

<b>Prüfbericht - Nr.:</b> 16019616 001		Seite 1 von 33 Page 1 of 33	
<i>Test Report No.:</i>			
<b>Auftraggeber:</b> <i>Client:</i>	Zhongshan K-mate General Elec. Co., Ltd. Fuwan Industrial Zone, Fuwan South Road, Sunwen East Road, East District, Zhongshan, Guangdong, P.R. China		
<b>Gegenstand der Prüfung:</b> Solar Bluetooth Car Kit <i>Test item:</i>			
<b>Bezeichnung:</b> <i>Identification:</i>	BTC003	<b>FCC ID:</b> <i>FCC ID</i>	WAD-BTC003
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	173047572	<b>Eingangsdatum:</b> <i>Date of receipt:</i>	16.Sep.2009
<b>Prüfört:</b> <i>Testing location:</i>	TÜV Rheinland (Guangdong) Ltd. EMC Laboratory Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou 510650, P. R. China		Listed test laboratory according to FCC rules section 2.948 for measuring devices under Parts 15
<b>Prüfgrundlage:</b> <i>Test specification:</i>	ANSI C63.4: 2003  FCC Part 15: July 10, 2008  Subpart B section 15.107 (a), 15.109 (a) Subpart C section 15.207, 15.209 and 15.247		
<b>Prüfergebnis:</b> <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>		
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>	TÜV Rheinland (Guangdong) Ltd.		
<b>geprüft/ tested by:</b>		<b>kontrolliert/ reviewed by:</b>	
03.Dec.2009	Frank Du Project Engineer	03.Dec.2009	Ricky Liu Project Manager
<i>Datum</i> <i>Date</i>	<i>Name/Stellung</i> <i>Name/Position</i>	<i>Datum</i> <i>Date</i>	<i>Name/Stellung</i> <i>Name/Position</i>
	<i>Unterschrift</i> <i>Signature</i>		<i>Unterschrift</i> <i>Signature</i>
<b>Sonstiges/ Other Aspects:</b>			
<div style="display: flex; justify-content: space-between;"> <div> <b>Abkürzungen:</b>  P(ass) = entspricht Prüfgrundlage  F(ail) = entspricht nicht Prüfgrundlage  N/A = nicht anwendbar  N/T = nicht getestet </div> <div> <b>Abbreviations:</b>  P(ass) = passed  F(ail) = failed  N/A = not applicable  N/T = not tested </div> </div>			
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</p> <p><i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

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## Test Summary

<b>FCC Rules</b>		<b>Test items</b>	<b>Result</b>
<b>Paragraph</b>	<b>Released Date</b>		
<b>Part 15 Per Section 15.107 (a)</b>	<b>July 10, 2008</b>	<b>Conducted Emission</b>	<b>Pass</b>
<b>Part 15 Per Section 15.109 (a)</b>	<b>July 10, 2008</b>	<b>Radiated Spurious Emission</b>	<b>Pass</b>
<b>Part 15 Per Section 15.207(a)</b>	<b>July 10, 2008</b>	<b>Conducted Emission</b>	<b>Pass</b>
<b>Part 15 Per Section 15.209(a)</b>	<b>July 10, 2008</b>	<b>Radiated Spurious Emission</b>	<b>Pass</b>
<b>Part 15 Per Section 15.203</b>	<b>July 10, 2008</b>	<b>Antenna requirement</b>	<b>Pass</b>
<b>Part 15 Per Section 15.247(b)(1)</b>	<b>July 10, 2008</b>	<b>Maximum Peak Output power</b>	<b>Pass</b>
<b>Part 15 Per Section 15.247(a)(1)</b>	<b>July 10, 2008</b>	<b>20dB Bandwidth</b>	<b>Pass</b>
<b>Part 15 Per Section 15.247(a)(1)</b>	<b>July 10, 2008</b>	<b>Hopping Channel Carrier Frequency Separation</b>	<b>Pass</b>
<b>Part 15 Per Section 15.247(a)(1)(iii)</b>	<b>July 10, 2008</b>	<b>Number of Hopping Frequency Used</b>	<b>Pass</b>
<b>Part 15 Per Section 15.247(a)(1)(iii)</b>	<b>July 10, 2008</b>	<b>Time of Occupancy (Dwell Time)</b>	<b>Pass</b>
<b>Part 15 Per Section 15.247(d)</b>	<b>July 10, 2008</b>	<b>Out-Of-Band Emission measurement</b>	<b>Pass</b>

