

FCC - TEST REPORT

| | | | | |
|---------------------|---|--|----------------|--------------------------|
| Report Number | : | 68.940.15.019.01 | Date of Issue: | <u>November 25, 2015</u> |
| Model | : | BTC100 | | |
| Product Type | : | MIPOW PLAYBULB SPHERE | | |
| Applicant | : | Shenzhen Baojia Battery Technology Co., Ltd | | |
| Address | : | Block A, Yonghe Road, Tongfuyu Industrial Zone, Heping, Fuyong, Baoan, Shenzhen,China | | |
| Production Facility | : | Shenzhen Baojia Battery Technology Co.,Ltd | | |
| Address | : | Block A, Yonghe Road, Tongfuyu Industrial Zone, Heping, Fuyong, Baoan, Shenzhen,China | | |
| Test Result | : | <input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative | | |
| Total pages | : | 21 | | |

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval

1 Table of Contents

| | | |
|------|--|----|
| 1 | Table of Contents..... | 2 |
| 2 | Details about the Test Laboratory | 3 |
| 3 | Description of the Equipment Under Test..... | 4 |
| 4 | Summary of Test Standards..... | 5 |
| 5 | Summary of Test Results..... | 6 |
| 6 | General Remarks | 7 |
| 7 | Test Setups..... | 8 |
| 8 | Test Methodology | 9 |
| 8.1 | Conducted Emission | 9 |
| 8.2 | Radiated Emission | 9 |
| 8.3 | Field Strength Calculation | 9 |
| 9 | Systems test configuration | 10 |
| 10 | Technical Requirement | 11 |
| 10.1 | Conducted Emission Test 150KHz – 30MHz..... | 11 |
| 10.2 | Radiated Emission of Fundamental Frequency..... | 13 |
| 10.3 | Field strength of the harmonics and spurious | 15 |
| 10.4 | Bandwidth Measurement | 19 |
| 11 | Test Equipment List | 20 |
| 12 | System Measurement Uncertainty | 21 |

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration No.: 502708

IC Registration No: 10320A-1

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

Test Site 2:

Company name: Dongguan Precise Testing Service Co., Ltd.
Building D, Baoding Technology Park, Guangming Road 2,
Dongcheng District, Dongguan,
Guangdong, China.

FCC Registration Number: 371540

Remark: All test items were performed at Site 2.

3 Description of the Equipment Under Test

| | |
|----------------------------|--|
| Product: | MIPOW PLAYBULB SPHERE |
| Model no.: | BTC100 |
| FCC ID: | SL7BTC100 |
| Rating: | Input: 5VDC/250mA Output: 4.2VDC/150mA |
| RF Transmission Frequency: | 117KHz |
| Modulation: | FSK |
| Antenna Type: | Integral Antenna |
| Antenna Gain: | 0dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a MIPOW PLAYBULB COMET operated at 117KHz. |

4 Summary of Test Standards

| Test Standards | |
|--|--|
| FCC Part 15 Subpart C 10-1-2014 Edition | PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators |

5 Summary of Test Results

| Technical Requirements | | | | |
|------------------------|--|------------|-----------|-------------|
| FCC Part 15 Subpart C | | | | |
| Test Condition | | Pages | Test Site | Test Result |
| §15.207 | Conducted emission AC power port | 11 | Site 2 | Pass |
| §15.209 | Field strength of fundamental | 13 | Site 2 | Pass |
| §15.215 | 20dB&99% bandwidth | 15 | Site 2 | Pass |
| §15.209(a) | Filed strength of harmonics and spurious | 17 | Site 2 | Pass |
| §15.203 | Antenna requirement | See note 1 | | Pass |

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an integral antenna, which gain is 0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: SL7BTC100 complies with Section 15.207, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- **Not** Performed

The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: November 11, 2015

Testing Start Date: November 11, 2015

Testing End Date: November 20, 2015

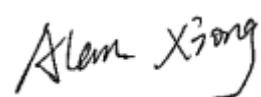
TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:



John Zhi
EMC Project Manager

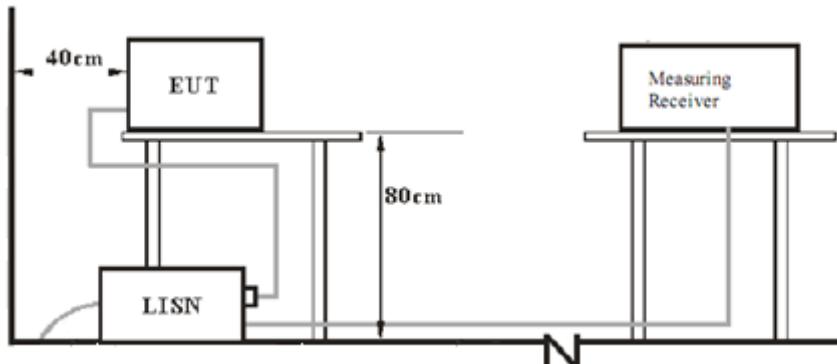
Prepared by:



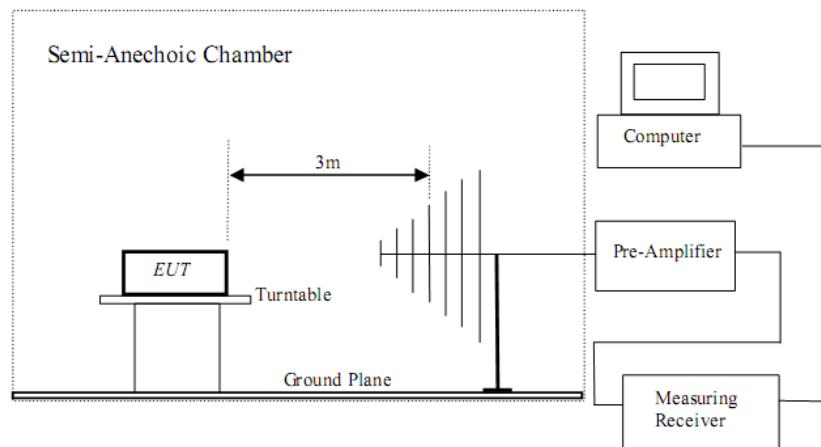
Alan Xiong
EMC Project Engineer

7 Test Setups

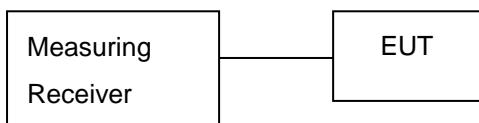
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



8 Test Methodology

8.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line
- 5.

8.2 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules.

8.3 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

FS = R + System Factor

System Factor = AF + CF + FA – PA

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

9 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| Adapter | 5V/250mA | --- | --- |

