



SUZHOU KR DISPLAY EQUIPMENT CO.,LTD.

CE EMC REPORT

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Prepared For : | SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. No.27 Shuangbang Rd. Xinzhuang Town, Changshu City 215562, China |
| Product Name: | LIGHTING BOX |
| Trademark: | WHIRLWIND |
| Model : | KR-V65-A1G, KR-V65-60160, KR-V65-85200, KR-V65-100200, KR-V65-120200, KR-V80-85200, KR-V80-100200, KR-V80-100230, KR-V80-100250, KR-V100-100200, KR-V100-100230, KR-V100-100250, KR-V100C |
| Prepared By : | BST Technology (Shenzhen) Co.,Ltd. No.7, New Era Industrial Zone, Guantian, Bao'an District, Shenzhen, Guangdong, China |
| Test Date: | Dec. 01, 2021 – Sep. 21, 2121 |
| Date of Report : | Dec. 09, 2021 |
| Report No.: | BSTXD211221041901ER |



TABLE OF CONTENTS

| | |
|-------------------------------------------------------------|-----------|
| TEST REPORT DECLARATION..... | 5 |
| 1. TEST RESULTS SUMMARY..... | 6 |
| 2. GENERAL INFORMATION..... | 7 |
| 2.1. Report information..... | 7 |
| 2.2. Measurement Uncertainty..... | 7 |
| 3. PRODUCT DESCRIPTION..... | 8 |
| 3.1. EUT Description..... | 8 |
| 3.2. Block Diagram of EUT Configuration..... | 8 |
| 3.3. Operating Condition of EUT..... | 8 |
| 3.4. Test Conditions..... | 8 |
| 3.5. Modifications..... | 8 |
| 3.6. Abbreviations..... | 9 |
| 3.7. Performance Criterion..... | 9 |
| 4. TEST EQUIPMENT USED..... | 10 |
| 4.1. For Conducted Emission Test..... | 10 |
| 4.2. For Magnetic Test (In Shielding Room)..... | 10 |
| 4.3. For Radiated Emission Measurement..... | 10 |
| 4.4. For Harmonic / Flicker Test..... | 10 |
| 4.5. For Electrostatic Discharge Immunity Test..... | 10 |
| 4.6. For RF Strength Susceptibility Test..... | 11 |
| 4.7. For Electrical Fast Transient/Burst Immunity Test..... | 11 |
| 4.8. For Surge Test..... | 11 |
| 4.9. For Injected Currents Susceptibility Test..... | 11 |
| 4.10. For Magnetic Field Immunity Test..... | 11 |
| 4.11. For Voltage Dips and Interruptions Test..... | 11 |
| 5. POWER LINE CONDUCTED EMISSION TEST..... | 12 |
| 5.1. Block Diagram of Test Setup..... | 12 |
| 5.2. Test Standard..... | 12 |
| 5.3. Power Line Conducted Emission Limit..... | 12 |
| 5.4. EUT Configuration on Test..... | 12 |
| 5.5. Operating Condition of EUT..... | 13 |
| 5.6. Test Procedure..... | 13 |
| 5.7. Test Result..... | 13 |
| 6. MAGNETIC TEST..... | 14 |
| 6.1. Block Diagram of Test Setup..... | 14 |
| 6.2. Test Standard..... | 14 |
| 6.3. Magnetic Field Emission Limits..... | 14 |
| 6.4. EUT Configuration on Test..... | 14 |
| 6.5. Operating Condition of EUT..... | 14 |
| 6.6. Test Procedure..... | 15 |
| 6.7. Test Results..... | 15 |
| 7. RADIATED EMISSION TEST..... | 16 |



| | |
|--------------------------------------------------------|-----------|
| 7.1. Semi-Anechoic Chamber Setup Diagram..... | 16 |
| 7.2. Test Standard..... | 16 |
| 7.3. Radiated Emission Limit..... | 16 |
| 7.4. EUT Configuration on Test..... | 16 |
| 7.5. Operating Condition of EUT..... | 17 |
| 7.6. Test Procedure..... | 17 |
| 7.7. Test Results..... | 17 |
| 8. HARMONIC CURRENT EMISSION TEST..... | 18 |
| 8.1. Block Diagram of Test Setup..... | 18 |
| 8.2. Test Standard..... | 18 |
| 8.3. Operating Condition of EUT..... | 18 |
| 8.4. Test Procedure..... | 18 |
| 8.5. Test Results..... | 18 |
| 9. VOLTAGE FLUCTUATIONS & FLICKER TEST..... | 19 |
| 9.1. Block Diagram of Test Setup..... | 19 |
| 9.2. Test Standard..... | 19 |
| 9.3. Operating Condition of EUT..... | 19 |
| 9.4. Test Data..... | 19 |
| 9.5. Test Results..... | 19 |
| 10. ELECTROSTATIC DISCHARGE TEST..... | 20 |
| 10.1. Block Diagram of ESD Test Setup..... | 20 |
| 10.2. Test Standard..... | 20 |
| 10.3. Severity Levels and Performance Criterion..... | 20 |
| 10.4. EUT Configuration on Test..... | 20 |
| 10.5. Operating Condition of EUT..... | 21 |
| 10.6. Test Procedure..... | 21 |
| 10.7. Test Results..... | 21 |
| 11. RF FIELD STRENGTH SUSCEPTIBILITY TEST..... | 23 |
| 11.1. R/S Test Setup..... | 23 |
| 11.2. Test Standard..... | 23 |
| 11.3. Severity Levels and Performance Criterion..... | 23 |
| 11.4. EUT Configuration on Test..... | 24 |
| 11.5. Operating Condition of EUT..... | 24 |
| 11.6. Test Procedure..... | 24 |
| 11.7. Test Results..... | 24 |
| 12. ELECTRICAL FAST TRANSIENT/BURST TEST..... | 26 |
| 12.1. EFT Test Setup..... | 26 |
| 12.2. Test Standard..... | 26 |
| 12.3. Severity Levels and Performance Criterion..... | 26 |
| 12.4. EUT Configuration on Test..... | 26 |
| 12.5. Operating Condition of EUT..... | 26 |
| 12.6. Test Procedure..... | 27 |
| 12.7. Test Results..... | 27 |
| 13. SURGE TEST..... | 29 |
| 13.1. Surge Test Setup..... | 29 |
| 13.2. Test Standard..... | 29 |
| 13.3. Severity Levels and Performance Criterion..... | 29 |
| 13.4. EUT Configuration on Test..... | 29 |



| | |
|-------------------------------------------------------|-----------|
| 13.5. Operating Condition of EUT..... | 29 |
| 13.6. Test Procedure..... | 30 |
| 13.7. Test Results..... | 30 |
| 14. INJECTED CURRENTS SUSCEPTIBILITY TEST..... | 32 |
| 14.1. Block Diagram of Test AC Mains Setup..... | 32 |
| 14.2. Test Standard..... | 32 |
| 14.3. Severity Levels and Performance Criterion..... | 32 |
| 14.4. EUT Configuration on Test..... | 32 |
| 14.5. Operating Condition of EUT..... | 32 |
| 14.6. Test Procedure..... | 33 |
| 14.7. Test Results..... | 33 |
| 15. MAGNETIC FIELD IMMUNITY TEST..... | 35 |
| 15.1. Block Diagram of Test Setup..... | 35 |
| 15.2. Test Standard..... | 35 |
| 15.3. Severity Levels and Performance Criterion..... | 35 |
| 15.4. EUT Configuration on Test..... | 35 |
| 15.5. Operating Condition of EUT..... | 35 |
| 15.6. Test Procedure..... | 36 |
| 15.7. Test Results..... | 36 |
| 16. VOLTAGE DIPS AND INTERRUPTIONS TEST..... | 38 |
| 16.1. Voltage Dips and Interruptions Test Setup..... | 38 |
| 16.2. Test Standard..... | 38 |
| 16.3. Severity Levels and Performance Criterion..... | 38 |
| 16.4. EUT Configuration on Test..... | 38 |
| 16.5. Operating Condition of EUT..... | 38 |
| 16.6. Test Procedure..... | 39 |
| 16.7. Test Result..... | 39 |
| APPENDIX I..... | 41 |
| APPENDIX II..... | 46 |
| APPENDIX III..... | 50 |
| APPENDIX IV..... | 53 |



TEST REPORT DECLARATION

| | |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicant | : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. |
| Address | : No.27 Shuangbang Rd. Xinzhuang Town, Changshu City 215562, China |
| EUT Description | : LIGHTING BOX |
| Model Number | : KR-V65-A1G, KR-V65-60160, KR-V65-85200, KR-V65-100200, KR-V65-120200, KR-V80-85200, KR-V80-100200, KR-V80-100230, KR-V80-100250, KR-V100-100200, KR-V100-100230, KR-V100-100250, KR-V100C (Note: The series products have the same circuit diagram, PCB layout and functionality. The differences are the model name and appearance, so, we select KR-V65-A1G to test.) |

Test Standards:

- EN IEC 55015:2019/A11:2020
- EN 61547:2009
- EN IEC 61000-3-2:2019/A1:2021
- EN 61000-3-3:2013/A1:2019

The EUT described above is tested by BST Technology (Shenzhen) Co.,Ltd. EMC Laboratory to determine the maximum emissions from the EUT and ensure the EUT to be compliance with the immunity requirements of the EUT. BST Technology (Shenzhen) Co.,Ltd. EMC Laboratory is assumed full responsibility for the accuracy of the test results. Also, this report shows that the EUT technically complies with the 2014/30/EU directive and its amendment requirements.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Prepared by :

Anna

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Toby Zhong

Test Engineer

Reviewer :

Tom chen



Approved & Authorized Signer :

Salon/Manager



1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

| Test Items | Test Results |
|---------------------------------------|--------------|
| Power Line Conducted Emission Test | PASS |
| Magnetic Test | PASS |
| Radiated Emission | PASS |
| Harmonic Current Emission Test | PASS |
| Voltage Fluctuations & Flicker Test | PASS |
| Electrostatic Discharge Test | PASS |
| RF Field Strength Susceptibility Test | PASS |
| Electrical Fast Transient/Burst Test | PASS |
| Surge Test | PASS |
| Injected Currents Susceptibility Test | PASS |
| Magnetic Field Immunity Test | PASS |
| Voltage Dips And Interruptions Test | PASS |
| | |



2. GENERAL INFORMATION

2.1. Report information

- 2.1.1. 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 BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.
- 2.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 2.1.3. 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 BST, unless the applicant has authorized BST in writing to do so.

