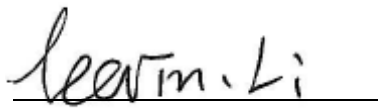
# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| Applicant | : | ADESSO INC. |
| Address | : | 20659 Valley BLVD. Walnut, CA 91789 |
| Equipment | : | Wireless Barcode Scanner |
| Model No. | : | NuScan 4300B, NuScan 4000B, NuScan 4100B, NuScan 4200B, NuScan 4400B, NuScan 4500B, NuScan 4600, NuScan 4700, NuScan 4800, NuScan 4900 |
| Trade Name | : | Adesso/Gyration |
| FCC ID. | : | 2ACFQ-4300B |
| Standard | : | FCC part 15 Subpart C §15.249 |

**I HEREBY CERTIFY THAT :**

**The sample was received on May. 19, 2023 and the testing was completed on Jul. 12, 2023 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.**

Approved by:



**Leevin Li /Supervisor**

# Contents

# History of this test report

| Report No. | Issue Date | Description |
|---|---|---|
| DEFC2304036 | Jul 17, 2023 | Original |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Report Type | | Description |
|---|---|---|
| ■ | Original report | NA |

# 1. Summary of Test Procedure and Test Results

## 1.1 Applicable Standards

**ANSI C63.10:2013**

**FCC Rules and Regulations Part 15 Subpart C §15.249**

| FCC Rule | . Description of Test | Result |
|---|---|---|
| 15.203 | . Antenna Requirement | Pass |
| 15.207 | . Conducted Emission | Pass |
| 15.209&15.249 | . Radiated Emission | Pass |
| 15.215 | . 20dB Bandwidth Measurement | Pass |
| 15.249 | . Band Edges Measurement Data | Pass |

Note: Deviations Yes ☐ No ■

*The lab has reduced the uncertainty risk factor from test equipment, environment and staff technicians which according to the standard on contract. Therefore, the test result will only be determined by standard requirement.

# 2. Test Configuration of Equipment under Test

## 2.1 Feature of Equipment under Test

| | |
|---|---|
| Equipment | Wireless Barcode Scanner |
| Model Name | NuScan 4300B, NuScan 4000B, NuScan 4100B, NuScan 4200B, NuScan 4400B, NuScan 4500B, NuScan 4600, NuScan 4700, NuScan 4800, NuScan 4900 |
| Model Discrepancy | Different color or tooling,<br>Model NuScan 4300B was chosen for final test. |
| Operation Frequency Range | BT/ BLE: 2400-2483.5MHz<br>2.4GHz: 2400MHz-2483.5MHz |
| Center Frequency Range | BT/ BLE: 2402MHz-2480MHz<br>2.4GHz: 2410MHz-2470MHz |
| Modulation Type | BT: GFSK, π/4-DQPSK, 8DPSK<br>BLE: GFSK<br>2.4GHz: GFSK |
| Data Rate | BT: GFSK:1Mbps, π/4-DQPSK: 2Mbps, 8DPSK:3Mbps<br>BLE: GFSK: 1Mbps<br>2.4GHz: GFSK: 1Mbps |
| Antenna Type | BT/BLE: PCB Antenna<br>2.4GHz: FPC Antenna |
| Antenna Gain | BT/BLE: 2402-2480MHz: 0.55dBi<br>2.4GHz: 2400-2500MHz: 0.22dBi |
| Working Temperature | -20°C to +50°C |
| Input Voltage | 5±5%VDC |
| Power Supply | 3.7V⎓500mA |

Note: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

## 2.2 Carrier Frequency of Channels

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| **1** | **2410** | 17 | 2426 | 33 | 2442 | 49 | 2458 |
| 2 | 2411 | 18 | 2427 | 34 | 2443 | 50 | 2459 |
| 3 | 2412 | 19 | 2428 | 35 | 2444 | 51 | 2460 |
| 4 | 2413 | 20 | 2429 | 36 | 2445 | 52 | 2461 |
| 5 | 2414 | 21 | 2430 | 37 | 2446 | 53 | 2462 |
| 6 | 2415 | 22 | 2431 | 38 | 2447 | 54 | 2463 |
| 7 | 2416 | 23 | 2432 | 39 | 2448 | 55 | 2464 |
| 8 | 2417 | 24 | 2433 | 40 | 2449 | 56 | 2465 |
| 9 | 2418 | 25 | 2434 | 41 | 2450 | 57 | 2466 |
| 10 | 2419 | 26 | 2435 | 42 | 2451 | 58 | 2467 |
| 11 | 2420 | 27 | 2436 | 43 | 2452 | 59 | 2468 |
| 12 | 2421 | 28 | 2437 | 44 | 2453 | 60 | 2469 |
| 13 | 2422 | 29 | 2438 | 45 | 2454 | **61** | **2470** |
| 14 | 2423 | 30 | 2439 | 46 | 2455 | | |
| 15 | 2424 | **31** | **2440** | 47 | 2456 | | |
| 16 | 2425 | 32 | 2441 | 48 | 2457 | | |

## 2.3 Test Mode and Test Software

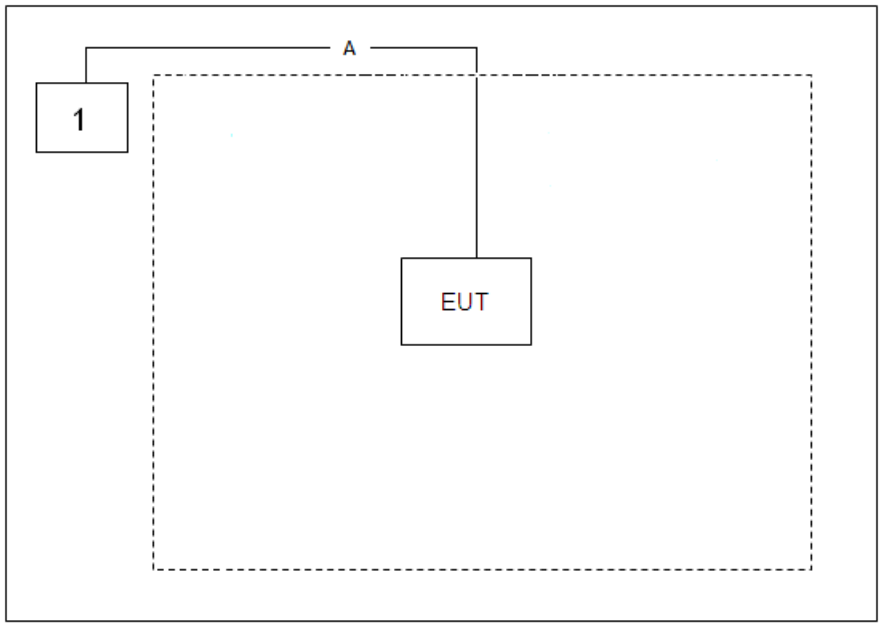
a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
b. The complete test system included support units and EUT for the RF test.
c. Run the test software "FCC_Test_Tool_3.0.exe (Ver.: 1.0.3.1)" under Win 7 System was executed to transmit and receive data via wireless.
d. The following test modes were performed for the test:

| Conducted Emissions from the AC mains power ports | |
|---|---|
| Test Mode | Operating Description |
| 1 | GFSK(2410) for AC120V |
| 2 | GFSK(2440) for AC120V |
| 3 | GFSK(2470) for AC120V |
| 4 | GFSK(2410) for AC240V |
| caused "Test Mode 1" generated the worst case, it was reported as the final data. | |
| Radiation Emissions (Below 1GHz) | |
| Test Mode | Operating Description |
| 1 | GFSK(2410) for AC120V |
| 2 | GFSK(2440) for AC120V |
| 3 | GFSK(2470) for AC120V |
| 4 | GFSK(2410) for AC240V |
| caused "Test Mode 1" generated the worst case, it was reported as the final data. | |
| Radiation Emissions (1GHz ~ 25GHz) | |
| Test Mode | Operating Description |
| 1 | GFSK(2410) |
| 2 | GFSK(2440) |
| 3 | GFSK(2470) |
| caused "Test Mode 1, 2, 3" generated the worst case, they were reported as the final data. | |

## 2.4 Description of Test System

| Product | | Manufacturer | Model No. | Serial No. | Power Cord |
|---|---|---|---|---|---|
| 1 | Notebook | SONY | PCG-71811P | 27544574 7000251 | Non-Shielded, 1.8m |

Connection Diagram




| Signal Cable Type | | Quantity | Signal cable Description |
|---|---|---|---|
| A | USB Cable | 1 | 5.0m Shielding |

## 2.5 General Information of Test

| | |
|---|---|
| Test Site | Cerpass Technology Corporation(Cerpass Laboratory)<br>Address: Room 102, No. 5, Xing'an Road, Chang'an Town, Dongguan City, Guangdong Province<br>Tel: +86-769-8547-1212<br>Fax: +86-769-8547-1912 |
| FCC Designation No.: | CN1288 |
| Frequency Range Investigated: | Conducted: from 150kHz to 30 MHz<br>Radiation: from 30 MHz to 25,000MHz |
| Test Distance: | The test distance of radiated emission from antenna to EUT is 3 M. |

| Test Item | Test Site | Test period | Environmental Conditions | Tested By |
|---|---|---|---|---|
| Radiated Emissions | 3M01-DG | 2023/07/11~2023/07/12 | 23~24℃ / 52~53% | Amos Zhang |
| AC Power Line Conducted Emission | CON01-DG | 2023/07/11 | 23℃ / 55% | Amos Zhang |

## 2.6 Measurement Uncertainty

| Measurement Item | Uncertainty |
|---|---|
| AC Power Line Conduction(150K~30MHz) | ±2.60dB |
| Radiated Spurious Emission(9KHz~30MHz) | ±4.10dB |
| Radiated Spurious Emission(30MHz~1GHz) | ±4.39dB |
| Radiated Spurious Emission(1GHz~18GHz) | ±5.36dB |
| Radiated Spurious Emission(18GHz~40GHz) | ±5.43dB |
| 6dB Bandwidth&20dB Bandwidth | ±4.8% |
| Occupied Bandwidth | ±4.5% |
| Peak Output Power(Conducted Power Meter) | ±0.94dB |
| Power Spectral Density | ±1.01dB |
| Dwell Time / Deactivation Time | ±3.5% |

## 3. Equipment and Ancillaries Used for Tests

| AC Power Line Conducted Emission | | | | | |
|---|---|---|---|---|---|
| Test Site | CON01-DG | | | | |
| Instrument/Ancillary | Manufacturer | Model No. | Serial No. | Calibration Date | Valid Date. |
| Test Receiver | R&S | ESCI | 100564 | 2023.01.06 | 2024.01.05 |
| LISN | SCHWARZBECK | NSLK 8127 | 8127748 | 2023.01.06 | 2024.01.05 |
| LISN | R&S | ENV216 | 100024 | 2023.01.06 | 2024.01.05 |
| ISN | TESEQ | ISN T800 | 42809 | 2023.05.06 | 2024.05.05 |
| Pulse Limiter with 10dB Attenuation | SCHWARZBECK | VTSD 9561-F | 9561-F106 | 2023.01.06 | 2024.01.05 |
| Temperature/ Humidity Meter | GEMLEAD | STH200A | N/A | 2022.08.05 | 2023.08.04 |

| Radiated Emissions | | | | | |
|---|---|---|---|---|---|
| Test Site | 3M01-DG | | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Valid Date |
| EMI Test Receiver | R&S | ESCI | 100565 | 2023.05.06 | 2024.05.05 |
| Amplifier | EMCI | EMC330 | 980082 | 2023.05.06 | 2024.05.05 |
| Loop Antenna | R&S | HFH2-Z2 | 100150 | 2022.05.11 | 2024.05.10 |
| Bilog Antenna | Sunol Science | JB6 | A111218 | 2023.01.12 | 2025.01.11 |
| Preamplifier | Agilent | 8449B | 3008A02342 | 2023.01.06 | 2024.01.05 |
| Preamplifier | COM-POWER | PA-840 | 711885 | 2023.05.06 | 2024.05.05 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA9120 D | 9120D-619 | 2022.05.22 | 2024.05.21 |
| Standard Gain Horn Antenna | TRC | HA-2640 | 18050 | 2022.05.09 | 2024.05.08 |
| Standard Gain Horn Antenna | TRC | HA-1726 | 18051 | 2022.05.09 | 2024.05.08 |
| FSQ Signal Analyzer | R&S | FSQ40 | 200012 | 2023.05.06 | 2024.05.05 |
| Temperature/ Humidity Meter | GEMLEAD | STH200A | N/A | 2022.08.05 | 2023.08.04 |

