EMC TEST REPORT for Intentional Radiator

No. SH11061463-001

Applicant	:	Philips Electronics (Suzhou) Co., Ltd Building B-3rd, 19-21st floor, 209 Zhu Yuan Road, New District, Suzhou, China, 215011
Manufacturer	:	Philips Electronics (Suzhou) Co., Ltd Building B-3rd, 19-21st floor, 209 Zhu Yuan Road, New District, Suzhou, China, 215011
Product Name	:	Game Controller
Type/Model	:	RCGP400512/01

SUMMARY

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

47CFR Part 15 (2009): 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

RSS-210 Issue 8 (December 2010): Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

RSS-Gen Issue 3 (December 2010): General Requirements and Information for the Certification of Radiocommunication Equipment

RSS-310 Issue 3 (December 2010): Licence-exempt Radio Apparatus (All Frequency Bands): Category II Equipment

Date of issue: July 13, 2011

Prepared by:

Wakeyou Wang (*Project Engineer*)

Reviewed by:

Daniel Zhao (*Reviewer*)

Description of Test Facility

Name: Intertek Testing Services Ltd. Shanghai ETL Semko
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IC Assigned Code: 2042B-1

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Content

1. General Information

1.1 Applicant Information

Applicant:	Philips Electronics (Suzhou) Co., Ltd Building B-3rd, 19-21st floor, 209 Zhu Yuan Road, New District, Suzhou, China, 215011
Name of contact:	Shi He
Tel: Fax:	+86 512 6878 6635 +86 512 6878 6689
Manufacturer:	Philips Electronics (Suzhou) Co., Ltd Building B-3rd, 19-21st floor, 209 Zhu Yuan Road, New District, Suzhou, China, 215011

Sample received date	:	June 27, 2011
Sample Identification No	:	*0110627-13-002*
Date of test	:	June 27, 2011~ July 5, 2011

1.2 Identification of the EUT

Equipment:	Game Controller
Type/model:	RCGP400512/01
FCC ID:	ZQ8RCGP4005B
IC:	135AD- RCGP4005B

1.3 Technical specification

Operation Frequency Band:	2402 - 2480 MHz
Modulation:	GFSK (Frequency Hopping Spread Spectrum)
Antenna Designation:	Integral, un-detachable antenna
Gain of Antenna:	2.0dBi max used.
Rating:	DC 3V(AAA×2 Battery)
Description of EUT:	Here is one model only. The EUT is a game controller using Bluetooth technology.
I/O port:	None
Channel Description:	There are 79 channels in all. The designed channel spacing is 1MHz.

Channel Identifier	Frequency (MHz)
low	2402
middle	2441
high	2480

1.4 Mode of operation during the test / Test peripherals used

Within this test report, EUT was tested under 3V. The EUT has transmitting as well as receiving modes, so both were assessed.
While testing the transmitter mode of the EUT, the internal modulation is applied.
While testing receiver mode of EUT, the signal generator with a transmitting antenna generating 2.4GHz sine wave is put in close proximity to the EUT.
The EUT is a portable device, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

Test Peripherals:
Laptop: FUJITSU SIMENS, LIFEBOOK
Bluetooth Test Set: Anritsu, MT8852A

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2010-10-22	2011-10-21
A.M.N.	ESH2-Z5	R&S	EC 3119	2011-1-10	2012-1-9
A.M.N.	ESH3-Z5	R&S	EC 2109	2011-1-10	2012-1-9
Horn antenna	HF 906	R&S	EC 3049	2011-5-13	2012-5-12
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2010-9-18	2011-9-17
Signal generator	SMR 20	R&S	EC 3044-1	2010-8-17	2011-8-16
Semi-anechoic chamber	-	Albatross project	EC 3048	2011-5-21	2012-5-20
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2011-2-8	2012-2-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2011-2-8	2012-2-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2011-2-8	2012-2-7
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2011-2-8	2012-2-7
Power sensor / Power meter	N1911A/N1921A	Agilent	EC4318	2011-04-11	2012-04-10
Spectrum analyzer	E7402A	Agilent	EC2254	2010-11-09	2011-11-08

