



# RF Test Report

**Product Name: Battery String Monitor Unit**

**Product Model: eMeter**

**Report Number: SYBH(R)01606158EB-1**

**FCC ID: QISEMETER**

**IC: 6369A-EMETER**

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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 for the test site located in Shenzhen is 97456, and the recognition numbers for the test site located in Shanghai is 684868.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers are 6369A-1 for the 3m chamber test site located at G2 building, 6369A-2 for the 3m chamber test site located at K3 building and 6369A-3 for the 10m chamber test site located at K3 building in Shenzhen; the recognition numbers are 6369D-1 for the 3m chamber test site and 6369D-2 for the 10m chamber test site located in Shanghai.
5. The laboratory has been listed by the VCCI to perform EMC measurements. The accreditation numbers for the test site No.1 located at G2 building in Shenzhen are R-3892, G-415, C-4361, and T-1348, and the accreditation numbers for the test site No.2 located at K3 building in Shenzhen 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 String Monitor Unit  
**Product Model:** eMeter

**Date of Receipt Sample:** 2014-11-27  
**Start Date of Test:** 2015-01-30  
**End Date of Test:** 2015-01-30

**Test Result:** Pass

<b>Approved by Senior</b>	2015-04-22	Zhang Xinghai	<i>Zhang Xing hai</i>
<b>Engineer:</b>	Date	Name	Signature

<b>Prepared by:</b>	2015-04-22	Zhang Weimin	<i>Zhang Weimin</i>
	Date	Name	Signature



### Modification Record

No.	Last Report No.	Modification Description
1	---	First report.
2	SYBH(R)010752 32EB-2	<p><input type="checkbox"/> Substituted Modification (The last report is withdrawn):</p> <p>Listed below are the changes:</p> <ul style="list-style-type: none"> <li>● ---</li> </ul> <p><input checked="" type="checkbox"/> Coexistence Modification (The last report is reserved):</p> <p>The present product/model (#New) utilizes the same or similar radio design, shielding, interface, physical layout and so on as another product/model (#Ref). The differences and modifications between these two products/models are declared by the applicant and showed as below:</p> <ul style="list-style-type: none"> <li>● The control interface is designed as COM port for the #New, while the control interface is respectively designed as GPRS or FE port for the #Ref (eBox-F and eBox-G).</li> <li>● All others designs are identical and not changed.</li> </ul> <p>The FCC ID and IC (ID) for the #Ref are:</p> <ul style="list-style-type: none"> <li>● FCC ID: QISEBOXG (for eBox-G), QISEBOXF (for eBox-F).</li> <li>● IC: 6369A-EBOXG (for eBox-G), 6369A-EBOXF (for eBox-F).</li> </ul> <p>Considering the differences and modifications as mentioned above, no further testing is required as the #New can be regarded as identical in performance to the #Ref. So, the test results for the #Ref can be used to demonstrate that the #New also comply with the relevant standard(s). In the present report, the test results for the #New are directly derived from the test results for the #Ref.</p> <p>In addition, due to the modification of the applied standards (FCC KDB), one test was re-tested and relevant results were also updated, that is "Maximum Peak Conducted Output Power".</p>
3	SYBH(R)014243 48EB-1	<p><input type="checkbox"/> Substituted Modification (The last report is withdrawn):</p> <p>Listed below are the changes:</p> <ul style="list-style-type: none"> <li>● ---</li> </ul> <p><input checked="" type="checkbox"/> Coexistence Modification (The last report is reserved):</p> <p>The present product/model (#New) utilizes the same or similar radio design, shielding, interface, physical layout and so on as another product/model (#Ref).</p> <p>The FCC ID and IC (ID) for the #Ref are:</p> <ul style="list-style-type: none"> <li>● FCC ID: QISEBOXS.</li> </ul>



No.	Last Report No.	Modification Description
		<ul style="list-style-type: none"><li>● IC: 6369A-EBOXS.</li></ul> <p>Some additional radiated tests are performed to demonstrate that the #New also comply with the relevant standard(s), other test results for the #New are directly derived from the test results for the #Ref.</p> <p>In addition, the versions of the rules are updated.</p>



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## 1 General Information

### 1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2, Subpart J (10-1-14 Edition)  
47 CFR FCC Part 15, Subpart C (10-1-14 Edition)  
RSS-Gen (Issue 4, November 2014)  
IC RSS-210 (Issue 8, December 2010)