# 4. Antenna Requirements

## 4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

## 4.2 Antenna Construction and Directional Gain

2.4GHz

| | |
|---|---|
| Antenna Type | FPC Antenna |
| Antenna Gain | 0.22dBi |

# 5. On Time, Duty Cycle and Measurement methods

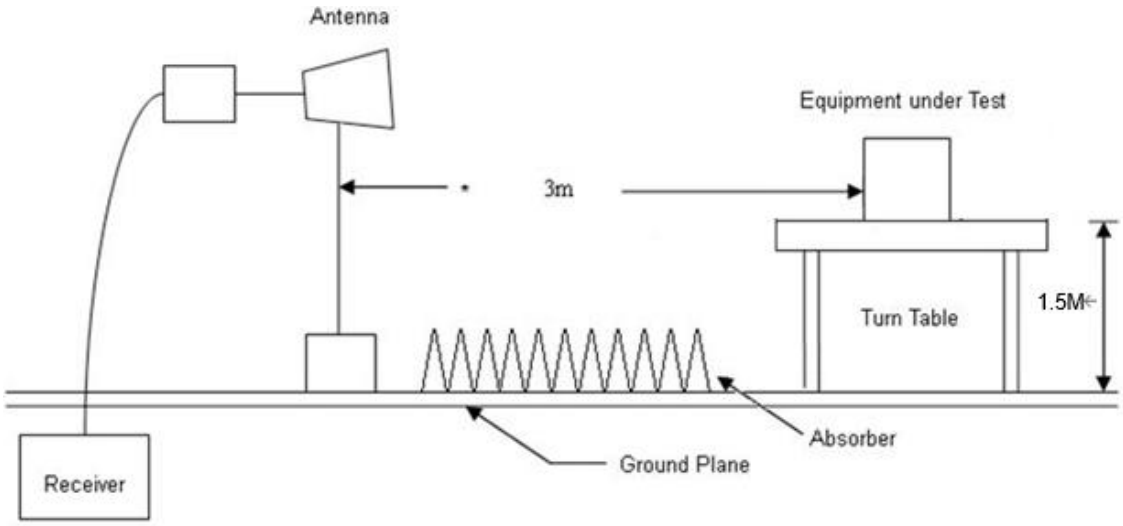
## 5.1 Test Limit

None; for reporting purposes only.

## 5.2 Test Procedure

Zero-Span Spectrum Analyzer Method.

## 5.3 Test Setup Layout



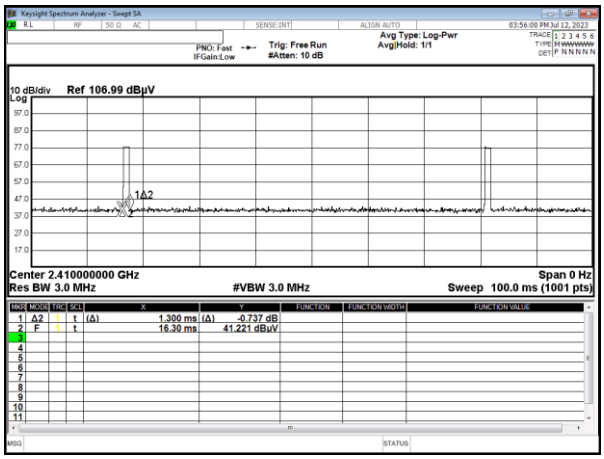

## 5.4 Test Result and Data

| Modulation Type | On Time (msec) | Period Time (msec) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|---|---|---|---|---|
| GFSK | 1.3*2＝2.6 | 100 | 2.60% | 31.70 |

Note: 1)Duty Cycle Correction Factor=20log(x),Where: x is Duty Cycle

2)Test plots refer to the following pages.

Modulation Type: GFSK



# 6. Test of AC Power Line Conducted Emission

## 6.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

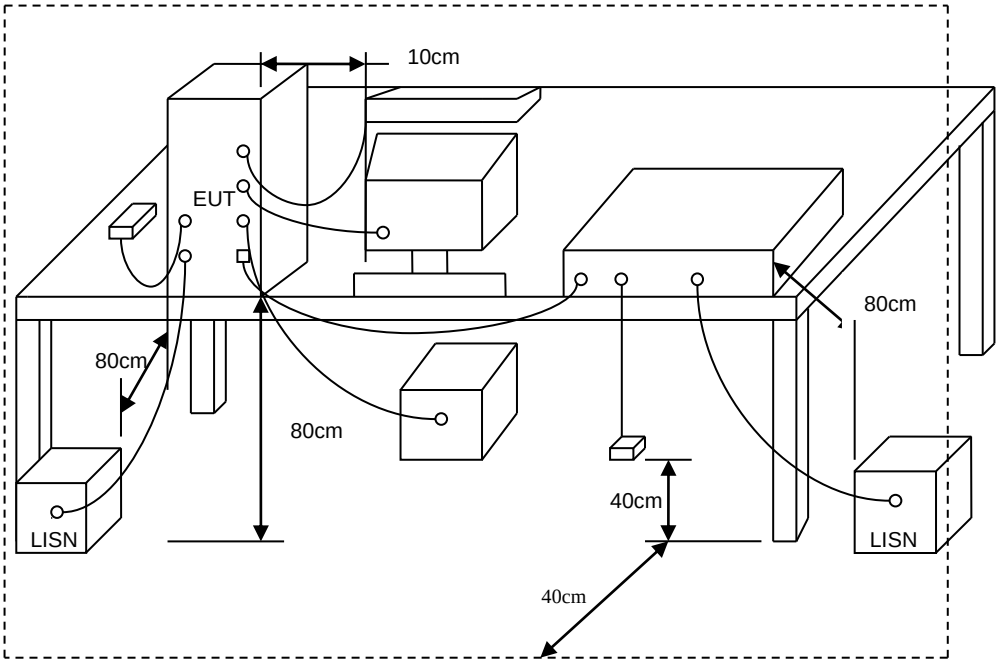
| Frequency (MHz) | Quasi Peak (dB μ V) | Average (dB μ V) |
|---|---|---|
| 0.15 – 0.5 | 66-56* | 56-46* |
| 0.5 – 5.0 | 56 | 46 |
| 5.0 – 30.0 | 60 | 50 |

*Decreases with the logarithm of the frequency.

## 6.2 Test Procedures

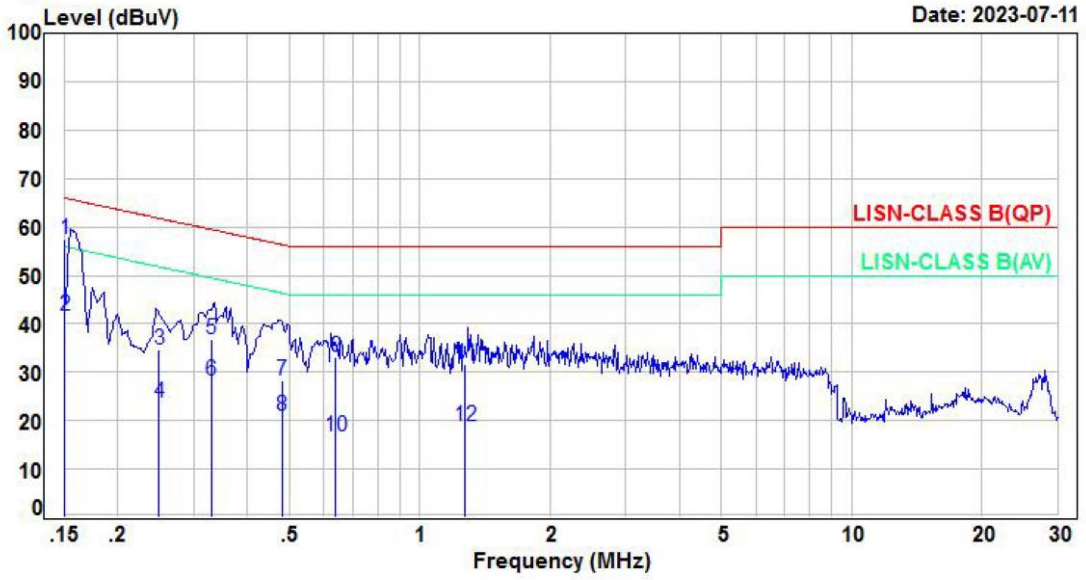
a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

## 6.3 Typical Test Setup



## 6.4 Test Result and Data

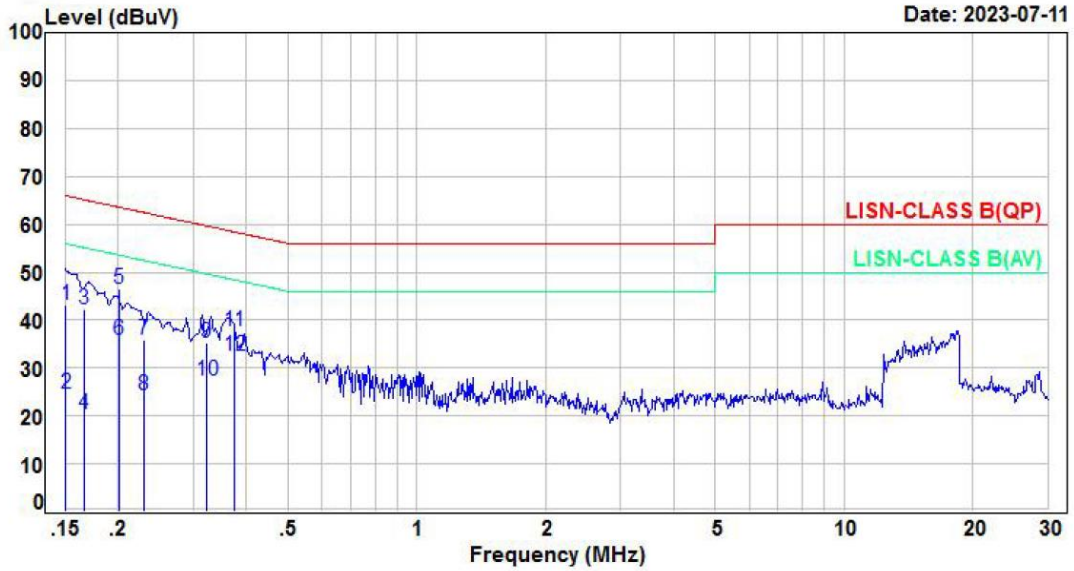
| Power | AC 120V/60Hz | Pol/Phase | LINE |
|---|---|---|---|
| Test Mode | Mode 1 | | |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 9.74 | 47.82 | 57.56 | 65.95 | -8.39 | QP | P |
| 2 | 0.15 | 9.74 | 31.88 | 41.62 | 55.95 | -14.33 | Average | P |
| 3 | 0.25 | 9.75 | 24.78 | 34.53 | 61.80 | -27.27 | QP | P |
| 4 | 0.25 | 9.75 | 14.08 | 23.83 | 51.80 | -27.97 | Average | P |
| 5 | 0.33 | 9.71 | 27.03 | 36.74 | 59.47 | -22.73 | QP | P |
| 6 | 0.33 | 9.71 | 18.60 | 28.31 | 49.47 | -21.16 | Average | P |
| 7 | 0.48 | 9.67 | 18.75 | 28.42 | 56.34 | -27.92 | QP | P |
| 8 | 0.48 | 9.67 | 11.34 | 21.01 | 46.34 | -25.33 | Average | P |
| 9 | 0.64 | 9.70 | 23.56 | 33.26 | 56.00 | -22.74 | QP | P |
| 10 | 0.64 | 9.70 | 7.15 | 16.85 | 46.00 | -29.15 | Average | P |
| 11 | 1.28 | 9.76 | 21.75 | 31.51 | 56.00 | -24.49 | QP | P |
| 12 | 1.28 | 9.76 | 8.97 | 18.73 | 46.00 | -27.27 | Average | P |

