



Test Report No.:
FCC2021-0042EMC

TEST REPORT

Applicant : Smart Meter Corporation
Product Name : Pulse Oximeter
Mode No. : SMPO1000-US

CVC Testing Technology Co., Ltd.

威凯检测技术有限公司

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, 510663, P. R. China
Telephone: +86-20-32293888 Fax : +86-20-32293889
E-mail: emc@cvc.org.cn

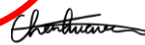
Applicant	Name : Smart Meter Corporation		
	Address : 201 E. Kennedy Blvd., Suite 880, Tampa, FL 33602		
Manufacturer	Name : Shanghai Berry Electronic Tech Co., Ltd.		
	Address : Unit 104, 1st Floor, 7th Building, NO.1188 Lianhang Road, Minhang District, 201112 Shanghai, China.		
Equipment under Test	Product Name : Pulse Oximeter		
	Model No. : SMPO1000-US		
	Trade mark : 		
	Serial no. : --		
	Sampling : 1-1		
Date of Receipt.	2021.12.01	Date of Issue	2021.12.01~2022.01.06
Test Specification		Test Result	
FCC 47 CFR Part 18-2019 FCC/OST MP-5 (1986)		PASS	
Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied.		
			
Tested by: 	Reviewed by: 	Approved by: 	
He Guanhuo ☐	Xu Zhenfei ☐	Chen Huawen ☐	
Name	Signature	Name	Signature
Other Aspects: NONE.			
Abbreviations: OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			
This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC.			

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1. General Product Information

1.1 General information

Product Name	Pulse Oximeter
Model No.	SMPO1000-US
Power Supply	2X1.5V AAA
Remark: This application is a single model.	

2. Test Sites

2.1 Test Facilities

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, 510663, P. R. China

Telephone : +86-20-32293888

Fax : +86-20-32293889

The EMC testing laboratory has been recognized by CNAS, and authorized by Nemko of Norway since 1997, and accredited by DAkkS of Germany since 2007, and assessed and found eligible to participated in the TDAP of VDE testing and certification Institute since 2004, and registered by FCC since 2001.

2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

2.3 List of Test and Measurement Instruments

Refer to **Appendix**.

3. Test Configuration

3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Verdict
Conducted Emissions	FCC 47 CFR Part 18 Section 18.307 FCC/OST MP-5 Clause 7.5	N/A
Radiated Emissions	FCC 47 CFR Part 18 Section 18.305 FCC/OST MP-5 Clause 4.6	PASS

5. Measurement procedure

5.1 Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
/	/	/

Method of Measurement:

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to FCC/OST MP-5. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

The test is in transmitting mode.

Limits:

(a) All Induction cooking ranges and ultrasonic equipment

Frequency of emission(MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.009 - 0.05	110	-
0.05 - 15	90-80*	-
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	56
5 - 30	60	50

*: Decreases with the logarithm of the frequency.

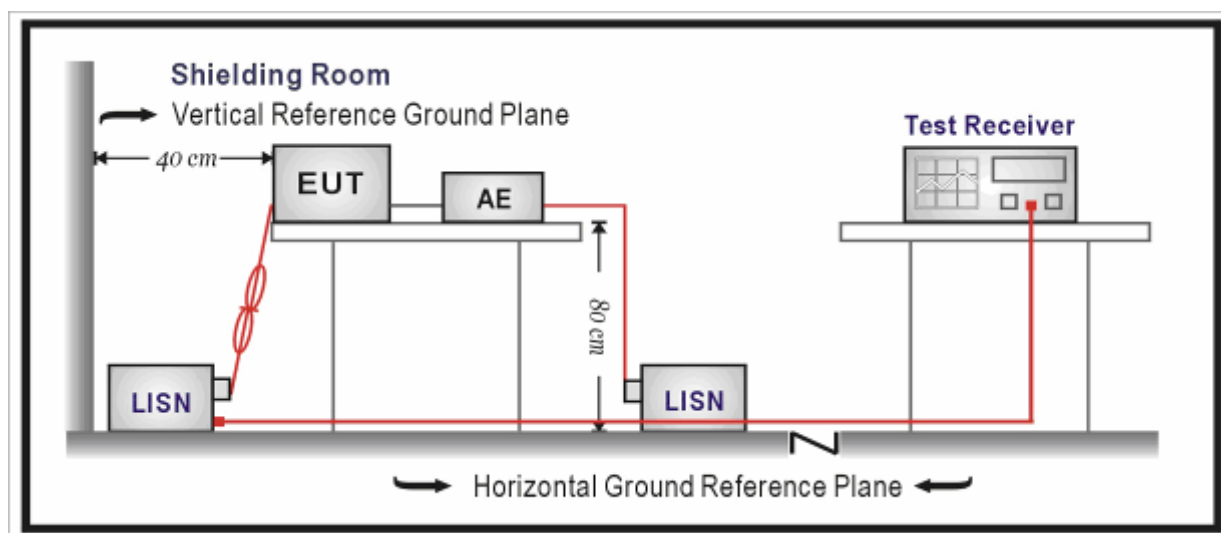
(b) All other part 18 consumer devices:

