



# RF Test Report

**Product Name: Battery Intelligent Management System**

**Product Model: eBat-2, eBat-12, eBox-G, eBox-F**

**Report Number: SYBH(R)01075232EB-2**

**FCC ID: QISEBAT2 (for eBat-2),  
QISEBAT12 (for eBat-12),  
QISEBOXG (for eBox-G),  
QISEBOXF (for eBox-F)**

**IC: 6369A-EBAT2 (for eBat-2),  
6369A-EBAT12 (for eBat-12),  
6369A-EBOXG (for eBox-G),  
6369A-EBOXF (for eBox-F)**

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## Notice

1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number is 97456.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-1, 6369A-2 and 6369A-3.
5. The laboratory has been listed by the VCCI to perform EMC measurements. The accreditation numbers of test site No.1 are R-3892, G-415, C-4361, and T-1348, and the accreditation numbers of test site No.2 are R-3760, G-485, C-4210 and T-1237.
6. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
7. The test report is invalid if there is any evidence of erasure and/or falsification.
8. The test report is only valid for the test samples.
9. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.



**Applicant:** Huawei Technologies Co., Ltd.  
**Address:** Administration Building, Headquarters of Huawei Technologies Co., Ltd.,  
 Bantian, Longgang District, Shenzhen, 518129, P.R.C  
**Product Name:** Battery Intelligent Management System  
**Product Model:** eBat-2, eBat-12, eBox-G, eBox-F

**Date of Receipt Sample:** 2013-09-13  
**Start Date of Test:** 2013-09-26  
**End Date of Test:** 2013-10-30

**Test Result:** Pass

<b>Approved by Senior Engineer:</b>	2013-11-22	Zhang Xinghai	<i>Zhang Xing hai</i>
	Date	Name	Signature

<b>Prepared by:</b>	2013-11-22	Zhang Weimin	<i>Zhang Weimin</i>
	Date	Name	Signature



### Modification Record

No.	Last Report No.	Modification Description
1	---	First report.



## Declaration

Type	Description
Multiple Models Applications	<p><input type="checkbox"/> The present report applies to single model.</p> <p><input checked="" type="checkbox"/> The present report applies to several models. The practical measurements are performed with the model <u>eBox-G</u>.</p> <p>These models utilize the similar radio design, shielding, interface, physical layout and so on. The differences and modifications between these models are declared by the applicant and showed as below:</p> <ul style="list-style-type: none"><li>● Considering the RF aspects, all models (eBat-2, eBat-12, eBox-G, eBox-F) adopt the identical designs and specifications for IEEE 802.15.4 parts, and the eBox-G additionally contains a GPRS modular. So, the eBox-G is used to perform RF tests about IEEE 802.15.4 part. See clause 3.1 for detailed descriptions.</li><li>● For non-RF parts of all models, see EMC reports for detailed, e.g. Radiated Emissions, Conducted Emissions, etc.</li></ul> <p>The present report only presents the worst test results of all these models.</p>



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## 1 General Information

### 1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2, Subpart J (10-1-12 Edition)  
47 CFR FCC Part 15, Subpart C (10-1-12 Edition)  
IC RSS-Gen (Issue 3, December 2010)  
IC RSS-210 (Issue 8, December 2010)

Test Method: FCC KDB 558074 D01 DTS Meas Guidance v02  
ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices

### 1.2 Test Location

Test Location 1 (TL1): Reliability Laboratory of Huawei Technologies Co., Ltd.  
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

### 1.3 Test Environment Condition

Temperature: 15 to 30 °C (Ambient)  
Relative Humidity: 20 to 85 % (Ambient)  
Atmospheric Pressure: Not applicable



