

EMC Test Report

Application No. : TB181220628
Applicant : JYC Battery Manufacturer Co., Ltd
Equipment Under Test (EUT)
EUT Name : Valve Regulated Lead Acid Battery
Model No. : 12V7AH
Serial Model No. : 2V50AH~2V3000AH, 6V1AH~6V250AH, 12V1AH~12V250AH
Brand Name : JYC
Receipt Date : 2018-12-14
Test Date : 2018-12-15 to 2018-12-17
Issue Date : 2018-12-18
Standards : EN 61000-6-3:2007+A1:2011
EN 61000-6-1:2017
Conclusions : **PASS**

In the configuration tested, the EUT complied with the standards specified above
The EUT technically complies with the 2014/30/EU directive requirements

Test/Witness Engineer :

Rebecca

Rebecca

Engineer Supervisor :

IVAN SU

Ivan Su

Engineer Manager :

Ray Lai

Ray Lai



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-075-1.0

TABLE OF CONTENTS

1.	GENERAL INFORMATION.....	4
1.1.	Client Information	4
1.2.	General Description of EUT (Equipment Under Test).....	4
1.3.	Block Diagram Showing The Configuration of System Tested	5
1.4.	Description of Support Units	5
1.5.	Description of Operating Mode	5
1.6.	Performance Criterion	6
1.7.	Measurement Uncertainty	6
1.8.	Test Facility	7
2.	TEST RESULTS SUMMARY	8
3.	TEST EQUIPMENT USED	9
4.	RADIATED EMISSION TEST	10
4.1.	Test Standard and Limit	10
4.2.	Test Setup	10
4.3.	Test Procedure	11
4.4.	Test Data	11
5.	ELECTROSTATIC DISCHARGE IMMUNITY TEST	12
5.1.	Test Requirements	12
5.2.	Test Setup	12
5.3.	Test Procedure	13
5.4.	Test Data	13
6.	RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST	14
6.1.	Test Requirements	14
6.2.	Test Setup	14
6.3.	Test Procedure	14
6.4.	Test Data	15
7.	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	16
8.	PHOTOGRAPHS - TEST SETUP	17
	ATTACHMENT A--RADIATED EMISSION TEST DATA (BELOW 1G)	18
	ATTACHMENT B--ELECTROSTATIC DISCHARGE TEST DATA	20
	ATTACHMENT C--RF FIELD STRENGTH SUSCEPTIBILITY TEST DATA.....	22

Revision History

Report No.	Version	Description	Issued Date
TB-EMC163411	Rev.01	Initial issue of report	2018-12-17

1. General Information

1.1. Client Information

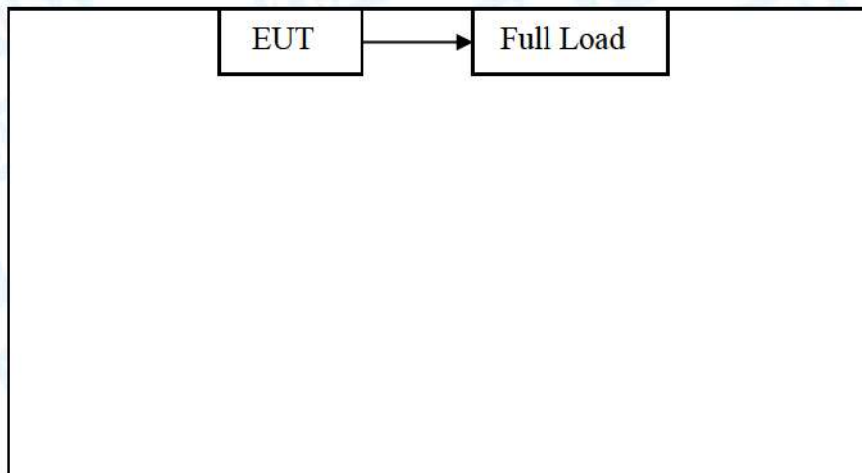
Applicant	:	JYC Battery Manufacturer Co., Ltd
Address	:	Wengcheng Industrial Park, Guandu development Zone, Wengyuan, Shaoguan, Guangdong, China
Manufacturer	:	JYC Battery Manufacturer Co., Ltd
Address	:	Wengcheng Industrial Park, Guandu development Zone, Wengyuan, Shaoguan, Guangdong, China

1.2. General Description of EUT (Equipment Under Test)

EUT Name	:	Valve Regulated Lead Acid Battery
Model(s)	:	12V7AH, 2V50AH~2V3000AH, 6V1AH~6V250AH, 12V1AH~12V250AH
Brand Name	:	JYC
Battery Rating	:	Standby use: 13.5-13.8V Cycle use: 14.4-15.0V Initial current: <2.1A

Remark: All above models are identical in schematic, structure and critical components except for only different voltage; therefore, EMC testing was performed with 12V7AH only.

