

DATE: 03 May 2007


**I.T.L. (PRODUCT TESTING) LTD.
FCC EMC/Radio Test Report
for
Mobile Access Networks**

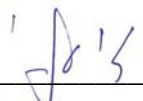
Equipment under test:

RF Booster

2000-iDEN-SMR4E

Written by: 
D. Shidlow, Documentation

Approved by: 
E. Pitt, Test Engineer

Approved by: 
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



**Measurement/Technical Report for
Mobile Access Networks
RF Booster**

2000-iDEN-SMR4E

FCC ID:OJFMA2K-IDEN-SMR

03 May 2007

This report concerns: Original Grant Class II change: X

Class B verification Class A verification Class I change

Equipment type: PCS Licensed Transmitter

Request Issue of Grant:
 x Immediately upon completion of review

Limits used:
CISPR 22 Parts 2; 90 x

Measurement procedure used is ANSI C63.4-2003.

Substitution Method used as in ANSI/TIA-603-B: 2002

Application for Certification	Applicant for this device:
prepared by:	(different from "prepared by")
Ishaishou Raz	Shai Rachamim
ITL (Product Testing) Ltd.	Mobile Access Networks
Kfar Bin Nun	Ofek 1 Center, Bldg.B
D.N. Shimshon 99780	Northern Industrial Zone,
	Lod, 71293
Israel	Israel
e-mail Sraz@itl.co.il	Tel: +972-8-918-3888
	Fax: +972-4-918-3844
	e-mail: ShaiR@mobileaccess.com

TABLE OF CONTENTS

1.	GENERAL INFORMATION -----	5
1.1	Administrative Information.....	5
1.2	List of Accreditations.....	6
1.3	Product Description.....	7
1.4	Test Methodology.....	7
1.5	Test Facility.....	7
1.6	Measurement Uncertainty.....	7
2.	PRODUCT LABELING -----	8
3.	SYSTEM TEST CONFIGURATION -----	9
3.1	Justification.....	9
3.2	EUT Exercise Software.....	9
3.3	Special Accessories.....	9
3.4	Equipment Modifications.....	9
3.5	Configuration of Tested System.....	10
4.	BLOCK DIAGRAM -----	11
4.1	Schematic Block/Connection Diagram.....	11
4.2	Theory of Operation.....	11
5.	PEAK OUTPUT POWER (IDEN) -----	12
5.1	Test procedure.....	12
5.2	Results table.....	14
5.3	Test Equipment Used.....	15
6.	OCCUPIED BANDWIDTH (IDEN) -----	16
6.1	Test Procedure.....	16
6.2	Results Table.....	19
6.3	Test Equipment Used.....	20
7.	EMISSION MASK (IDEN) -----	21
7.1	Test Specification.....	21
7.2	Test Procedure.....	21
7.3	Results Table.....	25
7.4	Test Equipment Used.....	26
8.	OUT OF BAND EMISSIONS AT ANTENNA TERMINALS (IDEN) -----	27
8.1	Test Specification.....	27
8.2	Test procedure.....	27
8.3	Results table.....	38
8.4	Test Equipment Used.....	39
9.	OUT OF BAND EMISSIONS (RADIATED) (IDEN) -----	40
9.1	Test Specification.....	40
9.2	Test Procedure.....	40
9.3	Test Data.....	41
9.4	Test Instrumentation Used, Radiated Measurements.....	42
10.	PEAK OUTPUT POWER (SMR) -----	43
10.1	Test Specification.....	43
10.2	Test procedure.....	43
10.3	Results table.....	45
10.4	Test Equipment Used.....	46
11.	OCCUPIED BANDWIDTH (SMR) -----	47
11.1	Test Specification.....	47
11.2	Test Procedure.....	47
11.3	Results Table.....	50
11.4	Test Equipment Used.....	51

12.	EMISSION MASK (SMR) -----	52
	12.1 Test Specification	52
	12.2 Test Procedure.....	52
	12.3 Results.....	58
	12.4 Test Equipment Used.....	59
13.	OUT OF BAND EMISSIONS AT ANTENNA TERMINALS (SMR) -----	60
	13.1 Test Specification	60
	13.2 Test procedure	60
	13.3 Results table.....	74
	13.4 Test Equipment Used.....	75
14.	OUT OF BAND EMISSIONS (RADIATED) (SMR) -----	76
	14.1 Test Specification	76
	14.2 Test Procedure.....	76
	14.3 Test Data	77
	14.4 Test Instrumentation Used, Radiated Measurements	78
15.	RADIATED EMISSION PER FCC PART 15 SUB-PART B TEST DATA -----	79
	15.1 Test Specification	79
	15.2 Test Procedure.....	79
	15.3 Test Data	79
	15.4 Test Instrumentation Used, Radiated Measurements	84
	15.5 Field Strength Calculation	85
16.	APPENDIX A - CORRECTION FACTORS -----	86
	16.1 Correction factors for CABLE	86
	16.2 Correction factors for Biconilog Antenna	87
	16.3 Correction factors for LOG PERIODIC ANTENNA	88
	16.4 Correction factors for HORN ANTENNA.....	89

1. General Information

1.1 Administrative Information

Manufacturer: Mobile Access Networks

Manufacturer's Address: Ofek 1 Center,Bldg.B
Northern Industrial Zone
Lod, 71293
Israel
Tel: +972-8-918-3888
Fax: +972-8-918-3844

Manufacturer's Representative: Shai Rachamim

Equipment Under Test (E.U.T): RF Booster

Equipment Model No.: 2000-iDEN-SMR4E

Equipment Serial No.: Not Designated

Date of Receipt of E.U.T: 14.03.07

Start of Test: 14.03.07

End of Test: 22.03.07

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

Test Specifications: FCC Part 90 Sub-part I, S
FCC Part 15 Sub-part B

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

See details Original Grant application.

The changes to the original product are:

PCB has been flattened.

New PA (power output has not changed, does not affect Uplink.)

DC converters (partially).

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

See details in original application.

3. System Test Configuration

3.1 *Justification*

See details in original application.

Peak Output Power, Occupied Bandwidth, Emission Mask, Spurious Emission at Antenna Terminal, Radiated Spurious Emission and Radiated Emission per FCC Part 15 Sub-part B, were re-tested. The changes to the E.U.T. are the same as the changes to the 1000-iDEN-SMRE.

3.2 *EUT Exercise Software*

See details in original application.

3.3 *Special Accessories*

See details in original application.

3.4 *Equipment Modifications*

See details in original application.

3.5 Configuration of Tested System

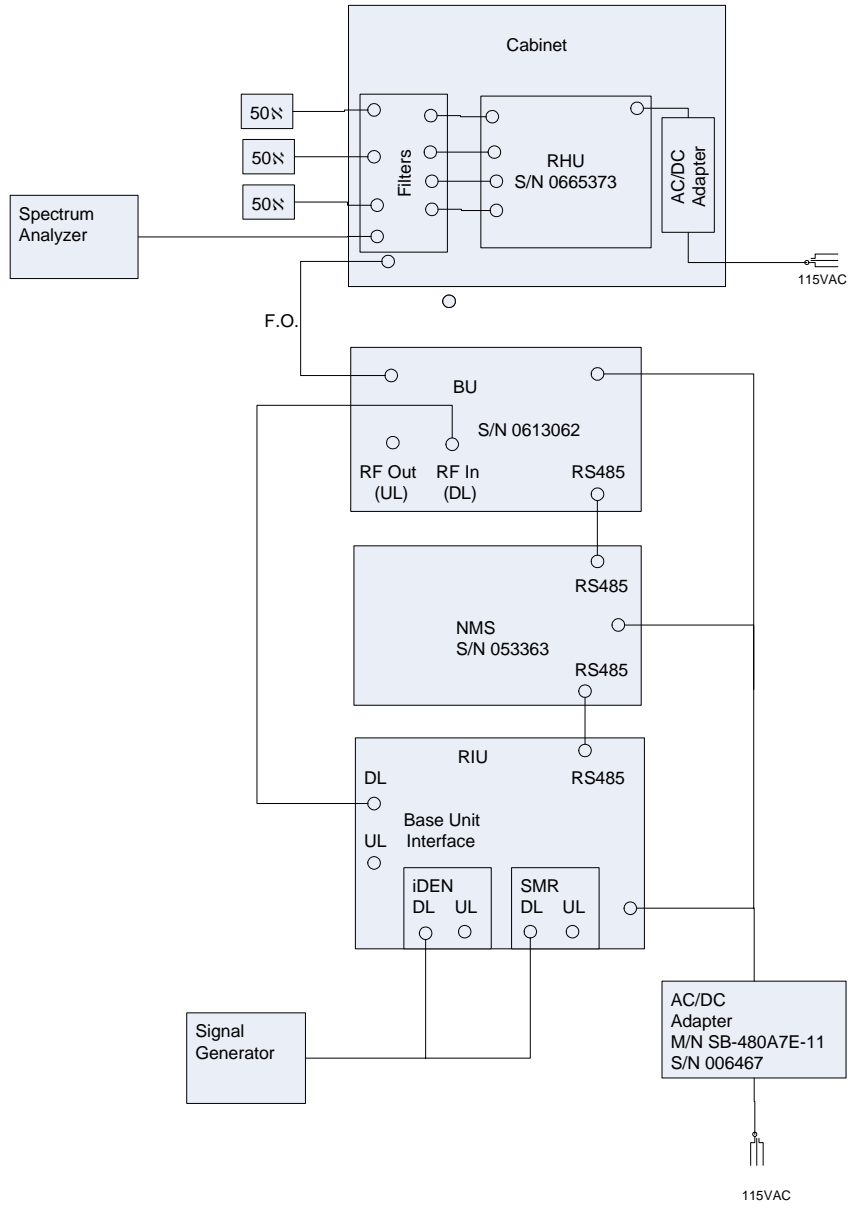


Figure 1. Tests Set-up

4. Block Diagram

4.1 *Schematic Block/Connection Diagram*

See original application.

4.2 *Theory of Operation*

See original application.

5. Peak Output Power (iDEN)

5.1 Test procedure

Peak Output Power must not exceed 32 dBm (EIRP – Antenna Gain = 37 – 5 = 32 dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through a 16 dB external attenuator (2 X 8 dB) and an appropriate coaxial cable (Cable Loss = 05 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz resolution BW. The output power level was measured at 851.0125, 860.00, and 868.9875 MHz.

Type of modulation is 16QAM, Simbol rate is 7.5 ksps.

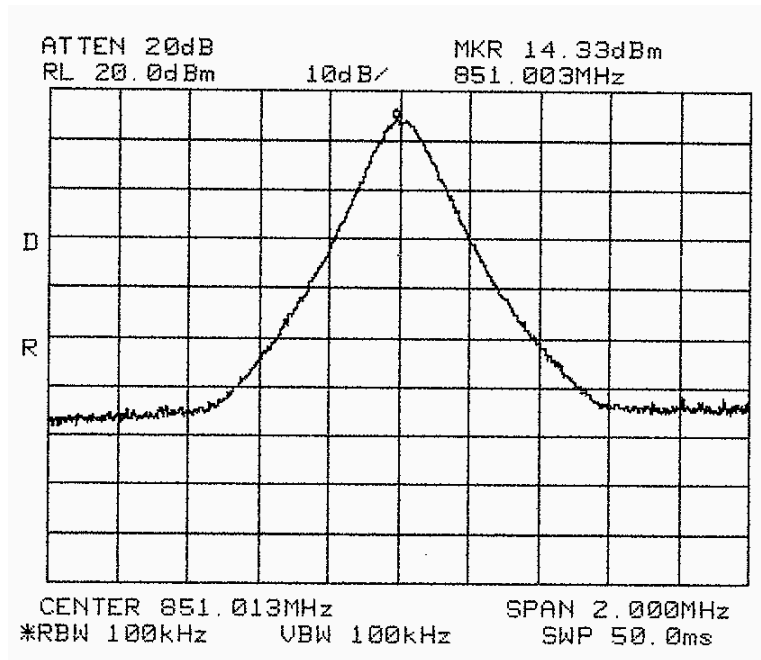


Figure 2.— 851.0125 MHz

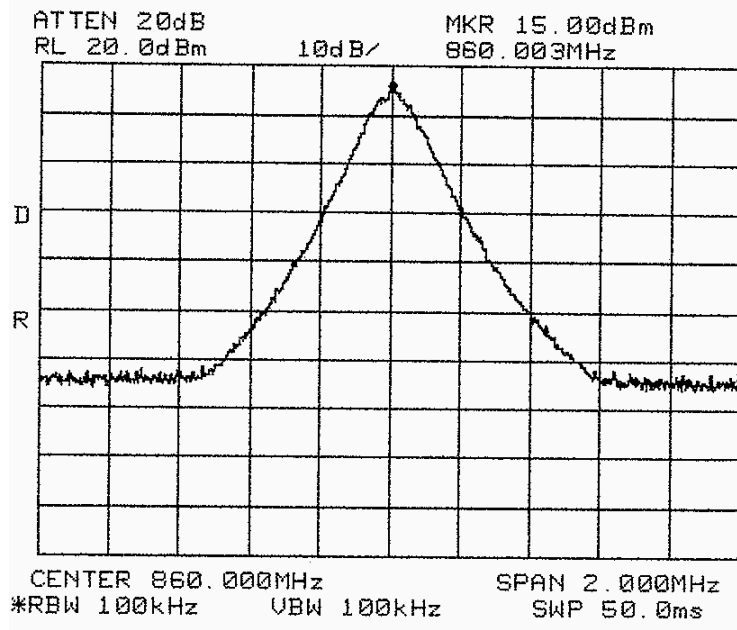


Figure 3.— 860.00 MHz

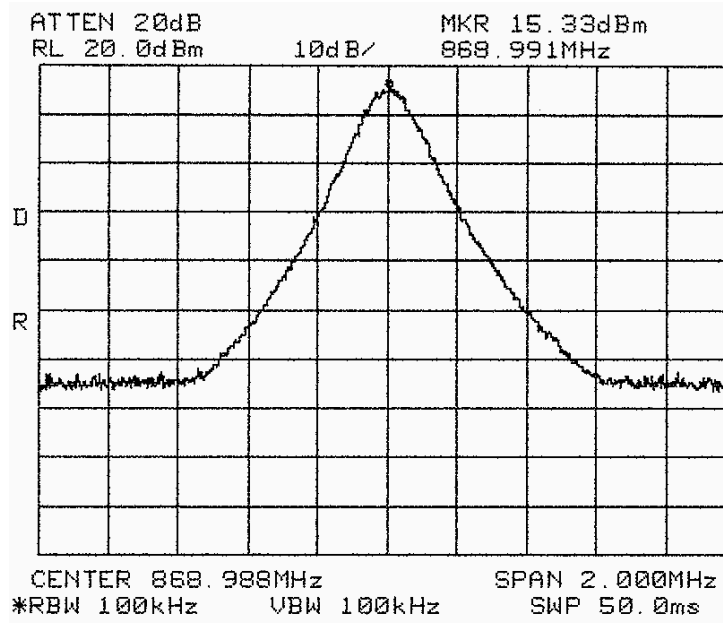


Figure 4.— 868.9875 MHz

5.3 Test Equipment Used.

Peak Output Power

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 6 Test Equipment Used

6. Occupied Bandwidth (iDEN)

6.1 Test Procedure

The E.U.T. was set to the applicable test frequency with 16QAM modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through a 16 dB external attenuator (2 X 8 dB) and appropriate coaxial cable (Cable Loss 0.5 dB). The spectrum analyzer was set to 300 Hz resolution B.W.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.

