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Guangzhou Branch**

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Report No.: GZEM190801497901
Page: 1 of 25

TEST REPORT

Application No.: GZEM1908014979HS
Applicant: Zhengzhou F-wheel Industrial Co., Ltd
Address of Applicant: Zhengzhou City Lianyun Road 27 District No.123 Huanghe Science and
Technology College science and Technology Park (South) B

Equipment Under Test (EUT):

EUT Name: Electric Bike
Model No.: D2+, D3+ ☐
☐ Please refer to section 2 of this report which indicates which model was
actually tested and which were electrically identical.

Standard(s) : EN 15194 :2017 Annex C 1.2.5~1.2.7,C.8

Date of Receipt: 2019-08-09
Date of Test: 2019-08-12 to 2019-08-23
Date of Issue: 2019-09-10

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

All ESAs, with the exception of cables shall bear the following and these marks shall be indelible and clearly legible: a) make of name of the manufacturer of the ESAs and their components; b) trade description, under the responsibility of the manufacturer, after completion of a Declaration of Conformity and compliance with all relevant standards.

Kobe Jian
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

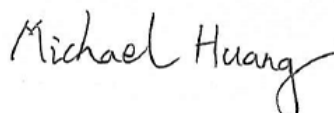
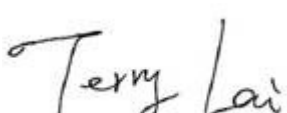


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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2019-09-10		Original

Authorized for issue by:			
Tested By			2019-08-12 to 2019-08-23
	Michael_Huang/Project Engineer		Date
Checked By			2019-09-10
	Terry_Lai /Reviewer		Date



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3 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emissions 30 MHz to 1 GHz	EN15194:2017	EN55025:2017	C.1.2.5 for broad band C.1.2.6 for narrow band	PASS
ESA Immunity (BCI for 20MHz to 400MHz)	EN15194:2017	ISO11452-4:2011	48mA	PASS
ESA immunity (ALSE for 400MHz to 2GHz)	EN15194:2017	ISO11452-2:2011	24V/m	PASS
ESD	EN15194:2017	EN 61000-4-2:2009	Contact ±4 kV Air ±8 kV	PASS

▣ **Declaration of EUT Family Grouping:**

Model No.: D2+, D3+

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on the size of wheel.

Therefore only one model **D3+** was tested in this report.



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5 General Information

5.1 Details of E.U.T.

Power Supply: DC 36V Li-ion battery
Cable: N/A

5.2 Description of Support Units

None.

5.3 Test Location

ESD were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663
Tel: +86 20 82155555 Fax: +86 20 82075059

Other tests were performed at:

Vkan Certification & Testing Institute

Address: No.3 Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, China 510663
Tel: 86-20-32293694



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5.4 Deviation from Standards

Radiated Emission test was performed in accordance with EN 55025 and not CISPR 25

5.5 Abnormalities from Standard Conditions

None

5.6 Monitoring of EUT for All Immunity Test

Visual: Motor running of the EUT,LCD display.

Audio: None.



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6 Equipment List

Electrostatic Discharge						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC2071	ESD Simulator	TESEQ AG	NSG 435	6739	2019-07-04	2019-07-03
EMC0804	ESD Ground Plane	SGS	3m x 3m	N/A	N/A	N/A
EMC0078	Temperature, & Humidity	Shanghai Meteorological Instrument factory Co., Ltd.	ZJ1-2B	201804001	2018-10-11	2019-10-10

Radiated Emission				
Instrument Name	Manufacturer	Type	SN	Calibration Until
EMI Test Receiver	R & S	ESCI	100875	2019-12-11
Biconical Antenna	Schwarzbeck	VHA 9103B BBA 9106	VHA 91032699	2020-05-07
Log-Periodic Antenna	Schwarzbeck	VULP 9118A	VULP 9118A-455	2020-04-27
Wide-Band Preamp1	Schwarzbeck	BBV9742	9742156	2020-06-13
Artificial Mains Network	Schwarzbeck	NNBM8124-200	00547	2020-07-18
Artificial Mains Network	Schwarzbeck	NNBM8124-200	00548	2020-07-18
Fully Anechoic Chamber	EMC Technology LTD	N/A	EMCT1702Q25	2020-01-24

Radiated Immunity				
Instrument Name	Manufacturer	Type	SN	Calibration Until
HF Signal Generator	Agilent	N5181A	MY49060320	2019-11-09
Function Signal Generator	Agilent	33250A	MY40022965	2019-11-09
Power Meter	Agilent	N1912A	MY45101976	2019-11-09
Artificial Mains Network	Schwarzbeck	NNBM8126D	8126D221	2020-05-07
Artificial Mains Network	Schwarzbeck	NNBM8126D	8126D223	2020-05-07
Power Amplifier	TESEQ	CBA 1G-1000	T43783	2019-09-09
Power Amplifier	MILMEGA	AS0104-400/200ST	1034230	2019-09-09
Directional Coupler	WERLATONE	C3908-727	87897	2019-10-25
Directional Coupler	ATM	CHP273E-30F-30R	K241104-01	2019-10-25
Horn Antenna	ETS-Lindgren	3106B	00102396	N/A
Horn Antenna	AR	AT4002A	0330766	N/A
Fully Anechoic Chamber	ETS	FACT-3	4633	2019-12-11