1.3. Block Diagram Showing The Configuration of System Tested



1.4. Description of Support Units

The EUT has been tested as an independent unit.

1.5. Description of Operating Mode

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Discharging Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as Following:

For EMI Test	
Final Test Mode	Description
Mode 1	Discharging Mode
For EMS Test	
Final Test Mode	Description
Mode 1	Discharging Mode

1.6. Performance Criterion

Criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.

Criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

1.7. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

Test	Parameters	Expanded Uncertainty (U_{Lab})	Expanded Uncertainty (U_{Cispr})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	± 3.42 dB ± 3.42 dB	± 4.0 dB ± 3.6 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	± 4.60 dB	N/A
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	± 4.40 dB	± 5.2 dB
Radiated Emission	Level Accuracy: Above 1000MHz	± 4.20 dB	N/A
Mains Harmonic	Voltage	$\pm 3.11\%$	N/A
Voltage Fluctuations & Flicker	Voltage	$\pm 3.25\%$	N/A

1.8. Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.

IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. TEST Results Summary

EMISSION		
Description of test items	Standards	Results
Conducted disturbance at mains terminals	EN 61000-6-3:2007+A1:2011	N/A
Radiated Disturbance	EN 61000-6-3:2007+A1:2011	Pass
Harmonic current emissions	EN 61000-3-2: 2014	N/A
Voltage fluctuation and flicker	EN 61000-3-3: 2013	N/A
IMMUNITY		
Description of test items	Standards	Results
Electrostatic Discharge (ESD)	EN 61000-4-2: 2009	Pass
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A1: 2008 +A2:2010	Pass
EFT/B Immunity	EN 61000-4-4: 2012	N/A
Surge Immunity	EN 61000-4-5: 2014	N/A
Conducted RF Immunity	EN 61000-4-6: 2014	N/A
Power frequency magnetic field	EN 61000-4-8: 2010	N/A
Voltage dips, >95% reduction	EN 61000-4-11: 2004	N/A
Voltage dips, 30% reduction		
Voltage interruptions		
Note: N/A is an abbreviation for Not Applicable.		

3. Test Equipment Used

Radiation Emission Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 18, 2018	Jul. 17, 2019
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Jul. 18, 2018	Jul. 17, 2019
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 16, 2018	Mar. 15, 2019
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 16, 2018	Mar. 15, 2019
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 16, 2018	Mar. 15, 2019
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 16, 2018	Mar. 15, 2019
Pre-amplifier	HP	11909A	185903	Mar. 17, 2018	Mar. 16, 2019
Pre-amplifier	HP	8449B	3008A00849	Mar. 17, 2018	Mar. 16, 2019
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 17, 2018	Mar. 16, 2019
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Mar. 17, 2018	Mar. 16, 2019
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Discharge Immunity Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
ESD Tester	TESEQ	NSG437	304	Jul. 18, 2018	Jul. 17, 2019
Radiated Immunity Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
Signal Generator	Rohde & Schwarz	SMT03	200754	Mar. 22, 2018	Mar. 21, 2019
Power Meter	Rohde & Schwarz	NRVD	110562	Feb. 12, 2018	Feb. 11, 2019
Voltage Probe	Rohde & Schwarz	URV5-Z2	12056	Feb. 12, 2018	Feb. 11, 2019
Voltage Probe	Rohde & Schwarz	URV5-Z2	12074	Feb. 12, 2018	Feb. 11, 2019
RF Amplifier	AR	50S1G4A	326720	Feb. 12, 2018	Feb. 11, 2019
Bilog Antenna	ETS	3142C	00047662	Feb. 12, 2018	Feb. 11, 2019
Horn Antenna	ARA	DRG-118A	16554	Feb. 12, 2018	Feb. 11, 2019
Audio Analyzer	Rohde & Schwarz	UPL 16	SB2208	Feb. 12, 2018	Feb. 11, 2019
Sound Level Calibrator	B&K	4231	264516	Feb. 12, 2018	Feb. 11, 2019

