# FCC PART 15.247 REPORT

On Model: PNAP-2007100

Prepared for Pico Communications, Inc.

According to FCC 15.247 Requirements

FCC ID # : PUF-PNAP-1A

Test Report # : B0110169

Prepared by : Paul Chen

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## Reproduction Clause

## Administrative Data

| | |
|---|---|
| Manufacturer | : Pico Communications, Inc. |
| FCC ID | : PUF-PNAP-1A |
| Class | : Spread Spectrum Transceiver |
| Interface Type | : 10/100 Base T |
| Frequency Range | : 2402 – 2480 MHz |
| Method | : Frequency Hopping Spread Spectrum Model |
| Name(s) | : PicoBlue |
| Part Number | : N/A |
| Max RF Output (W) | : 0.047 Watts |
| Power Supply | : AC to DC adapter |
| CFR Part(s) | : CFR15.247 |
| Date(s) of Tests | : July 26 – August 03, 2001 |
| Report Number | : *B0110169* |

## EUT Description

The subject EUT Model: PNAP-2007100 H/W Version #: B (refer to EUT in this test report) is a Bluetooth Network Access Point (PicoBlue) operating on the 2.402GHz – 2.480GHz band using Bluetooth technology. The EUT is a stand along unit which interface with a 10/100 Base T port. The EUT has 2 integral antennas and 1 RS-232 port for configuration used. The EUT is control by the software drivers, which delivered with the EUT.

## Test Summary (According to FCC Document No: CCSUC3134)

| Test Summary | | | |
|---|---|---|---|
| **Specifications** | **Requirement** | **Results** | **Notes** |
| CFR 15.31(m) | The hopping function were disabled for the following tests, which was performed with the EUT transmitting on the number of frequencies specified in this Section. The measurements made at the upper and lower ends of the band of operation were made with the EUT tuned to the highest and lowest available channels. | Complied | Tests were performed on CH 0, CH 38 and CH 79. |
| CFR 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may designed the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. | Complied | Attachment A |
| CFR15.207(a) | For an intentional radiator which 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 frequency within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. | Complied | Attachment B |
| CFR 15.204 | Antenna proposed for use with the EUT: (a) type (e.g., Yagi, patch, grid, dish, etc.), (b) manufacturer and model number, and (c) gain with reference to an isotropic radiator. | Info Provided | Attachment C |
| CFR15.247(a) | Frequency hopping systems operating in the 902 - 928 MHz band shall use at least 50 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period. | | |
| Carrier Frequency Separation | | Complied | Attachment D |
| Number of Hopping | | Complied | Attachment E |

| | | | |
|---|---|---|---|
| Frequencies | | | |
| Time of Occupancy | | Complied | Attachment F |
| 20 dB Bandwidth | | Complied | Attachment G |
| Pseudo-random Frequency Hopping Sequence | | Provided | Attachment H |
| Equal Hopping Frequency Use | | Provided | Attachment I |
| System Receiver Input Bandwidth | | Provided | Attachment J |
| System Receiver Hopping Capability | | Provided | Attachment K |
| CFR15.247(b)(1) | For frequency hopping systems operating in the 2400-2483.5 MHz or 5725-5850 MHz band and for all direct sequence systems: 1 watt. | | |
| Peak Output Power | | Complied | Attachment L |
| *De Facto* EIRP Limit | | Complied | Attachment M |
| Point-to-Point Operation | | Complied | Attachment N |
| CFR15.247(b)(4) | Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. Ses 1.1307(b)(1) of this chapter. | | |
| RF Exposure Compliance Requirements | | Complied | Attachment O |
| Operation Manual Requirements | | Complied | Attachment P |
| CFR15.247(c) | In any 100 kHz 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, base on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)). | | |
| Conducted RF Band-edge | | Complied | Attachment Q |
| Conducted Spurious RF | | Complied | Attachment R |

| | | | |
|---|---|---|---|
| Emissions | | | |
| Spurious Radiated Emissions | This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. | Complied | Attachment S |
| Section 15.247(g): | Describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system. | Complied | Attachment T |
| Section 15.247(h): | Describe how the EUT complies with the requirement that it not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters. | Complied | Attachment U |

## Test Location

Bay Area Compliance Laboratory Corp is located at 230 Commercial Street, Suite 2, Sunnyvale, CA 94085, USA.

## Accreditation Bodies

Bay Area Compliance Laboratory Corp is a fully accredited Test Laboratory.

In compliance with the site registration requirements of Section 2.948 of the FCC Rules to perform EMI measurements for the general public.

Accredited by the National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code # 200167-0.

## EUT Exercise Software

The client supplied the Bluetooth Test software. The software was used to exercise during conducted and radiated testing. No other data was transmitted to the EUT during testing.

## Equipment Modification

Any modifications installed previous to testing by Pico Communications, Inc. will be incorporated in each production model sold or leased in United States.

There were no modifications installed by Bay Area Compliance Laboratory Corp.

## Test System Details

| EUT | |
|---|---|
| **Model Number:** | **PNAP-2007100** |
| **Description:** | **Frequency Hopping Spread Spectrum Transceiver** |
| **Manufacturer:** | **Pico Communications, Inc.** |
| **Power Supplies:** | **1) LEI, Model #: 410610003CT, 2) LEI, Model: AD-071A (Alternative Power Supply).** |
| **SUPPORT EQUIPMENT** | |
| **Model Number:** | **None** |
| **Description:** | |
| **Manufacturer:** | |
| **Model Number:** | **None** |
| **Description:** | |
| **Manufacturer:** | |

## EUT INFORMATION

| | |
|---|---|
| Frequency Range: | 2.402GHz – 2.480GHz |
| # of Channels: | 79 Channels |
| Channel Separation: | 1.0MHz |
| Transmitting Method: | Pseudo-random Frequency Hopping Spread Spectrum |
| Transmitting Power: | 0.45 Watt (Max.) |
| Antenna (TX and RX): | 2 selectable Di-pole antennas (through RF switch) |
| Interface: | 10/100 Base-T |
| Power Supply: | AC to DC adapter |
| External Connections: | DC Jack and RS-232 port (for service only) |

