Israel Testing Laboratories

ACCREDITED

Cert. No. 1152.01
Electrical (EMC)

DATE: 22 December 2008

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

FCC Radio Test Report

for

AeroScout Ltd.

Equipment under test:

Exciter 5 GHz Bands

EX2000BW

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
A. Sharabi, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

AeroScout Ltd.

Exciter

EX2000BW

FCC ID: Q3HEX2000BW

22 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
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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:	22.12.08
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 5 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.

Band	Tested frequencies (MHz)			Tested modulations	
	Low	Mid	High	Low	High
5150-5350	5180	5200	5240	BPSK	64QAM
5725-5825	5745	5765	5805	BPSK	64QAM

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

The software version used is bbss127g.bin

Notes:

1. In order to operate the E.U.T. in the 5 GHz bands, the 5 GHz configuration must be loaded.
2. In order to change channels and speeds, the relevant command lines must be entered.

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

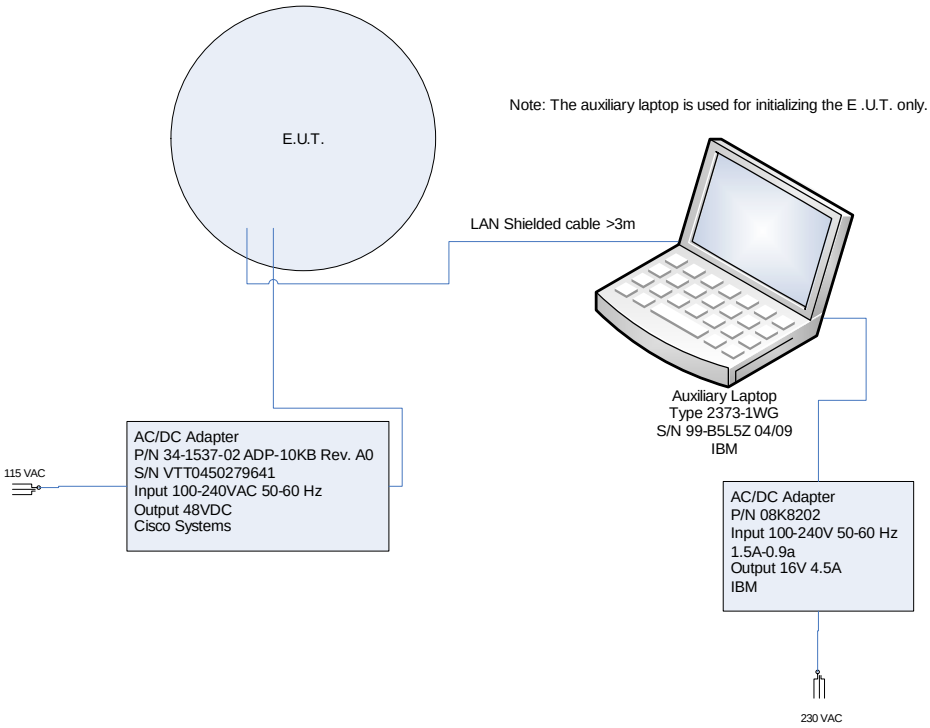


Figure 1. Configuration of Tested System

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 µHn 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

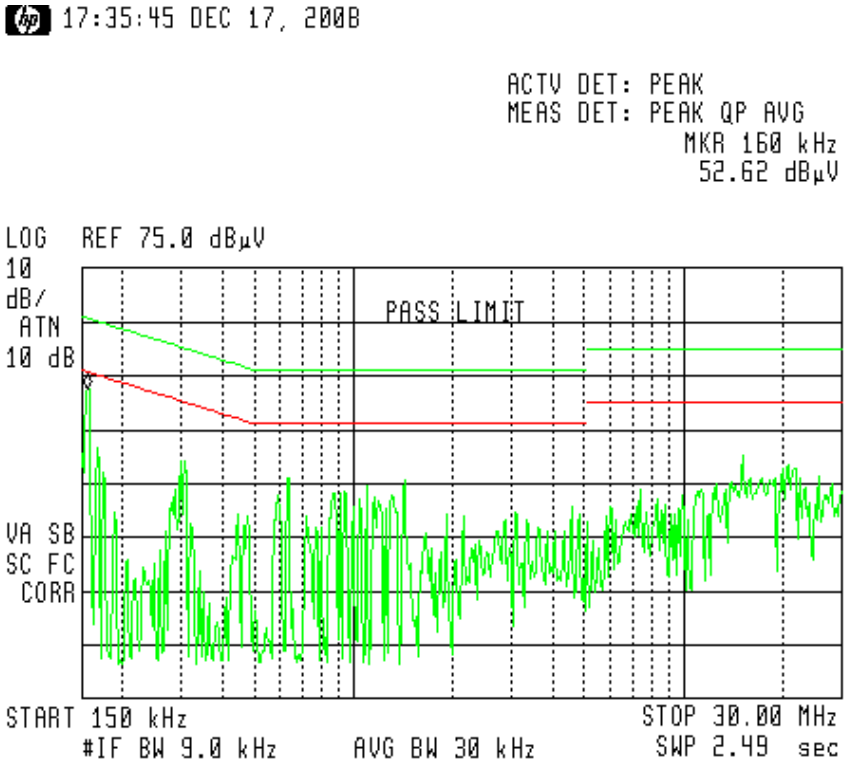


Figure 3. Detectors: Peak, Quasi-peak, Average

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

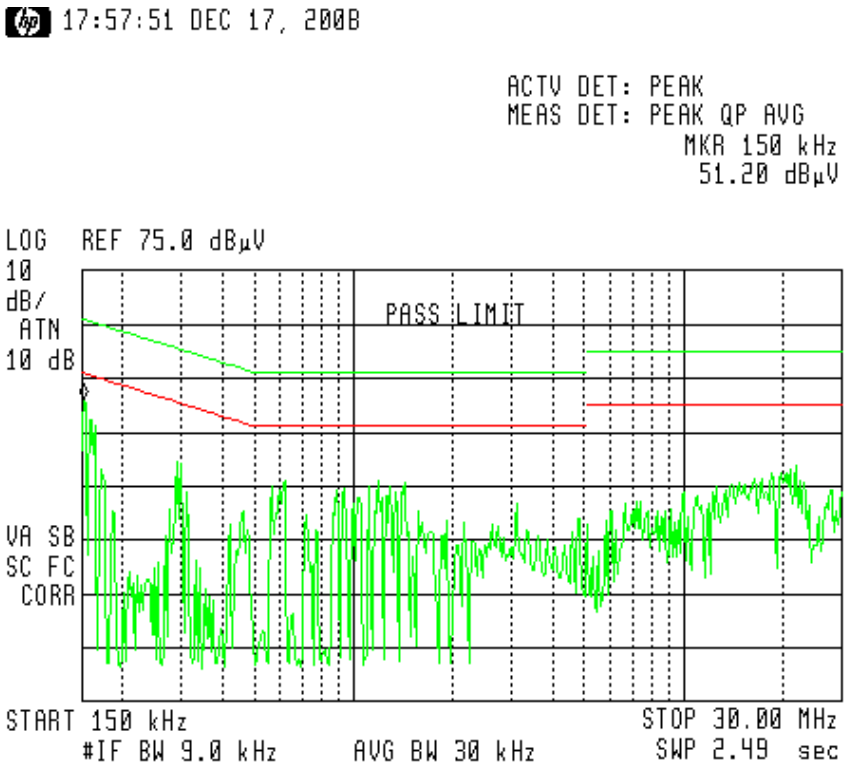


Figure 5 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

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	JPKGC19982	N/A	N/A

5. 26 dB 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 (20 dB) and appropriate coaxial cable. The spectrum analyzer was set to 300 kHz resolution BW. The spectrum bandwidth of the E.U.T. was measured and recorded.

The E.U.T. was tested at 5180,5200, 5240, 5745,5765, and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