2.2 Test Standard

47CFR Part 15 (2009)
ANSI C63.4: 2003
RSS-210 Issue 8 (December 2010)
RSS-Gen Issue 3 (December 2010)
RSS-310 Issue 3 (December 2010)

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	FCC REFERANCE	IC REFERANCE	RESULT
20 dB Bandwidth	15.247(a)(1)	RSS-210 Issue 8 Annex 8	Tested
Carrier Frequency Separation	15.247(a)(1)	RSS-210 Issue 8 Annex 8	Pass
Output power	15.247(b)(1)	RSS-210 Issue 8 Annex 8	Pass
Radiated Spurious Emissions	15.205 & 15.209	RSS-210 Issue 8 Clause 2	Pass
Conducted Spurious Emissions & Band Edge	15.247(d)	RSS-210 Issue 8 Annex 8	Pass
Power line conducted emission	15.207	RSS-Gen Issue 3 Clause 7.2.4	NA
Number of Hopping Frequencies	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	Pass
Dwell time	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	Pass
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested
Spurious emission for receiver	15B	RSS-310 Issue 3 Clause 3.1	Pass

Note: “NA” means “not applied”.

3. 20 dB Bandwidth

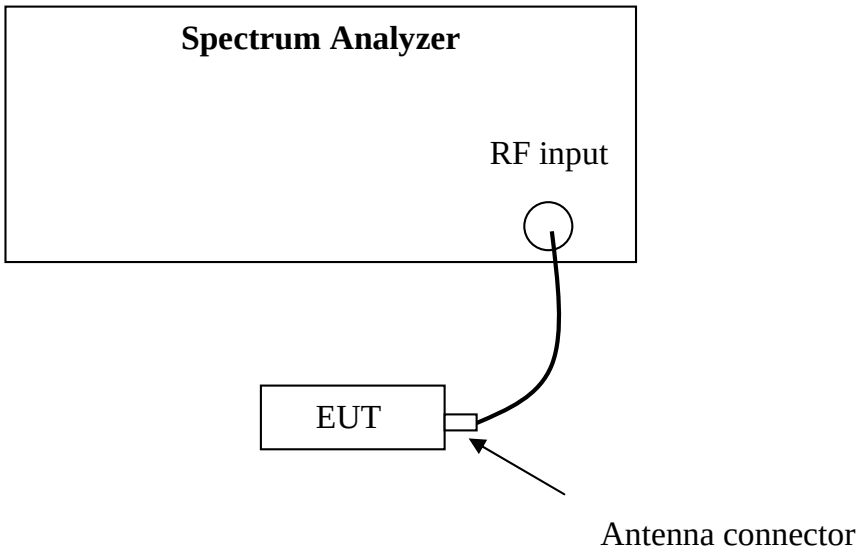
Test result: Tested

3.1 Limit

☒ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☐ 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

The 20 bandwidth per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span = 2 to 3 times the 20 dB bandwidth, RBW≥1% of the 20 dB bandwidth, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