## 2 Test Summary

### 2.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements	Test Result	Verdict	Test Location
DTS (6 dB) Bandwidth	15.247(a)(2)	RSS-210,A8.2(a)	≥ 500 kHz.	Annex A	Pass	TL1
Occupied Bandwidth	---	RSS-210,2.1 RSS-Gen,4.6.1	No limit.	Annex B	Pass	TL1
Maximum Peak Conducted Output Power	15.247(b)(3)	RSS-210,A8.4(4)	<30dBm-IF{G[dBi]>6dBi, G[dBi]-6dB,0dB}. (Peak)	Annex C	Pass	TL1
Maximum Power Spectral Density Level	15.247(e)	RSS-210,A8.2(b)	<8dBm/3kHz-IF{G[dBi]>6dBi,G[dBi]-6dB,0dB}. (Peak)	Annex D	Pass	TL1
Unwanted Emissions into Non-Restricted Frequency Bands	15.247(d)	RSS-210,A8.5	<-20dBc/100kHz.	Annex E	Pass	TL1
Unwanted Emissions into Restricted Frequency Bands (Note 1)	15.247(d) 15.209	RSS-210,A8.5 RSS-210,2.2 RSS-Gen,7.2.2 RSS-Gen,7.2.5	§15.209/§7.2.5 limit.	Annex F	Pass	TL1
AC Power Line Conducted Emissions	15.207	RSS-Gen,7.2.4	§15.207/§7.2.4 limit.	Annex G	---	TL1
Photos of Test Setups	---	---	---	Annex H	---	---
Note 1:	According to KDB558074, antenna-port conducted measurements (Cond.) are acceptable as an alternative to radiated measurements (Radt.) for demonstrating compliance to the limits in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case emissions (Radt-add) will also be required.					



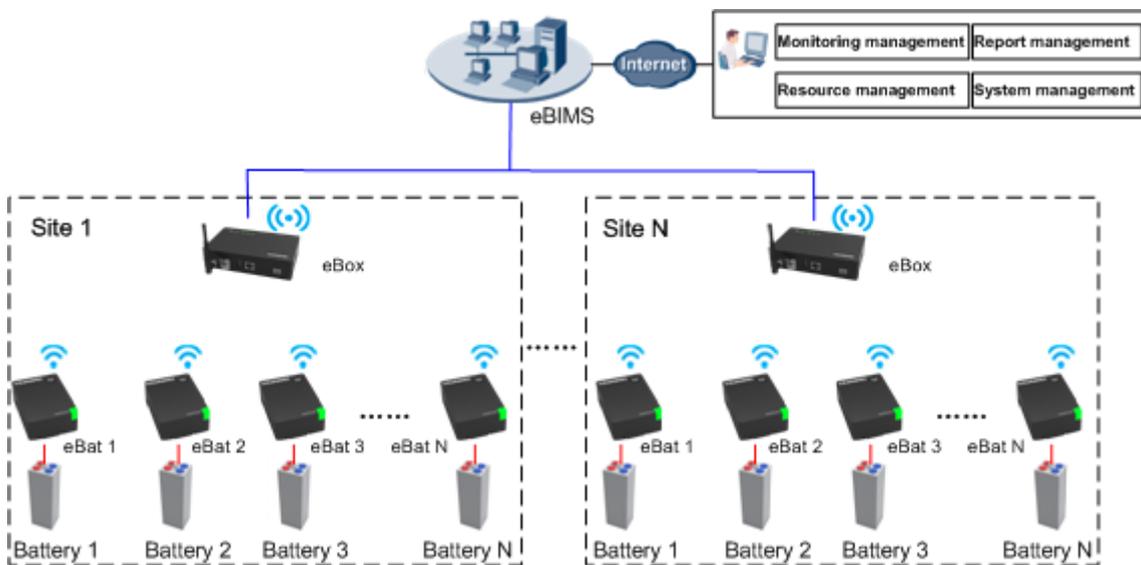
## 2.2 Non-measurement Technical Requirements

