NCT Technology

RED-RADIO TEST REPORT

for

Smart bracelet

Model: WB07

（Other models please see the page 3）

Prepared for :

Prepared By : **Shenzhen NCT Testing Technology Co., Ltd.**
1 / F, No. B Building, Mianshang Younger Pioneer Park, Hangcheng Road, Gushu Xixiang Street, Baoan District, Shenzhen

Date of Test:	**Jul. 04, 2018 to Jul. 12, 2018**
Date of Report:	**Jul. 12, 2018**
Report Number:	**NCT18007061E2-1**

Tested By Beryl zhao
Beryl Zhao

Reviewed By
Jack Du

The results detailed in this test report relate only to the specific sample(s) tested. It is the Application's responsibility to ensure that all production units are manufactured with equivalent EMC characteristics. This report is not to be reproduced except in full, without written approval from NCT Testing Technology.

Table of Contents

1.0 General Details

1.1 Client Information

Application:	
Address of Application:	
Manufacturer:	
Address of Manufacturer:	

1.2 General Description of E.U.T.

Product Name:	Smart bracelet
Model:	WB07
Additional Model:	WB07B, C07Plus.
Trade Mark:	
Bluetooth Version:	4.2
Operation Frequency:	2402 MHz-2480 MHz
Channel Number:	79
Channel Separation:	1 Hz
Antenna Type:	Internal Antenna
Antenna Gain:	0 dBi
Type of Modulation:	GFSK, Pi/4 QDPSK, 8DPSK
Power Supply:	Input:DC 5V⎓1.0A Battery: 3.7Vdc, 0.2Wh

Model Difference:	All models are the same except for model name and colour.

1.3 Test Facility

Name :	Shenzhen NCT Testing Technology Co., Ltd.
Address:	1 / F, No. B Building, Mianshang Younger Pioneer Park, Hangcheng Road, Gushu Xixiang Street, Baoan District, Shenzhen
Telephone:	+86-400-8864-819
Fax:	+86-755-27790922

1.4 Test Standards

ETSI EN 300 328 v 2.1.1 (2006-11)

Electromagnetic compatibility and Radio spectrum Matters(ERM);

Wideband Transmission systems;

Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques;

Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

1.5 Configuration of the E.U.T.

The E.U.T. was configured according to **CISPR16.** All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

AE used during the test

Equipment type	Manufacturer	Model
N.A.		
N.A.		

1.6 E.U.T. Modifications

No modification by Shenzhen NCT Testing Technology Co., Ltd

1.7 Measurement Uncertainty（95% confidence levels, k=2)

No.	Item	MU
1.	Radio Frequency	$\pm 1\times 10^{-9}$
2.	Temperature	±0.1℃
3.	Humidity	±1.0%
4.	RF power, conducted	±0.34dB
5.	RF power density, conducted	±1.45dB
6.	Spurious emissions, conducted	±3.70dB
7.	All emissions, radiated	±4.50dB

Note: 1) E.U.T. means Equipment Under Test; N.A. means Not Applicable

2) Due to the extreme test conditions were not declared by the manufacture, the relevant tests were conducted for the following setup:

Temperature	Normal	25℃
	High	55℃
	Low	-20℃
Power Supply	Normal	DC 3.7V
	High	DC 4.255V
	Low	DC 3.145V

3) During the test, the lowest frequency, the middle frequency and the highest frequency of channel were selected to perform the test, and the selected channels see below:

Channel	Frequency
The lowest channel	2402 MHz
The middle channel	2441 MHz
The highest channel	2480 MHz

2.0 Technical Test

2.1 Summary of Test Results

No deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (Only "Passed" if all Measurements are "Passed")	Pass

2.2 Test Report Summary

CLAUSE(ETSI EN 300 328)	TEST PARAMETER	RESULTS
Transmitter Parameters		
Clause 4.3.1	Effective Isotropic Radiated Power	PASS
Clause 4.3.2	Maximum e.i.r.p. spectral density	N.A.
Clause 4.3.3	Frequency Range	PASS
Clause 4.3.4	Frequency hopping requirements	PASS
Clause 4.3.5	Medium access protocol	PASS
Clause 4.3.6	Spurious Emissions	PASS
Receiver Parameters		
Clause 4.3.7	Receiver Spurious Emissions	PASS

Note: The clause numbers are referenced to ETSI EN 300 328 v 2.1.1 (2006-11)

Clause 4.3.1 Effective Isotropic Radiated Power (Conducted)

Remarks:

A temporary antenna connector provided when this test item was done. And the E.U.T. was connected to the power meter through the connector.

EIRP is calculated by method described under sub clause 7.2.1.2, using following formulae;

P=A+G+10 log (1/x);

Where:

A=Average Power (measured)

G= Antenna Gain= 0dBi

x= Duty Cycle=1(measured when E.U.T. transmit continuously)

Modulation Type	Freq.(MHz)	Average Power (dBm)
GFSK	2402	-1.00
	2441	-0.52
	2480	-0.46
Pi/4 QDPSK	2402	1.64
	2441	2.00
	2480	2.01
8DPSK	2402	2.01
	2441	2.44
	2480	2.44

Modulation Type	Test Conditions	Transmitter Power (dBm) EIRP		
		Low Freq. 2402MHz	Mid Freq. 2441MHz	High Freq. 2480MHz
GFSK	T_{nor} (25℃) V_{nor} (3.7V)	-1.00	-0.52	-0.46
	T_{low} (-20℃) V_{low} (3.145V)	-1.15	-0.66	-0.57
	T_{low} (-20℃) V_{hig} (4.255V)	-1.23	-0.79	-0.68
	T_{hig} (55℃) V_{low} (3.145V)	-1.18	-0.71	-0.61
	T_{hig} (55℃) V_{hig} (4.255V)	-1.07	-0.63	-0.72
Pi/4 QDPSK	T_{nor} (25℃) V_{nor} (3.7V)	1.64	2.00	2.01
	T_{low} (-20℃) V_{low} (3.145V)	1.54	1.88	1.93
	T_{low} (-20℃) V_{hig} (4.255V)	1.46	1.75	1.84
	T_{hig} (55℃) V_{low} (3.145V)	1.58	1.81	1.90
	T_{hig} (55℃) V_{hig} (4.255V)	1.40	1.77	1.78
8DPSK	T_{nor} (25℃) V_{nor} (3.7V)	2.01	2.44	2.44
	T_{low} (-20℃) V_{low} (3.145V)	1.91	2.33	2.35
	T_{low} (-20℃) V_{hig} (4.255V)	1.86	2.29	2.30
	T_{hig} (55℃) V_{low} (3.145V)	1.89	2.36	2.37
	T_{hig} (55℃) V_{hig} (4.255V)	1.83	2.25	2.26