2.2. Measurement Uncertainty

(95% confidence levels, $k=2$)

| Test Item | Uncertainty |
|------------------------------------------------------------|-------------|
| Uncertainty for Conduction emission test | 2.2dB |
| Uncertainty for Magnetic emission test | 3.3dB |
| Uncertainty for Radiation emission test (30MHz to 1GHz) | 4.0dB |

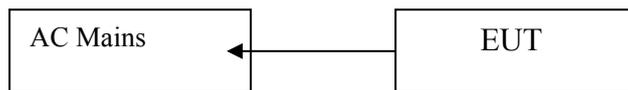


3. PRODUCT DESCRIPTION

3.1.EUT Description

| | | |
|--------------|---|-------------------------------------------------------------------------------------------------------------|
| Description | : | LIGHTING BOX |
| Applicant | : | SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. No.27 Shuangbang Rd. Xinzhuang Town, Changshu City 215562, China |
| Manufacturer | : | SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. No.27 Shuangbang Rd. Xinzhuang Town, Changshu City 215562, China |
| Model Number | : | KR-V65-A1G |

3.2.Block Diagram of EUT Configuration



3.3.Operating Condition of EUT

Test mode 1: ON

3.4.Test Conditions

Temperature: 23-26°C
Relative Humidity: 55-68 %

3.5.Modifications

No modification was made.



3.6. Abbreviations

| | |
|-----|--------------------------------|
| AC | Alternating Current |
| AMN | Artificial Mains Network |
| DC | Direct Current |
| EM | ElectroMagnetic |
| EMC | ElectroMagnetic Compatibility |
| EUT | Equipment Under Test |
| IF | Intermediate Frequency |
| RF | Radio Frequency |
| rms | root mean square |
| EMI | Electromagnetic Interference |
| EMS | Electromagnetic Susceptibility |

3.7. Performance Criterion

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

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

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



4. TEST EQUIPMENT USED

4.1.For Conducted Emission Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|----------------|-----------------|-----------|------------|-------------|---------------|
| 1. | Test Receiver | Rohde & Schwarz | ESHS30 | 828985/018 | Sep. 21, 21 | 1 Year |
| 2. | Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100006 | Sep. 21, 21 | 1 Year |
| 3. | L.I.S.N. | Rohde & Schwarz | ESH2-Z5 | 834549/005 | Sep. 21, 21 | 1 Year |
| 4. | Conical | Emtek | N/A | N/A | N/A | N/A |
| 5. | Voltage Probe | Schwarzbeck | TK9416 | N/A | Sep. 21, 21 | 1 Year |
| 6. | Coaxial Switch | Anritsu | MP59B | 6100214550 | Sep. 21, 21 | 1 Year |

4.2.For Magnetic Test (In Shielding Room)

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|---------------------|-----------------|-----------|----------------|-------------|---------------|
| 1. | Test Receiver | Rohde & Schwarz | ESHS20 | 836600/006 | Sep. 21, 21 | 1 Year |
| 2. | Triple-loop Antenna | Rohde & Schwarz | HM020 | 843885/002 | Sep. 21, 21 | 1 Year |
| 3. | RF Cable | MIYAZAKI | 5D-2W | Tri-loop Cable | Sep. 21, 21 | 1/2 Year |
| 4. | Coaxial Switch | Anritsu | MP59B | M73989 | Sep. 21, 21 | 1/2 Year |

4.3.For Radiated Emission Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-------------------|---------------|-----------|------------|-------------|---------------|
| 1. | Spectrum Analyzer | ANRITSU | MS2661C | 6200140915 | Sep. 21, 21 | 1 Year |
| 2. | Test Receiver | Rohde&Schwarz | ESC830 | 828982/018 | Sep. 21, 21 | 1 Year |
| 3. | Bilog Antenna | Schwarzbeck | VULB9163 | 142 | Sep. 21, 21 | 1 Year |
| 4. | 50 Coaxial Switch | Anritsu Corp | MP59B | 6100237248 | Sep. 21, 21 | 1 Year |
| 5. | Cable | Schwarzbeck | AK9513 | ACRX1 | Sep. 21, 21 | 1 Year |
| 6. | Cable | Rosenberger | N/A | FR2RX2 | Sep. 21, 21 | 1 Year |
| 7. | Cable | Schwarzbeck | AK9513 | CRRX2 | Sep. 21, 21 | 1 Year |
| 8. | Cable | Schwarzbeck | AK9513 | CRRX2 | Sep. 21, 21 | 1 Year |
| 9. | Signal Generator | HP | 864A | 3625U00573 | Sep. 21, 21 | 1 Year |

4.4.For Harmonic / Flicker Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-------------------------------|--------------|-----------|------------|-------------|---------------|
| 1. | Harmonic and Flicker analyzer | Laplace | AC2000A | 309709 | Sep. 21, 21 | 1 Year |

4.5.For Electrostatic Discharge Immunity Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|------------|--------------|-----------|------------|-------------|---------------|
| 1. | ESD Tester | HAEFELY | PSD 1600 | H911'292 | Sep. 21, 21 | 1 Year |



4.6.For RF Strength Susceptibility Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-------------------------|--------------|-------------|------------|-------------|---------------|
| 1. | Signal Generator | HP | 8648A | 3633A02081 | Sep. 21, 21 | 1 Year |
| 2. | Amplifier | A&R | 500A100 | 17034 | NCR | NCR |
| 3. | Amplifier | A&R | 100W/1000M1 | 17028 | NCR | NCR |
| 4. | Isotropic Field Monitor | A&R | FM2000 | 16829 | NCR | NCR |
| 5. | Isotropic Field Probe | A&R | FLW220100 | 16755 | Sep. 21, 21 | 1 Year |
| 6. | Biconic Antenna | EMCO | 3108 | 9507-2534 | NCR | NCR |
| 7. | Log-periodic Antenna | A&R | AT1080 | 16812 | NCR | NCR |
| 8. | PC | N/A | 486DX2 | N/A | N/A | N/A |

4.7.For Electrical Fast Transient/Burst Immunity Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|--------------|--------------|-----------|------------|-------------|---------------|
| 1. | Burst Tester | HAEFELY | PEFT 4010 | 080981-16 | Sep. 21, 21 | 1 Year |

4.8.For Surge Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|--------------|--------------|-----------|------------|-------------|---------------|
| 1. | Surge Tester | HAEFELY | PSURGE4.1 | 080107-04 | Sep. 21, 21 | 1 Year |

4.9.For Injected Currents Susceptibility Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-----------------|--------------|-------------|--------------|-------------|---------------|
| 1. | Simulator | EMTEST | CWS 500C | 0900-12 | Sep. 21, 21 | 1 Year |
| 2. | CDN | EMTEST | CDN-M2 | 510010010010 | Sep. 21, 21 | 1 Year |
| 3. | VDN | EMTEST | CDN-M3 | 0900-11 | Sep. 21, 21 | 1 Year |
| 4. | Injection Clamp | EMTEST | F-2031-23MM | 368 | Sep. 21, 21 | 1 Year |
| 5. | Attenuator | EMTEST | ATT6 | 0010222a | Sep. 21, 21 | 1 Year |

4.10.For Magnetic Field Immunity Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-----------------------|--------------|-----------|------------|-------------|---------------|
| 1. | Magnetic Field Tester | HEAFELY | MAG100.1 | 083858-10 | Sep. 21, 21 | 1 Year |

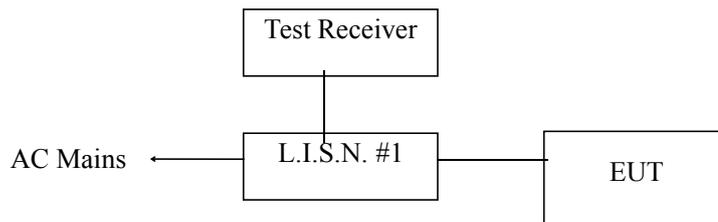
4.11.For Voltage Dips and Interruptions Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|-------------|--------------|------------|------------|-------------|---------------|
| 1. | Dips Tester | HEAFELY | PLINE 1610 | 083732-18 | Sep. 21, 21 | 1 Year |



5. POWER LINE CONDUCTED EMISSION TEST

5.1. Block Diagram of Test Setup



5.2. Test Standard

EN IEC 55015:2019/A11:2020

5.3. Power Line Conducted Emission Limit

| Frequency | At mains terminals (dB μ V) | |
|------------------|---------------------------------|---------------|
| | Quasi-peak Level | Average Level |
| 9KHz ~ 50KHz | 110 | -- |
| 50KHz ~ 150KHz | 90 ~ 80* | -- |
| 150KHz ~ 0.5MHz | 66 ~ 56* | 56 ~ 46* |
| 0.5MHz ~ 2.51MHz | 56 | 46 |
| 2.51MHz ~ 3.0MHz | 73 | 63 |
| 3.0MHz ~ 5.0MHz | 56 | 46 |
| 5.0MHz ~ 30MHz | 60 | 50 |

1. At the transition frequency the lower limit applies.
2. * decreasing linearly with logarithm of the frequency.

5.4. EUT Configuration on Test

The following equipments are installed on conducted emission test to meet EN55015 requirement and operating in a manner, which tends to maximize its emission characteristics in a normal application.

