



FCC ID: 2AQ8A-EKSWR1N
Report No.: TMWK2112001589KR

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Rev.: 01

FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Enkore Smart Wall Reader Narrow

Model No.: EKS-WR1N

Trade Name: Pamex

Issued to

Pamex Inc.
4680 Vinita Court, Chino, CA, 91710, United States

Issued by

Compliance Certification Services Inc.
Wugu Laboratory
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City, Taiwan. (R.O.C.)
Issued Date: January 26, 2022

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

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Revision History

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|------|------------------|----------------------------------|-------------------------------------|------------|
| 00 | January 19, 2022 | Initial Issue | ALL | Doris Chu |
| 01 | January 26, 2022 | See the following Note Rev. (01) | P.7, P.10, P.26~P.27, A-3~A-4 | Doris Chu |

Rev. (01)

1. Added conduction data in section 7.4.

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1. TEST RESULT CERTIFICATION

Applicant: Pamex Inc.
4680 Vinita Court, Chino, CA, 91710, United States

Manufacturer: ALZK Co., Ltd.
9F., No. 36, Sec. 3, Bade Rd., Songshan Dist., Taipei City, Taiwan

Equipment Under Test: Enkore Smart Wall Reader Narrow

Trade Name: Pamex

Model No.: EKS-WR1N

Date of Test: December 29, 2021 ~ January 24, 2022

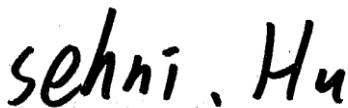
| APPLICABLE STANDARDS | |
|---|-------------------------|
| STANDARD | TEST RESULT |
| FCC 47 CFR Part 15 Subpart C | No non-compliance noted |
| Statements of Conformity | |
| Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty. | |

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.225.

The test results of this report relate only to the tested sample identified in this report.

Approved by:



Sehni Hu
Supervisor

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2. EUT DESCRIPTION

| | |
|-----------------------------|---------------------------------|
| Product | Enkore Smart Wall Reader Narrow |
| Model No. | EKS-WR1N |
| Model Discrepancy | N/A |
| Trade | Pamex |
| Received Date | December 24, 2021 |
| Power Supply | Power from Power supply. (12V) |
| Frequency Range | 13.56MHz |
| Modulation Technique | ASK |
| Number of Channels | 1 Channel |
| Antenna Requirement | Antenna type: Loop Antenna |
| HW Version | V0.0.2 |
| SW Version | W1-DVT-003 |

Remark:

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.225.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|----------------------------|---------------------|-----------------|------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.52525 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 156.7 - 156.9 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 162.0125 - 167.17 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 167.72 - 173.2 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 240 - 285 | 3600 - 4400 | (²) |
| 13.36 - 13.41 | 322 - 335.4 | | |

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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3.3 DESCRIPTION OF TEST MODES

The EUT had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

All modes and data rates were investigated and it was determined that ISO 14443A/B and ISO 18092 Type y, 106/212/424/848 kbps.

All data rates were investigated and it was determined that 106 Kbps was considered worst-case. Therefore, all testing was performed in 106 Kbps mode.

| AC Power Line Conducted Emission | |
|----------------------------------|--|
| Test Condition | AC Power line conducted emission for line and neutral |
| Power supply Mode | Mode 1: EUT power by Power Supply |
| Worst Mode | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

| Radiated Emission Measurement Below 30M | |
|---|---|
| Test Condition | Radiated Emission Below 30M |
| Power supply Mode | Mode 1: EUT power by Power supply |
| Worst Mode | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |
| Worst Position | <input type="checkbox"/> Placed in fixed position. <input type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input checked="" type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> Placed in fixed position at Z-Plane (H-Plane) |

| Radiated Emission Measurement Below 1G | |
|--|--|
| Test Condition | Radiated Emission Below 1G |
| Power supply Mode | Mode 1: EUT power by Power supply |
| Worst Mode | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X, Y, Z and two polarity, for radiated measurement. The worst case(Y-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

4. TEST SUMMARY

| FCC Standard Sec. | Chapter | Test Item | Result |
|-------------------|---------|---|--------|
| 15.203 | 2 | Antenna Requirement | Pass |
| 15.215 | 7.1 | Occupied Bandwidth (99%) and 20dB Bandwidth | Pass |
| 15.209 15.225 | 7.2 | Radiated Emissions | Pass |
| 15.225 | 7.3 | Frequency Stability | Pass |
| 15.207 | 7.4 | AC Power-line Conducted Emission | Pass |

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5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

| RF Conducted Test Site | | | | | |
|-------------------------------|---------------------|--------------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| EXA Signal Analyzer | KEYSIGHT | N9010B | MY55460167 | 05/25/2021 | 05/24/2022 |
| DC Power Supplies | GW Instek | SPS-3610 | GPE880163 | 12/21/2021 | 12/20/2022 |
| Thermostatic/Humidity Chamber | GWINSTEK | GTC-288MH-CC | TH160402 | 05/10/2021 | 05/09/2022 |
| Loop Ant | COM-POWER | AL-130 | 121051 | 04/07/2021 | 04/06/2022 |
| Coaxial Cable | Woken | WC12 | CC003 | 06/28/2021 | 06/27/2022 |
| Software | Radio Test Software | | | | |

| 3M 966 Chamber Test Site | | | | | |
|----------------------------|------------------|--------------------|------------|------------|------------|
| Equipment | Manufacturer | Model | S/N | Cal Date | Cal Due |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 07/19/2021 | 07/18/2022 |
| Coaxial Cable | HUBER SUHNER | SUCOFLEX 104PEA | 20995 | 02/24/2021 | 02/23/2022 |
| Digital Thermo-Hygro Meter | WISEWIND | 1206 | D07 | 12/28/2021 | 12/27/2022 |
| Loop Ant | COM-POWER | AL-130 | 121051 | 04/07/2021 | 04/06/2022 |
| Pre-Amplifier | EMEC | EM330 | 060609 | 02/24/2021 | 02/23/2022 |
| Spectrum Analyzer | Agilent | E4446A | US42510268 | 09/23/2021 | 09/22/2022 |
| DC Power Supplies | GW Instek | SPS-3610 | GPE880163 | 12/21/2021 | 12/20/2022 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R | N.C.R |
| Software | e3 6.11-20180413 | | | | |