Limits: Clause 4.3.1.2

Under All Test Conditions	≤20dBm/-10dBW/100mW

Clause 4.3.3 Frequency Range

For FHSS Systems

Modulation Type	Test Conditions		Transmitter Power dBm	
			Low Freq.(f_L) 2402MHz	High Freq.(f_H) 2480MHz
GFSK	T_{nor} (25℃)	V_{nor} (3.7V)	2401.60456	2480.36594
	T_{hig} (+55℃)	V_L (3.145V)	2401.60474	2480.36598
	T_{hig} (+55℃)	V_U (4.255V)	2401.60548	2480.36788
	T_{low} (-20℃)	V_U (4.255V)	2401.60443	2480.36686
	T_{low} (-20℃)	V_L (3.145V)	2401.60439	2480.36287
8DPSK	T_{nor} (25℃)	V_{nor} (3.7V)	2401.60477	2480.36581
	T_{hig} (+55℃)	V_L (3.145V)	2401.60449	2480.36682
	T_{hig} (+55℃)	V_U (4.255V)	2401.60594	2480.36769
	T_{low} (-20℃)	V_U (4.255V)	2401.60436	2480.36655
	T_{low} (-20℃)	V_L (3.145V)	2401.60450	2480.36266

Note: Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

Limits Clause 4.3.3.2

Under Normal Test Conditions	f_L > 2400MHz f_H < 2483.5MHz

Clause 4.3.4 Frequency hopping requirements

The Frequency Hopping systems used by the E.U.T. is the type of Adaptive Frequency Hopping systems

4.3.4.1 Dwell time

Modulation Type	Channel	Reading(ms)	Hoping Rate	Actual	Limit(s)
GFSK	DH1	0.420	800hop/s	0.1344	0.4
	DH3	1.710	400hop/s	0.2736	0.4
	DH5	2.970	266.667hop/s	0.3168	0.4
8DPSK	3DH1	0.440	800hop/s	0.1408	0.4
	3DH3	1.700	400hop/s	0.2720	0.4
	3DH5	2.985	266.667hop/s	0.3184	0.4

Actual = Reading × (Hopping rate / Number of channels) × Test period Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds]

NOTE: The E.U.T. makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the E.U.T. makes worst case 266.667 hops per second with 79 channels. It also meets the requirement of clause 4.3.4.3.

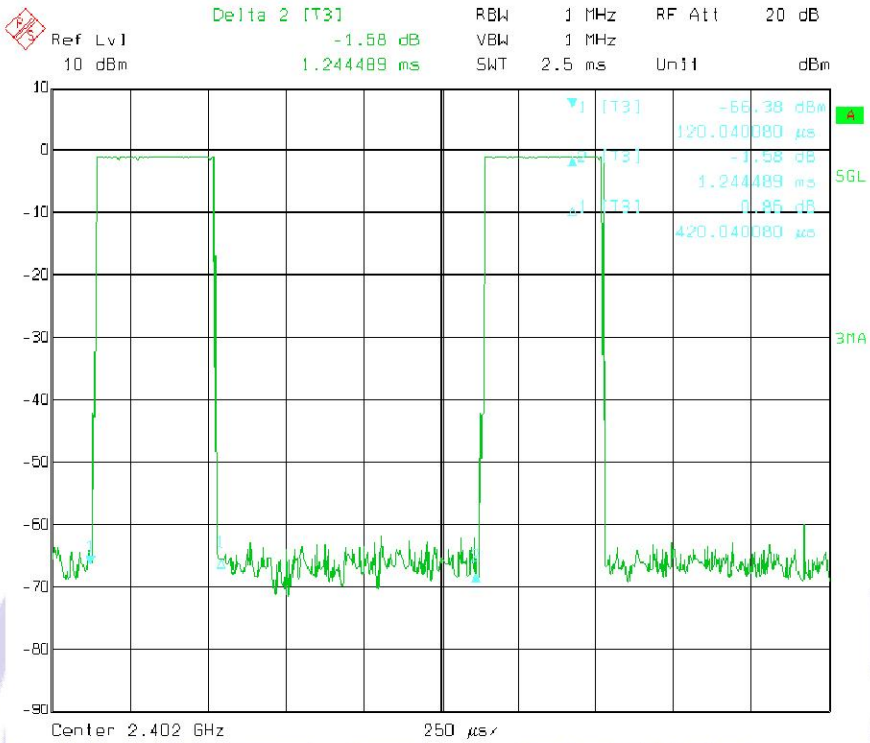
Each hopping channel of the hopping sequence is occupied at least once during a period not exceeding four times the product of the dwell time per hop and the number of channels.

Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

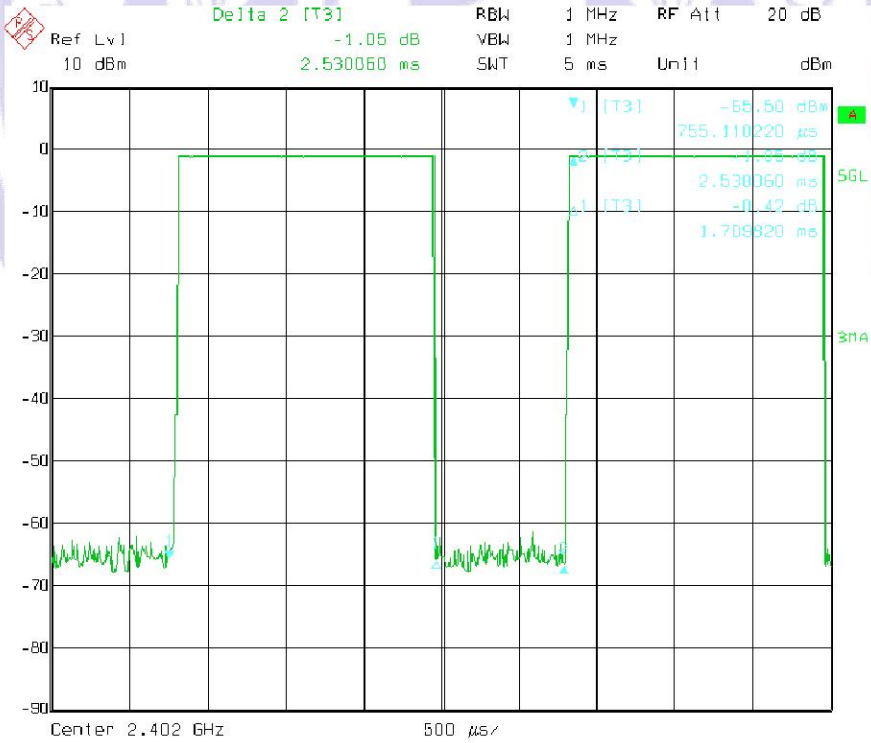
The Test Plots please refer to the next pages.