Bulk Current Injection (Substitution Method)



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Instrument Name	Manufacturer	Type	SN	Calibration Until
Signal Generator	TESEQ	NSG 4070-0	27008	2020-03-05
Power Amplifier	TESEQ	CBA 400M-100	T43825	2020-01-14
Directional Coupler	WERLATONE	C6934-10	87928	2020-06-13
Power Meter	TESEQ	NSG 4070-0	27008	2020-03-05
Current Injection Probe	FCC	F-140A-1	091062	2020-06-13
Artificial Mains Network	SCHWARZBECK	NNBM 8125 BCI	81251693	2020-07-18
Artificial Mains Network	SCHWARZBECK	NNBM 8125 BCI	81251694	2020-07-18
Calibrate Fixture	FCC	FCC-BCICF-2	091064	2020-06-13
Attenuator	BIRD	100-SA-MFN-30	0916	2020-06-13
Power Termination	BIRD	25-T-MN	0721	2020-07-18
Screened Room	ETS	CT000034-1049	/	2019-12-11



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7 Test Results

7.1 Radiated Emissions, 30 MHz to 1 GHz

Test Requirement:	EN 15194
Test Method:	EN 55025
Frequency Range:	30 MHz to 1 GHz
Measurement Distance:	1 meter
Limit:	C.1.2.5 for broadband emissions C.1.2.6 for narrowband emissions
Detector:	Peak for broadband emissions Average for narrowband emissions

7.1.1 E.U.T. Operation

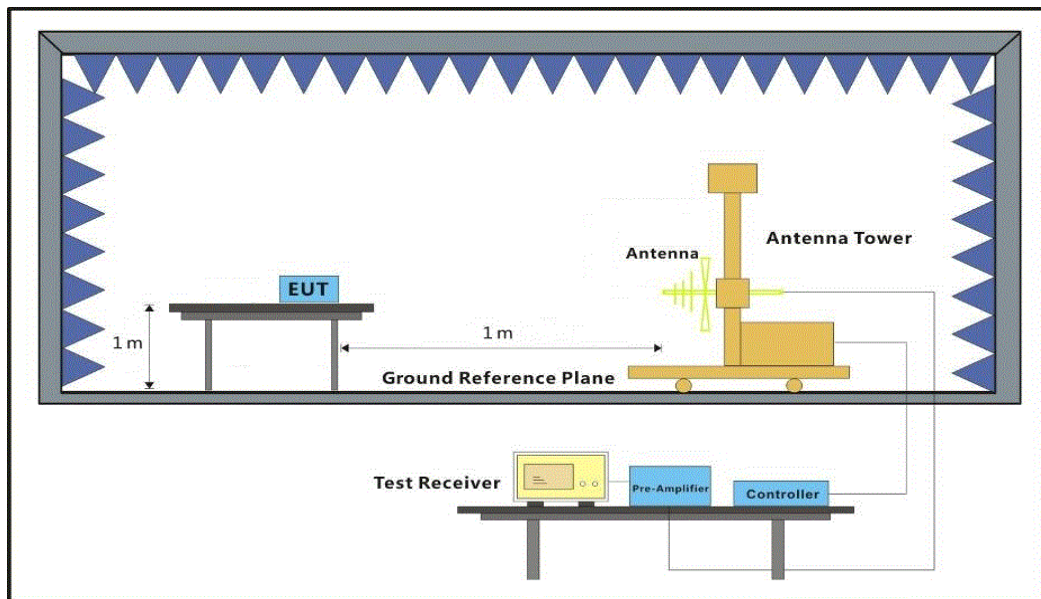
Operating Environment:

Temperature: 23.0°C Humidity: 52% RH Atmospheric Pressure: 1011 mbar

EUT Operation: a: Test the EUT in on mode, set the electrically power assisted cycles bicycle system continuous operating.