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| Conducted Emission Room | | | | | |
|-------------------------|-------------------------|-----------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| CABLE | EMCI | CFD300-NL | CERF | 06/28/2021 | 06/27/2022 |
| EMI Test Receiver | R&S | ESCI | 100064 | 07/05/2021 | 07/04/2022 |
| LISN | SCHAFFNER | NNB 41 | 03/10013 | 02/02/2021 | 02/01/2022 |
| DC Power Supplies | GW Instek | SPS-3610 | GPE880163 | 12/21/2021 | 12/20/2022 |
| Software | EZ-EMC(CCS-3A1-CE-WUGU) | | | | |

Remark:

1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Request.

5.3 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---|-------------|
| AC Powerline Conducted Emission | +/- 1.2575 |
| Emission bandwidth, 6dB bandwidth | +/- 0.0014 |
| RF output power, conducted | +/- 1.14 |
| Power density, conducted | +/- 1.40 |
| 3M Semi Anechoic Chamber / 9kHz-30MHz | +/- 2.30 |
| 3M Semi Anechoic Chamber / 30 MHz ~1 GHz (Horizontally) | +/- 3.91 |
| 3M Semi Anechoic Chamber / 30 MHz ~1 GHz (Vertically) | +/- 4.57 |

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5.4 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)
 CAB identifier: TW1309

| Test site | Test Engineer | Remark |
|--------------------|---------------|--------|
| AC Conduction Room | Jack Chen | - |
| Radiation | Ray Li | - |
| RF Conducted | Lance Chen | - |

Remark: The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC public Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

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6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix A for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

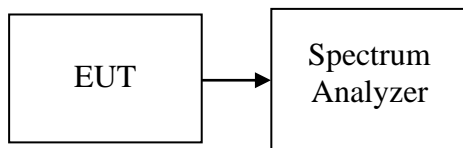
| No. | Device Type | Brand | Model | Series No. | FCC ID |
|-----|-----------------|----------|----------|------------|--------|
| 1 | DC Power Source | GWINSTEK | SPS-3610 | N/A | N/A |

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

7. FCC PART 15.225 REQUIREMENTS

7.1 OCCUPIED BANDWIDTH(99%) AND 20 DB BANDWIDTH TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW & VBW (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth (VBW) shall not be smaller than three times the RBW value.
4. Record the max. reading.

TEST RESULTS

No non-compliance noted.

Temperature: 18.4°C

Humidity: 48% RH

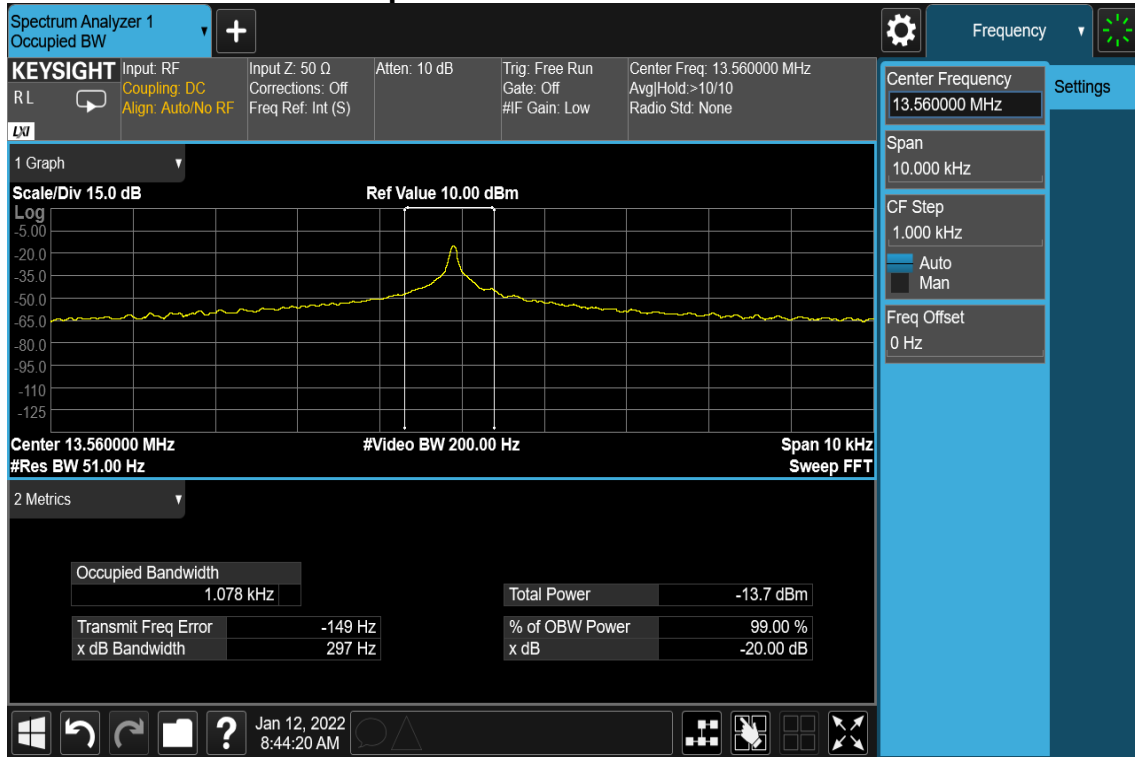
Tested by: Jack Chen

Test date: January 12, 2022

| Test Condition | Frequency(MHz) | Occupied Bandwidth 99% (kHz) | 20 dB Bandwidth (kHz) |
|----------------|----------------|---------------------------------|--------------------------|
| NFC | 13.56 | 1.078 | 0.297 |

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Test Plot 20 dB Bandwidth & Occupied Bandwidth 99%



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7.2 FUNDAMENTAL AND RADIATED EMISSIONS

LIMIT

According to §15.225

- (a) The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts / meter at 30 meters.
- (b) Within the bands 13.410 – 13.553 MHz and 13.567 -13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts / meter at 30 meters.
- (c) Within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts / meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz and shall not exceed the general radiated emission limits in §15.209.

