

TEST REPORT

ISO 7176-21

Wheelchairs —. Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and scooters, and battery chargers.

Mojo Electric Scooter

Model.: Mojo-T100

Prepared For : Dongguan Smarfody Mobility Technology Co.,Ltd

Room 205,Building C,NO.29 Baohong Road,Houjie
Town,Dongguan City,China

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Report Number: B-E201233905

Date of Test: Dec.14-22,2020

Date of Report: Dec.23,2020

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APPENDIX II (EUT PHOTOS)

(9 pages)

TEST REPORT DECLARATION

Applicant : Dongguan Smarfody Mobility Technology Co.,Ltd
Address : Room 205,Building C,NO.29 Baohong Road,Houjie
Town,Dongguan City,China
Client No. : 07698368
Manufacturer : Same As Holder
EUT Description : Mojo Electric Scooter
Model No. : Mojo-T100
Remark : Use Mojo-T100 do all the tests.
Technical Data : Adapter: Input:100-240V~, 50/60Hz,1.5A
Output:DC29.4V, 2A,58.8W
Battery:24V,10AH

The device described above is tested by Beide (Shenzhen) Product Service Limited to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and EUT's performance criterion. The test results are contained in this test report. Beide (Shenzhen) Product Service Limited is assumed of full responsibility for the accuracy and completeness of these tests.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Beide (Shenzhen) Product Service Limited.

Date of Test : Dec.14-22,2020

Prepared by : Sophia jiang
(Sophia jiang)

Checked by : Austin.zhong
(Austin zhong)

Approved by : Martin wang
(Martin wang)



1. General Information

1.1. Report Information

1.1.1. This report is not a certificate of quality, it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BEIDE approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BEIDE in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by applicant, BEIDE therefore assumes no responsibility for the accuracy of information on the brand names, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the applicant at an additional fee. No third part can obtain a copy of this report through BEIDE, unless the applicant has authorized BEIDE in writing to do so.

1.2. Description of Device (EUT)

Description : Mojo Electric Scooter

Number Model : Mojo-T100

Applicant : Dongguan Smarfody Mobility Technology Co.,Ltd
Room 205,Building C,NO.29 Baohong Road,Houjie
Town,Dongguan City,China

Manufacturer : Dongguan Smarfody Mobility Technology Co.,Ltd
Room 205,Building C,NO.29 Baohong Road,Houjie
Town,Dongguan City,China

Wheelchair Drive: (7.1.2 Operation of ISO 7176-21)
Switch on the wheelchair. Set the control device for a drive wheel speed of 50 % \pm 10 % of the maximum speed in the forward direction. Additionally, set the control device such that the steering servo is at the straight ahead position (the steered wheel angle is at $0^{\circ} \pm 1^{\circ}$).

Off-board and carry-on battery chargers: (7.4 Off-board and carry-on battery chargers of ISO 7176-21)
Discharge the battery set of the charger test load (6.5) to the cut-off voltage specified by the battery manufacturer, within a tolerance of $+5^0\%$. Operate the battery charger in accordance with the charger manufacturer's instructions for use, but using the charger test load in place of the load specified by the manufacturer.

1.3. Description of Test modes

Standard	Test mode
CISPR 11 Conducted Emission	Charging mode
CISPR 11 Radiated Emission	Driving and Charging mode
IEC 61000-3-2 Harmonic current Emission	Charging mode
IEC 61000-3-3 Flicker	Charging mode
IEC 61000-4-2 ESD	Driving and Charging mode
IEC 61000-4-3 RS	Driving and Charging mode
IEC 61000-4-4 EFT	Charging mode
IEC 61000-4-5 Surge	Charging mode
IEC 61000-4-6 CS	Charging mode
IEC 61000-4-8 PFMF	Driving and Charging mode
IEC 61000-4-11 DIP	Charging mode

1.4. Product Information

Folded Size	510x497x690mm
Unfolded Size	1010x497x935mm
Safe Gradient	0~12°
Turning Radius	1.4 m
Max Capacity	125 kg
Max drive distance	15 km+
Max Speed	0~6 km/h
Motor	24V 120w
Lithium Battery	24V 4.9Ah x2
Driving system	Rear wheel drive
Tires	Honeycomb Tires

1.5. Test Uncertainty

Conducted Emission Uncertainty = ± 3.44 dB

Radiated Emission Uncertainty = ± 4.98 dB

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%.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

1.6. Test Conditions

Temperature: 22°C-28°C

Relative Humidity: 45%-68%

1.7. Performance criteria of immunity test

Functional requirement of wheelchair

- The automatic brakes shall not release.
- The electrically powered devices which are not used for driving (such servo-assisted leg supports and seating systems with stand-up functions) shall not move.
- For category A, B, C, D, E and F wheelchairs (wheelchairs with electronic speed control), the average wheel speed change, (ΔS_{avg}) calculated shall not exceed $\pm 20\%$.
- For category A and D wheelchairs (wheelchairs with electronic differential steering), the differential wheel speed change (ΔS_{diff}) shall not exceed $\pm 25\%$.
- For category B and E wheelchairs (wheelchairs with electronic servo steering), the maximum permissible change in steering servo position or steered wheel angle is that corresponding to a turning radius of 4 m.

Functional requirement of wheelchair with an on-board battery charger when charging. (5.3 of ISO 7176-21)

- The driven wheels shall not move.
- The automatic brakes shall not release.
- The electrically powered devices which are not used for driving (such servo-assisted leg supports and seating systems with stand-up functions) shall not move.
- The battery charger shall continue to operate in accordance with its specification without operator intervention.

Functional requirement of wheelchair with an off-board and carry-on battery charger when charging. (5.4 of ISO 7176-21)

- The battery charger shall continue to operate in accordance with its specification without operator intervention.

2. TEST INSTRUMENT USED

2.1. For Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Aglient	E4402B-ESA	US1192821	2020.07.15	1 Year
2.	EMI Test Receiver	ROHDE&SCHWARZ	ESPI	101206	2020.07.15	1 Year
3.	L.I.S.N.	SCHWARZBECK	NSLK8126	8126-224	2020.07.15	1 Year
4.	L.I.S.N.	EMCO	3825/2	11977C	2020.07.15	1 Year

2.2. For Radiation Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Rohde&schwarz	FSEA20	DE25181	2020.07.15	1 Year
2.	Positioning Controller	C&C	CC-C-1F	N/A	2020.07.15	1 Year
3.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-333	2020.07.15	1 Year
4.	Horn Antenna	Schwarzbeck	BBHX9120	9120-426	2020.07.15	1 Year
5.	RF Switch	EM	EMSW18	SW060023	2020.07.15	1 Year
6.	Amplifier	Agilent	8447F	3113A06717	2020.07.15	1 Year
7.	Coaxial Cable	Schwarzbeck	AK9513	9513-10	2020.07.15	1 Year
8.	EMI Test Receiver	Rohde&schwarz	ESPI	25498514	2020.07.15	1 Year

2.3. For Harmonic / Flicker Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Conditioning Unit	SCHAFFNER	CCN1000-1	23980/7	2020.07.15	1 Year
2.	Signal Phase Impedance Network	SCHAFFNER	INA2152	0929-2	2020.07.15	1 Year
3.	5KVA AC Power Source	SCHAFFNER	NSG1007	2983332	2020.07.15	1 Year

2.4. For Electrostatic Discharge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	Noiseken	ESS-200AX	0223	2020.07.15	1 Year

2.5.For Radio Frequency Electromagnetic Field

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	IFR	2032	203002/100	2020.07.15	1 Year
2.	Amplifier	A&R	150W1000	301584	2020.07.15	1 Year
3.	Dual Directional Coupler	A&R	DC6080	301508	2020.07.15	1 Year
4.	Power Head	A&R	PH2000	301193	2020.07.15	1 Year
5.	Power Meter	A&R	PM2002	302799	2020.07.15	1 Year
6.	Field Monitor	A&R	FM5004	300329	2020.07.15	1 Year
7.	Field Probe	A&R	FP5000	300221	2020.07.15	1 Year

2.6.For Electrical Fast Transient/Burst Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Ultra Compact Simulator	EM TEST	UCS500M6	0500-19	2020.07.15	1 Year

2.7.For Surge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Tester	HAEFELY	PSURGE4.1	080107-04	2020.07.15	1 Year

2.8.For Injected Currents Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	IFR	2032	203002/100	2020.07.15	1 Year
2.	Amplifier	A&R	150W1000	301584	2020.07.15	NCR

2.9.For magnetic field immunity test

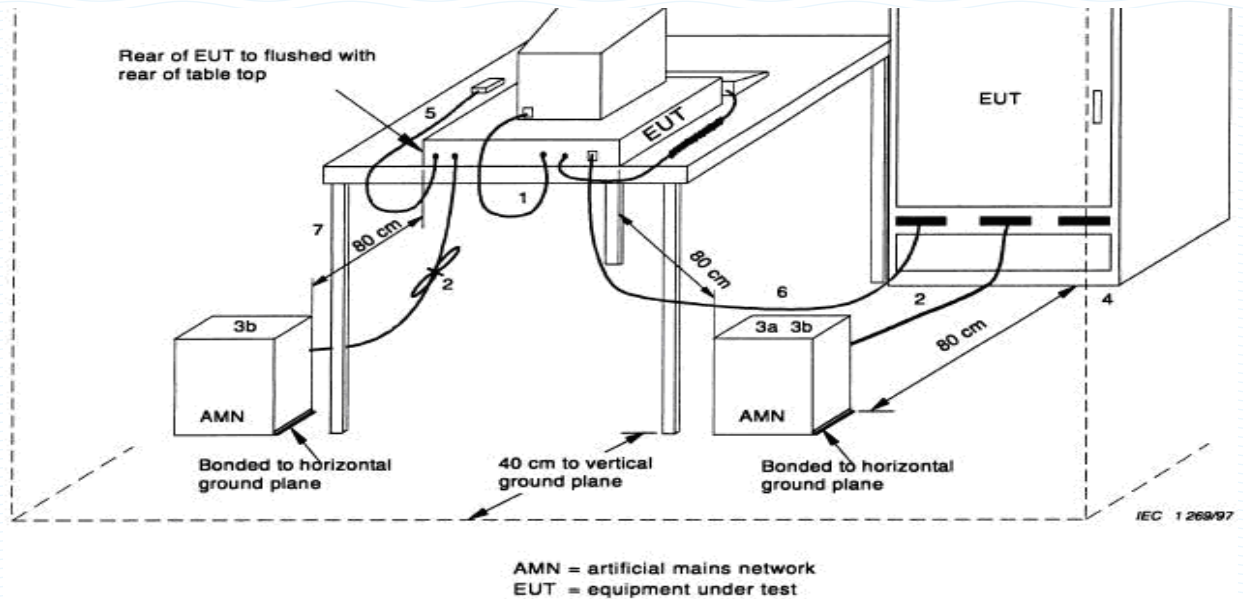
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Multifunctional Compact Immunity Test system	HEAFELY	CCS 600 No.: EE071	083732-18	2020.07.15	1 Year

2.10.For Voltage Dips and Interruptions Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Dips Tester	HEAFELY	PLINE 1610	083732-18	2020.07.15	1 Year

3. Power Line Conducted Emission Test (Eut Battery Charger)

3.1. Block Diagram of Test Setup



3.2. Power Line Conducted Emission Limit

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	56 ~ 66*	46 ~ 56*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

- Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.3. EUT Configuration on Test

