



DATE: 27 August 2007

I.T.L. (PRODUCT TESTING) LTD.
FCC EMC/Radio Test Report
for
MICRONET Ltd.

Equipment under test:
Mobile Data Terminal (MDT)

NET-960CE-S4*

* See customer's declaration on page 6.

Written by: D. Shidowsky
D. Shidowsky, Documentation

Approved by: E. Pitt
E. Pitt, Test Engineer

Approved by: I. Raz
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



Measurement/Technical Report for MICRONET Ltd.

Mobile Data Terminal (MDT)

NET-960CE-S4

FCC ID: U8ONET960CE

27 August 2007

This report concerns: Original Grant x Class II change

Class B verification Class A verification Class I change

Equipment type: Direct Sequence Spread Spectrum Transmitter

Request Issue of Grant:

x Immediately upon completion of review

Limits used:

CISPR 22 Part 15 x

Measurement procedure used is ANSI C63.4-2003.

Application for Certification

prepared by:

Ishaishou Raz

ITL (Product Testing) Ltd.

Kfar Bin Nun

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Israel

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Applicant for this device:

(different from "prepared by")

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1. General Information

1.1 Administrative Information

Manufacturer: MICRONET Ltd.

Manufacturer's Address: Hametsuda 27
P.O.B 11524
Azor 58001
Israel
Tel: +972-3-558 4884
Fax: +972-3-558 4885

Manufacturer's Representative: Natan Shvarts

Equipment Under Test (E.U.T): Mobile Data Terminal (MDT)

Equipment Model No.: NET-960CE-S4 (See customer's declaration on following page).

Equipment Serial No.: 404813

Date of Receipt of E.U.T: 25.03.07

Start of Test: 25.03.07

End of Test: 11.04.07

Test Laboratory Location: I.T.L (Product Testing) Ltd.
Kfar Bin Nun,
ISRAEL 99780

Test Specifications: See Section 2

MICRONET

Wednesday, 18 July 2007

DECLARATION

I hereby declare that the name, model, and serial number of the E.U.T. tested at the I.T.L. EMC laboratory between 25 March – 11 April 2007 is as follows:

E.U.T.: Mobile Data terminal (MDT)
Model Name: NET-960CE-S4
Serial Number: 404813

Please use the above names and serial number in the test reports and certificates.

I HEREBY DECLARE THAT

NET-960CE-S4

IS A FULL CONFIGURATION MODEL.

ANOTHER MODEL,
NET-960CE-S3,
DIFFERS FROM THE NET-960CE-S4 ONLY BY SOFTWARE AND/OR
EXTRACTED COMPONENTS/ASSEMBLIES.

Please relate to them all (from an EMC point of view) as the same product.

Thank you,

Joseph Ziv
V.P. R&D

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Page 1 of 1

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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 Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

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 E.U.T. is a programmable mobile data terminal (MDT) installed in vehicles. It provides and displays incoming messages and initiates outgoing messages, transmitted through various communication systems, which are connected to it, such as : GPRS, GPS, GSM, WiLAN (WiFi), Bluetooth. The E.U.T. incorporates optional built in communication and connectivity options, e.g. USB, RS-232(4COMs), J1708, CANbus, etc. The E.U.T. contains a GPRS module model: G24 of Motorola. The WiLAN (WiFi) feature is provided by embedded WiLAN module of Samsung ("Marvell" Chipset).

1.4 *Test Methodology*

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. 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 August 22, 2006).

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

1.6 *Measurement Uncertainty*

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. 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

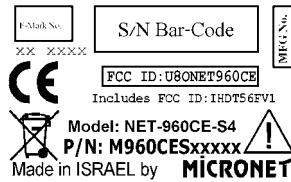


Figure 1. FCC Label



Figure 2. Location of Label on EUT

3. System Test Configuration

3.1 *Justification*

The WiLAN module worked in continuous transmit/receive mode, on one channel (chosen by the manufacturer). The WiLAN module is embedded in the terminal. The terminal communicated with a PC through 3COM router that provided the particular channels according to the standards of IEEE802.11g.

3.2 *EUT Exercise Software*

On the terminal side: the software operated the module in continuous mode by sending PINGs with big buffer to the router that was connected to the PC. This software can also provide sending or receiving data.

On the PC side: the software communicated with the terminal by sending or receiving data between them.

We observed if the module was still transmitting by using the touch screen connected to the terminal or by the terminal display.

3.3 *Special Accessories*

No special accessories were needed to achieve compliance.

3.4 *Equipment Modifications*

No modifications were necessary in order to achieve compliance.

3.5 Configuration of Tested System

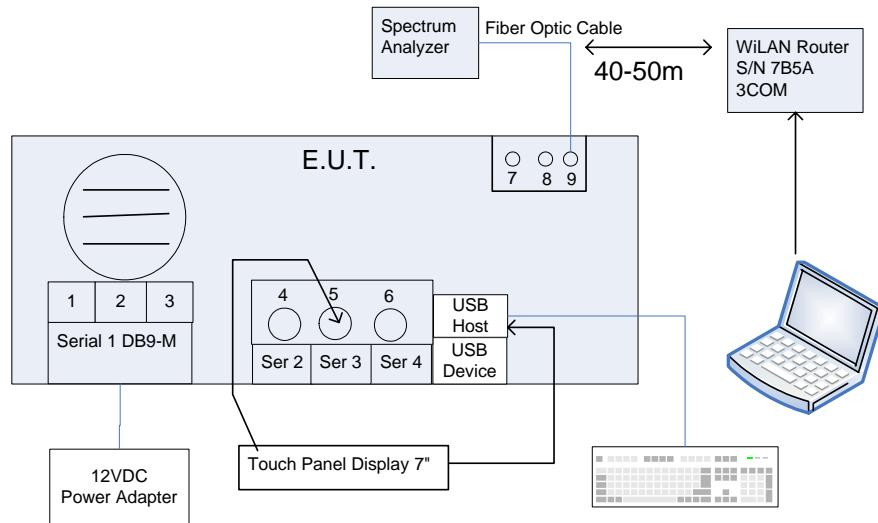


Figure 3. Configuration of Tested System

4. Block Diagram

4.1 *Schematic Block/Connection Diagram*

Intentionally Blank for Reasons of Confidentiality

4.2 *Theory of Operation*

The terminal has WINCE operating system, which works with the standard embedded WiLAN module.

Type of modulation of the E.U.T. is: IEEE Standard 802.11g OFDM baseband modulation (The module contains an on board 40MHz oscillator).

The minimum operation frequency is 2412 MHz and the maximum is 2462 MHz.

5. Radiated Measurement Test Set-up Photos



Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test

6 Spurious Radiated Emission in the Restricted Band, Below 1 GHz

6.1 Test Specification

9kHz-1000 MHz, F.C.C., Part 15, Subpart C

6.2 Test Procedure

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

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

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 configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-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 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.

In the frequency range 9 kHz-30 MHz, the loop antenna was rotated on its vertical axis, The antenna height (center of loop) was 1 meter.

In the frequency range 30-1000 MHz, 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.

The E.U.T. was tested at the operating frequencies of 2412, 2437, and 2462 MHz.



6.3 Test Data

JUDGEMENT: Passed by 10.4 dB

The signals in the band 9 kHz – 30 MHz were –20dB below the specification limit.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The margin between the emission level and the specification limit is 10.4 dB in the worst case at the frequency of 240.01 MHz, horizontal polarization.

TEST PERSONNEL:

Tester Signature:  Date: 04.07.07

Typed/Printed Name: E. Pitt



Radiated Emission

E.U.T Description Mobile Data Terminal (MDT)
Type NET-960CE-S4
Serial Number: 404813

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 30 MHz to 1000 MHz
Antenna: 3 meters distance Detectors: Peak, Quasi-peak

Frequency	Peak Amp	QP Amp	Correction	Specification	Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB)
108.00	35.8	32.7	12.6	43.5	-10.8
240.01	39.4	35.6	19.2	46.0	-10.4
960.04	46.2	41.1	29.1	54.0	-12.9

**Figure 6. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detectors: Peak, Quasi-peak**

Note: QP Delta 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.



Radiated Emission

E.U.T Description Mobile Data Terminal (MDT)
Type NET-960CE-S4
Serial Number: 404813

Specification: FCC Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 30 MHz to 1000 MHz
Antenna: 3 meters distance Detectors: Peak, Quasi-peak

Frequency	Peak Amp	QP Amp	Correction	Specification	Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB)
960.03	45.8	40.8	29.1	54.0	-13.2

**Figure 7. Radiated Emission. Antenna Polarization: VERTICAL.
Detectors: Peak, Quasi-peak**

Note: QP Delta 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.

6.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 22, 2006	1 year
RF Section	HP	85420E	3427A00103	November 22, 2006	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 22, 2007	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 30, 2006	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 16, 2006	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	LaserJet 2200	JPKGC19982	N/A	N/A



6.5 Field Strength Calculation

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

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

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.

7 Spurious Radiated Emission in the Restricted Band, Above 1 GHz

7.1 Radiated Emission Above 1 GHz

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

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

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 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.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

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.)



7.2 Test Data

JUDGEMENT: Passed by 12.7 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

The margin between the emission level and the specification limit is 12.7 dB in the worst case at the frequency of 4824.00 MHz, horizontal polarization.

All other signals not included in the result tables are at least 20dB below the specification limit.

The details of the highest emissions are given in Figure 8 to Figure 11.

TEST PERSONNEL:

Tester Signature:  Date: 04.07.07

Typed/Printed Name: E. Pitt

Radiated Emission Above 1 GHz

E.U.T Description Mobile Data Terminal (MDT)
 Type NET-960CE-S4
 Serial Number: 404813

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak

Freq. (MHz)	Peak Amp (dB μ V/m)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
4824.00	45.7	74.0	-28.3
4874.00	46.0	74.0	-28.0
4924.00	38.8	74.0	-35.2

**Figure 8. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detector: Peak**

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.

“Peak Amp” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss + FilterLoss- Preamplifier Gain



Radiated Emission Above 1 GHz

E.U.T Description Mobile Data Terminal (MDT)
Type NET-960CE-S4
Serial Number: 404813

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average

Freq. (MHz)	Average Amp (dB μ V/m)	Average Specification (dB μ V/m)	Peak. Margin (dB)
4824.00	41.3	54.0	-12.7
4874.00	40.6	54.0	-13.4
4924.00	31.4	54.0	-22.6

**Figure 9. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detector: Average**

Notes:

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.

“Average Amp” includes correction factor.

Correction Factor = Antenna Factor + Cable Loss + Filter Loss- Preamplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Mobile Data Terminal (MDT)
 Type NET-960CE-S4
 Serial Number: 404813

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak

Freq. (MHz)	Peak Amp (dB μ V/m)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
4824.00	43.5	74.0	-30.5
4874.00	43.6	74.0	-30.4
4924.00	39.8	74.0	-34.2

**Figure 10. Radiated Emission. Antenna Polarization: VERTICAL.
Detector: Peak**

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.

“Peak Amp” includes correction factor.

Correction Factor” = Antenna Factor + Cable Loss + Filter Loss - Preamplifier Gain



Radiated Emission Above 1 GHz

E.U.T Description Mobile Data Terminal (MDT)
Type NET-960CE-S4
Serial Number: 404813

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average

Freq. (MHz)	Average Amp (dB μ V/m)	Average Specification (dB μ V/m)	Peak. Margin (dB)
4824.00	38.7	54.0	-15.3
4874.00	35.7	54.0	-18.3
4924.00	33.4	54.0	-20.6

**Figure 11. Radiated Emission. Antenna Polarization: VERTICAL.
Detector: Average**

Notes:

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.

“Average Amp” includes correction factor.

Correction Factor = Antenna Factor + Cable Loss + Filter Loss – Preamplifier Gain

7.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	November 22, 2006	1 year
RF Section	HP	85420E	3427A00103	November 22, 2006	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	ThinkJet2225	2738508357	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 15, 2006	2 years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 2, 2006	1 year
Spectrum Analyzer	HP	8592L	3926A01204	November 21, 2006	1 year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

8 Maximum Transmitted Peak Power Output

8.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an appropriate coaxial cable. The Spectrum Analyzer was set to 1.0 MHz resolution BW. Peak power level was measured at selected operation frequencies.