According to §15.225, except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

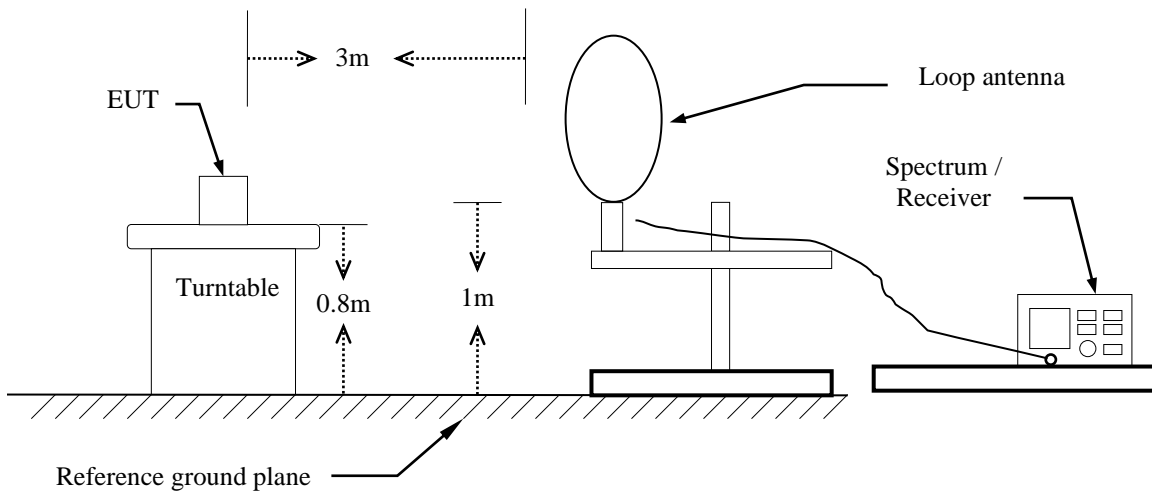
| Frequency (MHz) | Field Strength (µV/m at meter) | Measurement Distance (meter) |
|-----------------|--------------------------------|------------------------------|
| 0.009 – 0.490 | 2400 / F (kHz) | 300 |
| 0.490 – 1.705 | 24000 / F (kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 - 88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

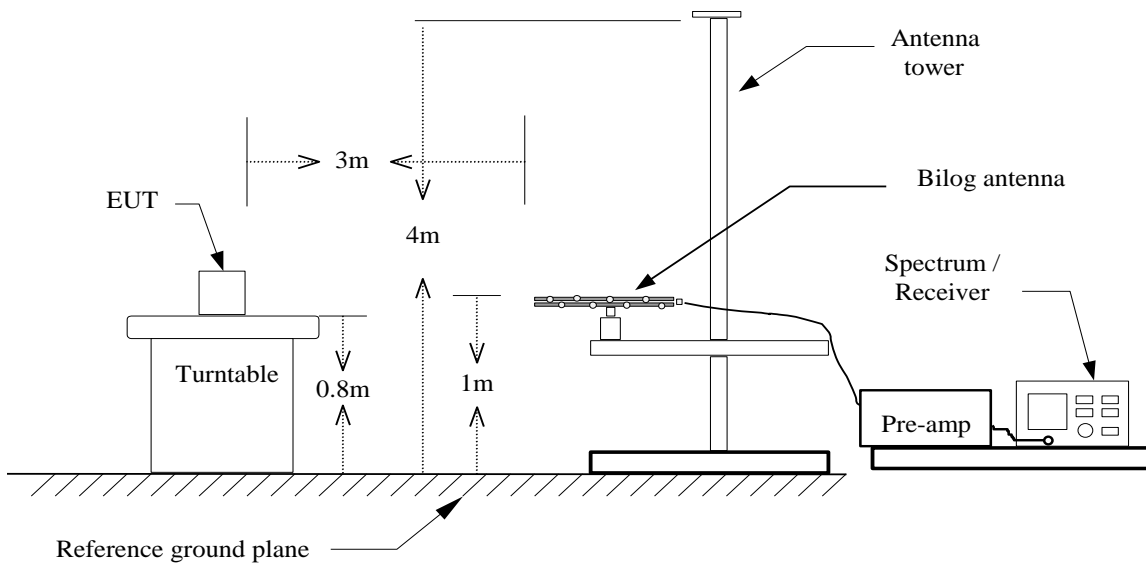
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Test Configuration

9kHz ~ 30MHz



30MHz ~ 1GHz



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TEST PROCEDURE

For 9kHz ~ 30MHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, The underside of the loop should be 1 m above the ground, then find the maximum emissions
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Set the spectrum analyzer in the following setting as:
9KHz-150KHz: RBW=200Hz / VBW=1kHz / Sweep=AUTO
150KHz-30MHz: RBW=10kHz / VBW=30kHz / Sweep=AUTO
6. Repeat above procedures until the measurements for all frequencies are complete.

