EMC TEST REPORT
No. JSH007100412-001

Applicant	:	TE-Group NV Edward Caertsstraat 39, Ekeren, Belgium, 2180
Manufacturer	:	Xingtel Xiamen Electronics Co., Ltd. Xingtel Building, Chuangx in Road, Torch Hi-Tech Industrial District, Xiamen, 361006, China
Equipment	:	Bluetooth Carkit
Type/Model	:	BLUE VISION II

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2006): Radio Frequency Devices
ANSIC63.4 (2003): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Date of issue: Nov 20, 2007

Tested by: Wakeyou Wang

Wakeyou Wang (*Project Engineer*)

Reviewed by:

Jonny Jing (*Reviewer*)

Description of Test Facility

Name: Intertek Testing Services Limited Shanghai
Address: Building No.86, 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

FCC Registration Number: 236597

Name of contact: Steve Li
Tel: +86 21 64956565 ext. 214
Fax: +86 21 54262335 ext. 214

Content

1. General Information

1.1 Applicant Information

Applicant:	TE-Group NV Edward Caertsstraat 39, Ekeren, Belgium, 2180
Name of contact:	Mr. Lieve Dufoer
Tel: Fax:	+32 3 660 22 44 +32 3 660 22 45
Manufacturer:	Xingtel Xiamen Electronics Co., Ltd. Xingtel Building, Chuangx in Road, Torch Hi-Tech Industrial District, Xiamen, 361006, China
Sample Receipt date: Test date:	Oct 20, 2007 Oct 20, 2007 ~ Nov 16, 2007

1.2 Identification of the EUT

Equipment: Type/model:	Bluetooth Carkit BLUE VISION II
FCC ID:	TP9BVII

1.3 Technical specification

Operation Frequency Band:	2.4GHz ~ 2.4835 GHz
Modulation:	GFSK
Antenna Designation:	Non-User Replaceable (Fixed)
Gain of Antenna: Rating:	-1.76dBi max DC 12V (Supplied by a DC/DC adapter connected to the vehicle.)
Description of EUT:	The EUT is a Bluetooth Carkit. By Bluetooth telecommunication with a personal mobile phone, it can substitute the calling function of the corresponding mobile phone.
Channel Description:	There are 79 channels named channel 0 to channel 78. Each channel occupies 1MHz. Channel 0 corresponds to carrier frequency 2402MHz and channel 78 corresponds to 2480MHz

1.4 Mode of operation during the test / Test peripherals used

While performing “dwell time” test, three packet settings were observed separately, namely DH1, DH3 and DH5.
For other tests, if hopping mode is necessary, DH5 with the biggest packet as the client’s description was setting to get the worst test results.

.

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2007-6-1	2008-5-31
Ultra-broadband antenna	HL 562	R&S	EC 3046-1	2007-6-1	2008-5-31
Horn antenna	HF 906	R&S	EC 3049	2007-6-1	2008-5-31
Signal generator	SMR 20	R&S	EC 3044-1	2007-8-22	2008-8-21
Power meter	PM2002	AR	EC3043-7	2007-1-23	2008-1-22
Power sensor	PH2000	AR	EC3043-8	2007-1-23	2008-1-22
Semi-anechoic chamber	-	Albatross project	EC 3048	2007-6-1	2008-5-31
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2007-6-1	2008-5-31
Pre-amplifier	Pre-amp 40	Beijing Radio 2	-	2007-3-4	2008-3-3
Horn antenna	K638A	Beijing Radio 2	-	2007-3-4	2008-3-3
A.M.N.	ESH2-Z5	R&S	EC 3119	2007-1-23	2008-1-22
Test Receiver	ESCS 30	R&S	EC 2107	2007-1-23	2008-1-22
Spectrum Analyzer	E4408B	Agilent	MY45102679	2006-11-20	2007-11-19
Spectrum Analyzer	E4446A	Agilent	MY45300103	2007-6-11	2008-6-10

2.2 Test Standard

47CFR Part 15 (2006)
ANSI C63.4: 2003

2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	REFERANCE	RESULT
Hopping channel separation	15.247(a)(1)	Pass
Maximum peak output power	15.247(b)(1)	Pass
Power spectrum density	15.247(e)	NA
Spurious emission	15.209	Pass
Restrict band radiated emission	15.205	Pass
Emission outside the frequency band	15.247(d)	Pass
Power line conducted emission	15.207	NA
Channel number of hopping system	15.247(a)(1)(iii)	Pass
Average time of occupancy in any channel	15.247(a)(1)(iii)	Pass

