# TEST REPORT

**Report Number: 30408642**
**Project Number: 3040864 & 3030973**
**June 10, 2003**

Testing performed on the
**Wireless Indoor Remote Unit**
**Model: BRU-150**
**FCC ID: QONBRU150**
to

**FCC Part 27**

for
**BeamReach Networks**

| **Test Performed by:** | **Test Authorized by:** |
|---|---|
| Intertek Testing Services | BeamReach Networks |
| 1365 Adams Court | 755 North Mathilda Avenue |
| Menlo Park, CA 94025 | Sunnyvale, CA 94086 |

Prepared by: _____ Date: 6/10/03
Arkadi Kaplan

Reviewed by: _____ Date: 7/17/03
David Chernomordik

## TABLE OF CONTENTS

## 1.0 Summary of Tests

**FCC ID: QONBRU150**
**Model No.: BRU-150**

| FCC RULE | DESCRIPTION OF TEST | RESULTS |
|---|---|---|
| 2.1046 | RF Power Output | Complies |
| 27.50 | Effective Radiated Power | Complies |
| 2.1049 | Occupied Bandwidth | Complies |
| 2.1051, 27.53 | Spurious Emissions at Antenna Terminals | Complies |
| 2.1053, 27.53 | Field Strength of Spurious Radiation | Complies |
| 15.207 | Line Conducted Emissions | Complies |
| 2.1055 | Frequency Stability vs. Temperature | Complies |
| 2.1055 | Frequency Stability vs. Voltage | Complies |

Date of Test: March 6 to April 11, 2003

## 2.0 General Description

### 2.1 Product Description

The BRU-150 is a wireless Indoor Remote Unit (IRU) that provides the subscriber termination point for a broadband wireless data system.

**Overview of BeamReach Wireless Indoor Remote Unit**

| | |
|---|---|
| **Applicant:**<br>**Address:**<br><br>**Telephone:**<br>**Fax:**<br>**Contact Person:** | BeamReach Networks<br>755 North Mathilda Avenue<br>Sunnyvale, CA 94086<br>408/869-8707<br>408/869-8900<br>Mr. Tony Tokuno |
| **Trade Name & Model No.** | BeamReach / BRU-150 |
| **FCC Identifier** | QONBRU150 |
| **Use of Product** | Wireless Internet Data Transceiver |
| **Rated RF Output Power** | 7 W peak |
| **Type of Transmission** | Digital data, TDD |
| **Type of Modulation, Emission Designator** | OFDM, 2M50D7D |
| **Bit Rate** | 1.2 Mbps Tx, 1.5 Mbps Rx |
| **The dc voltage applied to and current into the several elements of the final RF amplifying device** | Voltage: 11 V<br>Current: 1.75 A |
| **Frequency Range** | Three paired channels in WCS Block A:<br>2305-2310 MHz and 2350-2355 MHz<br>or<br>Three paired channels in WCS Block B:<br>2310-2315 MHz and 2355-2360 MHz<br><br>Paired channels, 1 each in lower and upper bands sequentially in frequency |
| **Max. Number of Tuning Channel Pairs** | 6 pairs, 12 total channels:<br>3 pairs each in WCS block A lower and upper<br>3 pairs each in WCS block B lower and upper |
| **Antenna(s) & Gain** | 11 dBi |
| **Detachable Antenna?** | No |
| **Receiver L.O. Frequency** | 1956.25 to 2008.75 MHz |
| **External Input** | Digital Data |

A production version of the EUT was received on March 5, 2003 in good operating condition.

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is site 1. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

## 3.0 System Test Configuration

3.1 Support Equipment

| Item # | Description | Model No. | Serial No. |
|---|---|---|---|
| 1 | Agilent ESG Vector Signal Generator | E4438C | MY41000110 |
| 2 | Agilent Spectrum Analyzer | 8562E | 3943A01249 |
| 3 | BeamReach Remote, Antenna and Housing Only for BRU-100, no Electronics | N/A | N/A |
| 4 | Silicon Microsystems Generic IBM Compatible PC | No Model Number (Pentium 2, 266 MHz) | No Serial Number |
| 5 | Mini-Circuits 3-dB Signal Spliter | 15542 | N/A |
| 6 | 6-foot Tri-pod Antenna Stands (2) | N/A | N/A |

3.2 Block Diagram of Test Setup

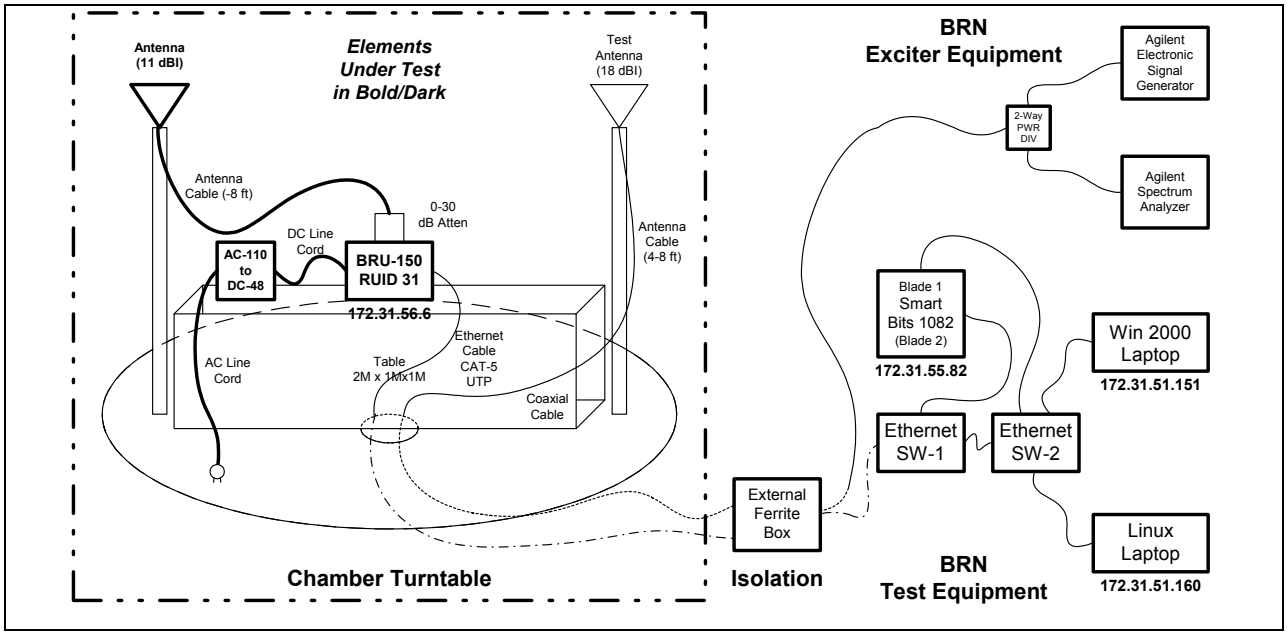



Figure 1. BRU-150, Part 2.1053 and Part 15.109 radiated emissions tests set-up

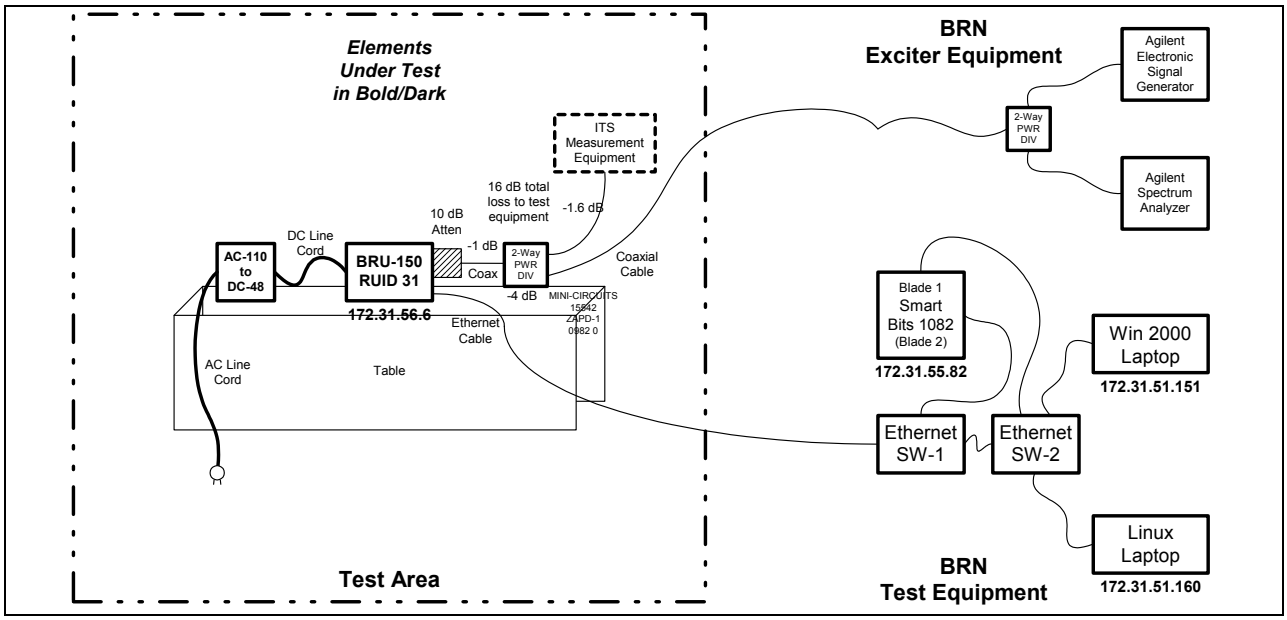



Figure 2. BRU-150, Part 2.1051 antenna conducted emission test set-up

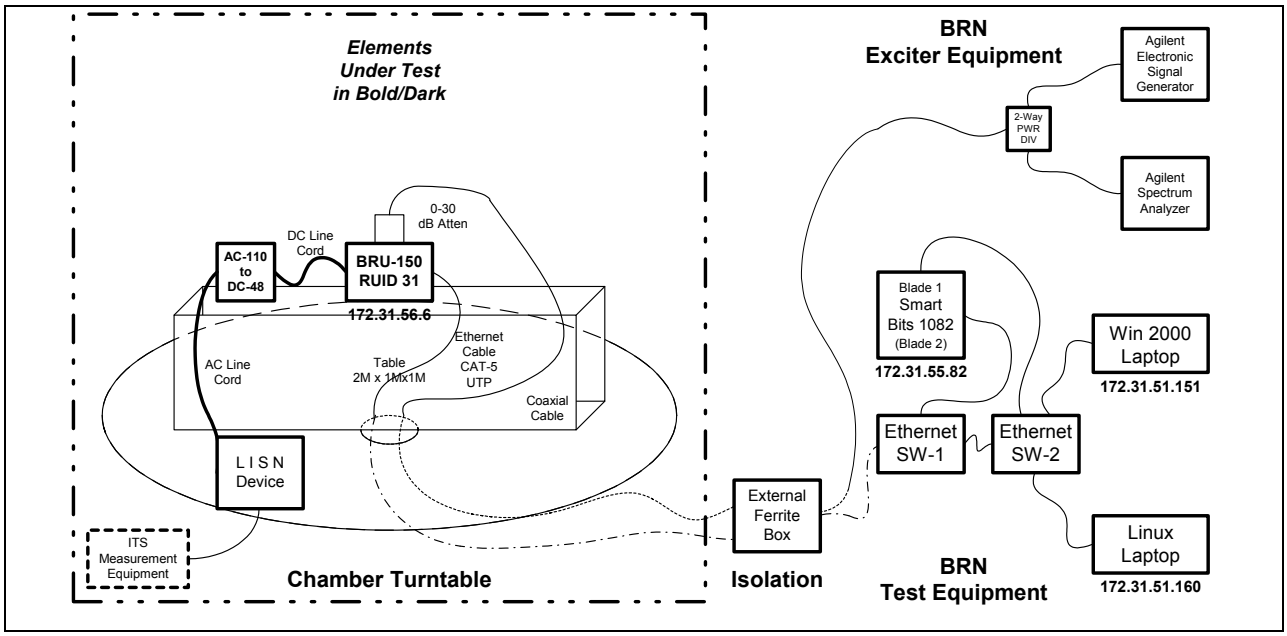



Figure 3. BRU-150, Part 15.207 AC-Line conducted emissions test set-up.

