Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14046936 001**		**Seite 1 von 16** *Page 1 of 16*
Auftraggeber: *Client:*	**EMES Smart Device Ltd.** **RM 8, 5/F, Sunbeam Centre** **Shing Yip St., Kwun Tong** **Hong Kong**		
Gegenstand der Prüfung: *Test Item:*	**Bluetooth Low Energy Smartwatch**		
Bezeichnung: *Identification:*	**Refer to "Models" on Page 4**	**Serien-Nr.:** *Serial No.:*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000459848-004**	**Eingangsdatum:** *Date of Receipt:*	**19.11.2016**
Prüfort: *Testing Location:*	**TÜV Rheinland Hong Kong Ltd.** 3/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong **Hong Kong Productivity Council** HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong		
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of test item at delivery:*	Test samples are not damaged and suitable for testing.		
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **ANSI C63.10-2013**		
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.** 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong		

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
15.02.2017	Kevin Wong Project Manager		15.02.2017	Benny Lau Senior Project Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges:
Other Aspects

FCC ID: 2AFXM-000003

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	40
Channel separation	2 MHz
Type of antenna	Integral Chip Antenna
Antenna gain (dBi)	0.5 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	Yes
Nominal voltage	3VDC
Independent Operation Modes	Transmitting

Product function and intended use

The equipment under test (EUT) is a smart watch with Bluetooth Low Energy Transceiver operating at 2.4GHz. It is used to link up with smartphone Apps to syncs time with the smartphone.

The manufacturer declares that the EUT has 9 models as listed in the below table. They are all identical in electrical including schematics, PCB layouts and components used except the housing color and model number only.

FCC ID: 2AFXM-000003

Models	**Product description**
70142-004(9373-009), 70142-077(9373-007), 70142-262(9373-008), 70142-222(9373-005), 70142-227(9373-006), 70142-807(9373-010), 70142-809(9373-011), 70142-604(9373-013)	Smartwatch

Submitted documents

Circuit Diagram
Block Diagram
Technical Description
User manual
Label
Bill of material

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

Related Submittal(s) Grants

None

Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The equipment under test (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.

- During test, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer. The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- None

Test Methodology

Radiated Emission

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

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and 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:

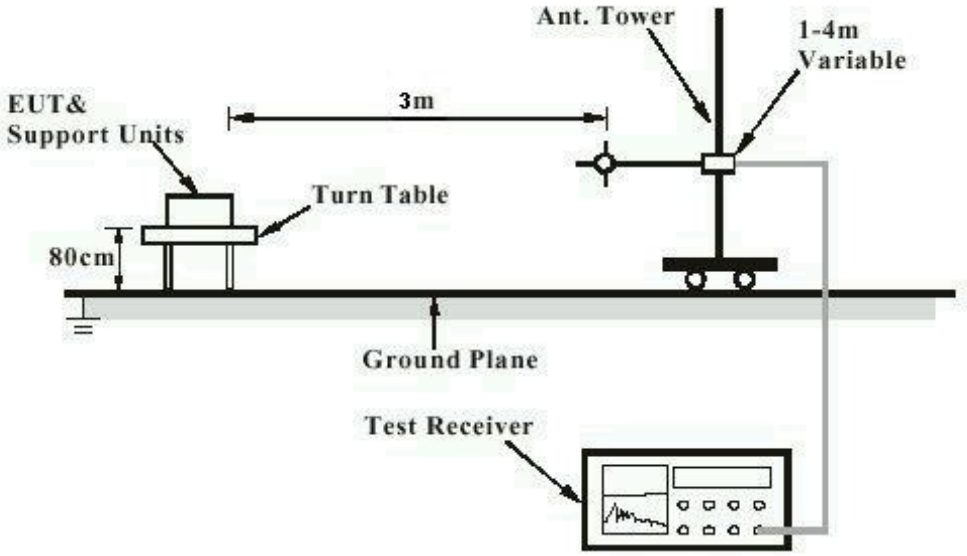
FS = R + AF + CF + FA – PA

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.

Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)

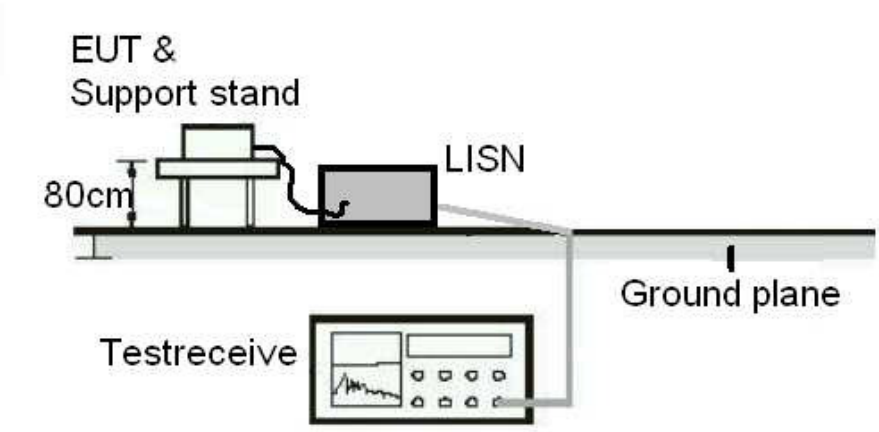
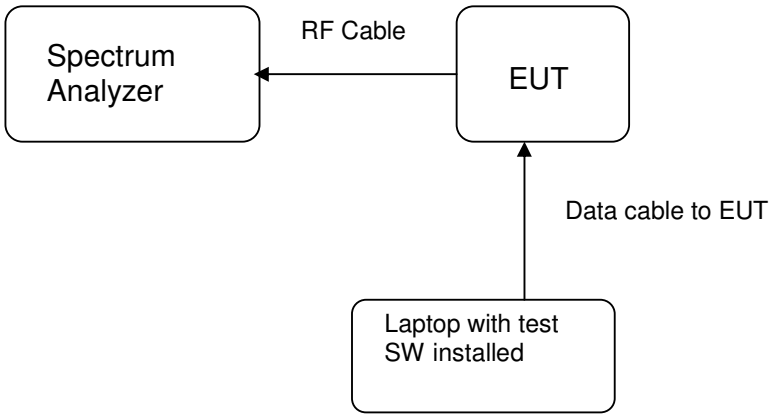


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC Registration number: 90656)

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	25-Apr-16	25-Apr-17
New Fully Ancheonic Chamber	TDK	N/A	19-Apr-16	19-Apr-17
Cable	Hubersuhner	SUCOFLEX 104	31-Mar-16	31-Mar-18
Test Receiver	R & S	ESU40	26-Jul-16	26-Jul-17
Bi-conical Antenna	R & S	HK116	1-Sep-15	1-Sep-17
Log Periodic Antenna	R & S	HL223	1-Sep-15	1-Sep-17
Coaxial cable	Harbour	LL335	10-Jun-16	10-Jun-18
Microwave amplifer 0.5-26.5GHz, 25dB gain	HP	83017A	18-Jul-16	18-Jul-18
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	28-Oct-15	28-Oct-17
Horn Antenna	EMCO	3115	26-Aug-15	26-Aug-17
Active Loop Antenna	EMCO	6502	27-Oct-16	27-Oct-17

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Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	16-Oct-16	15-Oct-17

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is ±3.43dB.

The estimated combined standard uncertainty for radiated emissions measurements is ±5.10dB (30MHz to 200MHz) and ±5.08dB (200MHz to 1000MHz) and is ±5.10dB (30MHz to 200MHz) and ±5.08dB (above 1GHz).

The estimated combined standard uncertainty for antenna conducted emission is ±1.56dB

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for the level of confidence is approximately 95%.