4. Radiated Emission Test

4.1. Test Standard and Limit

4.1.1. Test Standard

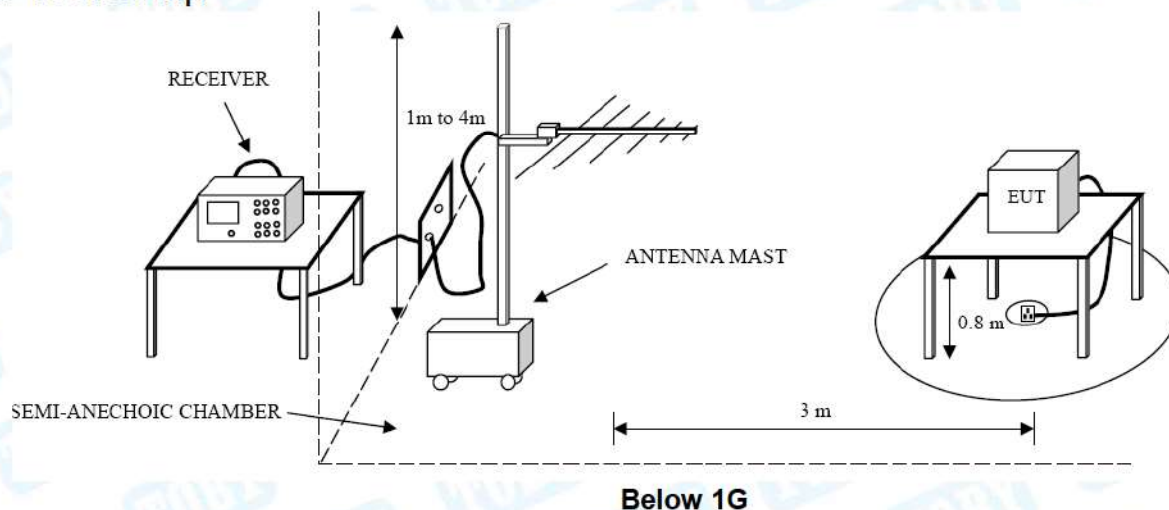
EN 61000-6-3:2007+A1:2011

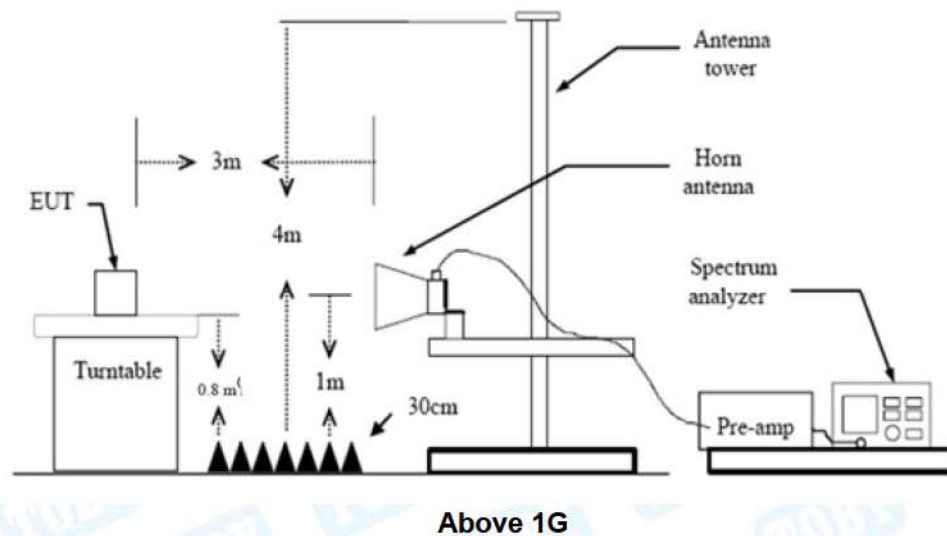
4.1.2. Test Limit

Radiated Disturbance Test Limit

Radiated Disturbance Test Limit-Below 1G		
Frequency (MHz)	Limit (dBμV/m)	
	Quasi-peak Level	
30~230	40	
230~1000	47	
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.		
Radiated Disturbance Test Limit-Above 1G		
Frequency (GHz)	Limit (dBμV/m)	
	Peak Level	Average Level
1~3	70	50
3~16	74	54
if the highest internal frequency of the EUT is less than 108 MHz, the measurement shall only be made up to 1GHz. if the highest internal frequency of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2GHz. if the highest internal frequency of the EUT is between 500MHz and 1GHz, the measurement shall only be made up to 5GHz. if the highest internal frequency of the EUT is above 1GHz, the measurement shall be made up to 6GHz.		

4.2. Test Setup





4.3. Test Procedure

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m. The table was rotated 360 degrees to determine the position of the highest radiation.

