



Cert. No. 1152.01

Electrical (EMC)

DATE: 08 July 2002

I.T.L. (PRODUCT TESTING) LTD.

EMC Test

for

Nexus Data (1993) Ltd.

Equipment under test:

Network Transceiver/Repeater

(For Transmitter Section)

P3V7-89

Approved by: _____

I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



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Electrical (EMC)

Measurement/Technical Report for
Nexus Data (1993) Ltd.
Network Transceiver/Repeater
(For Transmitter Section)

P3V7-89

FCC ID:NL3TR0001

08 July 2002

This report concerns: Original Grant x Class II change

Class B verification Class A verification Class I change

Equipment type: Radio Telemetry Transmitter

Request Issue of Grant:

 x Immediately upon completion of review

Limits used:

CISPR 22 _____

Part 15 x

Measurement procedure used is ANSI C63.4-2000.

Application for Certification

prepared by:

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1. General Information

1.1 Administrative Information

Manufacturer:	Nexus Data (1993) Ltd.
Manufacturer's Address:	16 Hamelacha St. Rosh Haayin 48091 Israel Tel: +972-3-9032288 Fax: +972-3-9033299
Manufacturer's Representative:	Shai Versano Shimon Zigdon
Equipment Under Test (E.U.T):	Network Transceiver/Repeater (For Transmitter Section)
Equipment Model No.:	P3V7-89
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	15.05.02
Start of Test:	15.05.02
End of Test:	04.06.02
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	See Section 2

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel laboratory Accreditation Authority (ISRAC) (Israel), Certificate No. 20/2.
4. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
5. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
6. Industry Canada (Canada), File No. IC 4025.
7. TUV Product Services, England, ASLLAS No. 97201.
8. Nemko (Norway), Authorization No. ELA 207.

All tests in this report were performed in accordance with the Israel Laboratory Accreditation Authority (ISRAC) of the Ministry of Industry and Trade. The Israel Laboratory Accreditation Authority is not responsible for the test results, and its accreditation does not imply approval of the product tested. I.T.L. Product Testing Ltd. is accredited by the American association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The Network Transceiver/Repeater (NTR) is a product designed to assist NexusData's network planner, by means of a low cost device, which provides reception coverage over a limited area, thus eliminating the need to install a Receiver Base Station (BS) for that purpose, an option that is significantly less economical.

The NTR addresses two main scenarios:

- a small suburban/rural installation, which is outside the coverage provided by Base Stations in the region.

- coverage 'holes' that may be the result of exceptional topographic or installation characteristics.

The NTR is a small, outdoors installable, AC powered device.

Installed as high as economically available in the area, it receives messages, then decodes and retransmits them, to be received in a Base Station or another NTR.

The NTR acts as a selective Receiver, passing messages on to the network only from Subscribers (Transmitters) that are registered in the NTR's memory.

In general the "repeat" capability of the Repeater makes it to act as a wireless link between the End units and Base stations. This fact makes the NexusData network to be more extended and flexible.

The NTR's transmitter transmits a burst 1 watt Direct Conversion, Direct sequence spread spectrum through an internal patch antenna. The transmitter frequency band is 903.8-926.2 MHz and channel spacing is 400 KHz; i.e. it has 58 channels. The transmitter local oscillator is synthesized using crystal oscillator reference of 16MHz. The modulation technique is SPSP Direct sequence BPSK with a chip rate of 1 Mchip/sec. The PN codes are 255 maximal length sequences.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:2000. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing March 9, 2001).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

The other tests in this report were performed at the Nexus Data facility, Rosh Ha'ayin, Israel.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2000. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. Product Labeling

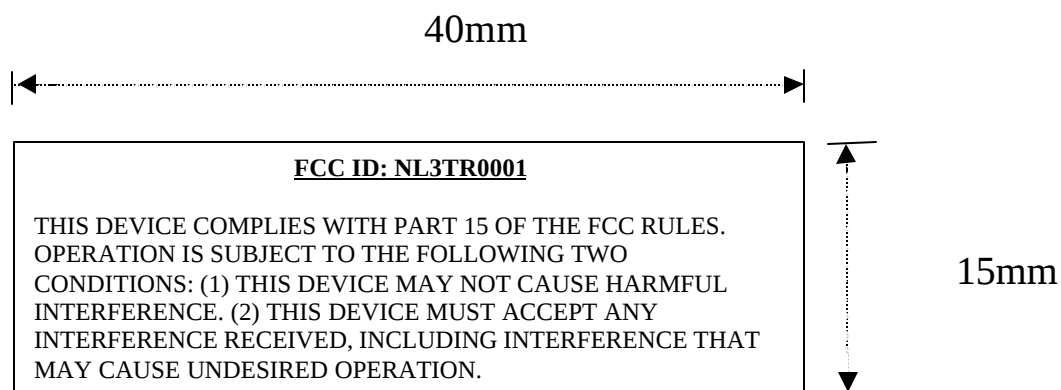


Figure 1. FCC Label

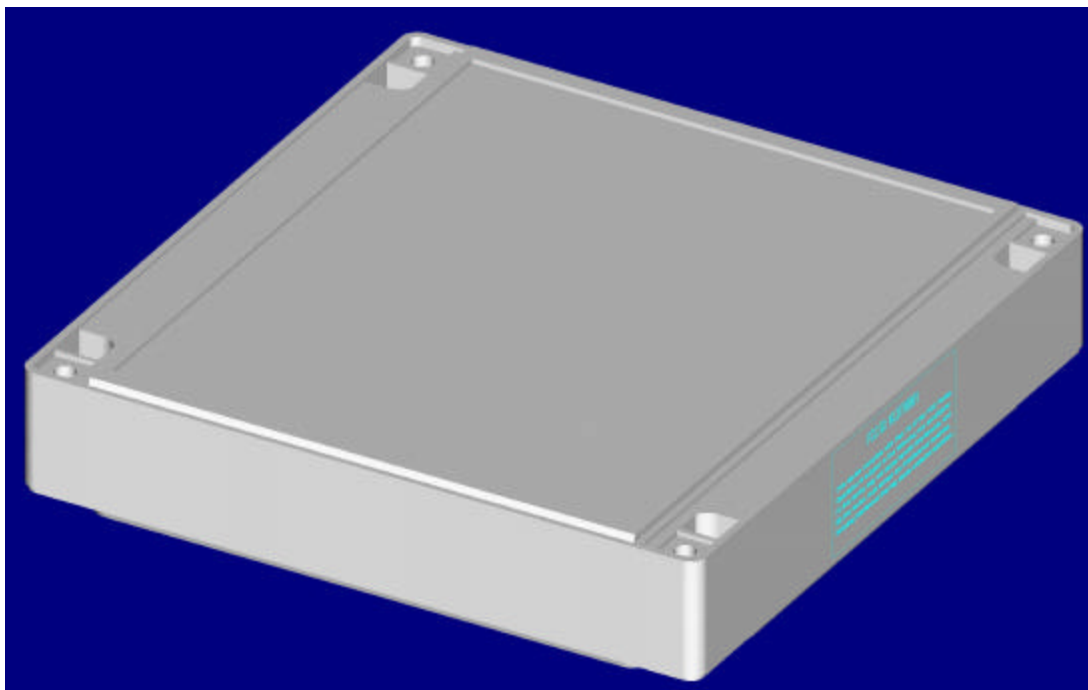


Figure 2. Location of Label on EUT

3. System Test Configuration

3.1 Justification

The N.T.R (Network Transceiver/Repeater) was configured to a frequent periodic transmission mode.

In this mode, all the sources of emissions were active. The N.T.R. output power is not programmable, and therefore it was tested when transmitting full 1watt peak output power. The N.T.R. configuration enabled investigation of emission power down, operating (housekeeping) and transmits modes.

3.2 EUT Exercise Software

The N.T.R. exercise program used in the testing procedures was the product's standard micro-controller operational firmware. The program was configured to operate the N.T.R. in all typical operational modes. The transmitter of the E.U.T. was operated in repeat periodical "ON" mode for 3 seconds an "OFF" mode for 5 seconds.

3.3 Special Accessories

Low pass filter at RF output.

Shielded RF and Analog circuits.

Separation of digital and analog circuitry.

3.4 Equipment Modifications

No modifications were needed to achieve compliance.

3.5 Configuration of Tested System

The configuration of the tested system is described in the figure 3.
During the emission tests, the unit was positioned vertically as it is mounted in normal operation.

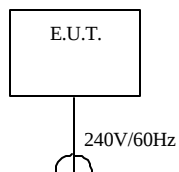


Figure 3. Configuration of Tested System

4. Block Diagram

4.1 Schematic Block/Connection Diagram

Intentionally blank for reasons of confidentiality.

Figure 4. E.U.T. Block Diagram

Intentionally blank for reasons of confidentiality.

Figure 5. RX/TX Section Block Diagram

4.2 Theory of Operation

The N.T.R receiving outputs from the Electric meter and convert them into an Uplink messages. The N.T.R. transmits the Uplink messages to the base station by means of spread spectrum technology on ISM frequencies. The unit's operation is supervised and controlled by a micro-controller.

Components:

- IO (input/output modules)
- Micro-controller
- Memory (including I2C memory)
- FPGA
- Transmitter module
- Receiver module

5. Conducted and Radiated Measurement Photos



Figure 6. Conducted Emission Test. Front



Figure 7. Conducted Emission Test. Side



Figure 8. Radiated Emission Test. Front



Figure 9. Radiated Emission Test. Side

6. Conducted Emission

6.1 Test Specification

0.45 - 30 MHz, FCC Part 15, Subpart B, CLASS B

6.2 Test Procedure

The E.U.T operation mode and test setup are as described in Section 7.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room (see Section 3), with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 230 V AC / 60 Hz via 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in the photograph, Figure 5. Conducted Emission Test.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying to CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak detector.

6.3 **Measured Data**

JUDGEMENT: Passed by 26.7 dB μ V

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The worst cases were:

for 903.8, 915.0, and 926.2 MHz, 26.7 dB at 16.00 MHz frequency, for the phase line and, 25.8 dB at 16.00 MHz frequency, for the neutral line.

The details of the highest emissions are given in Figure 10 to Figure 13.

TEST PERSONNEL:

Tester Signature:  Date: 21.07.02

Typed/Printed Name: Y. Mordukhovitch

Conducted Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: FCC Part 15, Subpart B, Class B
 Lead: Phase
 Detectors: Peak, Quasi-peak
 Operating Frequency 903.8 , 915.0, 926.2 MHz

Frequency (MHz)	Peak Amplitude (dBμV)	Quasi-peak Amplitude (dBμV)	Specification (dB μV)	Pass/Fail	Margin (dB)
10.67	17.1	12.6	48.0	Pass	-35.4
13.33	17.0	15.2	48.0	Pass	-32.8
15.10	19.5	12.7	48.0	Pass	-35.3
16.00	22.6	21.3	48.0	Pass	-26.7
21.61	15.6	12.4	48.0	Pass	-35.6
21.75	15.8	13.6	48.0	Pass	-34.4

Figure 10. Conducted Emission: PHASE. Detectors: Peak, QUASI-PEAK

Conducted Emission

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: FCC Part 15, Subpart B, Class B
Lead: Phase
Detectors: Peak, Quasi-peak
Operating Frequency 903.8, 915.0, 926.2 MHz