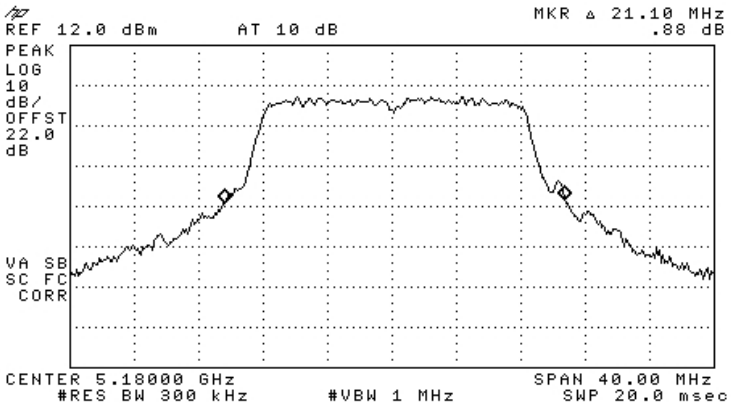


Figure 6 — 5180 MHz BPSK

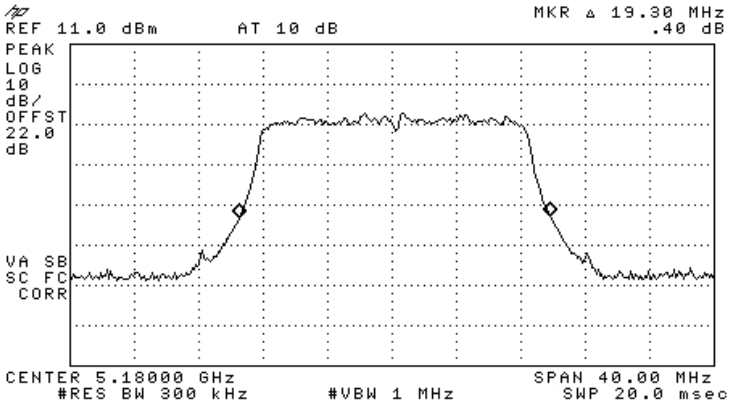


Figure 7 — 5180 MHz 64QAM

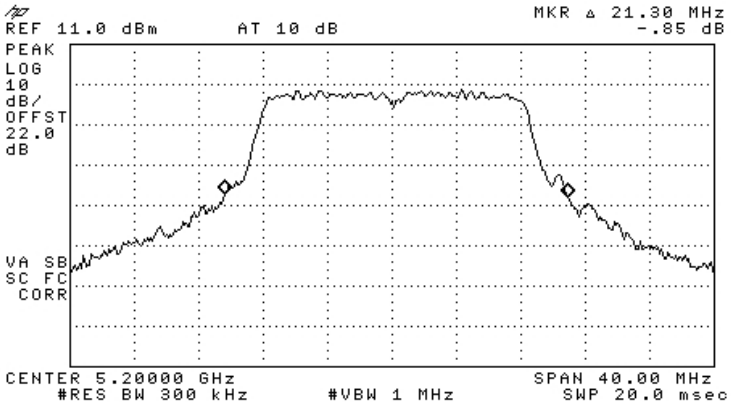


Figure 8 — 5200 MHz BPSK

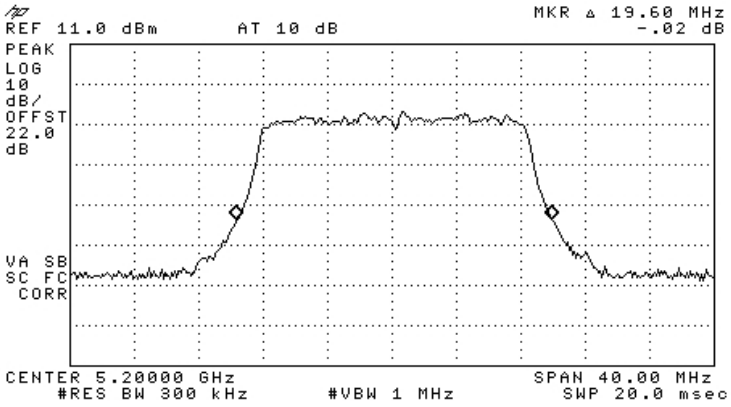


Figure 9 — 5200 MHz 64QAM

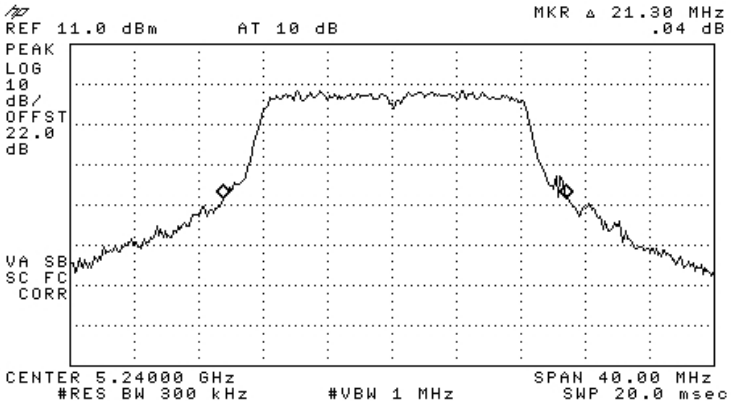


Figure 10 — 5240 MHz BPSK

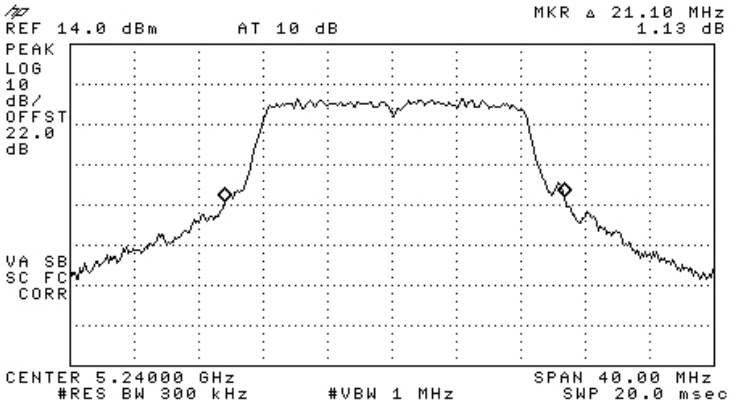


Figure 11 — 5240 MHz 64QAM

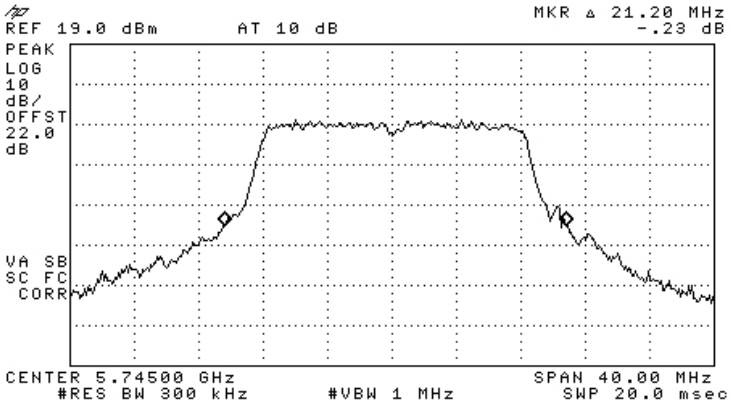


Figure 12 — 5745 MHz BPSK

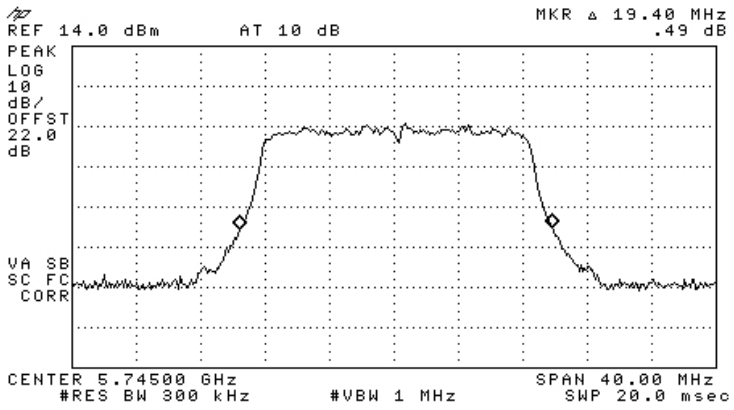


Figure 13 — 5745 MHz 64QAM

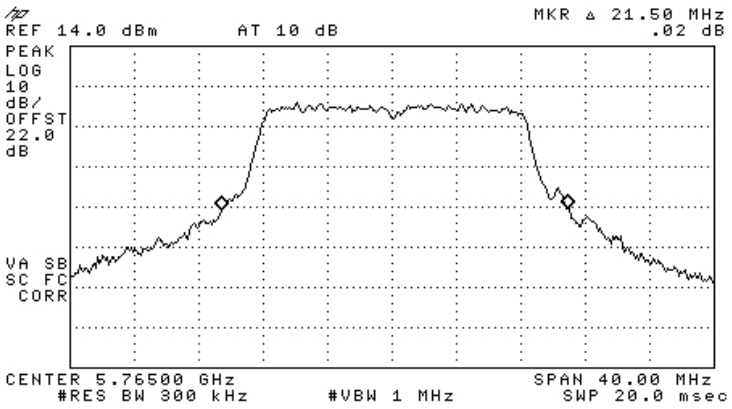


Figure 14 — 5765 MHz BPSK

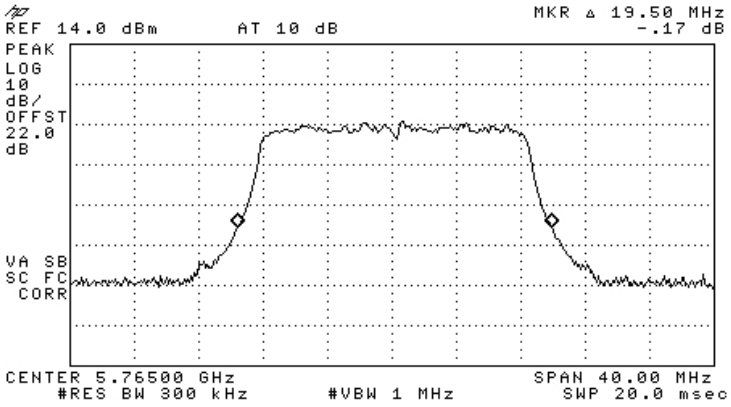


Figure 15 — 5765 MHz 64QAM

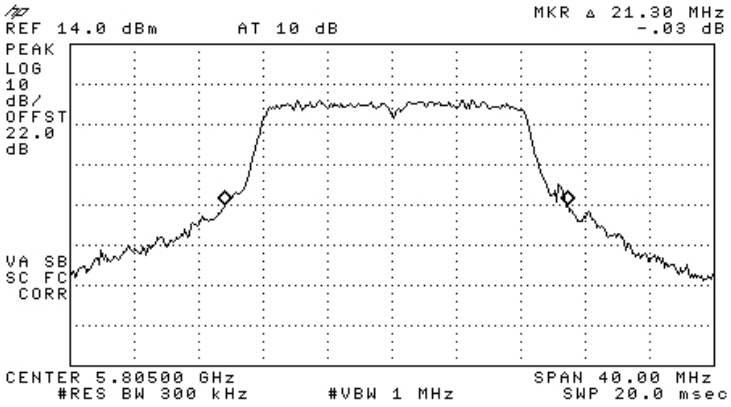


Figure 16 — 5805 MHz BPAK

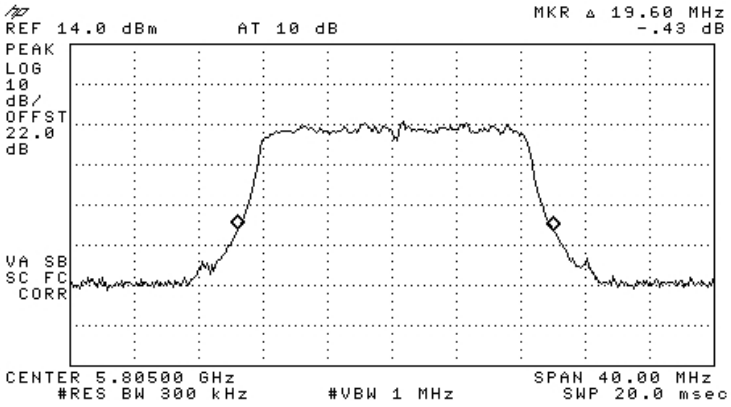


Figure 17 — 5805 MHz 64QAM

5.1 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)
5180	BPSK	21.10
	64QAM	19.30
5200	BPSK	21.30
	64QAM	19.60
5240	BPSK	21.30
	64QAM	21.10
5745	BPSK	21.20
	64QAM	19.40
5765	BPSK	21.50
	64QAM	19.50
5805	BPSK	21.30
	64QAM	19.60

TEST PERSONNEL:

Tester Signature: _____ Date: 22.12.08

Typed/Printed Name: A. Sharabi

5.2 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 18 Test Equipment Used

6. Maximum Transmitted Peak Power Output

6.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (20 dB) and an appropriate coaxial cable (cable loss = 2 dB). The Spectrum Analyzer was set to 1.0 MHz resolution BW. Sample detector and maximum hold were used.

The E.U.T. was tested at 5180, 5200, 5240, 5745, 5765 and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