5.4.1. EUT Information

Model Number : KR-V65-A1G
Serial Number : N/A
Manufacturer : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD



5.5. Operating Condition of EUT

- 5.5.1. Setup the EUT and simulators as shown in Section 5.1.
- 5.5.2. Turn on the power of all equipments.
- 5.5.3. Let the EUT work in test mode (ON) and test it.

5.6. Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground and connected to the AC mains through a Line Impedance Stabilization Network (L.I.S.N.). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are checked to find out the maximum conducted emission according to the EN55015 regulations during conducted emission test. And the voltage probe had been used for the load terminals test according to the EN55015 standard.

The bandwidth of the test receiver is set at 9kHz. in 150kHz~30MHz and 200Hz bandwidth in 9kHz~150kHz.

The frequency range from 9kHz to 30MHz is checked.

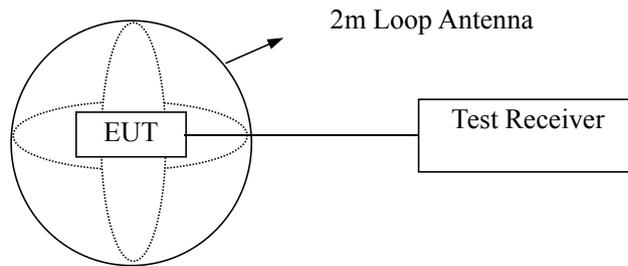
All the test results are listed in Section 5.7. The scanning waveform is put in **Appendix I**.

5.7. Test Result

PASS.

6. MAGNETIC TEST

6.1. Block Diagram of Test Setup



(EUT: LIGHTING BOX)

6.2. Test Standard

EN IEC 55015:2019/A11:2020

6.3. Magnetic Field Emission Limits

| Frequency | Limits for loop diameter (dB μ A) | |
|-----------------|---------------------------------------|--|
| | 2m | |
| 9KHz ~ 70KHz | 88 | |
| 70KHz ~ 150KHz | 88 ~ 58* | |
| 150KHz ~ 2.2MHz | 58 ~ 26* | |
| 2.2MHz ~ 3.0MHz | 58 | |
| 3.0MHz ~ 30MHz | 22 | |

1. At the transition frequency the lower limit applies.
2. * decreasing linearly with logarithm of the frequency.

6.4. EUT Configuration on Test

The configuration of the EUT is same as Section 3.2..

6.5. Operating Condition of EUT

- 6.5.1. Setup the EUT as shown in Section 6.1.
- 6.5.2. Turn on the power of all equipments.
- 6.5.3. Let the EUT work in test mode (ON) and test it.



6.6. Test Procedure

The EUT is placed on a wood table in the center of a loop antenna. The induced current in the loop antenna is measured by means of a current probe and the test receiver. Three field components is checked by means of a coax switch.

The frequency range from 9kHz to 30MHz is investigated. The receiver is measured with the quasi-peak detector. For frequency band 9kHz to 150kHz, the bandwidth of the field strength meter is set at 200Hz. For frequency band 150kHz to 30MHz, the bandwidth is set at 9kHz.

All the test results are listed in Section 6.7. and all the scanning waveform is put in **Appendix II**.

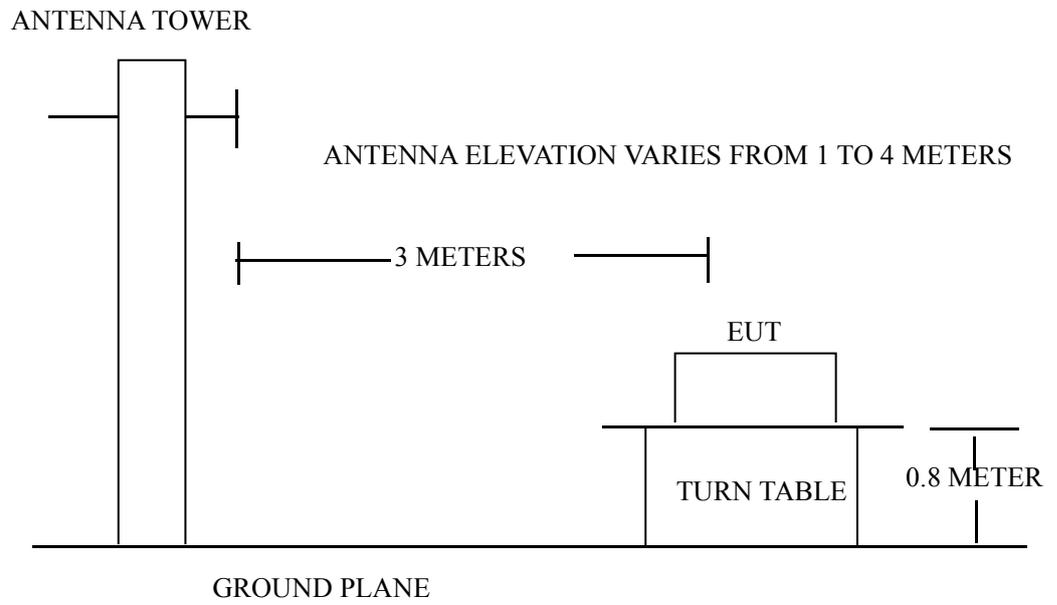
6.7. Test Results

PASS.

The frequency range from 9kHz to 30MHz is investigated.
As the peak value is too low against the limit, so the Quasi-peak value has been omitted.

7. RADIATED EMISSION TEST

7.1.Semi-Anechoic Chamber Setup Diagram



7.2.Test Standard

EN IEC 55015:2019/A11:2020

7.3.Radiated Emission Limit

All emanations from a 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 ~ 300 | 3 | 47 |

Note:(1) The tighter limit shall apply at the edge between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instruments antenna and the closed point of any part of the EUT.

7.4.EUT Configuration on Test

The EN55015 regulations test method must be used to find the maximum emission during radiated emission test.



7.5. Operating Condition of EUT

- 7.5.1. Setup the EUT as shown on Section 7.1.
- 7.5.2. Turn on the power of all equipments.
- 7.5.3. Let the EUT work in test mode (ON) and test it.

7.6. Test Procedure

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 are set on test.

The bandwidth setting on the test receiver is 120 kHz.

The EUT is tested in Semi-Anechoic Chamber. and all the scanning waveform is put in **Appendix III.**

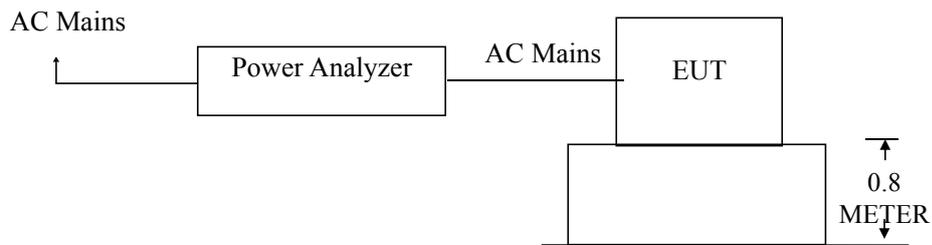
7.7. Test Results

PASS.



8. HARMONIC CURRENT EMISSION TEST

8.1. Block Diagram of Test Setup



(EUT: LIGHTING BOX)

8.2. Test Standard

EN IEC 61000-3-2:2019/A1:2021

Class C

8.3. Operating Condition of EUT

- 8.3.1. Setup the EUT as shown in Section 8.1.
- 8.3.2. Turn on the power of all equipments.
- 8.3.3. Let the EUT work in test mode (ON) and test it.

8.4. Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the Power of the EUT and use the test system to test the harmonic current level.

8.5. Test Results

PASS.



9. VOLTAGE FLUCTUATIONS & FLICKER TEST

9.1. Block Diagram of Test Setup

Same as Section 8.1..

9.2. Test Standard

EN 61000-3-3:2013/A1:2019

9.3. Operating Condition of EUT

Same as Section 8.3.. The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test.

Flicker Test Limit

| Test items | Limits |
|------------|---------------------------|
| Pst | 1.0 |
| dc | 3.3% |
| dmax | 4.0% |
| dt | Not exceed 3.3% for 500ms |

9.4. Test Data

Flicker test Data

Model No.: KR-V65-A1G

Test Mode: 1

| Items | Reading | Limit |
|-------|---------|---------------------------|
| dmax | 0.01 | 4.0% |
| dc | 0.03 | 3.3% |
| dt | 0.05 | Not exceed 3.3% for 500ms |
| Pst | 0.001 | 1.0 |

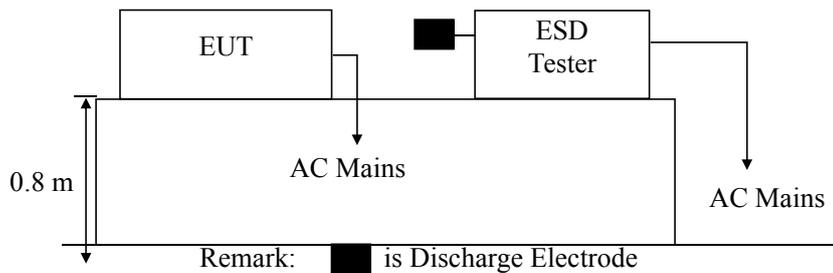
9.5. Test Results

PASS.