The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.

Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

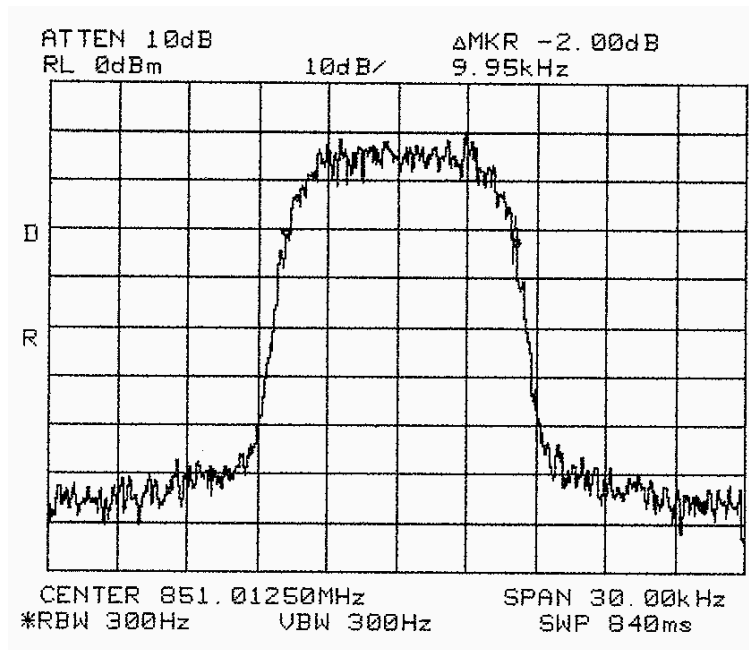


Figure 7.— 851.0125 Input

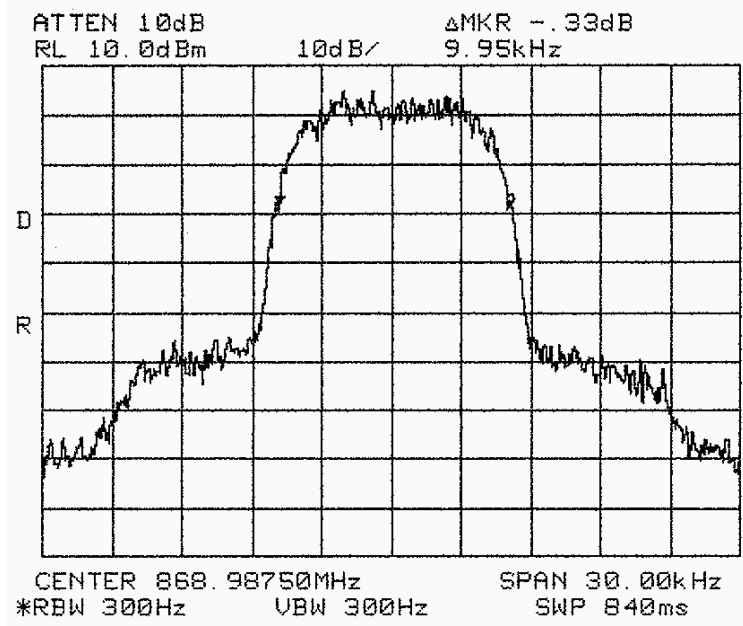


Figure 12.— 868.9875 Output

6.2 Results Table

E.U.T. Description: RF Booster

Model No.: 2000-iDEN-SMR4E


Serial Number: Not Designated

Specification: FCC Part 2, Section 2.1049; Part 90, Section 90.209

	Operating Frequency	Reading (kHz)
Input	851.0125	9.95
Output	851.0125	10.00
Input	860.00	9.95
Output	860.00	9.90
Input	868.9875	9.90
Output	868.9875	9.95

Figure 13 Occupied Bandwidth

TEST PERSONNEL:

Tester Signature: 

18.04.07

Typed/Printed Name: E. Pitt

6.3 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 14 Test Equipment Used

7. Emission Mask (iDEN)

7.1 Test Specification

FCC Part 90 Sub-part I Section 90.210; Part 90 Section 90.691

According to the table in Section 90.210, the following masks shall be used:

For the frequency band 851-854 MHz Mask H

For the frequency band 854-869 MHz Mask G

Also at all frequencies, the E.U.T. must comply with the emission mask in Section 90.691.

7.2 Test Procedure

The E.U.T. was set to the applicable test frequency with 16QAM modulation, Symbol rate of 7.5ksps.

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 16 dB (2 X 8 dB = 16 dB) external attenuator and appropriate coaxial cable (0.5 dB cable loss). The spectrum analyzer was set to 300 Hz resolution B.W.

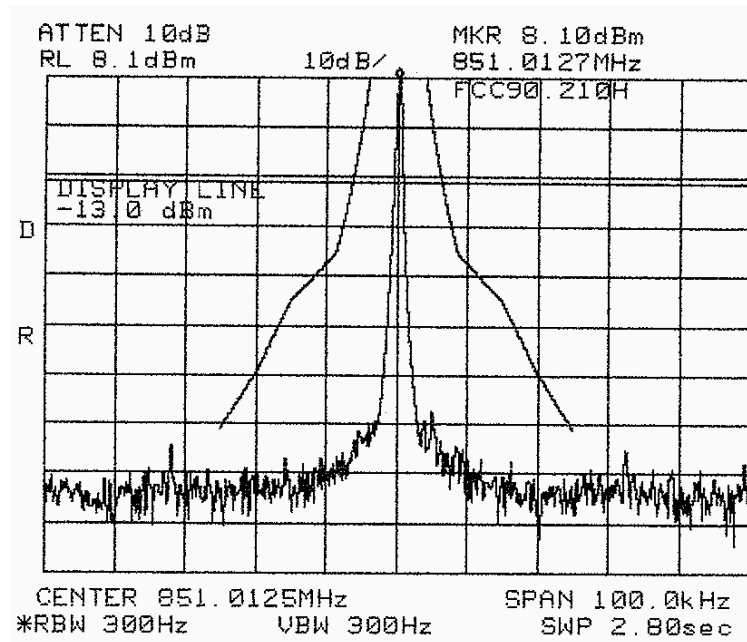


Figure 15.— 851.0125

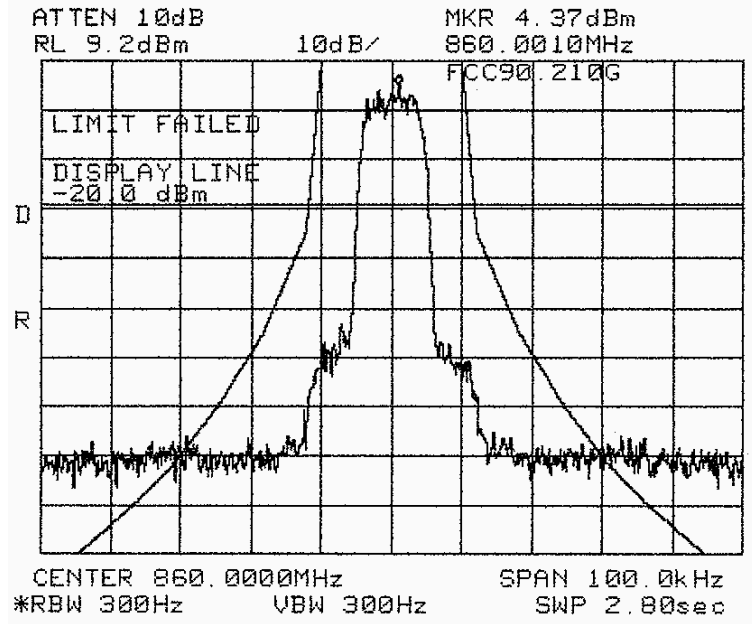


Figure 18.— 860.00

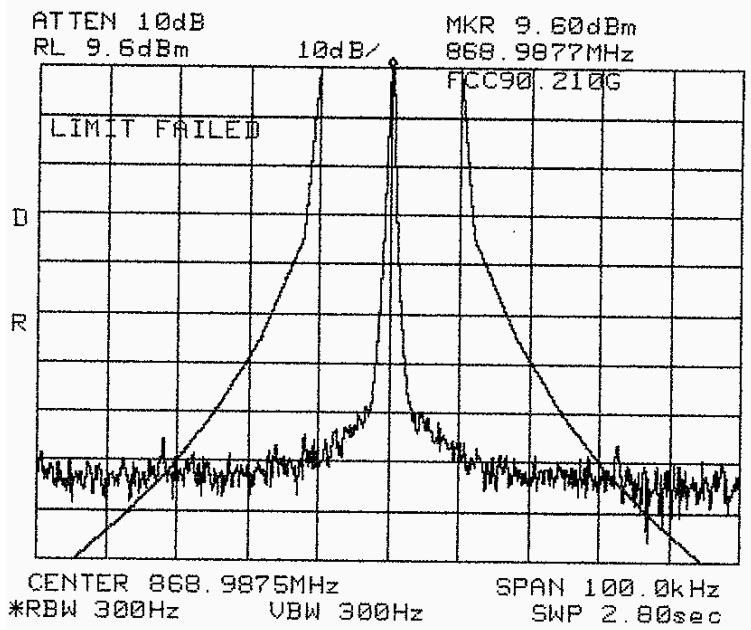


Figure 19.— 868.9875

7.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 23 Test Equipment Used

8. Out of Band Emissions at Antenna Terminals (iDEN)

8.1 Test Specification

FCC Part 90, Section 90.210

8.2 Test procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13 dBm. The resolution bandwidth was set to 1.0 kHz for the frequency range 9 kHz – 1 MHz, 100 kHz for the frequency range 1 MHz to 1 GHz, and 1 MHz in the frequency range 1 – 9 GHz. In the band edges, measurement was performed using resolution bandwidth of 10 kHz. Therefore the limit in these ranges = $-13 + 20 \log 10/100 = -33$ dBm.

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 16 dB (2×8 dB = 16 dB) external attenuator and an appropriate coaxial cable (Cable Loss= 0.5 dB).

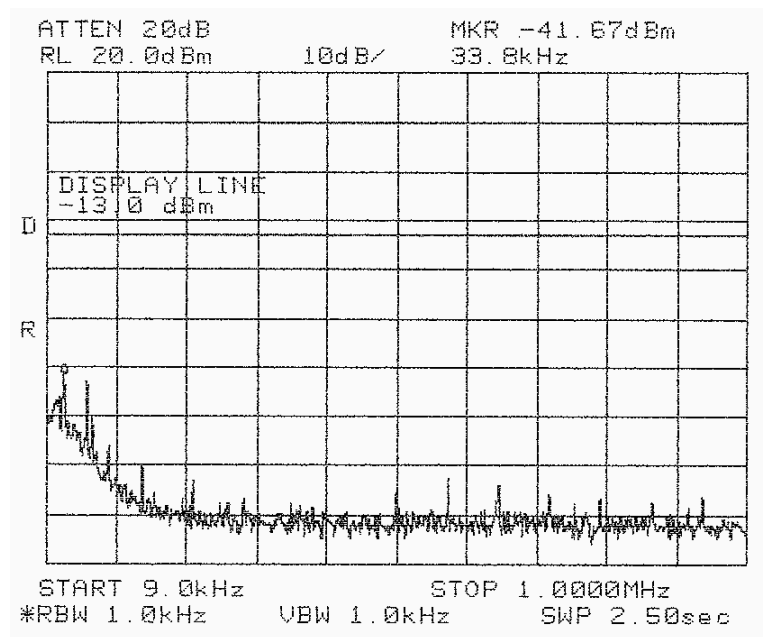


Figure 24.— 851.0125 MHz

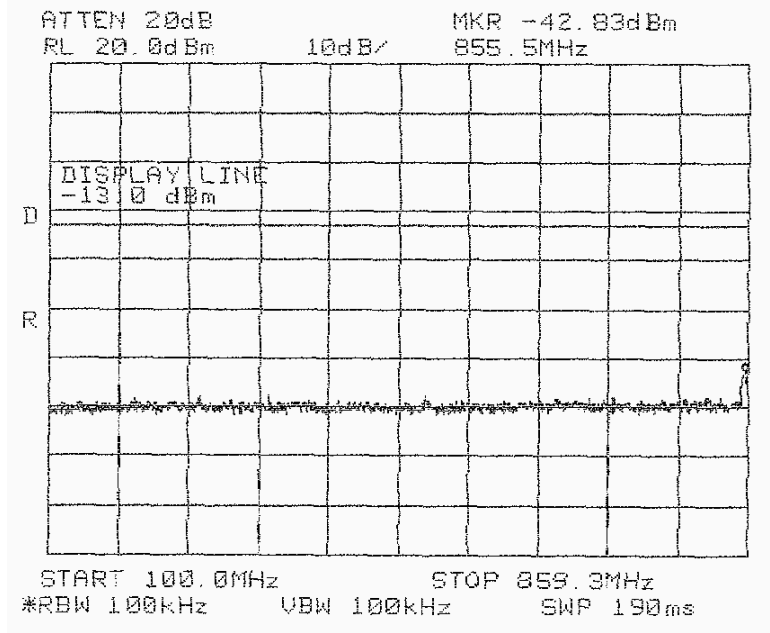


Figure 33.— 860.00 MHz

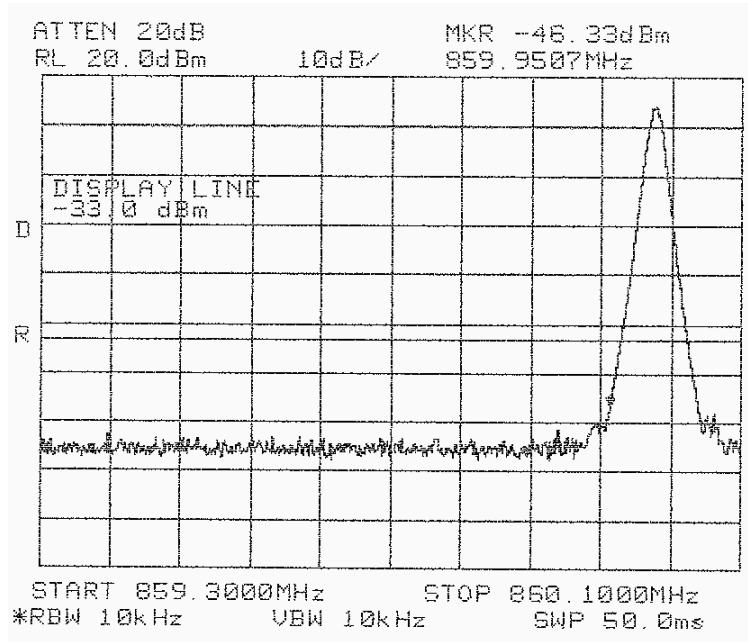


Figure 34.— 860.00 MHz

8.3 Results table

E.U.T. Description: RF Booster
 Model No.: 2000-iDEN-SMR4E
 Serial Number: Not Designated
 Specification: FCC Part 90, Section 90.210

Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
851.0125	-35.33	-13.0	-22.33
860.00	-27.17	-13.0	-14.17
868.9875	-36.00	-13.0	-23.00

Figure 45 Out of Band Emission Results

JUDGEMENT: Passed by 14.17 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.07

Typed/Printed Name: E. Pitt

8.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 46 Test Equipment Used

9. Out of Band Emissions (Radiated) (iDEN)

9.1 Test Specification

FCC, Part 90, Section 90.210

9.2 Test Procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm .

- (a) 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, 1.5 meters above the ground. The configuration tested is shown in Figure 3.5.