Item	FCC Rule	IC Rule	Requirements	Evidence	Verdict
Antenna use	§15.203	RSS-Gen,7.1.2	Permanently attached antenna. User manual notices required (see detailed for RSS-Gen, 7.1.2) .	See user's manual.	Comply
User manual notice for licence-exempt radio apparatus	---	RSS-Gen,7.1.3	User manual notice for licence-exempt radio apparatus is required (see detailed for RSS-Gen, 7.1.3).	See user's manual.	Comply
Radio apparatus containing digital circuits	15 subpart B	RSS-Gen,7.1.4 ICES-003	FCC: §15 subpart B. IC: ICES-003.	See separate test EMC report.	Comply
Radiation exposure	§15.247(i) §1.1307(b) §2.1091 §2.1093	RSS-Gen,5.6 RSS-102	General population/uncontrolled limit.	See separate test MPE/EMF report or declaration.	Comply

### 3 Description of the Equipment under Test (EUT)

#### 3.1 General Description

Batteries, an indispensable part of sites, are the O&M focus. The correctness of battery performance management, timeliness of battery fault rectification, and fix rate of network problems caused by battery faults have a large impact on network status. Therefore, low-cost automatic detection and analysis for batteries become key requirements of the management service center. The Huawei eBIMS fully meets battery maintenance requirements by remotely monitoring real-time battery status, detecting, predicting, and reporting battery faults, and identifying batteries reaching their replacement thresholds and guiding the battery replacement.



The eBIMS uses modular deployment. The typical configuration includes the software system, a set of matched hardware, multiple eBats, and one eBox. The number of eBats is determined by the eBox management capacity and the battery quantity. One eBat is used for each battery. There are 2 V and 12 V batteries

eBIMS product eBat and Box contain two kinds respectively:

- eBat-2: 2V Battery Monitor Unit eBat.
- eBat-12: 12V Battery Monitor Unit eBat.
- eBox-F: FE Battery Monitor Management Unit eBox.
- eBox-G: GPRS Battery Monitor Management Unit eBox.



## 3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

### 3.2.1 Board

Board	
Board Name	Description
JD02BMUA	Battery Monitor Unit
JD02BMUB	Battery Monitor Unit
JD02BMMAA	Battery Monitor Management Unit (FE)
JD02BMMAB	Battery Monitor Management Unit (GPRS)

### 3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Mechanical parts	EBAT	basismold	eBat Housing
Mechanical parts	EBOX	CLIP	eBox Housing



### 3.3 Technical Description

Characteristics	Description			
Signal System	IEEE 802.15.4.			
TX/RX Operating Range	2.4 GHz band	fc = 2405 MHz + (N - 11) * 5 MHz, where: <ul style="list-style-type: none"><li>● fc = "Operating Frequency" in MHz,</li><li>● N = "Channel Number" with the range from 11 to 25 with step of 1.</li></ul>		
Data Rate	2.4 GHz band	250 kbps.		
Modulation Type	O-QPSK (DSSS)			
Emission Designator	2M67G1D			
TX Power Control	<input checked="" type="checkbox"/> Supported, <input type="checkbox"/> Not Supported			
Antenna	Model/ID	(none, integrated on PCB)		
	Type	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated		
	Ports	<input checked="" type="checkbox"/> Ant 1, <input type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3, <input type="checkbox"/> Ant 4		
	Smart System	<input checked="" type="checkbox"/> SISO, <input type="checkbox"/> Diversity :       Tx &       Rx.		
	Gain	5.3 dBi (per antenna port, max.)		
	Remark	When the EUT is put into service, the practical maximum antenna gain should NOT exceed the value as described above.		
Power Supply	Type	<input type="checkbox"/> AC/DC Adapter	<input type="checkbox"/> PoE	<input type="checkbox"/> Other: External Battery
	Specification			Rated: 48 VDC. Range: 36 to 72 VDC



## 4 General Test Conditions / Configurations

### 4.1 EUT Configurations

#### 4.1.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, <ul style="list-style-type: none"><li>All TX tests are performed at all TX antenna ports of the EUT, and</li><li>All RX tests are performed at all RX antenna ports of the EUT.</li></ul>
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

