ACCREDITED
TESTING LABORATORY
CERTIFICATE#4323.01

BACL
Bay Area Compliance Labs Corp.

# FCC PART 15B

# MEASUREMENT AND TEST REPORT

For

## Micron Electronics LLC.

1001 Yamato Road, Suite 400, Boca Raton, Florida 33431 United States

**FCC ID: ZKQ-MHV**

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Tracker |

| | |
|---|---|
| **Test Engineer:** | Lee Li |
| **Report Number:** | RSHA190517003-00A |
| **Report Date:** | 2019-06-11 |
| **Reviewed By:** | Ray Wang<br>EMC Leader |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Kunshan)<br>No.248 Chenghu Road, Kunshan,Jiangsu province, China<br>Tel: +86-0512-86175000<br>Fax: +86-0512-88934268<br>www.baclcorp.com.cn |

# TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

| | |
|---|---|
| Applicant | Micron Electronics LLC. |
| Test Model | MH 1000V |
| Product | Tracker |
| Rate Voltage | DC 3.8V from Battery |
| Highest Operating Frequency | 2462MHz |
| Dimension | 78.7mm (L)* 44.6mm (W)* 21.8mm(H) |

*Adapter information:*
*Model: JT-H050100*
*Input: AC 100-240V, 50/60Hz*
*Output: DC 5V, 1A*

**All measurement and test data in this report was gathered from production sample serial number: 20190517003. (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-05-17)*

## Objective

This report is prepared on behalf of *Micron Electronics LLC.* in accordance with Part 2-Subpart J, and Part 15-Subparts A and B of the Federal Communication Commission's rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15, Class B device.

## Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and Part 15.231 DSC Submittal with FCC ID: ZKQ-MHV.

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01), the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

# SYSTEM TEST CONFIGURATION

## Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

*Test mode: Charging & GPS on*

## EUT Exercise Software

No exercise software to test.

## Special Accessories

No special accessory was used.

## Equipment Modifications

No modification was made to the EUT tested.

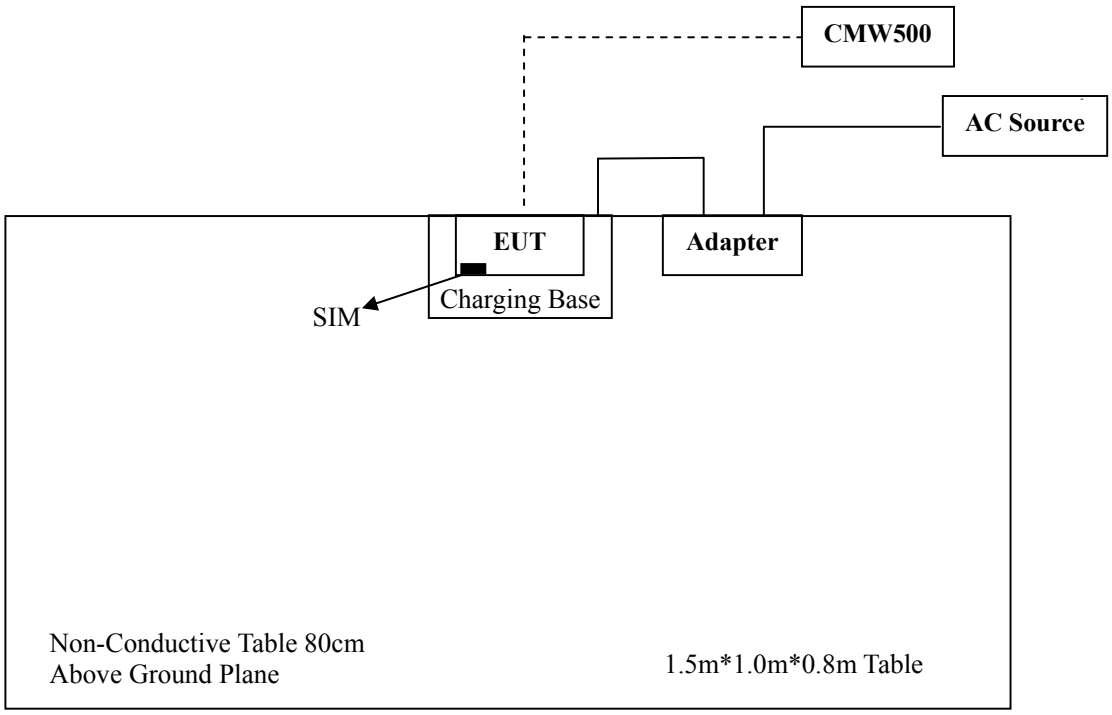
## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| / | SIM Card | / | / |
| Rohde & Schwarz | WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | 116218 |