The frequency range 30 MHz-10 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between $0-360^\circ$, and the antenna polarization. The emissions were measured at a distance of 3 meters.

- (b) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).

The signals observed in step (a) were converted to radiated power using:
 $P \text{ (dBm)} = P_g \text{ (dBm)} - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dBi)}$

P = Equivalent Isotropic Radiated Power.

P_g = Signal Generator Output Level.




9.3 Test Data

JUDGEMENT: Passed

The E.U.T met the requirements of the FCC, Part 90, Section 90.210 specifications.

The signals in the band 30 MHz – 10.0 GHz were below the spectrum analyzer noise level which is at least 20dB below the specification limit.

TEST PERSONNEL:

Tester Signature:  Date: 18.04.7

Typed/Printed Name: E. Pitt

9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMC Analyzer	HP	HP 8593	3536A00120	November 11, 2006	1 year
Antenna Bioconilog	EMCO	3142B	1250	August 23, 2006	1 year
Horn Antenna	ETS	3115	6142	May 16, 2006	2 year
Antenna Mast	ETS/EMCO	2070-2	9608=1497	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

10. Peak Output Power (SMR)

10.1 Test Specification

FCC Part 90, Section 90.219

10.2 Test procedure

Peak Power Output must not exceed 32 dBm (EIRP – Antenna gain = 37 – 5 = -32 dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through a 16 dB (2 x 8 dB = 16 dB) external attenuator and an appropriate coaxial cable (cable Loss = 0.5 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz resolution BW. The output power level was measured at 929.0125, 935.00, and 940.9875 MHz.

The type of modulation used is FM and the rate of modulation was 1 kHz.

The deviation is:

- For the frequency ranges 929-935 MHz, and 940-941 MHz, 5 kHz.
- For the frequency range 935-940 MHz, 2.5 kHz.

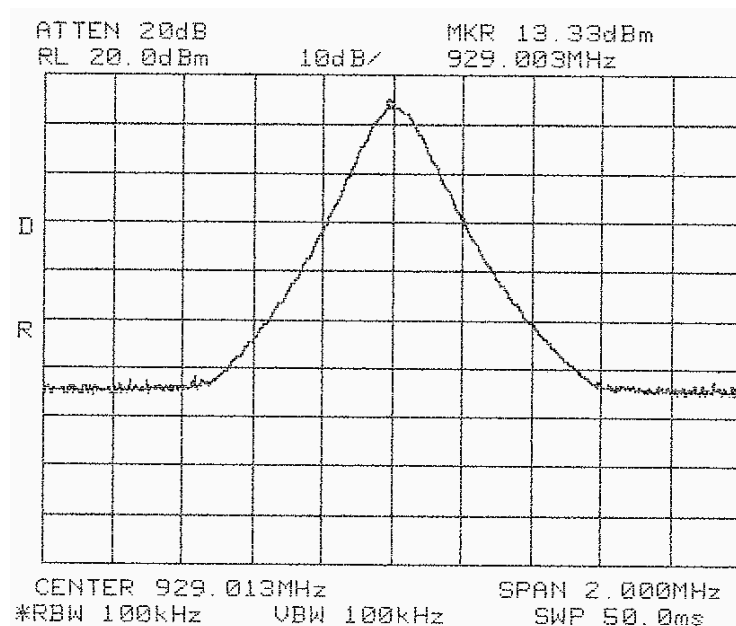


Figure 47.— 929.0125 MHz

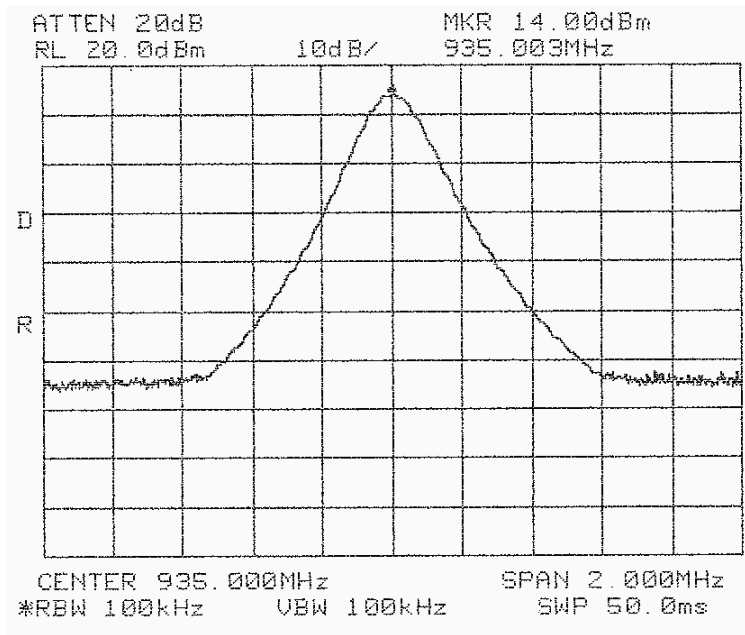


Figure 48.— 935.00 MHz

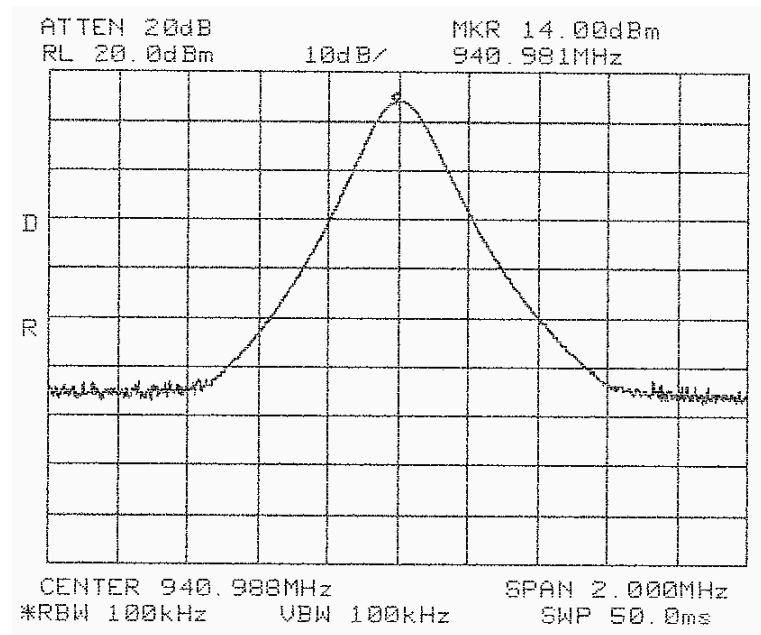


Figure 49.— 940.9875 MHz

10.3 Results table

E.U.T. Description: RF Booster
 Model No.: 2000-iDEN-SMR4E
 Serial Number: Not Designated
 Specification: FCC Part 90, Section 90.219

Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
929.0125	13.33	32.0	-18.67
935.00	14.00	32.0	-18.0
940.9875	14.00	32.0	-18.0

Figure 50 Peak Output Power

JUDGEMENT: Passed by 18.0 dB

TEST PERSONNEL:

Tester Signature: 

Date: 18.04.07

Typed/Printed Name: E. Pitt

10.4 Test Equipment Used.

Peak Output Power

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 51 Test Equipment Used

11. Occupied Bandwidth (SMR)

11.1 Test Specification

FCC Part 2, Section 2.202, FCC Part90 Section 90.209

11.2 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 a 16 dB (2 x 8 dB = 16 dB) external attenuator (at the output test) and an appropriate coaxial cable (Cable Loss = 0.5 dB). The spectrum analyzer was set to 300 Hz resolution B.W.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.

The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.

Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

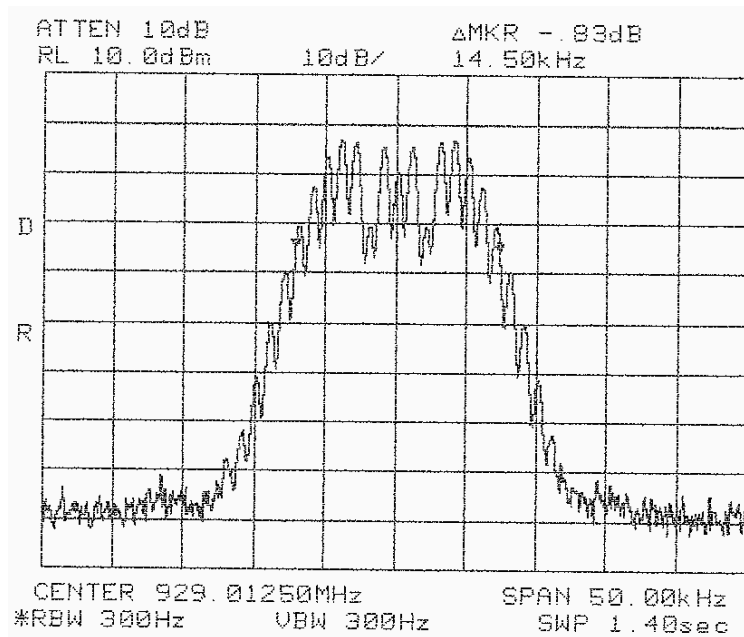


Figure 52.— Input 929.0125 MHz

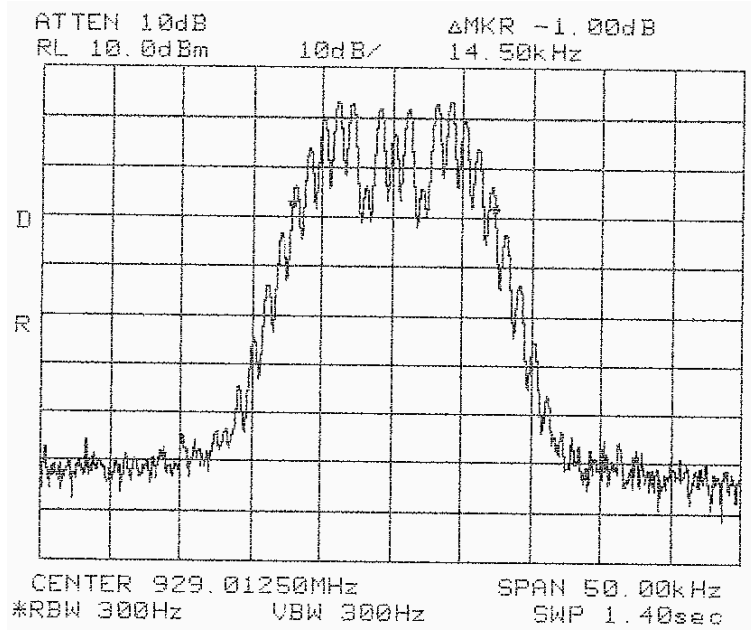


Figure 53.— Output 929.0125 MHz

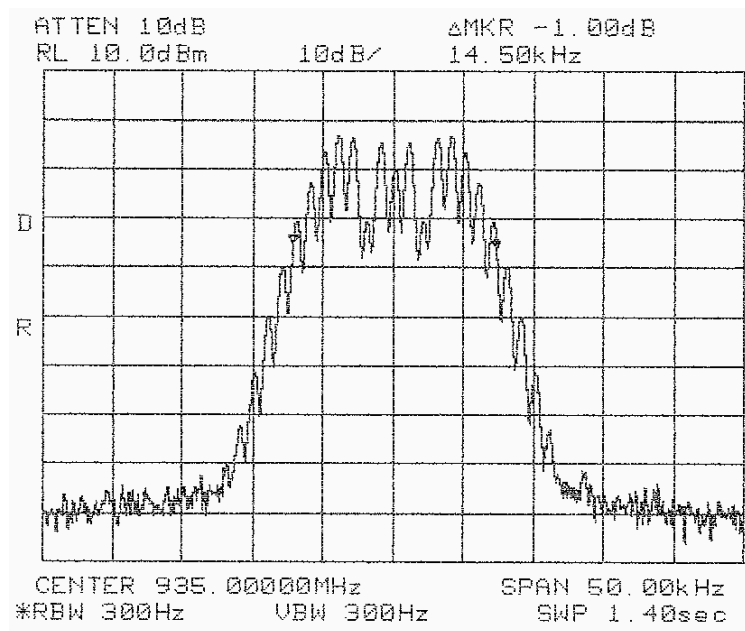


Figure 54.— Input 935.00 MHz

11.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 59 Test Equipment Used

12. Emission Mask (SMR)

12.1 Test Specification

FCC Part 90, Subpart I Section 90.210; Part 90 Section 90.691

According to the table in this section, the following masks shall be used:

For the frequency bands 929-930 MHz	Mask G
For the frequency bands 930-935 MHz	Mask C
For the frequency bands 935-940 MHz	Mask J
For the frequency bands 940-941 MHz	Mask C

Also, at all frequencies, the E.U.T. must comply with the emission mask in Section 90.691.

12.2 Test Procedure

The E.U.T. was set to the applicable test frequency with frequency modulation, rate of modulation 1 kHz.