**PSEUDO-RANDOM FREQUENCY LIST**

| Channel ID | Frequency (MHz) | Channel ID | Frequency (MHz) | Channel ID | Frequency (MHz) | Channel ID | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| 1 | 2402 | 21 | 2422 | 41 | 2442 | 61 | 2462 |
| 2 | 2403 | 22 | 2423 | 42 | 2443 | 62 | 2463 |
| 3 | 2404 | 23 | 2424 | 43 | 2444 | 63 | 2464 |
| 4 | 2405 | 24 | 2425 | 44 | 2445 | 64 | 2465 |
| 5 | 2406 | 25 | 2426 | 45 | 2446 | 65 | 2466 |
| 6 | 2407 | 26 | 2427 | 46 | 2447 | 66 | 2467 |
| 7 | 2408 | 27 | 2428 | 47 | 2448 | 67 | 2468 |
| 8 | 2409 | 28 | 2429 | 48 | 2449 | 68 | 2469 |
| 9 | 2410 | 29 | 2430 | 49 | 2450 | 69 | 2470 |
| 10 | 2411 | 30 | 2431 | 50 | 2451 | 70 | 2471 |
| 11 | 2412 | 31 | 2432 | 51 | 2452 | 71 | 2472 |
| 12 | 2413 | 32 | 2433 | 52 | 2453 | 72 | 2473 |
| 13 | 2414 | 33 | 2434 | 53 | 2454 | 73 | 2474 |
| 14 | 2415 | 34 | 2435 | 54 | 2455 | 74 | 2475 |
| 15 | 2416 | 35 | 2436 | 55 | 2456 | 75 | 2476 |
| 16 | 2417 | 36 | 2437 | 56 | 2457 | 76 | 2477 |
| 17 | 2418 | 37 | 2438 | 57 | 2458 | 77 | 2478 |
| 18 | 2419 | 38 | 2439 | 58 | 2459 | 78 | 2479 |
| 19 | 2420 | 39 | 2440 | 59 | 2460 | 79 | 2480 |
| 20 | 2421 | 40 | 2441 | 60 | 2461 | | |

## CFR 15.205 RESTRICTED BAND

Special attention is made for the EUT's harmonic and spurious radiated emission in the restricted bands of operation. The EUT was tested from 150kHz and up to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1GHz, average measurements was used using RBW 1MHz-VBW 10Hz and linearly polarized horn antennas. In addition, peak measurements were taken to ensure that the peak levels are not more than 20dB above the average limit. All out of band emissions, other than those created by the spreading frequency, data sequence, and the carrier modulation must not exceed the limits show in Table 2 per 150.209.

| Frequency (MHz) | Field strength (microvolts/meter) | Measure 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 |

**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. §§15.230 and 15.241.

## ATTACHMENT A - CFR 15.203 ANTENNA REQUIREMENT

An intentional radiator antenna shall be designed to ensure that no antenna other that that furnished by the applicant can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

The Pico Communications, Inc. Model: PNAP-2007100 complies with the requirement of 15.203. The antennas are permanent mounted di-pole antennas, no users accessible fasteners or parts.

**Conclusion:** **Pass, EUT meet 15.203 requirements. There are no provisions for connection to an external antenna or antenna replacement for users.**

## ATTACHMENT B – CFR 15.207 (a) CONDUCTED EMISSION TEST RESULTS

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is back onto the AC power line on frequency within the band 450 kHz to 30 MHz shall not exceed 250 microvolts.

| | |
|---|---|
| Operating Frequency = | 2402, 2440 and 2480 MHz |
| AC / DC Adapter = | 1) and 2) |
| Res. Bandwidth = | 9 kHz |
| Sweep Time = | 30 mS |

**Adapter #1:**

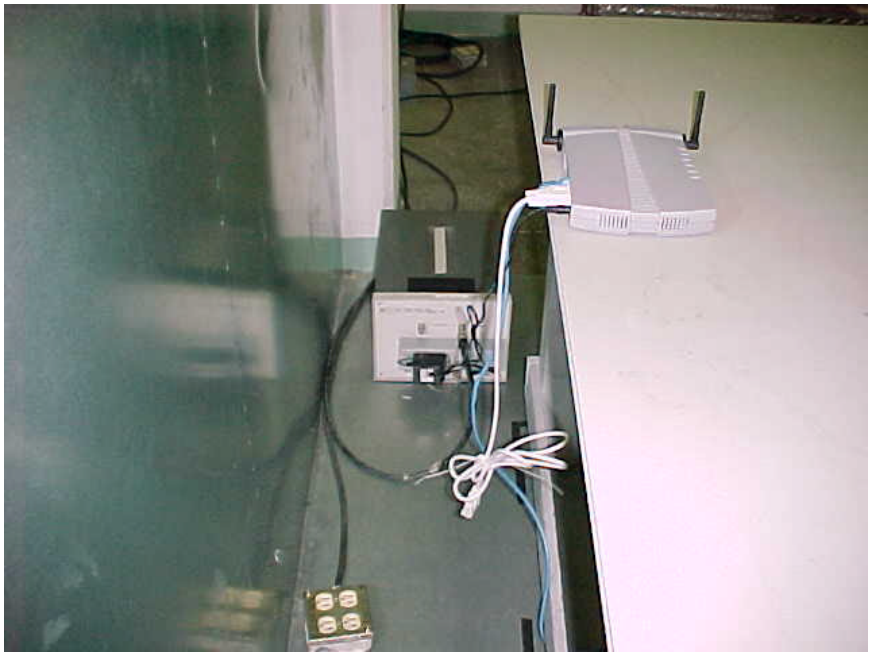
| Line | Frequency [MHz] | Corrected QP Reading [dB(µV)] | Delta QP [dB] | Limit [dB(µV)] |
|---|---|---|---|---|
| L1 | 2.3376 | 32.0 | -16.0 | 48.0 |
| L1 | 2.230 | 29.9 | -18.1 | 48.0 |
| L1 | 2.1253 | 29.65 | -18.35 | 48.0 |
| L2 | 2.4456 | 34.57 | -13.43 | 48.0 |
| L2 | 2.341 | 33.0 | -15.0 | 48.0 |
| L2 | 21.326 | 32.08 | -15.92 | 48.0 |