For 30MHz ~ 1GHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

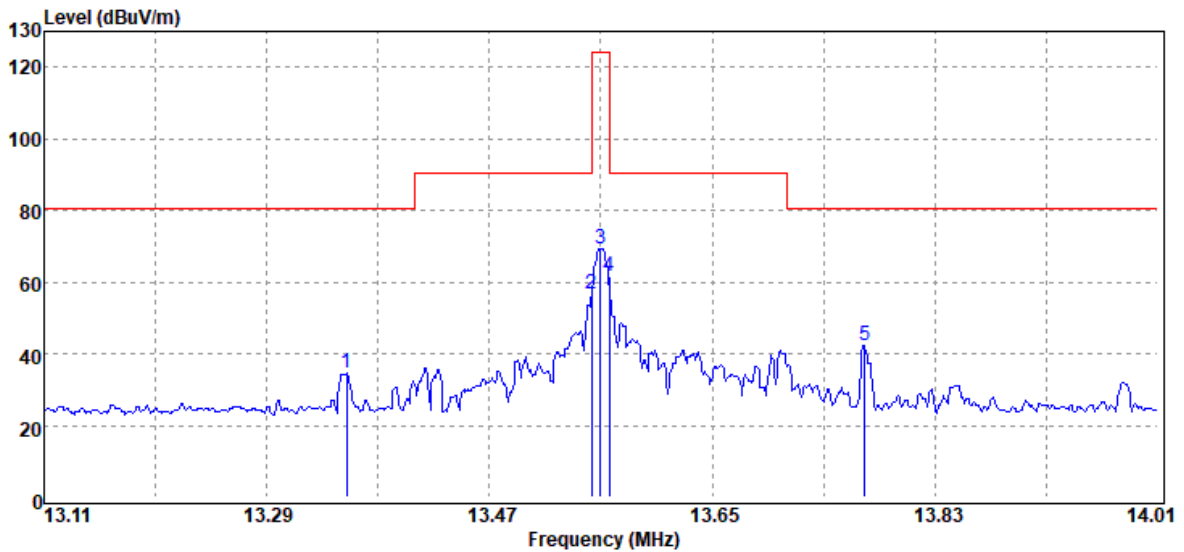
Remark :

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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Test Result of Mask

| | | | |
|------------------------|---------|-------------------|-----------------|
| Operation Mode: | TX mode | Test Date: | January 6, 2022 |
| Temperature: | 21.4°C | Tested by: | Ray Li |
| Humidity: | 58 % RH | Polarity: | Ver. |



| No. | Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|-----|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 1 | 13.355 | Peak | 19.30 | 15.27 | 34.57 | 80.50 | -45.93 |
| 2 | 13.553 | Peak | 41.43 | 15.27 | 56.70 | 90.47 | -33.77 |
| 3 | 13.560 | Peak | 53.97 | 15.27 | 69.24 | 124.00 | -54.76 |
| 4 | 13.567 | Peak | 46.41 | 15.27 | 61.68 | 90.47 | -28.79 |
| 5 | 13.773 | Peak | 27.06 | 15.27 | 42.33 | 80.50 | -38.17 |

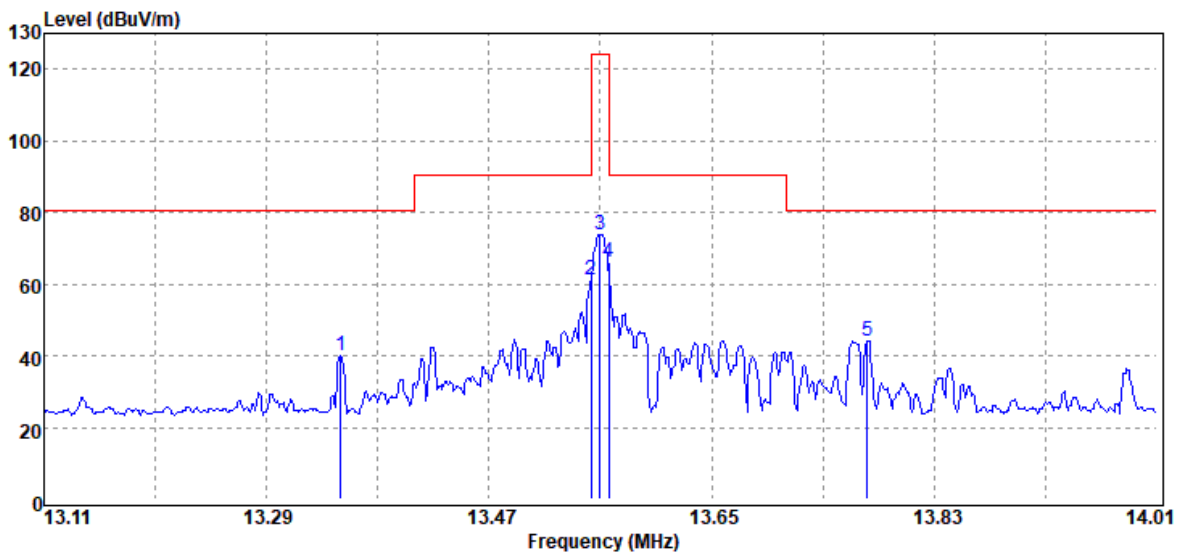
Remark:

- Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
- Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
- 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
 490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40*Log (30 meters/3 meters)
 1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

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Test Result of Mask

| | | | |
|------------------------|---------|-------------------|-----------------|
| Operation Mode: | TX mode | Test Date: | January 6, 2022 |
| Temperature: | 21.4°C | Tested by: | Ray Li |
| Humidity: | 58 % RH | Polarity: | Hor. |



| No. | Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|-----|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 1 | 13.350 | Peak | 24.81 | 15.27 | 40.08 | 80.50 | -40.42 |
| 2 | 13.553 | Peak | 45.96 | 15.27 | 61.23 | 90.47 | -29.24 |
| 3 | 13.560 | Peak | 58.53 | 15.27 | 73.80 | 124.00 | -50.20 |
| 4 | 13.567 | Peak | 50.98 | 15.27 | 66.25 | 90.47 | -24.22 |
| 5 | 13.776 | Peak | 28.97 | 15.27 | 44.24 | 80.50 | -36.26 |