10 Technical Requirement

10.1 Conducted Emission Test 150KHz – 30MHz

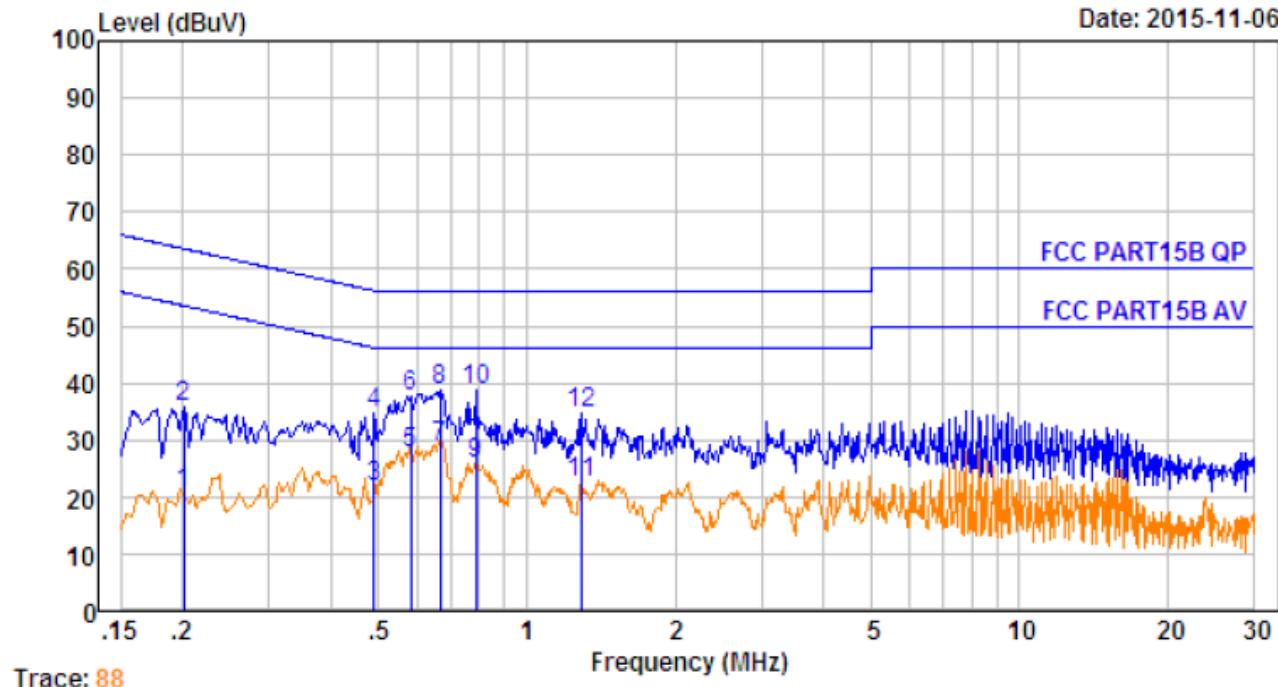
Product Type: MIPOW PLAYBULB SPHERE

M/N: BTC100

Operating Condition: TM1; Normal Working Mode

Test Specification: Power Line, Live

Comment: AC 120V/60Hz



| No. | Freq MHz | Cable Loss dB | AMN Factor dB | Receiver Reading dBuV | Emission Level dBuV | Limit dBuV | Over Limit dB | Remark |
|-----|----------|---------------|---------------|-----------------------|---------------------|------------|---------------|---------|
| 1. | 0.202 | 10.61 | 0.60 | 9.59 | 20.80 | 53.54 | -32.74 | Average |
| 2. | 0.202 | 10.61 | 0.60 | 24.59 | 35.80 | 63.54 | -27.74 | Peak |
| 3. | 0.489 | 10.64 | 0.60 | 10.46 | 21.70 | 46.19 | -24.49 | Average |
| 4. | 0.489 | 10.64 | 0.60 | 23.46 | 34.70 | 56.19 | -21.49 | Peak |
| 5. | 0.582 | 10.66 | 0.60 | 16.47 | 27.73 | 46.00 | -18.27 | Average |
| 6. | 0.582 | 10.66 | 0.60 | 26.47 | 37.73 | 56.00 | -18.27 | Peak |
| 7. | 0.668 | 10.66 | 0.60 | 17.43 | 28.69 | 46.00 | -17.31 | Average |
| 8. | 0.668 | 10.66 | 0.60 | 27.43 | 38.69 | 56.00 | -17.31 | Peak |
| 9. | 0.788 | 10.66 | 0.60 | 14.44 | 25.70 | 46.00 | -20.30 | Average |
| 10. | 0.788 | 10.66 | 0.60 | 27.44 | 38.70 | 56.00 | -17.30 | Peak |
| 11. | 1.289 | 10.68 | 0.60 | 11.34 | 22.62 | 46.00 | -23.38 | Average |
| 12. | 1.289 | 10.68 | 0.60 | 23.34 | 34.62 | 56.00 | -21.38 | Peak |

