

DATE: 21 December 2008

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

FCC Radio Test Report

for

AeroScout Ltd.

Equipment under test:

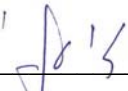
Exciter 2 GHz Band

EX2000BW

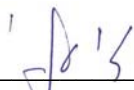
Written by: _____


D. Shidlow, Documentation

Approved by: _____


I. Raz, Test Engineer

Approved by: _____


I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Measurement/Technical Report for AeroScout Ltd.

Exciter

EX2000BW

FCC ID: Q3HEX2000BW

21 December 2008

This report concerns: Original Grant: X
Class I Change:
Class II Change:

Equipment type:

Limits used:

47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification

prepared by:

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Applicant for this device:

(different from "prepared by")

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1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout Ltd.
Manufacturer's Address:	3 Pekeris St. Einstein Entrance 4th Floor Rechovot 76702 Israel Tel: +972-8-9369393 Fax: +972-8-9365977
Manufacturer's Representative:	Dadi Matza
Equipment Under Test (E.U.T):	Exciter
Equipment Model No.:	EX2000BW
Equipment Part No.:	100-2035-0002
Date of Receipt of E.U.T:	15.12.08
Start of Test:	15.12.08
End of Test:	19.12.08
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	See Section 2

1.2 List of Accreditations

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

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel 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 AeroScout EX2000BW Exciter is a component of the AeroScout suite of enterprise visibility solutions that enables location-based applications. The EX2000BW Exciter extends the AeroScout suite to provide robust and sophisticated RFID detection capabilities, using the same AeroScout tags that can also be accurately located in real time by the AeroScout system. The EX2000BW Exciter triggers AeroScout's tags in range, and those transmit a message to AeroScout Location Receivers or compatible Access Points. This provides instant acknowledgment that a tagged asset was present in a well-defined area. The detection and programming capabilities of the Exciter, combined with the location features of the AeroScout Visibility System, make the AeroScout suite the most sophisticated enterprise visibility solution for a wide variety of industries. The EX2000BW Exciter include a 802.11b/g bridge card that connect the exciter to the network wirelessly.

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

Conducted Emission

The uncertainty for this test is ± 2 dB.

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. System Test Configuration

2.1 Justification

The E.U.T. was originally certified for FCC under the FCC ID: Q3HBS2035-1, Model Name EX-2000 (125 kHz transmitter).

A Permissive Change Class I was applied to the product earlier this year and the model was renamed EX-2000B.

A WiFi Dual Band 2.4/5.25 GHz IEEE802.11a/b/g transceiver was added to the E.U.T. and now a new filing is required.

Full testing was performed on the 2.4/5.25 GHz IEEE802.11a/b/g transceiver as well as co-location test with both radios (125 kHz and 2.4 GHz).

The E.U.T. is a fixed wall or ceiling mounted unit.

To determine the E.U.T. orientation for the spurious radiated emissions tests, the product carrier field level was measured in three orthogonal directions of the E.U.T. The vertical position was selected as the worst case final orientation position.

The typical operation of the Exciter (as a customer would normally use) is that the Exciter is used as a beacon, which is programmed to transmit a specific message in a preprogrammed interval (10 msec – 2 sec).

In the test configuration the Exciter was programmed to the lowest transmission interval of 10 msec and maximum transmission power, which is the worst case operating mode of the Exciter.

The WIFI card is set to continue transmission on the relevant Wi-Fi channels in the maximum power, which is the worst case operating mode of the Exciter with the Wi-Fi Bridge.

The E.U.T. was powered from an AC/DC adapter.

2.2 EUT Exercise Software

The Exciter SW test mode supports few modes of operation:

- Continuous 125 KHz carrier transmitting (used only in test mode).

- Transmitting of 125 kHz ASK modulated signal.

- Continuous WiFi modulated/unmodulated signal

2.3 Special Accessories

No special accessories were needed to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

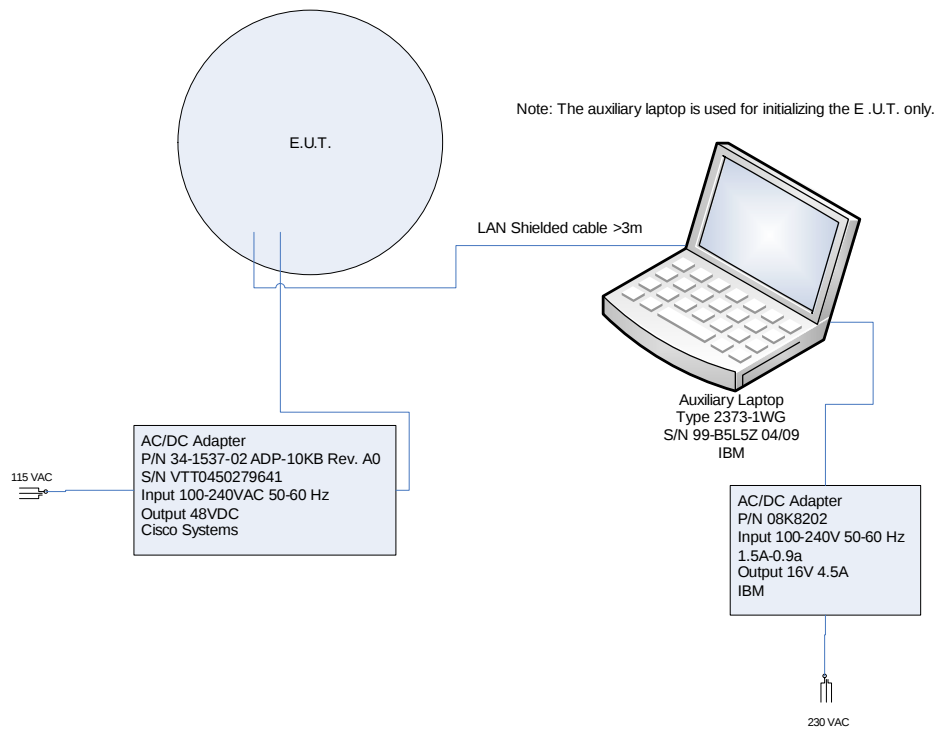


Figure 1. Configuration of Tested System

3. Theory of Operation

3.1 *Theory of Operation*

The Exciter is a 125 kHz transmitter, and can be powered from 48 VDC. The Exciter can be connected to another Exciter for chaining or programming or can act as standalone Exciter with no connection to the server.

The Exciter is a 125 kHz ASK modulated beacon, which transmits the same message in a preprogrammed transmission interval. The messages transmitted by Exciter cause the AeroScout Tag to wakeup and transmit a reply message to the AeroScout location receivers.

The EX2000BW is connected to the network through an 802.11a/b/g card included in the exciter. The 802.11 a/b/g/ card is connected to the wireless system and then bridges the exciter communication wirelessly

4. Conducted Emission Data

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

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

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

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

4.3 Measured Data

JUDGEMENT: Passed by 12.7 dB

The margin between the emission levels and the specification limit is, in the worst case, 14.9 dB for the phase line at 0.15 MHz and 12.7 dB at 1.44 MHz for the neutral line.

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

The details of the highest emissions are given in *Figure 2* to *Figure 5*.

TEST PERSONNEL:

Tester Signature: 

Date: 22.12.08

Typed/Printed Name: Y. Mordukhovitch

Conducted Emission

E.U.T Description Exciter
Type EX2000BW
Part Number: 100-2035-0002

Specification: F.C.C., Part 15, Subpart C
Lead: Phase
Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.150125	53.3	51.1	-14.9	37.5	-18.5	0.0
2	0.290425	39.4	36.6	-24.0	20.1	-30.5	0.0
3	0.480275	34.4	30.0	-26.4	26.6	-19.8	0.0
4	0.960808	35.3	31.2	-24.8	17.8	-28.2	0.0
5	1.440122	37.5	32.8	-23.2	28.8	-17.2	0.0
6	14.919965	38.2	35.5	-24.5	31.4	-18.6	0.0
7	18.526640	37.3	35.7	-24.3	32.6	-17.4	0.0

Figure 2. Detectors: Peak, Quasi-peak, AVERAGE .

Note: QP Delta/Av Delta refer 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.

Conducted Emission

E.U.T Description Exciter
 Type EX2000BW
 Part Number: 100-2035-0002

Specification: F.C.C., Part 15, Subpart C
 Lead: Phase
 Detectors: Peak, Quasi-peak, Average

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ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 160 kHz
 52.62 dB μ V

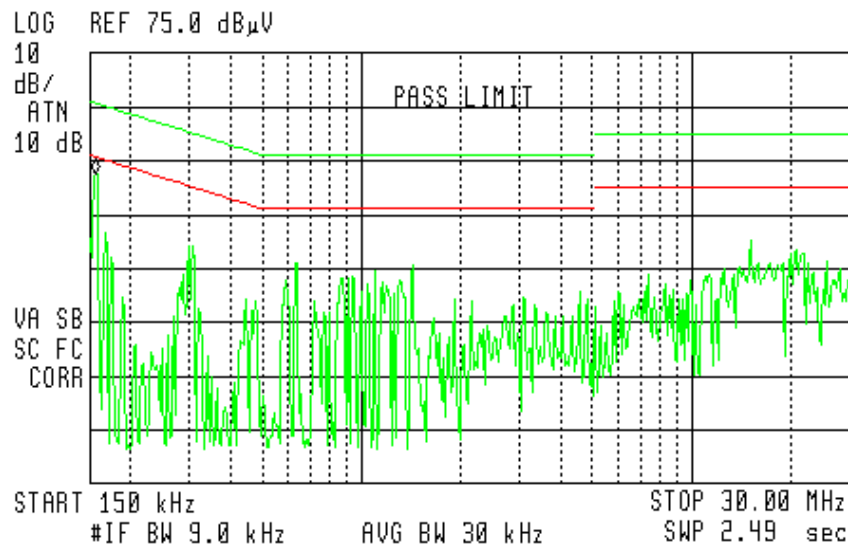


Figure 3. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description Exciter
Type EX2000BW
Part Number: 100-2035-0002

Specification: F.C.C., Part 15, Subpart C
Lead: Neutral
Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.150125	55.5	52.9	-13.1	37.0	-19.0	0.0
2	0.291825	39.3	36.2	-24.3	20.7	-29.8	0.0
3	0.479606	35.1	30.7	-25.7	26.1	-20.2	0.0
4	0.721385	31.6	28.6	-27.4	26.6	-19.4	0.0
5	1.443000	40.5	35.5	-20.5	33.3	-12.7	0.0
6	19.729665	38.0	37.1	-22.9	33.2	-16.8	0.0
7	20.932745	39.1	38.1	-21.9	33.8	-16.2	0.0

Figure 4. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refer 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.

Conducted Emission

E.U.T Description Exciter
 Type EX2000BW
 Part Number: 100-2035-0002

Specification: F.C.C., Part 15, Subpart C
 Lead: Neutral
 Detectors: Peak, Quasi-peak, Average

 17:57:51 DEC 17, 2008

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 150 kHz
 51.20 dBμV

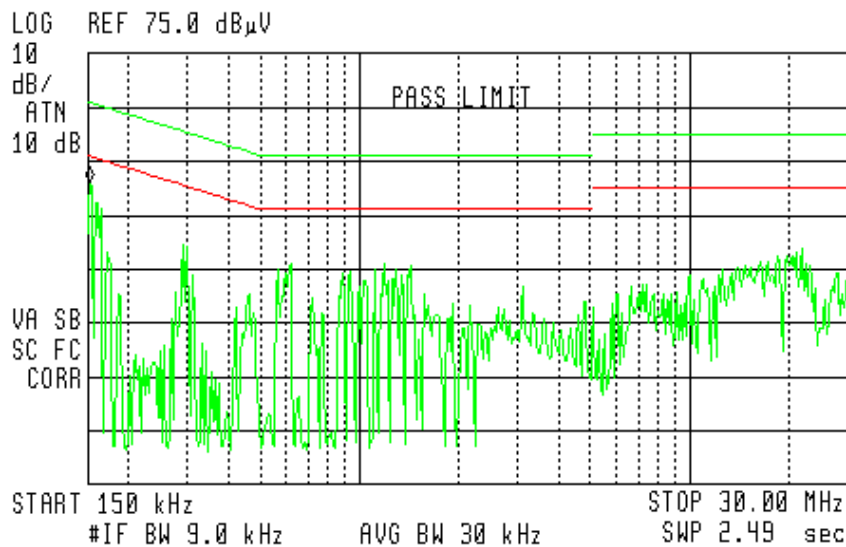


Figure 5 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 8, 2008	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 8, 2008	1 Year
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2008	1Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

5. 6 dB Minimum Bandwidth

5.1 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 external attenuator and 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.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