**Adapter #2:**

| Line | Frequency [MHz] | Corrected QP Reading [dB(µV)] | Delta QP [dB] | Limit [dB(µV)] |
|---|---|---|---|---|
| L1 | 2.3376 | 32.0 | -16.0 | 48.0 |
| L1 | 2.23 | 29.9 | -18.1 | 48.0 |
| L1 | 2.1253 | 29.65 | -18.35 | 48.0 |
| L2 | 2.4456 | 34.57 | -13.43 | 48.0 |
| L2 | 2.341 | 33.0 | -15.0 | 48.0 |
| L2 | 21.326 | 32.08 | -15.92 | 48.0 |

**Test Result:** **Pass, EUTs' meet minimum requirement.**

**Conducted Emission Setup**



**Conducted Emission Setup (shows Cable placement)**

## ATTACHMENT C - CFR 15.204 ANTENNA INFORMATION

Pico Communications, Inc. Model: PNAP-2007100equipped with 2 solid-state RF switch selectable Di-pole antennas. Pending on obstacle or terrain during receive and transmit functions. The units will automatically select a suitable antenna on next packets.

Manufacturer of Antenna:

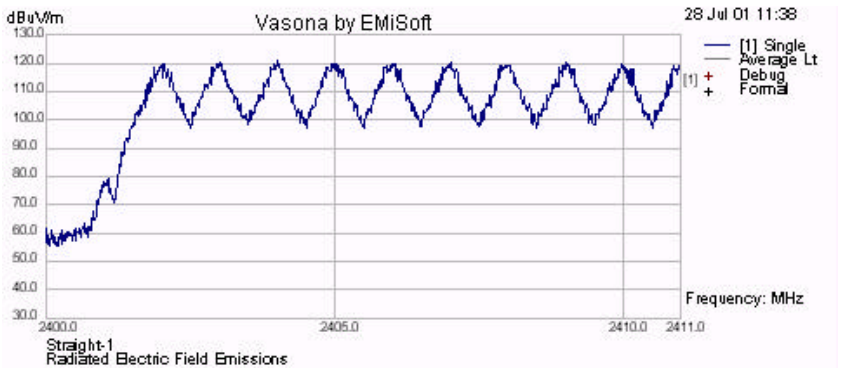
Model Number:

Antenna Gain: 1.8 dBi

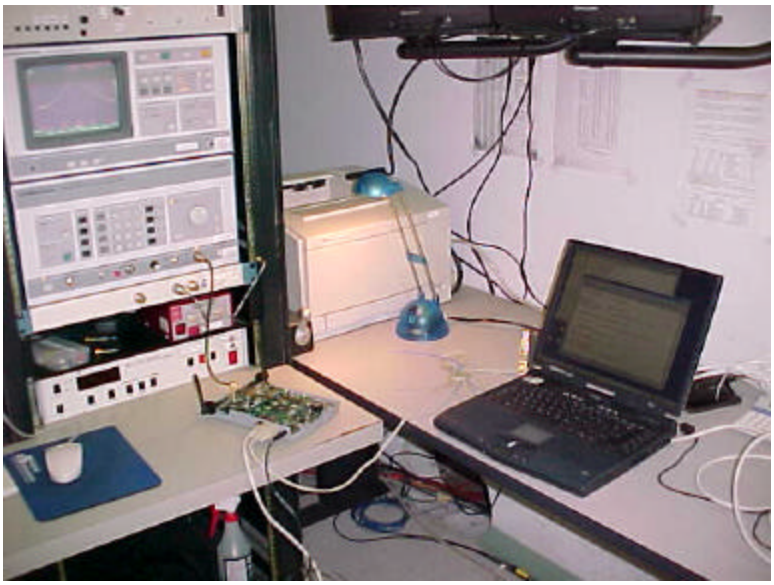
## ATTACHMENT D - CFR 15.247(a)(1) FREQUENCY SEPARATION (CONDUCTED)

Frequency hoping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

| | |
|---|---|
| EUT Operating Mode | = Hopping |
| R. Bandwidth | = 100 kHz |
| Video Bandwidth | = 100 kHz |
| Frequency Span | = 10 MHz |
| Sweep Time | = Auto |
| Detector | = Peak Mode |
| Trace | = Max Hold |




**Test Result:** **Channel separation = 1 MHz, EUT meets minimum requirement.**

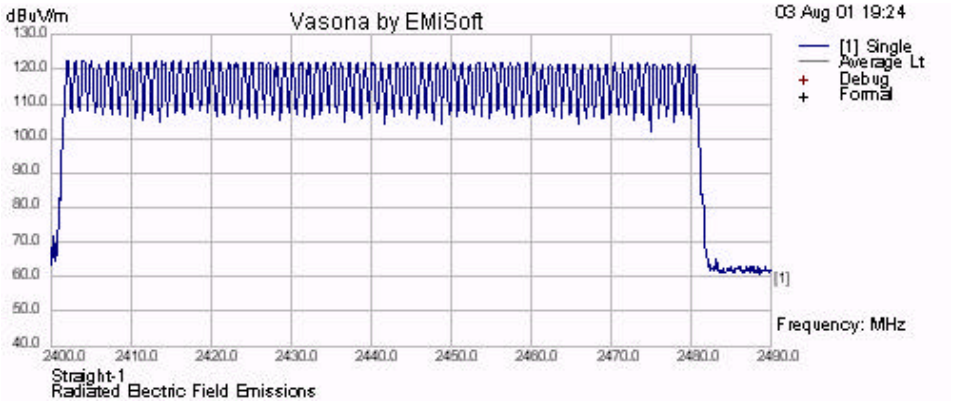


**Test Result:** **EUT meets minimum requirement.**

## ATTACHMENT E - NUMBER OF HOPPING FREQUENCIES

Frequency hopping systems operating in the 2400 – 2483.5 MHz band shall use at least 75 hopping frequencies.

| | |
|---|---|
| EUT Operating Mode | = Hopping |
| Frequency Span | = 90 MHz |
| R. Bandwidth | = 100 kHz |
| Video Bandwidth | = 100 kHz |
| Sweep Time | = Auto |
| Detector | = Peak Mode |
| Trace | = Max Hold |