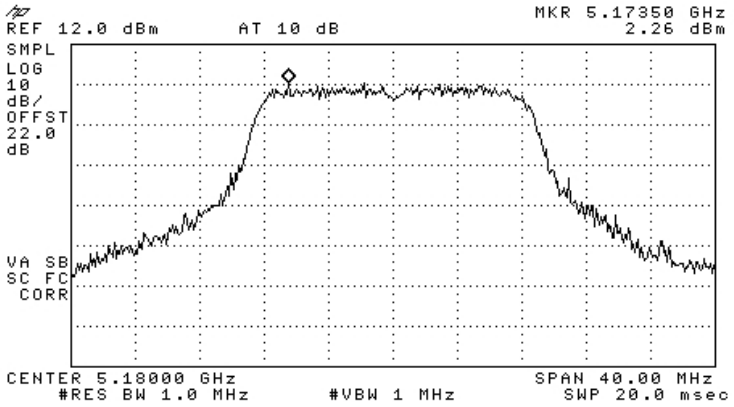


Figure 19 BPSK 5180 MHz

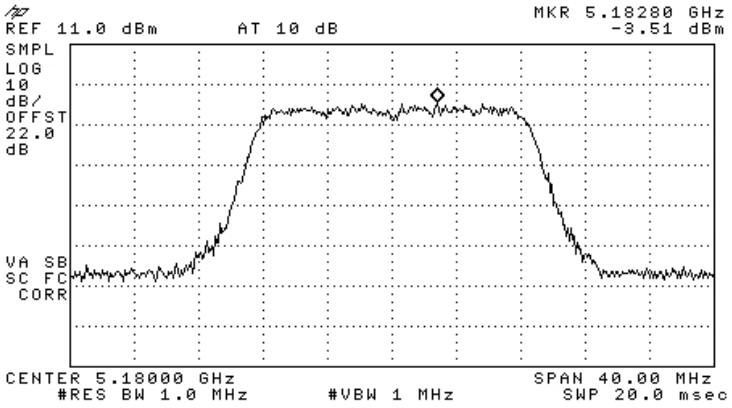


Figure 20 64QAM 5180 MHz

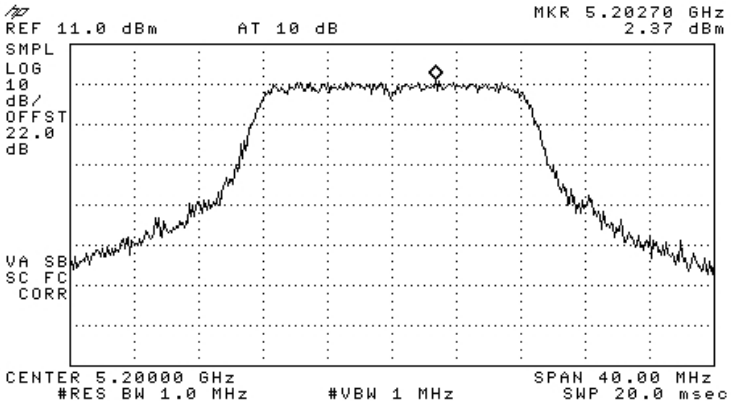


Figure 21 BPSK 5200 MHz

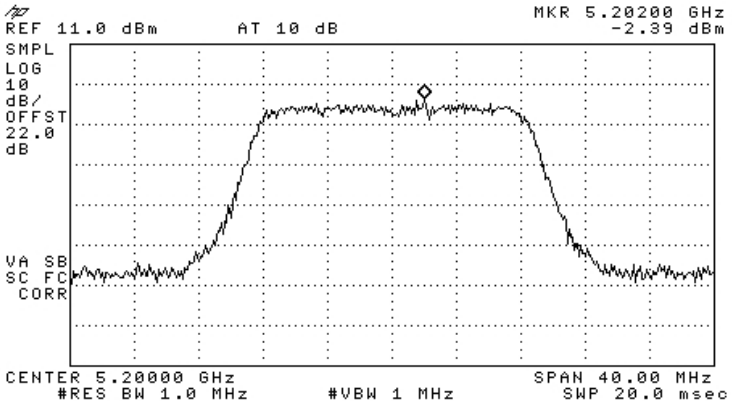


Figure 22 64QAM 5200 MHz

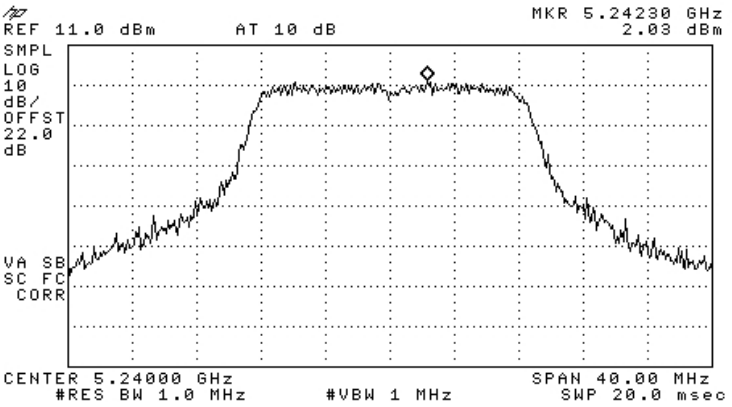


Figure 23 BPSK 5240 MHz

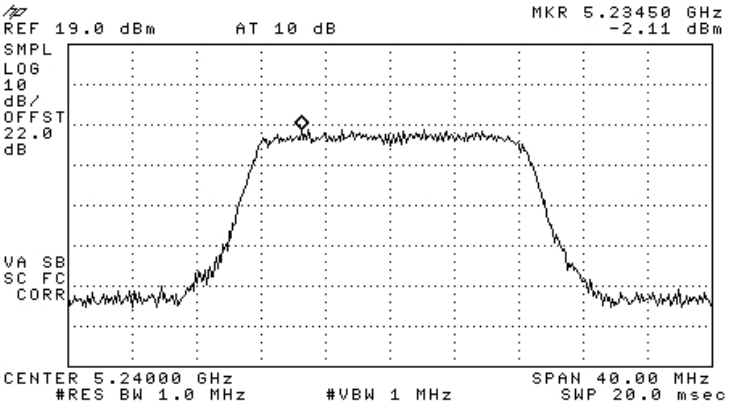


Figure 24 64QAM 5240 MHz

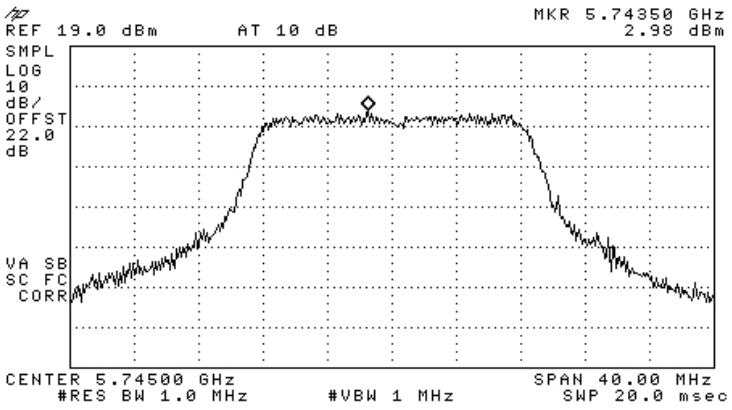


Figure 25 BPSK 5745 MHz

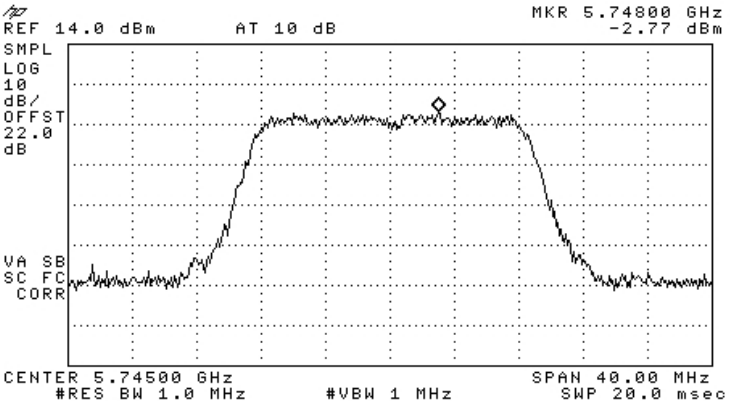


Figure 26 64QAM 5745 MHz

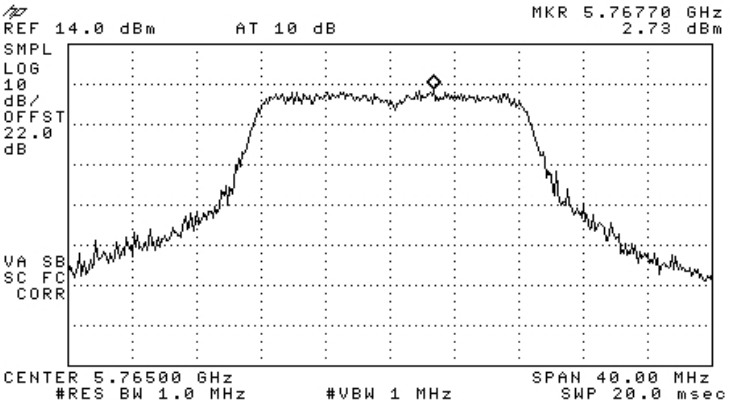


Figure 27 BPSK 5765 MHz

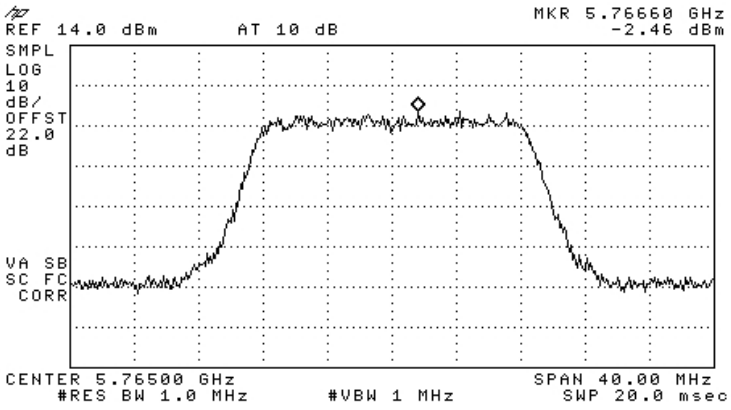


Figure 28 64QAM 5765 MHz

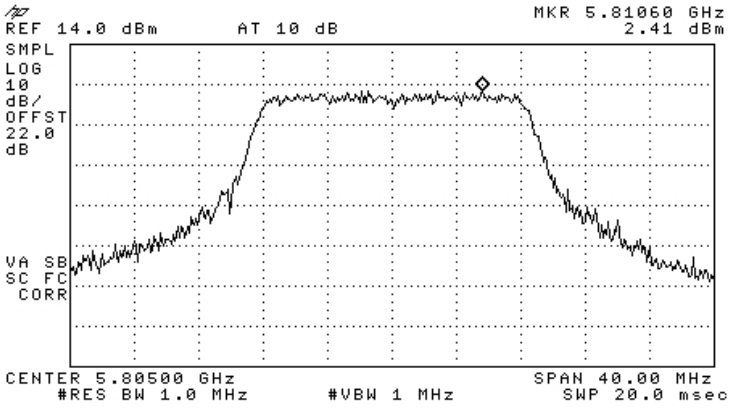


Figure 29 BPSK 5805 MHz

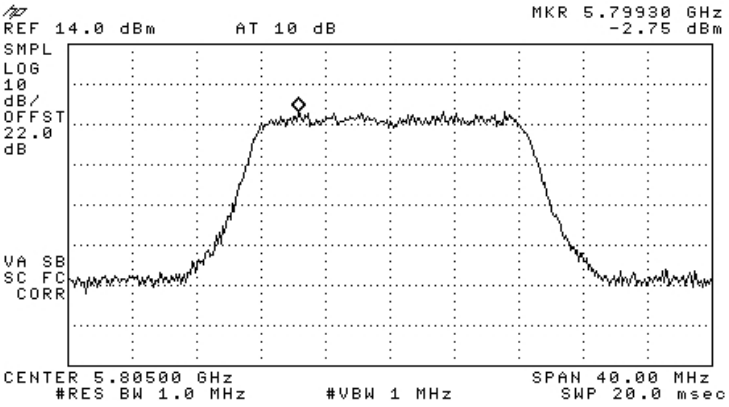


Figure 30 64QAM 5805 MHz

6.2 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	Modulation	Measured Peak	Calculated Power	Specification	Margin
(MHz)		(dBm)	(dBm)	(dBm)	(dB)
5180	BPSK	2.26	15.5	16.9	-1.4
	64QAM	-3.51	9.3	16.9	-7.6
5200	BPSK	2.37	15.7	16.9	-1.2
	64QAM	-2.39	10.5	16.9	-6.4
5240	BPSK	2.03	15.3	16.9	-1.6
	64QAM	-2.11	11.1	16.9	-5.8
5745	BPSK	2.98	16.2	30.0	-13.8
	64QAM	-2.77	10.1	30.0	-19.9
5765	BPSK	2.73	16.1	30.0	-13.9
	64QAM	-2.46	10.4	30.0	-19.6
5805	BPSK	2.41	15.7	30.0	-14.3
	64QAM	-2.75	10.2	30.0	-19.8

Peak Output Power = Reading + 10log BW
For 5.18; 5.20, 5.24 GHz Peak Output Power Limit = 4 + 10log BW or 10log50=16.9
For 5.745; 5.765, 5.805 GHz Peak Output Power Limit = 17 + 10log BW or 10log1000=30

Figure 31 Maximum Peak Power Output

JUDGEMENT: Passed by 1.6 dB

TEST PERSONNEL:
Tester Signature: _____ Date: 22.12.08
Typed/Printed Name: A. Sharabi

6.3 Test Equipment Used.

Peak Power Output

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 32 Test Equipment Used

7. Peak Power Output Out of 5150-5350; 5725-5825 MHz Bands

7.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 1 MHz resolution BW except for the frequency range 9 kHz-150 kHz where the RBW was set to 1kHz and the frequency range 150 kHz-10.0 MHz where the RBW was set to 10kHz. The frequency range from 9 kHz to 40 GHz was scanned. Level of spectrum components out of the 5150-5350; 5725-5825 MHz bands was measured at the selected operation frequencies.

The E.U.T. was tested at 5180, 5200, 5240, 5745, 5765 and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