## 4.0 RF Power Output, Radiated Power

FCC 2.1046, 27.50

4.1 Requirements

Fixed Stations transmitting are limited to 2000 Watts peak EIRP.

4.2 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a peak power meter. Transmitter output was read off the power meter in Watts.

4.3 Test Results

| Band | Operating center frequencies | Conducted Peak Power *, Watt | Peak EIRP **, Watt |
|---|---|---|---|
| Sub Band A1 | 2306.25 and 2351.25 MHz | 6.8 | 85.7 |
| Sub Band A3 | 2308.75 and 2353.75 MHz | 7.2 | 90.7 |
| Sub Band B1 | 2311.25 and 2356.25 MHz | 6.8 | 85.7 |
| Sub Band B3 | 2313.75 and 2358.75 MHz | 6.9 | 86.9 |

* Total Power for lower and upper channels,

** EIRP = P × G, where G is a numerical antenna gain (equal 12.6 or 11 dBi)

**Results:** Complies

## 5.0 Occupied Bandwidth

FCC 2.1049

### 5.1 Test Procedure

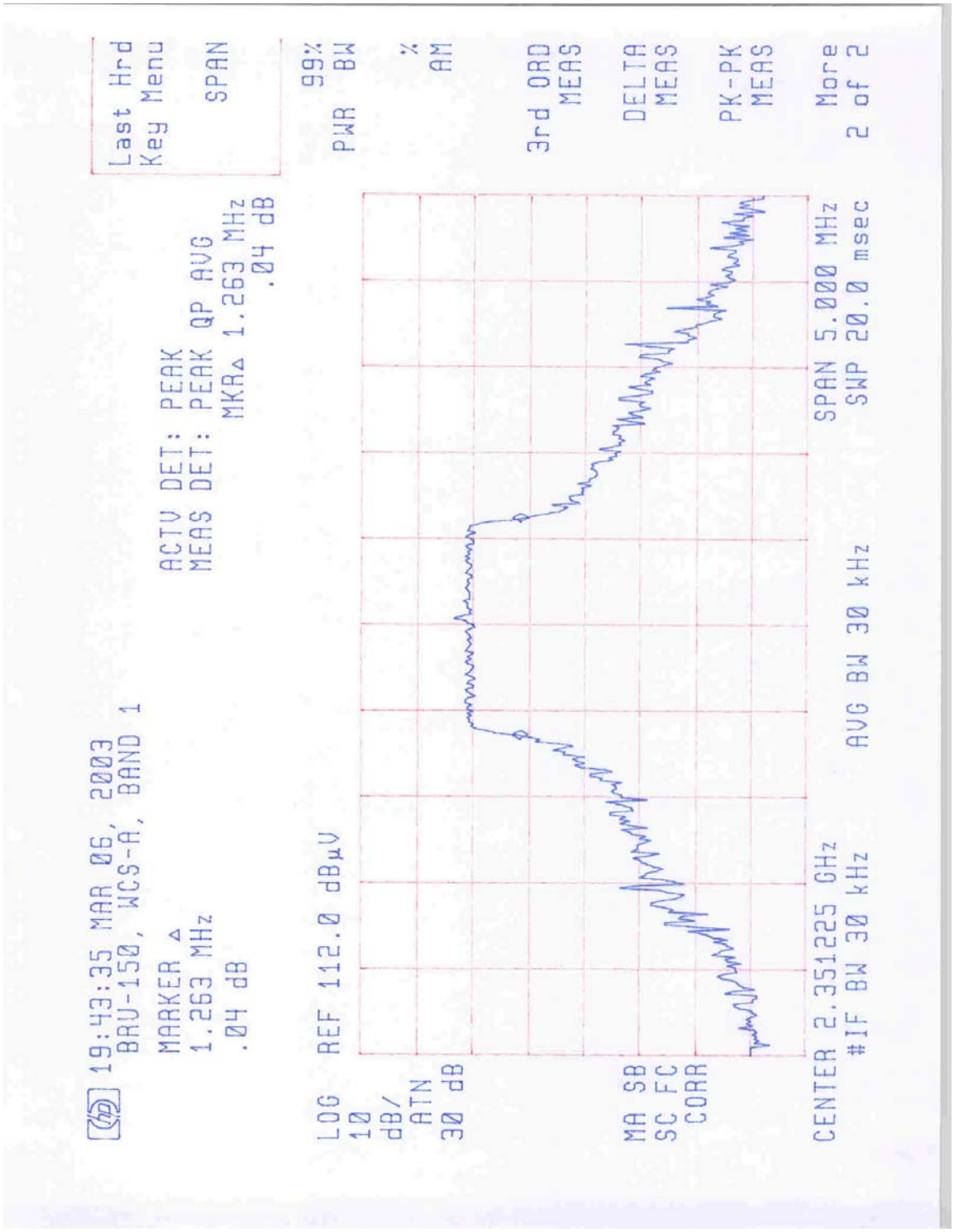
The antenna was disconnected from the transmitter and the short cable was connected to the transmitter RF output.

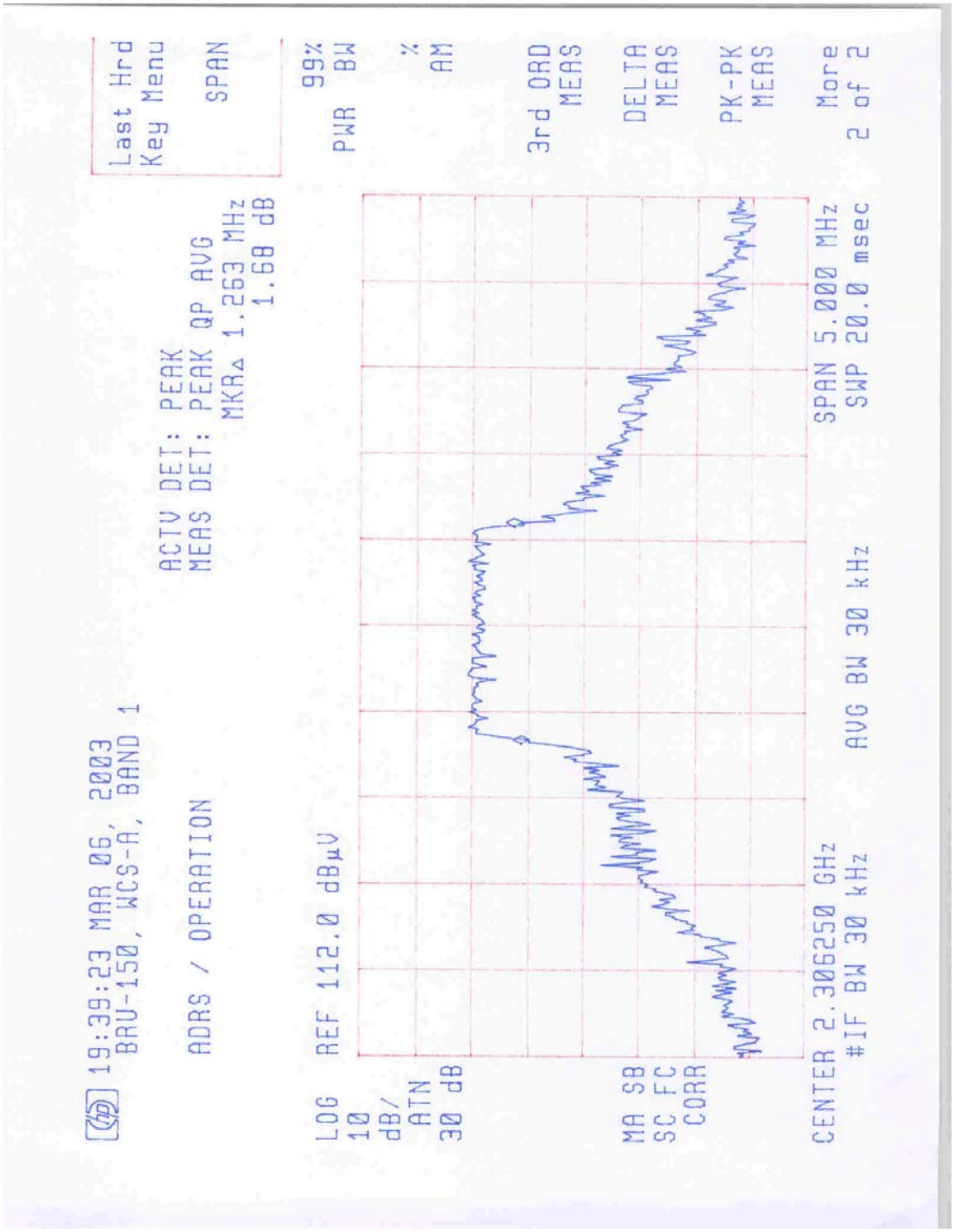
The RF output was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set up to 30 kHz and the 99% power bandwidth of the transmitting signal was recorded.

### 5.2 Test Results

The 99% power bandwidth was measured as 1.26 MHz (see the plot on the next page). The necessary bandwidth is actually 2.5 MHz, including both the 1.25 MHz lower channel and the 1.25 MHz upper channel. Therefore, emission designator is defined as 2M50D7D.


19:43:35 MAR 05, 2003
BRU-150, WCS-A, BAND 1
MARKER Δ
1.263 MHz
.04 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 1.263 MHz
.04 dB
Last Hrd
Key Menu
SPAN
99%
PWR BW
%
AM
3rd ORD
MEAS
DELTA
MEAS
PK-PK
MEAS
More
2 of 2
LOG REF 112.0 dBµV
10
dB/
ATN
30 dB
MA SB
SC FC
CORR
CENTER 2.351225 GHz
#IF BW 30 kHz
AVG BW 30 kHz
SPAN 5.000 MHz
SWP 20.0 msec


19:39:23 MAR 05, 2003
BRU-150, WCS-A, BAND 1
ADRS / OPERATION
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 1.263 MHz
1.68 dB
Last Hrd
Key Menu
SPAN
99%
PWR BW
%
AM
3rd ORD
MEAS
DELTA
MEAS
PK-PK
MEAS
More
2 of 2
LOG REF 112.0 dBµV
10
dB/
ATN
30 dB
MA SB
SC FC
CORR
SPAN 5.000 MHz
SWP 20.0 msec
CENTER 2.306250 GHz
#IF BW 30 kHz
AVG BW 30 kHz

## 6.0 Spurious Emissions at Antenna Terminal

FCC 2.1051, 27.53

### 6.1 Requirements

For operations in the bands 2305-2320 MHz and 2345-2360 MHz, the power of any emission outside the licensee's bands of operation shall be attenuated below the transmitter power (P in Watts) within the licensed band(s), by the following amounts:

≥ 70 + 10Log(P) on all frequencies below 2300 MHz
≥ 43 + 10Log(P) on all frequencies between 2300 and 2320 MHz, that are outside the licensed band
≥ 80 + 10Log(P) on all frequencies between 2320 and 2345 MHz
≥ 43 + 10Log(P) on all frequencies between 2345 and 2370 MHz, that are outside the licensed band
≥ 70 + 10Log(P) on all frequencies above 2370 MHz

### 6.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set 1 MHz. Sufficient scans were taken to show the out-of- band emissions if any up to 10th harmonic.