10.ELECTROSTATIC DISCHARGE TEST

10.1.Block Diagram of ESD Test Setup



10.2.Test Standard

EN61547:2009 (EN61000-4-2:2009)
Severity Level 3 for Air Discharge at 8KV
Severity Level 2 for Contact Discharge at 4KV

10.3.Severity Levels and Performance Criterion

10.3.1.Severity level

| Level | Test Voltage Contact Discharge (KV) | Test Voltage Air Discharge (KV) |
|-------|----------------------------------------|------------------------------------|
| 1. | 2 | 2 |
| 2. | 4 | 4 |
| 3. | 6 | 8 |
| 4. | 8 | 15 |
| X. | Special | Special |

10.3.2.Performance criterion: B

10.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.



10.5. Operating Condition of EUT

- 10.5.1. Setup the EUT as shown in Section 10.1.
- 10.5.2. Turn on the power of all equipments.
- 10.5.3. Let the EUT work in test mode (ON) and test it.

10.6. Test Procedure

10.6.1. Air Discharge:

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

10.6.2. Contact Discharge:

All the procedure shall be same as Section 10.6.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

10.6.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

10.6.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

10.7. Test Results

PASS.



Electrostatic Discharge Test Results

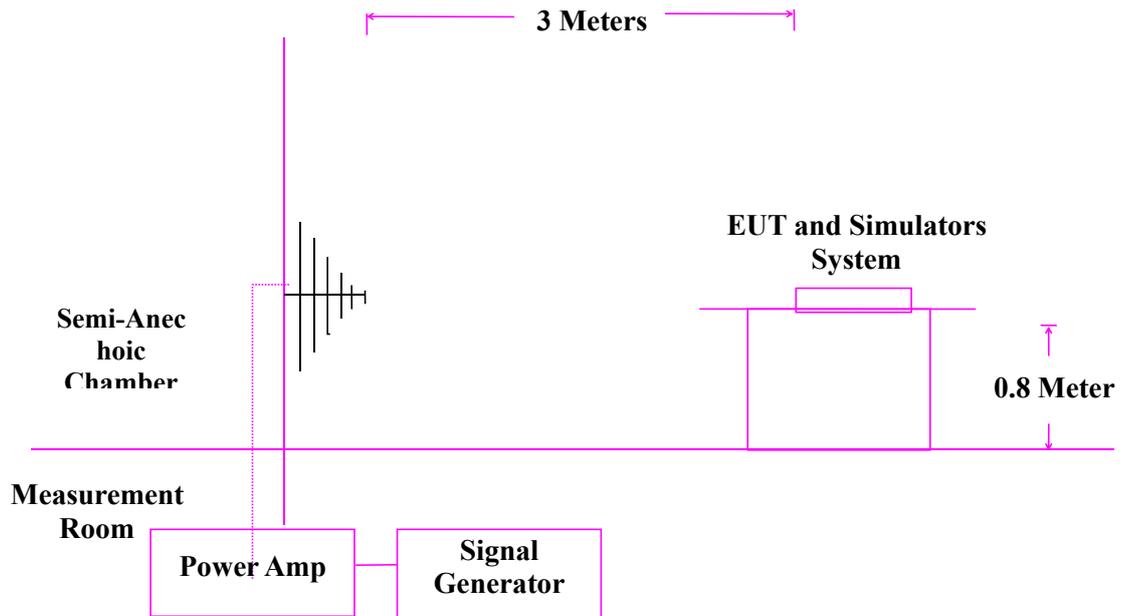
BST Technology (Shenzhen) Co.,Ltd.

| | | | |
|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------|------------------------|
| <i>Applicant</i> | <i>SUZHOU KR DISPLAY EQUIPMENT CO.,LTD.</i> | <i>Test Date</i> | <i>: Dec .07, 2021</i> |
| <i>EUT</i> | <i>LIGHTING BOX</i> | <i>Temperature</i> | <i>: 22 °C</i> |
| <i>M/N</i> | <i>KR-V65-A1G</i> | <i>Humidity</i> | <i>: 50 %</i> |
| <i>Power Supply</i> | <i>AC230V, 50Hz</i> | <i>Test Mode</i> | <i>: ON</i> |
| <i>Air Discharge: ±8KV For each point positive 10 times and negative 10 times discharge.</i> | | | |
| <i>Contact Discharge: ±4KV</i> | | | |
| <i>Location</i> | <i>Kind</i> <i>A-Air Discharge</i> <i>C-Contact Discharge</i> | <i>Result</i> | |
| <i>Slots</i> | <i>A</i> | <i>PASS</i> | |
| <i>Metal Parts</i> | <i>C</i> | <i>PASS</i> | |
| <i>HCP</i> | <i>C</i> | <i>PASS</i> | |
| <i>VCP</i> | <i>C</i> | <i>PASS</i> | |

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

11. RF FIELD STRENGTH SUSCEPTIBILITY TEST

11.1. R/S Test Setup



11.2. Test Standard

EN61547:2009 (EN 61000-4-3:2006 + A1:2008 + A2:2010)
Severity Level 2 at 3V / m

11.3. Severity Levels and Performance Criterion

11.3.1. Severity level

| Level | Field Strength V/m |
|-------|--------------------|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| X. | Special |

11.3.2. Performance criterion : A



11.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

11.5.Operating Condition of EUT

Setup the EUT as shown in Section 11.1.. The operating condition of EUT are listed in section 3.3.

11.6.Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance, a CCD camera is used to monitor the EUT. All the scanning conditions are as follows :

| Condition of Test | Remarks |
|------------------------------|------------------------------|
| 1. Fielded Strength | 3 V/m (Severity Level 2) |
| 2. Radiated Signal | Modulated |
| 3. Scanning Frequency | 80 - 1000 MHz, 1.4GHz-2.7GHz |
| 4. Sweeping time of radiated | 0.0015 decade/s |
| 5. Dwell Time | 1 Sec. |

11.7.Test Results

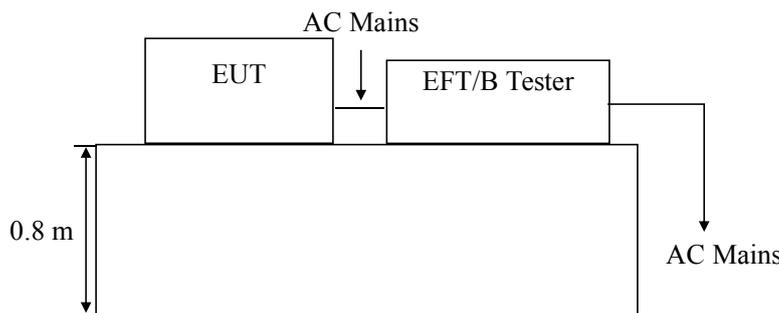
PASS.

Please refer to the following page.



12. ELECTRICAL FAST TRANSIENT/BURST TEST

12.1. EFT Test Setup



12.2. Test Standard

EN61547:2009 (EN61000-4-4:2012)
Severity Level 2 at 1KV

12.3. Severity Levels and Performance Criterion

12.3.1. Severity level

| Open Circuit Output Test Voltage $\pm 10\%$ | | |
|---------------------------------------------|-----------------------|-----------------------------------------------------|
| Level | On Power Supply Lines | On I/O (Input/Output) Signal data and control lines |
| 1. | 0.5 KV | 0.25 KV |
| 2. | 1 KV | 0.5 KV |
| 3. | 2 KV | 1 KV |
| 4. | 4 KV | 2 KV |
| X | Special | Special |

12.3.2. Performance criterion : B

12.4. EUT Configuration on Test

The configuration of EUT are listed in Section 3.2..

12.5. Operating Condition of EUT

Setup the EUT as shown in Section 12.1.. The operating condition of EUT are listed in section 3.3.



12.6. Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between the EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

12.6.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

12.6.2. For signal lines and control lines ports:

It's unnecessary to test.

12.6.3. For DC output line ports:

It's unnecessary to test.

12.7. Test Results

PASS.

Please refer to the following page.