Results FCC Part 15 – Subpart C

FCC 15.203 – Antenna Requirement 1		**Pass**
FCC Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	a) Antenna type: b) Manufacturer and model no: c) Peak Gain:	Integral Chip antenna Johanson Technology 2450AT18B100 0.5 dBi
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2	**N/A**
FCC Requirement:	An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.
Results:	Only one integral antenna can be used.
Verdict:	N/A

FCC 15.207 – Conducted Emission on AC Mains	**N/A**
There is no AC power input or output ports on the EUT.	

FCC 15.247 (a)(2) – 6dB Bandwidth Measurement	**Pass**
FCC Requirement:	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 : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Supply voltage : 3.0VDC Temperature : 23ºC Humidity : 50%	
Results:	For test protocols please refer to Appendix 1

Channel frequency (MHz)	**6 dB left (MHz)**	**6 dB right (MHz)**	**6dB bandwidth (kHz)**
2402	2401.656	2402.354	698.000
2440	2439.664	2440.360	696.000
2480	2479.652	2480.366	714.000

FCC 15.247(b)(3) – Maximum Peak Conducted Output Power	Pass
FCC Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)	
Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Supply voltage : 3.0VDC Temperature : 23ºC Humidity : 50%	
Results: For test protocols please refer to Appendix 1	

Frequency (MHz)	Measured Output Power (dBm)	Limit (dBm)	Verdict
2402	0.77	30.0	Pass
2440	0.99	30.0	Pass
2480	0.72	30.0	Pass

FCC 15.247(e) – Power Spectral Density	Pass
FCC Requirement: 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 : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak Supply voltage : 3.0VDC Temperature : 23ºC Humidity : 50%	
Results: For test protocols please refer to Appendix 1.	

Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2402	0.61	8.0	Pass
2440	0.81	8.0	Pass
2480	0.52	8.0	Pass

FCC 15.247(d) – Spurious Conducted Emissions **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : TX mode
Port of testing : Temporary antenna port
Supply voltage : 3.0VDC
Temperature : 23 ºC
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: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

Only the worst cases is shown below. For test protocols refer to Appendix 1

Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	2316	-45.14	0.61	45.75	Pass
	2372	-44.14	0.61	44.75	Pass
	2436	-39.02	0.61	39.63	Pass
2440	2460	-41.48	0.81	42.29	Pass
	2496	-42.82	0.81	43.63	Pass
	2564	-46.87	0.81	47.68	Pass
2480	2432	-40.46	0.52	40.98	Pass
	2460	-43.28	0.52	43.80	Pass
	2496	-40.35	0.52	40.87	Pass
	2564	-45.49	0.52	46.01	Pass

FCC 15.205 – Radiated Emissions in Restricted Frequency Bands	Pass

Test Specification : ANSI C63.10 – 2013
Mode of operation : TX mode
Port of testing : Enclosure
Supply voltage : 3.0VDC
Temperature : 23ºC
Humidity : 50%

FCC Requirement: 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 15.205(c).

Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.

Mode: 2402MHz TX — Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2312.200	47.26	74.0 / PK
2312.100	33.55	54.0 / AV
4803.563	56.73	74.0 / PK
4804.000	40.18	54.0 / AV

Mode: 2402 MHz TX — Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2369.500	49.52	74.0 / PK
2337.300	33.52	54.0 / AV
4804.317	56.77	74.0 / PK
4804.067	43.71	54.0 / AV

Mode: 2440 MHz TX — Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4879.688	58.51	74.0 / PK
4879.938	46.47	54.0 / AV

Mode: 2440 MHz TX — Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4879.750	60.39	74.0 / PK
4879.875	47.50	54.0 / AV

Mode: 2480MHz TX	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2493.256	49.96	74.0 / PK
2493.256	33.21	54.0 / AV
4960.375	62.15	74.0 / PK
4959.925	50.95	54.0 / AV
Mode: 2480 MHz TX	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2493.441	47.53	74.0 / PK
2483.500	33.50	54.0 / AV
4959.563	61.34	74.0 / PK
4959.938	49.79	54.0 / AV