

FCC - TEST REPORT

Report Number	:	60.790.17.051.01R01	Date of Issue	: _	January 16, 2018
Model	:	VELIGEAR/PS-01			
Product Type	:	BLE SMART WATCH			
Applicant	:	DAYTON INDUSTRIAL	CO, LTD		
Address	:	11A, 2-12 KWAI FAT RC HONGKONG	DDA, KWAI CHUNG	, NE	W TERRITORIES,
Production Facility	:	Kendy Electronics(Dong	guan) Co, Ltd		
Address	:	Xingsi Huangtang Village Province, P.R. China	e, Hengli Town, Dor	iggu	ang City, Guangdong
Test Result	:	■Positive	□Negative		
Total pages including Appendices	:	58			

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2. Details about the Test Laboratory

Company name:

TUV SUD Cert & Testing (China) Co., Ltd. Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District Shenzhen 518052 P.R. China

Telephone:	86 755	8828 6998
Fax:	86 755	828 5299

FCC Registration No.:

514049

3. Description of Equipment Under Test

Description of the Equipment Under Test

Product:	BLE SMART WATCH
Model no.:	VELIGEAR/PS-01
FCC ID:	O4GDAVGEAR
Rating:	1) 3.7VDC (1 x 3.7VDC Rechargeable battery) 2) 5.0VDC (USB charging port)
Frequency:	2402MHz-2480MHz
Antenna gain:	0 dBi
Number of operated channel:	40
Modulation:	GFSK



4. Summary of Test Standards

lest Standards				
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES			
10-1-2016 Edition	Subpart C - Intentional Radiators			

All the test methods for BLE were according to 558074 D01 DTS Meas Guidance v04 DTS Measurement Guidance and ANSI C63.10 (2013).



5. Summary of Test Results

5.1. FCC Part 15 Subpart C - BLE

Emission Tests					
FCC Part 15 Subpart C					
Test Condition	Pages	Te	Test Result		
		Pass	Fail	N/A	
FCC Title 47 Part 15.205, 15.209 & 15.247(d) Spurious Radiated Emission	10-16	\square			
FCC Title 47 Part 15.207 Conduct Emission	17-19	\square			
FCC Title 47 Part 15.247(a)(2) 6dB & 99% Bandwidth	20-23	\square			
FCC Title 47 Part 15.247(b) Peak Output Power	24-27	\square			
FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals	28-31	\square			
FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges	32-36	\square			
FCC Title 47 Part 15.247(e) Power Spectral Density	37-40				
FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement	41	\square			



6. General Remarks

Remarks

Client informs that the PS-01 has the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with BLE SMART WATCH, VELIGEAR. The difference lies only on different color of the different models. (Client's conformation letter shown at appendix C)

EMC Tests were performed on model: VELIGEAR.

This submittal(s) (test report) is intended for FCC ID: O4GDAVGEAR complies with: Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules for the DTS grant

The TX and RX range is 2402MHz-2480MHz for the BLE.

SUMMARY:

- All tests according to the regulations cited on page 5 were

- Performed
- □ Not Performed

- The Equipment Under Test

■ - Fulfills the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: October 6, 2017

Testing Start Date: October 11, 2017

Testing End Date: January 16, 2018

- TUV SUD CERT & TESTING (CHINA) CO., LTD.-

Reviewed by:

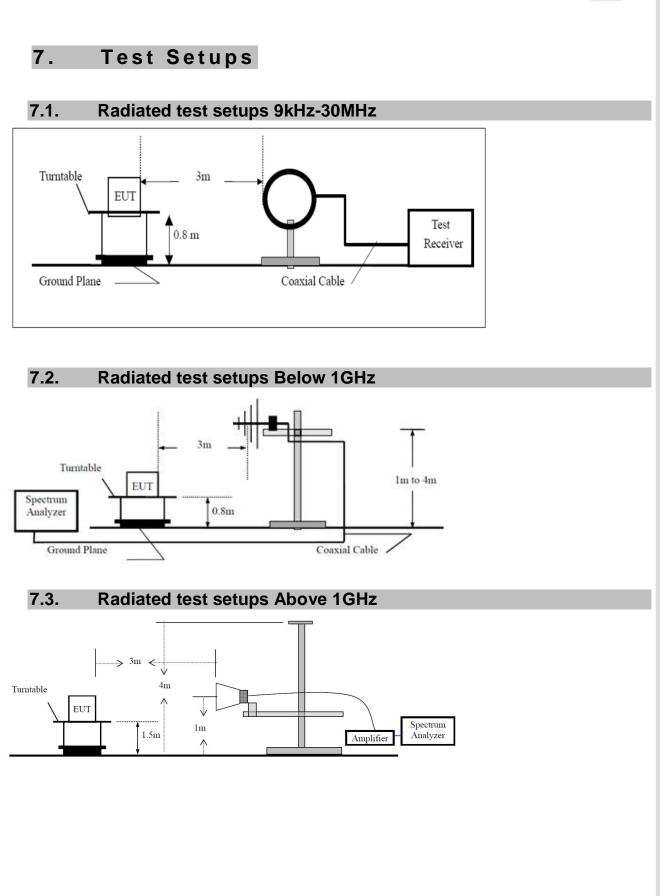
CHAN Kwong Ngai EMC Test Engineer

Prepared by:

Alex CHAN EMC Project Engineer

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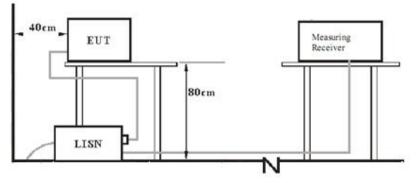
EMC_SZ_FR_23.05 FCC Release 2017-06-20 TUV SUD Cert & Testing (China) Co., Ltd. Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen 518052, P.R. China

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7.4.

AC Power Line Conducted Emission test setups



7.5. Conducted RF test setups

Measuring	EUT
Receiver	



8. Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTUR ER	MODEL NO.	S/N
Notebook	Lenovo	X240	/
Adapter	Apple	A1537	/

Test software: nRFgo test tool, which used to control the EUT in continues transmitting mode

The system was configured to channel 0, 19, and 39 for the test BLE mode

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power



9. Emission Test Results

9.1. Spurious Radiated Emission BLE

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.

3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above1GHz



 : Condition: Specification:	Test Result ☐ Passed ☐ Not Passed			
 omment: 3.7VDC emark: 9kHz to 25GHz				
Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
82.434	16.54	40	-23.46	Quasi Peak
180.942	19.68	43.5	-23.82	Quasi Peak
311.731	21.85	46	-24.15	Quasi Peak
876.271	31.83	46	-14.17	Quasi Peak
1234.687	27.16	54	-26.84	Peak

180.942	19.68	43.5	-23.82	Quasi Peak
311.731	21.85	46	-24.15	Quasi Peak
876.271	31.83	46	-14.17	Quasi Peak
1234.687	27.16	54	-26.84	Peak
2274.562	36.58	54	-17.42	Peak
4804.000	40.53	74	-33.47	Peak
4804.000	34.77	54	-19.23	Average
7206.094	38.66	74	-13.83	Peak
7206.094	36.71	54	-17.29	Average



EUT:VOp Condition:CTest Specification:FComment:3Remark:9

VELIGARE Operated, TX Mode (2402MHz) FCC15.205, 15.209 & 15.247(d) Antenna: Vertical 3.7VDC 9kHz to 25GHz

Test Result				
🛛 Passed				
Not Passed				

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
43.795	19.39	40	-20.61	Quasi Peak
83.188	22.54	40	-17.46	Quasi Peak
437.130	20.49	46	-25.51	Quasi Peak
874.493	31.26	46	-14.74	Quasi Peak
1254.563	28.33	54	-25.67	Peak
1769.500	28.22	54	-25.78	Peak
2314.563	37.06	54	-16.94	Peak
4804.000	41.55	74	-32.45	Peak
4804.000	37.98	54	-16.02	Average
7206.000	45.19	74	-13.83	Peak
7206.000	38.65	54	-15.35	Average



EUT: Op Condition: Test Specification:	VELIGARE Operated, TX Mode (2440MHz) FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal	Test Result
Comment: Remark:	3.7VDC 9kHz to 25GHz	

	1			
Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
38.468	19.66	40	-20.34	Quasi Peak
180.951	20.54	43.5	-22.96	Quasi Peak
287.898	20.12	46	-25.88	Quasi Peak
310.768	21.87	46	-24.13	Quasi Peak
1254.562	28.33	74	-45.67	Peak
1254.562	24.71	54	-29.29	Average
4880.000	40.88	74	-33.12	Peak
4880.000	37.42	54	-16.58	Average
7320.000	41.09	74	-13.83	Peak
7320.000	38.45	54	-15.55	Average



EUT:VELIGAREOp Condition:Operated, TX Mode (2440MHz)Test Specification:FCC15.205, 15.209 & 15.247(d) Antenna: VerticalComment:3.7VDCRemark:9kHz to 25GHz

Test Result	
🛛 Passed	
Test Result ☐ Passed ☐ Not Passed	

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
44.627	21.44	40	-18.56	Quasi Peak
108.605	15.15	43.5	-28.35	Quasi Peak
271.636	19.84	46	-26.16	Quasi Peak
425.051	22.37	46	-23.63	Quasi Peak
1262.375	30.36	74	-43.64	Peak
1262.375	23.86	54	-30.14	Average
4880.000	40.97	74	-33.03	Peak
4880.000	35.56	54	-18.44	Average
7320.000	44.06	74	-29.94	Peak
7320.000	39.15	54	-14.85	Average
12739.000	43.88	74	-30.12	Peak
12739.000	34.65	54	-19.35	Average