3.4 Test Protocol

Temperature : 22°C
Relative Humidity : 43 %

CH	Bandwidth (kHz)
L	963.90
M	957.15
H	959.85

4. Carrier Frequency Separation

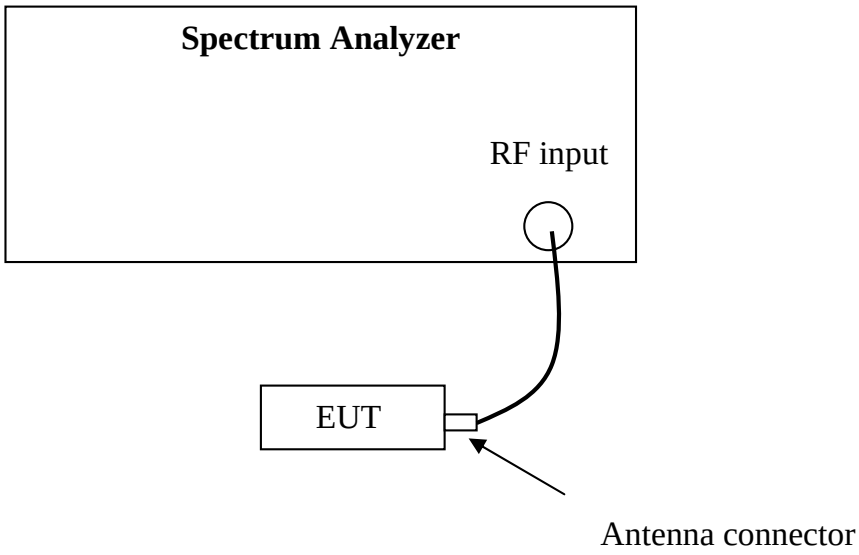
Test result: Pass

4.1 Limit

☒ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☐ 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.

4.2 Test Configuration



4.3 Test Procedure and test setup

The Carrier Frequency Separation per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span can capture two adjacent channels, RBW≥1% of the span, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

4.4 Test Protocol

Temperature : 22°C
Relative Humidity : 43 %

CH	Frequency Separation (kHz)	Limit (kHz)
L	1003.50	≥963.90
M	1002.00	≥957.15
H	1020.00	≥959.85

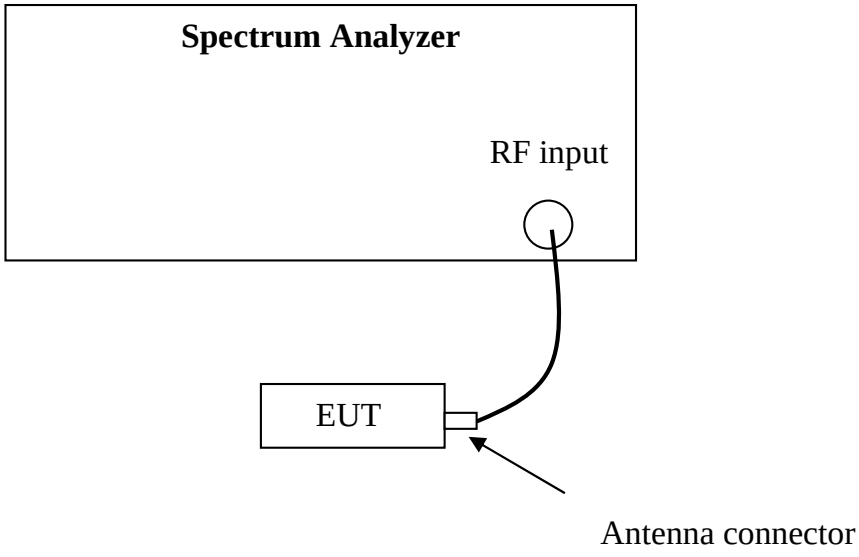
5. Maximum peak output power

Test result: Pass

5.1 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
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

5.2 Test Configuration



5.3 Test procedure and test setup

The power output per FCC § 15.247(b) is measured using the Spectrum Analyzer with Span = 5 times the 20 dB bandwidth, RBW≥ the 20 dB bandwidth, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

5.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

CH	Cable loss (dB)	Corrected reading (dBm)	Limit (dBm)
L	0.20	-1.00	≤30
M	0.20	-1.06	≤30
H	0.20	-0.87	≤30