## External I/O Cable

| Cable Description | Length (m) | From/Port | To |
|---|---|---|---|
| / | / | / | / |

## Block Diagram of Radiated Test Setup



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Results |
|---|---|---|
| §15.107 | Conducted Emissions | Compliant |
| §15.109 | Radiated Emissions | Compliant |

# FCC §15.107 –CONDUCTED EMISSIONS

## Applicable Standard

According to FCC§15.107

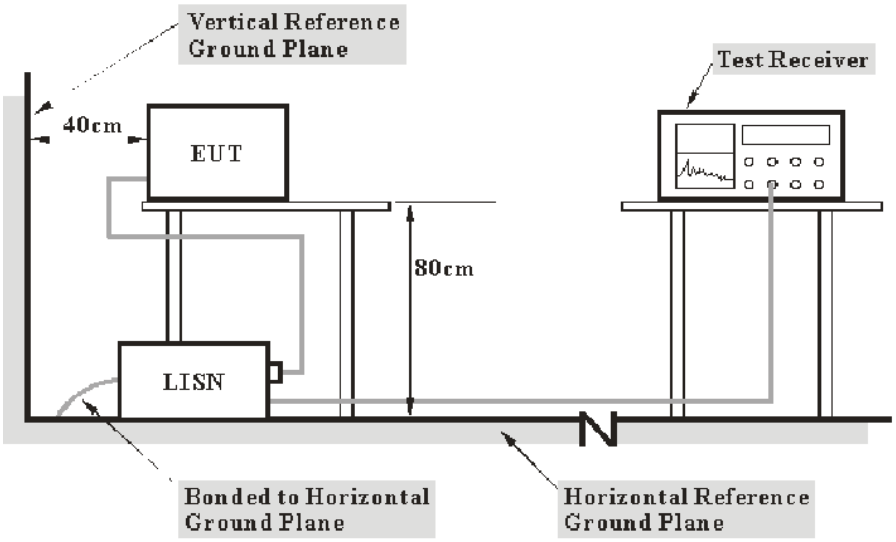
## Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

| Item | | Measurement Uncertainty | $U_{cispr}$ |
|---|---|---|---|
| AMN | 150kHz~30MHz | 3.19 dB | 3.4 dB |

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

## EUT Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.4-2014. The related limit was specified in FCC Part 15.107 Class B.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|---|---|
| 150 kHz – 30 MHz | 9 kHz |

## Test Procedure

During the conducted emission test, the AC 120V was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESR | 1316.3003K03-102454-Qd | 2018-06-25 | 2019-06-24 |
| Rohde & Schwarz | LISN | ENV216 | 3560655016 | 2018-11-30 | 2019-11-29 |
| Audix | Test Software | e3 | V9 | -- | -- |
| MICRO-COAX | Coaxial Cable | Cable-6 | 006 | 2018-09-08 | 2019-09-07 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Corrected Factor & Over Limit Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over Limit of 7dB means the emission is 7 dB above the limit. The equation for over Limit calculation is as follows:

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

## Test Data

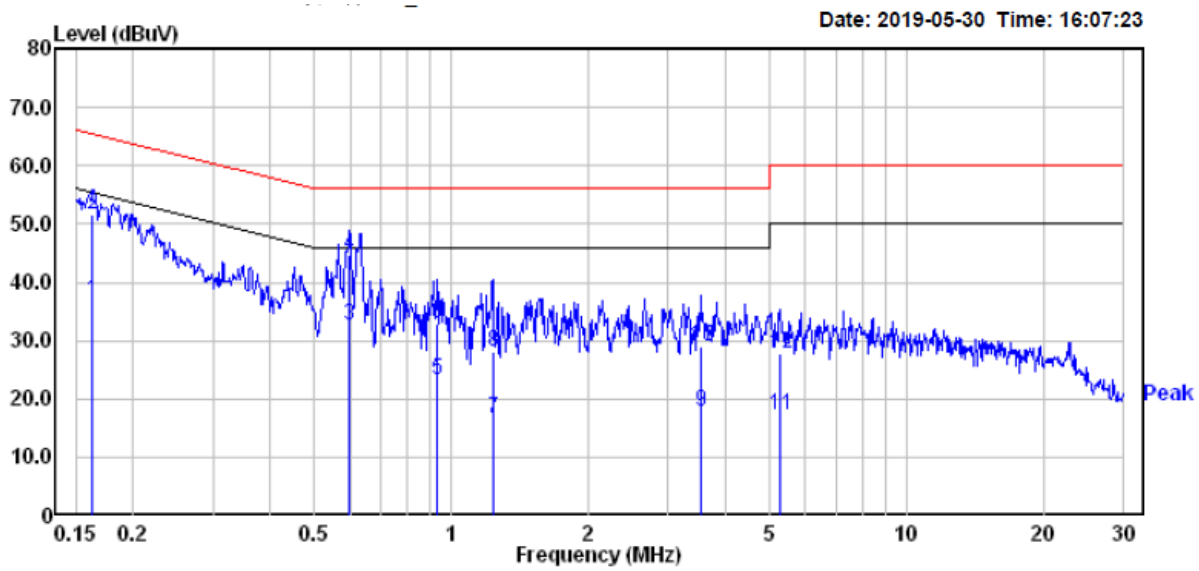
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Lee Li on 2019-05-30.*