The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range.

If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

4.4. Test Data

Please refer to the Attachment A.

5. Electrostatic Discharge Immunity Test

5.1. Test Requirements

5.1.1. Test Standard

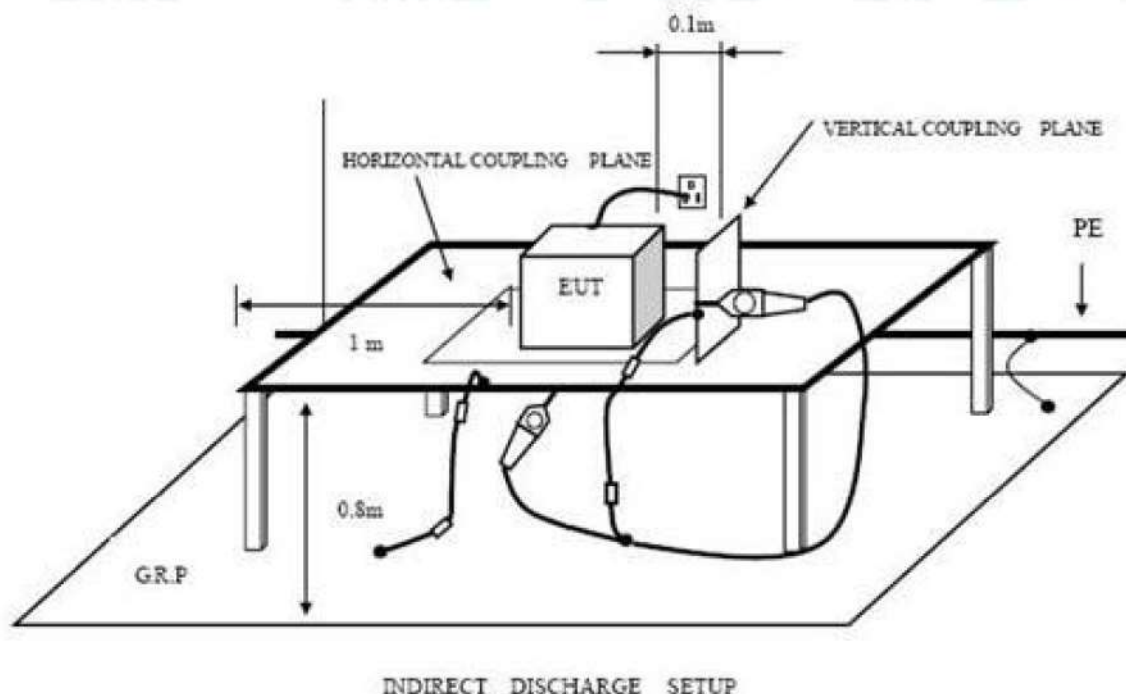
EN 61000-6-1: 2017 (EN 61000-4-2:2009)

5.1.2. Test Level

Discharge Impedance:	330 ohm/ 150pF
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV(Direct) Contact Discharge: 2kV/4kV (Direct /Indirect)
Polarity:	Positive& Negative
Number of Discharge:	Air Discharge: min.20 times at each test point Contact Discharge: min.200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.1.3. Performance criterion: B

5.2. Test Setup



5.3. Test Procedure

5.3.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

5.3.2. Contact Discharge:

All the procedure shall be same as air discharge. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

5.3.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

5.3.4. Indirect discharge for vertical coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

5.4. Test Data

Please refer to the Attachment B.

