



EUROFINS PRODUCT TESTING SERVICE (SHANGHAI) CO., LTD.

EMC TEST- REPORT

TEST REPORT NUMBER: EFSH16080436-IE-01-E01



Eurofins Product Testing Service (Shanghai) Co., Ltd.
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2 General Information

2.1 Notes


The results of this test report relate exclusively to the item tested as specified in chapter "Description of test item" and are not transferable to any other test items.

Eurofins Product Testing Service (Shanghai) Co., Ltd. is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

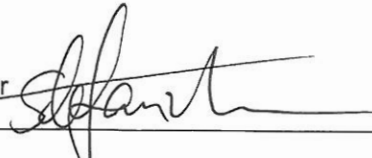
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Operator:

| | | | |
|------------|---------------|-----------------------------|---|
| 2016-09-12 | | Perry Li / Testing Engineer |  |
| Date | Eurofins-Lab. | Name / Title | Signature |

Technical responsibility for area of testing:

| | | | |
|------------|----------|--------------------------------|--|
| 2016-09-12 | | Stefan Zhao / Project Engineer |  |
| Date | Eurofins | Name / Title | Signature |

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2.2 Testing laboratory

Eurofins Product Testing Service (Shanghai) Co., Ltd.
No.395 West Jiangchang Road, Jing'an District, Shanghai, 200436, P.R. China
Telephone : +86-21-61819181
Telefax : +86-21-61819180

Test location, where different:

| | |
|---------------|---|
| Subcontractor | |
| Name | : BUREAU VERITAS ADT (SHANGHAI) CORPORATION. |
| Address | : 2F, Building C, No. 1618 Yishan Road SHANGHAI |
| Telephone | : + 86-21-6465 9091 |
| Fax | : + 86-21-6465 9092 |

Radiated emission was performed at BUREAU VERITAS ADT (SHANGHAI) CORPORATION.

2.3 Details of approval holder

Name :
Address :

Telephone : ./.
Fax : ./.

2.4 Application details

Date of receipt of application : 2016-08-05
Date of receipt of test item : 2016-08-12
Date of test : 2016-08-12 to 2016-08-26

2.5 EUT Information

Product type : Hair Clipper
Model name : RFC-1107, RF-601, RF-801, RF-901, RFC-1309, RFC-1105,
RFC-1311, RFC-208, RFC-508, RFC-678, RFC-209, RFC-1306,
RFC-1106, RFC-1311B

Brand name : ./.
Serial number : ./.
Ratings : DC 2,4 V, Class III
Adaptor input: 230-240VAC, 50Hz, 3W output: 3VDC, 250mA
Test voltage : 230V~, 50Hz (for adaptor); DC2.4V (built-in rechargeable AA battery)
Additional information :
The appliances covered by this report are hair clippers for household indoor use only.
All models are identical except for the model name.
Adaptor information: M/N: LW35001
Adaptor input: 230-240VAC, 50Hz, 3W output: 3VDC, 250mA.

After review, RFC-1107 was selected for all tests and the most unfavourable data was recorded.

2.6 Test standards

Technical standard :

EN 55014-1: 2006+A1:2009 +A2: 2011

EN 55014-2: 1997+A1: 2001+A2: 2008

EN 61000-3-2: 2014

EN 61000-3-3: 2013

3 Technical test

3.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed.



or

The deviations as specified were ascertained in the course of the tests performed.



3.2 Test environment

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| | | | | |
|---------------------------|---|-----|-----|--------|
| Temperature | : | 20 | ... | 25°C |
| Relative humidity content | : | 30 | ... | 60% |
| Air pressure | : | 100 | ... | 103kPa |

BUREAU VERITAS ADT (SHANGHAI) CORPORATION.

| | | |
|---------------------------|---|--------|
| Temperature | : | 24°C |
| Relative humidity content | : | 41% |
| Air pressure | : | 101kPa |

3.3 Test equipment utilized

| Measurement Equipment List | | | | |
|----------------------------|---|-------------|------------------------|---------------|
| No. | Name: | Type: | Manufacturer: | Cal due date: |
| 1 | EMI test receiver | ESCI | R&S | 2016-11-27 |
| 2 | Single phase Harmonics & Flicker analyser | PACS-1 | California Instruments | 2016-11-27 |
| 3 | AC Power Source | 5001iX | California Instruments | 2016-11-27 |
| 4 | Coupling/Decoupling Network | L 801 M2/M3 | Luethi | 2016-11-27 |
| 5 | Ultra Compact Simulator | UCS 500N7 | EMTEST | 2016-11-27 |
| 6 | ESD Gun | NSG 437 | TESEQ | 2016-11-27 |
| 7 | Current transformer | MC2630 | EMTEST | 2016-11-27 |
| 8 | Motorized variac | MV2616 | EMTEST | 2016-11-27 |
| 9 | Continuous wave simulator | CWS500N1 | EMTEST | 2016-11-27 |
| 10 | Magnetic field coil | MS100 | EMTEST | 2016-11-27 |
| 11 | Current transformer | MC26100 | EMTEST | 2016-11-27 |
| 12 | Artificial mains | ENV216 | R&S | 2016-11-27 |
| 13 | Click analyser | CL55C | AFJ | 2016-09-03 |
| 14 | Absorbing clamp | MDS21 | Luethi | 2016-11-27 |
| 15 | EM clamp | EM101 | Luethi | 2016-11-27 |
| 16 | Oscilloscope | TDS3012C | Tektronix | 2016-10-14 |
| 17 | EMI test receiver | ESCS30 | R&S | 2017-04-13 |
| 18 | Broadband Antenna | VULB9168 | Schwarzbeck | 2017-03-26 |
| 19 | Amplifier | 8447D | Agilent | 2016-11-06 |