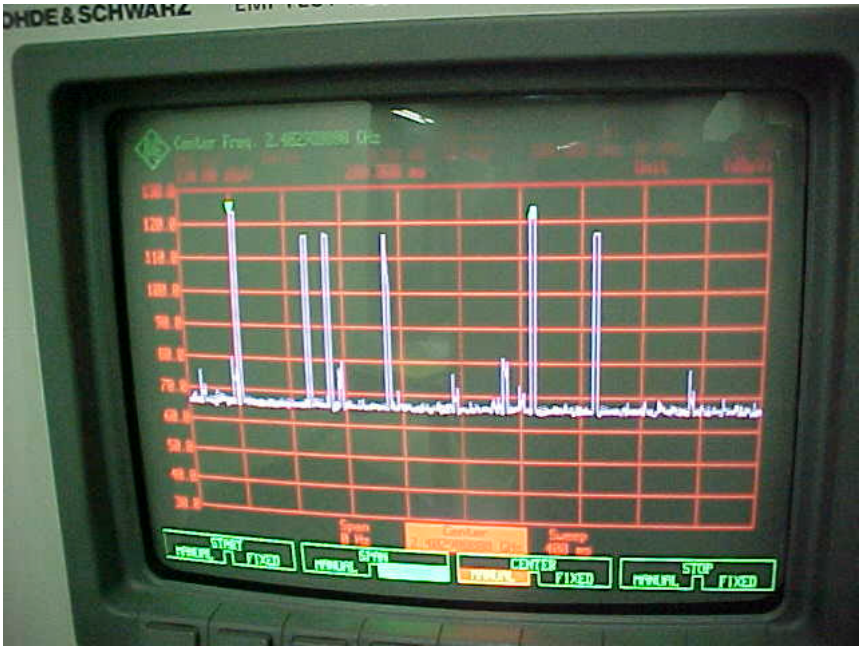



**Test Result:** **EUT meets minimum requirement. Total Number of Channels = 79**

## ATTACHMENT F - TIME OF OCCUPANCY

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period in a frequency hopping systems operating in the 2400 – 2483.5 MHz and the 5725 – 5850 MHz bands.

| | |
|---|---|
| Center Frequency | = 2.401.99 MHz |
| R. Bandwidth | = 1 MHz |
| Video Bandwidth | = 1 MHz |
| Frequency Span | = 0 Hz |
| Sweep Time | = 400 mS |
| Detector Function | = Peak Mode |
| Trace | = Max Hold |
| Marker Function | = Delta Marker |
| Test Procedure | = FCC Public Notice # DA 00-705 |




**Occupancy Time Plot**

**Test Result:** **Pass minimum requirement. Time of occupancy = 208 mS within a 30 second period.**

## ATTACHMENT G – 20 dB BANDWIDTH

The maximum allowed 20 dB bandwidth of the hopping channel is 1 MHz in the 2400 – 2483.5 MHz

| | |
|---|---|
| Frequency Span | = 3 MHz |
| R. Bandwidth | = 30 kHz |
| Video Bandwidth | = 100 kHz |
| Sweep Time | = 20 mS |
| Detector Function | = Peak Mode |
| Trace | = Max Hold |

| CHANNEL | FREQUENCY (MHz) | 20 dB Bandwidth (MHz) |
|---|---|---|
| CH 0 (Lowest) | 2401.84 | 0.923 |
| CH 39 (Mid) | 2439.99 | 0.920 |
| CH 78 (Highest) | 2479.99 | 0.926 |


**CH 0 (Lowest Channel)**

**CH 39 (Mid Channel)**


**CH 78 (Highest Channel)**

**Test Result:** **Pass, EUT meets minimum requirement.**

## ATTACHMENT H - PSEUDO-RANDOM FREQUENCY HOPPING SEQUENCE

The frequency channels and hopping pattern are based on the Bluetooth specification (BLUETOOTH SPECIFICATION Version 1.1, February 22, 2001). The 79 frequency channels are defined in the following table:

The hopping patterns are described in the page 126 – 131 of the BLUETOOTH SPECIFICATION Version 1.1, February 22, 2001.

| Geography | Regulatory Range | RF Channels |
|---|---|---|
| USA | 2.400-2.4835 GHz | f=2402+k MHz, k=0,…,78 |

**Test Result:** **Pass, EUT meets CFR 2.1 requirement.**

## ATTACHMENT I - EQUAL HOPPING FREQUENCY USE

The frequency channels and hopping pattern are based on the Bluetooth specification (BLUETOOTH SPECIFICATION Version 1.1, February 22, 2001). The 79 frequency channels are defined in the following table:

| Geography | Regulatory Range | RF Channels |
|---|---|---|
| USA | 2.400-2.4835 GHz | f=2402+k MHz, k=0,…,78 |

The hopping patterns are described in the page 126 – 131 of the BLUETOOTH SPECIFICATION Version 1.1, February 22, 2001.

## ATTACHMENT J - SYSTEM RECEIVER INPUT BANDWIDTH

The frequency channels and hopping pattern are based on the Bluetooth specification (BLUETOOTH SPECIFICATION Version 1.1, February 22, 2001). The 79 frequency channels are defined in the following table:

The hopping patterns are described in the page 126 – 131 of the BLUETOOTH SPECIFICATION Version 1.1, February 22, 2001.

| Geography | Regulatory Range | RF Channels |
|---|---|---|
| USA | 2.400-2.4835 GHz | f=2402+k MHz, k=0,…,78 |

## ATTACHMENT L - PEAK OUTPUT POWER MEASUREMENT

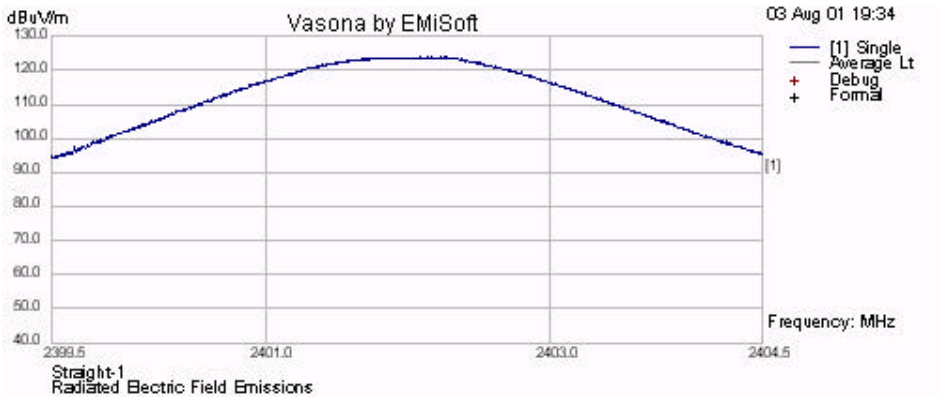
The maximum peak output power of the transmitter shall not exceed l watt (+30 dBm).

