
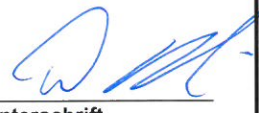


<b>Prüfbericht - Nr.:</b> 14041727 001		<b>Seite 1 von 14</b>	
<i>Test Report No.:</i>		<i>Page 1 of 14</i>	
<b>Auftraggeber:</b> <i>Client:</i>		EMES Smart Devices Limited Rm 8, 5/F, Sunbeam Centre 27 Shing Yip St, Kwun Tong Hong Kong	
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>		Bluetooth Low Energy Watch	
<b>Bezeichnung:</b> <i>Identification:</i>	Please refer to multiple models on page 3	<b>Serien-Nr.:</b> <i>Serial No.:</i>	Engineering sample
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	A000262929-001, A000260125-001	<b>Eingangsdatum:</b> <i>Date of Receipt:</i>	06.10.2015, 26.09.2015
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of test item at delivery:</i>		Test sample(s) is/are not damaged and suitable for testing.	
<b>Prüfort:</b> <i>Testing Location:</i>		Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong	
<b>Prüfgrundlage:</b> <i>Test Specification:</i>		FCC Part 15 Subpart C ANSI C63.10-2013	
<b>Prüfergebnis:</b> <i>Test Results:</i>		Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.  The above mentioned product was tested and <b>passed</b> .	
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>		TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong	
<b>geprüft/ tested by:</b>		<b>kontrolliert/ reviewed by:</b>	
12.11.2015 Hugo Wan Senior Project Manager		12.11.2015 Sharon Li Department Manager	
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Unterschrift</b> <i>Signature</i>
			
<b>Sonstiges / Other Aspects:</b> FCCID: 2AFXM-000002			
<b>Abkürzungen:</b> P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet		<b>Abbreviations:</b> P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested	
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

## Table of Content

	Page
<b>Cover Page .....</b>	<b>1</b>
<b>Table of Content .....</b>	<b>2</b>
<b>Product information .....</b>	<b>3</b>
Manufacturers declarations.....	3
Product function and intended use .....	3
Submitted documents .....	4
Remark.....	4
Independent Operation Modes .....	5
Related Submittal(s) Grants .....	5
<b>Test Set-up and Operation Mode.....</b>	<b>6</b>
Principle of Configuration Selection .....	6
Test Operation and Test Software .....	6
Special Accessories and Auxiliary Equipment .....	6
Countermeasures to achieve EMC Compliance .....	6
<b>Test Methodology .....</b>	<b>7</b>
Radiated Emission.....	7
Field Strength Calculation .....	7
<b>List of Test and Measurement Instruments.....</b>	<b>8</b>
<b>Results FCC Part 15 – Subpart C .....</b>	<b>9</b>
Subclause 15.203 – Antenna Information.....	Pass .....9
Subclause 15.204 – Antenna Information.....	Pass .....9
Subclause 15.207 – Disturbance Voltage on AC Mains .....	N/A.....9
FCC 15.247 (a)(2) – 6dB Bandwidth Measurement.....	Pass .....10
FCC 15.247 (b) (1), (3) – Maximum Peak Output Power .....	Pass .....10
FCC 15.247 (d) – Spurious Conducted Emissions .....	Pass .....11
FCC 15.247 (d) – Radiated Spurious Emissions .....	Pass .....12
FCC 15.247 (d) – Band Edge Emissions (Conducted).....	Pass .....13
FCC 15.247 (e) – Power Spectral Density .....	Pass .....14
<b>Appendix 1 – Test protocols .....</b>	<b>14 pages</b>
<b>Appendix 2 – Test setup .....</b>	<b>2 pages</b>
<b>Appendix 3 – Photo documentation .....</b>	<b>9 pages</b>
<b>Appendix 4 – Product documentation .....</b>	<b>14 pages</b>
<b>Appendix 5 – Radio Frequency Exposure.....</b>	<b>2 pages</b>

## Product information

### Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK / FHSS
Number of channels	40
Channel separation	2 MHz
Type of antenna	Chip antenna
Antenna gain (dBi)	0.5
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	V <sub>nor</sub> : 3.0 VDC
Independent Operation Modes	Bluetooth communication

### Product function and intended use

The Equipment Under Test (EUT) is a Bluetooth Low Energy watch which is powered by battery. It can be connected to Bluetooth enabled smart phone and transfer information to smart phone for data collection.

For details, please refer to the user manual.

