Certification Report

FCC ID: PH29949
IC: 9290A-24078

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

Report Number: AT72141742-1P2

Manufacturer: Dexcom, Inc
Model: G6 Receiver (MT24078 / MT24078-X)
ISED HVIN: MT24078-3

Test Begin Date: December 27, 2018
Test End Date: December 28, 2018

Report Issue Date: March 14, 2019

For Scope of Accreditation Under Certificate Number: 2955.09

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Prepared By:

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This report contains 15 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-247 for a Class II Permissive Change.

The purpose of this Class II Permissive Change is to address alternate parts due to obsolescence in the digital device portion of the circuitry, PCB improvements to support these alternate components and yield improvements, ESD protection improvements, and assembly improvements.

1.2 Product description

Product Name: G6 Receiver (MT24078 / MT24078-X)

The Equipment Under Test (EUT) was a Dexcom, Inc. G6 Continuous Glucose Monitoring System (G6 Receiver). The EUT is a small hand-held device that is part of the G6 Continuous Glucose Monitoring (GCM) System. The G6 Receiver communicates with a G6 Transmitter every 5 minutes over a Bluetooth Low Energy wireless link. The display screen on the G6 Receiver shows sensor glucose readings, trend graphs and trend arrows. The G6 Receiver also provides audible and vibratory alerts. The G6 receiver contains a touch screen that is used to navigate menus and control the device. The G6 Receiver is powered by a rechargeable lithium-polymer battery; also, it can be powered by an external power supply.

Note: The report applies to all localized versions of the receiver whose model number is either MT24078 or MT24078-X, where the X is a single- or double-digit alphanumerical identifier used to identify the localized / translated version of the user interface. All versions of the MT24078 and MT24078-X devices have identical hardware configuration and wireless radio performance.

Technical Information (BLE):

Detail	Description
Transmit Frequency / Alignment Range	2402 MHz – 2480 MHz
Receiver Frequency / Alignment Range	2402 MHz – 2480 MHz
Modulation Format	GFSK
Rated RF Output Power	+4dBm (Conducted)
Channel Spacing	2 MHz
Operating Voltage	5 VDC internal battery
Adaptive	Yes
Antenna Type / Gain:	Ceramic Chip (Johnson Tech, P/N: 2450AT18A100E) / 0.5 dBi
Type of equipment:	Mobile

Manufacturer Information:
Dexcom, Inc.
6340 Sequence Dr.
San Diego, CA 92121

Test Sample Serial Number(s): PL83401367

Test Sample Condition: The test sample was provided in working order with no visible defects.

1.3 Test Methodology and Considerations

All modes of operation, including all available data rates, were evaluated during the original certification. The data presented in this report represents the worst case where applicable. This evaluation for a Class II Permissive Change is limited to Radiated Spurious Emissions and AC Power Line Conducted Emissions only.

For Radiated Emissions, the EUT was programmed to generate a continuously modulated signal. The EUT was evaluated in multiple orientations; the worst-case has been reported (X-Axis). See test setup photos for more information.

For power line conducted emissions, the EUT was powered by a representative wall wart power supply.

Software power setting during test: +4dBm

2 TEST FACILITIES

2.1 Location

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

TÜV SÜD America, Inc.
5945 Cabot Pkwy, Suite 100
Alpharetta, GA 30005
Phone: (678) 341-5900

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation/A2LA accreditation program and has been issued certificate number 2955.09 in recognition of this accreditation.

Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scopes of accreditation.

The Semi-Anechoic Chamber Test Sites and Conducted Emissions Sites have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number:	967699
ISED Canada Lab Code:	23932
VCCI Member Number:	1831
• VCCI Registration Number	A-0295

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site – Chamber A

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 5' in diameter and is located 5'6" 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 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted EMCO Model 1060 installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. 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 during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chase from the turntable to the pit that allows 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.

The chamber rear wall is covered with a mixture of Siepel pyramidal absorber. The side walls of the chamber are partially covered with Siepel pyramidal absorber.