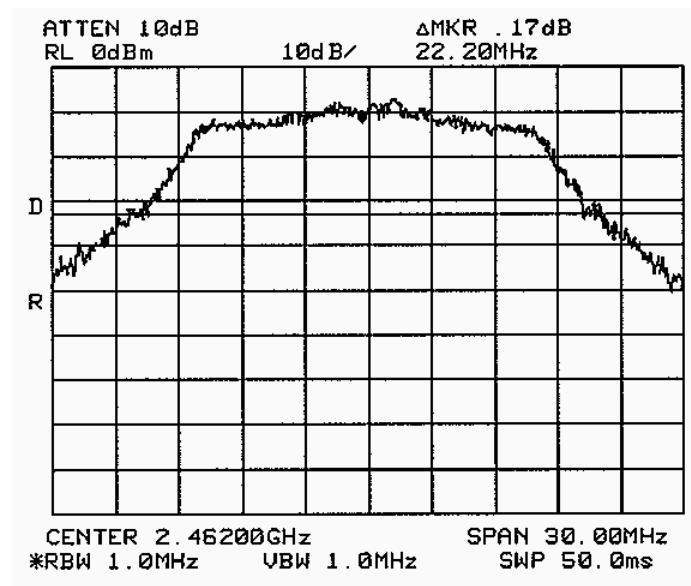


Figure 12

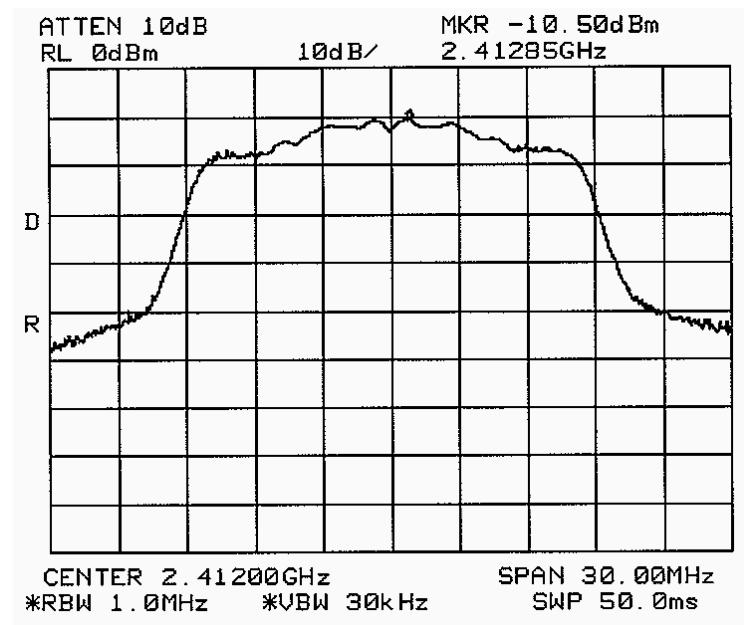


Figure 13 2412 MHz

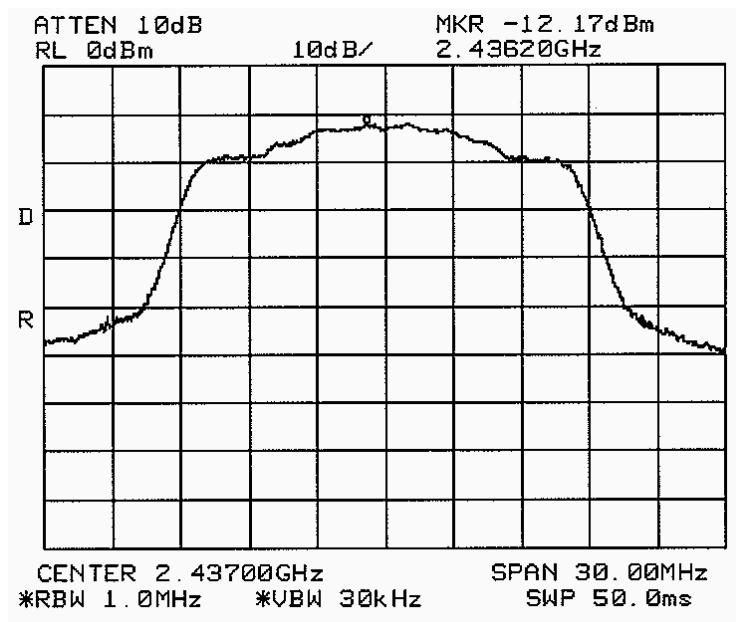


Figure 14 2437 MHz

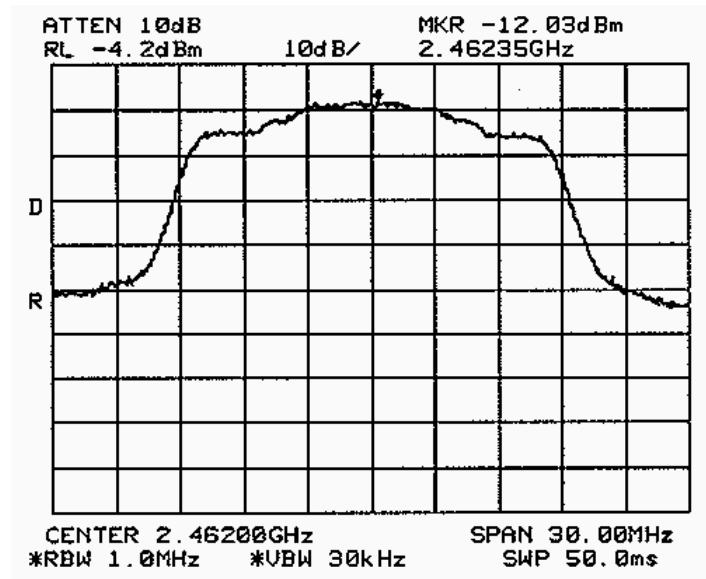


Figure 15 2462 MHz

8.2 Results table

E.U.T. Description: Mobile Data Terminal (MDT)

Model No.: NET-960CE-S4

Serial Number: 404813

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

Operation Frequency (MHz)	Calculated Power (dBm)	Specification (dBm)	Margin (dB)
2412	3.0	30.0	-27.0
2437	1.3	30.0	-28.7
2462	1.5	30.0	-28.5

Figure 16 Maximum Peak Power Output

Calculated Power:

$$\text{EBW} = 22.2\text{MHz}$$

$$\text{For 2412 MHz: } P = -10.5 + 10 \log (\text{EBW}/\text{RBW}) = -10.5 + 13.5 = 3.0\text{dBm}$$

$$\text{For 2437 MHz: } P = -12.17 + 10 \log (\text{EBW}/\text{RBW}) = -12.17 + 13.5 = 1.3\text{dBm}$$

$$\text{For 2462 MHz: } P = -12 + 10 \log (\text{EBW}/\text{RBW}) = -12 + 13.5 = 1.5\text{dBm}$$



JUDGEMENT: Passed by 27.0 dB

TEST PERSONNEL:

Tester Signature: Date: 04.07.07
Typed/Printed Name: E. Pitt

8.3 Test Equipment Used.

Peak Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 21, 2006	1 year
Cable	Rhophase	KPS-1501-1000	A1675	December 16, 2006	1 year

Figure 17 Test Equipment Used

9 Peak Power Output Out of 2400-2483.5 MHz Band

9.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW except for the frequency range 9 kHz-150 kHz where the RBW was set to 1kHz and the frequency range 150 kHz-1.0 MHz where the RBW was set to 10kHz. The frequency range from 9 kHz to 25 GHz was scanned. Level of spectrum components out of the 2400-2483.5 MHz was measured at the selected operation frequencies.