The limits for attenuation of out-of-band and spurious emissions written above can be converted to the emission limit as following:

-40 dBm on all frequencies below 2300 MHz
-13 dBm on all frequencies between 2300 and 2320 MHz, that are outside the licensed band
-50 dBm on all frequencies between 2320 and 2345 MHz
-13 dBm on all frequencies between 2345 and 2370 MHz, that are outside the licensed band
-40 dBm on all frequencies above 2370 MHz

For frequencies above 1 GHz, average value of spurious (out-of-band) emissions was measured using the spectrum analyzer resolution bandwidth of 1 MHz and sampling averaging in linear mode.

### 6.3 Test Results

| |
|---|
| **Results:** Complies by 2.5 dB |

Refer to the plots in Appendix A.

## 7.0 Field Strength of Spurious Radiation

FCC 2.1053, 27.53

### 7.1 Requirements

The same limits for spurious emission attenuation, as written in section 5.1, are applied. Therefore, the same limits (see sec 5.2) for radiated power are applicable.

### 7.2 Test Procedure

The transmitter was placed on a turntable. The measurement antenna was placed at a distance of 3 m (or 1 m for frequencies above 10 GHz) from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The test was performed by the substitution method unless the field strength is too low, more than 20 dB below the corresponding radiated power limit. For the spurious emissions (harmonics) the radiated power limit is –40 dBm which corresponds (approximately) to 55.3 dB(μV/m) at 3m distance. Therefore, the measurements by substitution method is performed on the frequencies where the field strength is below 35.3 dB(μV/m) at 3m or 45.3 dB(μV/m) at 1m.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

7.3 Test Result

For the Field Strength of harmonics, see the test data in Appendix 1. As can be seen, the Field Strength exceed 35.3 dB(μV/m) at 3m for frequencies above 9.5 GHz. Therefore, only for frequencies below 9.5 GHz the EIRP measurements by the substitution method were performed.

**EIRP**
**(Measured by Substitution Method)**

Sub Band A1, Band 3/39

| Frequency GHz | Spectrum Analyzer Reading (from EUT) dB(μV) | Sig. Generator Power required for the same SA Reading dBm | Transmitting Antenna Gain dBi | Equivalent Isotropically Radiated Power (EIRP) dBm | EIRP Limit dBm | Margin dB |
|---|---|---|---|---|---|---|
| 3.913 | 33.6 | -66.8 | 9.6 | -57.2 | -40.0 | -17.2 |
| 4.003 | 32.1 | -68.6 | 9.6 | -59.0 | -40.0 | -19.0 |
| 4.613 | 29.1 | -71.1 | 10.5 | -60.6 | -40.0 | -20.6 |
| 4.703 | 33.0 | -66.6 | 10.4 | -56.2 | -40.0 | -16.2 |
| 5.869 | 40.0 | -57.8 | 10.8 | -47.0 | -40.0 | -7.0 |
| 6.004 | 32.1 | -65.6 | 11.3 | -54.3 | -40.0 | -14.3 |
| 6.919 | 33.2 | -64.9 | 10.3 | -54.6 | -40.0 | -14.6 |
| 7.054 | 31.5 | -66.3 | 10.3 | -56.0 | -40.0 | -16.0 |
| 7.825 | 28.7 | -69.2 | 10.8 | -58.4 | -40.0 | -18.4 |
| 8.005 | 33.7 | -63.3 | 9.4 | -53.9 | -40.0 | -13.9 |
| 9.225 | 28.2 | -69.5 | 10.9 | -58.6 | -40.0 | -18.6 |
| 9.405 | 30.5 | -67.4 | 11.0 | -56.4 | -40.0 | -16.4 |

Sub Band A3, Band 5/41

| Frequency GHz | Spectrum Analyzer Reading (from EUT) dB(μV) | Sig. Generator Power required for the same SA Reading dBm | Transmitting Antenna Gain dBi | Equivalent Isotropically Radiated Power (EIRP) dBm | EIRP Limit dBm | Margin dB |
|---|---|---|---|---|---|---|
| 3.918 | 32.3 | -68.7 | 9.6 | -59.1 | -40.0 | -19.1 |
| 4.618 | 34.8 | -66.3 | 10.5 | -55.8 | -40.0 | -15.8 |
| 4.663 | 40.8 | -59.4 | 10.4 | -49.0 | -40.0 | -9.0 |
| 4.708 | 32.7 | -67.2 | 10.8 | -56.4 | -40.0 | -16.4 |
| 5.876 | 31.5 | -66.7 | 11.3 | -55.4 | -40.0 | -15.4 |
| 7.061 | 25.1 | -70.3 | 10.3 | -60.0 | -40.0 | -20.0 |
| 7.835 | 27.7 | -68.9 | 9.7 | -59.2 | -40.0 | -19.2 |
| 8.015 | 27.7 | -69.3 | 9.4 | -59.9 | -40.0 | -19.9 |
| 9.235 | 28.3 | -69.2 | 10.6 | -58.6 | -40.0 | -18.6 |
| 9.325 | 30.0 | -66.5 | 10.7 | -55.8 | -40.0 | -15.8 |

Sub Band B1, Band 7/43

| Frequency GHz | Spectrum Analyzer Reading (from EUT) dB(μV) | Sig. Generator Power required for the same SA Reading dBm | Transmitting Antenna Gain dBi | Equivalent Isotropically Radiated Power (EIRP) dBm | EIRP Limit dBm | Margin dB |
|---|---|---|---|---|---|---|
| 3.923 | 33.2 | -67.8 | 9.6 | -58.2 | -40.0 | -18.2 |
| 4.623 | 44.7 | -56.1 | 10.5 | -45.6 | -40.0 | -5.6 |
| 4.668 | 45.6 | -54.2 | 10.4 | -44.0 | -40.0 | -4.0 |
| 4.723 | 42.7 | -57.3 | 10.8 | -46.5 | -40.0 | -6.5 |
| 5.884 | 30.2 | -68.0 | 11.0 | -57.0 | -40.0 | -17.0 |
| 6.019 | 29.5 | -67.9 | 11.3 | -56.6 | -40.0 | -16.6 |
| 6.934 | 32.3 | -62.8 | 10.5 | -52.3 | -40.0 | -12.3 |
| 7.069 | 33.7 | -62.0 | 10.3 | -51.7 | -40.0 | -11.7 |
| 7.845 | 32.2 | -63.2 | 10.2 | -53.0 | -40.0 | -13.0 |
| 8.025 | 28.7 | -66.7 | 9.4 | -57.3 | -40.0 | -17.3 |
| 9.245 | 29.0 | -68.2 | 10.8 | -57.4 | -40.0 | -17.4 |
| 9.335 | 31.0 | -65.9 | 10.8 | -55.1 | -40.0 | -15.1 |

Sub Band B3, Band 9/45

| Frequency GHz | Spectrum Analyzer Reading (from EUT) dB(μV) | Sig. Generator Power required for the same SA Reading dBm | Transmitting Antenna Gain dBi | Equivalent Isotropically Radiated Power (EIRP) dBm | EIRP Limit dBm | Margin dB |
|---|---|---|---|---|---|---|
| 3.928 | 33.3 | -67.4 | 9.6 | -57.8 | -40.0 | -17.8 |
| 4.018 | 34.2 | -66.4 | 9.6 | -56.8 | -40.0 | -16.8 |
| 4.628 | 42.7 | -57.9 | 10.4 | -47.5 | -40.0 | -7.5 |
| 4.673 | 44.7 | -55.4 | 10.4 | -45.0 | -40.0 | -5.0 |
| 4.718 | 44.7 | -54.8 | 10.4 | -44.4 | -40.0 | -4.4 |
| 5.891 | 32.0 | -66.1 | 11.2 | -54.9 | -40.0 | -14.9 |
| 6.026 | 29.8 | -67.2 | 11.3 | -55.9 | -40.0 | -15.9 |
| 6.941 | 32.3 | -62.3 | 10.3 | -52.0 | -40.0 | -12.0 |
| 7.076 | 26.0 | -69.4 | 10.3 | -59.1 | -40.0 | -19.1 |
| 7.855 | 30.3 | -66.1 | 9.6 | -56.5 | -40.0 | -16.5 |
| 9.255 | 28.2 | -68.7 | 10.9 | -57.8 | -40.0 | -17.8 |
| 9.346 | 29.8 | -67.2 | 11.0 | -56.2 | -40.0 | -16.2 |
| 9.435 | 27.1 | -71.0 | 11.3 | -59.7 | -40.0 | -19.7 |

Note: EIRP was calculated by adding the antenna gain (in dBi) of the substitution antenna to the Signal Generator Power (in dBm).

**Results:** Complies by 4.0 dB

## 8.0 AC Line Conducted Emissions

FCC § 15.207

### 8.1 Test Procedure

AC line conducted emission test was performed according the ANSI C63.4 standard. The EUT was connected to AC Line through the LISN.

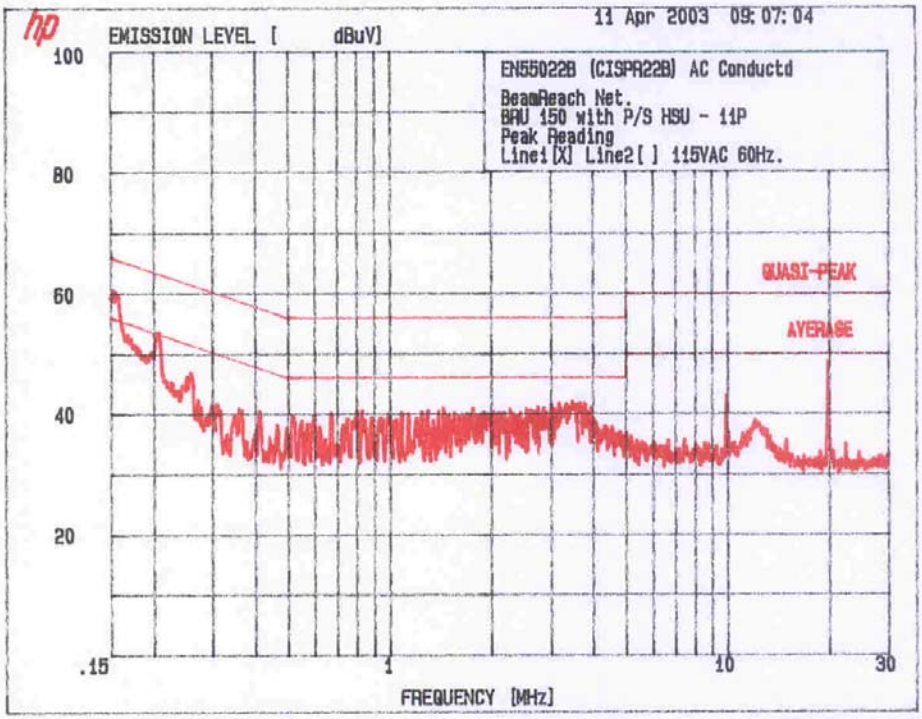
A CISPR 22 test procedure and limits were used. A complete scan from 0.15 - 30 MHz was made with spectrum analyzer resolution bandwidth of 9 kHz. At frequencies where peak reading was close or exceed the quasi-peak or average limits, quasi-peak and/or average readings were taken.

