# EMC
# TEST REPORT

**Report No. : EME-020875**
**Model No. : KWL-320**
**Issued Date : Sep. 2, 2002**

**Applicant : Kai-Link Corporation Ltd.**
**No. 13-1, Chung Hwa Road, Hsin-Chu Industrial District, Hsin-Chu, 303, Taiwan, R.O.C.**

**Test By : Intertek Testing Services Taiwan Ltd.**
**No. 11, Ko-Tze-Nan Chia-Tung Li, Shiang-Shan District, Hsinchu, Taiwan, R.O.C.**



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## Table of Contents

**Summary of Tests**

## 2.4GHz WLAN Access Point-Model: KWL-320
## FCC ID: OIBKWL-320

| Test | Reference | Results |
|---|---|---|
| Minimum 6dB Bandwidth test | 15.247(a)(2) | Complies |
| Maximum Output Power test | 15.247(b) | Complies |
| RF Antenna Conducted Spurious test | 15.247(c) | Complies |
| Radiated Spurious Emission test | 15.205, 15.209 | Complies |
| Power Spectrum Density test | 15.247(d) | Complies |
| Power Line Conducted Emission test | 15.207 | Complies |

## 1. General information

### 1.1 Identification of the EUT

| | |
|---|---|
| Manufacturer | : Kai-Link Corporation Ltd. |
| Product | : 2.4GHz WLAN Access Point |
| Model No. | : KWL-320 |
| FCC ID. | : OIBKWL-320 |
| Frequency Range | : 2412MHz to 2462MHz |
| Channel Number | : 11 channels |
| Frequency of Each Channel | : 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz |
| Type of Modulation | : DSSS, DBPSK, DQPSK, CCK |
| Power Supply | : 120Vac, 60Hz with adapter (SA0105-A) |
| Power Cord | : N/A |
| Sample Received | : July 31, 2002 |
| Test Date(s) | : Aug. 12, 2002 to Aug. 14, 2002 |

A FCC DoC report has been generated for the client.

### 1.2 Additional information about the EUT

The EUT acts as a bridge between user's existing wired network and wireless equipped computers. Users can take advantage of this technology and gain the freedom user need around the home or office without using cables. The easy installation and setup will have user's networking wirelessly in minutes.

The EUT has multiple listee listed as below, the different model number for different brand serves as marketing strategy.

| Model No. | Trade Name |
|---|---|
| KWL-320 | W@LKLAN, KAI-LINK |
| PWL610 | PLEXUSCOM |

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

### 1.3 Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : 2dBi
Antenna Type : 1/4 λ Dipole antenna

### 1.4 Peripherals equipment

| Peripherals | Manufacturer | Product No. | Serial No. | FCC ID |
|---|---|---|---|---|
| PC | IBM | 634588V | BN3R1VC | FCC DoC Approved |
| Key Board | IBM | 37L2548 | 0095996 | FCC DoC Approved |
| Monitor | IBM | 6331-0LN | 23-NW855 | ARSCM560S |
| Mouse | Logitech | 850693-0001 | LAZ82706831 | FCC DoC Approved |
| Printer | HP | C2642A | TH86K1N2ZB | FCC DoC Approved |
| Modem | Dynalink | V1456VQE | 00V230A00051494 | FCC DoC Approved |

Data Cable: RJ-45 Cat. 5 UTP Cable 20m length × 1

## 2. Test specifications

### 2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section §15.207、§15.209 、§15.247 and ANSI C63.4/1992.

The AC power conducted emissions was invested over the frequency range from 0.45MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading recorded also on the report.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

The EUT setup configurations please refer to the photo of test configuration in item.

### 2.2 Operation mode

The EUT was supplied with 120Vac, 60Hz and was running in accordance with the manufacture’s operation manual.

EUT operation condition:
1. Power on all equipment.
2. Run testing program on PC
3. Traffic cable length: Cat. 5 UTP cable 20m × 1

The EUT was continuously transmit during the test.