Modulation Type: GFSK

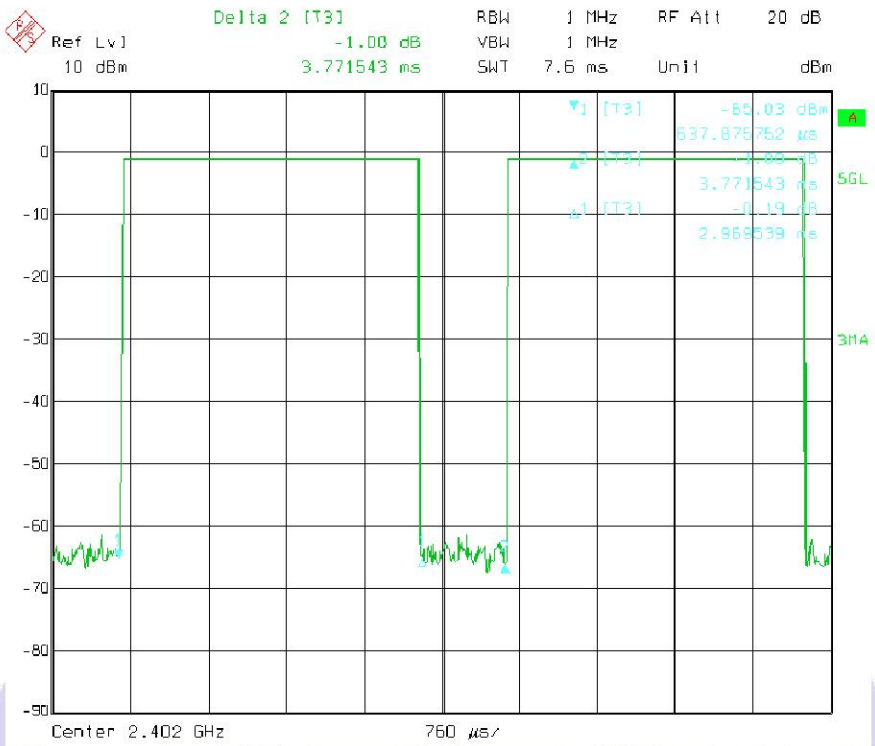
DH1



DH3

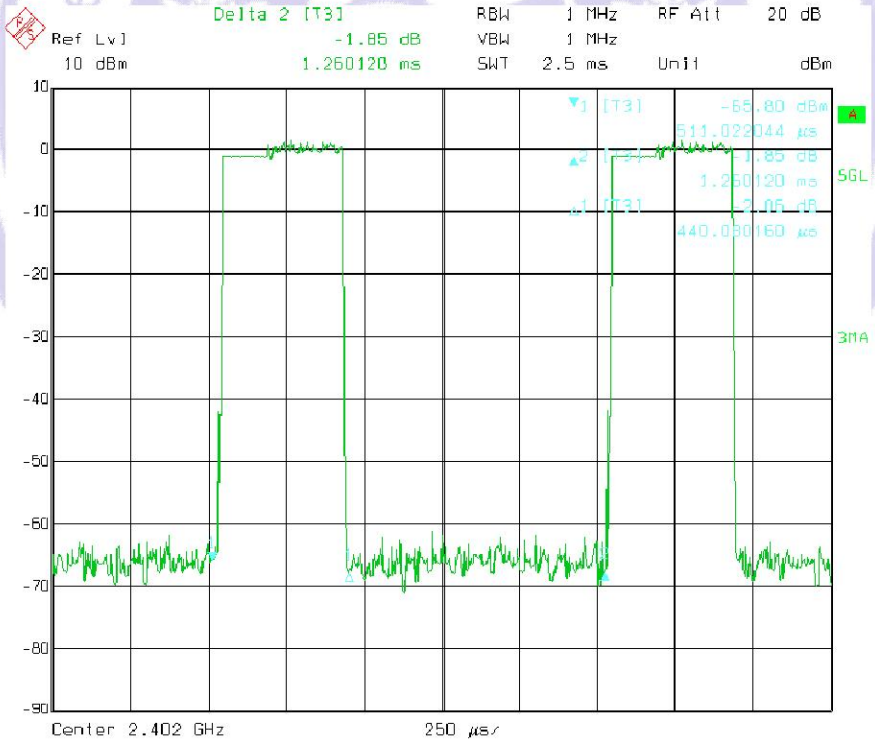


DH5



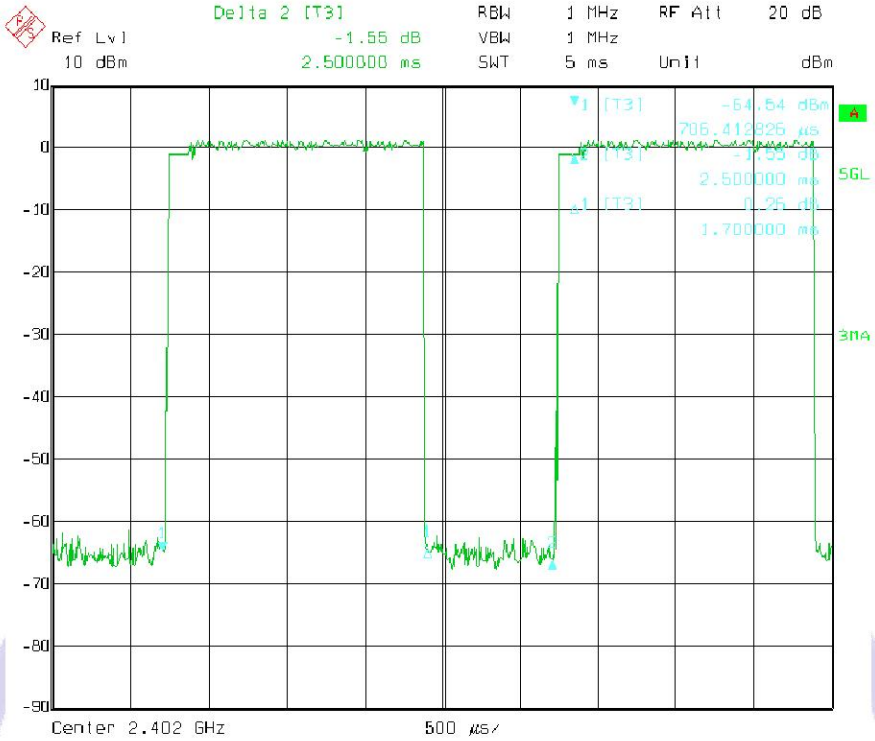
Modulation Type: 8DPSK

3-DH1

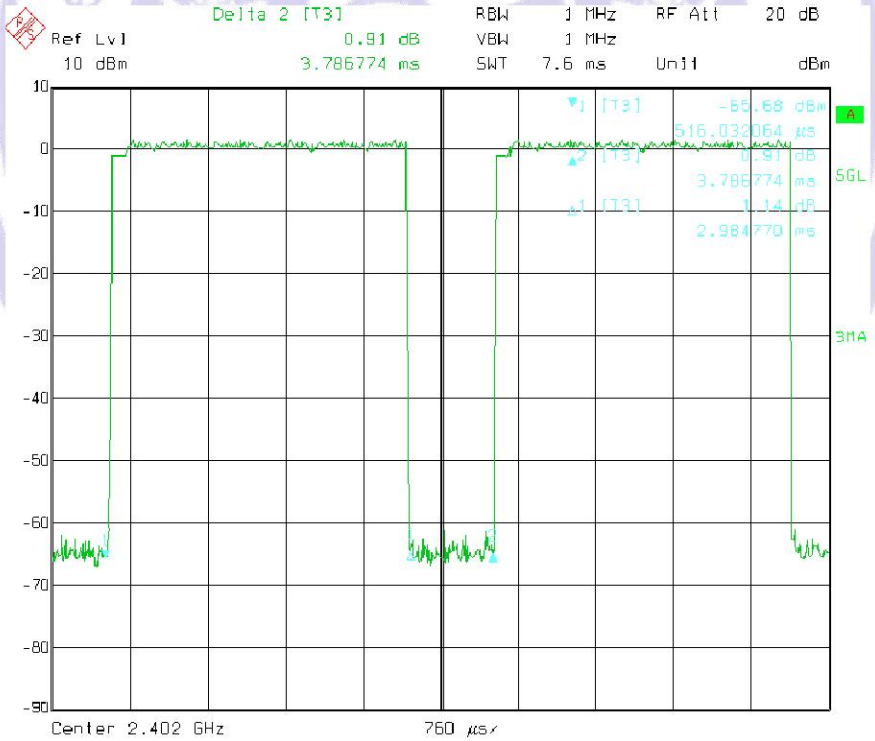


Hotline: 400-886-4819 Fax: 86-755-27790922 http://www.nct-testing.cn

3-DH3



3-DH5



4.3.4.2 Hopping channel

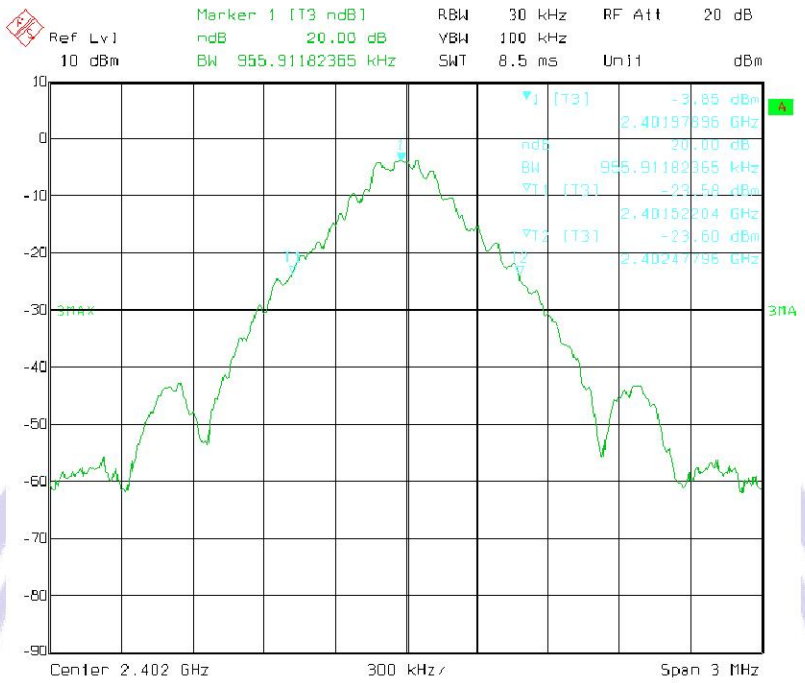