#### 4.1.2 Customized Configurations

# EUT Conf.	Test Mode	Ant. Port	TX/RX Freq. [MHz]	Power Conf. per Port	Duty Cycle
TX-B	Tx, O-QPSK, 250 kbps.	Ant 1	2405 (Ch. 11)	4.5	1
TX-M	Tx, O-QPSK, 250 kbps.	Ant 1	2440 (Ch. 18)	4.5	1
TX-T	Tx, O-QPSK, 250 kbps.	Ant 1	2475 (Ch. 25)	4.5	1



## 4.2 Test Environments

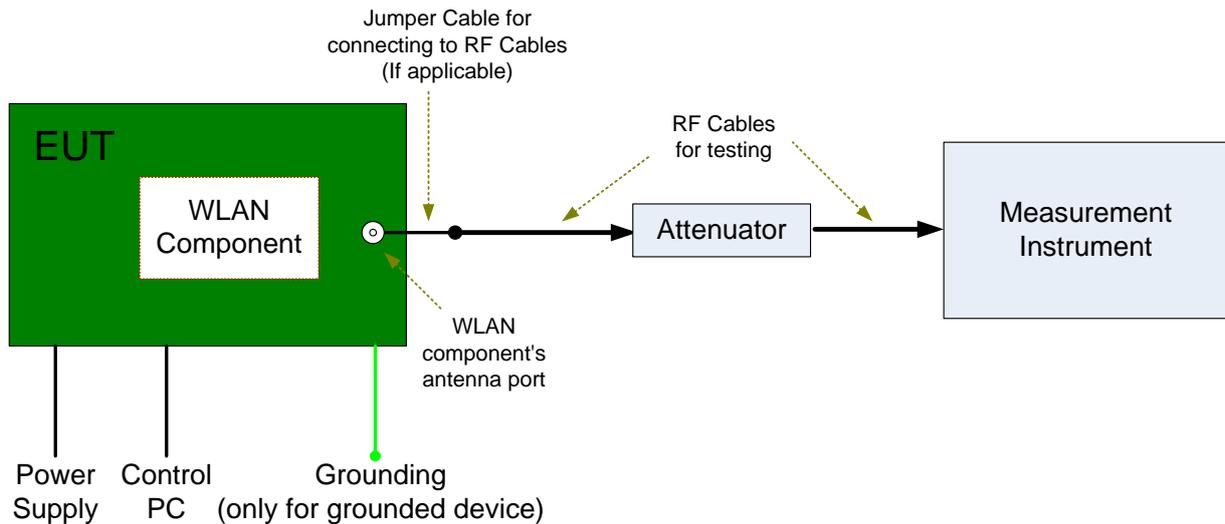
NOTE: The values used in the test report may be stringent than the declared.