Site: CON01-DG
Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current/Voltage Probe or Combining Network) Factor +Cabel loss

| Power | AC 120V/60Hz | Pol/Phase | NEUTRAL |
|---|---|---|---|
| Test Mode | Mode 1 | | |




| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 9.79 | 33.32 | 43.11 | 65.94 | -22.83 | QP | P |
| 2 | 0.15 | 9.79 | 14.98 | 24.77 | 55.94 | -31.17 | Average | P |
| 3 | 0.17 | 9.77 | 32.40 | 42.17 | 65.14 | -22.97 | QP | P |
| 4 | 0.17 | 9.77 | 10.71 | 20.48 | 55.14 | -34.66 | Average | P |
| 5 | 0.20 | 9.75 | 36.77 | 46.52 | 63.58 | -17.06 | QP | P |
| 6 | 0.20 | 9.75 | 26.13 | 35.88 | 53.58 | -17.70 | Average | P |
| 7 | 0.23 | 9.78 | 26.21 | 35.99 | 62.48 | -26.49 | QP | P |
| 8 | 0.23 | 9.78 | 14.67 | 24.45 | 52.48 | -28.03 | Average | P |
| 9 | 0.32 | 9.80 | 25.48 | 35.28 | 59.67 | -24.39 | QP | P |
| 10 | 0.32 | 9.80 | 17.64 | 27.44 | 49.67 | -22.23 | Average | P |
| 11 | 0.37 | 9.76 | 27.81 | 37.57 | 58.44 | -20.87 | QP | P |
| 12 | 0.37 | 9.76 | 22.66 | 32.42 | 48.44 | -16.02 | Average | P |

Site: CON01-DG
Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current/Voltage Probe or Combining Network) Factor +Cabel loss

# 7. Test of Spurious Emission (Radiated)

## 7.1 Test Limit

FCC §15.249 (a)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|---|
| 902-928 MHz | 50 | 500 | 3 |
| 2400-2483.5 MHz | 50 | 500 | 3 |
| 5725-5875 MHz | 50 | 500 | 3 |
| 24.0-24.25 GHz | 250 | 2500 | 3 |

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

| Frequency (MHz) | Field Strength (microvolt/meter) | Measurement Distance (meters) |
|---|---|---|
| 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 |

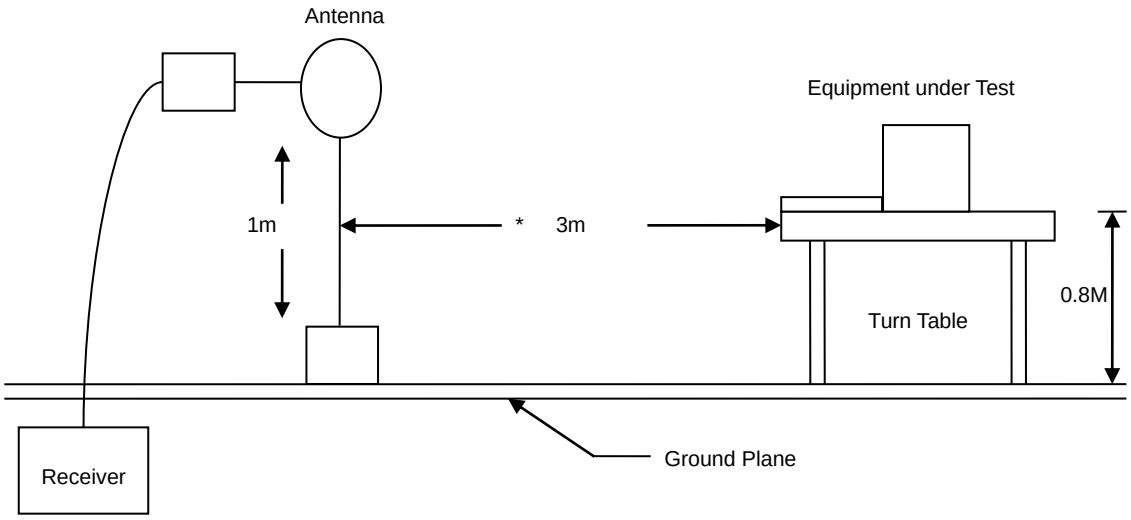
## 7.2 Test Procedures

a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
i. “Cone of radiation” has been considered to be 3dB bandwidth of the measurement antenna.

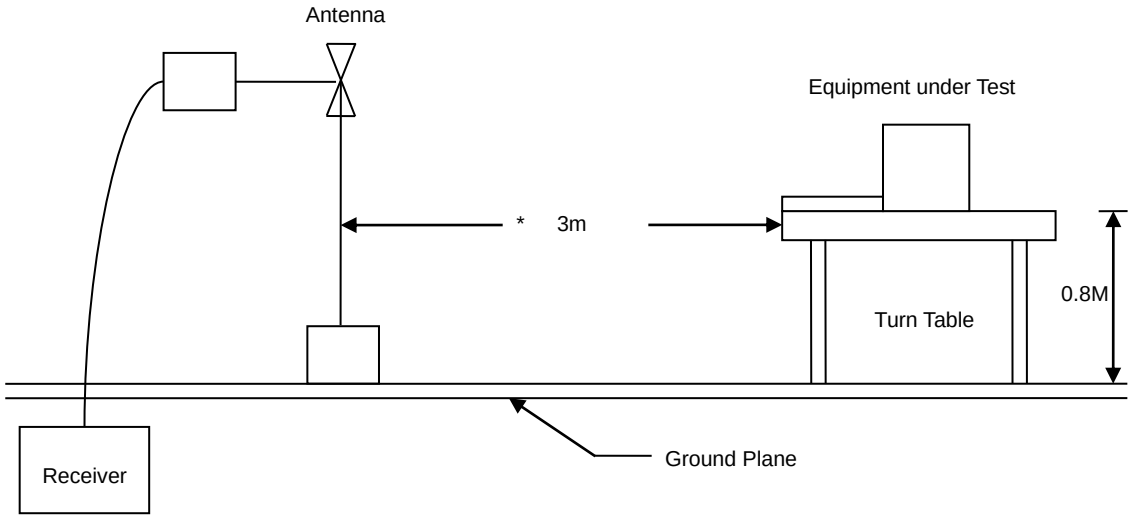
Note:
1)The Average value = Peak value + Duty Cycle Correction Factor
2)The supporting fixture shall permit orientation of the EUT in each of three orthogonal axis positions such that emissions from the EUT are maximized.(X AXIS is the worst.)