| | |
|---|---|
| Frequency Span | = 5 MHz |
| Center Frequency | = Lowest, mid and highest Channels |
| R. Bandwidth | = 3 MHz |
| Video Bandwidth | = 3 MHz |
| Sweep Time | = 20 mS |
| Detector Function | = Peak Mode |
| Trace | = Max Hold |
| External Attenuator | = None |

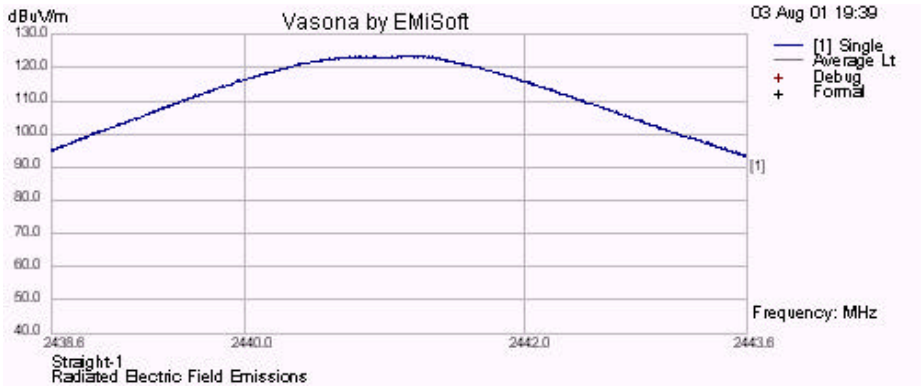
**Peak Output Power = Meter Reading + External Attenuator + Cable Loss**

| CHANNEL | CENTER FREQUENCY (MHz) | EXTERNAL ATTENUATION (dB) | CABLE LOSS (dB) | PEAK OUTPUT POWER (dBm) |
|---|---|---|---|---|
| CH 0 (Low) | 2401.99 | 0 | 1.1 | 17.91 |
| CH 38 (Mid) | 2441.11 | 0 | 1.1 | 17.45 |
| CH 78 (High) | 2480.21 | 0 | 1.1 | 17.43 |

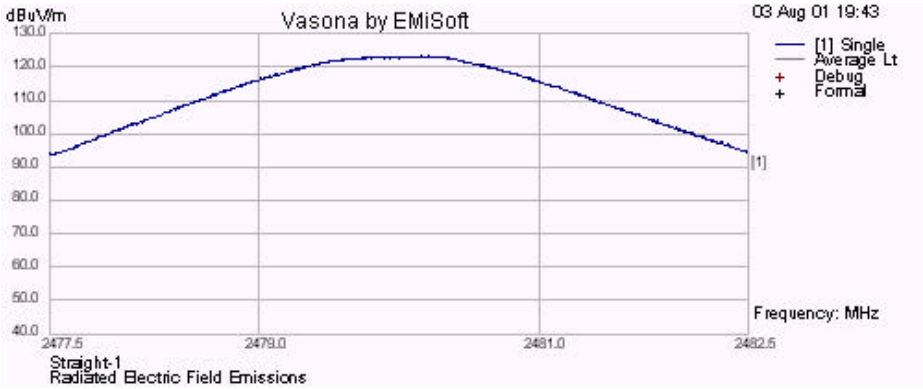
**Test Result:** **Pass, EUT meets minimum requirement.**




CH 0




CH 38




CH 78

# ATTACHMENT M - DE FACTO E.I.R.P. LIMIT

## ATTACHMENT N - POINT-TO - POINT OPERATION

## ATTACHMENT O - RF EXPOSURE COMPLIANCE REQUIREMENTS

According to FCC CFR 47 Section 2.1091 the separation distance between the antenna and the human body is 20 cm or more.

The peak conducted output power of the applying equipment is 17.9 dBm and the antenna gain is 1.8 dBi. The peak radiated (EIRP) output power is calculated as follows.

EIRP = P + G = 17.9 dBm + 1.8 dBi = 19.7 dBm (54.1 mW)

The maximum power density in 20 cm distance is calculated as:

$S = EIRP/(4 \times R^2 \times pi) = 0.00697\ mW/cm^2$

When an operator will use the applying equipment during 30 minutes continuously in normal operation, the time-averaging exposure is:

0.00697 x 30 = 0.21 (in worst case, time-averaging duty cycle is 100%)

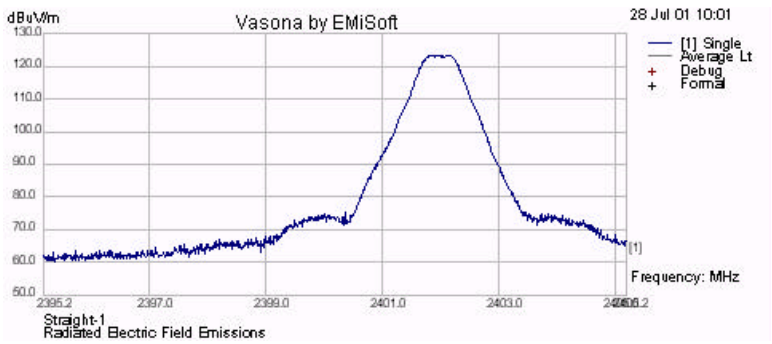
**Test Result:** EUT meets the MPE requirements for general Population / Uncontrolled exposure.