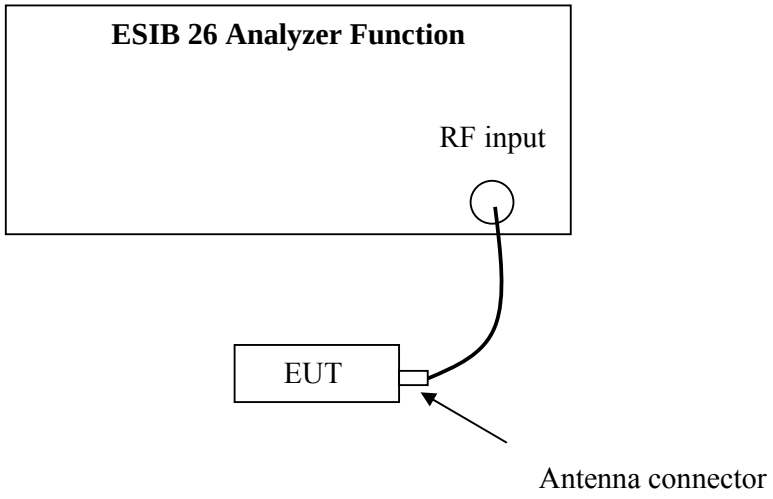
3. Hopping channel separation

Test result: PASS

3.1 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

3.2 Test Configuration



3.3 Test Procedure and test setup

Hopping Channel separation per FCC § 15.247(a)(1) is measured using the ESIB 26 analyzer function with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel).

3.4 Test Protocol

Temperature : 22°C
Relative Humidity : 43%

Channel	Channel Frequency (GHz)	20 dB Bandwidth (kHz)
0(lowest)	2.402	877
39(middle)	2.441	882
78(highest)	2.480	877

Channel	Channel Separation (kHz)	Max. 20 dB Bandwidth (kHz)	Margin (kHz)
1	998	882	116
2			

Remark: Margin = Max. 20 dB Bandwidth - Channel Separation

3.5 Measurement uncertainty

The measurement uncertainty is ±100Hz.

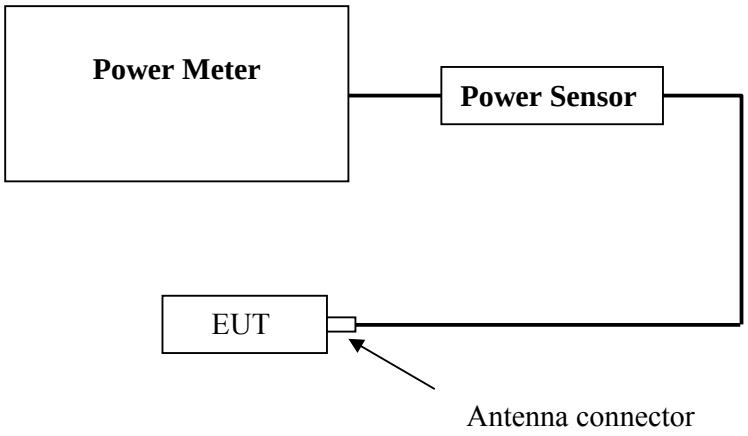
4. Maximum peak output power

Test result: Pass

4.1 Test limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts

4.2 Test Configuration



4.3 Test procedure and test setup

The power output per FCC § 15.247(b)(1) was measured on the EUT using a power meter via power sensor. The test was performed at 3 channels (lowest, middle and highest channel).

4.4 Test protocol

Temperature : 22°C
Relative Humidity : 43%

Channel	Reading of power meter (dBm) **R**	Cable loss (dB) **L**	Corrected Reading (dBm) **C**	Limit (dBm)
0(lowest)	-3.22	1.09	-2.13	30
39(middle)	-2.97	1.50	-1.47	30
78(highest)	-4.21	1.59	-2.62	30