7.1.2 Test Setup

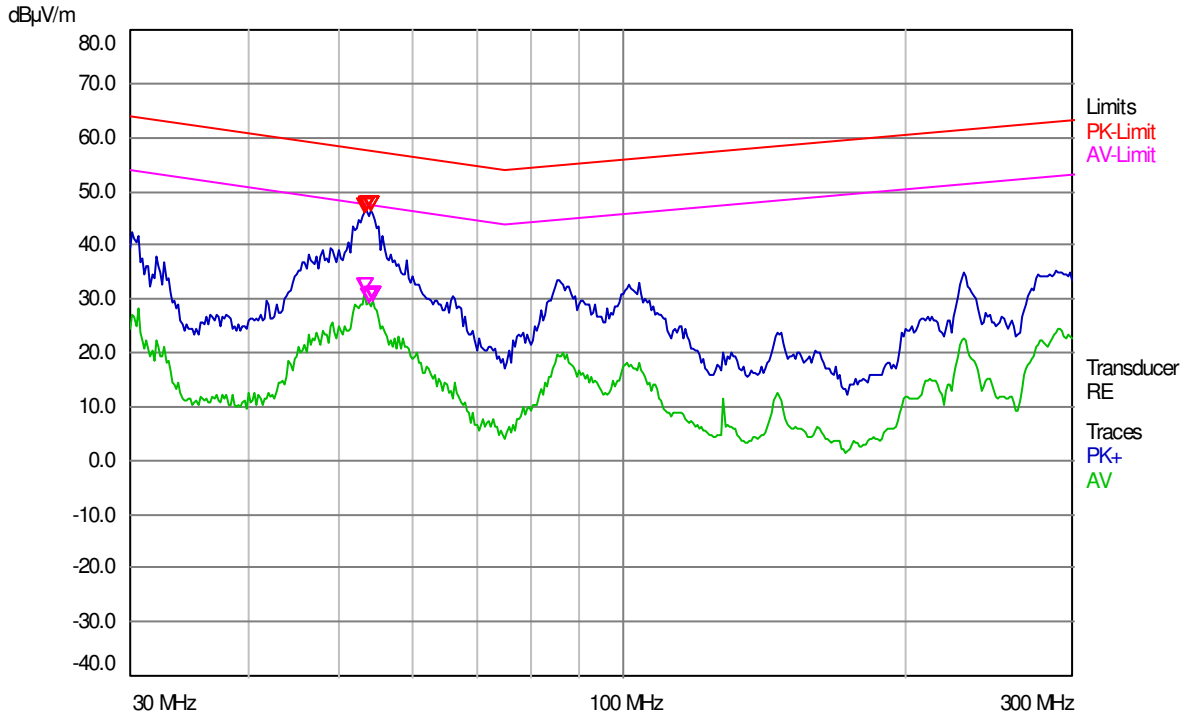
The EUT was insulated placed 50 mm above the ground plane, the ground plan was in a height of 1 m to the reference plane of semi-anechoic chamber and with electrical connection. No additional electric connection was made between the EUT and ground plane as the EUT will not be intended to be bonded to the bodywork of the vehicle. The EUT was powered by vehicle battery through 5 uH/50 ohm LISN.



