RF TEST REPORT

Test item	:	Blood Glucose Monitoring System
Model No.	:	01GM51
Order No.	:	DEMC1301-00280
Date of receipt	:	2013-01-23
Test duration	:	2013-02-02 ~ 2013-02-08
Date of issue	:	2013-02-12
Use of report	:	FCC Original Grant

Applicant : SD Biosensor, Inc.
C-4th&5th Floor Digital Empire Building 980-3,Yeongtong-Dong, Yeongtong-Gu, Suwon-Si,Gyeonggi-Do, 443-813, Korea

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 449-080, Korea

Test specification	:	FCC Part 15.225 Subpart C
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer JaiJin, Lee	N/A	Deputy General Manager SunKyu, Ryu

Test Report Version

Test Report No.	Date	Description
DRTCET1302-0107	Feb. 12, 2013	Initial issue

CONTENTS

1.Equipment information

1.1 Equipment description

FCC Equipment Class	Low Power Communications Device Transmitter(DXX)
Equipment type	Blood Glucose Monitoring System
Equipment model name	01GM51
Equipment add model name	N/A
Equipment serial no.	Identical prototype
Hardware version	GM51 PCB v1.0
Software version	GM51 R001
Frequency band	13.56MHz
Modulation type	ASK
Channel	1
Power	Alkaline Battery: DC 3.0V
Antenna type	Loop Antenna

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2. Information about test items

2.1 Test mode

Test mode	Continuous transmitting mode

Note: For this test mode, a test program was supported by manufacturer.

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
RF CARD READER	DRAGON	DRAGON-0000001522	DUALi Inc.	FCCID: SWUDRAGON
Laptop	X51RL	85N0AS318314227	ASUSTeK Computer Inc.	FCC DoC

Note:The RF Card Reader was used for normal operating of EUT.

2.3 Tested frequency

	TXFrequency(MHz)	RX Frequency(MHz)
Lowest Channel	13.56	13.56
Middle Channel	-	-
Highest Channel	-	-

2.4 Tested environment

Temperature	:	20 ~ 24°C
Relative humidity content	:	38 ~ 42 % R.H.
Details of power supply	:	Battery: DC 3.0V

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Test Items				
2.1049	20 dB Bandwidth	N/A	Radiated	**C**
15.225 (a)	In-Band Emissions	15,848μN/m @ 30m 15.553 – 13.567 MHz		**C**
15.225 (b)	In-Band Emissions	334μN/m @ 30m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		**C**
15.225 (c)	In-Band Emissions	106μN/m @ 30m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		**C**
15.225 (d) 15.205 15.209	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		**C**
15.225 (e)	Frequency Stability Tolerance	±0.01% of operating frequency	Conducted	**C**
15.207	AC Conducted Emissions	EN 55022	AC Line Conducted	**NA** Note.2
15.203	Antenna requirements	FCC Part 15.203	-	**C**

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: This test is not applicable. Because the power of this device is supplied from only batteries.