Modulation Type	Channel	Channel Frequency (MHz)	20 dB Channel Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
GFSK	Low	2402	955.9	--	Pass
	Middle	2441	961.9	--	Pass
	High	2480	961.9	--	Pass
8DPSK	Low	2402	1346.7	--	Pass
	Middle	2441	1352.7	--	Pass
	High	2480	1352.7	--	Pass

Note: Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

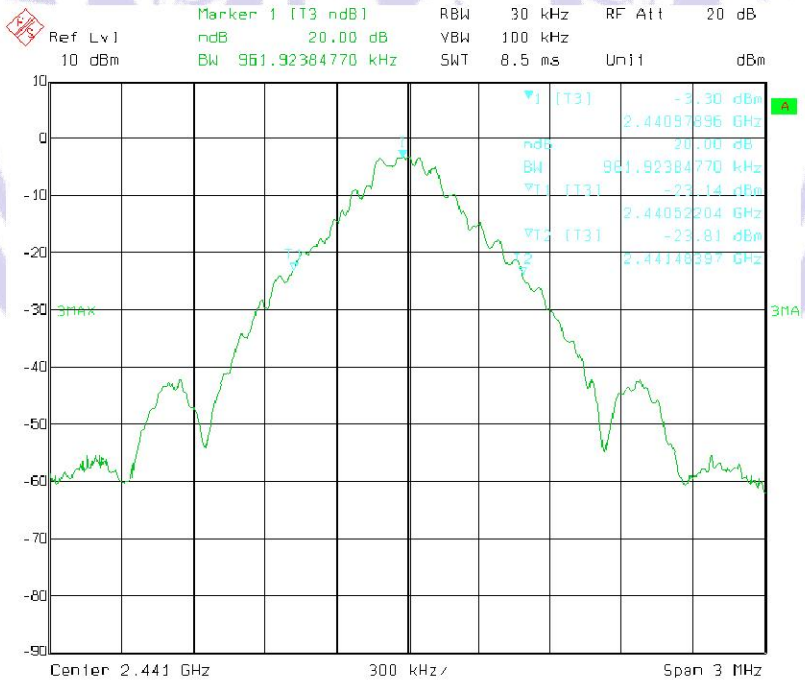
The Test Plots please refer to the next pages.