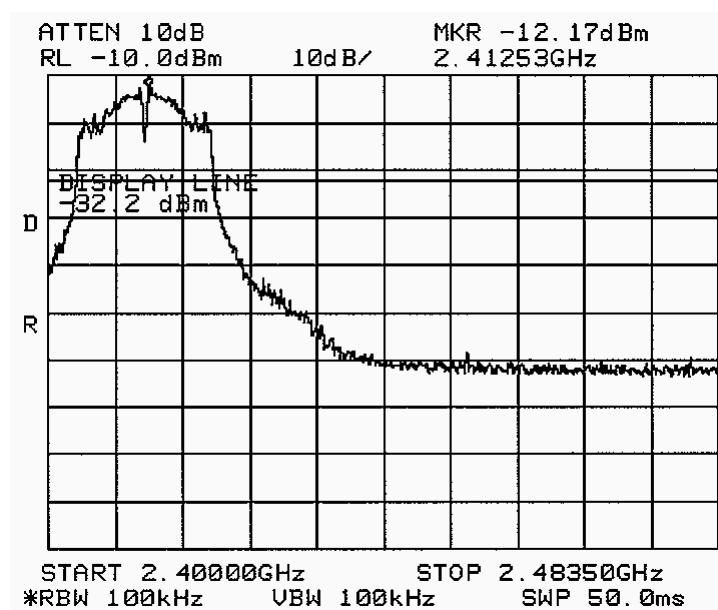


Figure 18 —2412 MHz

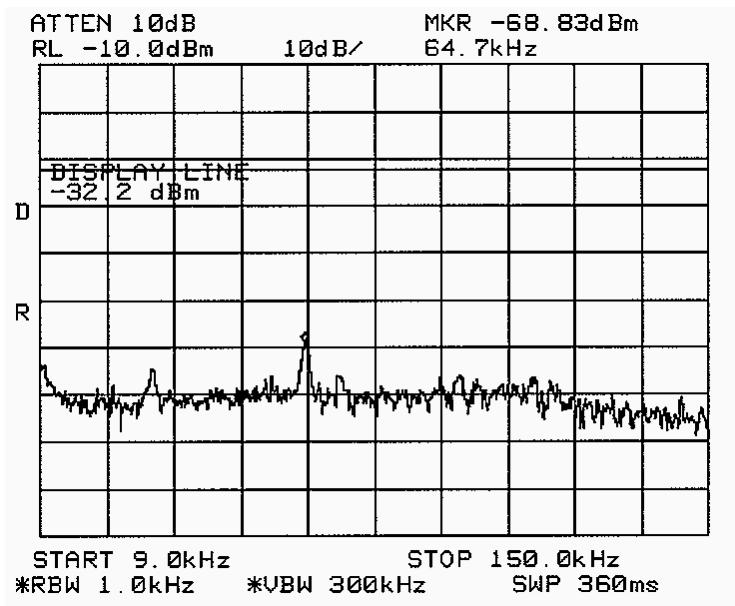


Figure 19 — 2412 MHz

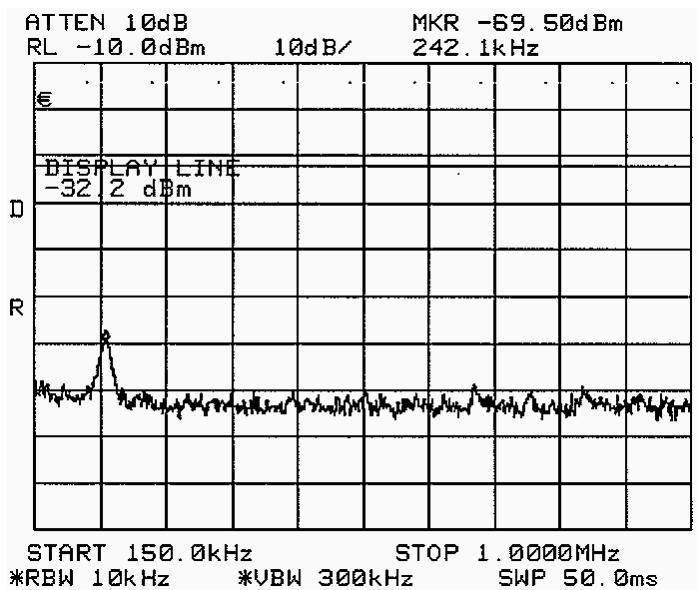


Figure 20 — 2412 MHz

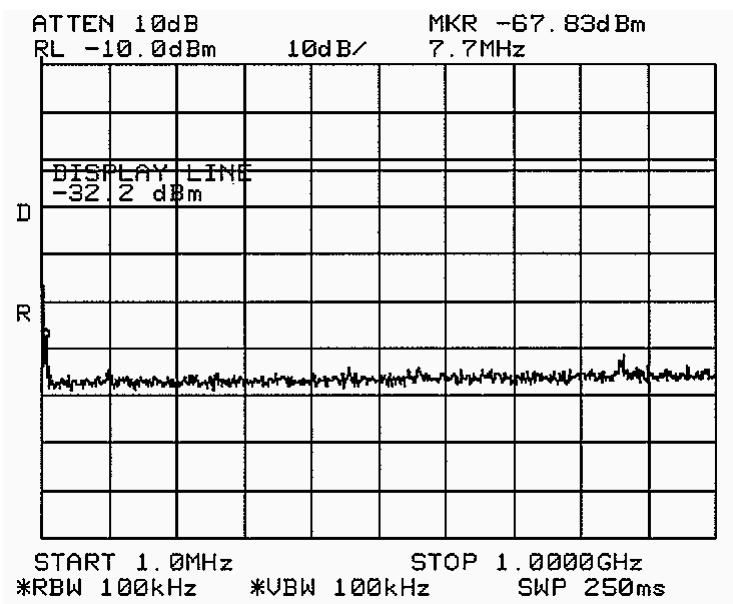


Figure 21 — 2412 MHz

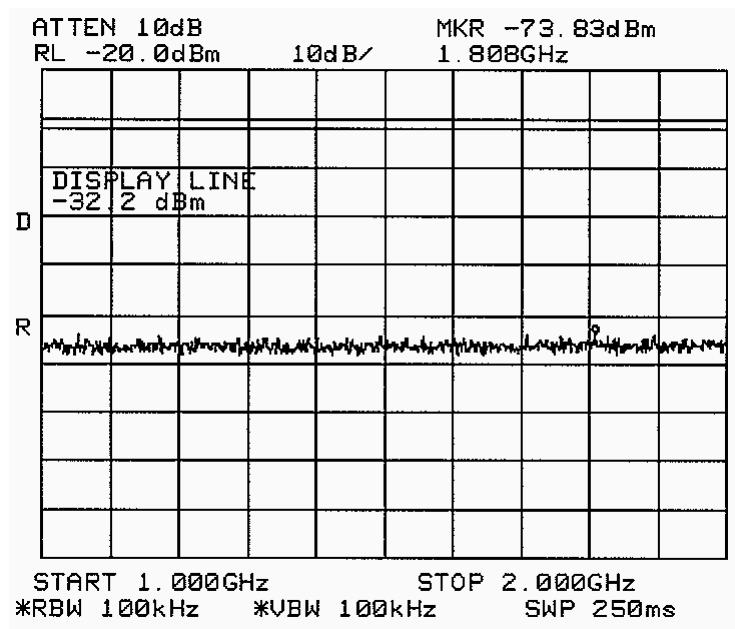


Figure 22 — 2412 MHz

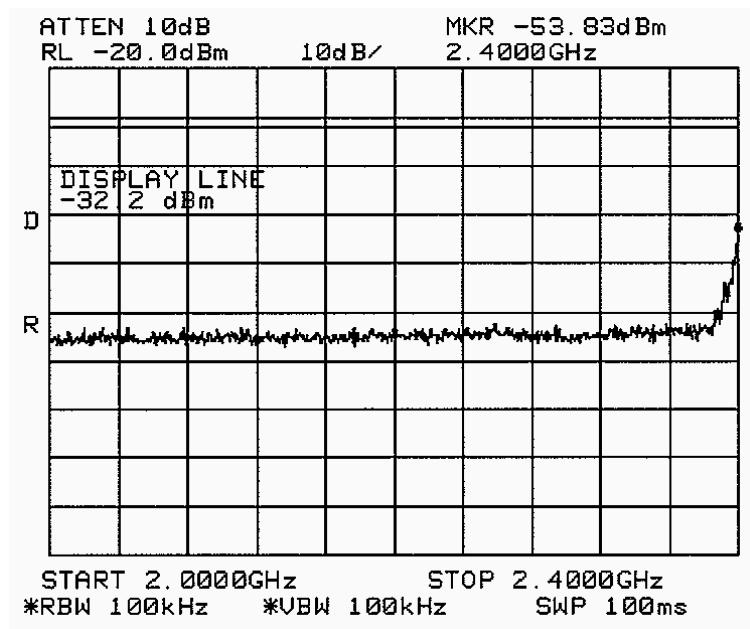


Figure 23 —2412 MHz

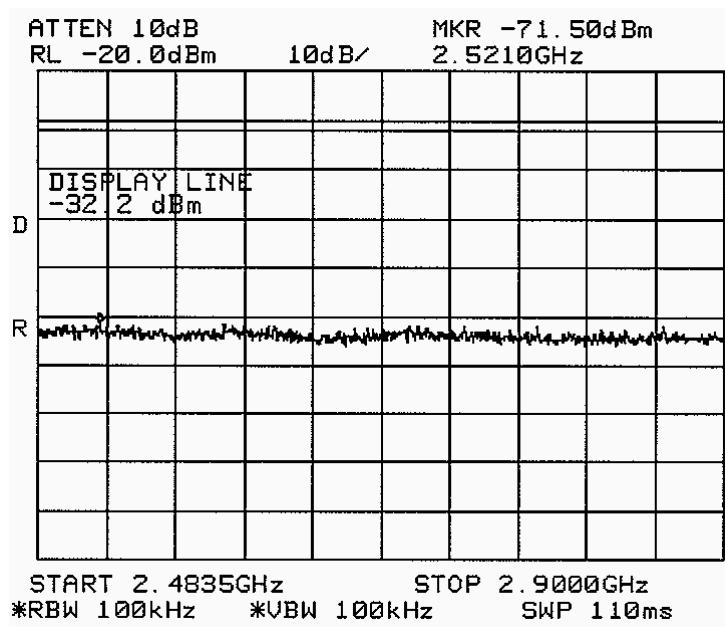


Figure 24 —2412 MHz

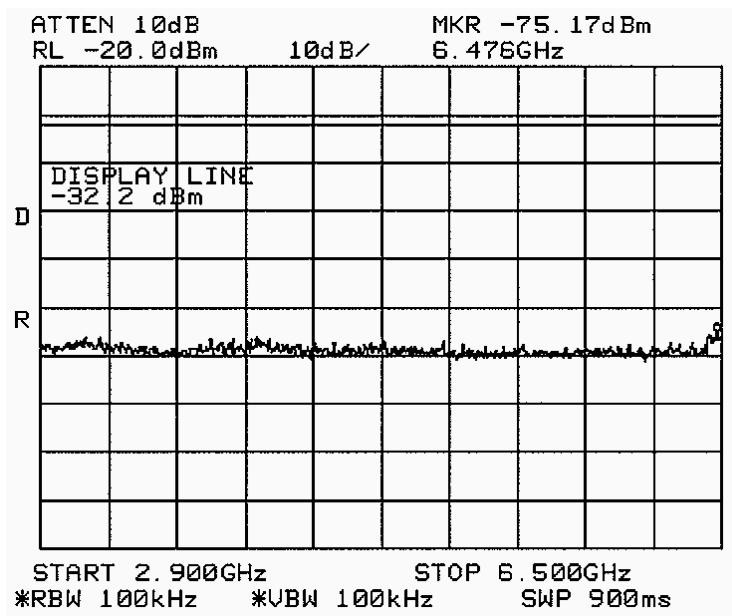


Figure 25 —2412 MHz

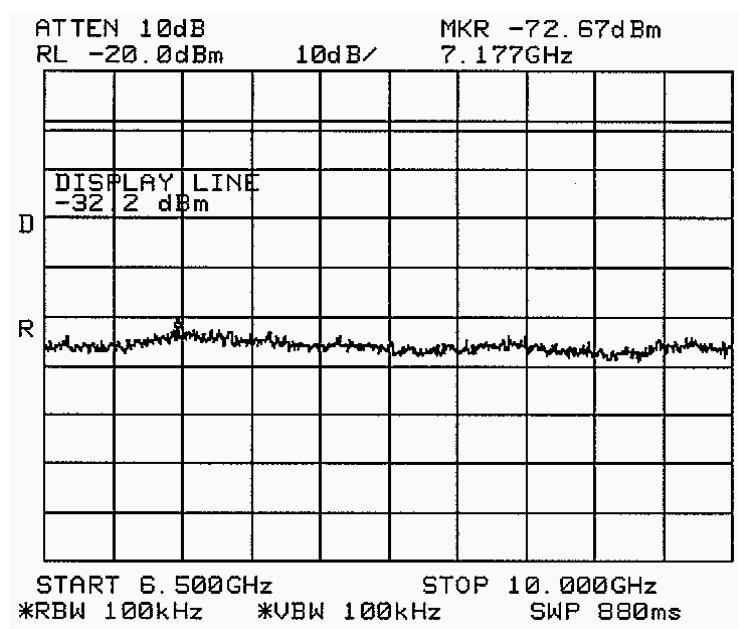


Figure 26 —2412 MHz

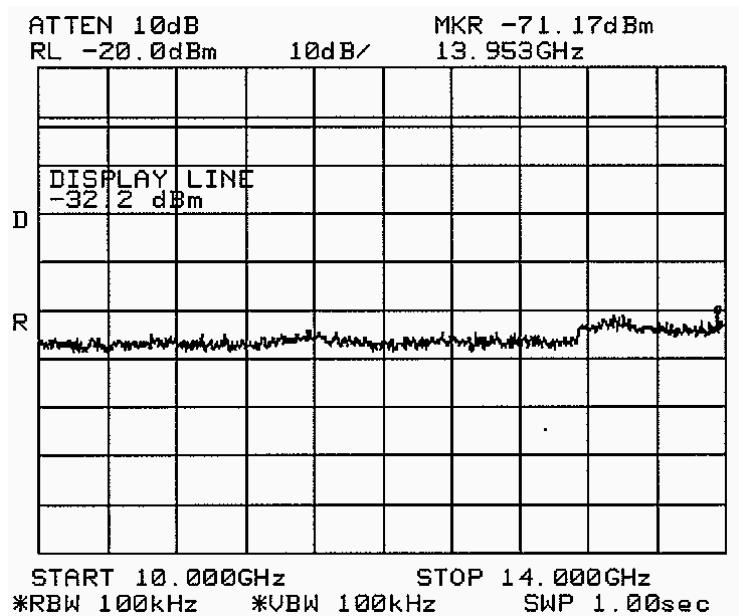


Figure 27 —2412 MHz

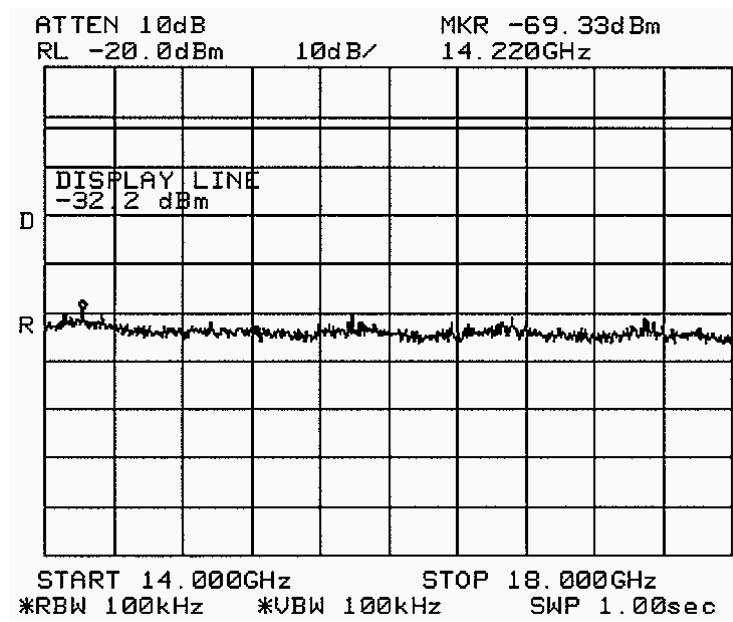


Figure 28 —2412 MHz

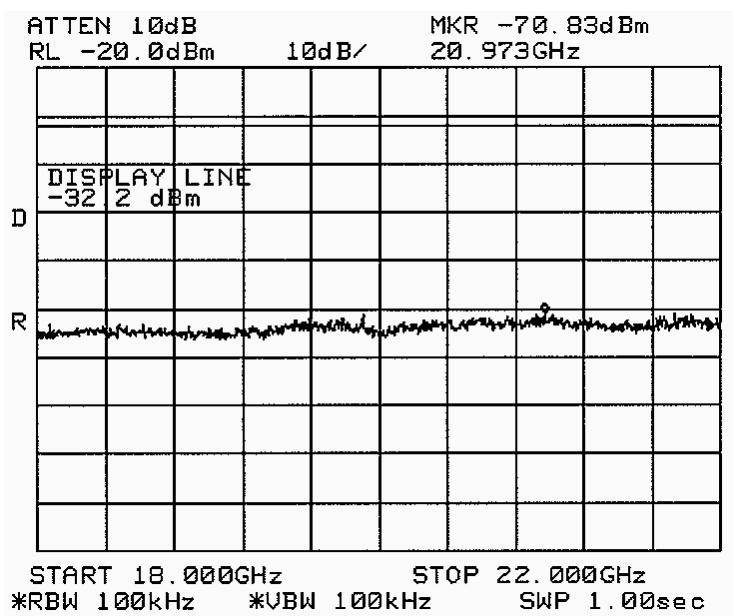


Figure 29 —2412 MHz

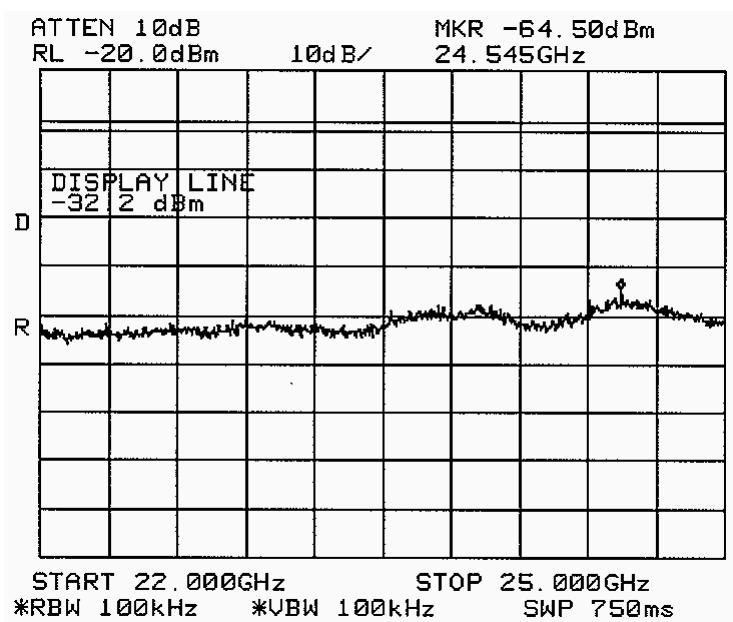


Figure 30 —2412 MHz

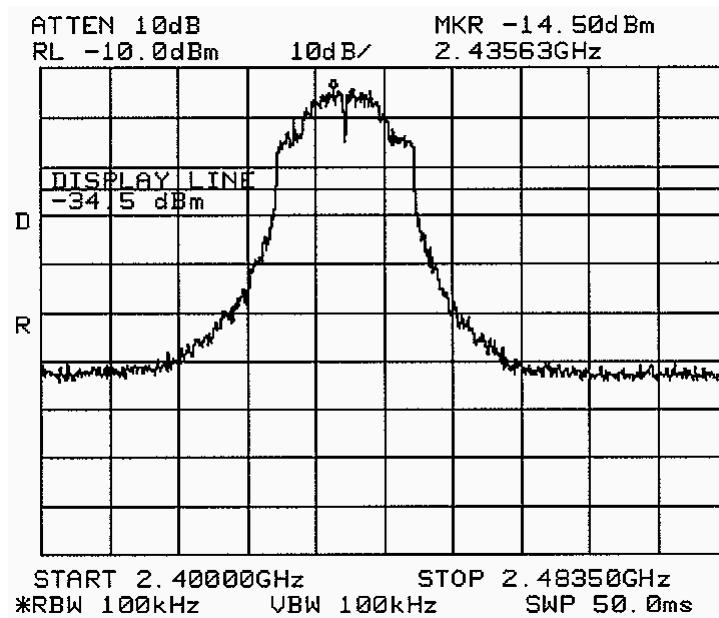


Figure 31 —2437 MHz

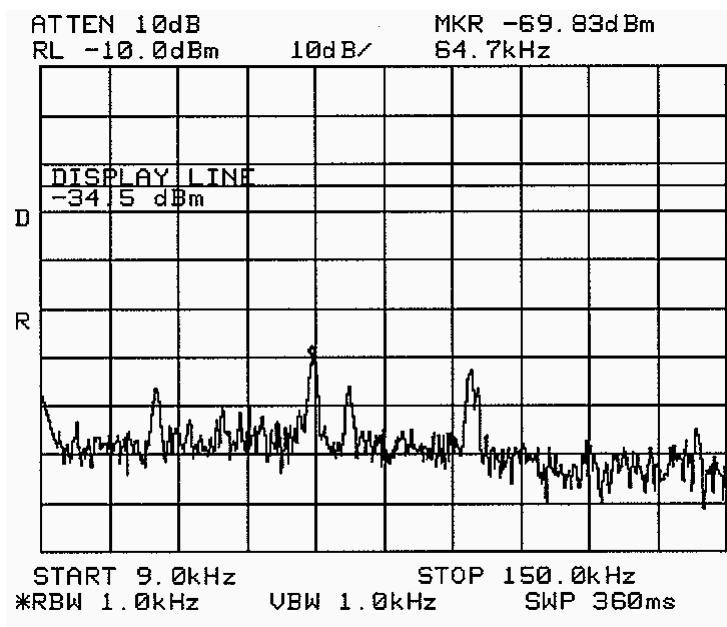


Figure 32 —2437 MHz

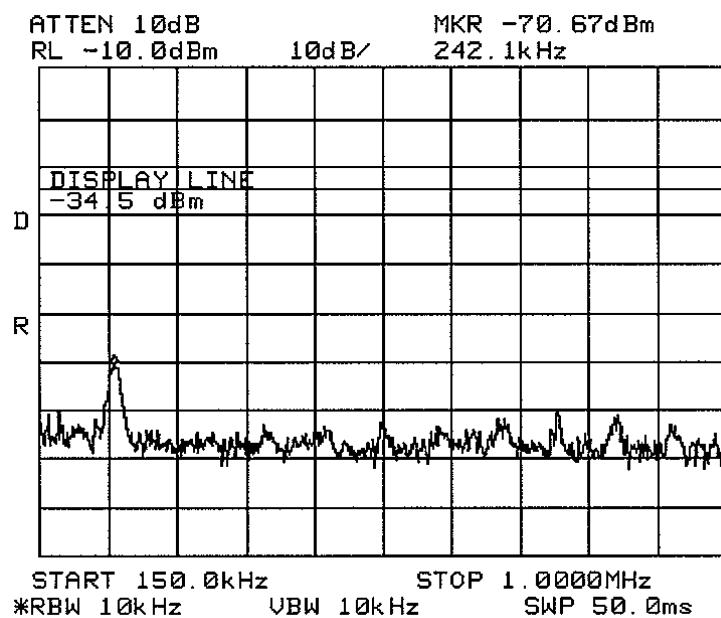


Figure 33 — 2437 MHz

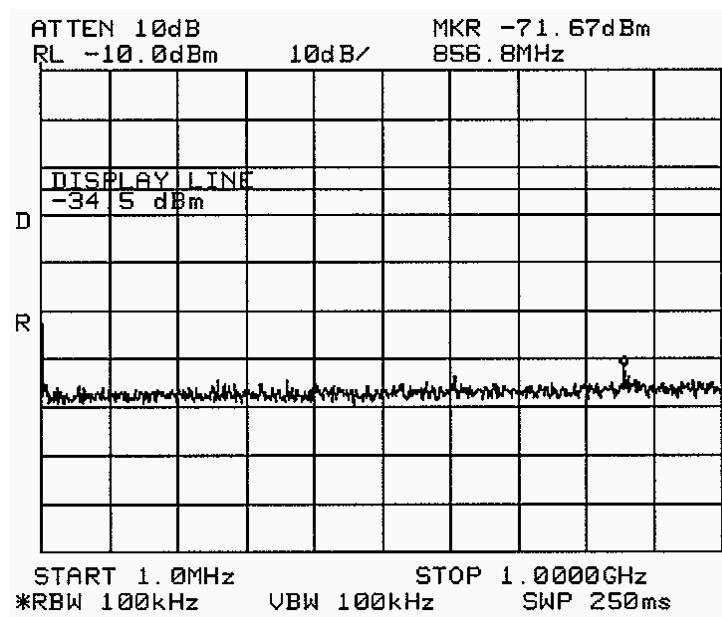