Frequency of emission(MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	56
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

(C) RF lighting devices:

Frequency (MHz)	Maximum RF line voltage measured with a 50 uH/50 ohm LISN (uV)
Non-consumer equipment:	
0.45 to 1.6	1000
1.6 to 30	3000
Consumer equipment:	
0.45 to 2.51	250
2.51 to 3.0	3000
3.0 to 30	250

Test Setup:



Note: AC Power source is used to change the voltage 120V/60Hz.

Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 2.66$ dB.

Test Results:

Power Line	/
Worst Case Operating Mode:	/

Conducted Emission					
Port: AC Power Line(Power line L)					
Freq. (MHz)	QP Limits (dB μ V)	QP Reading (dB μ V)	Freq. (MHz)	AV Limits (dB μ V)	AV Reading (dB μ V)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

Power Line	/
Worst Case Operating Mode:	/

Conducted Emission					
Port: AC Power Line(Power line N)					
Freq. (MHz)	QP Limits (dBμV)	QP Reading (dBμV)	Freq. (MHz)	AV Limits (dBμV)	AV Reading (dBμV)
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/

Remark: This application product is sold without power adapter, and conducted emission experiment is not applicable.

5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
24°C	57%	102kPa

Method of Measurement:

The test set-up was made in accordance to the general provisions of FCC/OST MP-5. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 10 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated harassment signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz(detector: Peak):

(a)PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b)AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded. The worst emission was found in EUT with cradle mode and the worst case was recorded.

Limits

Limit in restricted band(Part 18 .18.305(b))

Equipment	Operating frequency	RF power generated by equipment(watts)	Field strength limit($\mu\text{V/m}$)	Distance (meters)	$\text{dB}\mu\text{V/m}$ (10m)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500	25	300	57.50
		500 or more	$25 \times \text{SQRT}(\text{power}/500)$	¹ 300	--
	Any non-ISM frequency	Below 500	15	300	53.04
		500 or more	$15 \times \text{SQRT}(\text{power}/500)$	¹ 300	--
Industrial heaters and RF stabilized arc welders	On or below 5725 MHz	Any	10	1600	64.08
	Above 5725 MHz	Any	(²)	(²)	--
Medical diathermy	Any ISM frequency	Any	25	300	57.50
	Any non-ISM frequency	Any	15	300	53.04
Ultrasonic	Below 490 kHz	Below 500	$2400/\text{F}(\text{kHz})$	300	--
		500 or more	$2400/\text{F}(\text{kHz}) \times \text{SQRT}(\text{power}/500)$	³ 300	--
	490 to 1600 kHz	Any	$2400/\text{F}(\text{kHz})$	30	--
	Above 1600 kHz	Any	15	30	33.04
Induction cooking ranges	Below 90 kHz	Any	1500	⁴ 30	73.06
	On or above 5725 MHz	Any	300	⁴ 30	59.08

1: Field strength may not exceed $10\mu\text{V/m}$ at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

2: Reduced to the greatest extent possible.