3.4 Test results

☒ 1st test

☐ test after modification

☐ production test

| Test case | Subclause | Required | Test passed | Test failed |
|---|--|-------------------------------------|-------------------------------------|--------------------------|
| Conducted Emission | Clause 4.1.1 of EN 55014-1 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Disturbance power | Clause 4.1.2 of EN 55014-1 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Radiated disturbance | Clause 4.1.2 of EN 55014-1 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Discontinuous disturbance | Clause 4.2 of EN 55014-1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Harmonic Current Emissions | EN 61000-3-2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Voltage Changes, Voltage Fluctuations and Flicker | EN 61000-3-3 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Electrostatic Discharge | Clause 5.1 of EN 55014-2 & IEC 61000-4-2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Electrical Fast Transients | Clause 5.2 of EN 55014-2 & IEC 61000-4-4 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Injected currents (RF continues conducted) | Clause 5.3 & 5.4 of EN 55014-2 & IEC 61000-4-6 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Radio frequency electromagnetic fields | Clause 5.5 of EN 55014-2 & IEC 61000-4-3 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Surge immunity | Clause 5.6 of EN 55014-2 & IEC 61000-4-5 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Voltage dips and Interruption | Clause 5.7 of EN 55014-2 & IEC 61000-4-11 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Note 1: The Harmonic Current Emissions test was not required as the EUT with a rated power of 75 W or less. (Charging condition)

Note 2: Category I apparatus is deemed to fulfil the relevant immunity requirements without testing.

4 Emission Test

4.1 Conducted Emission

This clause lays down the general requirements for the measurement of disturbance voltage produced at the terminals of apparatus.

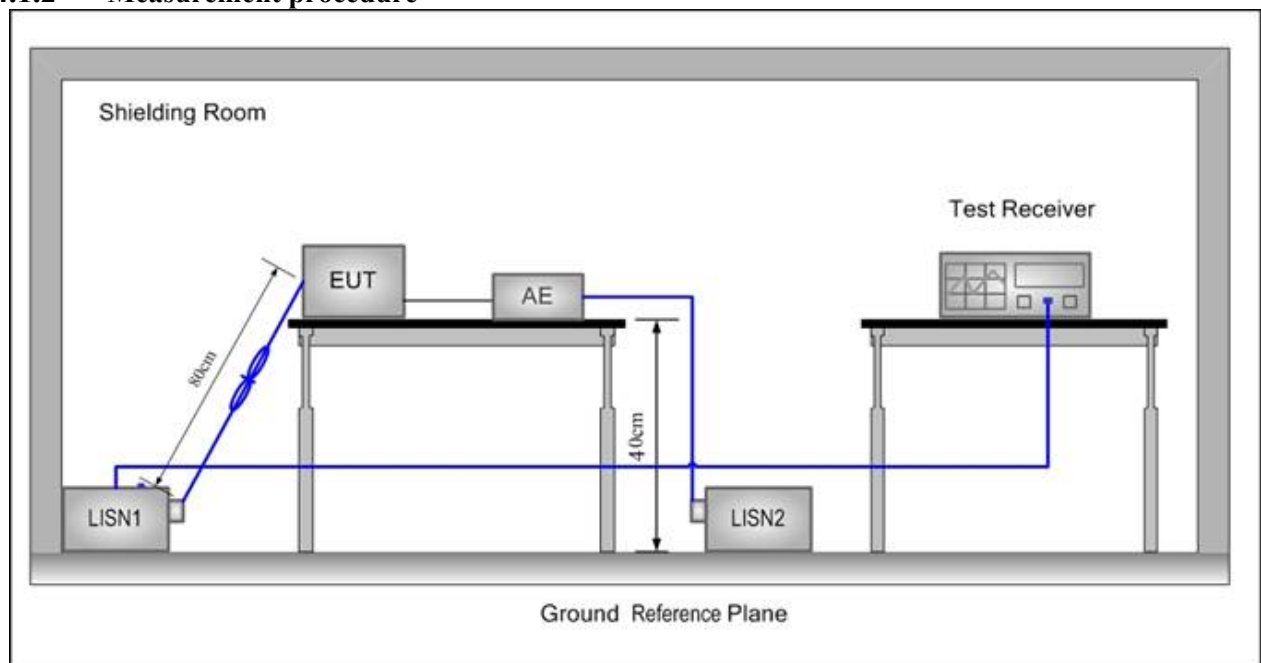
4.1.1 Limits

| Frequency range MHz | At mains terminals dB (μV) | |
|------------------------|-------------------------------|---------------|
| | Quasi-peak Limit | Average Limit |
| 0.15 to 0.50 | 66 to 56 | 59 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Note1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 30 MHz.

Note2: The lower limit is applicable at the transition frequency.