6. Radiated Electromagnetic Field Immunity Test

6.1. Test Requirements

6.1.1. Test Standard

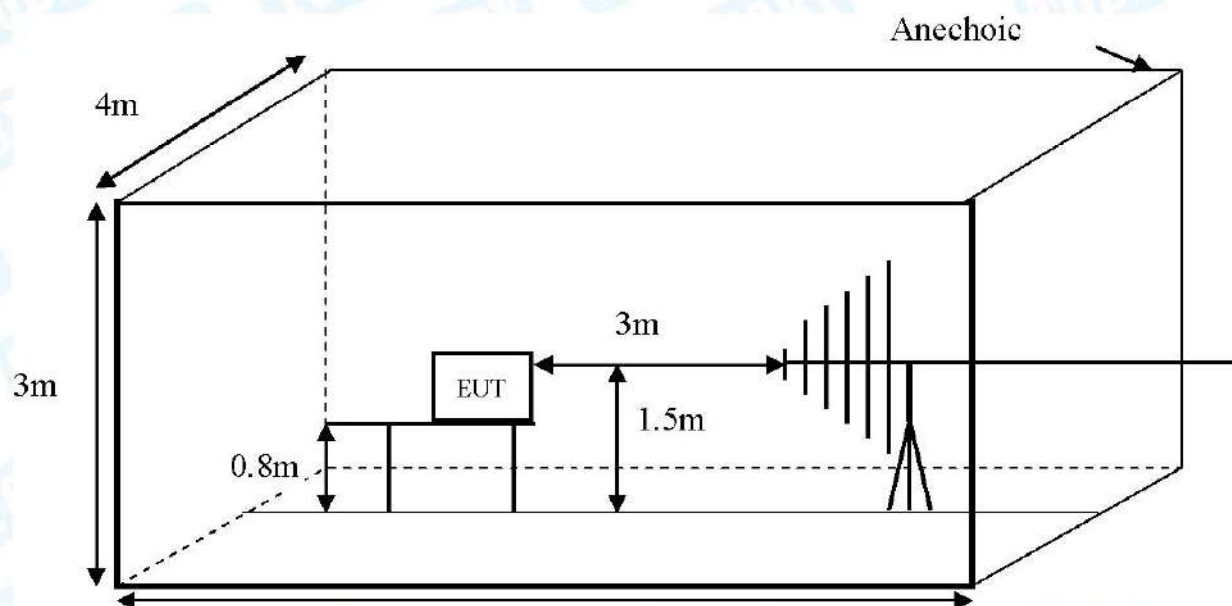
EN 61000-6-1: 2017 (EN 61000-4-3:2006+A1:2008+A2:2010)

6.1.2. Test Level

Test Specification		
80-1000MHz 3 V/m 80 % AM (1kHz)	1400-2000MHz 3 V/m 80 % AM (1kHz)	2000-2700MHz 1 V/m 80 % AM (1kHz)

6.1.3. Performance criterion: A

6.2. Test Setup



6.3. Test Procedure

The EUT are placed on a table, which is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna, which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a camera is used to monitor its screen.

All the scanning conditions are as following:

Condition of Test	Remark		
	3V/m	3V/m	1V/m
Fielded strength	3V/m	3V/m	1V/m
Radiated signal	Modulated	Modulated	Modulated
Scanning frequency	80-1000MHz	1400-2000MHz	2000-2700MHz
Dwell time	3 Sec.	3 Sec.	3 Sec.