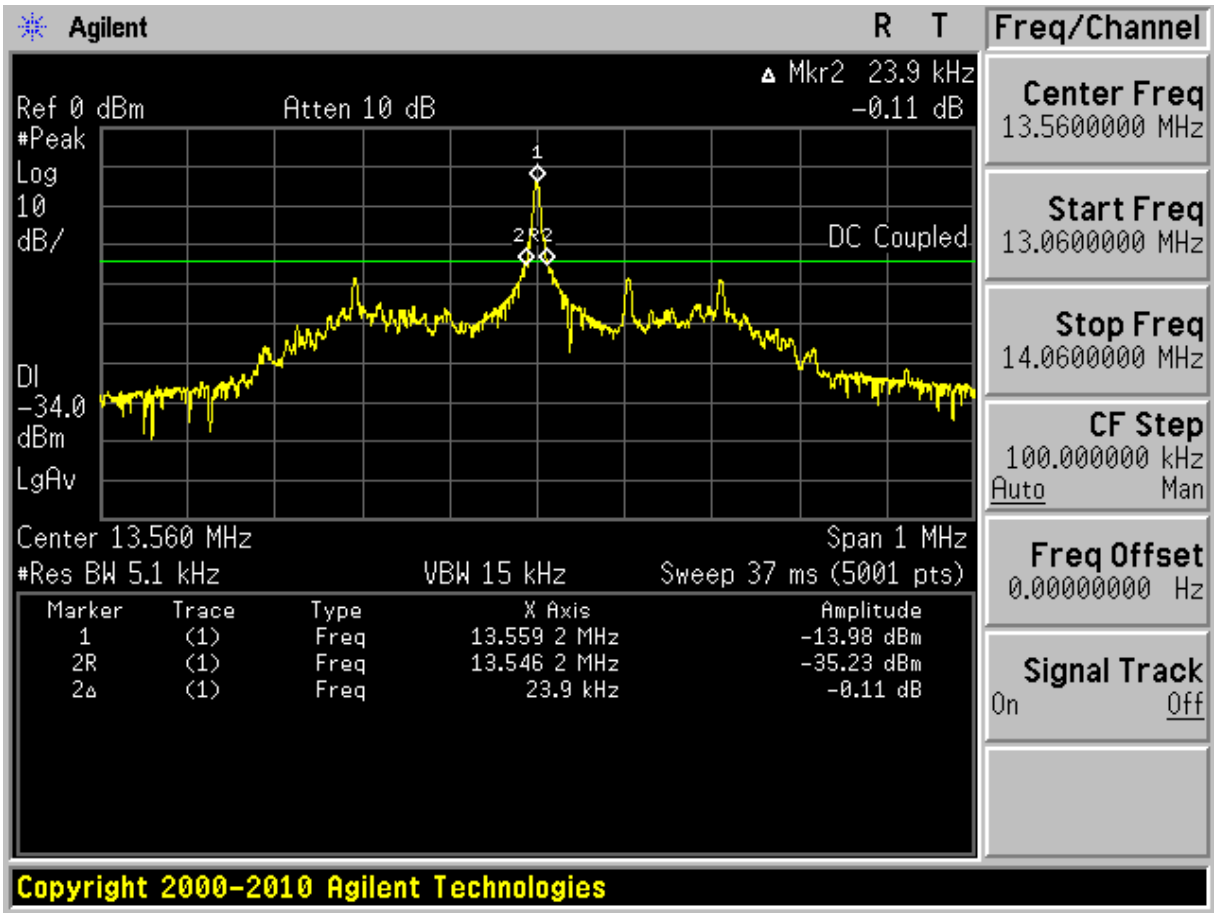
The sample was tested according to the following specification:
ANSI C-63.10-2009

3.2 Transmitter requirements

3.2.1 20dB Bandwidth Measurement

- Procedure:
The 20dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

- Measurement Data: Comply



- Minimum Standard: Part 2.1049

None

3.2.2 In-Band Radiated Spurious Emission

- Procedure:

The EUT was placed on a 0.8m high wooden table inside a 10m semi anechoic chamber. An antenna was placed at 3 m distance from the EUT Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions. A loop antenna was used for this test item. And this test item was performed for both vertical and horizontal polarization.

- **Measurement Data: Comply**

Test Frequency Band [MHz]	Freq. [MHz]	EUT Posi.	Reading Level [dBuV]	T.F	Field Strength @3m [dBuV/m]	Field Strength @30m [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.110 ~ 13.410	13.344	Y	27.70	6.60	46.60	6.60	40.51	33.91
13.410 ~ 13.553	13.551	Y	48.80	27.70	67.70	27.70	50.47	22.77
13.553 ~ 13.567	13.560	Y	54.50	33.40	73.40	33.40	84.00	50.60
13.567 ~ 13.710	13.569	Y	45.50	24.40	64.40	24.40	50.47	26.07
13.710 ~ 14.010	13.769	Y	28.20	7.10	47.10	7.10	40.51	33.41

Note 1. This test item was performed using a loop antenna.

Note 2. This test item was performed at 3m and the data were extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)2.

▪ Extrapolation Factor = 20 $\log_{10}(30/3)^2$ = 40dB

Note 3. All data were recorded using a spectrum analyzer employing a peak detector.
If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

Note 4. Sample Calculation.
Margin = Limit – Field Strength @ 30m / Field Strength @ 30m = Field Strength @ 3m – 40
Field Strength @ 3m = Reading + T.F / T.F = AF + CL – AG
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

- Minimum Standard: Part 15.225(a), (b), (c)

Frequency Band [MHz]	Limit	
	[uV/m]	[dBuV/m]
13.553-13.567	15,848	84.00
13.410-13.553 13.567-13.710	334	50.47
13.110-13.410 13.710-14.010	106	40.51

3.2.3 Radiated Spurious Emission Measurements, Out-of-Band

- Procedure:

The EUT was tested from 9kHz up to the 1GHz excluding the band 13.110-14.010MHz. All measurements were recorded with spectrum analyzer employing a peak detector for emissions below 30MHz. Above 30MHz a Quasi-peak detector was used. All out-of-band emissions must not exceed the limits §15.209. A loop antenna was used for searching for emissions below 30MHz.