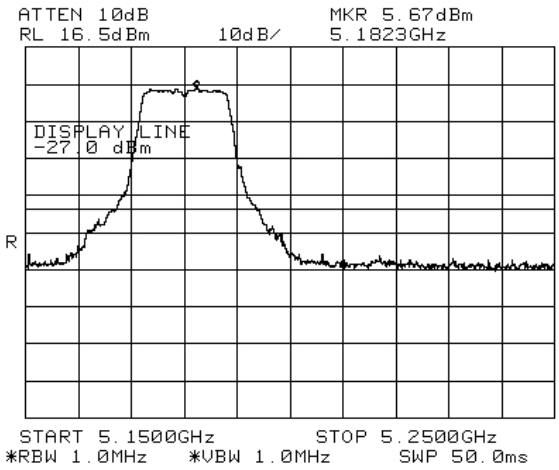


Figure 33 — BPSK 5180 MHz

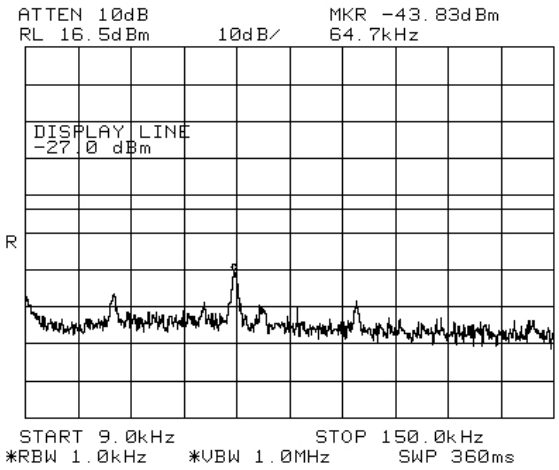


Figure 34 — BPSK 5180 MHz

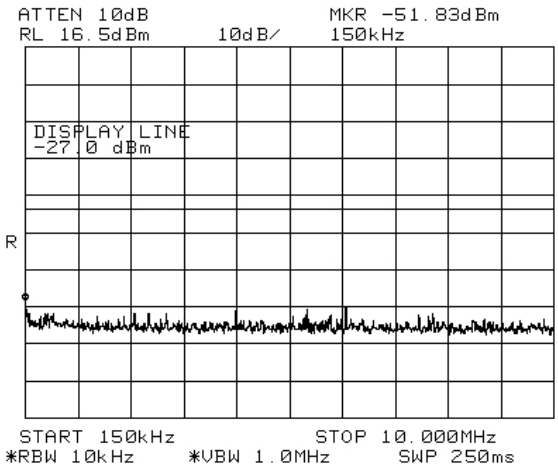


Figure 35 — BPSK 5180 MHz

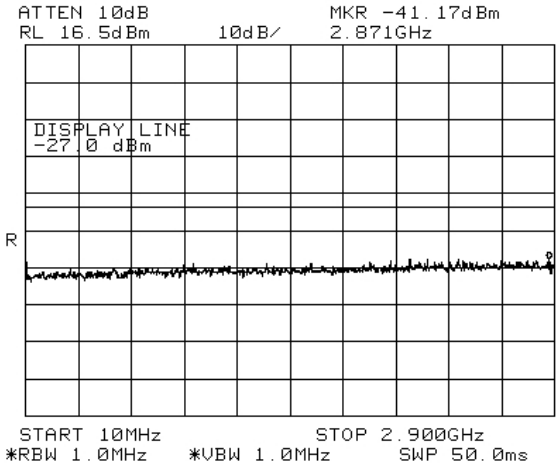


Figure 36 — BPSK 5180 MHz

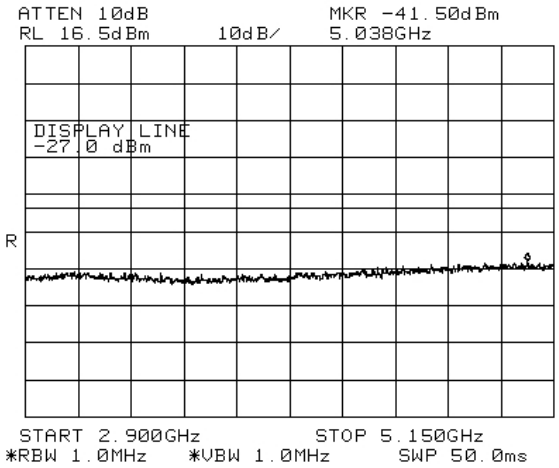


Figure 37 — BPSK 5180 MHz

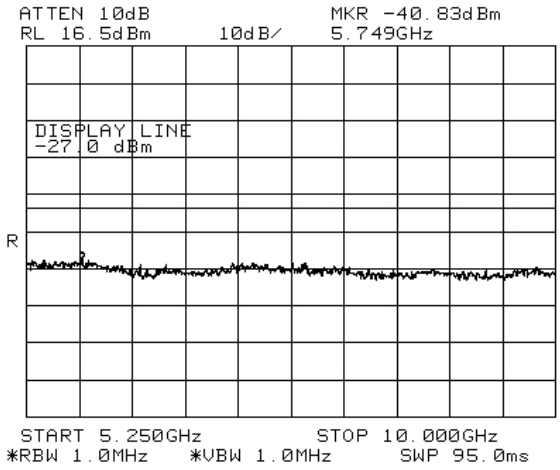


Figure 38 — BPSK 5180 MHz

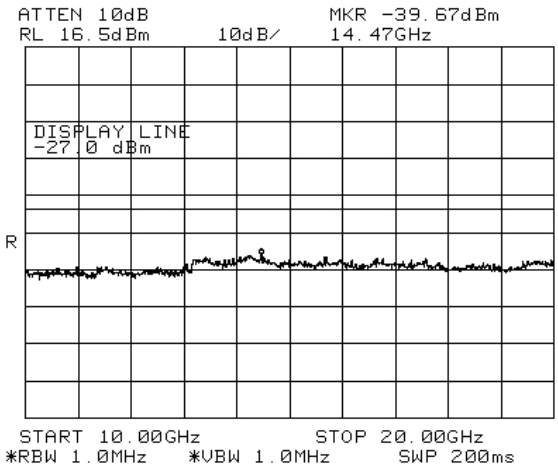


Figure 39 — BPSK 5180 MHz

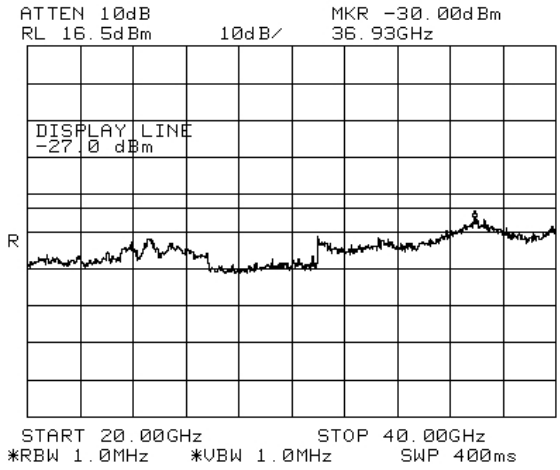


Figure 40 — BPSK 5180 MHz

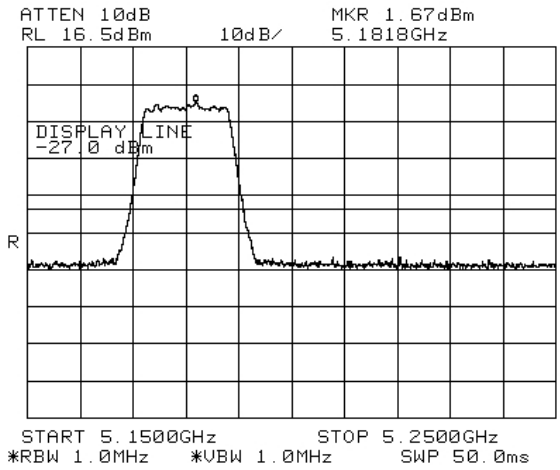


Figure 41 — 64QAM 5180 MHz

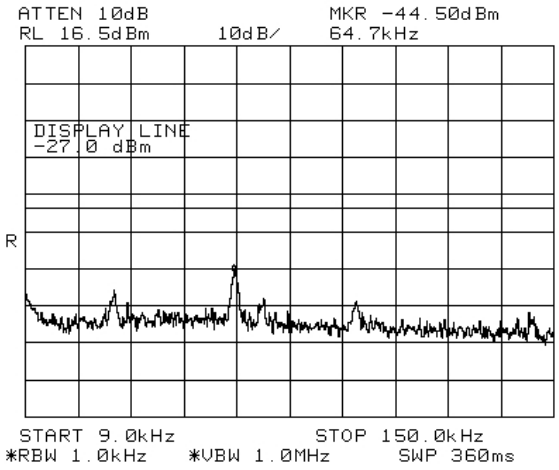


Figure 42 — 64QAM 5180 MHz

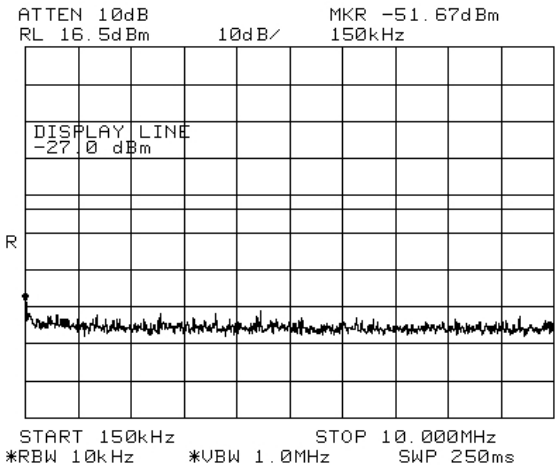


Figure 43 — 64QAM 5180 MHz

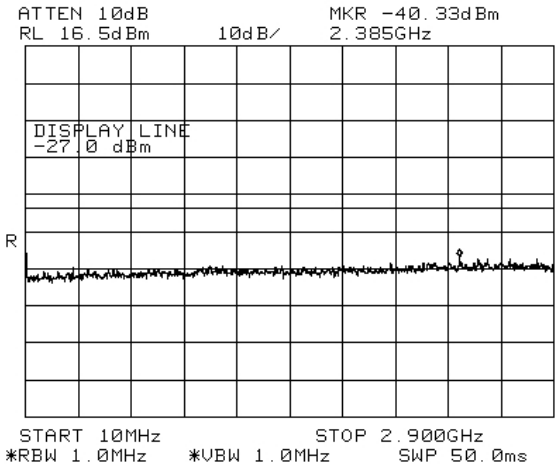


Figure 44 — 64QAM 5180 MHz

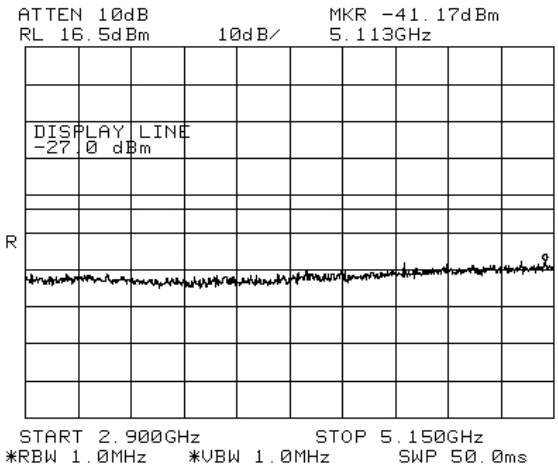


Figure 45 — 64QAM 5180 MHz

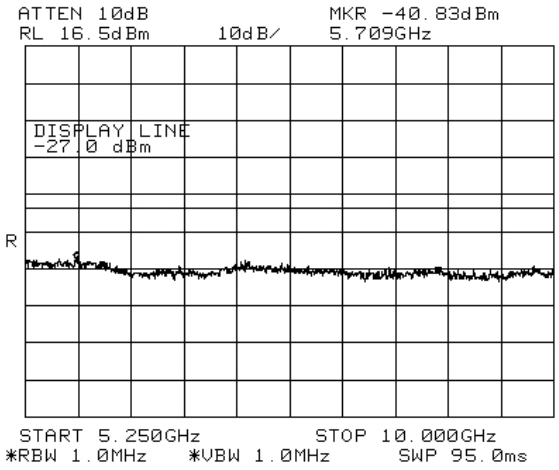


Figure 46 — 64QAM 5180 MHz

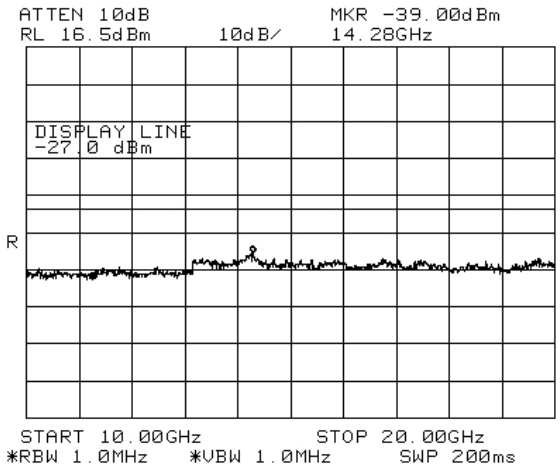


Figure 47 — 64QAM 5180 MHz