6. Radiated Spurious Emissions

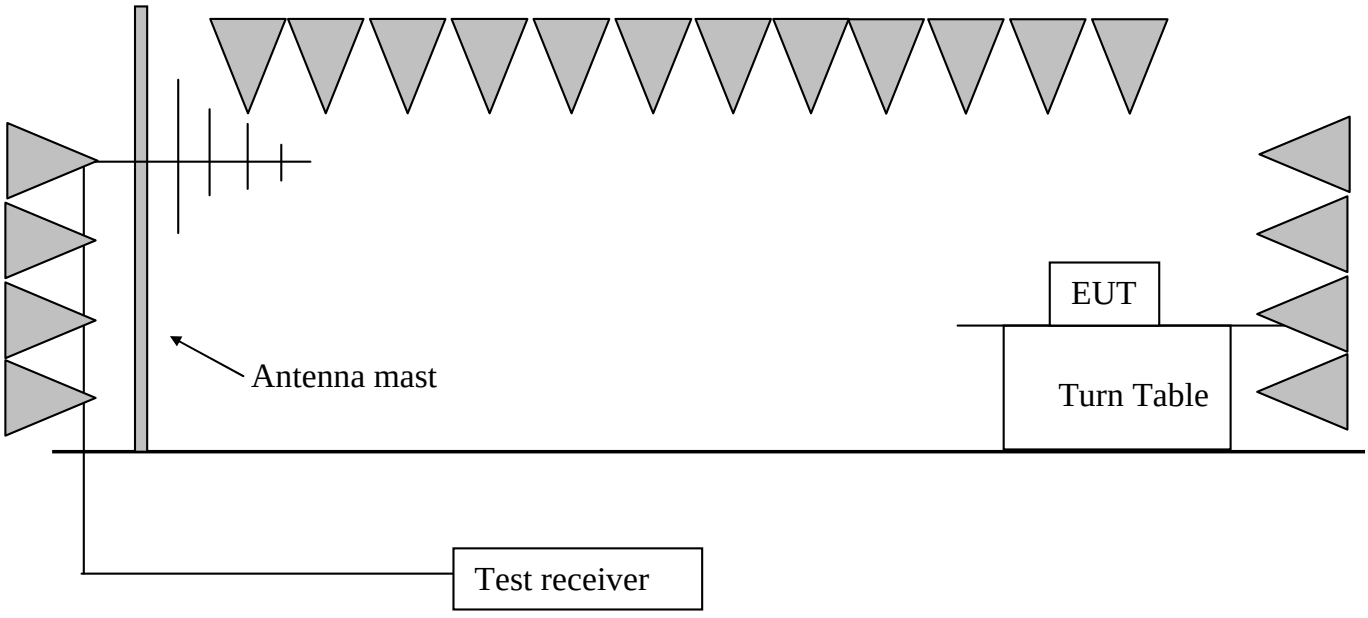
Test result: PASS

6.1 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

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, if applied, the pre-amplifier would be 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.
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”.

6.4 Test protocol

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	30.70	90.60	Fundamental	/	PK
	H	409.06	18.70	33.10	46.00	12.90	PK
	V	1601.20	-11.50	44.60	54.00	9.40	PK
	V	4803.61	-3.10	44.50	54.00	9.50	PK
	V	9608.00	8.70	46.90	54.00	7.10	PK
	V	2390.00	30.70	61.60	74.00	12.40	PK
	V	2390.00	30.70	48.00	54.00	6.00	AV
	V	2483.50	34.00	61.30	74.00	12.70	PK
	V	2483.50	34.00	45.50	54.00	8.50	AV
M	V	2440.78	30.70	89.70	Fundamental	/	PK
	H	409.06	18.70	33.10	46.00	12.90	PK
	V	1625.25	-11.40	44.10	54.00	9.90	PK
	V	4881.76	-3.10	43.60	54.00	10.40	PK
	V	9764.00	9.00	47.00	54.00	7.00	PK
	V	2390.00	30.70	61.50	74.00	12.50	PK
	V	2390.00	30.70	47.80	54.00	6.20	AV
	V	2483.50	34.00	61.10	74.00	12.90	PK
	V	2483.50	34.00	45.20	54.00	8.80	AV
H	H	2479.26	30.70	90.70	Fundamental	/	PK
	H	409.06	18.70	33.10	46.00	12.90	PK
	V	1653.31	-11.30	44.10	54.00	9.90	PK
	V	4960.72	-3.50	44.20	54.00	9.80	PK
	V	9921.55	9.30	47.00	54.00	7.00	PK
	V	2390.00	30.70	61.40	74.00	12.60	PK
	V	2390.00	30.70	47.80	54.00	6.20	AV
	V	2483.50	34.00	63.20	74.00	10.80	PK