Figure 34 —2437 MHz

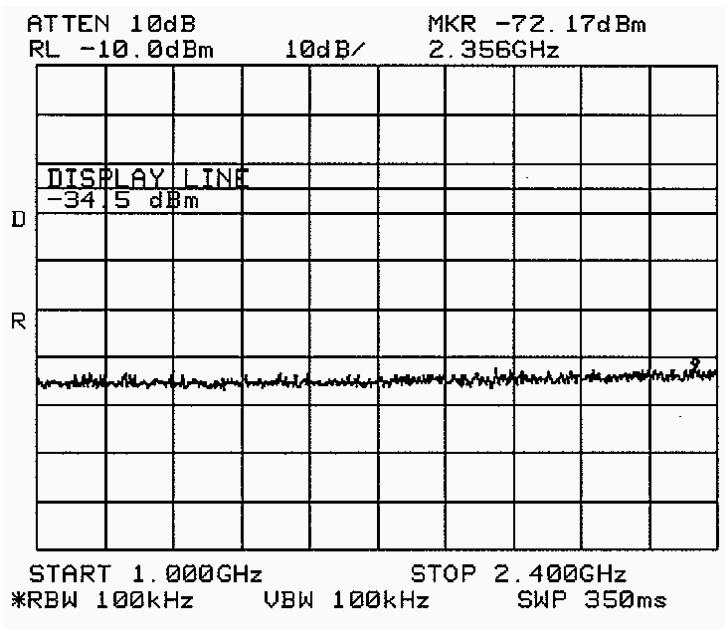


Figure 35 —2437 MHz

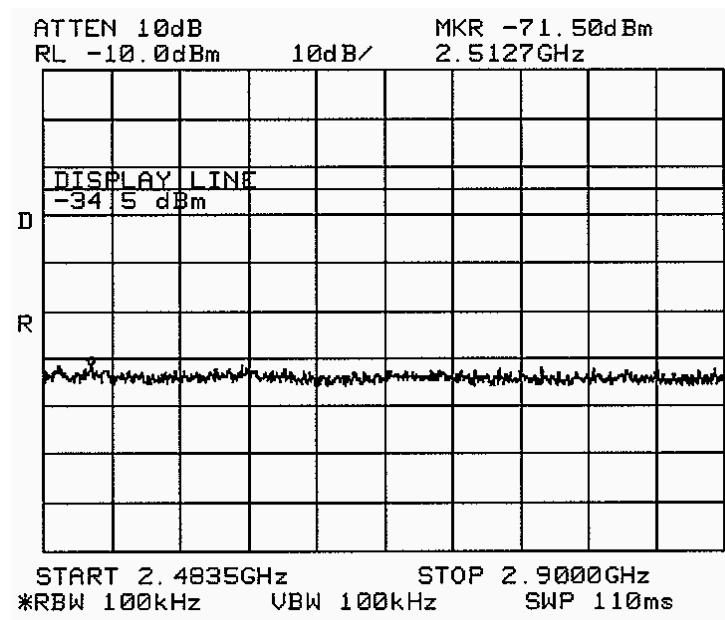


Figure 36 —2437 MHz

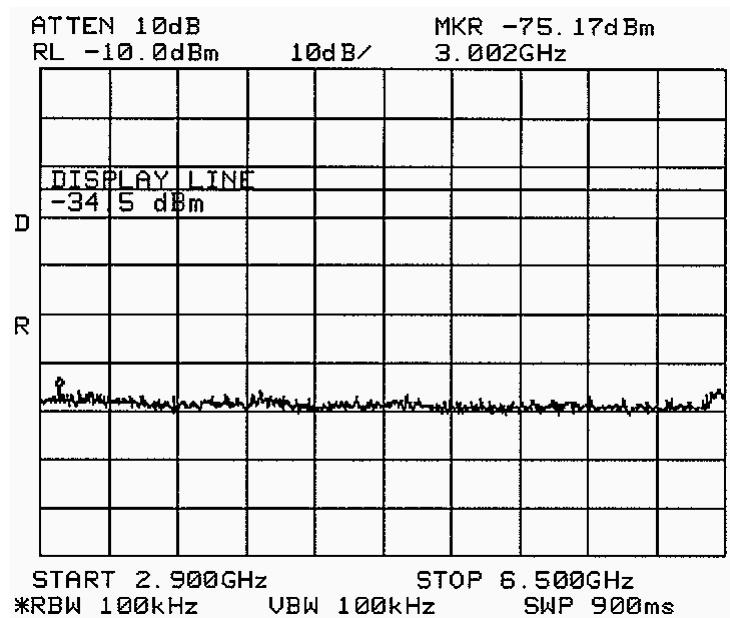


Figure 37 —2437 MHz

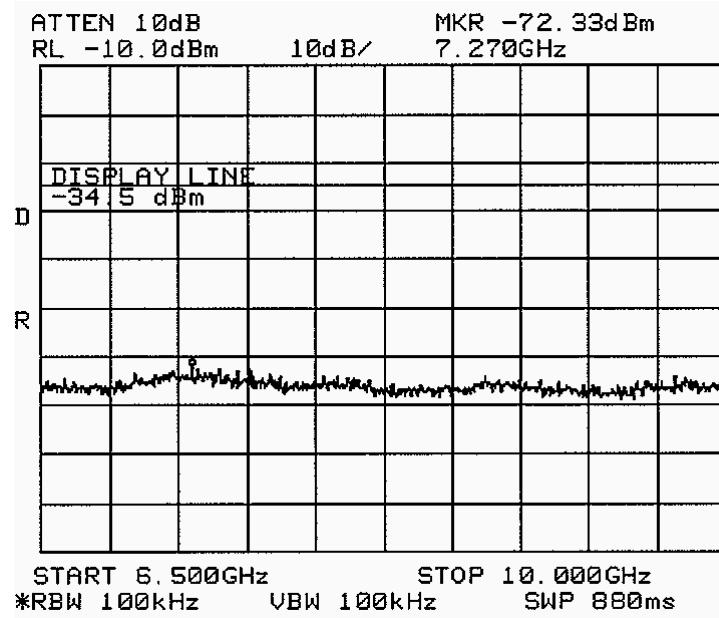


Figure 38 —2437 MHz

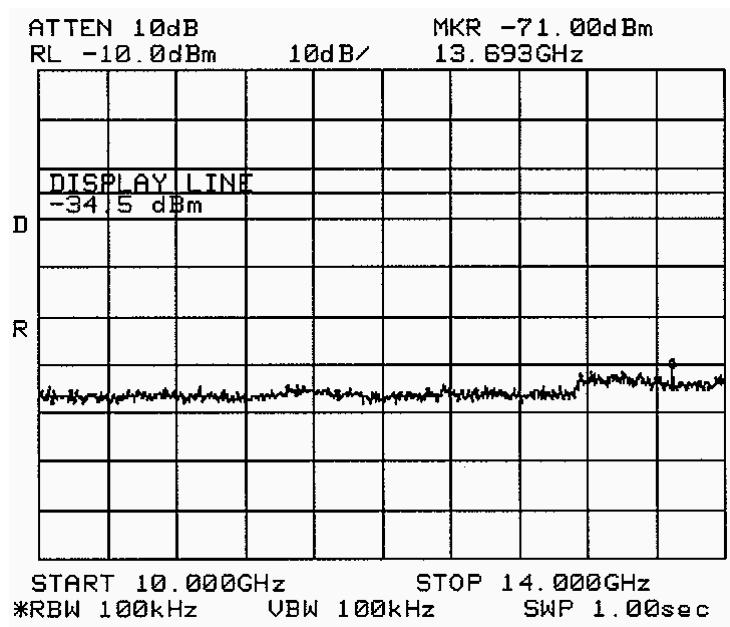


Figure 39 — 2437 MHz

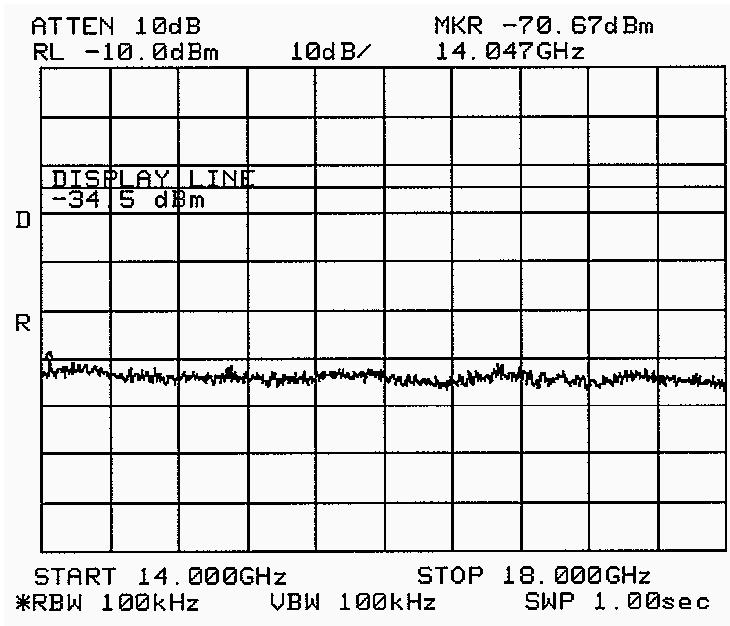


Figure 40 —2437 MHz

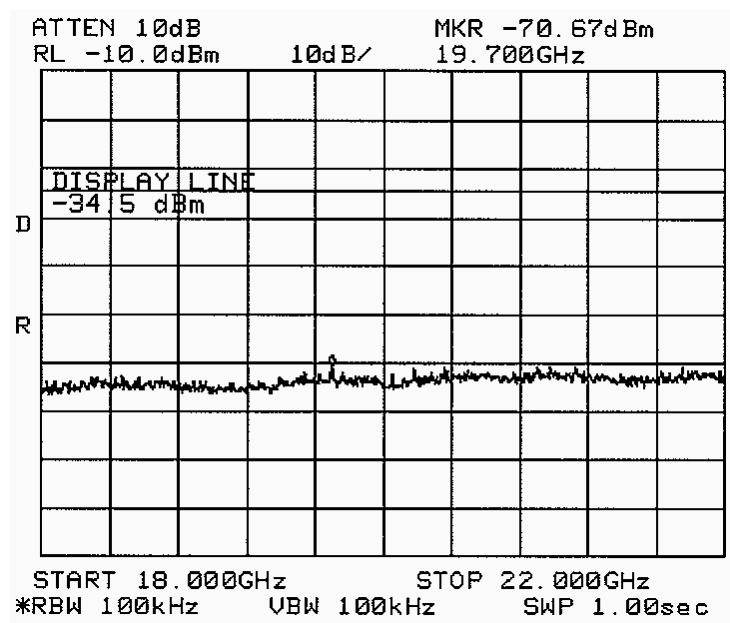


Figure 41 —2437 MHz

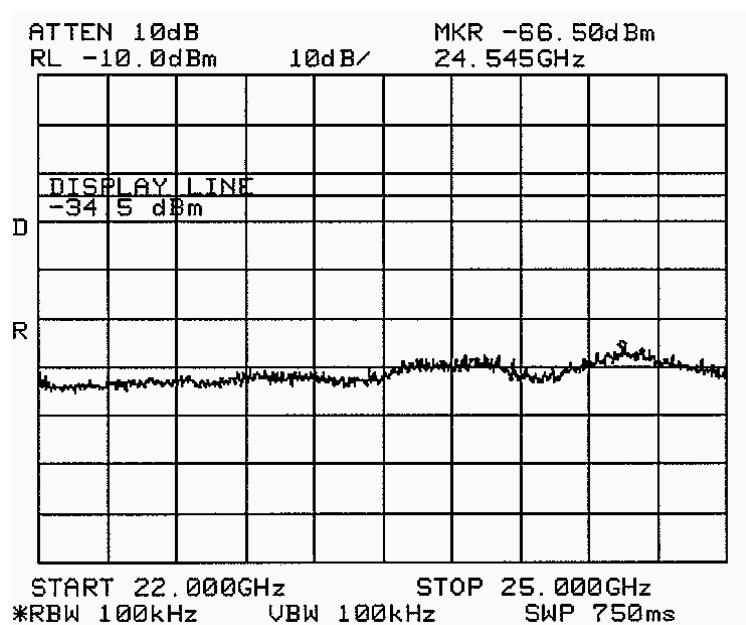


Figure 42 — 2437 MHz

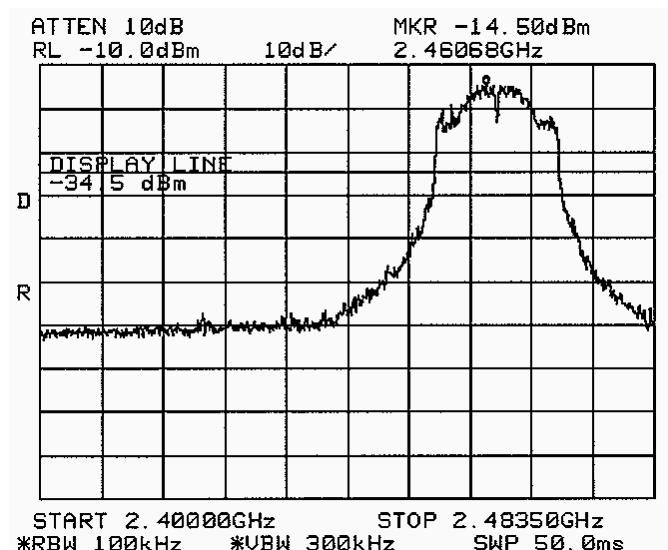


Figure 43 —2462 MHz

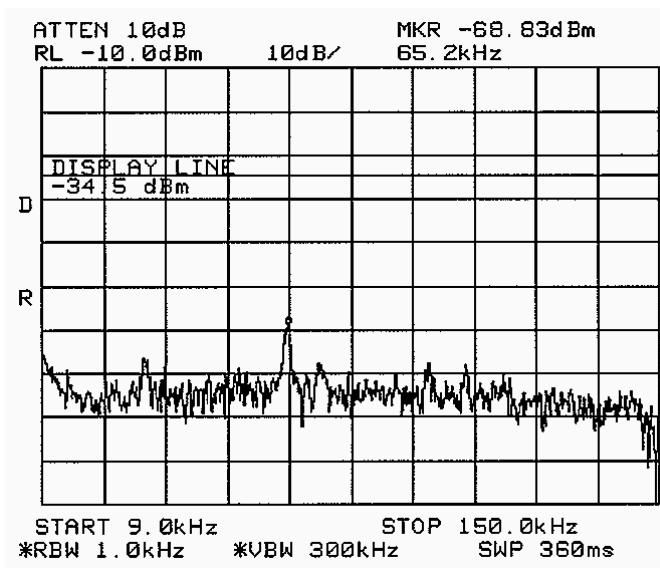


Figure 44 —2462 MHz

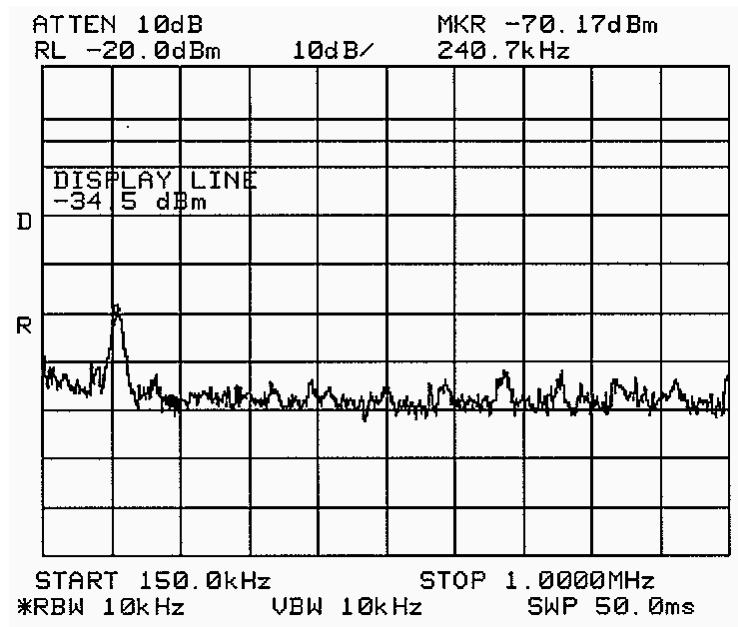


Figure 45 — 2462 MHz

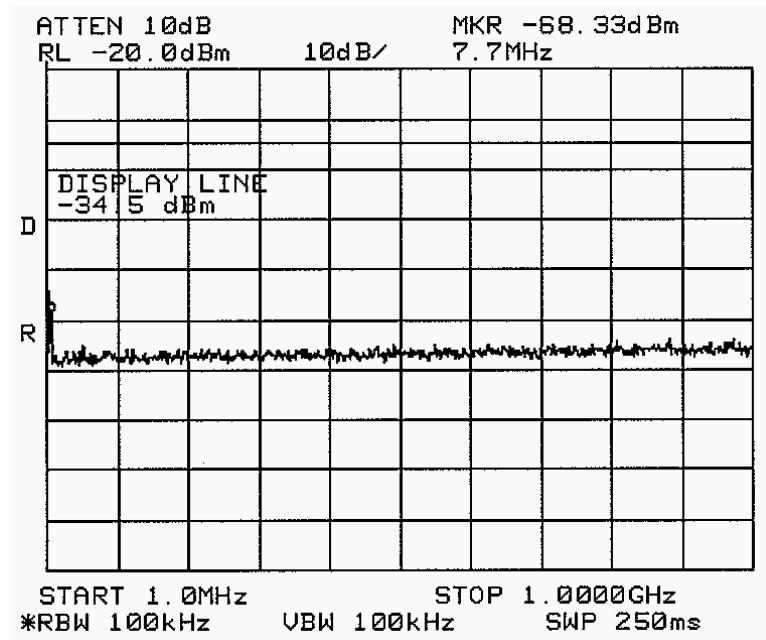


Figure 46 — 2462 MHz

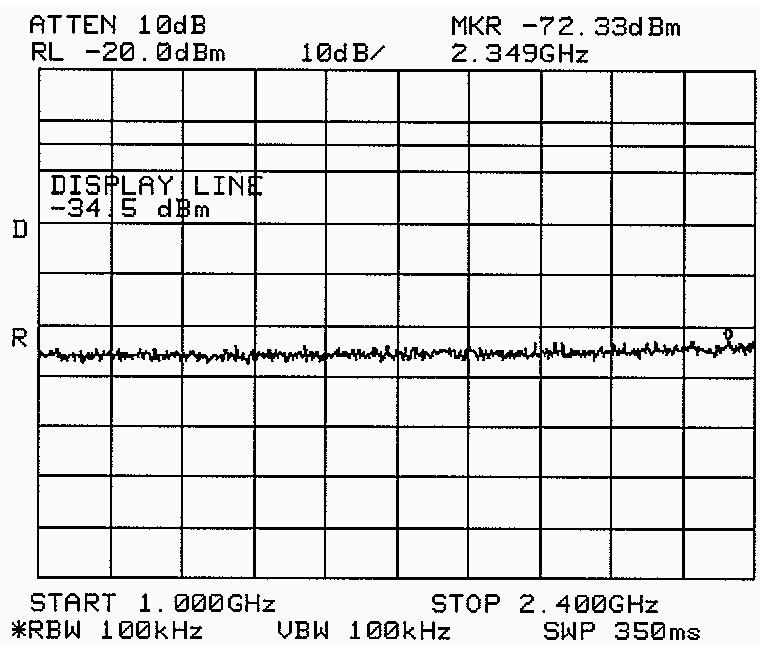


Figure 47 —2462 MHz

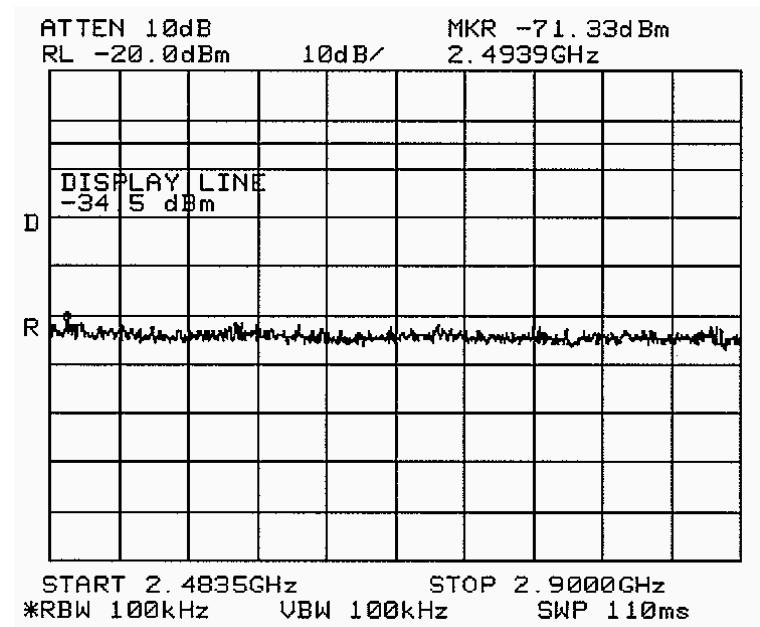


Figure 48 —2462 MHz

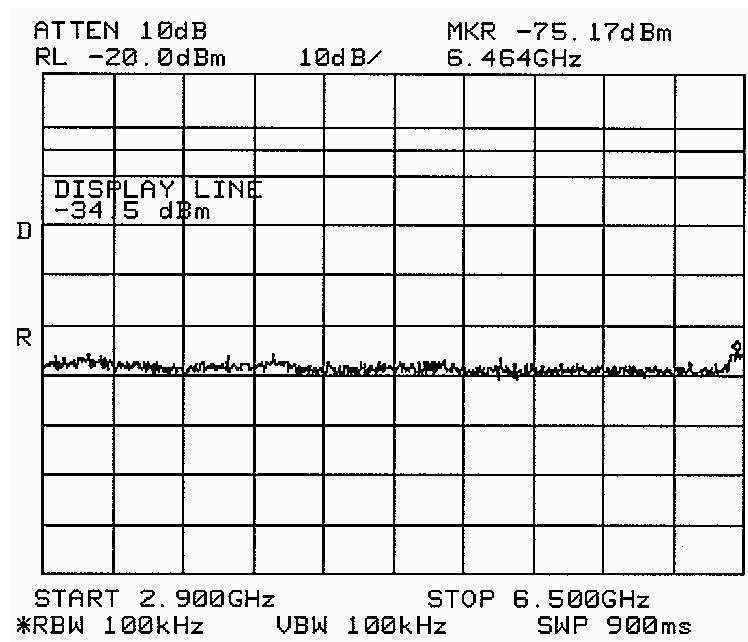


Figure 49 —2462 MHz

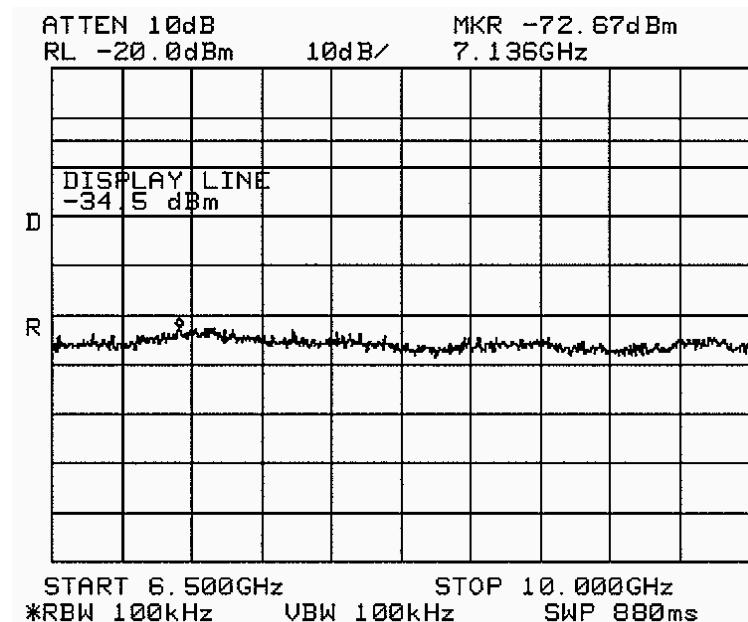