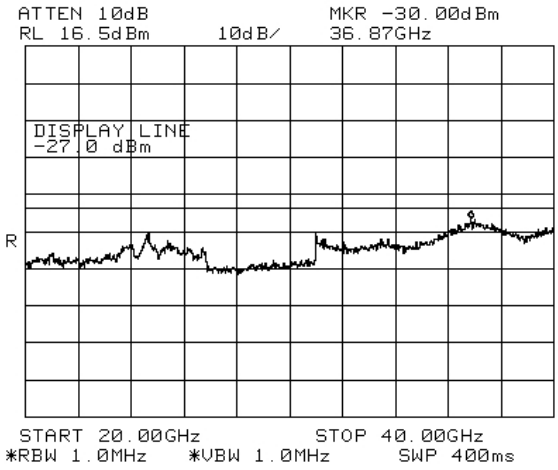


Figure 48 — 64QAM 5180 MHz

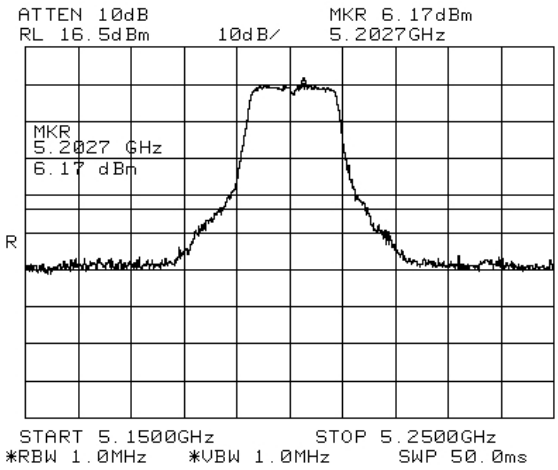


Figure 49 — BPSK 5200 MHz

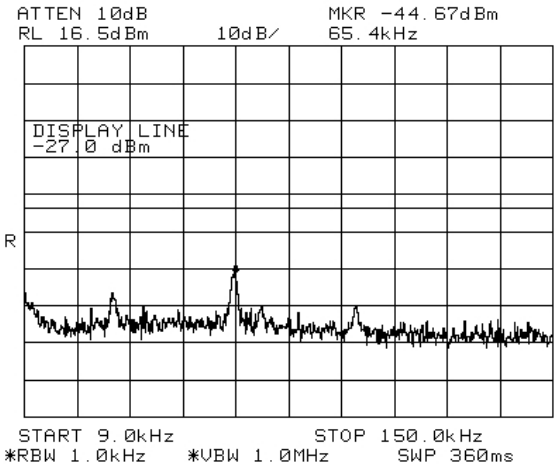


Figure 50 — BPSK 5200 MHz

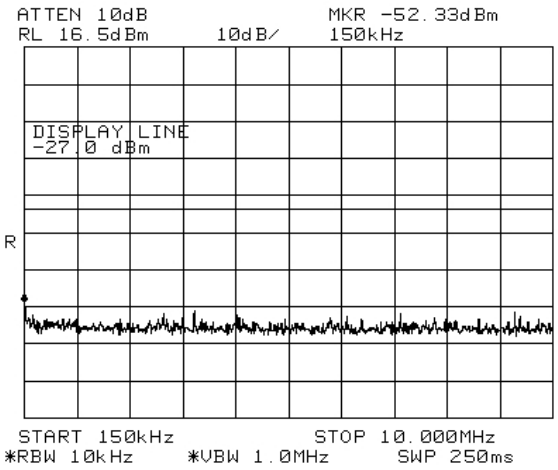


Figure 51 — BPSK 5200 MHz

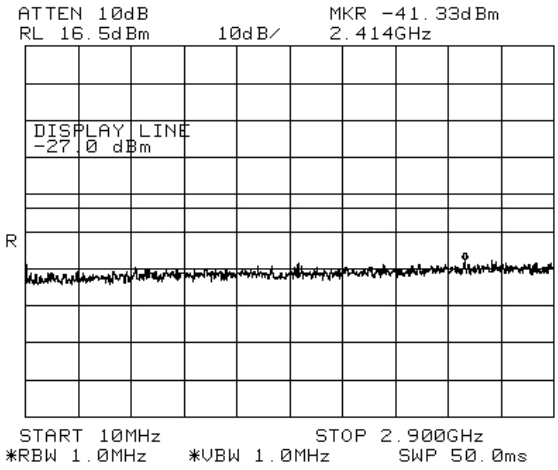


Figure 52 — BPSK 5200 MHz

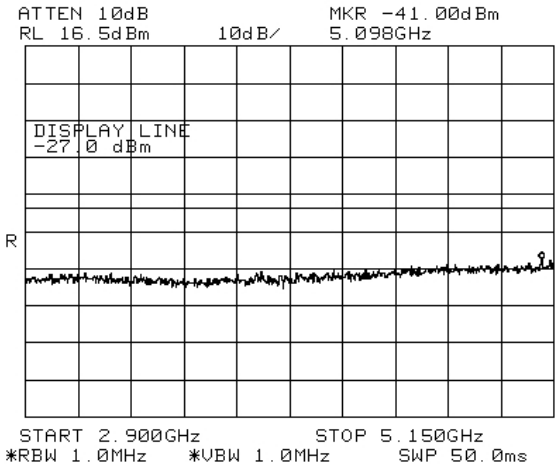


Figure 53 — BPSK 5200 MHz

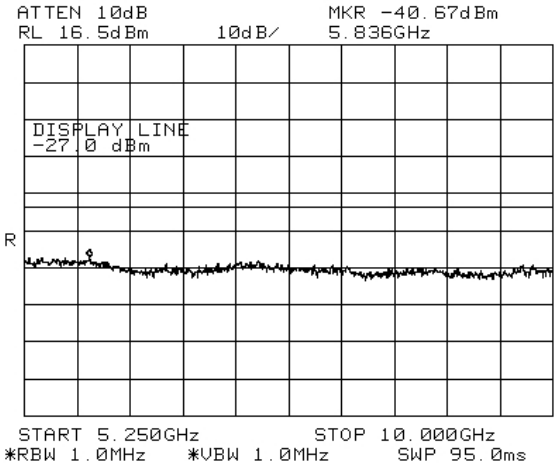


Figure 54 — BPSK 5200 MHz

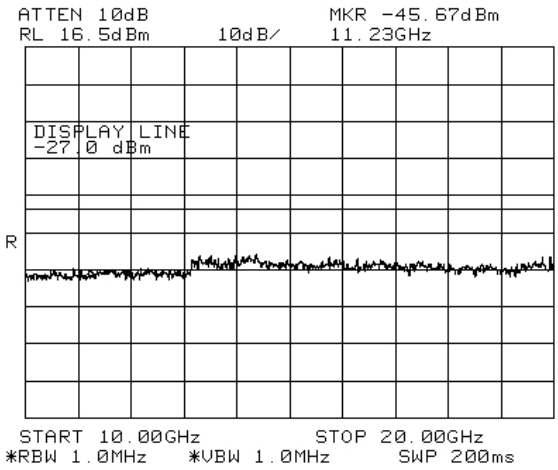


Figure 55 — BPSK 5200 MHz

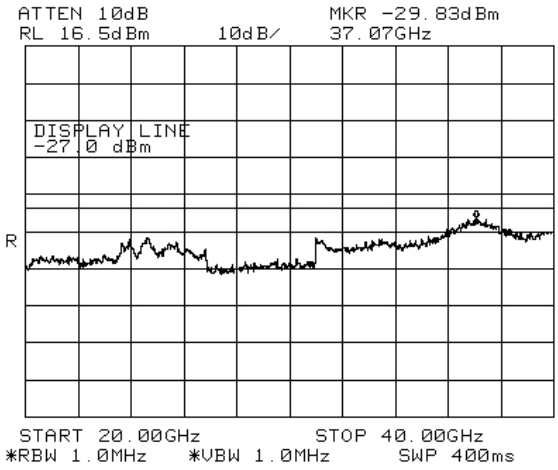


Figure 56 — BPSK 5200 MHz

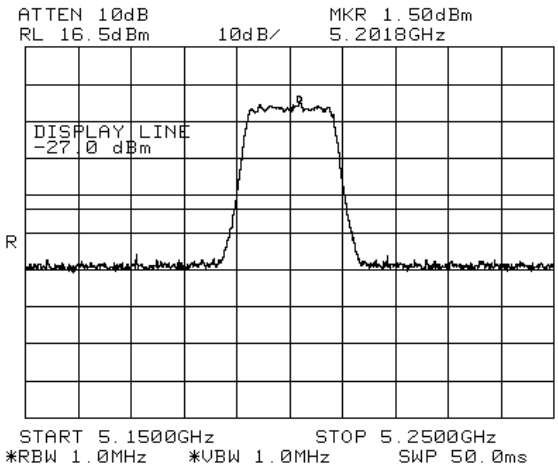


Figure 57 — 64QAM 5200 MHz

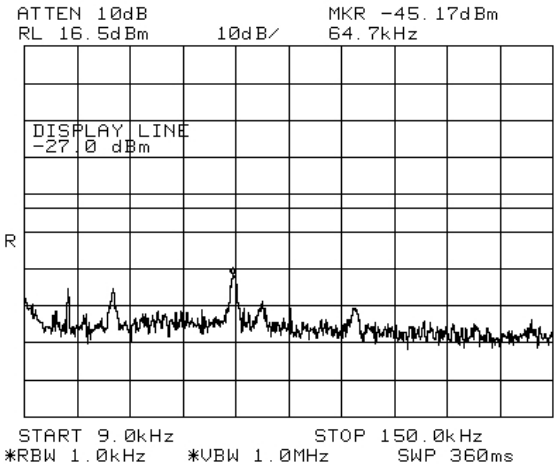


Figure 58 — 64QAM 5200 MHz

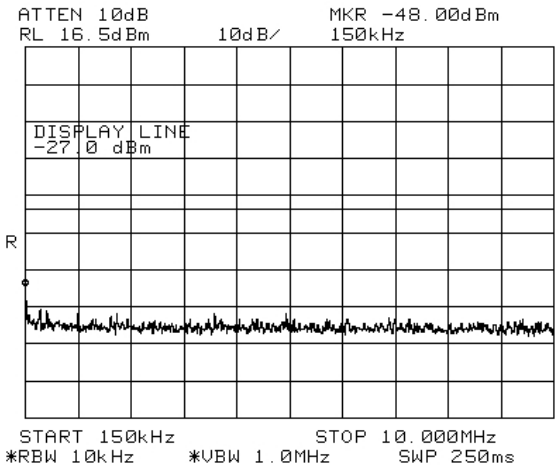


Figure 59 — 64QAM 5200 MHz

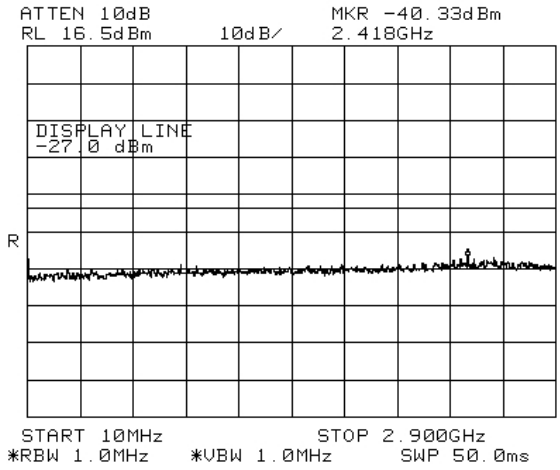


Figure 60 — 64QAM 5200 MHz

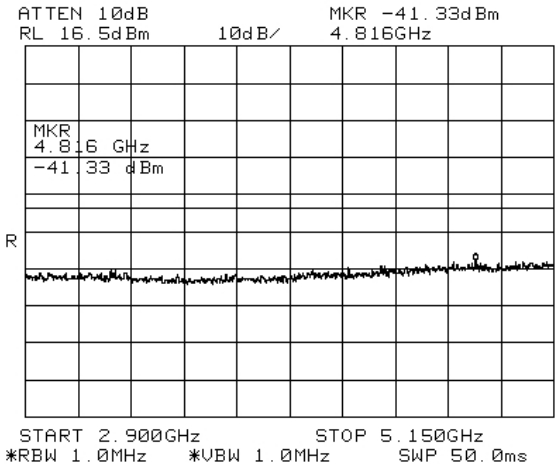


Figure 61 — 64QAM 5200 MHz

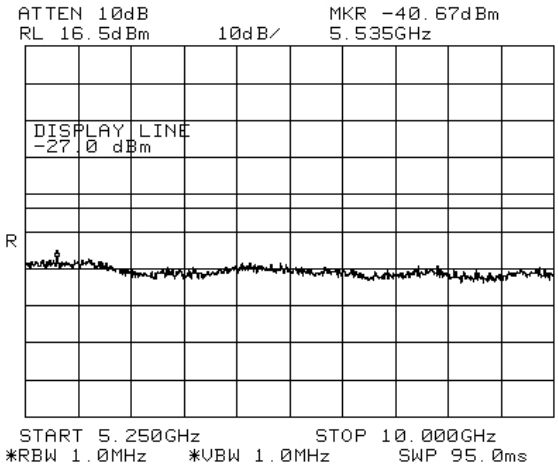


Figure 62 — 64QAM 5200 MHz