Modulation Type: GFSK

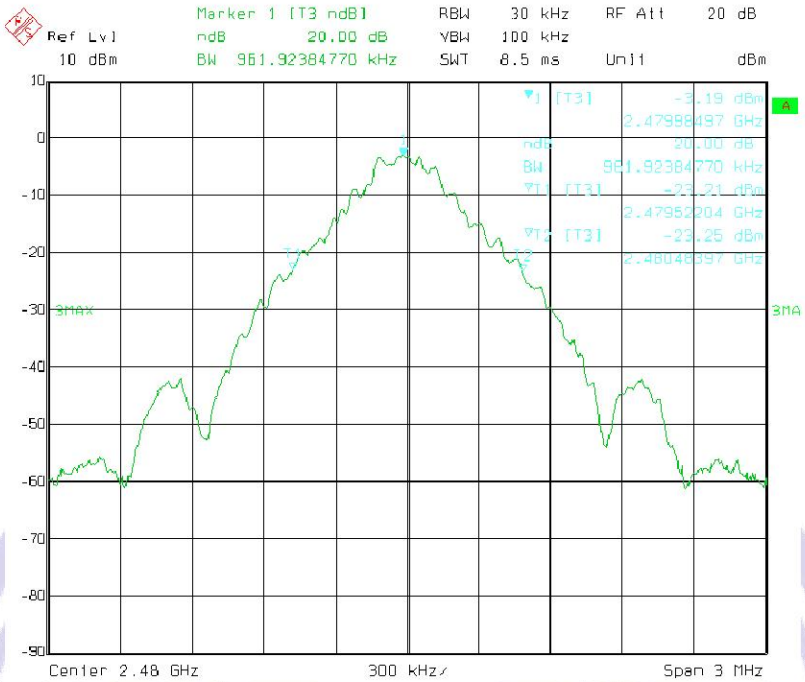
Low Channel



Middle Channel

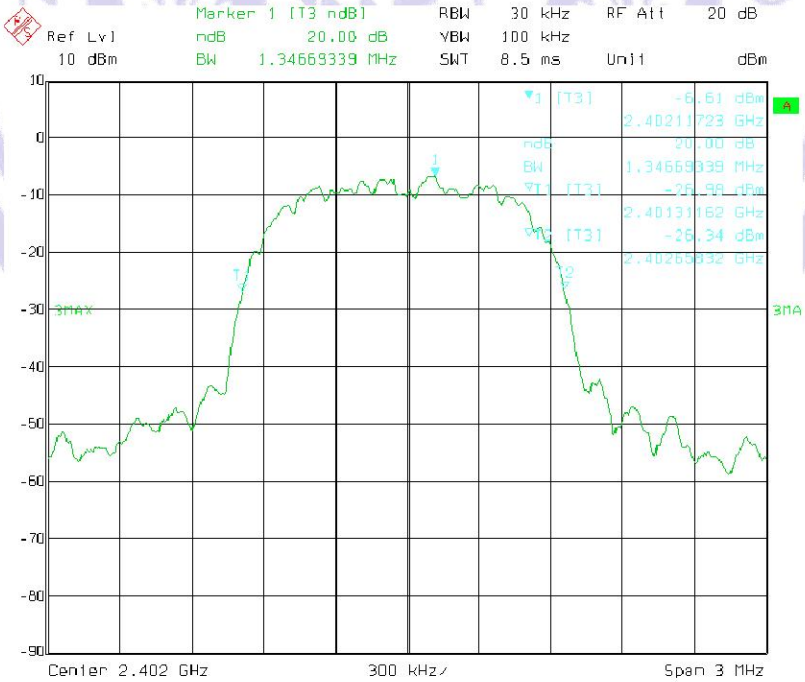


High Channel

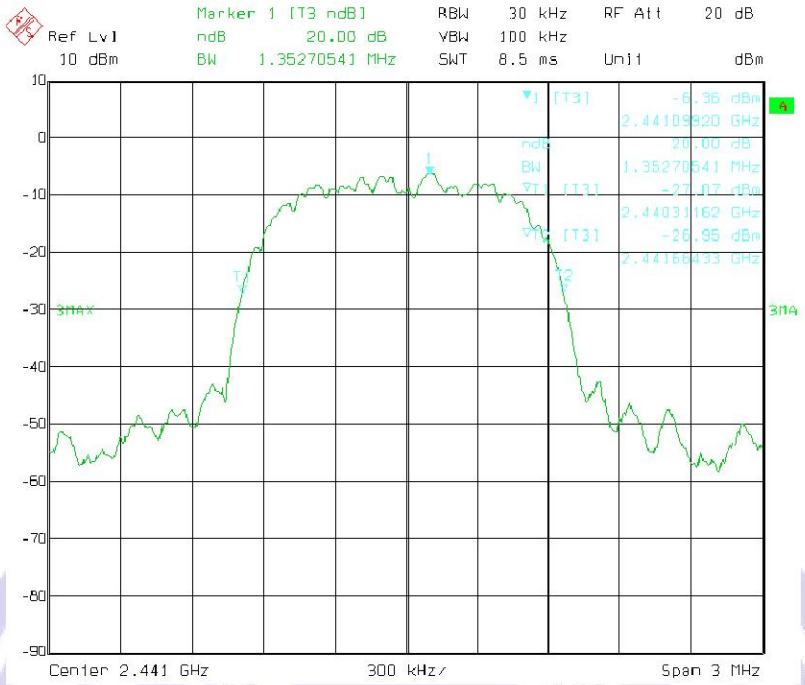


Modulation Type: 8DPSK

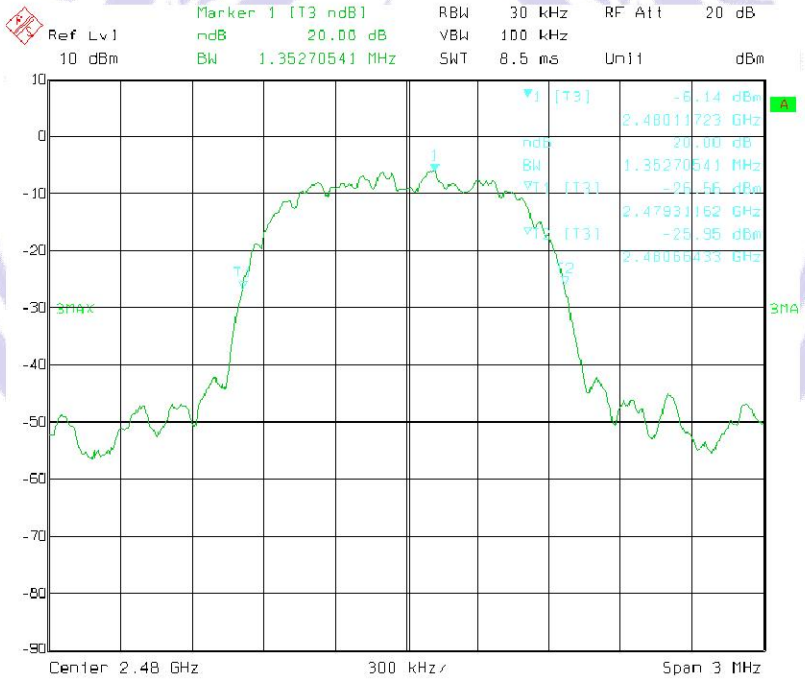
Low Channel



Middle Channel



High Channel



4.3.4.3 Carrier Frequency Separation

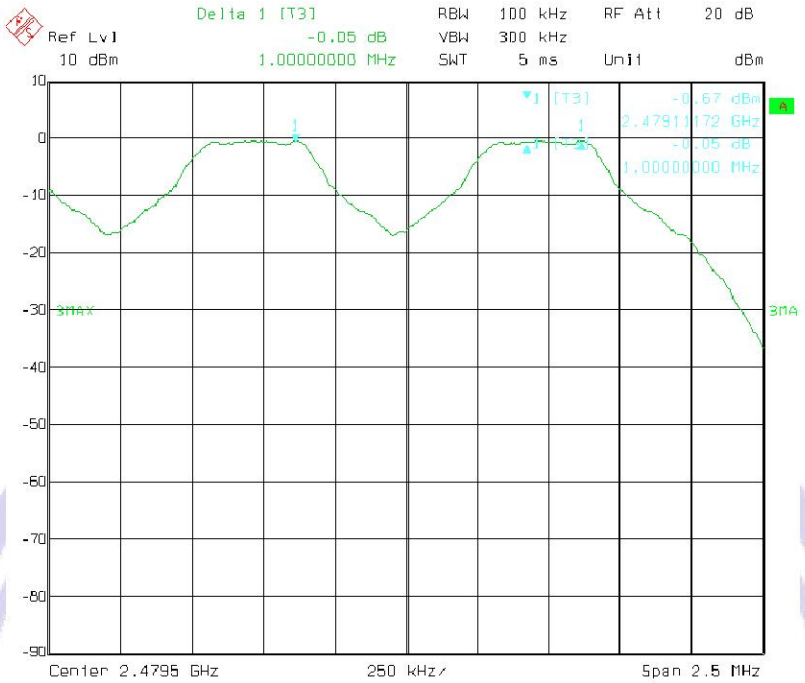
Modulation Type	Channel	Channel Frequency (MHz)	Carrier Frequency Separation	Limit	Pass/ Fail
GFSK	High	2480	1.000MHz	⩾1MHz	Pass