4.1.2 Measurement procedure



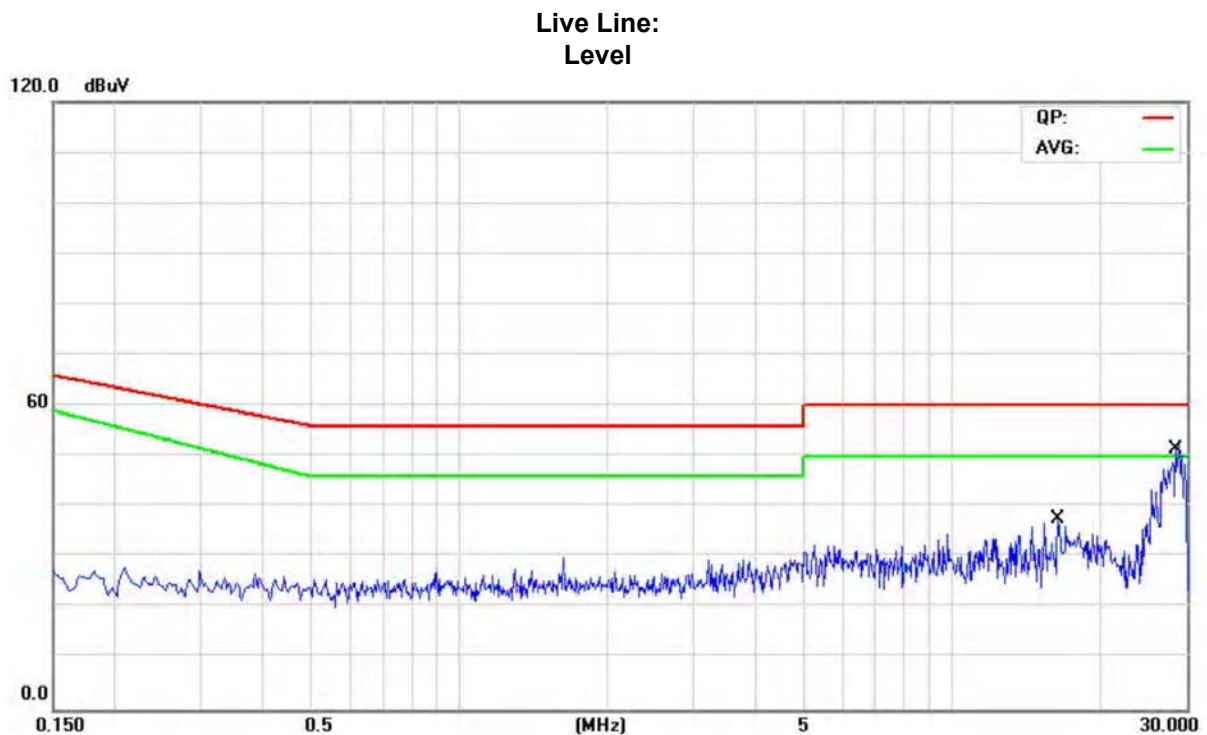
1. The mains terminal disturbance voltage was measured with the EUT in a shielded room.
2. The EUT was connected to AC power source through a LISN (Line Impedance Stabilization Network) which provides a $(50 \mu H + 5 \Omega) \parallel 50 \Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN, which was bonded to the ground reference plane in the same way as the LISN for the unit being measured.
3. The tabletop EUT was placed upon a non-metallic table 0.4m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

4. According to a pre-test at 160kHz, the voltage 230V/50Hz was selected for final test. Before get the final emission results with quasi-peak(QP) detector and average(AVG) detector, a pre-scan was performed with the peak(PK) and average(AVG) detector to find out the maximum emission data plots of the EUT.

4.1.3 Measurement uncertainty

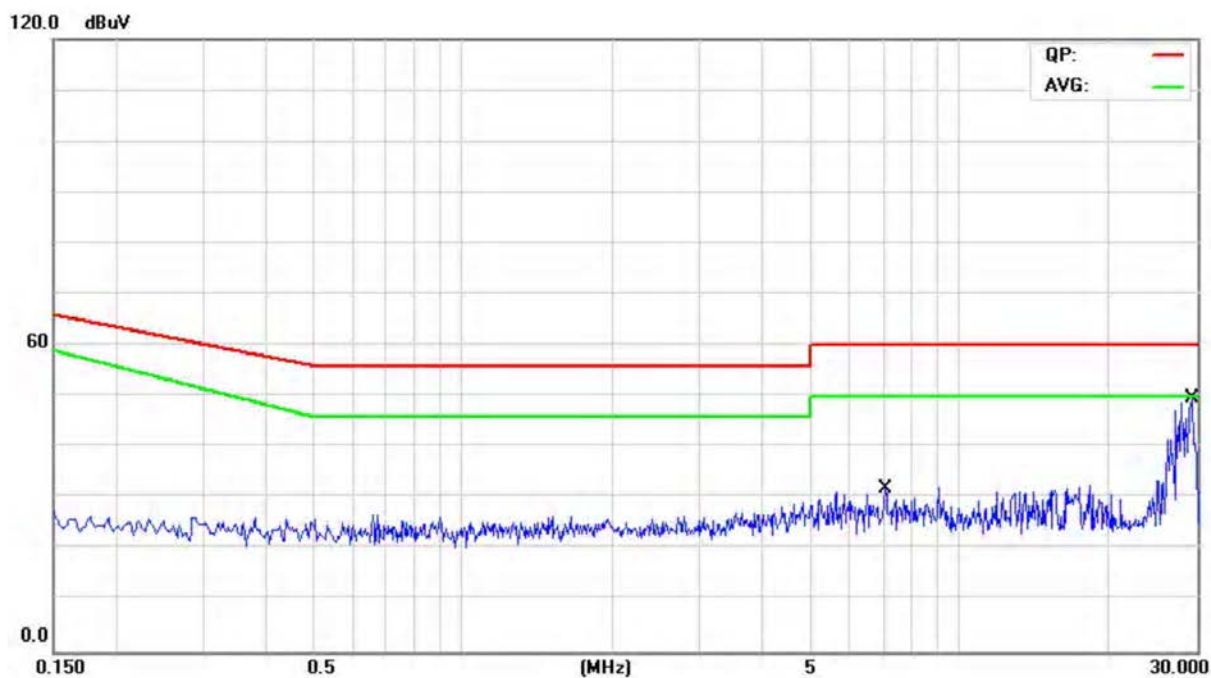
$U_{lab}(cond) = 2.5dB$ at 95% level of confidence, $k=2$

4.1.4 Results -Measurement Data



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over | |
|-----|-----|---------|---------|---------|----------|-------|--------|----------|
| | | MHz | Level | Factor | ment | | | Detector |
| | | | dBuV | dB | dBuV | dBuV | dB | |
| 1 | | 16.4580 | 11.39 | 10.56 | 21.95 | 60.00 | -38.05 | QP |
| 2 | | 16.4580 | 4.60 | 10.56 | 15.16 | 50.00 | -34.84 | AVG |
| 3 | * | 28.4820 | 26.21 | 10.58 | 36.79 | 60.00 | -23.21 | QP |
| 4 | | 28.4820 | 8.07 | 10.58 | 18.65 | 50.00 | -31.35 | AVG |