8772.654

8772.654

42.03

34.17



Spurious Radiated Emission BLE

	: Condition: Specification:	VELIGARE Operated, TX Mode (2480MHz) FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal			Test Result ☐ Passed ☐ Not Passed
Com Rem	iment: iark:	3.7VDC 9kHz to 25GH	3.7VDC 9kHz to 25GHz		
	MHz	dBµV/m	dBµV/m	dB	
	45.350	21.65	40	-18.35	Quasi Peak
	198.986	17.67	43.5	-25.83	Quasi Peak
	255.134	21.78	46	-24.22	Quasi Peak
	454.576	20.87	46	-25.13	Quasi Peak
	1254.563	28.33	74	-45.67	Peak
	1254.563	22.56	54	-31.44	Average
	4960.000	40.88	74	-33.12	Peak
	4960.000	35.76	54	-18.24	Average
	7440.000	43.24	74	-30.76	Peak
	7440.000	37.17	54	-16.83	Average

74

54

-31.97

-19.83

Peak

Average



EUT:VELIGAREOp Condition:Operated, TX Mode (2480MHz)Test Specification:FCC15.205, 15.209 & 15.247(d) Antenna: VerticalComment:3.7VDCRemark:9kHz to 25GHz

Test Result				
🛛 Passed				
Not Passed				

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
44.345	19.56	40	-20.44	Quasi Peak
112.675	17.35	43.5	-26.15	Quasi Peak
287.330	22.43	46	-23.57	Quasi Peak
543.250	21.05	46	-24.95	Quasi Peak
1259.750	30.02	74	-43.98	Peak
1259.750	24.18	54	-29.82	Average
4960.000	41.84	74	-32.16	Peak
4960.000	36.17	54	-17.83	Average
7440.000	45.65	74	-28.35	Peak
7440.000	41.17	54	-12.83	Average
13562.000	44.89	74	-29.11	Peak
13562.000	32.54	54	-21.46	Average



9.2. Conducted Emission

Test Method

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.107, conducted emissions limit as below:

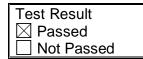
Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

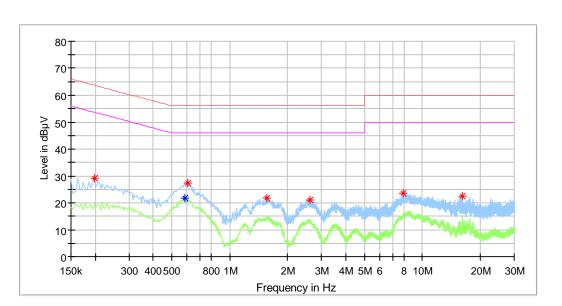
*Decreasing linearly with logarithm of the frequency



Conducted Emission BLE

EUT: Op Condition: Test Specification: Comment: VELIGEAR. Operated, Tx Mode FCC 15.207 Conduct Emission, L Line 120VAC, 60Hz (For external adaptor)





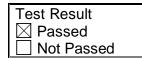
Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.198000	29.03		63.69	34.67
0.582000		21.64	46.00	24.36
0.606000	27.22		56.00	28.78
1.554000	21.75		56.00	34.25
2.598000	21.15		56.00	34.85
7.970000	23.64		60.00	36.36
16.170000	22.31		60.00	37.69

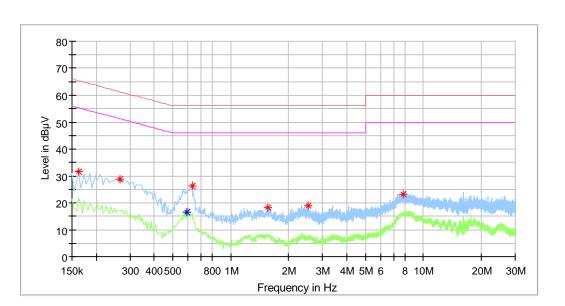
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Conducted Emission BLE

EUT: Op Condition: Test Specification: Comment: VELIGEAR. Operated, Tx mode FCC 15.207 Conduct Emission, N Line 120VAC, 60Hz (For external adaptor)





Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.162000	31.65		65.36	33.71
0.266000	28.61		61.24	32.63
0.590000		16.66	46.00	29.34
0.630000	26.41		56.00	29.59
1.554000	18.18		56.00	37.82
2.538000	18.85		56.00	37.15
7.910000	23.19		60.00	36.81

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9.3. 6dB & 99% Bandwidth BLE

Test Method

1. Use the following spectrum analyzer settings:

RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold 2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.