## 7.3 Typical Test Setup

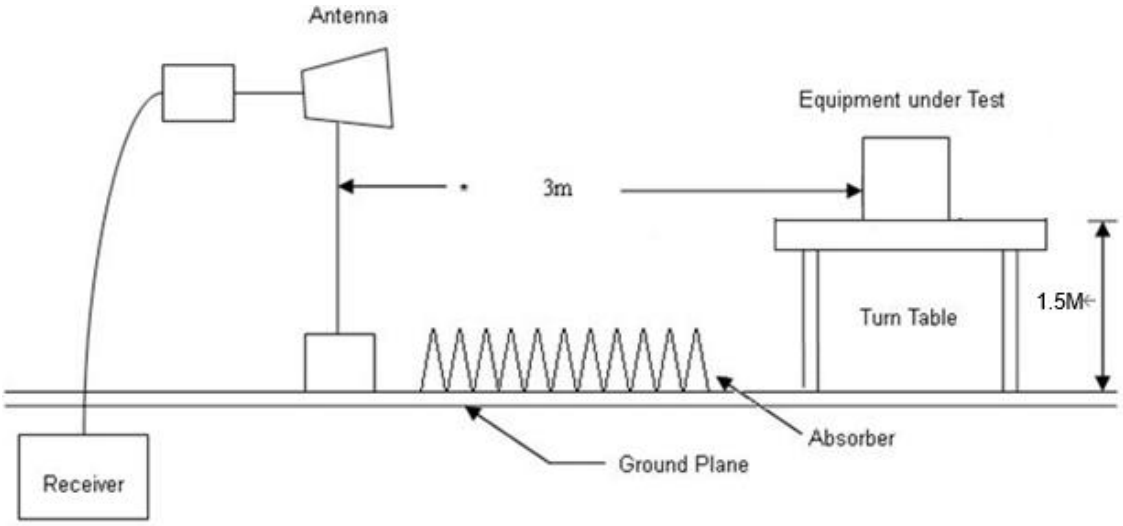
Below 30MHz test setup




30MHz- 1GHz Test Setup




Above 1GHz Test Setup

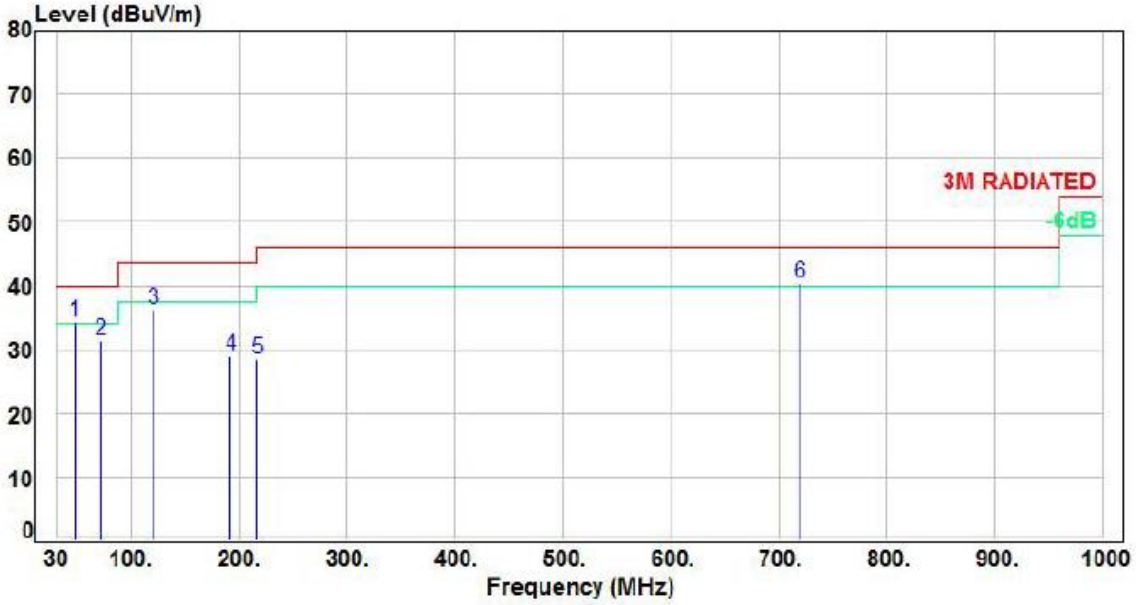


## 7.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz-30MHz spurious emission is under limit 20dB more.

## 7.5 Test Result and Data (30MHz ~ 1GHz)

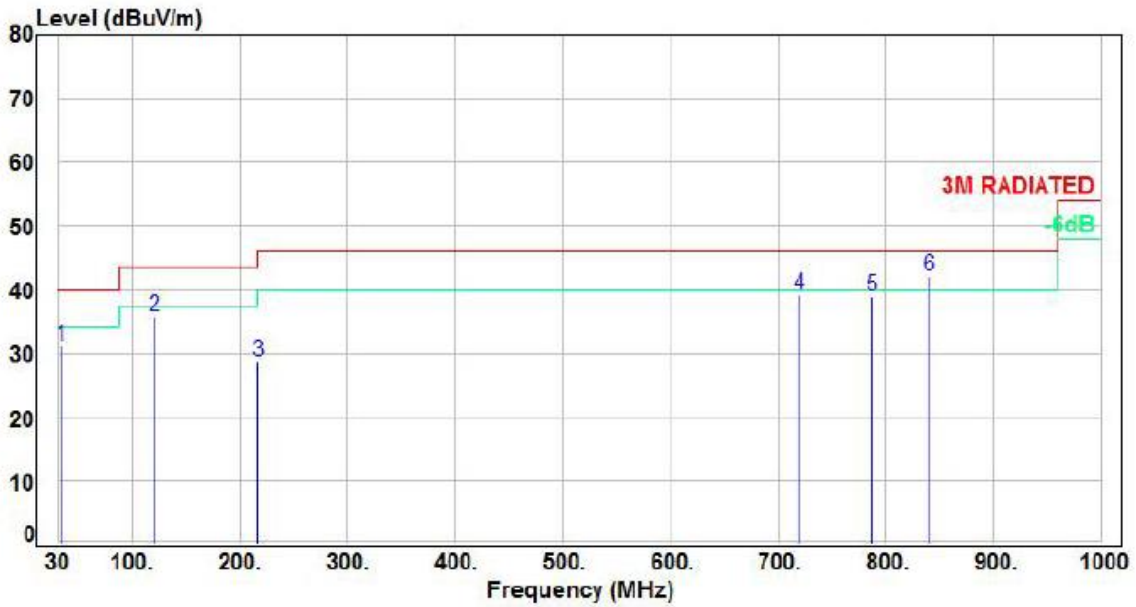
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | Mode 1 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 47.46 | -15.23 | 49.51 | 34.28 | 40.00 | -5.72 | QP | P |
| 2 | 71.71 | -16.37 | 47.81 | 31.44 | 40.00 | -8.56 | Peak | P |
| 3 | 120.21 | -9.88 | 46.23 | 36.35 | 43.50 | -7.15 | Peak | P |
| 4 | 191.99 | -11.75 | 40.70 | 28.95 | 43.50 | -14.55 | Peak | P |
| 5 | 216.24 | -12.35 | 40.91 | 28.56 | 46.00 | -17.44 | Peak | P |
| 6 | 719.67 | -0.24 | 40.50 | 40.26 | 46.00 | -5.74 | QP | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

| Power | AC 120V/60Hz | Pol/Phase | HORIZONTAL |
|---|---|---|---|
| Test Mode | Mode 1 | | |

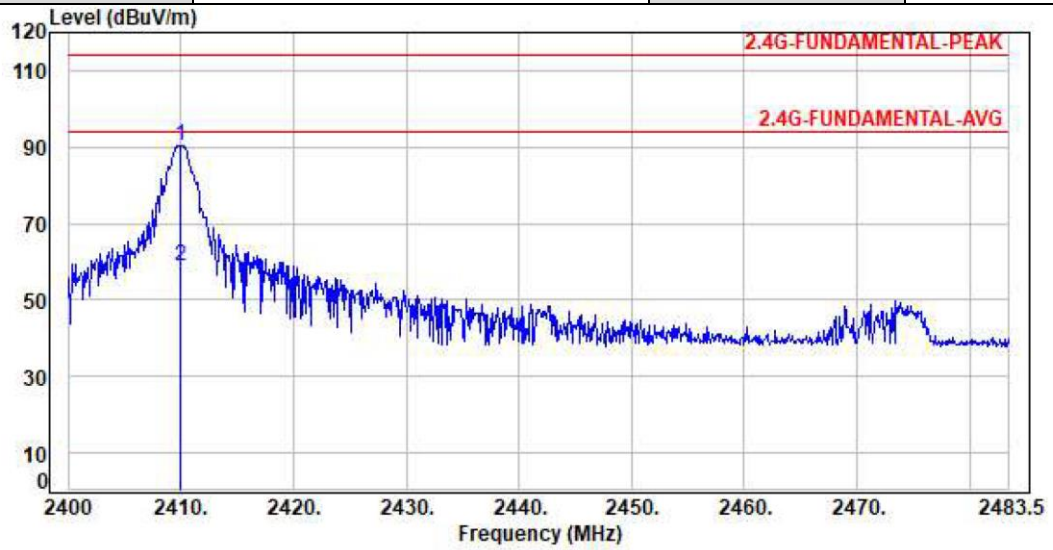



| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 33.88 | -6.83 | 38.05 | 31.22 | 40.00 | -8.78 | Peak | P |
| 2 | 120.21 | -9.88 | 45.63 | 35.75 | 43.50 | -7.75 | Peak | P |
| 3 | 216.24 | -12.35 | 40.94 | 28.59 | 46.00 | -17.41 | Peak | P |
| 4 | 719.67 | -0.24 | 39.45 | 39.21 | 46.00 | -6.79 | Peak | P |
| 5 | 786.60 | 0.58 | 38.43 | 39.01 | 46.00 | -6.99 | Peak | P |
| 6 | 839.95 | 1.60 | 40.48 | 42.08 | 46.00 | -3.92 | QP | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

## 7.6 Test Result of Fundamental Emission

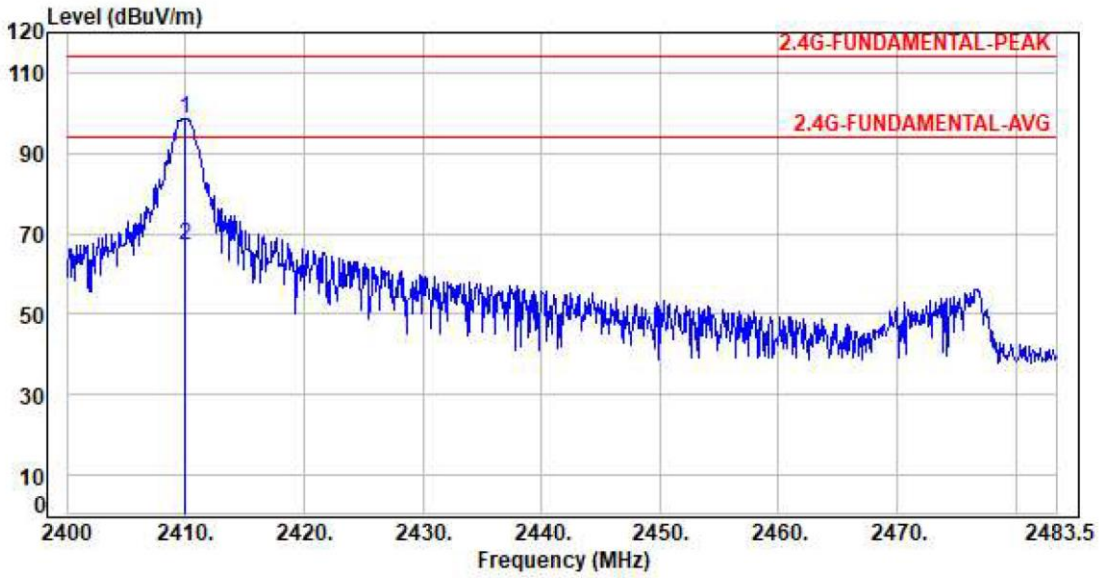
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | CH1 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2410.00 | -4.26 | 94.78 | 90.52 | 114.00 | -23.48 | Peak | P |
| 2 | 2410.00 | -4.26 | 63.08 | 58.82 | 94.00 | -35.18 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

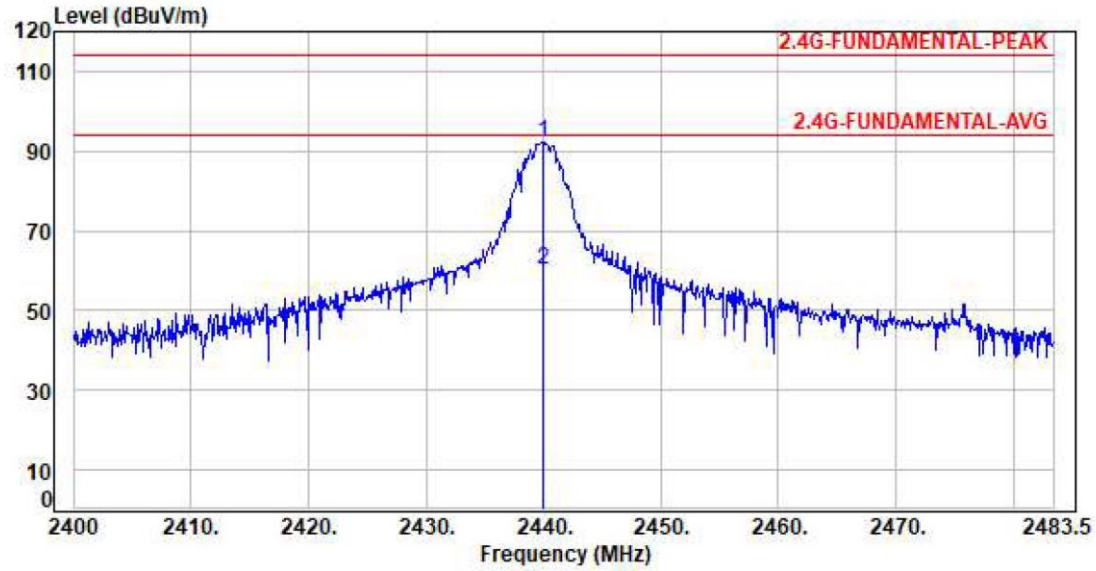
| Power | AC 120V/60Hz | Pol/Phase | Horizontal |
|---|---|---|---|
| Test Mode | CH1 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2410.00 | -4.26 | 102.82 | 98.56 | 114.00 | -15.44 | Peak | P |
| 2 | 2410.00 | -4.26 | 71.12 | 66.86 | 94.00 | -27.14 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