Neutral Line:
Level



| No. | Mk. | Freq. | Reading | Correct | Measure- | Limit | Over | |
|-----|-----|---------|---------|---------|----------|-------|--------|----------|
| | | MHz | Level | Factor | ment | | | Detector |
| | | | dBuV | dB | dBuV | dBuV | dB | |
| 1 | | 7.0900 | 10.93 | 10.41 | 21.34 | 60.00 | -38.66 | QP |
| 2 | | 7.0900 | 4.94 | 10.41 | 15.35 | 50.00 | -34.65 | AVG |
| 3 | * | 29.2420 | 23.26 | 10.64 | 33.90 | 60.00 | -26.10 | QP |
| 4 | | 29.2420 | 7.64 | 10.64 | 18.28 | 50.00 | -31.72 | AVG |

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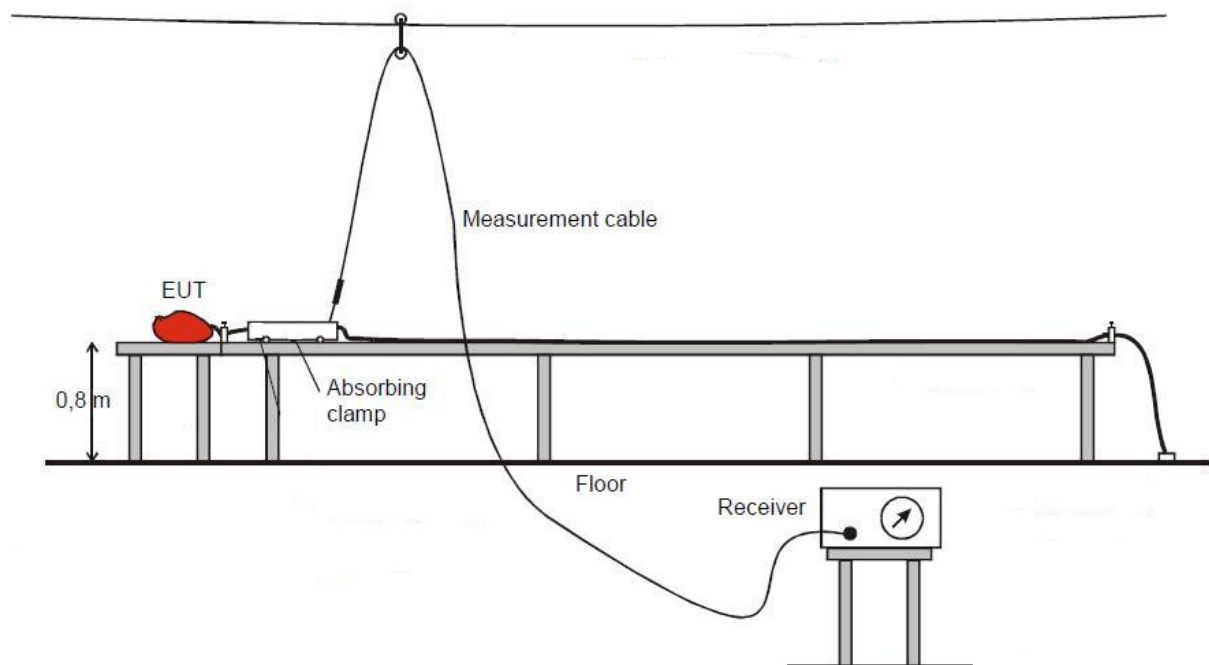
4.2 Disturbance power

This clause lays down the general requirements for the measurement of disturbance power produced at the terminals of apparatus.

4.2.1 limits

| Frequency range MHz | Limit dB (pW) | |
|---|------------------|----------|
| | Quasi-peak | Average |
| 30 to 300 | 45 to 55 | 35 to 45 |
| Note1: Increasing linearly with the frequency from. | | |

