6.25 dBi
Input Voltage: 9 VDC (6 AA Batteries)

Manufacturer Information:
Current Products Corp.
1995 Hollywood Ave
Pensacola, FL 32505

Test Sample Serial Number(s): 00000046.73.34 (radiated emissions), 0000001F.73.34 (bandwidth and timing parameters).

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

1.3 Test Methodology and Considerations

The EUT was evaluated in accordance to FCC Section 15.231 using the test firmware version 1.0.73 and power setting of 0X87.

The radiated emissions evaluation was performed for the EUT up to the 10^{th} harmonic of the fundamental frequency. The EUT was set in the orientation of typical installation (EUT Vertical) during the evaluation. Preliminary measurements were performed with the vertical and horizontal torque transfer clamps around the motor shaft. No significant difference was observed between the two configurations. The results are reported for the horizontal torque transfer configuration and are deemed representative of both cases.

The bandwidth and timing parameters of the EUT were assessed using a sample modified with a temporary N-Type connector for direct coupling to a spectrum analyzer. The periodic operation of the EUT was evaluated for automatic and manual transmissions covering the device and link request modes. The results are reported for all conditions.

The evaluation of the EUT for unintentional emissions is recorded in a separate verification test report.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Innovation, Science and Economic Development Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 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.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1060 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