Remark: **C = R+ L**

4.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

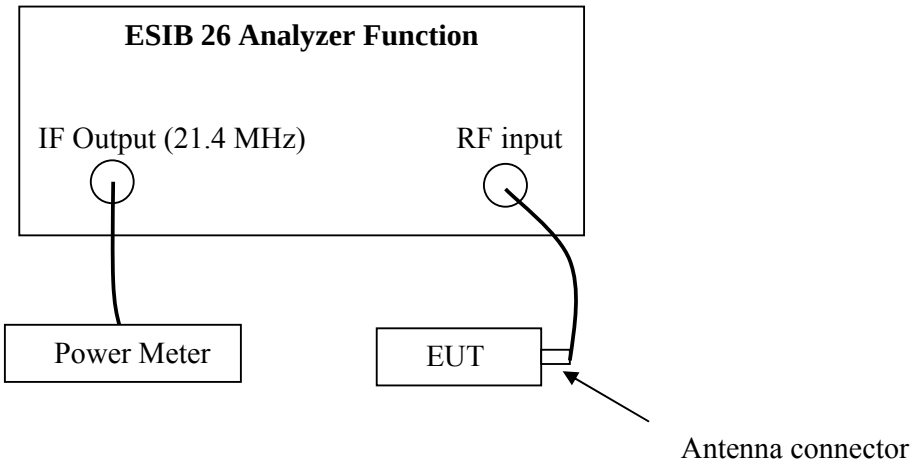
5. Power spectrum density

Test result: **NA**

5.1 Test limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Configuration



5.3 Test procedure and test setup

The power output per FCC §15.247(e) is measured using the ESIB 26 analyzer function with a power meter connected to IF output (21.4MHz) port. Under spectral measurement mode, catch the frequency point with maximum power spectrum. Then set the span to be 0 and the resolutions bandwidth to be 3 kHz. After calibration, it is found that the power spectral density equals the reference level of analyzer plus the reading of power meter.
The test was performed at 3 channels (lowest, middle and highest channel).

5.4 Test Protocol

Temperature : °C

Relative Humidity : %

Channel	Channel Frequency(GHz)	Maximum power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
-	-	-	-
-	-	-	-
-	-	-	-

5.5 Measurement uncertainty

The measurement uncertainty is ±1dB/3kHz.

6. Spurious emission

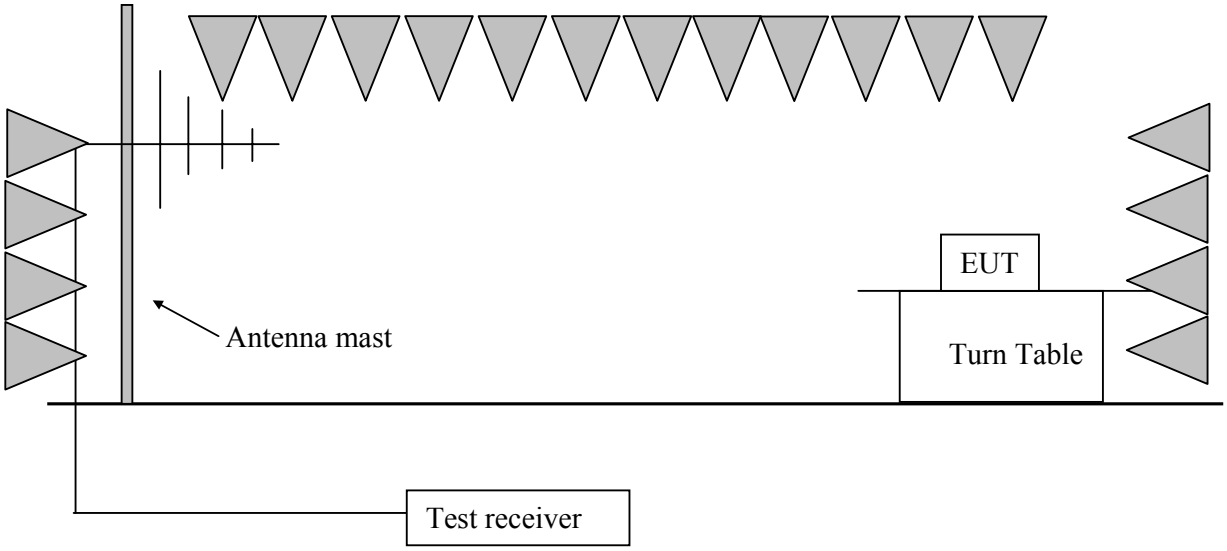
Test result: PASS

6.1 Test limit

The spurious emission shall test through the 10th harmonic. It must comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.2 Test Configuration



6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, the pre-amplifier is equipped just at the output terminal of the antenna.
The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

6.4 Test protocol

For QP test below 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
0	H	253.17	15.70	28.20	46.00	17.80
0	V	253.17	*	*	*	*
39	H	253.23	15.70	27.90	46.00	18.10
39	V	253.23	*	*	*	*
78	H	253.14	15.70	27.60	46.00	18.40
78	V	253.14	*	*	*	*

Remark: 1.Correct Factor = Antenna Factor + Cable Loss
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
4. If the margin > 20dB, it would be marked as "*".
5. For more details, please refer to the test data.