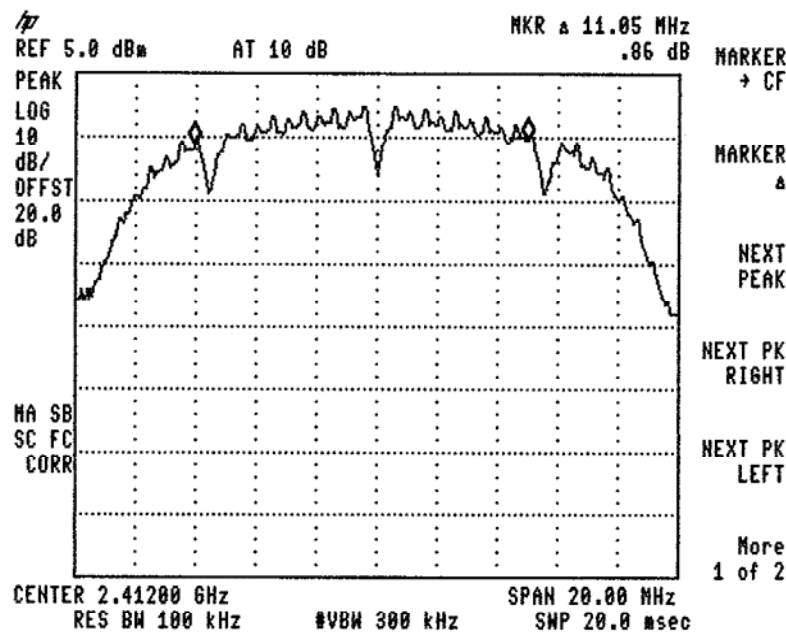


Figure 6 — DBPSK 2412 MHz

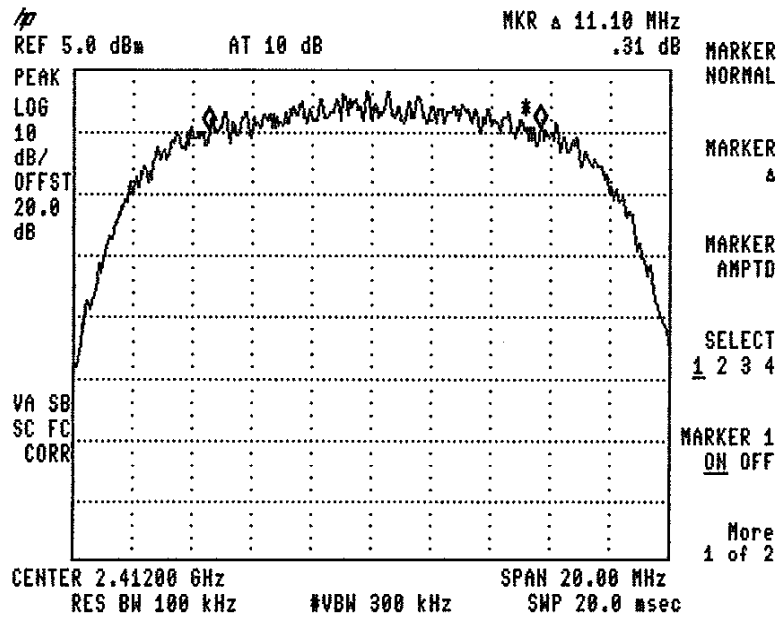


Figure 7 — CCK 2412 MHz

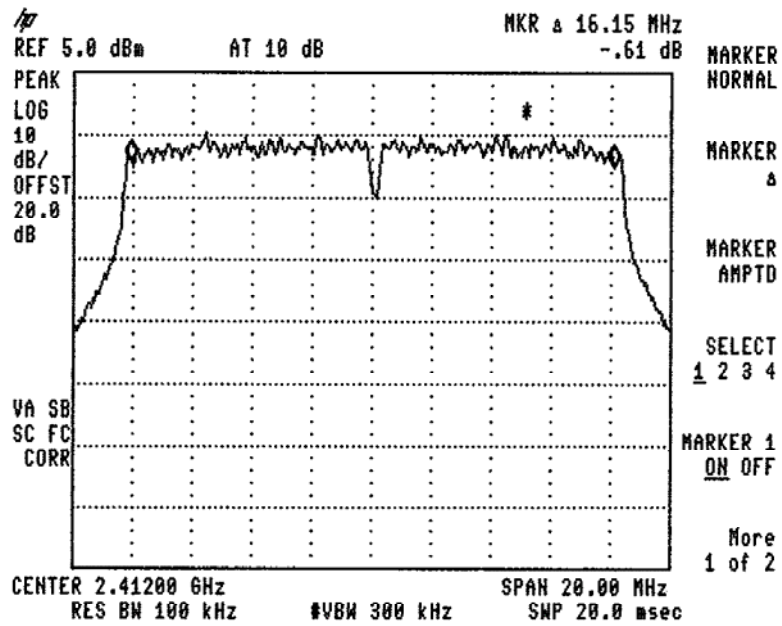


Figure 8 — 64QAM 2412 MHz

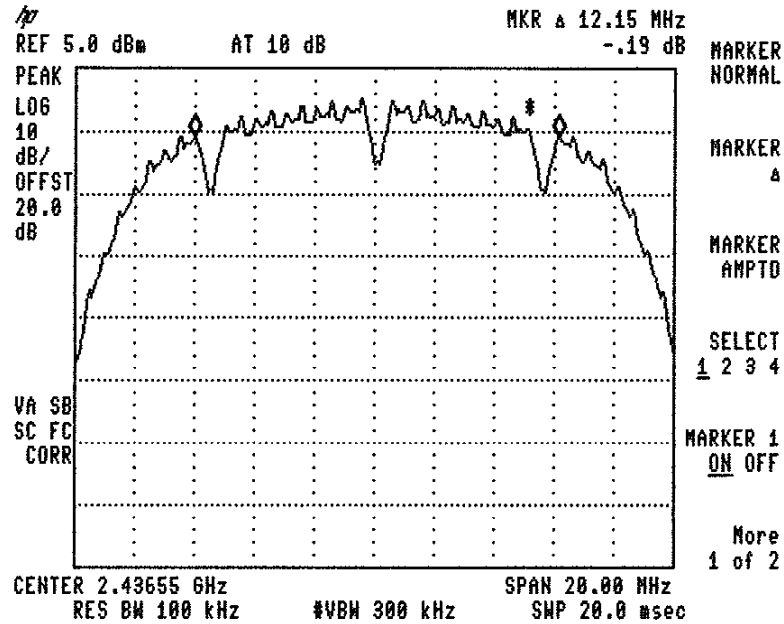


Figure 9 — DBPSK 2437 MHz

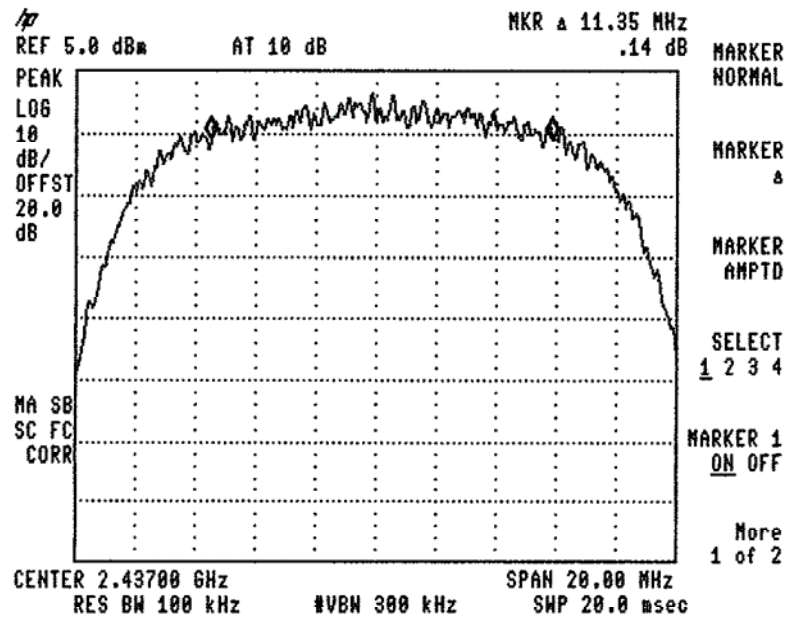


Figure 10 — CCK 2437 MHz

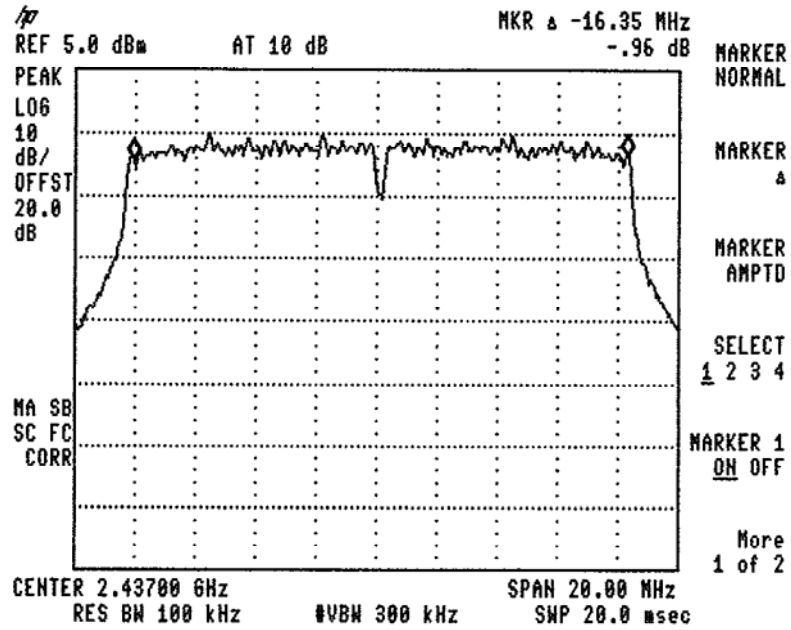


Figure 11 — 64QAM 2437 MHz

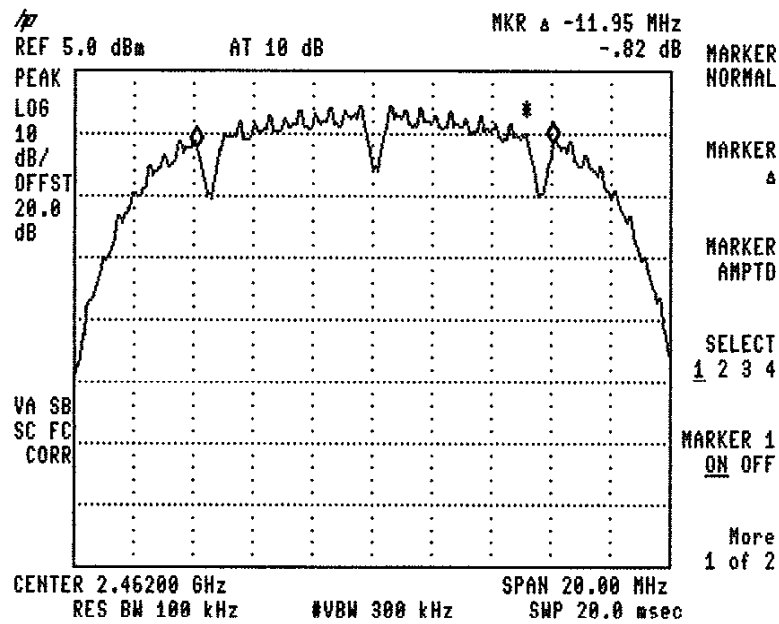


Figure 12 — DBPSK 2462 MHz

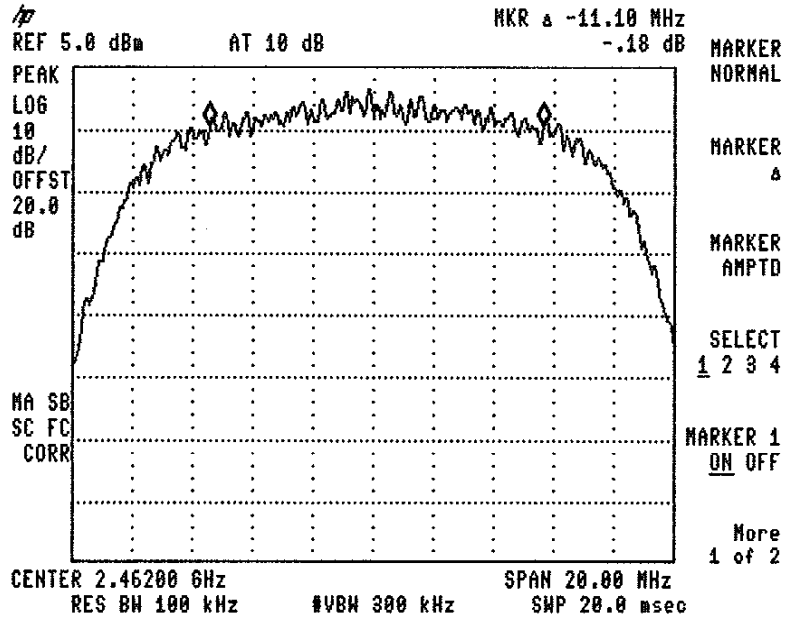


Figure 13 — CCK 2462 MHz

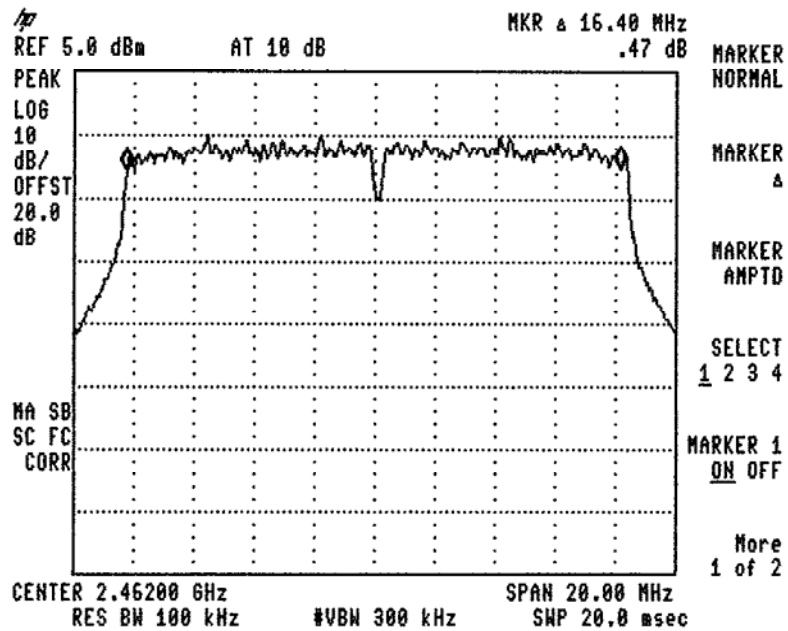


Figure 14 — 64QAM 2462 MHz

5.2 Results table

E.U.T Description: Exciter

Model No.: EX2000BW

Part Number: 100-2035-0002

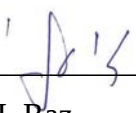
Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Modulation	Reading (MHz)	Specification (MHz)
2412	BPSK	11.05	0.5
	CCK	11.10	0.5
	64QAM	16.15	0.5
2437	BPSK	12.15	0.5
	CCK	11.35	0.5
	64QAM	16.35	0.5
2462	BPSK	11.95	0.5
	CCK	11.10	0.5
	64QAM	16.40	0.5

Figure 15 6 dB Minimum Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 21.12.08

Typed/Printed Name: I. Raz

5.3 Test Equipment Used.

6 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	August 14, 2008	1 year
Cable	Rhophase	KPS-1501-1000	A1675	August 14, 2008	1 year

Figure 16 Test Equipment Used

6. 26 dB Bandwidth

6.1 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 external attenuator and appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW. The spectrum bandwidth of the E.U.T. was measured and recorded.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

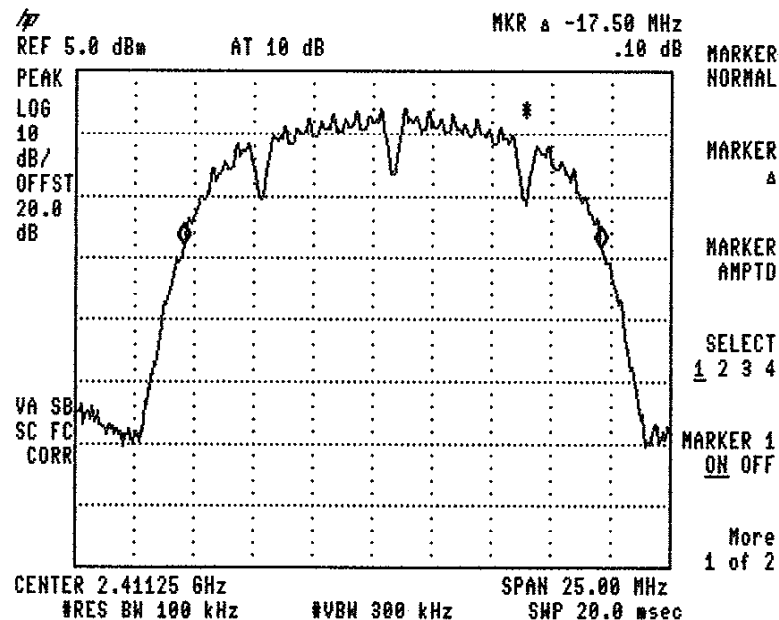


Figure 17 —2412 MHz DBPSK

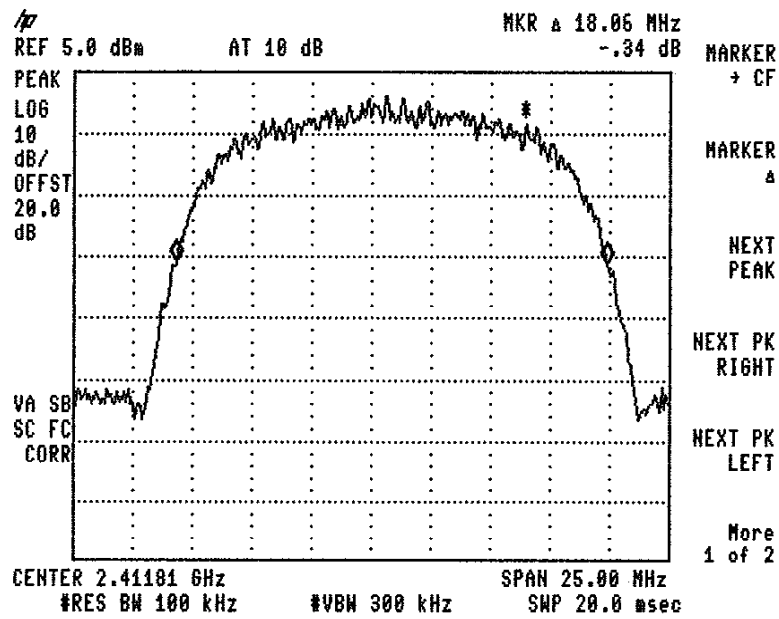


Figure 18 —2412 MHz CCK

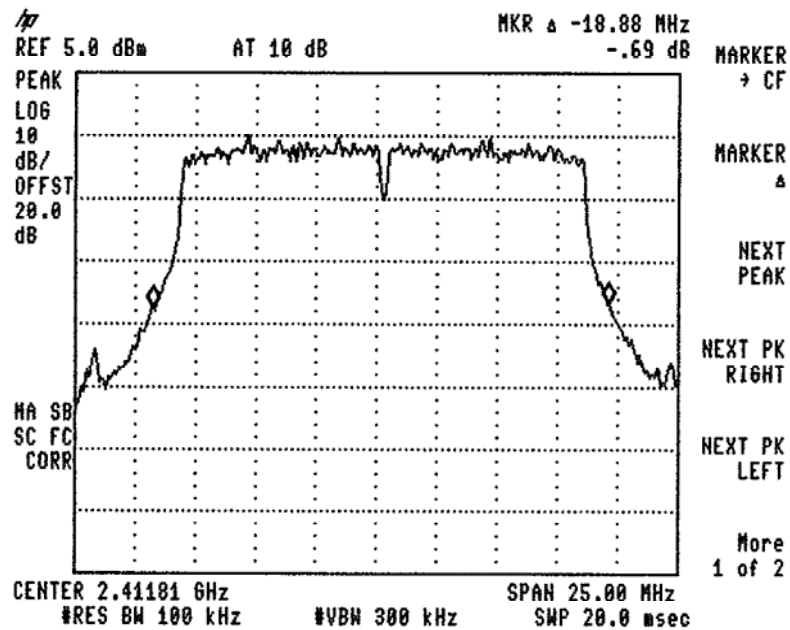


Figure 19 —2412 MHz 64QAM

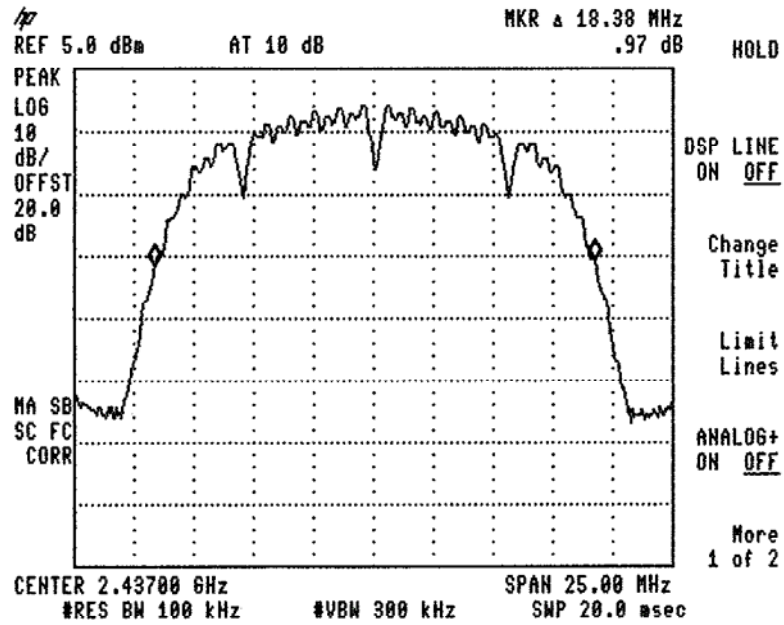


Figure 20 —2437 MHz DBPSK

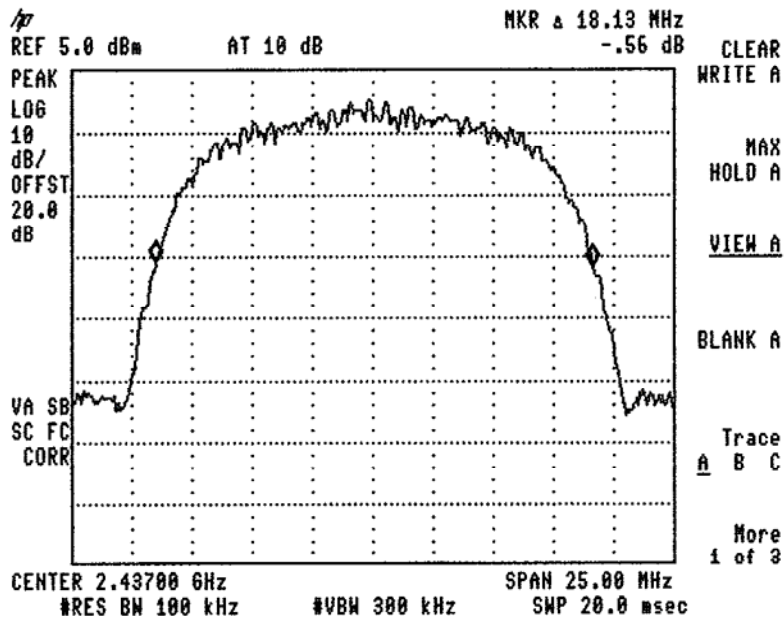


Figure 21 —2437 MHz CCK

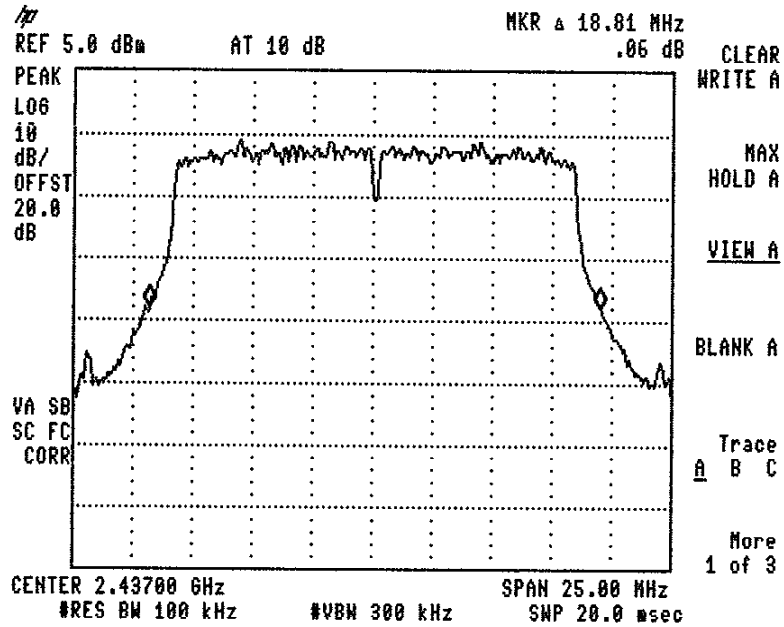


Figure 22 —2437 MHz 64QAM

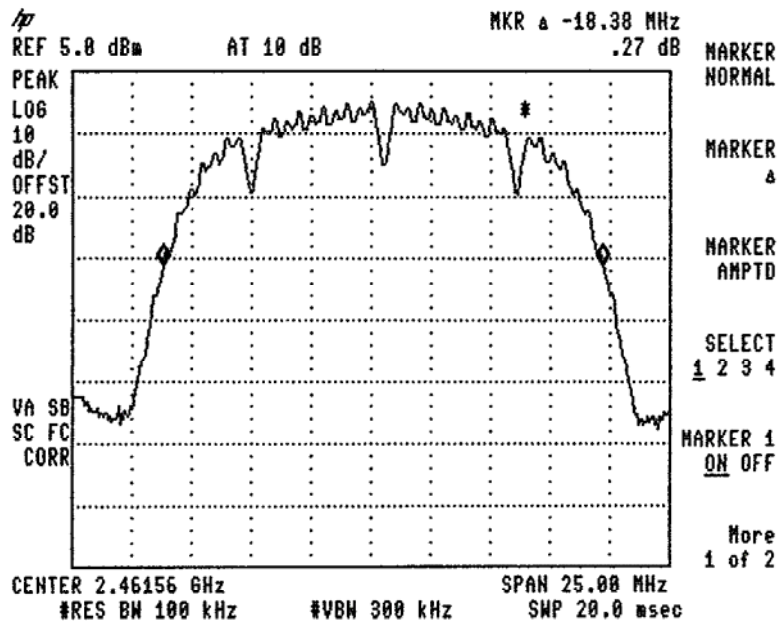


Figure 23 —2462 MHz DBPSK

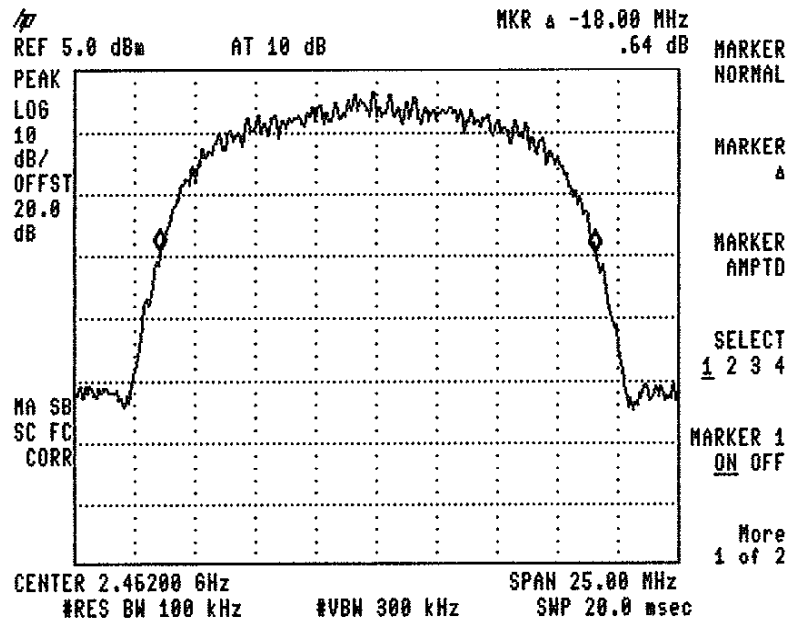


Figure 24 —2462 MHz CCK

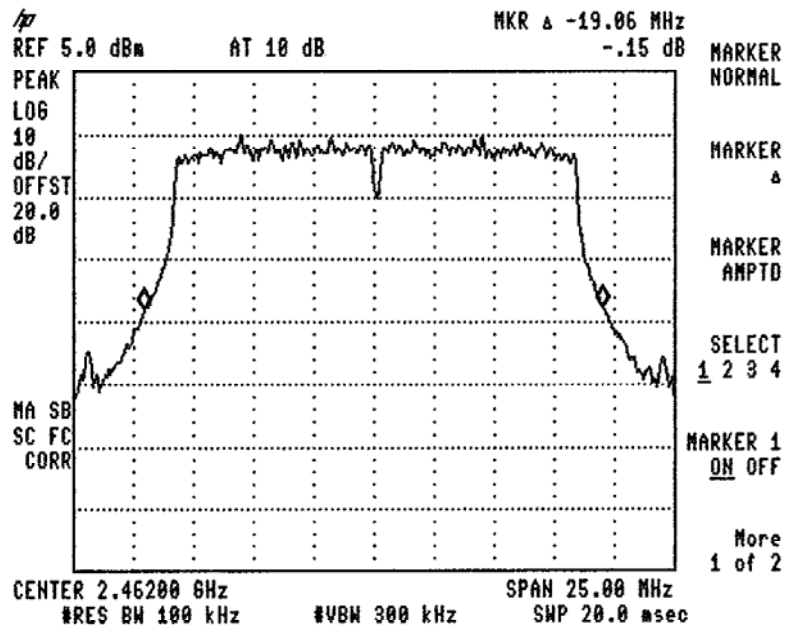


Figure 25 —2462 MHz 64QAM

6.1 Results table

E.U.T Description: Exciter

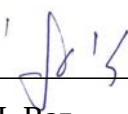
Model No.: EX2000BW

Part Number: 100-2035-0002

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

Operation Frequency (MHz)	Modulation	26 dB Bandwidth (dBm)
2412	DBPSK	17.50
	CCK	18.06
	64QAM	18.88
2437	DBPSK	18.38
	CCK	18.13
	64QAM	18.81
2462	DBPSK	19.06
	CCK	18.00
	64QAM	18.38

TEST PERSONNEL:

Tester Signature: 

Date: 21.12.08

Typed/Printed Name: I. Raz

6.2 Test Equipment Used.

26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	August 14, 2008	1 year
Cable	Rhophase	KPS-1501-1000	A1675	August 14, 2008	1 year

