



# **RADIO TEST REPORT**

**Test Report No.: 33AE0103-SH-01-A**

**Applicant** : Sony Corporation

**Type of Equipment** : Bluetooth Audio System

**Model No.** : WX-GT90BT

**FCC ID** : AK8WXGT90BT

**Test regulation** : FCC Part15 Subpart C: 2012

**Test result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** September 6 to 13, 2012

**Tested by:**

*S. Takano*

Shinichi Takano  
Engineer of WiSE Japan, UL  
Verification Service

**Approved by :**

*T. Imamura*

Toyokazu Imamura  
Leader of WiSE Japan, UL  
Verification Service

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
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13-EM-F0429

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**SECTION 1: Customer information**

Company Name : Sony Corporation  
Brand Name : SONY  
Address : Shinagawa INTERCITY C Tower, 2-15-3 Konan, Minato-ku, Tokyo 108-6201  
Japan  
Telephone Number : +81-3-5769-5640  
Facsimile Number : +81-3-5769-5901  
Contact Person : Maeda, Toshihiro

**SECTION 2: Equipment under test (E.U.T.)****2.1 Identification of E.U.T.**

Type of Equipment : Bluetooth Audio System  
Model Number : WX-GT90BT  
Serial Number : Refer to Section 4.2  
Rating : DC 12V (car battery)  
Country of Mass-production : Thailand  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Receipt Date of Sample : September 1, 2012  
Modification of EUT : The test lab did not make the modification to the EUT supplied from the customer to have it pass the tests.

**2.2 Product description**

Model: WX-GT90BT (referred to as the EUT in this report) is a Bluetooth Audio System.

Clock frequency(ies) in the system : 36.48MHz, 16.934MHz, 12MHz, 7.92MHz, 32.768kHz

## &lt;Radio part&gt;

Equipment type : Transceiver  
Frequency of operation : 2402MHz to 2480MHz  
Bandwidth & channel spacing : 79MHz & 1MHz  
Type of modulation : GFSK,  $\pi/4$ DQPSK, 8DPSK  
Antenna type : Inverted F type  
Antenna connector type : None  
Antenna gain : -4.9dBi (Peak)  
ITU code : F1D, G1D  
Operating Voltage (Radio part) : DC 3.3V  
Operation temperature range : -20 to +60 deg.C

## FCC 15.31 (e)

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC3.3V) through its own regulator regardless of input voltage.  
Therefore, this EUT complies with the requirement.

## FCC Part 15.203

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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**SECTION 3: Test specification, procedures & results****3.1 Test specification**

Test specification : FCC Part 15 Subpart C: 2012, final revised on August 13, 2012  
and effective September 12, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,  
and 5725-5850MHz

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 33AE0103-SH-01-C.

**3.2 Procedures & Results**

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC Section 15.207	-	N/A	-	N/A *1)
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)	Conducted	N/A	*See data.	Complied
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)	Conducted	N/A		Complied
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)(iii)	Conducted	N/A		Complied
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (a)(1)(iii)	Conducted	N/A		Complied
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (b)(1)	Conducted	N/A		Complied
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.247 (d) Section15.209	Conducted/ Radiated	N/A	3.0dB (202.151MHz, QP, Horizontal, Tx 2402MHz, DH5)	Complied

Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422.

\*1) The test is not applicable since the EUT does not have AC Mains.

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**3.3 Addition to standard**

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2003 13. Measurement of intentional radiators, RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	-	-
Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422.					

\* Other than above, no addition, exclusion nor deviation has been made from the standard.

**3.4 Uncertainty**

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Item	Frequency range	No.1 SAC <sup>*1</sup> /SR <sup>*2</sup> (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Conducted emission (AC Mains) LISN	150kHz-30MHz	3.6 dB	3.6 dB	3.6 dB
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.6 dB	3.7 dB	3.7 dB
	30MHz-300MHz	5.0 dB	5.1 dB	5.0 dB
	300MHz-1GHz	5.1 dB	5.1 dB	5.1 dB
	1GHz-15GHz	4.9 dB	4.9 dB	5.4 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.7 dB	5.7 dB	5.7 dB
	18GHz-40GHz	4.9 dB	4.4 dB	4.5 dB

\*1: SAC=Semi-Anechoic Chamber

\*2: SR= Shielded Room is applied besides radiated emission

**Radiated emission test**

The data listed in this test report meets the limits unless the uncertainty is taken into consideration.