6.4. Test Data

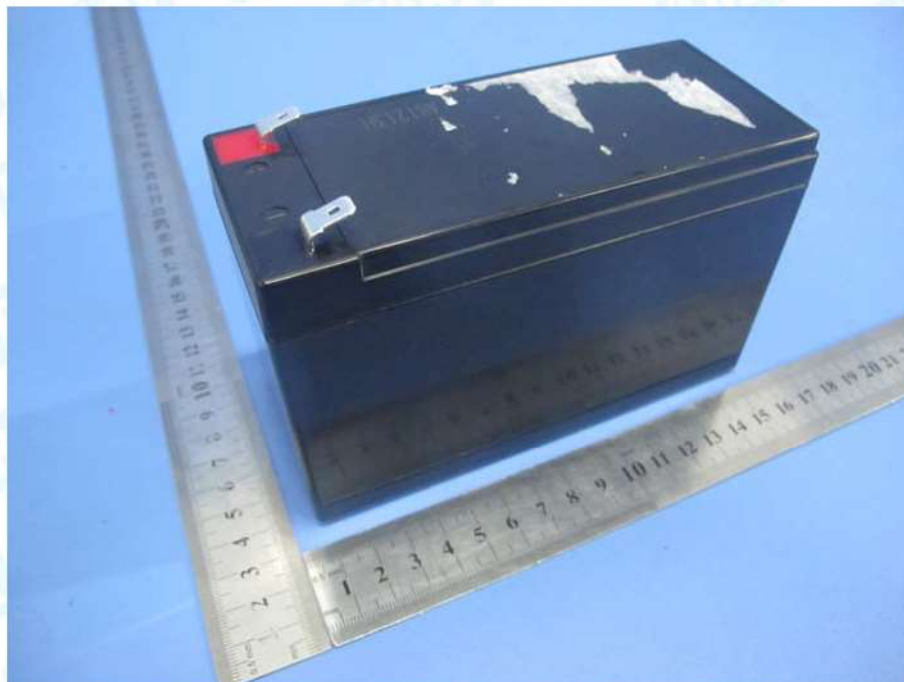
Please refer to the Attachment C.