Figure 26 Test Equipment Used

7. Maximum Transmitted Peak Power Output

7.1 Test procedure

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

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

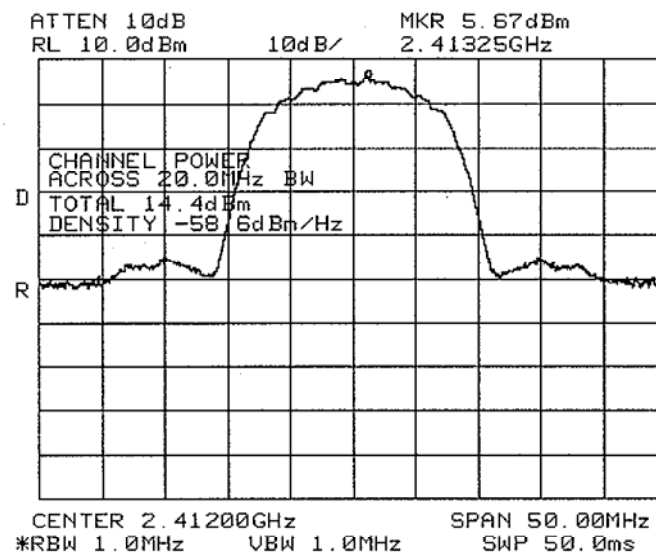


Figure 27 BPSK 2412 MHz

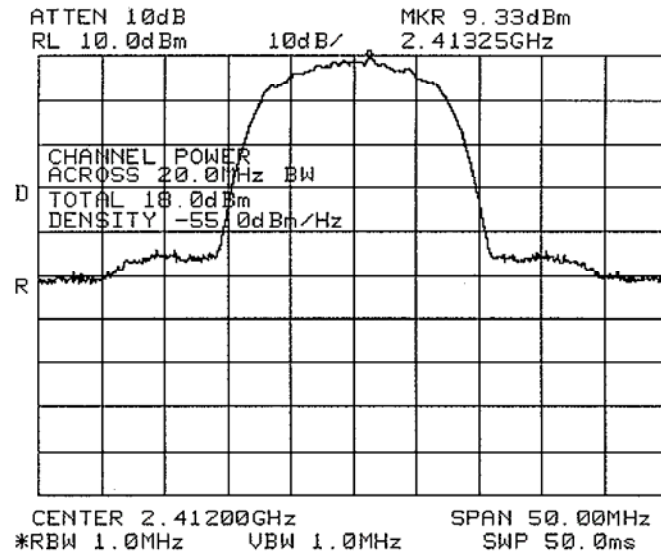


Figure 28 CCK 2412 MHz

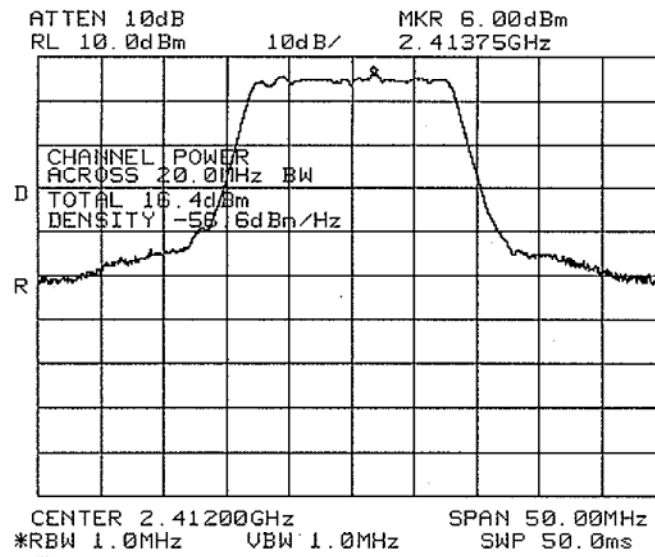


Figure 29 64QAM 2412 MHz

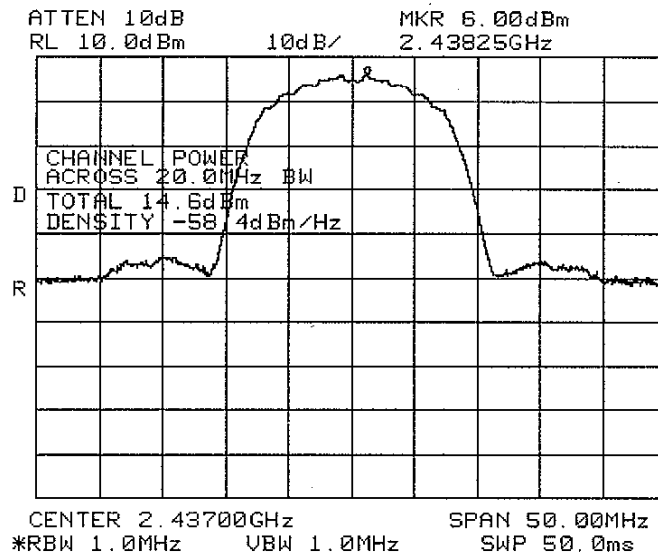


Figure 30 BPSK 2437 MHz

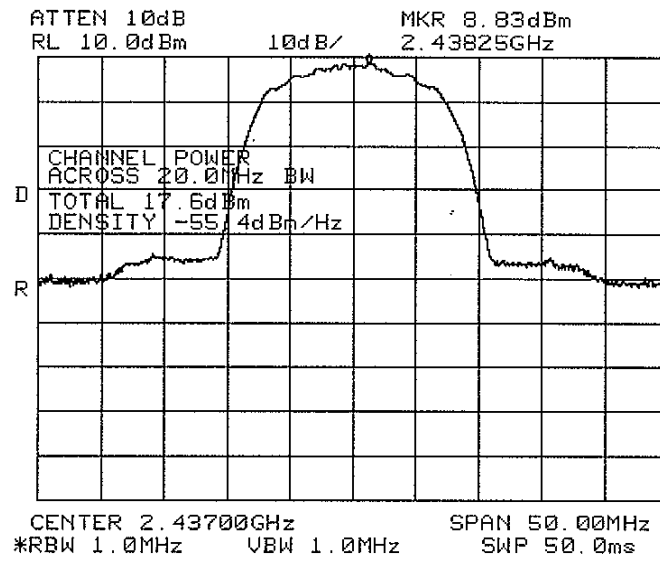


Figure 31 CCK 2437 MHz

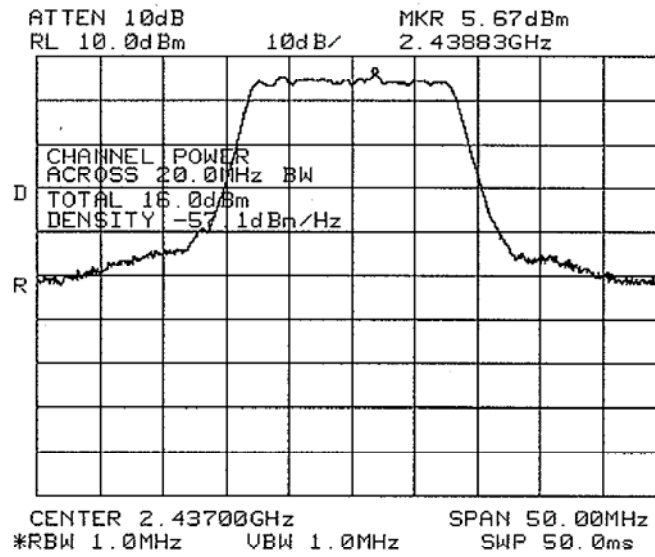


Figure 32 64QAM 2437 MHz

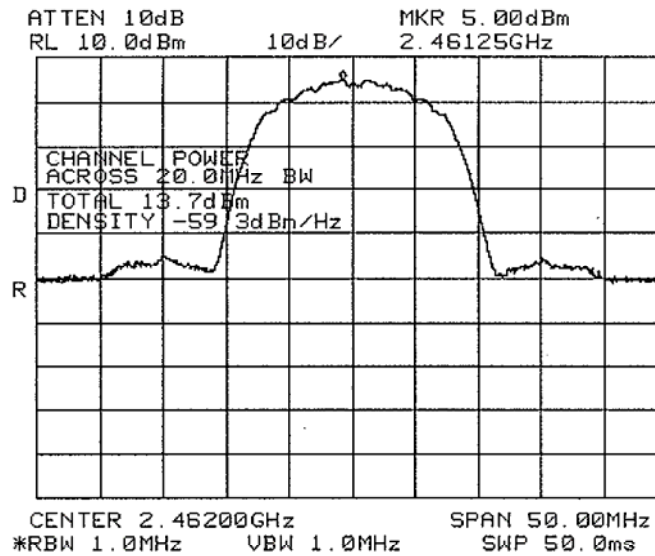


Figure 33 BPSK 2462 MHz

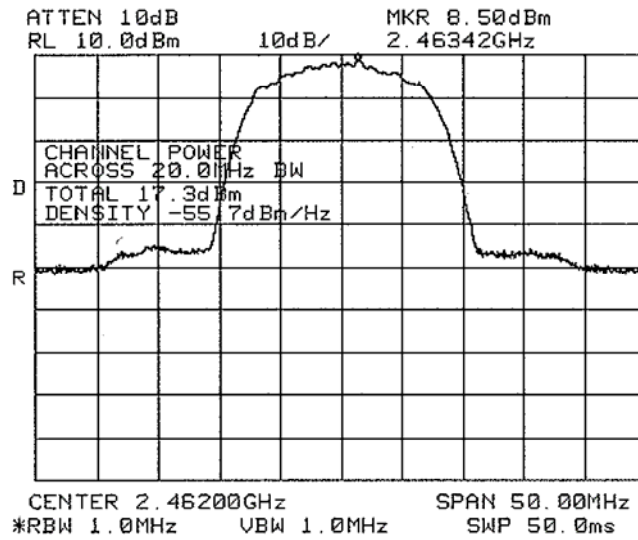


Figure 34 CCK 2462 MHz

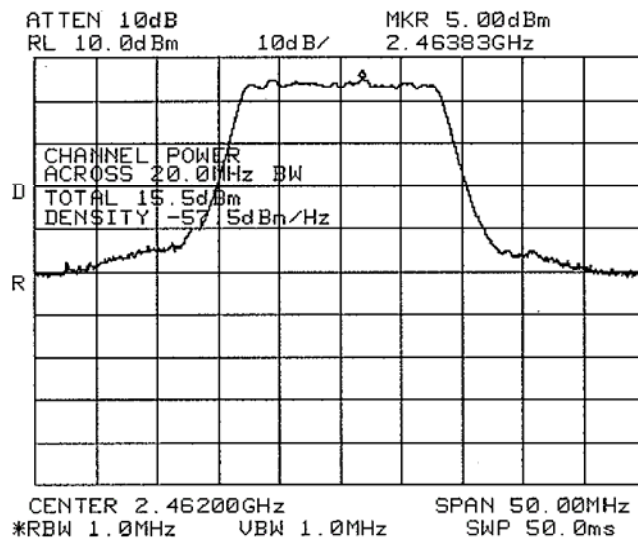


Figure 35 645QAM 2462 MHz

7.2 Results table

E.U.T. Description: Exciter

Model No.: EX2000BW

Part Number: 100-2035-0002

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

Operation Frequency (MHz)	Modulation	Power (dBm)	Specification (dBm)	Margin (dB)
2412	DBPSK	14.4	30.0	-15.6
	CCK	18.0	30.0	-12.0
	64QAM	16.4	30.0	-13.6
2437	DBPSK	14.6	30.0	-15.4
	CCK	17.6	30.0	-12.4
	64QAM	16.0	30.0	-14.0
2462	DBPSK	13.7	30.0	-16.3
	CCK	17.3	30.0	-12.7
	64QAM	15.5	30.0	-14.5

Figure 36 Maximum Peak Power Output

JUDGEMENT:

Passed by 12.0 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 21.12.08

Typed/Printed Name: I. Raz

7.3 Test Equipment Used.

Peak Power Output

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	December 15, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	August 14, 2008	1 year
Cable	Rhophase	KPS-1501-1000	A1675	August 14, 2008	1 year

Figure 37 Test Equipment Used

8. Peak Power Output Out of 2400-2483.5 MHz Band

8.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and 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-10 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.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