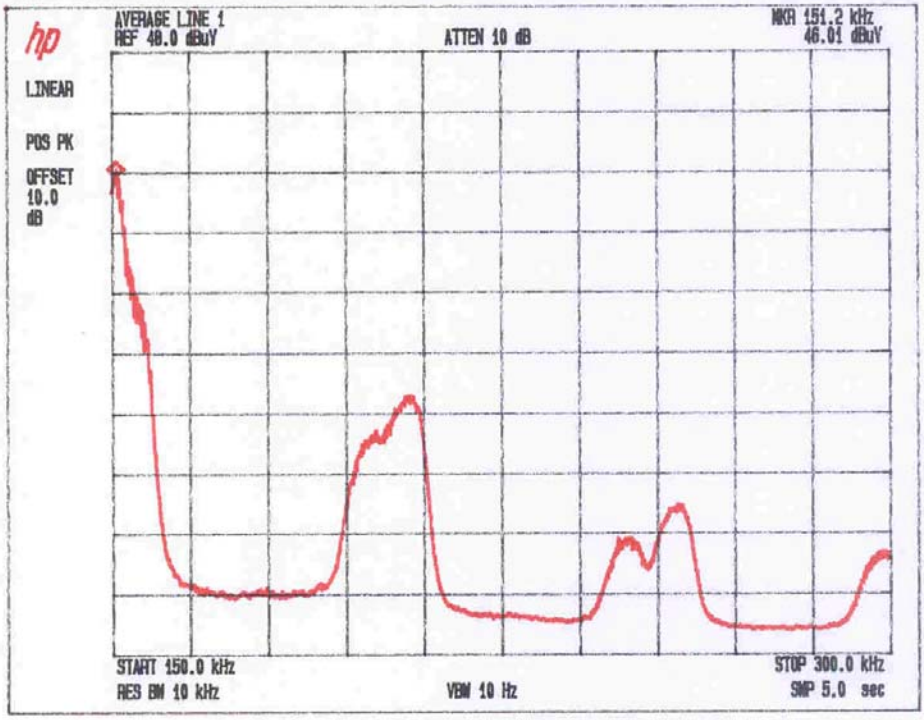
Tests were performed for three power supplies.

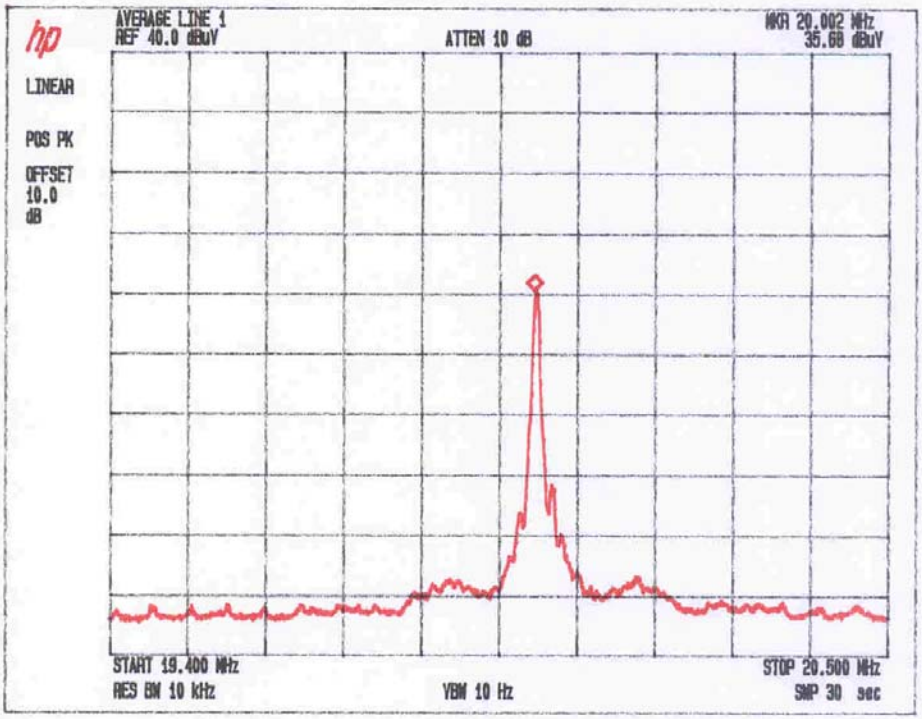
## 8.2 Test Results

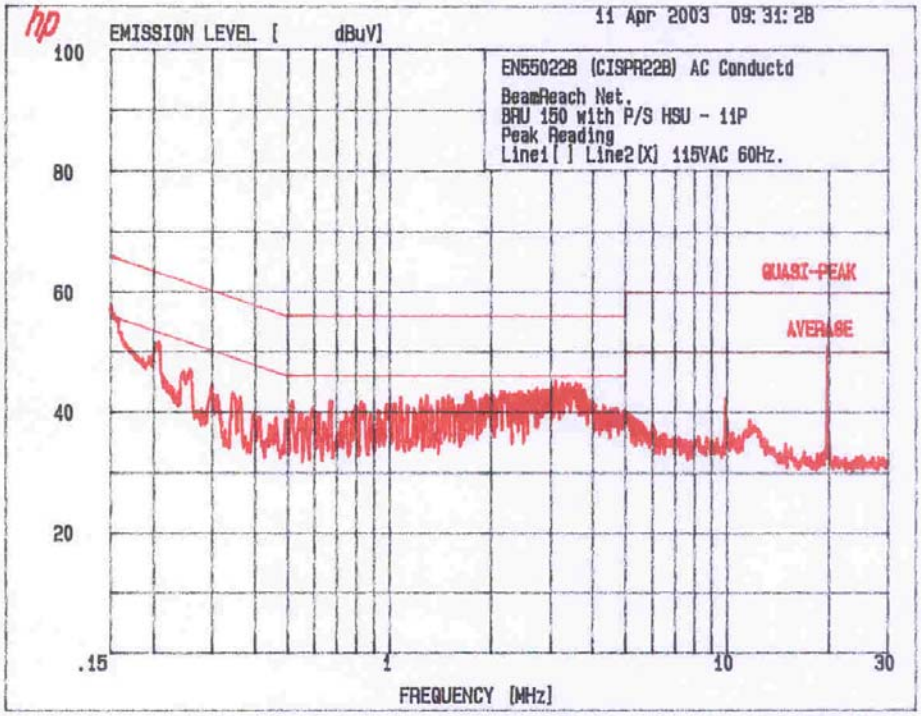
For the test result, see attached plots.

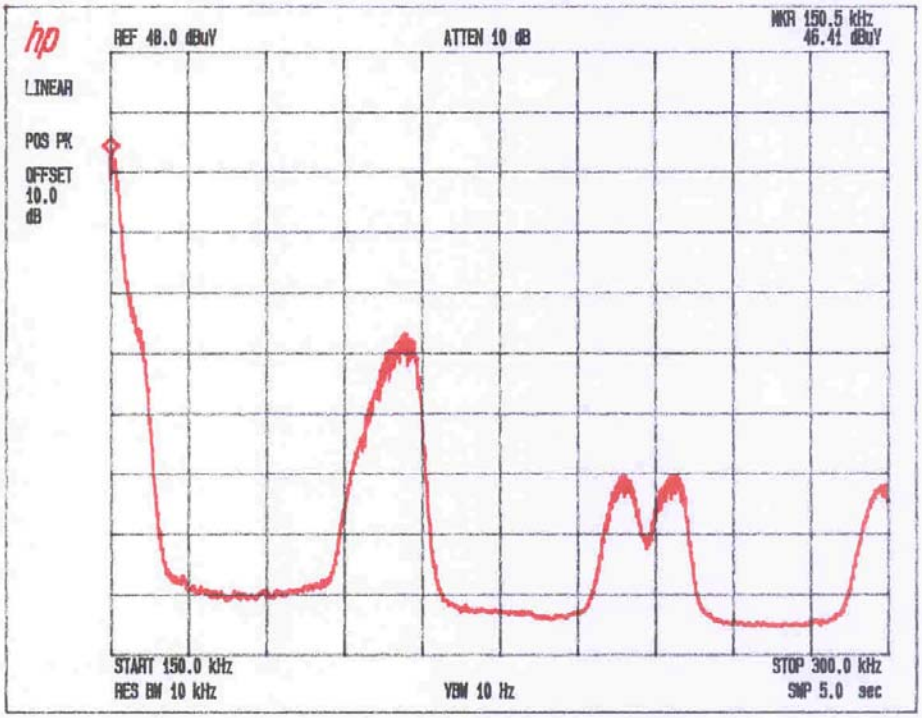
| |
|---|
| **Results:** Complies by 3.8 dB |

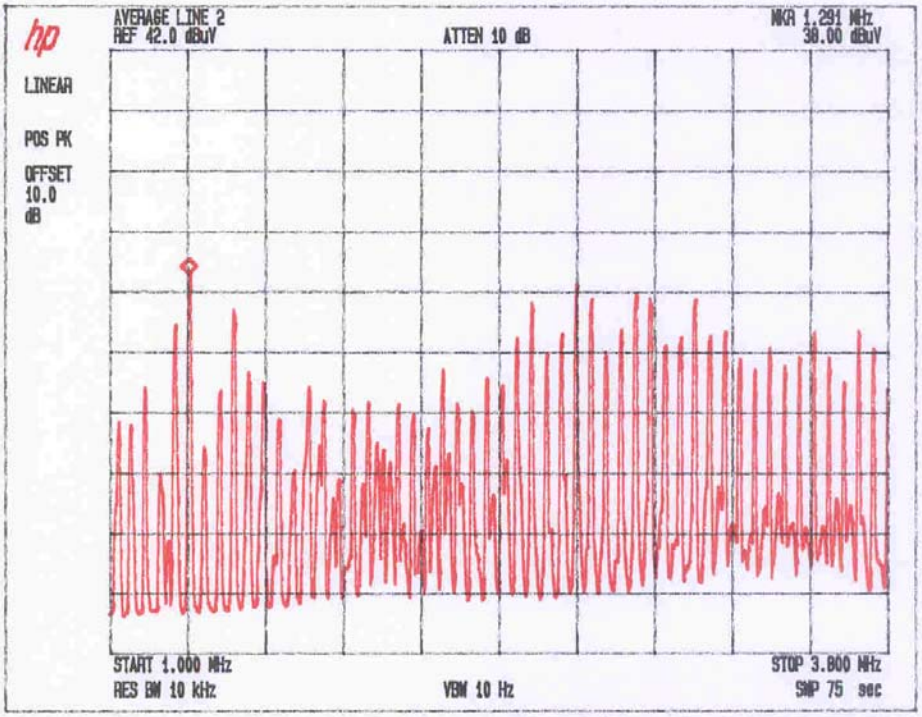

11 Apr 2003 09:07:04
EMISSION LEVEL [ dBuV]
EN55022B (CISPR22B) AC Conductd
BeamReach Net.
BRU 150 with P/S HSU - 11P
Peak Reading
Line1[X] Line2[ ] 115VAC 60Hz.
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

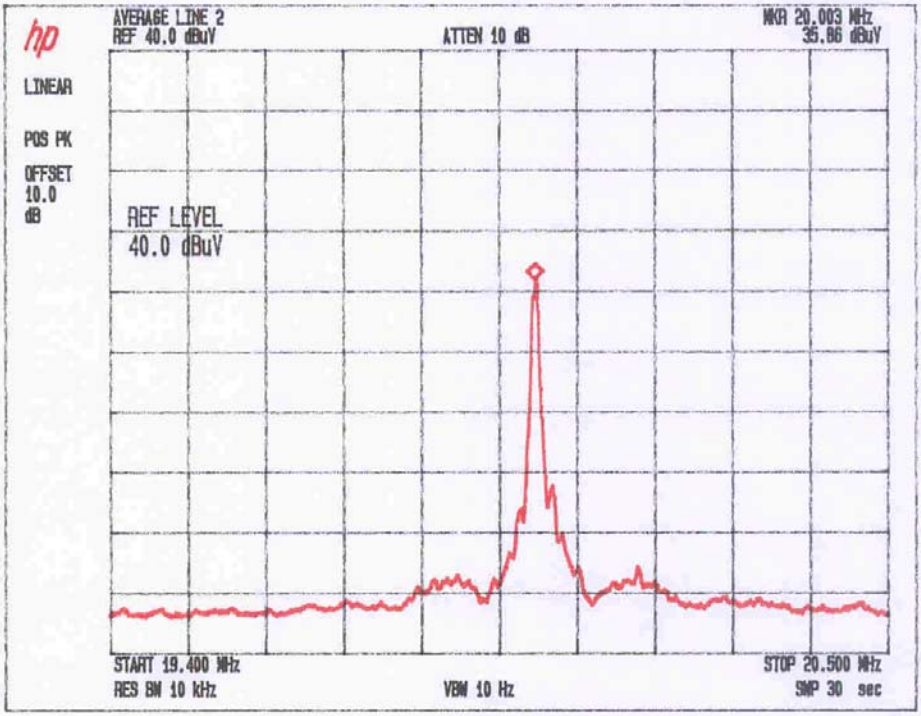

AVERAGE LINE 1
REF 46.0 dBuV
ATTEN 10 dB
MKR 151.2 kHz
46.01 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 10 Hz
STOP 300.0 kHz
SWP 5.0 sec