**2.4 Test equipment**

| Equipment | Brand | Frequency range | Model No. | Series No. | Cal.Date |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | 9kHz~2.75GHz | ESCS 30 | 825788/014 | May 24, 2002 |
| EMI Test Receiver | Rohde & Schwarz | 20Hz~26.5GHz | ESMI | 825428/005 | June 10, 2002 |
| Spectrum Analyzer | Rohde & Schwarz | 9kHz~30GHz | FSP 30 | 100137 | July 10, 2002 |
| Horn Antenna | EMCO | 1GHz~18GHz | 3115 | 9906-5822 | Sep. 10, 2001 |
| Horn Antenna | SCHWARZBECK | 14GHz~40GHz | BBHA 9170 | 159 | June 20, 2002 |
| Bilog Antenna | SCHWARZBECK | 25MHz~1.7GHz | VULB 9160 | 3111 | June 20, 2002 |
| Turn Table | HDGmbH | N/A | DS 420S | 420/669/01 | N/A |
| Antenna Tower | HDGmbH | N/A | MA 240 | 240/573 | N/A |
| Microwave Amplifier | Agilent | 2GHz~26.5GHz | 8348A | 3111A00567 | Dec. 20, 2001 |
| RF Power Meter | Boonton | 10kHz~100GHz | 4231A | 79401 | May 22, 2002 |
| Power Sensor | Boonton | 30MHz~8GHz | 51011-EMC | 32482 | May 25, 2002 |

Note:
1. The calibration interval of the above instruments is 12 months.

## 3. Minimum 6dB Bandwidth test

### 3.1 Operating environment

Temperature: 21 ℃
Relative Humidity: 58 %

### 3.2 Test setup & procedure

The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth is in the following Table.

See Minimum 6dB Bandwidth plot as file name “Minimum 6dB Bandwidth plot.pdf”

### 3.3 Measured data of Minimum 6dB Bandwidth test results

| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit |
|---|---|---|---|
| Low | 2413.40 | 11 | ＞500kHz |
| Middle | 2438.40 | 11 | ＞500kHz |
| High | 2463.40 | 11 | ＞500kHz |

## 4. Maximum Output Power test

### 4.1 Operating environment

Temperature: 22 ℃
Relative Humidity: 60 %

### 4.2 Test setup & procedure

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to power meter via power sensor. Power was read directly and cable loss correction (1dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

### 4.3 Measured data of Maximum Output Power test results

| Channel | Frequency (MHz) | C.B.L. (dB) | Reading (dBm) | Power Output | | Limit (W) |
|---|---|---|---|---|---|---|
| | | | | (dBm) | (mW) | |
| Lowest | 2412 | 1 | 13.80 | 14.80 | 30.199 | 1 |
| Middle | 2437 | 1 | 13.70 | 14.70 | 29.512 | 1 |
| Highest | 2462 | 1 | 13.24 | 14.24 | 26.546 | 1 |

## 5. RF Antenna Conducted Spurious test

### 5.1 Operating environment

Temperature: 21 ℃
Relative Humidity: 58 %

### 5.2 Test setup & procedure

The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz.
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

See RF Antenna Conducted plot as file name “RF Antenna Conducted plot.pdf”

### 5.3 Measured data of the highest RF Antenna Conducted Spurious test result

| Channel | Max Spurious level at Frequency (MHz) | Spurious Emission level (dBm) | Limit (dB) |
|---|---|---|---|
| Low | 2395.26 | -36.72 | -18.57 |
| Middle | 696.64 | -45.55 | -18.86 |
| High | 722.04 | -46.85 | -19.62 |

Note: 1. Limit = peak power output (in 100kHz RBW) – 20dB
2. All the other emissions were very low the limit.