8DPSK	High	2480	1.000MHz	⩾1MHz	Pass

Note: Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

The Test Plots please refer to the next pages.

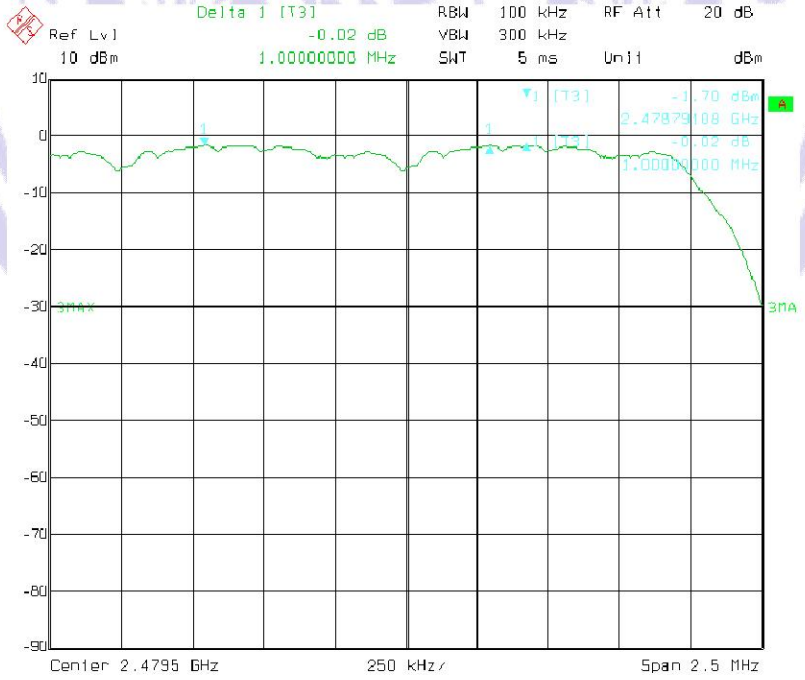
Modulation Type: GFSK

High Channel



Modulation Type: 8DPSK

High Channel



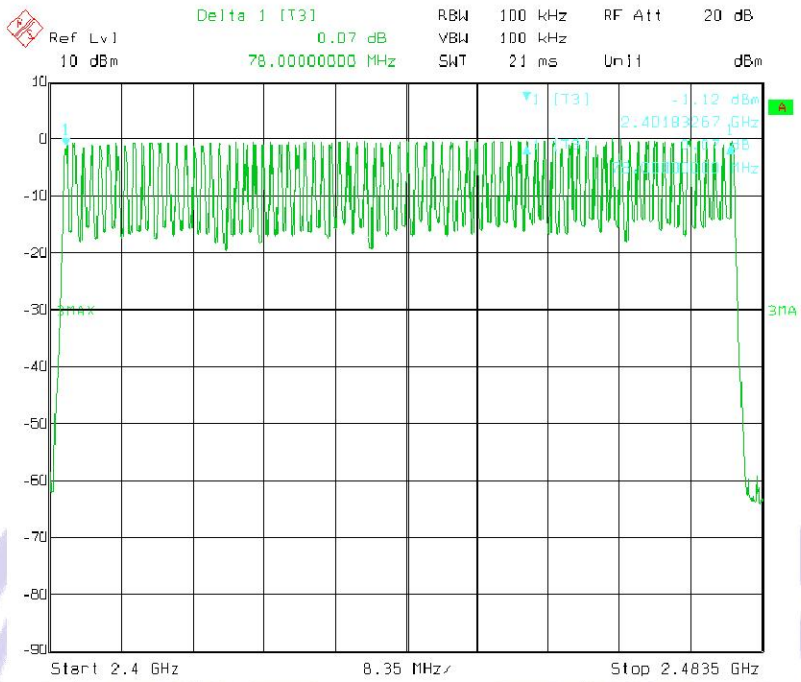
Clause 4.3.4.3 Hopping sequence

Modulation Type	Operating Frequency	Number of hopping channels	Limit	Pass/ Fail	Operating Frequency
GFSK	2402-2480MHz	79	≥ 15	Pass	2402-2480MHz
8DPSK	2402-2480MHz	79	≥ 15	Pass	2402-2480MHz