# ATTACHMENT P - OPERATION MANUAL REQUIREMENTS

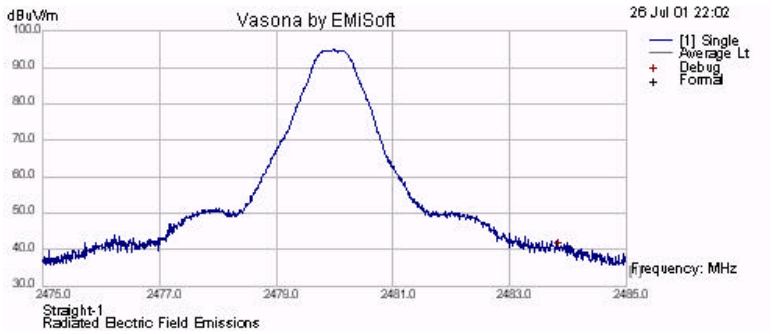
## ATTACHMENT Q - CONDUCTED RF BAND-EDGE

The Band-edge radiated emission measurements may be necessary to demonstrate compliance with radiated emission limits in Sections 15.249(c) or 15.205 when a restricted band is located adjacent to a 15.247 band (e.g., the restricted band beginning at 2483.5 MHz).

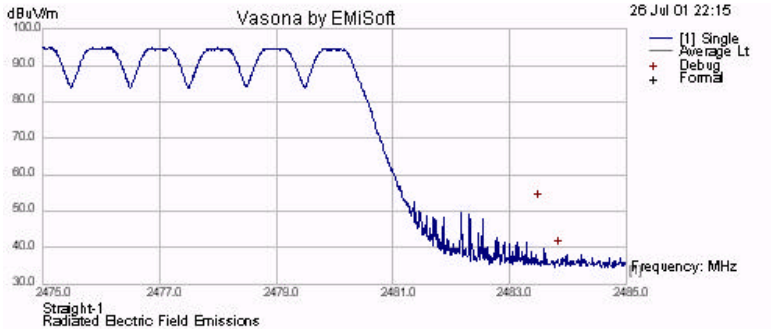
| | |
|---|---|
| Frequency Span | = 5 MHz |
| Center Frequency | = CH 0 and CH 79 (closed to restricted band) |
| R. Bandwidth | = 300 kHz |
| Video Bandwidth | = 1 MHz |
| Sweep Time | = 20 mS |
| Detector Function | = Peak Mode |
| Trace | = Max Hold |




**CH 0**




**CH 78**

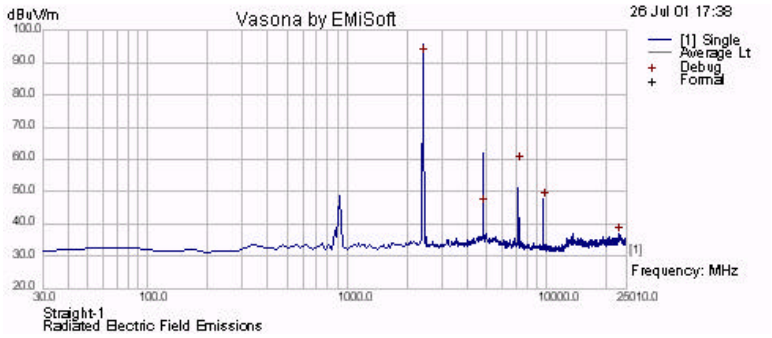



**CH 78 (Hopping Enabled)**

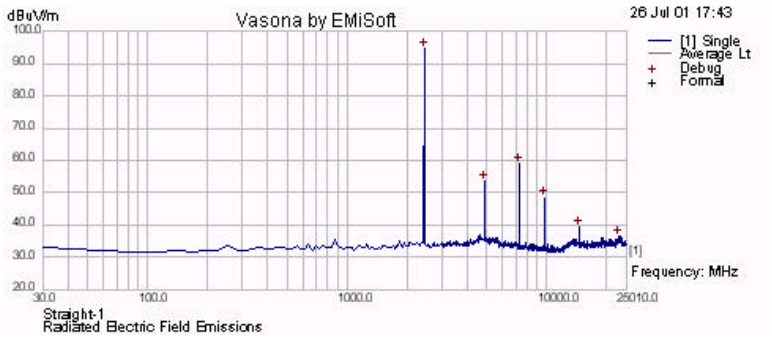
**Test Result:** **Pass, EUT meets minimum requirement.**

## ATTACHMENT R - CONDUCTED SPURIOUS RF EMISSIONS

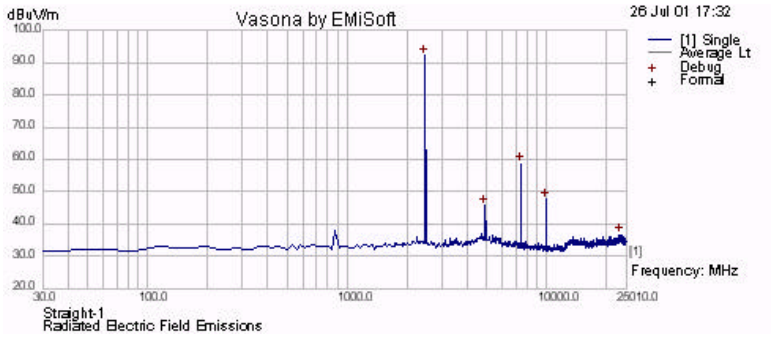
| | |
|---|---|
| Frequency Range | = 30 MHz to 25.01 GHz |
| Channels Tested | = CH 0 (lowest), CH 39 (mid) and CH 78 (highest) |
| R. Bandwidth | = 300 kHz |
| Video Bandwidth | = 1 MHz |
| Sweep Time | = Auto |
| Detector Function | = Peak Mode |
| Trace | = Max Hold |




**CH 0**




**CH 38**




**CH 78**

## ATTACHMENT S - SPURIOUS RADIATED EMISSIONS

In any 100 kHz 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, base on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

| | |
|---|---|
| Channels Tested | = CH 0 (lowest), CH 39 (mid) and CH 78 (highest) |
| Antenna Tested | = Antenna A and B (software selected) |
| Frequency Span | = 10 MHz |
| R. Bandwidth | = 1 MHz (f ≥ 1GHz), 100 kHz (f < 1 GHz) |
| Video Bandwidth | = 1 MHz |
| Sweep Time | = Auto |
| Detector Function | = Peak Mode |
| Trace | = Max Hold |