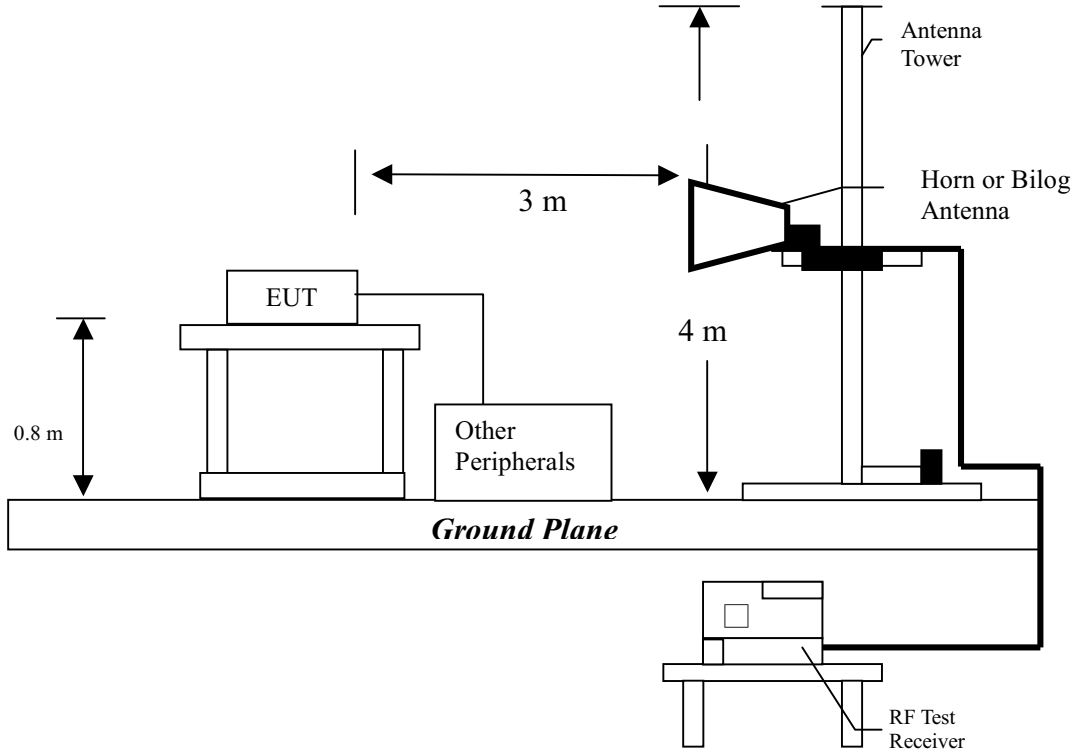
## 6. Radiated Emission test

### 6.1 Operating environment

| | | |
|---|---|---|
| Temperature: | 21 | ℃ |
| Relative Humidity: | 58 | % |

### 6.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.




Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.
The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

**6.3 Emission limits**

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

| Frequency (MHz) | Limits (dB $\mu$ V/m@3m) |
|---|---|
| 30-88 | 40 |
| 88-216 | 43.5 |
| 216-960 | 46 |
| Above 960 | 54 |

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of radiated emission measurement is ±3.078 dB.

**6.4 Radiated spurious emission test data**

**6.4.1 Measurement results: frequencies equal to or less than 1 GHz**

EUT : KWL-320
Test Condition : Tx at low channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 88.20000 | QP | V | 9.81 | 15.49 | 25.30 | 43.50 | -18.20 |
| 130.90000 | QP | V | 13.36 | 16.44 | 29.80 | 43.50 | -13.70 |
| 220.10000 | QP | V | 11.82 | 13.08 | 24.90 | 46.00 | -21.10 |
| 262.80000 | QP | V | 13.32 | 8.48 | 21.80 | 46.00 | -24.20 |
| 394.70000 | QP | V | 16.67 | 10.63 | 27.30 | 46.00 | -18.70 |
| 484.00000 | QP | V | 18.61 | 12.39 | 31.00 | 46.00 | -15.00 |
| 130.90000 | QP | H | 13.36 | 7.74 | 21.10 | 43.50 | -22.40 |
| 220.10000 | QP | H | 11.82 | 13.98 | 25.80 | 46.00 | -20.20 |
| 262.80000 | QP | H | 13.32 | 9.38 | 22.70 | 46.00 | -23.30 |
| 307.40000 | QP | H | 14.47 | 9.13 | 23.60 | 46.00 | -22.40 |
| 394.70000 | QP | H | 16.67 | 8.43 | 25.10 | 46.00 | -20.90 |
| 484.00000 | QP | H | 18.61 | 8.59 | 27.20 | 46.00 | -18.80 |