Test Method: FCC KDB 558074 D01 DTS Meas Guidance v03r02

### 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

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-Gen,6.6; RSS-Gen,8.11	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-210,2.2; RSS-210,2.5; RSS-Gen,6.13; RSS-Gen,8.9; RSS-Gen,8.10	§15.209/§8.9 limit.	Annex F	Pass	TL1
AC Power Line Conducted Emissions	15.207	RSS-Gen,8.8	§15.207/§8.8 limit.	Annex G	---	TL1
Photos of Test Setups	---	---	---	Annex H	---	---
<p>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.</p>						



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

#### 3.1 General Description

The eMeter is a battery string voltage and current detection module and communicates with the eBox using wireless connection. The eMeter is connected to the positive and negative ends of a battery string using cables and connect with a current transducer. The eMeter has the following functions:

- Detects the battery string voltage (Currently only 48V battery string is supported).
- Detects the battery string current.
- Transmits detected battery information to the 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
JD02VTCA	Battery String Monitor Unit

##### 3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
---	---	---	---

### 3.3 Technical Description

Characteristics	Description			
Signal System	IEEE 802.15.4.			
TX/RX Operating Range	2.4 GHz band	$fc = 2405 \text{ MHz} + (N - 11) * 5 \text{ MHz}$ , where: <ul style="list-style-type: none"> <li>● <math>fc</math> = "Operating Frequency" in MHz,</li> <li>● <math>N</math> = "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 DC
	Specification			Rated: 48 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

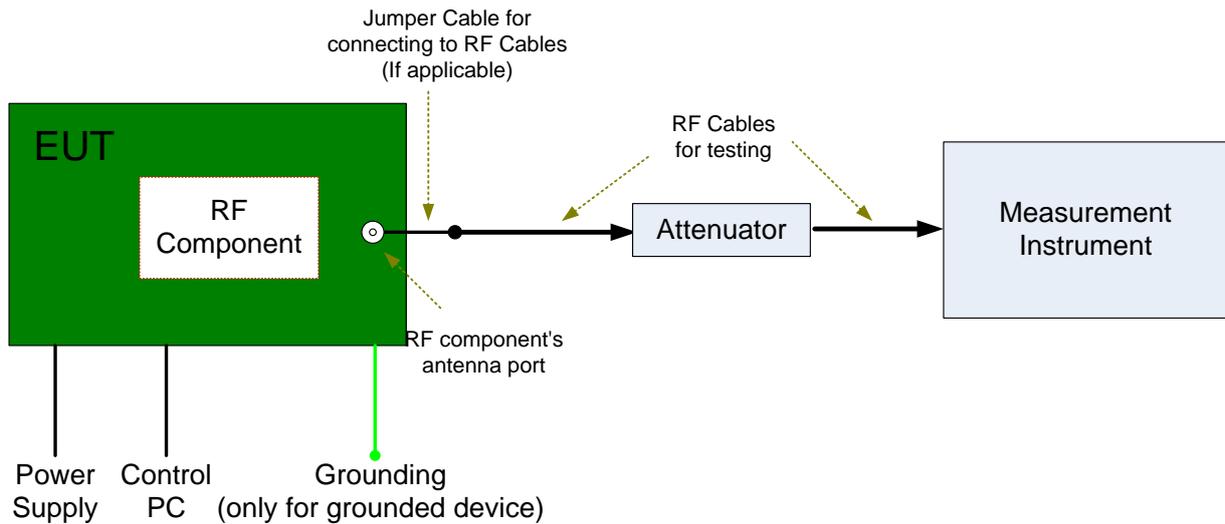
NOTE: The values used in the test report may be stringent than the declared.