**CH 0 (Lowest)**

| Freq. (MHz) | RAW Reading (dBuV) | Correction Factors (dB/m) | Polar. (V/H) | Detector (Peak/Ave) | Field Strength (dBuV/m) | Margin (dB) | Notes |
|---|---|---|---|---|---|---|---|
| 2402.03 | 101.49 | 10.46 | V | Peak | 111.96 | - | **OF** |
| 2401.74 | 94.49 | 10.47 | H | Peak | 104.96 | - | **OF** |
| 4804.26 | 34.53 | 15.96 | V | Ave | 50.50 | -3.50 | **RB** |
| 4804.45 | 28.18 | 15.96 | H | Ave | 44.15 | -9.85 | **RB** |
| 7206.47 | 44.13 | 23.17 | V | Ave | 48.13 | -63.68 | **NRB** |
| 7206.21 | 36.41 | 23.17 | H | Ave | 59.58 | -45.38 | **NRB** |
| 9607.31 | 27.52 | 26.98 | V | Ave | 54.50 | -57.46 | **NRB** |
| 9608.76 | 23.94 | 26.98 | H | Ave | 50.92 | -54.04 | **NRB** |

**CH 39 (Mid)**

| Freq. (MHz) | RAW Reading (dBuV) | Correction Factors (dB/m) | Polar. (V/H) | Detector (Peak/Ave) | Field Strength (dBuV/m) | Margin (dB) | Notes |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2441.08 | 102.98 | 10.56 | V | Peak | 113.54 | - | **OF** |
| 2441.10 | 94.86 | 10.56 | H | Peak | 105.42 | - | **OF** |
| 4882.28 | 35.16 | 16.31 | V | Ave | 51.46 | -2.54 | **RB** |
| 7323.43 | 27.55 | 23.55 | V | Ave | 51.10 | -2.9 | **RB** |
| 9764.48 | 24.17 | 26.95 | V | Ave | 51.10 | -2.9 | **NRB** |

**CH 78 (Highest)**

| Freq. (MHz) | RAW Reading (dBuV) | Correction Factors (dB/m) | Polar. (V/H) | Detector (Peak/Ave) | Field Strength (dBuV/m) | Margin (dB) | Notes |
|---|---|---|---|---|---|---|---|
| 2480.22 | 96.37 | 10.65 | V | Peak | 107.02 | - | **OF** |
| 2479.98 | 94.93 | 10.65 | H | Peak | 105.58 | - | **OF** |
| 4960.45 | 35.54 | 16.63 | V | Ave | 52.17 | -1.83 | **RB** |
| 7441.36 | 24.83 | 23.92 | V | Ave | 48.75 | -5.25 | **RB** |
| 9920.13 | 22.77 | 26.91 | V | Ave | 49.69 | -57.33 | **NRB** |
| 4960.14 | 30.95 | 16.63 | H | Ave | 47.58 | -6.42 | **RB** |
| 7440.44 | 27.17 | 23.92 | H | Ave | 51.09 | -2.91 | **RB** |
| 9919.35 | 21.30 | 26.91 | H | Ave | 48.22 | -5.78 | **NRB** |

**Antenna B CH 78 (Highest)**

| Freq. (MHz) | RAW Reading (dBuV) | Correction Factors (dB/m) | Polar. (V/H) | Detector (Peak/Ave) | Field Strength (dBuV/m) | Margin (dB) | Notes |
|---|---|---|---|---|---|---|---|
| 4959.64 | 32.49 | 16.63 | V | Ave | 49.12 | -4.88 | **RB** |
| 4959.59 | 32.10 | 16.63 | H | Ave | 48.69 | -5.30 | **RB** |

**Legends:**

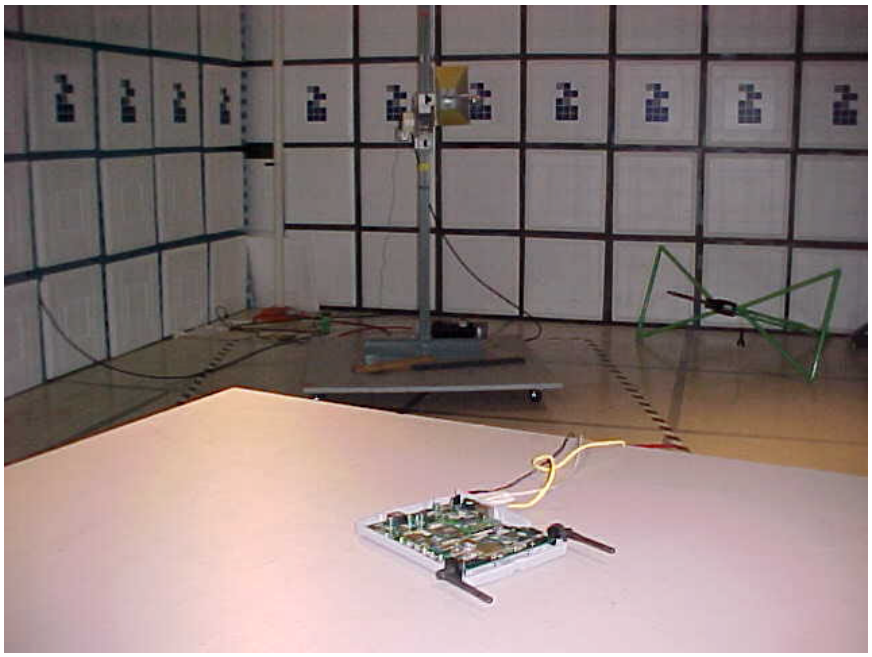
**OF = Operating Frequency.**

**NRB = Non Restricted Band, Limits should be 20 dB below the "OF".**

**RB = Frequency within the Restricted Bands according to CFR15.205, Limits shall comply with CFR15.209. In this case the limit is 500uV/m (54dBuV/m).**

**Note:**

**1. During this test EUT is manipulated through typical positions, polarity and length, the worst case emissions are reported above.**



**Test Result: Pass, EUT meet minimum requirements.**

# ATTACHMENT T - SECTION 15.247(G)

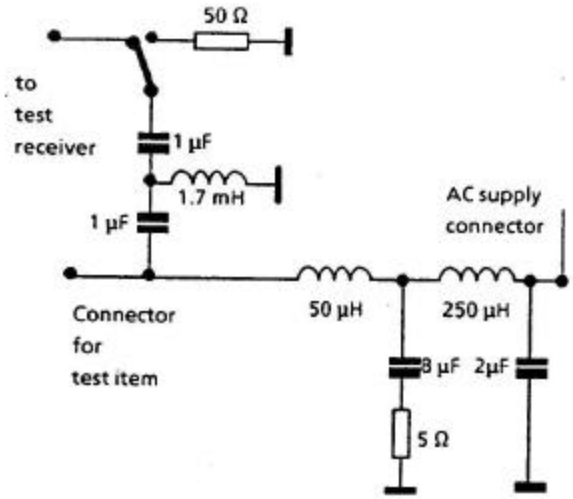
# ATTACHMENT U - SECTION 15.247(H)

