

RADIO TEST REPORT  
For  
Decade Smart Technology Co., Ltd.  
Bluetooth Smart Watch  
Test Model: SN07

Prepared for : Decade Smart Technology Co., Ltd.  
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Date of receipt of test sample : June 02, 2017  
Number of tested samples : 1  
Serial number : Prototype  
Date of Test : June 12, 2017~June 16, 2017  
Date of Report : June 26, 2017



**EMC TEST REPORT****ETSI EN 301 489-17 V3.1.1(2017-02)**

ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU

**Report Reference No.** ..... : **LCS170602004AE**

**Date Of Issue** ..... : June 26, 2017

**Testing Laboratory Name**..... : **Shenzhen LCS Compliance Testing Laboratory Ltd.**

**Address** ..... : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

**Testing Location/ Procedure**..... : Full application of Harmonised standards ☒  
 Partial application of Harmonised standards ☐  
 Other standard testing method ☐

**Applicant's Name**..... : **Decade Smart Technology Co., Ltd**

**Address** ..... : Floor 3th, 5th building, Haomai Hi-Tech park, Huating road, Dalang town, Longhua district, Shenzhen, China

**Test Specification**

**Standard**..... : ETSI EN 301 489-1 V2.1.1 (2017-02)  
 ETSI EN 301 489-17 V3.1.1(2017-02)

**Test Report Form No.** ..... : LCSEMC-1.0

**TRF Originator** ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

**Master TRF** ..... : Dated 2017-02

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**Test Item Description.** ..... : **Bluetooth Smart Watch**

**Trade Mark** ..... : N/A

**Test Model**..... : SN07

**Ratings**..... : DC 3V by battery(600mAh)

**Result** ..... : **Positive**

**Compiled by:**

*Linda He*

Linda He / File administrators

**Supervised by:**

*Glin Lu*

Glin Lu/ Technique principal

**Approved by:**



Gavin Liang/ Manager

**RADIO -- TEST REPORT****Test Report No. : LCS170602005AE**June 26, 2017  
Date of issue

Test Model..... : SN07

EUT..... : Bluetooth Smart Watch

**Applicant..... : Decade Smart Technology Co., Ltd.**Address..... : Floor 3th, Building 5th, Haomai Hi-Tech Park , Huating Road  
Dalang Zone, Longhua District, Shenzhen, China.

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Telephone..... : /

Fax..... : /

**Factory..... : Decade Smart Technology Co., Ltd.**Address..... : Floor 3th, Building 5th, Haomai Hi-Tech Park , Huating Road  
Dalang Zone, Longhua District, Shenzhen, China.

Telephone..... : /

Fax..... : /

**Test Result:****Positive**

The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## Revision History

Revision	Issue Date	Revisions	Revised By
000	June 26, 2017	Initial Issue	Gavin Liang

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## 1. GENERAL INFORMATION

### 1.1. Product Description for Equipment Under Test (EUT)

EUT	: Bluetooth Smart Watch
Model Number	: SN07
Model Declaration	: /
Test Model	: SN07
Power Supply	: DC 3V by battery(600mAh)
Hardware Version	: SN07-V1.3
Software Version	: 2.5.6
Bluetooth	:
Frequency Range	: 2402.00-2480.00MHz
Channel Number	: 40 channels for Bluetooth V4.0 (DTS)
Channel Spacing	: 2MHz for Bluetooth V4.0(DTS)
Modulation Type	: GFSK for Bluetooth V4.0 (DTS)
Bluetooth Version	: V4.0
Antenna Description	: Internal Antenna, 0.6dBi(Max.)

### 1.2. Objective

This Type approval report is prepared on behalf of **YaMeiShi Plastic & Electronic Co., Ltd** in accordance with ETSI EN 300 328 V2.1.1 (2016-11) , Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.

The objective is to determine compliance with ETSI EN 300 328 V2.1.1 (2016-11).

### 1.3. Related Submittal(s)/Grant(s)

No Related Submittals.

### 1.4. Test Methodology

The objective is to determine compliance with ETSI EN 300 328 V2.1.1 (2016-11).

### 1.5. Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

### 1.6. Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

### 1.7. External I/O

I/O Port Description	Quantity	Cable
--	--	--



**1.8. List Of Measuring Equipment**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	2017/06/18	2018/06/17
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	2016/07/16	2017/07/15
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	2017/06/18	2018/06/17
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	2017/06/18	2018/06/17
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	2017/06/18	2018/06/17
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	2017/06/18	2018/06/17
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz	2017/06/18	2018/06/17
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHz	2017/04/18	2018/04/17
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	2017/04/18	2018/04/17
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	2017/04/18	2018/04/17
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	2017/04/18	2018/04/17
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	2017/04/18	2018/04/17
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	2017/04/18	2018/04/17
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	2017/04/18	2018/04/17
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	2017/06/18	2018/06/17
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	2017/06/18	2018/06/17
Power Meter	R&S	NRVS	100444	DC-40GHz	2017/06/18	2018/06/17
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	2017/06/18	2018/06/17
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	2017/06/18	2018/06/17
AC Power Source	HPC	HPA-500E	HPA-9100024	AC 0~300V	2017/06/18	2018/06/17
DC power Source	GW	GPC-6030D	C671845	DC 1V-60V	2017/06/18	2018/06/17
Temp. and Humidity Chamber	Giant Force	GTH-225-20-S	MAB0103-00	N/A	2017/06/18	2018/06/17
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	2017/06/18	2018/06/17
RF CABLE-2m	JYE Bao	RG142	CB035-2m	20MHz-1GHz	2017/06/18	2018/06/17
Signal Generator	R&S	SMR40	10016	10MHz~40GHz	2016/07/16	2017/07/15
Universal Radio Communication Tester	R&S	CMU200	112012	N/A	2016/10/27	2017/10/26
Wideband Radio Communication Tester	R&S	CMW500	1201.0002K50	N/A	2016/11/19	2017/11/18
MXG Vector Signal Generator	Agilent	N5182A	MY47071151	250KHz~6GHz	2016/10/27	2017/10/26
MXG Vector Signal Generator	Agilent	E4438C	MY42081396	250KHz~6GHz	2016/10/27	2017/10/26
PSG Analog Signal Generator	Agilent	N8257D	MY46520521	250KHz~20GHz	2016/11/19	2017/11/18
MXA Signal Analyzer	Agilent	N9020A	MY50510140	10Hz~26.5GHz	2016/10/27	2017/10/26
DC Power Supply	Agilent	E3642A	/	0-8V,5A/0-20V,2.5A	2017/05/20	2018/05/19
RF Control Unit	Tonscend	JS0806-1	/	/	2016/11/19	2017/11/18
LTE Test Software	Tonscend	JSW80120-1	/	Version: 2.5.7.0	N/A	N/A
X-series USB Peak and Av	Agilent	U2021XA	MY54080022	/	2016/10/27	2017/10/26
4 Ch.Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	MY54080016	/	2016/10/27	2017/10/26
Test Software	Ascentest	AT890-SW	20141230	Version: 20160630	N/A	N/A
Splitter/Combiner(Qty: 2)	Mini-Circuits	ZAPD-50W 4.2-6.0 GHz	NN256400424	/	2016/10/27	2017/10/26
Splitter/Combine(Qty: 2)	MCLI	PS3-7	4463/4464	/	2016/10/27	2017/10/26
ATT (Qty: 1)	Mini-Circuits	VAT-30+	30912	/	2016/10/27	2017/10/26