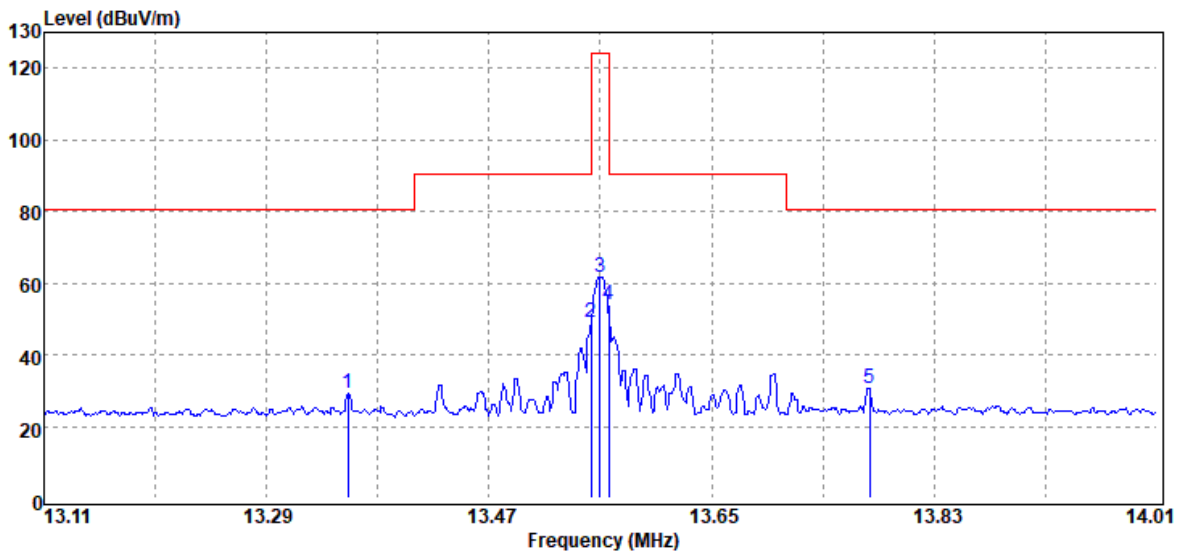
Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit (@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40*Log (30 meters/3 meters)
1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

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Test Result of Mask

| | | | |
|------------------------|---------|-------------------|-----------------|
| Operation Mode: | TX mode | Test Date: | January 6, 2022 |
| Temperature: | 21.4°C | Tested by: | Ray Li |
| Humidity: | 58 % RH | Polarity: | Ground |



| No. | Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|-----|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 1 | 13.356 | Peak | 14.12 | 15.27 | 29.39 | 80.50 | -51.11 |
| 2 | 13.553 | Peak | 33.91 | 15.27 | 49.18 | 90.47 | -41.29 |
| 3 | 13.560 | Peak | 46.45 | 15.27 | 61.72 | 124.00 | -62.28 |
| 4 | 13.567 | Peak | 38.90 | 15.27 | 54.17 | 90.47 | -36.30 |
| 5 | 13.778 | Peak | 15.52 | 15.27 | 30.79 | 80.50 | -49.71 |

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit (@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40*Log (30 meters/3 meters)
1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Report No.: TMWK2112001589KR

9kHz ~ 30MHz

Operation Mode: TX mode

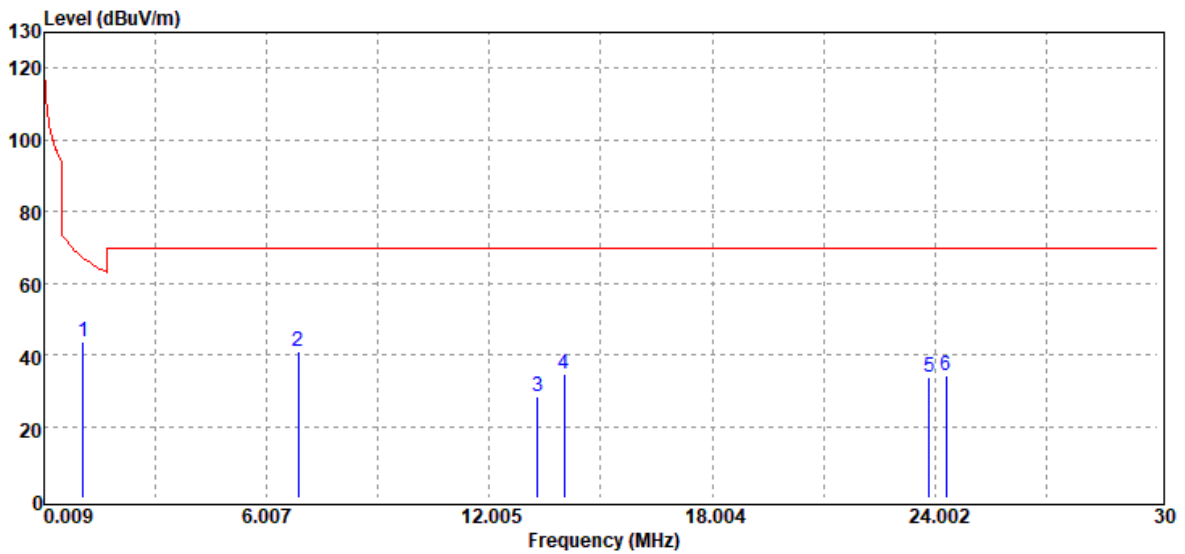
Test Date: January 4, 2022

Temperature: 21.4°C

Tested by: Ray Li

Humidity: 58 % RH

Polarity: Hor.



| No. | Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|-----|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 1 | 1.06 | Peak | 29.94 | 13.70 | 43.64 | 67.11 | -23.47 |
| 2 | 6.85 | Peak | 26.15 | 14.95 | 41.10 | 69.54 | -28.44 |
| 3 | 13.30 | Peak | 12.87 | 15.28 | 28.15 | 69.54 | -41.39 |
| 4 | 14.02 | Peak | 19.46 | 15.26 | 34.72 | 69.54 | -34.82 |
| 5 | 23.85 | Peak | 19.58 | 14.37 | 33.95 | 69.54 | -35.59 |
| 6 | 24.30 | Peak | 20.04 | 14.28 | 34.32 | 69.54 | -35.22 |

Remark:

- 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
 490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40*Log (30 meters/3 meters)
 1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Report No.: TMWK2112001589KR