3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

≥500



6dB & 99% Bandwidth BLE

EUT: Op Condition: Test Specification: Comment:	VELIGARE Operated, TX Mo FCC15.247(a)(2), 6d 3.7VDC	de (2402MHz) IB Bandwidth & 99% Ba	Test Result ☐ Passed andwidth ☐ Not Passed
Spectrum	ר		
Ref Level 13.0	_		
Att	30 dB SWT 19 µs 🖷 VBW	/ 300 kHz Mode Auto FFT	
10 dBm		D1[1]	0.11 dB
10 080			677.30 kHz
-0 dBm D1	-0.110 dBm	Occ Bw	1.059334298 MHz -6.15 dBm
	-D2 -6.110 dBm		2.40166570 GHz
-10 dBm		T2	
	7	Y	
-20 dBm			
-30 dBm			
-40 dBm			
-+0 UBII			
-50 dBm			
-60 dBm			
-70 dBm			
-80 dBm			
CF 2.402 GHz		691 pts	Span 3.0 MHz

6dB bandwidth	Limit
677.300 kHz	>500 kHz

99% bandwidth
1015.334 kHz



6dB & 99% Bandwidth BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2440MHz) FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth 3.7VDC Test Result ☐ Passed ☐ Not Passed

Spectrun	n							
	13.00 dBm			BW 100 kH				
Att 1Pk Max	30 dB	SWT	19 µs 😑 V	'BW 300 kH	z Mode /	Auto FFT		
-					D	1[1]		0.04 dE
10 dBm					<u> </u>	1[1]	ſ	599.00 kH;
					0	cc Bw		68162 MH
0 dBm	D1 -1.420 c	Bm		~ ~	M	1[1]		-7.31 dBn
	D2Z	420 dBm	M1		\sim	01	2.439	64400 GH
-10 dBm	02 -77	+20 ubiii	T1/			T2		
			7			X		
-20 dBm			/					
		/						
-30 dBm								
		\sim					\sim	
-40 dBm								
~								
-50 dBm								~
-50 abiii								\sim
-60 dBm								
-60 aBm								
-70 dBm								
-80 dBm—								
CF 2.44 G	Hz			691	pts		Spa	n 3.0 MHz

6dB bandwidth	Limit
699.000 kHz	>500 kHz

99% bandwidth	
1041.968 kHz	

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6dB & 99% Bandwidth BLE

EUT: Op Conditi Test Speci Comment:			ed, TX Mo 47(a)(2), 60		180MHz) Iwidth & 99% I	Bandwidth	\triangleright	est Res Passe Not P	
	Spectrum	<u> </u>							
	Ref Level	13.00 dBm Offset	1.00 dB 😑 RB'	W 100 kHz				(.)	
	e Att	30 dB SWT	19 µs 🔵 VB	W 300 kHz	Mode Auto FFT				
	⊖1Pk Max								
	10 dBm				D1[1]		6	0.16 dB	
					Occ Bw			58162 MHz	
	O dBm——	D1 -0.840 dBm	M1	~~~~	M1[1]		2 470	-6.80 dBm 64400 GHz	
	-10 dBm	D2 -6.840 dBm	×		1		2.175	54400 0112	
	-10 UBIII		T1 V		T2				
	-20 dBm								
			Λ						
	-30 dBm								
							\sim		
	-40 dBm						\rightarrow		
	~								
	-50 dBm							$\rightarrow \sim$	
	-60 dBm								
	-70 dBm								
	-80 dBm								
	oo abiii								
	CF 2.48 GH	Iz		691 p	ts		Spa	1 3.0 MHz	

6dB bandwidth	Limit
699.000 kHz	>500 kHz

99% bandwidth	
1041.968 kHz	

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9.4. Conducted Peak Output Power BLE

Test Method

1. Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW,

- Sweep = auto, Detector function = peak, Trace = max hold
- 2. Add a correction factor to the display.

3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

Limits

Frequency Range	Limit	Limit
MHz	W	dBm
2400-2483.5	≤1	≤30



Conducted Peak Output Power BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2402MHz) FCC15.247(b) 3.7VDC, Antenna gain: 0 dBi, Cable Loss: 0.5dB Test Result ☐ Passed ☐ Not Passed

Att	25 dB	SWT	1 ms 😑 🗸	SW SMUS	Mode Aut	o Culoop		
1Pk Max	20 UD	3991	1 IIIS 👅 VI		Moue Aut	u sweep		
				M1	м	1[1]	2.401	1.26 dBn 168160 GH:
) dBm								
10 dBm								
20 dBm							~	
30 dBm —	/						1	
40 dBm								and the second s
50 dBm								w
60 dBm								
70 dBm								
80 dBm								