 11:49:36 JUN 04, 2002

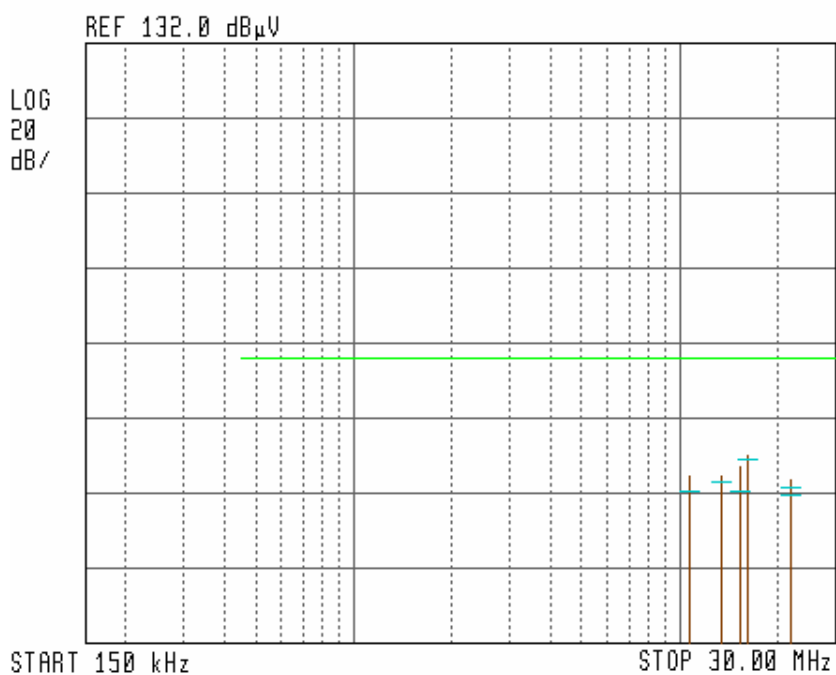


Figure 11. Detectors: Peak, Quasi-peak

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Conducted Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: FCC Part 15, Subpart B, Class B
 Lead: Neutral
 Detectors: Peak, Quasi-peak
 Operating Frequency 903.8, 915.0, 926.2 MHz

Frequency (MHz)	Peak Amplitude (dB μ V)	Quasi-peak Amplitude (dB μ V)	Specification (dB μ V)	Pass/Fail	Margin (dB)
2.67	14.5	12.5	48.0	Pass	-35.5
5.33	15.2	13.1	48.0	Pass	-34.9
10.67	16.2	14.9	48.0	Pass	-33.1
13.33	20.7	19.6	48.0	Pass	-28.4
16.00	23.4	22.2	48.0	Pass	-25.8
21.33	18.5	13.2	48.0	Pass	-34.8

Figure 12. Detectors: Peak, QUASI-PEAK

Conducted Emission

E.U.T Description	Network Transceiver/Repeater
Type	P3V7-89
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart B, Class B
Lead:	Neutral
Detectors:	Peak, Quasi-peak
Operating Frequency	903.8, 915.0, 926.2 MHz

11:29:16 JUN 04, 2002

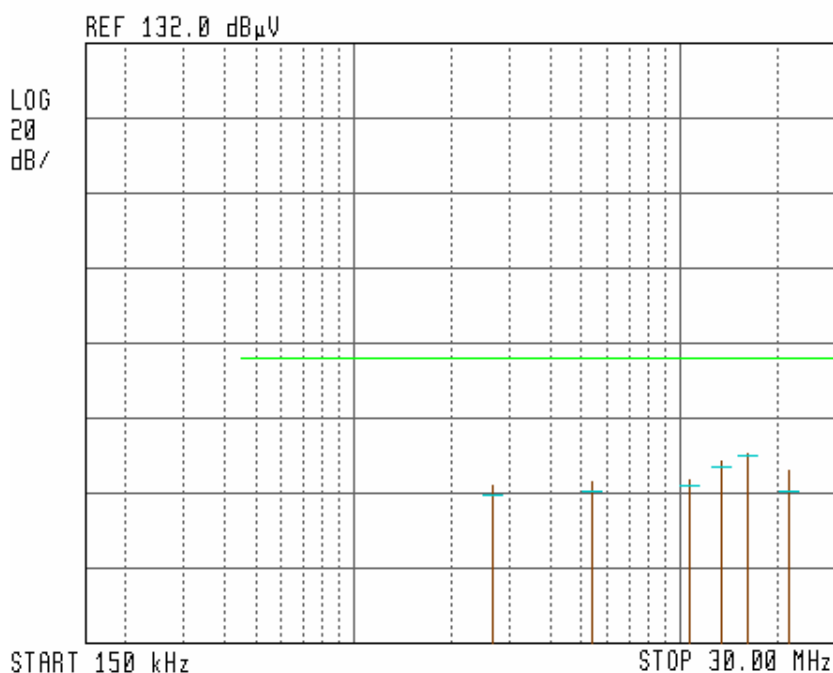


Figure 13 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

6.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
LISN	Fischer	FCC-LISN-2A	127	March 12, 2002	1 year
LISN	Fischer	FCC-LISN-2A	128	March 12, 2002	1 year
Receiver	HP	85420E/85422E	3427A00103/34	Dec. 2, 2001	1 year
Printer	HP	ThinkJet2225	2738508357	N/A	N/A

7. Radiated Emission, Below 1 GHz

7.1 Test Specification

30-1000 MHz, F.C.C., Part 15, Subpart C

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in Figure 3.1.

The frequency range 30-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emission levels for other frequencies were compared to the fundamental carrier level and the requirement of Section 15.249 (c).

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

7.3 **Measured Data**

JUDGEMENT: Passed by 3.6 dB μ V/m

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The worst cases were:

for 903.8 MHz, 4.9 dB at 902.00 MHz frequency, vertical polarization.

for 915.0 MHz, 15.0 dB at 144.00 MHz frequency, horizontal polarization

for 926.2 MHz, 3.6 dB at 928.00 MHz frequency, horizontal polarization

The details of the highest emissions are given in Figure 14 to Figure 25.

TEST PERSONNEL:

Tester Signature: 

Date: 21.07.02

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 30 MHz to 300 MHz
 Test Distance: 3 meters Detector: Quasi-peak
 Operating Frequency: 903.8 MHz

Frequency	Peak Amp	QP Amp	Correction	Specification	Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V/m)
112.00	30.0	26.6	13.1	43.5*	-16.9
144.00	31.7	29.4	14.6	43.5*	-14.1
176.01	29.0	25.3	15.9	43.5*	-18.2
207.98	29.8	26.9	17.9	43.5*	-16.6
240.00	31.2	27.7	19.5	46.0*	-18.3
271.98	31.5	27.6	21.6	46.0*	-18.4
288.00	30.2	25.3	22.3	46.0*	-20.7

**Figure 14. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 300 MHz to 1 GHz
 Test Distance: 3 meters Detector: Peak, Quasi-peak
 Operating Frequency: 903.8 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB μ V/m)
326.00	22.1	16.8	15.7	46.0*	-29.2
401.21	25.9	20.0	18.5	46.0*	-26.0
408.12	25.6	19.8	18.6	46.0*	-26.2
611.72	30.2	24.1	22.4	46.0*	-21.9
902.00	84.5	82.4	27.1	105.1**	-22.7
903.80	127.6	125.1	26.2	N/A***	-
928.00	38.6	33.4	27.6	105.1**	-71.7
979.21	36.1	30.7	28.5	54.0*	-23.3

**Figure 15. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak, Quasi -peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

**Note: The limit for field strength outside of Frequency Restricted Band is at least 20 dB below the field strength at the operating frequency 903.8 MHz. The limit is 105.1 dB μ V/m.

***Note: The standard has no field limit for the operating frequency.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 30 MHz to 300 MHz
 Test Distance: 3 meters Detector: Quasi-peak
 Operating Frequency: 903.8 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB)
112.00	35.2	32.0	13.1	43.5*	-11.5
144.00	29.1	25.1	14.6	43.5*	-18.4
176.01	28.4	25.8	15.9	43.5*	-17.7
208.01	27.4	23.9	17.9	43.5*	-19.6
272.00	26.6	22.8	21.6	46.0*	-23.2
288.01	24.1	19.0	22.3	46.0*	-27.0

**Figure 16. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 300 MHz to 1 GHz
Test Distance: 3 meters Detector: Peak, Quasi-peak
Operating Frequency: 903.8 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB μ V/m)
329.74	22.8	16.8	15.9	46.0*	-29.2
400.88	25.2	20.2	18.5	46.0*	-25.8
408.76	25.2	19.9	18.6	46.0*	-26.1
611.57	24.4	18.1	22.4	46.0*	-27.9
902.00	87.8	85.7	27.1	90.6**	-4.9
903.80	115.3	110.6	26.2	N/A***	-
928.00	40.0	36.1	27.6	90.6**	-54.5
976.41	30.1	25.1	28.5	54.0*	-28.9

**Figure 17. Radiated Emission. Antenna Polarization: VERTICAL.
Detector: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

**Note: The limit for field strength outside of Frequency Restricted Band is at least 20 dB below the field strength at the operating frequency 903.8 MHz. The limit is 90.6 dB μ V/m.

***Note: The standard has no field limit for the operating frequency.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 30 MHz to 300 MHz
 Test Distance: 3 meters Detector: Quasi-peak
 Operating Frequency: 915 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB)
80.00	20.6	14.2	10.6	40.0*	-25.8
112.00	31.5	27.4	13.1	43.5*	-16.1
144.00	29.2	26.6	14.6	43.5*	-16.9
176.00	28.1	25.1	15.8	43.5*	-18.4
208.00	30.2	27.1	17.9	43.5*	-16.4
240.00	31.0	27.3	19.5	46.0*	-18.7
272.00	32.4	28.3	21.6	46.0*	-17.7

**Figure 18. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal

Frequency range: 300 MHz to 1 GHz

Test Distance: 3 meters

Detector: Peak, Quasi-peak

Operating Frequency: 915 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB μ V/m)
327.91	17.4	11.5	15.8	46.0*	-34.5
401.92	20.6	14.9	18.5	46.0*	-31.1
407.00	25.6	20.0	18.6	46.0*	-26.0
608.00	24.9	19.3	22.4	46.0*	-26.7
902.00	38.4	34.1	27.1	90.3**	-56.2
915.01	115.2	110.3	27.4	N/A***	-
928.00	47.2	44.0	27.6	90.3**	-46.3
986.16	31.3	25.3	28.6	54.0*	-28.7

**Figure 19. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part 15, Subpart C.

**Note: The limit for field strength outside of Frequency Restricted Band is at least 20 dB below the field strength at the operating frequency 915.0 MHz. The limit is 90.3 dB μ V/m.

***Note: The standard has no field limit for the operating frequency.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 30 MHz to 300 MHz
 Test Distance: 3 meters Detector: Quasi-peak
 Operating Frequency: 915 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB)
112.00	31.5	27.6	13.1	43.5*	-15.9
144.00	30.8	28.5	14.6	43.5*	-15.0
175.99	29.9	27.5	15.8	43.5*	-16.0
207.98	27.3	23.5	17.9	43.5*	-20.0
272.00	27.6	23.9	21.6	46.0*	-22.1
288.00	24.4	19.2	22.3	46.0*	-26.8

**Figure 20. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 300 MHz to 1 GHz
Test Distance: 3 meters Detector: Peak, Quasi-peak
Operating Frequency: 915 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB μ V/m)
324.87	21.6	16.7	15.7	46.0*	-29.3
401.06	20.4	14.9	18.5	46.0*	-31.1
407.15	25.3	19.9	18.6	46.0*	-26.1
610.60	23.5	18.2	22.4	46.0*	-27.8
902.00	41.3	36.9	27.1	105.2**	-68.3
915.01	130.2	125.2	27.4	N/A***	-
928.00	46.7	43.1	27.6	105.2**	-62.1
978.68	31.3	25.5	28.5	54.0*	-28.5

**Figure 21. Radiated Emission. Antenna Polarization: VERTICAL.
Detector: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

**Note: The limit for field strength outside of Frequency Restricted Band is at least 20 dB below the field strength at the operating frequency 915.0 MHz. The limit is 105.2 dB μ V/m.