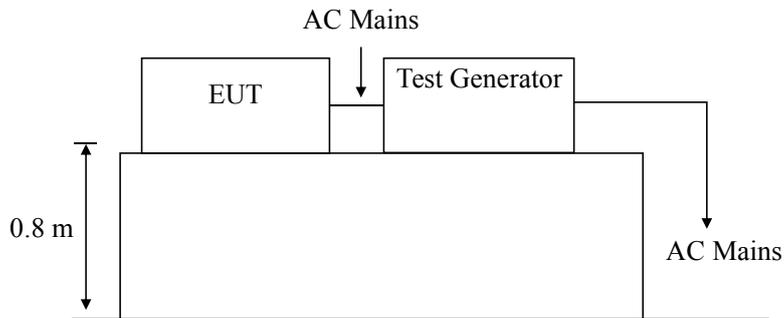
Electrical Fast Transient/Burst Test Results

BST Technology (Shenzhen) Co.,Ltd.

| | | | | | | | | | |
|--------------------------------|----------------------------------------|-----------------------|----------------------|----------------|--------------------|-------------------|-----------------------|----------------------|----------------|
| <i>Applicant</i> | : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. | <i>Test Date</i> | : Dec .07, 2021 | | | | | | |
| <i>EUT</i> | : LIGHTING BOX | <i>Temperature</i> | : 22 °C | | | | | | |
| <i>M/N</i> | : KR-V65-A1G | <i>Humidity</i> | : 50 % | | | | | | |
| <i>Power Supply</i> | : AC 230V, 50Hz | <i>Test Mode</i> | : ON | | | | | | |
| <i>Inject Place : AC Mains</i> | | | | | | | | | |
| <i>Inject Line</i> | <i>Voltage KV</i> | <i>Inject Time(s)</i> | <i>Inject Method</i> | <i>Results</i> | <i>Inject Line</i> | <i>Voltage KV</i> | <i>Inject Time(s)</i> | <i>Inject Method</i> | <i>Results</i> |
| L | ±1 | 120 | Direct | PASS | | | | | |
| N | ±1 | 120 | Direct | PASS | | | | | |
| L N | ±1 | 120 | Direct | PASS | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

13.SURGE TEST

13.1.Surge Test Setup



13.2.Test Standard

EN61547:2009 (EN61000-4-5:2014)
Severity Level 2 for Line to Neutral at 1.0KV

13.3.Severity Levels and Performance Criterion

13.3.1.Severity level

| Severity Level | Open-Circuit Test Voltage KV |
|----------------|---------------------------------|
| 1 | 0.5 |
| 2 | 1.0 |
| 3 | 2.0 |
| 4 | 4.0 |
| * | Special |

Performance criterion : **B**

13.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

13.5.Operating Condition of EUT

13.5.1.Setup the EUT as shown in Section 13.1..

13.5.2.Turn on the power of all equipments.

13.5.3.Let the EUT work in test mode (ON) and test it..



13.6. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 13.1
- 2) For line to line coupling mode, provide a 1KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

13.7. Test Results

PASS.

Please refer to the following page.



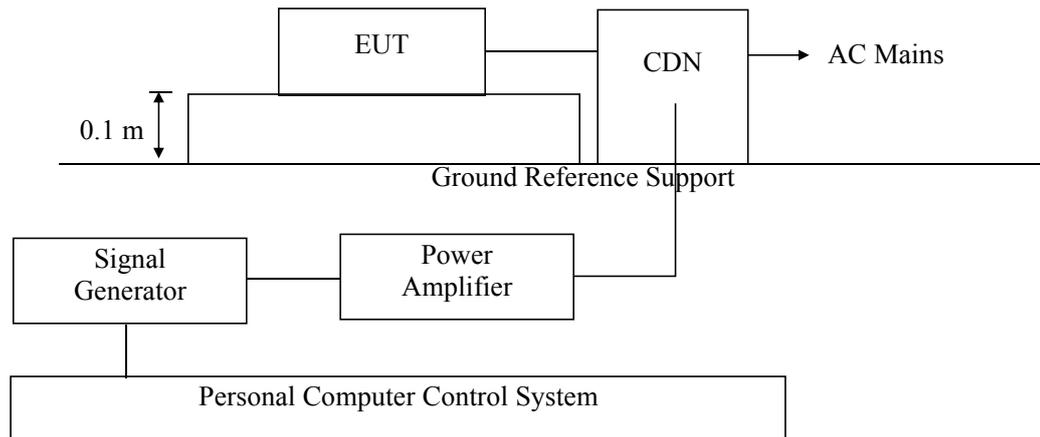
Surge Immunity Test Results

BST Technology (Shenzhen) Co.,Ltd.

| <i>Applicant</i> : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. | | | | <i>Test Date</i> : Dec .07, 2021 | |
|---------------------------------------------------------|-----------------|--------------------|--------------------|----------------------------------|---------------|
| <i>EUT</i> : LIGHTING BOX | | | | <i>Temperature</i> : 22 °C | |
| <i>M/N</i> : KR-V65-A1G | | | | <i>Humidity</i> : 50 % | |
| <i>Power Supply</i> : AC 230V, 50Hz | | | | <i>Test Mode</i> : ON | |
| <i>Location</i> | <i>Polarity</i> | <i>Phase Angle</i> | <i>No of Pulse</i> | <i>Pulse Voltage (KV)</i> | <i>Result</i> |
| L-N | + | 0 | 5 | 1.0 | PASS |
| | + | 90 | 5 | 1.0 | PASS |
| | + | 180 | 5 | 1.0 | PASS |
| | + | 270 | 5 | 1.0 | PASS |
| | - | 0 | 5 | 1.0 | PASS |
| | - | 90 | 5 | 1.0 | PASS |
| | - | 180 | 5 | 1.0 | PASS |
| | - | 270 | 5 | 1.0 | PASS |

14.INJECTED CURRENTS SUSCEPTIBILITY TEST

14.1.Block Diagram of Test AC Mains Setup



14.2.Test Standard

EN61547:2009 (EN61000-4-6:2014)
Severity Level 2 at 3 V (rms), 0.15MHz ~ 80MHz

14.3.Severity Levels and Performance Criterion

14.3.1.Severity level

| Level | Field Strength V/m |
|-------|--------------------|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| X | Special |

14.3.2.Performance criterion: A

14.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

14.5.Operating Condition of EUT

Setup the EUT as shown in Section 14.1.. The operating condition of EUT are listed in section 3.3.



14.6. Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 14.1.
- 2) Let the EUT work in test mode and test it.
- 3) The EUT are placed on an insulating support 0.8m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
- 7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

14.7. Test Results

PASS.

Please refer to the following page.



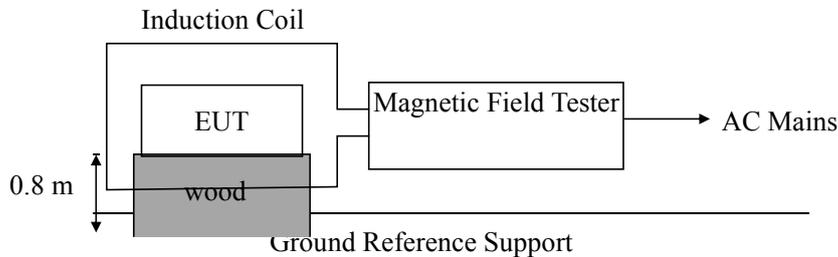
Injected Currents Susceptibility Test Results

BST Technology (Shenzhen) Co.,Ltd.

| <i>Applicant</i> : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD. | | <i>Test Date</i> : Dec .07, 2021 | | |
|---------------------------------------------------------|-------------------|----------------------------------|-----------|--------|
| <i>EUT</i> : LIGHTING BOX | | <i>Temperature</i> : 22 °C | | |
| <i>M/N</i> : KR-V65-A1G | | <i>Humidity</i> : 50 % | | |
| <i>Power Supply</i> : AC 230V, 50Hz | | <i>Test Mode</i> : ON | | |
| Frequency Range (MHz) | Injected Position | Strength | Criterion | Result |
| 0.15 ~ 20 | AC Line | 3V(rms), Unmodulated | A | PASS |
| 20 ~ 80 | AC Line | 3V(rms), Unmodulated | A | PASS |
| | | <i>Note:</i> | | |

15. MAGNETIC FIELD IMMUNITY TEST

15.1. Block Diagram of Test Setup



15.2. Test Standard

EN61547:2009 (EN61000-4-8:2010)
Severity Level 2 at 3A/m

15.3. Severity Levels and Performance Criterion

15.3.1. Severity level

| Level | Magnetic Field Strength A/m |
|-------|-----------------------------|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| 4. | 30 |
| 5. | 100 |
| X. | Special |

15.3.2. Performance criterion : A

15.4. EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

15.5. Operating Condition of EUT

15.5.1. Setup the EUT as shown in Section 15.1

15.5.2. Turn on the power of all equipments.

15.5.3. Let the EUT work in test mode (ON) and test it.



15.6. Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m) and shown in Section 15.1. The induction coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

15.7. Test Results

PASS.

Please refer to the following page.



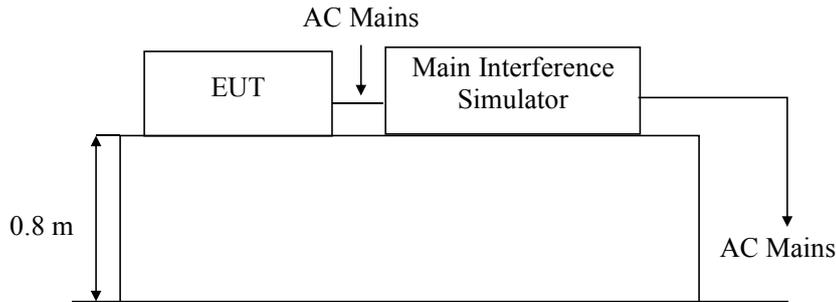
Magnetic Field Immunity Test Results

BST Technology (Shenzhen) Co.,Ltd.

| <i>Applicant : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD.</i> | | <i>Test Date : Dec .07, 2021</i> | | |
|---------------------------------------------------------|-------------------------|------------------------------------------------------------|------------------|---------------|
| <i>EUT : LIGHTING BOX</i> | | <i>Temperature : 22 °C</i> | | |
| <i>M/N : KR-V65-A1G</i> | | <i>Humidity : 60 %</i> | | |
| <i>Power Supply : AC 230V, 50Hz</i> | | | | |
| <i>Test Mode: ON</i> | | | | |
| <i>Test Level</i> | <i>Testing Duration</i> | <i>Coil Orientation</i> | <i>Criterion</i> | <i>Result</i> |
| <i>3A/M</i> | <i>5 mins</i> | <i>Horizontal</i> | <i>A</i> | <i>PASS</i> |
| <i>3A/M</i> | <i>5 mins</i> | <i>Vertical</i> | <i>A</i> | <i>PASS</i> |
| <i>Remark:</i> | | <i>Test Equipment : Magnetic Field Tester MAG100.1</i> | | |

16. VOLTAGE DIPS AND INTERRUPTIONS TEST

16.1. Voltage Dips and Interruptions Test Setup



Remark: Combination wave generator and decoupling network are included in test generator.