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## **1 General Remarks**

### **1.1 Complementary Materials**

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test result

## **2 Test Sites**

### **2.1 Test Facilities**

**TÜV Rheinland (Guangdong) Ltd. EMC Laboratory**

Guangzhou Auto Market, Yuan Gang Section of Guangshan Road  
Guangzhou 510650

P. R. China

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## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

Kind of Equipment	Type	Manufacturer	S/N	Calibrated until	Calibrated Interval
EMI Test Receiver	ESCI-3	Rohde & Schwarz	100216	26.Nov.2009	1 year
Spectrum Analyzer	FSP30	Rohde & Schwarz	100286	27.Aug.2010	1 year
Trilog-Broadband Antenna	VULB9168 (30MHz-1GHz)	SCHWARZBECK MESSELEKTRONIK	209	07.Nov.2010	2 years
Double-Ridged Waveguide Horn Antenna	HF906 (1-18GHz)	Rohde & Schwarz	100385	18.Jul.2010	2 years
Pre-amplifier	AFS42-00101800-25-S-42	MITEQ	1101599	31.Jul.2010	2 years
Band Reject Filter	BRM50702	Micro-Tronics	023	14.Mar.2010	2 years
Standard Gain Horn Antenna	3160-09 (18-26.5GHz)	EMCO	21642	26.Jun.2014	5 years
Pre-amplifier	AFS33-18002650-30-8P-44	MITEQ	1108282	31.Jul.2010	2 years
3m Anechoic Chamber	N/A	Albatross Project GmbH	N/A	10.Feb.2010	1 year
Loop Antenna	HFH2-Z2 (<30MHz)	Rohde & Schwarz	100111	26.Nov.2009	2 years
EMI Test Receiver	ESCS30	Rohde & Schwarz	100316	27.Mar.2010	1 year
Two-Line V-Network	ESH3-Z5	Rohde & Schwarz	100308	27.Mar.2010	1 year
Pulse Limiter	ESH3-Z2	Rohde & Schwarz	100701	27.Mar.2010	1 year

## 2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications.

## 2.5 Measurement Uncertainty

Uncertainty for conducted emissions measurements is  $\pm 2.68\text{dB}$ .

Uncertainty for radiated emissions measurements is  $\pm 4.94\text{dB}$  (30M-1GHz) and  $\pm 4.88\text{dB}$  ( $> 1\text{GHz}$ )

The reported expanded uncertainty is based on a standard uncertainty multiply by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

## 2.6 Location of original data

The original copies of test data taken during actual testing were attached at Appendix 1 of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangdong) file for certification follow-up purposes.

## 2.7 Status of facility used for testing

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory; Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou 510650, P. R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements, the register no. 833845.

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### 3 General Product Information

The submitted sample is a solar powered bluetooth hand free kit. It is powered by chargeable battery which can be charged by USB port or solar energy. It can be linked to bluetooth mobile phone to answer and dial the call. The EUT can be programmed via the USB interface while it is connected to PC.

For details, refer to technical document and the user manual.

#### 3.1 Product Function and Intended Use

Refer to the Technical Documentation and user manual.

#### 3.2 Ratings and System Details

Frequency range	:	2402.0MHz – 2480.0MHz (unlicensed ISM band)
Number of employed channels	:	79 channels
Total Number of channels	:	79 channels
Modulation Type	:	Frequency Hopping Spread Spectrum
Type of antenna	:	Integral antenna
Power supply of Bluetooth headset	:	3.7V DC, (built-in li-ion battery)
Ports	:	5V DC USB charge port
Protection Class	:	III

Refer to the Technical Documentation for further information.



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### **3.3 Independent Operation Modes**

Bluetooth: RF Transmitting and receiving

For further information refer to User Manual

### **3.4 Submitted Documents**

Block Diagram  
Schematics  
Operation Description  
Components List  
FCC label and location  
User Manual  
Internal Photos  
External Photos  
Application form

## 4 Test Set-up and Operation Mode

### 4.1 Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 Test Operation and Test Software

Refer to test set-up in chapter 5.