Date: 26.OCT.2017 16:12:43

Conducted Output Power	Limit
1.26dBm	30dBm



Conducted Peak Output Power BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2440MHz) FCC15.247(b) 3.7VDC, Antenna gain: 0 dBi, Cable Loss: 0.5dB Test Result
Passed
Not Passed

Spectrum Ref Level		Offset ().50 dB 👄 RI	BW 1 MHz					
Att	25 dB	SWT	1 ms 🖷 V		Mode Aut	o Sweep			
)1Pk Max									
				M1	м	1[1]	1	2.439	0.83 dBn 967440 GH:
) dBm									
10 dBm									
20 dBm									
30 dBm	J. C.								
40 dBm									No.
50 dBm									and a second
60 dBm									
70 dBm									
80 dBm									

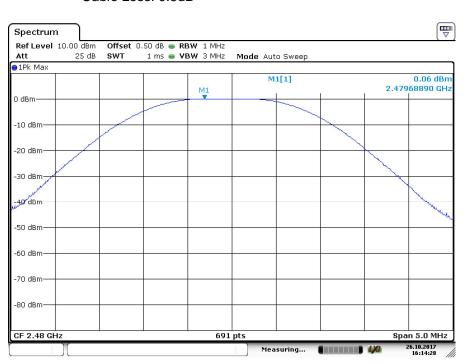
Date: 26.OCT.2017 16:14:06

Conducted Output Power	Limit
0.83dBm	30dBm



Conducted Peak Output Power BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2480MHz) FCC15.247(b) 3.7VDC, Antenna gain: 0 dBi, Cable Loss: 0.5dB Test Result
Passed
Not Passed



Date: 26.OCT.2017 16:14:28

Conducted Output Power	Limit
0.06dBm	30dBm



9.5. Spurious Emissions at Antenna Terminals BLE

Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 3. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

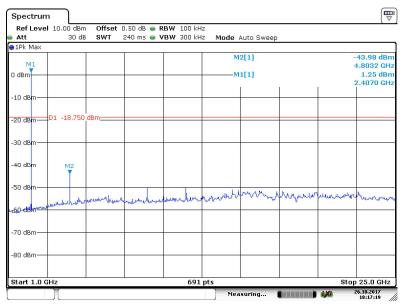


Spurious Emissions at Antenna Terminals BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2402MHz) FCC2.1051 & 15.247(d) 3.7VDC Test Result Passed Not Passed

-70 dBm	
0 dBm M1[1] 0 dBm -10 dBm -20 dBm 01 -18.750 dBm -30 dBm	
0 dBm -10 dBm -20 dBm -20 dBm -30 dBm -40 dBm -40 dBm -50 dBm -70 d	
-10 dBm	-57.02 dBr 849.10 MH
-20 dBm 01 -18.750 dBm	
-30 dBm -30 dBm -50 dBm -50 dBm -70 dBm	
-40 dBm -50 dBm -50 dBm -70 dBm	
50 dBm	
59 Blann na orde the mutaneous and a standard and the stand	
70 dBm	M1
	alunting the market
80 dBm	
Start 30.0 MHz 691 pts	

Date: 26.OCT.2017 18:18:00



Date: 26.OCT.2017 18:17:19

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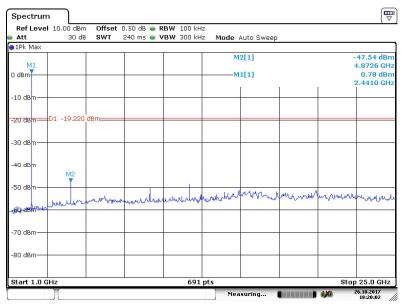
Spurious Emissions at Antenna Terminals BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2440MHz) FCC2.1051 & 15.247(d) 3.7VDC

Test Result				
🛛 Passed				
Not Passed				

	10.00 dBm		0.50 dB 😑 R						
Att	30 dB	SWT	9.7 ms 😑 🖌	/BW 300 kH	z Mode	Auto Sweep			
1Pk Max					м	1[1]			-57.12 dBm 645.50 MHz
) dBm									
10 dBm									
20 dBm	D1 -19.220	dBm====							
-30 dBm									
-40 dBm									
-50 dBm						M1			
60. dBm-++	muchidentun	-	Harright	www.www.wah	and the second second		houtomation	and the second states of the	Munurud
-70 dBm									
-80 dBm									<u> </u>
Start 30.0	MHz			691	pts			Ste	op 1.0 GHz

Date: 26.OCT.2017 18:21:36



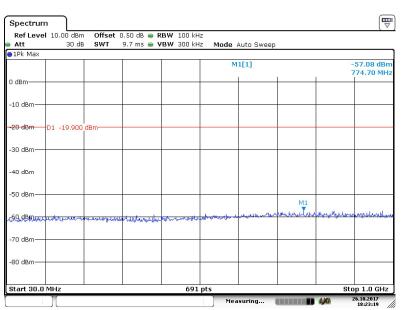
Date: 26.0CT.2017 18:20:02

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Spurious Emissions at Antenna Terminals BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2480MHz) FCC2.1051 & 15.247(d) 3.7VDC Test Result ☐ Passed ☐ Not Passed