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7.1.3 Measurement Data

Polarization:Horizontal
 30-300MHz_PK+AV_PH



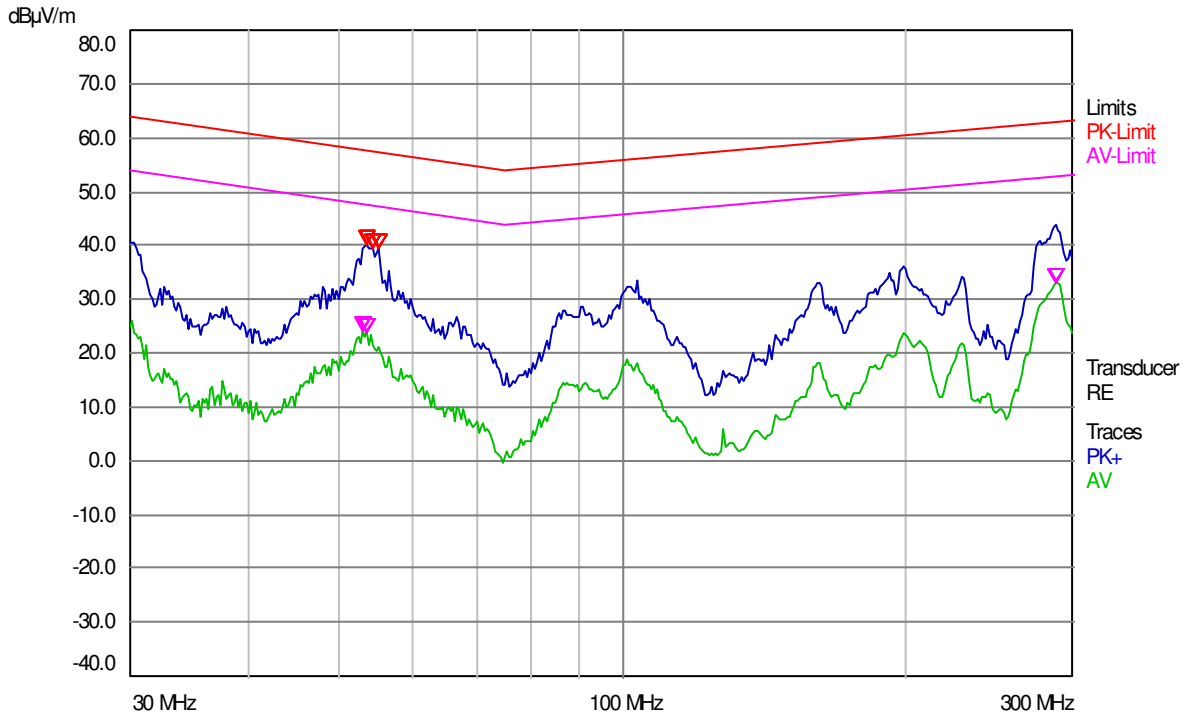
Peak Search Results

Trace	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)
1 PK+	53.1	46.08	57.77	-11.69
1 PK+	53.45	46.59	57.70	-11.11
1 PK+	54.1	46.33	57.56	-11.23
2 AV	53.1	31.12	47.77	-16.65
2 AV	53.75	29.23	47.64	-18.41
2 AV	54.15	29.81	47.55	-17.74



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Polarization:Vertical
 30-300MHz_PK+AV_PV



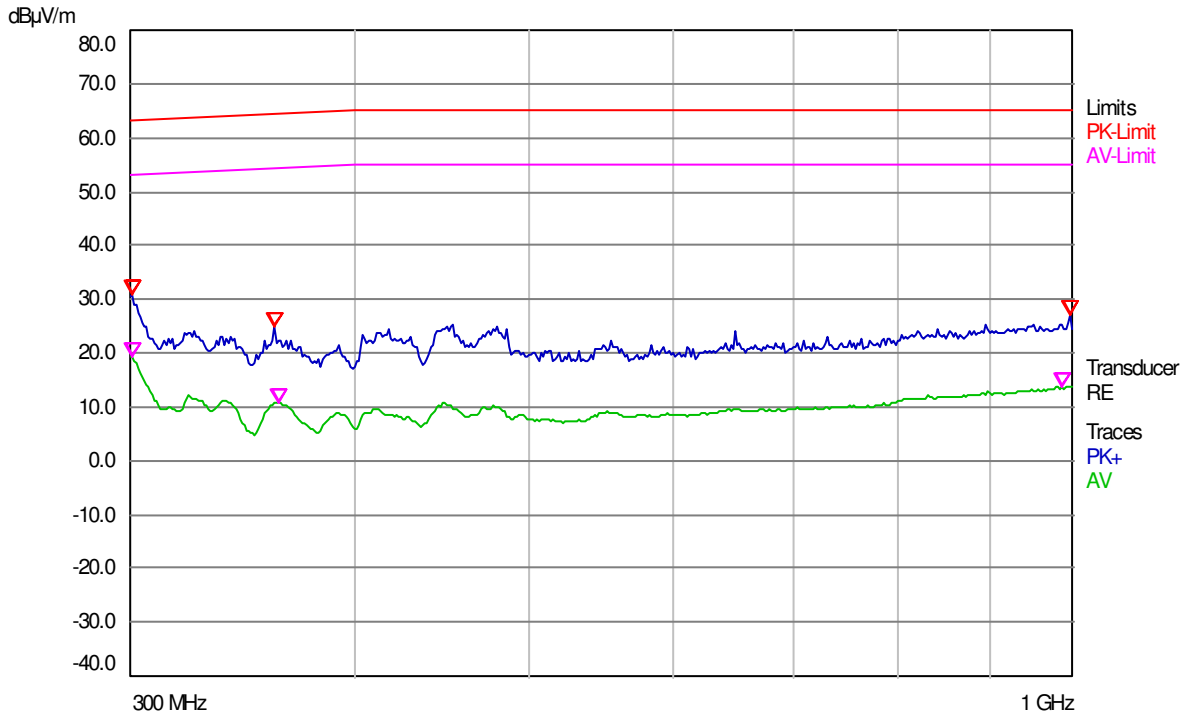
Peak Search Results

Trace	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)
1 PK+	53.35	40.08	57.72	-17.64
1 PK+	54.15	39.42	57.55	-18.13
1 PK+	54.95	39.22	57.39	-18.17
2 AV	52.9	24.26	47.81	-23.55
2 AV	53.55	23.72	47.68	-23.96
2 AV	289.0	33.11	52.86	-19.75



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Polarization:Horizontal
 #1_300-1000MHz_PK+AV_PH