	V	2483.50	34.00	46.70	54.00	7.30	AV

Remark: 1. For fundamental & restrict emission at 2300-2390MHz and 2483.5-2500MHz test, no amplifier is employed.
2. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
3. Corrected Reading = Original Receiver Reading + Correct Factor
4. Margin = limit – Corrected Reading
5. If the PK reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m, then Margin = 54 -10.20 = 43.80dBuV/m

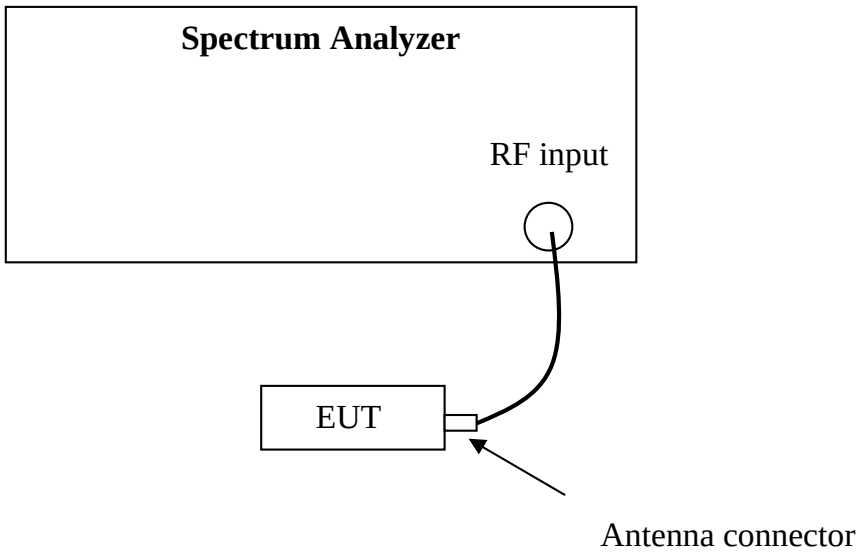
7. Conducted Spurious Emissions & Band Edge

Test result: **PASS**

7.1 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.

7.2 Test Configuration



7.3 Test procedure and test setup

The Conducted Spurious Emissions per FCC § 15.247(d) is measured using the Spectrum Analyzer with Span wide enough capturing all spurious from the lowest emission frequency of the EUT up to 10th harmonics, RBW = 100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

7.4 Test protocol

It was found all the emission outside the frequency band from 30MHz to 25GHz is at least 20 dB below that in the 100 kHz bandwidth within the band.
Please refer to the graph of emission from 30MHz to 7GHz in the “Test data” file.

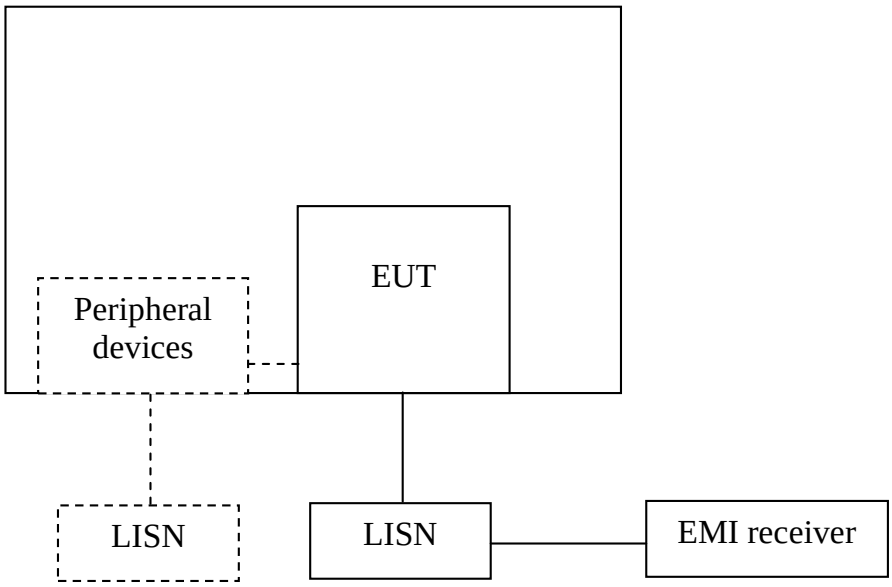
8. Power line conducted emission

Test result: **NA**

8.1 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.		