Date: 26.OCT.2017 18:23:19

Att 30	dB SWT	240 ms 👄 🖌	BW 300 kH	z Mode	Auto Sweep			
1Pk Max								
				M	2[1]			-43.42 dBn
				M	1[1]		1:	2.4100 GH: 0.10 dBn
o ubili					111			2.4760 GH
					1			
-10 dBm								
-20 dBm D1 -19.9	00 dBm							
-30 dBm	-							
-40 dBm			M2					
-50 dBm					A. 8 & . 1	h		
. entre	manth	monumban	www.who	montenanta	and a ment	mound	womented	munulan
+60-etBhatelen							-	-
-70 dBm								
-80 dBm	_							
Start 1.0 GHz			691					25.0 GHz

Date: 26.OCT.2017 18:22:31

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9.6. 100kHz Bandwidth of band edges BLE

Test Method

- 1 Use the following spectrum analyzer settings:
 - Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.



EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2402MHz) FCC15.247(d), Conducted 3.7VDC

Test Result Passed Not Passed

Spectrum							
Ref Level		m Offset 0.50 dB					(•)
Att	30 d		VBW 300 kHz	Mode Auto Sw	een		
1Pk Max							
				M1[1]			1.12 dBm
0.10						2.	401770 Hz
0 dBm				M2[1]			-54.61 dBm
-10 dBm						2.	400000 GHz
-10 0800							\square
-20 dBm0	01 -18.880	0 dBm					
-20 0811							
-30 dBm							
-30 dbiii							111
-40 dBm							
10 abiii							
-50 dBm							100
						МЗ	I N
69.dBm	-	www. the west www. and west	- Antonio Caroly on	with the second s	around and and	action of the second	police the the
-70 dBm							
-80 dBm							
Start 2.31 (Hz		691 pts			Ston	2.405 GHz
Marker			551 pt3				2.100 012
Type Ref	Trc	X-value	Y-value	Function	Fun	ction Resu	It 1
M1	1	2.40177 GHz	1.12 dBm	- unction	rum	Alon Kesu	<u>n</u>
M2	1	2.4 GHz	-54.61 dBm				
M3	1	2.39 GHz	-60.55 dBm				
	Π			Measuring		170	26.10.2017

Date: 26.OCT.2017 18:26:00

Band edges	Limit
55.73 dB	> 20dB



EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2402MHz) FCC15.247(d), Radiated 3.7VDC Test Result ☐ Passed ☐ Not Passed

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
2390.000	40.14	74	-33.86	Peak
2390.000	34.45	54	-19.55	Average



EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2480MHz) FCC15.247(d), Conducted 3.7VDC Test Result ⊠ Passed □ Not Passed

Spectrum	'n								
Ref Leve			-						
Att	30	dB SWT 75.9	µs 👄 VB	W 300 kHz	Mode /	Auto FF	Г		
M1					М	1[1]		2.47	0.20 dBm 96980 GHz
0 dBm					M	2[1]		-1	60.28 dBm 35000 GHz
-10 dBm									
-20 dBm -30 dBm	D1 -19.9	00 dBm							
-30 dBm	٦								
-50 dBm-	1								
-60 dBm	har	MP		un and a			мв		
00 00.00		- mar mar and	minin	man my	month and a second	- moure	when	munun	-www.
-70 dBm									
-80 dBm									
Start 2.47	7 GHz			691 p	ıts			Stop	2.51 GHz
Marker									
Type Re	f Trc	X-value		/-value	Func	tion	Fun	ction Result	
M1	1	2.479698 0		0.20 dBm					
M2 M3	1	2.4835 0 2.5 0		-60.28 dBm -61.39 dBm					
)(Mea	suring		2 ()	6.10.2017 18:24:51

Date: 26.OCT.2017 18:24:51

Band edges	Limit
60.48 dB	> 20dB



EUT:
Op Condition:
Test Specification:
Comment:

VELIGARE Operated, TX Mode (2480MHz) FCC15.247(d), Radiated 3.7VDC

Test Result	
🛛 Passed	
Not Passed	

Frequency	Result	Limit	Margin	Detector
MHz	dBµV/m	dBµV/m	dB	
2483.500	43.43	74	-30.57	Peak
2483.500	36.71	54	-17.29	Average



9.7. Power Special Density BLE

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

- 1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
- 2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]