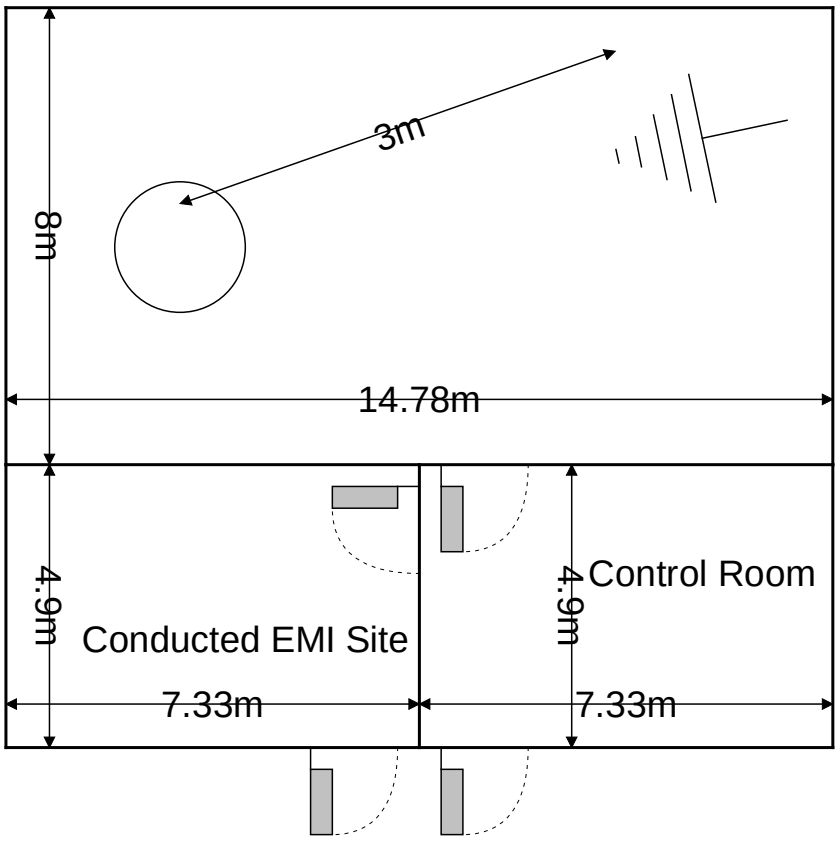


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

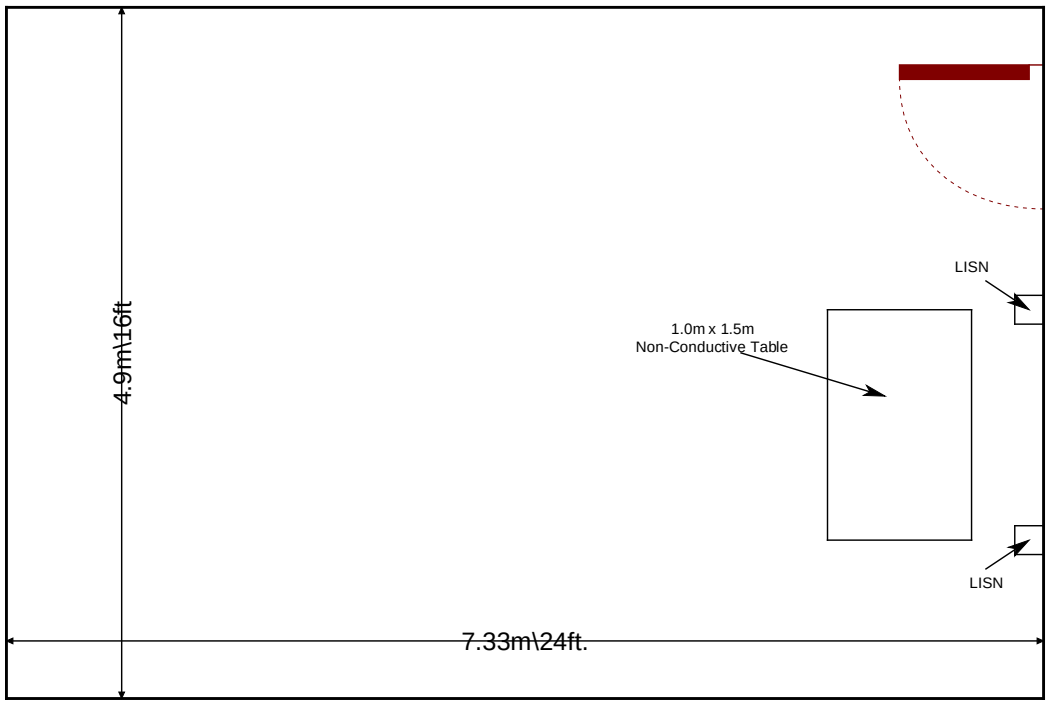


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- 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
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, November 2014.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-210 - Licence-Exempt Radio Apparatus: Category I Equipment, Issue 9 August 2016.

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
78	EMCO	6502	Antennas	9104-2608	5/11/2016	5/11/2018
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	7/21/2016	7/21/2018
523	Agilent	E7405	Spectrum Analyzers	MY45103293	12/26/2014	12/26/2016
523	Agilent	E7405	Spectrum Analyzers	MY45103293	12/9/2016	12/9/2018
2002	EMCO	3108	Antennas	2147	11/19/2015	11/19/2017
2004	EMCO	3146	Antennas	1385	11/19/2015	11/19/2017
2006	EMCO	3115	Antennas	2573	4/14/2015	4/14/2017
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	11/18/2015	11/18/2016
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	11/2/2016	11/2/2017
2073	Mini Circuits	NHP-800	Filter	10247	11/17/2015	11/17/2016
2073	Mini Circuits	NHP-800	Filter	10247	12/1/2016	12/1/2017
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	11/16/2015	11/16/2016
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	11/2/2016	11/2/2017
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/9/2015	12/9/2016
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/2/2016	12/2/2017
2094	Mini Circuits	SHP-1000+	Filter	R UU27401137	3/25/2016	3/25/2017
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2111	Aeroflex Inmet	40AH2W-20	Attenuator	2111	7/20/2016	7/20/2017
2112	Teledyne Storm Products	921-0101-036	Cables	12-06-698	11/13/2015	11/13/2016
2112	Teledyne Storm Products	921-0101-036	Cables	12-06-698	11/2/2016	11/2/2017
2121	ACS Boca	Radiated Cable Set	Cable Set	2121	8/1/2016	8/1/2017

Notes:

- **NCR=No Calibration Required**
- **The Calibration cycle information is provided to cover the entire test period. The equipment was used only during the active period of the calibration cycles.**