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

EUT : KWL-320
Test Condition : Tx at middle channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 88.20000 | QP | V | 9.81 | 14.29 | 24.10 | 43.50 | -19.40 |
| 130.90000 | QP | V | 13.36 | 15.24 | 28.60 | 43.50 | -14.90 |
| 220.10000 | QP | V | 11.82 | 13.28 | 25.10 | 46.00 | -20.90 |
| 262.80000 | QP | V | 13.32 | 8.78 | 22.10 | 46.00 | -23.90 |
| 394.70000 | QP | V | 16.67 | 10.13 | 26.80 | 46.00 | -19.20 |
| 484.00000 | QP | V | 18.61 | 11.09 | 29.70 | 46.00 | -16.30 |
| 130.90000 | QP | H | 13.36 | 7.24 | 20.60 | 43.50 | -22.90 |
| 220.10000 | QP | H | 11.82 | 12.28 | 24.10 | 46.00 | -21.90 |
| 262.80000 | QP | H | 13.32 | 8.58 | 21.90 | 46.00 | -24.10 |
| 307.40000 | QP | H | 14.47 | 8.33 | 22.80 | 46.00 | -23.20 |
| 394.70000 | QP | H | 16.67 | 7.63 | 24.30 | 46.00 | -21.70 |
| 484.00000 | QP | H | 18.61 | 6.79 | 25.40 | 46.00 | -20.60 |

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

EUT : KWL-320
Test Condition : Tx at high channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 88.20000 | QP | V | 9.81 | 15.59 | 25.40 | 43.50 | -18.10 |
| 130.90000 | QP | V | 13.36 | 14.24 | 27.60 | 43.50 | -15.90 |
| 220.10000 | QP | V | 11.82 | 14.28 | 26.10 | 46.00 | -19.90 |
| 262.80000 | QP | V | 13.32 | 10.08 | 23.40 | 46.00 | -22.60 |
| 394.70000 | QP | V | 16.67 | 10.13 | 26.80 | 46.00 | -19.20 |
| 484.00000 | QP | V | 18.61 | 11.79 | 30.40 | 46.00 | -15.60 |
| 130.90000 | QP | H | 13.36 | 10.24 | 23.60 | 43.50 | -19.90 |
| 220.10000 | QP | H | 11.82 | 11.88 | 23.70 | 46.00 | -22.30 |
| 262.80000 | QP | H | 13.32 | 8.88 | 22.20 | 46.00 | -23.80 |
| 307.40000 | QP | H | 14.47 | 10.33 | 24.80 | 46.00 | -21.20 |
| 394.70000 | QP | H | 16.67 | 8.43 | 25.10 | 46.00 | -20.90 |
| 484.00000 | QP | H | 18.61 | 8.29 | 26.90 | 46.00 | -19.10 |

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

**6.4.2 Measurement results: frequency above 1GHz**

EUT : KWL-320
Test Condition : Tx at low channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Preamp (dB) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4824 | PK | V | 28.02 | 37.9 | 40.11 | 49.99 | 74 | -24.01 |
| 4824 | AV | V | 28.02 | 37.9 | 29.05 | 38.93 | 54 | -15.07 |
| 7236 | PK | V | 28.02 | 43.26 | - | - | 74 | - |
| 7236 | AV | V | 28.02 | 43.26 | - | - | 54 | - |
| 9648 | PK | V | 28.02 | 46.8 | - | - | 74 | - |
| 9648 | AV | V | 28.02 | 46.8 | - | - | 54 | - |
| 2038 | PK | V | 0 | 30.79 | 19.33 | 50.12 | 74 | -23.88 |
| 2038 | AV | V | 0 | 30.79 | 12.86 | 43.65 | 54 | -10.35 |
| 4076 | PK | V | 28.02 | 37.54 | 37.51 | 47.03 | 74 | -26.97 |
| 4076 | AV | V | 28.02 | 37.54 | 26.91 | 36.43 | 54 | -17.57 |
| 6114 | PK | V | 28.02 | 41.82 | 42 | 55.8 | 74 | -18.2 |
| 6114 | AV | V | 28.02 | 41.82 | 36.2 | 50 | 54 | -4 |
| 8152 | PK | V | 28.02 | 44.95 | 42.93 | 59.86 | 74 | -14.14 |
| 8152 | AV | V | 28.02 | 44.95 | 32.04 | 48.97 | 54 | -5.03 |
| 10190 | PK | V | 28.02 | 46.81 | - | - | 74 | - |
| 10190 | AV | V | 28.02 | 46.81 | - | - | 54 | - |