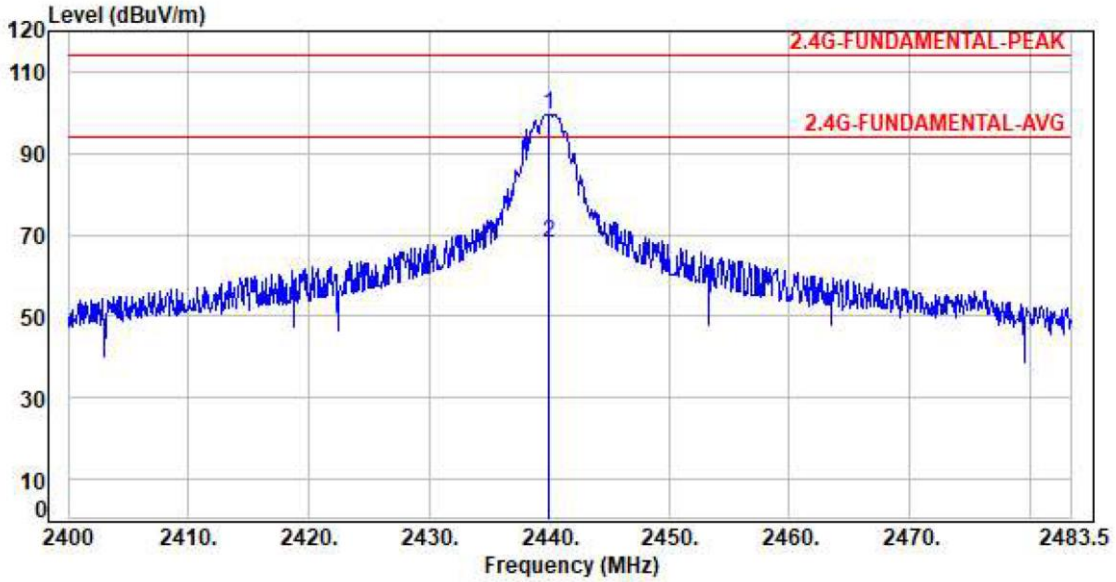
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | CH31 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2440.00 | -4.15 | 96.24 | 92.09 | 114.00 | -21.91 | Peak | P |
| 2 | 2440.00 | -4.15 | 64.54 | 60.39 | 94.00 | -33.61 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

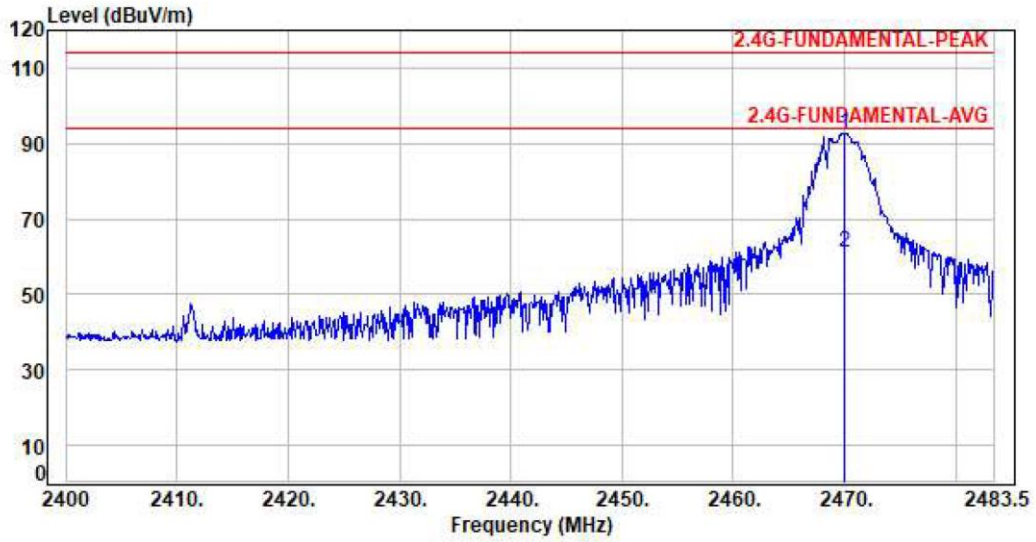
| Power | AC 120V/60Hz | Pol/Phase | Horizontal |
|---|---|---|---|
| Test Mode | CH31 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2440.00 | -4.15 | 103.79 | 99.64 | 114.00 | -14.36 | Peak | P |
| 2 | 2440.00 | -4.15 | 72.09 | 67.94 | 94.00 | -26.06 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

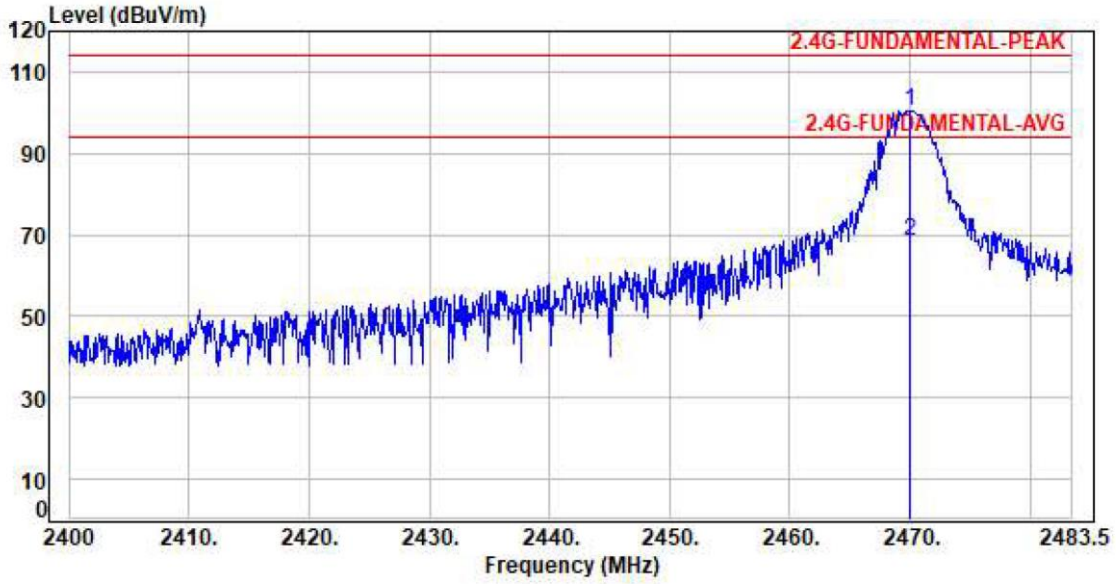
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | CH61 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2470.00 | -4.03 | 96.83 | 92.80 | 114.00 | -21.20 | Peak | P |
| 2 | 2470.00 | -4.03 | 65.13 | 61.10 | 94.00 | -32.90 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

| Power | AC 120V/60Hz | Pol/Phase | Horizontal |
|---|---|---|---|
| Test Mode | CH61 | | |

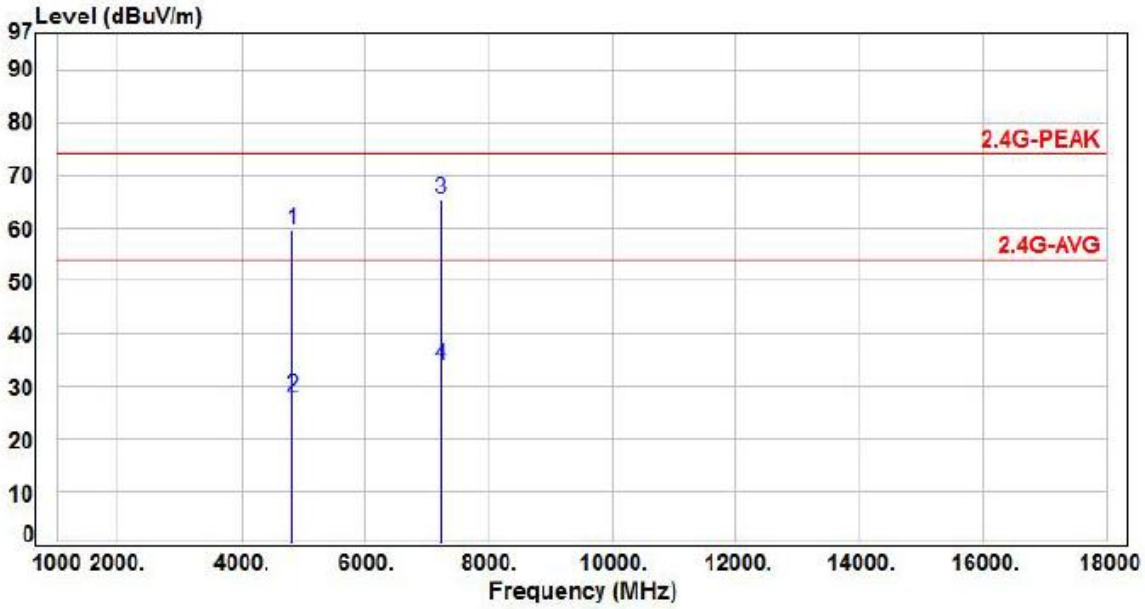



| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2470.00 | -4.03 | 104.39 | 100.36 | 114.00 | -13.64 | Peak | P |
| 2 | 2470.00 | -4.03 | 72.69 | 68.66 | 94.00 | -25.34 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

## 7.7 Test Result and Data (1GHz ~ 25GHz)

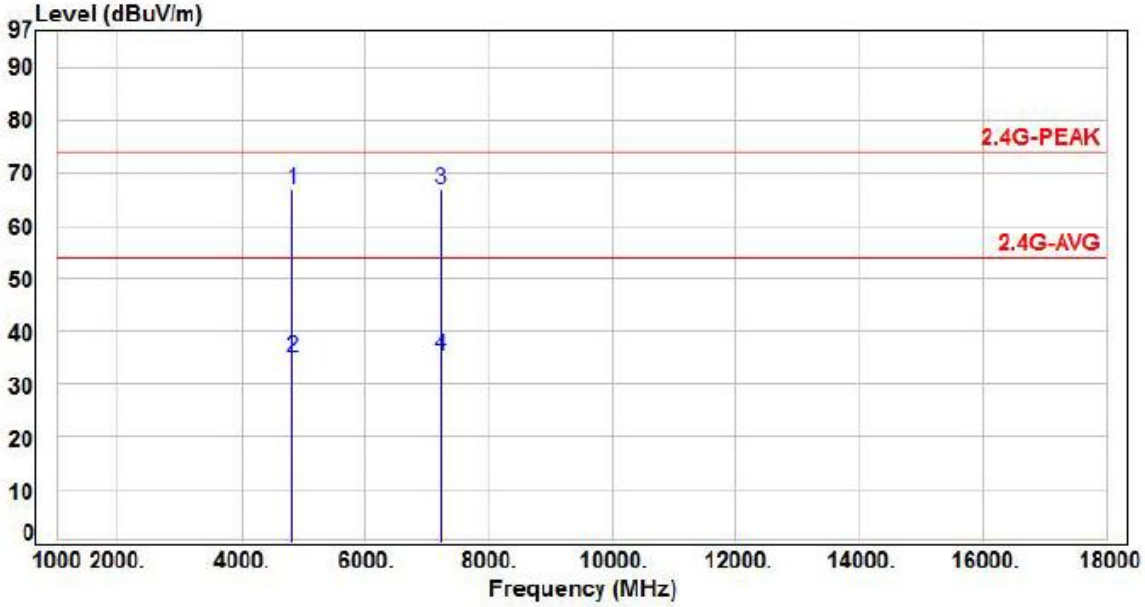
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | Mode 1, CH 1 | Operation mode | TX |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4820.00 | 2.64 | 56.96 | 59.60 | 74.00 | -14.40 | Peak | P |
| 2 | 4820.00 | 2.64 | 25.26 | 27.90 | 54.00 | -26.10 | Average | P |
| 3 | 7230.00 | 8.60 | 56.89 | 65.49 | 74.00 | -8.51 | Peak | P |
| 4 | 7230.00 | 8.60 | 25.19 | 33.79 | 54.00 | -20.21 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