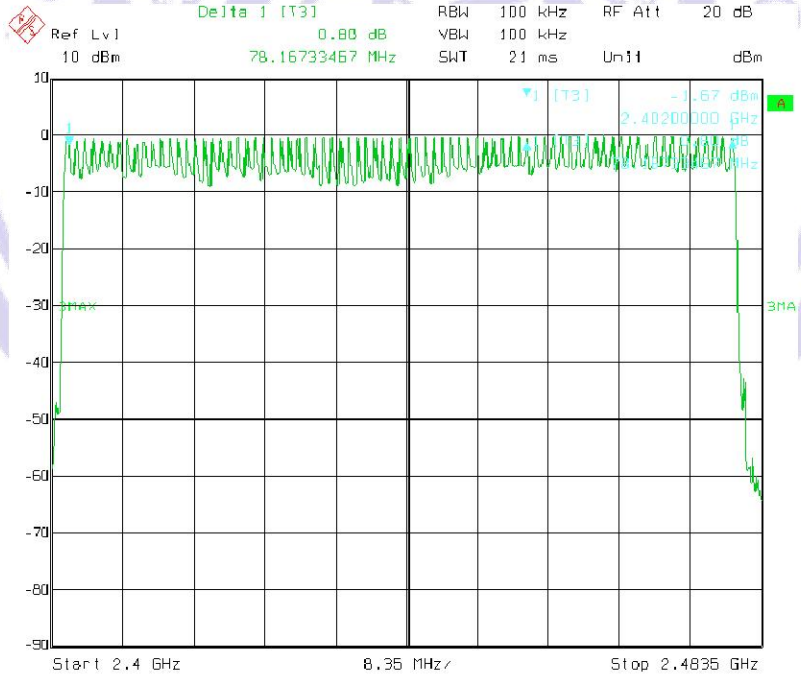
Note: Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

The Test Plots please refer to the next pages.

Modulation Type: GFSK



Modulation Type: 8DPSK



Clause 4.3.5 Medium access protocol

A medium access protocol is a mechanism designed to facilitate spectrum sharing with other devices in a wireless network.

Result: A medium access protocol is implemented by the equipment

Clause 4.3.6 Transmitter Spurious Emissions (Radiated)

Note:

1. Measurements were done on low & high channels, but depicting the worst case is submitted in the report.
2. The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges.
3. Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is GFSK mode.

Lowest Frequency （2402MHz）			Highest Frequency (2480MHz)		
f(MHz)	Band-Width (kHz)	Level (dBm)	f(MHz)	Band-Width (kHz)	Level (dBm)
4804	1000	-38.47	4960	1000	-37.49
7206	1000	-36.81	7440	1000	-37.53

Limits Clause 4.3.6.2

Frequency Range	Narrowband Spurious Emissions		Wideband Spurious Emissions	
	Limit When Operating	Limit When in Standby	Limit When Operating	Limit When in Standby
30MHz-1GHz	-36 dBm	-57 dBm	-86 dBm/Hz	-107 dBm/Hz
Above 1GHz-12.75GHz	-30 dBm	-47 dBm	-80 dBm/Hz	-97 dBm/Hz
1.8GHz-1.9GHz 5.15GHz-5.3GHz	-47 dBm	-47 dBm	-97 dBm/Hz	-97 dBm/Hz

Transmitter Standby

Lowest Frequency （2402MHz）			Highest Frequency (2480MHz)		
f(MHz)	Band-Width (kHz)	Level (dBm)	f(MHz)	Band-Width (kHz)	Level (dBm)
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		

Note: NF=No Significant Peak was Found
Please see the following pages for details.

Limits Clause 4.3.6.2

Frequency Range	Narrowband Spurious Emissions		Wideband Spurious Emissions	
	Limit When Operating	Limit When in Standby	Limit When Operating	Limit When in Standby
30MHz-1GHz	-36 dBm	-57 dBm	-86 dBm/Hz	-107 dBm/Hz
Above 1GHz-12.75GHz	-30 dBm	-47 dBm	-80 dBm/Hz	-97 dBm/Hz
1.8GHz-1.9GHz 5.15GHz-5.3GHz	-47 dBm	-47 dBm	-97 dBm/Hz	-97 dBm/Hz

Clause 4.3.7 Receiver Spurious Emissions (Radiated)

Note:

1. Measurements were conducted on low & high channels, but the worst case was submitted in the report only.
2. The receiver spurious emissions were conducted with different settings, using the relevant pre-amplifiers for the relevant frequency ranges.

Lowest Frequency			Highest Frequency		
f(MHz)	Band-Width (kHz)	Level (dBm)	f(MHz)	Band-Width (kHz)	Level (dBm)
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		
NF			NF		

NF=No significant peak noise was found

Limits Clause 4.3.7.2

Frequency Range	Narrowband Spurious Emissions	Wideband Spurious Emissions
30MHz-1GHz	-57 dBm	-107 dBm/Hz
Above 1GHz-12.75GHz	-47 dBm	-97 dBm/Hz