≤8

Test result

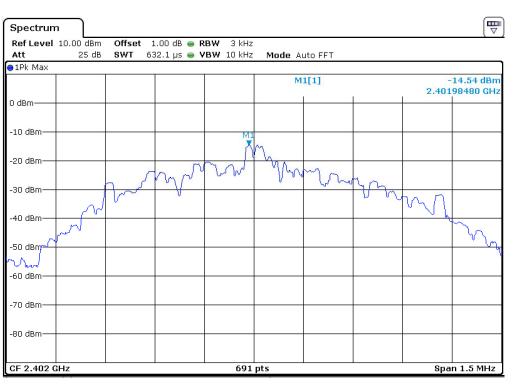
	Power spectral	
Frequency	density	Result
MHz	dBm	
Top channel 2402MHz	-14.54	Pass
Middle channel 2440MHz	-13.28	Pass
Bottom channel 2480MHz	-12.60	Pass



Power Spectral Density BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2402MHz) FCC15.247(e) 3.7VDC

Test Result Passed Not Passed



PSD	Limit
-14.54 dBm	< 8 dBm

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Power Spectral Density BLE

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2440MHz) FCC15.247(e) 3.7VDC

Test Result Passed Not Passed

Spectrun	1								
	10.00 dBm	Offset 1	.00 dB 🔵 R	BW 3 kHz					(*)
Att	25 dB			' BW 10 kHz	Mode At	uto FFT			
●1Pk Max									
					М	1[1]			13.28 dBm 02600 GHz
0 dBm									
-10 dBm—				~	M1				
-20 dBm			n	m	MAR				
-30 dBm		7-5	my		v vu	r fra	Ym	~	
-40 dBm	~	Ŷ					ν ω	M	
. r	\sim								"hy
-50 dBm									Ĩ
-60 dBm									
-70 dBm									
-80 dBm									
CF 2.44 Gł	ΗZ			691	pts			Spa	n 1.5 MHz 🍃

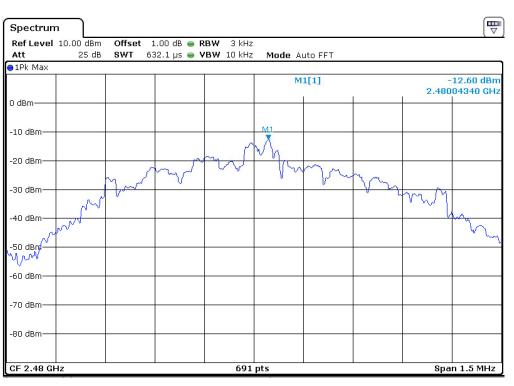
PSD	Limit
-13.28 dBm	< 8 dBm



Power Special Density

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode (2480MHz) FCC15.247(e) 3.7VDC

Test Result Passed Not Passed



PSD	Limit
-12.60 dBm	< 8 dBm



9.8. Antenna Requirement

EUT: Op Condition: Test Specification: Comment: VELIGARE Operated, TX Mode FCC15.203 & 15.247(b) 3.7VDC

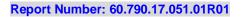
Test Result			
🛛 Passed			
Not Passed			

Limit

For intentional device, according to FCC Title 47 Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC Title 47 Part 15.247(b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The antenna used in this product is PCB antenna, and the maximum gain of this antenna is 0.0 dBi.











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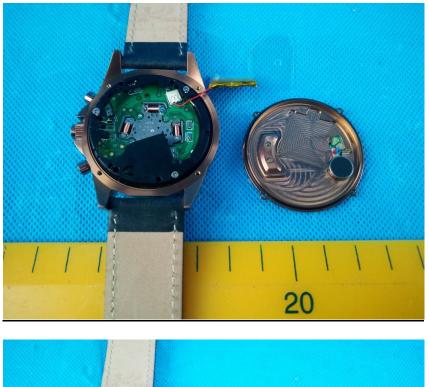




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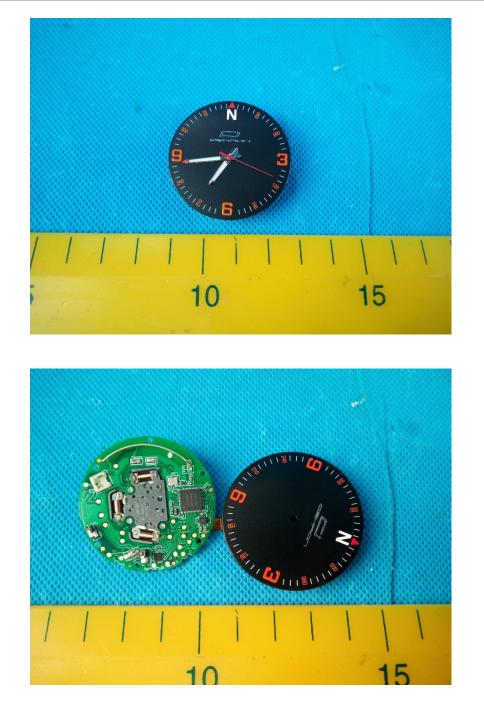