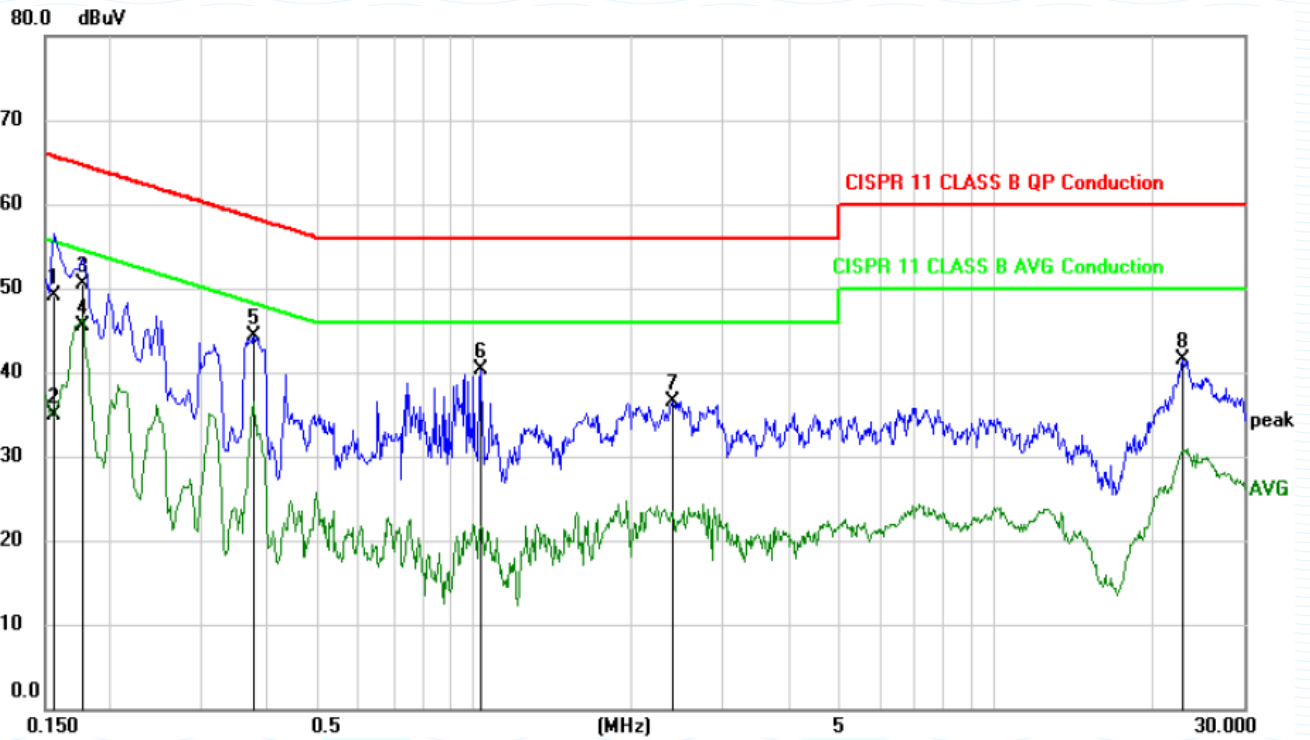
Tested in accordance with 9.1.2 of ISO 7176-21, the battery charger shall meet the mains terminal disturbance limits specified in CISPR 11 for group 1, class B equipment. Support the charger test load as specified in CISPR 11 for floor-standing equipment. Perform the mains terminal disturbance test specified in CISPR 11 equipment. On the battery charger as table-top. The bandwidth of the test receiver (R&S Test Receiver ESPI) is set at 10kHz.

The frequency range from 150 kHz to 30 MHz is investigated. The scanning waveform are attached within Appendix I.

3.4. Power Line Conducted Emission Test Results

The test result is in conformance with the requirement

Job No.:		Polarization:	Neutral
Standard:	EN55011	Power Source:	AC 230V~
Test item:	Conduct Test	Temp.(°C)/Hum.(%RH):	24°C/53%RH
EUT:	Mojo Electric Scooter	Date:	2020/12/21
Model:	Mojo-T100	Distance:	
Note:	For charger		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1560	39.16	9.94	49.10	65.67	-16.57	QP	
2		0.1560	24.94	9.94	34.88	55.67	-20.79	AVG	
3		0.1770	40.61	9.93	50.54	64.63	-14.09	QP	
4	*	0.1770	35.49	9.93	45.42	54.63	-9.21	AVG	
5		0.3780	34.32	9.94	44.26	58.32	-14.06	peak	
6		1.0320	30.45	9.92	40.37	56.00	-15.63	peak	
7		2.3970	26.70	9.90	36.60	56.00	-19.40	peak	
8		22.8420	31.05	10.45	41.50	60.00	-18.50	peak	

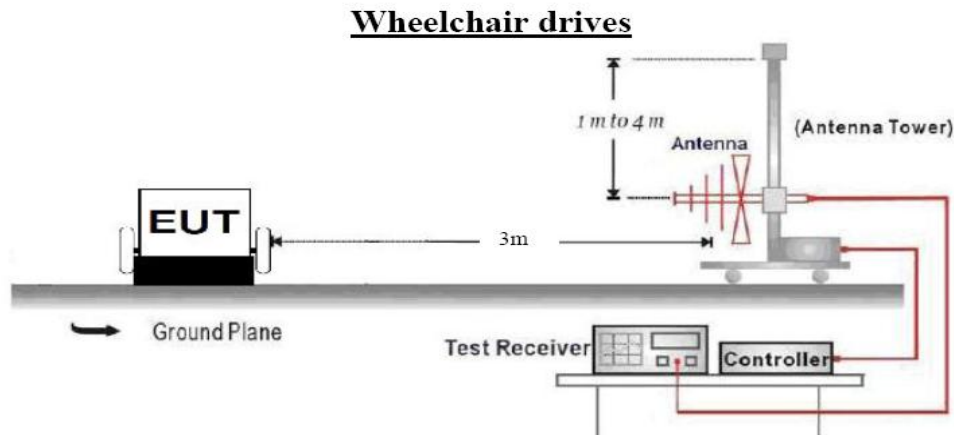
Job No.:		Polarization:	Line
Standard:	EN55011	Power Source:	AC 230V~
Test item:	Conduct Test	Temp.(°C)/Hum.(%RH):	24°C/53%RH
EUT:	Mojo Electric Scooter	Date:	2020/12/21
Model:	Mojo-T100	Distance:	
Note:	For charger		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1590	40.26	9.94	50.20	65.52	-15.32	QP	
2		0.1590	26.28	9.94	36.22	55.52	-19.30	AVG	
3		0.1770	41.84	9.93	51.77	64.63	-12.86	QP	
4	*	0.1770	36.30	9.93	46.23	54.63	-8.40	AVG	
5		0.3780	37.20	9.94	47.14	58.32	-11.18	peak	
6		1.9770	28.37	9.88	38.25	56.00	-17.75	peak	
7		4.0830	28.77	9.97	38.74	56.00	-17.26	peak	
8		22.3950	28.21	10.45	38.66	60.00	-21.34	peak	

4. Radiation Emission Test (Eut Battery Charger And Wheelchair)

4.1. Block Diagram of Test Setup



4.2. Radiation Emission Limit

All emanations from a Class B computing devices or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMITS (dB μ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

- Notes: 1. The tighter limit shall apply at the edge between two frequency bands.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

4.3. Description of the test

Tested in accordance with 9.2.1 of ISO 7176-21. The wheelchair shall meet the radiated emissions limits specified in CISPR 11 for group 1, class B equipment.

Perform the radiated emissions test specified in CISPR 11 on the battery charger as table-top equipment.

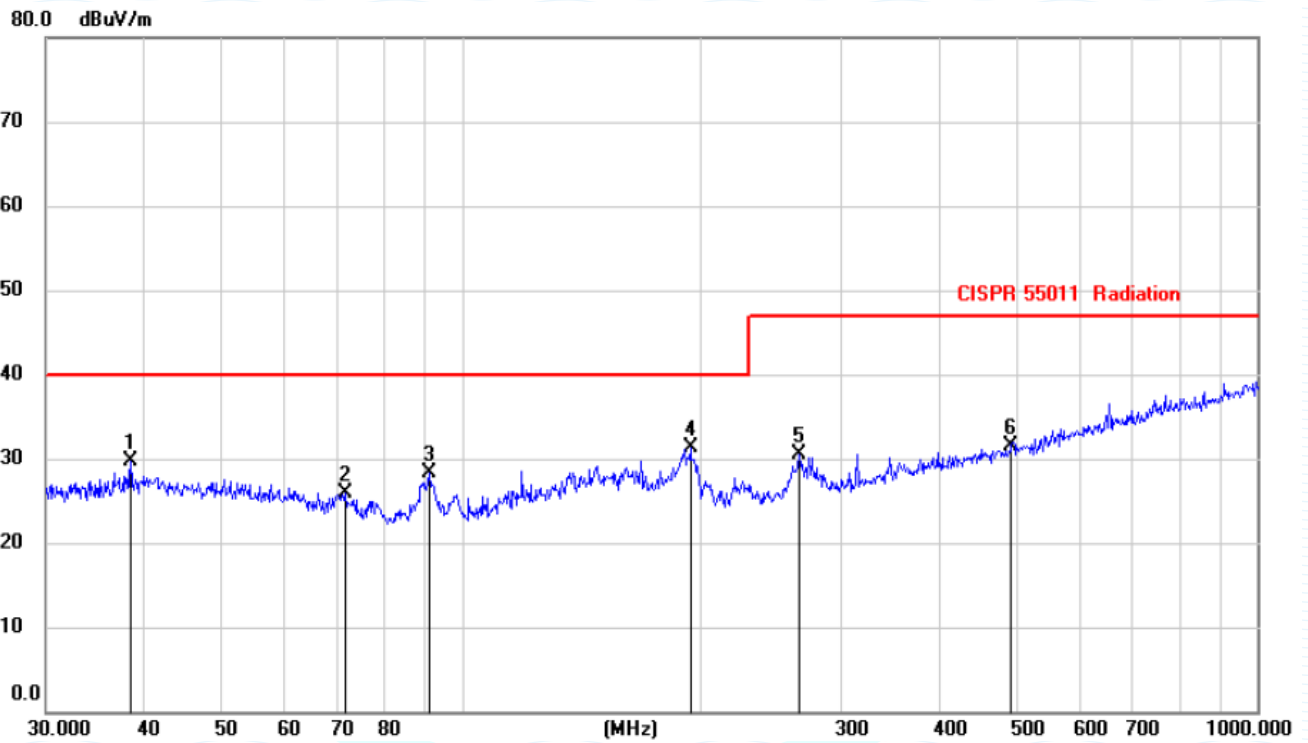
The EUT is placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna (calibrated by dipole antenna) are used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