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	Ambient	48 VDC	Ambient

## 4.3 Test Setups

### 4.3.1 Test Setup 1

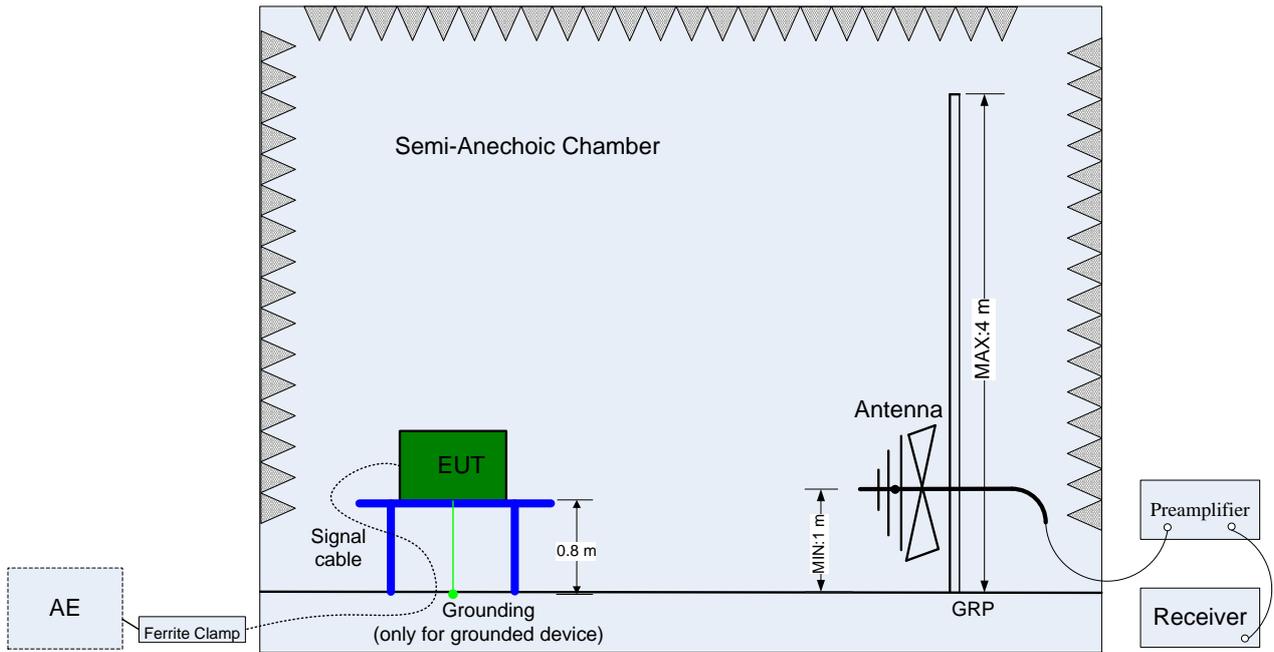
The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



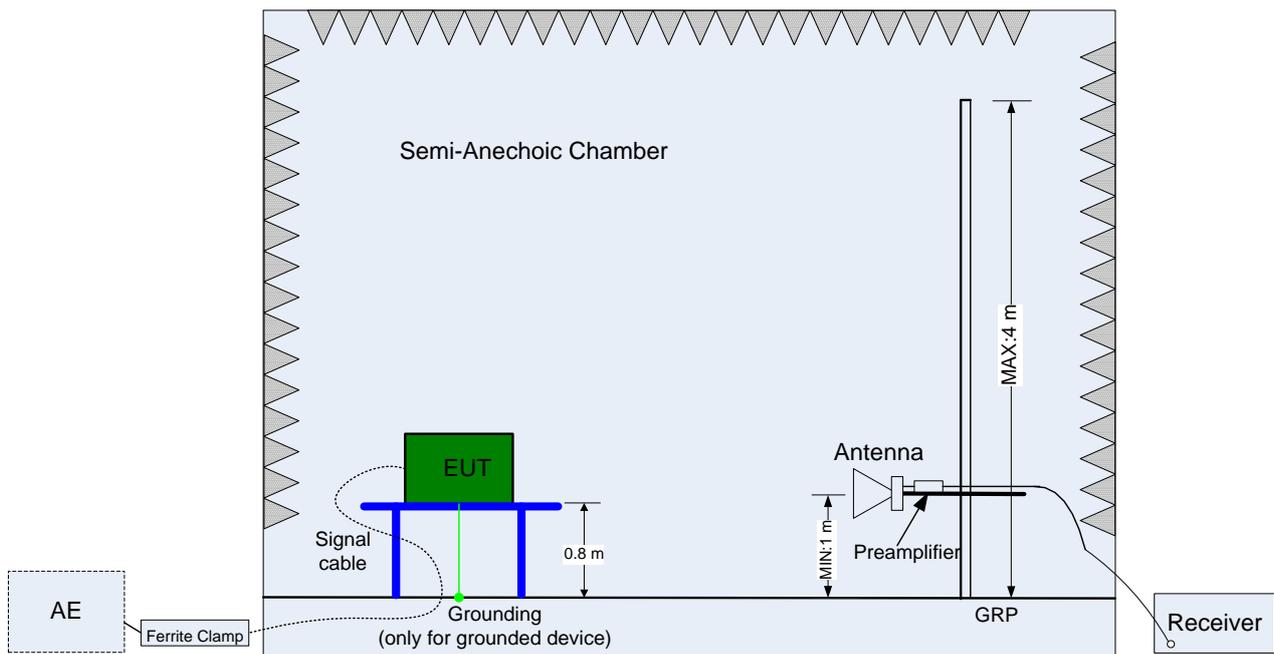
### 4.3.2 Test Setup 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.4. The test distance is 3 m. The setup is according to ANSI C63.10, ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22.