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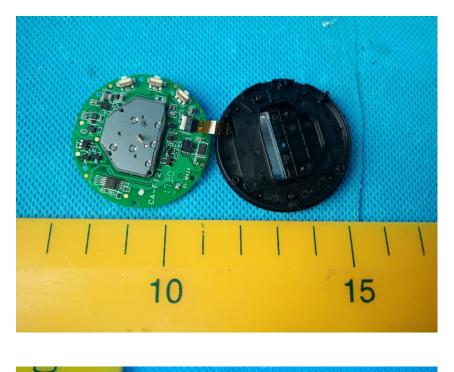


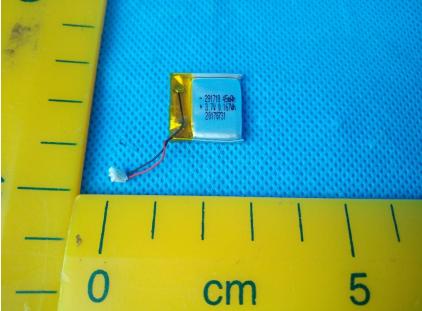


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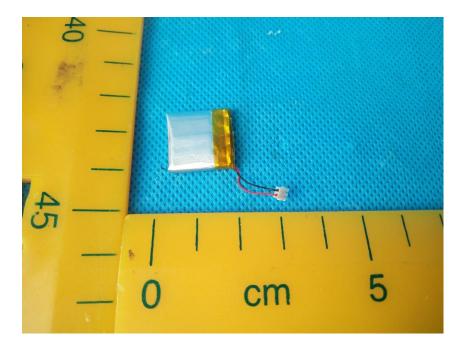




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Appendix B



Conducted Emission



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Appendix B

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Min. No. of Hopping Frequencies, Min. Hopping Channel Carrier Frequency Separation, Average Time of Occupancy





12. Appendix C - General Product Information

Radiofrequency radiation exposure evaluation

According to KDB 447498 D01v06 section 4.3.1, For frequencies between 100 MHz to 6GHz and test separation distances \leq 50 mm, the Numeric threshold is determined as:

Step a)

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] $\cdot [\sqrt{f(GHz)}] \le 3.0$ for 1-g SAR

>> The fundamental frequency of the EUT is 2402-2480MHz, the test separation distance is ≤ 50mm. (Manufacturer specified the separation distance is: 5mm)

Step b)

- >> Numeric threshold (2402MHz), mW / 5mm * $\sqrt{2.402GHz} \le 3.0$ Numeric threshold (2402MHz) ≤ 38.713 mW
- >> Numeric threshold (2440MHz), mW / 5mm * $\sqrt{2.440}$ GHz \leq 3.0 Numeric threshold (2440MHz) \leq 38.411mW
- >> Numeric threshold (2480MHz), mW / 5mm * $\sqrt{2.480GHz} \le 3.0$ Numeric threshold (2480MHz) ≤ 38.100 mW
- >> The power of EUT measured (2402MHz) is: 1.26dBm = 1.337mW The power of EUT measured (2440MHz) is: 0.83dBm = 1.211mW The power of EUT measured (2480MHz) is: 0.06dBm = 1.014mW

Which is smaller than the Numeric threshold. Therefore, the device is exempt from stand-alone SAR test requirements.



Appendix C



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file: declaration letter-template

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13. Test Equipment Site List

Radiated emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-14
Loop Antanne	Rohde & Schwarz	HFG2-Z2	335471152	2018-7-14
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2018-7-7
Attenuator	Agilent	8491A	MY39264334	2018-7-7
3m Semi-anechoic chamber	TDK	9X6X6		2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2018-7-14
LISN	Rohde & Schwarz	ENV4200	100249	2018-7-14
LISN	Rohde & Schwarz	ENV432	101318	2018-7-14
LISN	Rohde & Schwarz	ENV216	100326	2018-7-14
ISN	Rohde & Schwarz	ENY81	100177	2018-7-14
ISN	Rohde & Schwarz	ENY81-CA6	101664	2018-7-14
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2018-7-14
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2018-7-14
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2018-7-7
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Power Spectral Density

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2018-7-7
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-7
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2018-7-7
RF Switch Module	Rohde & Schwarz	OSP120/OSP- B157	101226/100851	2018-7-7



14. Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty			
Items	Extended Uncertainty		
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.54dB		
Uncertainty for Radiated Emission in 3m chamber	Horizontal: 4.83dB;		
30MHz-1000MHz	Vertical: 4.91dB;		
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;		
Uncertainty for Conducted RF test	2.04dB		