Figure 50 —2462 MHz

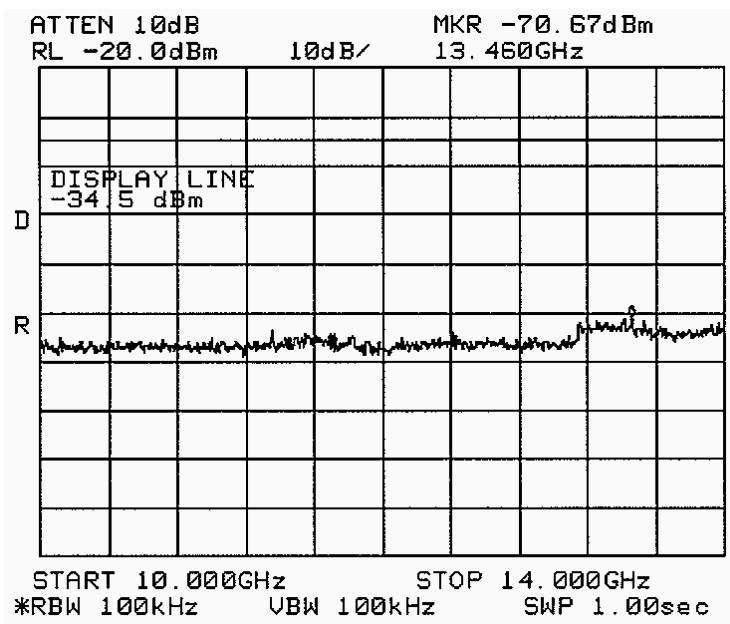


Figure 51 —2462 MHz

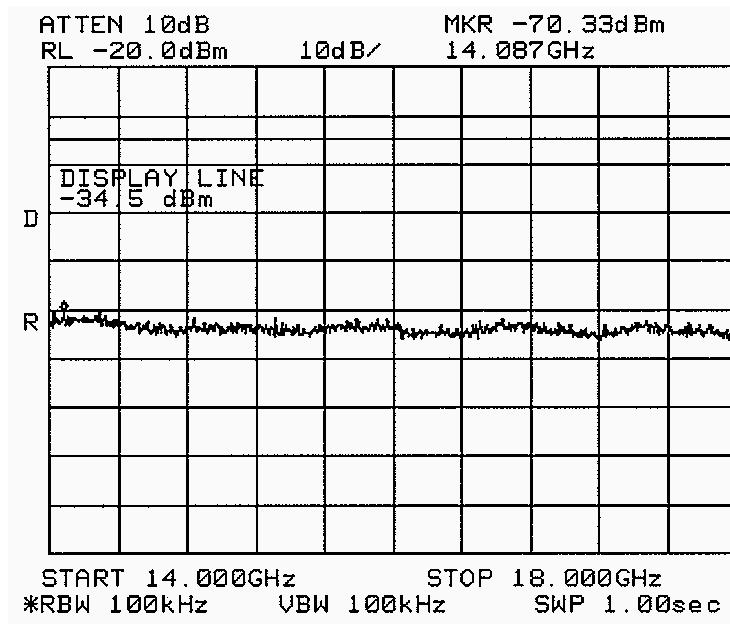


Figure 52 —2462 MHz

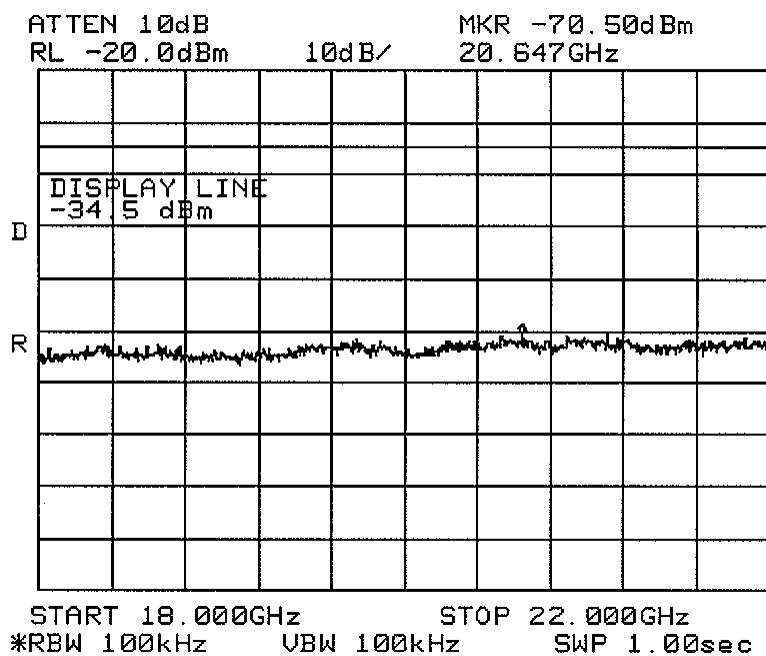


Figure 53 —2462 MHz

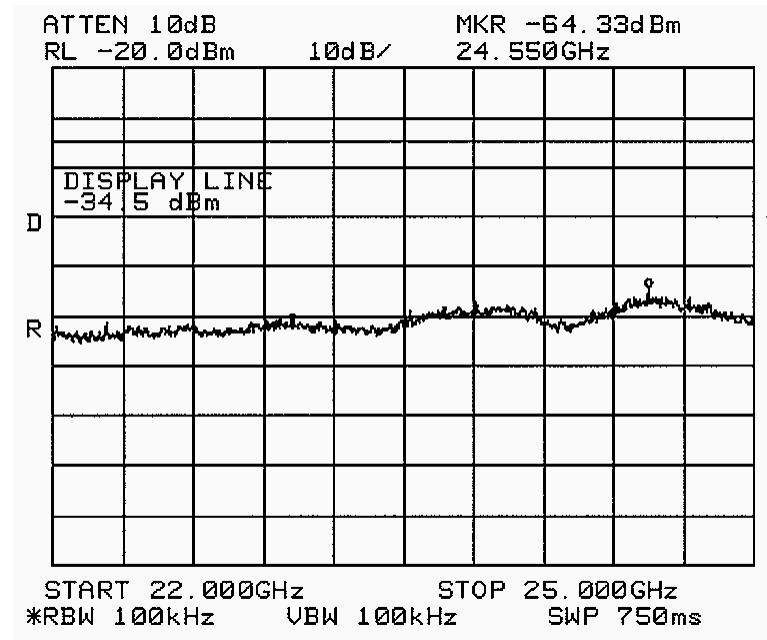


Figure 54 —2462 MHz



9.2 Results table

E.U.T Description: Mobile Data Terminal (MDT)

Model No.: NET-960CE-S4

Serial Number: 404813

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

Operation Frequency (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
2412	41.66	20.0	21.66
2437	52.00	20.0	32.00
2462	49.83	20.0	29.83

Figure 55 Peak Power Output of 2400-2483.5 MHz Band

JUDGEMENT: Passed by 21.66 dB

TEST PERSONNEL:

Tester Signature: Pitt Date: 04.07.07

Typed/Printed Name: E. Pitt

9.3 Test Equipment Used.

Peak Power Output of 2400-2438.5 MHz Band

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 21, 2006	1 year
Cable	Rhophase	KPS-1501-1000	A1675	December 16, 2006	1 year

Figure 56 Test Equipment Used

10 6 dB Minimum Bandwidth

10.1 Test procedure