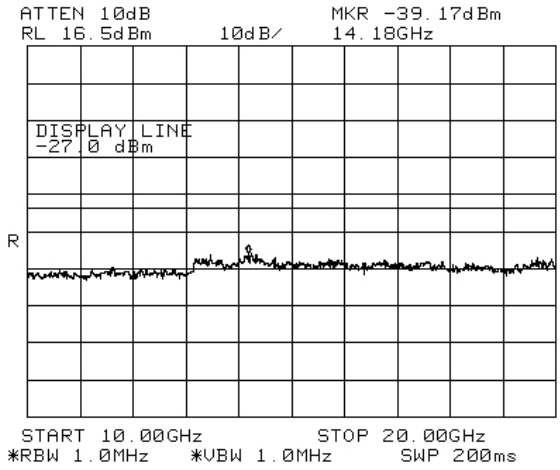


Figure 63 — 64QAM 5200 MHz

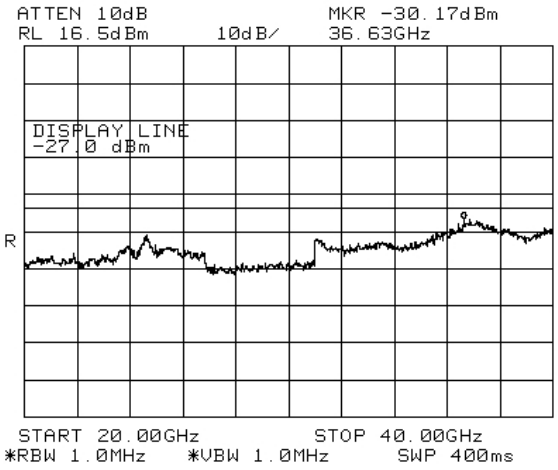


Figure 64 — 64QAM 5200 MHz

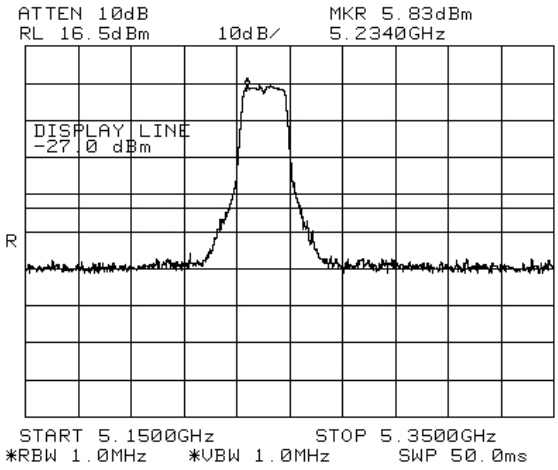


Figure 65 — BPSK 5240 MHz

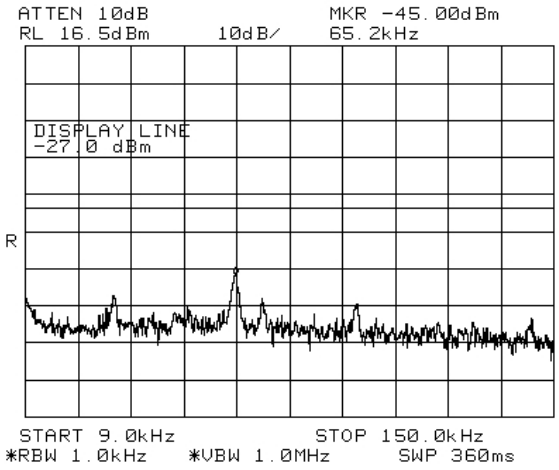


Figure 66 — BPSK 5240 MHz

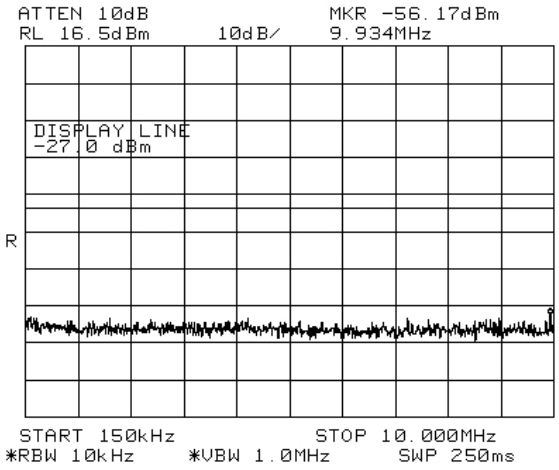


Figure 67 — BPSK 5240 MHz

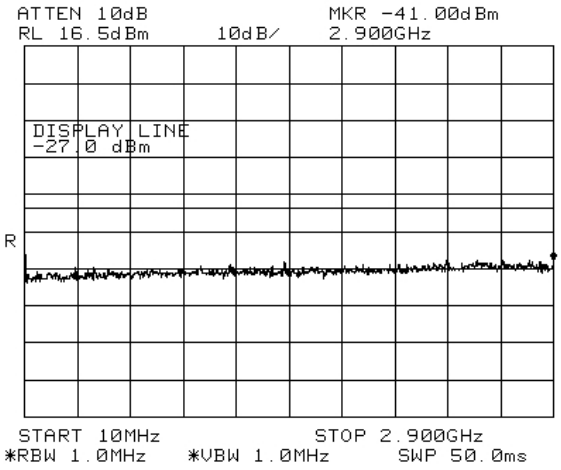


Figure 68 — BPSK 5240 MHz

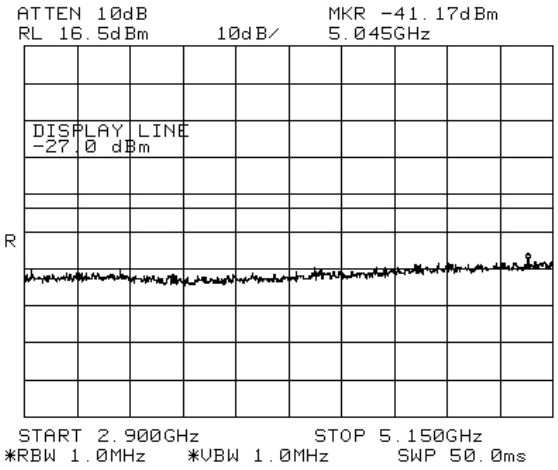


Figure 69 — BPSK 5240 MHz

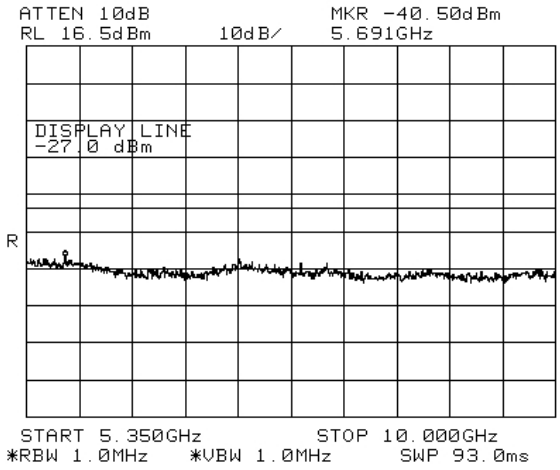


Figure 70 — BPSK 5240 MHz

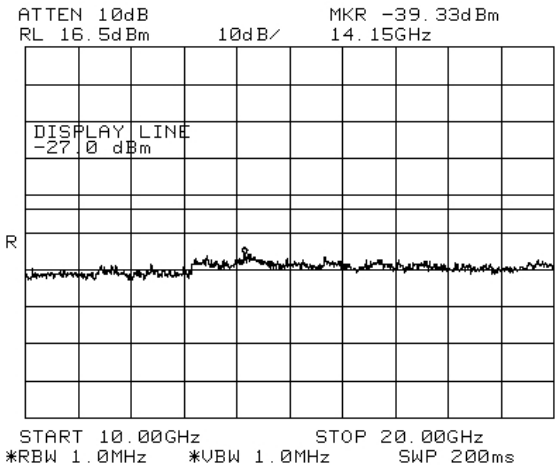


Figure 71 — BPSK 5240 MHz

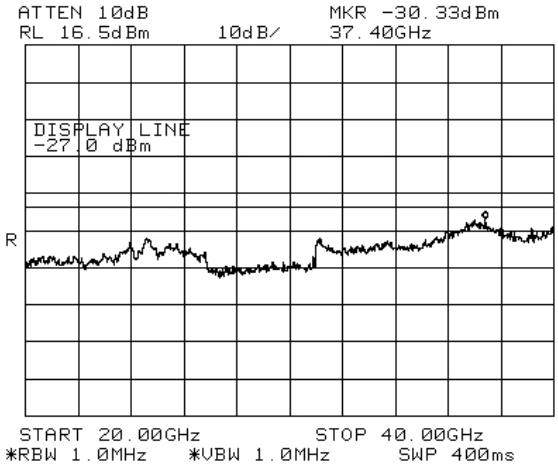


Figure 72 — BPSK 5240 MHz

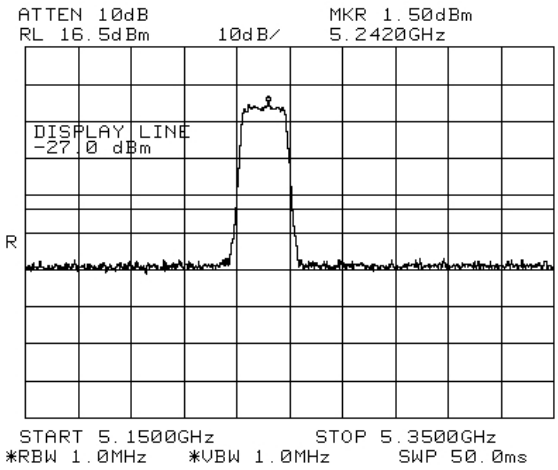


Figure 73 — 64QAM 5240 MHz

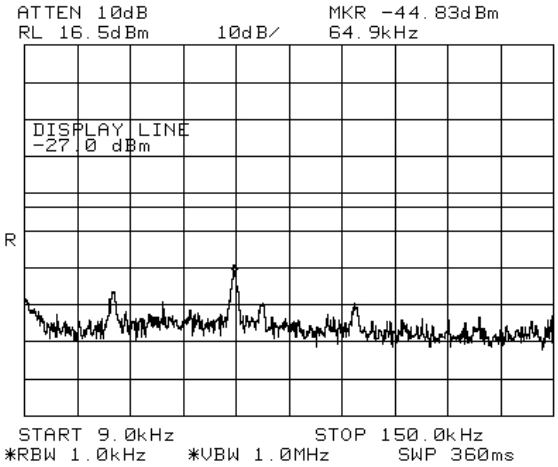


Figure 74 — 64QAM 5240 MHz

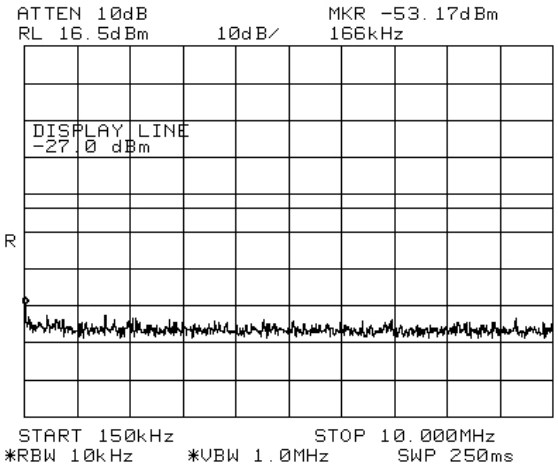


Figure 75 — 64QAM 5240 MHz

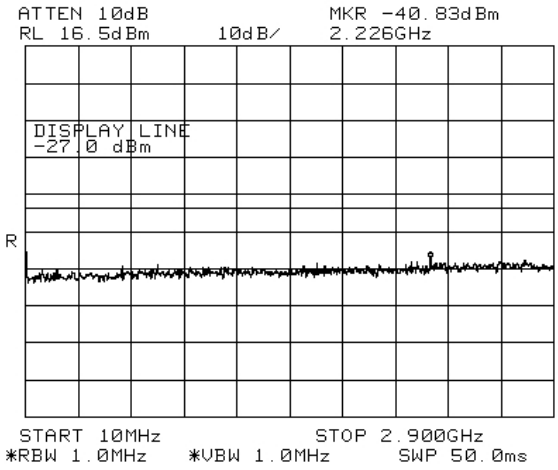


Figure 76 — 64QAM 5240 MHz

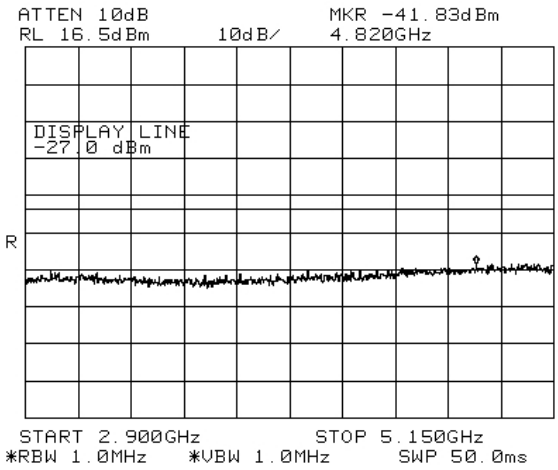


Figure 77 — 64QAM 5240 MHz