The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).



(Below 1 GHz)

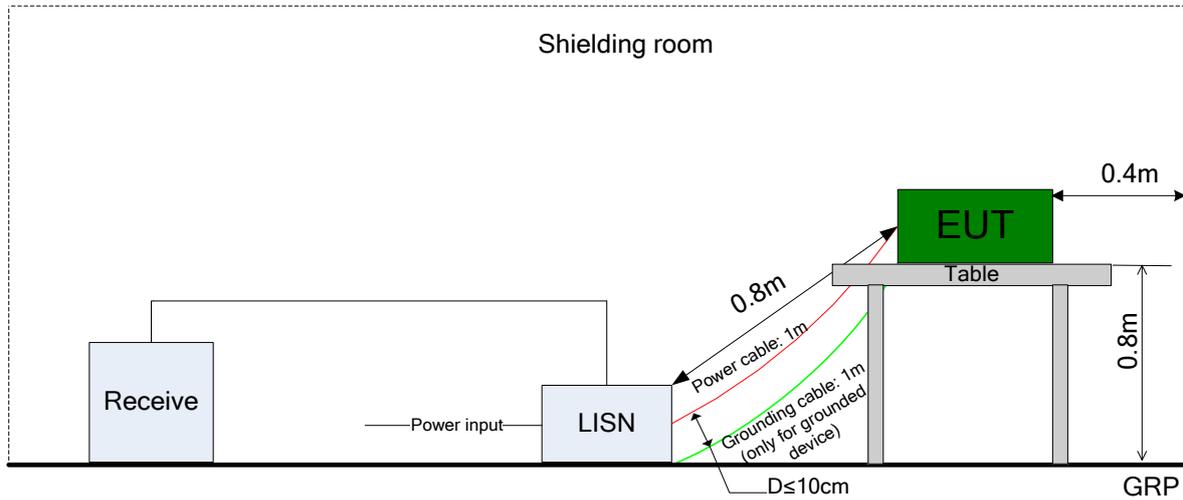


(Above 1 GHz)

### 4.3.3 Test Setup 3

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.