3: Field strength may not exceeded $10\mu\text{V/m}$ at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

4: Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

The field strength limits for RF lighting devices shall be the following: (Part 18.18.305(c))

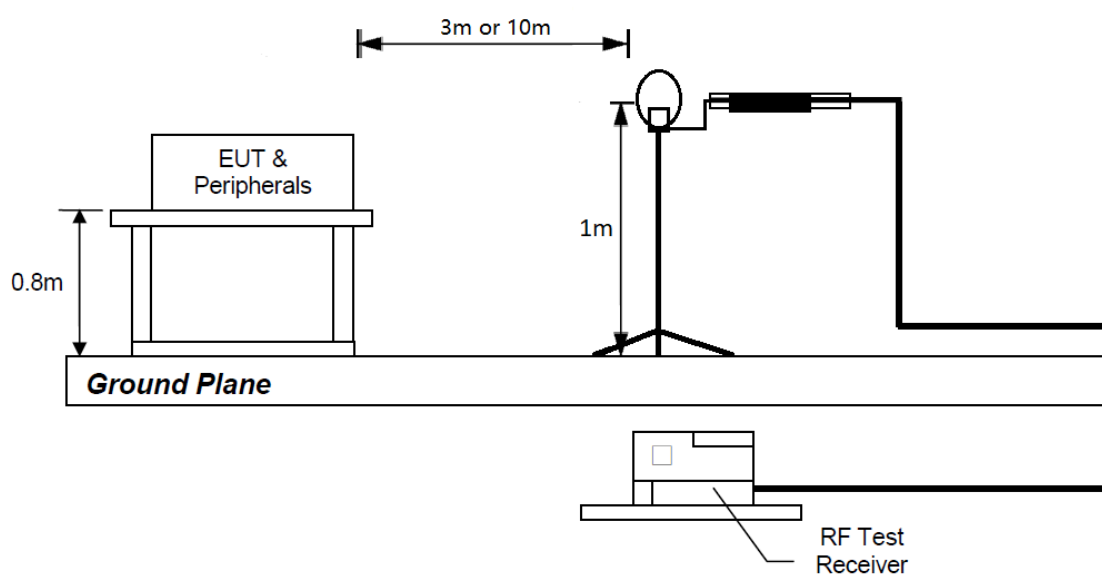
Frequency(MHz)	Field strength limit at 30 meters (μV/m)
Non-consumer equipment	
30 - 88	30
88 - 216	50
216 - 1000	70
Consumer equipment	
30 - 88	10
88 - 216	15
216 - 1000	20

According to FCC 47 CFR Part 18 Section 18.309, for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

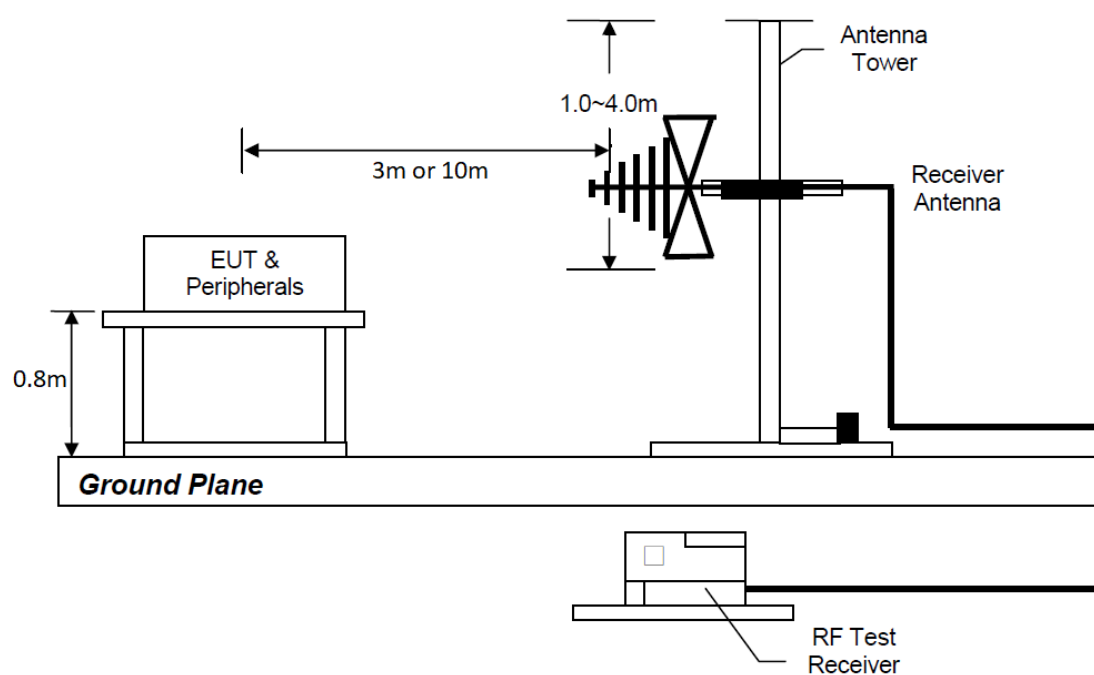
Frequency band in which device operates (MHz)	Range of frequency measurements	
	Lowest frequency	Highest frequency
Below 1.705	Lowest frequency generated in the device, but not lower than 9 kHz	30MHz
1.705 - 30	Lowest frequency generated in the device, but not lower than 9 kHz	400MHz
30 - 500	Lowest frequency generated in the device or 25 MHz, whichever is lower	Tenth harmonic or 1000 MHz, whichever is higher
500 - 1000	Lowest frequency generated in the device or 100 MHz, whichever is lower	Tenth harmonic
Above 1000	do	Tenth harmonic or highest detectable emission