5 SUPPORT EQUIPMENT

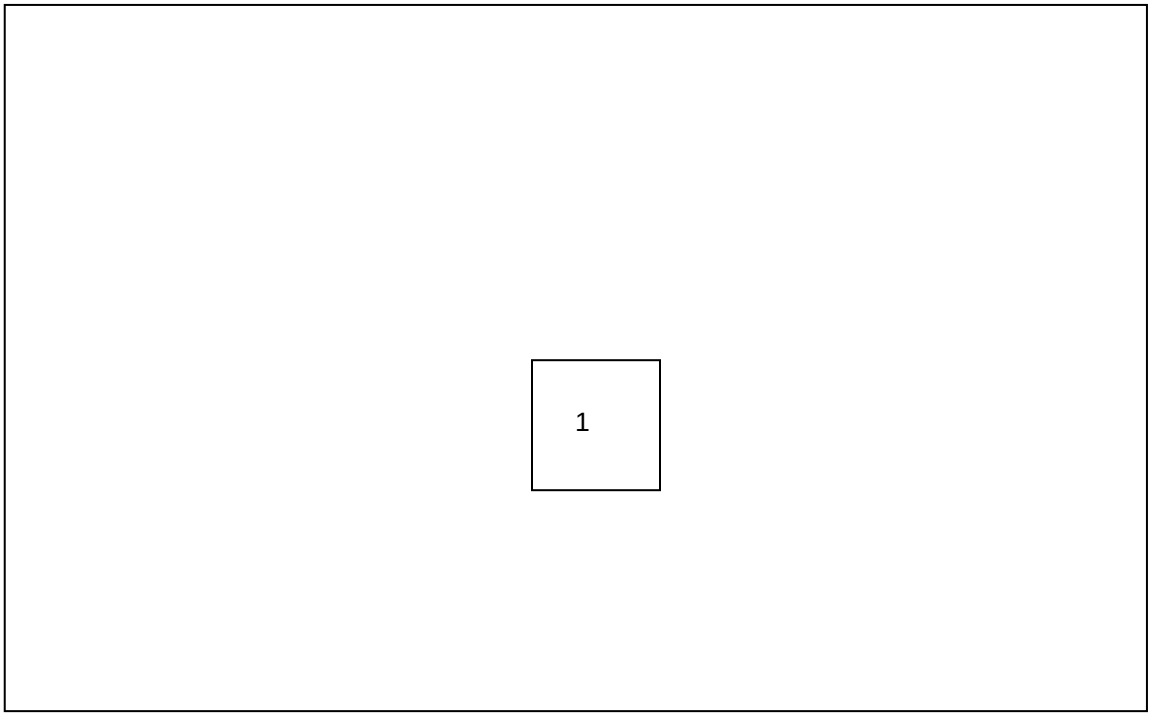
Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Current Products Corp.	CP16E0060	00000046.73.34

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
	The EUT is Standalone with no Provision for Accessory Equipment			

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



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: Section 15.203

The EUT uses a whip antenna that is directly soldered to the PCB. The antenna is not easily replaceable thus meeting the requirements of FCC 15.203.

7.2 Periodic Operation – FCC: Section 15.231(a) / ISED Canada: RSS-210 A.1.1

7.2.1 Test Methodology

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

The transmitter was activated manually and automatically and was evaluated using a spectrum analyzer at zero span with a > 5 second sweep time.

7.2.2 Test Results

The transmitter ceased operation 1.4822s after automatic activation, 1.472s after release in manual device mode and 3.0192s in the manual link request mode. The results are shown below.