### 1.9. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Occupied Channel Bandwidth	5 %
RF output power, conducted	1,5 dB
Power Spectral Density, conducted	3 dB
Unwanted Emissions, conducted	3 dB
All emissions, radiated	6 dB
Temperature	1 °C
Humidity	5 %
DC and low frequency voltages	3 %
Time	5 %
Duty Cycle	5 %

### 1.10. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

### 1.11. Description Of Test Modes

LCS has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode1: Transmit by BLE
Mode2: Receive by BLE

Note:

- (1) For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.
- (2) Regard to the frequency band operation for systems using Wide Band modulation: the lowest, middle, highest frequency channel for conducted test, and the lowest, highest frequency channel for radiation spurious test.
- (3) The extreme test condition for voltage and temperature were declared by the manufacturer.

## **2. SYSTEM TEST CONFIGURATION**

### **2.1. Justification**

The system was configured for testing in engineering mode.

### **2.2. EUT Exercise Software**

N/A.

### **2.3. Special Accessories**

N/A.

### **2.4. Block Diagram/Schematics**

Please refer to the related document.

### **2.5. Equipment Modifications**

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

### **2.6. Configuration of Test Setup**

Please refer to the test setup photo.

### 3. SUMMARY OF TEST RESULT

- ☒ No deviations from the test standards  
☐ Deviations from the test standards as below description:

Technical requirements for the equipment using wide band modulations other than FHSS:

Performed Test Item	Normative References	Test Performed	Result
RF Output Power& Receiver Category	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS
Power Spectral Density	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS
Duty cycle, Tx-Sequence, Tx-gap	ETSI EN 300 328 V2.1.1 (2016-11)	N/A	N/A
Medium Utilisation (MU) factor	ETSI EN 300 328 V2.1.1 (2016-11)	N/A	N/A
Adaptivity	ETSI EN 300 328 V2.1.1 (2016-11)	N/A	N/A
Occupied Channel Bandwidth	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS
Transmitter unwanted emissions in the out-of-band domain	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS
Transmitter unwanted emissions in the spurious domain	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS
Receiver Spurious Emissions	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS
Receiver Blocking	ETSI EN 300 328 V2.1.1 (2016-11)	Yes	PASS

Note: The EUT can operate in an adaptive mode, and can't operate in a non-adaptive mode which is stated by the supplier.

## 4. RF OUTPUT POWER & RECEIVER CATEGORY

### 4.1. Limit

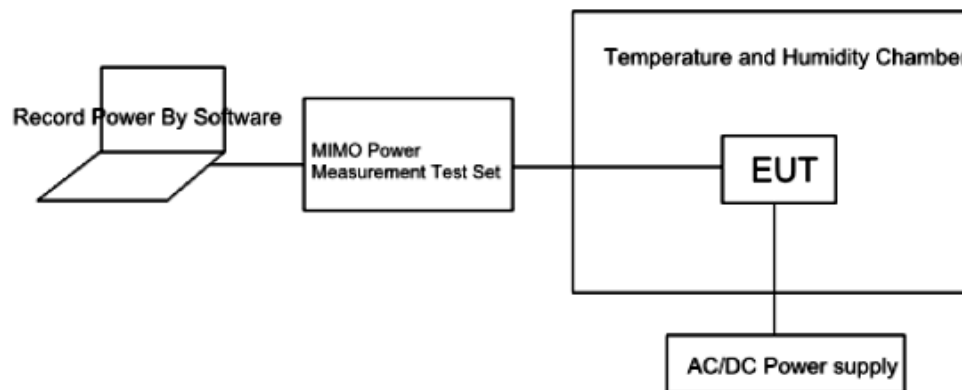
For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

This limit shall apply for any combination of power level and intended antenna assembly.

### 4.2. Test Setup

For Conducted Measurement



### 4.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.2

**Step 1:**

- The fast power sensor use the following setting: Sample speed 1 MS/s.

**Step 2:**

- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.

**Step 3:**

- Find the start and stop times of each burst in the stored measurement samples.

**Step 4:**

- Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these Pburst values, as well as the start and stop times for each burst.

**Step 5:**

- The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

**Step 6:**

- Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
- If applicable, add the additional beamforming gain "Y" in dB.

The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G + Y$$

#### 4.4. Test Result

Pass

\*\*\*Note: 20 bursts had been captured for power measurement.