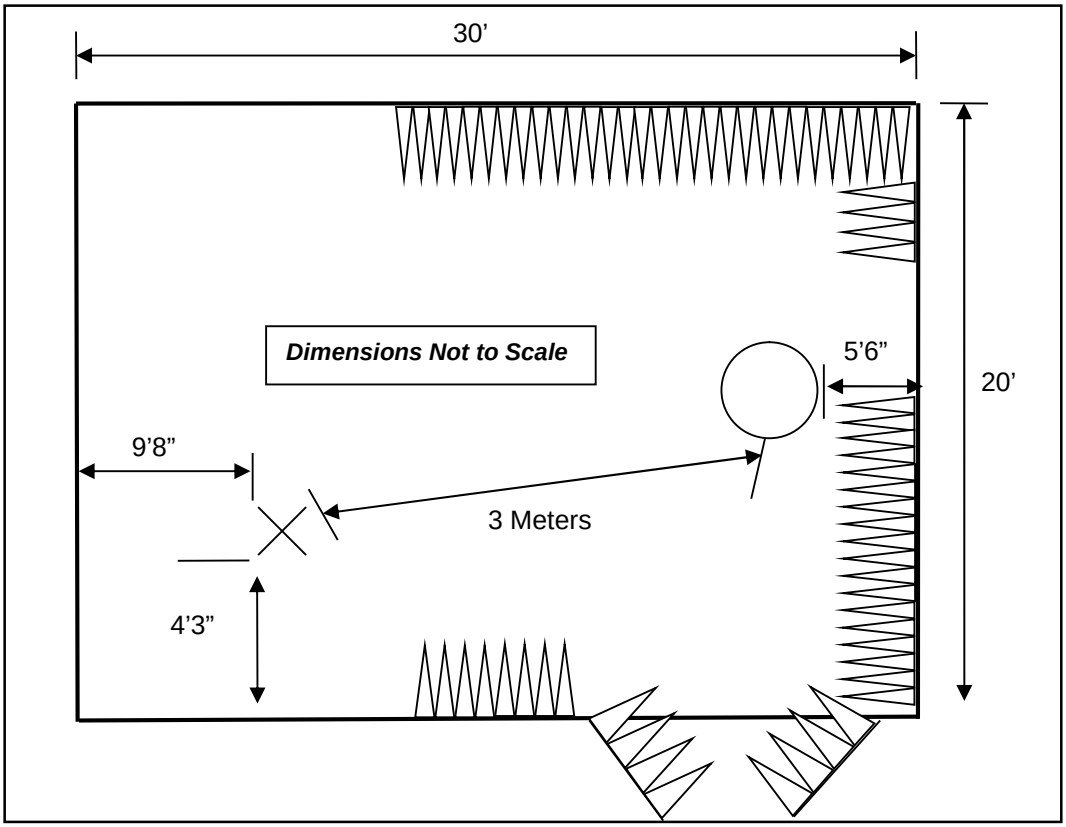

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site – Chamber A

2.3.2 Semi-Anechoic Chamber Test Site – Chamber B

The Semi-Anechoic Chamber Test Site consists of a 20'W x 30'L x 20'H shielded enclosure. The chamber is lined with ETS-Lindgren Ferrite Absorber, model number FT-1500. The ferrite tile 600 mm x 600 mm (2.62 in x 23.62 in) panels and are mounted directly on the inner walls of the chamber shield.

The specular regions of the chamber are lined with additional ETS-Lindgren PS-600 hybrid absorber to extend its frequency range up to 18GHz and beyond.

The turntable is a 2m ETS-Lindgren Model 2170 and installed off the center axis is located 5'6" 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 shield using #8 solid copper wire.

The antenna mast is an EMCO 1060 and is remotely controlled from the control room for both antenna height and polarization.