***Note: The standard has no field limit for the operating frequency.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 30 MHz to 300 MHz
 Test Distance: 3 meters Detector: Quasi-peak
 Operating Frequency: 926.2 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB)
112.00	29.5	26.0	13.1	43.5*	-17.5
144.00	31.9	29.9	14.6	43.5*	-13.6
176.00	27.7	25.0	15.9	43.5*	-18.5
208.00	30.0	27.4	17.9	43.5*	-16.1
240.00	30.7	26.7	19.5	46.0*	-19.3
272.00	28.9	25.8	21.6	46.0*	-20.2
288.00	25.5	20.5	22.3	46.0*	-25.5

**Figure 22. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 300 MHz to 1 GHz
Test Distance: 3 meters Detector: Peak, Quasi-peak
Operating Frequency: 926.2 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB μ V/m)
326.35	23.1	16.6	15.7	46.0*	-29.4
400.00	26.6	21.6	18.5	46.0*	-24.4
406.85	25.5	19.9	18.6	46.0*	-26.1
611.82	29.8	24.2	22.5	46.0	-21.8
902.00	34.5	29.5	27.1	89.8**	-60.3
926.20	114.6	109.8	26.3	N/A***	-
928.00	88.3	86.2	27.6	89.8**	-3.6
983.59	46.3	40.9	28.6	54.0*	-13.1

**Figure 23. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detector: Peak, Quasi -peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

**Note: The limit for field strength outside of Frequency Restricted Band is at least 20 dB below the field strength at the operating frequency 926.2 MHz. The limit is 89.8 dB μ V/m.

***Note: The standard has no field limit for the operating frequency.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 30 MHz to 300 MHz
 Test Distance: 3 meters Detector: Quasi-peak
 Operating Frequency: 926.2 MHz

Frequency (MHz)	Peak Amp (dBμV/m)	QP Amp (dBμV/m)	Correction (dB)	Specification (dBμV/m)	Margin (dB)
112.00	30.9	26.8	13.1	43.5*	-16.7
144.00	31.7	29.8	14.6	43.5*	-13.7
176.00	28.7	26.5	15.9	43.5*	-17.0
207.98	28.1	24.4	17.9	43.5*	-19.1
272.00	29.7	24.7	21.6	46.0*	-21.3
287.99	24.5	19.1	22.3	46.0*	-26.9

**Figure 24. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

Radiated Emission

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 300 MHz to 1 GHz
 Test Distance: 3 meters Detector: Peak, Quasi-peak
 Operating Frequency: 926.2 MHz

Frequency (MHz)	Peak Amp (dB μ V/m)	QP Amp (dB μ V/m)	Correction (dB)	Specification (dB μ V/m)	Margin (dB μ V/m)
326.35	22.8	16.6	15.7	46.0*	-29.4
400.00	26.0	22.7	18.5	46.0*	-23.3
408.85	20.7	14.9	18.6	46.0*	-31.1
611.82	29.9	24.2	22.5	46.0*	-21.8
902.00	35.9	31.4	27.1	101.3**	-69.9
926.20	126.2	121.3	26.3	N/A***	-
928.00	89.2	87.2	27.6	101.3**	-14.1
983.59	35.9	30.9	28.6	54.0*	-23.1

**Figure 25. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak, Quasi-peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

*Note: It is the specified limit for QP detector at 3m distance for Frequency Restricted Band according to FCC Part15, Subpart C.

**Note: The limit for field strength outside of Frequency Restricted Band is at least 20 dB below the field strength at the operating frequency 926.2 MHz. The limit is 101.3 dB μ V/m.

***Note: The standard has no field limit for the operating frequency.

7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	December 2, 2001	1 year
RF Section	HP	85420E	3427A00103	December 2, 2001	1 year
Antenna Bioconical HP	ARA	BCD 235/B	1041	March 18, 2002	1 year
Antenna –Log Periodic	ARA	LPD-2010/A	1038	March 10, 2002	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

7.5 *Field Strength Calculation*

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

FS:	Field Strength [dB μ V/m]
RA:	Receiver Amplitude [dB μ V]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

8. Radiated Emission Above 1 GHz

8.1 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in Figure 3.1.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emission levels for other frequencies were compared to the fundamental carrier level and the requirement of Section 15.249 (c).

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements and a High Pass Filter were used. The test distance was 3 meters.

In the frequency range 2.9-9.3 GHz, a spectrum analyzer including a low noise amplifier was used. The test distance was 3 meters. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

8.2 Test Data

JUDGEMENT: Passed by 1.1 dB μ V/m

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The worst cases were:

for 903.8 MHz, 6.9 dB at 3615.20 MHz frequency, horizontal polarization.

for 915.0 MHz, 4.3 dB at 2745.03 MHz frequency, horizontal polarization

for 926.2 MHz, 4.5 dB at 3704.80 MHz frequency, horizontal polarization

The details of the highest emissions are given in Figure 26 to Figure 49.

TEST PERSONNEL:

Tester Signature: 

Date: 21.07.02

Typed/Printed Name: Y. Mordukhovitch

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 903.8 MHz

Freq.	Avg. Amp	Correction HPF	Correction Antenna and Cable	Avg. Det. Spec.	Final Result FR(A)	Avg. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note *	(dB)
2711.40	42.3	1.7	44.0	54.0	44.0	-10.0

**Figure 26. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1 GHz to 2.9 GHz, the final result of field strength was calculated directly by the EMI Receiver HP85420E software by using disks for antenna and cable correction factors, and using the following equation:

$$FR(A) = AVG + HPF$$

Where:

FR(A) (dB μV/m) is the final result of field strength for average detector,

AVG (dB μV/m) is the average detector measurement,

HPF (dB) is the high pass filter attenuation.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 903.8 MHz

Freq.	Peak Amp	Correction HPF	Correction Antenna and Cable	Peak Det. Spec.	Final Result FR(P)	Peak. Margin
(MHz)	(dB μ V/m)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m) See Note *	(dB)
1807.60	65.8	1.6	38.7	107.6**	67.4	-40.2
2711.40	56.1	1.7	44.0	74.0	57.8	-16.2

**Figure 27. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note *: In the frequency range from 1.0 GHz to 2.9 GHz, the final result of field strength is calculated by the EMI Receiver HP 85420E software, using disks for antenna and cable corrections factors and the following equation:

$$FR(P) \text{ (dB}\mu\text{V/m)} = \text{Peak} + \text{HPF}$$

Where:

FR(P) is the final result of peak detector field strength,.

Peak (dB μ V/m) is the peak detector measurement,

HPF is the high pass filter attenuation.

Note**: The peak detector specification is 20 dB below the fundamental frequency peak measured. The limit is 107.6 dB μ V/m.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 2.9 GHz to 9.3 GHz
Test Distance: 3 meters Detector: Peak
Operating Frequency: 903.8 MHz

Freq.	Peak Amp	Correction Factors			Peak. Specification	Peak Final Result FR (P)*	Peak. Margin
(MHz)	(dBμV)	Antenna AF	Cable CF	Preamp PF	(dB μV/m)	(dB μV/m) See Note *	(dB)
3615.20	45.6	33.8	2.2	30.5	74.0	51.1	-22.9
4519.00	40.4	35.6	2.6	30.5	74.0	47.7	-26.3
5422.80	39.1	36.6	2.8	30.3	74.0	48.2	-25.8
8134.20	39.5	40.0	3.8	29.8	74.0	53.5	-20.5
9038.00	39.5	40.8	4.0	29.9	74.0	54.4	-19.6

**Figure 28. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note *: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(P) = \text{Peak} + AF + CF - PF$$

Where: FR (P) is final peak detector result.

Peak is peak detector measurement.

AF is antenna factor.

CF is cable factor.

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 2.9 GHz to 9.3 GHz
Test Distance: 3 meters Detector: Average
Operating Frequency: 903.8 MHz

Freq. (MHz)	Avg Amp (dBμV)	Correction Factors			AVG Specification (dB μV/m)	AVG Final Result FR (A) (dB μV/m) See Note *	AVG Margin (dB)
		Antenna AF (dB)	Cable CF (dB)	Preamp PF (dB)			
3615.20	41.6	33.8	2.2	30.5	54.0	47.1	-6.9
4519.00	33.0	35.2	2.6	30.5	54.0	40.3	-13.7
5422.80	31.8	36.6	2.8	30.3	54.0	40.9	-13.1
8134.20	25.8	40.0	3.8	29.8	54.0	39.8	-14.2
9038.00	25.1	40.8	4.0	29.9	54.0	40.0	-14.0

**Figure 29. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(A) = AVG + AF + CF - PF$$

Where: FR(A) is final average detector result.

AVG is average detector measurement.

AF is antenna factor.

CF is cable factor.

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1 GHz to 2.9 GHz
Test Distance: 3 meters Detector: Average
Operating Frequency: 903.8 MHz

Freq.	Avg. Amp	Correction HPF	Correction Antenna and Cable	Avg. Det. Spec.	Final Result FR(A)	Avg. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note *	(dB)
2711.40	43.2	1.7	44.0	54.0	44.9	-9.1

**Figure 30. Radiated Emission. Antenna Polarization: VERTICAL.
Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1 GHz to 2.9 GHz, the final result of field strength was calculated directly by the EMI Receiver HP85420E software by using disks for antenna and cable correction factors, and the following equation:

$$FR(A) = AVG + HPF$$

Where :

FR(A) (dB μV/m) is the final result of field strength for average detector

AVG (dB μV/m) is the average detector measurement

HPF (dB) is the high pass filter attenuation

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 903.8 MHz

Freq.	Peak Amp	Correction HPF	Correction Antenna and Cable	Peak. Det. Spec.	Final Result FR(P)	Peak. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note *	(dB)
1807.60	63.2	1.6	38.7	95.3**	64.8	-70.7
2711.40	56.2	1.7	44.0	74.0	57.9	-16.1

**Figure 31. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1.0 GHz to 2.9 GHz, the final result of field strength is calculated by the EMI Receiver HP 85420E software by using disks for antenna and cable correction factors, and the following equation:

$$FR(P) \text{ (dB}\mu\text{V/m)} = \text{Peak} + \text{HPF}$$

Where:

FR(P) is the final result of peak detection field strength,

Peak (dBμV/m) is the peak detector measurement,

HPF is the high pass filter attenuation.

Note**: The peak detector specification is 20 dB below the fundamental frequency peak measured. The limit is 95.3 dBμV/m.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 903.8 MHz

Freq.	Peak Amp	Correction Factors			Peak. Specification	Peak Final Result FR (P)	Peak. Margin
(MHz)	(dBμV/m)	Antenna AF (dB)	Cable CF (dB)	Preamp PF (dB)	(dB μV/m)	(dB μV/m) See Note *	(dB)
3615.20	43.1	33.8	2.2	30.5	74.0	48.6	-25.4
4519.00	37.9	35.6	2.6	30.5	74.0	45.6	-28.4
5422.20	37.8	36.6	2.8	30.3	74.0	46.9	-27.1
8134.20	39.5	40.0	3.8	29.8	74.0	53.5	-20.5
9038.00	39.5	40.8	4.0	29.9	74.0	54.4	-19.6

**Figure 32. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(P) = \text{Peak} + AF + CF - PF$$

Where: FR (P) is final peak detector result,
 Peak is peak detector measurement,
 AF is antenna factor,
 CF is cable factor,
 PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 903.8 MHz

Freq.	Avg Amp	Correction Factors			AVG Specification	AVG Final Result FR (A)*	AVG Margin
(MHz)	(dB μ V)	Antenna AF	Cable CF	Preamp PF	(dB μ V/m)	(dB μ V/m) See Note *	(dB)
3615.20	36.3	33.8	2.2	30.5	54.0	41.8	-12.2
4519.00	27.5	35.2	2.6	30.5	54.0	34.8	-19.2
5422.20	27.8	36.6	2.8	30.3	54.0	36.9	-17.1
8134.20	25.8	40.0	3.8	29.8	54.0	39.8	-14.2
9038.00	25.1	40.8	4.0	29.9	54.0	40.0	-14.0

**Figure 33. Radiated Emission. Antenna Polarization: VERTICAL
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(A) = AVG + AF + CF - PF$$

Where: FR(A) is average detector result,

AVG is average detector measurement,

AF is antenna factor,

CF is cable factor,

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 915 MHz

Freq.	Avg. Amp	Correction HPF	Correction Antenna and Cable	Avg. Det. Spec.	Final Result FR(A)	Avg. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note *	(dB)
2745.03	48.0	1.7	44.3	54.0	49.7	-4.3

**Figure 34. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1 GHz to 2.9 GHz, the final result of field strength was calculated directly by the EMI Receiver HP85420E software, using disks for antenna and cable correction factors , and the following equation:

$$FR(A) = AVG + HPF$$

Where:

FR(A) is the final result for average detector

AVG (dB μV/m) is the average detector measurement

HPF (dB) is the high pass filter attenuation

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C:
 Class B

Antenna Polarization: Horizontal Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 915 MHz

Freq. (MHz)	Peak Amp (dBμV/m)	Correction HPF (dB)	Correction Antenna and Cable (dB)	Peak Det. Spec. (dBμV/m)	Final Result FR(P) (dB μV/m) See Note *	Peak. Margin (dB)
1830.00	51.3	1.6	39.0	95.2**	52.9	-42.3
2745.03	59.7	1.7	44.3	74.0	61.4	-12.6

**Figure 35. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1.0 GHz to 2.9 GHz, the final result of field strength is calculated by the software of the EMI Receiver HP 85420E, and using the disks for antenna and cable correction factors, and the following equation:

$$FR(P) = \text{Peak} + \text{HPF}$$

Where:

FR(P) is the final result of peak detector field strength,

Peak is the peak detector measurement,

HPF is the high pass filter attenuation.