16.2. Test Standard

EN61547:2009 (EN61000-4-11:2004)

16.3. Severity Levels and Performance Criterion

16.3.1. Severity level

| Test Level %UT | Voltage dip and short interruptions %UT | Duration (in period) |
|-------------------|-----------------------------------------------|-------------------------|
| 0 | 100 | 250p |
| 40 | 60 | 5p |
| 70 | 30 | 0.5p |

16.3.2. Performance criterion : C&B

16.4. EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

16.5. Operating Condition of EUT

16.5.1. Setup the EUT as shown in Section 16.1..

16.5.2. Turn on the power of all equipments.

16.5.3. Let the EUT work in test mode (ON) and test it.



16.6. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 16.1.
- 2) The interruptions is introduced at selected phase angles with specified duration.
- 3) Record any degradation of performance.

16.7. Test Result

PASS.

Please refer to the following page.



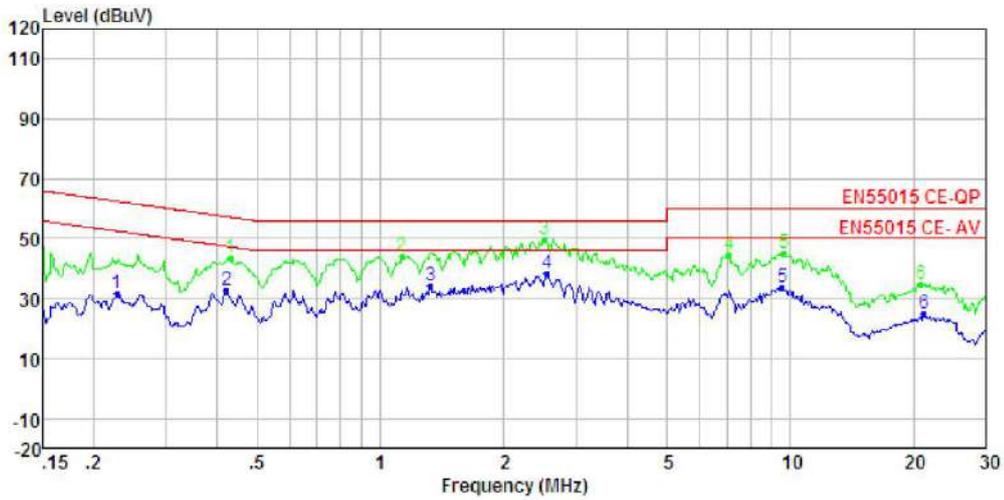
Voltage Dips And Interruptions Test Results

BST Technology (Shenzhen) Co.,Ltd.

| <i>Applicant : SUZHOU KR DISPLAY EQUIPMENT CO.,LTD.</i> | | | <i>Test Date : Dec .07, 2021</i> | | |
|----------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------|------------------|---------------|
| <i>EUT : LIGHTING BOX</i> | | | <i>Temperature : 22 °C</i> | | |
| <i>M/N : KR-V65-A1G</i> | | | <i>Humidity : 64 %</i> | | |
| <i>Power Supply : AC 230V, 50Hz</i> | | | | | |
| <i>Test Mode: ON</i> | | | | | |
| <i>Test Level % U_T</i> | <i>Voltage Dips & Short Interruptions % U_T</i> | <i>Duration (in period)</i> | <i>Phase Angle</i> | <i>Criterion</i> | <i>Result</i> |
| 70 | 30 | 10P | 90° | C | PASS |
| 0 | 100 | 0.5P | 180° | B | PASS |
| <i>Remark: U_T is the rated voltage for the equipment.</i> | | | <i>Test Equipment : Main Interference Simulator (HEAFELY PLINE1610)</i> | | |



APPENDIX I



Site : Shenzhen BST Technology Co.,Ltd.

Condition:

: RBW:9.000KHz VBW:30.000KHz

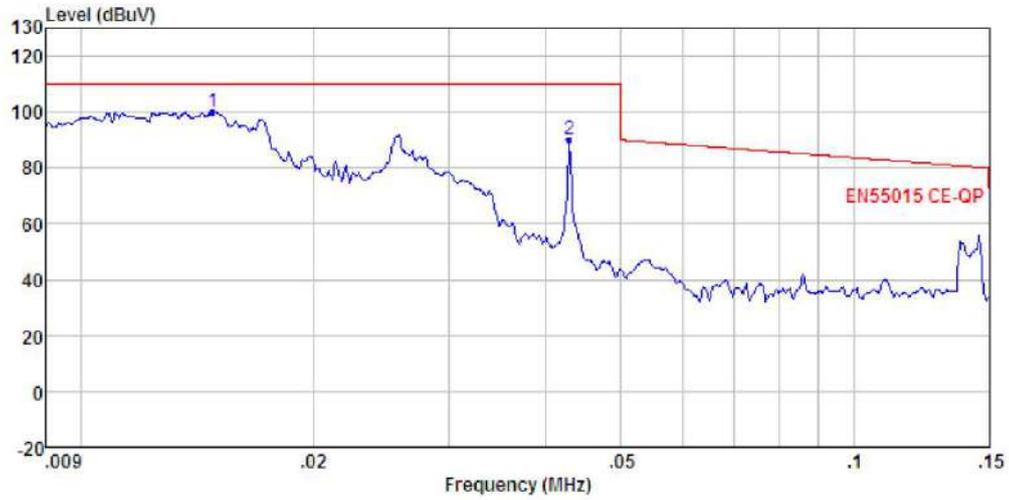
| | Freq | Level | Limit | Over | Remark | Pol/Phase |
|-------|--------|-------|-------|-------|---------|-----------|
| | MHz | dBuV | dBuV | dB | | |
| 1 | 0.228 | 31.8 | 52.5 | -20.7 | Average | LINE |
| 2 | 0.421 | 32.5 | 47.4 | -14.9 | Average | LINE |
| 3 Max | 1.324 | 34.2 | 46.0 | -11.8 | Average | LINE |
| 4 | 2.554 | 38.4 | 46.0 | -7.6 | Average | LINE |
| 5 | 9.552 | 33.9 | 50.0 | -16.1 | Average | LINE |
| 6 | 21.147 | 24.7 | 50.0 | -25.3 | Average | LINE |

Site : Shenzhen BST Technology Co.,Ltd.

Condition:

: RBW:9.000KHz VBW:30.000KHz

| | Freq | Level | Limit | Over | Remark | Pol/Phase |
|-------|--------|-------|-------|-------|--------|-----------|
| | MHz | dBuV | dBuV | dB | | |
| 1 | 0.431 | 43.4 | 57.2 | -13.8 | Peak | LINE |
| 2 | 1.129 | 44.1 | 56.0 | -11.9 | Peak | LINE |
| 3 Max | 2.527 | 49.7 | 56.0 | -6.3 | Peak | LINE |
| 4 | 7.100 | 44.5 | 60.0 | -15.5 | Peak | LINE |
| 5 | 9.654 | 45.3 | 60.0 | -14.7 | Peak | LINE |
| 6 | 20.814 | 34.9 | 60.0 | -25.1 | Peak | LINE |

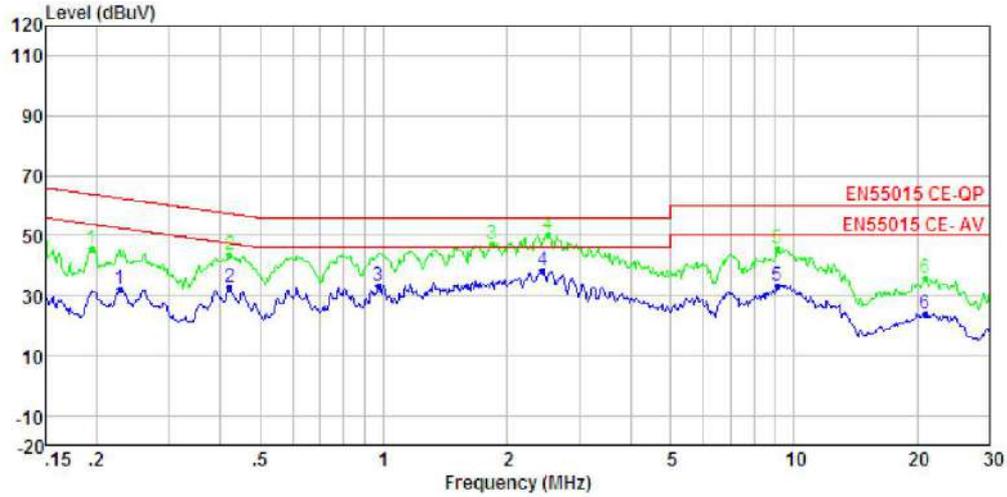


Site : Shenzhen BST Technology Co.,Ltd.