Conducted Emission Test 150kHz – 30MHz

Product Type: MIPOW PLAYBULB SPHERE

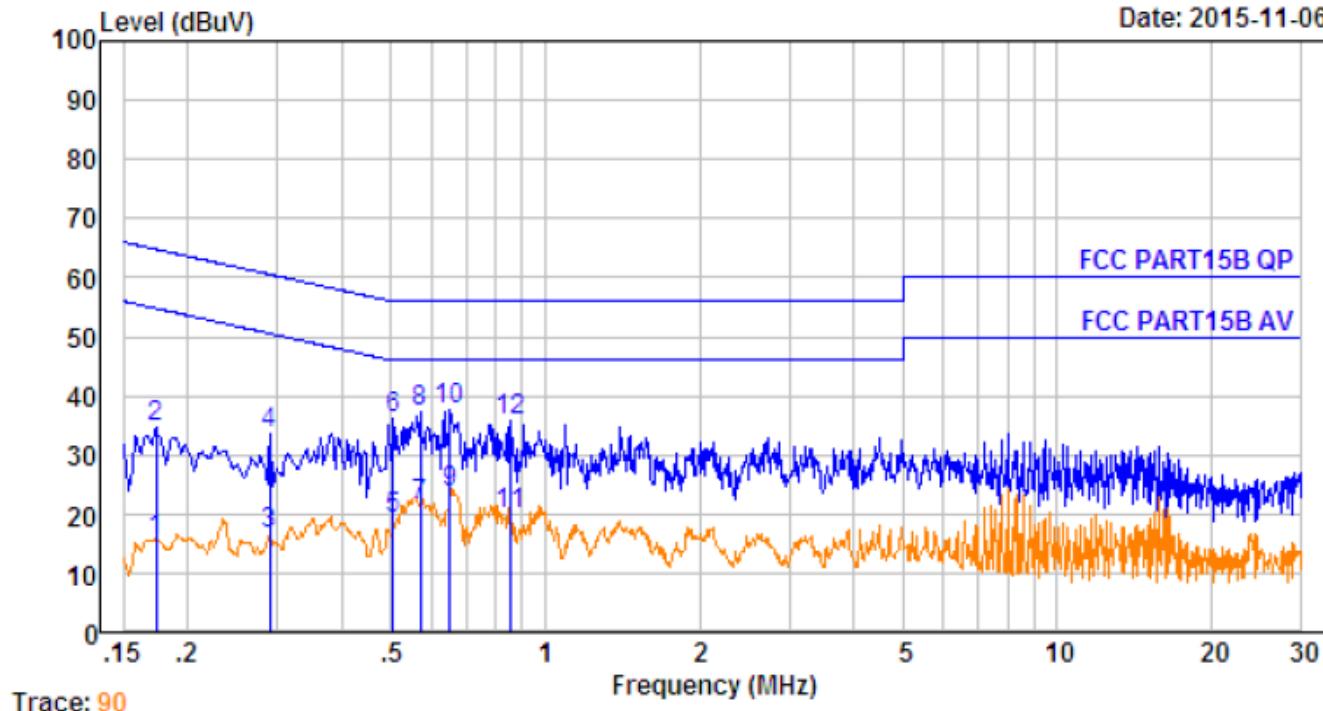
M/N: BTC100

Operating Condition: TM1; Normal Working Mode

Test Specification: Power Line, Neutral

Comment: AC 120V/60Hz

Date: 2015-11-06

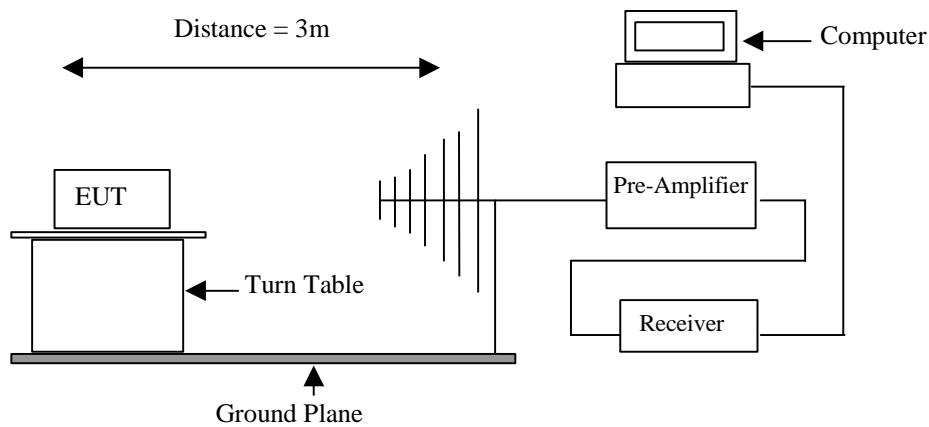


| No. | Freq MHz | Cable Loss dB | AMN Factor dB | Receiver Reading dBuV | Emission Level dBuV | Over Limit dB | Remark |
|-----|----------|---------------|---------------|-----------------------|---------------------|---------------|--------|
| 1. | 0.174 | 10.60 | 0.60 | 4.33 | 15.53 | 54.77 | -39.24 |
| 2. | 0.174 | 10.60 | 0.60 | 23.33 | 34.53 | 64.77 | -30.24 |
| 3. | 0.289 | 10.63 | 0.60 | 5.46 | 16.69 | 50.54 | -33.85 |
| 4. | 0.289 | 10.63 | 0.60 | 22.46 | 33.69 | 60.54 | -26.85 |
| 5. | 0.505 | 10.65 | 0.60 | 7.78 | 19.03 | 46.00 | -26.97 |
| 6. | 0.505 | 10.65 | 0.60 | 24.78 | 36.03 | 56.00 | -19.97 |
| 7. | 0.570 | 10.66 | 0.60 | 10.11 | 21.37 | 46.00 | -24.63 |
| 8. | 0.570 | 10.66 | 0.60 | 26.11 | 37.37 | 56.00 | -18.63 |
| 9. | 0.651 | 10.66 | 0.60 | 12.31 | 23.57 | 46.00 | -22.43 |
| 10. | 0.651 | 10.66 | 0.60 | 26.31 | 37.57 | 56.00 | -18.43 |
| 11. | 0.857 | 10.67 | 0.60 | 8.71 | 19.98 | 46.00 | -26.02 |
| 12. | 0.857 | 10.67 | 0.60 | 24.71 | 35.98 | 56.00 | -20.02 |