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

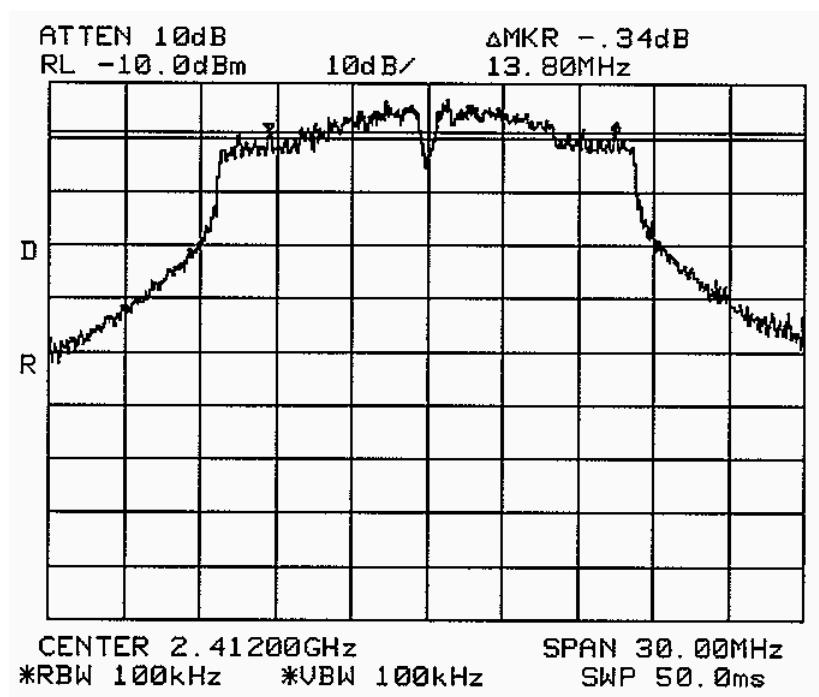


Figure 57 —2412 MHz

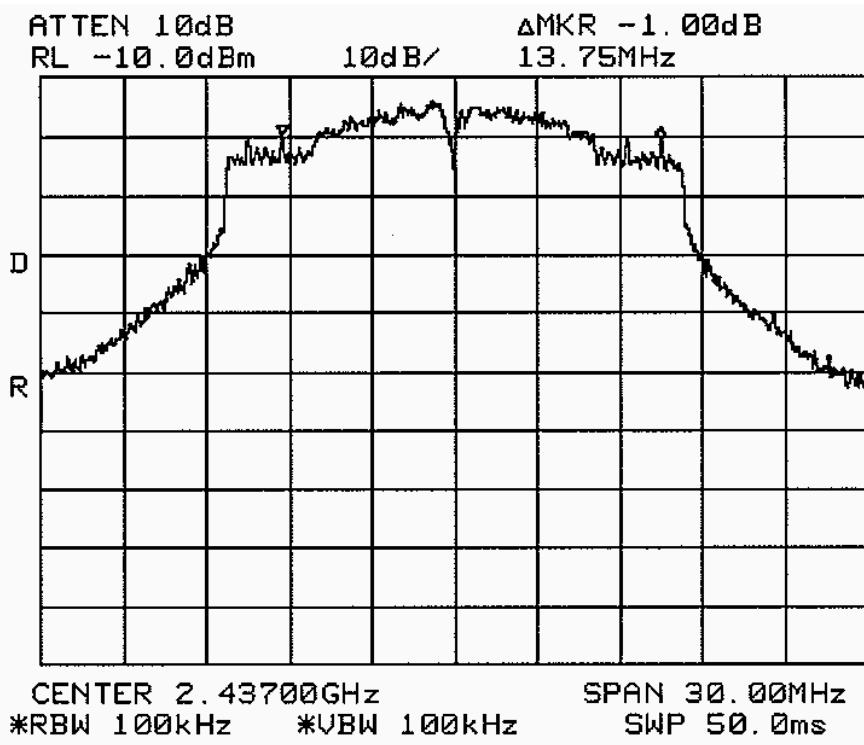


Figure 58 —2437 MHZ

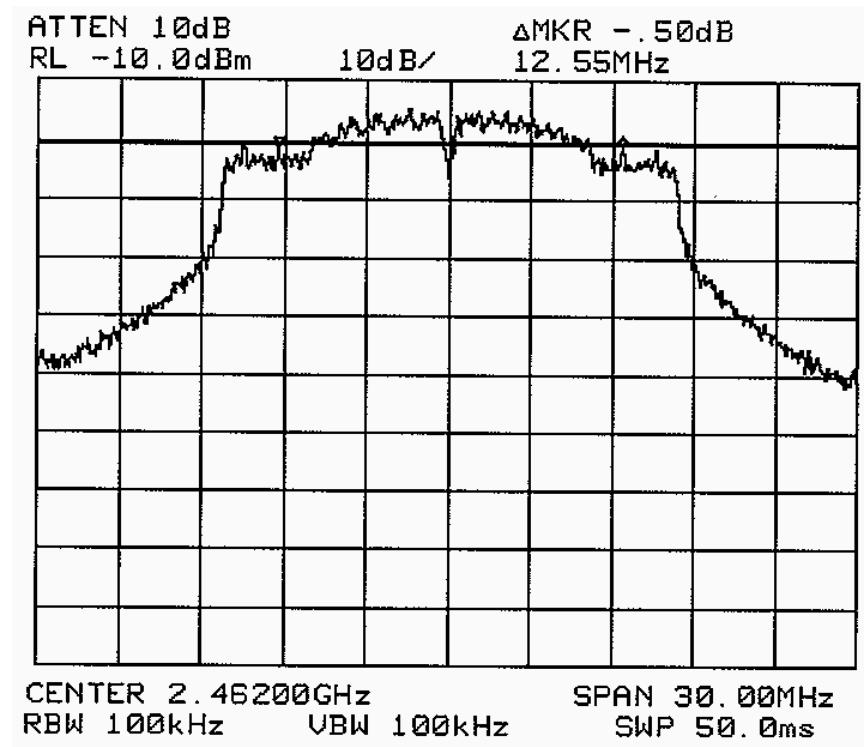


Figure 59 —2462 MHz

10.2 Results table

E.U.T Description: Mobile Data Terminal (MDT)

Model No.: NET-960CE-S4

Serial Number: 404813

Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Reading (MHz)	Specification (MHz)
2412	13.80	0.5
2437	13.75	0.5
2462	12.55	0.5

Figure 60 6 dB Minimum Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: E. Pitt Date: 04.07.07

Typed/Printed Name: E. Pitt

10.3 Test Equipment Used.

6 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 21, 2006	1 year
Cable	Rhophase	KPS-1501-1000	A1675	December 16, 2006	1 year

Figure 61 Test Equipment Used

11 Band Edge Spectrum

[In Accordance with section 15.247(c)]

11.1 Test procedure

The E.U.T. 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 2400 MHz and above 2483.5 MHz was measured relative to power level at 2412 MHz, and 2462 MHz correspondingly.