Remark:
1.Corrected Level = Reading Level + Correction Factor－Preamp
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

EUT : KWL-320
Test Condition : Tx at low channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Preamp (dB) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4824 | PK | H | 28.02 | 37.9 | 39.25 | 49.13 | 74 | -24.87 |
| 4824 | AV | H | 28.02 | 37.9 | 27.85 | 37.73 | 54 | -16.27 |
| 7236 | PK | H | 28.02 | 43.26 | - | - | 74 | - |
| 7236 | AV | H | 28.02 | 43.26 | - | - | 54 | - |
| 9648 | PK | H | 28.02 | 46.8 | - | - | 74 | - |
| 9648 | AV | H | 28.02 | 46.8 | - | - | 54 | - |
| 2038 | PK | H | 0 | 30.79 | 17.5 | 48.29 | 74 | -25.71 |
| 2038 | AV | H | 0 | 30.79 | 7.52 | 38.31 | 54 | -15.69 |
| 4076 | PK | H | 28.02 | 37.54 | 36.78 | 46.3 | 74 | -27.7 |
| 4076 | AV | H | 28.02 | 37.54 | 25.1 | 34.62 | 54 | -19.38 |
| 6114 | PK | H | 28.02 | 41.82 | 40.28 | 54.08 | 74 | -19.92 |
| 6114 | AV | H | 28.02 | 41.82 | 31.68 | 45.48 | 54 | -8.52 |
| 8152 | PK | H | 28.02 | 44.95 | 41.97 | 58.9 | 74 | -15.1 |
| 8152 | AV | H | 28.02 | 44.95 | 30.58 | 47.51 | 54 | -6.49 |
| 10190 | PK | H | 28.02 | 46.81 | - | - | 74 | - |
| 10190 | AV | H | 28.02 | 46.81 | - | - | 54 | - |

Remark:
1.Corrected Level = Reading Level + Correction Factor－Preamp
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

EUT : KWL-320
Test Condition : Tx at middle channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Preamp (dB) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4874 | PK | V | 28.02 | 37.9 | 37.85 | 47.73 | 74 | -26.27 |
| 4874 | AV | V | 28.02 | 37.9 | 26.41 | 36.29 | 54 | -17.71 |
| 7311 | PK | V | 28.02 | 43.26 | - | - | 74 | - |
| 7311 | AV | V | 28.02 | 43.26 | - | - | 54 | - |
| 9748 | PK | V | 28.02 | 46.8 | - | - | 74 | - |
| 9748 | AV | V | 28.02 | 46.8 | - | - | 54 | - |
| 2063 | PK | V | 0 | 30.79 | 20.95 | 51.74 | 74 | -22.26 |
| 2063 | AV | V | 0 | 30.79 | 17.04 | 47.83 | 54 | -6.17 |
| 4126 | PK | V | 28.02 | 37.54 | 38.41 | 47.93 | 74 | -26.07 |
| 4126 | AV | V | 28.02 | 37.54 | 26.95 | 36.47 | 54 | -17.53 |
| 6189 | PK | V | 28.02 | 41.82 | 42.07 | 55.87 | 74 | -18.13 |
| 6189 | AV | V | 28.02 | 41.82 | 36.44 | 50.24 | 54 | -3.76 |
| 8252 | PK | V | 28.02 | 45.12 | 39.73 | 56.83 | 74 | -17.17 |
| 8252 | AV | V | 28.02 | 45.12 | 29.64 | 46.74 | 54 | -7.26 |
| 10315 | PK | V | 28.02 | 46.97 | - | - | 74 | - |
| 10315 | AV | V | 28.02 | 46.97 | - | - | 54 | - |

Remark:
1.Corrected Level = Reading Level + Correction Factor－Preamp
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