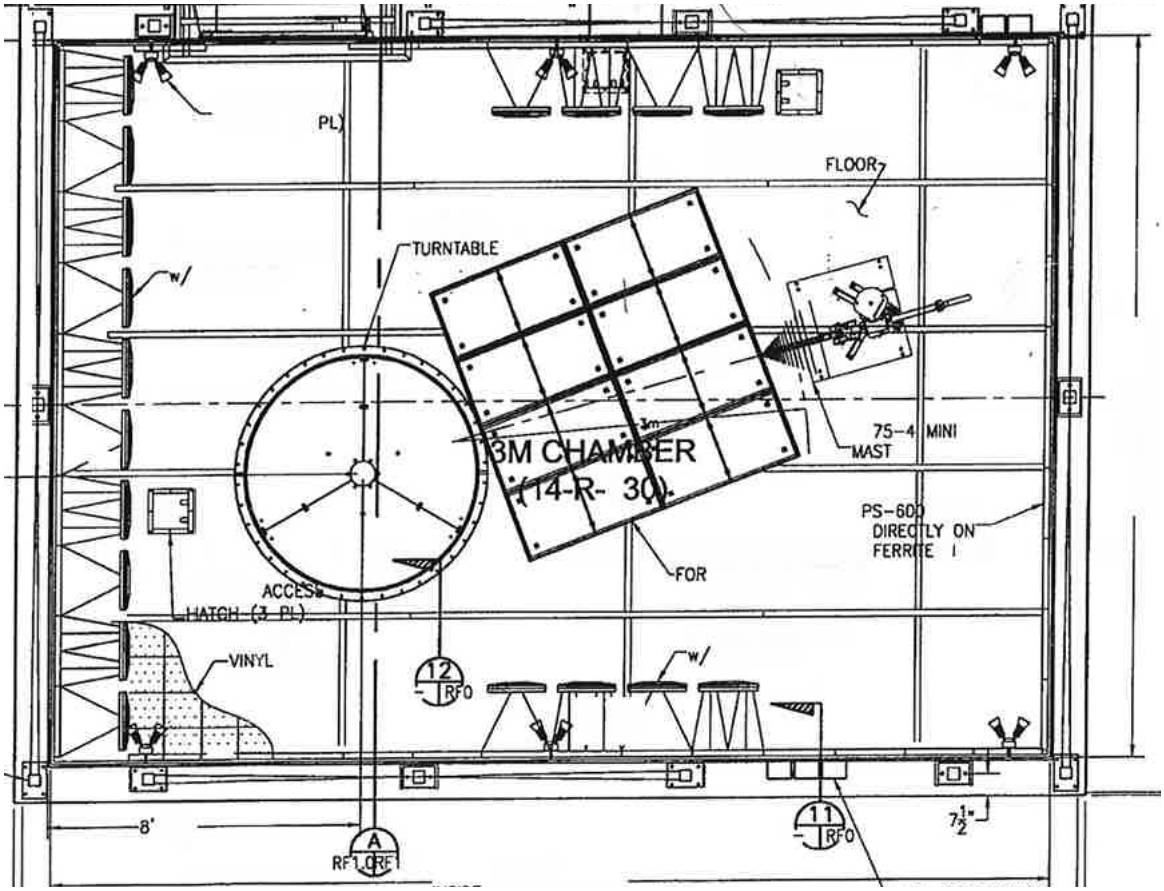

Figure 2.3.2-1: Semi-Anechoic Chamber Test Site – Chamber B

2.4 Conducted Emissions Test Site Description

2.4.1 Conducted Emissions Test Site

The AC mains conducted EMI site is located in the main EMC lab. It consists of a 12' x 10' horizontal coupling plane (HCP) as well as a 12'x8' vertical coupling plane(VCP). The HGP is constructed of 4' x 10' sheets of particle board sandwiched by galvanized steel sheets. These panels are bonded using 11AWG 1/8" x 2" by 10' galvanized sheet steel secured to the panels via by screws. The VCP is constructed of three 4'x8' sheets of 11AWG solid aluminum.

The HCP and VCP are electrically bonded together using 1"x1" angled aluminum secured with screws.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.10.