### Multiple models

The manufacturer declares that the EUT has 5 models as listed in the below table. They are all identical in electrical including schematics, PCB layout and components used except the model number and housing color only.

Due to the manufacturer declaration of equivalence, the model 9328-002 was provided by client as a representative for testing and construction photo taking.

#### FCCID: 2AFXM-000002

Models
9328-002
9328-004
9328-007
9328-009
SMARTL1

[www.tuv.com](http://www.tuv.com)

### Submitted documents

Circuit Diagram  
Block Diagram  
Bill of material  
User Manual  
Label Artwork

### Remark

--

## **Independent Operation Modes**

The basic operation modes are:

- Radio communication link maintained with data transfer.

For further information refer to User Manual

## **Related Submittal(s) Grants**

This is a single application for certification of the transmitter.

## Test Set-up and Operation Mode

### Principle of Configuration Selection

**Emission:** The EUT was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### Test Operation and Test Software

Test operation should refer to test methodology.

- 1) The EUT was powered by the button cell.
- 2) A control software provided by client was used on laptop computer to control the transmission frequencies 2402, 2440 and 2480MHz. at highest RF output power and longest burst time.

### Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessory:

nil

### Countermeasures to achieve EMC Compliance

nil

## Test Methodology

### Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.10-2013.

For emission measurement at or below 1GHz, the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For emission testing above 1GHz, the EUT was placed at the middle of 1.5m height turntable. In above two measurement, the turntable is 3 meters far from the measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

### Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.  
R = Reading of Spectrum Analyzer in dBuV.  
AF = Antenna Factor in dB.  
CF = Cable Attenuation Factor in dB.  
FA = Filter Attenuation Factor in dB.  
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

## List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC Registration number: 90656)

### Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	14 Apr 2015	14 Apr 2016
Cable	Hubersuhner	SUCOFLEX 104	72799 /6	31 Mar 2014	31 Mar 2016
Test Receiver	R & S	ESU26	100050	12 Feb 2015	12 Feb 2016
Bi-conical Antenna	R & S	HK116	100241	01 Sep 2015	01 Sep 2017
Log Periodic Antenna	R & S	HL223	841516/017	01 Sep 2015	01 Sep 2017
Coaxial cable	Harbour	LL335	N/A	10 Jun 2014	10 Jun 2016
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	17 Jul 2014	17 Jul 2016
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	28 Oct 2013	28 Dec 2015
Horn Antenna	EMCO	3115	9002-3347	26 Aug 2015	26 Aug 2017
Active Loop Antenna	EMCO	6502	9107-2651	15 Aug 2015	15 Aug 2016
Spectrum Analyzer	Rohde & Schwarz	FSP30	100007	13 Jan 2015	13 Jan 2017



## Results FCC Part 15 – Subpart C

<b>Subclause 15.203 – Antenna Information</b>		<b>Pass</b>
<b>FCC Requirement:</b> No antenna other than that furnished by the responsible party shall be used with the device		
<b>Results:</b>	Permanent attached antenna	
<b>Verdict:</b>	Pass	

<b>Subclause 15.204 – Antenna Information</b>		<b>Pass</b>
<b>FCC Requirement:</b> Provide information for every antenna proposed for the use with the EUT		
<b>Results:</b>		
	a) Antenna type:	Chip Antenna
	b) Manufacturer	Johanson Technology
	c) Model no:	2450AT18B100
	d) Gain with reference to an isotropic radiator:	0.5 dBi
<b>Verdict:</b>	Pass	

<b>Subclause 15.207 – Disturbance Voltage on AC Mains</b>		<b>N/A</b>
There is no AC mains power port on EUT. Hence this test is not applicable.		

FCC 15.247 (a)(2) – 6dB Bandwidth Measurement				Pass
<b>FCC Requirement:</b> Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.				
Test Specification : KDB 558074 D01 DTS Meas Guidance v03r02 Mode of operation : BLE Tx mode, (2402MHz, 2440MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100KHz/ 300KHz Supply voltage : 3.0 VDC from DC power supply Temperature : 23°C Humidity : 50%				
<b>Results:</b> For test protocols please refer to Appendix 1, page 2-3.				
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (MHz)	
2402	2401.646	2402.342	0.696	
2440	2439.652	2440.336	0.684	
2480	2479.646	2480.336	0.690	