EUT : KWL-320
Test Condition : Tx at middle channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Preamp (dB) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4874 | PK | H | 28.02 | 37.9 | 35.91 | 45.79 | 74 | -28.21 |
| 4874 | AV | H | 28.02 | 37.9 | 24.17 | 34.05 | 54 | -19.95 |
| 7311 | PK | H | 28.02 | 43.26 | - | - | 74 | - |
| 7311 | AV | H | 28.02 | 43.26 | - | - | 54 | - |
| 9748 | PK | H | 28.02 | 46.8 | - | - | 74 | - |
| 9748 | AV | H | 28.02 | 46.8 | - | - | 54 | - |
| 2063 | PK | H | 0 | 30.79 | 19.31 | 50.1 | 74 | -23.9 |
| 2063 | AV | H | 0 | 30.79 | 13.38 | 44.17 | 54 | -9.83 |
| 4126 | PK | H | 28.02 | 37.54 | 38.98 | 48.5 | 74 | -25.5 |
| 4126 | AV | H | 28.02 | 37.54 | 27.51 | 37.03 | 54 | -16.97 |
| 6189 | PK | H | 28.02 | 41.82 | 40.1 | 53.9 | 74 | -20.1 |
| 6189 | AV | H | 28.02 | 41.82 | 31.75 | 45.55 | 54 | -8.45 |
| 8252 | PK | H | 28.02 | 45.12 | - | - | 74 | - |
| 8252 | AV | H | 28.02 | 45.12 | - | - | 54 | - |

Remark:
1.Corrected Level = Reading Level + Correction Factor－Preamp
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

**The radiated spurious emissions at**

| Frequency(MHz) | Margin |
|---|---|
| 2088 | -0.77 |

**are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.**

EUT : KWL-320
Test Condition : Tx at high channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Preamp (dB) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4924 | PK | V | 28.02 | 37.9 | 38.95 | 48.83 | 74 | -25.17 |
| 4924 | AV | V | 28.02 | 37.9 | 25.41 | 35.29 | 54 | -18.71 |
| 7386 | PK | V | 28.02 | 43.26 | - | - | 74 | - |
| 7386 | AV | V | 28.02 | 43.26 | - | - | 54 | - |
| 9848 | PK | V | 28.02 | 46.78 | - | - | 74 | - |
| 9848 | AV | V | 28.02 | 46.78 | - | - | 54 | - |
| 2088 | PK | V | 0 | 30.79 | 25.15 | 55.94 | 74 | -18.06 |
| 2088 | AV | V | 0 | 30.79 | 22.44 | 53.23 | 54 | -0.77 |
| 4176 | PK | V | 28.02 | 37.54 | 39.61 | 49.13 | 74 | -24.87 |
| 4176 | AV | V | 28.02 | 37.54 | 28.32 | 37.84 | 54 | -16.16 |
| 6264 | PK | V | 28.02 | 41.98 | 42.48 | 56.44 | 74 | -17.56 |
| 6264 | AV | V | 28.02 | 41.98 | 36.47 | 50.43 | 54 | -3.57 |
| 8352 | PK | V | 28.02 | 45.12 | 39.75 | 56.85 | 74 | -17.15 |
| 8352 | AV | V | 28.02 | 45.12 | 28.81 | 45.91 | 54 | -8.09 |
| 10440 | PK | V | 28.02 | 47.03 | - | - | 74 | - |
| 10440 | AV | V | 28.02 | 47.03 | - | - | 54 | - |

Remark:
1.Corrected Level = Reading Level + Correction Factor－Preamp
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