Power Measurement uncertainty above 1GHz for this test was: (±) 1.5dB

Conducted emissions Measurement (below 1GHz) uncertainty for this test was: (±) 1.7dB

Conducted emissions, Power Density Measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Conducted emissions Measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Conducted emissions Measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB

Bandwidth Measurement uncertainty for this test was: (±) 5.4%

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### 3.5 Test location

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JAB Accreditation No. : RTL02610

No.1/ No.2/ No.3 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on April 17, 2009 (Registration No.: 697847).

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input checked="" type="checkbox"/> No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 Semi-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input checked="" type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

### 3.6 Test setup, Data of EMI & Test instruments

Refer to APPENDIX 1 to 3.

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## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating mode

Test item	Operating mode	Tested frequency
Carrier frequency separation	Transmitting Hopping ON (DH5 / 3-DH5)/Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5)/Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON) - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5 ----- -Inquiry	-
Maximum peak output power	Transmitting Hopping OFF (DH5 / 2-DH5 / 3-DH5) / Inquiry, Payload: PRBS9 - DH5 - 2-DH5 - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted) ----- (Radiated)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON / Inquiry -Hopping OFF ----- Transmitting (DH5 / 3-DH5), Payload: PRBS9	Band edge compliance: 2402MHz, 2480MHz  Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	2402MHz, 2441MHz, 2480MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum packet type / payload (except Dwell time test)</p> <p>*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT. As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.</p> <p>*EUT has the power settings by the software as follows; Software: BlueTest.exe Ver.1.24, BtCli.exe Ver.1.24 (Inquiry mode only) Power settings: BDR: Ext.=255, Int.=44 EDR: Ext.=255, Int.=48</p> <p>*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>		

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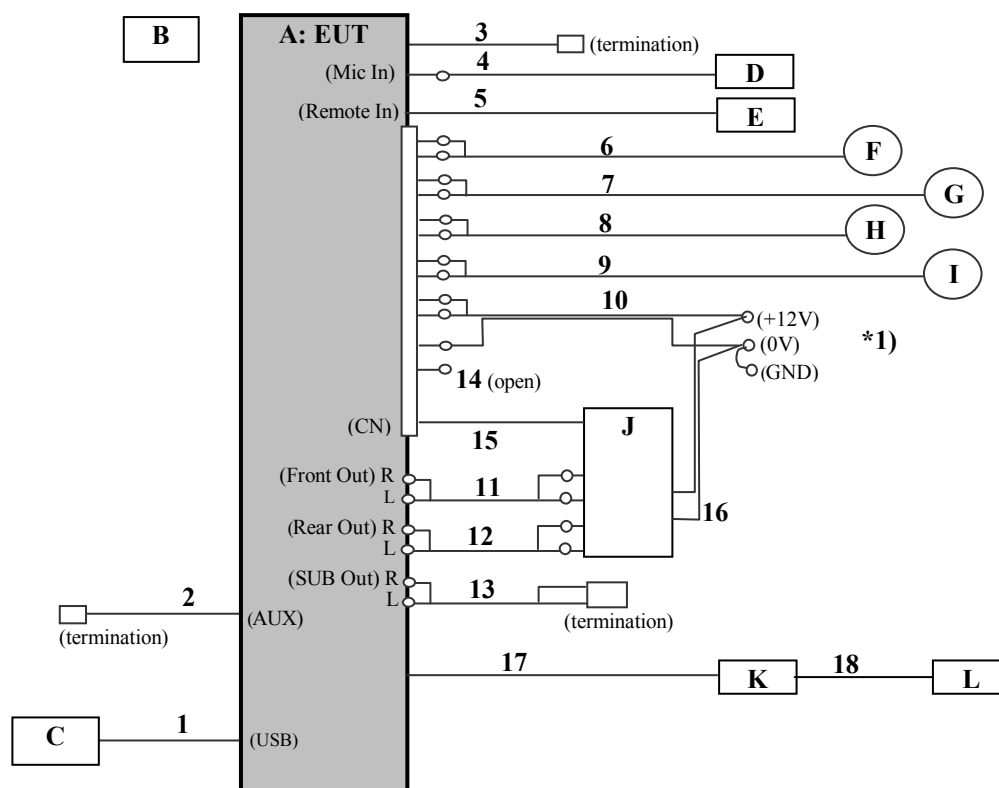
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## 4.2 Configuration of tested system



\* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Audio System	WX-GT90BT	24 *2), 22 *3)	Sony	EUT
B	Remote Commander	RM-X231	-	Sony	-
C	USB Memory	SDK-USM4GL(B)	10615MEDB	Sony	-
D	Microphone	XA-MC10	-	Sony	-
E	Wired Remote Controller	RM-X4S	-	Sony	-
F	Speaker 1	XS-F1611	-	Sony	-
G	Speaker 2	XS-F1611	-	Sony	-
H	Speaker 3	1-544-814-31	-	AIWA	-
I	Speaker 4	1-544-814-31	-	AIWA	-
J	Stereo Power Amplifier	XM-423SL	0020316	Sony	-
K	SIRIUS XM Connect Vehicle Tuner	SXV100	1113	SIRIUS	-
L	SIRIUS XM antenna	XVANT1	1046	SIRIUS	-

\*1) DC power supply (Model No.: PAN35-10A) was used for DC 12V input.

\*2) Used for Radiated emission tests.

\*3) Used for Antenna terminal tests.

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**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB	1.8	Shielded	Shielded	-
2	AUX	1.5	Shielded	Shielded	-
3	FM antenna	1.1	Shielded	Shielded	-
4	External Microphone	0.25+4.0	Shielded	Shielded	-
5	Remote wire	2.0	Unshielded	Unshielded	-
6	Speaker (1)	0.25+2.0	Unshielded	Unshielded	-
7	Speaker (2)	0.25+2.0	Unshielded	Unshielded	-
8	Speaker (3)	0.25+2.0	Unshielded	Unshielded	-
9	Speaker (4)	0.25+2.0	Unshielded	Unshielded	-
10	DC Power	2.0	Unshielded	Unshielded	-
11	RCA (Front Audio Out)	5.2	Shielded	Shielded	-
12	RCA (Rear Audio Out)	5.2	Shielded	Shielded	-
13	RCA (Sub Audi Out)	1.5	Shielded	Shielded	-
14	Illumination	0.2	Unshielded	Unshielded	-
15	AMP Remote	3.0	Unshielded	Unshielded	-
16	DC Power	1.5	Unshielded	Unshielded	-
17	SiriusXM	0.65	Shielded	Shielded	-
18	SiriusXM Antenna	7.0	Shielded	Shielded	-

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## **SECTION 5: Radiated emission**

### **5.1 Operating environment**

Test place : See test data (APPENDIX 1)  
Temperature : See test data (APPENDIX 1)  
Humidity : See test data (APPENDIX 1)

### **5.2 Test configuration**

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

The configuration was set in accordance with ANSI C63.4: 2009.

The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in APPENDIX 3.

### **5.3 Test conditions**

Frequency range : 30MHz to 25GHz  
Test distance : 3m(below 15GHz) / 1m(above15GHz)  
EUT position : Table top  
EUT operation mode : Refer to SECTION 4.1

### **5.4 Test procedure**

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m(below 15GHz) / 1m(above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection of the test receiver.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	* Average	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz	RBW: 100kHz VBW: 300kHz

\* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

The carrier level and noise levels were confirmed at angle of 0 to 45 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (0 deg.) that has the maximum noise.