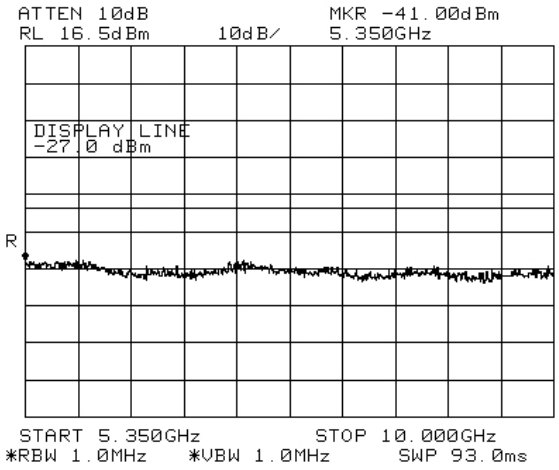


Figure 78 — 64QAM 5240 MHz

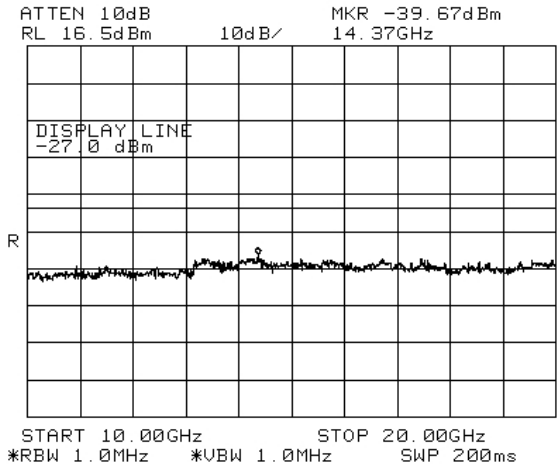


Figure 79 — 64QAM 5240 MHz

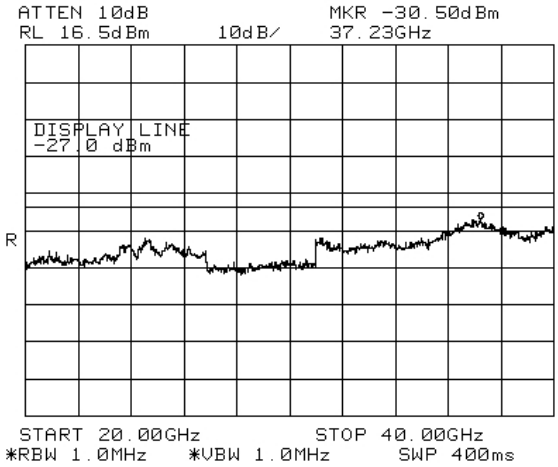


Figure 80 — 64QAM 5240 MHz

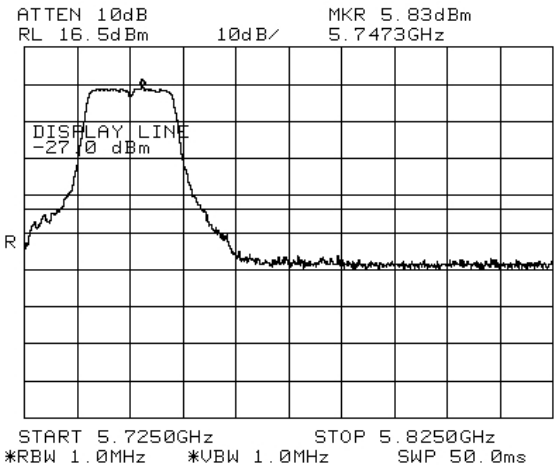


Figure 81 — BPSK 5745 MHz

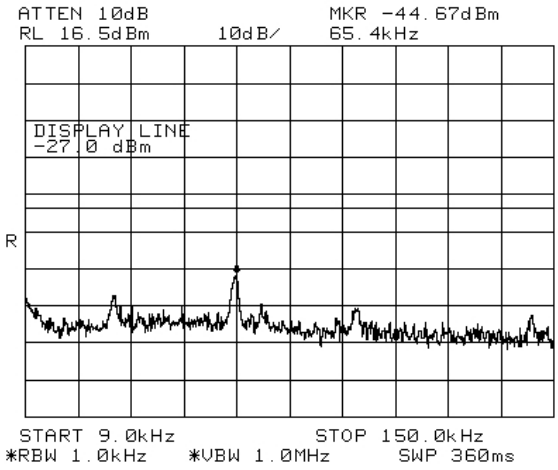


Figure 82 — BPSK 5745 MHz

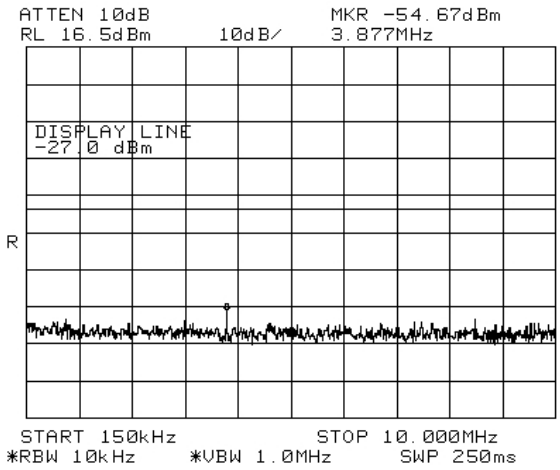


Figure 83 — BPSK 5745 MHz

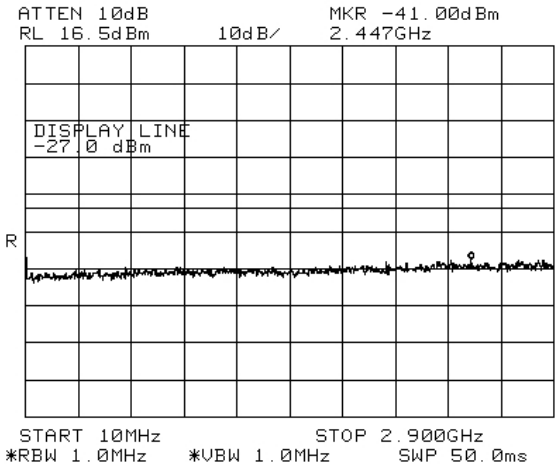


Figure 84 — BPSK 5745 MHz

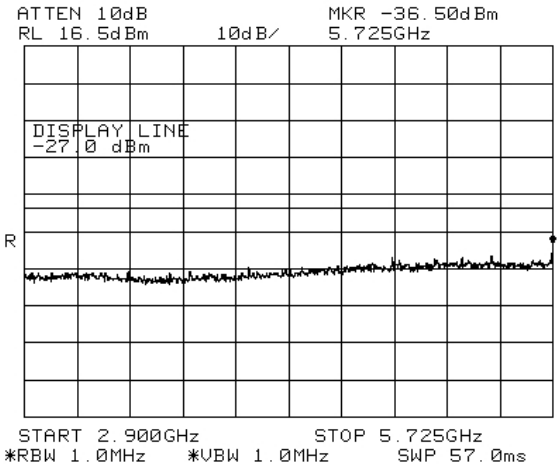


Figure 85 — BPSK 5745 MHz

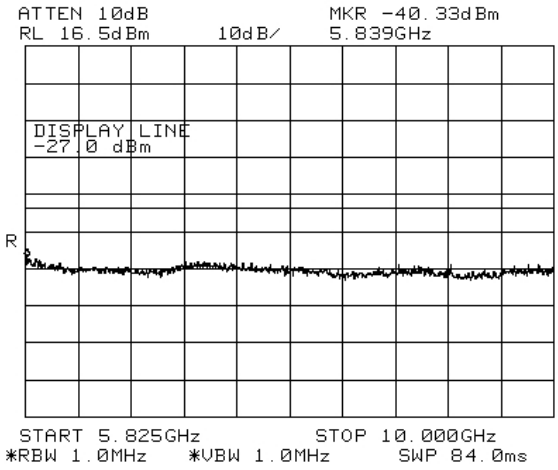


Figure 86 — BPSK 5745 MHz

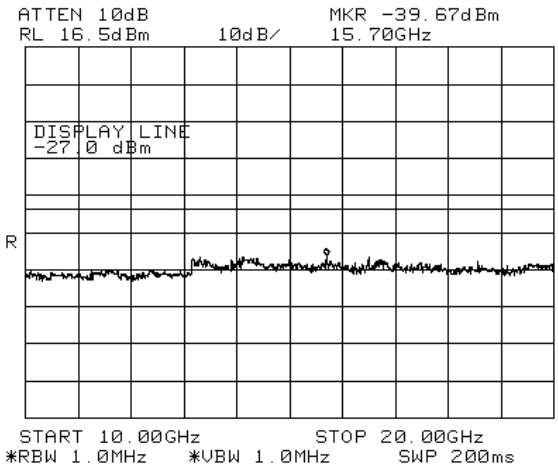


Figure 87 — BPSK 5745 MHz

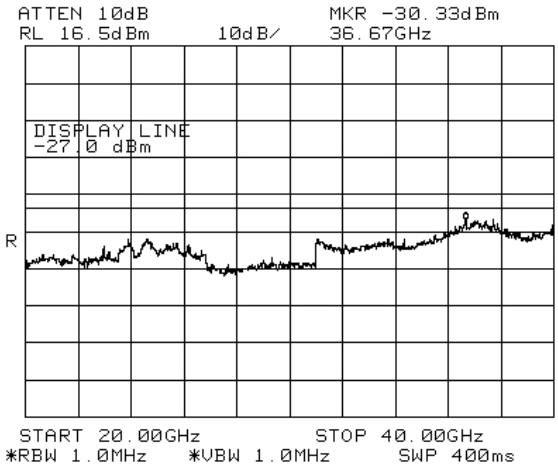


Figure 88 — BPSK 5745 MHz

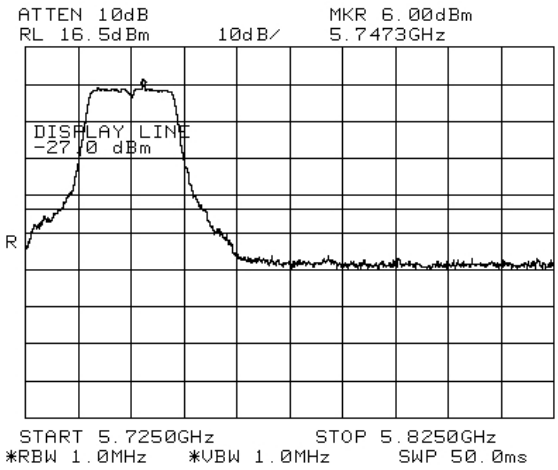


Figure 89 — 64QAM 5745 MHz

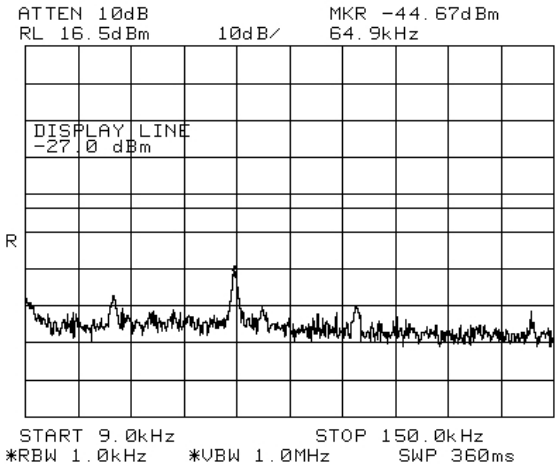


Figure 90 — 64QAM 5745 MHz

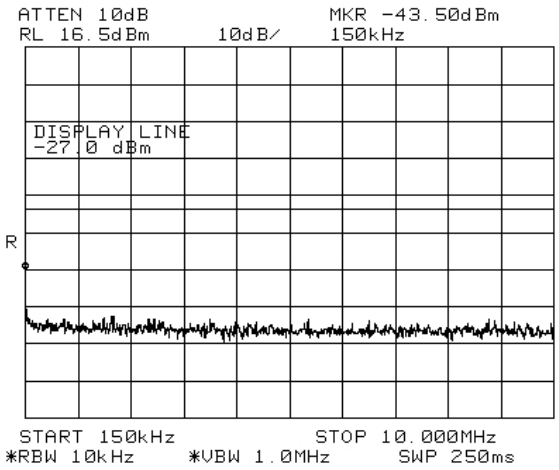


Figure 91 — 64QAM 5745 MHz

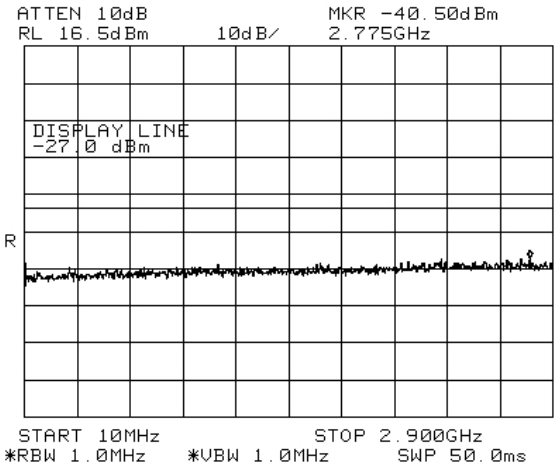


Figure 92 — 64QAM 5745 MHz