4.4. Radiation Emission Test Results

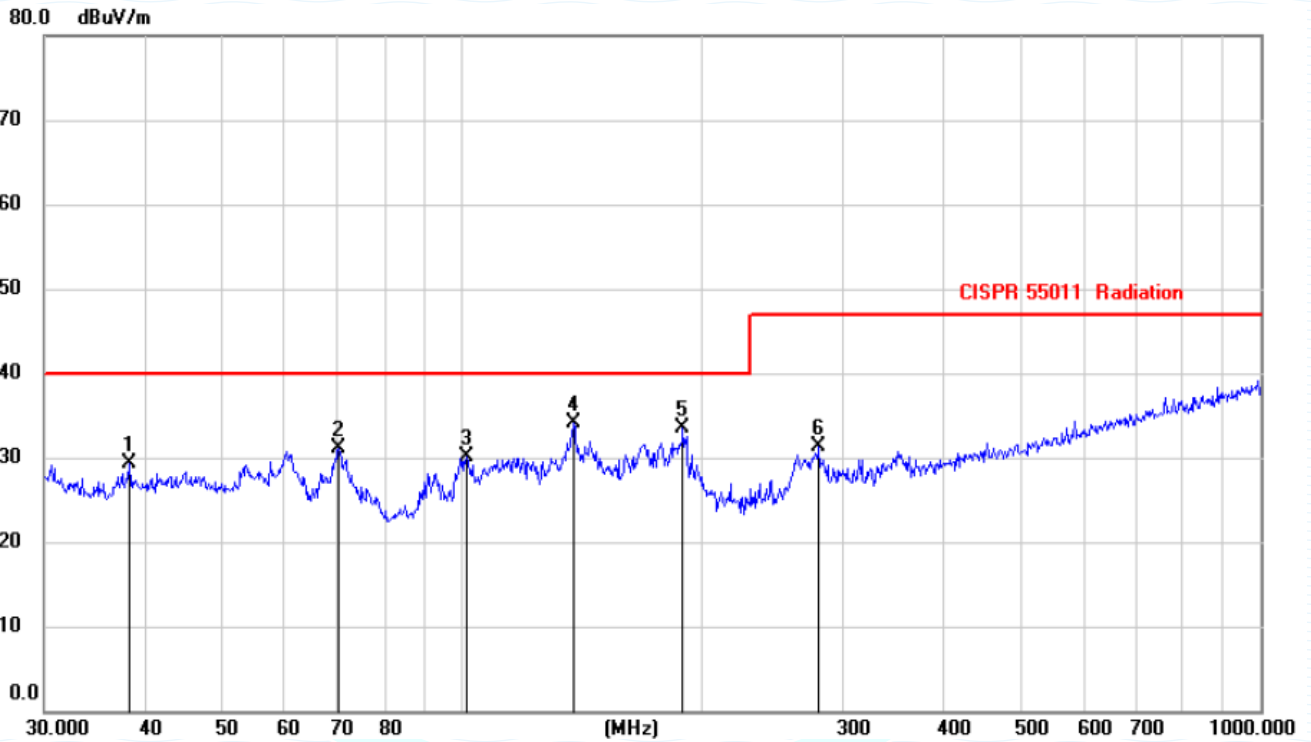
The test result is in conformance with the requirement.

Job No.:		Polarization:	Horizontal
Standard:	EN55011	Power Source:	AC 230V~
Test item:	Radiation Test	Date:	2020/12/21
Temp.(°C)/Hum.(%RH):	24°C/53%RH		
EUT:	Mojo Electric Scooter		
Model:	Mojo-T100	Distance:	3m
Note:	For charger		



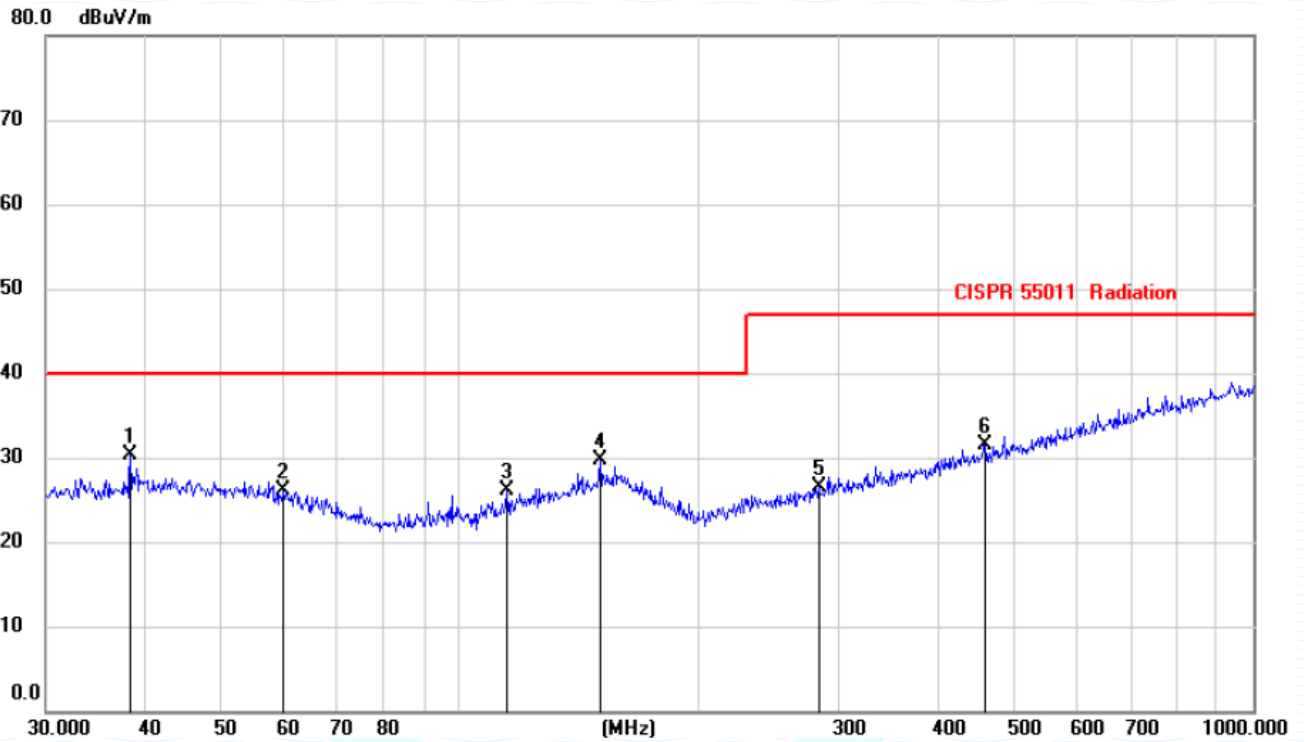
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree	Detector	Comment
1		38.3799	15.36	14.26	29.62	40.00	-10.38			peak	
2		71.4552	14.75	11.07	25.82	40.00	-14.18			peak	
3		91.2146	18.10	10.21	28.31	40.00	-11.69			peak	
4	*	194.1979	20.02	11.19	31.21	40.00	-8.79			peak	
5		266.1419	17.42	13.13	30.55	47.00	-16.45			peak	
6		492.2527	13.41	18.08	31.49	47.00	-15.51			peak	

Job No.:		Polarization:	Vertical
Standard:	EN55011	Power Source:	AC 230V~
Test item:	Radiation Test	Date:	2020/12/21
Temp.(°C)/Hum.(%RH):	24°C/53%RH		
EUT:	Mojo Electric Scooter		
Model:	Mojo-T100	Distance:	3m
Note:	For charger		



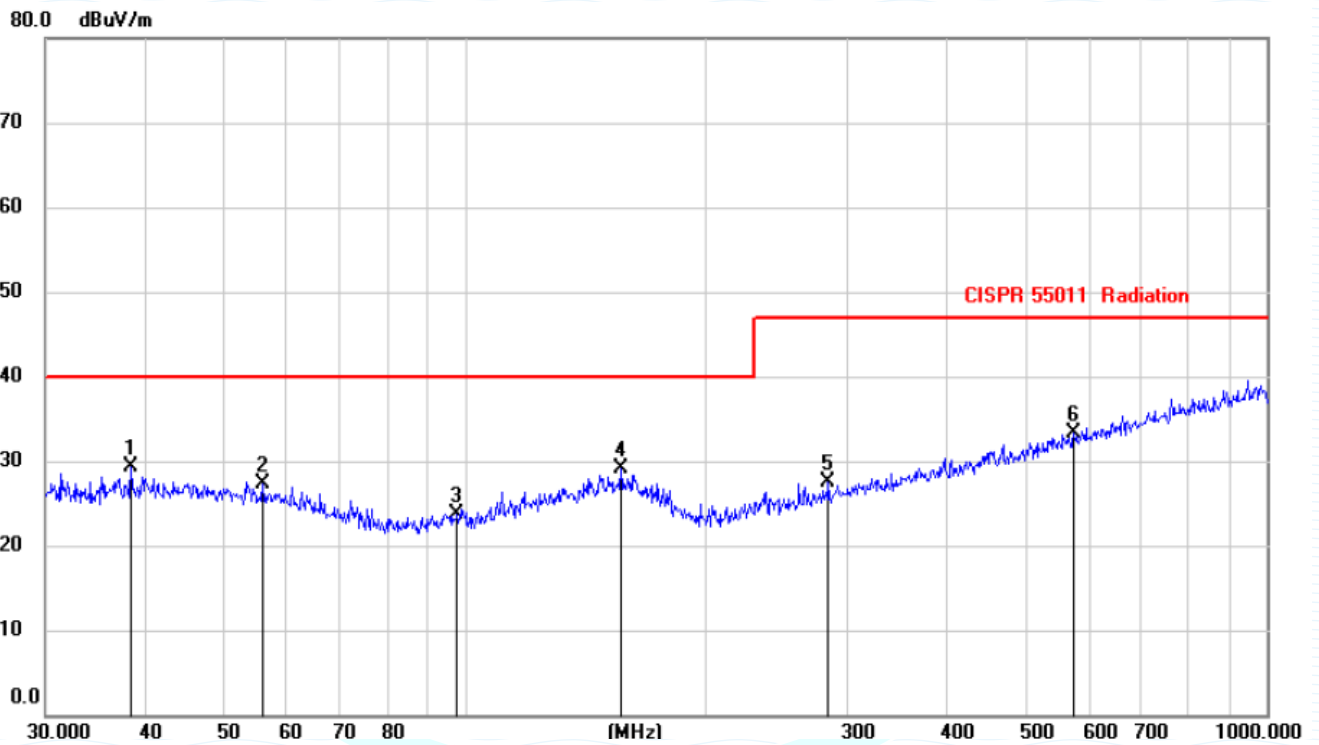
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		38.4135	15.01	14.27	29.28	40.00	-10.72	peak		
2		70.3057	19.78	11.28	31.06	40.00	-8.94	peak		
3		101.3773	19.15	10.95	30.10	40.00	-9.90	peak		
4	*	138.1449	19.92	14.17	34.09	40.00	-5.91	peak		
5		189.3231	21.97	11.50	33.47	40.00	-6.53	peak		
6		280.1466	17.70	13.57	31.27	47.00	-15.73	peak		

Job No.:		Polarization:	Horizontal
Standard:	EN55011	Power Source:	DC48V
Test item:	Radiation Test	Date:	2020/12/21
Temp.(°C)/Hum.(%RH):	24°C/53%RH		
EUT:	Mojo Electric Scooter		
Model:	Mojo-T100	Distance:	3m
Note:	Working		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree	Detector	Comment
1	*	38.4135	16.12	14.27	30.39	40.00	-9.61			peak	
2		59.8851	12.93	13.25	26.18	40.00	-13.82			peak	
3		114.6151	13.73	12.36	26.09	40.00	-13.91			peak	
4		150.1424	14.63	14.99	29.62	40.00	-10.38			peak	
5		283.2333	12.86	13.64	26.50	47.00	-20.50			peak	
6		458.3102	13.91	17.63	31.54	47.00	-15.46			peak	