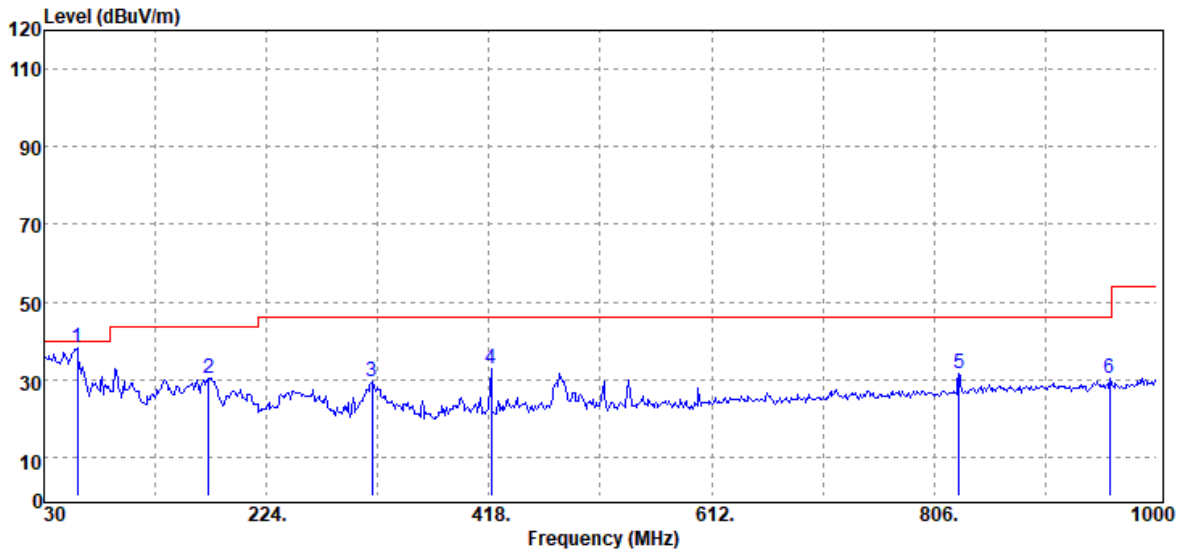
30MHz ~ 1GHz

Operation Mode: TX mode **Test Date:** January 4, 2022
Temperature: 21.4°C **Tested by:** Ray Li
Humidity: 58 % RH **Polarity:** Ver. / Hor.

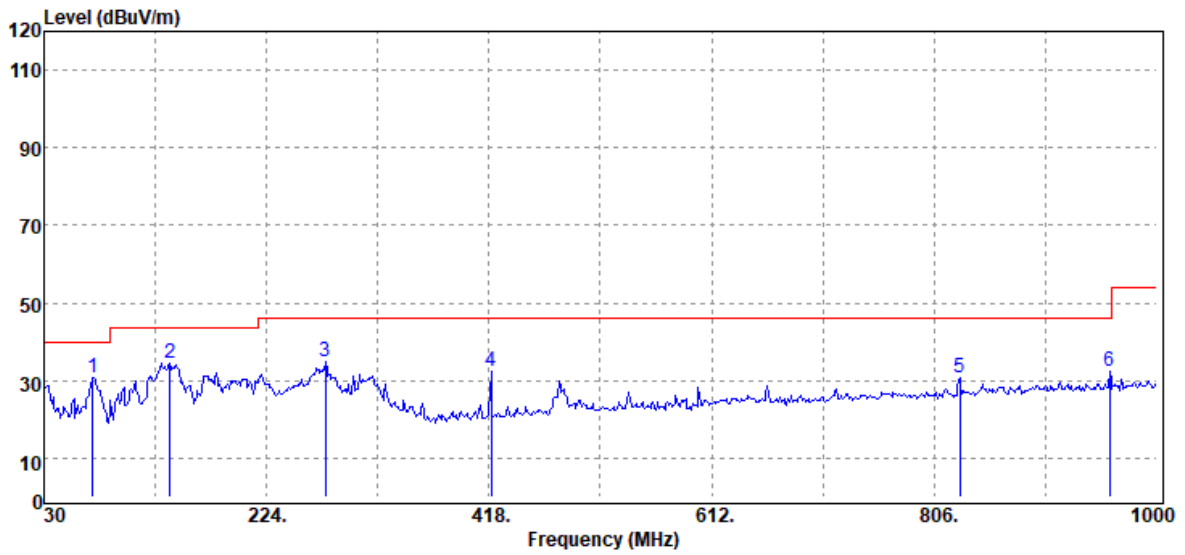
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB | Polarity |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|----------|
| 59.10 | Peak | 54.20 | -15.96 | 38.24 | 40.00 | -1.76 | V |
| 173.56 | Peak | 41.69 | -11.29 | 30.40 | 43.50 | -13.10 | V |
| 316.15 | Peak | 37.68 | -8.25 | 29.43 | 46.00 | -16.57 | V |
| 419.94 | Peak | 38.22 | -5.26 | 32.96 | 46.00 | -13.04 | V |
| 827.34 | Peak | 29.80 | 1.92 | 31.72 | 46.00 | -14.28 | V |
| 959.26 | Peak | 26.58 | 3.83 | 30.41 | 46.00 | -15.59 | V |
| 72.68 | Peak | 45.96 | -15.21 | 30.75 | 40.00 | -9.25 | H |
| 139.61 | Peak | 44.26 | -9.90 | 34.36 | 43.50 | -9.14 | H |
| 275.41 | Peak | 43.62 | -8.88 | 34.74 | 46.00 | -11.26 | H |
| 419.94 | Peak | 37.53 | -5.26 | 32.27 | 46.00 | -13.73 | H |
| 828.31 | Peak | 28.57 | 1.95 | 30.52 | 46.00 | -15.48 | H |
| 959.26 | Peak | 28.49 | 3.83 | 32.32 | 46.00 | -13.68 | H |