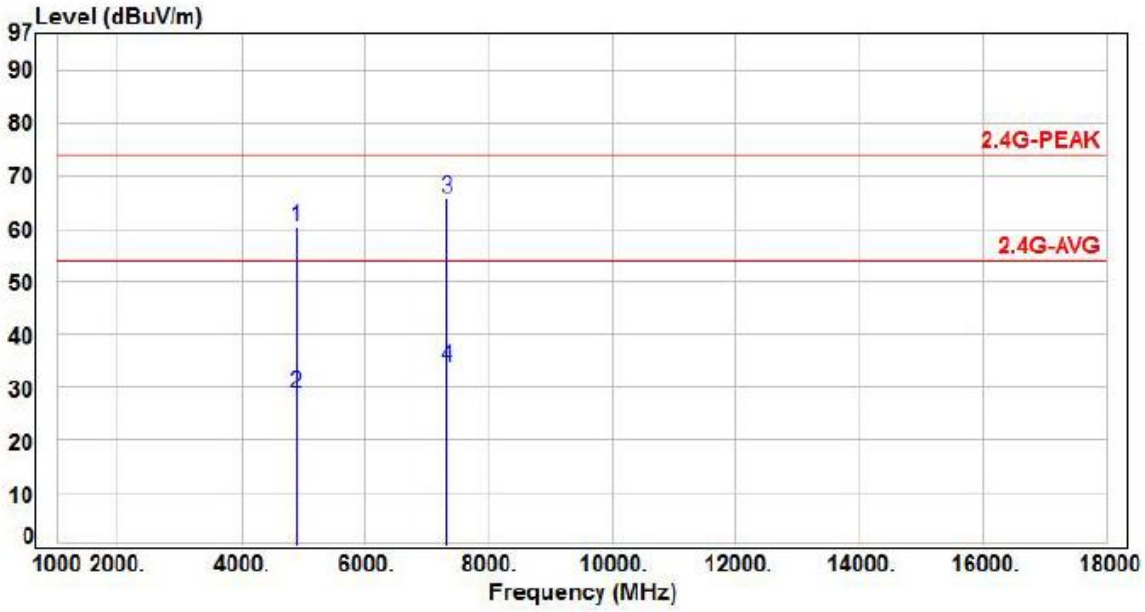
| Power | AC 120V/60Hz | Pol/Phase | HORIZONTAL |
|---|---|---|---|
| Test Mode | Mode 1, CH 1 | Operation mode | TX |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4820.00 | 2.64 | 64.25 | 66.89 | 74.00 | -7.11 | Peak | P |
| 2 | 4820.00 | 2.64 | 32.55 | 35.19 | 54.00 | -18.81 | Average | P |
| 3 | 7230.00 | 8.60 | 58.35 | 66.95 | 74.00 | -7.05 | Peak | P |
| 4 | 7230.00 | 8.60 | 26.65 | 35.25 | 54.00 | -18.75 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

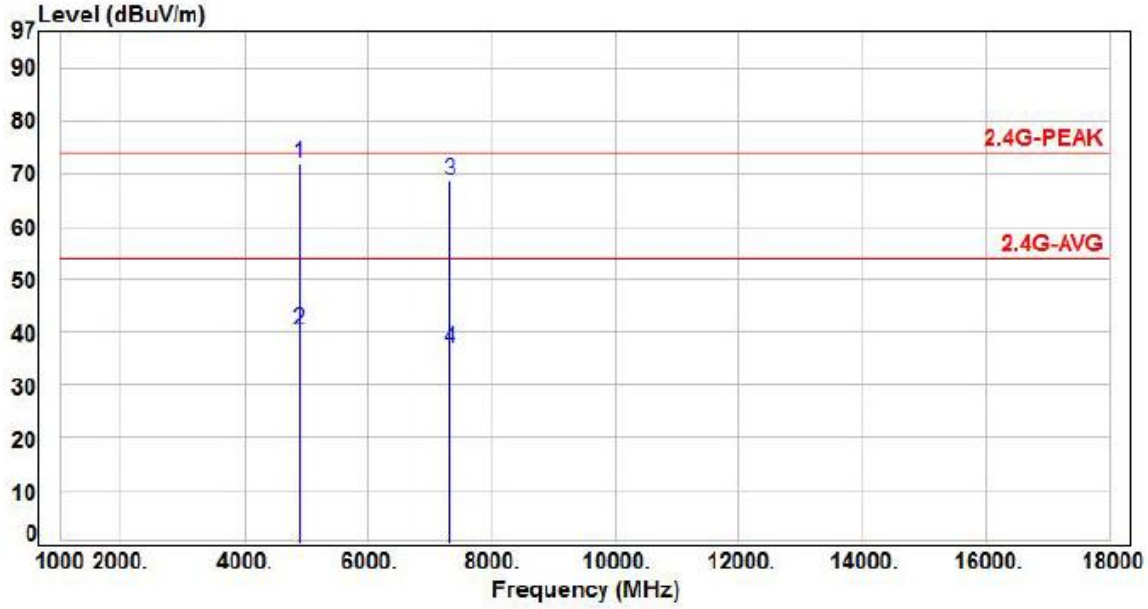
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | Mode 2, CH31 | Operation mode | TX |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4880.00 | 2.58 | 57.97 | 60.55 | 74.00 | -13.45 | Peak | P |
| 2 | 4880.00 | 2.58 | 26.27 | 28.85 | 54.00 | -25.15 | Average | P |
| 3 | 7320.00 | 8.64 | 57.04 | 65.68 | 74.00 | -8.32 | Peak | P |
| 4 | 7320.00 | 8.64 | 25.34 | 33.98 | 54.00 | -20.02 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

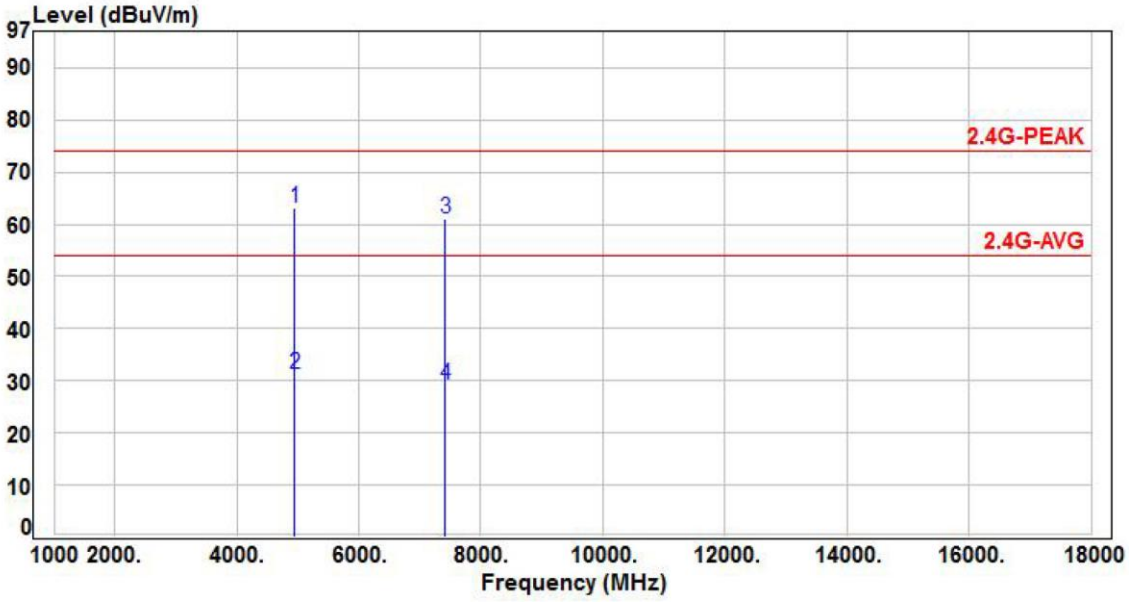
| Power | AC 120V/60Hz | Pol/Phase | HORIZONTAL |
|---|---|---|---|
| Test Mode | Mode 2, CH31 | Operation mode | TX |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4880.00 | 2.58 | 69.45 | 72.03 | 74.00 | -1.97 | Peak | P |
| 2 | 4880.00 | 2.58 | 37.75 | 40.33 | 54.00 | -13.67 | Average | P |
| 3 | 7320.00 | 8.64 | 59.92 | 68.56 | 74.00 | -5.44 | Peak | P |
| 4 | 7320.00 | 8.64 | 28.22 | 36.86 | 54.00 | -17.14 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

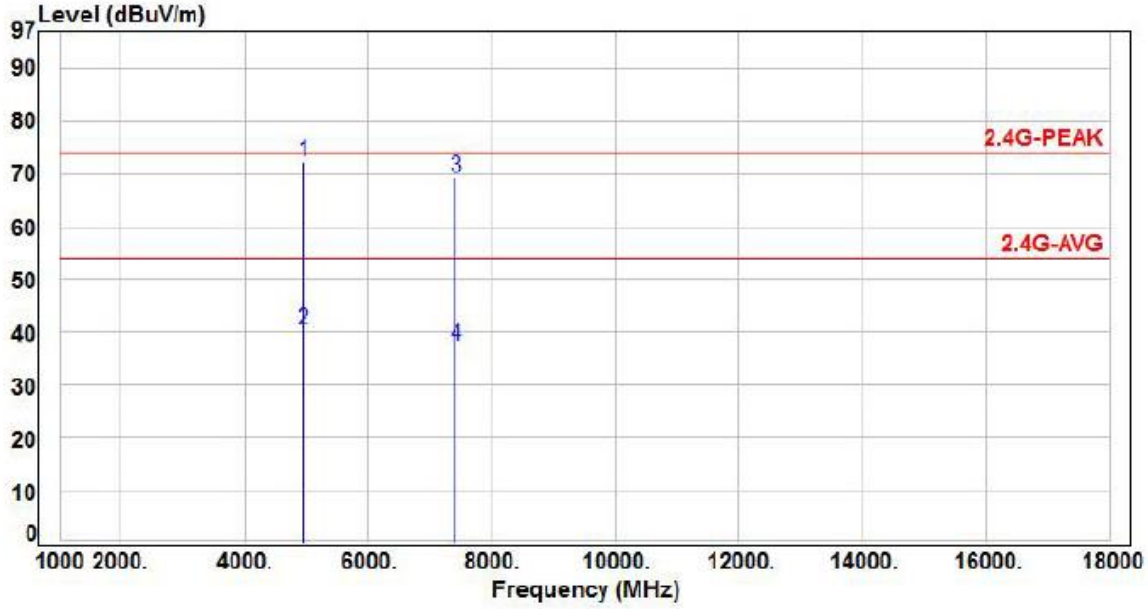
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | Mode 3, CH61 | Operation mode | TX |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4940.00 | 2.54 | 60.54 | 63.08 | 74.00 | -10.92 | Peak | P |
| 2 | 4940.00 | 2.54 | 28.84 | 31.38 | 54.00 | -22.62 | Average | P |
| 3 | 7410.00 | 8.70 | 52.24 | 60.94 | 74.00 | -13.06 | Peak | P |
| 4 | 7410.00 | 8.70 | 20.54 | 29.24 | 54.00 | -24.76 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

| Power | AC 120V/60Hz | Pol/Phase | HORIZONTAL |
|---|---|---|---|
| Test Mode | Mode 3, CH61 | Operation mode | TX |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4940.00 | 2.54 | 69.63 | 72.17 | 74.00 | -1.83 | Peak | P |
| 2 | 4940.00 | 2.54 | 37.93 | 40.47 | 54.00 | -13.53 | Average | P |
| 3 | 7410.00 | 8.70 | 60.52 | 69.22 | 74.00 | -4.78 | Peak | P |
| 4 | 7410.00 | 8.70 | 28.82 | 37.52 | 54.00 | -16.48 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