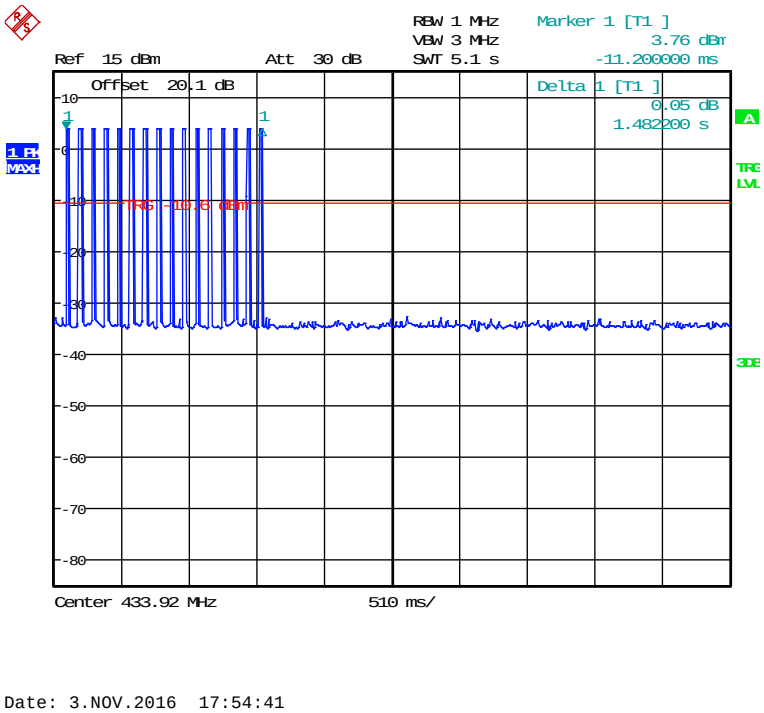
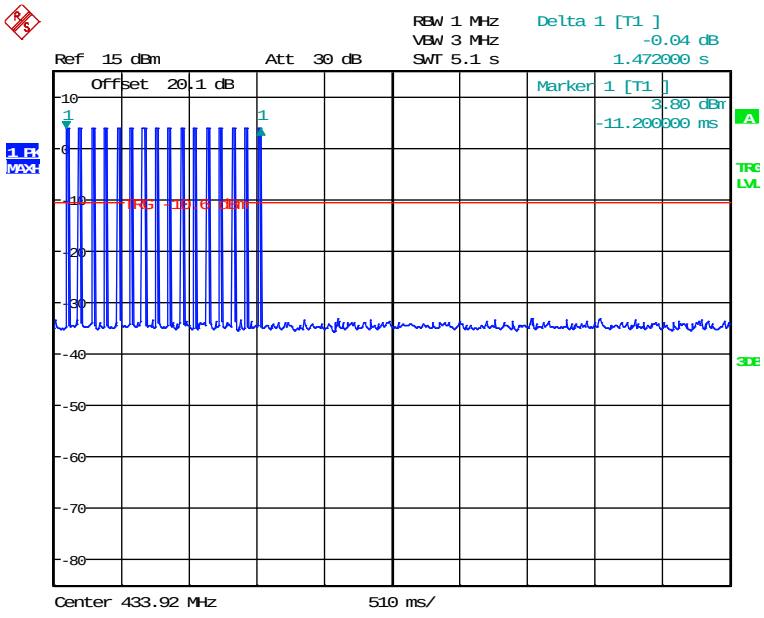
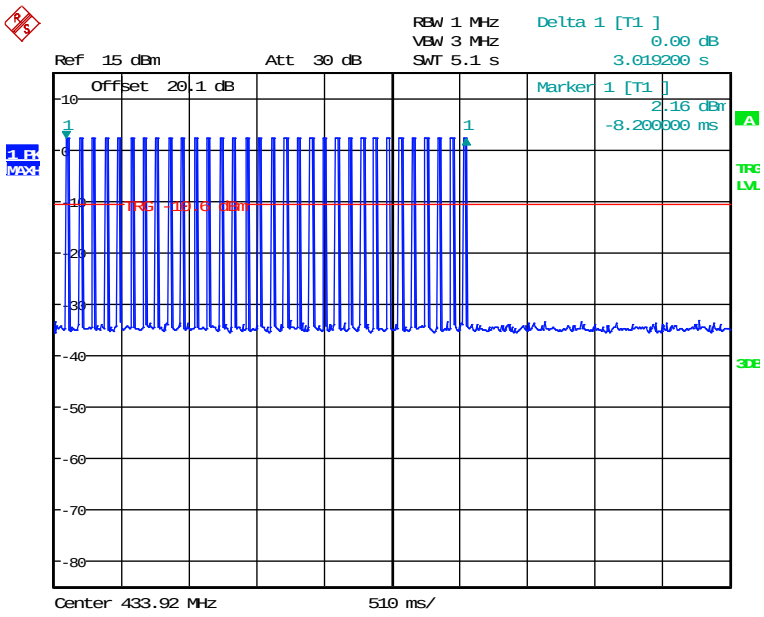


Figure 7.2.2-1: Periodic Operation – Sensor triggered



Date: 3.NOV.2016 17:39:07

Figure 7.2.2-2: Periodic Operation – Manually triggered – Device Mode



Date: 11.JAN.2017 17:55:10

Figure 7.2.2-3: Periodic Operation – Manually triggered – Link Request Mode

7.3 20dB / 99% Bandwidth: FCC: Section 15.231(c)(1) / ISED Canada RSS-210.A.1.3

7.3.1 Measurement Procedure

The measurement was performed via direct coupling to a spectrum analyzer via suitable attenuation.