Note**: The peak detector specification is 20 dB below the fundamental frequency peak measured. The limit is 95.2 dBμV/m.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 915 MHz

Freq.	Peak Amp	Correction Factor			Peak. Specification	Peak Final Result FR (P)	Peak. Margin
(MHz)	(dBμV)	Antenna AF	Cable CF	Preamp PF	(dB μV/m)	(dB μV/m) See Note *.	(dB)
3660.00	44.3	33.8	2.2	30.5	74.0	49.8	-24.2
4575.00	42.3	35.4	2.5	30.5	74.0	49.7	-24.3
7320.00	39.3	39.0	3.2	29.8	74.0	51.7	-22.3
8235.00	39.8	40.1	3.8	29.9	74.0	53.8	-20.2
9150.00	39.8	40.9	4.2	30.0	74.0	54.9	-19.1

**Figure 36. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(P) = \text{Peak} + AF + CF - PF$$

Where: FR (P) is final peak detector result,

Peak is peak detector measurement,

AF is antenna factor,

CF is cable factor,

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 915 MHz

Freq. (MHz)	Avg Amp (dBμV)	Correction Factors			AVG Specification (dB μV/m)	AVG Final Result FR (A) (dB μV/m) See Note *.	AVG Margin (dB)
		Antenna AF (dB)	Cable CF (dB)	Preamp PF (dB)			
3660.00	40.4	33.8	2.2	30.5	54.0	45.9	-8.1
4575.00	34.2	35.4	2.5	30.5	54.0	41.6	-12.4
7320.00	25.4	39.0	3.2	29.8	54.0	37.8	-16.2
8235.00	25.9	40.1	3.8	29.9	54.0	39.9	-14.1
9150.00	25.1	40.9	4.2	30.0	54.0	40.2	-13.8

**Figure 37. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(A) = AVG + AF + CF + PF$$

Where: FR(A) is final average detector result,

AVG is average detector measurement,

AF is antenna factor,

CF is cable factor,

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 915 MHz

Freq.	Avg. Amp	Correction HPF	Correction Antenna and Cable	Avg. Det. Spec.	Final Result FR(A)	Avg. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note *.	(dB)
2745.03	45.1	1.7	443.	54.0	46.8	-7.2

**Figure 38. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1 GHz to 2.9 GHz, the final result of field strength was calculated directly by the EMI Receiver HP85420E software, using the disks for antenna and cable correction factors and the following equation:

$$FR(A) = AVG + HPF$$

Where :

FR(A) is the final result for average detector

AVG (dB μV/m) is the average detector measurement

HPF (dB) is the high pass filter attenuation

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 915 MHz

Freq.	Peak Amp	Correction HPF	Correction Antenna and Cable	Peak Det. Spec.	Final Result FR(P)	Peak. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note*.	(dB)
1830.00	51.4	1.6	39.0	110.2**	53.0	-57.2
2745.03	58.1	1.7	44.3	74.0	59.8	-14.2

**Figure 39. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1.0 GHz to 2.9 GHz, the final result of field strength is calculated directly by the EMI Receiver HP 85420E software and using disks for antenna and cables correction factors and the following equation:

$$FR(P) = \text{Peak} + \text{HPF}$$

Where:

FR(P) is the final result of peak detector field strength,

Peak (dBμV/m) is the peak detector measurement,

HPF is the high pass filter attenuation

Note**: The peak detector specification is 20 dB below the fundamental frequency peak measured. The limit is 110.2 dBμV/m.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 915 MHz

Freq.	Peak Amp	Correction Factor			Peak. Specification	Peak Final Result FR (P)	Peak. Margin
(MHz)	(dBμV)	Antenna AF	Cable CF	Preamp PF	(dB μV/m)	(dB μV/m) See Note *.	(dB)
3660.00	45.1	33.8	2.2	30.5	74.0	50.6	-23.4
4575.00	38.5	35.4	2.5	30.5	74.0	45.9	-28.1
7320.00	39.3	39.0	3.2	29.8	74.0	51.7	-22.3
8235.00	39.8	40.1	3.8	29.9	74.0	53.8	-20.2
9150.00	39.8	40.9	4.2	30.0	74.0	54.9	-19.1

**Figure 40. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength is manually calculated by using the following equation:

$$FR(P) = \text{Peak} + AF + CF - PF$$

Where: FR (P) is final peak detector result,
 Peak is peak detector measurement,
 AF is antenna factor,
 CF is cable factor,
 PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 915 MHz

Freq.	AVG Amp	Correction Factors			AVG Specification	AVG Final Result FR (A)	AVG Margin
(MHz)	(dBμV)	Antenna AF (dB)	Cable CF (dB)	Pream p PF (dB)	(dB μV/m)	(dB μV/m) See Note*.	(dB)
3660.00	40.4	33.8	2.2	30.5	54.0	45.9	-8.1
4575.00	31.6	35.4	2.5	30.5	54.0	39.0	-15.0
7320.00	25.4	39.0	3.2	29.8	54.0	37.8	-16.2
8235.00	25.9	40.1	3.8	29.9	54.0	39.9	-14.1
9150.00	25.1	40.9	4.2	30.0	54.0	40.2	-13.8

**Figure 41. Radiated Emission. Antenna Polarization: VERTICAL
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(A) = AVG + AF + CF - PF$$

Where: FR(A) is average detector result,

AVG is average detector measurement,

AF is antenna factor,

CF is cable factor,

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 926.2 MHz

Freq.	Correction HPF	Avg. Amp	Correction Antenna and Cable	Avg. Det. Spec.	Final Result FR(A)	Avg. Margin
(MHz)	(dB)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V/m) See Note *.	(dB)
2779.10	45.0	1.7	44.5	54.0	46.7	-7.3

**Figure 42. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1 GHz to 2.9 GHz, the final result of field strength was calculated directly by the EMI Receiver HP85420E software, using disks for antenna and cable correction factors and the following equation:

$$FR(A) = AVG + HPF$$

Where:

FR(A) is the final result for average detector,
 AVG (dB μ V/m) is the average detector measurement,
 HPF (dB) is the high pass filter attenuation.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
Type P3V7-89
Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1 GHz to 2.9 GHz
Test Distance: 3 meters Detector: Peak
Operating Frequency: 926.2 MHz

Freq.	Peak Amp	Correction HPF	Correction Antenna and Cable	Peak Det. Spec.	Final Result FR(P)	Peak. Margin
(MHz)	(dB μ V/m)	(dB)	(dB)	(dB μ V/m).	(dB μ V/m) See Note *.	(dB)
1852.40	52.3	1.6	39.2	94.6**	53.9	-40.7
2779.10	58.1	1.7	44.5	74.0	59.8	-14.2

**Figure 43. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1.0 GHz to 2.9 GHz, the final result of field strength is calculated directly by the EMI Receiver HP 85420E software using disks for antenna and cable correction factors and the following equation:

$$FR(P) \text{ (dB}\mu\text{V/m)} = \text{Peak} + \text{HPF}$$

Where:

FR(P) is the final result of peak detector field strength,

Peak (dB μ V/m) is the peak detector measurement,

HPF is the high pass filter attenuation.

Note**: The peak detector specification is 20 dB below the fundamental frequency peak measured. The limit is 94.6 dB μ V/m.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 2.9 GHz to 9.3GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 926.2 MHz

Freq.	Peak Amp	Correction Factors			Peak. Specification	Peak Final Result FR (P)*	Peak. Margin
(MHz)	(dB μ V)	Antenna AF	Cable CF	Preamp PF	(dB μ V/m)	(dB μ V/m) See Note *.	(dB)
3704.80	46.0	33.9	2.2	30.5	74.0	51.6	-22.4
4631.00	41.5	35.5	2.6	30.4	74.0	49.2	-24.8
7409.60	37.0	39.1	3.2	29.8	74.0	49.5	-24.5
8335.80	36.0	40.2	3.8	29.9	74.0	50.1	-23.9

**Figure 44. Radiated Emission. Antenna Polarization: HORIZONTAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(P) = \text{Peak} + AF + CF - PF$$

Where: FR (P) is final peak detector result,
 Peak is peak detector measurement,
 AF is antenna factor,
 CF is cable factor,
 PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 926.2 MHz

Freq.	AVG Amp	Correction Factors			AVG Specification	AVG Final Result FR (A)	AVG Margin
(MHz)	(dBμV)	Antenna AF	Cable CF	Preamp PF	(dB μV/m)	(dB μV/m) See Note *.	(dB)
3704.80	43.9	33.9	2.2	30.5	54.0	49.5	-4.5
4631.00	35.8	35.5	2.6	30.4	54.0	43.5	-10.5
7409.60	26.7	39.1	3.2	29.8	54.0	39.2	-14.8
8335.80	26.1	40.2	3.8	29.9	54.0	40.2	-13.8

**Figure 45. Radiated Emission. Antenna Polarization: AVERAGE.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(A) = AVG + AF + CF - PF$$

Where: FR(A) is final average detector result,

AVG is average detector measurement,

AF is antenna factor,

CF is cable factor.

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 926.2 MHz

Freq.	Avg. Amp	Correction HPF	Correction Antenna and Cable	Avg. Det. Spec.	Final Result FR(A)	Avg. Margin
(MHz)	(dBμV/m)	(dB)	(dB)	(dBμV/m)	(dB μV/m) See Note*.	(dB)
2779.10	44.2	1.7	44.0	54.0	45.9	-8.1

**Figure 46. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1 GHz to 2.9 GHz, the final result of field strength was calculated directly by the EMI Receiver HP85420E software, and using disks for antenna and cable correction factors and the following equation:

$$FR(A) = AVG + HPF$$

Where :

FR(A) (dB μV/m) is the final result for average detector,
 AVG (dB μV/m) is the average detector measurement,
 HPF (dB) is the high pass filter attenuation.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1 GHz to 2.9 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 926.2 MHz

Freq. (MHz)	Peak Amp (dBμV/m)	Correction HPF (dB)	Correction Antenna and Cable (dB)	Peak Spec. (dBμV/m).	Final Result FR(P) (dBμV/m) See Note *.	Peak. Margin (dB)
1852.40	51.6	1.6	38.7	106.2**	53.2	-53.0
2779.10	57.9	1.7	44.0	74.0	59.6	-14.4

**Figure 47. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range from 1.0 GHz to 2.9 GHz, the final result of field strength is calculated by the EMI Receiver HP 85420E software using disks for antenna and cable correction factors and the following equation:

$$FR(P) \text{ (dB}\mu\text{V/m)} = \text{Peak} + \text{HPF}$$

Where:

FR(P) is the final result of peak detection field strength,

Peak (dBμV/m) is the peak detector measurement,

HPF is the high pass filter attenuation.