# 8. 20dB Bandwidth Measurement Data

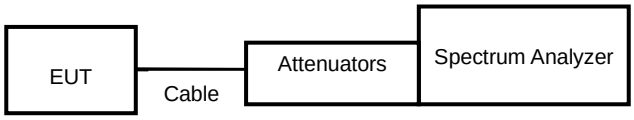
## 8.1 Test Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

## 8.2 Test Procedure

a. The transmitter output was connected to the spectrum analyzer.
b. Set RBW of spectrum analyzer to 30 KHz and VBW to 100KHz.
c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

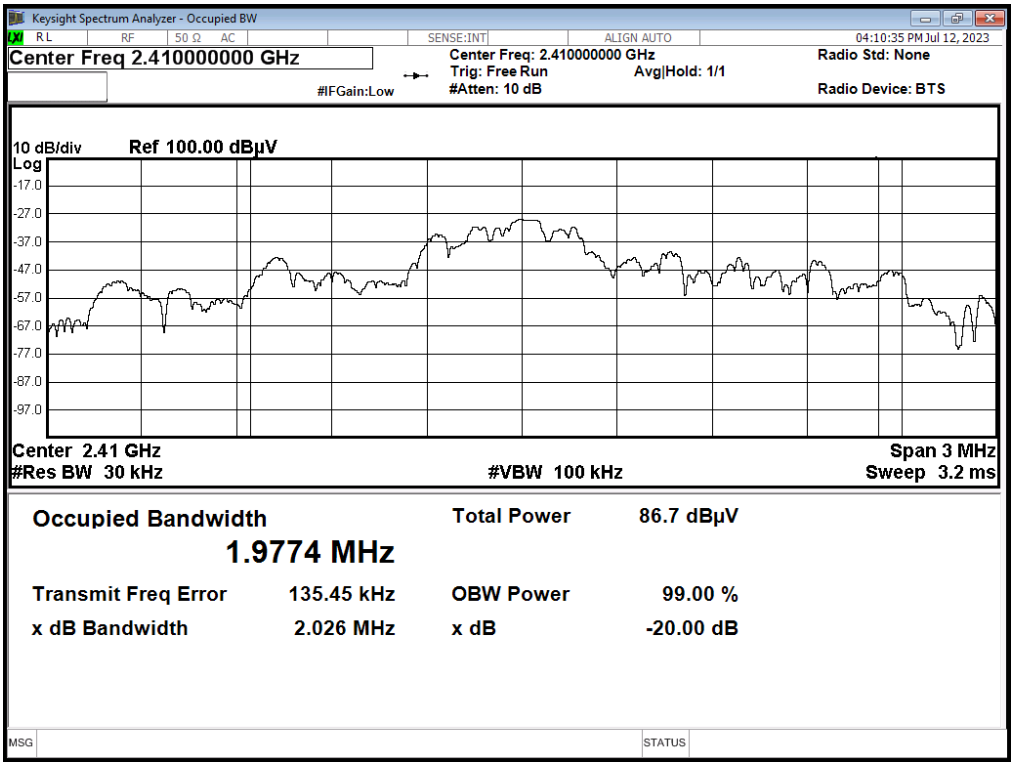
## 8.3 Test Setup Layout



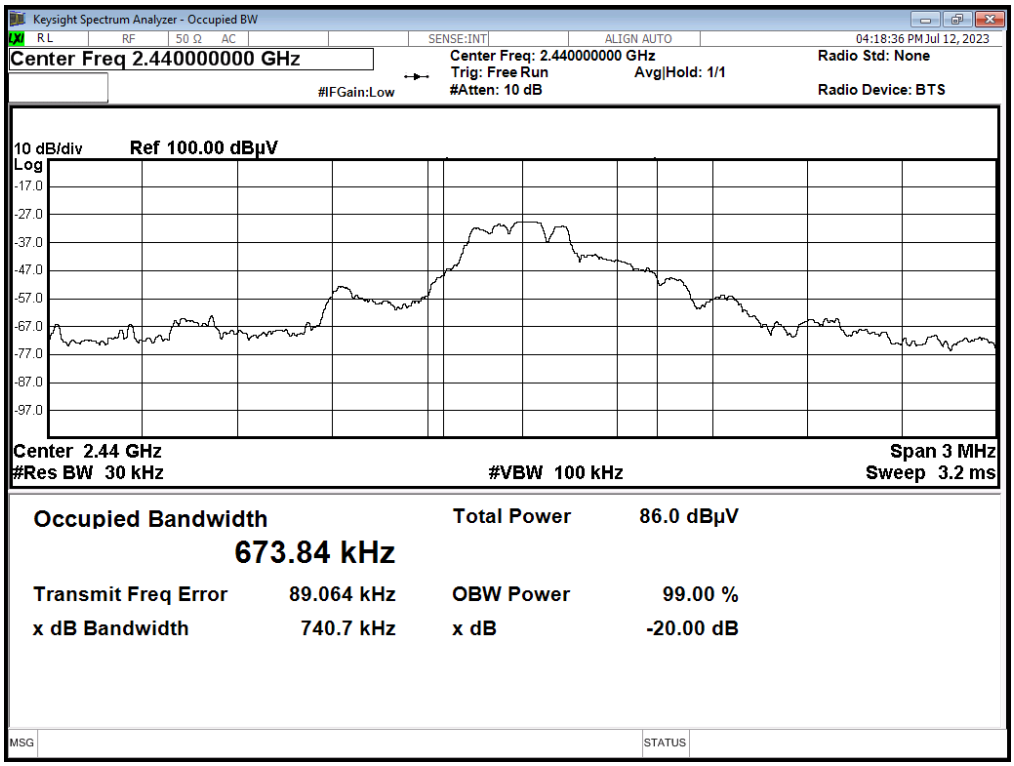

## 8.4 Test Result and Data

| Channel | Frequency (MHz) | 20dB Bandwidth (KHz) |
|---|---|---|
| Low | 2410 | 2026 |
| Mid | 2440 | 740.7 |
| High | 2470 | 1642 |

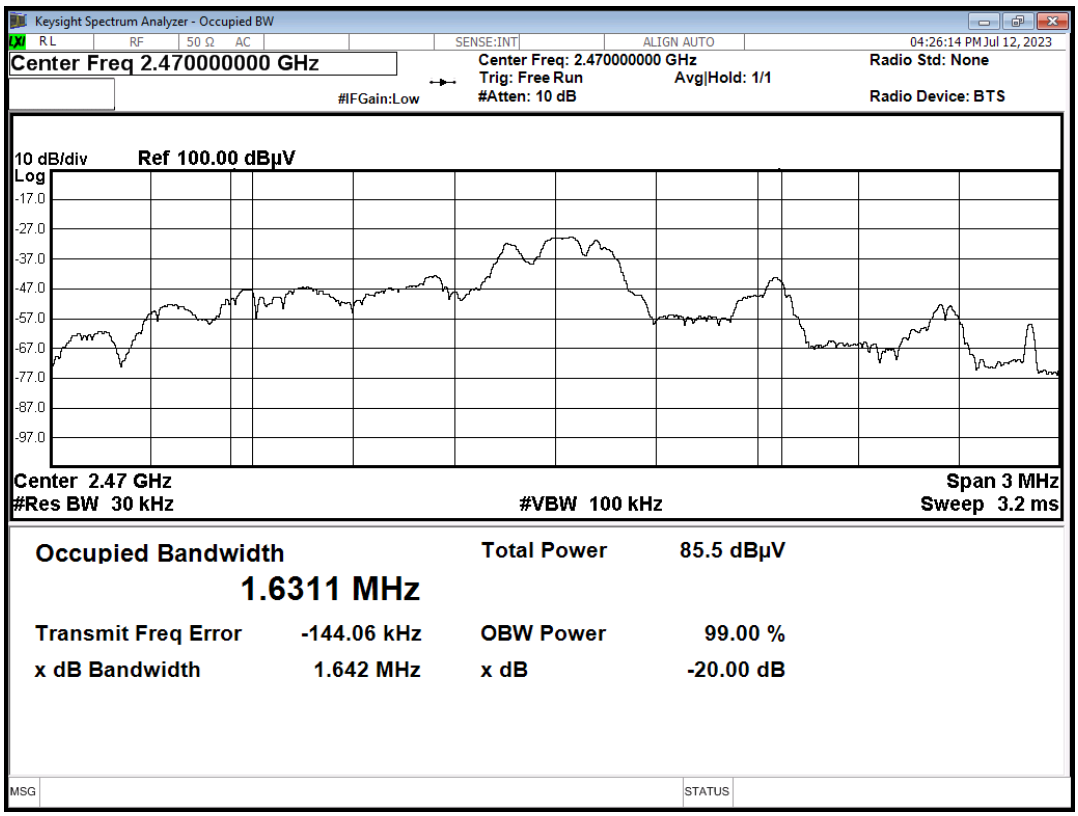
Channel: Low




Channel: Mid



Channel: High



# 9. Band Edges Measurement

## 9.1 Test Limit

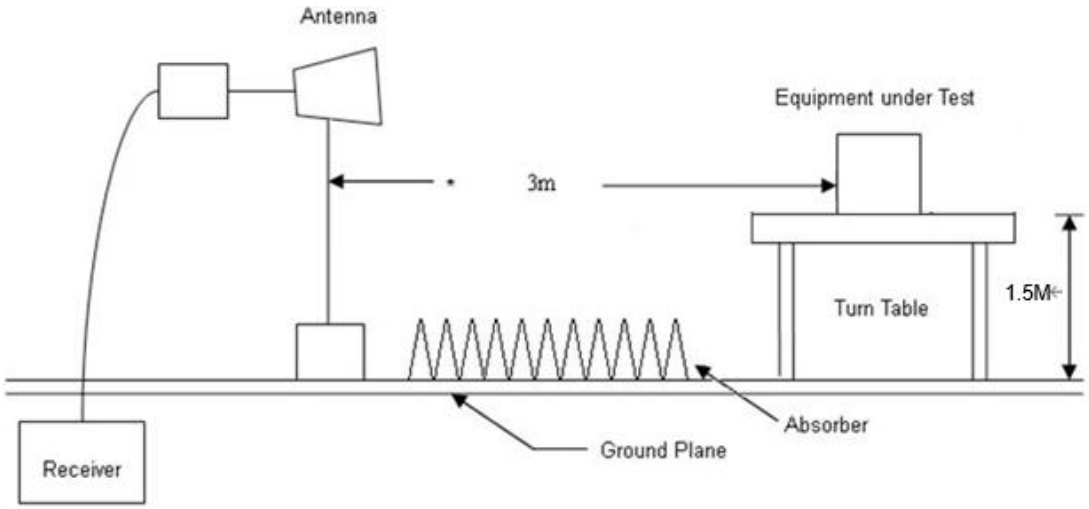
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

## 9.2 Test Procedure

a) The EUT was placed on a rotatable table top 1.5 meter above ground.
b) The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c) The table was rotated 360 degrees to determine the position of the highest radiation.
d) The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1GHz.
e) The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
f) The band edges was measured and recorded.