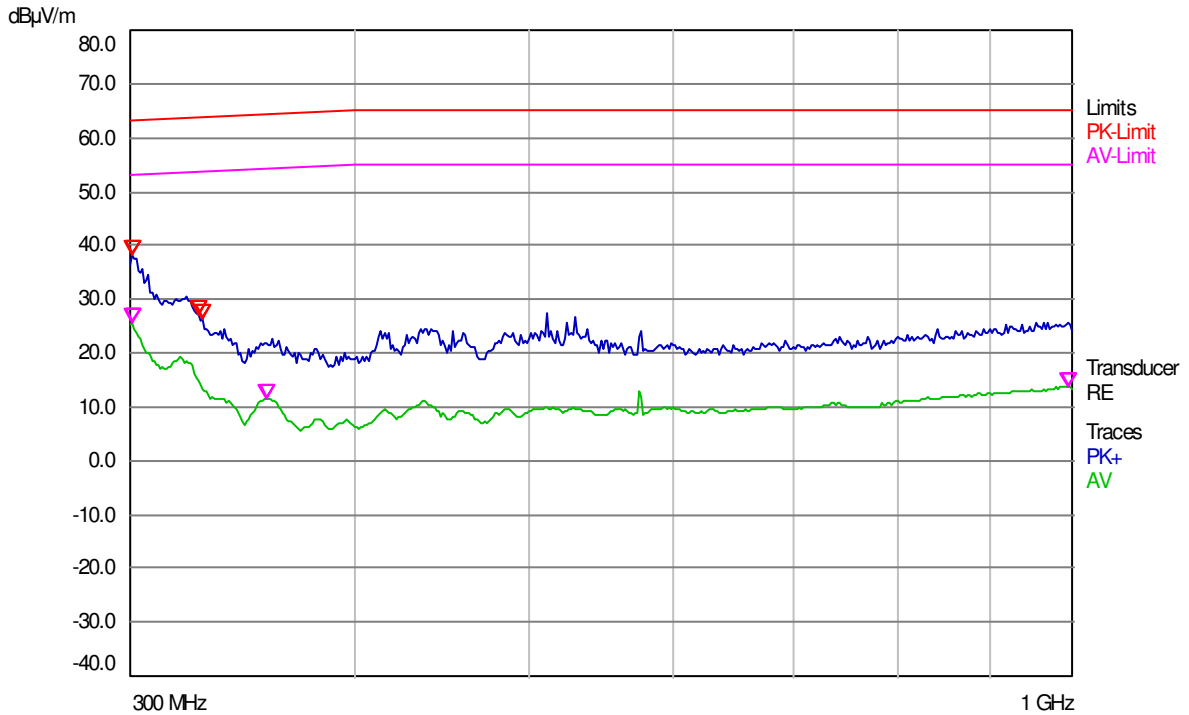
Peak Search Results

Trace	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)
1 PK+	300.9	30.76	63.13	-32.37
1 PK+	360.4	24.91	64.31	-39.40
1 PK+	996.5	27.17	65.00	-37.83
2 AV	300.5	19.25	53.12	-33.87
2 AV	362.9	10.86	54.36	-43.50
2 AV	987.4	13.71	55.00	-41.29



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Polarization:Vertical
 #1_300-1000MHz_PK+AV_PV



Peak Search Results

Trace	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)
1 PK+	300.65	38.20	63.12	-24.92
1 PK+	327.15	26.94	63.68	-36.74
1 PK+	329.25	26.35	63.72	-37.37
2 AV	300.65	25.44	53.12	-27.68
2 AV	356.7	11.48	54.25	-42.77
2 AV	994.65	13.78	55.00	-41.22



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8 Immunity Test Results

8.1 Performance Criteria Description in C.4.6.2 and C.8 of EN 15194

<p>C.7.5.3 for electromagnetic radiation:</p>
<p>A vehicle is deemed to fulfil the requisite immunity conditions if, during the tests carried out in the manner required by this clause:</p> <p>there are no abnormal changes in the speed of the vehicle's drive wheels,</p> <p>there are no signs of operational deterioration which might mislead other road users and</p> <p>there are no other noticeable phenomena which could result in a deterioration in the direct control of the vehicle.</p>
<p>C.8 for ESD test:</p>
<p>The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product. The recommended classification is as follows:</p> <p>A) normal performance within limits specified by the manufacturer, requestor or purchaser;</p> <p>B) temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention;</p> <p>C) temporary loss of function or degradation of performance, the correction of which requires operator intervention;</p> <p>D) loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.</p>



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8.2 ESA Immunity (BCI) 20MHz to 400MHz

Test Requirement: EN 15194
 Test Method: ISO11452-4
 Frequency Range: 20MHz to 400MHz
 Test level: 48mA
 Modulation: 80 %, 1kHz Amplitude Modulation

8.2.1 E.U.T. Operation

Operating Environment:

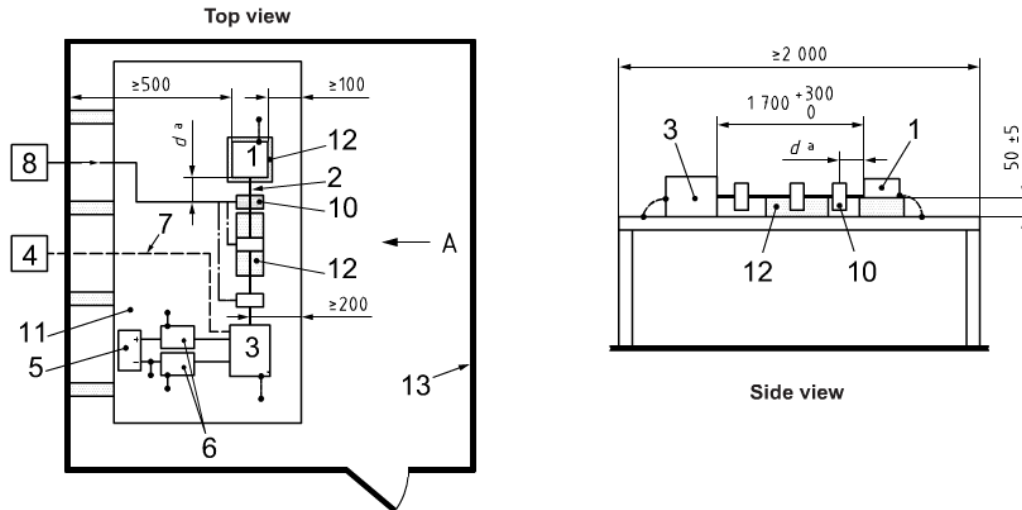
Temperature: 24.0 °C Humidity: 63 % RH Atmospheric Pressure: 1018 mbar

EUT Operation: a: Test the EUT in on mode, set the electrically power assisted cycles bicycle system continuous operating.

8.2.2 Test Setup

The EUT placed on a non-conductive, low relative permittivity at (50±5)mm above the ground plane.

The face of the EUT shall be located at least 100mm from the edge of the ground plane. At least 50mm between the EUT and any metal part such as the walls of the shielded enclosure, with the exception of the ground on which the EUT is placed. The test location of current probe shall be placed at 150mm, 450mm, 750mm.



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Key

- | | |
|---|--|
| 1 DUT (connected to ground if specified in the test plan) | 8 high-frequency equipment |
| 2 wiring harness (S) | 9 optional current measurement probe (not shown in this figure, but shown in Figure 2) |
| 3 load simulator (placement and ground connection according to 7.5) | 10 injection probe (represented at 3 positions) |
| 4 stimulation and monitoring system | 11 ground plane (connected to the shielded room) |
| 5 power supply | 12 low relative permittivity support ($\epsilon_r \leq 1,4$) |
| 6 AN | 13 shielded room |
| 7 optical fibres | |

8.2.3 Test Results:

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Observation (Performance Criterion)
20 MHz to 200 MHz	Signal cable and DC cable	48mA	80 %, 1 kHz Amp. Mod.	5%	2s	No Loss of Function (A)



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8.3 ESA Immunity (ALSE) 400MHz to 2GHz

Test Requirement: EN 15194
 Test Method: ISO 11452-2
 Frequency Range: 400MHz to 2GHz,
 Antenna Polarization: Horizontal & Vertical
 Severity: 24V/m

8.3.1 E.U.T. Operation

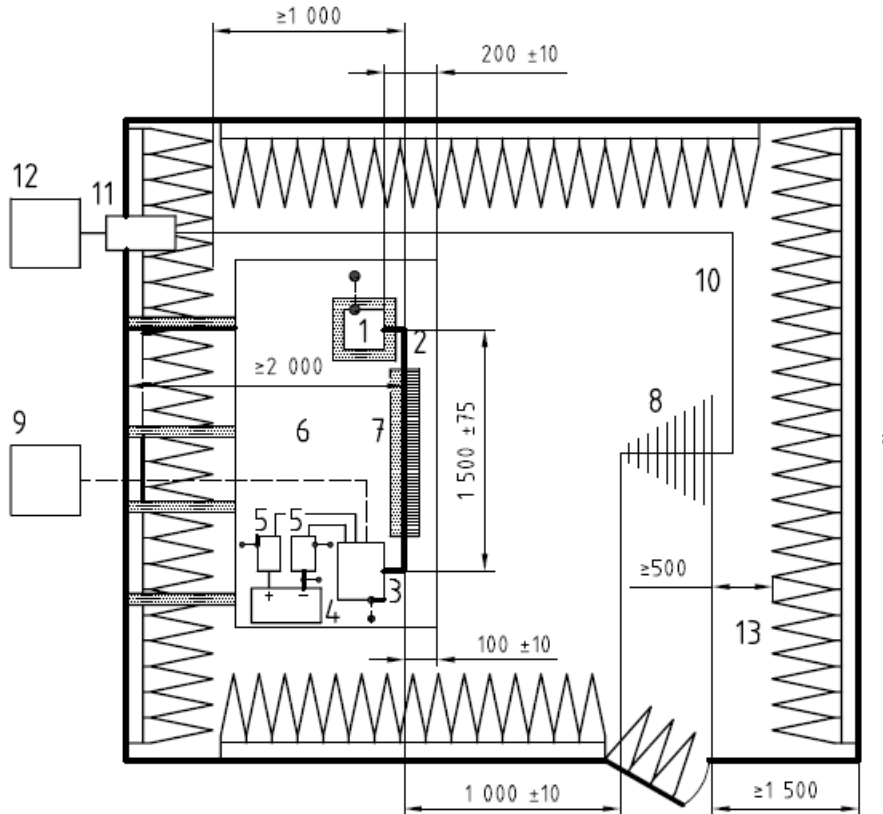
Operating Environment:

Temperature: 24.0 °C Humidity: 63% RH Atmospheric Pressure: 1012 mbar

EUT Operation: a: Test the EUT in on mode, set the electrically power assisted cycles bicycle system continuous operating.

b: Test the EUT in idle mode.

8.3.2 Test Setup



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- 1.The DUT shall be placed on a non-conductive, low relative permittivity (dielectric-constant) material ,at (50 ± 5) mm above the ground plane.
- 2.The case of the DUT shall not be grounded to the ground plane unless it is intended to simulate the actual vehicle configuration.
- 3.The face of the DUT shall be located at a distance of (200 ± 10) mm from the edge of the ground plane.
- 4.The height of the phase centre of the antenna shall be (100 ± 10) mm above the ground plane.
- 5.No part of any antenna radiating element shall be closer than 250 mm to the floor. The radiating elements of the antenna shall not be closer than 500 mm to any absorber material, and shall not be closer than 1 500 mm to the walls or ceiling of the shielded enclosure.
- 6.The phase centre of the antenna for frequencies from 80 MHz to 1 000 MHz shall be in line with the centre of the longitudinal part (1 500 mm length) of the wiring harness.
- 7.The phase centre of the antenna for frequencies above 1 000 MHz shall be in line with the DUT.

8.3.3 Test Results

Frequency	Level	Modulation	EUT Face	Result / Observations
400MHz-800MHz	24V/m	Unmodulated sine wave(CW) & 2% step size, 1KHz 80% AM modulation from 400MHz to 800MHz	0°V	A
			0°H	
			90°V	A
			90°H	
			180°V	A
			180°H	
			270°V	A
			270°H	
800MHz-2.0GHz	24V/m	t _{on} = 577 μs and period = 4 600 μs PM modulation & unmodulated sine wave(CW) from 800MHz to 2000MHz	0°V	A
			0°H	
			90°V	A
			90°H	
			180°V	A
			180°H	
			270°V	A
			270°H	



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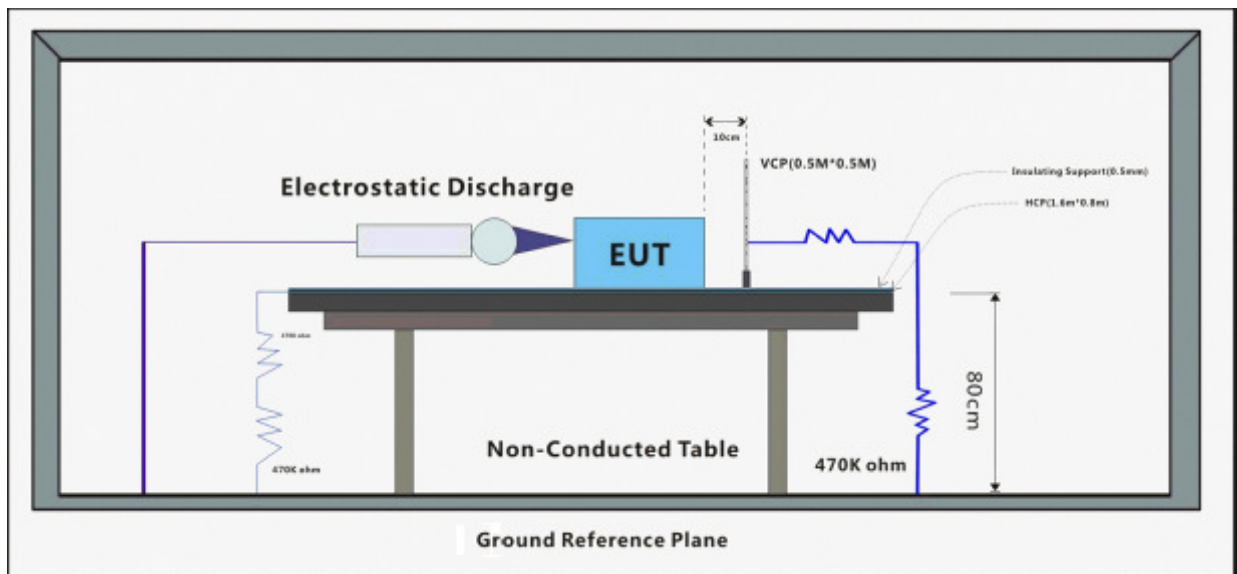
8.4 ESD