Note**: The peak detector specification is 20 dB below the fundamental frequency peak measured. The limit is 106.2 dBμV/m.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Peak
 Operating Frequency: 926.2 MHz

Freq.	Peak Amp	Correction Factors			Peak. Specification	Peak Final Result FR (P)	Peak. Margin
(MHz)	(dBμV)	Antenna AF (dB)	Cable CF (dB)	Preamp PF (dB)	(dB μV/m)	(dB μV/m) See Note *.	(dB)
3704.80	44.7	33.9	2.2	30.5	74.0	50.3	-23.7
4631.00	38.0	35.5	2.6	30.4	74.0	45.7	-28.3
7409.60	37.0	39.1	3.2	29.8	74.0	49.5	-24.5
8335.80	36.0	40.2	3.8	29.9	74.0	50.1	-23.9

**Figure 48. Radiated Emission. Antenna Polarization: VERTICAL.
 Detector: Peak**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(P) = \text{Peak} + AF + CF - PF$$

Where: FR (P) is final peak detector result,

Peak is peak detector measurement,

AF is antenna factor,

CF is cable factor,

PF is preamplifier factor.

Radiated Emission Above 1 GHz

E.U.T Description Network Transceiver/Repeater
 Type P3V7-89
 Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 2.9 GHz to 9.3 GHz
 Test Distance: 3 meters Detector: Average
 Operating Frequency: 926.2 MHz

Freq.	AVG Amp	Correction Factors			AVG Specification	AVG Final Result FR (A)	AVG Margin
(MHz)	(dBμV)	Antenna AF	Cable CF	Pream p PF	(dB μV/m)	(dB μV/m) See Note*.	(dB)
3704.80	41.3	33.9	2.2	30.5	54.0	46.9	-7.1
4631.00	29.6	35.5	2.6	30.4	54.0	37.3	-16.7
7409.60	26.7	39.1	3.2	29.8	54.0	39.2	-14.8
8335.80	26.1	40.2	3.8	29.9	54.0	40.2	-13.8

**Figure 49. Radiated Emission. Antenna Polarization: VERTICAL
 Detector: Average**

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Note*: In the frequency range above 2.9 GHz, the field strength was manually calculated by using the following equation:

$$FR(A) = AVG + AF + CF - PF$$

Where: FR(A) is average detector result,

AVG is average detector measurement,

AF is antenna factor,

CF is cable factor,

PF is preamplifier factor.

8.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	December 2, 2001	1 year
RF Section	HP	85420E	3427A00103	December 2, 2001	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001.0	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357.0	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253.0	January 31,2001	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	April 10, 2002	1 year
1 GHz High Pass Filter	Technion Haifa	915-HPF	01	March 1, 2002	1 year
Spectrum Analyzer	HP	8592L	3745A08184	January 31,2002	1 year

9. Maximum Transmitted Peak Power Output

9.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through appropriate coaxial cable. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 3 MHz resolution BW. Peak power level was measured at selected operation frequencies.

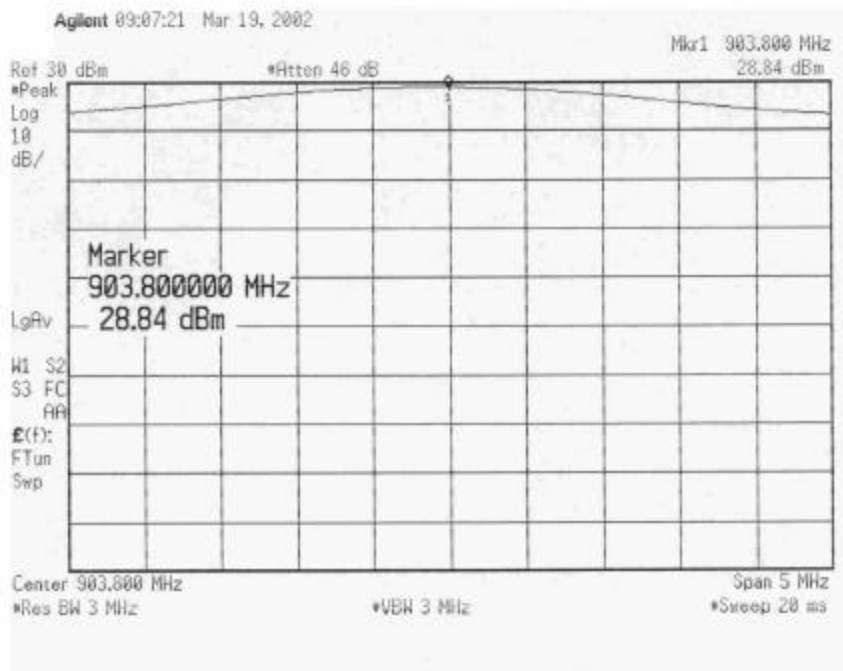


Figure 50.

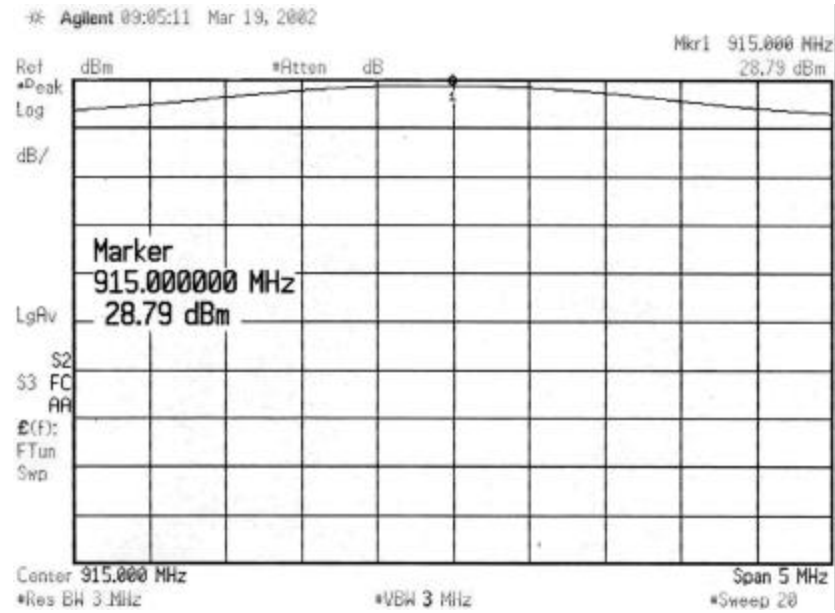


Figure 51.

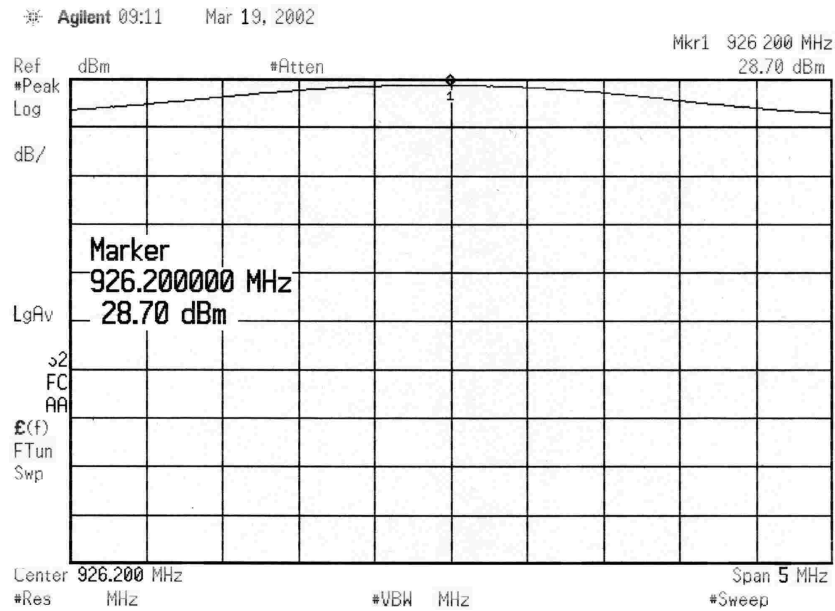


Figure 52.

9.2 Results table

E.U.T. Description: Network Transceiver/Repeater

Model No.: P3V7-89

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C

Operation Frequency (MHz)	Reading (dBm)	Final Result (dBm)	Specification (dBm)	Margin (dB)	Cable Attenuation (dB)
903.8	28.84	29.54	30	0.46	0.7
915.0	28.79	29.49	30	0.51	0.7
926.2	28.70	29.40	30	0.60	0.7

Figure 53 Maximum Power Output

JUDGEMENT: Passed by 0.46 dB

TEST PERSONNEL:

Tester Signature: Shimon Zigdon

Date: 24.07.02

Typed/Printed Name: S. Zigdon

9.3 Test Equipment Used.

Peak Power Output

Testing performed on 19 March 2002

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	Anritzu	E4440A	US40420202	1.3.2002	1 year
Cable	Huber Suhner	RG142	None	1.3.2002	1 year

Figure 54 Test Equipment Used

10. Peak Power Output Out of 902-928 MHz Band

10.1 Test procedure

The N.T.R. antenna terminal was connected to the spectrum analyzer through appropriate coaxial cable. The spectrum analyzer was set to 100 KHz resolution BW. Frequency range from 10 KHz to 8.5 GHz was scanned. Level of spectrum components out of the 902-928 MHz was measured at the selected operation frequencies.