Test Setup:

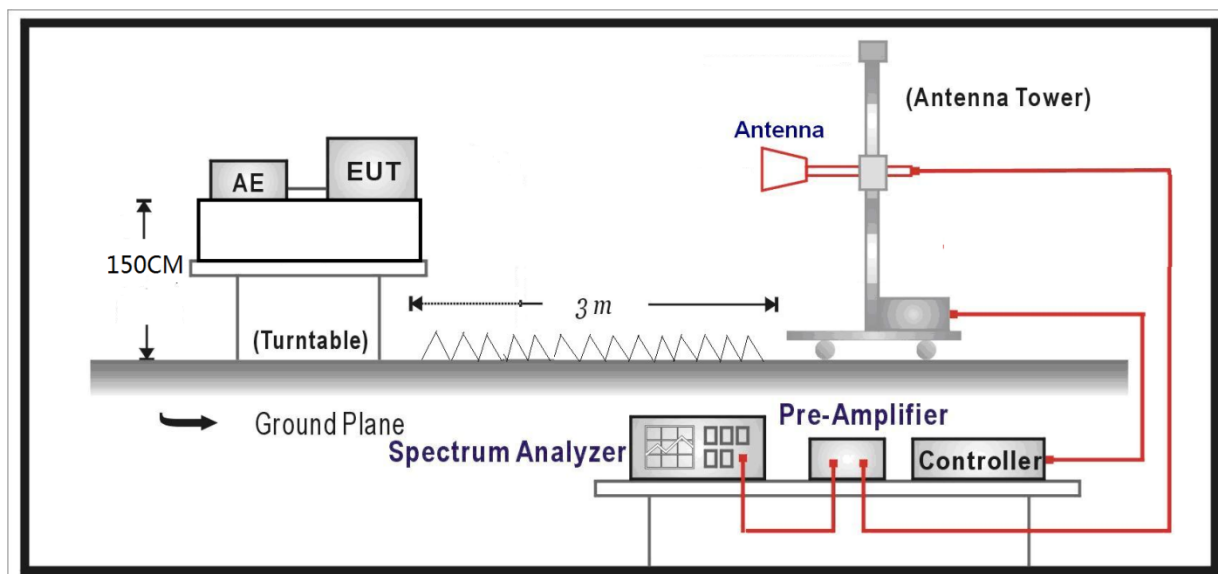
9kHz to 30MHz Test Setup:



30MHz to 1GHz Test Setup:



Above 1GHz Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

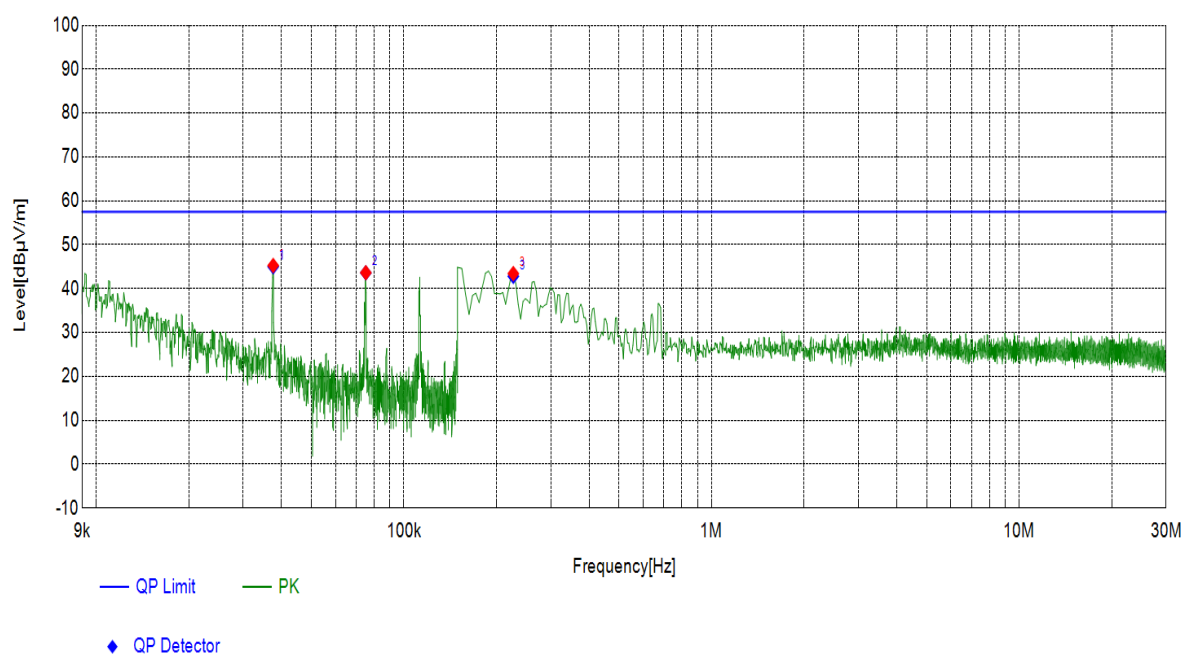
Frequency	Uncertainty
above 1G	4.84 dB
below 1G	4.10 dB

Test Results:

SPURIOUS EMISSIONS 9kHz~30MHz:

Radiated Emission	9kHz-30MHz
Polarity	X axis
Worst Case Operating Mode:	Measure blood oxygen parameters

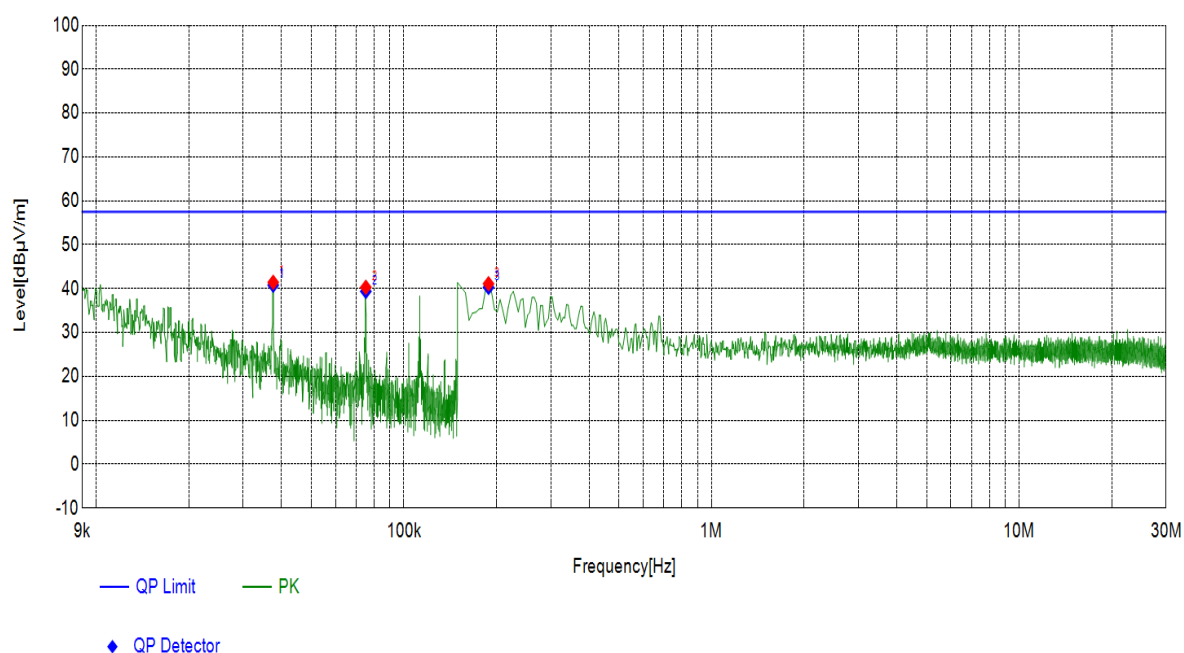
radiated emission						
Frequency [MHz]	Polarity	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]
0.0376	X axis	44.97	57.50	12.53	200	190
0.0752	X axis	43.60	57.50	13.90	200	240
0.2268	X axis	42.81	57.50	14.69	200	270