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

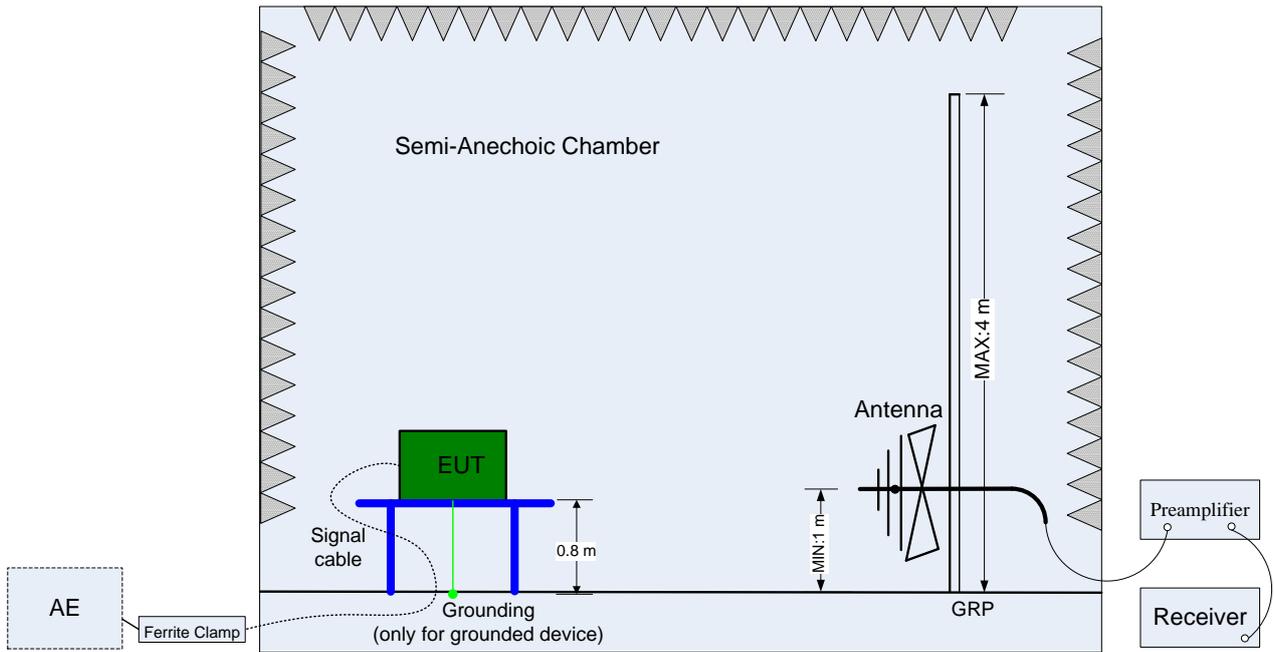
The RF component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



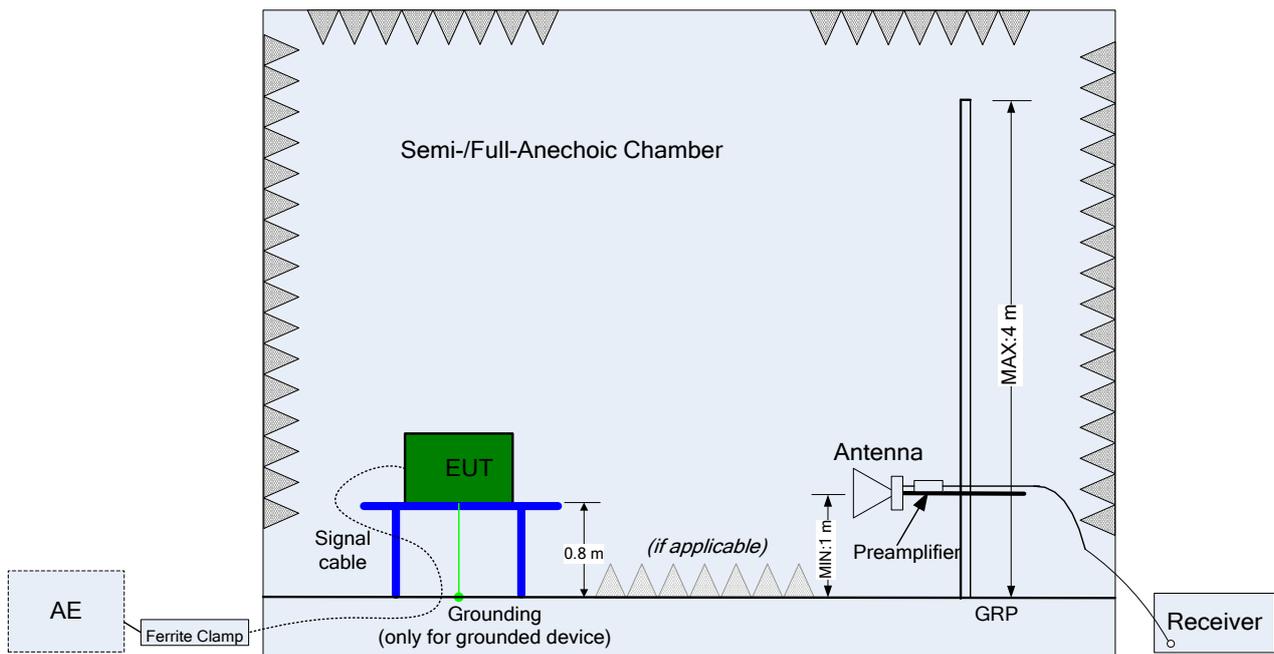
#### 4.3.2 Test Setup 2

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)