Frequency 903.8MHz

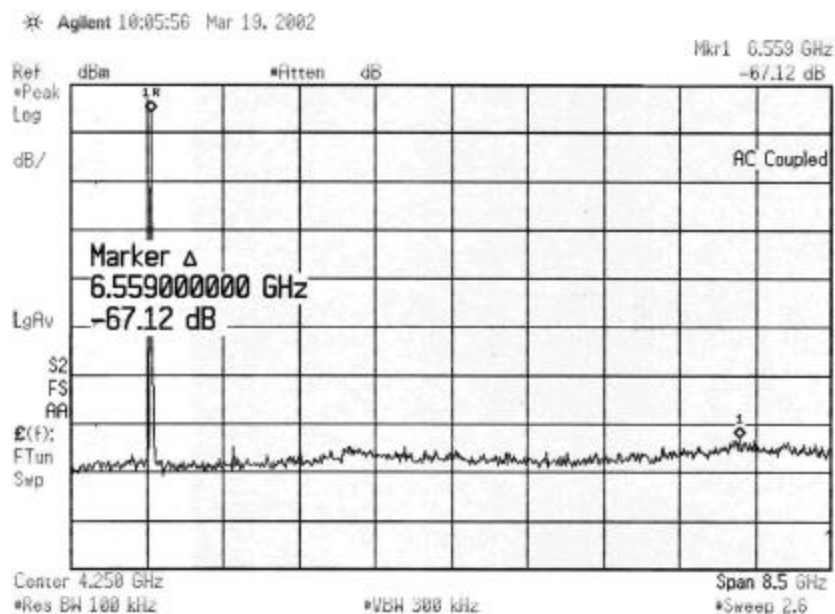


Figure 55

Frequency 915MHz

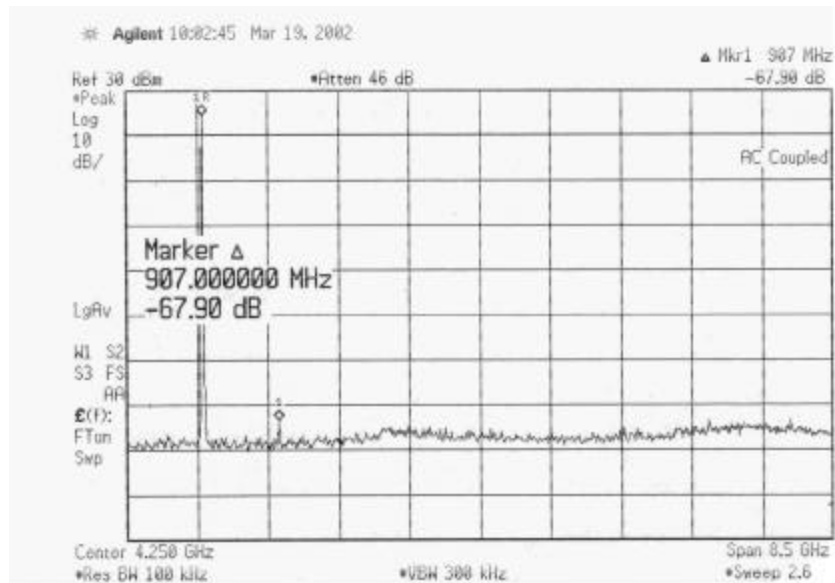


Figure 56

Frequency 926.2MHz

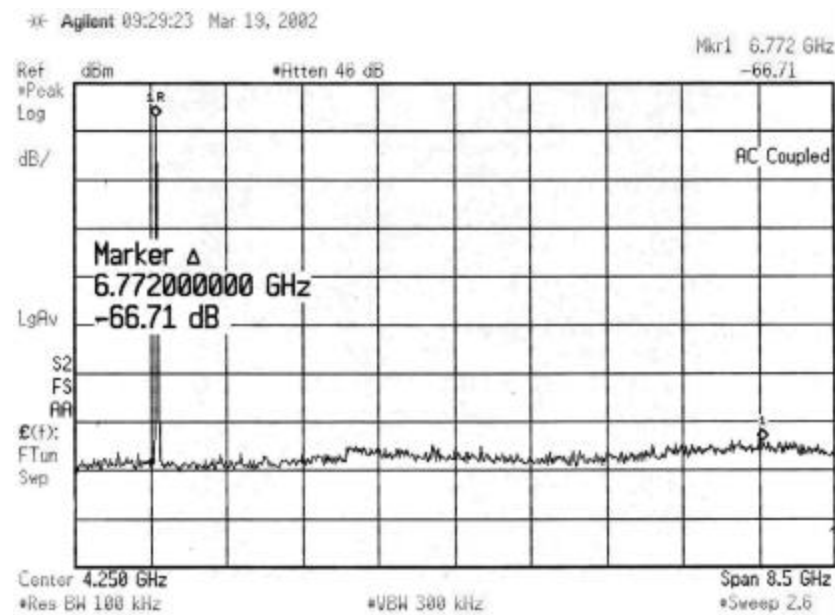


Figure 57

10.2 Results table

E.U.T Description: Network Transceiver/Repeater

Model No.: P3V7-89

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
903.8	67.12	20	47.12
915.0	67.90	20	47.90
926.2	66.71	20	46.71

Figure 58 Peak Power Output of 902-928 MHz Band

JUDGEMENT: Passed by 46.71 dB

TEST PERSONNEL:

Tester Signature: Shimon Zigdon

Date: 24.07.02

Typed/Printed Name: S. Zigdon

10.3 Test Equipment Used.

Peak Power Output of 902-928 MHz Band

Testing Performed on 19 March 2002.

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	Anritzu	E4440A	US40420202	1.3.2002	1 year
Cable	Huber Suhner	RG142	None	1.3.2002	1 year

Figure 59 Test Equipment Used

11. 6 dB Minimum Bandwidth

11.1 Test procedure

The N.T.R. was set to the applicable test frequency. The N.T.R. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable section. The spectrum analyzer was set to 100 kHz resolution BW. The spectrum bandwidth of the N.T.R. at the point of 6 dB below maximum peak power was measured and recorded.

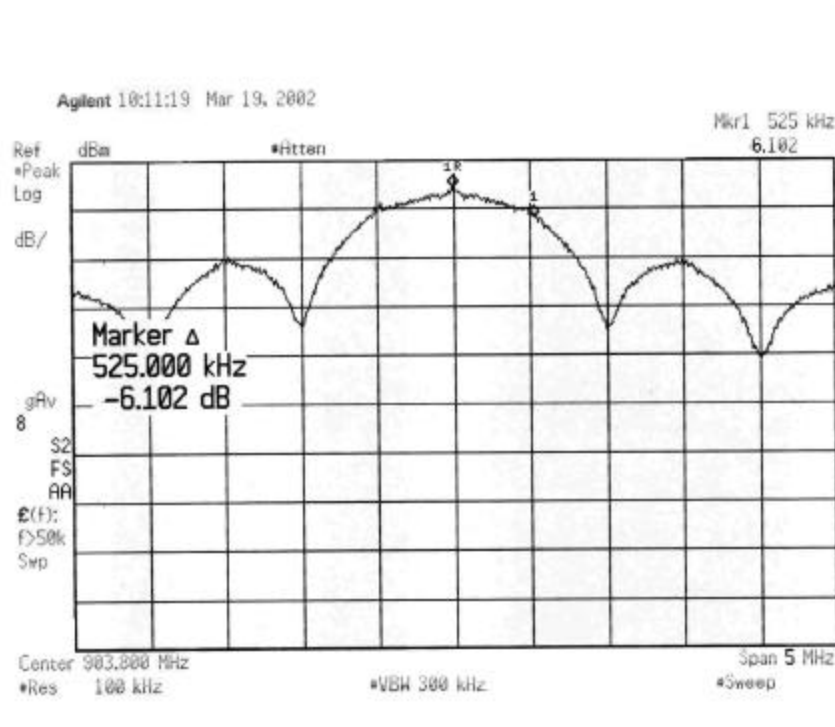


Figure 60

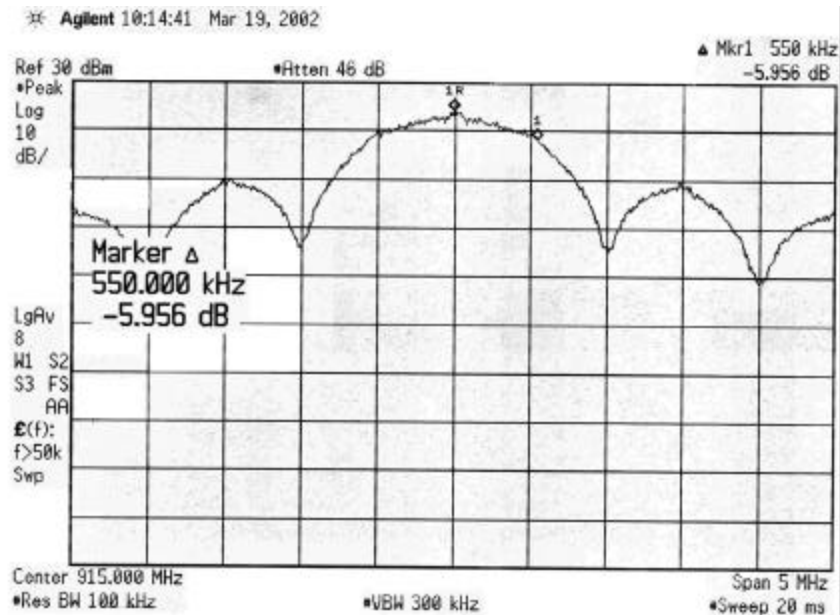


Figure 61

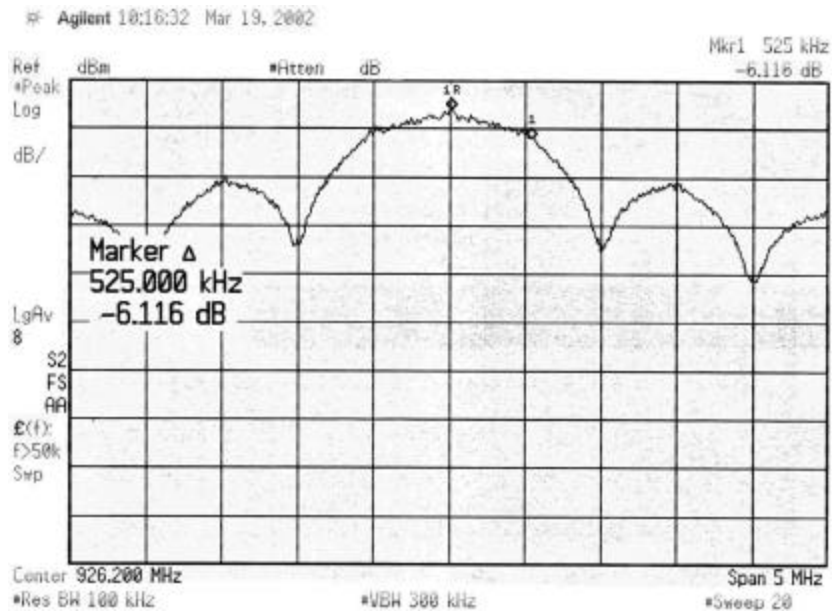


Figure 62

11.2 Results table

E.U.T Description: Network Transceiver/Repeater
 Model No.: P3V7-89
 Serial Number: Not Designated
 Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Reading (MHz)	Specification (MHz)	Margin (MHz)
903.8	1.05	0.5	0.55
915.0	1.10	0.5	0.60
926.2	1.05	0.5	0.55

Figure 63 6 dB Minimum Bandwidth

JUDGEMENT: Passed by 0.55 MHz

TEST PERSONNEL:

Tester Signature: Shimon Zigdon
 Typed/Printed Name: S. Zigdon

Date: 24.07.02

11.3 Test Equipment Used.

6 dB Minimum Bandwidth

Testing performed on 19 March 2002

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	Anritzu	E4440A	US40420202	1.3.2002	1 year
Cable	Huber Suhner	RG142	None	1.3.2002	1 year

Figure 64 Test Equipment Used

12. Band Edge Spectrum

[In Accordance with section 15.247(c)]

12.1 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (903.8 MHz) and the highest operation frequency (926.2 MHz) in which the N.T.R. is planned to be used.

The N.T.R. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW. Maximum power level below 902 MHz and above 928 MHz was measured relative to power level at 903.8 MHz and 926.2 MHz correspondingly.