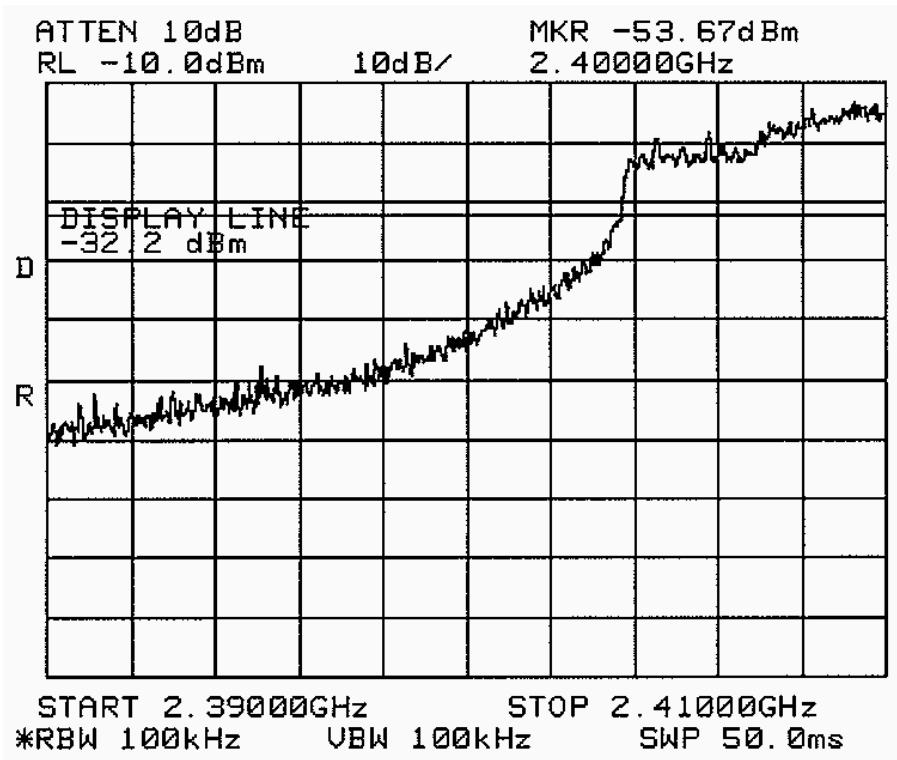


Figure 62 —2412 MHz

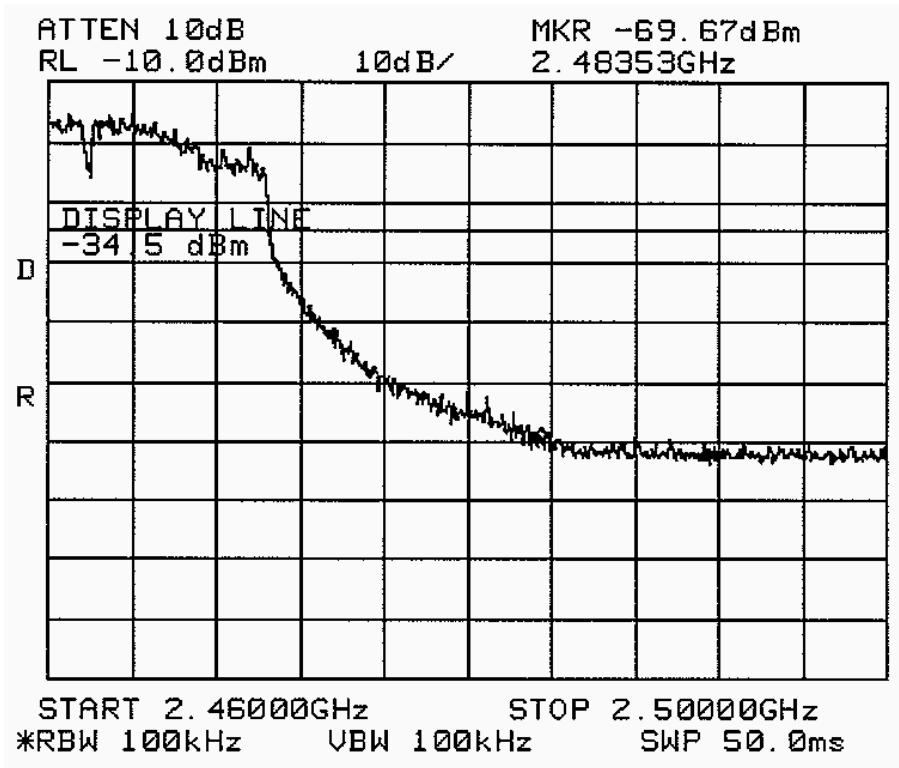


Figure 63 —2462 MHz

11.2 Results table

E.U.T. Description: Mobile Data Terminal (MDT)

Model No.: NET-960CE-S4

Serial Number: 404813

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

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBc)	Specification (dBc)	Margin (dB)
2412	2400.00	41.47	20.0	-21.47
2462	2483.53	55.17	20.0	-35.17

Figure 64 Band Edge Spectrum

JUDGEMENT: Passed by 21.47 dB

TEST PERSONNEL:

Tester Signature: Pitt

Date: 04.07.07

Typed/Printed Name: E. Pitt



11.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 21, 2006	1 year
Cable	Rhophase	KPS-1501-1000	A1675	December 16, 2006	1 year

Figure 65 Test Equipment Used

12 Transmitted Power Density

[In accordance with section 15.247(d)]

12.1 Test procedure

The E.U.T. 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.

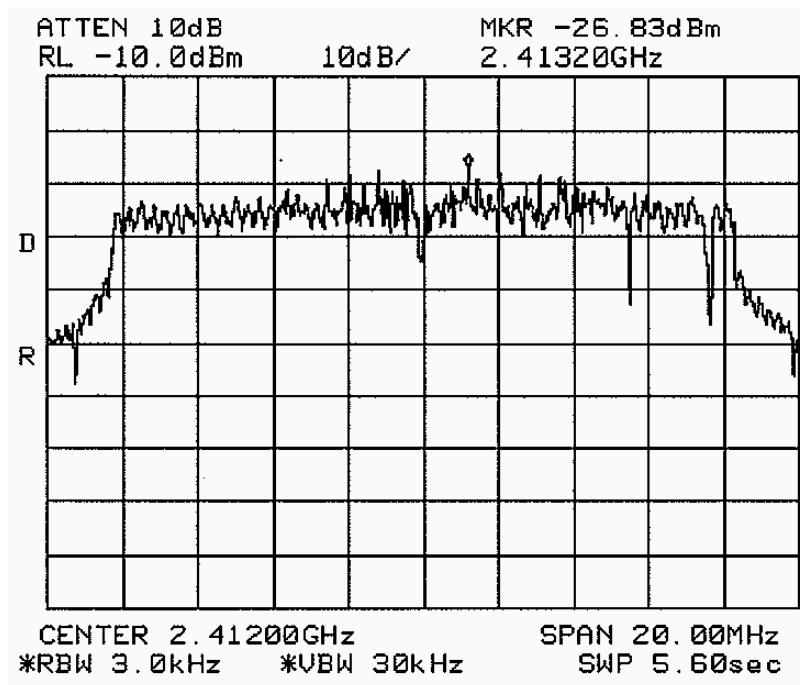


Figure 66 —2412 MHz

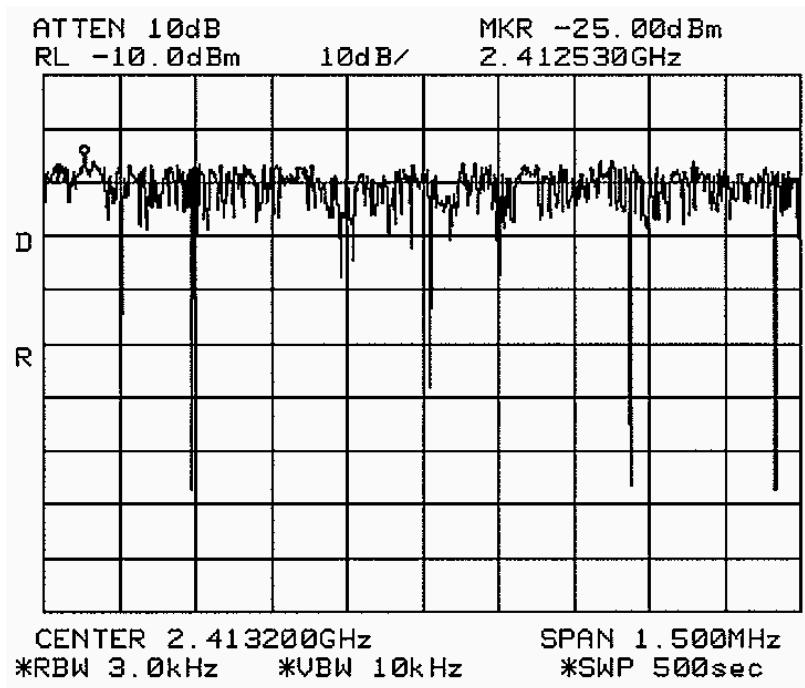


Figure 67 —2412 MHz

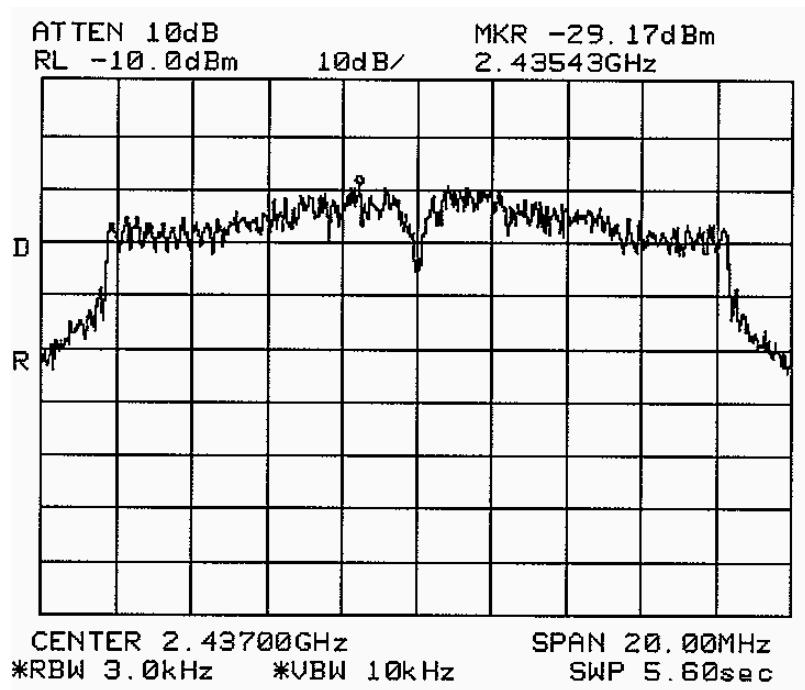


Figure 68 —2437 MHz

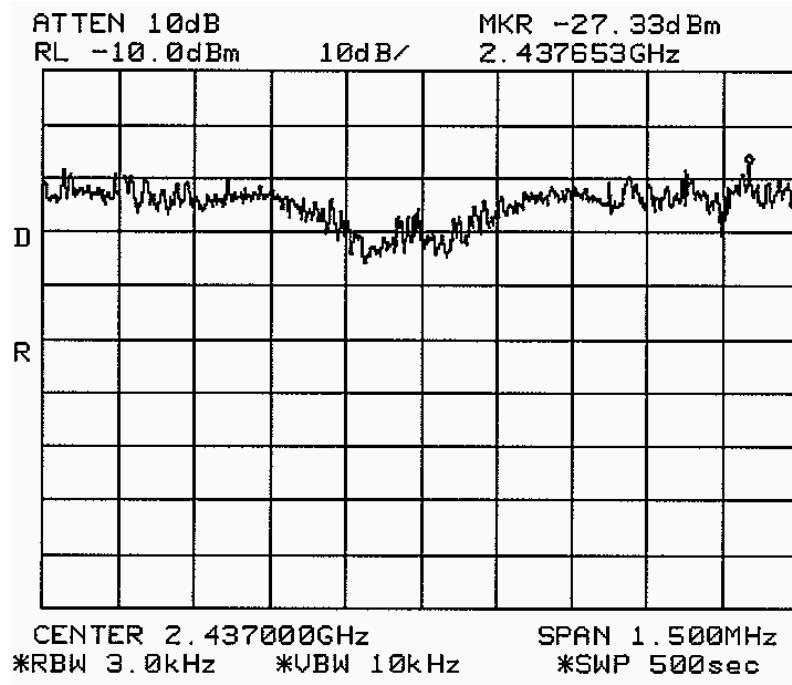


Figure 69 —2437 MHz

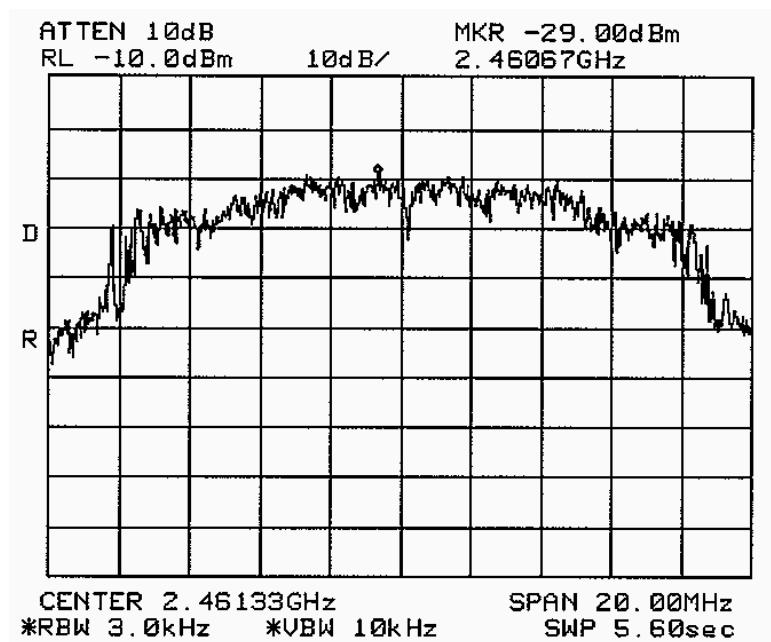


Figure 70 —2462 MHz

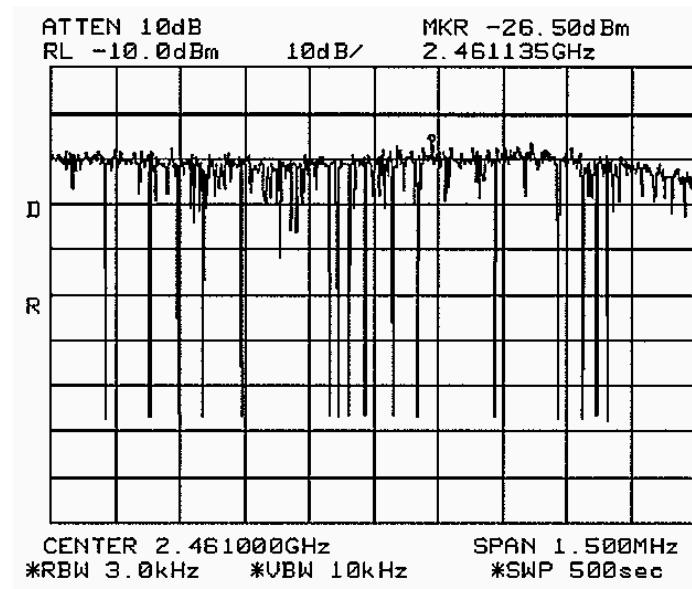


Figure 71 —2462 MHz

12.2 Results table

E.U.T. Description: Mobile Data Terminal (MDT)

Model No.: NET-960CE-S4

Serial Number: 404813

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

Operation Frequency (MHz)	Reading Signal Analyzer (dBm)	Specification (dBm)	Margin (dB)
2412	-25.00	8.0	-33.00
2437	-27.33	8.0	-35.33
2462	-26.50	8.0	-34.50

Figure 72 Test Results



JUDGEMENT: Passed by 33.00 dB

TEST PERSONNEL:

Tester Signature: E. Pitt Date: 04.07.07
Typed/Printed Name: E. Pitt

12.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 21, 2006	1 year
Cable	Rhophase	KPS-1501-1000	A1675	December 16, 2006	1 year

Figure 73 Test Equipment Used



13 Antenna Gain

The antenna gain is 2.1dBi.