For PK test above 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
0	H	1104.30	-0.20	45.70	54.00	8.30
0	V	1104.30	-0.20	45.30	54.00	8.70
39	H	1207.50	-0.20	46.20	54.00	7.80
39	V	1834.30	0.60	45.50	54.00	8.50
78	H	1486.10	0.40	45.40	54.00	8.60
78	V	1924.40	0.60	46.90	54.00	7.10

Remark: 1.Correct Factor = Antenna Factor + Cable Loss - Gain of Preamplifier
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
4. Here the AV limit is used to evaluate PK test data and therefore AV test is not necessary .
5. For more details, please refer to the test data (the emission within2.4GHz ~ 2.4835GHz is fundamental signal and not observed in this test).

6.5 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of radiated emission is: ± 5.31dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.

7. Restrict band radiated emission

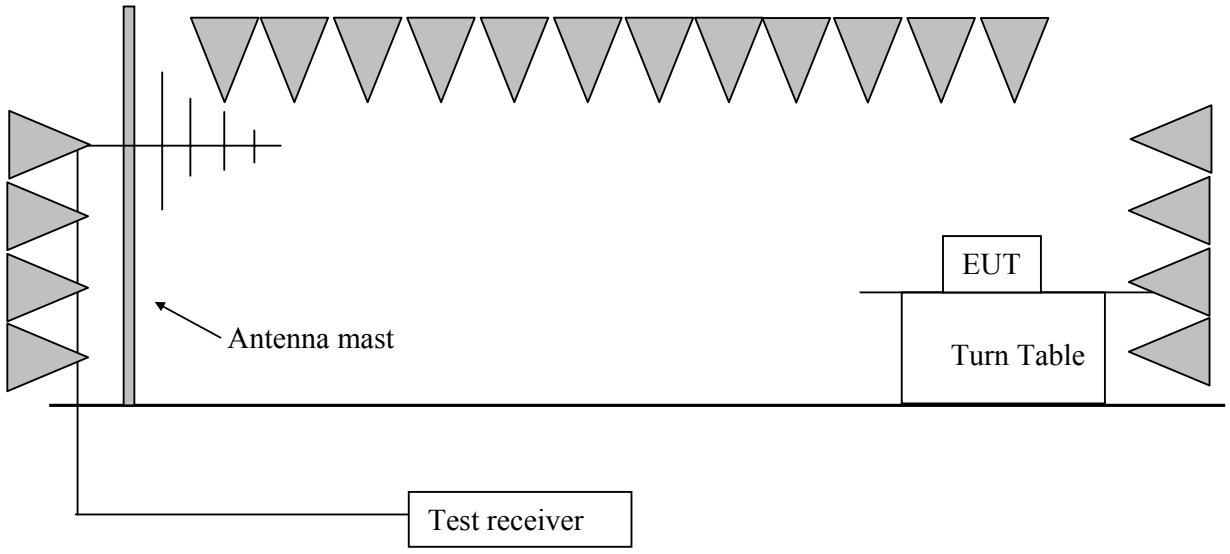
Test result: PASS

7.1 Test limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

7.2 Test Configuration



7.3 Test procedure and test setup

1. Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function as the Spurious Radiated Emissions test procedure.
2. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the

fundamental emission and the relevant band-edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.
3. Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance as required by Section 15.205.
4. The above "delta" measurement technique may be used for measuring emissions that are up to two "standard" bandwidths away from the band-edge, where a "standard" bandwidth is the bandwidth specified by C63.4 for the frequency being measured. For example, for band-edge measurements in the restricted band that begins at 2483.5 MHz, C63.4 specifies a measurement bandwidth of at least 1 MHz. Therefore you may use the "delta" technique for measuring emissions up to 2 MHz removed from the band-edge.
5. Radiated emissions that are removed by more than two “standard” bandwidths must be measured as the above Spurious Radiated Emissions test procedure.