The deviation at the frequency ranges 929-935 MHz and 940-941 MHz is 5 kHz.

The deviation at the frequency range 935-40 MHz is 2.5 kHz.

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 16 dB (2 X 8 dB = 16 dB) external attenuator and appropriate coaxial cable (0.5 dB cable loss). The spectrum analyzer was set to 300 Hz resolution B.W.

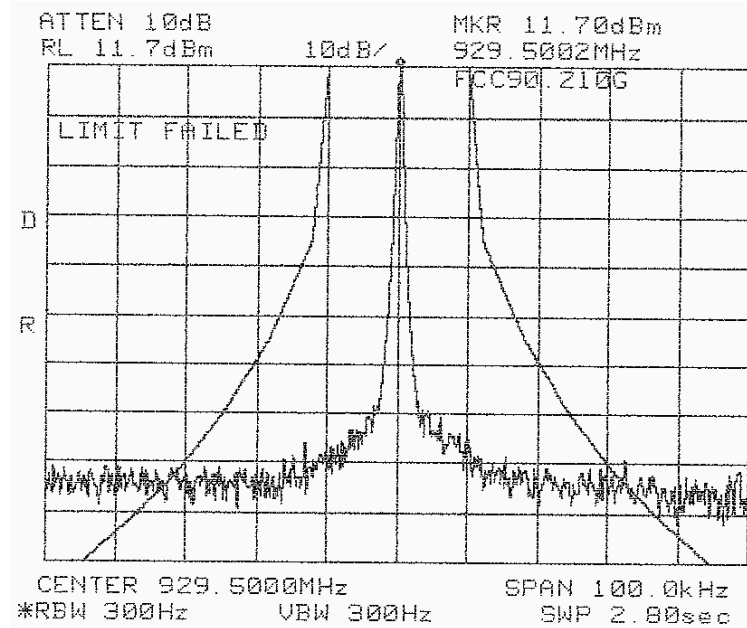


Figure 60.— 929.50

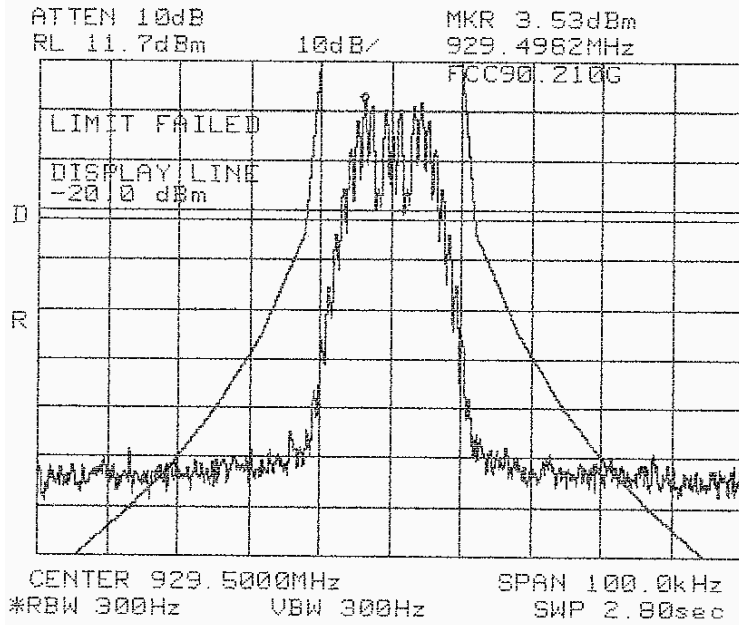


Figure 61.— 929.50

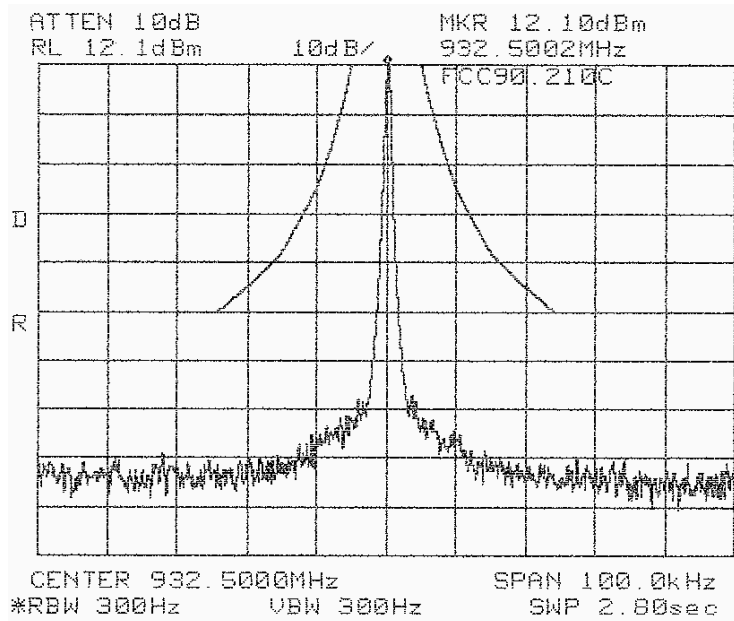


Figure 62.— 932.50

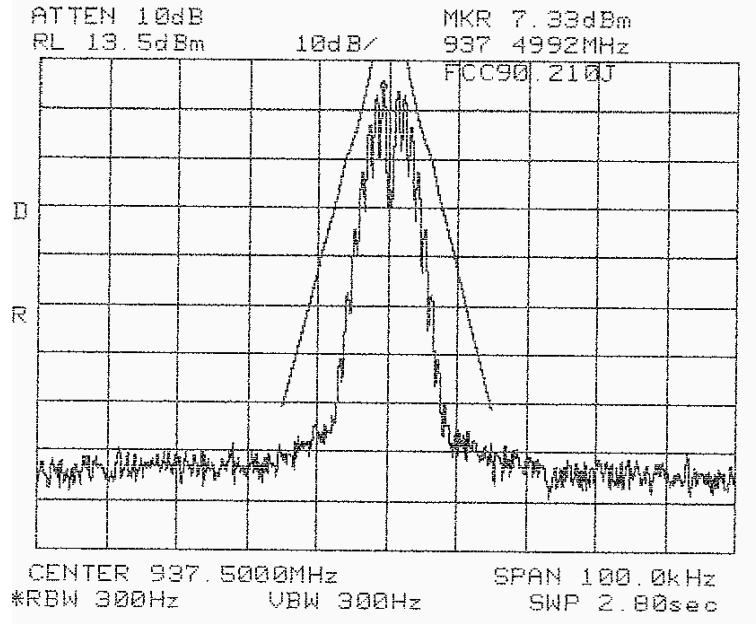


Figure 65.— 937.50

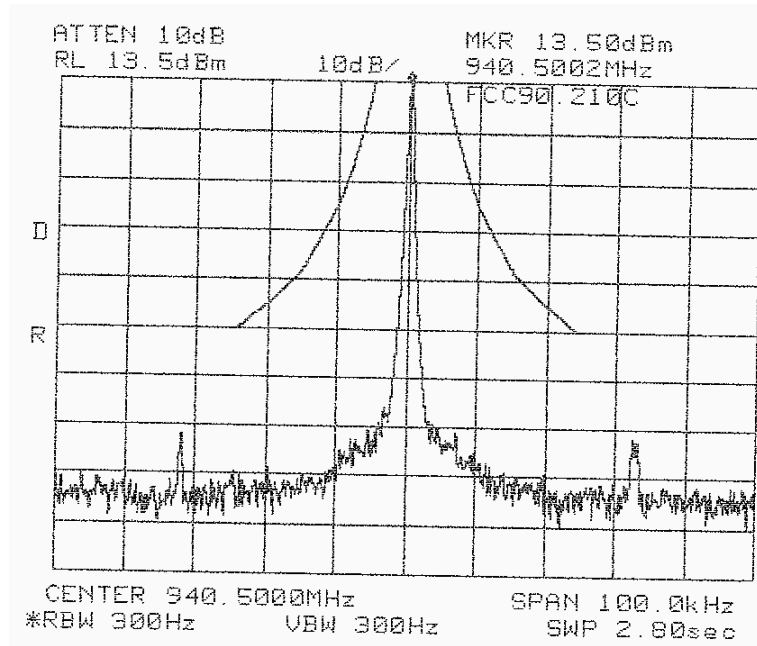


Figure 66.— 940.50

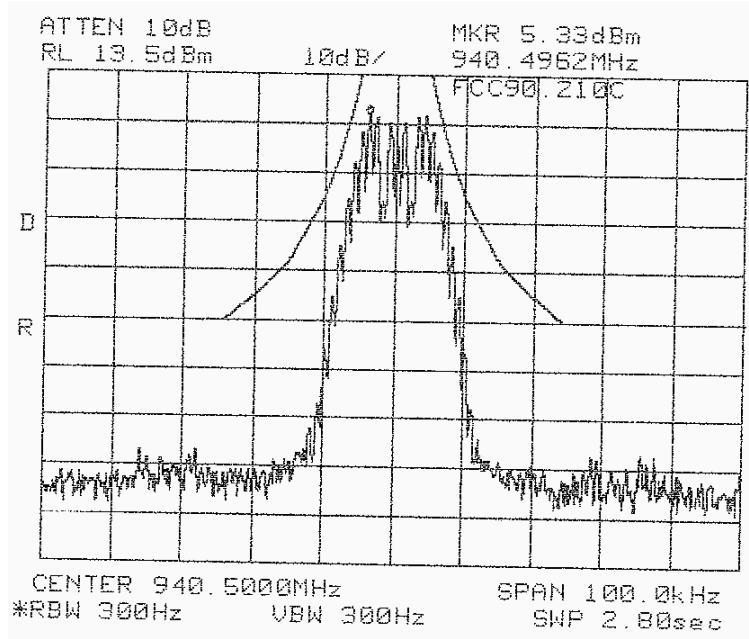


Figure 67.— 940.50

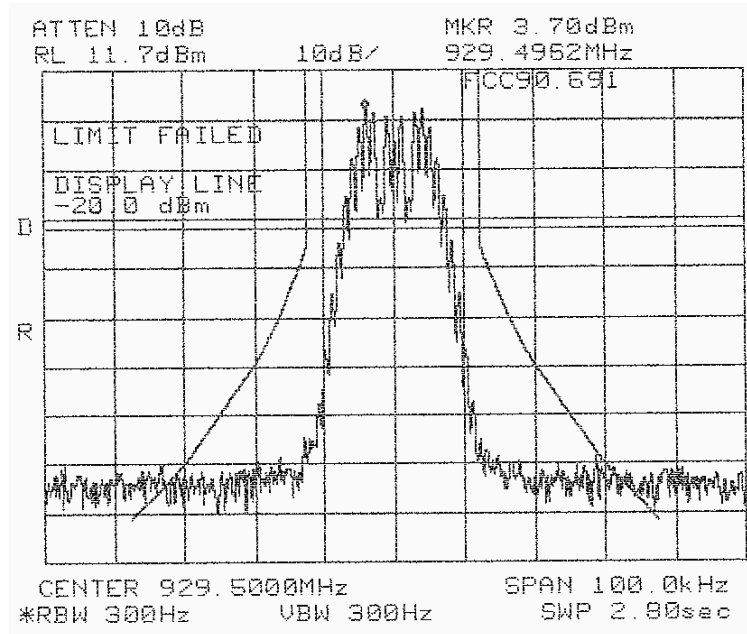


Figure 68.— 929.50

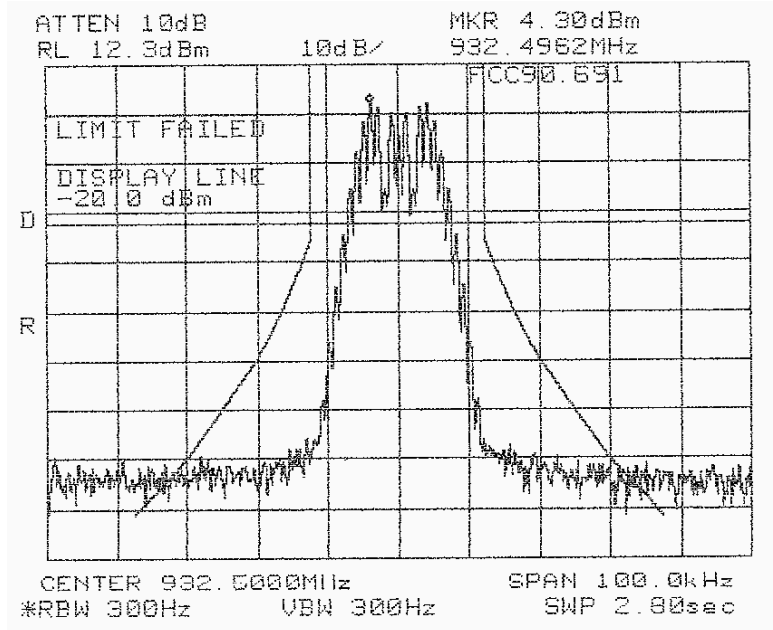


Figure 69.— 932.50

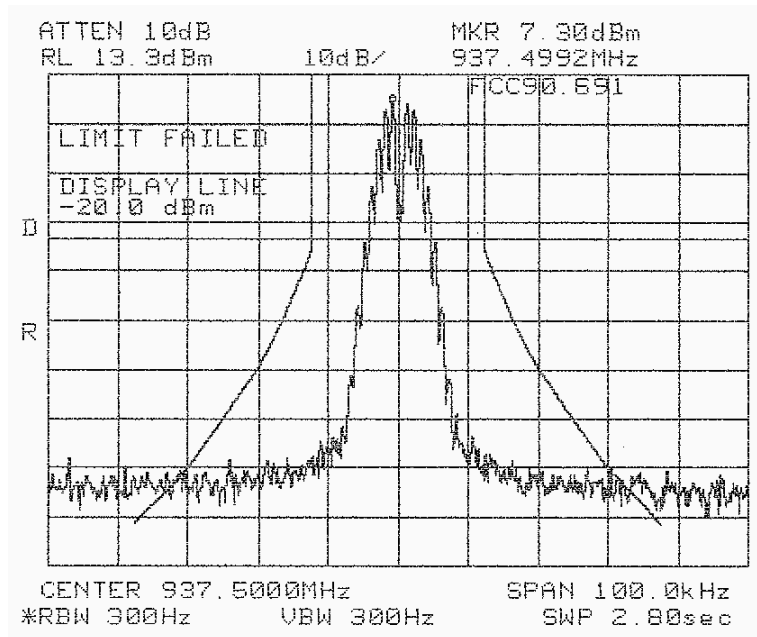


Figure 70.— 937.50

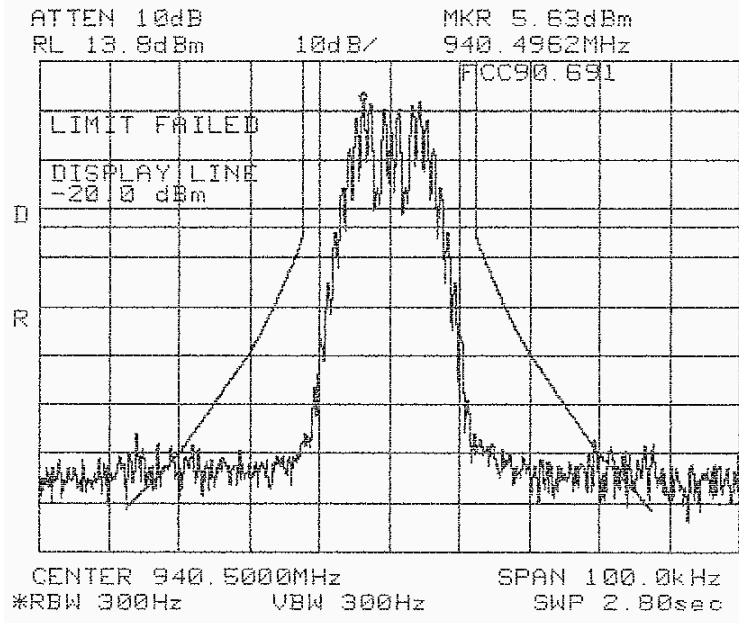


Figure 71.— 940.50

12.3 Results

E.U.T. Description: RF Booster
 Model No.: 2000-iDEN-SMR4E
 Serial Number: Not Designated
 Specification: FCC Part 90, Section 90.210 C; Part 90, Section 90.210 G;
 FCC Part 90, Section 90.210 J; Part 90 Section 691