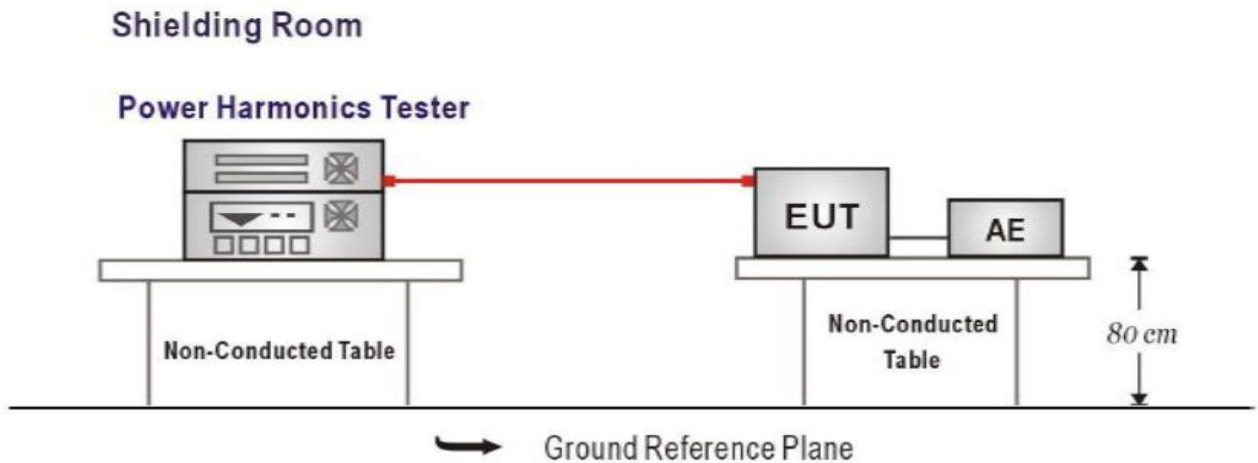
Job No.:		Polarization:	Vertical
Standard:	EN55011	Power Source:	DC48V
Test item:	Radiation Test	Date:	2020/12/21
Temp.(°C)/Hum.(%RH):	24°C/53%RH		
EUT:	Mojo Electric Scooter		
Model:	Mojo-T100	Distance:	3m
Note:	Working		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	38.4135	15.03	14.27	29.30	40.00	-10.70	peak		
2		56.0744	13.76	13.54	27.30	40.00	-12.70	peak		
3		98.1419	13.05	10.69	23.74	40.00	-16.26	peak		
4		156.9386	14.15	15.00	29.15	40.00	-10.85	peak		
5		284.7270	13.84	13.68	27.52	47.00	-19.48	peak		
6		575.8866	13.53	19.70	33.23	47.00	-13.77	peak		

5. Harmonic Current Emission Test (Eut Battery Charger)

5.1. Block Diagram of Test Setup



5.2. Test Standard

Basic Standard	Harmonic order n	Maximum permissible harmonic current A
IEC 61000-3-2	Odd harmonic	
	3	2.30
	5	1.14
	7	0.77
	9	0.40
	11	0.33
	13	0.21
	$15 \leq n \leq 39$	$0.15 \times 15/n$
	Even harmonic	
	2	1.08
4	0.43	
6	0.30	
$8 \leq n \leq 40$	$0.23 \times 8/n$	

5.3. Description of the test

1. Tested in accordance with 9.3.2 of ISO 7176-21, the battery charger shall meet the requirements of IEC 61000-3-2.
2. Fully charge the battery set of the charger test load and then discharge the battery set at its 5 h rate, $15 \pm 5\%$, for (60 ± 5) min.
Perform the harmonic current emissions test on the battery charger as specified in IEC 61000-3-2.

5.4. Test Results

The test result is in conformance with the requirement.

Power Analyzer: Voltech PM6000 SN: 200006700495 Firmware version: v1.22.07RC6

Channel(s):

1. SN: 090015501951, 28 Adjusted Date: 16 APR 2013. 2. SN:None Adjusted Date:None

3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None

5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None

Shunt(s):

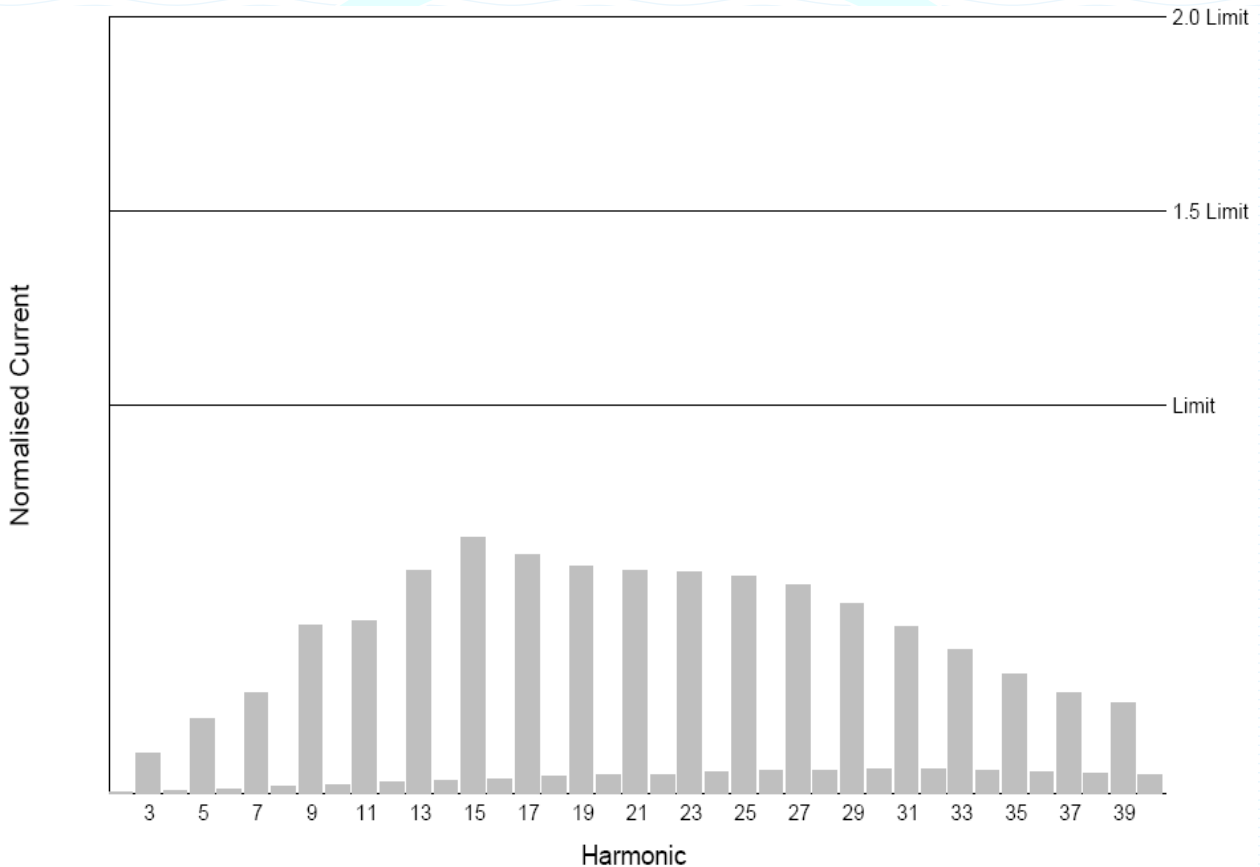
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3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None

5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None

AC Source: Mains / Manual Source

Class	Class A
Class Multiplier	1



Power Analyzer: Voltech PM6000 SN: 200006700495 Firmware version: v1.22.07RC6
Channel(s):

1. SN: 090015501951, 28 Adjusted Date: 16 APR 2013. 2. SN:None Adjusted Date:None

3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None

5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None

Shunt(s):

1. SN: 091024301771, 4 Adjusted Date: 16 APR 2013. 2. SN:None Adjusted Date:None

3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None

5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None

AC Source: Mains / Manual Source

Class	Class A
Class Multiplier	1

Harm	Limit 1	Limit 2	Average Reading	<L1 <L2	Max Reading	<L2	Pass FAIL	Harm	Limit 1	Limit 2	Average Reading	<L1 <L2	Max Reading	<L2	Pass FAIL
2	1.0800A	1.6200A	2.078mA	N/A	2.892mA	N/A	N/A	3	2.3000A	3.4500A	226.4mA	✓ ✓	236.3mA	✓	Pass
4	430.0mA	645.0mA	2.492mA	N/A	3.013mA	N/A	N/A	5	1.1400A	1.7100A	212.1mA	✓ ✓	220.6mA	✓	Pass
6	300.0mA	450.0mA	2.941mA	N/A	3.389mA	N/A	N/A	7	770.0mA	1.1550A	192.4mA	✓ ✓	199.2mA	✓	Pass
8	230.0mA	345.0mA	3.321mA	N/A	3.874mA	N/A	N/A	9	400.0mA	600.0mA	168.9mA	✓ ✓	173.7mA	✓	Pass
10	184.0mA	276.0mA	3.591mA	N/A	4.211mA	N/A	N/A	11	330.0mA	495.0mA	143.9mA	✓ ✓	146.7mA	✓	Pass
12	153.3mA	230.0mA	3.753mA	N/A	4.414mA	N/A	N/A	13	210.0mA	315.0mA	119.6mA	✓ ✓	120.8mA	✓	Pass
14	131.4mA	197.1mA	3.805mA	N/A	4.461mA	N/A	N/A	15	150.0mA	225.0mA	98.18mA	✓ ✓	98.58mA	✓	Pass
16	115.0mA	172.5mA	3.818mA	N/A	4.451mA	N/A	N/A	17	132.3mA	198.5mA	81.02mA	✓ ✓	81.53mA	✓	Pass
18	102.2mA	153.3mA	3.817mA	N/A	4.394mA	N/A	N/A	19	118.4mA	177.6mA	68.87mA	✓ ✓	69.33mA	✓	Pass
20	92.00mA	138.0mA	3.774mA	N/A	4.292mA	N/A	N/A	21	107.1mA	160.7mA	60.82mA	✓ ✓	61.39mA	✓	Pass
22	83.63mA	125.4mA	3.754mA	N/A	4.183mA	N/A	N/A	23	97.82mA	146.7mA	54.92mA	✓ ✓	55.70mA	✓	Pass
24	76.66mA	115.0mA	3.680mA	N/A	4.160mA	N/A	N/A	25	90.00mA	135.0mA	49.56mA	✓ ✓	50.32mA	✓	Pass
26	70.76mA	106.1mA	3.573mA	N/A	4.117mA	N/A	N/A	27	83.33mA	125.0mA	43.94mA	✓ ✓	44.57mA	✓	Pass
28	65.71mA	98.57mA	3.438mA	N/A	4.003mA	N/A	N/A	29	77.58mA	116.3mA	37.52mA	✓ ✓	37.89mA	✓	Pass
30	61.33mA	92.00mA	3.219mA	N/A	3.776mA	N/A	N/A	31	72.58mA	108.8mA	30.93mA	✓ ✓	31.28mA	✓	Pass
32	57.50mA	86.25mA	2.964mA	N/A	3.533mA	N/A	N/A	33	68.18mA	102.2mA	24.82mA	✓ ✓	25.21mA	✓	Pass
34	54.11mA	81.17mA	2.667mA	N/A	3.217mA	N/A	N/A	35	64.28mA	96.42mA	19.49mA	✓ ✓	19.75mA	✓	Pass
36	51.11mA	76.66mA	2.341mA	N/A	2.864mA	N/A	N/A	37	60.81mA	91.21mA	15.35mA	✓ ✓	15.68mA	✓	Pass
38	48.42mA	72.63mA	2.059mA	N/A	2.534mA	N/A	N/A	39	57.69mA	86.53mA	12.79mA	✓ ✓	13.47mA	✓	Pass
40	46.00mA	69.00mA	1.766mA	N/A	2.165mA	N/A	N/A								

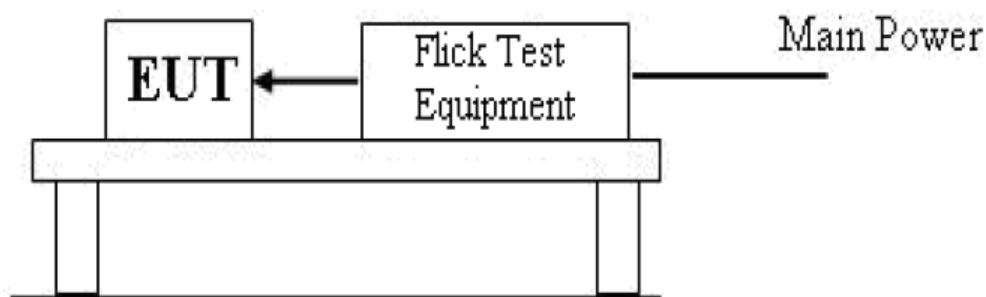
<L1 : Reading is below limit 1.