### 4.3 Special Accessories and Auxiliary Equipment

The products have been tested together with the following device:

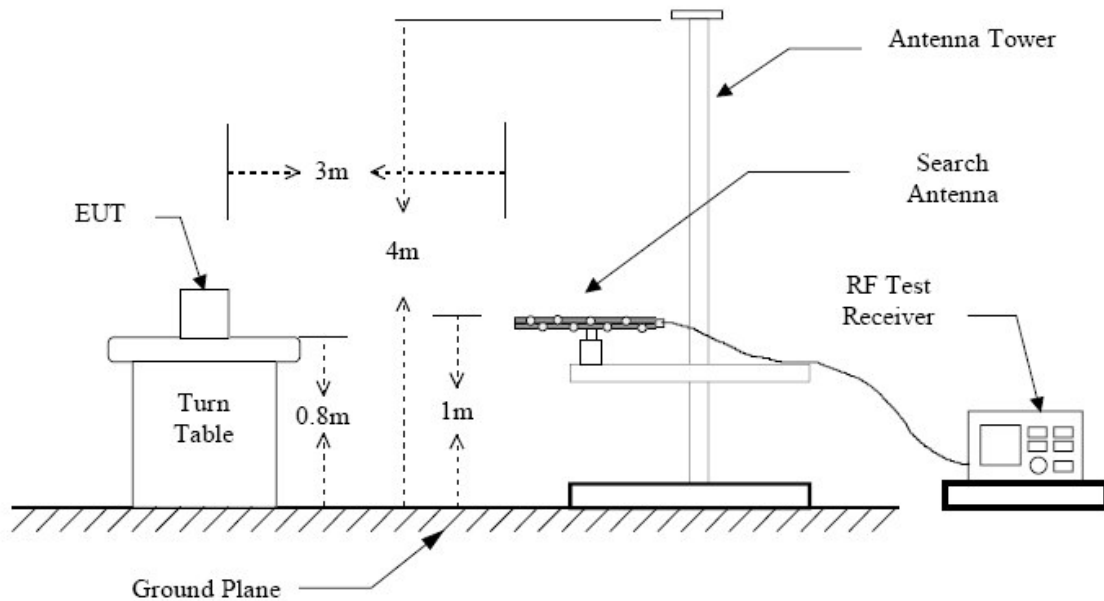
Device	Manufacture	Model	Serial no./ Version
Laptop notebook	IBM R40e	2684	99-CYY55
Desktop PC	Dell Inc.	DMC	SY28W1X
Bluetooth test Software	CSR	BlueTest	1.24

### 4.4 Countermeasures to achieve EMC Compliance

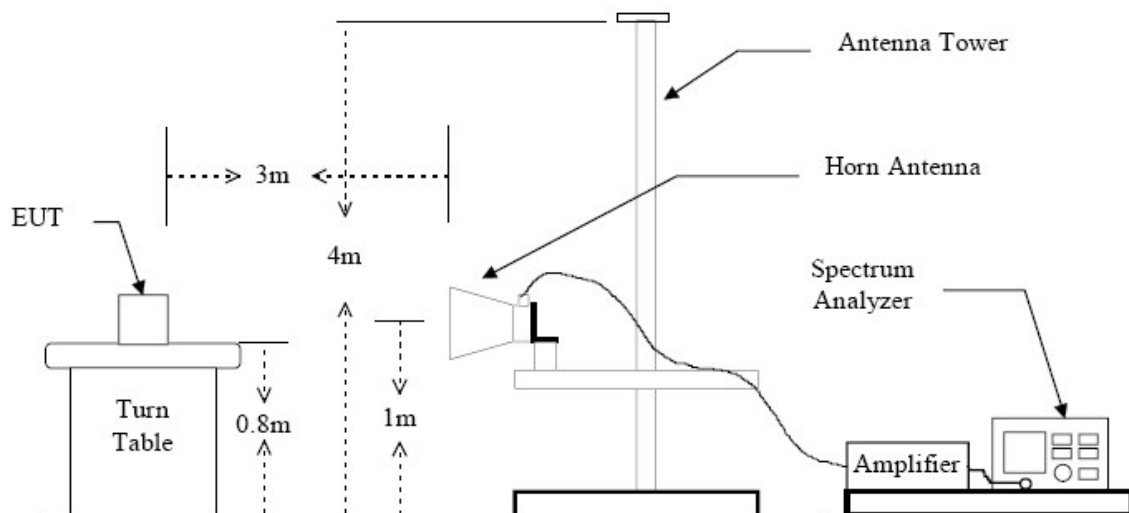
The test sample, which has been tested, contained the noise suppression parts as described in the technical document. No additional measures were employed to achieve compliance.