4.2.2 Measurement procedure

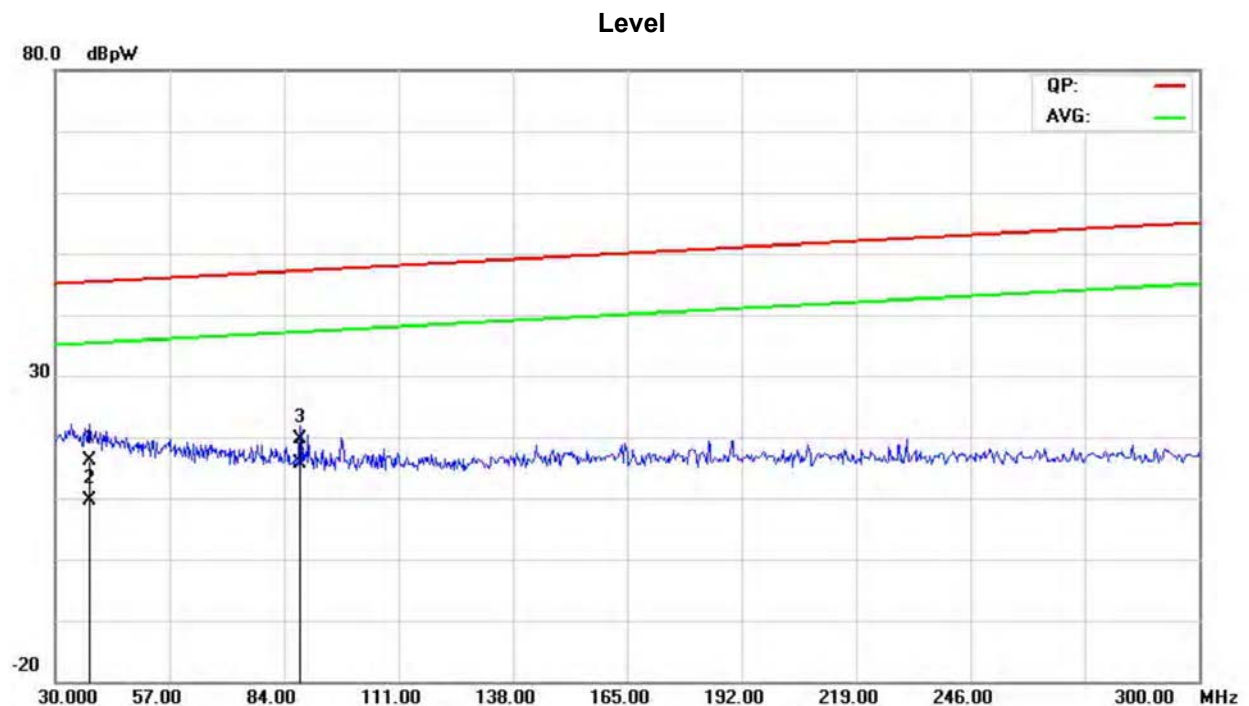


The test configuration corresponds to the standard EN 55014-1. The equipment under test is placed on a non metallic table with 0,8 m high. The lead to be measured is stretched horizontally in a straight line, to permit variation in position of the absorbing clamp along the lead to find the maximum indication. The lead shall be at least length of 6 meter. According to a pre-test at 50MHz, the voltage 230V/50Hz was selected for final test. Before get the final emission results with quasi-peak(QP) detector and average(AVG) detector, a pre-scan was performed with the peak(PK) detector to find out the maximum emission data plots of the EUT. The absorbing clamp is placed around the lead.

4.2.3 Measurement uncertainty

$U_{lab}(cond) = 4.08 \text{ dB}$ at confidence of 95%, $k=2$

4.2.4 Results



| No. | Mk. | Freq. MHz | Reading Level dBpW | Correct Factor dB | Measure- ment dBpW | Limit dBpW | Over dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|
| 1 | | 38.3200 | -3.57 | 19.68 | 16.11 | 45.31 | -29.20 | QP |
| 2 | | 38.3200 | -10.08 | 19.68 | 9.60 | 35.31 | -25.71 | AVG |
| 3 | | 87.8800 | 2.86 | 16.86 | 19.72 | 47.14 | -27.42 | QP |
| 4 | * | 87.8800 | -1.26 | 16.86 | 15.60 | 37.14 | -21.54 | AVG |

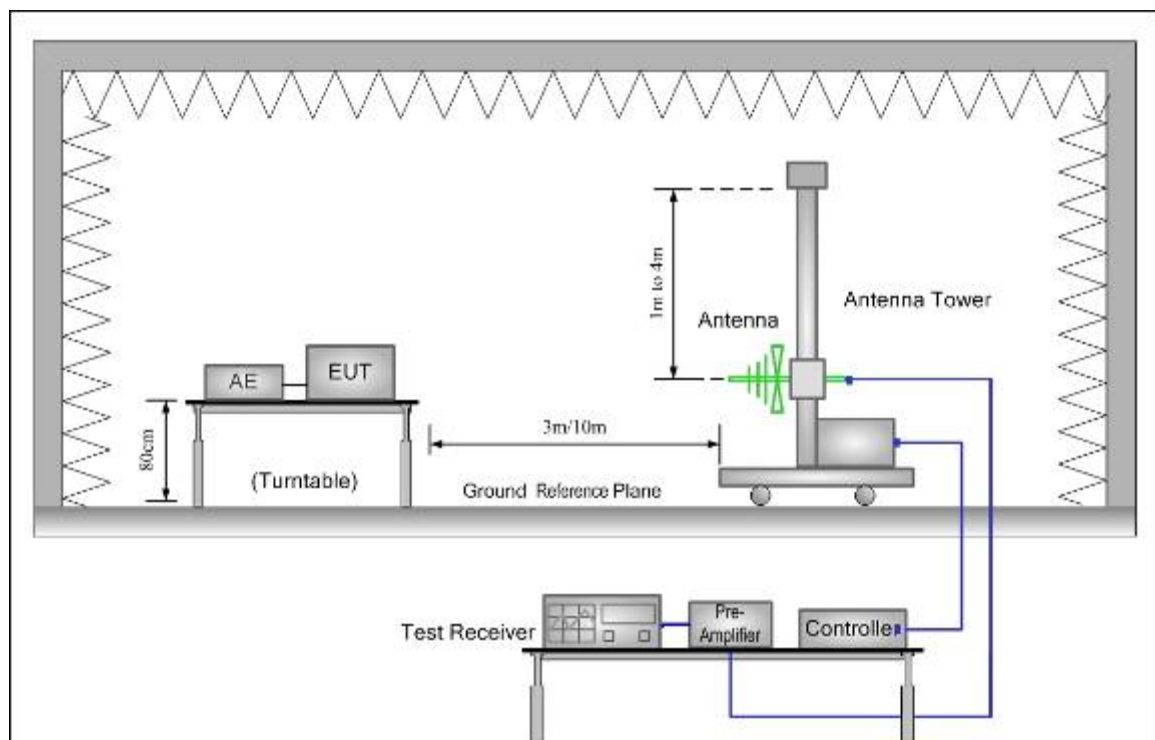
4.3 Radiated disturbance

This clause lays down the general requirements for the measurement of Radiated disturbance produced at the space of apparatus.

4.3.1 Limits

| Frequency range | Quasi-peak limits at 10m | Quasi-peak limits at 3m |
|--|--------------------------|-------------------------|
| MHz | dB ($\mu\text{V/m}$) | dB ($\mu\text{V/m}$) |
| 30 to 230 | 30 | 40 |
| 230 to 1000 | 37 | 47 |
| At transitional frequencies the lower limit applies. | | |