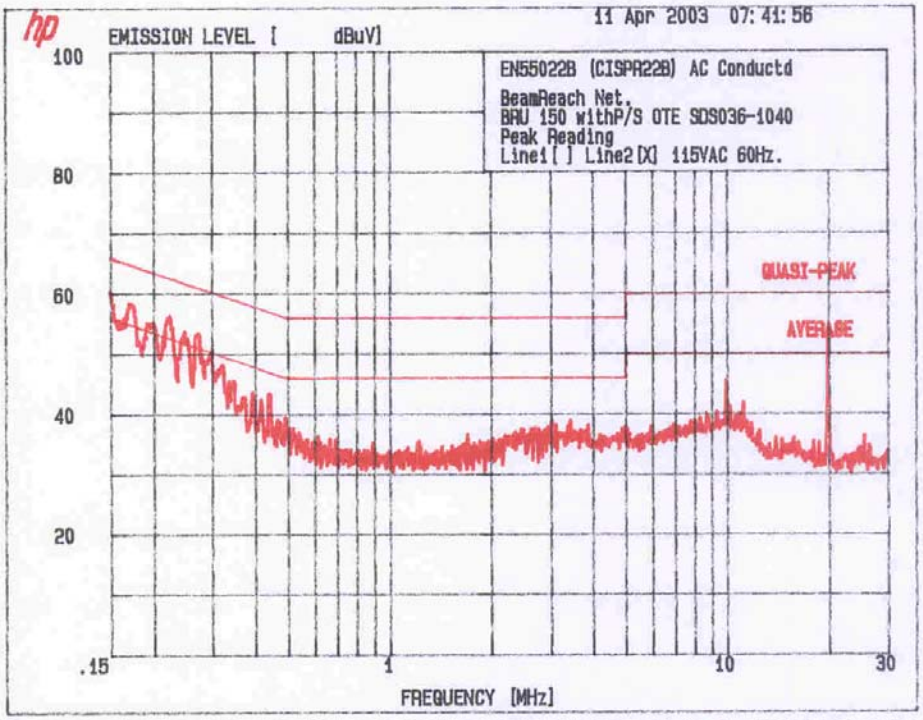

AVERAGE LINE 1
REF 40.0 dBuV
ATTEN 10 dB
MKR 20.002 MHz
35.68 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 19.400 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 20.500 MHz
SWP 30 sec

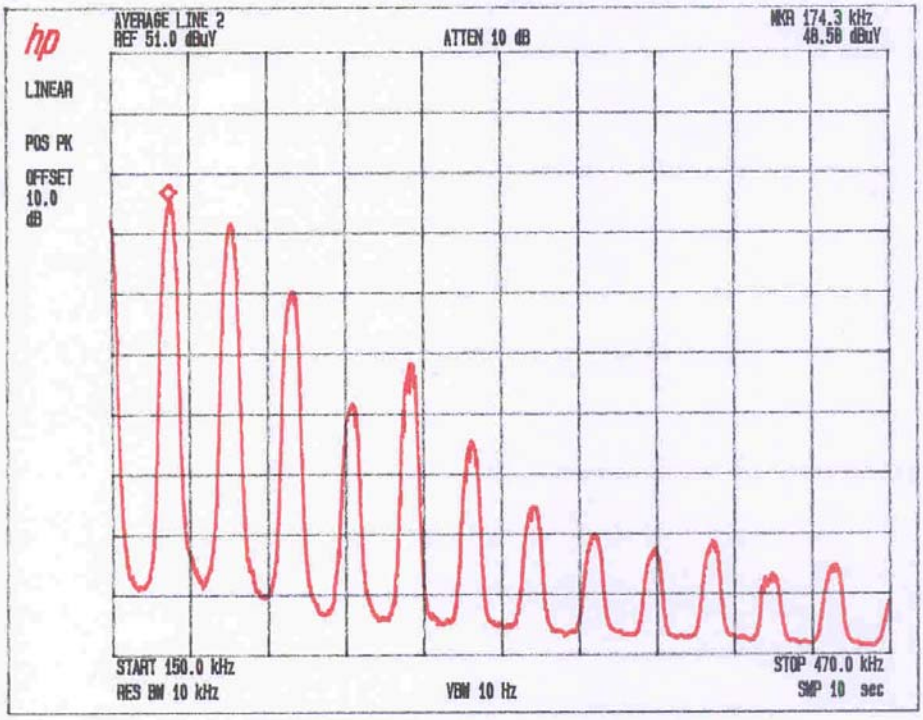

EMISSION LEVEL [ dBuV]
11 Apr 2003 09:31:28
EN55022B (CISPR22B) AC Conductd
BeamReach Net.
BRU 150 with P/S HSU - 11P
Peak Reading
Line1[ ] Line2[X] 115VAC 60Hz.
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

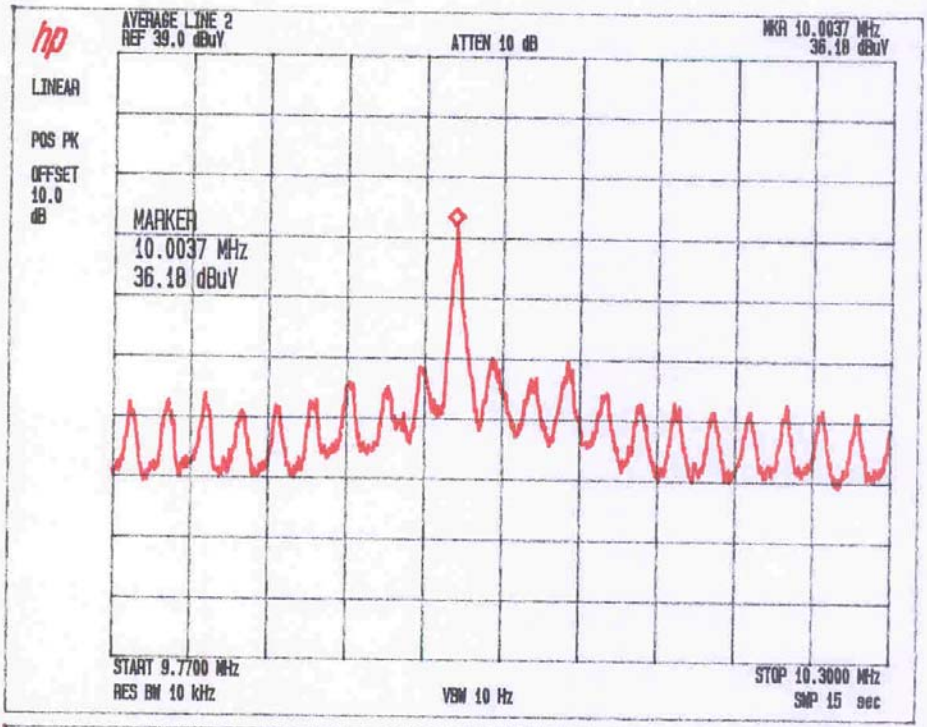

REF 48.0 dBuV
ATTEN 10 dB
MKR 150.5 kHz
46.41 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 10 Hz
STOP 300.0 kHz
SWP 5.0 sec

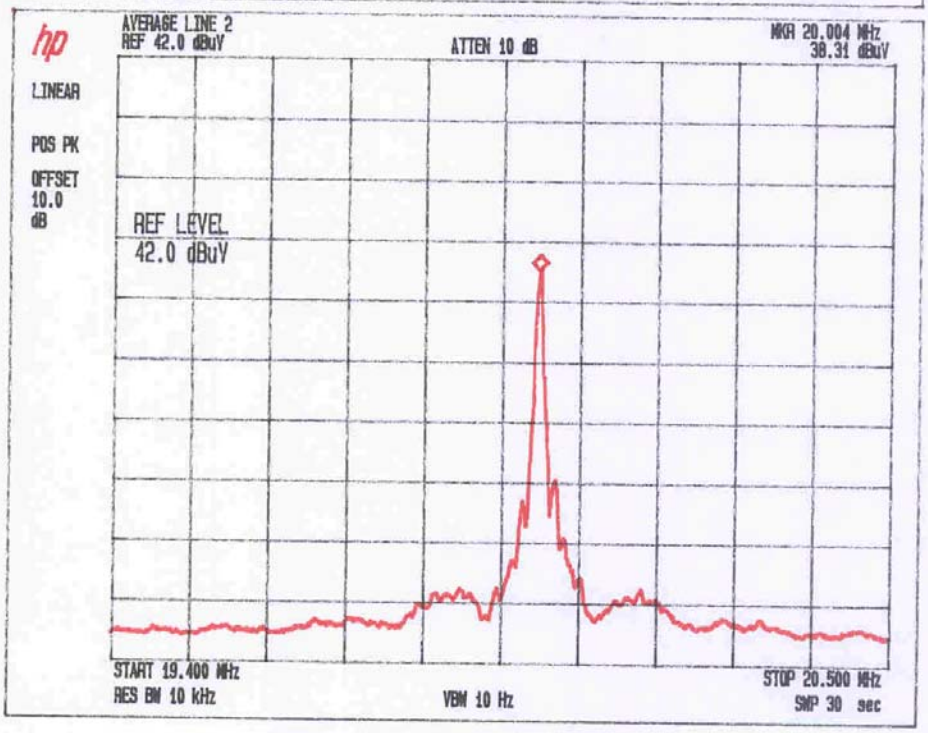

AVERAGE LINE 2
REF 42.0 dBuV
ATTEN 10 dB
MKR 1.291 MHz
38.00 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 1.000 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 3.800 MHz
SWP 75 sec

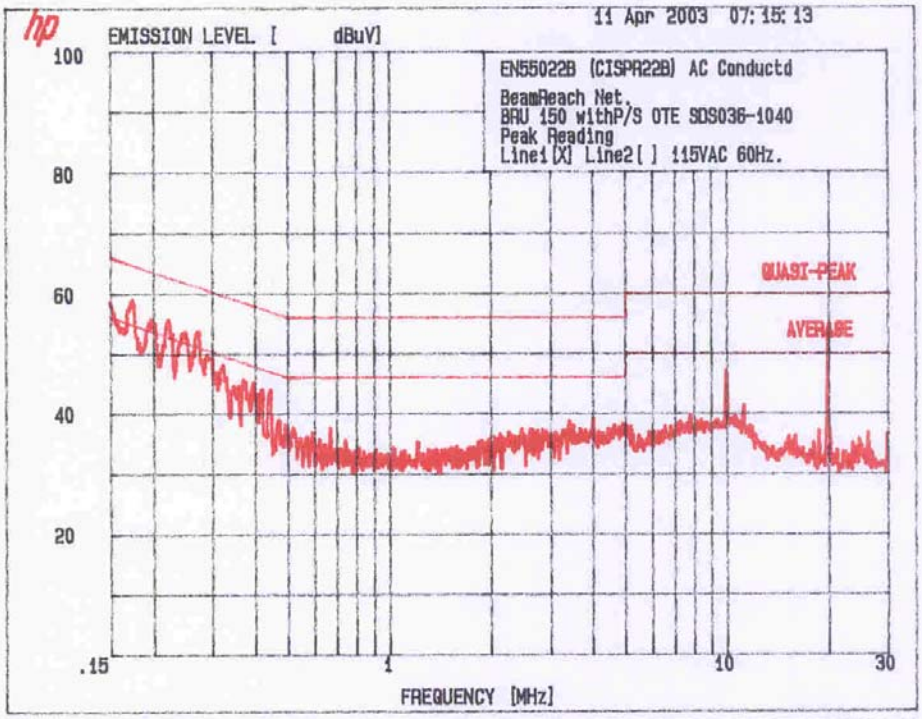

AVERAGE LINE 2
REF 40.0 dBuV
ATTEN 10 dB
MKR 20.003 MHz
35.86 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
REF LEVEL
40.0 dBuV
START 19.400 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 20.500 MHz
SWP 30 sec