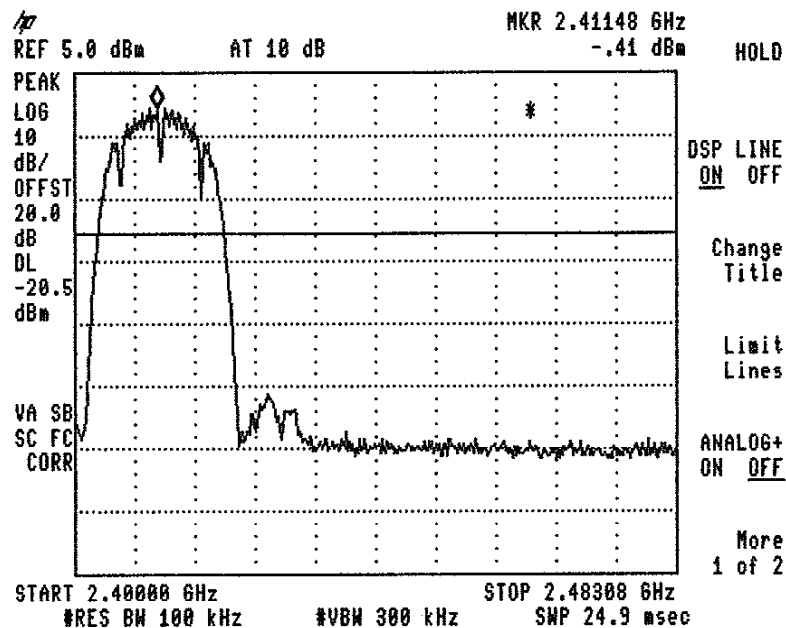


Figure 38 — DBPSK 2412 MHz

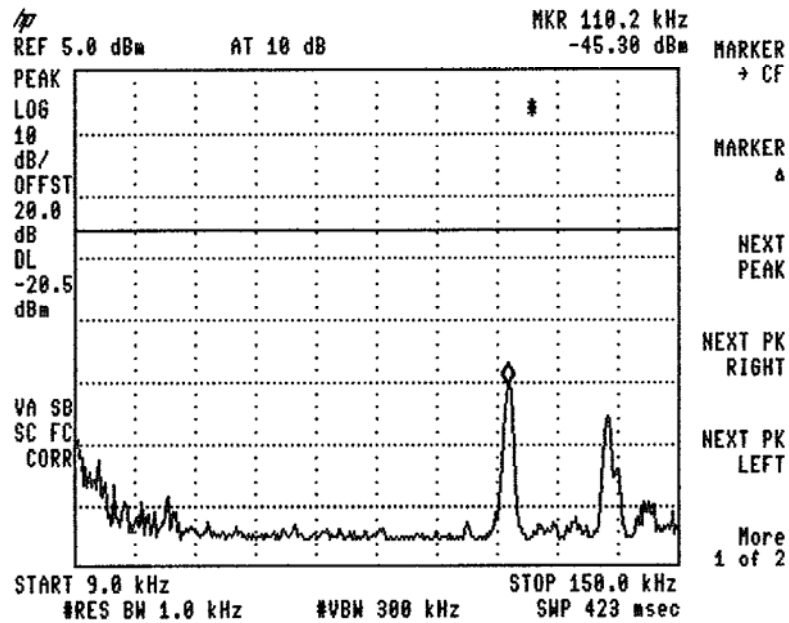


Figure 39 — DBPSK 2412 MHz

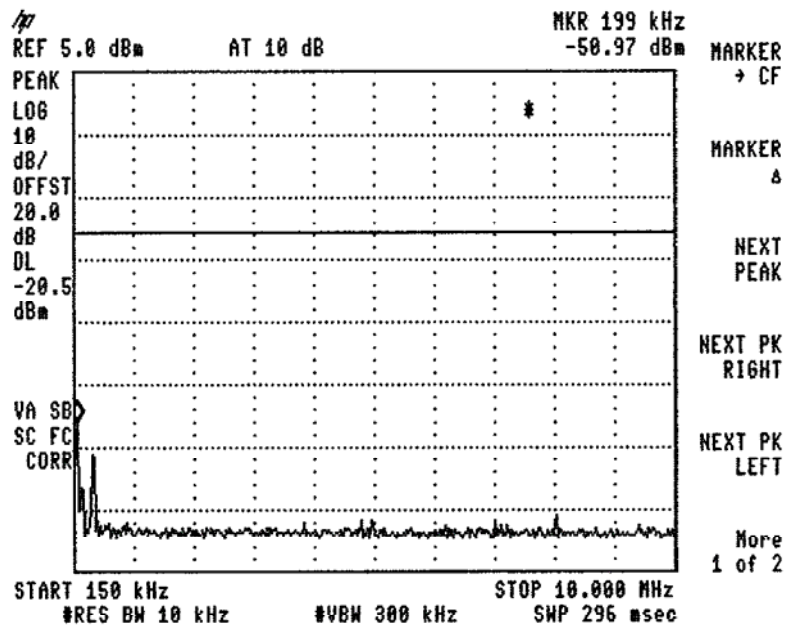


Figure 40 — DBPSK 2412 MHz

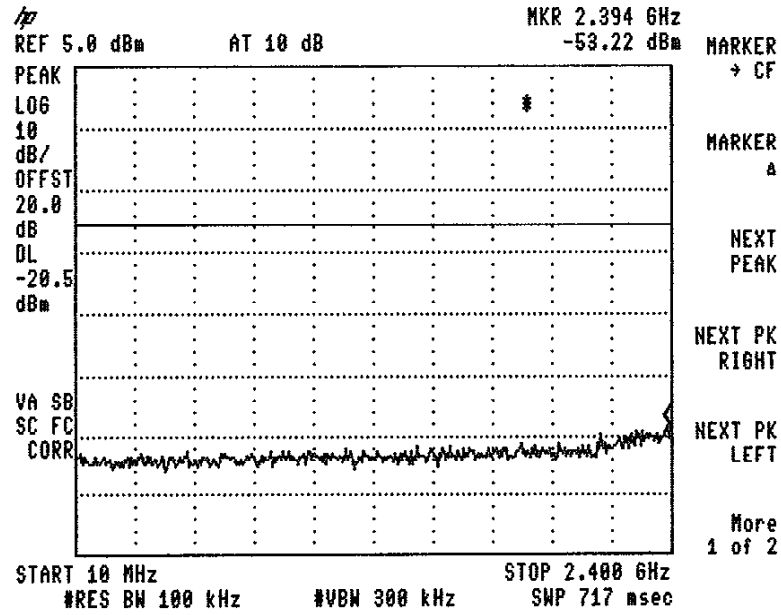


Figure 41 — DBPSK 2412 MHz

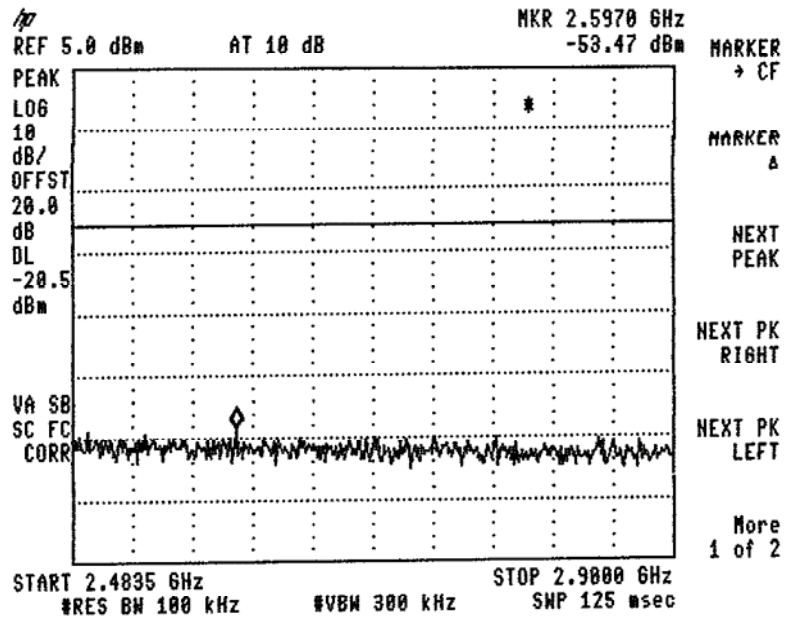


Figure 42 — DBPSK 2412 MHz

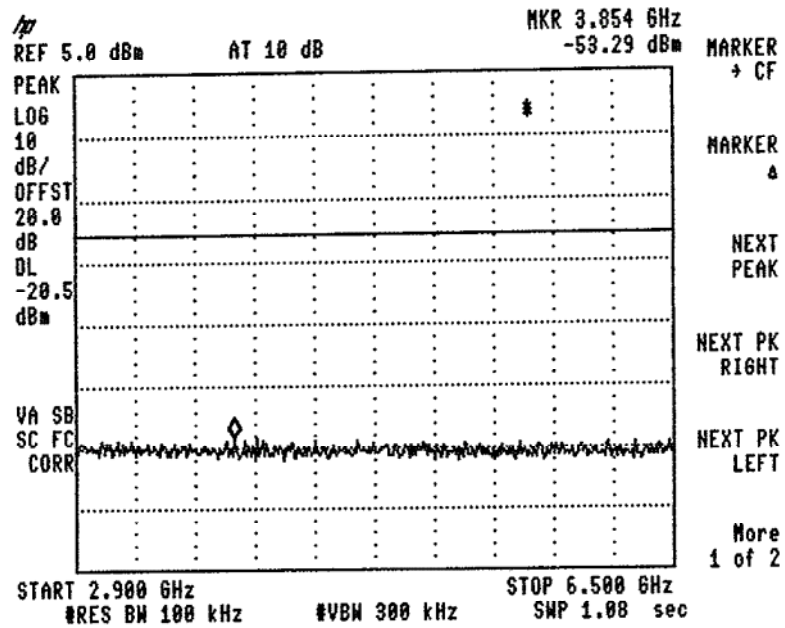


Figure 43 — DBPSK 2412 MHz

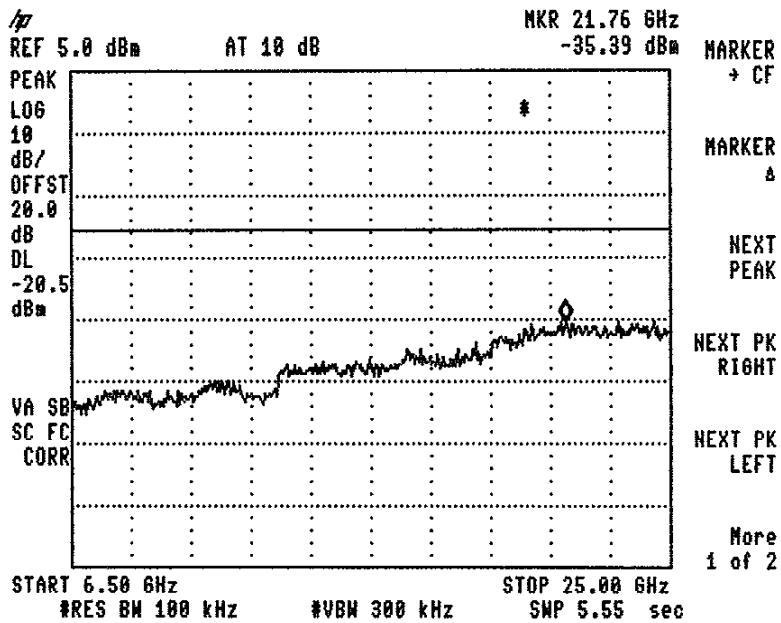


Figure 44 — DBPSK 2412 MHz

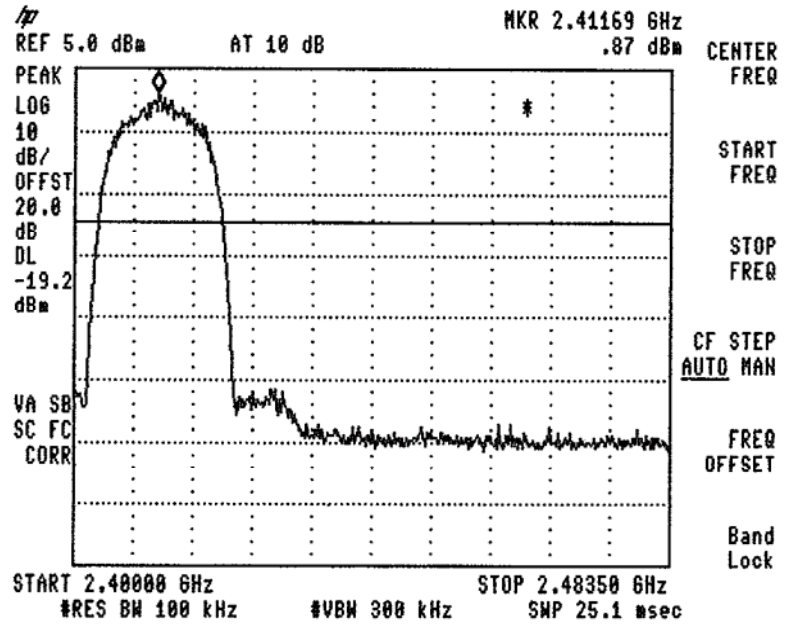


Figure 45 — CCK 2412 MHz

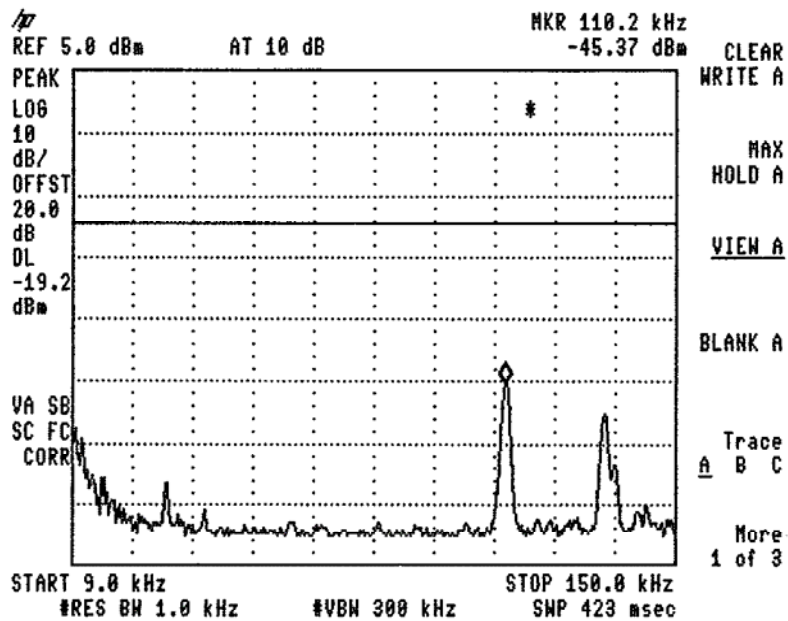


Figure 46 — CCK 2412 MHz

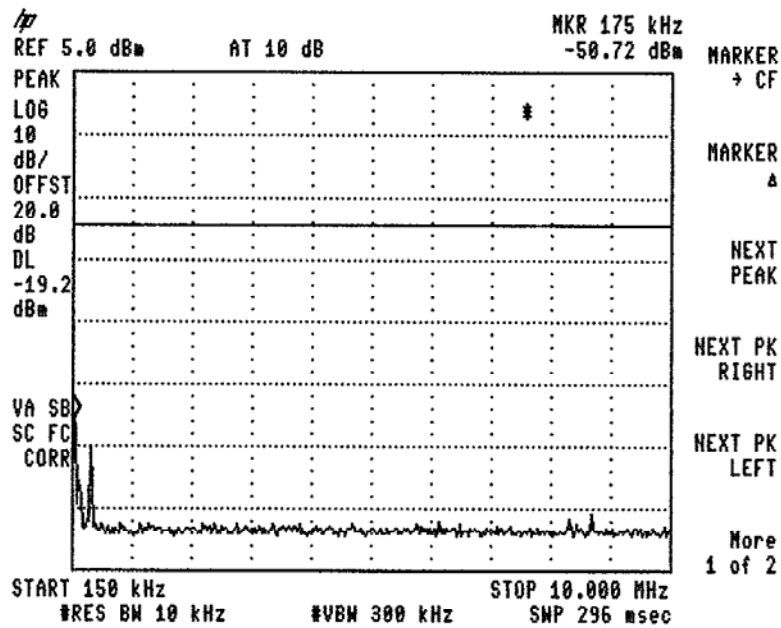


Figure 47 — CCK 2412 MHz

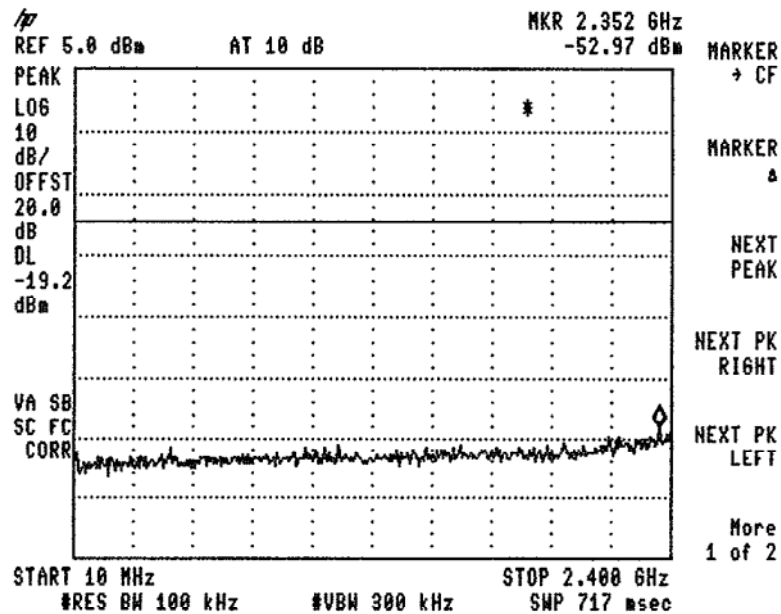


Figure 48 — CCK 2412 MHz

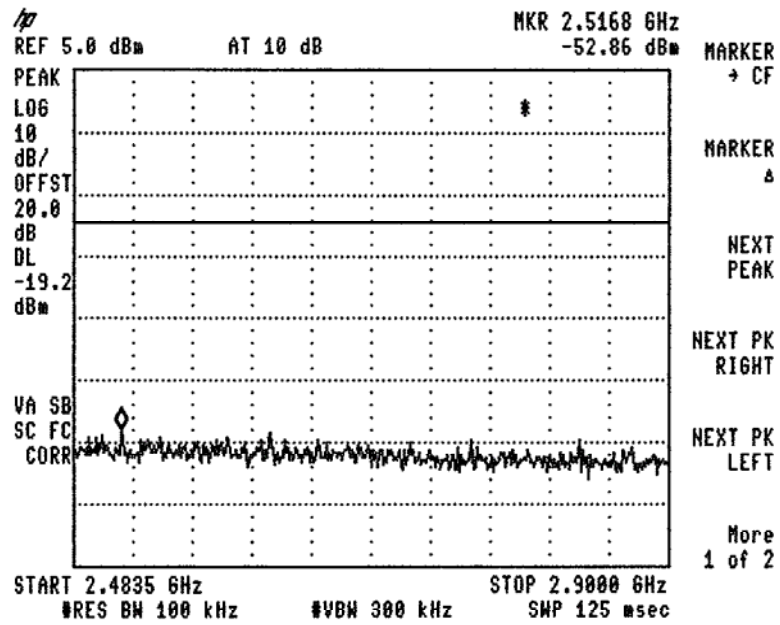


Figure 49 — CCK 2412 MHz

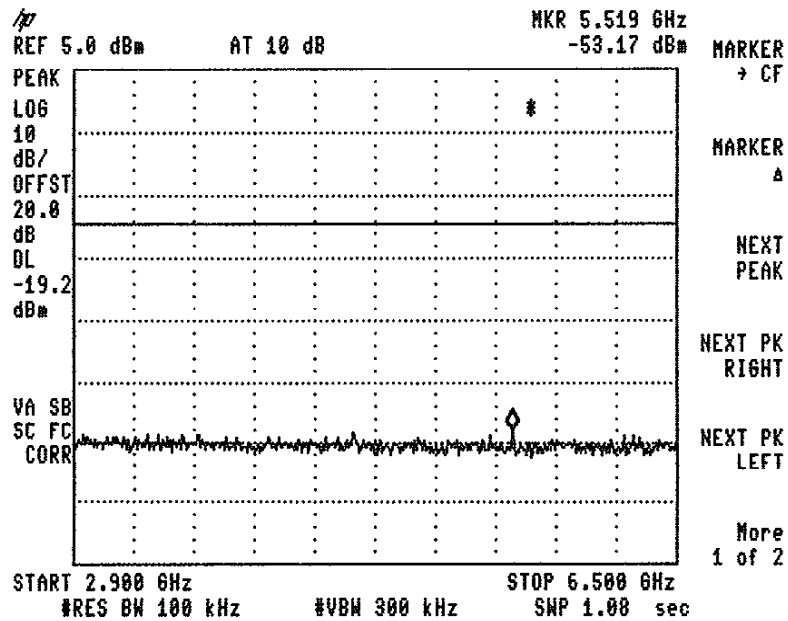


Figure 50 — CCK 2412 MHz

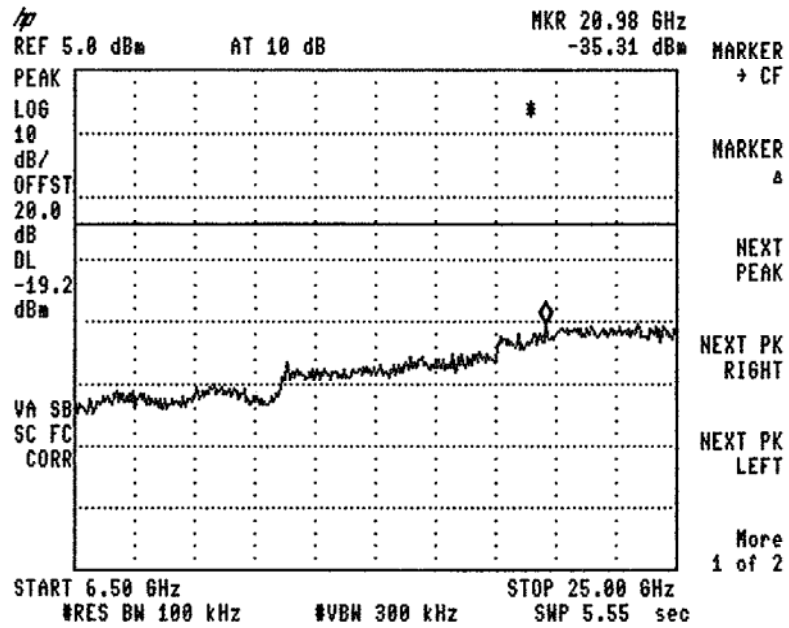


Figure 51 — CCK 2412 MHz

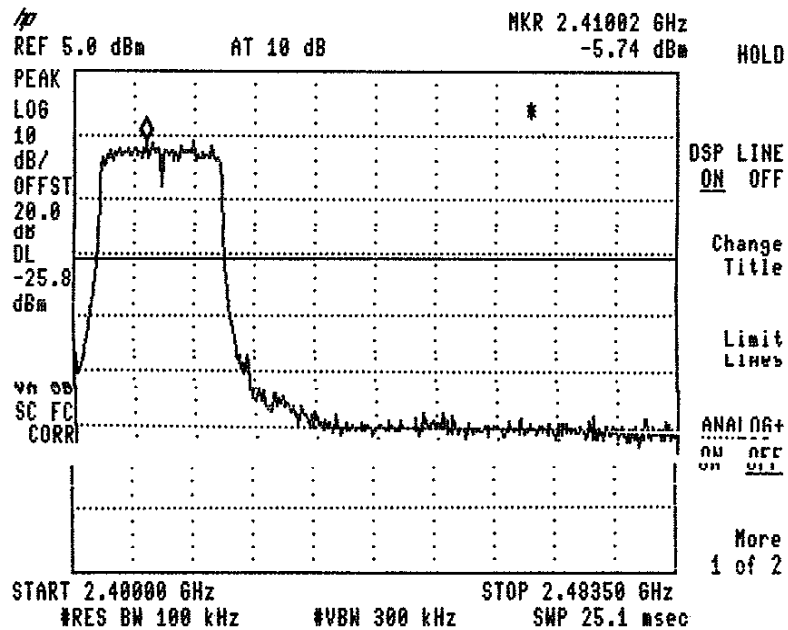


Figure 52 — 64QAM 2412 MHz

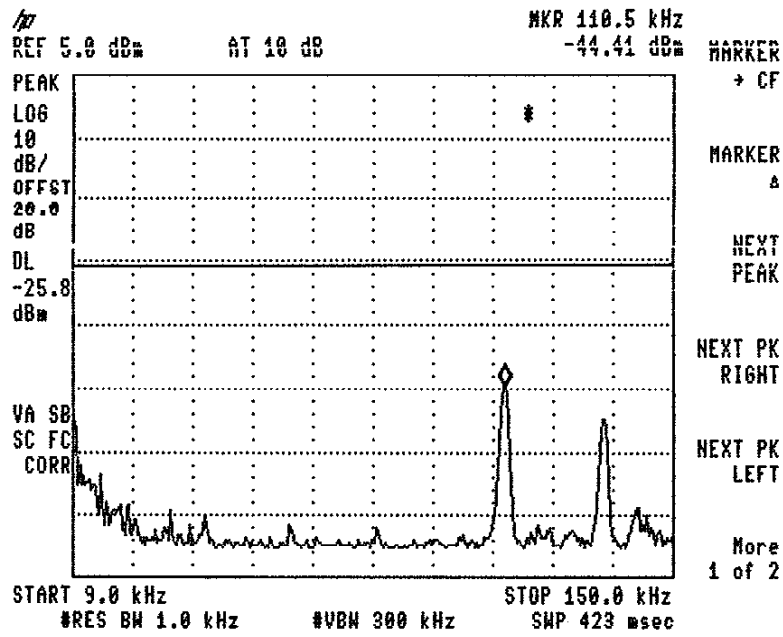


Figure 53 — 64QAM 2412 MHz

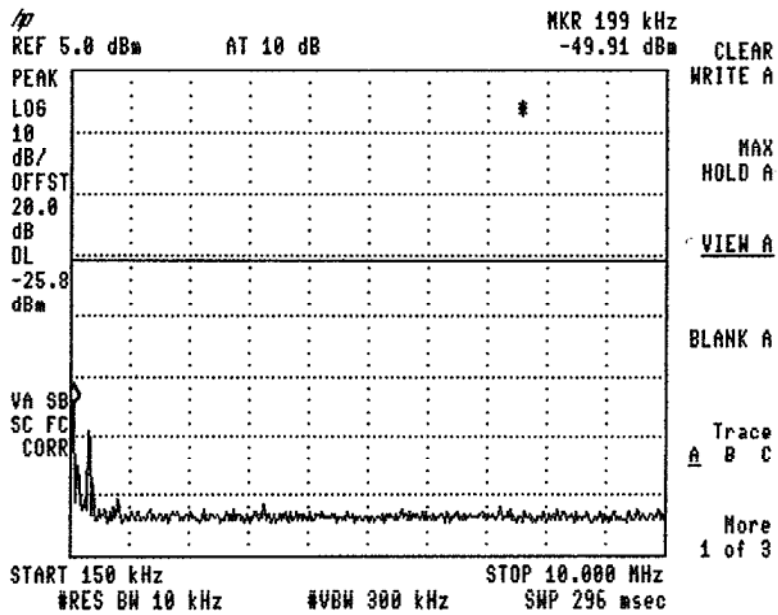


Figure 54 — 64QAM 2412 MHz

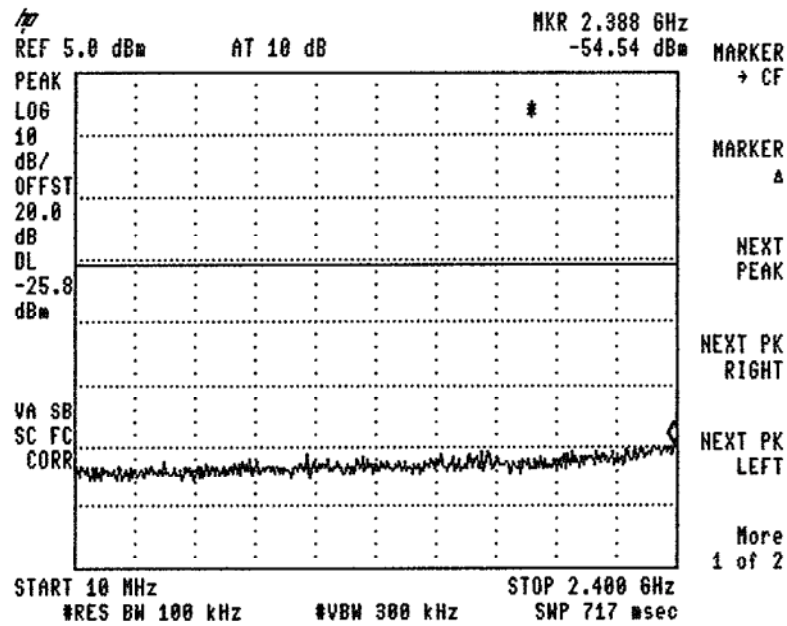


Figure 55 — 64QAM 2412 MHz

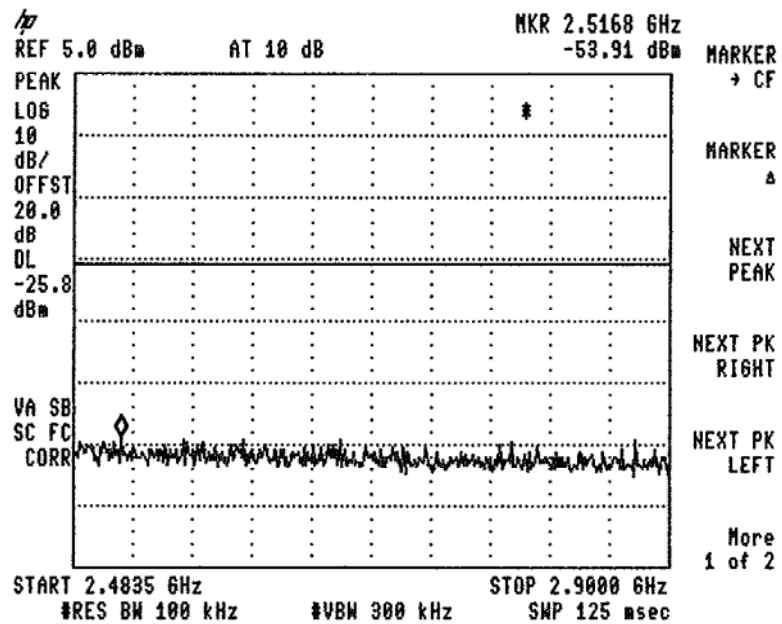


Figure 56 — 64QAM 2412 MHz

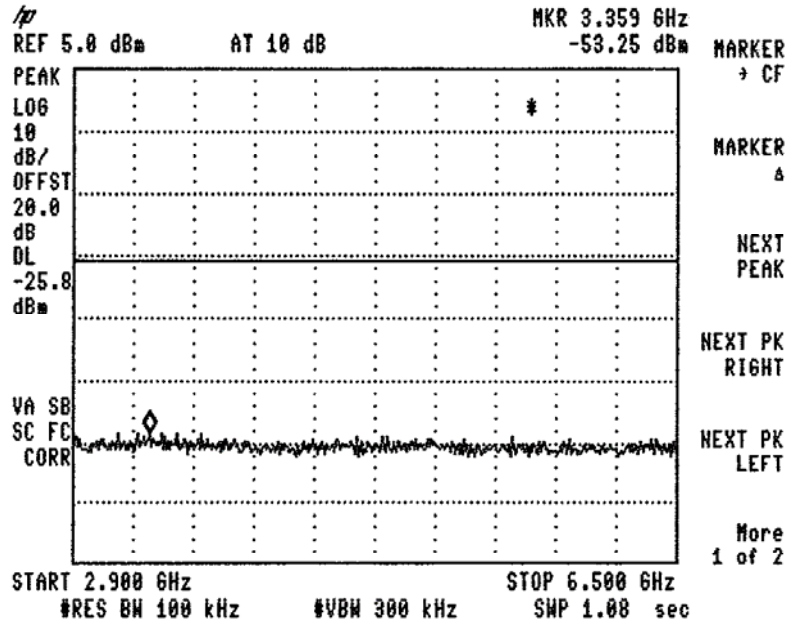


Figure 57 — 64QAM 2412 MHz

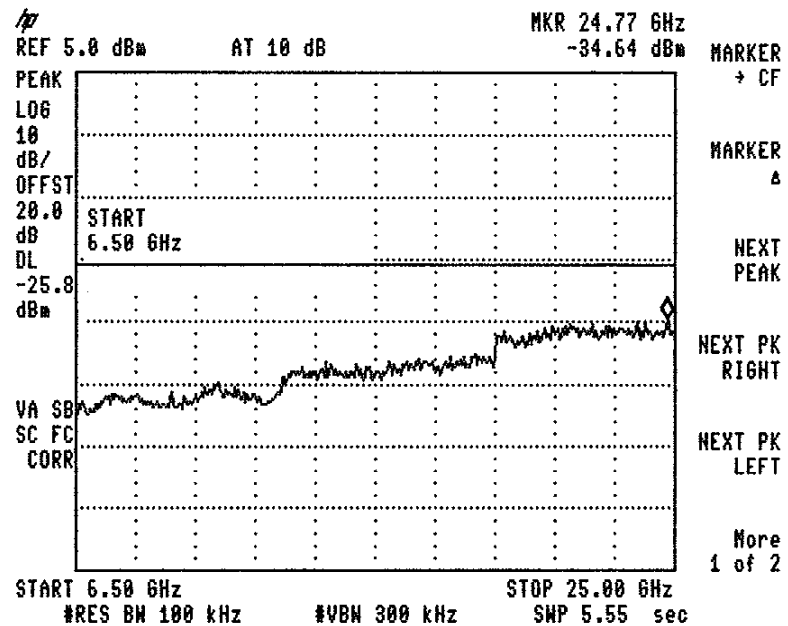


Figure 58 — 64QAM 2412 MHz

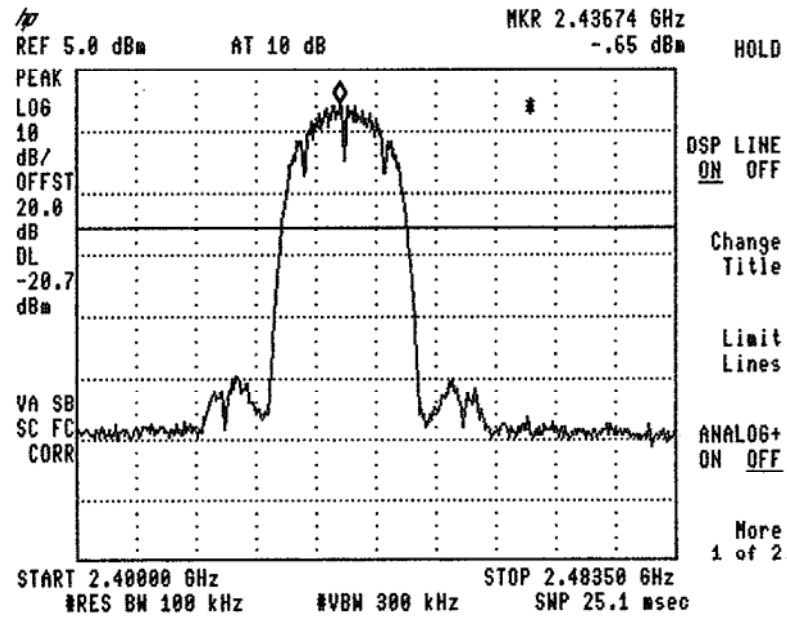


Figure 59 — DBPSK 2437 MHz

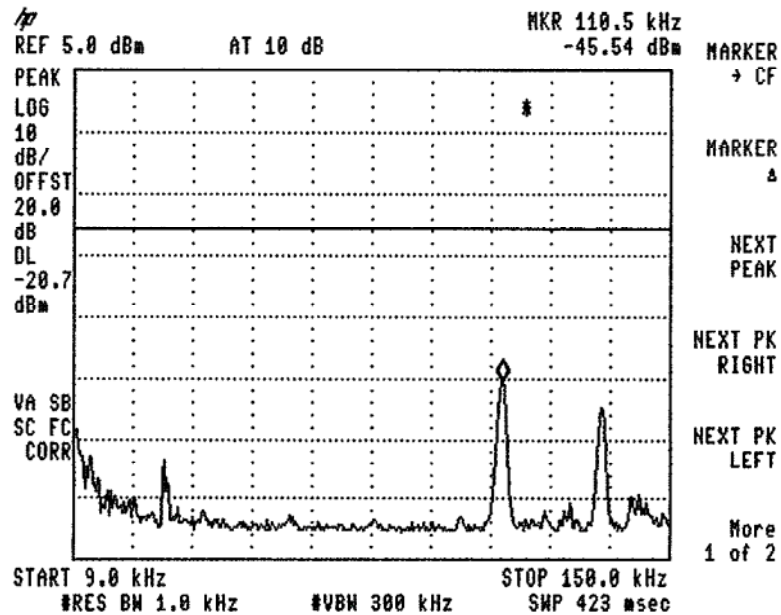


Figure 60 — DBPSK 2437 MHz