8.2 Test configuration



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

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

8.3 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 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

8.4 Test protocol

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

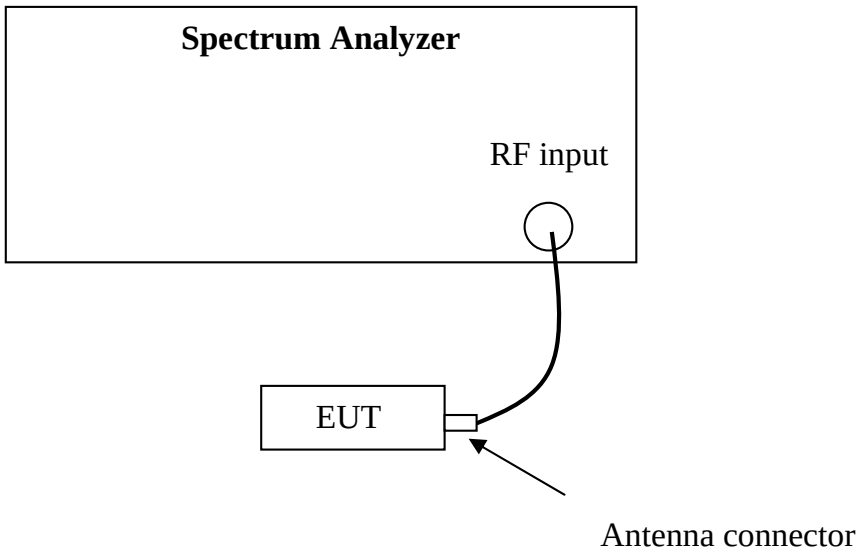
9. Number of Hopping Frequencies

Test result: **Pass**

9.1 Limit

Number of Hopping Frequencies in the 2400-2483.5 MHz band shall use at least 15 channels.

9.2 Test Configuration



9.3 Test procedure and test setup

The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with RBW=100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold. The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

9.4 Test protocol

Channel Number	Limit
79	≥15

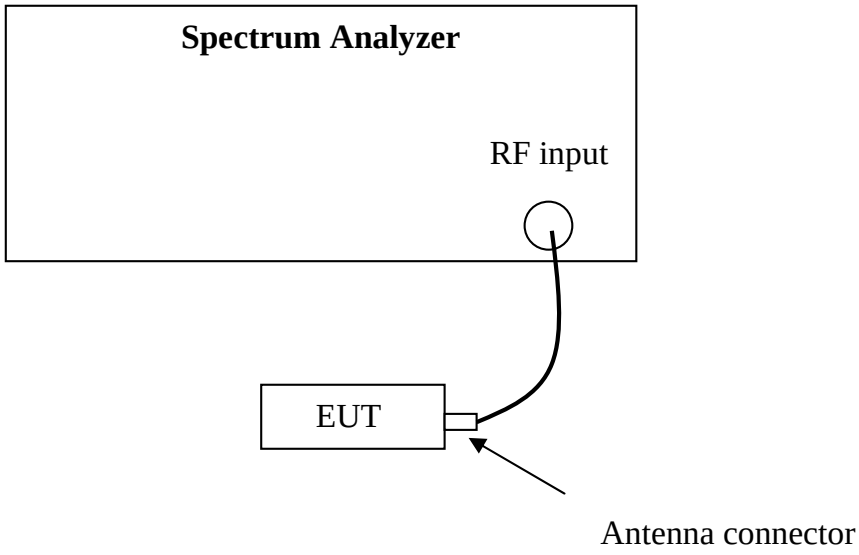
10. Dwell Time

Test result: **Pass**

10.1 Limit

The dwell time 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.