Product	:	Bluetooth Smart Watch
Test Item	:	RF Output Power
Test Mode	:	Mode 1: Transmit by BLE
Env./ Ins	:	25.6°C/50.4%
Test Engineer	:	Demi Lin

Test Conditions		Frequency (MHz)	RF Output Power EIRP (dBm)	Limit (dBm)
Tnom (25°C)	Vnom (DC 3V)	2402	1.13	20
		2440	1.71	
		2480	1.49	
Tmax (40°C)	Vnom (DC 3V)	2402	<b>1.72</b>	20
		2440	1.28	
		2480	0.90	
Tmin (-20°C)	Vnom (DC 3V)	2402	0.79	20
		2440	0.64	
		2480	0.82	

#### 4.5. Receiver Category

**Receiver Category 1:** Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.

**Receiver Category 2:** Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.

**Receiver Category 3:** Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

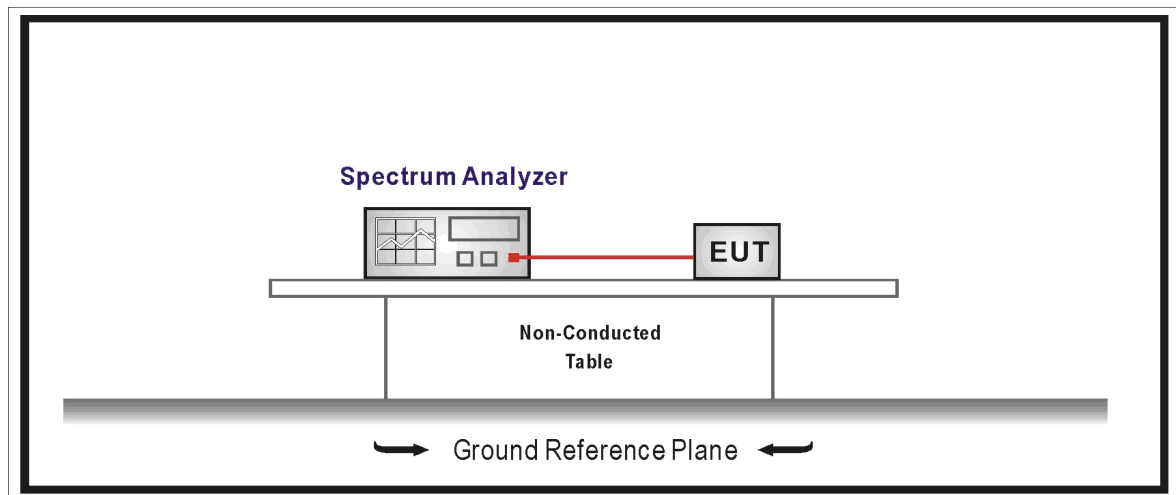
As this an adaptivity device with a maximum power of 1.70dBm, **it belongs to receiver category 2.**

## 5. POWER SPECTRAL DENSITY

### 5.1. Limit

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10dBm per MHz.

### 5.2. Test Setup



### 5.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.3

#### Step 1:

Connect the UUT to the spectrum analyser and use the following settings:

- Start Frequency: 2 400 MHz
- Stop Frequency: 2 483,5 MHz
- Resolution BW: 10 kHz
- Video BW: 30 kHz
- Sweep Points: > 8 350
- Detector: RMS
- Trace Mode: Max Hold
- Sweep time: Auto

For non-continuous signals, wait for the trace to be completed. Save the (trace) data set to a file.

#### Step 2:

For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.

#### Step 3:

Add up the values for amplitude (power) for all the samples in the file.



**Step 4:**

Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.).

**Step 5:**

Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100).

This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

**Step 6:**

Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 5 (i.e. sample #2 to #101).

**Step 7:**

Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments. From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT.

**5.5. Test Result**

Product	:	Bluetooth Smart Watch
Test Item	:	Maximum Spectral Power Density
Test Mode	:	Mode 1: Transmit by BLE
Env./ Ins	:	25.6°C/50.4%
Test Engineer	:	Demi Lin

Frequency (MHz)	Total Power Density (dBm/MHz)	Limit (dBm/MHz)
2402	-0.05	10.00
2440	-0.05	10.00
2480	-0.06	10.00

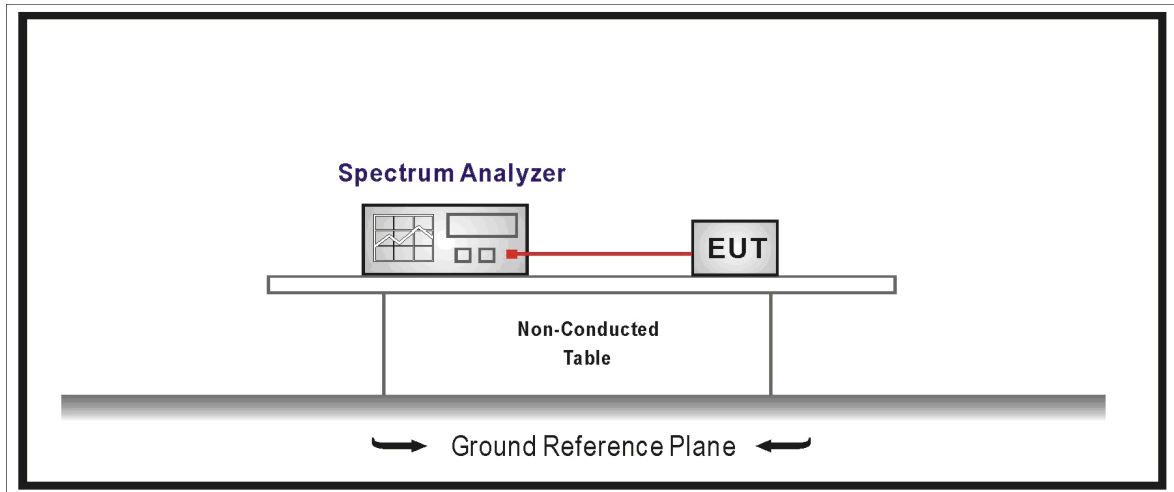
## 6. DUTY CYCLE, TX-SEQUENCE, TX-GAP

### 6.1. Limit

The Duty Cycle shall be equal to or less than the maximum value declared by the supplier.

The Tx-sequence time shall be equal to or less than 10 ms. The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.

### 6.2. Test Setup



### 6.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.2

### 6.4. Test Result

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

These requirements do not apply for equipment with a maximum declared RF Output power of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

No applicable.