Condition:

: RBW:0.200KHz VBW:30.000KHz

| | Freq | Level | Limit | Over | Remark | Pol/Phase |
|-------|-------|-------|-------|-------|--------|-----------|
| | MHz | dBuV | dBuV | dB | | |
| 1 Max | 0.015 | 100.4 | 110.0 | -9.6 | Peak | LINE |
| 2 | 0.043 | 90.4 | 110.0 | -19.6 | Peak | LINE |



Site : Shenzhen BST Technology Co.,Ltd.

Condition:

: RBW:9.000KHz VBW:30.000KHz

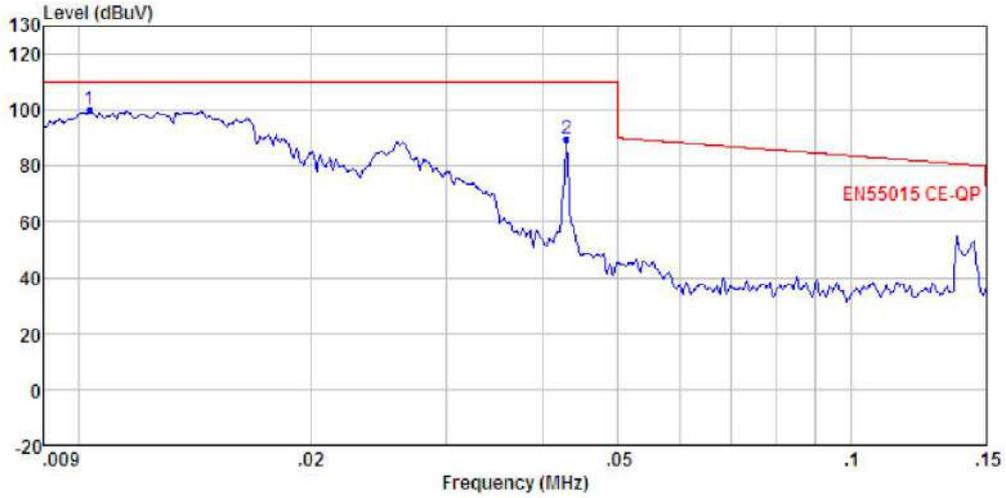
| | Freq | Level | Limit | Over | Remark | Pol/Phase |
|-------|--------|-------|-------|-------|---------|-----------|
| | MHz | dBuV | dBuV | dB | | |
| 1 | 0.228 | 32.4 | 52.5 | -20.1 | Average | NEUTRAL |
| 2 | 0.421 | 32.9 | 47.4 | -14.5 | Average | NEUTRAL |
| 3 | 0.974 | 33.3 | 46.0 | -12.7 | Average | NEUTRAL |
| 4 Max | 2.448 | 38.3 | 46.0 | -7.7 | Average | NEUTRAL |
| 5 | 9.107 | 33.2 | 50.0 | -16.8 | Average | NEUTRAL |
| 6 | 20.924 | 24.0 | 50.0 | -26.0 | Average | NEUTRAL |

Site : Shenzhen BST Technology Co.,Ltd.

Condition:

: RBW:9.000KHz VBW:30.000KHz

| | Freq | Level | Limit | Over | Remark | Pol/Phase |
|-------|--------|-------|-------|-------|--------|-----------|
| | MHz | dBuV | dBuV | dB | | |
| 1 | 0.194 | 45.7 | 63.8 | -18.1 | Peak | NEUTRAL |
| 2 | 0.421 | 43.5 | 57.4 | -13.9 | Peak | NEUTRAL |
| 3 | 1.839 | 47.3 | 56.0 | -8.7 | Peak | NEUTRAL |
| 4 Max | 2.527 | 50.2 | 56.0 | -5.8 | Peak | NEUTRAL |
| 5 | 9.107 | 45.5 | 60.0 | -14.5 | Peak | NEUTRAL |
| 6 | 20.924 | 35.8 | 60.0 | -24.2 | Peak | NEUTRAL |



Site : Shenzhen BST Technology Co.,Ltd.

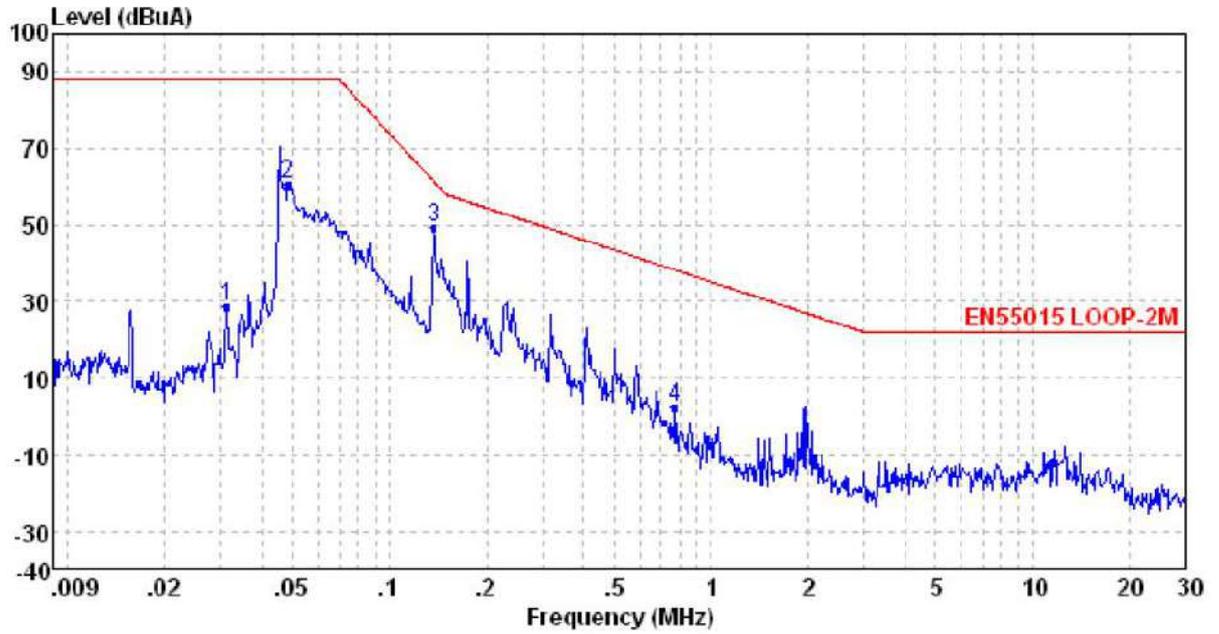
Condition:

: RBW:0.200KHz VBW:30.000KHz

| | Freq | Level | Limit | Over | Remark | Pol/Phase |
|-------|-------|-------|-------|-------|--------|-----------|
| | MHz | dBuV | dBuV | dB | | |
| 1 Max | 0.010 | 100.0 | 110.0 | -10.0 | Peak | NEUTRAL |
| 2 | 0.043 | 89.4 | 110.0 | -20.6 | Peak | NEUTRAL |