Report No.: TMWK2112001589KR

Vertical



Horizontal



Report No.: TMWK2112001589KR

7.3 FREQUENCY STABILITY

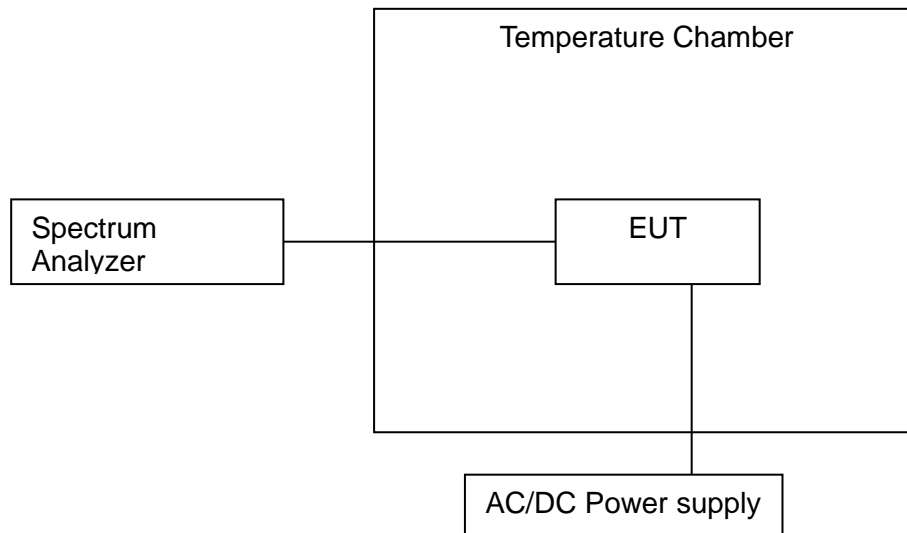
LIMIT

According to §15.225(e)

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Turn the EUT off, and place it inside the environmental temperature chamber.
2. Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
3. Set the spectrum analyzer as RBW=1kHz, VBW = RBW, Span = 200kHz, Sweep = auto.
4. Turn the EUT on and record the operating frequency at startup and two, five, and ten minutes after the EUT is energized.
5. Switch off the EUT and Lower the chamber temperature by not more than 10 °C and allow the temperature inside the chamber to stabilize.
6. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
7. Repeat step 4 through step 6 down to the lowest specified temperature.

Report No.: TMWK2112001589KR

TEST RESULTS

No non-compliance noted.

Temperature: 19.4°C Humidity: 63% RH
Tested by: Lance Chen Test date: December 29, 2021

TEST DATA

| Condition | | | Frequency Error (ppm) | | | | | | | | | Limit (ppm) | Result |
|-------------------------------------|-----------------|------------|-----------------------|-----------|-----------|-----------|-------|-------|-------|--------|-----|-------------|--------|
| Temperature | Modulation Mode | Test Freq. | 0 min | 2 min | 5 min | 10 min | 0 min | 2 min | 5 min | 10 min | | | |
| Normal | | | | | | | | | | | | | |
| T _{20°C} V _{max} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | 100 | Pass | |
| T _{20°C} V _{min} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| Extreme | | | | | | | | | | | | | |
| T _{50°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | 100 | Pass | |
| T _{40°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| T _{30°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| T _{20°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| T _{10°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| T _{0°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| T _{-10°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |
| T _{-20°C} V _{nom} | ASK | 13.56 | 13.560000 | 13.560000 | 13.560000 | 13.560000 | 0.00 | 0.00 | 0.00 | 0.00 | | Pass | |

Remark: V_{nom}: 12Vdc
V_{max}: 13.8Vdc
V_{min}: 10.2Vdc

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7.4 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range (MHz) | Limits (dB μ V) | |
|--------------------------|------------------------|-----------|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

Report No.: TMWK2112001589KR

TEST RESULTS

Operation Mode: Mode 1

Test Date: January 24, 2022

Temperature: 20.1°C

Tested by: Jack Chen

Humidity: 63% RH

| Freq. (MHz) | QP Reading (dBuV) | AV Reading (dBuV) | Corr. factor (dB/m) | QP Result (dBuV/m) | AV Result (dBuV/m) | QP Limit (dBuV) | AV Limit (dBuV) | QP Margin (dB) | AV Margin (dB) | Note |
|-------------|-------------------|-------------------|---------------------|--------------------|--------------------|-----------------|-----------------|----------------|----------------|------|
| 0.1940 | 35.04 | 31.04 | 10.29 | 45.33 | 41.33 | 63.86 | 53.86 | -18.53 | -12.53 | L1 |
| 0.2620 | 32.15 | 27.80 | 10.29 | 42.44 | 38.09 | 61.37 | 51.37 | -18.93 | -13.28 | L1 |
| 0.2940 | 32.36 | 29.53 | 10.29 | 42.65 | 39.82 | 60.41 | 50.41 | -17.76 | -10.59 | L1 |
| 0.3900 | 33.85 | 31.74 | 10.29 | 44.14 | 42.03 | 58.06 | 48.06 | -13.92 | -6.03 | L1 |
| 0.4580 | 26.10 | 17.77 | 10.29 | 36.39 | 28.06 | 56.73 | 46.73 | -20.34 | -18.67 | L1 |
| 13.5620 | 46.92 | 30.00 | 10.46 | 57.38 | 40.46 | 60.00 | 50.00 | -2.62 | -9.54 | L1 |
| 0.1580 | 28.19 | 19.43 | 10.29 | 38.48 | 29.72 | 65.57 | 55.57 | -27.09 | -25.85 | N |
| 0.1980 | 35.63 | 30.90 | 10.29 | 45.92 | 41.19 | 63.69 | 53.69 | -17.77 | -12.50 | N |
| 0.2620 | 30.61 | 26.06 | 10.29 | 40.90 | 36.35 | 61.37 | 51.37 | -20.47 | -15.02 | N |
| 0.2940 | 32.37 | 29.50 | 10.29 | 42.66 | 39.79 | 60.41 | 50.41 | -17.75 | -10.62 | N |
| 0.3900 | 33.41 | 31.66 | 10.29 | 43.70 | 41.95 | 58.06 | 48.06 | -14.36 | -6.11 | N |
| 13.5660 | 40.70 | 24.30 | 10.46 | 51.16 | 34.76 | 60.00 | 50.00 | -8.84 | -15.24 | N |