## 4.5 Test set-up

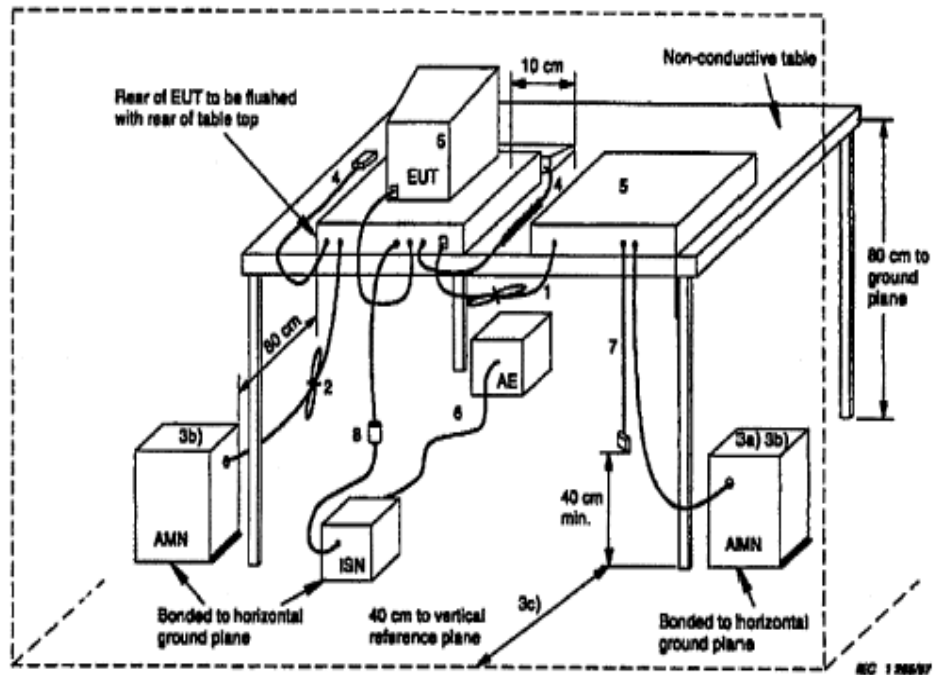
### Diagram 1 of Configuration for Testing Radiated Emission 30MHz -1 GHz



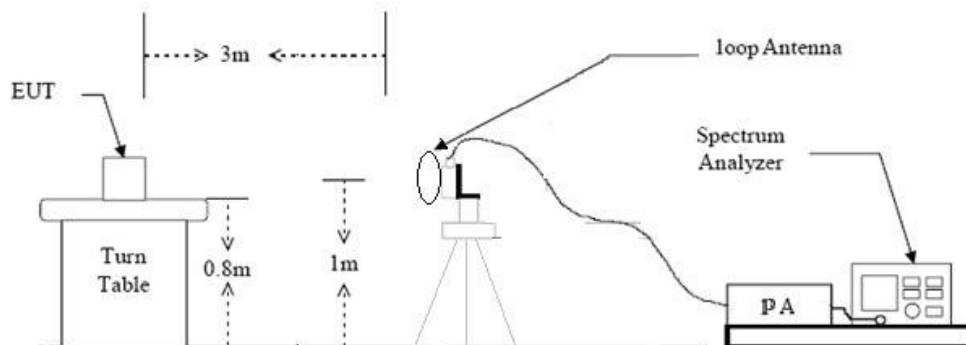
### Diagram 2 of Configuration for Testing Radiated Emission above 1 GHz



### Diagram 3 of Configuration for Testing Conducted Emission



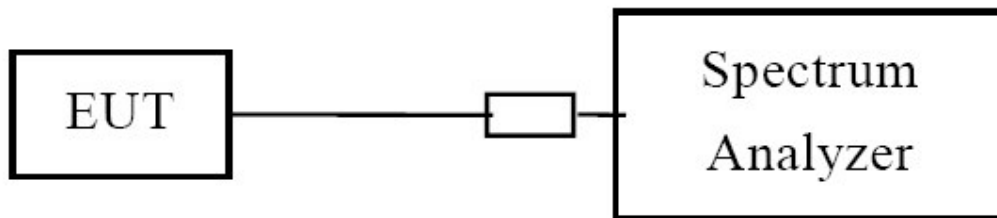
**Diagram 4 of Configuration for Testing Radiated Emission below 30MHz**