## APPENDIX 1 - TEST EQUIPMENT

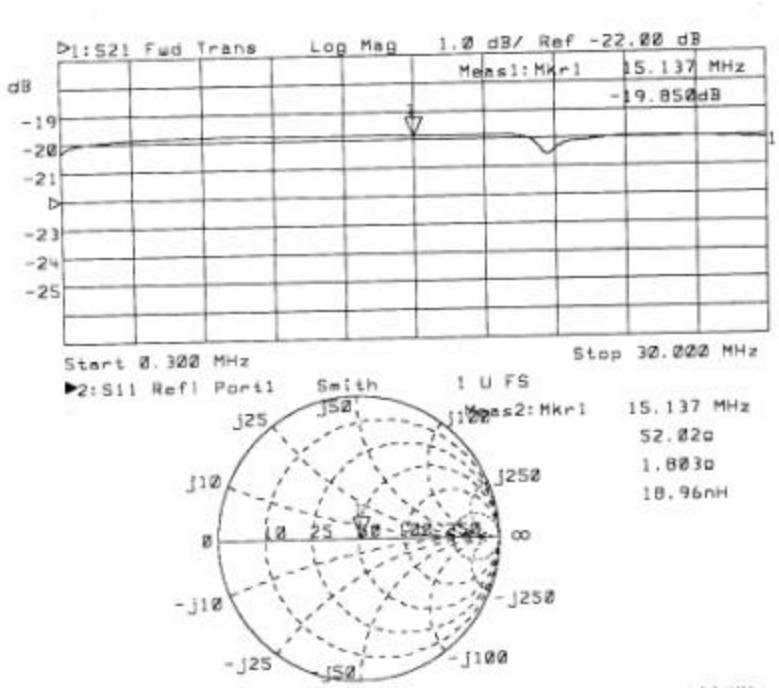
| Test Equipment | Manufacturer/ Model | Serial No. | Last Cal. | Cal. Due Date |
|---|---|---|---|---|
| EMI Receiver | R&S / ESMI-RF | 849937/006 | 03/01/01 | 03/01/02 |
| EMI Receiver | R&S / ESAI-D | 825035/005 | 03/01/01 | 03/01/02 |
| Bilog Antenna | CHASE CBL6112A | 2274 | 11/16/00 | 11/16/01 |
| Horn Antenna | EMCO / 3115 w/ Miteq Amp | 001 | 10/28/00 | 10/28/01 |
| Horn Antenna | EMCO / 3116 w/ Miteq Amp | 002 | 10/28/00 | 10/28/01 |
| LISN | R & S / ESH3-Z5 | 844249/018 | 11/15/00 | 11/15/01 |
| Signal Generator | HP / 83711B | 3324A03288 | 08/29/00 | 08/29/01 |
| Attenuators | HP / 8491C | 00423 | VBU | VBU |
| Note: All testing were performed using internationally recognized standards. All test instruments were calibrated and traceable to the National Institute of Standards and Technology (NIST). | | | | |

## APPENDIX 2 – LISN SPECIFICATIONS

LISN use in this test is manufactured by R & S, model ESH3-Z5. This LISN complies with the FCC and CISPR requirements. The test frequency range is from 9kHz to 30MHz and impedance is 50 Ohms.




LISN Schematics (only 1 line shown)




Network Analyzer Plot

## ANNEX 1 – FCC 15.209 RADIATED EMISSION TEST RESULTS

In any 100 kHz 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, base on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

| | |
|---|---|
| **TEST PROCEDURE:** | The EUT was set up according to the guidelines of ANSI C63.4-1992 for radiated emissions. An EMI receiver peak scan was made at the frequency measurement range (pre-scan) in an Anechoic chamber. Signal discrimination was then performed and the significant peaks marked. These peaks were then quasi-peaked from 30 MHz to 1GHz at OATs or an Anechoic chamber.<br><br>The following data lists the significant emission frequencies, measured levels, correction factors (including cable and antenna correction factors), and the corrected readings against the limits. Explanation of the Correction Factor are given as follows:<br><br>FS= RA + AF + CF - AG<br><br>Where: FS = Field Strength<br><br>RA = Receiver Amplitude<br><br>AF = Antenna Factor<br><br>CF = Cable Attenuation Factor<br><br>AG = Amplifier Gain |
| **TESTED RANGE:** | 30 MHz to 1,000 MHz |
| **RESULTS:** | The EUT meets the requirements of test reference for Radiated Emissions on vertical polarization by 1.2 dB at 442.414 MHz. The test results relate only to the equipment under test provided by client. |
| **CHANGES OR MODIFICATIONS:** | There were no modifications installed by Bay Area Compliance Laboratory Corp test personnel. |
| **M. UNCERTAINTY:** | Freq. $\pm 2x10^{-7}$ x Center Freq., Amp $\pm$ 2.6 dB |

| Frequency [MHz] | Antenna Polarization [V/H] | Corrected Reading [dBµV/m] | Delta, QP [dB] | 10 Meters Limits [dBµV/m] | Correction Factors [dB/m] |
|---|---|---|---|---|---|
| Set-up/Configuration: ANSI C63.4-1992, EN 55022:1998, CISPR 16-1:1993 | | | | | |
| 442.414 | H | 35.8 | -1.2 | 37.0 | 20.8 |
| 344.100 | H | 35.8 | -1.2 | 37.0 | 18.0 |
| 196.628 | V | 28.7 | -1.3 | 30.0 | 11.8 |
| 196.624 | H | 28.6 | -1.4 | 30.0 | 11.8 |
| 76.433 | H | 28.1 | -1.9 | 30.0 | 7.5 |
| 491.547 | H | 35.1 | -1.9 | 37.0 | 21.8 |
| Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 120kHz, with a 30 ms sweep time. A video filter was not used. | | | | | |