4.3.2 Measurement procedure



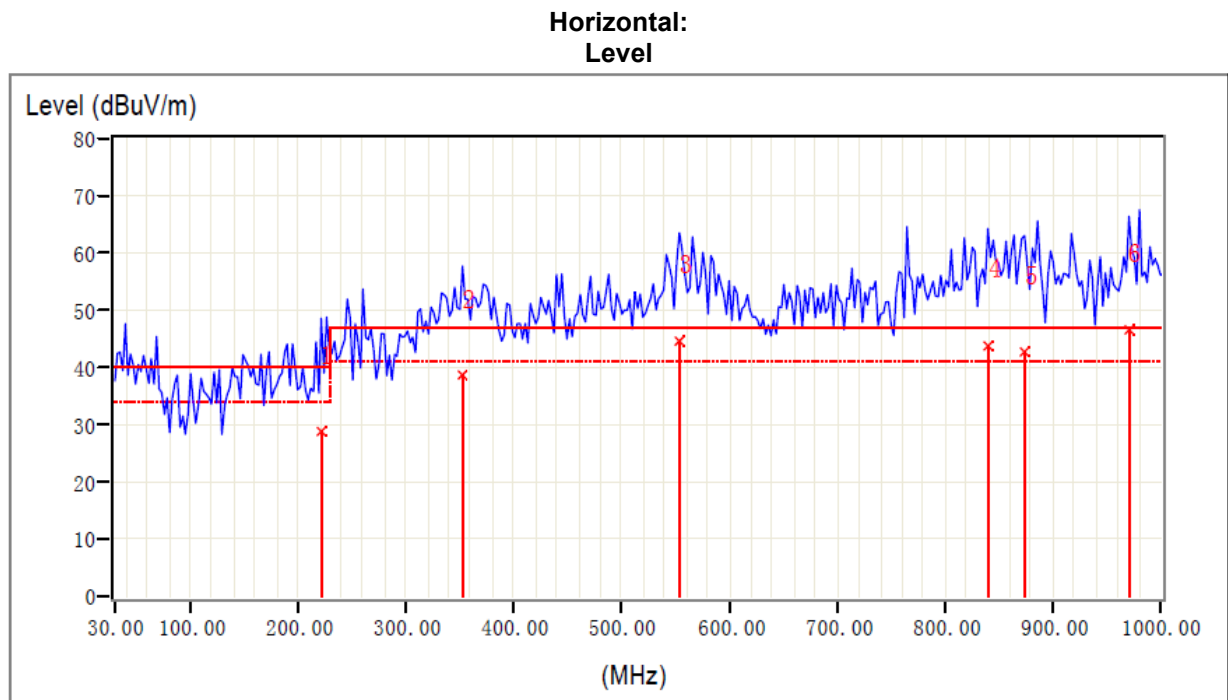
1. The radiated emissions test was conducted in a semi-anechoic chamber. The EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
2. Before get the final emission results with quasi-peak(QP) detector, a pre-scan was performed with the peak(PK) detector to find out the maximum emission data plots of the EUT.
3. The frequencies of maximum emission were determined in the final radiated emissions measurement, the physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization. Test was performed on subcontractor.

4.3.3 Measurement uncertainty

U_{lab}(cond) = 3.22dB at 95% level of confidence, k=2

4.3.4 Results

Note: Standalone operating mode as the worst mode to be recorded.

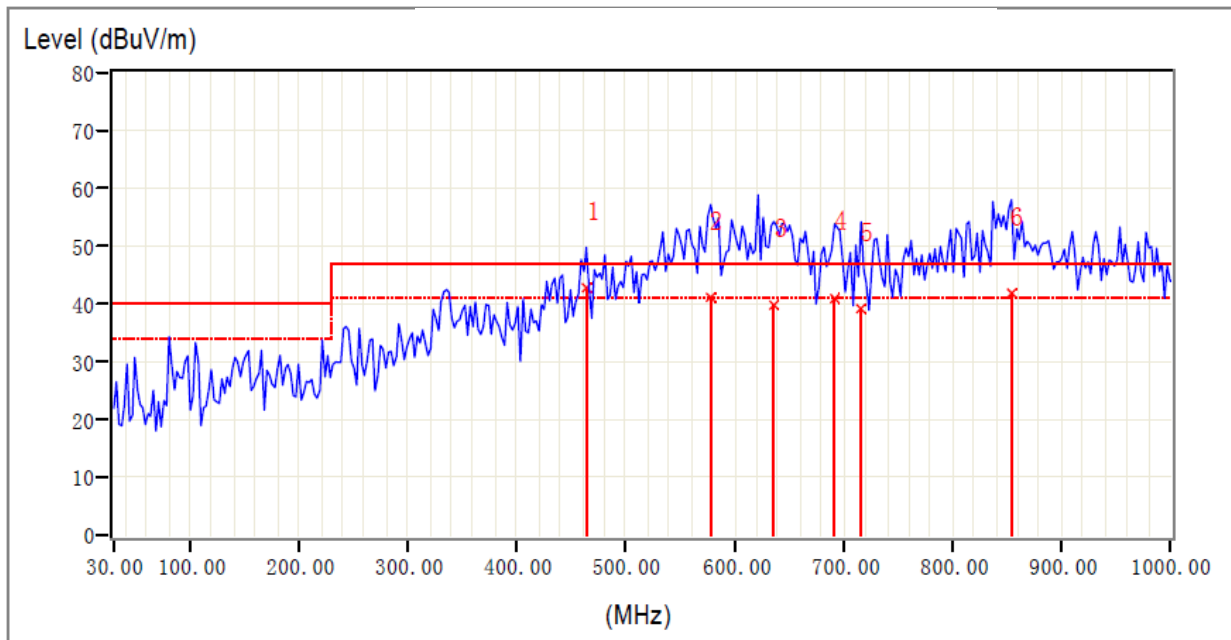


| No. | Frequency MHz | Factor dB | Reading dBuV/m | Emission dBuV/m | Limit dBuV/m | Over Limit dB | Tower / Table | |
|-----|------------------|--------------|-------------------|--------------------|-----------------|------------------|---------------|-----|
| | | | | | | | cm | deg |
| 1 | 221.57 | 11.65 | 17.12 | 28.76 | 40.00 | -11.24 | 175 | 249 |
| 2 | 352.52 | 15.85 | 22.76 | 38.61 | 47.00 | -8.39 | 100 | 125 |
| 3 | 553.80 | 21.25 | 23.31 | 44.56 | 47.00 | -2.44 | 189 | 74 |
| 4 | 839.95 | 26.68 | 16.99 | 43.67 | 47.00 | -3.33 | 100 | 135 |
| 5 | 873.90 | 26.84 | 15.84 | 42.68 | 47.00 | -4.32 | 170 | 241 |
| * | 6 | 970.90 | 28.89 | 17.62 | 46.51 | -0.49 | 100 | 229 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Emission Level = Reading Level + Factor.