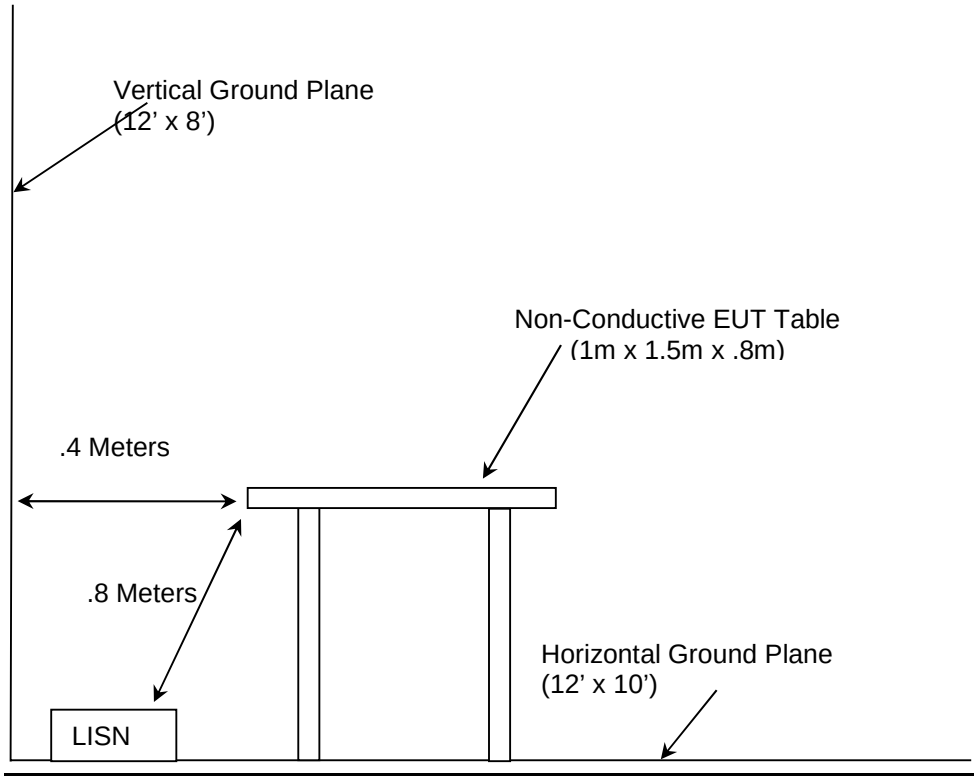

Figure 2.4.1-1: AC Mains Conducted EMI Site

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, 2018
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2018
- ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, April 2018.

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

Asset ID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
30	Spectrum Technologies	DRH-0118	1-18GHz Horn Antenna	970102	05/09/2017	05/09/2019
144	Omega	RH411	Temp / Humidity Meter	H0103373	10/24/2018	10/24/2020
321	Hewlett Packard	HPC 8447D	Low Freq. Pre-Amp	1937A02809	09/12/2018	09/12/2019
324	ACS	Belden	Conducted EMI Cable	8214	04/05/2018	04/05/2019
335	Suhner	SF-102A	Cable (40GHZ)	882/2A	07/10/2018	07/10/2019
338	Hewlett Packard	8449B	High Frequency Pre-Amp	3008A01111	07/11/2017	07/11/2019
628	EMCO	6502	Active Loop Antenna 10kHz-30MHz	9407-2877	02/11/2016	02/11/2019
651	Rohde & Schwarz	TS-PR26	18GHz to 26.5GHz Pre-Amplifier	100023	07/10/2018	07/10/2019
652	Rohde & Schwarz	3160-09	High Frequency Antenna 18GHz to 26.5GHz	060922-21894	NCR	NCR
813	PMM	9010	EMI Receiver; RF Input 50ohm; 10Hz-50MHz; 10Hz-30MHz	697WW30606	02/12/2018	02/12/2019
819	Rohde & Schwarz	ESR26	EMI Test Receiver	101345	11/06/2018	11/06/2019
851	TUV ATLANTA	FMC0101951-100CM	ASAC Cable Set Consisting of 566, 619, and 643	N/A	09/26/2018	09/26/2019
852	Teseq	CBL 6112D	Bilog Antenna; Attenuator	51617	10/15/2018	10/15/2019
3010	Rohde & Schwarz	ENV216	Two-Line V-Network	3010	07/11/2018	07/11/2019

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	AC/DC Adapter	Dongguan Shilong Fuhua Elec Co LTD	UES06WNCPU-050100SPA	NA