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: *E. Pitt*

Date: 18.04.07

Typed/Printed Name: E. Pitt

12.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 72 Test Equipment Used

13. Out of Band Emissions at Antenna Terminals (SMR)

13.1 Test Specification

FCC Part 90, Section 210

13.2 Test procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least $43 + \log(P)$ dB, yielding -13 dBm for the frequency ranges 929-935 and 940-941 MHz and at least $50 + 10 \log(P)$, yielding -20 dBm for the frequency range 935-940 MHz.

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 16 dB (2×8 dB = 16 dB) external attenuator and an appropriate coaxial cable (Cable Loss = 0.5dB).

In the frequency ranges, where the resolution bandwidth of 10 kHz was used, instead of 100 kHz, the new limit = $\text{Lim} + 20 \log 10/100$.

The operating frequencies of 929.0125, 935.00, and 940.0875 MHz were tested.

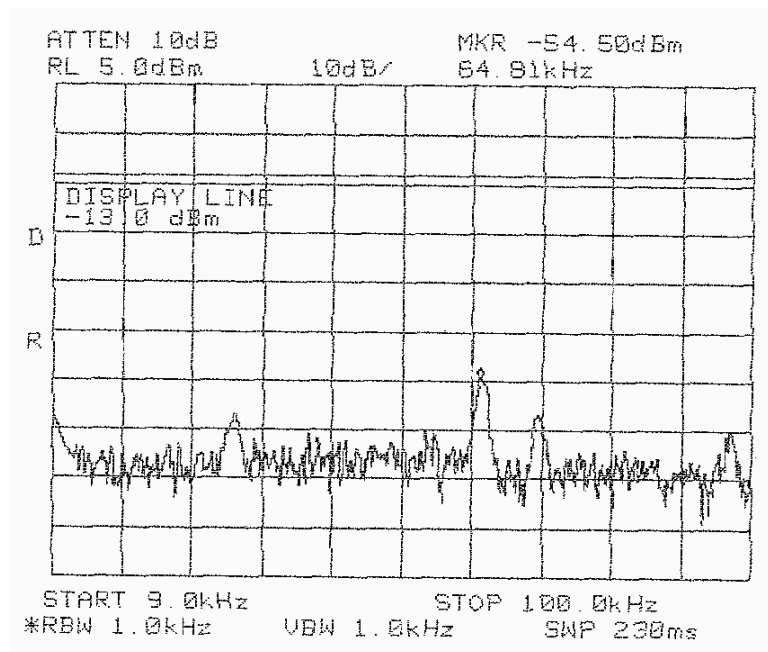


Figure 73.— 929.0125 MHz

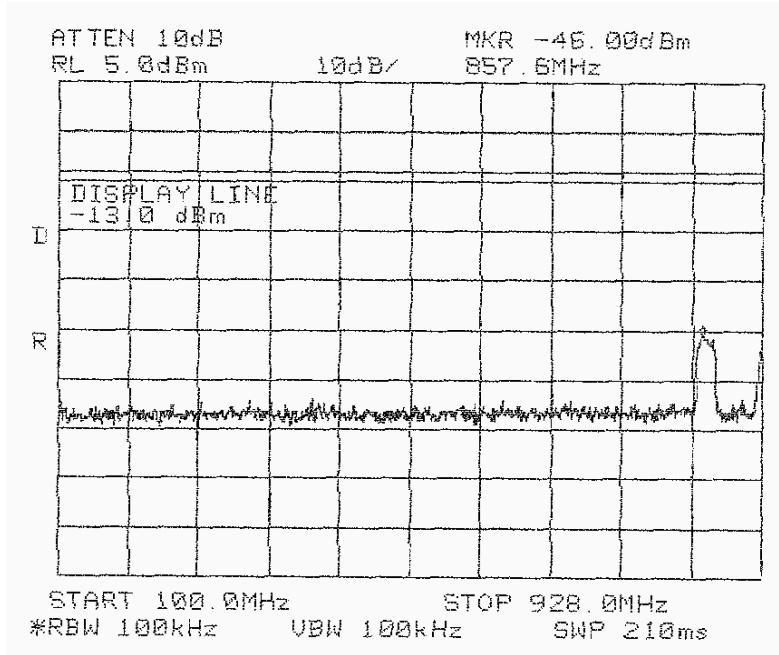


Figure 76.— 929.0125 MHz

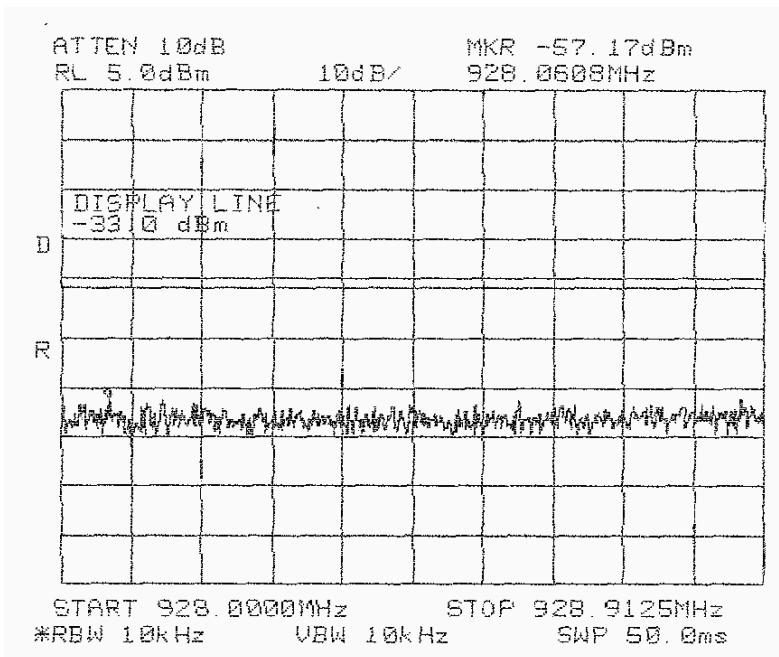


Figure 77.— 929.0125 MHz

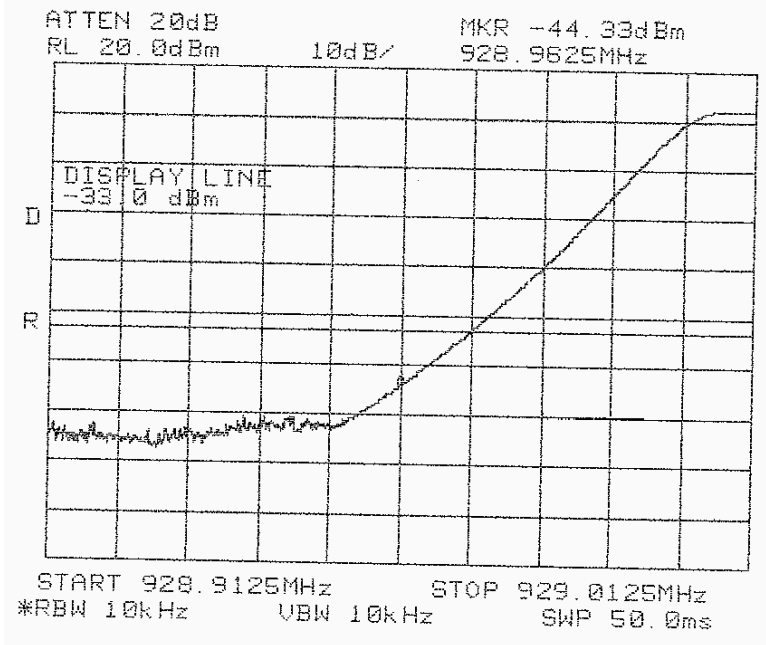


Figure 78.— 929.0125 MHz

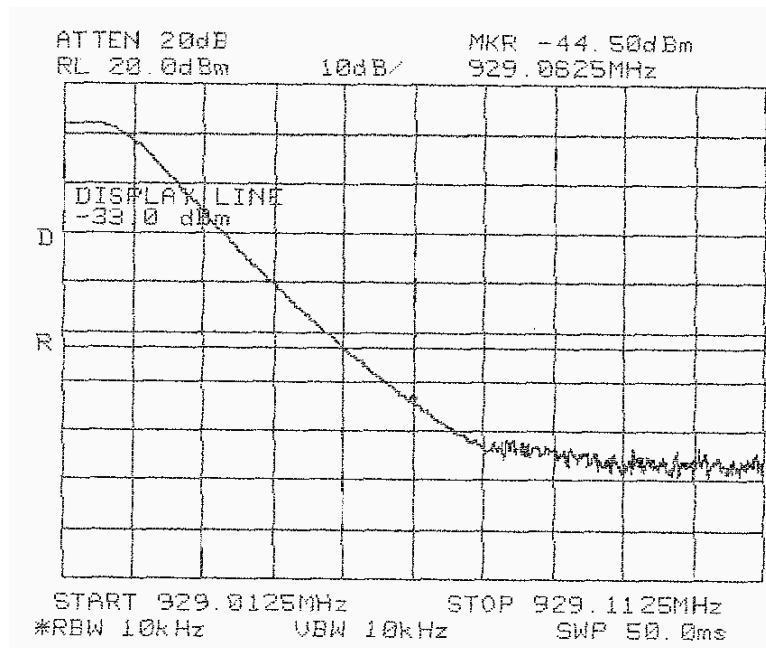


Figure 79.— 929.0125 MHz