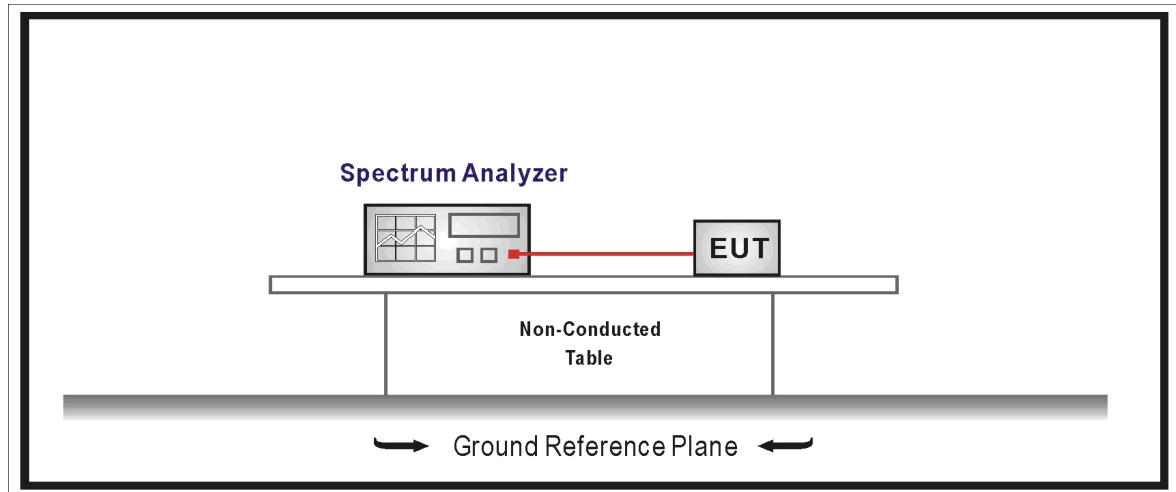
## 7. MEDIUM UTILISATION (MU) FACTOR

### 7.1. Limit

#### For non-adaptive equipment

For non-adaptive equipment using wide band modulations other than FHSS, the maximum Medium Utilization factor shall be 10 %.

### 7.2. Test Setup



### 7.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.2

### 7.4. Test Result

This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode. In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

No applicable.

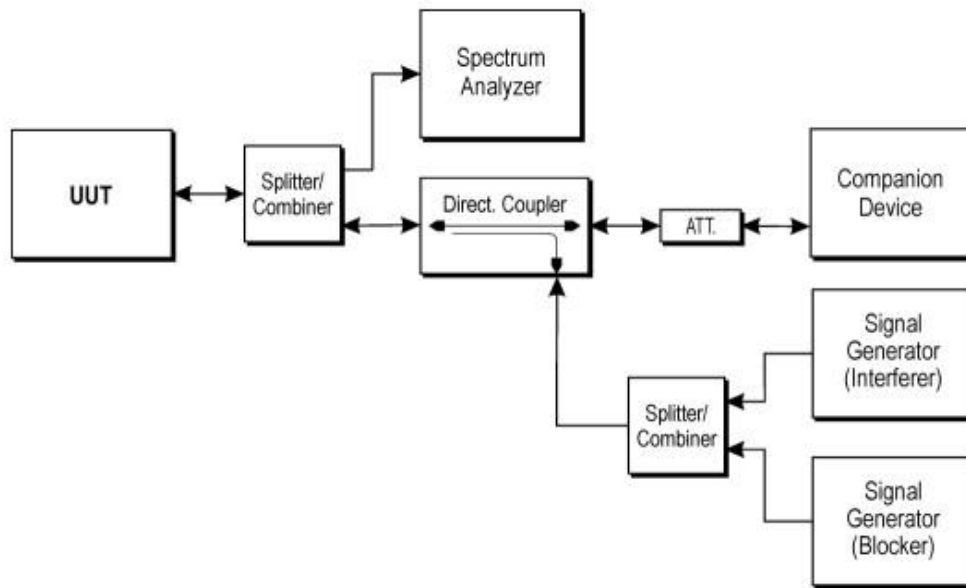
## 8. ADAPTIVITY (ADAPTIVE EQUIPMENT USING MODULATIONS OTHER THAN FHSS)

### 8.1. Limit

Adaptivity Limit
<input checked="" type="checkbox"/> Non-LBT based Detect and Avoid --- The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel; --- $COT \leq 40$ ms; --- Idle Period shall be minimum 5% of COT with a minimum of 100us; --- Detection threshold level = $-70\text{dBm/MHz} + (20\text{dBm} - P_{\text{out e.i.r.p}})/1\text{MHz}$ ( $P_{\text{out}}$ in dBm);
<input type="checkbox"/> LBT based Detect and Avoid(Frame Based Equipment) --- The CCA observation time shall be not less than 18 us; --- $COT = 1-10$ ms; --- Idle Period = 5% of COT; --- Detection threshold level = $-70\text{dBm/MHz} + (20\text{dBm} - P_{\text{out e.i.r.p}})/1\text{MHz}$ ( $P_{\text{out}}$ in dBm);
<input type="checkbox"/> LBT based Detect and Avoid(Load Based Equipment) --- The CCA observation time shall be not less than 18 us; --- $COT \leq 13$ ms; --- Detection threshold level = $-70\text{dBm/MHz} + (20\text{dBm} - P_{\text{out e.i.r.p}})/1\text{MHz}$ ( $P_{\text{out}}$ in dBm);
<input type="checkbox"/> Short Control Signalling Transmissions: --- Short Control Signalling Transmissions shall have have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

## 8.2. Test Setup

Conducted measurements



## 8.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.6

## 8.4. Test Result

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.

In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

No applicable.