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Micro USB	1m	Yes	EUT-1

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

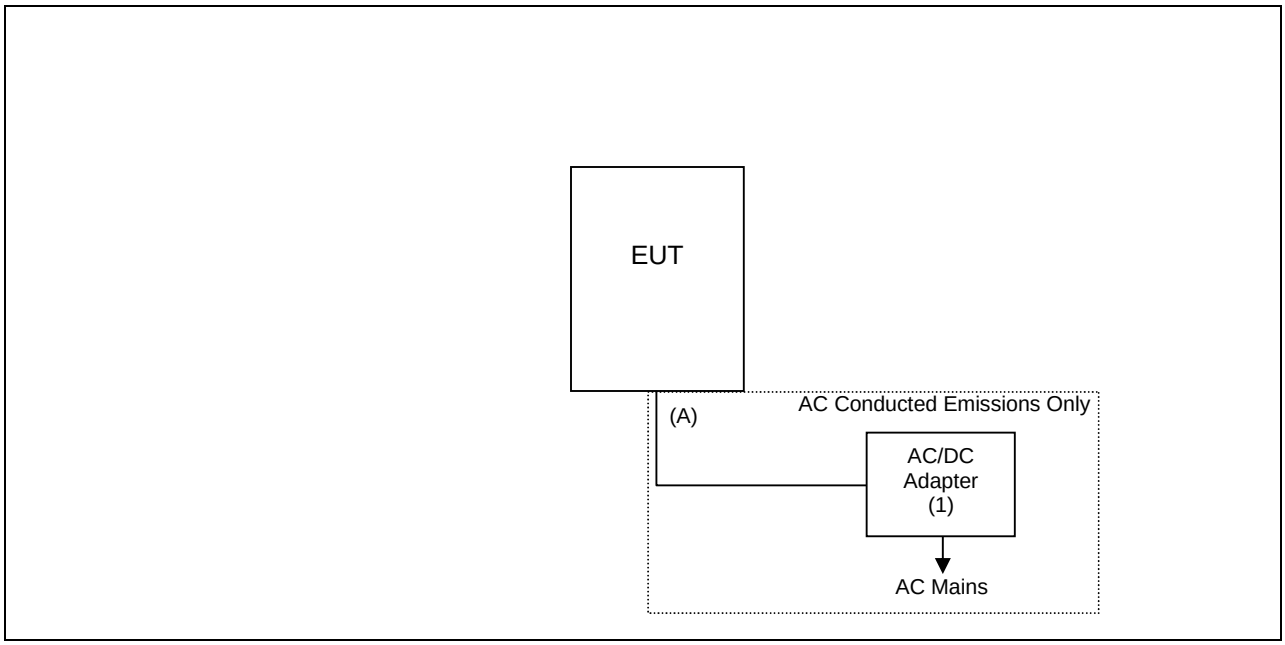

Figure 6-1: EUT System Block Diagram

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: Part 15.203

The antenna is a Ceramic Chip (Johnson Tech, P/N: 2450AT18A100E) and is non-detachable without compromising the device, therefore satisfying Part 15.203. The antenna gain is 0.5 dBi.

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

7.2.1 Measurement Procedure

ANSI C63.10 section 6 was the guiding documents 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 = Corrected Reading - Applicable Limit

7.2.2 Measurement Results

Performed by: Jeremy Pickens

Table 7.2.2-1: Conducted EMI Results Line 1

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.15	44.55	26.65	66	56	-21.45	-29.35	9.59
0.154	47.37	30.15	65.78	55.78	-18.41	-25.63	9.58
0.17	47.08	28.34	65.16	55.16	-18.08	-26.82	9.58
0.18	46.06	28.24	64.58	54.58	-18.52	-26.34	9.58
0.19	44.61	25.37	64.04	54.04	-19.43	-28.67	9.58
0.20	44.56	27.41	63.53	53.53	-18.97	-26.12	9.58
0.23	44.12	25.67	62.6	52.6	-18.48	-26.93	9.58
0.24	42.59	22.41	62.03	52.03	-19.44	-29.62	9.58
0.26	40.87	22.4	61.5	51.5	-20.63	-29.1	9.58
0.40	39.75	22.4	57.9	47.9	-18.15	-25.5	9.59

Table 7.2.2-2: Conducted EMI Results Line 2

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.15	19.29	13.17	66	56	-46.71	-42.83	9.59
0.154	39.76	29.01	65.78	55.78	-26.02	-26.77	9.58
0.17	31.37	16.22	65.16	55.16	-33.79	-38.94	9.58
0.18	25.28	11.6	64.58	54.58	-39.3	-42.98	9.58
0.20	36.25	28.95	63.69	53.69	-27.44	-24.74	9.58
0.21	35.22	29.73	63.21	53.21	-27.99	-23.48	9.58
0.23	31	10.84	62.6	52.6	-31.6	-41.76	9.58
0.24	30.92	12.86	62.17	52.17	-31.25	-39.31	9.58
0.25	29.2	24.68	61.76	51.76	-32.56	-27.08	9.58
0.27	27.22	23.83	61.12	51.12	-33.9	-27.29	9.59

7.3 Emission Levels

7.3.1 Emissions into Restricted Frequency Bands – FCC: Sections 15.205, 15.209, 15.247(d); ISED Canada: RSS-Gen 8.9 / 8.10

7.3.1.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 25 GHz, 10 times the highest fundamental frequency.