<L2 : Reading is below limit 2.

N/A : Harmonic current below 0.6% of rated current or 5mA, whichever is greater, are disregarded.

6. Voltage Fluctuations & Flicker Test (Eut Battery Charger)

6.1. Block Diagram of Test Setup



6.2. Test Standard

Basic Standard	Test Item	Limit	Note
IEC 61000-3-3	P_{ST}	1.0	P_{ST} means short-term flicker
	P_{IT}	0.65	P_{IT} means long-term flicker
	$d(t)$	500ms	$d(t)$ means maximum time exceed 3.3%
	$d_C(\%)$	3.3%	$d_C(\%)$ means relative steady state voltage change
	$d_{max}(\%)$	4%	$d_{max}(\%)$ mean maximum relative voltage change

6.3. Description of the test

1. Tested in accordance with 9.4.2, the battery charger shall meet the requirements of IEC 61000-3-3.
2. Perform the voltage fluctuations and flicker test on the battery charger as specified in IEC 61000-3-3.

6.4. Test Results

The test result is in conformance with the requirement.

Power Analyzer: Voltech PM6000 SN: 200006700495 Firmware Version: v1.22.07RC6

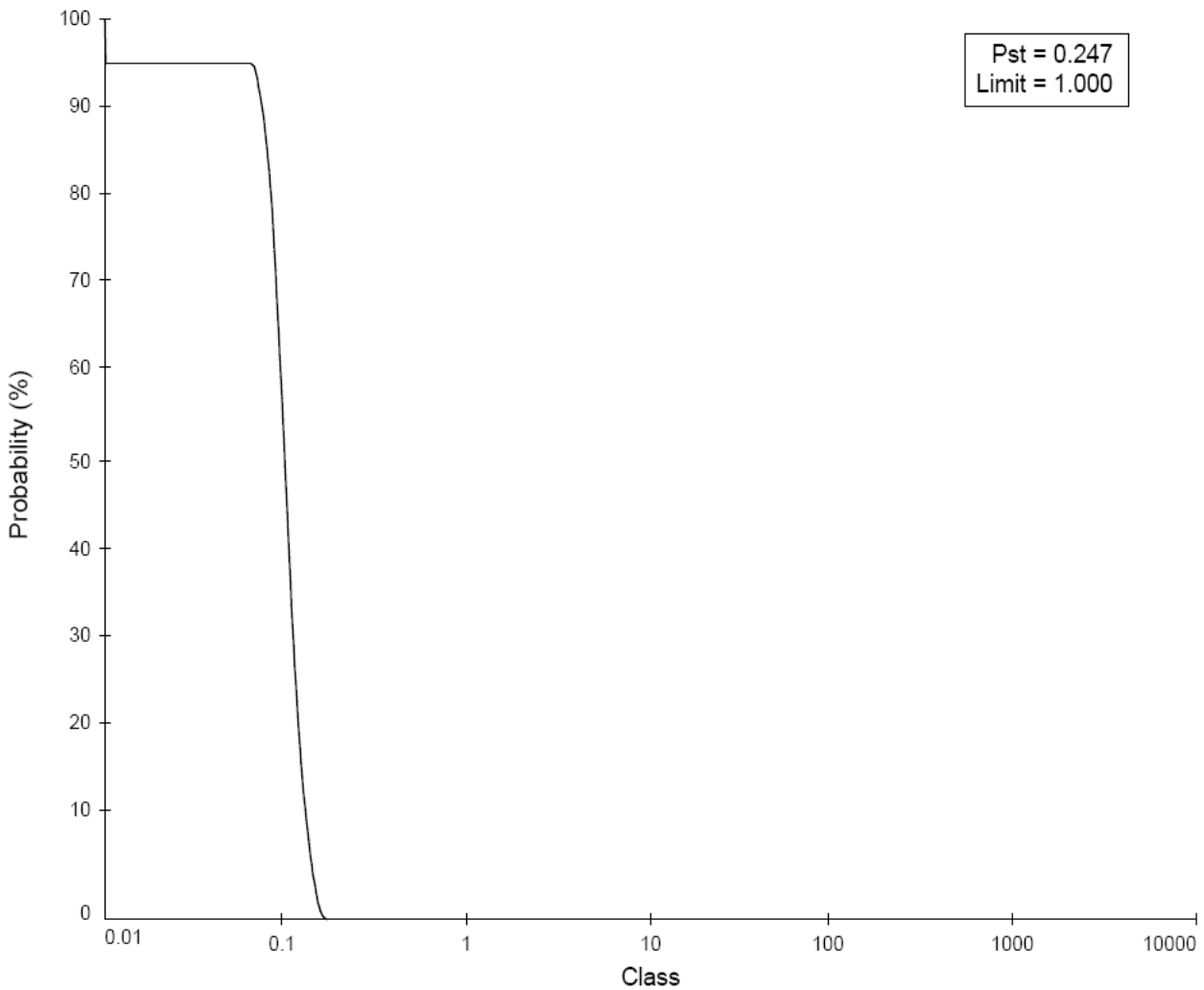
Channel(s):

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- 3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None
- 5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None

Shunt(s):

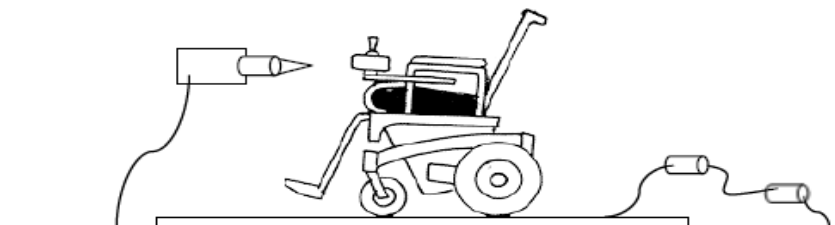
- 1. SN: 091024301771, 4 Adjusted Date: 16 APR 2013. 2. SN:None Adjusted Date:None
- 3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None
- 5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None

AC Source: Mains / Manual Source



7. Electrostatic Discharge Test (Eut Wheelchair)

7.1. Block Diagram of Test Setup



7.2. Test specification

Basic Standard	Test Item	Test Port	Test Specification
IEC 61000-4-2	Test Specification	Human Body Mode	±6KV Contact ,VCP ±8KV Air Discharge
IEC 61000-4-2		Charged Frame	±8KV Charge Voltage

7.3. Description of the test

1. Tested in accordance with 10.1.1 of ISO 7176-21.
2. Human body model

Test the wheelchair as specified in IEC 61000-4-2 for floor-standing equipment, with exceptions as follows: perform indirect discharge testing only using the vertical coupling plane (VCP); do not use the horizontal coupling plane. Place the support system on the ground plane.

3. Charged frame

Use a ground reference plane as specified in IEC 61000-4-2 for testing floor-standing equipment. Prepare the wheelchair. Place the support system on the ground plane. Connect one end of the discharge ground strap and the discharge return cable of the ESD generator ground strap to the ground plane with low impedance bonds. Establish one test point at each location around the perimeter of the wheelchair that may come into contact with grounded metal structures during normal operation. Set up the test generator for air discharges.

Place the discharge tip of the ESD generator in direct electrical contact with that part of the wheelchair frame that is closest to the test point. Charge the frame to the test level using the ESD generator. Keeping the tip of the ESD generator in place, make a discharge by moving the discharge strap to the test point as quickly as practicable.

Make ten discharges of each polarity (positive and negative) to each test point.

7.4. Test Results

The test result is in conformance with the requirement.

Electrostatic Discharge Test Results

Beide (Shenzhen) Product Service Limited

Date: Dec.21,2020

Applicant	: Dongguan Smarfody Mobility Technology Co.,Ltd	Test Date	: Dec.21,2020
EUT	: Mojo Electric Scooter	Temperature	: 24°C
M/N	: Mojo-T100	Humidity	: 51%
Test Voltage	: DC 48V	Test Mode	: ON
Test Engineer	: Jack		
Air Discharge: $\pm 2\text{Kv}$ $\pm 4\text{Kv}$ $\pm 6\text{Kv}$ For each point positive 10 times and negative 10 times discharge.			
Contact Discharge: $\pm 2\text{Kv}$ $\pm 4\text{Kv}$ $\pm 8\text{Kv}$			
Location		Kind 1 Air Discharge C-Contact Discharge	Result
Cable	1 points	A	PASS
Connector cover	1 points	A	PASS
Switch lever	1 points	A	PASS
Switch button	1 points	A	PASS
Indicator	1 points	A	PASS
Control knob	1 points	A	PASS
Battery charger case	6 points	A	PASS
HCP	5 points	A	PASS
VCP	5 points	A	PASS

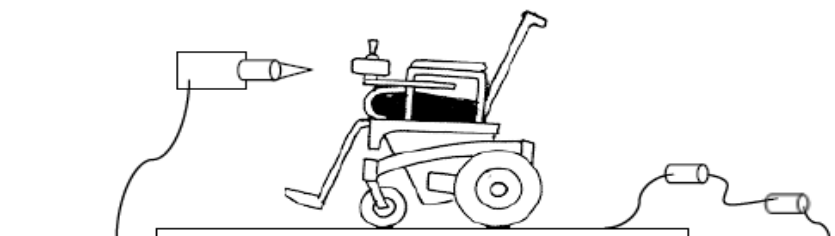
Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

Reviewer: _____

Austin Zhang

8. Electrostatic Discharge Test (Eut Battery Charger)

8.1. Block Diagram of Test Setup



8.2. Test specification

Basic Standard	Test Item	Test Specification
IEC 61000-4-2	Battery charger	± 6 KV Contact ,VCP ± 8 KV Air Discharge

8.3. Description of the test

1. Testing the battery charger in accordance with 10.1.3 of ISO 7176-21, using test levels of ± 2 kV, ± 4 kV and ± 6 kV for contact discharges and test levels of ± 2 kV, ± 4 kV and ± 8 kV for air discharges, during each discharge and for 2 s following each discharge or set of discharges, the battery charger shall continue to operate in accordance with its specification without operator intervention.
2. Prepare the battery charger as specified in 7.4. of ISO 7176-21. Support the charger test load as specified in IEC 61000-4-2 for floor-standing equipment.
3. Test the battery charger as specified in IEC 61000-4-2 for table-top equipment.
4. Establish test points at the following locations:
 - a) one test point on each cable, connector housing, switch lever or button, control, knob and indicator;
 - b) one test point on each face if the enclosure of the battery charger is approximately cubical;
 - c) one test point on each surface that would most closely approximate that of a cubical enclosure of similar size, to a maximum of six points if the enclosure of the battery charger is non-cubical.
4. Apply ten discharges of each polarity (positive and negative) at each applicable test level to each test point. Apply contact discharges and/or air discharges in accordance with the guidance given in IEC 61000-4-2.

8.4. Test Results

The test result is in conformance with the requirement.

Electrostatic Discharge Test Results

Beide (Shenzhen) Product Service Limited

Date: Dec.21,2020

Applicant	: Dongguan Smarfody Mobility Technology Co.,Ltd	Test Date	: Dec.21,2020
EUT	: Battery Charger	Temperature	: 24°C
M/N	: --	Humidity	: 51%
Test Voltage	: AC 230V/50Hz	Test Mode	: ON
Test Engineer : Jack			

Air Discharge: $\pm 2KV \pm 4KV \pm 6KV$ For each point positive 10 times and negative 10 times discharge.