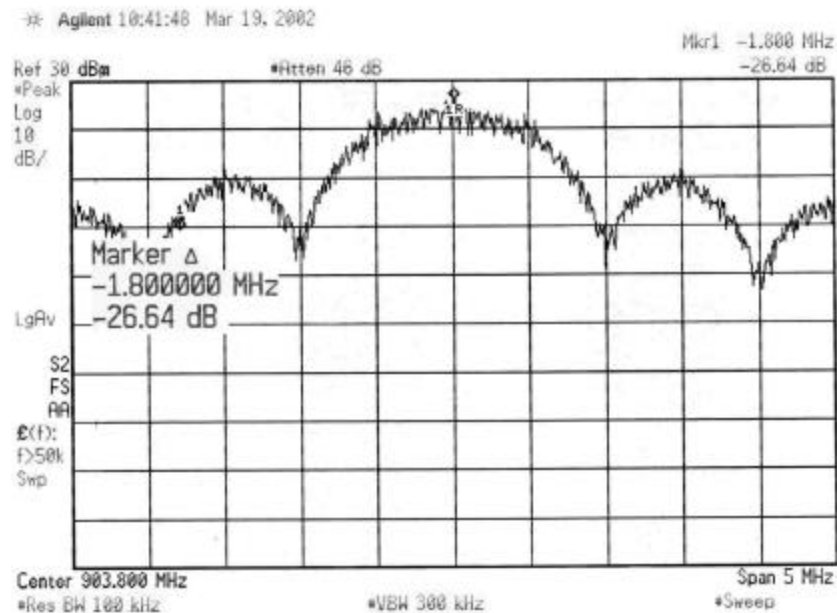


Figure 65

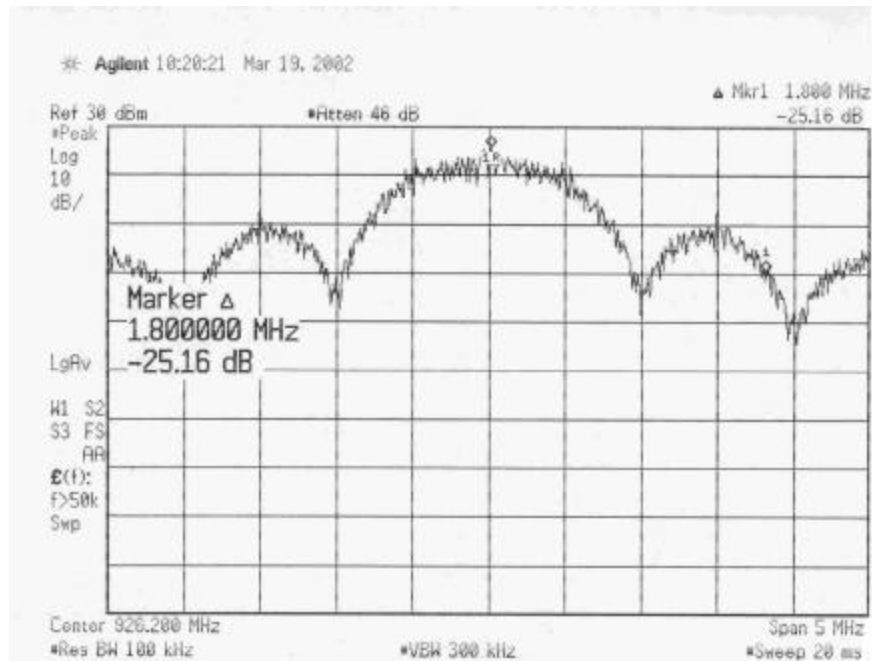


Figure 66

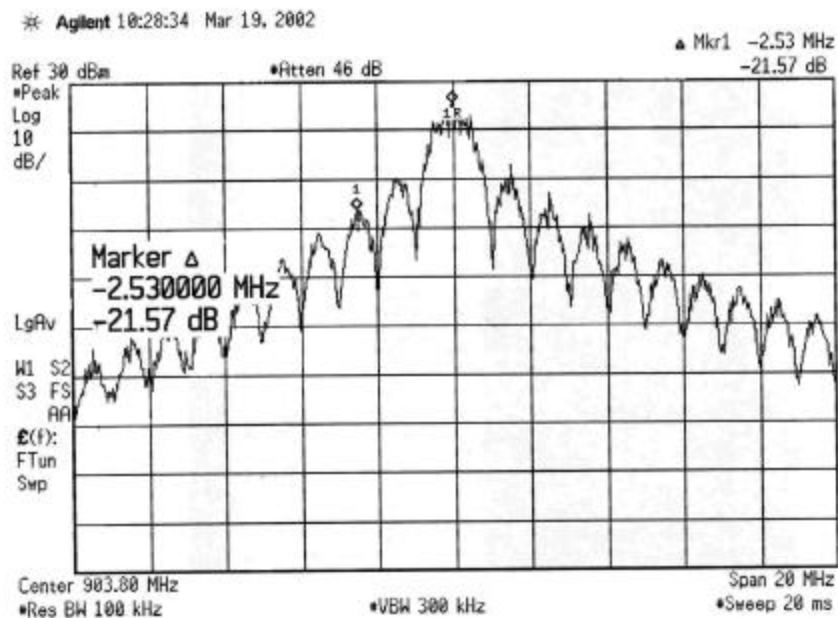


Figure 67

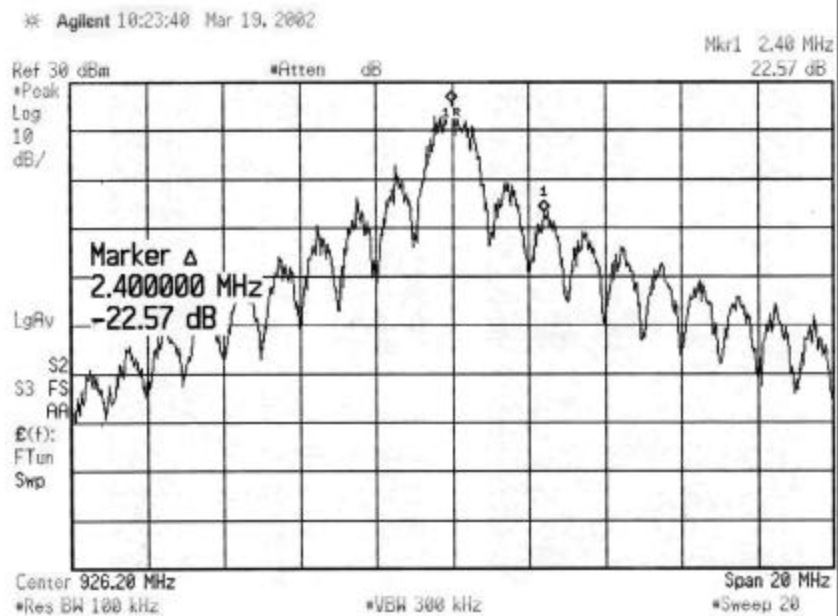


Figure 68

12.2 Results table

E.U.T. Description: Network transceiver/Repeater
 Model No.: P3V7-89
 Serial Number: Not Designated
 Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBc)	Specification (dBc)	Margin (dB)
903.8	902	21.57	20	1.57
926.2	928	22.57	20	2.57

Figure 69 Band Edge Spectrum

JUDGEMENT: Passed by 1.57 dB

TEST PERSONNEL:

Tester Signature: Shimon Zigdon

Date: 24.07.02

Typed/Printed Name: S. Zigdon

12.3 Test Equipment Used.

Band edge Spectrum

Testing was performed on 19 March 2002.

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	Anritzu	E4440A	US40420202	1.3.2002	1 year
Cable	Huber Suhner	RG142	None	1.3.2002	1 year

Figure 70 Test Equipment Used

13. Transmitted Power Density

[In accordance with section 15.247(d)]

13.1 Test procedure

The N.T.R. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 3 KHz resolution BW. 10 KHz video BW and sweep time of 1 second for each 3 KHz “window”. The spectrum peaks were located at each of the 3 operating frequencies.

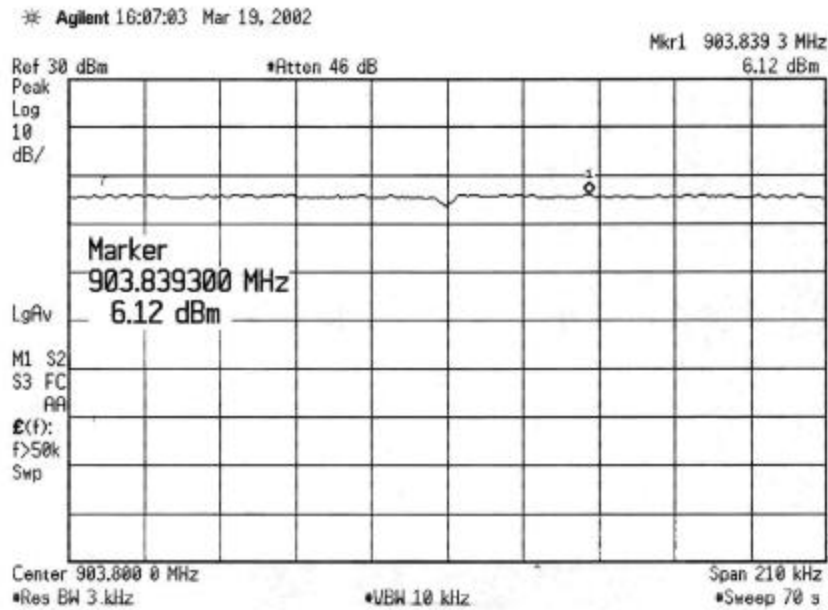


Figure 71

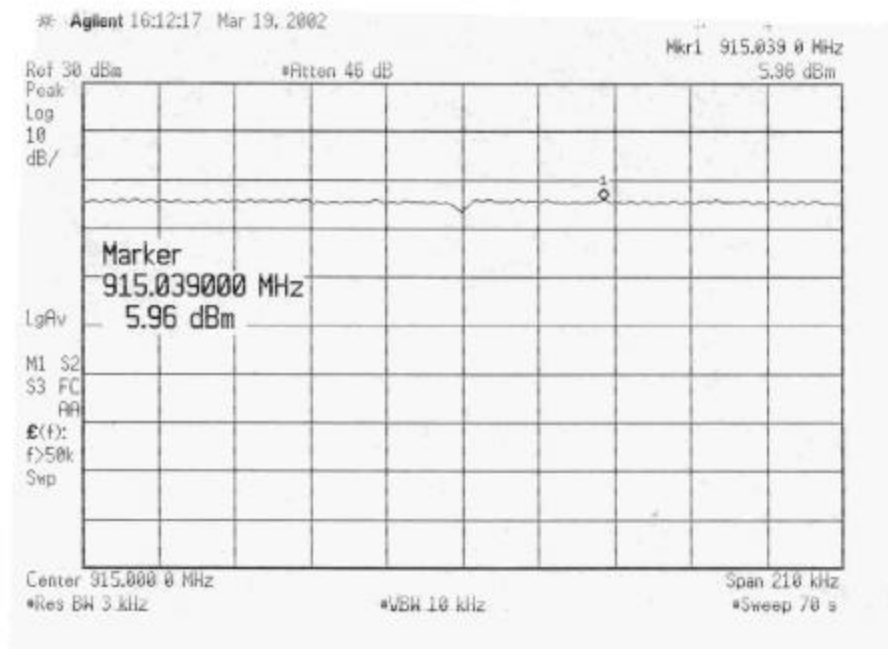


Figure 72

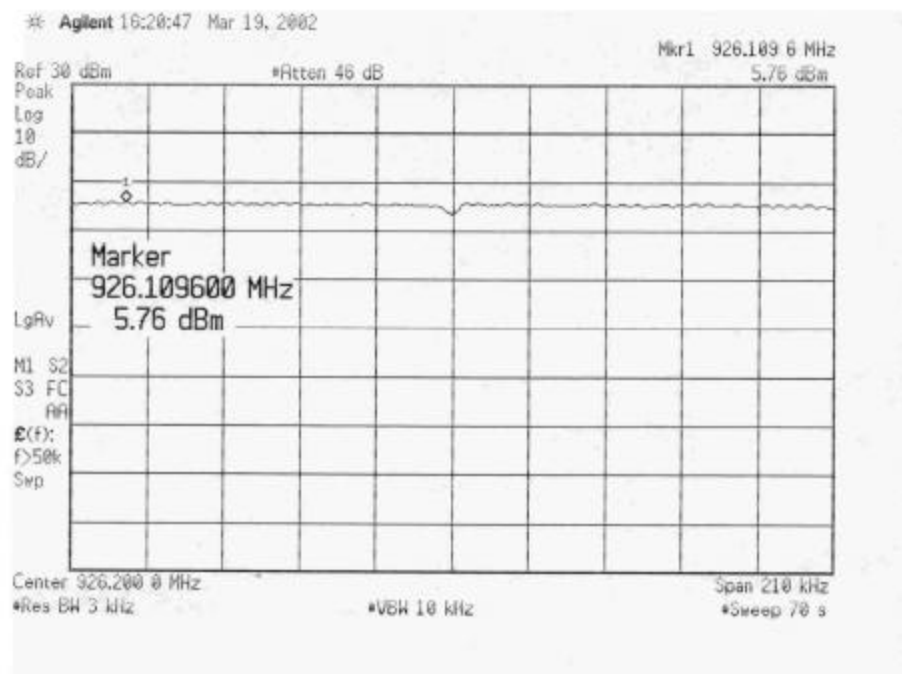


Figure 73

13.2 Results table

E.U.T. Description: Network Transceiver/Repeater

Model No.: P3V7-89

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Reading (dBm)	Final Result (dBm)	Specification (dBm)	Margin (dB)	Cable Attenuation (dB)
903.8	6.12	6.82	8	1.18	0.7
915.0	5.96	6.66	8	1.34	0.7
926.2	5.76	6.46	8	1.54	0.7

Figure 74 Test Equipment Used

JUDGEMENT: Passed by 1.18 dB

TEST PERSONNEL:

Tester Signature: Shimon Zigdon

Date: 24.07.02

Typed/Printed Name: S. Zigdon

13.3 Test Equipment Used.

Transmitted Power Density

Testing was performed on 19 March 2002.