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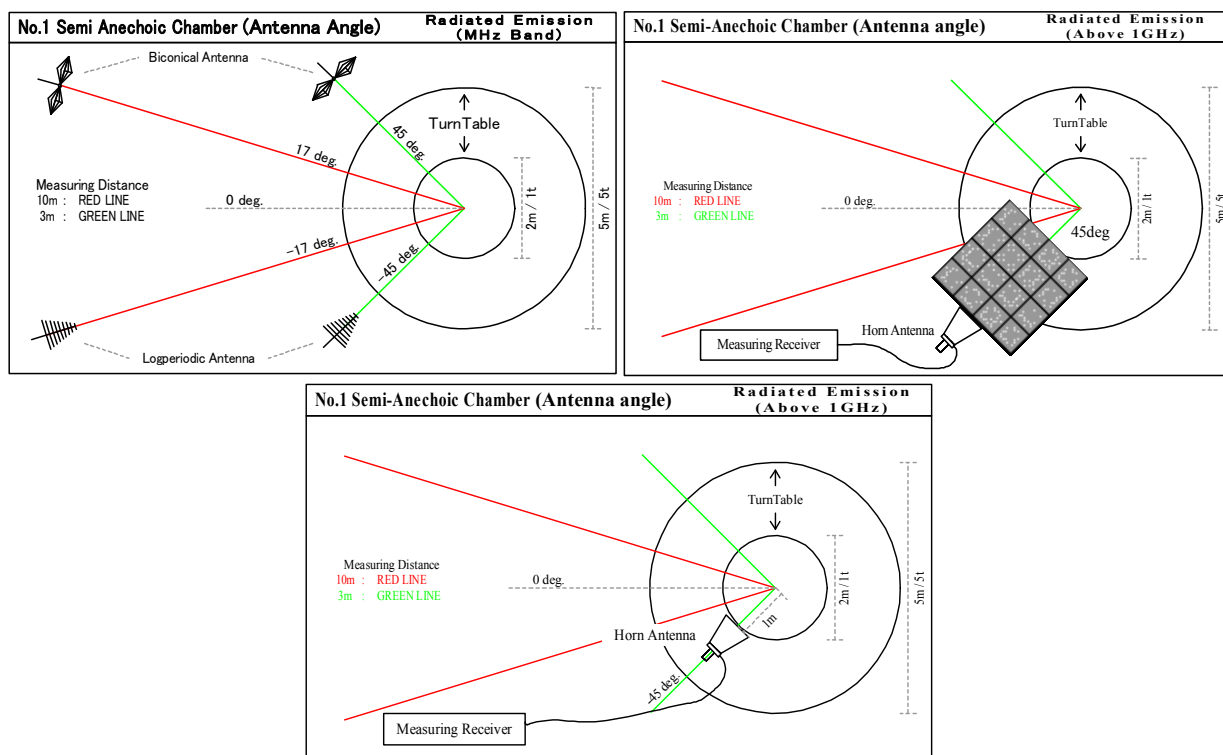


Figure 1. Antenna angle

## 5.5 Band edge

Band edge level at 2400MHz is less than 20dB of peak point of the carrier. Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209. Refer to the data.

## 5.6 Results

Summary of the test results : Pass \*No noise was detected above the 3<sup>rd</sup> order harmonics.  
Refer to APPENDIX 1

## **SECTION 6: Out of band emissions (Antenna port conducted)**

### **Test procedure**

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port. In any 100kHz 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 confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement. In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 7: Carrier frequency separation**

### **Test procedure**

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 8: 20dB bandwidth & Occupied bandwidth (99%)**

### **Test procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port. The channel separation in Hopping mode and Inquiry mode was separated by 25kHz and 2/3 of the 20dB bandwidth.

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 9: Number of hopping frequency**

### **Test procedure**

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 10: Dwell time**

### **Test procedure**

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 11: Maximum peak output power**

### **Test procedure**

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

Summary of the test results: Pass  
Refer to APPENDIX 1

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## **Contents of APPENDIXES**

### **APPENDIX 1: Data of EMI test**

20dB bandwidth and Carrier frequency separation  
Number of Hopping Frequency  
Dwell time  
Maximum peak output power  
Radiated emission  
Spurious emission (Antenna port conducted)  
Occupied Bandwidth

### **APPENDIX 2: Test instruments**

Test instruments

### **APPENDIX 3: Photographs of test setup**

Radiated emission  
Pre-check of worst angle

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