#### 4.4 Test Conditions

Configuration	Description								
DTS (6 dB) Bandwidth									
Test Method	FCC KDB 558074, §8.1 Option 1.								
Test Env.	NTNV								
Test Setup	Test Setup 1								
EUT Conf.	TX-B, TX-M, TX-T.								
Occupied Bandwidth									
Test Method	RSS-Gen, §4.6.1.								
Test Env.	NTNV								
Test Setup	Test Setup 1								
EUT Conf.	TX-B, TX-M, TX-T.								
Maximum Peak Conducted Output Power									
Test Method	FCC KDB 558074, §9.1.2 Integrated Band Power Method.								
Test Env.	NTNV								
Test Setup	Test Setup 1								
EUT Conf.	TX-B, TX-M, TX-T.								
Maximum Power Spectral Density Level									
Test Method	FCC KDB 558074, §10.2 Method PKPSD (Peak PSD).								
Test Env.	NTNV								
Test Setup	Test Setup 1								
EUT Conf.	TX-B, TX-M, TX-T.								
Unwanted Emissions into Non-Restricted Frequency Bands									
Test Method	FCC KDB 558074, §11 (Peak-based).								
Test Env.	NTNV								
Test Setup	Test Setup 1								
EUT Conf.	TX-B, TX-M, TX-T.								
Unwanted Emissions into Restricted Frequency Bands									
Test Method	ANSI C63.10; FCC KDB 558074, §12.1 Radiated Emission Measurements.								
	<table border="1"> <tr> <td>9k-150kHz</td> <td>Pre.: RBW=300Hz; VBW=1kHz; Det=Peak. Final: ---</td> </tr> <tr> <td>150k-30MHz</td> <td>Pre.: RBW=10kHz; VBW=30kHz; Det=Peak. Final: ---</td> </tr> <tr> <td>30M-1GHz</td> <td>Pre.: RBW=100kHz; VBW=300kHz; Det=Peak. Final: RBW=120kHz; Det=CISPR Quasi-Peak.</td> </tr> <tr> <td>≥1GHz</td> <td>Avg.: RBW=1MHz; VBW=3MHz; Det.=RMS; SPAN/Sweep-point≤RBW/2; Sweep-time=Auto; Trace≥RMS*100; Add-Transd.=10*lg(1/X). Peak: RBW=1MHz; VBW=3MHz; Det.=Peak; Sweep-time=Auto; Trace=Max Hold.</td> </tr> </table>	9k-150kHz	Pre.: RBW=300Hz; VBW=1kHz; Det=Peak. Final: ---	150k-30MHz	Pre.: RBW=10kHz; VBW=30kHz; Det=Peak. Final: ---	30M-1GHz	Pre.: RBW=100kHz; VBW=300kHz; Det=Peak. Final: RBW=120kHz; Det=CISPR Quasi-Peak.	≥1GHz	Avg.: RBW=1MHz; VBW=3MHz; Det.=RMS; SPAN/Sweep-point≤RBW/2; Sweep-time=Auto; Trace≥RMS*100; Add-Transd.=10*lg(1/X). Peak: RBW=1MHz; VBW=3MHz; Det.=Peak; Sweep-time=Auto; Trace=Max Hold.
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≥1GHz	Avg.: RBW=1MHz; VBW=3MHz; Det.=RMS; SPAN/Sweep-point≤RBW/2; Sweep-time=Auto; Trace≥RMS*100; Add-Transd.=10*lg(1/X). Peak: RBW=1MHz; VBW=3MHz; Det.=Peak; Sweep-time=Auto; Trace=Max Hold.								
Test Env.	NTNV								



Configuration	Description	
Test Setup	Test Setup 2	
EUT Conf.	30M-1GHz	Worst Case (TX-B)
	1G-3GHz	TX-B, TX-M, TX-T.
	3G-18GHz	TX-B, TX-M, TX-T.
	18G-26.5GHz	Worst Case (TX-B)
AC Power Line Conducted Emissions		
Test Method	---	
Test Env.	---	
Test Setup	---	
EUT Conf.	---	



## 5 Main Test Instruments

NOTE: Unless otherwise specified, the calibration intervals for test instruments were Annual (per year). The other intervals, if applicable, are marked with (##y), which denotes ## years calibration interval.

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1				
Spectrum Analyzer	Agilent	N9020A	MY51240619	2014-02-03
Test Setup 2				
EMI Test Receiver	R&S	ESU26	100150	2014-05-14
Bilog Antenna (30M-1GHz)	SCHWARZBECK	VULB 9163	9163-357	2014-05-27 (2y)
Horn Antenna (1G-18GHz)	R&S	HF906	100683	2014-02-01 (2y)
Horn Antenna (18G-26.5GHz)	ETS	3160-9	053215-21874	2014-12-24 (2y)

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END