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	Anritzu	E4440A	US40420202	1.3.2002	1 year
Cable	Huber Suhner	RG142	None	1.3.2002	1 year

Figure 75 Test Equipment Used

14. Processing Gain

[In accordance with section 15.247(e)]

14.1 Test procedure

The processing gain was measured according to the guideline in section 15.247(e). The transmitter was enclosed in a small RF chamber and configured to transmit periodically typical length burst messages. The jammer was simulated by HP8647A signal generator. The composed signal (transmitter and jammer) was fed to the SPSP receiver and the demodulated was fed to a PC with decoding and analyzing program. Instead of pointing out a require BER, the criteria that was used is 80% success rate in detecting and decoding burst messages (error free decoding messages). This criteria, which it's related to probability of detection rather than to "required BER", is more suitable in measuring the performance in our system because of it's burst nature. By simulating we can show that for criteria of 80% success rate, the required S/N ratio is 13db. The test consists of stepping signal generator in 50 kHz increments across the passband. The measurement was taken in 3 different frequencies- near the lower edge of the band in 903.8 MHz, in the center frequency 915MHz and near the upper edge of the band 926.2MHz. The measurement was taken when the system was configured to work with 255 PN maximal length codes.

Test Setup

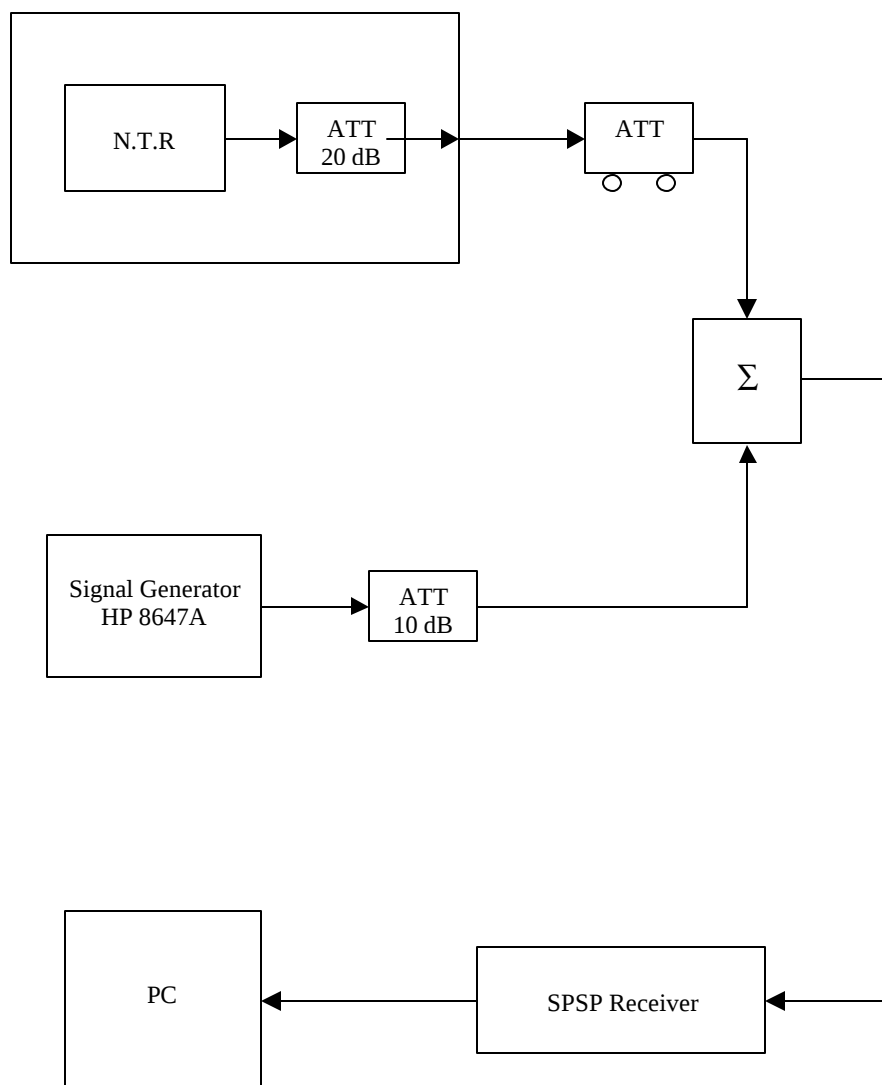


Figure 76 Processing Gain, Block Scheme

Processing Gain

PN Code Length 255

Frequency 903.8 MHz

DeltaF, MHZ	J/S, dB
0	7 Discard
0.05	8
0.1	8
0.15	8
0.2	8
0.25	9
0.3	9
0.35	9
0.4	9
0.45	10
0.5	10
0.55	11
0.6	12
-0.05	8 Discard
-0.1	8
-0.15	8
-0.2	8
-0.25	8
-0.3	9
-0.35	9
-0.4	10
-0.45	11
-0.5	11
-0.55	12
-0.6	13

Figure 77 Processing Gain: $13+8=21$

Processing Gain PN Code Length 255

Frequency 915 MHz

DeltaF, MHZ	J/S, dB
0	7 Discard
0.05	8 Discard
0.1	8
0.15	9
0.2	9
0.25	9
0.3	9
0.35	10
0.4	10
0.45	11
0.5	12
0.55	12
0.6	13
-0.05	8
-0.1	8
-0.15	8
-0.2	9
-0.25	9
-0.3	9
-0.35	10
-0.4	10
-0.45	11
-0.5	11
-0.55	12
-0.6	13

Figure 78 Processing Gain: 13+8=21

Processing Gain PN Code Length 255

Frequency 926.2 MHz

DeltaF, MHZ	J/S, dB
0	7 Discard
0.05	8
0.1	8
0.15	8
0.2	8
0.25	9
0.3	9
0.35	10
0.4	11
0.45	11
0.5	11
0.55	12
0.6	13
-0.05	8 Discard
-0.1	8
-0.15	8
-0.2	9
-0.25	9
-0.3	9
-0.35	9
-0.4	10
-0.45	10
-0.5	11
-0.55	11
-0.6	12

Figure 79 Processing Gain: $13+8=21$

TEST PERSONNEL:

Tester Signature: Shimon Zigdon

Date: 24.07.02

Typed/Printed Name: S. Zigdon

14.2 Test Equipment Used.

Transmitted Power Density

Testing was performed on 19 March 2002

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	Anritzu	E4440A	US40420202	1.3.2002	1 year
Cable	Huber Suhner	RG142	None	1.3.2002	1 year
Signal Generator	HP	8648A	3416u00103	1.5.2000	1 year
Power Splitter	Mini Circuits	ZAPD21	09716	1.3.2002	1 year
Variable Attenuator	HP	8496A	3308A14531	1.3.2002	1 year
20 dB Attenuator	Mini Circuits	SAT 20	8992612	1.3.2002	1 year
10 dB Attenuator	Mini Circuits	SAT10	942312	1.3.2002	1 year
PC					
Receiver	NEXUS DATA	AP-BX	None	1.7.2000	1 year

Figure 80 Test Equipment Used

15. Antenna Gain

The antenna used in the device is a patch antenna.

Antenna specifications:

Dimensions: 105mm x 121.7mm.

Gain: 3dBi.

Band Width: 6Mhz.

Impedance: 50ohm

16. R.F Exposure/Safety

The E.U.T. is installed in fixed locations for application of transmitting data of gas consumption to central data collection offices. The distance between the E.U.T. and the general population is at least several meters.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 915 MHz

$$S = \frac{915}{1500} = 0.61 \frac{mW}{cm^2}$$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t - Transmitted Power 1000mw (Peak)

G_t - Antenna Gain, 2(3dBi)

R - Distance from Transmitter using 100cm worst case

(c) The peak power density is :

$$S_p = \frac{10^3 \times 2}{4\pi (100)^2} = 15.92 \times 10^{-3} \frac{mW}{cm^2}$$

(d) The duty cycle of transmission in actual worst case is 150 msec pulses per 1.5 sec intervals.

The average power over 30 minutes is:

$$P_{AV} = \frac{1000 \times 0.15}{1.5} = 100 mW$$

(e) The averaged power density of the E.U.T. is:

$$S_{AV} = \frac{100 \times 2}{4\pi (100)^2} = 15 \times 10^{-4} \frac{mW}{cm^2}$$

(f) This is significantly below the FCC limit.

17. Photographs of Tested E.U.T.



Figure 81 Top View Closed Cover



Figure 82 Top View Antenna Cover and Antenna Removed



Antenna

Figure 83 Top View Antenna Cover Removed

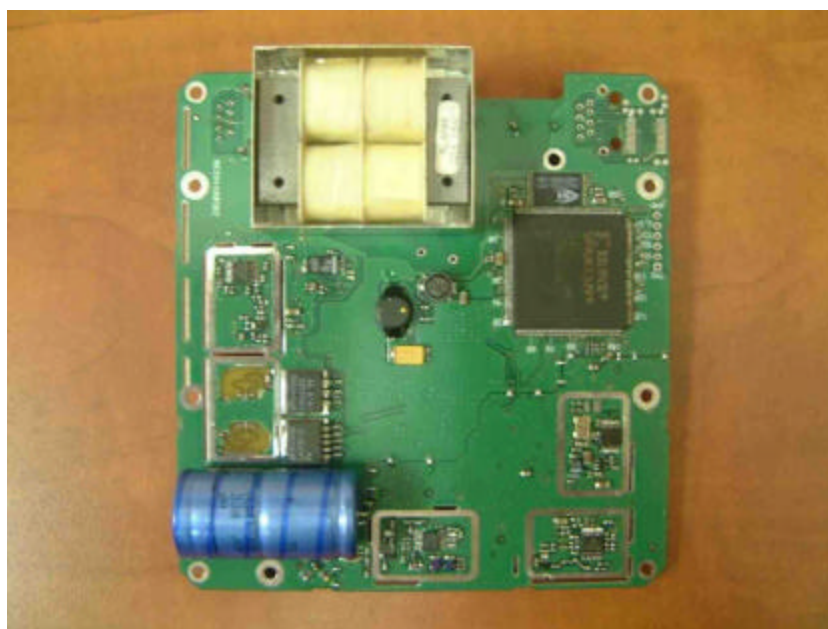


Figure 84 Printed Circuit Side 1

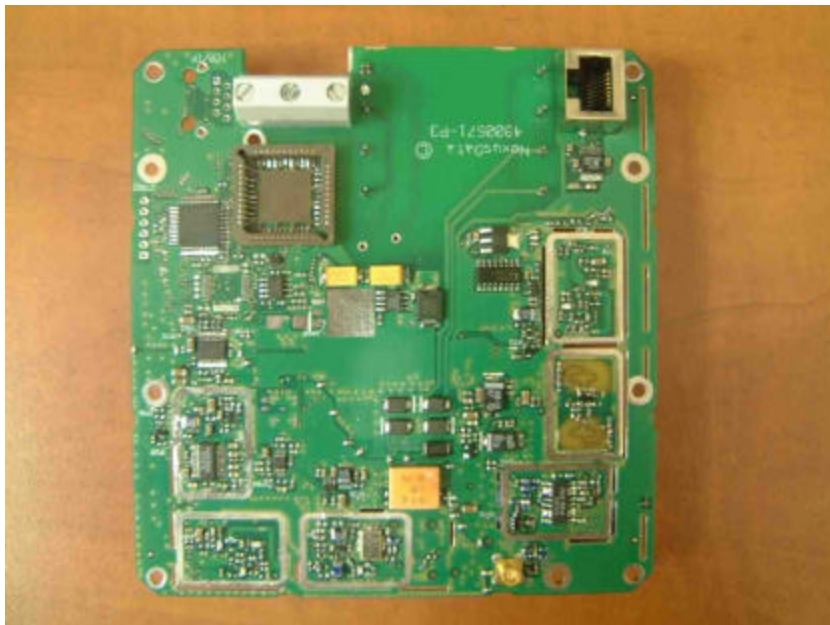


Figure 85 Printed Circuit Side 2



Figure 86 Printed Circuit Mounted in Housing/ E.U.T. Disassembled