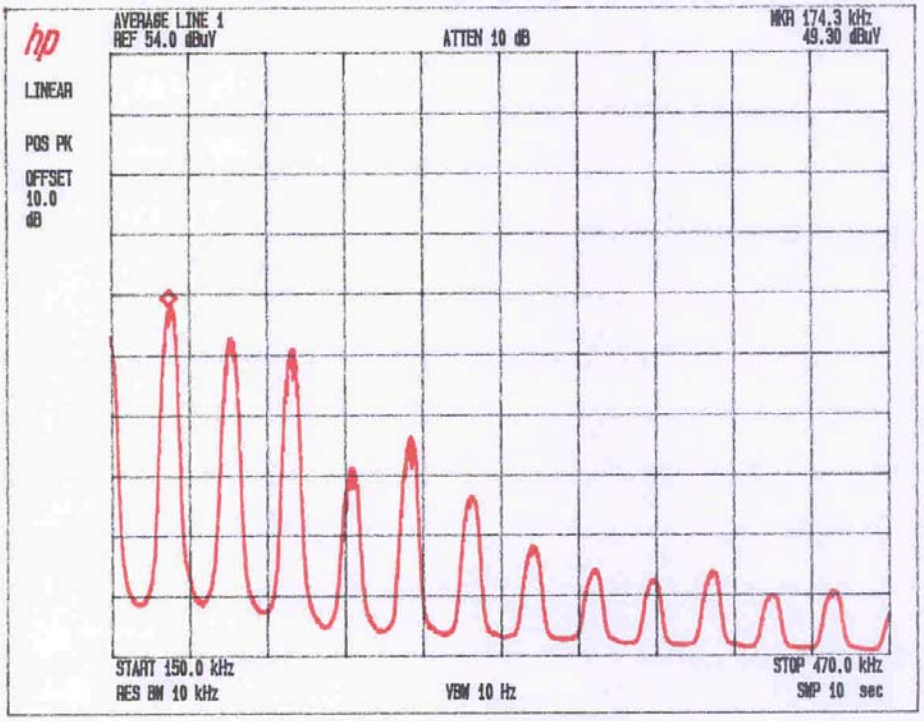

11 Apr 2003 07:41:56
EMISSION LEVEL [ dBuV]
EN55022B (CISPR22B) AC Conductd
BeamReach Net.
BRU 150 withP/S OTE SDS036-1040
Peak Reading
Line1[ ] Line2[X] 115VAC 60Hz.
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

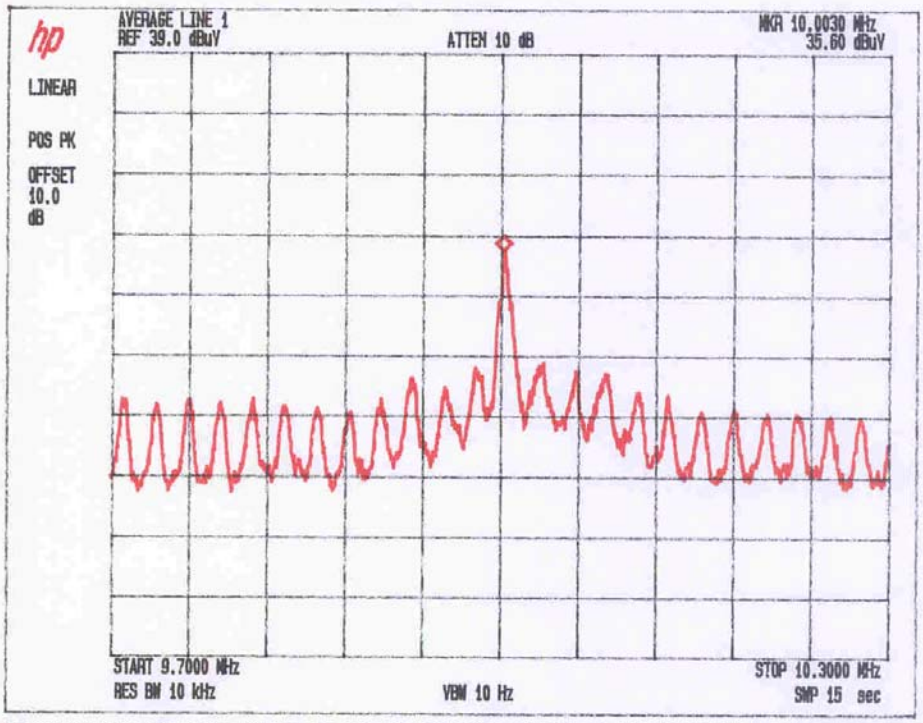

AVERAGE LINE 2
REF 51.0 dBuV
ATTEN 10 dB
MKR 174.3 kHz
48.5B dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 10 Hz
STOP 470.0 kHz
SWP 10 sec

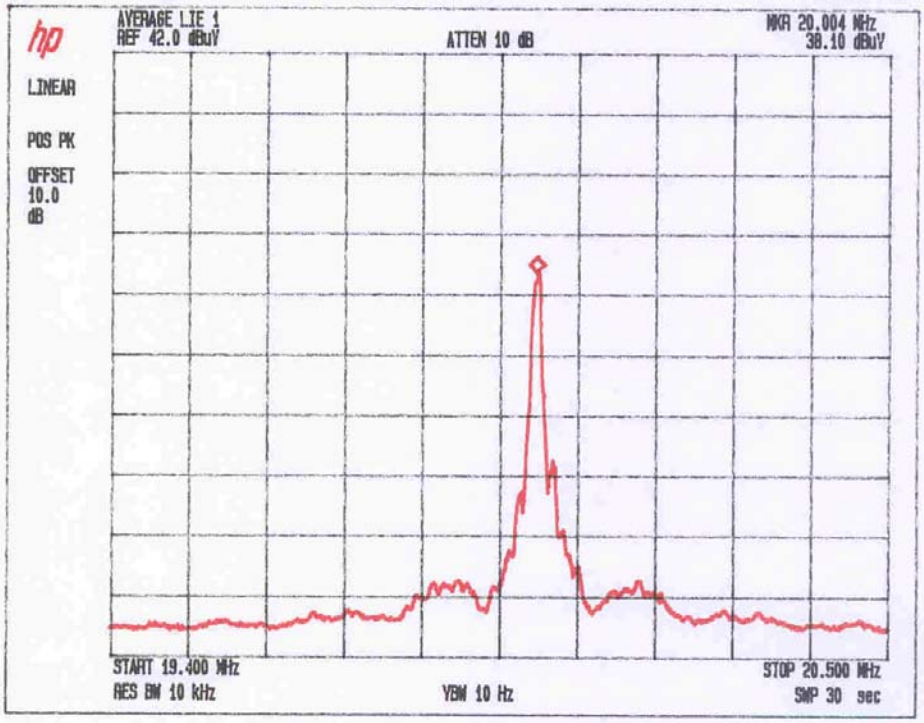

AVERAGE LINE 2
REF 39.0 dBuV
ATTEN 10 dB
MKR 10.0037 MHz
36.18 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
MARKER
10.0037 MHz
36.18 dBuV
START 9.7700 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 10.3000 MHz
SWP 15 sec

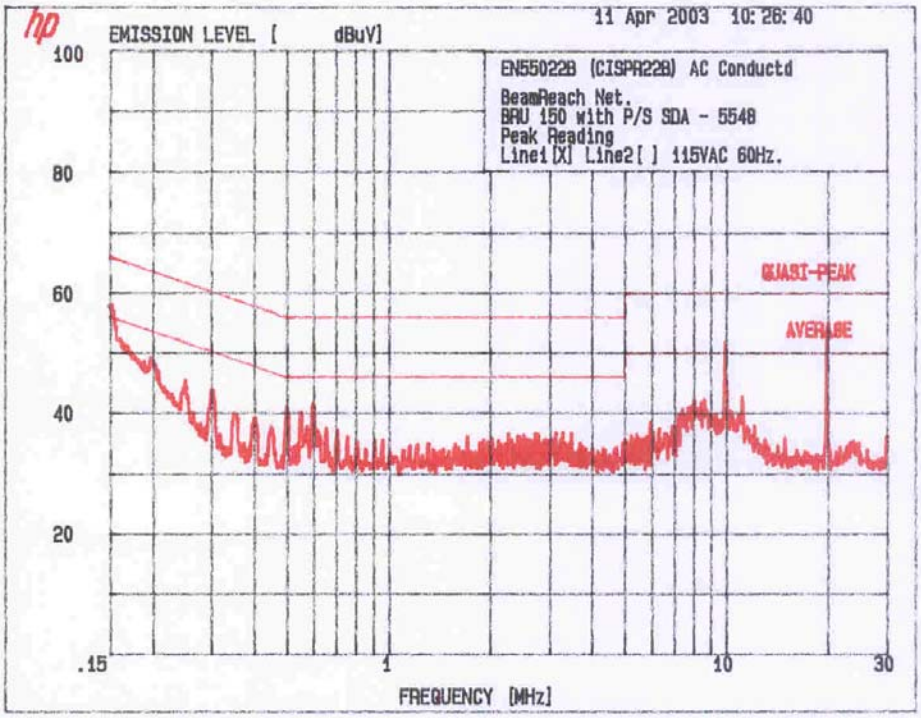

AVERAGE LINE 2
REF 42.0 dBuV
ATTEN 10 dB
MKR 20.004 MHz
38.31 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
REF LEVEL
42.0 dBuV
START 19.400 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 20.500 MHz
SWP 30 sec

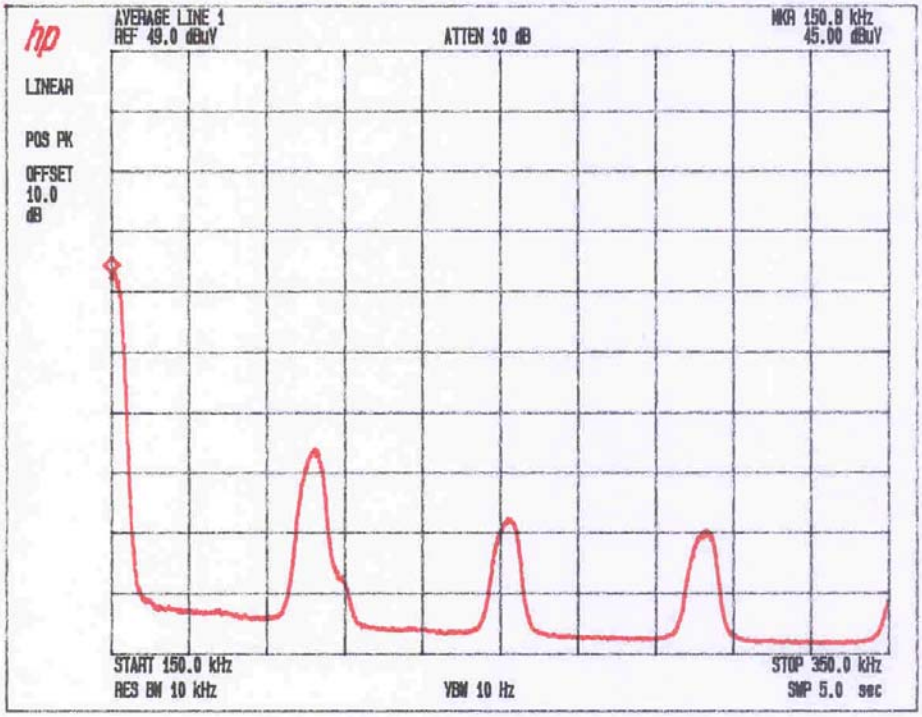

EMISSION LEVEL [ dBuV]
11 Apr 2003 07:15:13
EN55022B (CISPR22B) AC Conductd
BeamReach Net.
BRU 150 withP/S OTE SDS036-1040
Peak Reading
Line1[X] Line2[ ] 115VAC 60Hz.
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