EUT : KWL-320
Test Condition : Tx at high channel

| Frequency (MHz) | Spectrum Analyzer Detector | Antenna Polariz. (H/V) | Preamp (dB) | Correction Factor (dB/m) | Reading (dBuV) | Corrected Reading (dBuV) | Limit @ 3 m (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4924 | PK | H | 28.02 | 37.9 | 36.21 | 46.09 | 74 | -27.91 |
| 4924 | AV | H | 28.02 | 37.9 | 24.82 | 34.7 | 54 | -19.3 |
| 7386 | PK | H | 28.02 | 43.26 | - | - | 74 | - |
| 7386 | AV | H | 28.02 | 43.26 | - | - | 54 | - |
| 9848 | PK | H | 28.02 | 46.78 | - | - | 74 | - |
| 9848 | AV | H | 28.02 | 46.78 | - | - | 54 | - |
| 2088 | PK | H | 0 | 30.79 | 21.26 | 52.05 | 74 | -21.95 |
| 2088 | AV | H | 0 | 30.79 | 16.62 | 47.41 | 54 | -6.59 |
| 4176 | PK | H | 28.02 | 37.54 | 40.39 | 49.91 | 74 | -24.09 |
| 4176 | AV | H | 28.02 | 37.54 | 30.01 | 39.53 | 54 | -14.47 |
| 6264 | PK | H | 28.02 | 41.98 | 40.9 | 54.86 | 74 | -19.14 |
| 6264 | AV | H | 28.02 | 41.98 | 30.13 | 44.09 | 54 | -9.91 |
| 8352 | PK | H | 28.02 | 45.12 | - | - | 74 | - |
| 8352 | AV | H | 28.02 | 45.12 | - | - | 54 | - |

Remark:
1.Corrected Level = Reading Level + Correction Factor－Preamp
2.Correction Factor = Antenna Factor + Cable Loss
3. “-“ means the emission is below the noise floor.

## 7. Power Spectrum Density test

### 7.1 Operating environment

Temperature: 21 ℃
Relative Humidity: 58 %

### 7.2 Test setup & procedure

The power spectrum density per FCC §15.247(d) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 30kHz, a span of 1.5 MHz, and the sweep time set at 500 seconds. Power Density was read directly and cable loss (1dB)/external attenuator (3dB) correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

See Power Spectrum Density plot as file name "Power Spectrum Density plot.pdf"

### 7.3 Measured data of Power Spectrum Density test results

| Channel | Frequency (MHz) | Measured level (dBm) | Limit (dBm) |
|---|---|---|---|
| Low | 2413.472 | -8.90 | 8 |
| Middle | 2438.472 | -9.18 | 8 |
| High | 2463.474 | -9.62 | 8 |

**8. Emission on the band edge §FCC 15.247(C)**

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

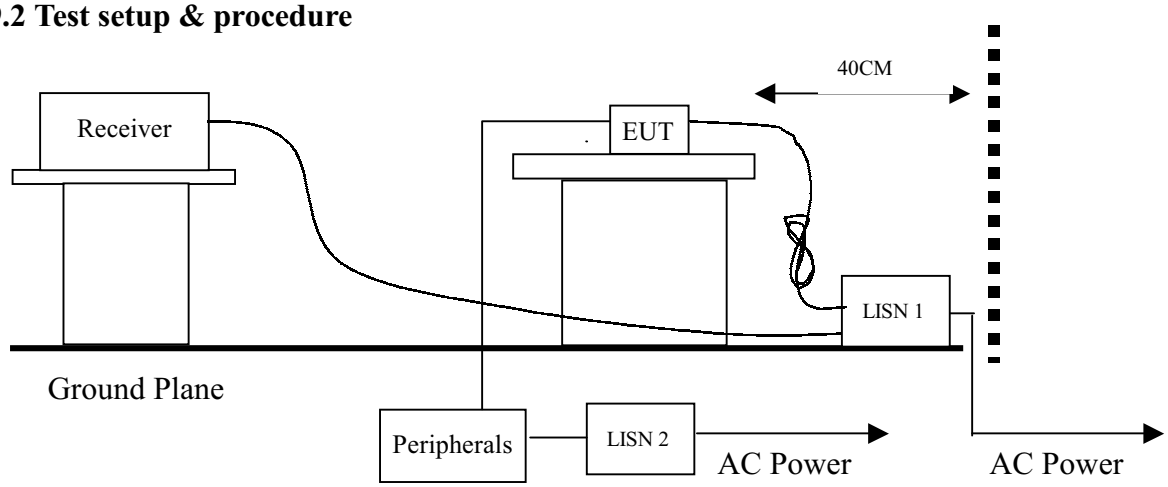
See band-edge plot as file name “Band-edge plot.pdf”.

## 9. Power Line Conducted Emission test §FCC 15.207

### 9.1 Operating environment

Temperature: 22 ℃
Relative Humidity: 60 %

### 9.2 Test setup & procedure




The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

See Power Line Conducted Emission plot as file name “Power Line Conducted Emission plot.pdf”.