FCC 15.247 (b) (1), (3) – Maximum Peak Output Power						Pass
<b>FCC Requirement:</b> For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)						
Test Specification : KDB 558074 D01 DTS Meas Guidance v03r02 Mode of operation : BLE Tx mode, (2402MHz, 2440MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : ≥ DTS BW / ≥ 3xRBW Span : ≥ 3 x RBW Supply voltage : 3.0 VDC from DC power supply Temperature : 23°C Humidity : 50%						
<b>Results:</b> For test protocols please refer to Appendix 1, page 4-5.						
Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict	
2402	-13.43	1.5	-11.93	1 / 30.0	Pass	
2440	-16.21	1.5	-14.71	1 / 30.0	Pass	
2480	-18.28	1.5	-16.78	1 / 30.0	Pass	

FCC 15.247 (d) – Spurious Conducted Emissions					Pass
Test Specification : KDB 558074 D01 DTS Meas Guidance v03r02 Mode of operation : Tx mode (2402MHz, 2440MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.0 VDC from DC power supply Temperature : 23 °C Humidity : 50 %					
<b>FCC Requirement:</b> In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
<b>Results:</b> All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1, page 6-11.					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	3064.980	-53.73	-12.20	-41.53	Pass
2440	0.0355	-54.28	-14.96	-39.32	Pass
	2987.160	-43.67	-14.69	-28.98	Pass
2480	0.0355	-52.75	-17.14	-35.61	Pass
	3661.600	-44.00	-17.14	-26.86	Pass

FCC 15.247 (d) – Radiated Spurious Emissions		Pass
Test Specification	: ANSI C63.10 – 2013	
Mode of operation	: Tx mode (2402MHz, 2440MHz, 2480MHz), hopping off	
Port of testing	: Enclosure	
Detector	: Peak	
RBW/VBW	: 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz	
Measurement range	: 9kHz to 25GHz	
Supply voltage	: 3.0 VDC from battery	
Temperature	: 23°C	
Humidity	: 50%	
<b>FCC Requirement:</b> In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).		
<b>Results:</b>	Pre-scan has been conducted to determine the worst-case mode from all possible combinations in available packet length.  All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.	
Tx frequency 2402MHz Vertical Polarization		
Freq MHz	Level dBµV/m	Limit/ Detector dBµV/m
2356.026	46.48	74.0 / P
4804.128	57.23	74.0 / P
4804.000	47.28	54.0 / A
Tx frequency 2402MHz Horizontal Polarization		
Freq MHz	Level dBµV/m	Limit/ Detector dBµV/m
2372.948	46.57	74.0 / P
Tx frequency 2440MHz Vertical Polarization		
Freq MHz	Level dBµV/m	Limit/ Detector dBµV/m
4879.696	56.95	74.0 / P
4880.000	46.98	54.0 / A
Tx frequency 2440MHz Horizontal Polarization		
Freq MHz	Level dBµV/m	Limit/ Detector dBµV/m
4880.096	55.54	74.0 / P
4880.032	43.68	54.0 / A

Tx frequency 2480MHz		Vertical Polarization	
Freq MHz	Level dBμV/m	Limit/ Detector dBμV/m	
2493.389	46.60	74.0 / P	
4959.487	55.89	74.0 / P	
4959.903	43.39	54.0 / A	
Tx frequency 2480MHz		Horizontal Polarization	
Freq MHz	Level dBμV/m	Limit/ Detector dBμV/m	
2489.238	47.07	74.0 / P	

FCC 15.247 (d) – Band Edge Emissions (Conducted)				Pass	
Test Specification : KDB 558074 D01 DTS Meas Guidance v03r02 Mode of operation : BLE Tx mode (2402MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.0 VDC from DC power supply Temperature : 23°C Humidity : 50%					
FCC Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
Results:		The peak found outside any 100 kHz bandwidth of the operating frequency band comply with the requirement. For test protocols refer to Appendix 1, page 12.			
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	2399.940	-56.76	-12.20	-44.56	Pass
2480	2483.520	-61.27	-17.14	-44.13	Pass

<b>FCC 15.247 (e) – Power Spectral Density</b>			<b>Pass</b>
<b>FCC Requirement:</b> For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.			
Test Specification : KDB 558074 D01 DTS Meas Guidance v03r02 Mode of operation : BLE Tx mode (2402MHz, 2440MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : $\geq 100$ kHz / $\geq 3 \times$ RBW span : $\geq 1.5 \times$ DTS BW Supply voltage : 3.0 VDC from DC power supply Temperature : 23°C Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1, page 13-14.			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2402	-12.20	8.0	Pass
2440	-14.96	8.0	Pass
2480	-17.14	8.0	Pass