SPURIOUS EMISSIONS 9kHz~30MHz:

Radiated Emission	9kHz-30MHz
Polarity	Y axis
Worst Case Operating Mode:	Measure blood oxygen parameters

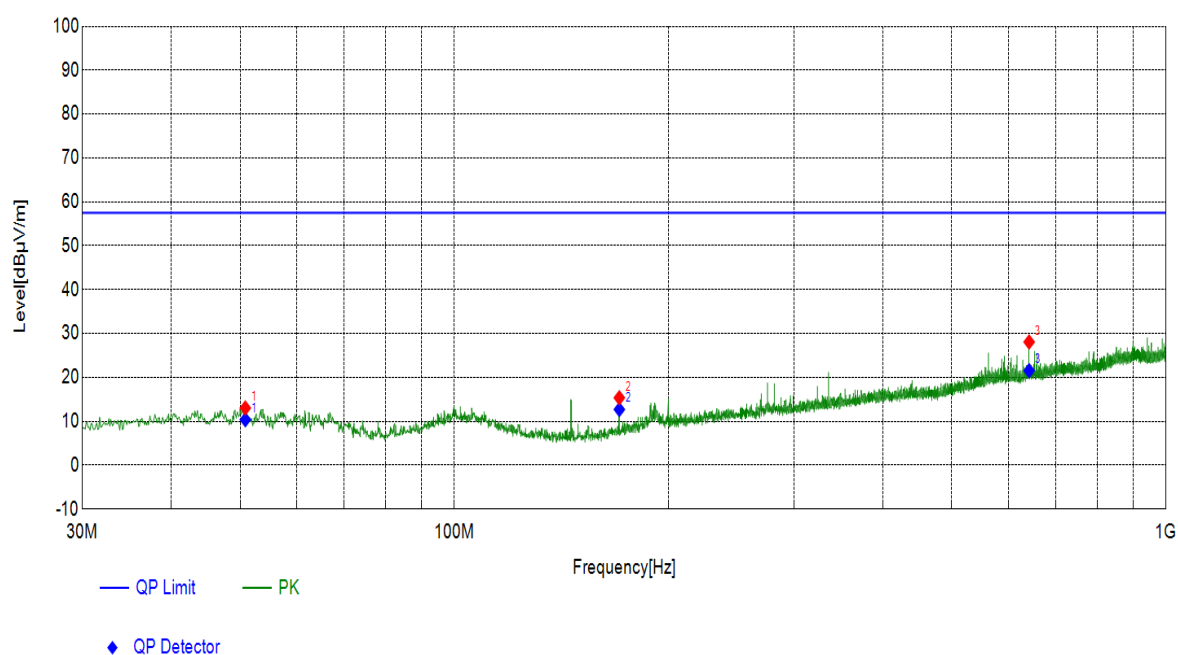
radiated emission						
Frequency [MHz]	Polarity	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]
0.0376	Y axis	40.78	57.50	16.72	200	350
0.0752	Y axis	39.37	57.50	18.13	200	80
0.1884	Y axis	40.29	57.50	17.21	200	140



SPURIOUS EMISSIONS 30MHz~1GHz:

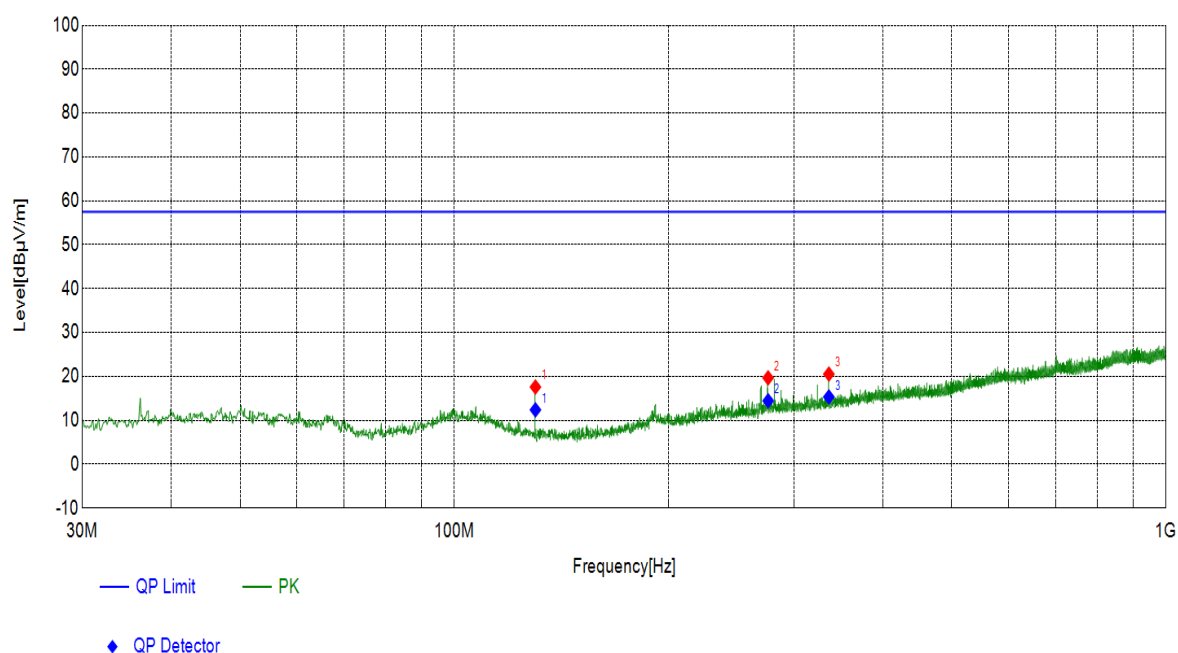
Radiated Emission	30MHz-1GHz
Polarity	Horizontal
Worst Case Operating Mode:	Measure blood oxygen parameters

radiated emission						
Frequency [MHz]	Polarity	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]
50.8571	Horizontal	10.37	57.50	47.13	123	192
170.5671	Horizontal	12.69	57.50	44.81	115	149
642.1312	Horizontal	21.55	57.50	35.95	150	16



Radiated Emission	30MHz-1GHz
Polarity	Vertical
Worst Case Operating Mode:	Measure blood oxygen parameters

radiated emission						
Frequency [MHz]	Polarity	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]
130.017	Vertical	12.37	57.50	45.13	154	117
276.0166	Vertical	14.45	57.50	43.05	220	270
335.9686	Vertical	15.32	57.50	42.18	180	275



Note: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain

6. Key components list

Key components relative with EMC performance				
Component	Manufacture	Type	Parameter	Certification
PCB	Shanghai Berry Electronic Tech Co., Ltd.	BM1000B_V 5.4	/	/
4G module	/	nRF9160	/	/

7. Measurement Equipment

Test Equipment	Type/Mode	Equipment No.	Manufacturer	Cal. Due
EMI Test Receiver	N9038A-508	EM-000396	Agilent	2022-03-05
Broadband Antenna(10m)	VULB 9163	EM-000381	SCHWARZBECK	2022-07-08
Loop Antenna	HLA 6121	EM-000546	TESEQ	2022-06-05
Semi-Anechoic Chamber(10m)	10m-SAC	EM-000460	Albatross	2024-06-30

The End