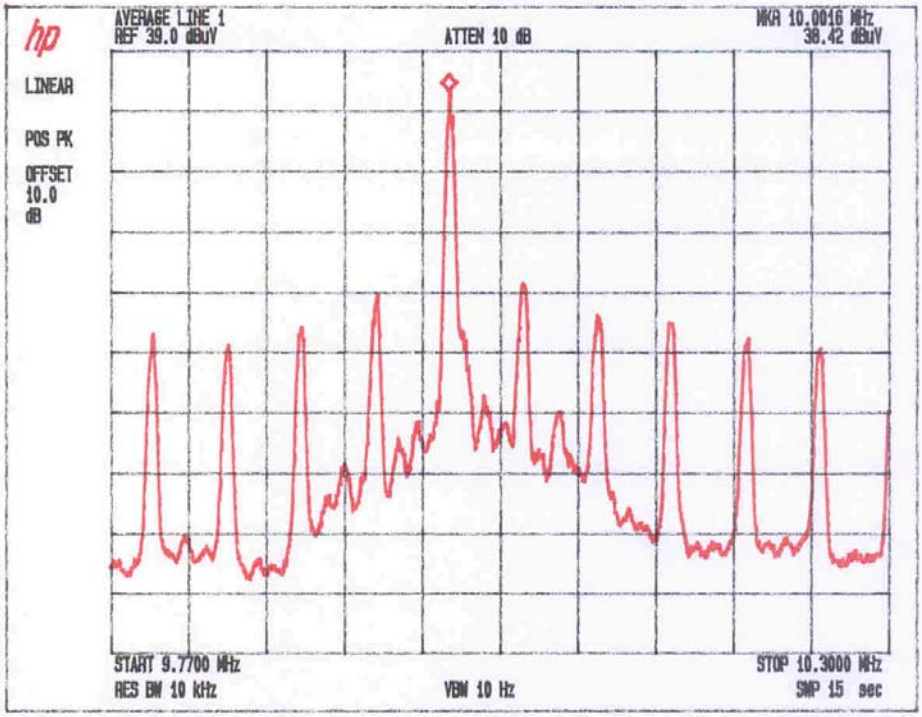

AVERAGE LINE 1
REF 54.0 dBuV
ATTEN 10 dB
MKR 174.3 kHz
49.30 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 10 Hz
STOP 470.0 kHz
SWP 10 sec

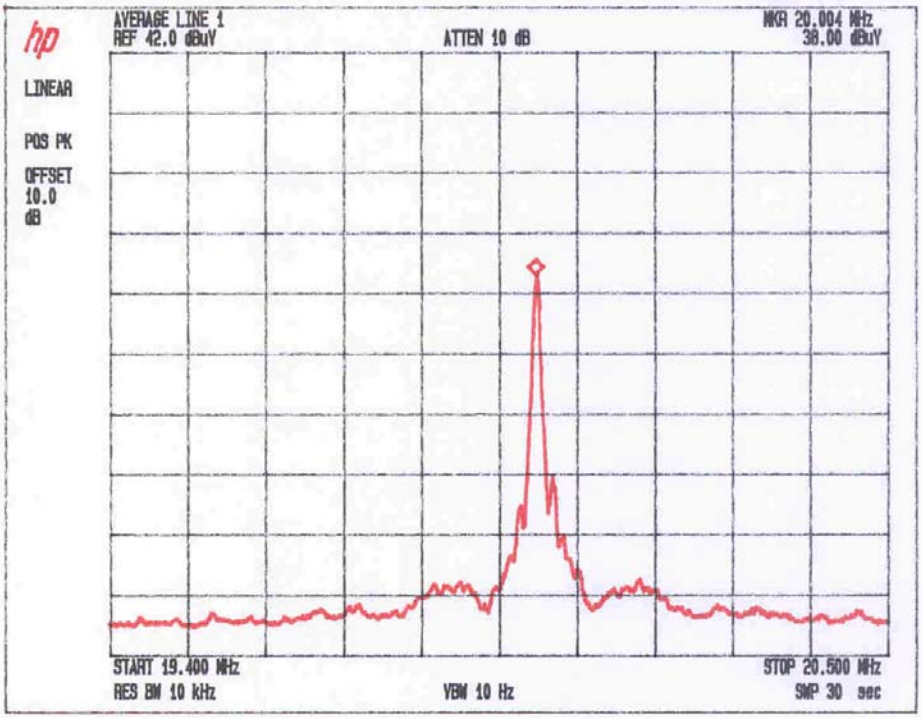

AVERAGE LINE 1
REF 39.0 dBuV
ATTEN 10 dB
MKR 10.0030 MHz
35.60 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 9.7000 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 10.3000 MHz
SWP 15 sec

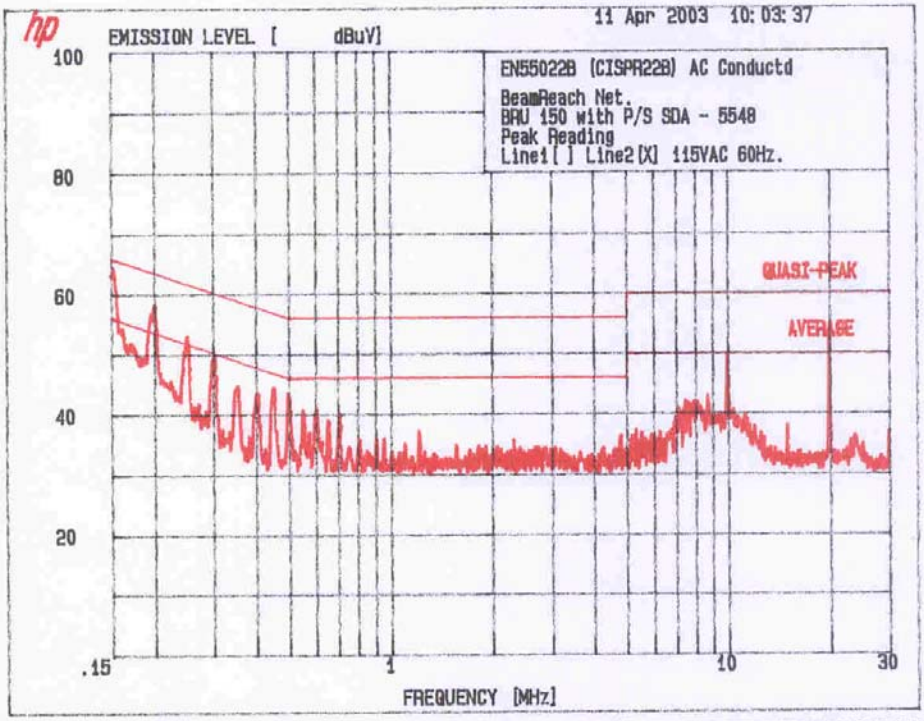

AVERAGE LIE 1
REF 42.0 dBuV
ATTEN 10 dB
MKR 20.004 MHz
38.10 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 19.400 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 20.500 MHz
SWP 30 sec

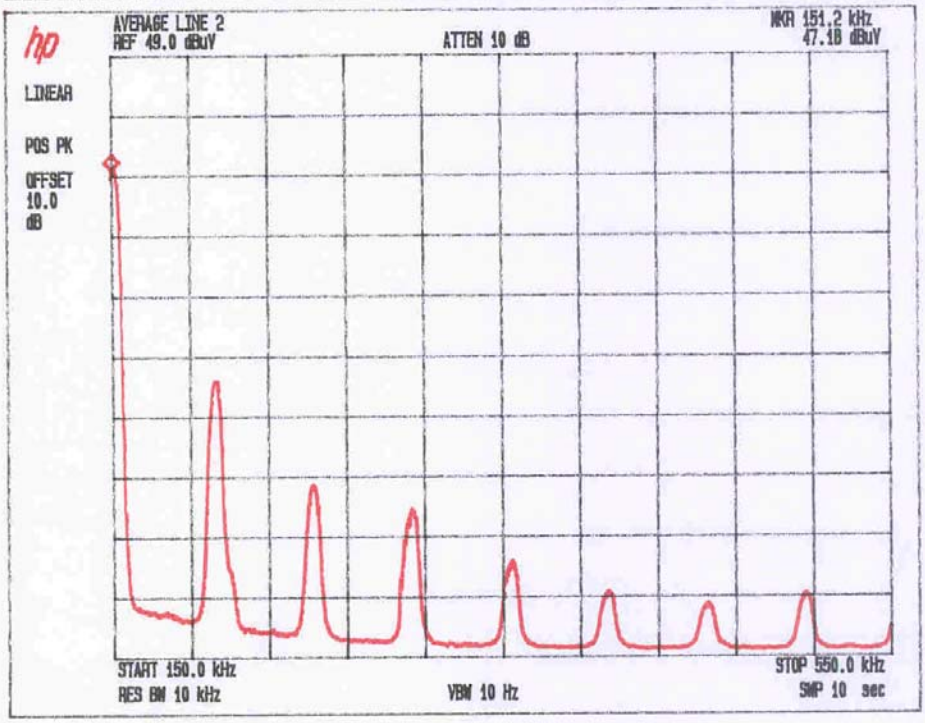

EMISSION LEVEL [ dBuV]
11 Apr 2003 10:26:40
EN55022B (CISPR22B) AC Conductd
BeamReach Net.
BRU 150 with P/S SDA - 5548
Peak Reading
Line1[X] Line2[ ] 115VAC 60Hz.
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]

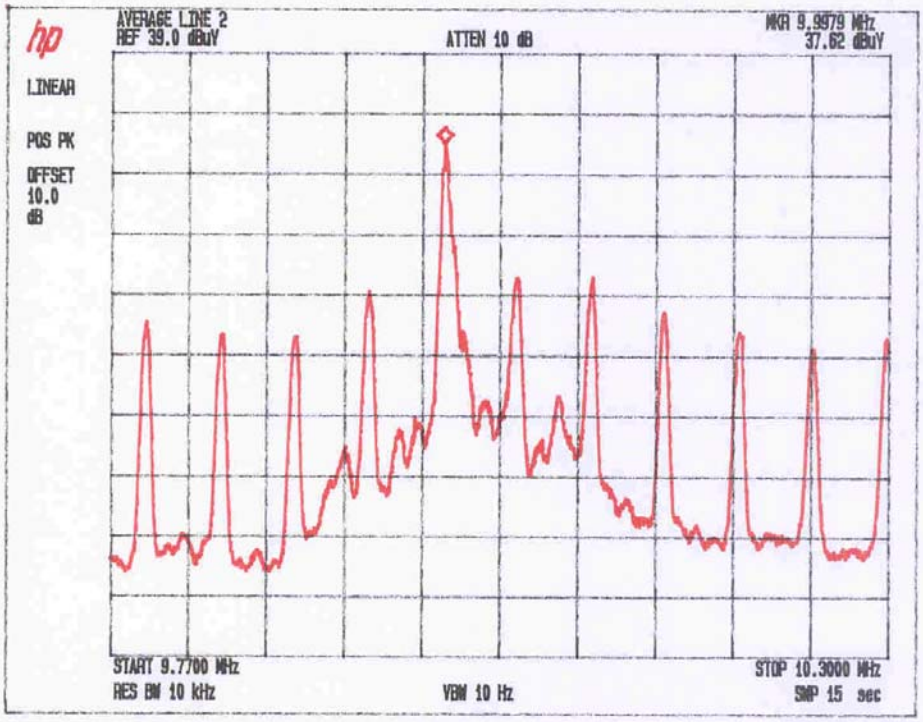

AVERAGE LINE 1
REF 49.0 dBuV
ATTEN 10 dB
MKR 150.8 kHz
45.00 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 10 Hz
STOP 350.0 kHz
SWP 5.0 sec