10.2 Radiated Emission of Fundamental Frequency

Test Requirement: FCC part 15 section 15.209(a)
 Test Method: ANSI C63.4:2003
 Test Date: 2015-11-14
 Mode of Operation: Transmitting mode.
 Detector Function: Quasi Peak(CISPR)
 Measurement BW: RBW 10KHz ; VBW 30KHz
 Trace mode: Max hold

Test Setup:



Results: PASS

| Test conditions | | Maximum power (dB μ V/m) | |
|------------------|------------------|------------------------------|-------|
| Frequency | | 117KHz | |
| Mode | | At 10 m distance | |
| T _{nom} | V _{nom} | 18.93 | -9.77 |

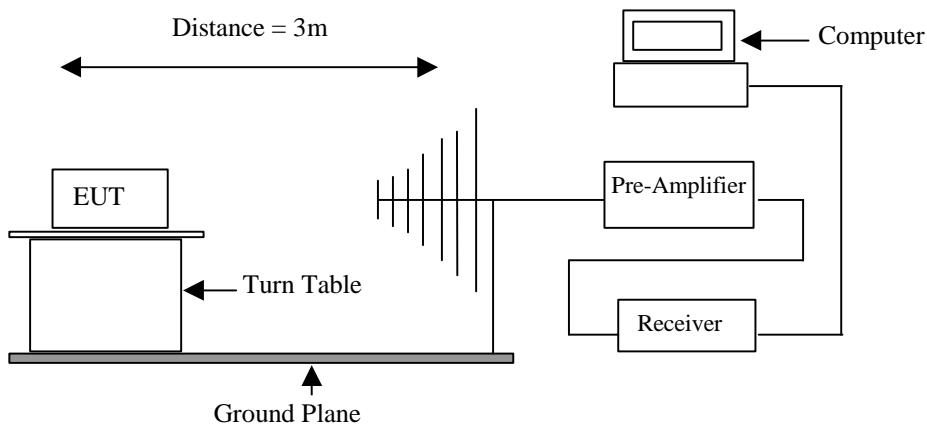
Limits for Fundamental Frequency: [Section 15.209(a)]:

| Frequency (MHz) | Field strength (μ V/m) | Measurement distance (m) |
|-----------------|-----------------------------|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30(29.5dB μ V/m) | 30 |
| 30-88 | 100(40dB μ V/m) | 3 |
| 88-216 | 150(43.5dB μ V/m) | 3 |
| 216-960 | 200(46dB μ V/m) | 3 |
| Above 960 | 500(54dB μ V/m) | 3 |

10.3 Field strength of the harmonics and spurious

Test Requirement: FCC part 15 section 15.209
 Test Method: ANSI C63.4:2003
 Test Date: 2015-11-14
 Mode of Operation: Transmitting mode.
 Detector Function Quasi Peak(CISPR)
 Measurement BW RBW 120KHz ; VBW 300KHz
 Trace mode: Max hold