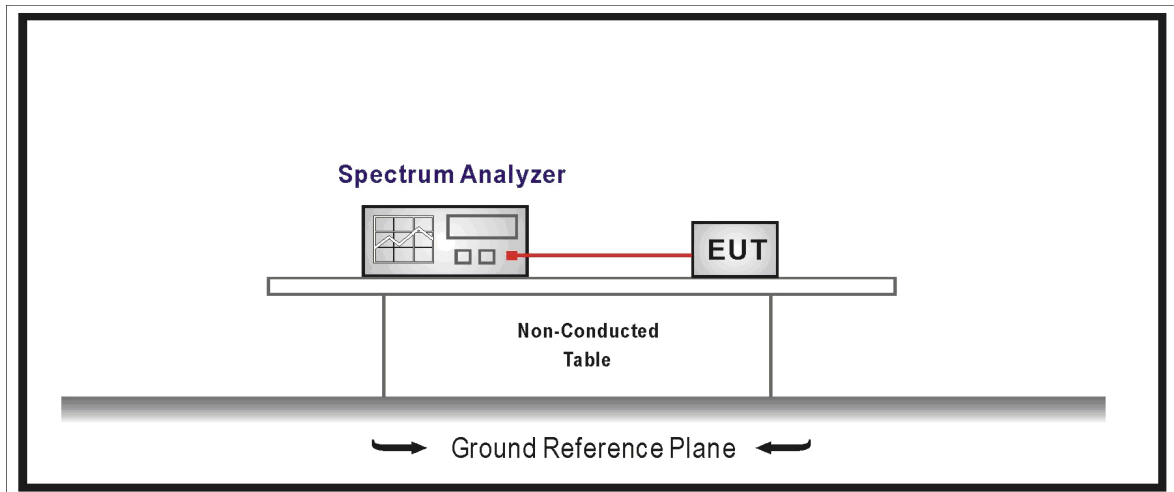
## 9. OCCUPIED CHANNEL BANDWIDTH

### 9.1. Limit

The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.

In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

### 9.2. Test Setup



### 9.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.7

#### Step 1:

Connect the UUT to the spectrum analyser and use the following settings:

- Centre Frequency: The centre frequency of the channel under test
- Resolution BW:  $\sim 1\%$  of the span without going below  $1\%$  (We set RBW= 20KHz)
- Video BW:  $3 \times$  RBW (We set RBW= 62KHz)
- Frequency Span:  $2 \times$  Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: RMS
- Trace Mode: Max Hold

#### Step 2:

Wait until the trace is completed. Find the peak value of the trace and place the analyser marker on this peak.

#### Step 3:

Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

#### 9.4. Test Result

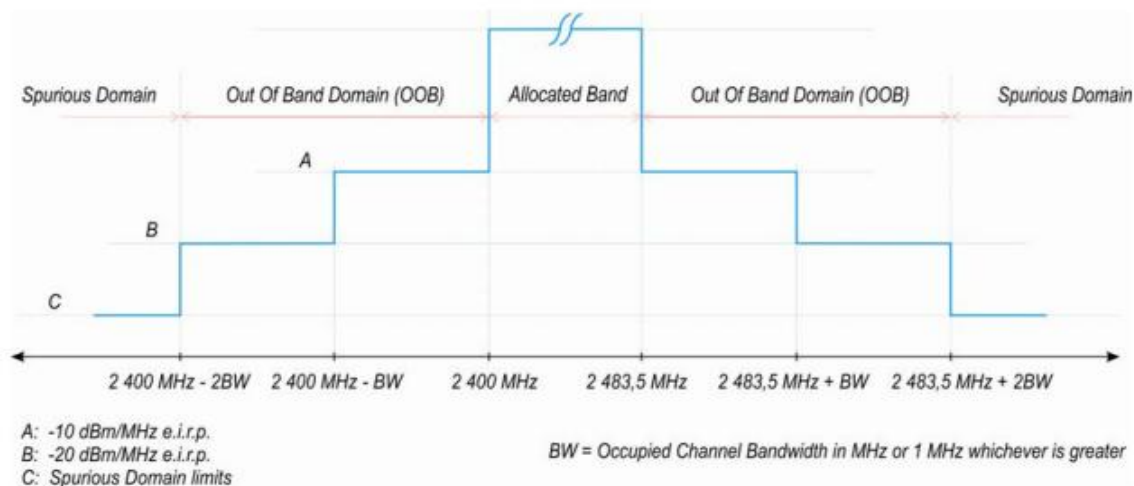
Product	:	Bluetooth Smart Watch
Test Item	:	Occupied Channel Bandwidth
Test Mode	:	Mode 1: Transmit by BLE
Env./ Ins	:	25.6℃/50.4%
Test Engineer	:	Demi Lin
Test Result	:	Pass

Channel No.	Frequency (MHz)	99% Bandwidth (MHz)	Limit
00	2402	1.10	Within the band 2400.0MHz~2483.5MHz
39	2480	1.10	

## 10. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

### 10.1. Limit

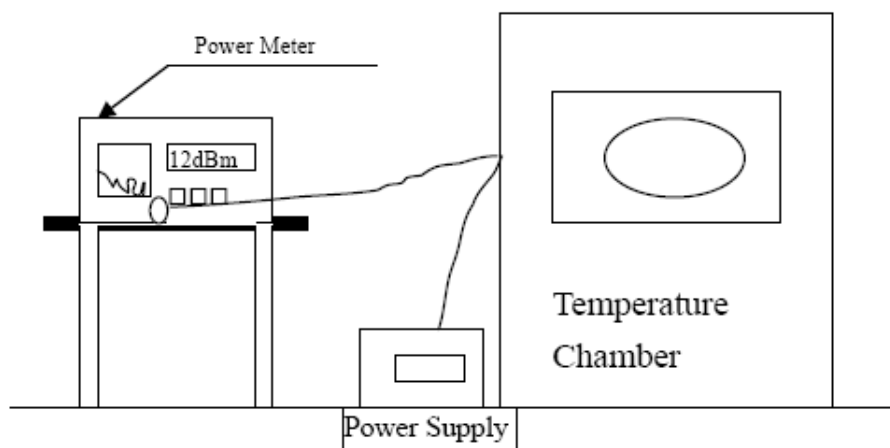
The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.



Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

### 10.2. Test Setup

For Conducted Measurement





### 10.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.8

#### Step 1:

- Connect the UUT to the spectrum analyser and use the following settings:
- Centre Frequency: 2 484 MHz
- Span: 0 Hz
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz
- Detector Mode: RMS
- Trace Mode: Clear / Write
- Sweep Mode: Continuous
- Sweep Points: Sweep Time [s] / (1  $\mu$ s) or 5 000 whichever is greater
- Trigger Mode: Video trigger

NOTE 1: In case video triggering is not possible, an external trigger source may be used.

- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

#### Step 2: (segment 2 483,5 MHz to 2 483,5 MHz + BW)

- Adjust the trigger level to select the transmissions with the highest power level.
- For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.
- Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.
- Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.
- Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

#### Step 3: (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW)

- Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz.

#### Step 4: (segment 2 400 MHz - BW to 2 400 MHz)

- Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

**Step 5:** (segment 2 400 MHz - 2BW to 2 400 MHz - BW)

- Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

**Step 6:**

- In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figures 1 or 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.
- In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:
  - Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figures 1 or 3.
  - Option 2: the limits provided by the mask given in figures 1 or 3 shall be reduced by  $10 \times \log_{10}(A_{ch})$  and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE 2:  $A_{ch}$  refers to the number of active transmit chains.

It shall be recorded whether the equipment complies with the mask provided in figures 1 or 3.

## 10.4. Test Result

Product	:	Bluetooth Smart Watch
Test Item	:	Transmitter unwanted emissions in the out-of-band domain
Test Mode	:	Mode 1: Transmit by BLE
Env./ Ins	:	25.6°C/50.4%
Test Engineer	:	Demi Lin

Frequency (MHz)	Test Conditions (°C)	Max measured Values (dBm/MHz)	Limit (dBm/MHz)
2400-2BW~ 2400-BW	25	-70.63	-20
2400-BW~2400	25	-67.93	-10
2483.5~ 2483.5+BW	25	-69.38	-10
2483.5+BW~ 2483.5+2BW	25	-68.63	-20

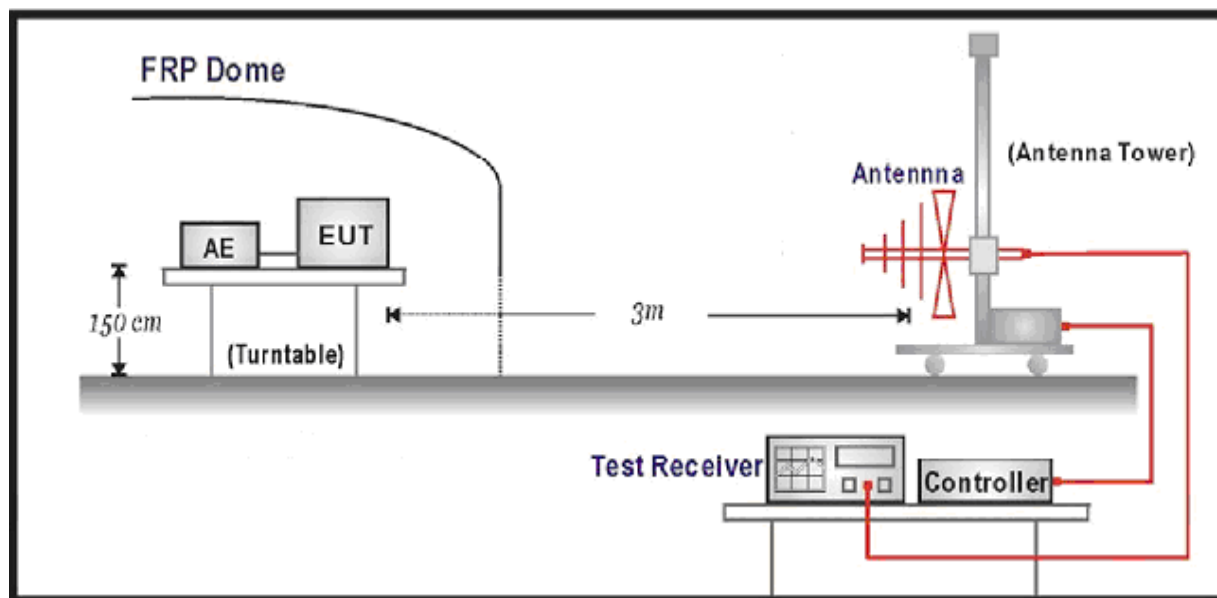
## 11. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

### 11.1. Limit

Transmitter Limits for Spurious Emissions		
Frequency Range	Maximum power E.R.P. ( $\leq 1\text{GHz}$ ) E.I.R.P. ( $> 1\text{GHz}$ )	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

### 11.2. Test Setup

For Radiated Measurement



### 11.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.9

#### Step 1:

The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in tables 1 or 4.

#### Step 2:

The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

- Resolution bandwidth: 100 kHz
- Video bandwidth: 300 kHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points:  $\geq 19400$

NOTE 1: For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.

• Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT. For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequency in different hopping sequences. Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.3.10.2.1.3 and compared to the limits given in tables 1 or 4.

#### Step 3:

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

- Resolution bandwidth: 1 MHz
- Video bandwidth: 3 MHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points:  $\geq 23500$

NOTE 2: For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.

• Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT.

**11.4. Test Result**

Product	:	Bluetooth Smart Watch
Test Item	:	Transmitter spurious emissions
Test Mode	:	Mode 1: Transmit by BLE
Env./ Ins	:	25.6°C/50.4%
Test Engineer	:	Demi Lin

Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
Channel 0 (2402MHz)					
150.66	H	-48.55	-36	-12.55	PK
220.97	V	-67.71	-54	-13.71	PK
935.95	H	-48.28	-36	-12.28	PK
966.52	V	-53.97	-36	-17.97	PK
4803.93	H	-50.31	-30	-20.31	PK
4804.22	V	-42.99	-30	-12.99	PK
7205.24	H	-44.25	-30	-14.25	PK
7206.49	V	-47.67	-30	-17.67	PK
Channel 39 (2480MHz)					
173.14	H	-46.29	-36	-10.29	PK
208.96	V	-66.55	-54	-12.55	PK
928.40	H	-53.75	-36	-17.75	PK
819.03	V	-66.10	-54	-12.10	PK
4959.99	H	-43.18	-30	-13.18	PK
4959.79	V	-42.67	-30	-12.67	PK
7440.23	H	-46.42	-30	-16.42	PK
7440.18	V	-44.01	-30	-14.01	PK