Contact Discharge: $\pm 2KV \pm 4KV \pm 8KV$

Location		Kind		Result
		Air Discharge	C-Contact Discharge	
Cable	1 points	A		PASS
Battery charger case	6 points	A		PASS
Connector housing	1 points	A		PASS
Light	1 points	A		PASS
Seams	1 points	A		PASS
H/VCP(Battery Charger)	1 points	A		PASS
H/VCP(Four Sides)	1 points	A		PASS

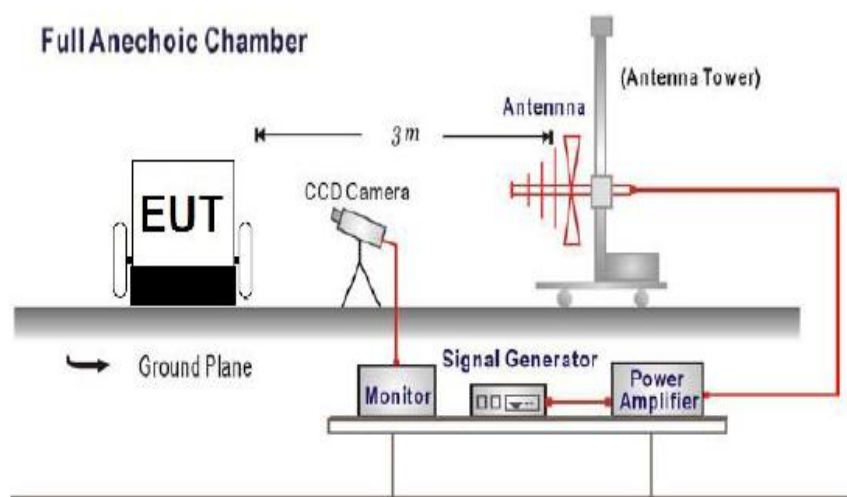
Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

Reviewer:

Austin Zhang

9. Rf Field Strength Susceptibility Test (Eut Wheelchair Drives)

9.1. Block Diagram of Test Setup



9.2. Test specification

Basic Standard	Test Specification	Units
IEC61000-4-3	26-2500	MHz
	20	V/m
	80	(Unmodulated,rms) % AM (1kHz)

Performance criterion : **A**

9.3. Description of the test

1. Tested in accordance with 10.2.1.2 Anechoic or semi-anechoic chamber test method of ISO 7176-21.
2. Perform the radiated R.F. field immunity test specified in IEC 61000-4-3 on the wheelchair as table-top equipment. Ensure that each frequency step does not exceed 1 % of the current frequency.
3. Monitor the output of the power amplifier to ensure that it is not saturating. Maintain the output at the required level for at least 2 s. Measure the wheel speed and the servo steering angle. The 2 s dwell time while the R.F. field is still applied
4. Use an anechoic or semi-anechoic chamber as specified in IEC 61000-4-3. Orient the wheelchair so that:
 - a) the forward direction of travel is toward the antenna;
 - b) the rearward direction of travel is toward the antenna;
 - c) the forward direction of travel is perpendicular to the axis of the antenna, with the antenna facing the side of the wheelchair on which the control device is located or in the case that the control device is centrally located, the side of the wheelchair where most of the electronic control units are located or most of the cables are routed.Position the wheelchair so that the appropriate vertical plane closest to the antenna coincides with the uniform field area (UFA). For each orientation of the wheelchair, carry out the test with both horizontal and vertical polarization.

9.4. Test Results

The test result is in conformance with the requirement.

RF Field Strength Susceptibility Test Results

Beide (Shenzhen) Product Service Limited

Date: Dec.21,2020

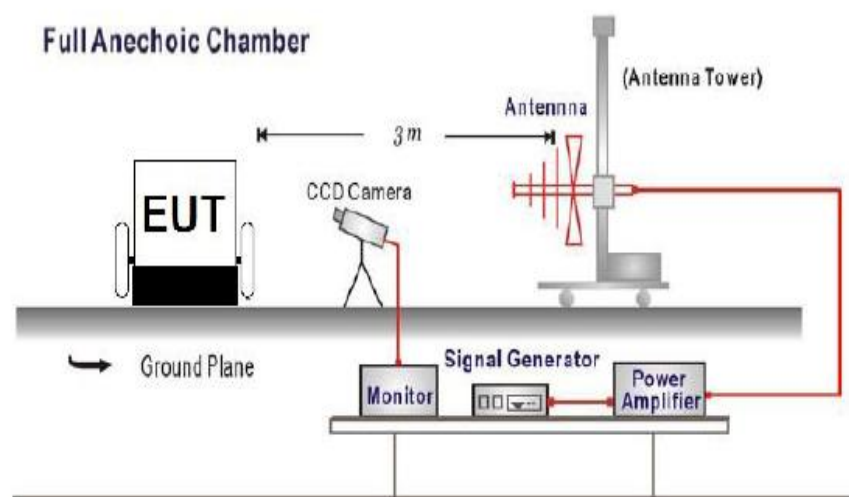
Applicant	: Dongguan Smarfody Mobility Technology Co.,Ltd	Test Date	: Dec.21,2020
EUT	: Mojo Electric Scooter	Temperature	: 24°C
M/N	: Mojo-T100	Humidity	: 53%
Test Voltage	: DC 48V	Test Mode	: ON
Test Engineer	: Jack	Frequency Range	: --
Modulation: <input checked="" type="checkbox"/> AM <input type="checkbox"/> Pulse <input type="checkbox"/> none 1 kHz 80%			
Criterion : A			
		Frequency Range: 26 MHz~2.5 GHz	
Steps	1%	1%	
	Horizontal	Vertical	
Front	Pass	Pass	
Right	Pass	Pass	
Rear	Pass	Pass	
Left	Pass	Pass	

Reviewer :

Austin.Zhang

10.Rf Field Strength Susceptibility Test (Eut Battery Charger)

10.1. Block Diagram of Test Setup



10.2. Test specification

Basic Standard	Phenomena	Test Specification	Units
IEC61000-4-3	Radio-Frequency Electromagnetic Field.	80-1000	MHz
	Amplitude Modulated.	3	V/m (Unmodulated,rms)
		80	% AM (1kHz)

Performance criterion : A

10.3. Description of the test

1. Testing the battery charger in accordance with 10.2.3 of ISO 7176-21, using a test level of 3 V/m from 80 MHz to 1 GHz, the battery charger shall continue to operate in accordance with its specification without operator intervention.
2. Support the charger test load as specified in IEC 61000-4-3 for floor-standing equipment.
2. Perform the radiated R.F. field immunity test specified in IEC 61000-4-3 on the battery charger as table-top equipment.
3. Where the frequency is increased in a continuous sweep, the rate of increase shall not be greater than 1 % per 500 ms.
4. Where the frequency is increased in steps, ensure that each frequency step does not exceed 1 % of the current frequency and that the dwell time at each frequency is not less than 500 ms.
5. Carry out the test with the antenna facing each side of the battery charger, using both horizontal and vertical polarization.

10.4. Test Results

The test result is in conformance with the requirement.

RF Field Strength Susceptibility Test Results

Beide (Shenzhen) Product Service Limited

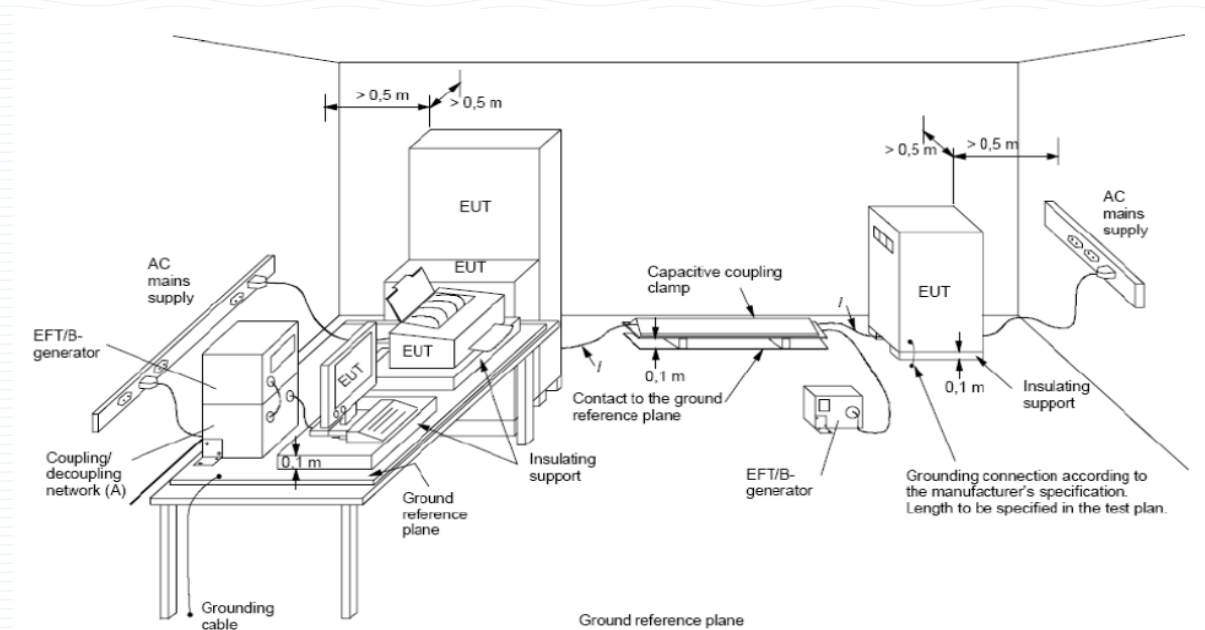
Date: Dec.21,2020

Applicant	: Dongguan Smarfody Mobility Technology Co.,Ltd	Test Date	: Dec.21,2020
EUT	: Battery Charger	Temperature	: 24°C
M/N	: --	Humidity	: 53%
Test Voltage	: AC 230V/50Hz	Test Mode	: ON
Test Engineer	: Jack	Frequency Range	: --
Modulation:	<input checked="" type="checkbox"/> AM	<input type="checkbox"/> Pulse	<input type="checkbox"/> none 1 kHz 80%
Criterion	: A		
	Frequency Range:	80-1000 MHz	
Steps	1%	1%	
	Horizontal	Vertical	
Front	Pass	Pass	
Right	Pass	Pass	
Rear	Pass	Pass	
Left	Pass	Pass	

Reviewer : Austin.Zhang

11. Electrical Fast Transient/Burst Test (Eut Battery Charger)

11.1. Block Diagram of Test Setup



11.2. Test specification

Basic Standard	Phenomena	Test Specification	Units
IEC 61000-4-4	Fast Transients	+2	kV (Peak)
		5/50	Tr / Td ns
		5	Rep. Frequency kHz

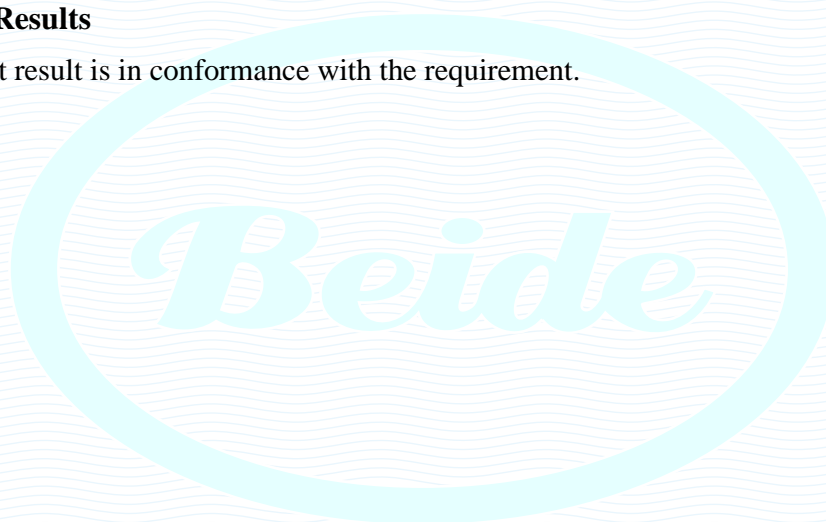
Performance criterion : **B**

11.3. Description of the test

1. Testing the battery charger in accordance with 10.3.2 of ISO 7176-21, using test level 2 specified in IEC 61000-4-4, the battery charger shall continue to operate in accordance with its specification without operator intervention.
2. Perform the laboratory type test specified in IEC 61000-4-4 on the a.c. mains port of the battery charger a stable-top equipment, with the following provisions:
 - support the charger test load as specified in IEC 61000-4-4 for floor-standing equipment;
 - use a repetition rate of 100 kHz;
 - use both polarities of test voltage;Test for not less than 1 min and not more than 2 min for each polarity of test voltage.