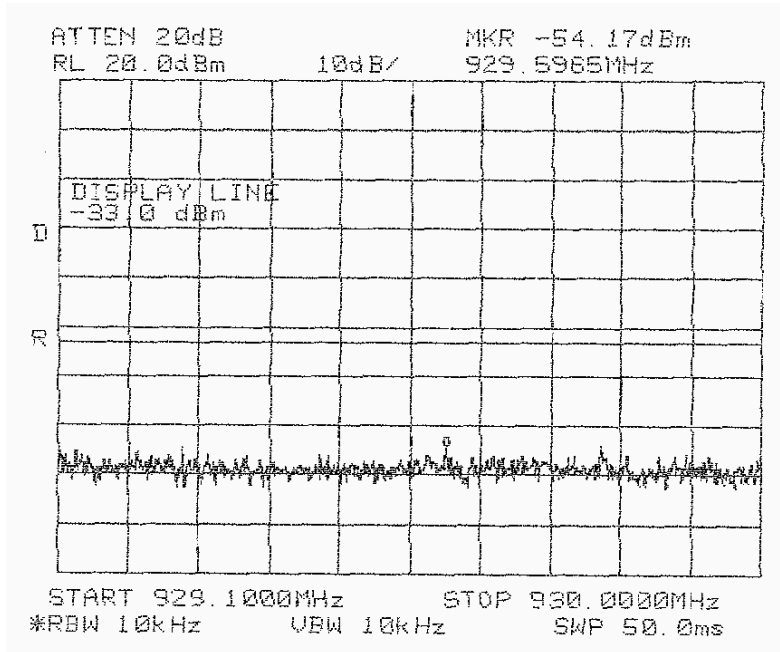


Figure 80.— 929.0125 MHz

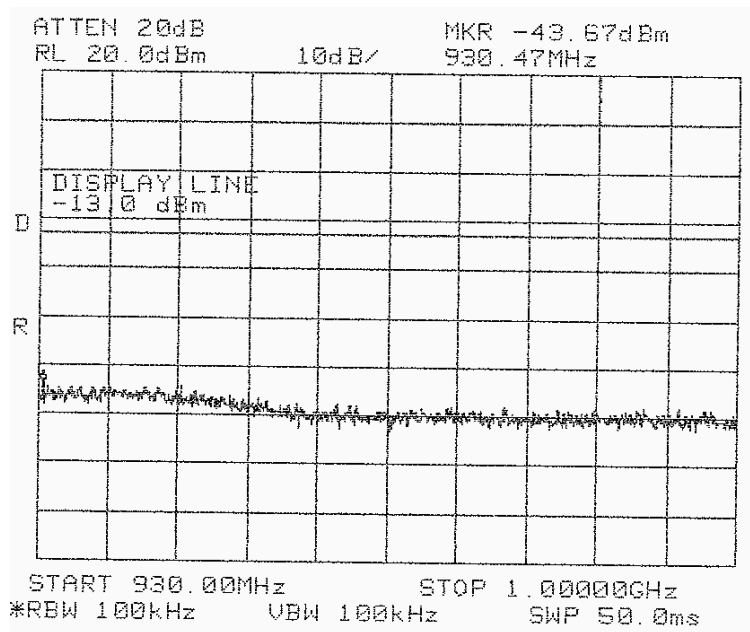


Figure 81.— 929.0125 MHz

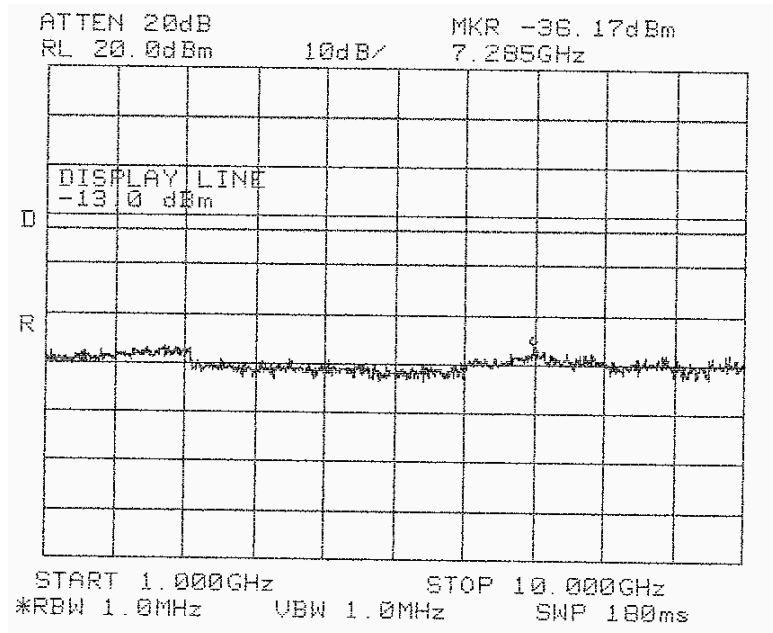


Figure 82.— 929.0125 MHz

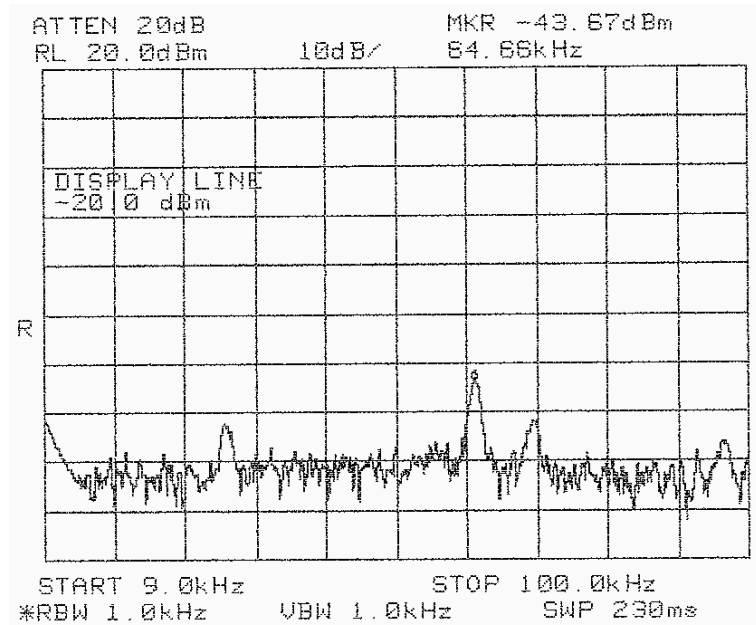


Figure 83.— 935.00 MHz

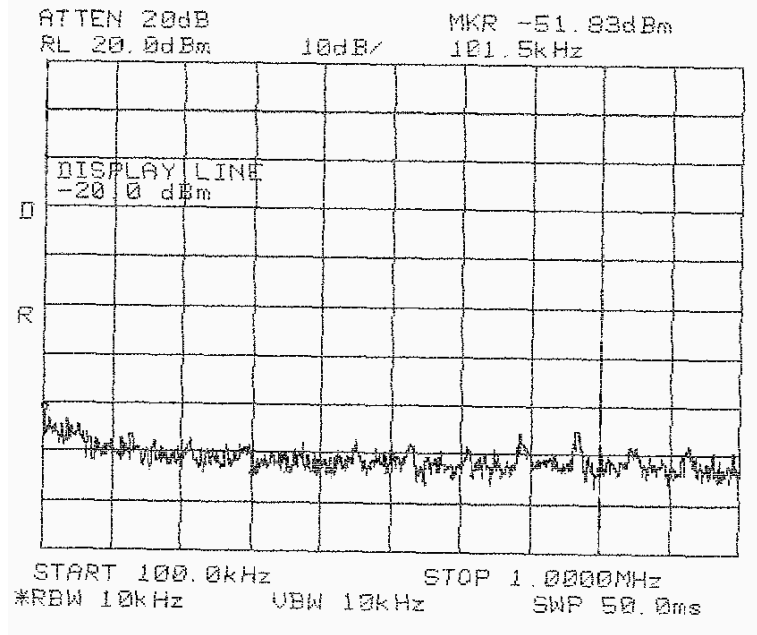


Figure 84.— 935.00 MHz

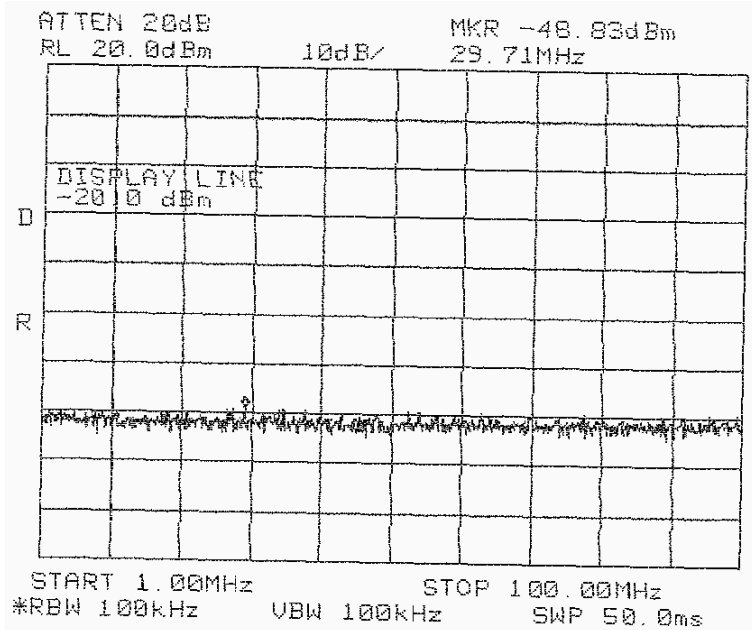


Figure 85.— 935.00 MHz

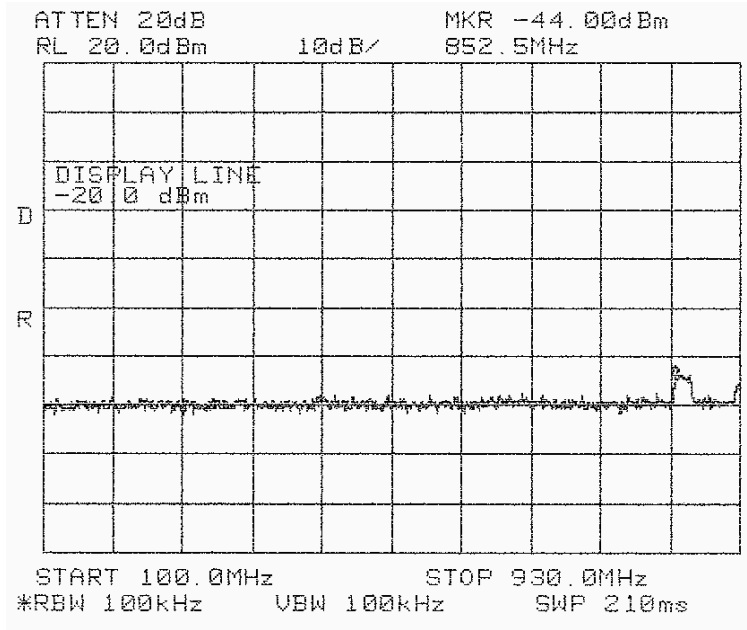


Figure 86.— 935.00 MHz

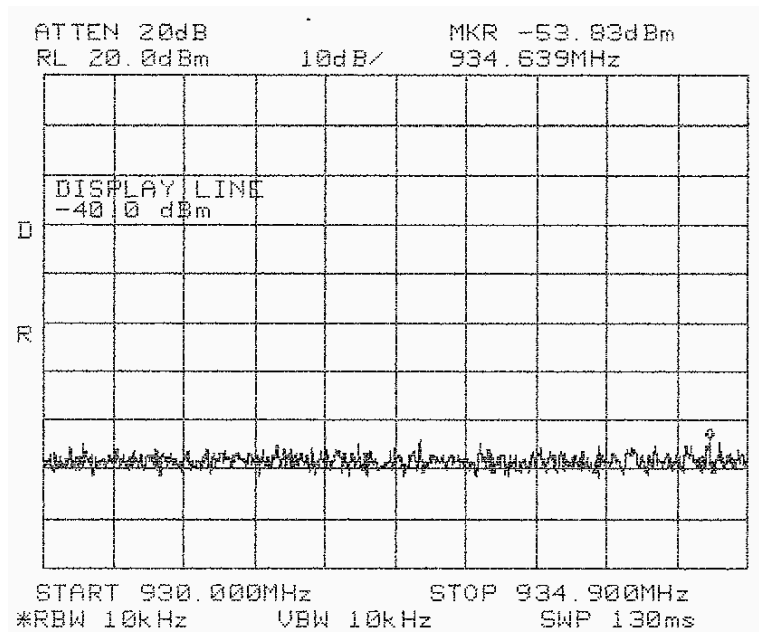


Figure 87.— 935.00 MHz

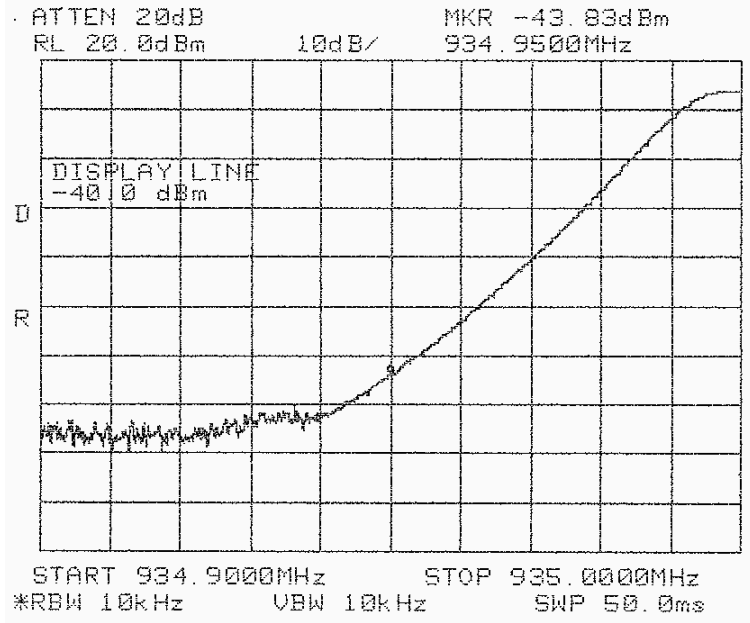


Figure 88.— 935.00 MHz

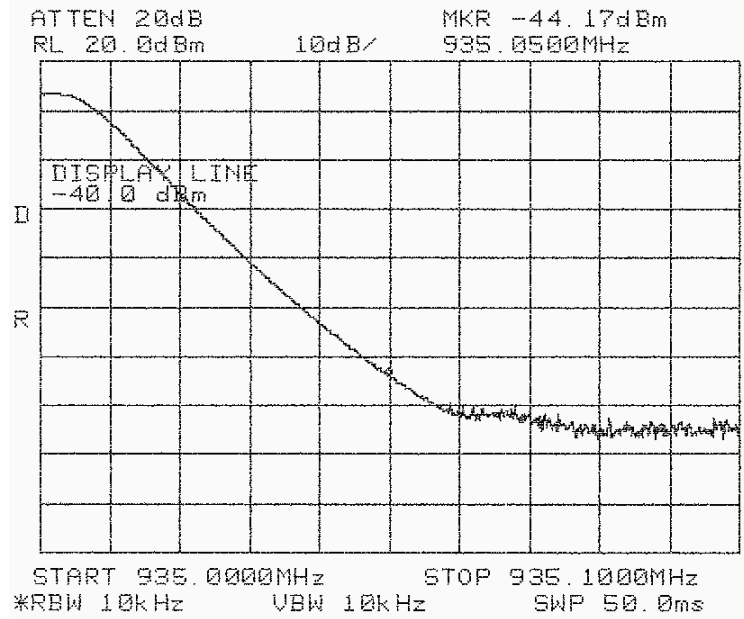


Figure 89.— 935.00 MHz

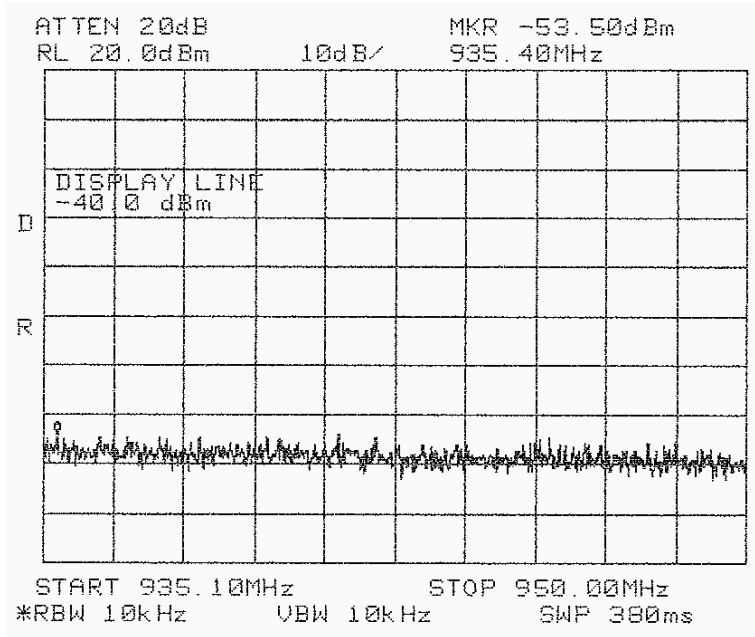


Figure 90.— 935.00 MHz

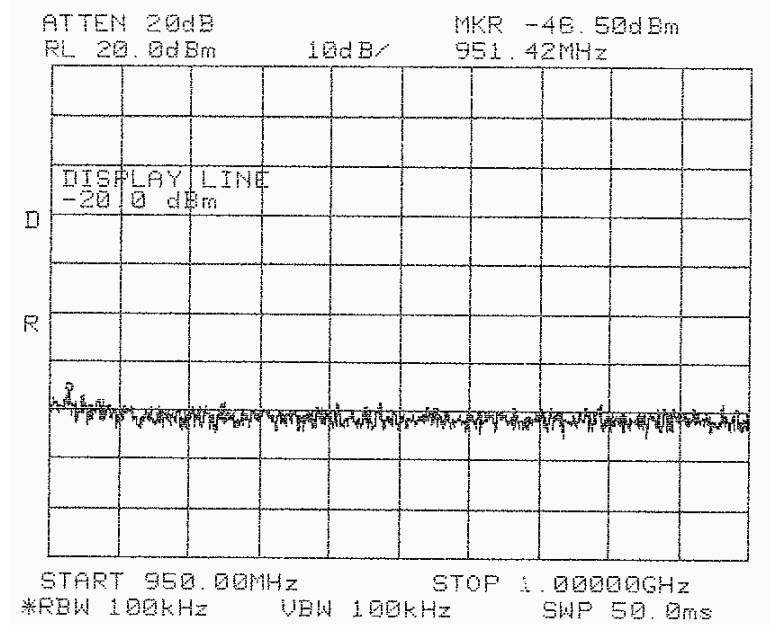


Figure 91.— 935.00 MHz

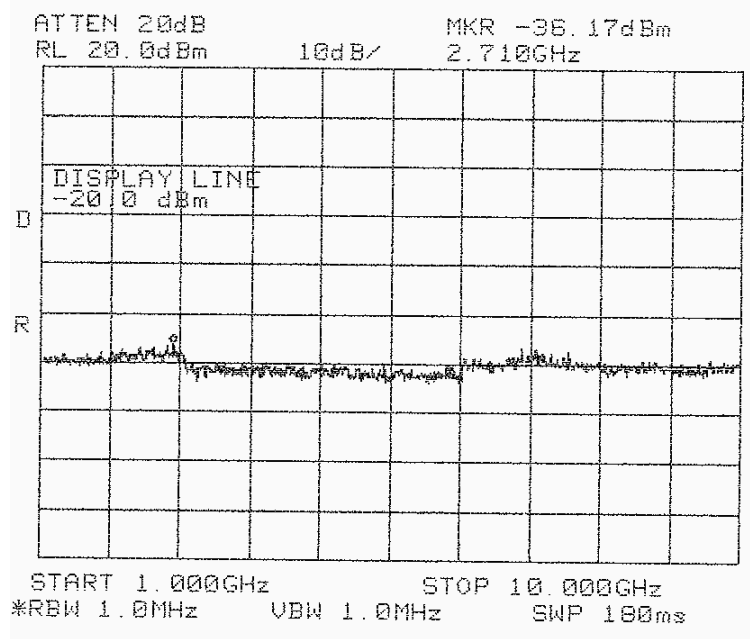


Figure 92.— 935.00 MHz

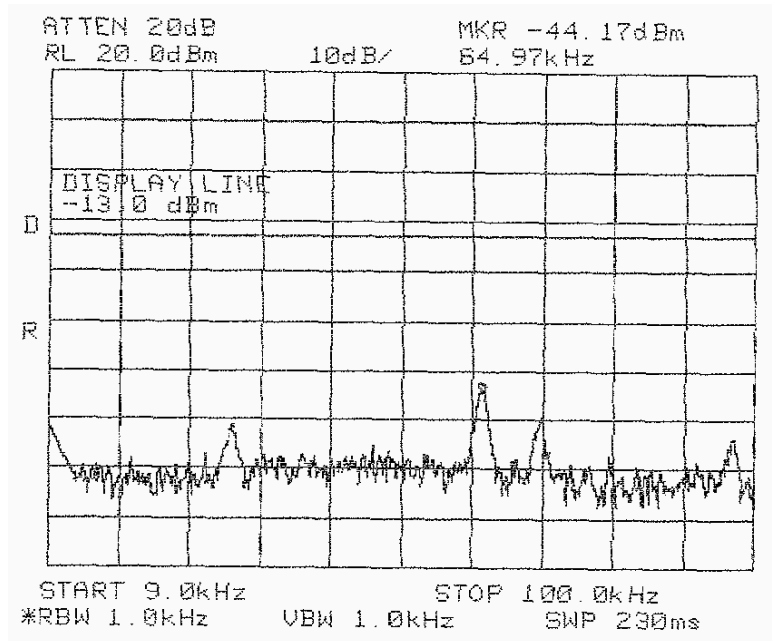


Figure 93.— 940.9875 MHz

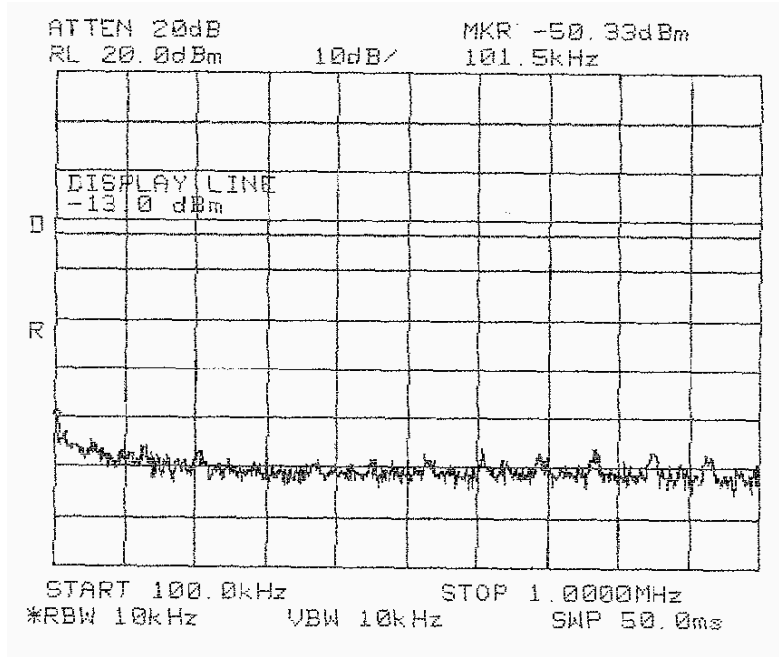


Figure 94.— 940.9875 MHz

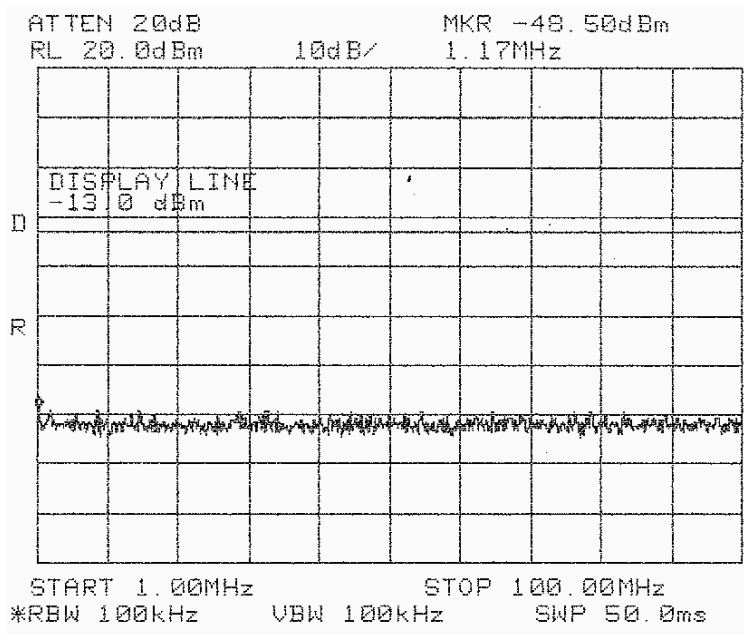


Figure 95.— 940.9875 MHz

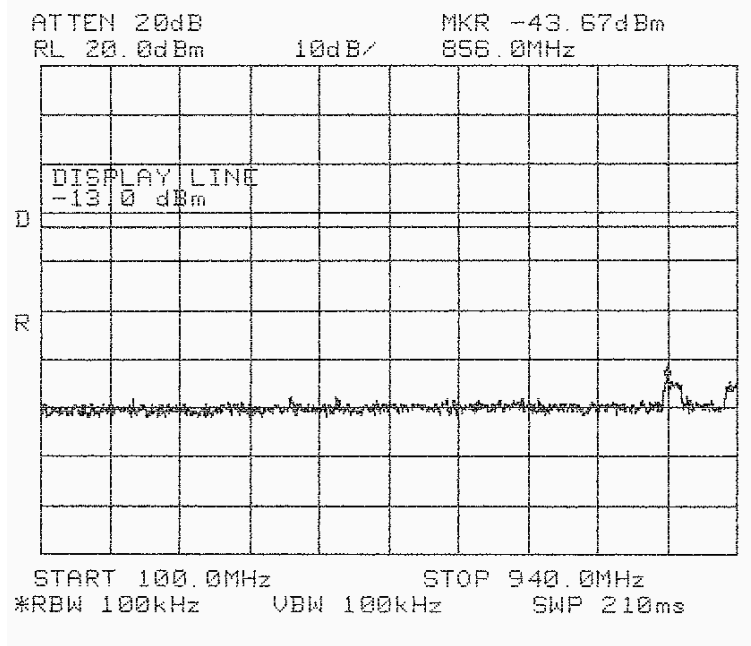


Figure 96.— 940.9875 MHz

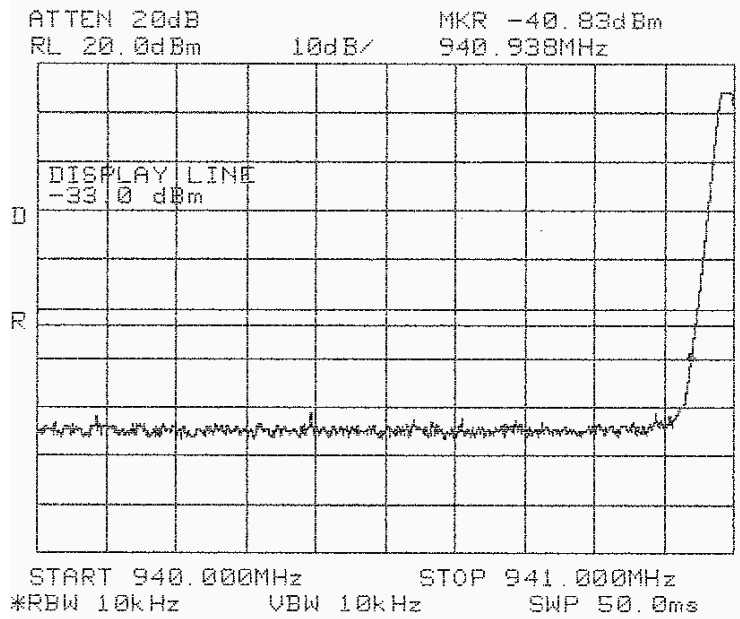


Figure 97.— 940.9875 MHz

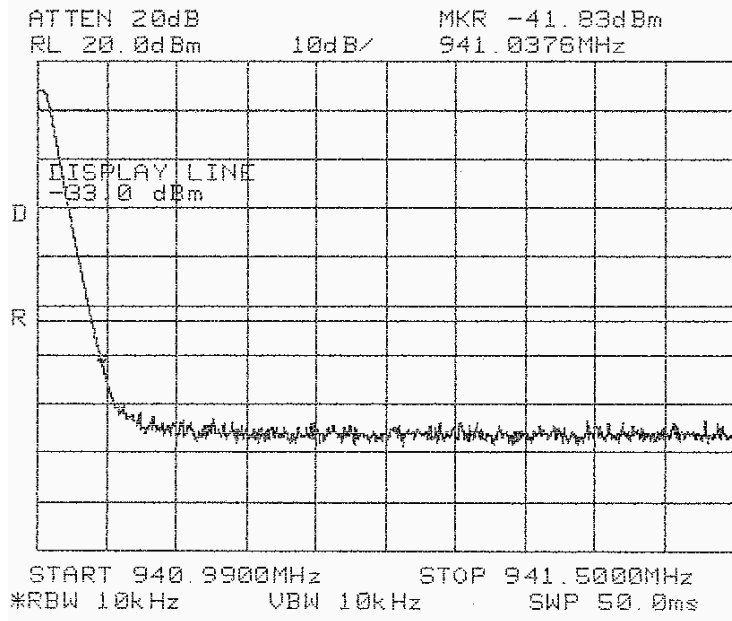


Figure 98.— 940.9875 MHz