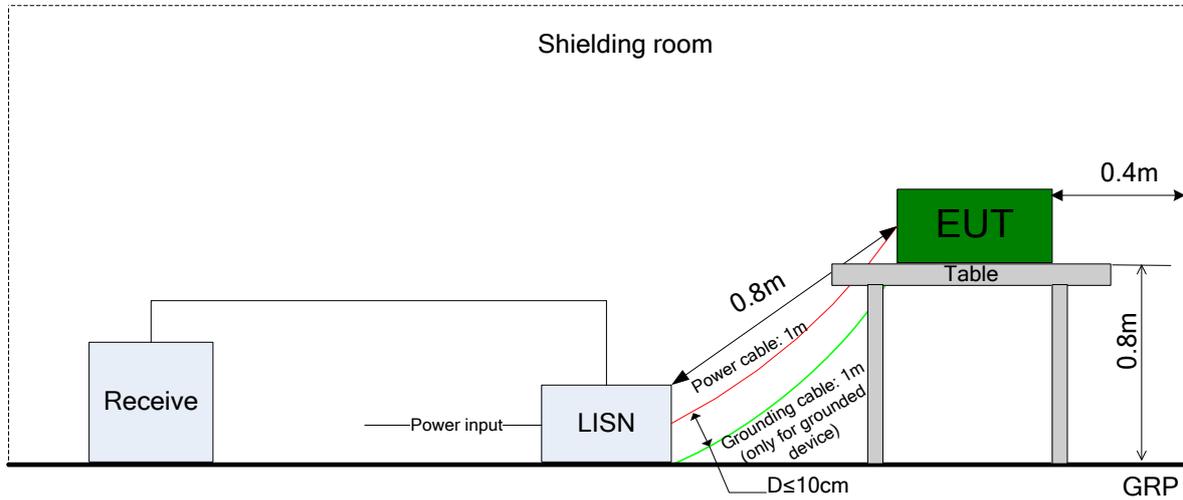


(Above 1 GHz)

### 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 Env.	NTNV	
Test Setup	Test Setup 1	
EUT Conf.	TX-B, TX-M, TX-T.	
Occupied Bandwidth		
Test Env.	NTNV	
Test Setup	Test Setup 1	
EUT Conf.	TX-B, TX-M, TX-T.	
Maximum Peak Conducted Output Power		
Test Env.	NTNV	
Test Setup	Test Setup 1	
EUT Conf.	TX-B, TX-M, TX-T.	
Maximum Power Spectral Density Level		
Test Env.	NTNV	
Test Setup	Test Setup 1	
EUT Conf.	TX-B, TX-M, TX-T.	
Unwanted Emissions into Non-Restricted Frequency Bands		
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.	
	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*Ig(1/X). Peak: RBW=1MHz; VBW=3MHz; Det.=Peak; Sweep-time=Auto; Trace=Max Hold.
Test Env.	NTNV	
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)



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Configuration	Description
AC Power Line Conducted Emissions	
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.

(For referenced tests)

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)

(For referenced tests)

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1				
Spectrum Analyzer	Agilent	E4440A	MY49420179	2014-08-30

(For new updated test)

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 2				
EMI Test Receiver	R&S	ESU40	100144	2015-11-14
Bilog Antenna (30M-1GHz)	Schaffner	CBL 6112B	2941	2016-08-18 (2y)
Horn Antenna (1G-18GHz)	R&S	HF906	359287/005	2016-03-22 (2y)
Horn Antenna (18G-26.5GHz)	ETS	3160-9	053215-21876	2017-02-11 (2y)



## 6 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items		Extended Uncertainty
Radiated emission (G2 3m chamber)	Field strength (dB $\mu$ V/m)	U=4.15 dB; k=2 (30 MHz-1 GHz)
		U=3.64 dB; k=2 (1 GHz-18 GHz)

END