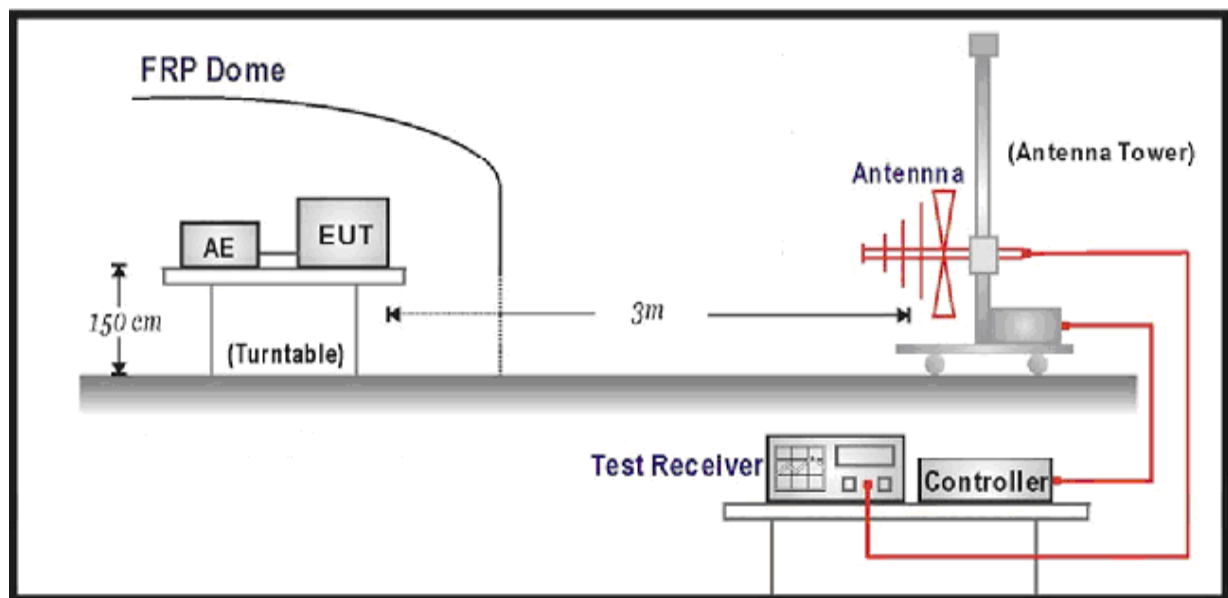
## 12. RECEIVER SPURIOUS EMISSIONS

### 12.1. Limit

Spurious emissions limits for receivers		
Frequency Range	Maximum power E.R.P. ( $\leq 1\text{GHz}$ ) E.I.R.P. ( $> 1\text{GHz}$ )	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

### 12.2. Test Setup

For Radiated Measurement



### 12.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.10

#### Step 1:

The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in tables 2 or 5.

#### Step 2:

The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

- Resolution bandwidth: 100 kHz
- Video bandwidth: 300 kHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points:  $\geq 19400$
- Sweep time: Auto

Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in tables 2 or 5.

#### Step 3:

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

- Resolution bandwidth: 1 MHz
- Video bandwidth: 3 MHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points:  $\geq 23500$
- Sweep time: Auto

Allow the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in tables 2 or 5. Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.10.2.1.3.

#### Step 4:

- In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), the steps 2 and 3 need to be repeated for each of the active receive chains (Ach). The limits used to identify emissions during this pre-scan need to be reduced with  $10 \times \log_{10}(\text{Ach})$  (number of active receive chains).



**12.4. Test Result**

Product	:	Bluetooth Smart Watch
Test Item	:	Receiver spurious emissions
Test Mode	:	Mode 2: Receive by BLE
Env./ Ins	:	25.6°C/50.4%
Test Engineer	:	Demi Lin

Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
Channel 0 (2402MHz)					
125.02	H	-69.62	-57	-12.62	PK
268.62	V	-73.78	-57	-16.78	PK
990.38	H	-70.61	-57	-13.61	PK
817.69	V	-66.69	-57	-9.69	PK
1511.71	H	-62.04	-47	-15.04	PK
1890.62	V	-62.92	-47	-15.92	PK
2796.95	H	-58.30	-47	-11.30	PK
2345.44	V	-62.24	-47	-15.24	PK
Channel 39 (2480MHz)					
275.77	H	-77.59	-57	-20.59	PK
142.86	V	-79.80	-57	-22.80	PK
907.63	H	-71.50	-57	-14.50	PK
925.95	V	-66.05	-57	-9.05	PK
1513.87	H	-62.35	-47	-15.35	PK
1312.65	V	-63.86	-47	-16.86	PK
2724.28	H	-60.69	-47	-13.69	PK
2583.72	V	-59.19	-47	-12.19	PK

## 13. RECEIVER BLOCKING

### 13.1. Limit

Adaptive Frequency Hopping equipment shall comply with the requirements defined in clause 4.3.1.12.4

**Table 6: Receiver Blocking parameters for Receiver Category 1 equipment**

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
$P_{\min} + 6 \text{ dB}$	2 380 2 503,5	-53	CW
$P_{\min} + 6 \text{ dB}$	2 300 2 330 2 360	-47	CW
$P_{\min} + 6 \text{ dB}$	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE 1: $P_{\min}$ is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.			
NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

**Table 7: Receiver Blocking parameters receiver category 2 equipment**

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
$P_{\min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW
$P_{\min} + 6 \text{ dB}$	2 300 2 583,5	-47	CW
NOTE 1: $P_{\min}$ is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.			
NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