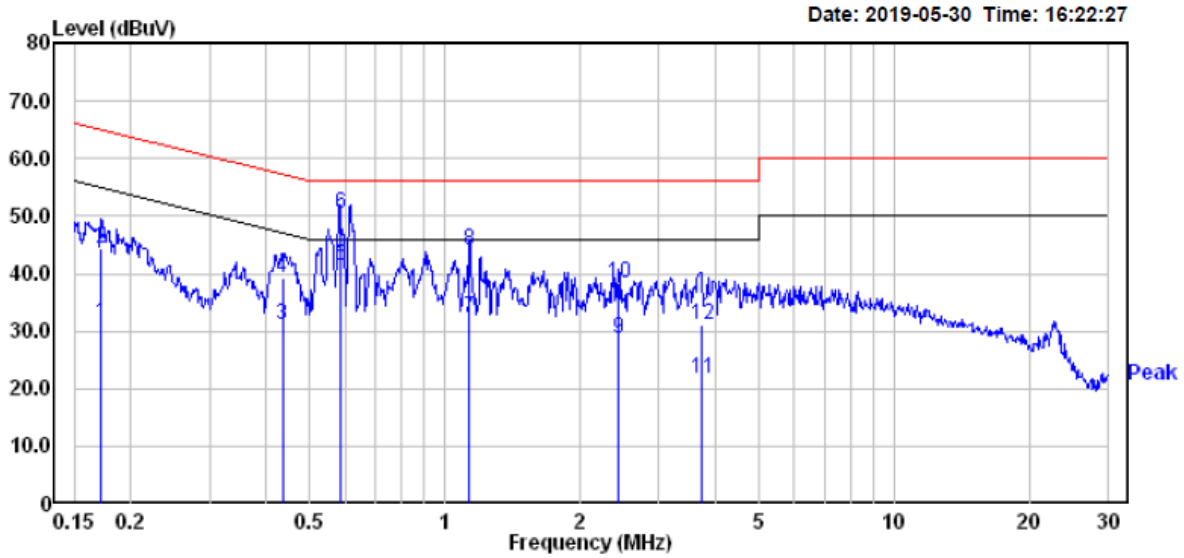
*Test mode: Charging & GPS on*

***Line:***




| | Freq | Read Level | Cable Loss | LISN Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.163 | 20.60 | 6.13 | 9.97 | 36.70 | 55.30 | -18.60 | Average |
| 2 | 0.163 | 35.40 | 6.13 | 9.97 | 51.50 | 65.30 | -13.80 | QP |
| 3 | 0.598 | 16.60 | 6.13 | 9.87 | 32.60 | 46.00 | -13.40 | Average |
| 4 | 0.598 | 28.60 | 6.13 | 9.87 | 44.60 | 56.00 | -11.40 | QP |
| 5 | 0.933 | 7.21 | 6.13 | 9.87 | 23.21 | 46.00 | -22.79 | Average |
| 6 | 0.933 | 16.81 | 6.13 | 9.87 | 32.81 | 56.00 | -23.19 | QP |
| 7 | 1.236 | 0.50 | 6.14 | 9.92 | 16.56 | 46.00 | -29.44 | Average |
| 8 | 1.236 | 11.90 | 6.14 | 9.92 | 27.96 | 56.00 | -28.04 | QP |
| 9 | 3.528 | 2.20 | 6.15 | 9.55 | 17.90 | 46.00 | -28.10 | Average |
| 10 | 3.528 | 13.20 | 6.15 | 9.55 | 28.90 | 56.00 | -27.10 | QP |
| 11 | 5.277 | 1.50 | 6.16 | 9.56 | 17.22 | 50.00 | -32.78 | Average |
| 12 | 5.277 | 12.20 | 6.16 | 9.56 | 27.92 | 60.00 | -32.08 | QP |

***Neutral:***




| | Freq | Read Level | Cable Loss | LISN Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.172 | 15.30 | 6.13 | 9.97 | 31.40 | 54.86 | -23.46 | Average |
| 2 | 0.172 | 28.20 | 6.13 | 9.97 | 44.30 | 64.86 | -20.56 | QP |
| 3 | 0.435 | 15.00 | 6.13 | 9.88 | 31.01 | 47.15 | -16.14 | Average |
| 4 | 0.435 | 23.10 | 6.13 | 9.88 | 39.11 | 57.15 | -18.04 | QP |
| 5 | 0.585 | 25.31 | 6.13 | 9.87 | 41.31 | 46.00 | -4.69 | Average |
| 6 | 0.585 | 34.31 | 6.13 | 9.87 | 50.31 | 56.00 | -5.69 | QP |
| 7 | 1.135 | 16.10 | 6.14 | 9.92 | 32.16 | 46.00 | -13.84 | Average |
| 8 | 1.135 | 28.00 | 6.14 | 9.92 | 44.06 | 56.00 | -11.94 | QP |
| 9 | 2.435 | 12.81 | 6.14 | 9.61 | 28.56 | 46.00 | -17.44 | Average |
| 10 | 2.435 | 22.61 | 6.14 | 9.61 | 38.36 | 56.00 | -17.64 | QP |
| 11 | 3.720 | 5.90 | 6.15 | 9.55 | 21.60 | 46.00 | -24.40 | Average |
| 12 | 3.720 | 15.30 | 6.15 | 9.55 | 31.00 | 56.00 | -25.00 | QP |