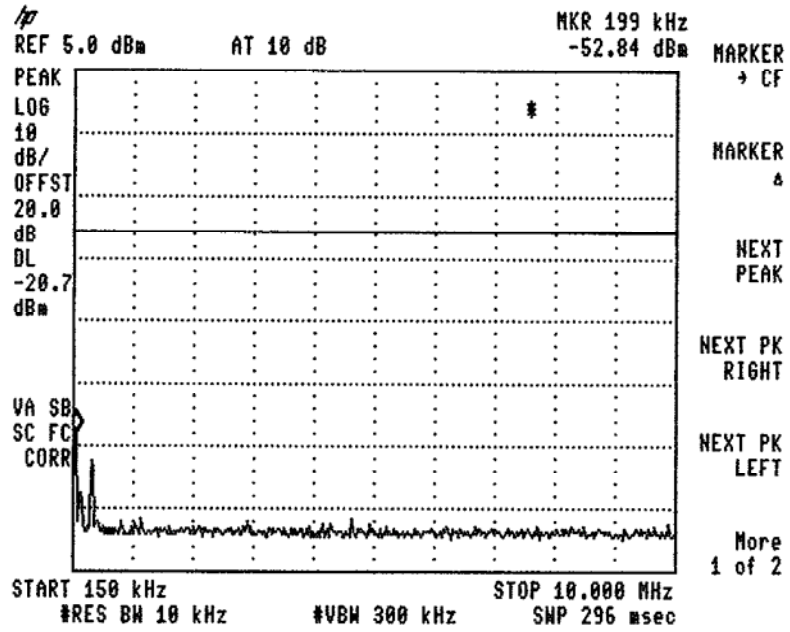


Figure 61 — DBPSK 2437 MHz

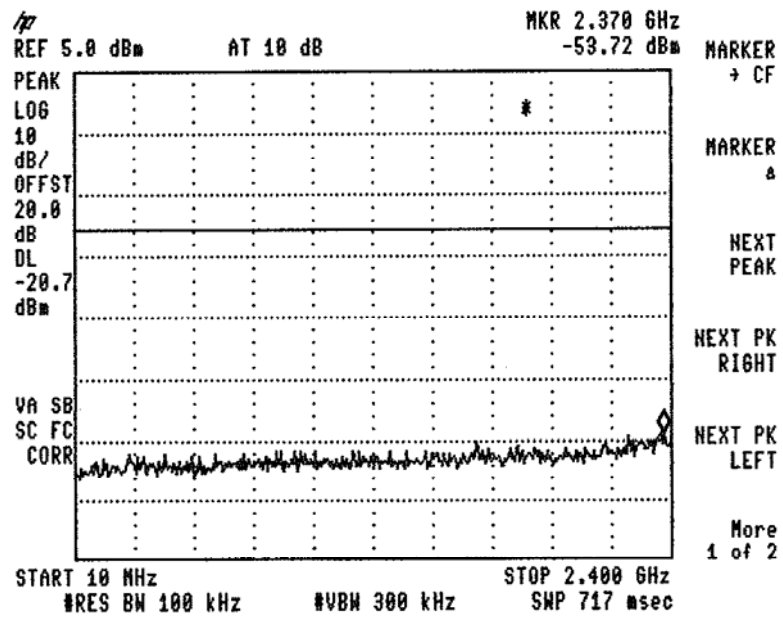


Figure 62 — DBPSK 2437 MHz

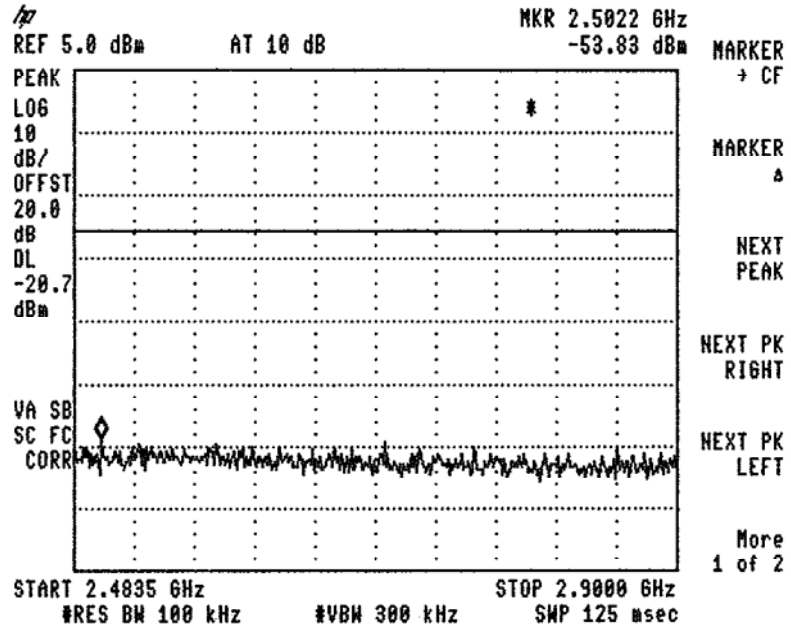


Figure 63 — DBPSK 2437 MHz

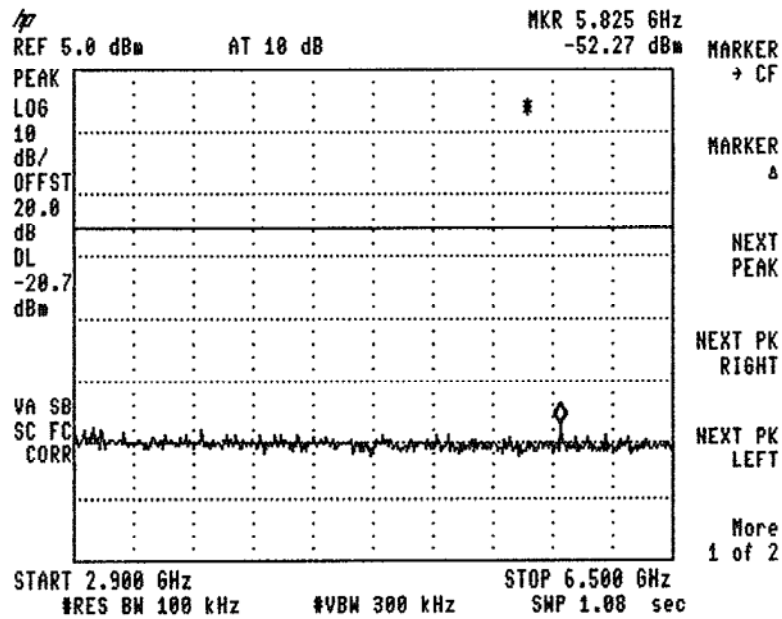


Figure 64 — DBPSK 2437 MHz

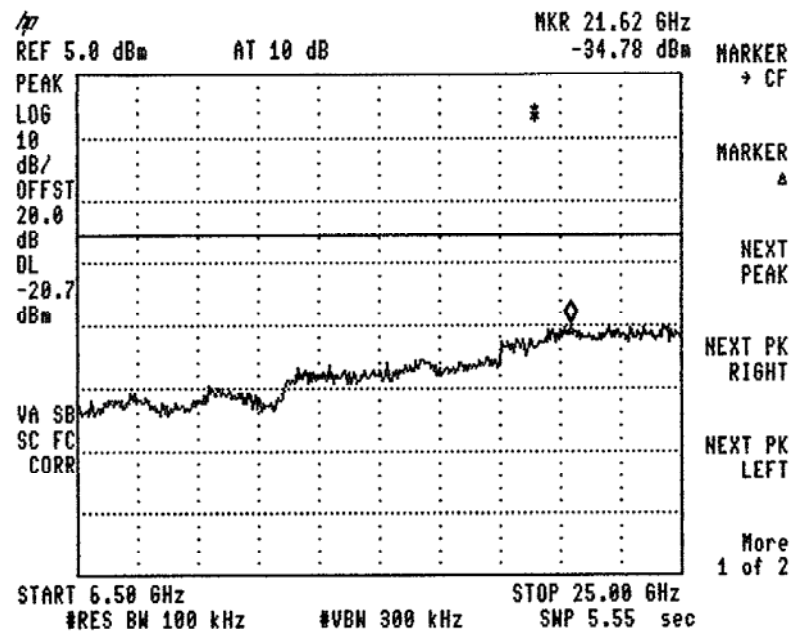


Figure 65 — DBPSK 2437 MHz

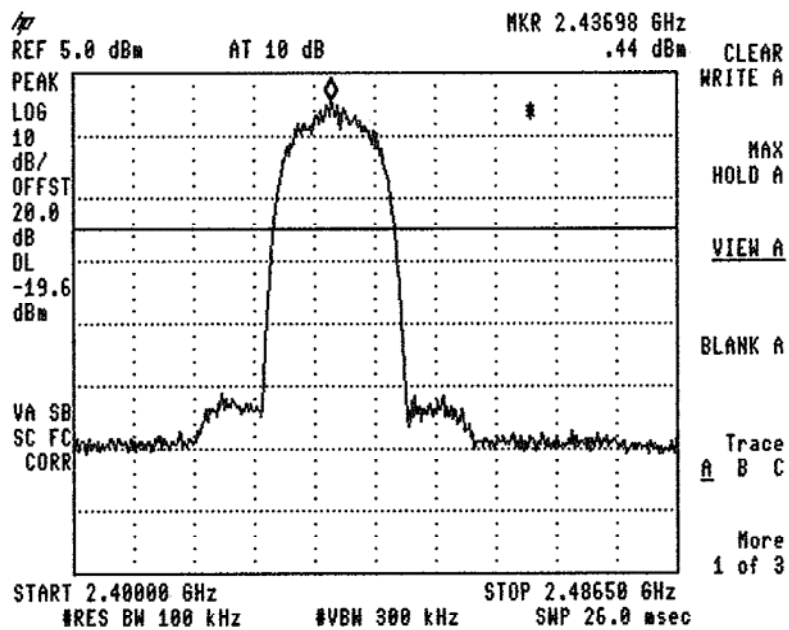


Figure 66 — CCK 2437 MHz

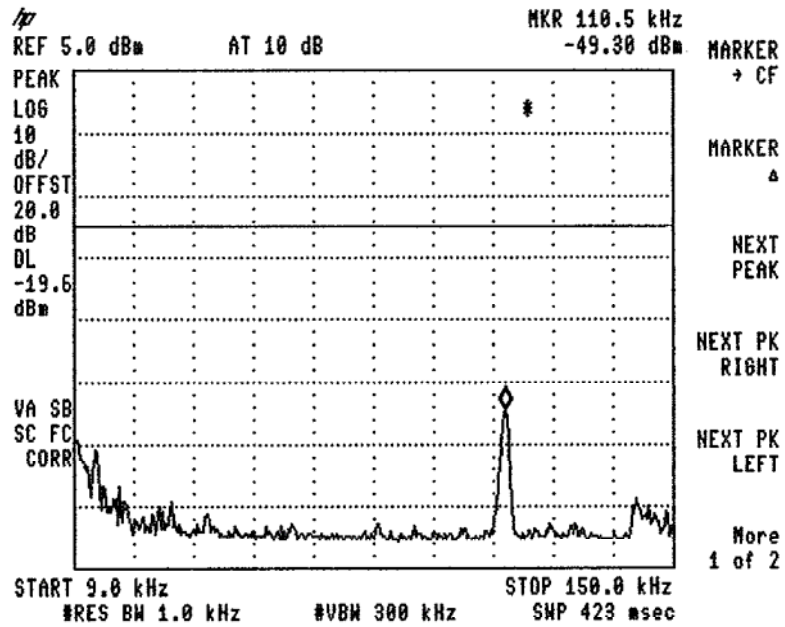


Figure 67 — CCK 2437 MHz

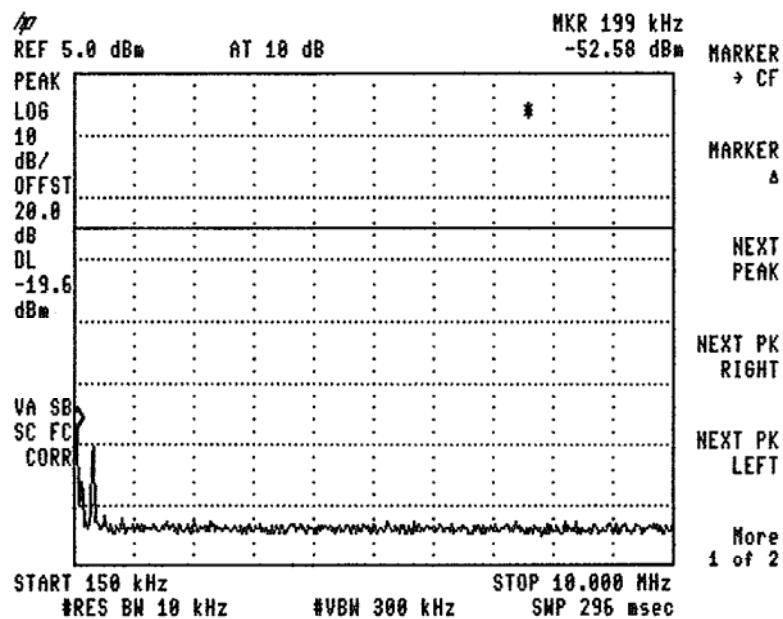


Figure 68 — CCK 2437 MHz

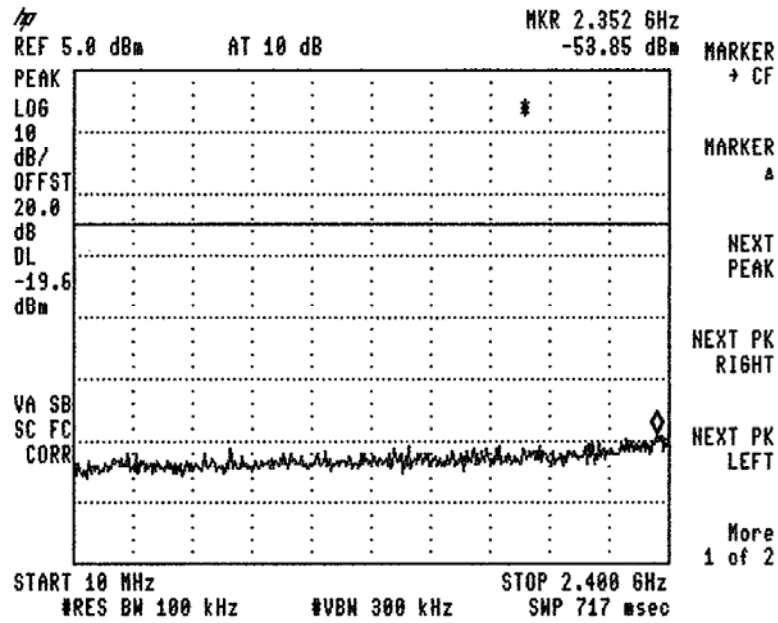


Figure 69 — CCK 2437 MHz

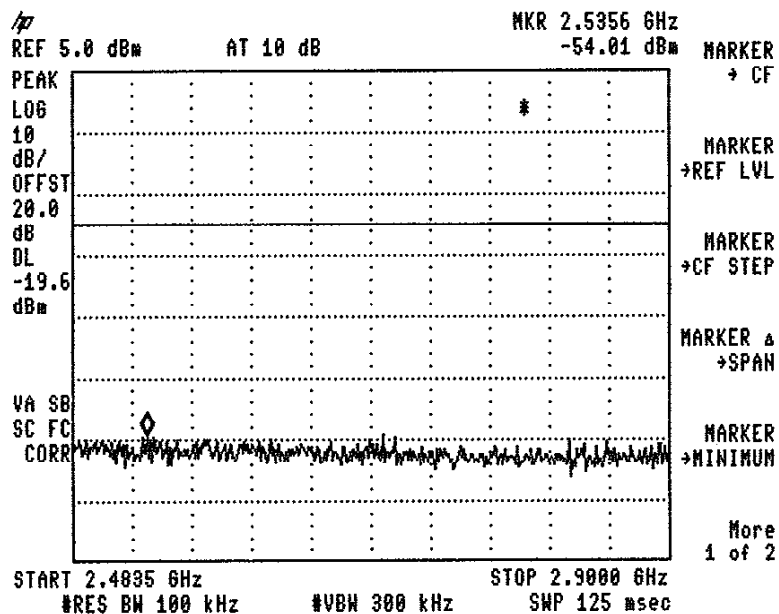


Figure 70 — CCK 2437 MHz

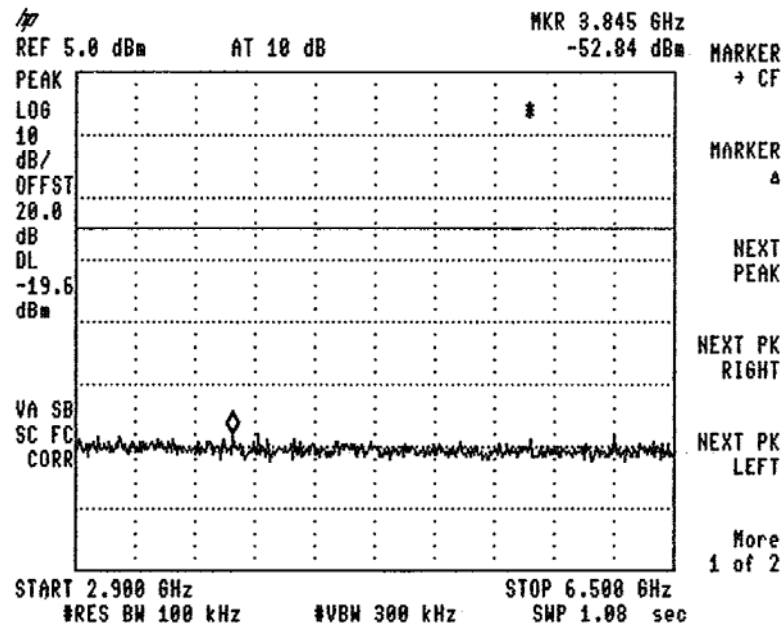


Figure 71 — CCK 2437 MHz

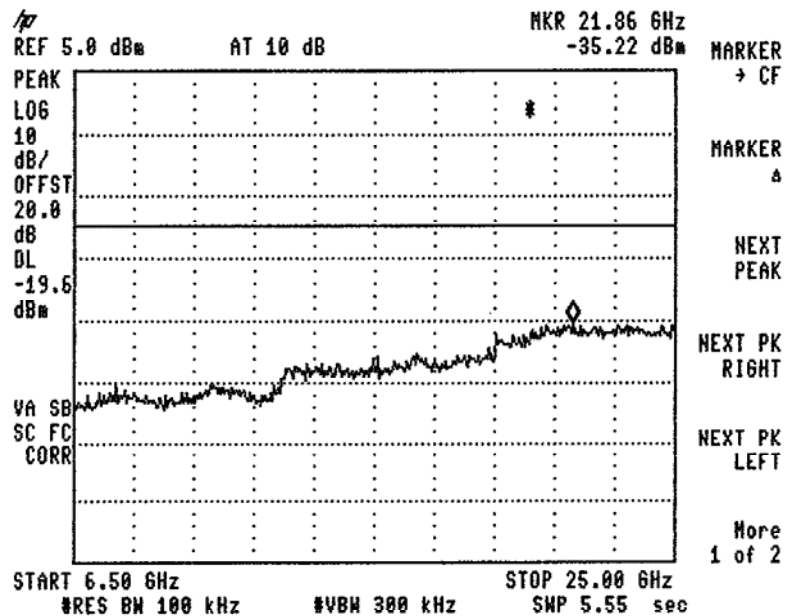


Figure 72 — CCK 2437 MHz

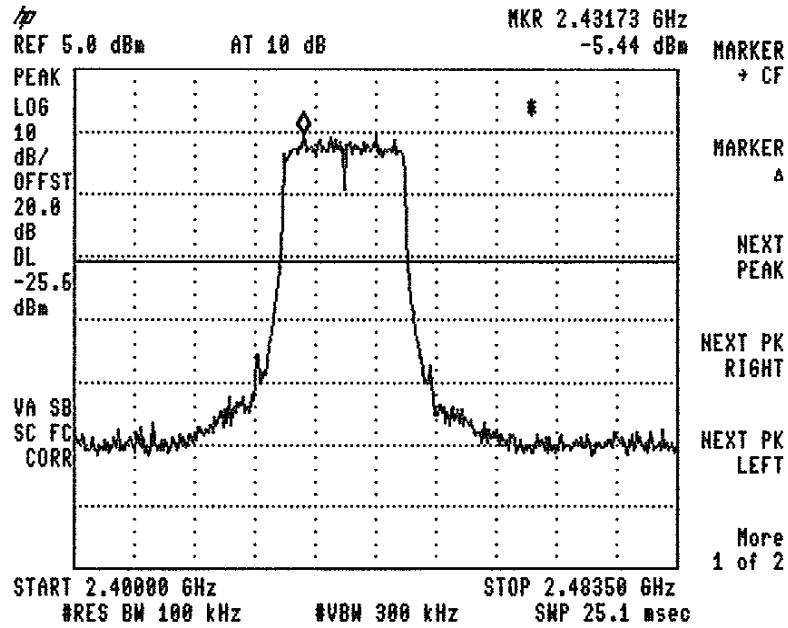


Figure 73 — 64QAM 2437 MHz

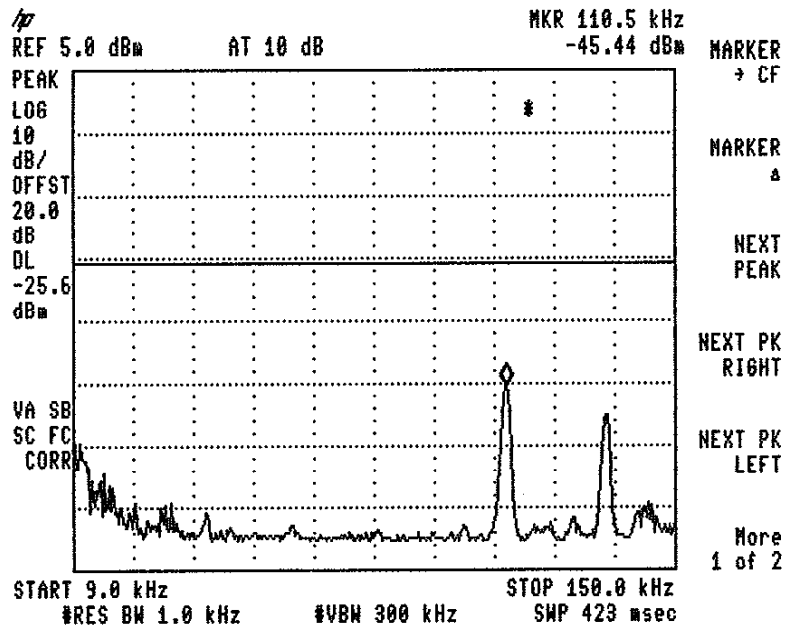


Figure 74 — 64QAM 2437 MHz

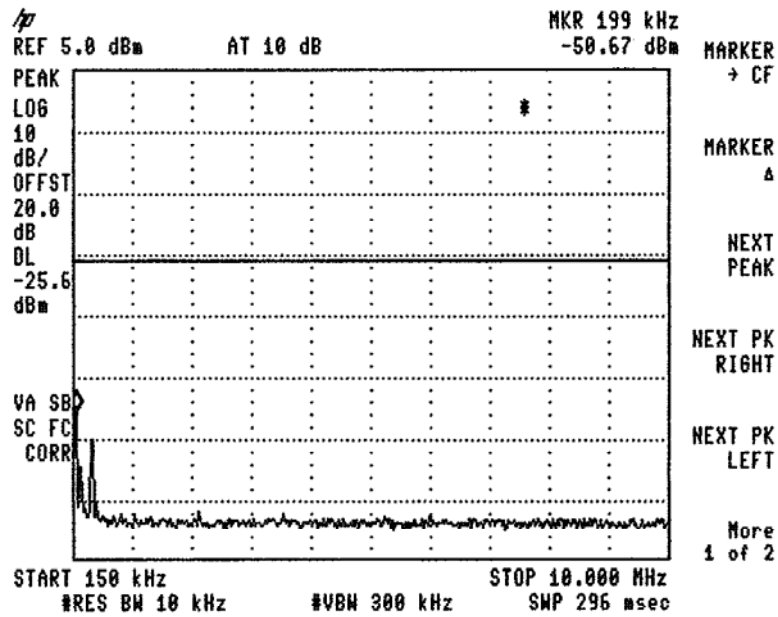


Figure 75 — 64QAM 2437 MHz

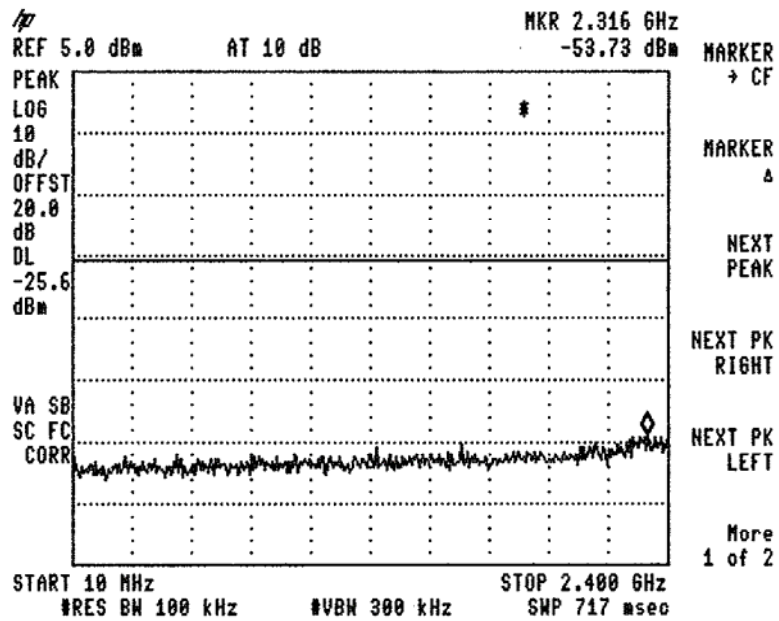


Figure 76 — 64QAM 2437 MHz

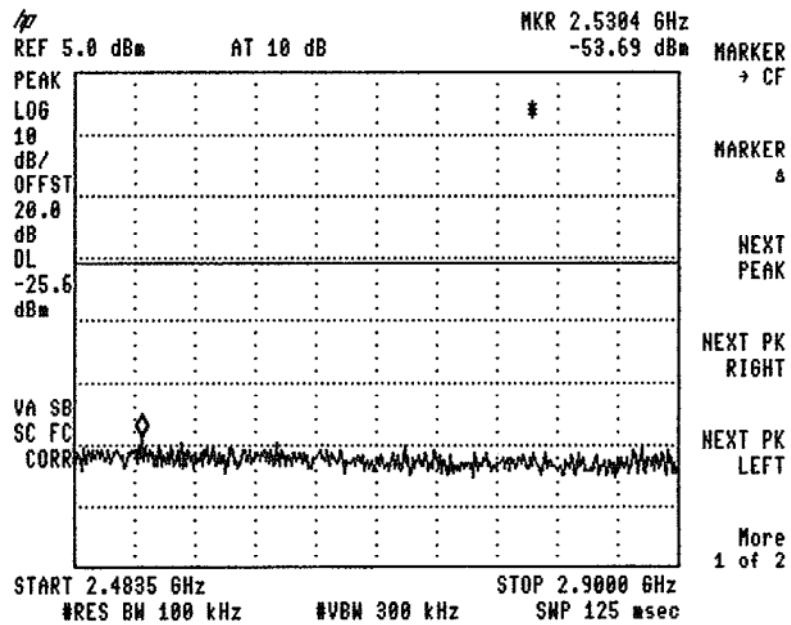


Figure 77 — 64QAM 2437 MHz

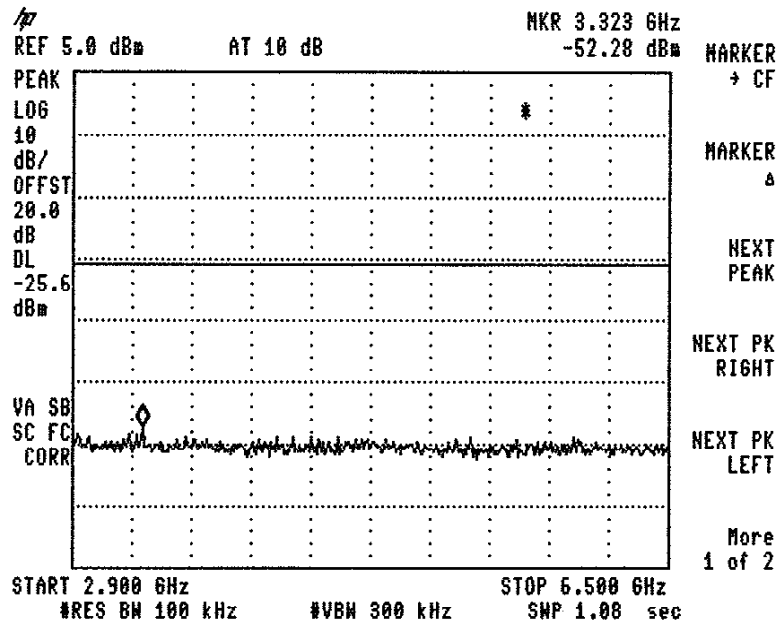


Figure 78 — 64QAM 2437 MHz

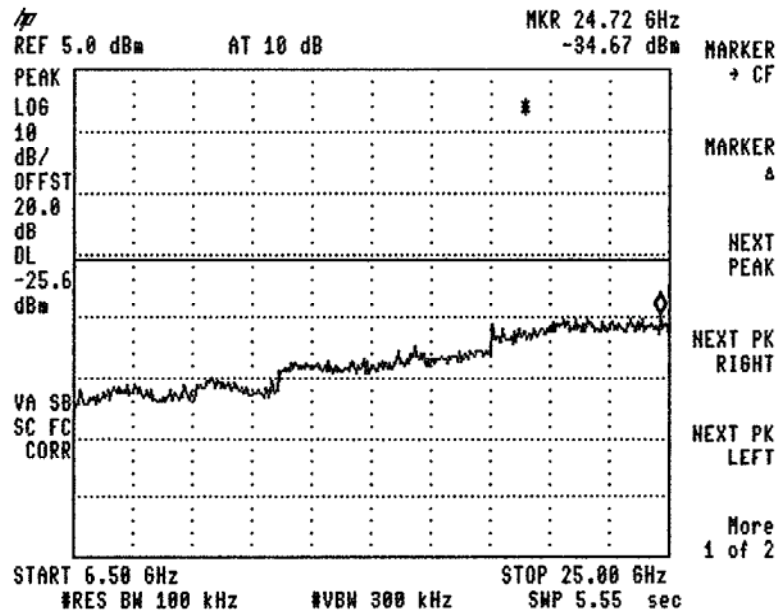


Figure 79 — 64QAM 2437 MHz

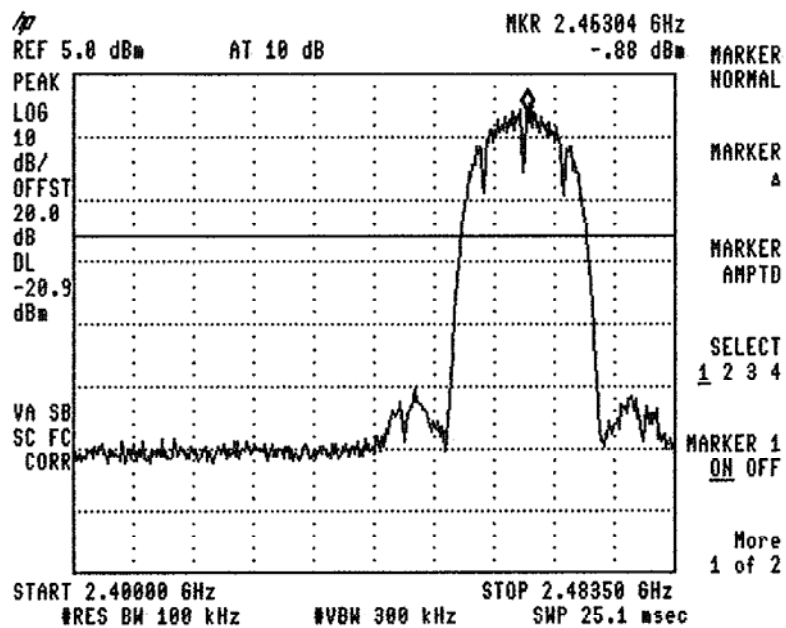


Figure 80 — DBPSK 2462 MHz

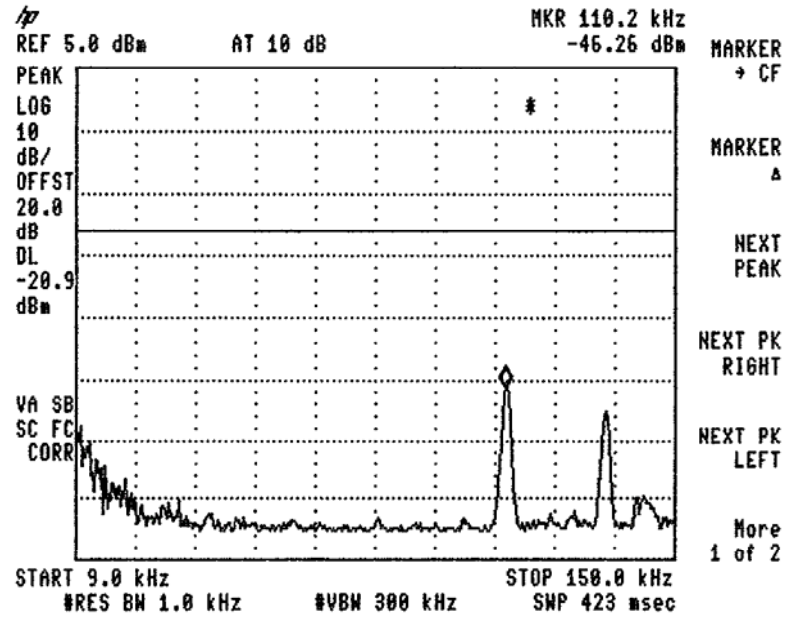


Figure 81 — DBPSK 2462 MHz

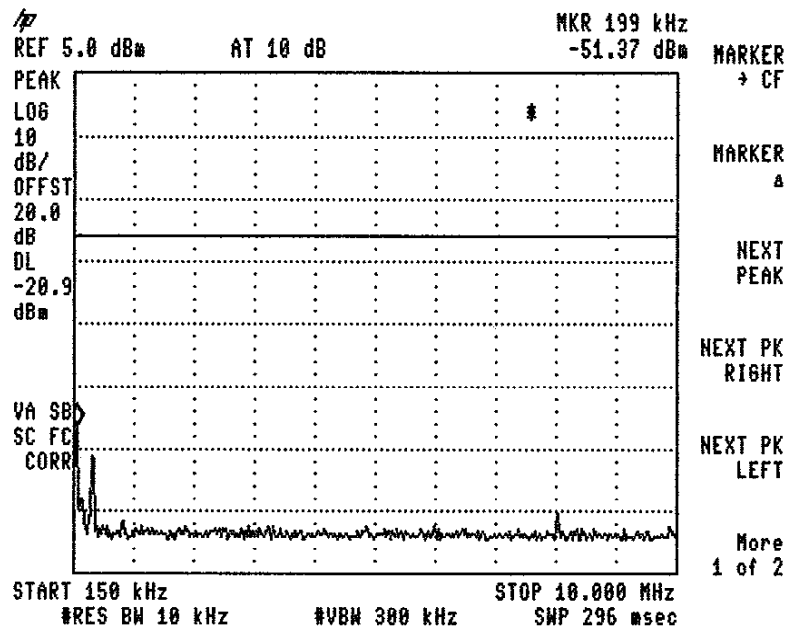


Figure 82 — DBPSK 2462 MHz

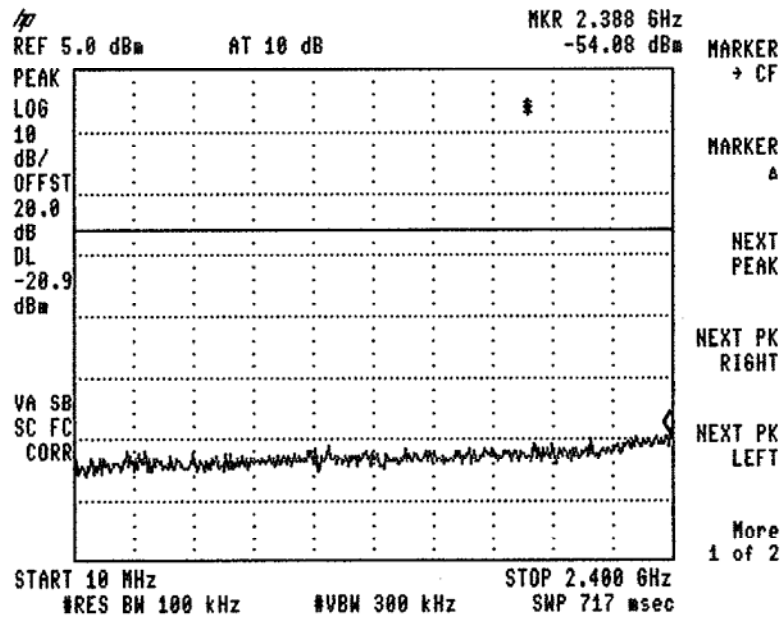