11.4. Test Results

The test result is in conformance with the requirement.



Electrical Fast Transient/Burst Test Results

Beide (Shenzhen) Product Service Limited

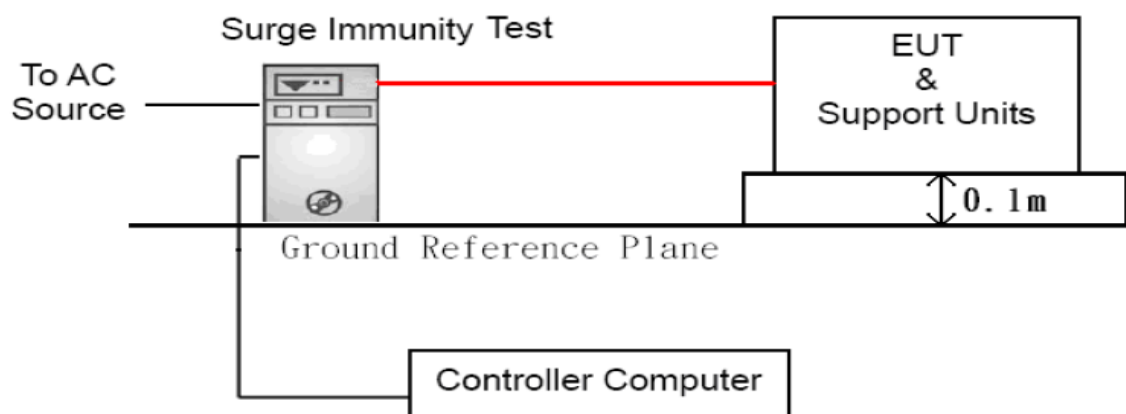
Date: Dec.21,2020

Applicant : Dongguan Smarfody Mobility Technology Co.,Ltd					Test Date : Dec.21,2020				
EUT : Battery charger					Temperature : 24℃				
M/N : --					Humidity : 53%				
Test Voltage : AC 230V/50Hz					Test Mode : ON				
Test Engineer : Jack									
Inject Place : AC Mains									
Inject Line	Voltage kV	Inject Time(s)	Inject Method	Results	Inject Line	Voltage kV	Inject Time(s)	Inject Method	Results
Inject Line	Voltage kV	Inject Time(s)	Inject Method	Results	Inject Line	Voltage kV	Inject Time(s)	Inject Method	Results
L1	±1	120	Direct	PASS					
N	±1	120	Direct	PASS					
PE	±1	120	Direct	PASS					
L1+N	±1	120	Direct	PASS					
L1+PE	±1	120	Direct	PASS					
N+PE	±1	120	Direct	PASS					
L1+N+PE	±1	120	Direct	PASS					

Reviewer: Justin Zhang

12. Surge Test (Eut Battery Charger)

12.1. Block Diagram of Test Setup



12.2. Test specification

Basic Standard	Test Port	Test Specification	Units
IEC 61000-4-5	Line to Earth	1.2/50(8/20) ±2	Tr/Td μs kV
	Line to Line	±1	kV

Performance criterion : **B**

12.3. Description of the test

1. Testing the battery charger in accordance with 10.4.2 of ISO 7176-21, using test level 2 specified in IEC 61000-4-5, the battery charger shall continue to operate in accordance with its specification without operator intervention.
2. Perform the surge immunity test specified in IEC 61000-4-5 on the a.c. mains port of the battery charger, with the following provisions:
apply five positive and five negative pulses each at 0 °, 90 °, 180 ° and 270 °,
apply successive pulses at periods of 60 s or less.

12.4. Test Results

The test result is in conformance with the requirement.

Surge Immunity Test Results

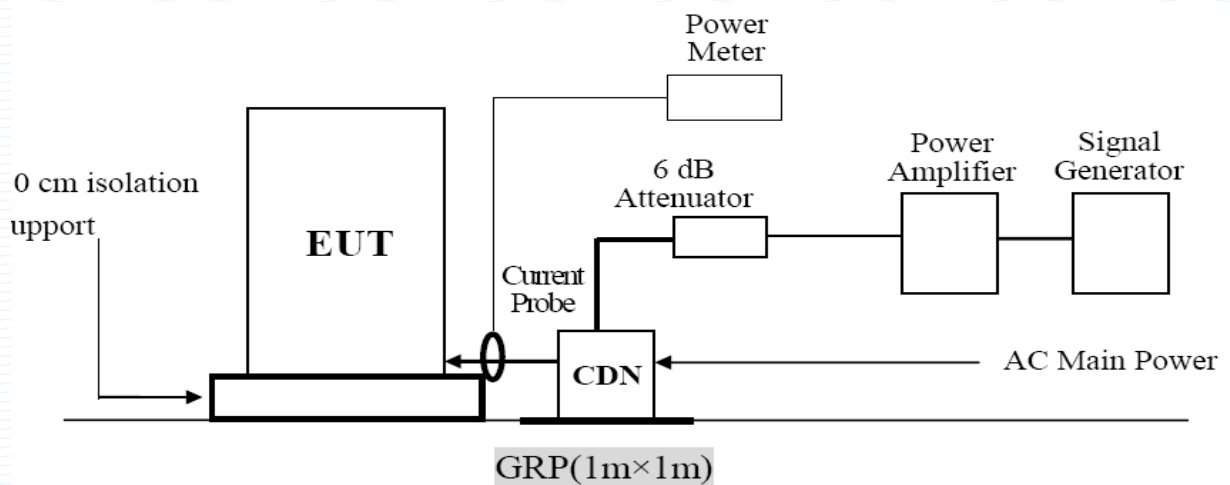
Beide (Shenzhen) Product Service Limited.

Date: Dec.21,2020

Applicant : Dongguan Smarfody Mobility Technology Co.,Ltd				Test Date : Dec.21,2020	
EUT : <u>Battery charger</u>				Temperature : 24°C	
M/N : _____				Humidity : 53%	
Test Voltage : AC230V/50Hz				Test Mode : On	
Location	Polarity	Phase Angle	No of Pulse	Pulse Voltage (kV) EN 61000-4-5	Result
L1-N	+	0	5	1	Pass
	+	90	5	1	Pass
	+	180	5	1	Pass
	+	270	5	1	Pass
	-	0	5	1	Pass
	-	90	5	1	Pass
	-	180	5	1	Pass
	-	270	5	1	Pass
L1-PE N-PE	+	0	5	2	Pass
	+	90	5	2	Pass
	+	180	5	2	Pass
	+	270	5	2	Pass
	-	0	5	2	Pass
	-	90	5	2	Pass
	-	180	5	2	Pass
	-	270	5	2	Pass
Remark:				Reviewer: <u>Justin Zhang</u>	

13. Injected Currents Susceptibility Test (Eut Battery Charger)

13.1. Block Diagram of Test Setup



13.2. Test specification

Basic Standard	Phenomena	Test Specification	Units
IEC 61000-4-6	Radio-Frequency	0.15-80	MHz
	Common Mode	3	V(rms)
	Amplitude	80	(Unmodulated,rms)
	Modulated.	150	% AM (1kHz)
			Source Impedance Ω

Performance criterion: A

13.3. Description of the test

1. Testing the battery charger in accordance with 10.5.2 of ISO 7176-21, using test level 2 specified in IEC 61000-4-6, from 150 kHz to 80 MHz, the battery charger shall continue to operate in accordance with its specification without operator intervention.
2. Perform the conducted disturbance immunity test specified in IEC 61000-4-6 on the a.c. mains port of the battery charger as table-top equipment. Ensure the dwell time at each frequency is not less than 2 s.

13.4. Test Results

The test result is in conformance with the requirement.

Injected Currents Susceptibility Test Results

Beide (Shenzhen) Product Service Limited

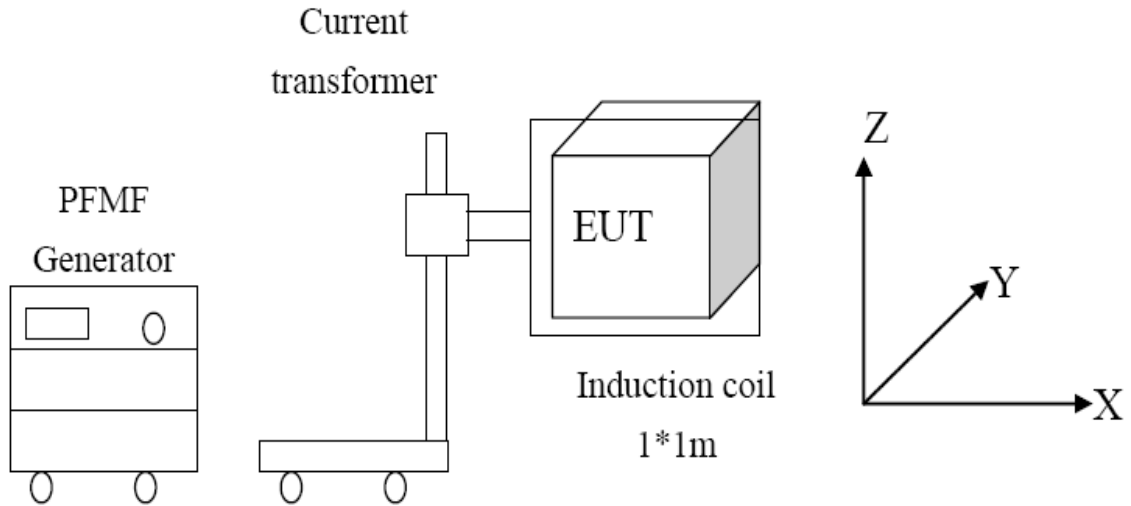
Date: Dec.21,2020

Applicant : <u>Dongguan Smarfody Mobility Technology Co.,Ltd</u> EUT : <u>Battery charger</u> M/N : <u>--</u> Test Voltage : <u>AC230V/50Hz</u> Test Engineer : <u>Jack</u>		Test Date : <u>Dec.21,2020</u> Temperature : <u>24°C</u> Humidity : <u>53%</u> Test Mode : <u>ON</u>		
Frequency Range (MHz)	Injected Position	Strength	Criterion	Result
0.15 ~ 80	AC Mains	3V(rms), Unmodulated	A	PASS
Remark : 1. Modulation Signal:1kHz 80% AM 2. Dwell Time: 1sec 3.step:1%		Note:		

Reviewer: *Austin Zhong*

14. Magnetic Field Immunity Test (Eut Wheelchair Drives)

14.1. Block Diagram of Test Setup



14.2. Test specification

Frequency	Magnetic Field Strength	Basic Standard
50/60Hz	30A/m	IEC 61000-4-8

Performance criterion: A

14.3. Description of the test

1. The wheelchair is tested in accordance with 10.6 of ISO 7176-21, using test level 4 specified in IEC 61000-4-8.
2. Perform the continuous field immunity test specified in IEC 61000-4-8 on the wheelchair as table-top equipment. Test the wheelchair for not less than 1 min for each orientation of the applied field.

14.4. Test Results

The test result is in conformance with the requirement.