Emission Limit

| FCC Part 15 Paragraph 15.207 | | |
|---|---|---|
| Freq. (MHz) | Maximum RF Line Voltage | |
| | uV | dBuV |
| 0.45 - 30 | 250 | 48.0 |

**9.3 Power Line Conducted Emission test data**

EUT : KWL-320
Test Condition : Tx at low channel

| Power Line (circle) | Freq. (MHz) | Reading (dB $\mu$ V) QP | Limit (dB $\mu$ V) QP | Margin (dB) QP |
|---|---|---|---|---|
| LINE | 0.49000 | 35.6 | 48.00 | -12.40 |
| LINE | 1.27400 | 34.9 | 48.00 | -13.10 |
| LINE | 1.76200 | 35.2 | 48.00 | -12.80 |
| LINE | 2.74600 | 35.6 | 48.00 | -12.40 |
| LINE | 2.84200 | 37.0 | 48.00 | -11.00 |
| LINE | 3.23400 | 36.9 | 48.00 | -11.10 |
| NEUTRAL | 1.27400 | 39.8 | 48.00 | -8.20 |
| NEUTRAL | 1.66600 | 39.8 | 48.00 | -8.20 |
| NEUTRAL | 1.76200 | 40.1 | 48.00 | -7.90 |
| NEUTRAL | 2.15400 | 40.4 | 48.00 | -7.60 |
| NEUTRAL | 2.25000 | 38.8 | 48.00 | -9.20 |
| NEUTRAL | 3.23400 | 39.2 | 48.00 | -8.80 |

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
   Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

EUT : KWL-320
Test Condition : Tx at middle channel

| Power Line (circle) | Freq. (MHz) | Reading (dB $\mu$ V) QP | Limit (dB $\mu$ V) QP | Margin (dB) QP |
|---|---|---|---|---|
| LINE | 0.49000 | 35.5 | 48.00 | -12.50 |
| LINE | 1.27400 | 34.9 | 48.00 | -13.10 |
| LINE | 1.76200 | 35.4 | 48.00 | -12.60 |
| LINE | 2.25000 | 35.0 | 48.00 | -13.00 |
| LINE | 2.84200 | 36.5 | 48.00 | -11.50 |
| LINE | 3.23400 | 36.5 | 48.00 | -11.50 |
| NEUTRAL | 1.27400 | 39.7 | 48.00 | -8.30 |
| NEUTRAL | 1.66600 | 39.8 | 48.00 | -8.20 |
| NEUTRAL | 1.76200 | 40.1 | 48.00 | -7.90 |
| NEUTRAL | 2.15400 | 40.4 | 48.00 | -7.60 |
| NEUTRAL | 2.54600 | 38.8 | 48.00 | -9.20 |
| NEUTRAL | 2.84200 | 38.6 | 48.00 | -9.40 |

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

EUT : KWL-320
Test Condition : Tx at high channel

| Power Line (circle) | Freq. (MHz) | Reading (dB $\mu$ V) QP | Limit (dB $\mu$ V) QP | Margin (dB) QP |
|---|---|---|---|---|
| LINE | 0.49000 | 35.5 | 48.00 | -12.50 |
| LINE | 1.27400 | 34.9 | 48.00 | -13.10 |
| LINE | 1.76200 | 35.4 | 48.00 | -12.60 |
| LINE | 2.25000 | 35.0 | 48.00 | -13.00 |
| LINE | 2.84200 | 36.4 | 48.00 | -11.60 |
| LINE | 3.23400 | 36.4 | 48.00 | -11.60 |
| NEUTRAL | 1.27400 | 39.7 | 48.00 | -8.30 |
| NEUTRAL | 1.66600 | 39.8 | 48.00 | -8.20 |
| NEUTRAL | 1.76200 | 40.2 | 48.00 | -7.80 |
| NEUTRAL | 2.15400 | 40.6 | 48.00 | -7.40 |
| NEUTRAL | 2.54600 | 38.9 | 48.00 | -9.10 |
| NEUTRAL | 2.64200 | 39.4 | 48.00 | -8.60 |

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.