**Table 8: Receiver Blocking parameters receiver category 3 equipment**

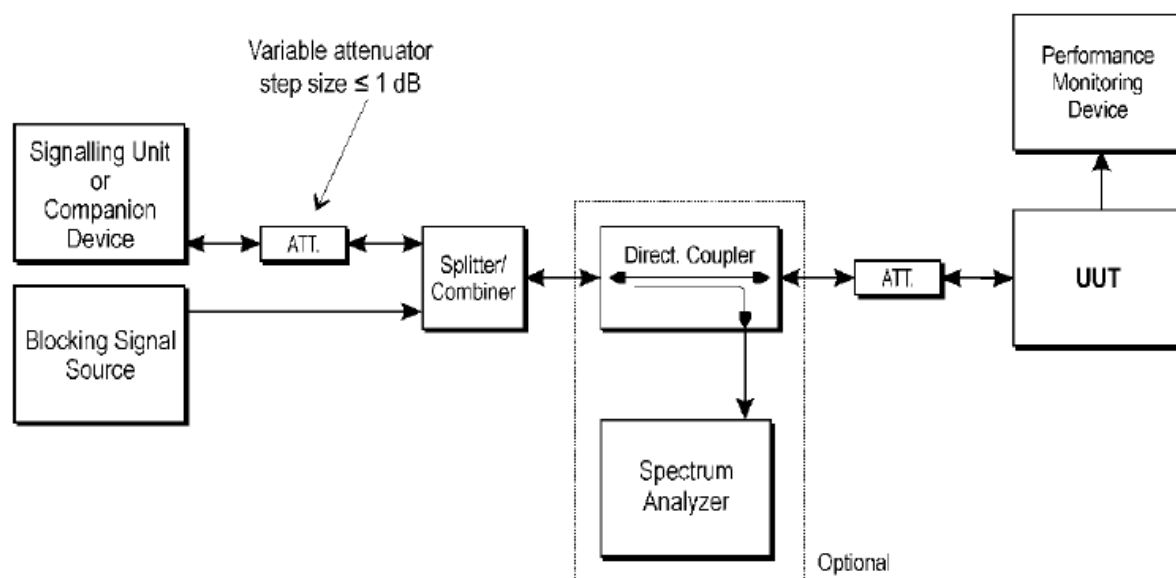
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
$P_{\min} + 12$ dB	2 380 2 503,5	-57	CW
$P_{\min} + 12$ dB	2 300 2 583,5	-47	CW

NOTE 1:  $P_{\min}$  is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

### 13.2. Test Setup

Conducted measurements



### 13.3. Test Procedure

Step 1:

- For non-frequency hopping equipment, the UUT shall be set to the lowest operating channel.

Step 2:

- The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.

Step 3:

- With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is Pmin.
- This signal level (Pmin) is increased by the value provided in the table corresponding to the receiver category and type of equipment.

Step 4:

- The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is met.

Step 5:

- Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

Step 6:

- For non-frequency hopping equipment, repeat step 2 to step 5 with the UUT operating at the highest operating channel.

### 13.4. Test Result

Test Condition	Test Mode	Test Channel	Ant	Pmin[dBm]	Wanted signal Level[dBm] (Pmin +6dB)	Blocking signal [dBm]	Freq [MHz]	CW Level [dBm]	PER [%]	Limit [%]	Verdict
TNVN	BLE	2402	Ant1	-83.00	-76.00	-45.26	2300	-47	6.90	<=10	PASS
TNVN	BLE	2402	Ant1	-83.00	-76.00	-55.27	2380	-57	6.67	<=10	PASS
TNVN	BLE	2402	Ant1	-83.00	-76.00	-54.41	2503.5	-57	5.06	<=10	PASS
TNVN	BLE	2402	Ant1	-83.00	-76.00	-44.19	2583.5	-47	6.10	<=10	PASS
TNVN	BLE	2480	Ant1	-80.00	-74.00	-42.53	2300	-47	6.20	<=10	PASS
TNVN	BLE	2480	Ant1	-80.00	-74.00	-54.16	2380	-57	6.49	<=10	PASS
TNVN	BLE	2480	Ant1	-80.00	-74.00	-53.44	2503.5	-57	8.52	<=10	PASS
TNVN	BLE	2480	Ant1	-80.00	-74.00	-45.54	2583.5	-47	7.09	<=10	PASS

## 14. PHOTOGRAPHS OF TEST SETUP

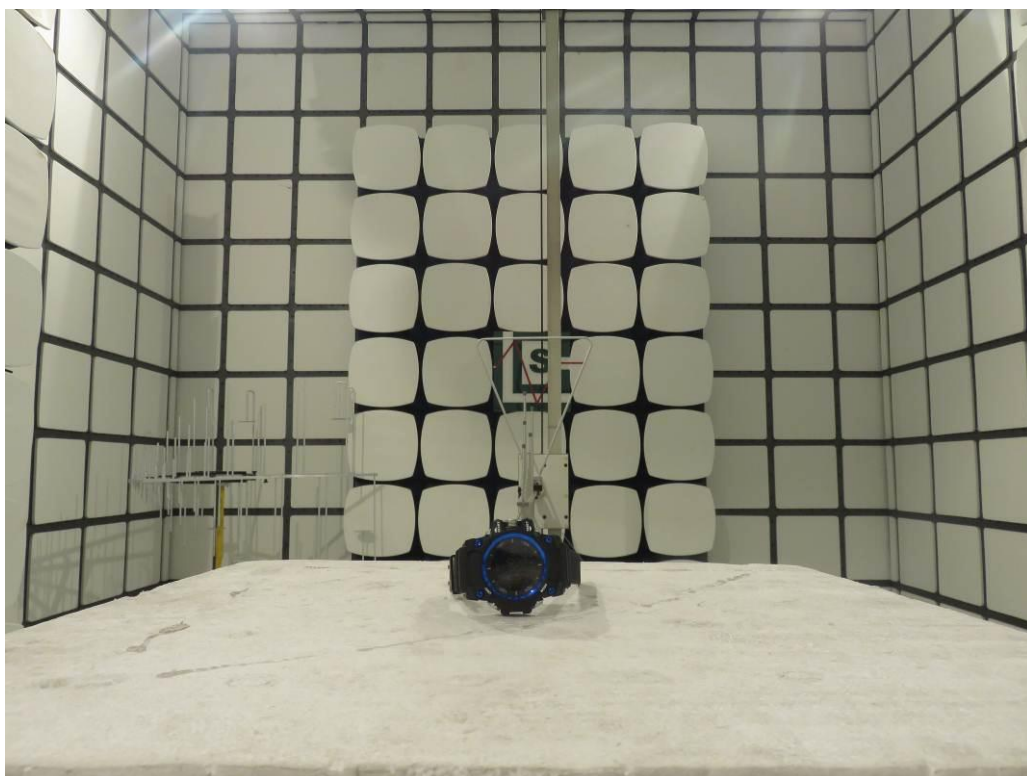


Fig. 1



Fig. 2

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