Test Setup:



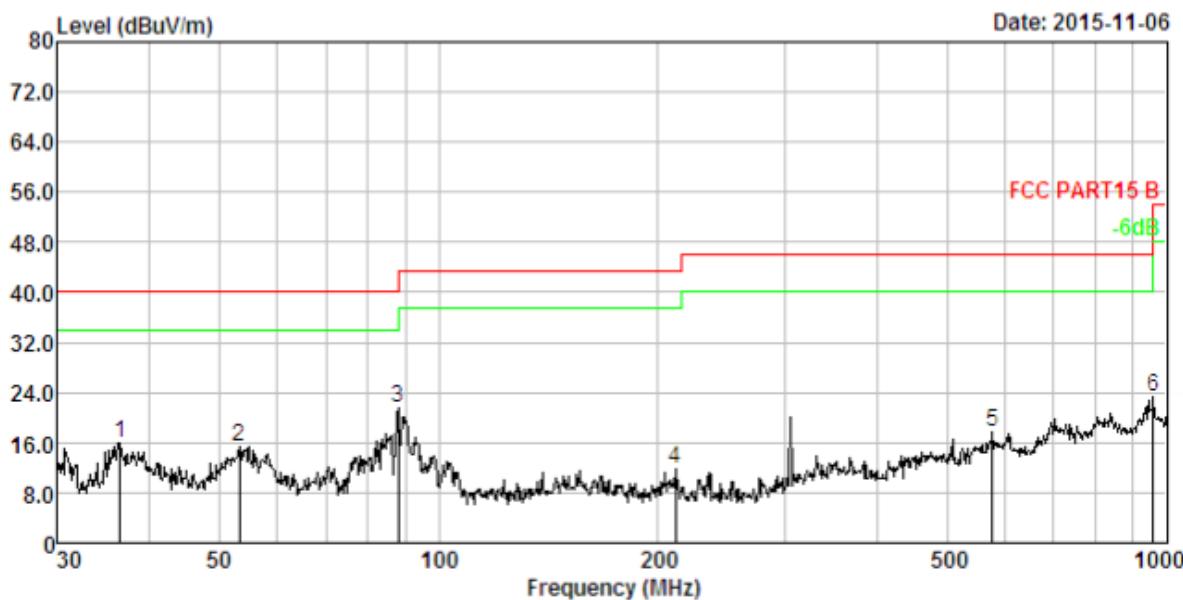
Results: PASS

EUT: MIPOW PLAYBULB SPHERE

M/N: BTC100

Operating Condition: Transmitting Mode

Test Specification: Horizontal



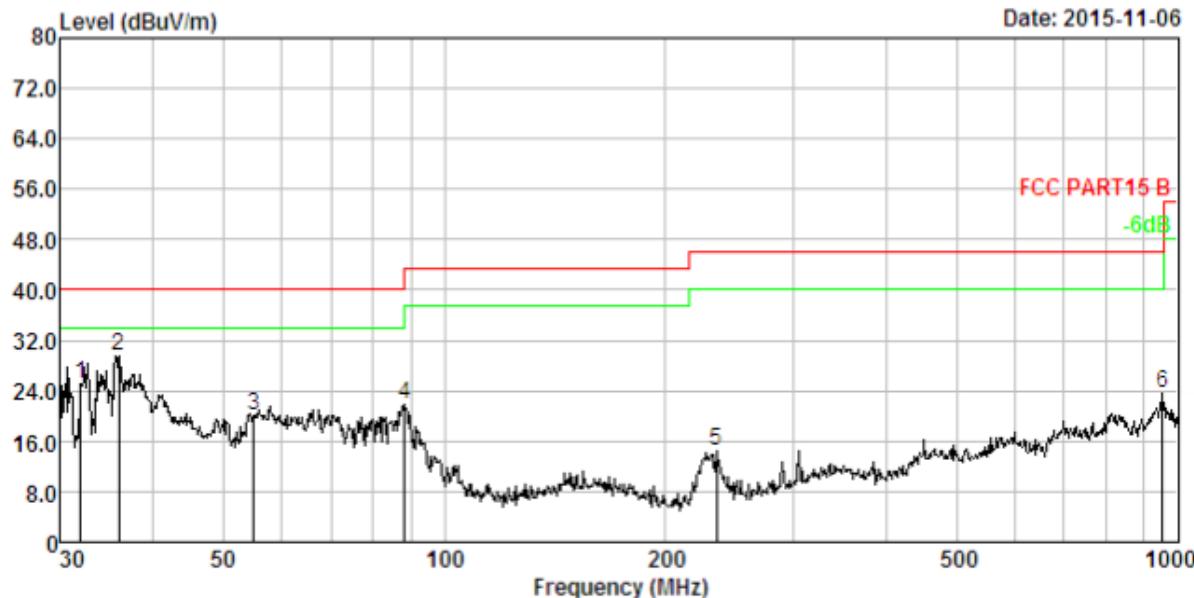
| No. | Freq MHz | Cable Loss dB | ANT Factor dB/m | Receiver Reading dB _{uV} | Preamp Factor dB | Emission Level dB _{uV/m} | Limit dB _{uV/m} | Over Limit dB | Remark |
|-----|----------|---------------|-----------------|-----------------------------------|------------------|-----------------------------------|--------------------------|---------------|--------|
| 1. | 36.509 | 1.23 | 13.47 | 31.43 | 30.04 | 16.09 | 40.00 | -23.91 | Peak |
| 2. | 53.318 | 1.58 | 12.02 | 31.97 | 30.17 | 15.40 | 40.00 | -24.60 | Peak |
| 3. | 88.033 | 2.03 | 9.06 | 40.90 | 30.34 | 21.65 | 43.50 | -21.85 | Peak |
| 4. | 211.527 | 2.82 | 10.60 | 29.04 | 30.65 | 11.81 | 43.50 | -31.69 | Peak |
| 5. | 576.644 | 3.73 | 18.55 | 26.31 | 31.00 | 17.59 | 46.00 | -28.41 | Peak |
| 6. | 958.794 | 4.19 | 23.43 | 26.83 | 31.18 | 23.27 | 46.00 | -22.73 | Peak |

EUT: MIPOW PLAYBULB SPHERE

M/N: BTC100

Operating Condition: Transmitting Mode

Test Specification: Vertical



| No. | Freq MHz | Cable Loss dB | ANT Factor dB/m | Receiver Reading dBuV | Preamp Factor dB | Emission Level dBuV/m | Limit dBuV/m | Over Limit dB | Remark |