10.2 Test Configuration



10.3 Test procedure and test setup

Dwell time per FCC § 15.247(a)(1)(iii) is measured using the Spectrum Analyzer with Span = 0, RBW=1MHz, VBW≥RBW, Sweep can capture the entire dwell time, Detector = peak, Trace = max hold.
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

10.4 Test protocol

Packet	Occupancy time for single hop (ms) **O**	CH	Real observed period (s) **P**	Hops among Observed period **I**	Dwell time (s) **T**	Limit (s)
DH1	0.38	L	3.16	49	0.19	≤0.4
		M	3.16	48	0.18	
		H	3.16	48	0.18	
DH3	1.67	L	31.6	140	0.23	
		M	31.6	142	0.24	
		H	31.6	141	0.24	
DH5	2.88	L	31.6	101	0.30	
		M	31.6	102	0.30	
		H	31.6	101	0.30	

Remark: 1. There are 79 channels in all. So the complete observed period P = 0.4 * 79 = 31.6 s.

2. Average time of occupancy **T = O *I * 31.6 / P**

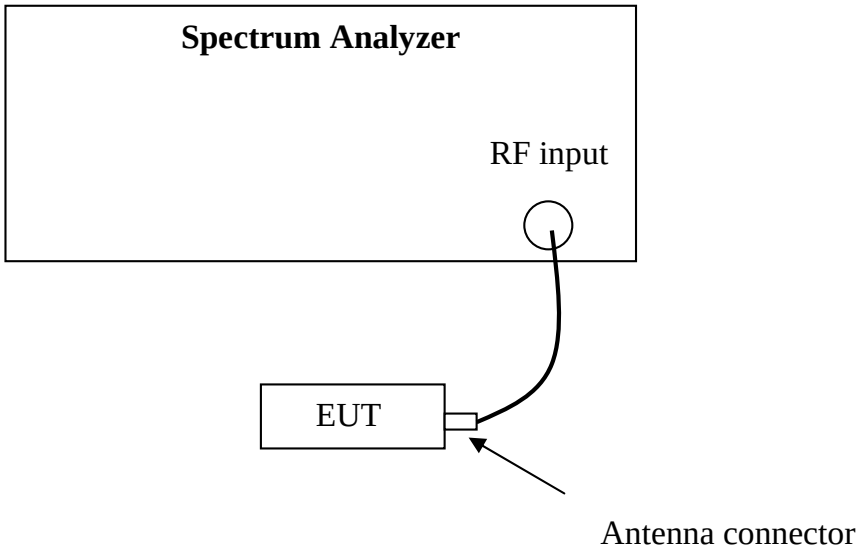
11. Occupied Bandwidth

Test Status: Tested

11.1 Test limit

None

11.2 Test Configuration



11.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the RBW close to 1% of the selected span, VBW = 3 * RBW Detector = Sample, Sweep = Auto.

11.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

Channel	Occupied Bandwidth (MHz)
L	0.908
M	0.906
H	0.905

12. Spurious emission for receiver

Test result: **PASS**

12.1 Test limit

The spurious emission shall test through 3 times tuneable or local oscillator frequency whichever is the higher, without exceeding 40 GHz.

☐ If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5nW above 1 GHz.

☒ If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 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

12.2 Test Configuration

Please refer to clause 6.2

12.3 Test procedure and test setup

Please refer to clause 6.3.

12.4 Test protocol

Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	18.60	22.50	40.00	17.50	PK
H	383.79	18.10	29.50	46.00	16.50	PK
H	409.06	18.70	33.10	46.00	12.90	PK
H	599.56	21.40	29.40	46.00	16.60	PK
H	673.43	22.10	32.40	46.00	13.60	PK
H	801.72	23.30	32.50	46.00	13.50	PK
V	30.00	18.60	21.60	40.00	18.40	PK
V	150.52	11.20	26.20	43.50	17.30	PK
V	154.41	11.20	24.50	43.50	19.00	PK
V	601.50	21.40	29.00	46.00	17.00	PK
V	725.91	22.60	30.50	46.00	15.50	PK
V	896.97	23.80	34.10	46.00	11.90	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit – Corrected Reading

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 = 32.20dB/m; Corrected Reading = 10dBuV + 32.20dB/m = 42.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 42.20dBuV/m, then Margin = 54 -42.20 = 11.80dBuV/m