Measurements below 30 MHz were performed with a 3 meter separation distance between the EUT and measurement antenna. The EUT was rotated 360° to maximize each emission. The magnetic loop receiving antenna was positioned with its lowest point 1 meter above the ground. The loop antenna was aligned along the site axis, orthogonal to the site axis, and ground-parallel to the site axis.

The spectrum analyzer's resolution and video bandwidths were set to 200 Hz and 1000 Hz respectively for frequencies below 150 kHz and 9 kHz and 30 kHz respectively for frequencies above 150 kHz and below 30 MHz.

For measurements above 30 MHz, the EUT was rotated through 360° and the receive antenna height was varied from 1 meter to 4 meters so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz. For frequencies above 1000 MHz, measurements were made with RBW of 1 MHz and a VBW of 3 MHz.

Each emission found to be in a restricted band as defined by section 15.205, was compared to the radiated emission limits as defined in section 15.209.

7.3.2 Test Results

Performed by: Jeremy Pickens

Radiated spurious emissions are reported in Table 7.3.2-1. Emissions not reported were below the noise floor of the measurement system. There were emissions detected between 30 and 1000MHz, but these were determined by comparison scans to not be related to the radio module and fall under the Subpart B Section 15.109 unintentional emissions requirements.

Table 7.3.2-1: Radiated Emissions – Bluetooth Low Energy

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
Spurious Emissions - Low Channel										
2390	53.20	33.80	H	-3.90	49.30	29.90	74.0	54.0	24.7	24.1
2390	52.10	33.90	V	-3.90	48.20	30.00	74.0	54.0	25.8	24.0
4804	46.10	32.50	H	4.13	50.23	36.27	74.0	54.0	23.8	17.7
4804	47.1	34.1	V	4.13	51.23	37.87	74.0	54.0	22.8	16.1
Spurious Emissions - Mid Channel										
4880	46.6	32.3	H	4.47	51.07	36.77	74.0	54.0	22.9	17.2
4880	47	33.3	V	4.47	51.47	37.77	74.0	54.0	22.5	16.2
7320	47.7	33.7	H	10.14	57.84	43.84	74.0	54.0	16.2	10.2
7320	47	33.3	V	10.14	57.14	43.44	74.0	54.0	16.9	10.6
Spurious Emissions - High Channel										
2483.5	59.9	36.1	H	-3.46	56.44	32.64	74.0	54.0	17.6	21.4
2483.5	60.2	36.2	V	-3.46	56.74	32.74	74.0	54.0	17.3	21.3
4960	46.90	33.00	H	4.83	51.73	37.83	74.0	54.0	22.3	16.2
4960	47.80	35.70	V	4.83	52.63	40.53	74.0	54.0	21.4	13.5
7440	47.70	33.70	V	10.23	57.93	43.93	74.0	54.0	16.1	10.1

7.3.3 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 – High Channel – 7440MHz– Vertical polarity
Corrected Level: 47.70 + 10.23 = 57.93dBuV
Margin: 74dBuV – 57.93dBuV = 16.1dB

Example Calculation: Average – High Channel – 7440MHz– Vertical polarity
Corrected Level: 33.70 + 10.23 = 43.93dBuV
Margin: 54dBuV – 43.93dBuV = 10.1dB

8 ESTIMATION OF MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Table 8-1: Estimation of Measurement Uncertainty

Parameter	U_{lab}
Occupied Channel Bandwidth	± 0.009 %
RF Conducted Output Power	± 0.349 dB
Power Spectral Density	± 0.372 dB
Antenna Port Conducted Emissions	± 1.264 dB
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	± 2.832×10^{-8}
AC Power Line Conducted Emissions	± 3.360 dB

9 CONCLUSION

In the opinion of TÜV SÜD America Inc. the G6 Receiver (MT24078) manufactured by Dexcom, Inc met the requirements of FCC Part 15 subpart C and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein.

END REPORT