|-----|----------|---------------|-----------------|-----------------------|------------------|-----------------------|--------------|---------------|--------|
| 1. | 31.955 | 1.11 | 13.22 | 40.85 | 29.99 | 25.19 | 40.00 | -14.81 | Peak |
| 2. | 36.001 | 1.22 | 13.44 | 45.04 | 30.03 | 29.67 | 40.00 | -10.33 | Peak |
| 3. | 55.027 | 1.60 | 11.90 | 36.75 | 30.18 | 20.07 | 40.00 | -19.93 | Peak |
| 4. | 88.342 | 2.03 | 9.10 | 41.15 | 30.35 | 21.93 | 43.50 | -21.57 | Peak |
| 5. | 234.991 | 2.92 | 11.48 | 30.70 | 30.69 | 14.41 | 46.00 | -31.59 | Peak |
| 6. | 952.094 | 4.19 | 23.43 | 27.21 | 31.17 | 23.66 | 46.00 | -22.34 | Peak |

Note: No further spurious emissions found between 30 MHz and lowest internal used/generated frequency.

Limits for Radiated Emission [Section 15.209]:

| Frequency (MHz) | Field strength (μ V/m) | Measurement distance (m) |
|-----------------|-----------------------------|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30(29.5dB μ V/m) | 30 |
| 30-88 | 100(40dB μ V/m) | 3 |
| 88-216 | 150(43.5dB μ V/m) | 3 |
| 216-960 | 200(46dB μ V/m) | 3 |
| Above 960 | 500(54dB μ V/m) | 3 |

Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in section 15.209, whichever permits a higher field strength.

Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

10.4 Bandwidth Measurement

Test Requirement: FCC part 15 section 15.215
 Test Method: ANSI C63.4:2003
 Test Date: 2015-11-17
 Mode of Operation: Transmitting continuously mode
 Detector Function: Peak
 Trace mode: Max hold

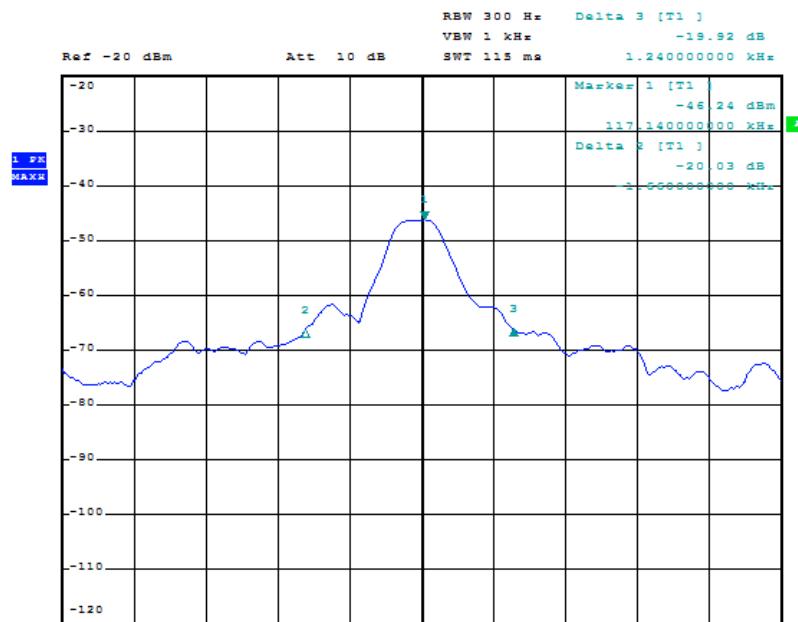
Test setup:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Result: Pass

Result data graph is shown in the following for reference.

| Occupied Bandwidth(KHz) | |
|-------------------------|------|
| 20dB | 2.90 |



11 Test Equipment List

List of Test Instruments

| | DESCRIPTION | MANUFACTURE R | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|----|-------------------------------------|-----------------|-----------|-------------|---------------|
| CE | EMI Test Receiver | Rohde & Schwarz | ESCI | 101417 | July 3, 2016 |
| | Artificial Mains Network | Narda | L2-16B | 000WX31025 | July 7, 2016 |
| | Artificial Mains Network (AUX) | Narda | L2-16B | 000WX31026 | July 7, 2016 |
| | RF Cable | SCHWARZBECK | AK9515E | 96222 | July 3, 2016 |
| | Shielded Room | CHENGYU | 843 | PTS-002 | June 5, 2016 |
| C | EMI Test Receiver | Rohde & Schwarz | ESCI | 101417 | July 3, 2016 |
| RE | EMI Test Receiver | Rohde & Schwarz | ESCI | 101417 | July 3, 2016 |
| | Trilog Broadband Antenna (25M-1GHz) | SCHWARZBECK | VULB9160 | 9160-3355 | July 3, 2016 |
| | Signal Amplifier | SCHWARZBECK | BBV 9475 | 9745-0013 | July 3, 2016 |
| | RF Cable | SCHWARZBECK | AK9515E | 96221 | July 3, 2016 |
| | 3m Anechoic Chamber | CHENGYU | 966 | PTS-001 | June 5, 2016 |
| | MULTI-DEVICE Positioning Controller | Max-Full | MF-7802 | MF780208339 | N/A |
| | Active loop antenna (9K-30MHz) | Schwarzbeck | FMZB1519 | 1519-038 | June 5, 2016 |
| | Spectrum analyzer | Agilent | E4407B | MY46185649 | June 5, 2016 |
| | Horn Antenna (1G-18GHz) | SCHWARZBECK | BBHA9120D | 9120D-1246 | June 5, 2016 |
| | Horn Ant (18G-40GHz) | Schwarzbeck | BBHA 9170 | 9170-181 | June 5, 2016 |

12 System Measurement Uncertainty

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

| System Measurement Uncertainty | |
|--|--|
| Items | Extended Uncertainty |
| Radiated Emissions Electric field 3 m distance | ±3.80 dB |
| Conducted emissions mains | ±2.45 dB |
| Conducted RF test | Power level test involved: 2.04dB Frequency test involved: 1.1×10^{-7} |