Test Requirement: EN 15194
 Test Method: EN 61000-4-2
 Criterion required: B
 Discharge Impedance: 330 Ω / 150 pF
 Discharge Voltage: Air Discharge: 2, 4, 8 kV
 Contact Discharge: 2, 4 kV
 VCP/HCP: 2, 4 kV
 Polarity: Positive & Negative
 Number of Discharge: Minimum 10 times at each test point
 Discharge Mode: Single Discharge
 Discharge Period: 1 second minimum

8.4.1 E.U.T. Operation

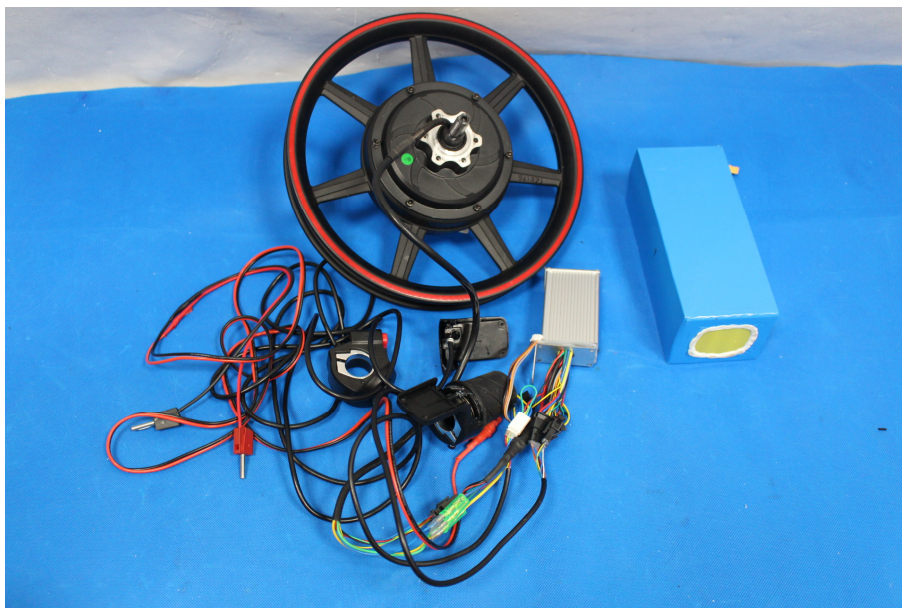
Operating Environment:
 Temperature: 21.0 °C Humidity: 46% RH Atmospheric Pressure: 1009 mbar
 EUT Operation: a: Test the EUT in on mode, set the electrically power assisted cycles bicycle system continuous operating.

8.4.2 Test Setup



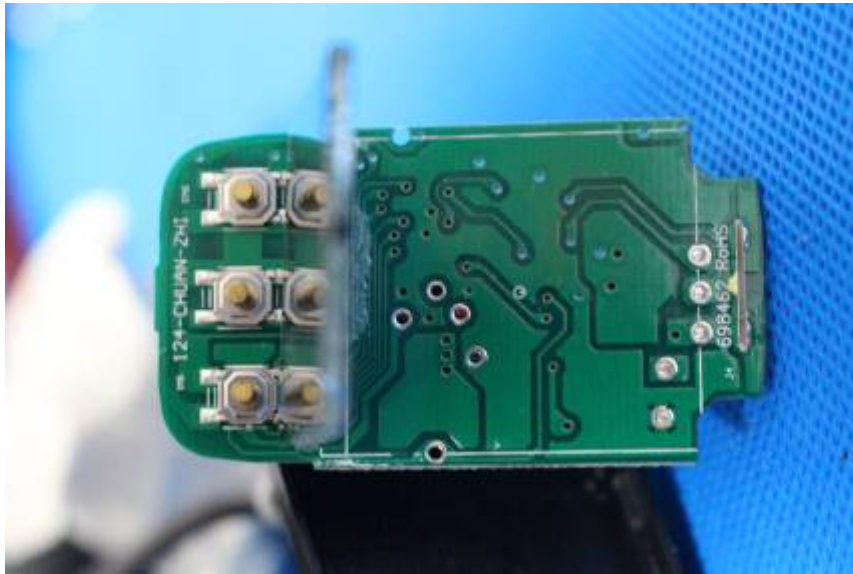
9 Photographs

9.1 EUT Constructional Details



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--End of Report--



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