Magnetic Field Immunity Test Results

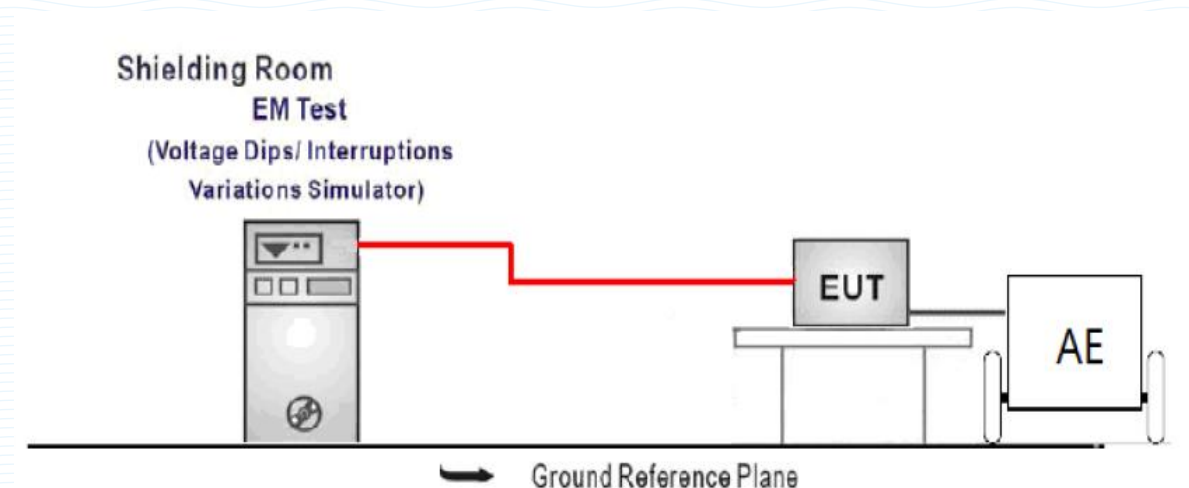
Beide (Shenzhen) Product Service Limited

Date: Dec.21,2020

Applicant : Dongguan Smarfody Mobility <u>Technology Co.,Ltd</u> EUT : <u>Mojo Electric Scooter</u> M/N : <u>Mojo-T100</u> Test Mode: <u>ON</u> Test Voltage: <u>DC 48V</u>			Test Date : <u>Dec.21,2020</u> Temperature : <u>24°C</u> Humidity : <u>49%</u> Test Engineer : <u>Jack</u>	
Test Level	Testing Duration	Coil Orientation	Criterion	Result
30A/m	2 mins	X	A	PASS
30A/m	2 mins	Y	A	PASS
30A/m	2 mins	Z	A	PASS
Remark:			Test Equipment : Magnetic Field Tester EM TEST	

15. Voltage Dips And Interruptions Test (Eut Battery Charger)

15.1. Block Diagram of Test Setup



15.2. Test specification

Basic Standard	Test Level in % of rated voltage	Test Duration cycle / ms
IEC 61000-4-11	70	25/500
	0	0.5/10
	0	1/20
	0	250/5000

Performance criterion : B

15.3. Description of the test

1. During and following testing in accordance with 10.7.2 of ISO 7176-21, using the Class 2 test level specified in IEC 61000-4-11, the battery charger may exhibit a temporary loss of function or degradation of performance, but it shall cease when the disturbance ceases, and the charger shall recover its normal performance without operator intervention.
2. Perform the voltage dips and short interruption tests specified in IEC 61000-4-11 on the a.c. mains port of the battery charger.

15.4. Test Results

The test result is in conformance with the requirement.

Voltage Dips And Interruptions Test Results

Beide (Shenzhen) Product Service Limited

Date: Dec.21,2020

Applicant : <u>Dongguan Smarfody Mobility Technology Co.,Ltd</u>			Test Date : <u>Dec.21,2020</u>			
EUT : <u>Batter charger</u>			Temperature : <u>24°C</u>			
M/N : <u>--</u>			Humidity : <u>53%</u>			
Power Supply: <u>AC230V/50Hz</u>						
<input checked="" type="checkbox"/> Single Test Voltage			<input type="checkbox"/> Dual Test Voltage			
Test Model: <u>ON</u>						
Test Level % U _T	Voltage Dips & Short Interruptions % U _T	Duration (in period)	Phase Angle	Criterion	Result	PASS
0	100	0.5P	0-360	B	B	Pass
0	100	250P	0-360	B	B	Pass
70	30	25P	0-360	B	B	Pass
Remark: U _T is the rated voltage for the equipment.						

Reviewer: *Austin Zhang*



APPENDIX II
(EUT Photos)

Figure 1
CONDUCTED EMISSION TEST

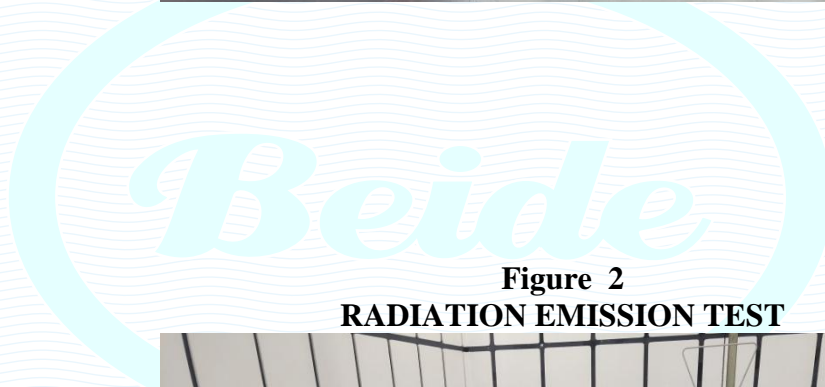


Figure 2
RADIATION EMISSION TEST



Figure 3
RADIATION EMISSION TEST

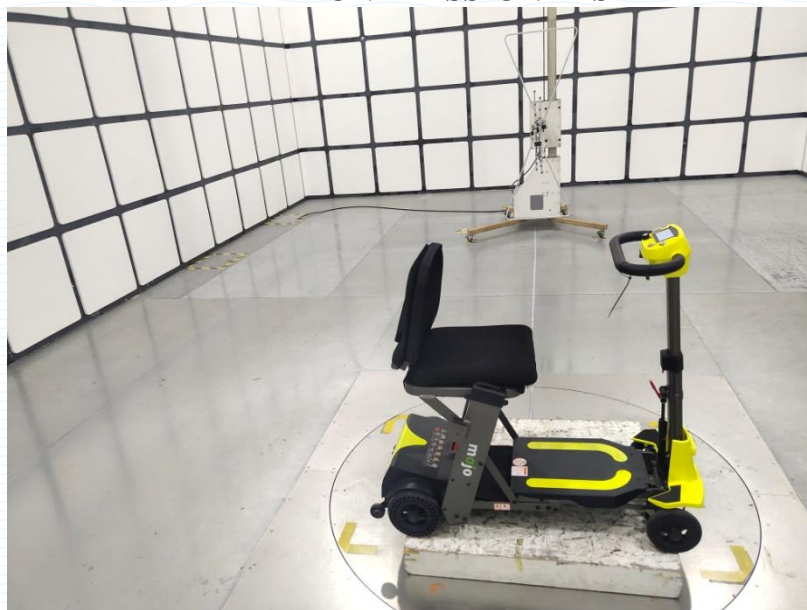


Figure 4
HARMONIC CURRENT EMISSION TEST
VOLTAGE FLUCTUATIONS & FLICKER TEST



Figure 5
ELECTROSTATIC DISCHARGE TEST



Figure 6
RADIO FREQUENCY ELECTROMAGNETIC FIELD



Figure 7
ELECTRICAL FAST TRANSIENT/BURST TEST
SURGE TEST
VOLTAGE DIPS AND INTERRUPTIONS TEST



Figure 8
INJECTED CURRENTS SUSCEPTIBILITY TEST

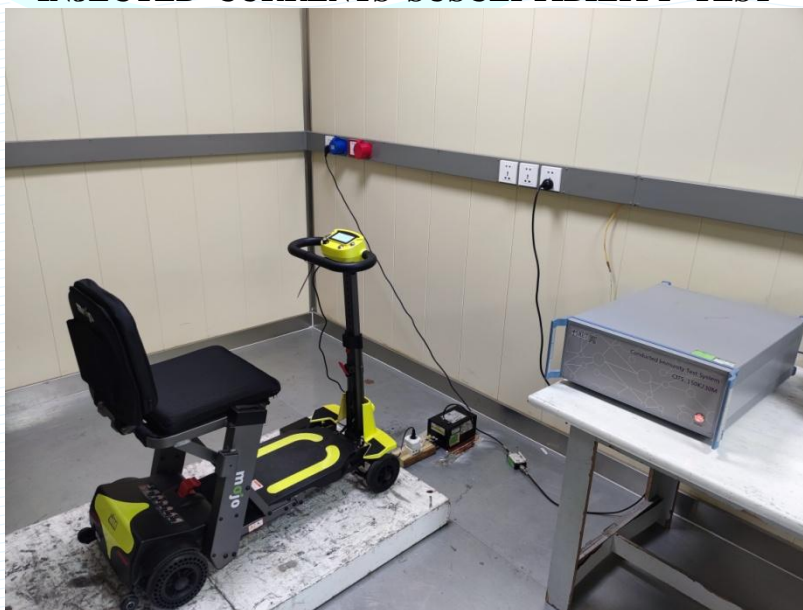


Figure 9
MAGNETIC FIELD IMMUNITY TEST



Figure 10
APPEARANCE OF EUT



Figure 11
APPEARANCE OF EUT

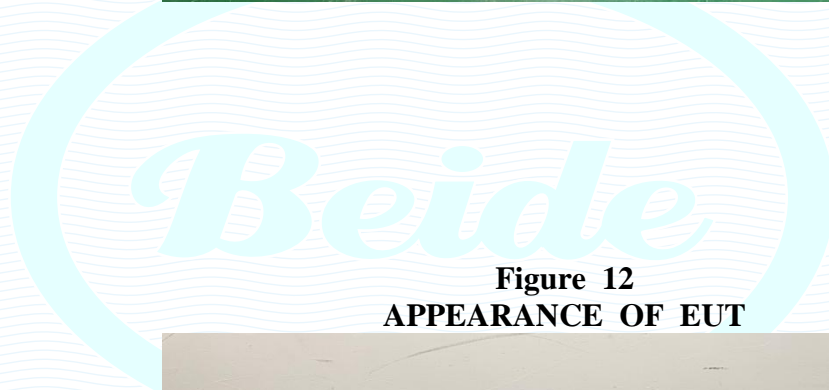


Figure 12
APPEARANCE OF EUT



Figure 13
APPEARANCE OF EUT



Figure 14
APPEARANCE OF EUT



Figure 15
APPEARANCE OF EUT

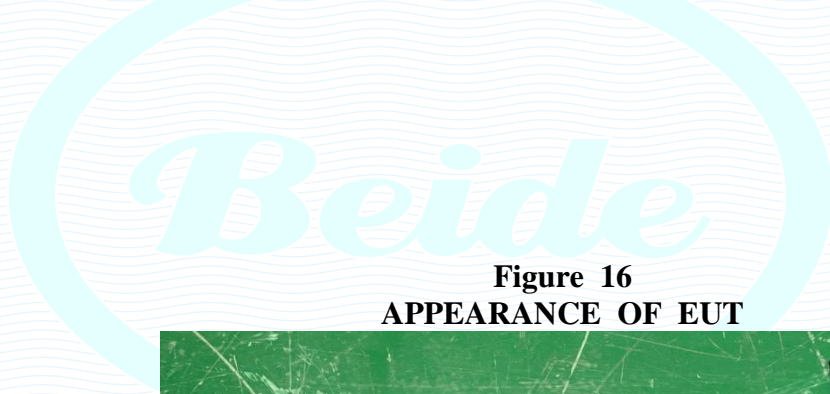


Figure 16
APPEARANCE OF EUT



Figure 17
APPEARANCE OF EUT



Figure 18
APPEARANCE OF EUT