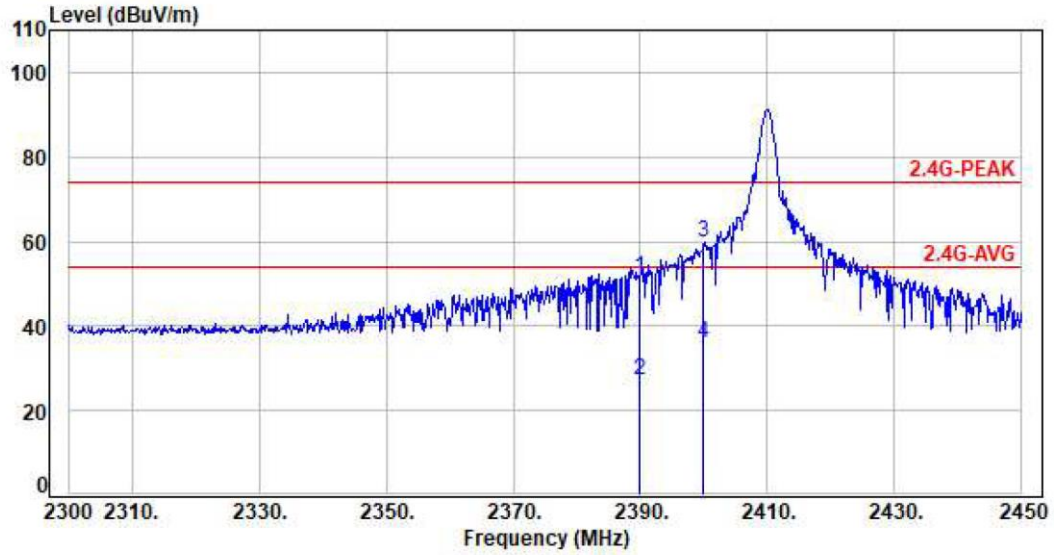
## 9.3 Test Setup Layout

Above 1GHz Test Setup



## 9.4 Restrict band emission Measurement Data

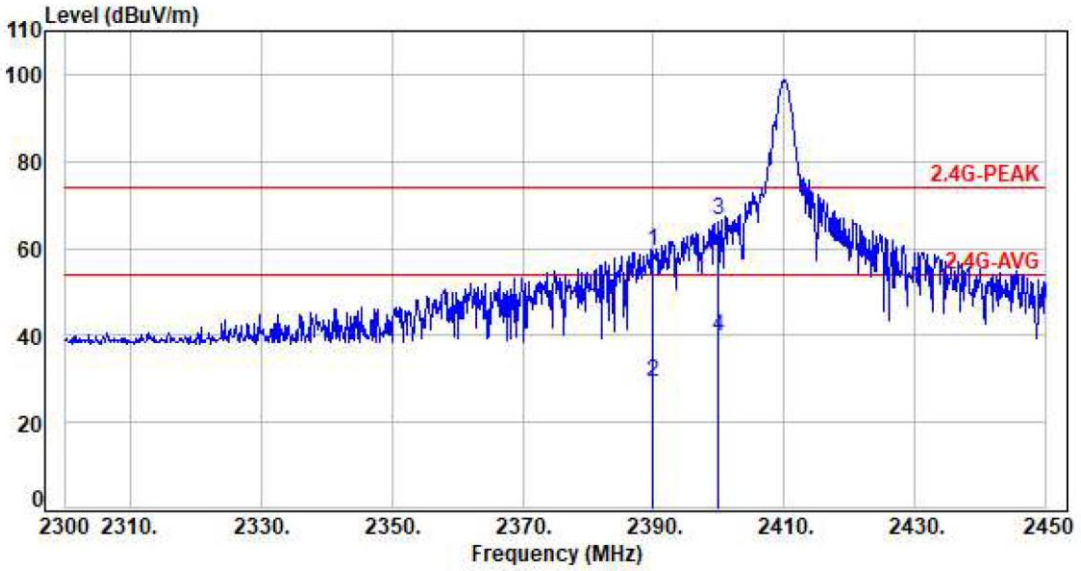
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | CH1 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2390.00 | -4.35 | 55.83 | 51.48 | 74.00 | -22.52 | Peak | P |
| 2 | 2390.00 | -4.35 | 31.48 | 27.13 | 54.00 | -26.87 | Average | P |
| 3 | 2400.00 | -4.30 | 63.91 | 59.61 | 74.00 | -14.39 | Peak | P |
| 4 | 2400.00 | -4.30 | 40.45 | 36.15 | 54.00 | -17.85 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

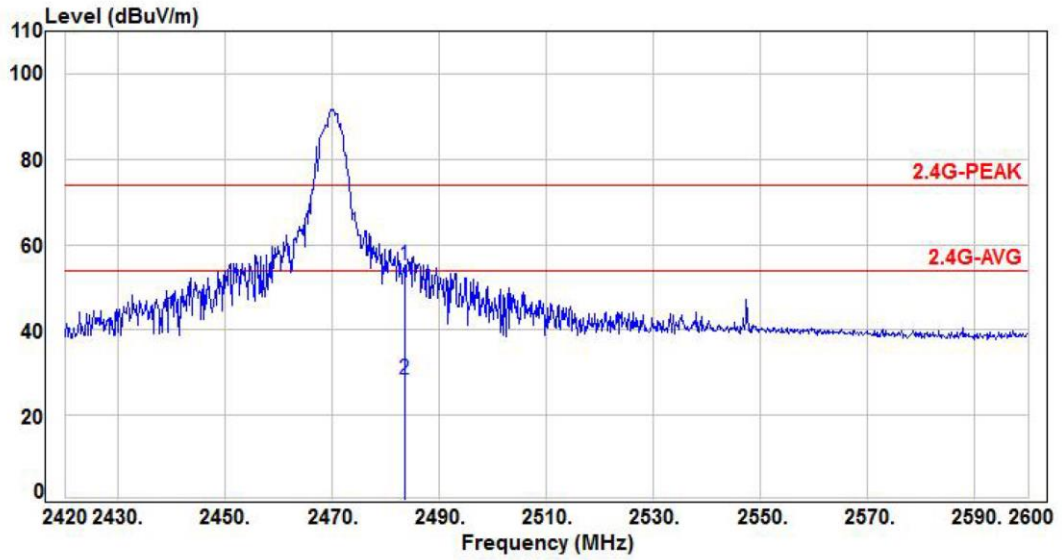
| Power | AC 120V/60Hz | Pol/Phase | HORIZONTAL |
|---|---|---|---|
| Test Mode | CH1 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2390.00 | -4.35 | 63.59 | 59.24 | 74.00 | -14.76 | Peak | P |
| 2 | 2390.00 | -4.35 | 33.68 | 29.33 | 54.00 | -24.67 | Average | P |
| 3 | 2400.00 | -4.30 | 70.76 | 66.46 | 74.00 | -7.54 | Peak | P |
| 4 | 2400.00 | -4.30 | 44.14 | 39.84 | 54.00 | -14.16 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

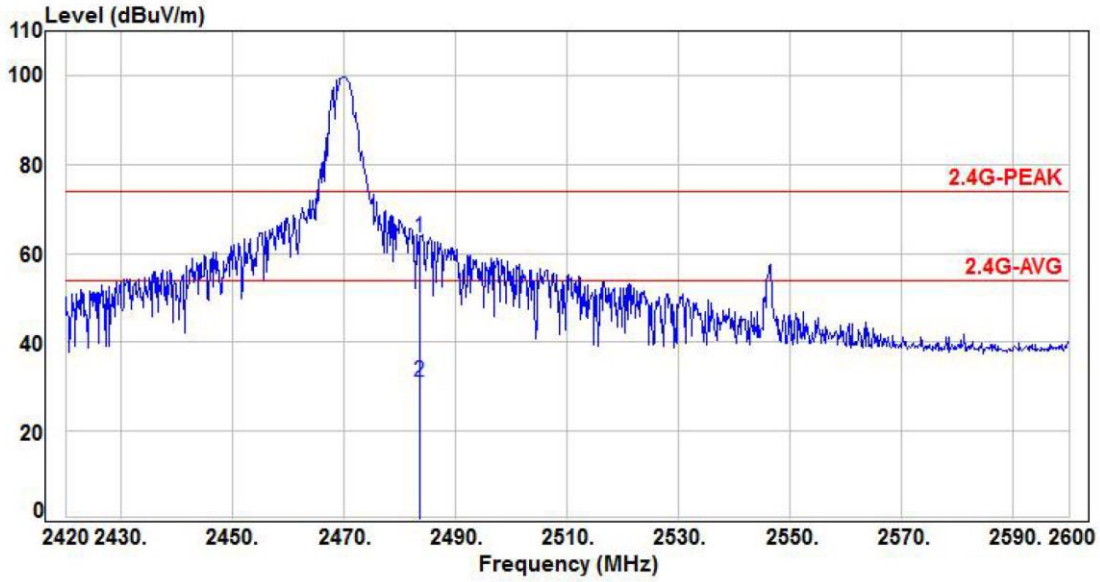
| Power | AC 120V/60Hz | Pol/Phase | VERTICAL |
|---|---|---|---|
| Test Mode | CH61 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | -3.98 | 59.10 | 55.12 | 74.00 | -18.88 | Peak | P |
| 2 | 2483.50 | -3.98 | 32.51 | 28.53 | 54.00 | -25.47 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

| Power | AC 120V/60Hz | Pol/Phase | HORIZONTAL |
|---|---|---|---|
| Test Mode | CH61 | | |




| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | -3.98 | 67.63 | 63.65 | 74.00 | -10.35 | Peak | P |
| 2 | 2483.50 | -3.98 | 34.95 | 30.97 | 54.00 | -23.03 | Average | P |

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

# 10. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.09000 – 0.11000 | 16.42000 – 16.42300 | 399.9 – 410.0 | 4.500 – 5.250 |
| 0.49500 – 0.505** | 16.69475 – 16.69525 | 608.0 – 614.0 | 5.350 – 5.460 |
| 2.17350 – 2.19050 | 16.80425 – 16.80475 | 960.0 – 1240.0 | 7.250 – 7.750 |
| 4.12500 – 4.12800 | 25.50000 – 25.67000 | 1300.0 – 1427.0 | 8.025 – 8.500 |
| 4.17725 – 4.17775 | 37.50000 – 38.25000 | 1435.0 – 1626.5 | 9.000 – 9.200 |
| 4.20725 – 4.20775 | 73.00000 – 74.60000 | 1645.5 – 1646.5 | 9.300 – 9.500 |
| 6.21500 – 6.21800 | 74.80000 – 75.20000 | 1660.0 – 1710.0 | 10.600 – 12.700 |
| 6.26775 – 6.26825 | 108.00000 – 121.94000 | 1718.8 – 1722.2 | 13.250 – 13.400 |
| 6.31175 – 6.31225 | 123.00000 – 138.00000 | 2200.0 – 2300.0 | 14.470 – 14.500 |
| 8.29100 – 8.29400 | 149.90000 – 150.05000 | 2310.0 – 2390.0 | 15.350 – 16.200 |
| 8.36200 – 8.36600 | 156.52475 – 156.52525 | 2483.5 – 2500.0 | 17.700 – 21.400 |
| 8.37625 – 8.38675 | 156.70000 – 156.90000 | 2655.0 – 2900.0 | 22.010 – 23.120 |
| 8.41425 – 8.41475 | 162.01250 – 167.17000 | 3260.0 – 3267.0 | 23.600 – 24.000 |
| 12.29000 – 12.29300 | 167.72000 – 173.20000 | 3332.0 – 3339.0 | 31.200 – 31.800 |
| 12.51975 – 12.52025 | 240.00000 – 285.00000 | 3345.8 – 3358.0 | 36.430 – 36.500 |
| 12.57675 – 12.57725 | 322.00000 – 335.40000 | 3600.0 – 4400.0 | Above 38.6 |
| 13.36000 – 13.41000 | | | |

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

## 10.1 Test results

Refer to Chapter 9 for test results.

**----------THE END OF REPORT----------**