For the 20 dB bandwidth measurement, the RBW was set between 1% and 5% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

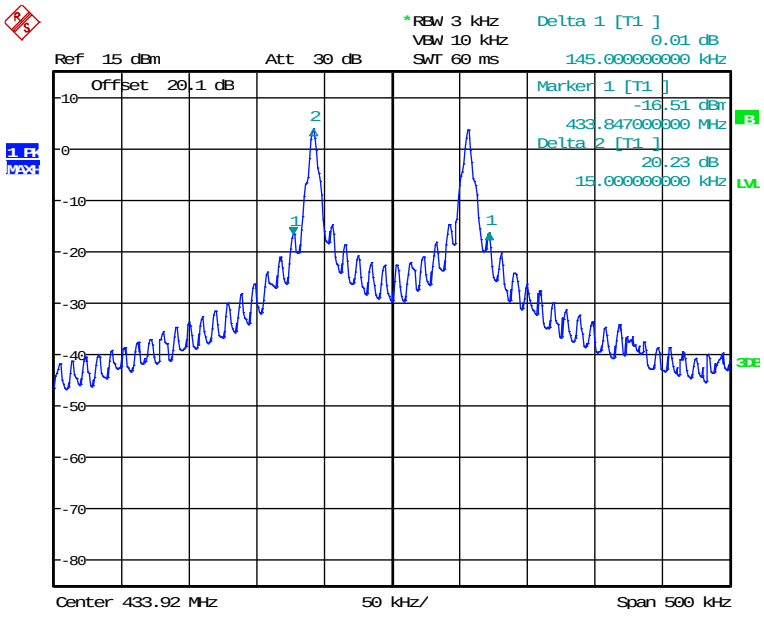
For the 99% occupied bandwidth measurements, the RBW was set between 1% and 5% of the estimated bandwidth using a sample detector. The occupied 99% bandwidth was measured by using the bandwidth measurement function of the spectrum analyzer
.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 and Figures 7.3.2-1 through 7.3.2-2

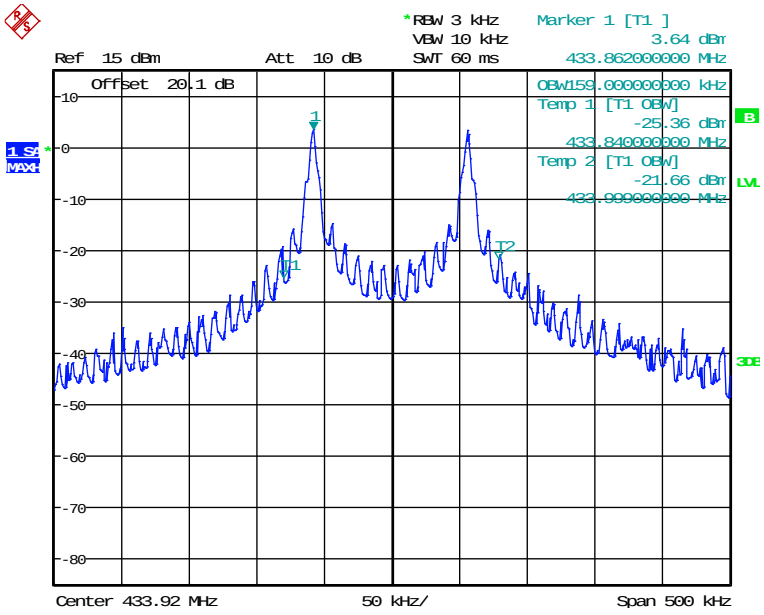
Table 7.3.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
433.92	145.0	159.0



Date: 3.NOV.2016 18:43:37

Figure 7.2.2-1: 20dB BW



Date: 3.NOV.2016 18:40:44

Figure 7.2.2-2: 99% OBW

7.4 Radiated Spurious Emissions – FCC: Section 15.231(b) / ISED Canada: RSS-210 A.1.2

7.4.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 5 GHz, 10 times the highest fundamental frequency.

For measurements below 30 MHz, the receive antenna height was set to 1m and the EUT was rotated through 360 . The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

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 resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3MHz respectively.

The EUT was configured to transmit continuously at 100 % duty cycle. The average measurements were further corrected using a duty cycle correction factor as described below.

7.4.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced to account for the duty cycle of the EUT. The worst case duty cycle was determined as (26.1ms)/95.9ms = 27.2%. The duty cycle correction factor is calculated using the formula 20*log(27.2/100) = -11.3 dB. Determination of the duty cycle correction is determined in the plot and the justification below.