7. Photographs - Constructional Details

Photo 1 Appearance of EUT



Photo 2 Appearance of EUT

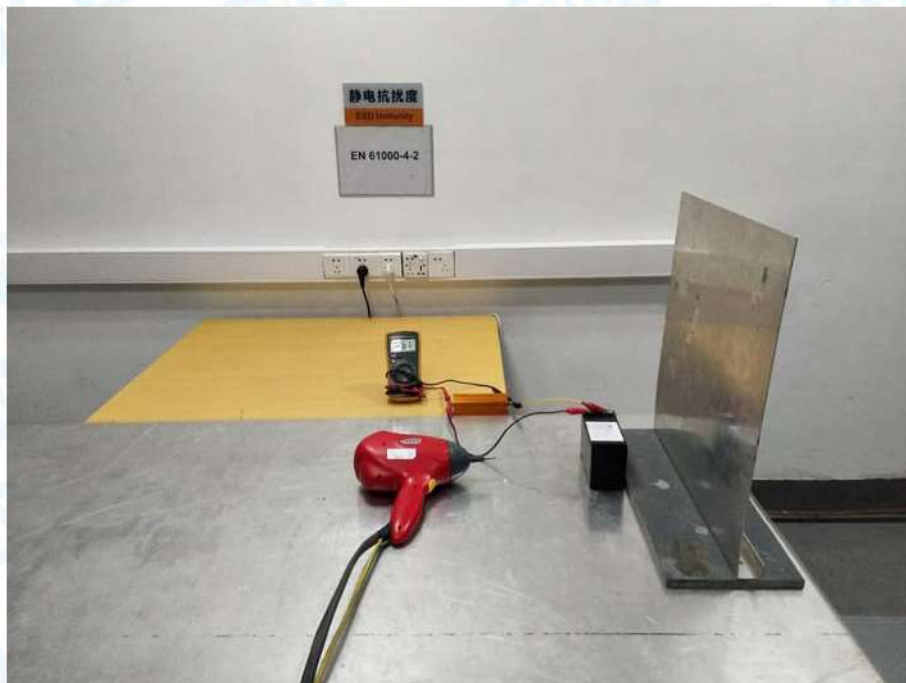


8. Photographs - Test Setup

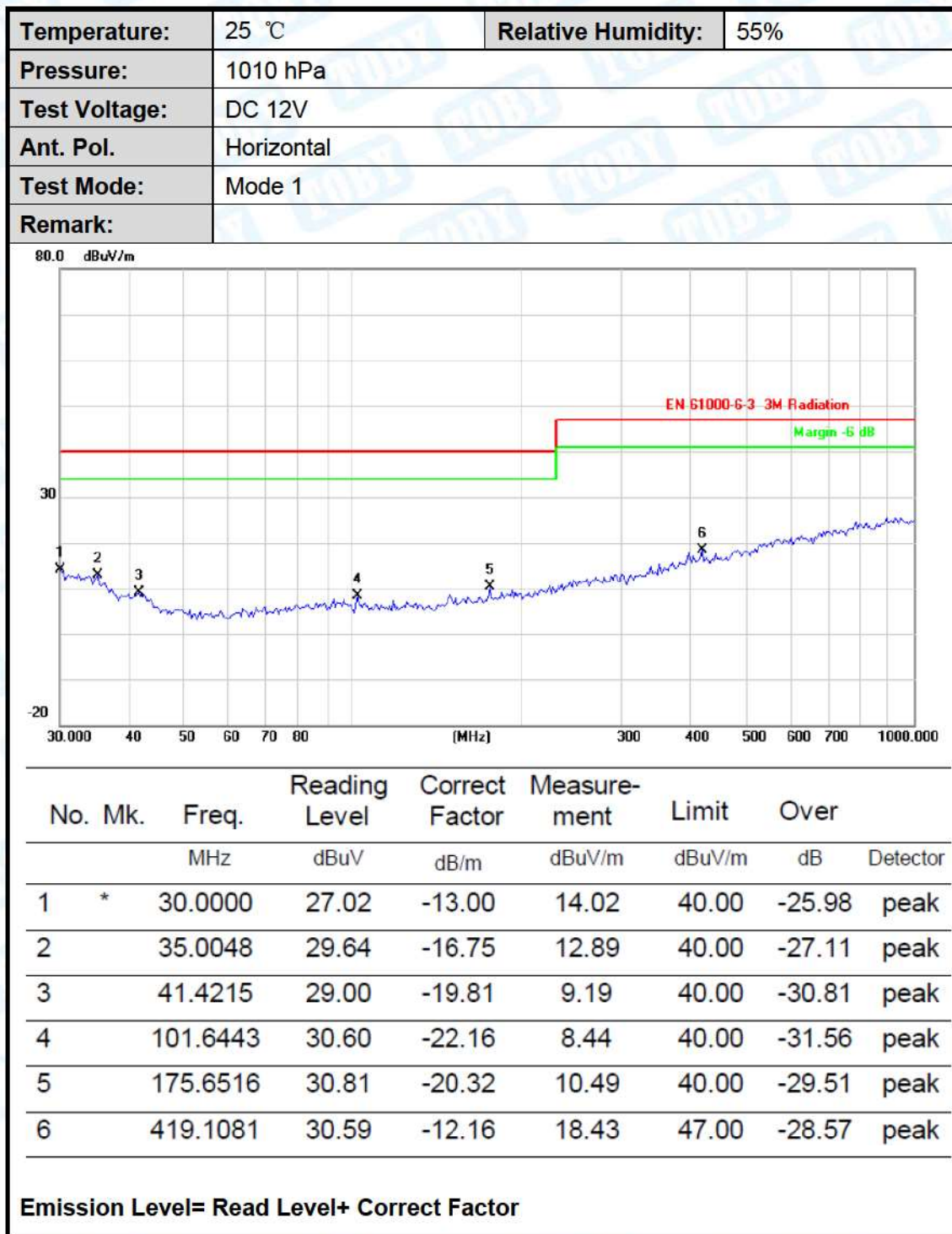
Radiated Emission Test Setup—Below 1G

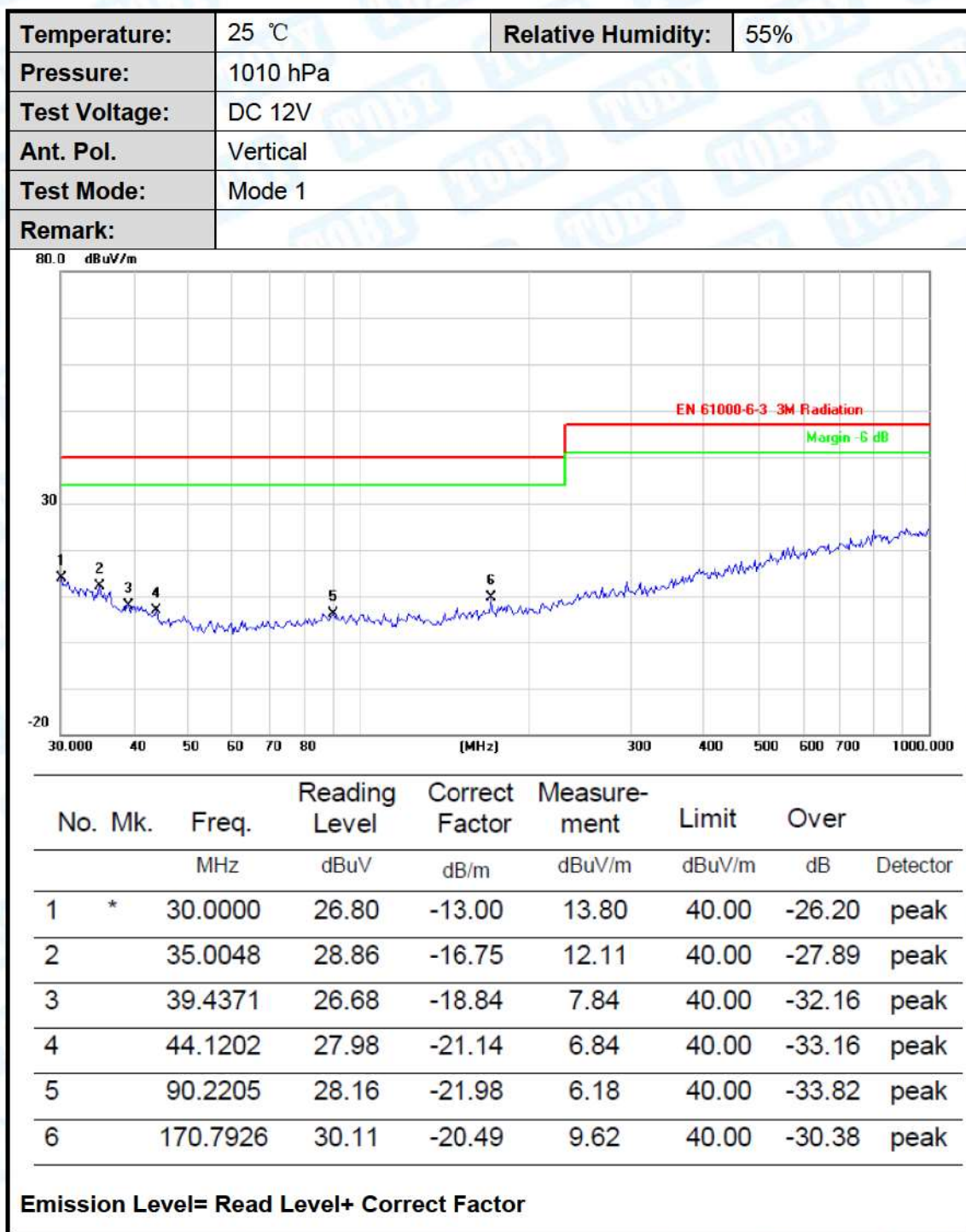


Electrostatic Discharge Test Setup



Attachment A--Radiated Emission Test Data (Below 1G)





Attachment B--Electrostatic Discharge Test Data

Temperature : 24.3°C	Humidity : 53%			
Power supply : DC 12V	Test Mode : Mode 1			
Required Performance Criteria: B				
Air Discharge: $\pm 2/\pm 4/\pm 8$ kV Contact Discharge: $\pm 2/\pm 4$ kV				
Location	Test Level (kV)	No. of Discharge	Judgment	Result
HCP	± 4 kV	40	A	PASS
VCP	± 4 kV	40	A	

Test Location Photos**Note:**

- 1) Criteria A: There was no change operated with initial operating during the test.
- 2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 3) Criteria C: The system shut down during the test.

Attachment C--RF Field Strength Susceptibility Test Data

Temperature	: 23.5°C	Humidity	: 52%				
Power supply	: DC 12V	Test Mode	: Mode 1				
Required Performance Criteria: A							
Position	Frequency Range 1		Frequency Range 2		Frequency Range 3		Result
	80~1000MHz		1400~2000MHz		2000~2700MHz		
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
Front	A	A	A	A	A	A	PASS
Right	A	A	A	A	A	A	
Rear	A	A	A	A	A	A	
Left	A	A	A	A	A	A	
Remark:							
1) Criteria A: There was no change operated with initial operating during the test.							
2) Criteria B: The EUT function loss during the test, but self-recoverable after the test.							
3) Criteria C: The system shut down during the test.							

-----END OF REPORT-----