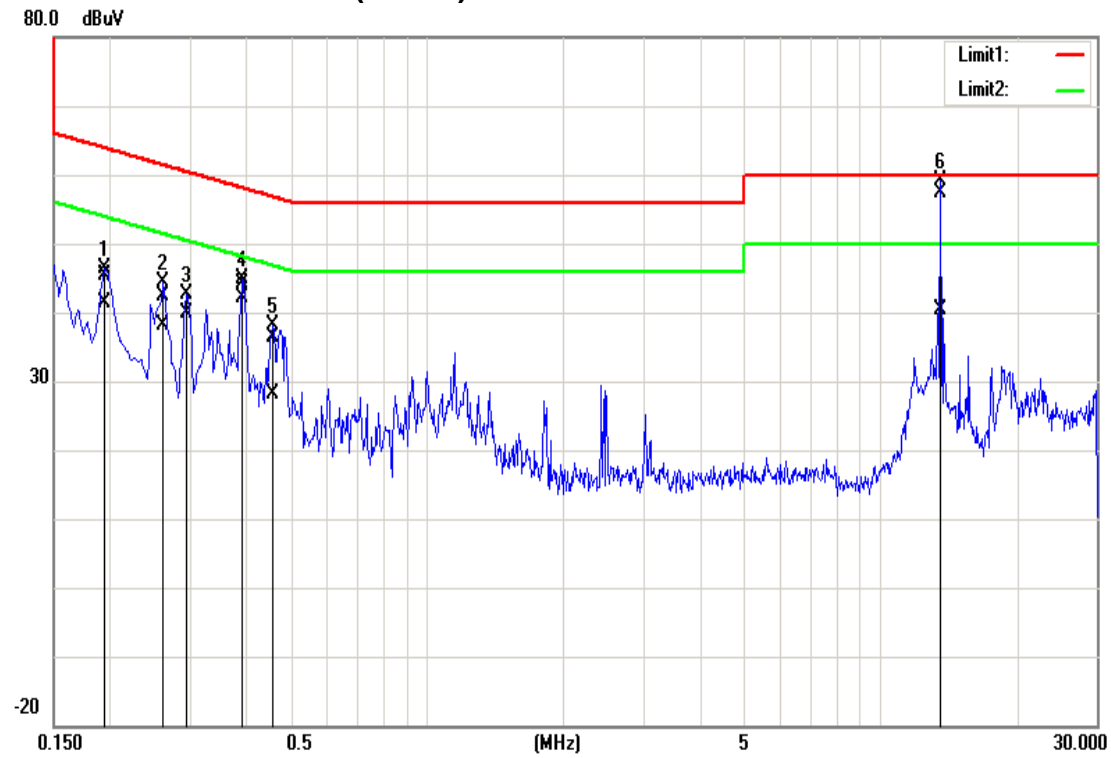
Remark:

1. The measuring frequencies range between 0.15 MHz and 30 MHz.
2. The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)
5. "-" means Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
6. Correction factor = LISN loss + Cable loss.

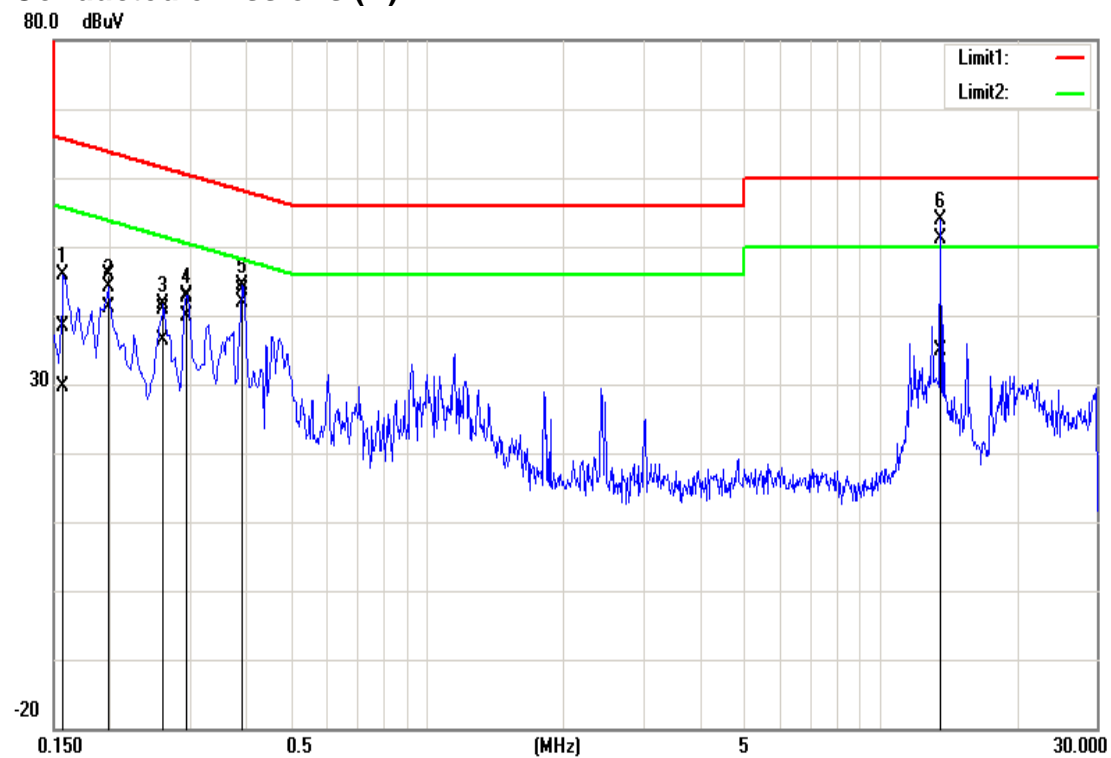
Report No.: TMWK2112001589KR

Test Plots

Conducted emissions (Line 1)



Conducted emissions (N)



- End of Test Report -