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**Diagram 5 of Configuration for Testing other test items**



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## 5 Test Results EMISSION

### 5.1 Conducted Emission

**RESULT:**

**Pass**

Date of testing	:	Nov.26.2009, Oct.30.2009
Test specification	:	FCC Part 15 Per Section 15.107(a) FCC Part 15 Per Section 15.207(a)
Limits	:	FCC Part 15 Per Section 15.107(a) FCC Part 15 Per Section 15.207(a)
Test procedure	:	Procedure specified in ANSI C63.4 were followed
Deviations from Standard Test procedures	:	None
Kind of test site	:	Shielded room
Operation mode	:	Being Programmed for 15.107(a) Charging for 15.207(a)
Power supply	:	DC 3.7V
Temperature	:	21°C
Humidity	:	50%

**Test procedure:**

1. Place the EUT as specified in ANSI C63.4 Clause 7.2.1
2. Plug the LISN to a correct power source (pay attention to: AC/DC, voltage, frequency).
4. Connect the EUT to LISN and choose N or L1 on the LISN.
5. Connect measurement receiver and LISN with a 50-ohm coaxial cable and a pulse limiter then begin exploratory measurement as specified in ANSI C63.4 Clause 7.2.3
6. Make final measurement as specified in ANSI C63.4 Clause 7.2.4
7. Switch to the other line on the LISN and repeat step 4 to 6.

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**Table 2: Disturbance Voltage on AC Mains (test result for 15.207(a))**

Frequency [MHz]	Line L/N	QP [dB $\mu$ V]	AV [dB $\mu$ V]	Quasi Peak Limit [dB $\mu$ V]	Average Limit [dB $\mu$ V]
0.150	L	51.3	/	66.0	56.0
0.177	N	47.2	/	64.6	54.6
0.186	N	46.2	/	64.2	54.2
0.195	N	45.3	/	63.8	53.8
0.208	L	49.8	/	63.3	53.3
3.583	N	39.5	/	56.0	46.0
3.574	L	/	36.6	56.0	46.0
3.781	L	/	35.5	56.0	46.0
3.916	L	/	35.2	56.0	46.0
3.997	N	/	36.2	56.0	46.0
4.056	L	/	36.5	56.0	46.0
10.522	L	/	36.2	60.0	50.0
*)					

\*) Measurement is made from 150 kHz to 30 MHz. Disturbances other than those mentioned above are small or not detectable.

If the result of the measurement with the Quasi Peak detector is below the Average limit, the measurement with Average Detector may be omitted.

**Refer to Appendix 1 for the test result for 15.107(a).**

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## 5.2 Radiated Spurious Emission

### RESULT:

**Pass**

Date of testing	:	Nov.26.2009, Oct.30.2009
Test specification	:	FCC Part 15 Per Section 15.109(a) FCC Part 15 Per Section 15.209(a)
Limits	:	FCC Part 15 Per Section 15.109(a) FCC Part 15 Per Section 15.209(a)
Test procedure	:	Procedure specified in ANSI C63.4
Deviations from Standard Test procedures	:	None
Kind of test site	:	3m Semi-anechoic chamber
Operation mode	:	Being Programmed for 15.109(a) Bluetooth RF transmitting at fix channel with max power (High, Low, Mid) for 15.209(a)
Power supply	:	DC 3.7V
Temperature	:	22°C
Humidity	:	52%

### Test procedure:

1. The EUT was placed on the top of a rotatable table 0.8 meters above the ground with 3-orthogonal direction and be kept close enough to the receiving antenna. The table was rotated 360 degrees to determine the suspected emission frequency and the position of the worst radiation case with both horizontal and vertical antenna polarization.
2. The EUT was then set 3 meters away from the receiving antenna, which was mounted on a variable-height antenna tower.
3. For each suspected emission frequency recorded in step 1, the EUT was arranged to its worst case and:  
for tests below 30MHz the loop antenna is positioned with its plane vertical and the center of it is 1m above the ground. During the tests it is rotated about its vertical axis for maximum response at each azimuth about the EUT;  
for tests above 30MHz the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to read the maximum emission.