Figure 83 — DBPSK 2462 MHz

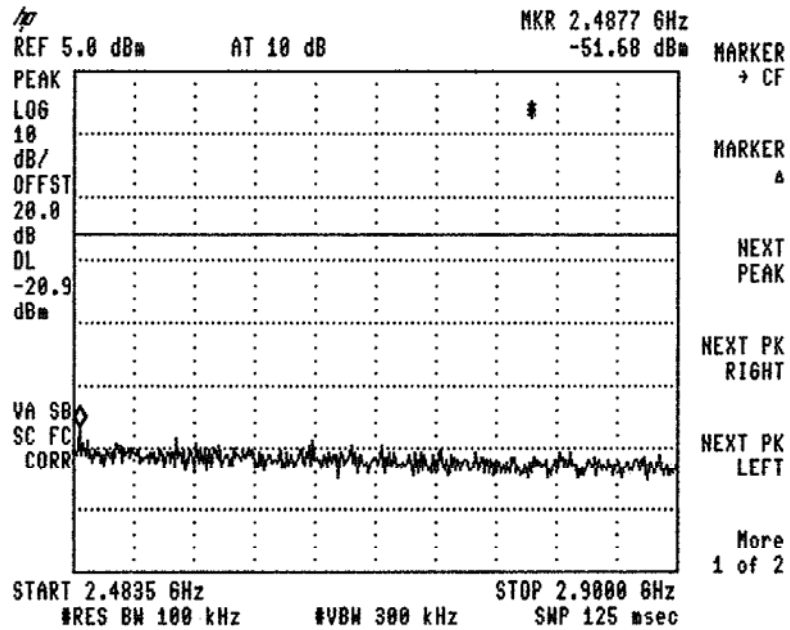


Figure 84 — DBPSK 2462 MHz

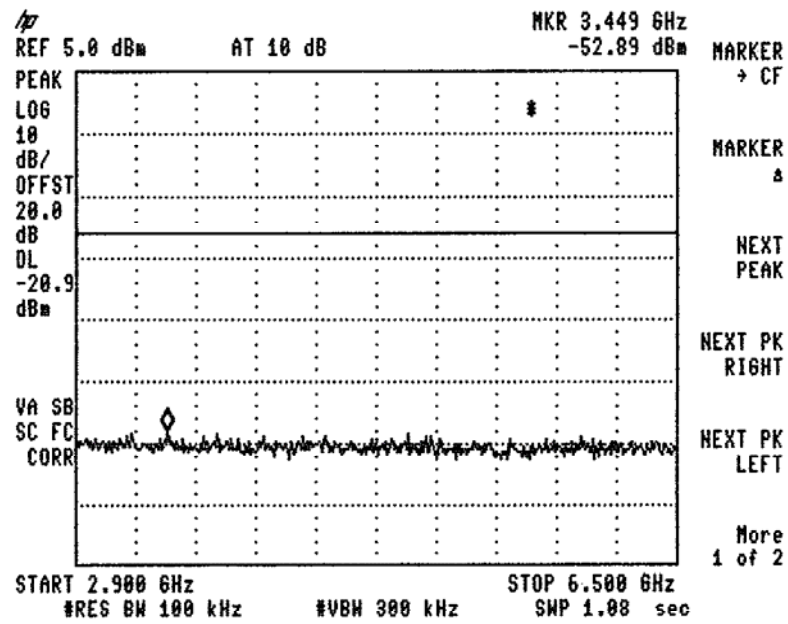


Figure 85 — DBPSK 2462 MHz

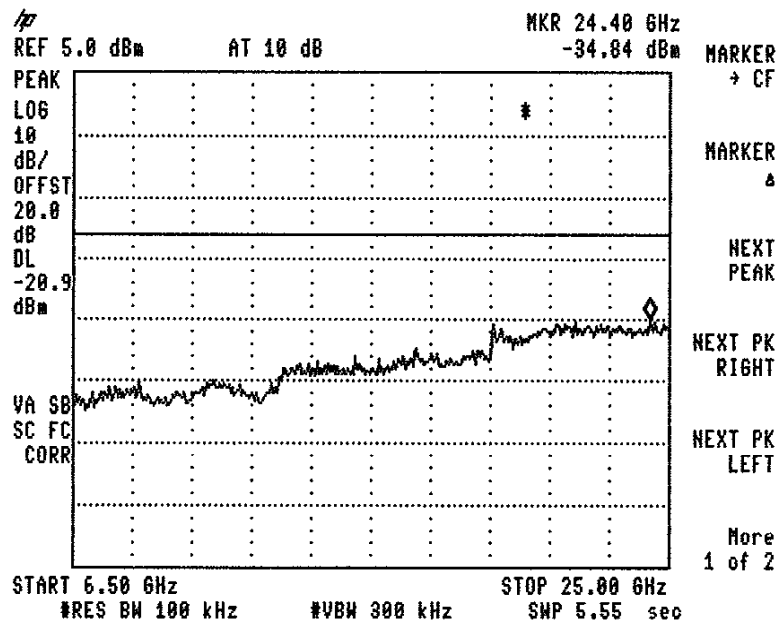


Figure 86 — DBPSK 2462 MHz

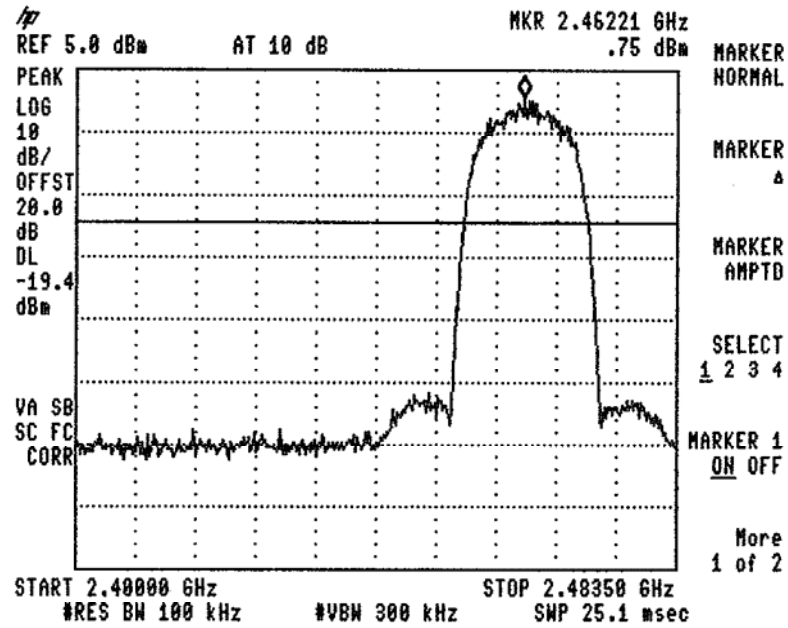


Figure 87 — CCK 2462 MHz

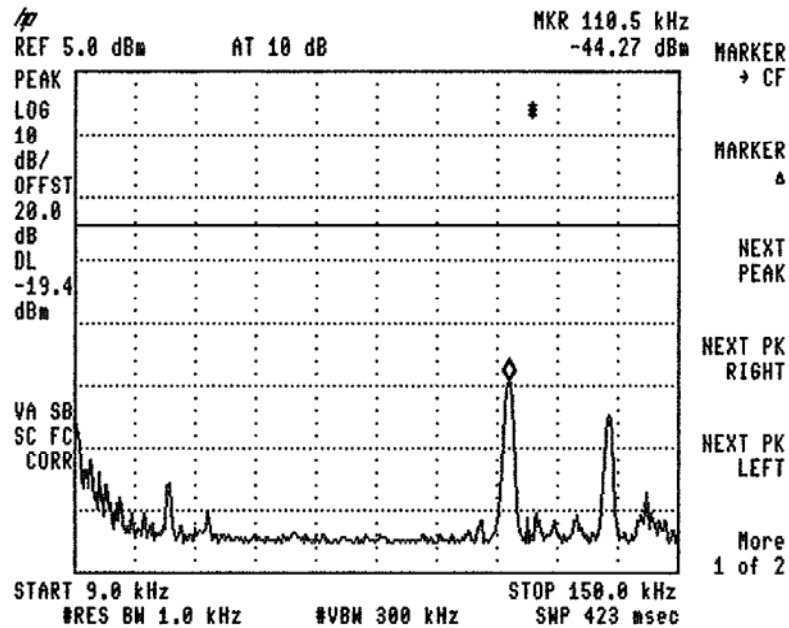


Figure 88 — CCK 2462 MHz

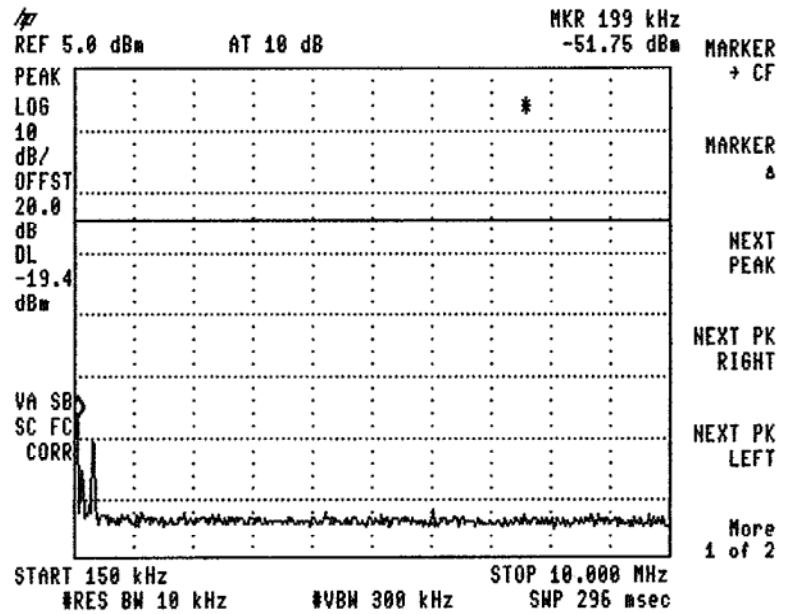


Figure 89 — CCK 2462 MHz

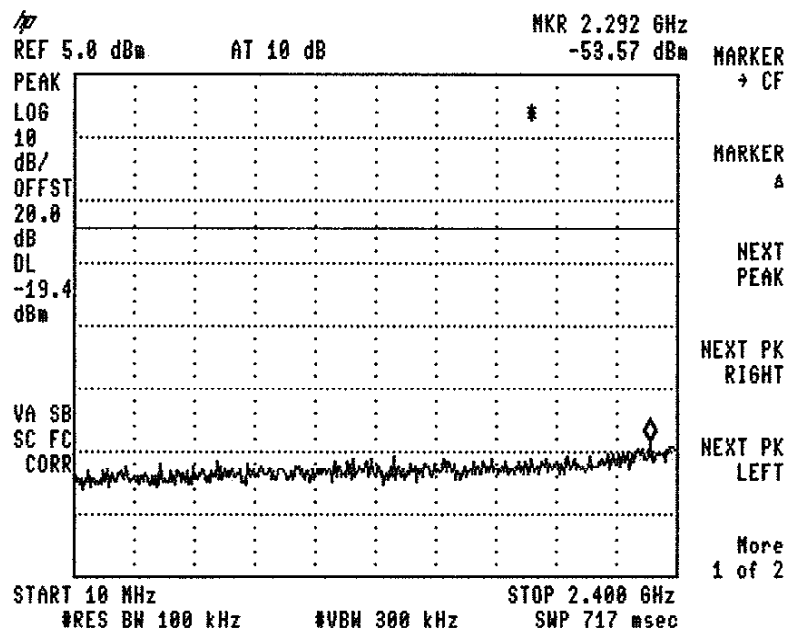


Figure 90 — CCK 2462 MHz

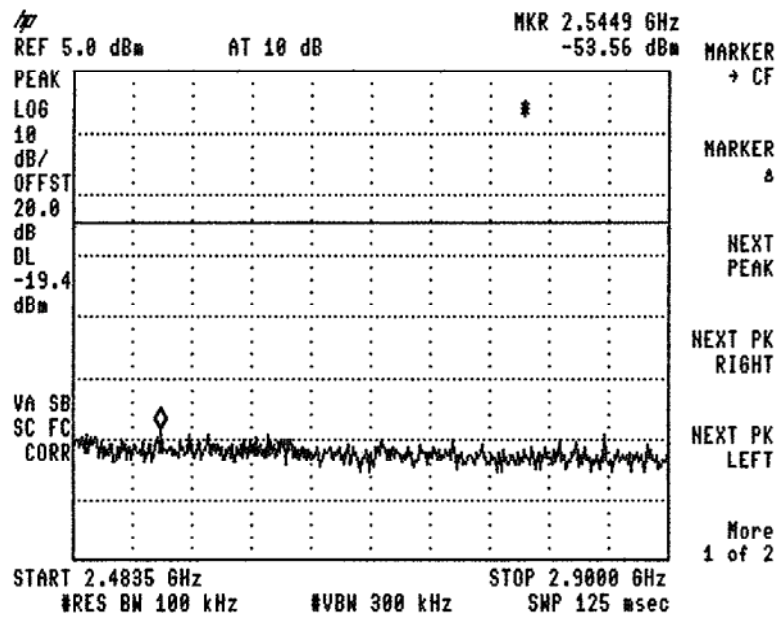


Figure 91 — CCK 2462 MHz

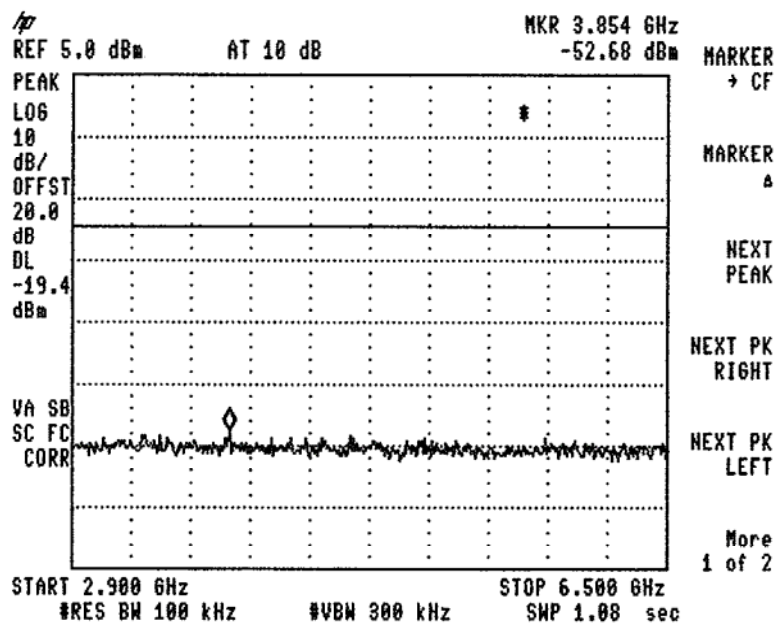


Figure 92 — CCK 2462 MHz

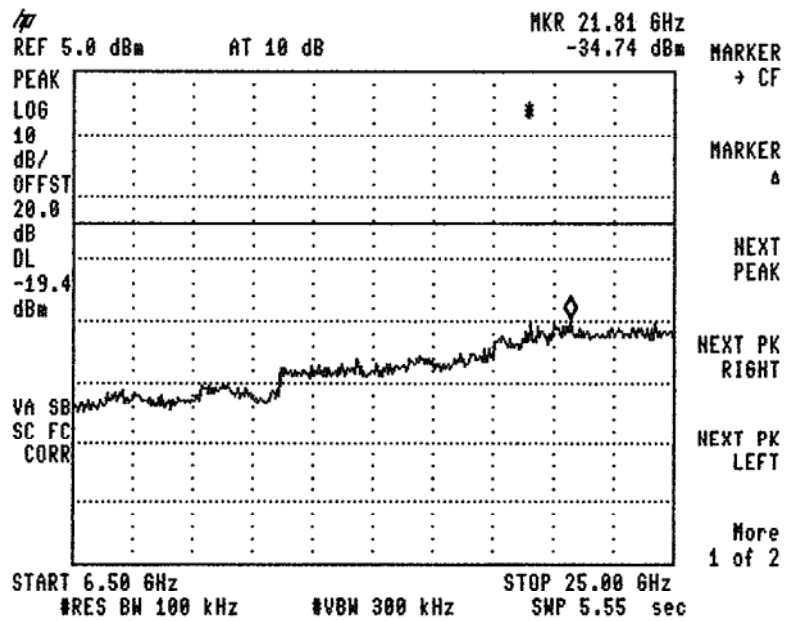


Figure 93 — CCK 2462 MHz

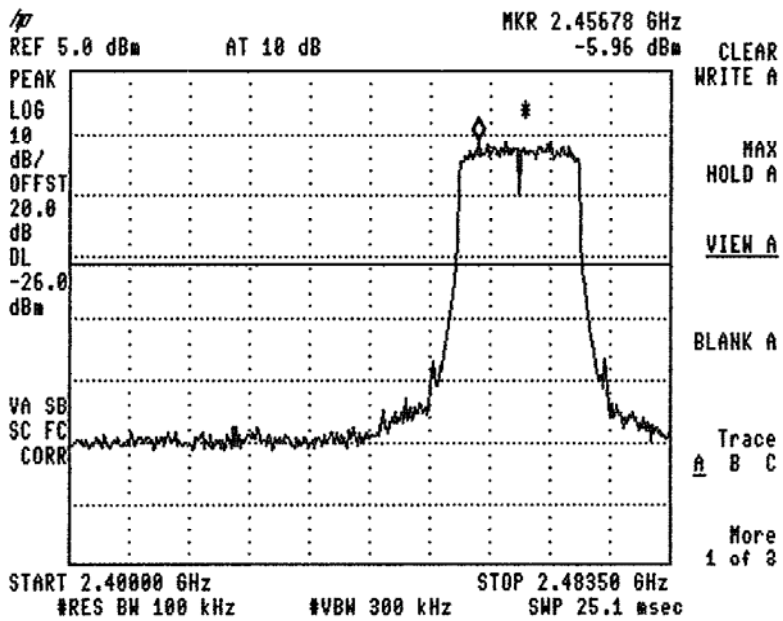


Figure 94 — 64QAM 2462 MHz

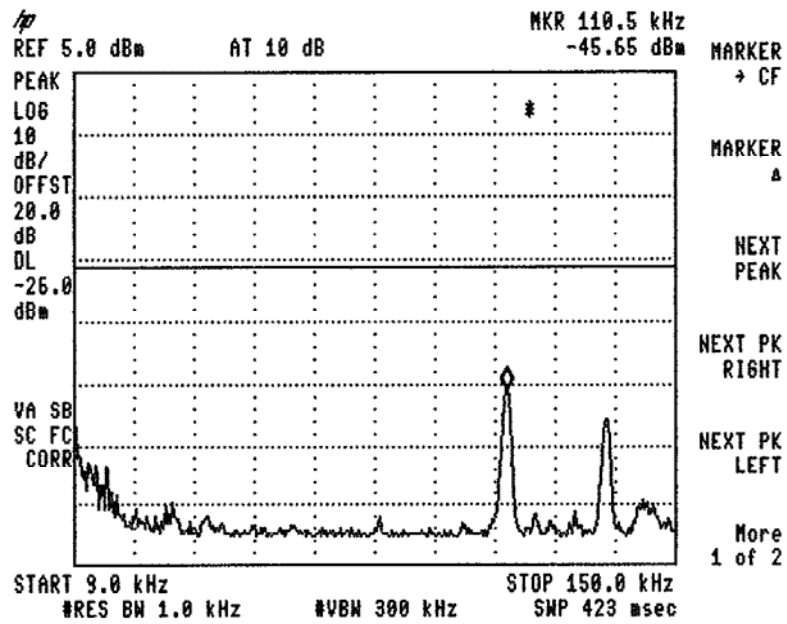


Figure 95 — 64QAM 2462 MHz

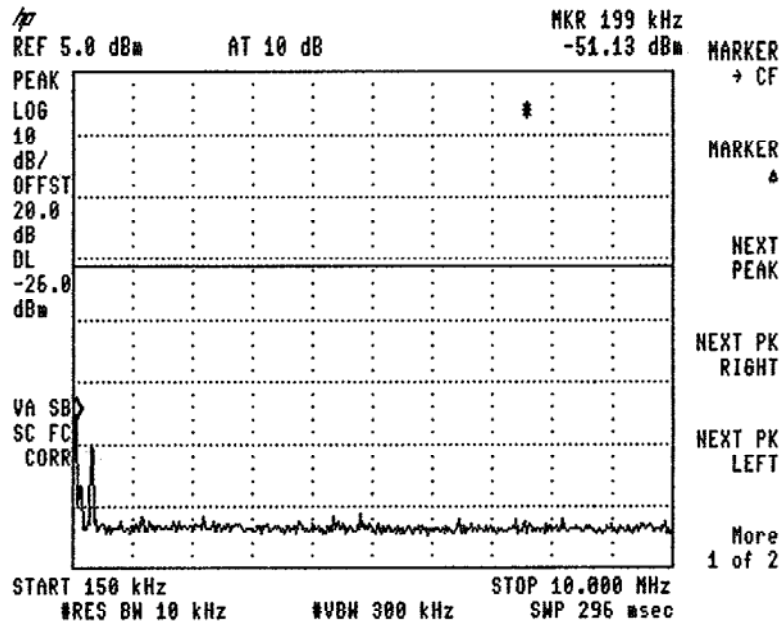


Figure 96 — 64QAM 2462 MHz

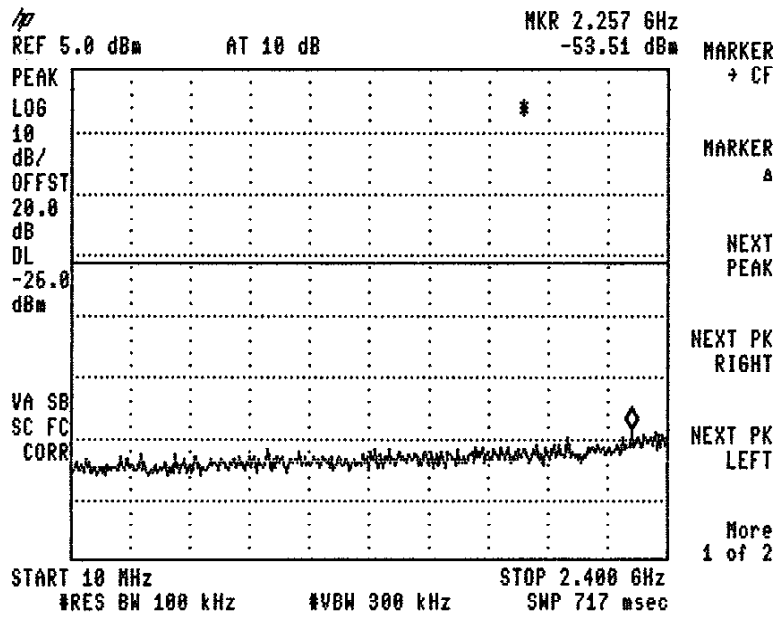


Figure 97 — 64QAM 2462 MHz

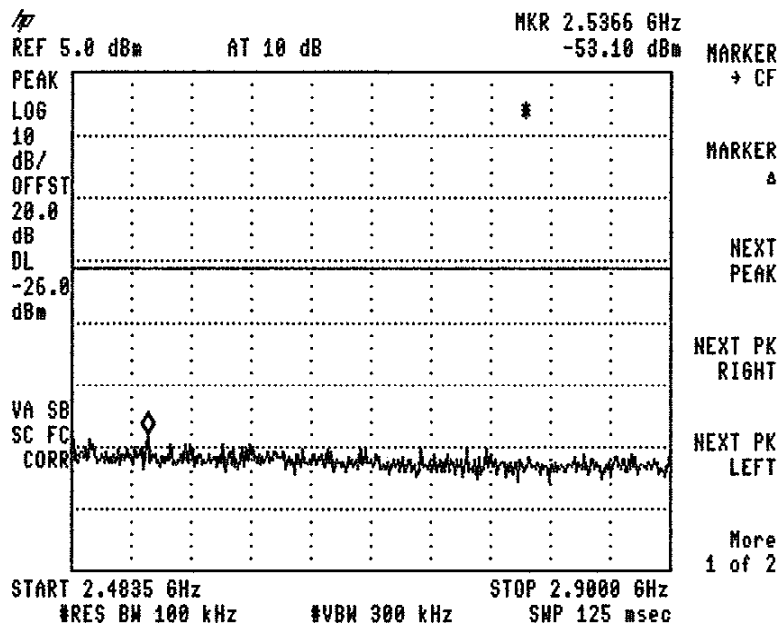


Figure 98 — 64QAM 2462 MHz

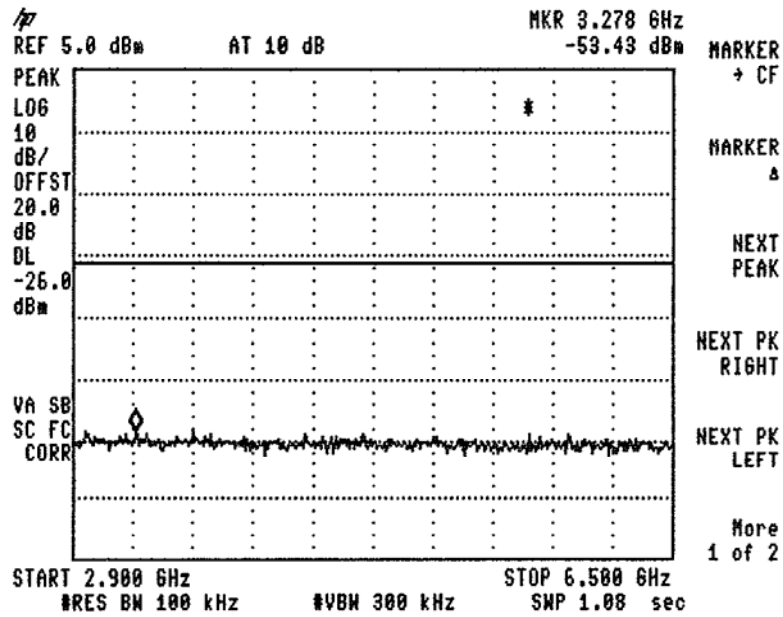


Figure 99 — 64QAM 2462 MHz

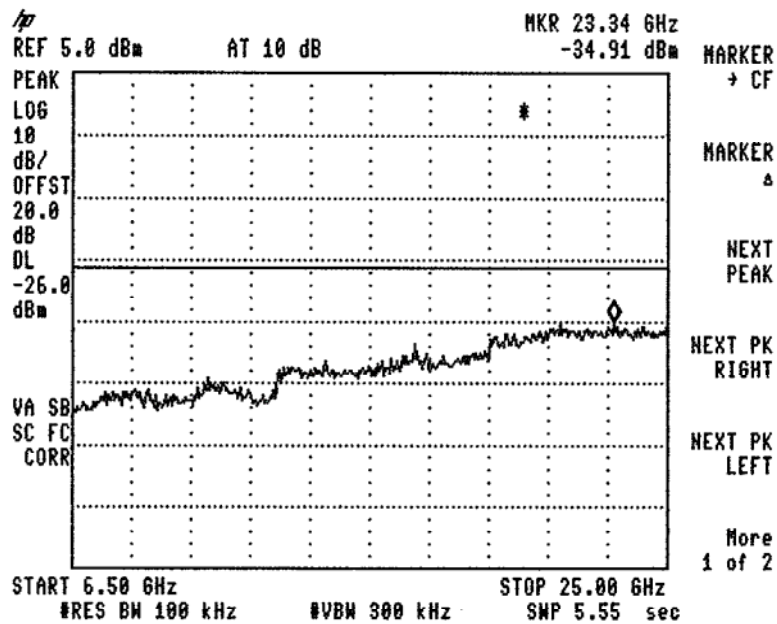


Figure 100 — 64QAM 2462 MHz

8.2 Results table

E.U.T Description: Exciter

Model No.: EX2000BW

Serial Number: 100-2035-0002

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

Operation Frequency (MHz)	Modulation	Reading (dBc)	Specification (dBc)	Margin (dB)
2412	BPSK	35.0	20.0	-15.0
	CCK	34.4	20.0	14.4
	64QAM	28.9	20.0	-8.9
2437	BPSK	34.0	20.0	-14.0
	CCK	34.0	20.0	-14.0
	64QAM	29.0	20.0	-9.0