**Note:**

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

# FCC §15.109 - RADIATED EMISSIONS

## Applicable Standard

FCC §15.109

## Measurement Uncertainty

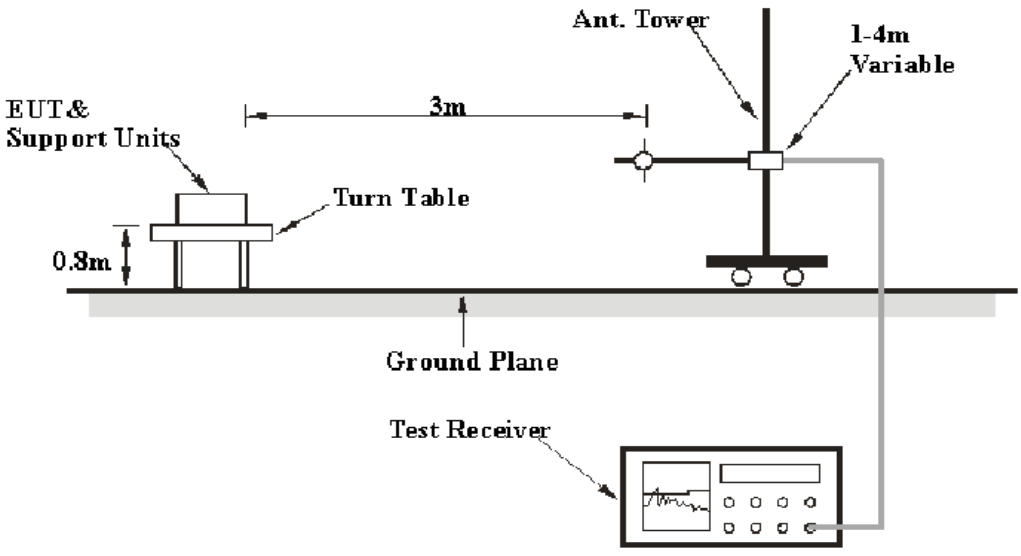
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average) and system repeatability.

| Item | | Measurement Uncertainty | $U_{cispr}$ |
|---|---|---|---|
| Radiated Emission | 30MHz~1GHz | 6.11dB | 6.3 dB |
| | 1GHz~6GHz | 4.45dB | 5.2 dB |
| | 6 GHz ~18 GHz | 5.23dB | 5.5 dB |

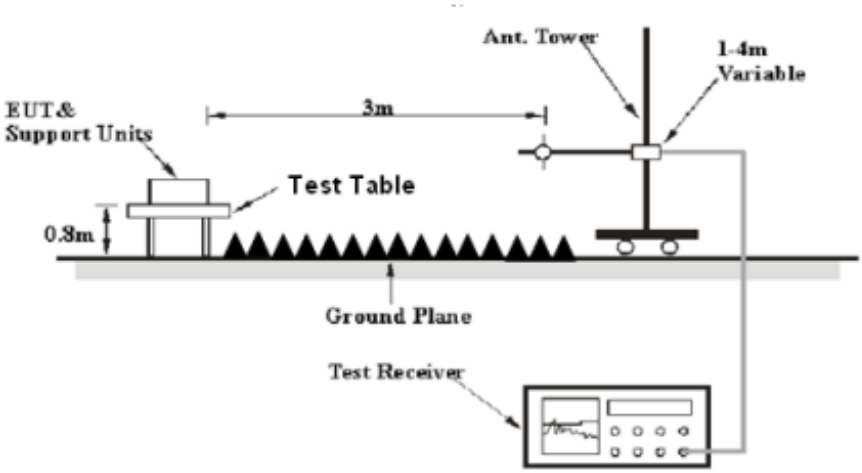
Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

## EUT Setup

Below 1GHz:



Above 1GHz:




The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The system was investigated from 30 MHz to 18 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|---|---|---|---|---|
| 30MHz – 1000 MHz | 120 kHz | 300 kHz | 120kHz | QP |
| Above 1 GHz | 1MHz | 3 MHz | / | Peak |
| | 1MHz | 3 MHz | 1MHz | AVG |

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Sonoma Instrument | Amplifier | 310N | 185700 | 2018-08-14 | 2019-08-13 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100195 | 2018-11-12 | 2019-11-11 |
| Sunol Sciences | Broadband Antenna | JB3 | A060217 | 2016-12-26 | 2019-12-25 |
| Champrotek | Chamber | Chamber A | T-KSEMC049 | - | - |
| Champrotek | Chamber | Chamber B | T-KSEMC080 | - | - |
| R&S | Auto test Software | EMC32 | 100361 | - | - |
| ETS | Horn Antenna | 3115 | 6229 | 2016-12-12 | 2019-12-11 |
| Rohde & Schwarz | EMI Receiver | ESU40 | 100207 | 2018-08-27 | 2019-08-26 |
| A.H.Systems, inc | Amplifier | 2641-1 | 491 | 2019-02-20 | 2020-02-19 |
| MICRO-COAX | Coaxial Cable | Cable-8 | 008 | 2018-08-15 | 2019-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-9 | 009 | 2018-08-15 | 2019-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-10 | 010 | 2018-08-15 | 2019-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-4 | 004 | 2018-08-15 | 2019-08-14 |
| MICRO-COAX | Coaxial Cable | Cable-5 | 005 | 2018-08-15 | 2019-08-14 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

## Test Data

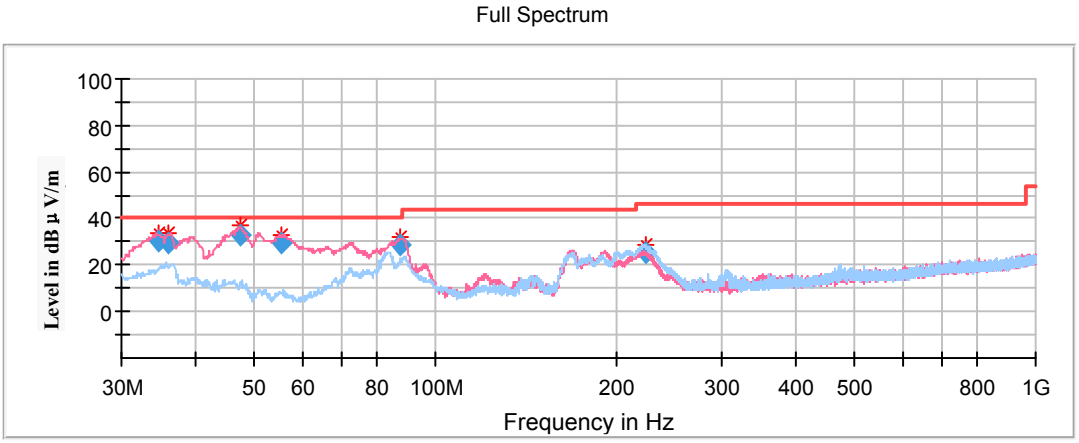
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 20.2 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Lee Li on 2019-06-07.*