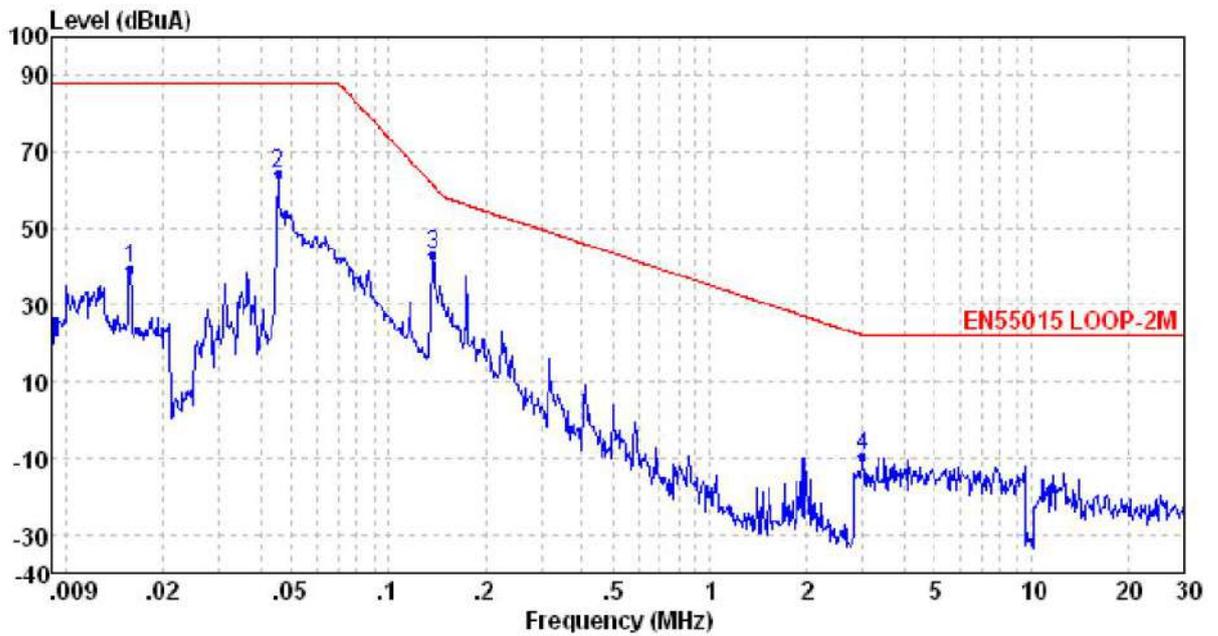


APPENDIX II



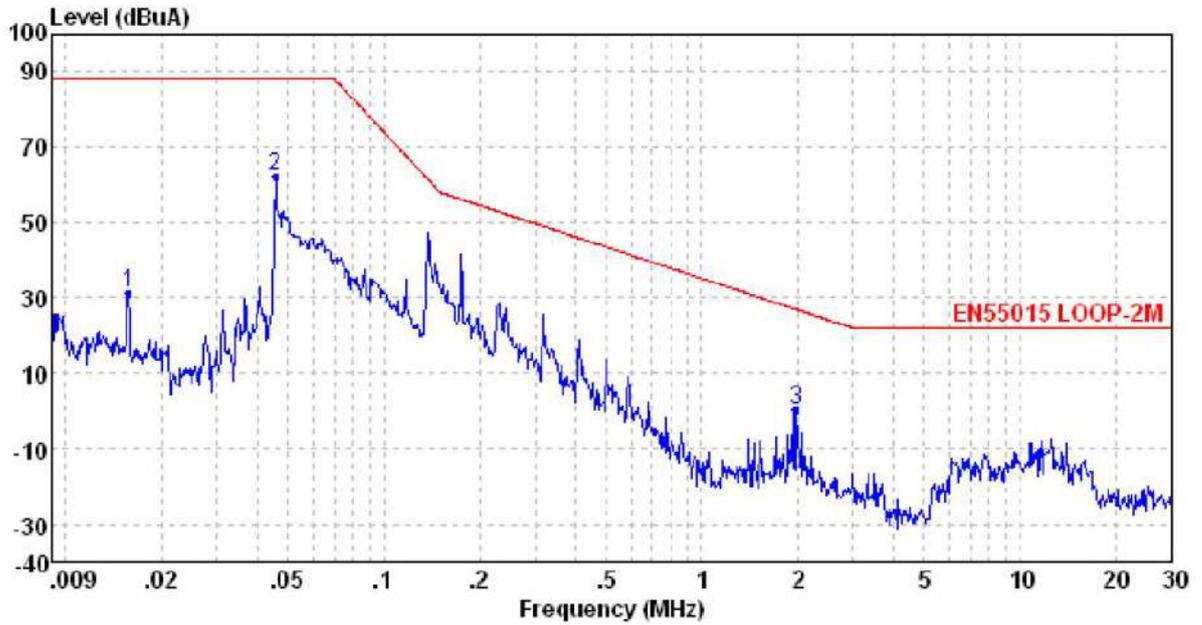
Site : Shenzhen BST Technology Co.,Ltd.

| | Freq | Level | Limit | Over | Pol/Phase |
|-------|------|-------|-------|--------|-----------|
| | MHz | dBuA | dBuA | dB | |
| 1 | 0.03 | 28.64 | 88.02 | -59.38 | |
| 2 | 0.05 | 60.78 | 88.02 | -27.24 | |
| 3 Max | 0.14 | 49.12 | 61.48 | -12.36 | |
| 4 | 0.77 | 2.43 | 38.31 | -35.88 | |



Site : Shenzhen BST Technology Co.,Ltd.

| | Freq | Level | Limit | Over | Pol/Phase |
|-------|------|-------|-------|--------|-----------|
| | MHz | dBuA | dBuA | dB | |
| 1 | 0.05 | 67.59 | 88.02 | -20.43 | |
| 2 Max | 0.14 | 46.13 | 61.80 | -15.67 | |
| 3 | 1.29 | 5.39 | 32.17 | -26.78 | |

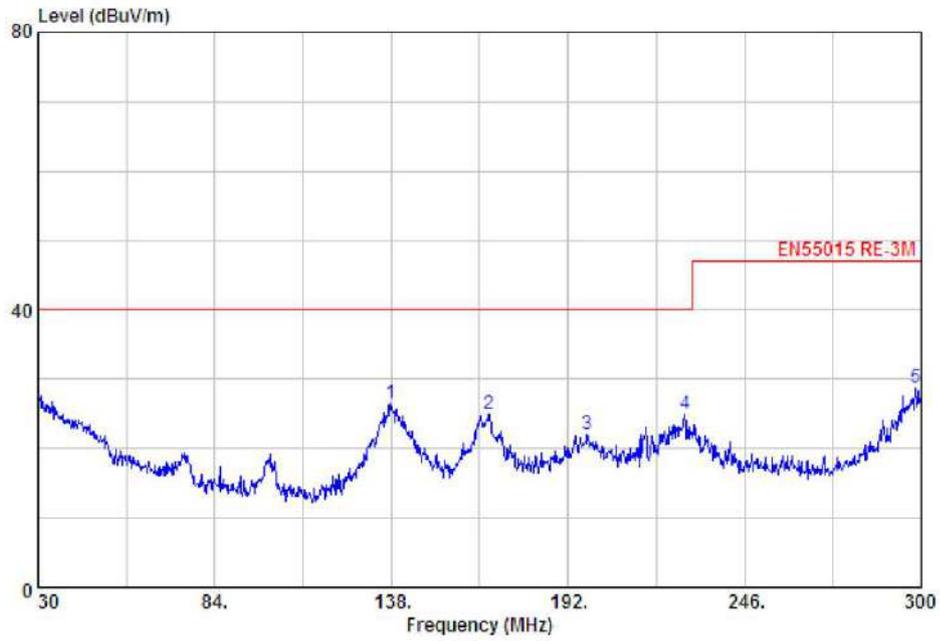


Site : Shenzhen BST Technology Co.,Ltd.

| | Freq | Level | Limit | Over |
|-------|------|-------|-------|--------|
| | MHz | dBuA | dBuA | dB |
| 1 | 0.02 | 31.50 | 88.02 | -56.52 |
| 2 Max | 0.05 | 62.37 | 88.02 | -25.65 |
| 3 | 1.98 | 0.13 | 27.01 | -26.88 |

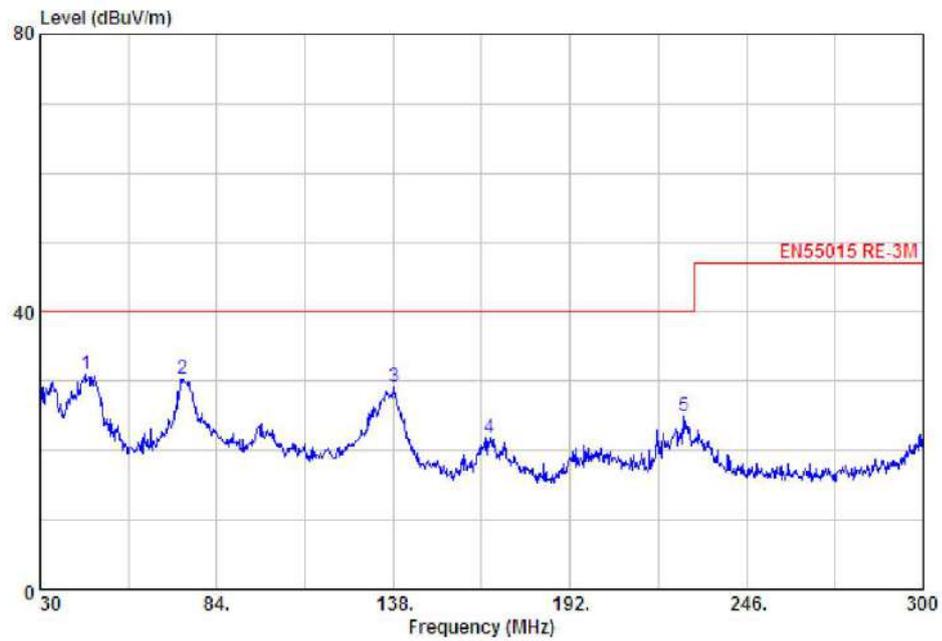


APPENDIX III



Condition : EN55015 RE-3M 3m HORIZONTAL
 : RBW:120.000KHz VBW:300.000KHz SWT:Auto

| | Limit | Over | | | |
|-------|---------|--------|--------|------------|------------|
| Line | Level | Limit | Remark | Pol/Phase | |
| Freq | dBuV/m | dBuV/m | dB | | |
| MHz | dBuV/m | dBuV/m | dB | | |
| 1 max | 137.730 | 40.0 | 26.5 | -13.5 Peak | HORIZONTAL |
| 2 | 167.970 | 40.0 | 25.0 | -15.0 Peak | HORIZONTAL |
| 3 | 197.670 | 40.0 | 22.1 | -17.9 Peak | HORIZONTAL |
| 4 | 227.640 | 40.0 | 24.9 | -15.1 Peak | HORIZONTAL |
| 5 | 298.110 | 47.0 | 28.7 | -18.3 Peak | HORIZONTAL |



Condition : EN55015 RE-3M 3m VERTICAL
 : RBW:120.000KHz VBW:300.000KHz SWT:Auto

| | Freq | Limit | Over | Remark | Pol/Phase |
|-------|---------|--------|--------|------------|-----------|
| | | Line | Level | | |
| | MHz | dBuV/m | dBuV/m | dB | |
| 1 max | 44.040 | 40.0 | 31.0 | -9.0 Peak | VERTICAL |
| 2 | 73.740 | 40.0 | 30.3 | -9.7 Peak | VERTICAL |
| 3 | 138.270 | 40.0 | 29.2 | -10.8 Peak | VERTICAL |
| 4 | 187.430 | 40.0 | 21.9 | -18.1 Peak | VERTICAL |
| 5 | 226.830 | 40.0 | 25.0 | -15.0 Peak | VERTICAL |



APPENDIX IV



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