7.4 Test protocol

Highest reading on restrict band 2310MHz ~ 2390MHz, hopping on channel 0

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	2318.27	2.20	59.76	74
AV	2376.18	2.20	47.92	54

Highest reading on restrict band 2483.5MHz ~ 2500MHz, hopping on channel 78

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	2483.63	2.20	60.84	74
AV	2483.50	2.20	53.42	54

7.5 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of radiated emission is: ± 5.31dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.

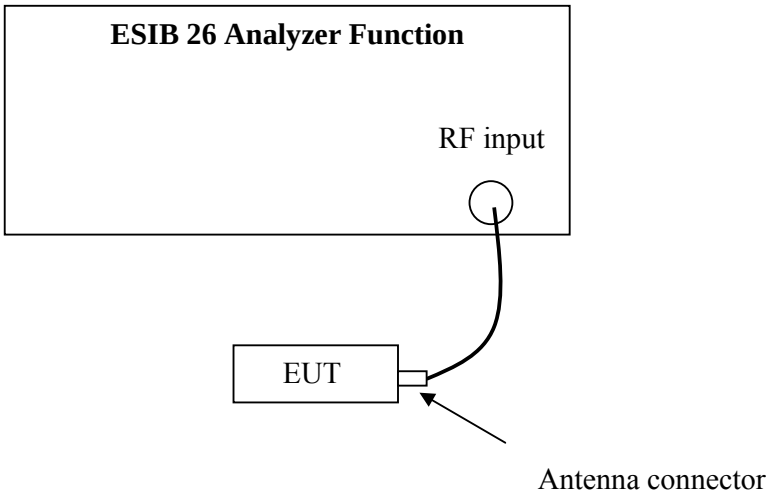
8. Emission outside the frequency Band

Test result: **PASS**

8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

8.2 Test Configuration



8.3 Test procedure and test setup

The Emission outside the frequency Band per FCC §15.247(d) is measured using the ESIB 26 analyzer function with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.

8.4 Test protocol

Working Condition	Highest level outside the band edge (dBm)	Highest emission within the band edge (dBm)	Delta (dBm)	Limit
Hopping on channel 0	-53.73	-2.37	51.36	≥ 20dB
Hopping on channel 39	-54.96	-2.58	52.38	≥ 20dB
Hopping on channel 78	-54.08	-2.41	51.67	≥ 20dB

8.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

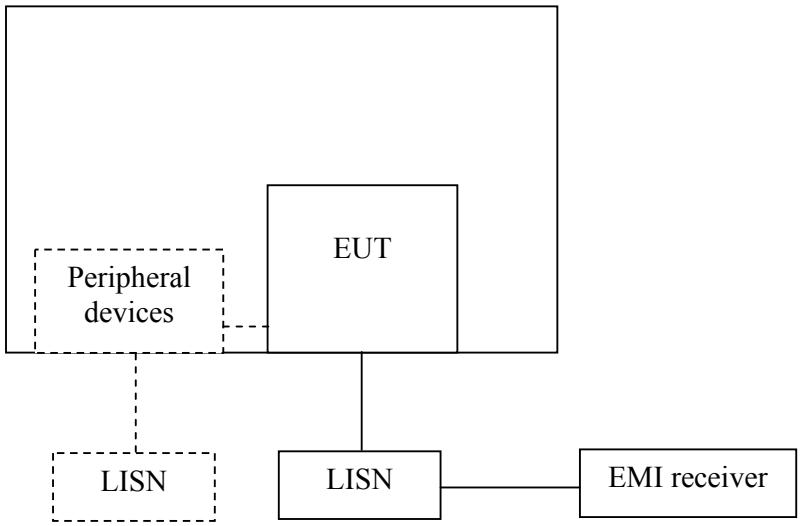
9. Power line conducted emission

Test result: **NA**

9.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

9.2 Test configuration



☐ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

9.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.

9.4 Test protocol

Power line: L

Freq	Correct Factor (dB)	Receiver Reading (dBuV) QP	AV	Corrected Reading (dBuV) QP	AV	Limit (dBuV) QP	AV	Margin (dB) QP	AV
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB).
2. Margin (dB) = Limit - Corrected Reading.
If margin>20dB, it would be marked as *.