2462	BPSK	34.1	20.0	-14.1
	CCK	34.8	20.0	-14.8
	64QAM	29.2	20.0	-9.2

Figure 101 Peak Power Output of 2400-2483.5 MHz Band

JUDGEMENT: Passed by 8.9 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 21.12.08

Typed/Printed Name: I. Raz

8.3 Test Equipment Used.

Peak Power Output of 2400-2438.5 MHz Band

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	August 14, 2008	1 year
Cable	Rhophase	KPS-1501-1000	A1675	August 14, 2008	1 year

Figure 102 Test Equipment Used

9. Band Edge (Conducted)

[In Accordance with section 15.247(c)]

9.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and 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.

The E.U.T. was tested at 2412 and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

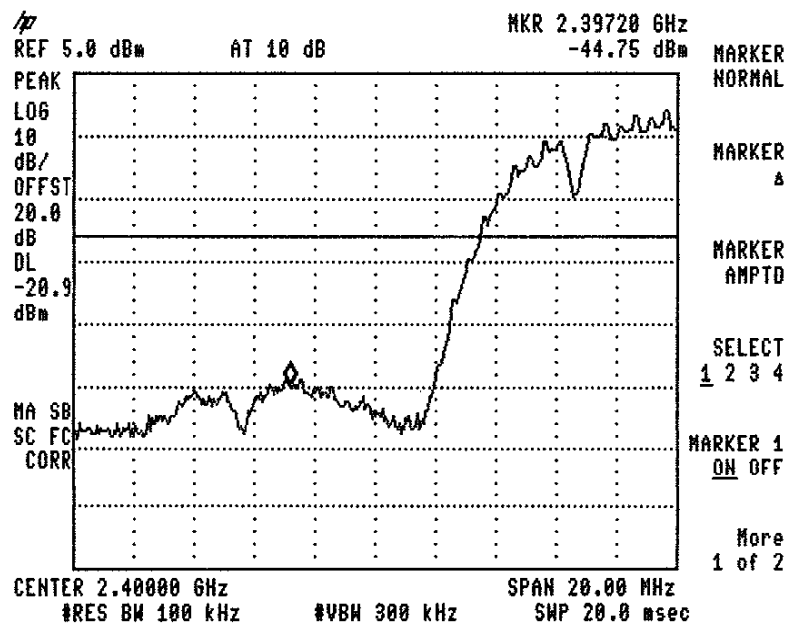


Figure 103 — DBPSK 2412 MHz

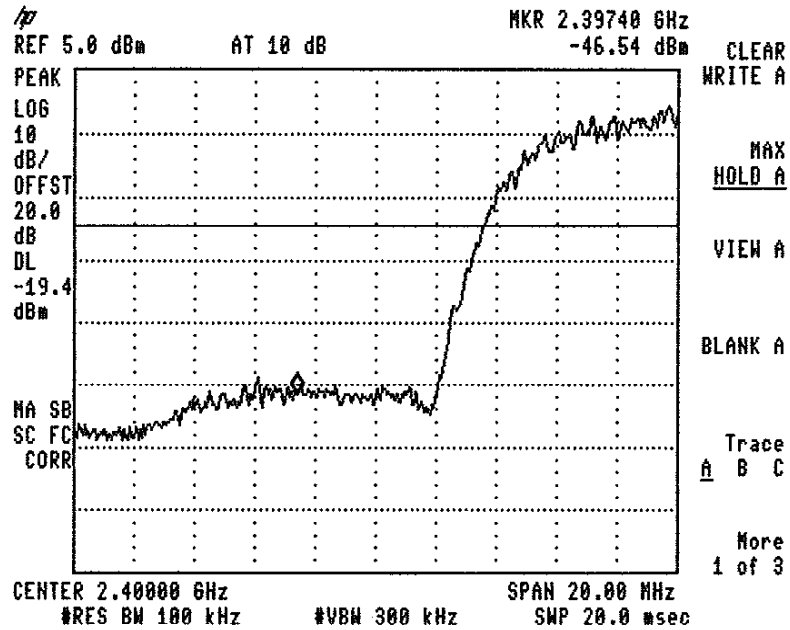


Figure 104 — CCK 2412 MHz

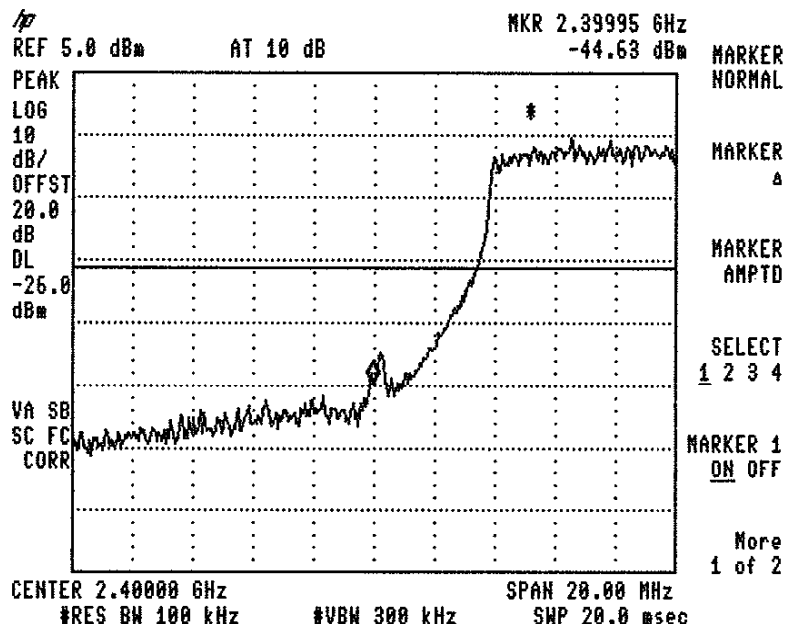


Figure 105 — 64QAM 2412 MHz

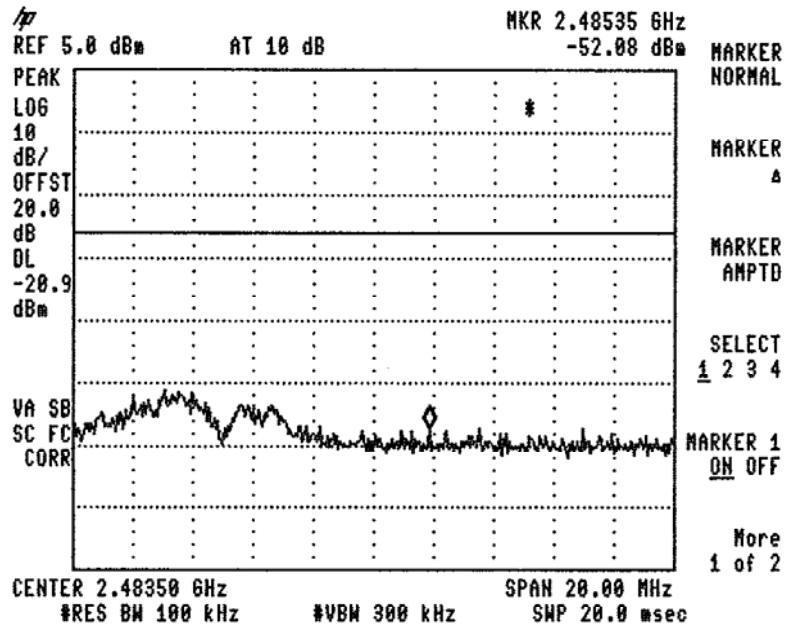


Figure 106 — BPSK 2462 MHz

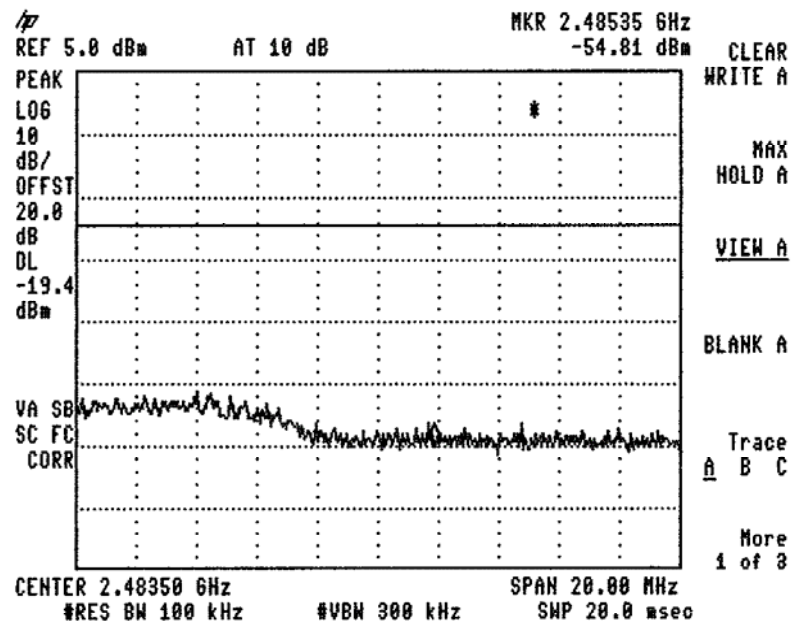


Figure 107 — CCK 2462 MHz

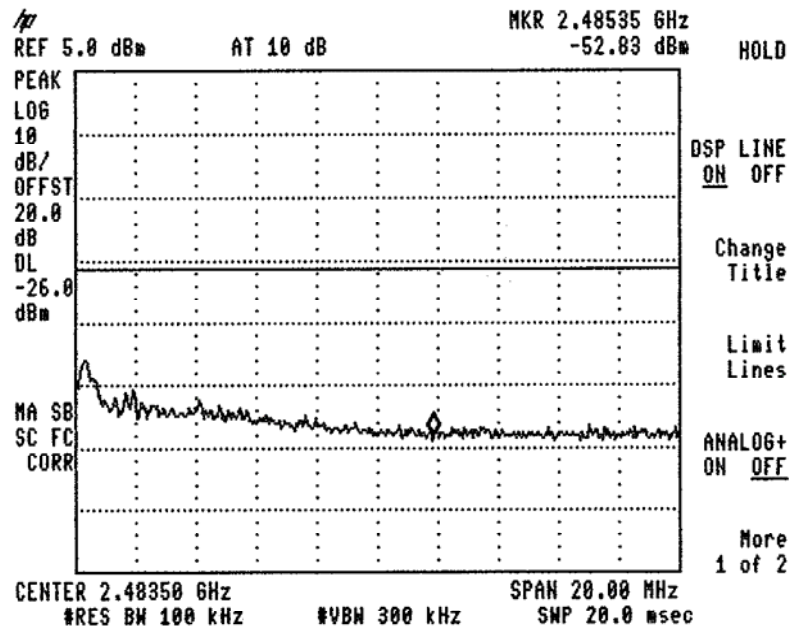


Figure 108 — 64QAM 2462 MHz

9.2 Results table

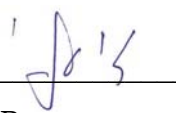
E.U.T. Description: Exciter
Model No.: EX2000BW
Part Number: 100-2035-0002
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Spectrum Level (dBc)	Specification (dBc)	Margin (dB)
2412	BPSK	2397.20	43.85	20.0	-23.85
	CCK	2397.40	47.14	20.0	-27.14
	64QAM	2399.95	38.63	20.0	-18.63
2462	BPSK	2485.35	51.18	20.0	-31.18
	CCK	2485.35	55.41	20.0	-35.41
	64QAM	2485.35	46.83	20.0	-26.83