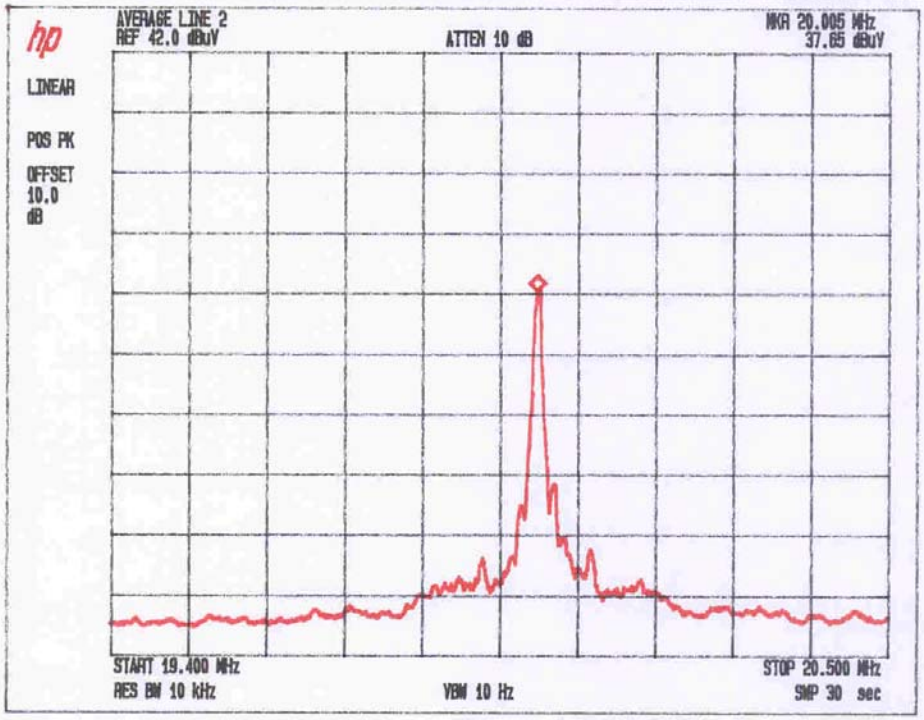

AVERAGE LINE 1
REF 39.0 dBuV
ATTEN 10 dB
MKR 10.0016 MHz
38.42 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 9.7700 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 10.3000 MHz
SWP 15 sec


AVERAGE LINE 1
REF 42.0 dBuV
ATTEN 10 dB
MKR 20.004 MHz
38.00 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 19.400 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 20.500 MHz
SWP 30 sec


hp
EMISSION LEVEL [ dBuV]
11 Apr 2003 10:03:37
EN55022B (CISPR22B) AC Conductd
BeamReach Net.
BRU 150 with P/S SDA - 5548
Peak Reading
Line1[ ] Line2[X] 115VAC 60Hz.
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]


hp
AVERAGE LINE 2
REF 49.0 dBuV
ATTEN 10 dB
MKR 151.2 kHz
47.18 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 10 Hz
STOP 550.0 kHz
SWP 10 sec


AVERAGE LINE 2
REF 39.0 dBuV
ATTEN 10 dB
MKR 9.9979 MHz
37.62 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 9.7700 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 10.3000 MHz
SWP 15 sec


AVERAGE LINE 2
REF 42.0 dBuV
ATTEN 10 dB
MKR 20.005 MHz
37.65 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 19.400 MHz
RES BW 10 kHz
VBW 10 Hz
STOP 20.500 MHz
SWP 30 sec

## 9.0 Frequency Stability vs Temperature and Voltage

FCC 2.1055

### 9.1 Test Procedure

The equipment under test was connected to AC power line and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The power leads, RF output cable, exited the chamber through an opening.

After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

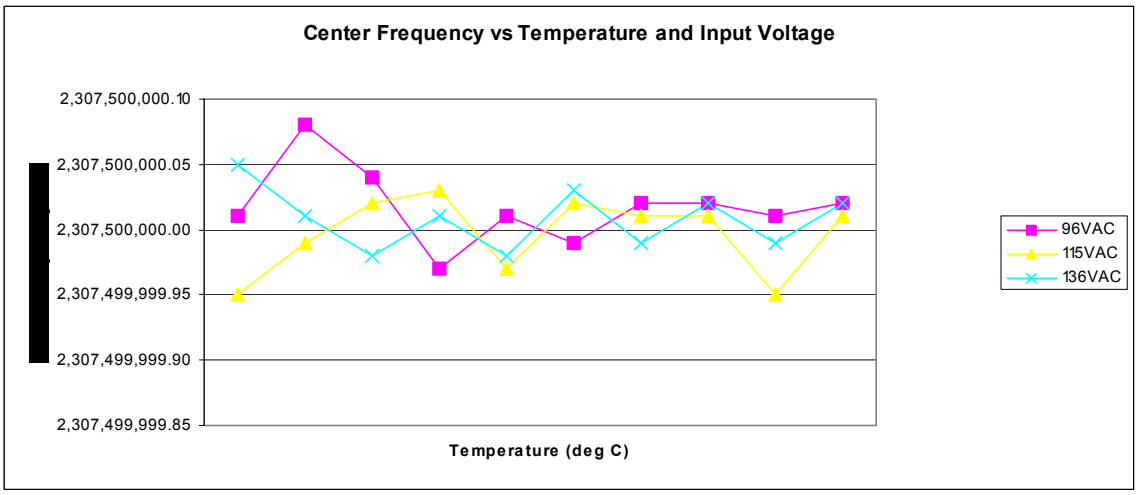
The frequency of the transmitter was measured for temperature range from –30°C to +60°C and voltage range from 115% of the nominal value and for 85% of the nominal value.

### 9.2 Test Results

Refer to the test data and graph below.

Reference Frequency: 2307500000 Hz

| Temp | **Error at 96VAC (Hz)** | **Error at 115VAC (Hz)** | **Error at 136VAC (Hz)** |
|---|---|---|---|
| -30 | 0.01 | -0.05 | 0.05 |
| -20 | 0.08 | -0.01 | 0.01 |
| -10 | 0.04 | 0.02 | -0.02 |
| 0 | -0.03 | 0.03 | 0.01 |
| 10 | 0.01 | -0.03 | -0.02 |
| 20 | -0.01 | 0.02 | 0.03 |
| 30 | 0.02 | 0.01 | -0.01 |
| 40 | 0.02 | 0.01 | 0.02 |
| 50 | 0.01 | -0.05 | -0.01 |
| 60 | 0.02 | 0.01 | 0.02 |




**Results**: The maximum error is 0.08 Hz

## 10.0 List of Test Equipment

| Equipment | Manufacturer | Model/Type | Serial # | Cal Int | Cal Due |
|---|---|---|---|---|---|
| BI-Log Antenna | EMCO | 3143 | 9509-1160 | 12 | 9/19/03 |
| Pre-Amplifier | Sonoma Inst. | 310 | 185634 | 12 | 10/30/03 |
| RF Filter Section | Hewlett Packard | 85460A | 3448A00267 | 12 | 7/16/03 |
| EMI Receiver | Hewlett Packard | 8546A | 3710A00373 | 12 | 7/16/03 |
| Spectrum Analyzer | Hewlett Packard | 8565E | - | 12 | 5/27/04 |
| Double-ridged Horn Antenna | EMCO | 3115 | 8812-3049 | 12 | 4/03/04 |
| Double-ridged Horn Antenna | EMCO | 3115 | 9170-3712 | 12 | 6/02/03 |
| Horn Antenna | EMCO | 3160-09 | ITS51 | # | # |
| Signal Generator | Hewlett Packard | 83732A | 3222A00119 | 12 | 3/04/04 |
| Pre-Amplifier | ITS | ITSPA-1 | 44156 | 12 | 5/16/03 |
| Pre-Amplifier | Miteq | AMF-4D-001180-24-10P | 799159 | 12 | 9/06/03 |
| Pre-amplifier | CTT | ACO/400 | 47526 | 12 | 5/28/03 |
| Power Meter | Hewlett Packard | 8900D | 3607U00673 | 12 | 7/08/03 |
| Spectrum Analyzer w/8650 QP Adapter | Hewlett Packard | 8568B | 1912A0053 2521A01021 | 12 | 11/20/03 |
| LISN | FCC | FCC-LISN-50-50-M-H | 2012 | 12 | 1/23/04 |
| Pulse Limiter | Hewlett Packard | 11947A | 2820A00184 | 12 | 9/3/03 |

# No calibration required

## 11.0 Document History

| Revision/ Job Number | Writer Initials | Date | Change |
|---|---|---|---|
| 1.0 / 3040864 and 3030973 | DC | June 10, 2003 | Original document |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## 12.0 Appendix A

Sub band A1 (operating center frequencies: 2306.25 and 2351.25 MHz)

| Plot Number | Description |
|---|---|
| 1.1 | Scan 10 MHz – 1 GHz |
| 1.2 | Scan 1 GHz – 2.300 GHz |
| 1.3 | Scan 2.300 GHz – 2.310 GHz |
| 1.4 | Scan 2.315 GHz – 2.320 GHz |
| 1.5 | Scan 2.320 GHz – 2.345 GHz |
| 1.6 | Scan 2.450 GHz – 2.355 GHz |
| 1.7 | Scan 2.360 GHz – 2.370 GHz |
| 1.8 | Scan 2.370 GHz – 6.4 GHz |
| 1.9 | Scan 6.4 GHz – 24 GHz |

Sub band A3 (operating center frequencies: 2308.75 and 2353.75 MHz)

| Plot Number | Description |
|---|---|
| 2.1 | Scan 10 MHz – 1 GHz |
| 2.2 | Scan 1 GHz – 2.300 GHz |
| 2.3 | Scan 2.300 GHz – 2.310 GHz |
| 2.4 | Scan 2.315 GHz – 2.320 GHz |
| 2.5 | Scan 2.320 GHz – 2.345 GHz |
| 2.6 | Scan 2.450 GHz – 2.355 GHz |
| 2.7 | Scan 2.360 GHz – 2.370 GHz |
| 2.8 | Scan 2.370 GHz – 6.4 GHz |
| 2.9 | Scan 6.4 GHz – 24 GHz |

Sub band B1 (operating center frequencies: 2311.25 and 2356.25 MHz)

| Plot Number | Description |
|---|---|
| 3.1 | Scan 10 MHz – 1 GHz |
| 3.2 | Scan 1 GHz – 2.300 GHz |
| 3.3 | Scan 2.300 GHz – 2.310 GHz |
| 3.4 | Scan 2.315 GHz – 2.320 GHz |
| 3.5 | Scan 2.320 GHz – 2.345 GHz |
| 3.6 | Scan 2.450 GHz – 2.355 GHz |
| 3.7 | Scan 2.360 GHz – 2.370 GHz |
| 3.8 | Scan 2.370 GHz – 6.4 GHz |
| 3.9 | Scan 6.4 GHz – 24 GHz |

Sub band B3 (operating center frequencies: 2313.75 and 2358.75 MHz)

| Plot Number | Description |
|---|---|
| 3.1 | Scan 10 MHz – 1 GHz |
| 3.2 | Scan 1 GHz – 2.300 GHz |
| 3.3 | Scan 2.300 GHz – 2.310 GHz |
| 3.4 | Scan 2.315 GHz – 2.320 GHz |
| 3.5 | Scan 2.320 GHz – 2.345 GHz |
| 3.6 | Scan 2.450 GHz – 2.355 GHz |
| 3.7 | Scan 2.360 GHz – 2.370 GHz |
| 3.8 | Scan 2.370 GHz – 6.4 GHz |
| 3.9 | Scan 6.4 GHz – 24 GHz |