Power line: N

Freq	Correct Factor (dB)	Receiver Reading (dBuV) QP	AV	Corrected Reading (dBuV) QP	AV	Limit (dBuV) QP	AV	Margin (dB) QP	AV
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB).
2. Margin (dB) = Limit - Corrected Reading.
If margin>20dB, it would be marked as *.

9.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty at mains terminal: ± 1.99dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.

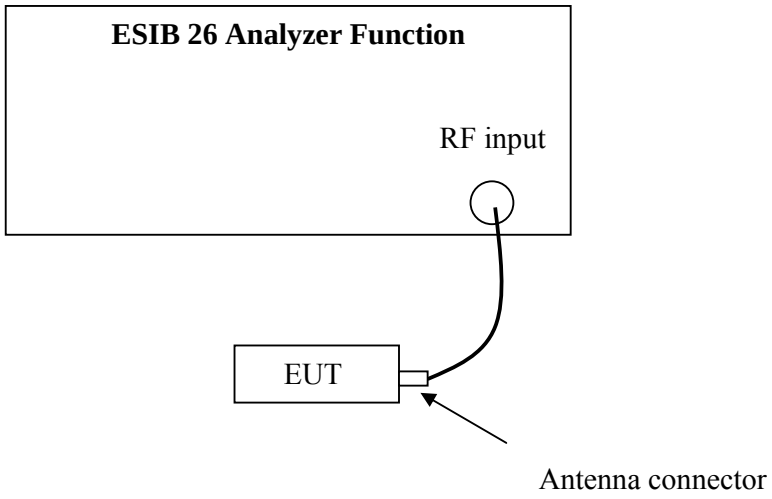
10. Channel Number of hopping system

Test result: **PASS**

10.1 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

10.2 Test Configuration



10.3 Test procedure and test setup

The channel number per FCC §15.247(a)(1)(iii) is measured using the ESIB 26 analyzer function with the resolutions bandwidth set at 1MHz, the video bandwidth set at 1MHz, and the SPAN>>RBW.

10.4 Test protocol

Channel Number	Limit
79	≥15

10.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

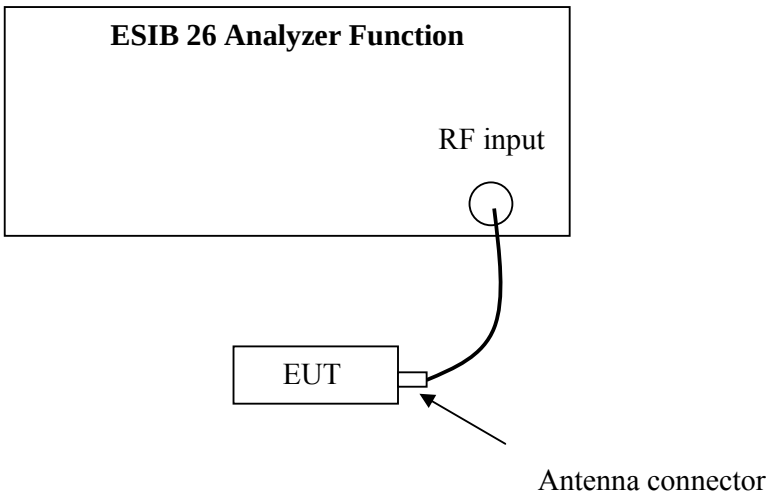
11. Average time of occupancy in any channel

Test result: **PASS**

11.1 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

11.2 Test Configuration



11.3 Test procedure and test setup

Average time of occupancy in any channel per FCC § 15.247(a)(1)(iii)
is measured using the ESIB 26 analyzer function with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN set to be 0Hz to test in time domain. The test is performed at the middle channel.

11.4 Test protocol

The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels.

Time of occupancy (dwell time) for DH1
Dwell time = 421.800 µs * 1600 * 1/2 * 1/s / 79 *31.6s = 134.98 ms (in a 31.6s period)

Time of occupancy (dwell time) for DH3
Dwell time = 1.68 ms * 1600 * 1/4 * 1/s / 79 *31.6s = 268.80 ms (in a 31.6s period)

Time of occupancy (dwell time) for DH5
Dwell time = 2.93 ms * 1600 * 1/6 * 1/s / 79 *31.6s = 312.53 ms (in a 31.6s period)

11.5 Measurement uncertainty

The measurement uncertainty is ± 10µs.