- Measurement Data: Comply(refer to the next page)

- Minimum Standard: Part 15. 205, 209, 225(d)

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3.6 ~ 4.4	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		

▪ **FCC Part 15.205(b):**

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▪ **FCC Part 15.209(a):**

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	200	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.209(b):**

In the emission table above, the tighter limit applies at the band edges.

- Measurement Data:

Tested Frequency : **13.56MHz**

Measurement Distance : **3 Meters**

Frequency [MHz]	EUT Posi.	ANT Pol	Reading [dBuV]	T.F [dB/m]	Distance factor	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
27.116	Z	H	11.7	20.1	40.0	-8.2	29.5	37.7
54.225	X	H	51.8	-15.9	0.0	35.9	40.0	4.1
81.352	Y	H	52.4	-15.3	0.0	37.1	40.0	2.9
189.822	X	H	50.9	-12.1	0.0	38.8	43.5	4.7
265.366	Y	H	50.6	-8.0	0.0	42.6	46.0	3.4

Note 1. All measurements were recorded using a spectrum analyzer employing a peak detector for blew 30MHz and a Quasi-peak detector for above 30MHz.
Note 2. Both Vertical and Horizontal polarities of the receiver antenna were evaluated with the worst case emissions being reported.
Note 3. The worst-case emissions are reported.
Note 4. No other spurious and harmonic emissions were reportedgreater than listed emissions above table.
Note 5. Sample calculation

Margin = Limit – Field Strength
Field Strength = Reading + T.F – Distance factor
T.F = AF + CL – AG
Distance factor = 20log(Measurement distance / The measured distance)^2
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

3.2.4 Frequency Stability

- Procedure:

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

- Measurement Data: Comply

Operating Frequency : **13,559,082Hz**

VOLTAGE (%)	POWER (VDC)	TEMP (℃)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.000	+23(ref)	13,559,082	0	0.000000
100%		-20	13,559,123	41	0.000302
100%		-10	13,559,105	23	0.000170
100%		0	13,559,090	8	0.000059
100%		+10	13,559,088	6	0.000044
100%		+20	13,559,080	-2	-0.000015
100%		+30	13,559,071	-11	-0.000081
100%		+40	13,559,044	-38	-0.000280
100%		+50	13,559,031	-51	-0.000376
85%	2.550	+23	13,559,085	3	0.000022
115%	3.450	+23	13,559,086	4	0.000030
BATT.ENDPOINT	2.000	+23	13,559,083	1	0.000007

- Minimum Standard: Part 15. 225(e)

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency.

3.2.5 AC Line Conducted Emissions

- Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.21(m). Emissions closest to the limit are measured in the quasi-peak and average detector mode with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

- Measurement Data: N/A

- This test is not applicable. Because the power of this device is supplied from only batteries.

- Minimum Standard: FCC Part 15.207(a)

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
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

APPENDIX

TEST EQUIPMENT FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4440A	12/09/18	13/09/18	MY45304199
TEMP & HUMIDITY Chamber	SJ SCIENCE	TEMI850-10	12/03/06	13/03/06	S7400LE267 1226
Digital Multimeter	H.P	34401A	12/03/05	13/03/05	3146A13475
Thermo hygrometer	BODYCOM	BJ5478	12/06/20	13/06/20	120612-2
DC Power Supply	HP	6633A	12/03/05	13/03/05	3524A06634
LOOP Antenna	Schwarzbeck	FMZB1513	12/09/24	13/09/24	1513-128
EMI TEST RECEIVER	R&S	ESU	13/01/08	14/01/08	100014
Vector Signal Generator	Rohde Schwarz	SMJ100A	13/01/08	14/01/08	100148
BILOG ANTENNA	SCHAFFNER	CBL6112B	12/11/16	14/11/16	2737
Amplifier (22dB)	H.P	8447E	13/01/08	14/01/08	2945A02865
CVCF	KIKUSUI	PCR1000L	12/09/15	13/09/15	14110610
EMI Test Receiver	R&S	ECSI	12/03/06	13/03/06	100364
LISN	R&S	ESH2-Z5	12/09/18	13/09/18	828739/006