### Note:

While testing, the EUT is connected with a serial port bridge board for test mode setup. The length of the communication cable between the EUT and the bridge board, which including Tx, Rx, GND serial pins, is minimized to reduce the unwanted influence to test result. The bridge board can be connected to a host computer with standard DB9 com port cable for running of the test setup software. After setup successfully, the EUT can keep the test mode with the host computer and the cable removed.



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**Table 3: Radiated Emission (Bluetooth: Transmitting at channel low, test result for 15.209(a))**

Frequency	QP	AV	PK	Polarity	Limit		
					QP	AV	PK
[MHz]	[dBμV/m]			(H/V)	[dBμV/m]		
320.0	38.5	N/A	N/A	H	46.0	N/A	N/A
480.1	41.1	N/A	N/A	H	46.0	N/A	N/A
3204.0	N/A	31.2	42.5	H	N/A	54.0	74.0
4804.0	N/A	39.7	50.4	H	N/A	54.0	74.0
8463.0	N/A	33.0	46.2	H	N/A	54.0	74.0
22708.0	N/A	44.2	57.5	H	N/A	54.0	74.0
24195.0	N/A	42.6	55.0	H	N/A	54.0	74.0
241.2	20.6	N/A	N/A	V	46.0	N/A	N/A
288.0	22.5	N/A	N/A	V	46.0	N/A	N/A
1602.0	N/A	34.6	45.6	V	N/A	54.0	74.0
3204.0	N/A	33.1	42.6	V	N/A	54.0	74.0
4804.0	N/A	42.2	52.6	V	N/A	54.0	74.0
22754.0	N/A	44.3	56.8	V	N/A	54.0	74.0
24182.0	N/A	42.5	55.1	V	N/A	54.0	74.0
*)---							

**Table 4: Radiated Emission (Bluetooth: Transmitting at channel mid, test result for 15.209(a))**

Frequency	QP	AV	PK	Polarity	Limit		
					QP	AV	PK
[MHz]	[dBμ V/m]			(H/V)	[dBμ V/m]		
480.0	36.5	N/A	N/A	H	46.0	N/A	N/A
512.0	36.1	N/A	N/A	H	46.0	N/A	N/A
3253.0	N/A	32.1	42.5	H	N/A	54.0	74.0
4882.0	N/A	35.1	47.8	H	N/A	54.0	74.0
6034.0	N/A	30.8	44.3	H	N/A	54.0	74.0
22824.0	N/A	44.2	57.2	H	N/A	54.0	74.0
24167.0	N/A	42.4	54.6	H	N/A	54.0	74.0
192.0	21.1	N/A	N/A	V	43.5	N/A	N/A
512.0	26.5	N/A	N/A	V	46.0	N/A	N/A
1627.0	N/A	33.3	45.8	V	N/A	54.0	74.0
3252.5	N/A	26.2	39.4	V	N/A	54.0	74.0
4882.0	N/A	44.3	56.9	V	N/A	54.0	74.0
22743.0	N/A	44.2	57.0	V	N/A	54.0	74.0
24224.0	N/A	42.6	55.5	V	N/A	54.0	74.0
*)---							

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**Table 5: Radiated Emission (Bluetooth: Transmitting at channel high, test result for 15.209(a))**

Frequency	QP	AV	PK	Polarity	Limit		
					QP	AV	PK
[MHz]	[dBμ V/m]			(H/V)	[dBμ V/m]		
480.0	35.2	N/A	N/A	H	46.0	N/A	N/A
640.0	35.7	N/A	N/A	H	46.0	N/A	N/A
3305.5	N/A	29.1	41.6	H	N/A	54.0	74.0
4960.0	N/A	34.0	49.0	H	N/A	54.0	74.0
7311.0	N/A	32.4	45.6	H	N/A	54.0	74.0
22666.0	N/A	43.9	56.3	H	N/A	54.0	74.0
25485.0	N/A	43.0	56.0	H	N/A	54.0	74.0
160.0	23.1	N/A	N/A	V	43.5	N/A	N/A
511.5	25.8	N/A	N/A	V	46.0	N/A	N/A
1653.0	N/A	39.9	47.2	V	N/A	54.0	74.0
4960.0	N/A	35.2	51.1	V	N/A	54.0	74.0
22847.0	N/A	44.1	56.7	V	N/A	54.0	74.0
25449.0	N/A	43.0	55.1	V	N/A	54.0	74.0
*)---							

\*) Note:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz at frequency below 1GHz.