14 R.F Exposure/Safety

Typical use of the E.U.T. is vehicle tracking and monitoring. The typical placement of the E.U.T. is in a motor vehicle. The typical distance between the E.U.T. and the user in the worst case application, is >20 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2437 MHz is: $1 \frac{mW}{cm^2}$

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 2mw (Peak) = 3 dBm

G_T- Antenna Gain, 2.1 dBi

R- Distance from Transmitter using 20cm worst case

(c) The peak power density is :

$$S_p = \frac{1.2}{4\pi(20)^2} = 0.4 \times 10^{-3} \frac{mW}{cm^2}$$

(d) The duty cycle of transmission in actual worst case during 100 msec., 2 packets, each packet 13.4 msec.

The average power source based time average, 100 msec. time window) is:

$$P_{AV} = \frac{2 \times 26.8}{100} = 0.54mW$$

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

$$S_{AV} = \frac{0.54}{4\pi(20)^2} = 1.1 \times 10^{-4} \frac{mW}{cm^2}$$

(f) This is 4 orders of magnitude below the FCC limit.

15. Radiated Emission Test Data Per FCC Part 15, Sub-part B

15.1 ***Test Specification***

30-1000 MHz, FCC Part 15, Subpart B, CLASS B

15.2 ***Test Procedure***

The E.U.T operation mode and test configuration are as described in section 4.

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 photographs *Figure 4. Radiated Emission Test* and *Figure 5. Radiated Emission Test*.

The E.U.T. highest frequency source or used frequency is 96 MHz.

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

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.

The emissions were measured at a distance of 3 meters.

The E.U.T. was tested in both Rx and Tx modes.

The E.U.T. was tested together with the PS/2 to RS232 Keyboard Adapter, M/N NET-531, S/N 377280, manufactured by Micronet.



15.3 Test Data

JUDGEMENT: Passed by 2.4 dB

The results for both Rx and Tx modes were the same.

The E.U.T met the requirements of the FCC Part 15, Subpart B, Class B specification.

The details of the highest emissions are given in *Figure 74* to *Figure 77*.



Radiated Emission

E.U.T Description Mobile Data Terminal (MDT)
Type NET-960CE-S4
Serial Number: 404813

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	108.000000	35.8	32.7	-10.8			12.6
2	216.020500	39.7	34.6	-11.4			18.0
3	240.007000	39.4	35.6	-10.4			19.2
4	384.020000	49.7	43.4	-2.6			18.5
5	480.042500	43.0	39.4	-6.6			20.1
6	960.035000	46.2	41.1	-12.9			29.1

**Figure 74. Radiated Emission. Antenna Polarization: HORIZONTAL.
Detectors: Peak, Quasi-peak**

Note: QP Delta 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.

Radiated Emission

E.U.T Description: Mobile Data Terminal (MDT)
Type: NET-960CE-S4
Serial Number: 404813

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal Frequency range: 30 MHz to 1000 MHz
Antenna: 3 meters distance Detectors: Peak, Quasi-peak

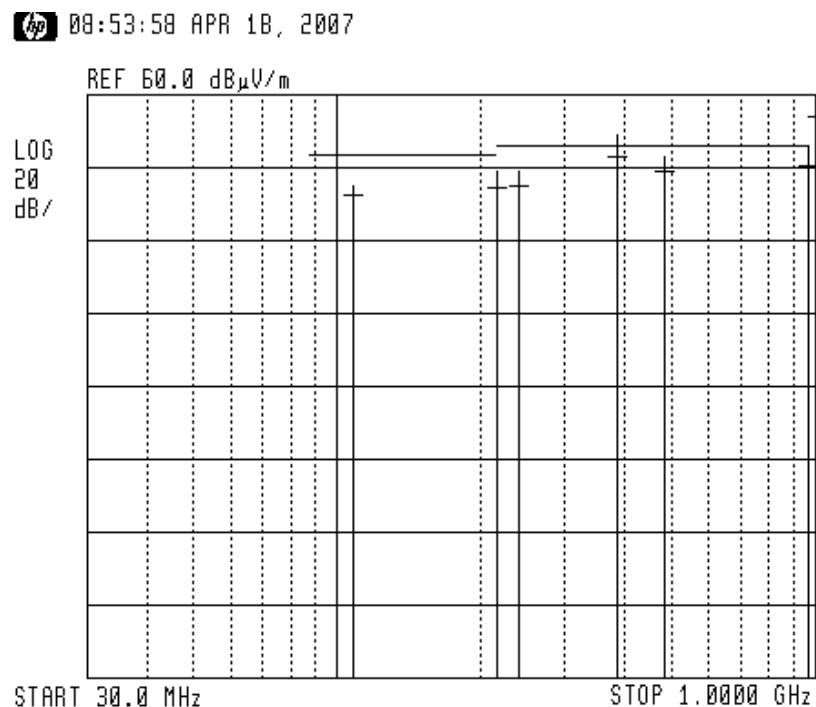


Figure 75. Radiated Emission. Antenna Polarization: HORIZONTAL Detectors: Peak, Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V/m).
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.



Radiated Emission

E.U.T Description Mobile Data Terminal (MDT)
Type NET-960CE-S4
Serial Number: 404813

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	48.015000	40.2	37.6	-2.4			11.6
2	80.007500	38.8	35.6	-4.4			10.3
3	189.252500	38.2	36.0	-7.5			16.2
4	192.020000	42.0	38.8	-4.7			16.4
5	480.042500	44.5	38.8	-7.2			20.1
6	960.032250	45.8	40.8	-13.2			29.1

**Figure 76. Radiated Emission. Antenna Polarization: VERTICAL.
Detectors: Peak, Quasi-peak**

Note: QP Delta 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.

Radiated Emission

E.U.T Description: Mobile Data Terminal (MDT)
Type: NET-960CE-S4
Serial Number: 404813

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

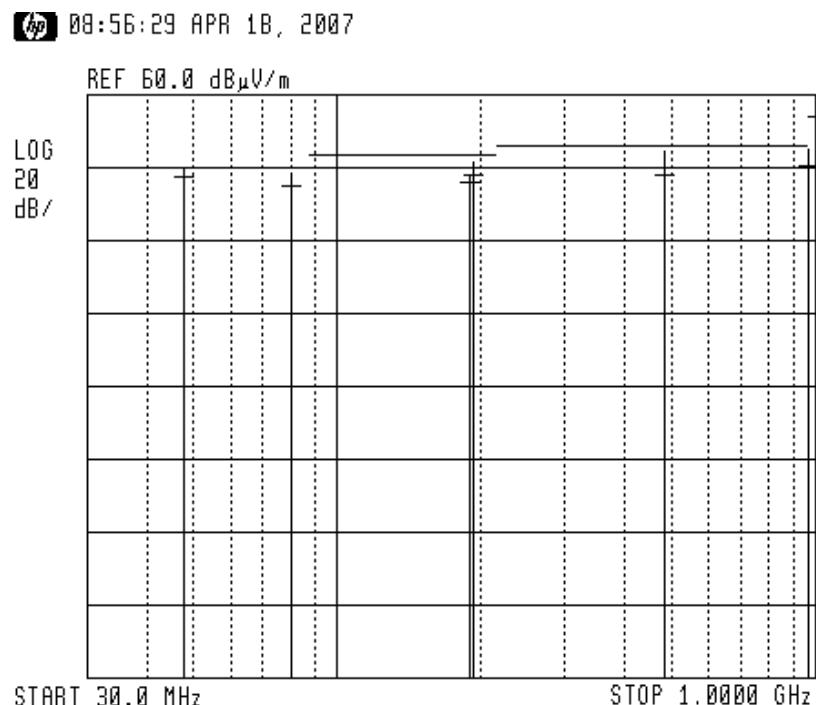


Figure 77. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V/m).
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.

15.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 22, 2006	1 Year
RF Filter Section	HP	85420E	3705A00248	November 22, 2006	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	March 22, 2007	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 30, 2006	1 Year
Antenna Log Periodic	A.H. Systems	SAS- 200/511	253	February 4, 2007	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 15, 2006	2 Years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	2 Years
Horn Antenna	Narda	V637	0410	December 8, 2006	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	November 2, 2006	1 Year
Spectrum Analyzer	HP	8592L	3926A01204	November 21, 2006	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	LaserJet 2200	JPKGC19982	N/A	N/A

16. Photographs of Tested E.U.T.



Figure 78 Front View



Figure 79 Rear View



Figure 80 PCB in Case

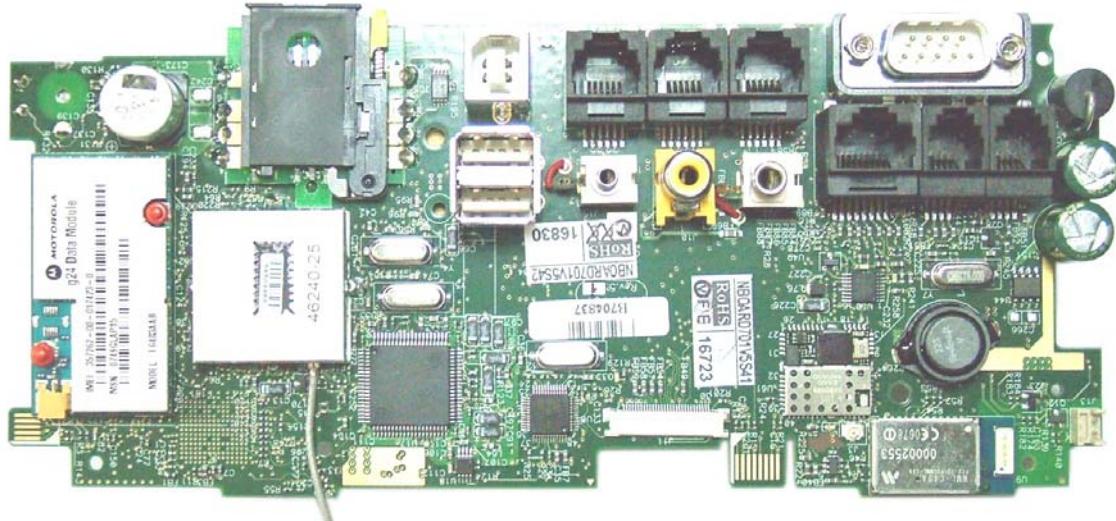


Figure 81 PCB Side 1

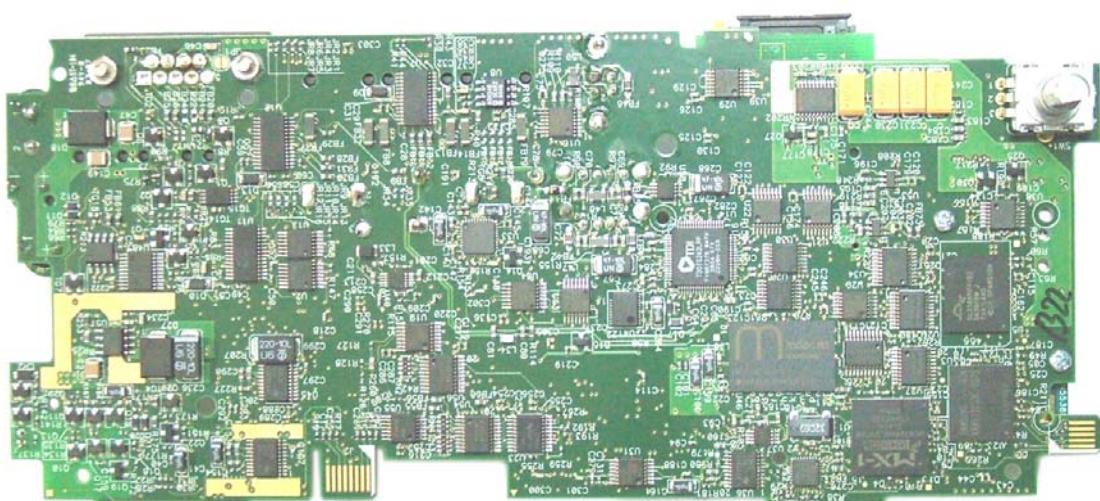


Figure 82 PCB Side 2



Figure 83 Keyboard PCB Side 1

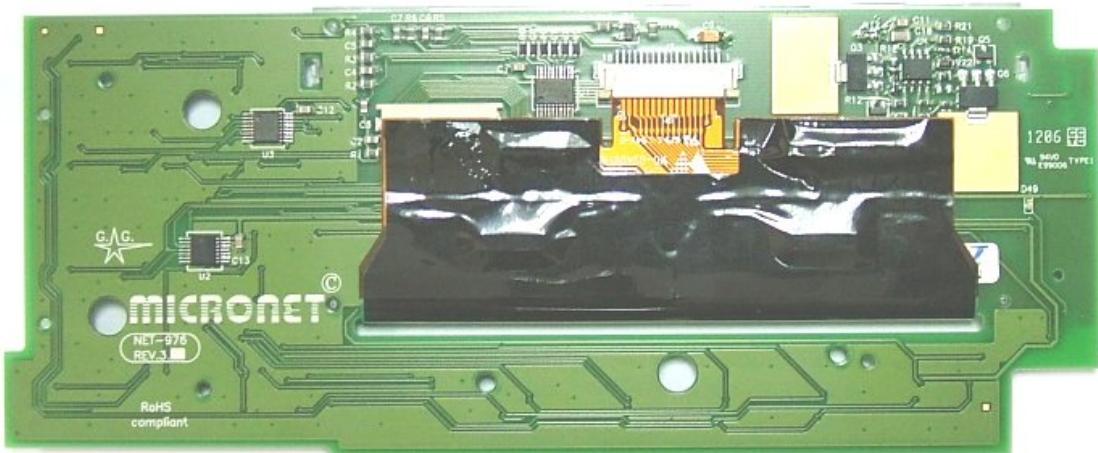


Figure 84 Keyboard PCB Side 2