Figure 109 Band Edge (Conducted)

JUDGEMENT: Passed by 18.6 dB

TEST PERSONNEL:

Tester Signature: 

Date: 21.12.08

Typed/Printed Name: I. Raz

9.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	August 14, 2008	1 year
Cable	Rhophase	KPS-1501-1000	A1675	August 14, 2008	1 year

Figure 110 Test Equipment Used

10. Band Edge (Radiated)

[In Accordance with section 15.247(c)]

10.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2412 MHz, and 2462 MHz correspondingly.

The E.U.T. was tested at 2412, and 2462 MHz with DBPSK (1Mbit/sec) modulations.

10.2 Test Data

JUDGEMENT: Passed by 8.9 dB

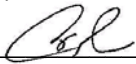
For the operation frequency of 2412 MHz, the margin between the emission level and the specification limit is 9.5 dB in the worst case at the frequency of 2390.00 MHz, vertical polarization.

For the operation frequency of 2462 MHz, the margin between the emission level and the specification limit is 8.9 dB in the worst case at the frequency of 2483.50 MHz, vertical polarization.

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

The details of the highest emissions are given in *Figure 111* to *Figure 112*.

TEST PERSONNEL:

Tester Signature:  Date: 22.12.08

Typed/Printed Name: A. Sharabi

Band Edge (Radiated)

E.U.T Description Exciter
Type EX2000BW
Part Number: 100-2035-0002

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 2412; 2462 MHz

Operation Frequency	Freq.	Polarity	Peak Reading	Peak. Specification	Peak. Margin
(MHz)	(MHz)	(H/V)	(dB μ V/m)	(dB μ V/m)	(dB)
2412.00	2250.00	V	51.2	74.0	-22.8
2412.00	2310.00	V	54.7	74.0	-19.3
2412.00	2390.00	V	54.1	74.0	-19.9
2462.00	2483.50	V	53.3	74.0	-20.7
2462.00	2490.00	V	57.1	74.0	-16.9

**Figure 111. 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 Reading” includes correction factor.

Correction Factor” = Antenna Factor + Cable Loss

Band Edge (Radiated)

E.U.T Description Exciter
Type EX2000BW
Part Number: 100-2035-0002

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical

Frequency range: 1.0 GHz to 25.0 GHz

Test Distance: 3 meters

Detector: Average

Operation Frequency: 2412; 2462 MHz

Operation Frequency	Freq.	Polarity	Average Reading	Average Specification	Average Margin
(MHz)	(MHz)	(H/V)	(dB μ V/m)	(dB μ V/m)	(dB)
2412.00	2250.00	V	43.4	54.0	-10.6
2412.00	2310.00	V	43.5	54.0	-10.5
2412.00	2390.00	V	44.5	54.0	-9.5
2462.00	2483.50	V	45.1	54.0	-8.9
2462.00	2490.00	V	45.2	54.0	-8.8

**Figure 112. 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 Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss

10.3 Test Equipment Used.

Band Edge (Radiated)

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	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
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years

Figure 113 Test Equipment Used

11. Radiated Emission, 9 kHz – 30 MHz

11.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

11.2 Test Procedure

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

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

The frequency range 9 kHz-30 MHz was scanned.

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-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of kHz. This frequency was measured using a peak detector.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

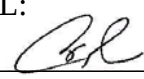
11.3 Measured Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The signals in the band 9 kHz – 30 MHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

TEST PERSONNEL:

Tester Signature: 

Date: 21.12.08

Typed/Printed Name: A. Sharabi

11.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	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

11.5 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.

12. Spurious Radiated Emission 30 – 1000 MHz

12.1 Test Specification

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

12.2 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 1.

The frequency range 30 MHz-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 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 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

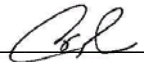
12.3 Test Data

JUDGEMENT: Passed

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

The signals in the band 30 MHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

TEST PERSONNEL:

Tester Signature:  Date: 22.12.08

Typed/Printed Name: A. Sharabi

12.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	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

12.5 Field Strength Calculation

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

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

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

No external pre-amplifiers are used.

13. Spurious Radiated Emission Above 1 GHz

13.1 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.)

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

13.2 Test Data

JUDGEMENT: Passed by 20.2 dB

For the operation frequency of 2412 MHz, the margin between the emission level and the specification limit is 20.2 dB in the worst case at the frequency of 4824.00 MHz, horizontal polarization.

For the operation frequency of 2437 MHz, the margin between the emission level and the specification limit is 20.3 dB in the worst case at the frequency of 4874.00 MHz, horizontal polarization.

For the operation frequency of 2462 MHz, the margin between the emission level and the specification limit is 20.5 dB in the worst case at the frequency of 4928.00 MHz, horizontal polarization.

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

The details of the highest emissions for the worst case modulation are given in *Figure 114* to *Figure 115*.

TEST PERSONNEL:

Tester Signature:  _____

Date: 22.12.08

Typed/Printed Name: E. Pitt

Radiated Emission Above 1 GHz

E.U.T Description Exciter
Type EX2000BW
Part Number: 100-2035-0002

Specification: FCC, Part 15, Subpart C

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

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dB μ V/m)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2412.00	4824.00	H	44.1	74.0	-29.9
2412.00	4824.00	V	46.4	74.0	-27.6
2437.00	4874.00	H	45.1	74.0	-28.9
2437.00	4874.00	V	47.0	74.0	-27.0
2462.00	4928.00	H	44.8	74.0	-29.2
2462.00	4928.00	V	44.8	74.0	-29.2

**Figure 114. Radiated Emission. Antenna Polarization: HORIZONTAL / 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 Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description Exciter
Type EX2000BW
Part Number: 100-2035-0002

Specification: FCC, Part 15, Subpart C

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

Operation Frequency	Freq.	Polarity	Average Reading	Average Specification	Average Margin
(MHz)	(MHz)	(H/V)	(dB μ V/m)	(dB μ V/m)	(dB)
2412.00	4824.00	H	33.8	54.0	-20.2
2412.00	4824.00	V	33.6	54.0	-20.4
2437.00	4874.00	H	33.7	54.0	-20.3
2437.00	4874.00	V	33.4	54.0	-20.6
2462.00	4928.00	H	33.5	54.0	-20.5
2462.00	4928.00	V	33.1	54.0	-20.9

**Figure 115. Radiated Emission. Antenna Polarization: HORIZONTAL / 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 Reading” includes correction factor.

Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

13.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2008	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	March 23, 2008	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	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 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	2.5 Years
Horn Antenna	Narda	V637	0410	December 8, 2006	2.5 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 2, 2008	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 9, 2008	1 Year
Low Noise Amplifier	MK Milliwave	MKT6-3000 4000-30-13P	399	January 9, 2008	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	December 15, 2008	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	JPKG19982	N/A	N/A

14. Transmitted Power Density

[In accordance with section 15.247(d)]

14.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable. The spectrum analyzer was set to 3 kHz resolution BW. and sweep time of 1 second for each 3 kHz “window”. The spectrum peaks were located at each of the 3 operating frequencies.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: DBPSK (1Mbit/sec), CCK (11Mbit/sec) and 64QAM (54Mbit/sec).

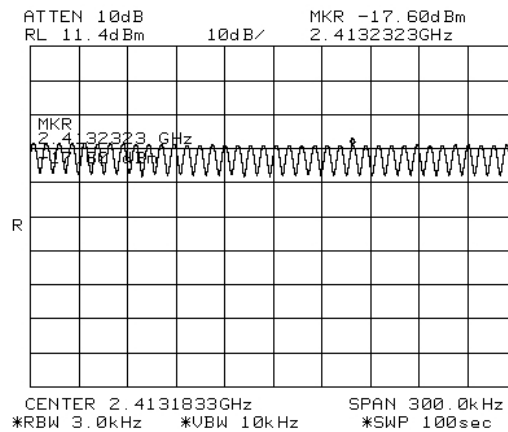


Figure 116 — DPBSK 2412 MHz

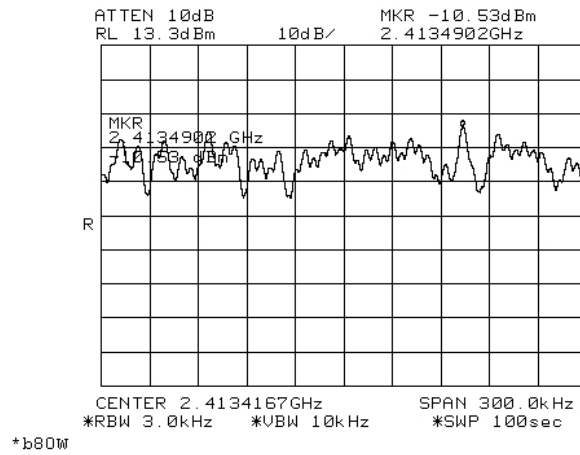


Figure 117 — CCK 2412 MHz

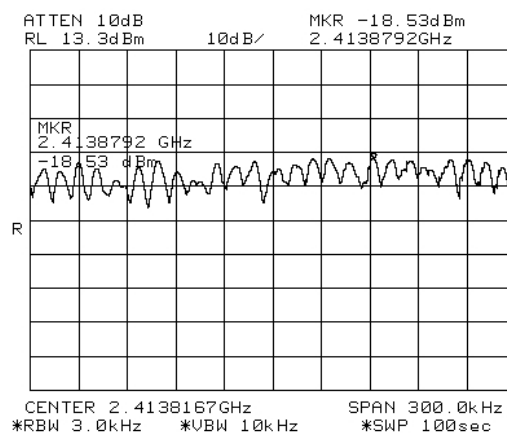


Figure 118 — 64QAM 2412 MHz

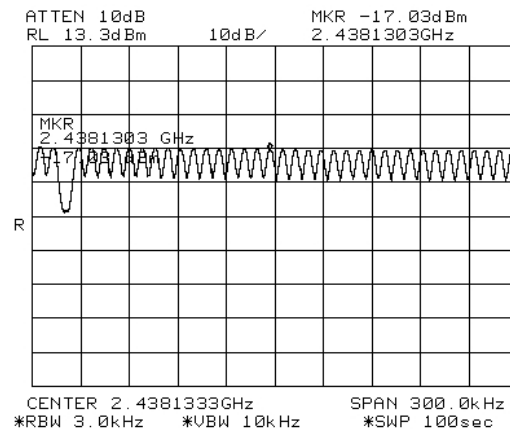


Figure 119 — DPBPSK 2437 MHz

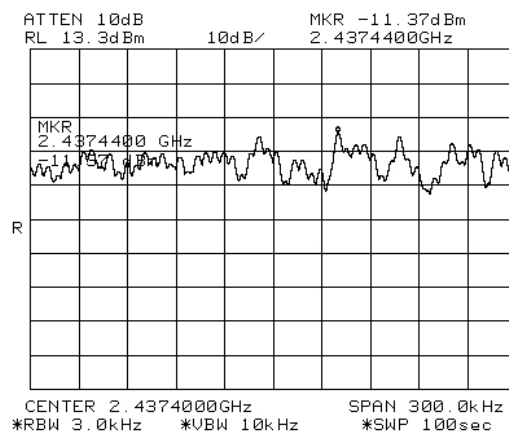


Figure 120 — CCK 2437 MHz

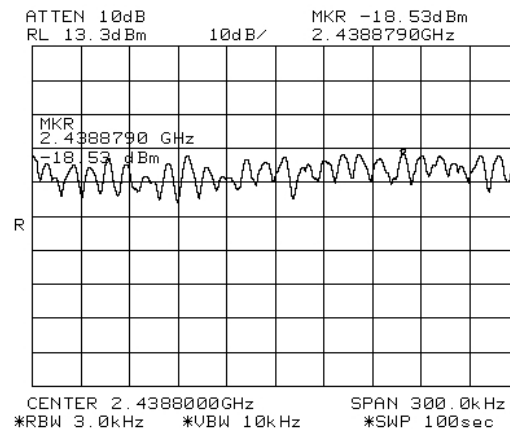


Figure 121 — 64QAM 2437 MHz

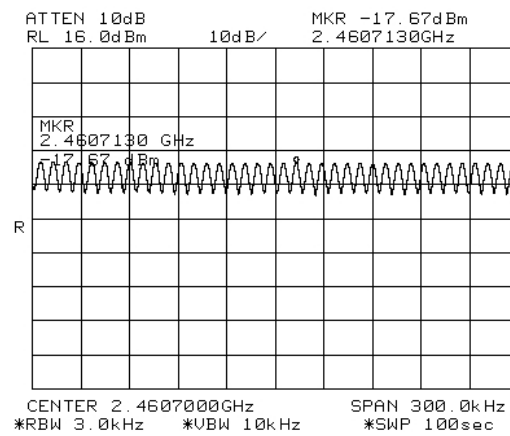


Figure 122 — DPBSK 2462 MHz

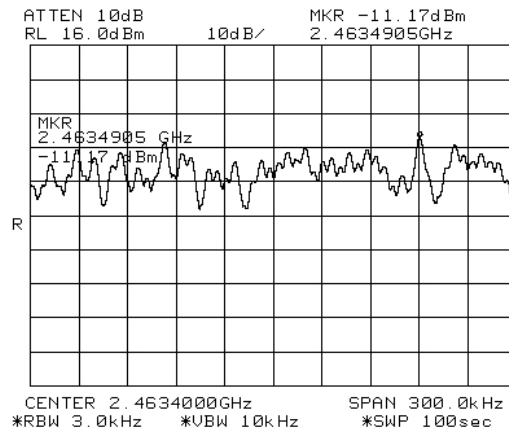


Figure 123 — CCK 2462 MHz

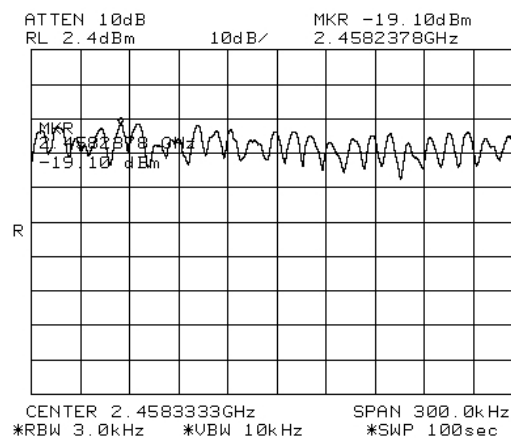


Figure 124 — 64QAM 2462 MHz

14.2 Results table

E.U.T. Description: Exciter

Model No.: EX2000BW

Part Number: 100-2035-0002

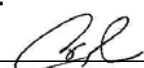
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency	Modulation	Reading Spectrum Analyzer	Specification	Margin
(MHz)		(dBm)	(dBm)	(dB)
2412	DBPSK	-17.60	8.0	-25.60
	CCK	-10.53	8.0	-18.53
	64QAM	-18.53	8.0	-26.53
2437	DBPSK	-17.03	8.0	-25.03
	CCK	-11.37	8.0	-19.37
	64QAM	-18.53	8.0	-26.53
2462	DBPSK	-17.67	8.0	-25.67
	CCK	-11.17	8.0	-19.17
	64QAM	-19.10	8.0	-20.10

Figure 125 Test Results

JUDGEMENT: Passed by 18.53 dB

TEST PERSONNEL:

Tester Signature: 

Date: 22.12.08

Typed/Printed Name: A. Sharabi

14.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	December 15, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	August 14, 2008	1 year
Cable	Rhophase	KPS-1501-1000	A1675	August 14, 2008	1 year

Figure 126 Test Equipment Used

15. Intermodulation (2.4GHz, 125KHz)

15.1 Test Specification

3rd Order Product

15.2 Test Procedure

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

The E.U.T was placed in the open site on a non-conductive table, 0.8 meters above the ground. The table azimuth was controlled by a remote positioner.

The emissions below 2.9 GHz 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 above 2.9 GHz, a spectrum analyzer including a low noise amplifier was used. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The receiver and/or spectrum analyzer center frequency was set to 3rd order intermodulation products, resulting from the transmitters' operation frequencies below.

The emissions were measured at a distance of 3 meters.

The configurations tested included 2 transmitters operating at the following frequencies:

LF Transmitter: 125KHz

WiFi Transmitter: 2437.00 MHz

15.3 Test Data

JUDGEMENT: No 3rd Order Products were detected.

TEST PERSONNEL:

Tester Signature: 

Date: 22.12.08

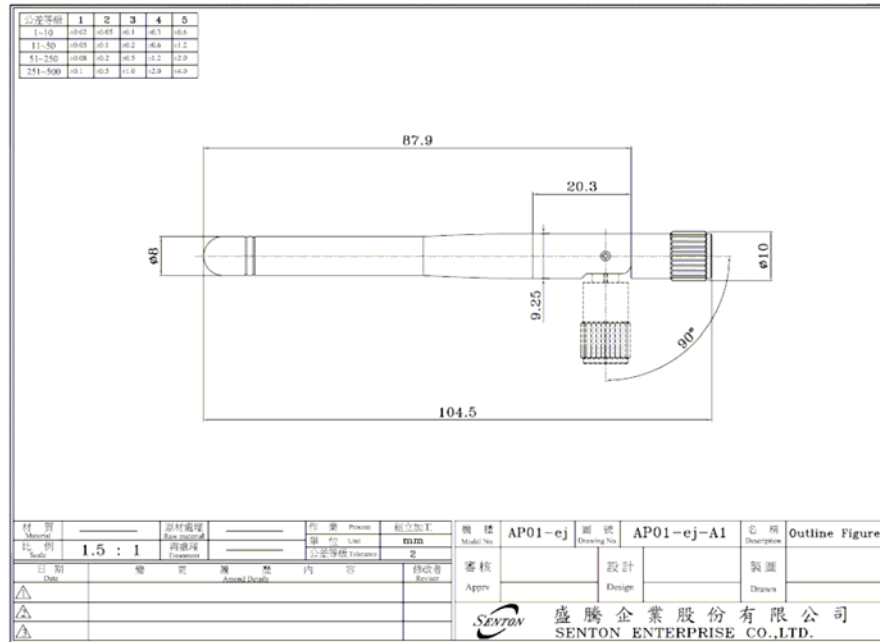
Typed/Printed Name: A. Sharabi

15.4 Test Instrumentation Used, Intermodulation Measurements

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2008	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	March 23, 2008	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	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 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	2.5 Years
Horn Antenna	Narda	V637	0410	December 8, 2006	2.5 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 2, 2008	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 9, 2008	1 Year
Low Noise Amplifier	MK Milliwave	MKT6-3000 4000-30-13P	399	January 9, 2008	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	December 15, 2008	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	JPKG19982	N/A	N/A

16. Antenna Gain/Information

The antenna gain is < 2dBi dBi.



■ ELECTRICAL SPECIFICATION

- | | | |
|--------------------|--------------------------------------|---|
| 1. ANTENNA TYPE | : Dipole Antenna
(Swivel Type) | 6. ADMITTED POWER RADIATION: 3W |
| 2. FREQUENCY RANGE | : 2.4GHz / 5.8GHz | 7. TYPE OF RADIATION : Omni |
| 3. IMPENDANCE | : 50 Ohms | 8. POLARIZATION : Vertical |
| 4. GAIN | : 2.4GHz < 2.0 dBi
5.8GHz < 0 dBi | 9. ELECTRICAL LENGTH : 1/4 λ Dipole |
| 5. VSWR | : ≤ 2.0 | 10. STANDARD CONNECTOR : SMA (Male Reverse) |

17. R.F Exposure/Safety

Typical use of the E.U.T. is enabling location based applications, i.e. AeroScout tags . The typical placement of the E.U.T. is wall/ceiling mounted . The typical distance between the E.U.T. and the user in the worst case application, is >20cm .

Calculation of Maximum Permissible Exposure (MPE) Based on Section 1.1307(b)(1) Requirements

(a) FCC limit 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 0.63 mw (Peak) = 18 dBm

G_T- Antenna Gain, 2 dBi = 1.58 (numeric)

R- Distance from Transmitter using 0.2 m worst case

(c) The peak power density is :

$$S_p = \frac{6.31 \times 1.58}{4\pi(20)^2} = 0.02 \frac{mW}{cm^2}$$

(f) This is more than an order of magnitude below the FCC limit.

18. APPENDIX A - CORRECTION FACTORS

18.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

18.2 Correction factors for CABLE
from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

- 1. The cable type is RG-8.*
- 2. The overall length of the cable is 10 meters.*

18.3 Correction factors for

CABLE

from spectrum analyzer
to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

12.6 Correction factors for LOG PERIODIC ANTENNA

**Type LPD 2010/A
at 3 and 10 meter ranges.**

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range,
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission
Test EMI Receiver".

18.4 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".

**18.5 Correction factors for BICONICAL ANTENNA
Type BCD-235/B,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

18.6 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

18.7 Correction factors for

**Horn Antenna
Model: SWH-28
at 1 meter range.**

FREQUENCY (GHz)	APE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

18.8 Correction factors for

Horn Antenna Model: V637

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

18.9 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2