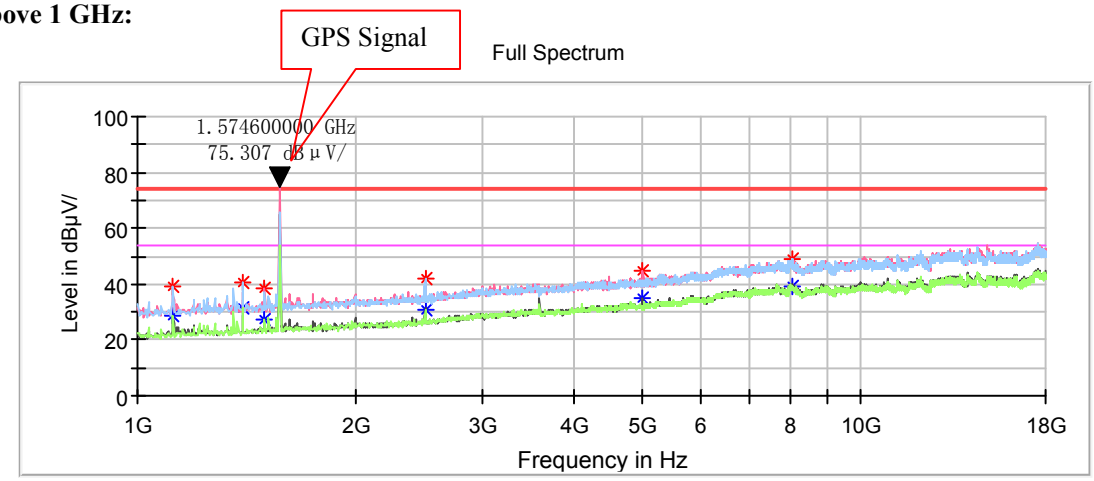
*Test mode: Charging & GPS on*

**30MHz ~ 1GHz:**




| Frequency (MHz) | Quasi Peak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|
| 34.612880 | 30.13 | 40.00 | 9.87 | 100.0 | V | 279.0 | -14.1 |
| 35.872480 | 29.83 | 40.00 | 10.17 | 100.0 | V | 1.0 | -14.7 |
| 47.194000 | 32.82 | 40.00 | 7.18 | 100.0 | V | 36.0 | -21.3 |
| 55.458800 | 29.19 | 40.00 | 10.81 | 100.0 | V | 36.0 | -23.1 |
| 87.193520 | 28.88 | 40.00 | 11.12 | 100.0 | V | 105.0 | -23.2 |
| 224.529680 | 25.48 | 46.00 | 20.52 | 100.0 | H | 206.0 | -18.0 |

**Above 1 GHz:**




| Frequency (MHz) | Max Peak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|
| 1119.000000 | --- | 28.34 | 54.00 | 25.66 | 100.0 | H | 305.0 | -12.0 |
| 1119.000000 | 38.96 | --- | 74.00 | 35.04 | 100.0 | H | 305.0 | -12.0 |
| 1397.800000 | --- | 31.20 | 54.00 | 22.80 | 100.0 | H | 0.0 | -10.5 |
| 1397.800000 | 40.36 | --- | 74.00 | 33.64 | 100.0 | H | 0.0 | -10.5 |
| 1496.400000 | --- | 27.14 | 54.00 | 26.86 | 100.0 | V | 218.0 | -9.9 |
| 1496.400000 | 38.56 | --- | 74.00 | 35.44 | 100.0 | V | 218.0 | -9.9 |
| 2499.400000 | --- | 30.55 | 54.00 | 23.45 | 100.0 | H | 289.0 | -6.9 |
| 2499.400000 | 42.06 | --- | 74.00 | 31.94 | 100.0 | H | 289.0 | -6.9 |
| 4998.400000 | --- | 35.22 | 54.00 | 18.78 | 100.0 | V | 325.0 | -0.3 |
| 4998.400000 | 44.51 | --- | 74.00 | 29.49 | 100.0 | V | 325.0 | -0.3 |
| 8017.600000 | --- | 39.49 | 54.00 | 14.51 | 200.0 | H | 112.0 | 7.0 |
| 8017.600000 | 49.10 | --- | 74.00 | 24.90 | 200.0 | H | 112.0 | 7.0 |
| 1119.000000 | --- | 28.34 | 54.00 | 25.66 | 100.0 | H | 305.0 | -12.0 |
| 1119.000000 | 38.96 | --- | 74.00 | 35.04 | 100.0 | H | 305.0 | -12.0 |

*******END OF REPORT*******