The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz at frequency above 1GHz.

Measurement is made from 9kHz to 25 GHz. Disturbances other than those mentioned above are small or not detectable.

**Refer to Appendix 1 for the test result for 15.109(a)**

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### 5.3 Antenna requirement

**RESULT:**

**Pass**

Date of testing : ---  
Test specification : FCC Part 15 Per Section 15.203  
FCC Part 15 Per Section 15.247(b)

For intentional device, according to 15.203, and intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to 15.247(b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by amount in dB than the directional gain of the antenna exceeds of 6dBi.

As the BT antenna is permanently printed on RF Board, there is no consideration of replacement.

And the max gain of the antenna is 0dBi.

## 5.4 Maximum Peak Output Power

**RESULT:**

# Pass

Date of testing : Sep. 25, 2009  
 Test specification : FCC Part 15 Per Section 15.247(b)(1)  
 Limits : FCC Part 15 Per Section 15.247(b)(1)

For frequency hopping systems operating in the band 2400-2483.5 MHz employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

Deviations from Standard Test procedures	:	None
Test procedure	:	Procedure specified in ANSI C63.4
Kind of test site	:	Shielded room
Operation mode	:	Bluetooth continuously transmitting on the measured channel.
Power supply	:	DC 3.7V
Temperature	:	22°C
Humidity	:	52%

**Table 6: Peak Conducted Power**

Channel	Frequency (MHz)	Power Reading(dBm)	Cable Loss (dB)	Output Power		Limit (mW) *
				(dBm)	(mW)	
Low	2402.2	5.57	0.40	5.97	3.95	1000
Mid	2440.8	5.22	0.40	5.62	3.64	1000
High	2479.8	4.87	0.40	5.27	3.37	1000

\*Note: Refer to the test result of “Number of Hopping Channel Used” for the non-overlap channel number.

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## 5.5 20dB Bandwidth

### RESULT:

**Pass**

Date of testing : Sep. 25, 2009  
Test specification : FCC Part 15 Per Section 15.247(a)(1)  
Limits : FCC Part 15 Per Section 15.247(b)(1)

Frequency hopping systems operating in the band 2400-2483.5 MHz 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 0.125W.

Deviations from Standard Test procedures : None  
Test procedure : Procedure specified in ANSI C63.4  
Operation mode : Bluetooth continuously transmitting on the measured channel.  
Kind of test site : Shielded room  
Power supply : DC 3.7V  
Temperature : 22°C  
Humidity : 52%

### Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low lost cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency= measured channel, RBW=10kHz, VBW=30kHz.
4. Mark the peak power frequency point and the -20dB upper and lower frequency points.
5. Read the frequency delta value between the -20dB upper and lower frequency points.
6. Repeat step 2 to 5 until all the channels required are finished.

**Table 7: 20dB Bandwidth**

Channel	Frequency (GHz)	Test Result (kHz)
Low	2402.0	920
Mid	2441.0	920
High	2480.0	916

Please refer to Appendix 1 for measurement data.

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## 5.6 Hopping Channel Carrier Frequency Separation

### RESULT:

**Pass**

Date of testing : Sep. 25, 2009  
Test specification : FCC Part 15 Per Section 15.247(a)(1)  
Limits : FCC Part 15 Per Section 15.247(a)(1)

Frequency hopping systems operating in the band 2400-2483.5 MHz 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 0.125W.

Deviations from Standard Test procedures : None  
Test procedure : Procedure specified in ANSI C63.4  
Kind of test site : Shielded room  
Operation mode : Bluetooth transmitting with hopping at the full channel set  
Power supply : DC 3.7V  
Temperature : 22°C  
Humidity : 55%

### Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low lost cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 30 kHz, VBW = 100 kHz, Frequency Span = wide enough to cover the adjacent channel.
4. Mark the peak power frequency point of the measured channel and its adjacent channel(s)
5. Read the frequency delta value between the measured channel and its adjacent channel(s)
6. Repeat step 3 to 5 until all the channels measured are finished.