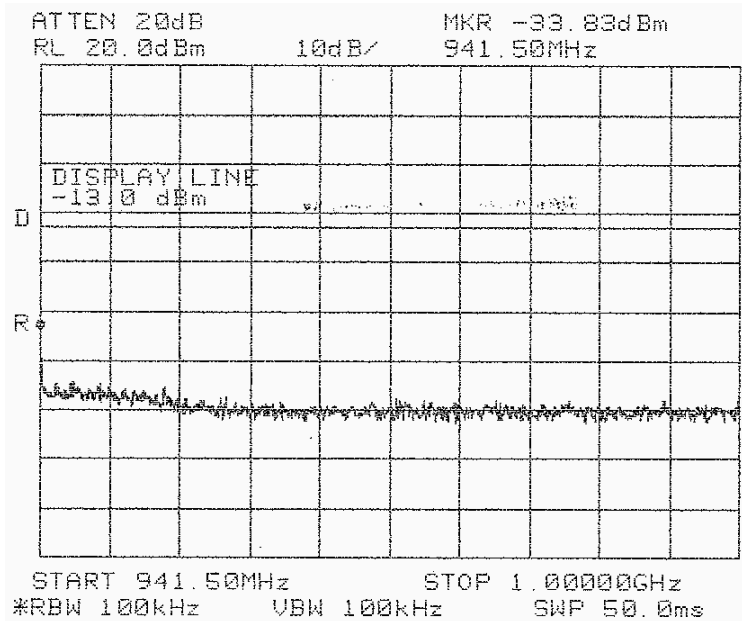


Figure 99.— 940.9875 MHz

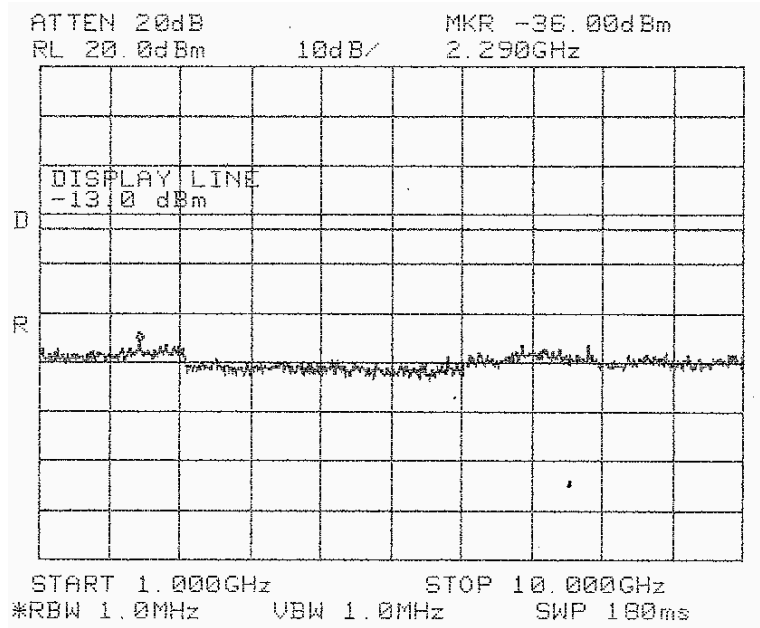


Figure 100.— 940.9875 MHz

13.3 Results table

E.U.T. Description: RF Booster
 Model No.: 2000-iDEN-SMR4E
 Serial Number: Not Designated
 Specification: FCC Part 90, Section 210

Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
929.0125	-36.17	-33.0	-3.17
935.00	-36.17	-40.0	-3.83
940.0875	-33.83	-33.0	-0.83

Figure 101 Out of Band Emission Results

JUDGEMENT: Passed by 0.83 dB

TEST PERSONNEL:

Tester Signature: *E. Pitt*

Date: 18.04.07

Typed/Printed Name: E. Pitt

13.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	21 November 2006	1 year
Signal Generator	HP	E4432B	GB38450502	10 April 2006	1 year
Power Supply	Horizon Electronics	DHR 3653D-1.0	TE1232	N/A	1 year
Cable	RHOPHASE	KPS-1500	A1675	16 December 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0050	21 November 2006	1 year
Attenuator	Macom	M3933/24-74N	4106-0202	21 November 2006	1 year

Figure 102 Test Equipment Used

14. Out of Band Emissions (Radiated) (SMR)

14.1 Test Specification

FCC, Part 90, Section 90.210

14.2 Test Procedure

The power of any emission outside of the authorized bandwidth must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm .

- (a) 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, 1.5 meters above the ground. The configuration tested is shown in Figure 3.5.

The frequency range 30 MHz-10 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between $0-360^\circ$, and the antenna polarization. The emissions were measured at a distance of 3 meters.

- (c) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).

The signals observed in step (a) were converted to radiated power using:
 $P(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dBi)}$

P = Equivalent Isotropic Radiated Power.

P_g = Signal Generator Output Level.

14.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMC Analyzer	HP	HP 8593	3536A00120	November 11, 2006	1 year
Antenna Bioconilog	EMCO	3142B	1250	August 23, 2006	1 year
Horn Antenna	ETS	3115	6142	May 16, 2006	2 year
Antenna Mast	ETS/EMCO	2070-2	9608=1497	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

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

15.1 Test Specification

30-2000 MHz, FCC Part 15, Subpart B, CLASS A

15.2 Test Procedure

The E.U.T. operation mode and test set-up 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 *Figure 1. Tests Set-up*.

The E.U.T. highest frequency source or used frequency is 450 MHz.

The frequency range 30-2000 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.

15.3 Test Data

JUDGEMENT: Passed by 8.9 dB

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

In the band 30 MHz – 1.0 GHz, the results were the same for both horizontal and vertical polarizations.

The details of the highest emissions are given in *Figure 103 to Figure 106*.

TEST PERSONNEL:

Tester Signature:  Date: 18.04.07

Typed/Printed Name: E. Pitt

Radiated Emission

E.U.T Description RF Booster
 Type 2000-iDEN-SMR4E
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart B, Class A

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

Frequency MHz	Pol	Peak dBuV/m	QP Lmt dBuV/m	DelLim-Pk dB
45.702869	Vert	25.82	49.50	-23.68
46.219672	Vert	29.37	49.50	-20.13
97.104918	Vert	33.23	54.00	-20.77
136.660245	Vert	35.68	54.00	-18.32
218.990984	Vert	39.19	56.90	-17.71
399.116804	Vert	38.40	56.90	-18.50
705.779918	Vert	41.61	56.90	-15.29

**Figure 103. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL.
 Detectors: Peak, Quasi-peak**

Note: DelLim-Pk 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.

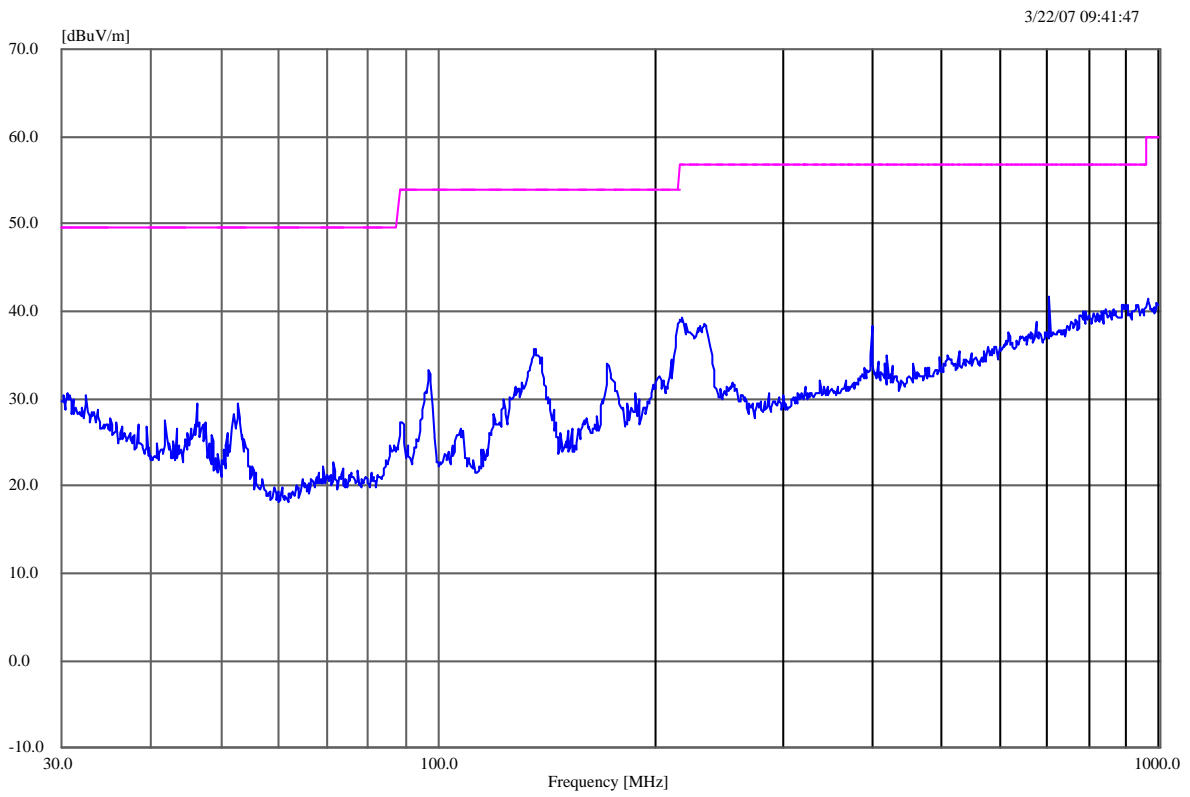
Radiated Emission

E.U.T Description RF Booster
 Type 2000-iDEN-SMR4E
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Horizontal/Vertical
 Antenna: 3 meters distance

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



**Figure 104. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL
 Detectors: Peak, Quasi-peak**

Note: The above graph denotes preliminary testing in the shielded room.

Radiated Emission

E.U.T Description RF Booster
 Type 2000-iDEN-SMR4E
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 2.0 GHz
 Antenna: 3 meters distance Detectors: Peak, Average

Frequency MHz	Pol	Peak dBuV/m	Avg Lmt dBuV/m	DelLim-Pk dB
1362.261905	Horz	47.65	60.00	-12.35
1758.730159	Horz	50.13	60.00	-9.87
1836.865079	Vert	50.04	60.00	-9.96
1872.460317	Vert	50.95	60.00	-9.05
1959.761904	Horz	50.14	60.00	-9.86
1971.230159	Vert	51.10	60.00	-8.90
1982.023809	Horz	50.54	60.00	-9.46

**Figure 105. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL.
 Detectors: Peak, Average**

Note: DelLim-Pk 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 RF Booster
 Type 2000-iDEN-SMR4E
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart B, Class A

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 2.0 GHz
 Antenna: 3 meters distance Detectors: Peak, Average

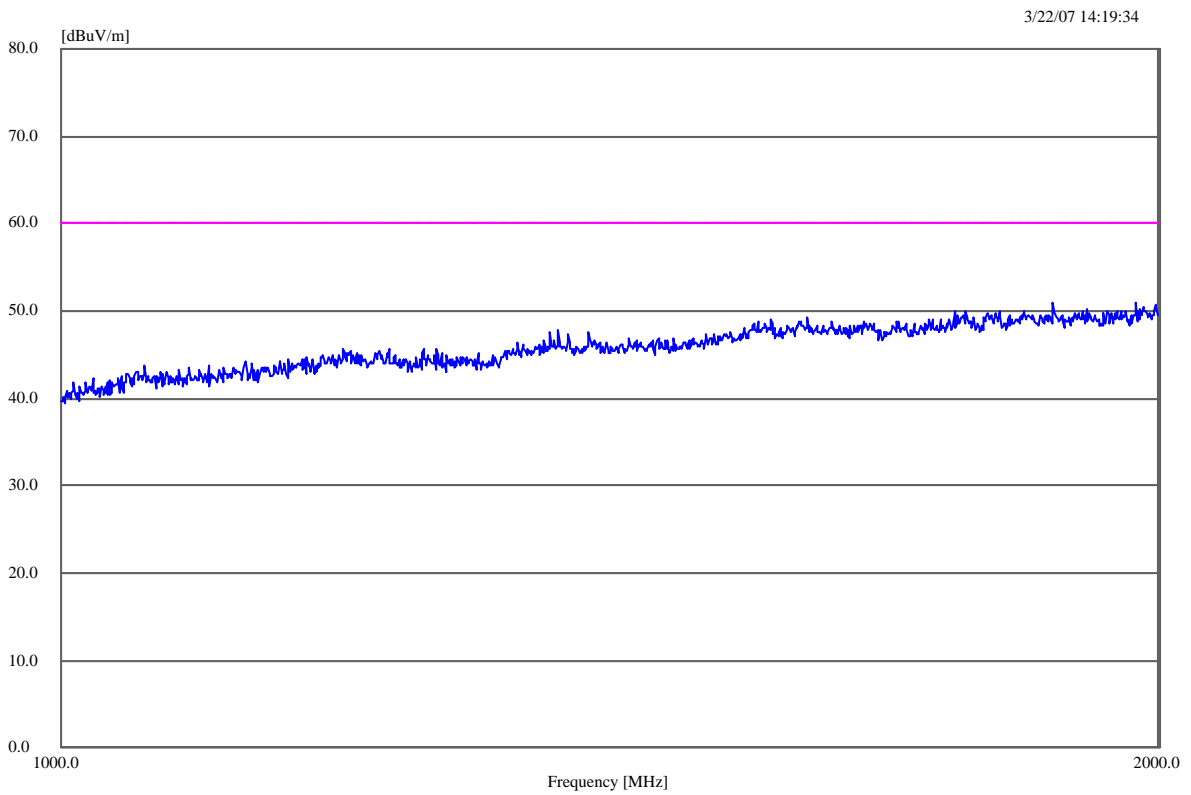


Figure 106. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL. Detectors: Peak, Average

Note: The above graph denotes preliminary testing in the shielded room.

15.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	8546A	3650A00365	October 10, 2006	1 year
EMI Receiver Filter Section	HP	85460A	3650A00365	October 10, 2006	1 year
EMC Analyzer	HP	HP 8593	3536A00120	November 11, 2006	1 year
Antenna Biconilog	EMCO	3142B	1250	August 23, 2006	1 year
Antenna Mast	ETS/EMCO	2070-2	9608=1497	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

15.5 **Field Strength Calculation**

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

$$FS = RA + AF + CF$$

- 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.

16. APPENDIX A - CORRECTION FACTORS

16.1 Correction factors for CABLE
from EMI receiver
to test antenna
at 3 and 10 meter range.

FREQUENCY	CORRECTION FACTOR	FREQUENCY	CORRECTION FACTOR
(MHz)	(dB)	(MHz)	(dB)
30	1.96	150	5.06
35	2.08	160	5.35
40	2.26	170	5.57
45	2.43	180	5.7
50	2.59	190	5.84
55	2.65	200	6.02
60	2.86	250	6.86
65	2.96	300	7.59
70	3.04	350	8.09
75	3.27	400	8.7
80	3.41	450	9.15
85	3.54	500	9.53
90	3.68	550	9.82
95	3.77	600	10.24
100	3.93	650	10.74
110	4.19	700	11.25
120	4.41	800	12.53
130	4.6	900	13.86
140	4.83	1000	14.86

NOTE:

The cable type is RG-214/U.

12.6 Correction factors for Biconilog Antenna

at 3 and 10 meter ranges.

Model: 3142

Antenna serial number: 1250

3 meter range

FREQUENCY	AFE	FREQUENCY	AFE
(MHz)	(dB/m)	(MHz)	(dB/m)
30	18.4	500	18.6
40	13.7	600	19.6
50	9.9	700	21.1
60	8.1	800	21.4
70	7.4	900	23.5
80	7.2	1000	24.3
90	7.5	1100	25
100	8.5	1200	24.9
120	7.8	1300	26
140	8.5	1400	26.1
160	10.8	1500	27.1
180	10.4	1600	27.2
200	10.5	1700	28.3
250	12.7	1800	28.1
300	14.3	1900	28.5
400	17	2000	28.9

12.7 Correction factors for LOG PERIODIC ANTENNA
Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

16.8 Correction factors for HORN ANTENNA

Model: 3115
Antenna serial number: 0004-6142
1 meter range

FREQUENCY	AFE	FREQUENCY	AFE
(MHz)	(dB/m)	(MHz)	(dB/m)
1000	23.9	7500	37.5
1500	25.4	8000	37.6
2000	27.3	8500	38.3
2500	28.5	9000	38.5
3000	30.4	9500	38.1
3500	31.6	10000	38.6
4000	33	10500	38.4
4500	32.7	11000	38.5
5000	34.1	11500	39.4
5500	34.5	12000	39.2
6000	34.9	12500	39.4
6500	35.1	13000	40.7
7000	35.9		