**Vertical:
Level**



| No. | | Frequency | Factor | Reading | Emission | Limit | Over Limit | Tower / Table | |
|-----|---|-----------|--------|---------|----------|--------|------------|---------------|-----|
| | | MHz | dB | dBuV/m | dBuV/m | dBuV/m | dB | cm | deg |
| * | 1 | 464.07 | 19.43 | 23.31 | 42.74 | 47.00 | -4.26 | 100 | 359 |
| | 2 | 578.05 | 22.05 | 19.02 | 41.07 | 47.00 | -5.93 | 100 | 57 |
| | 3 | 636.25 | 23.23 | 16.51 | 39.74 | 47.00 | -7.26 | 100 | 14 |
| | 4 | 692.02 | 24.16 | 16.66 | 40.82 | 47.00 | -6.18 | 100 | 227 |
| | 5 | 716.27 | 24.71 | 14.42 | 39.13 | 47.00 | -7.87 | 100 | 360 |
| | 6 | 854.50 | 26.64 | 15.15 | 41.79 | 47.00 | -5.21 | 100 | 228 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Emission Level = Reading Level + Factor.

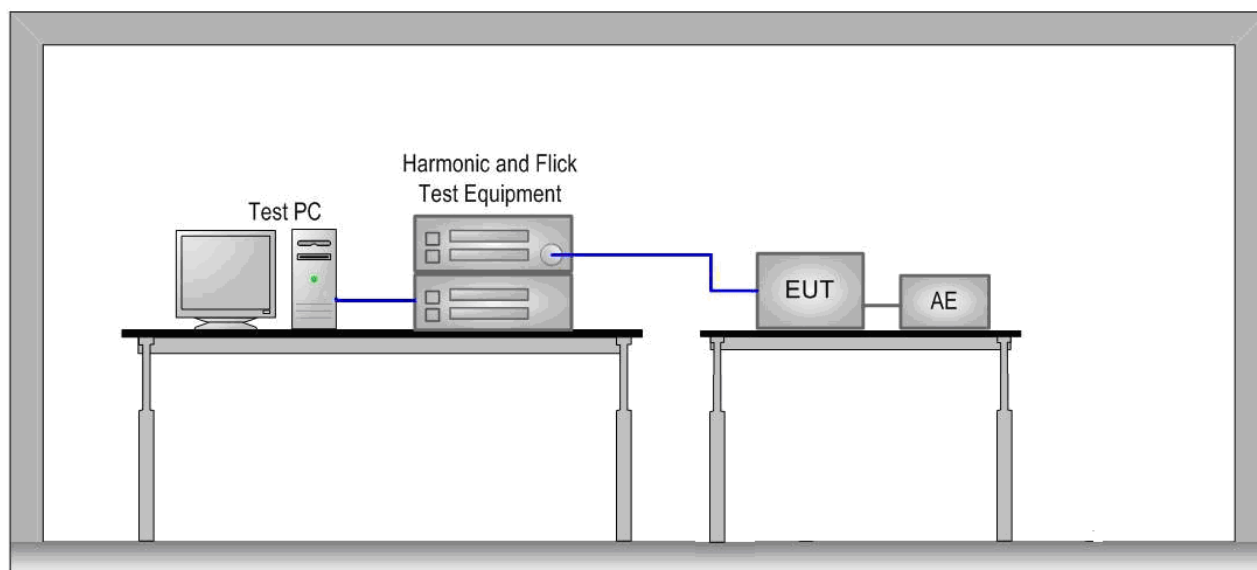
4.4 Voltage Changes, Voltage Fluctuations and Flicker

This part is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

4.4.1 Limits

| Value | Limit |
|-------|-------|
| Pst | 1,0 |
| Plt | 0,65 |
| dt | 3,3% |
| dc | 3,3% |
| dmax | 4,0% |

4.4.2 Measurement test procedure



The equipment under test is placed on a wooden table with a height of 0,8 m in the EMC lab. The voltage fluctuations and flicker were measured at the supply terminals of the EUT.

4.4.3 Results

Parameter values recorded during the test:

Vrms at the end of test (Volt): 230.02

Highest dt (%): 0.00

Time(mS) > dt: 0.0

Highest dc (%): 0.00

Highest dmax (%): 0.00

Highest Pst (10 min. period): 0.064

Test limit (%): 3.30

Pass

Test limit (mS): 500.0

Pass

Test limit (%): 3.30

Pass

Test limit (%): 4.00

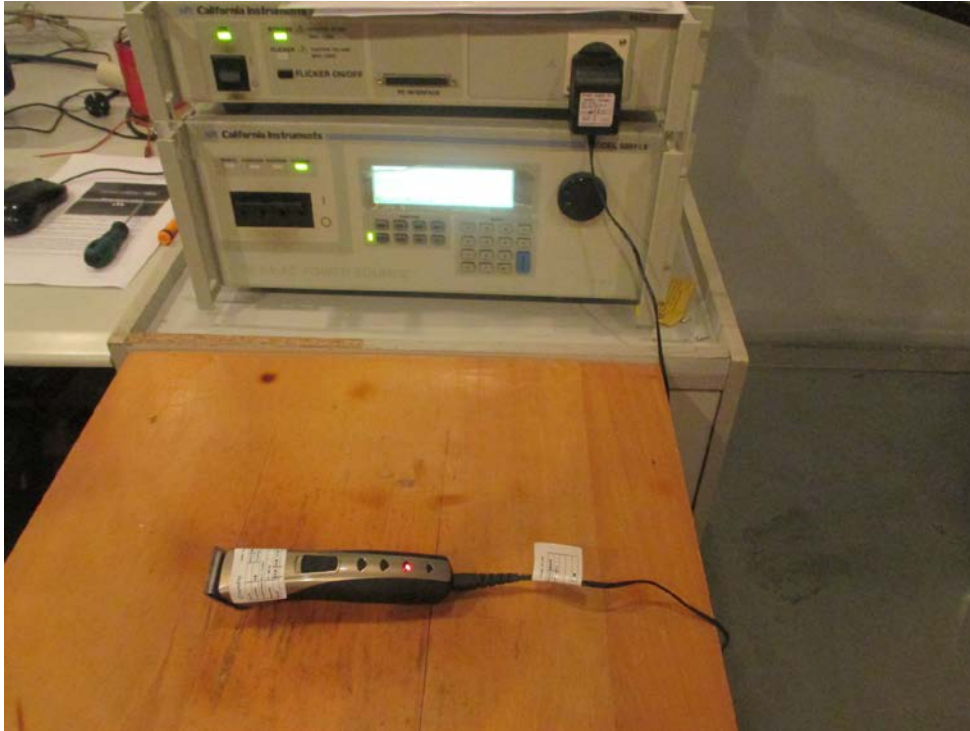
Pass

Test limit: 1.000

Pass

5 Test Setup Photos

Harmonic & Flicker



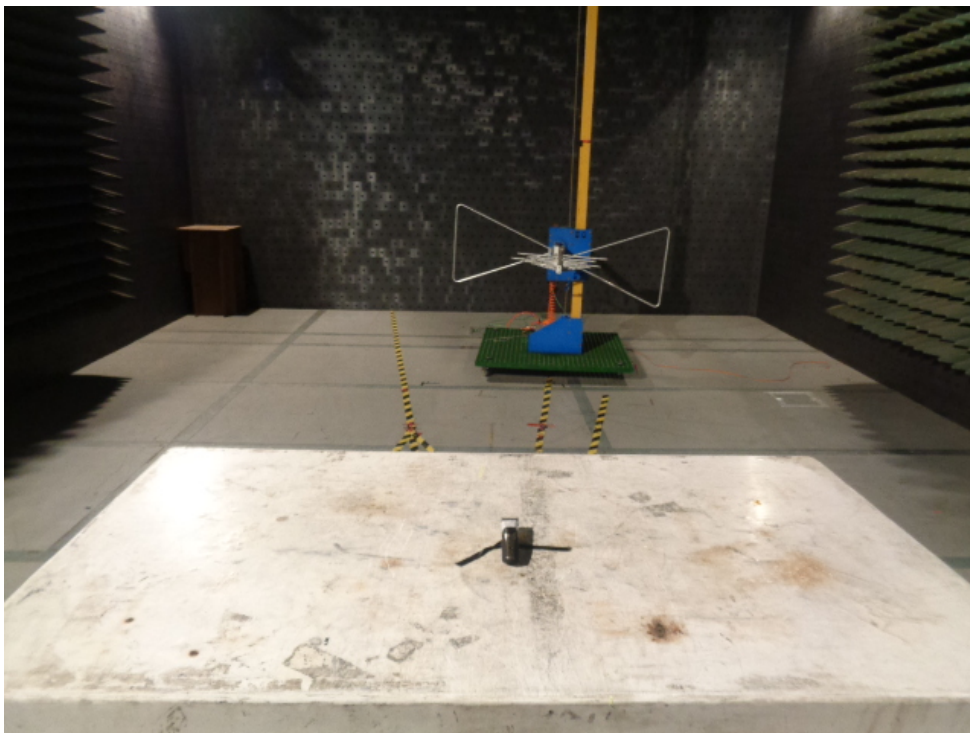
Conducted Emission



Disturbance power



Radiated Emission



6 EUT Photos

Description: Top view for all models



Description: Side view for all models



Description: Rear view



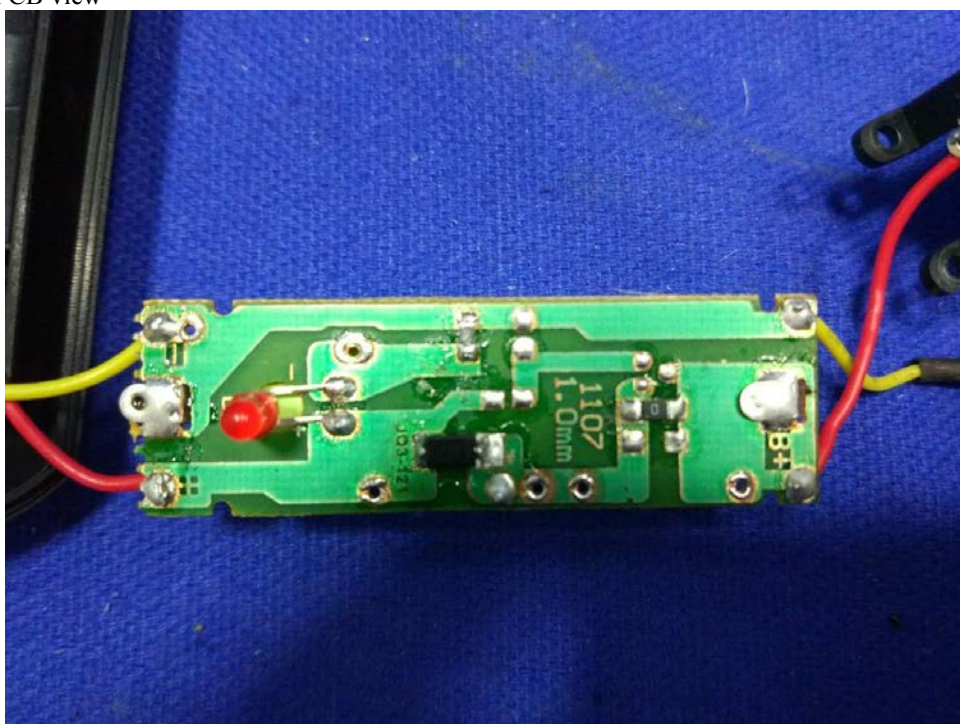
Description: Internal view



Description: PCB and battery view



Description: PCB view



Description: Motor view



Description: Adaptor view



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Description: Internal view