3.0 Product Labelling

CE Mark label specification

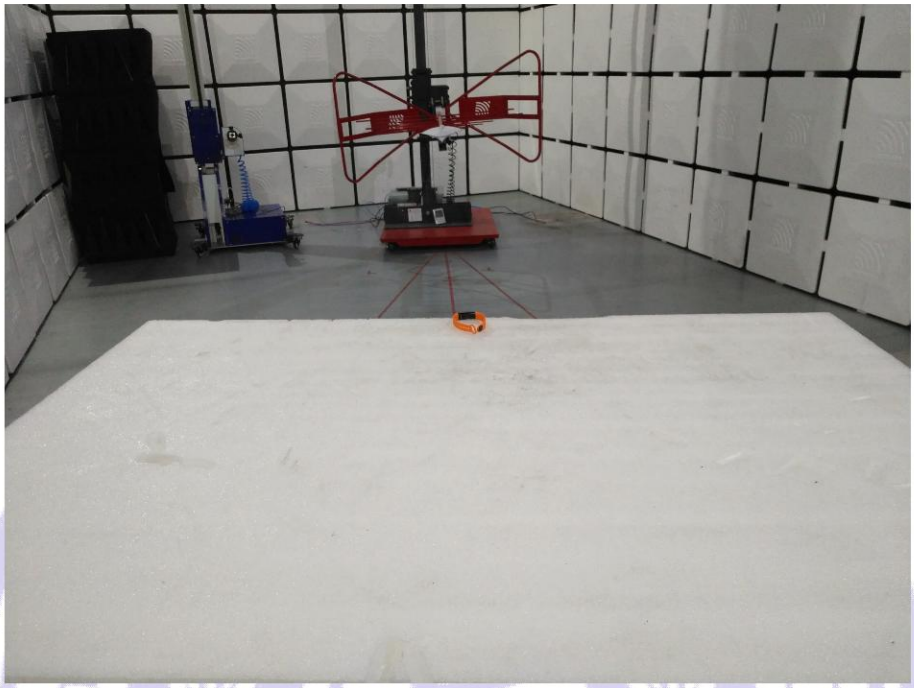
Text of the mark is black or white in color and is left justified. Labels are printed in indelible ink on permanent adhesive backing and shall be affixed at a conspicuous location on the E.U.T. or silk-screened onto the E.U.T..

Mark Location: Rear enclosure

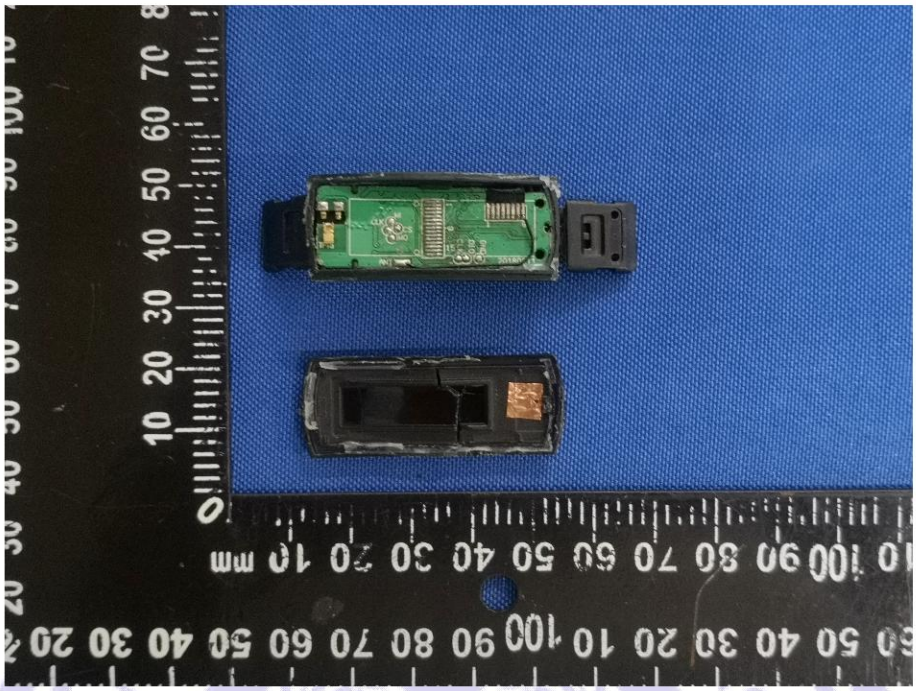
CE

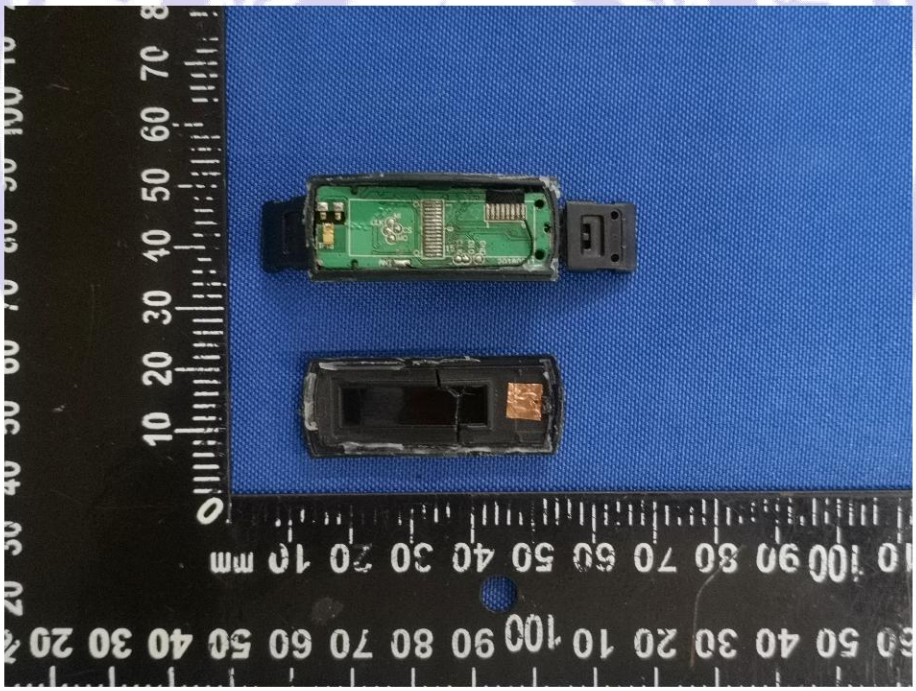
4.0 Photographs – Test Setup

Radiated emission test view



5.0 Photographs – E.U.T.





6.0 List of the test equipments

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	July 07, 2018	July 06, 2019
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	July 07, 2018	July 06, 2019
System Controller	CT	SC100	-	July 07, 2018	July 06, 2019
Spectrum Analyzer	ROHDE&SCHWARZ	FSU	-	July 07, 2018	July 06, 2019
Pre-amplifier	Agilent	8447D	83153007374	July 07, 2018	July 06, 2019
Pre-amplifier	Agilent	8449B	3008A01738	July 07, 2018	July 06, 2019
Horn Antenna	ETS LINDGREN	3117	--	July 07, 2018	July 06, 2019
Conditional Chamber	KSON	THS-D4T-150	--	July 07, 2018	July 06, 2019

END OF REPORT