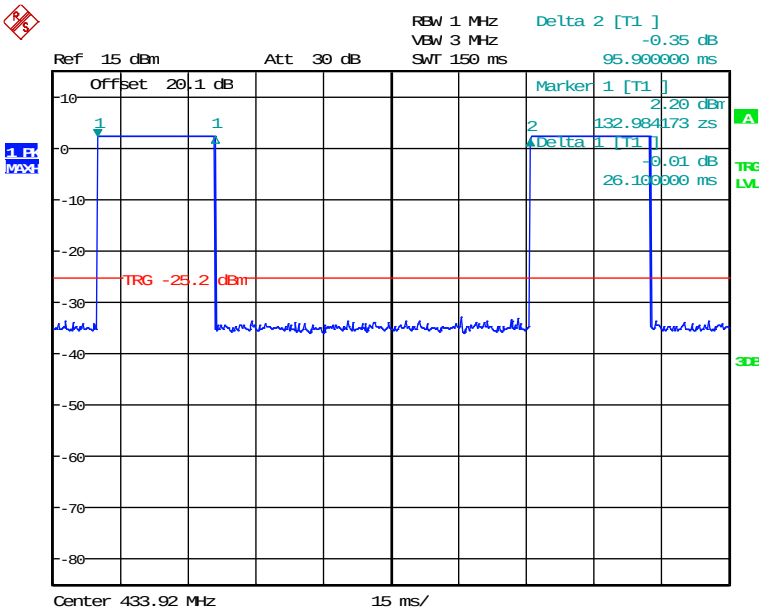


Figure 7.4.2-1: Duty Cycle

7.4.3 Measurement Results

Radiated spurious emissions found in the band of 9 kHz to 5 GHz are reported in the Table 7.4.3-1 below.

Table 7.4.3-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	avg	(H/V)	(dB)	pk	avg	pk	avg	pk	avg
Fundamental Frequency										
433.92	94.05	93.39	H	-9.63	84.42	72.45	100.8	80.8	16.4	8.3
433.92	101.00	100.30	V	-9.63	91.37	79.36	100.8	80.8	9.4	1.4
Spurious Emissions										
867.84	37.66	17.51	H	-0.60	37.06	5.60	80.8	60.8	43.7	55.2
867.84	45.12	23.75	V	-0.60	44.52	11.84	80.8	60.8	36.3	49.0
1301.76	53.06	39.77	H	-11.59	41.47	16.87	74	54	32.5	37.1
1301.76	61.09	47.62	V	-11.59	49.50	24.72	74	54	24.5	29.3
1735.68	50.94	38.24	H	-8.32	42.62	18.61	80.8	60.8	38.2	42.2
1735.68	70.03	43.68	V	-8.32	61.71	24.05	80.8	60.8	19.1	36.7
2169.6	51.74	42.37	H	-5.90	45.84	25.16	80.8	60.8	35.0	35.6
2169.6	52.51	44.26	V	-5.90	46.61	27.05	80.8	60.8	34.2	33.7
2603.52	53.09	39.06	H	-3.72	49.37	24.03	80.8	60.8	31.4	36.8
2603.52	54.92	40.20	V	-3.72	51.20	25.17	80.8	60.8	29.6	35.6
3037.44	48.18	35.18	H	-0.97	47.21	22.90	80.8	60.8	33.6	37.9
3037.44	51.77	37.15	V	-0.97	50.80	24.87	80.8	60.8	30.0	35.9
3471.36	51.26	42.57	H	1.07	52.33	32.33	80.8	60.8	28.5	28.5
3471.36	51.05	41.54	V	1.07	52.12	31.30	80.8	60.8	28.7	29.5
3905.28	47.84	35.29	H	2.56	50.40	26.54	74	54	23.6	27.5
3905.28	47.55	34.67	V	2.56	50.11	25.92	74	54	23.9	28.1
4339.2	55.14	34.90	H	2.67	57.81	26.26	74	54	16.2	27.7
4339.2	51.13	37.40	V	2.67	53.80	28.76	74	54	20.2	25.2

Note:

1. The fundamental level was measured using RBW = 1 MHz which is greater than the measured emission bandwidth.
2. The average measurement levels were further corrected by using a duty cycle correction factor of 20*log(27.2/100) = -11.3 dB.

7.4.4 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: 61.09 + (-11.59) = 49.5 dBµV/m
Margin: 74 dBµV/m – 49.5 dBµV/m = 24.5dB

Example Calculation: Average
Corrected Level: 47.62 + (-11.59) – 11.3 = 24.73 dBµV
Margin: 54 dBµV – 24.73 dBµV = 29.3 dB

8 CONCLUSION

In the opinion of ACS, Inc. the CP16E0060, manufactured by Current Products Corp. meets the requirements of FCC Part 15 subpart C and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-210.

END REPORT