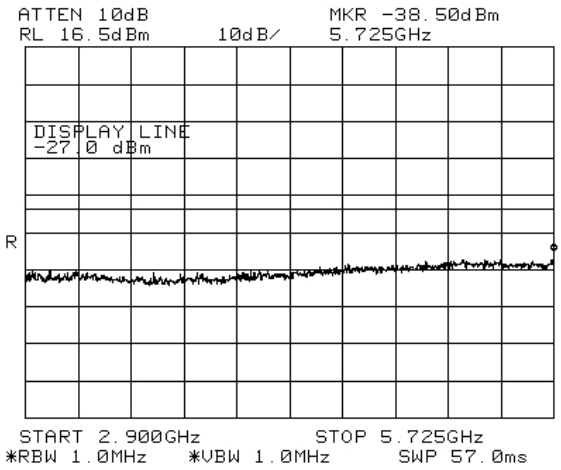


Figure 93 — 64QAM 5745 MHz

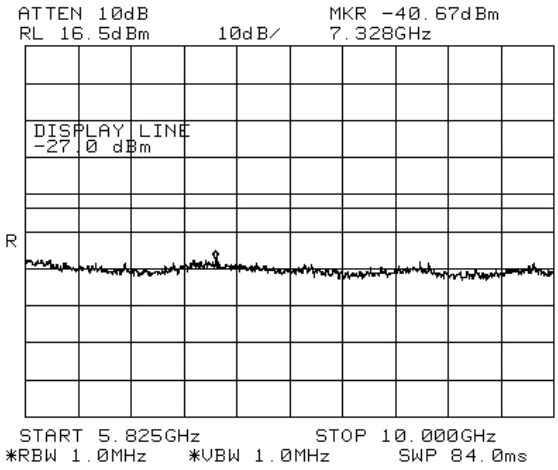


Figure 94 — 64QAM 5745 MHz

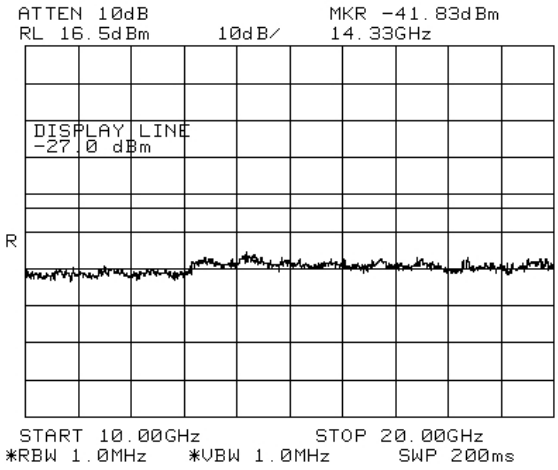


Figure 95 — 64QAM 5745 MHz

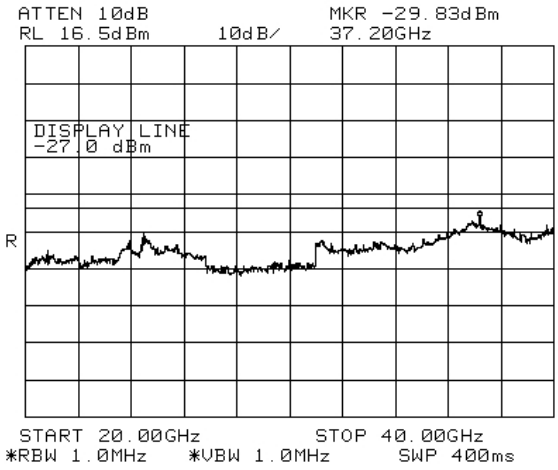


Figure 96 — 64QAM 5745 MHz

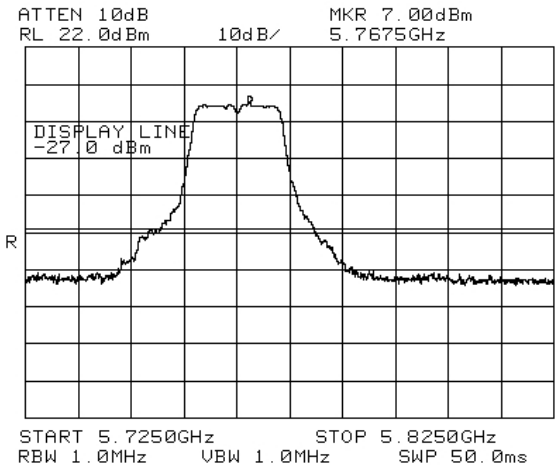


Figure 97 — BPSK 5765 MHz

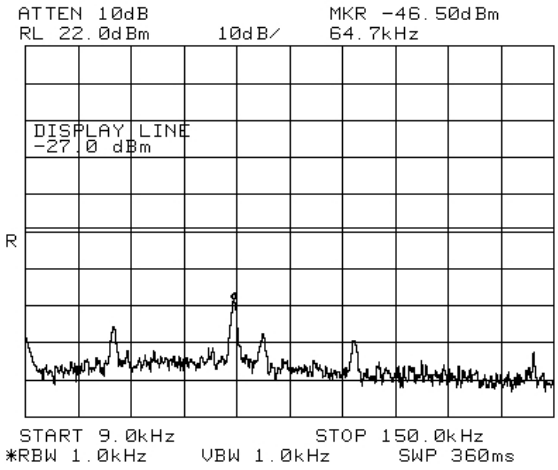


Figure 98 — BPSK 5765 MHz

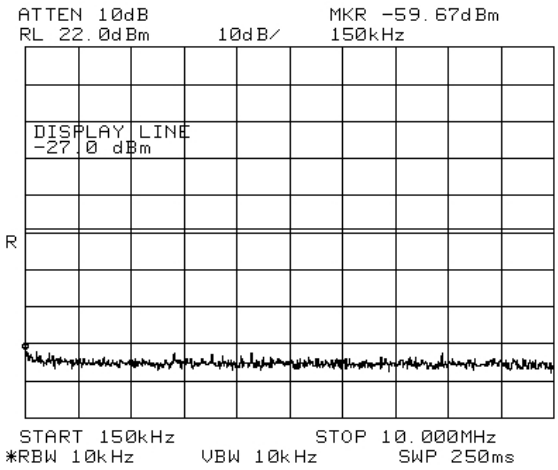


Figure 99 — BPSK 5765 MHz

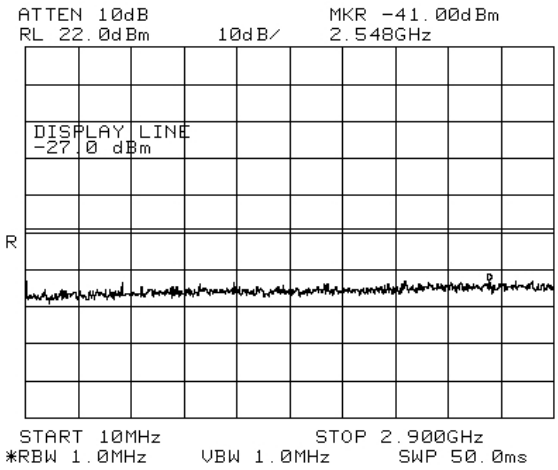


Figure 100 — BPSK 5765 MHz

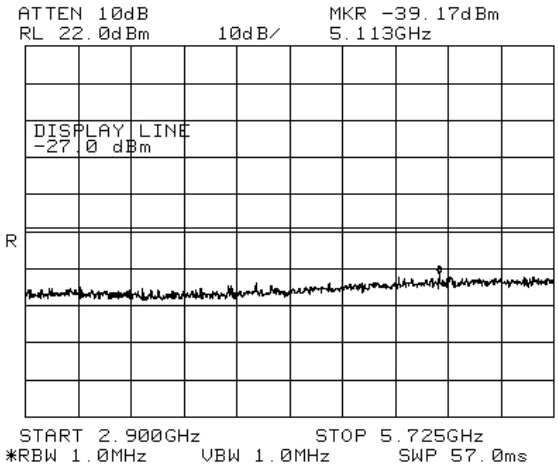


Figure 101 — BPSK 5765 MHz

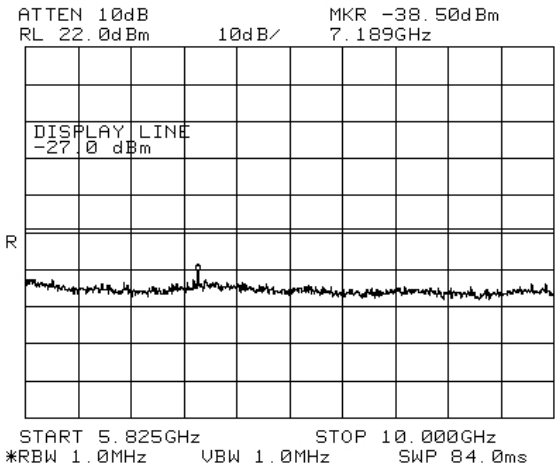


Figure 102 — BPSK 5765 MHz

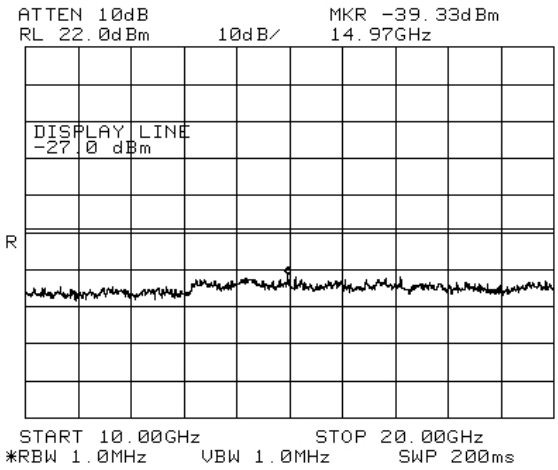


Figure 103 — BPSK 5765 MHz

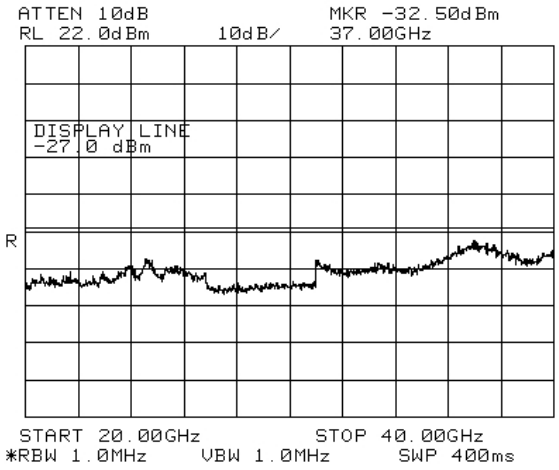


Figure 104 — BPSK 5765 MHz

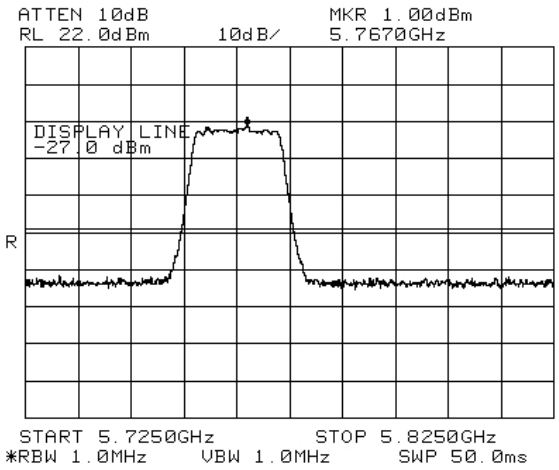


Figure 105 — 64QAM 5765 MHz

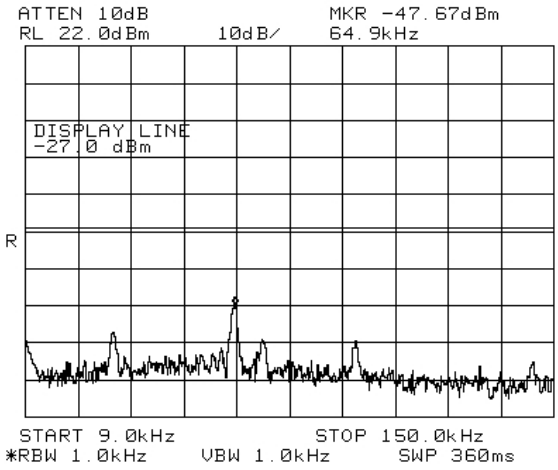


Figure 106 — 64QAM 5765 MHz

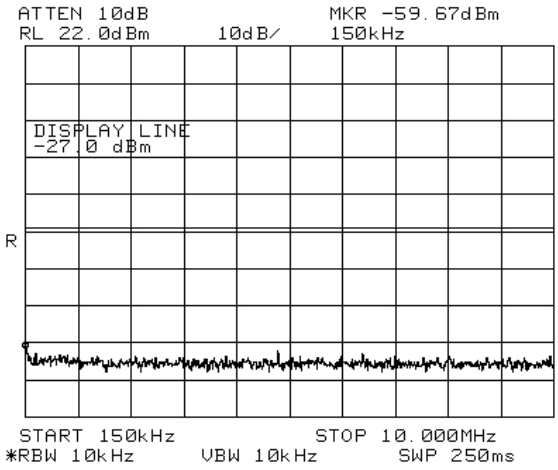


Figure 107 — 64QAM 5765 MHz

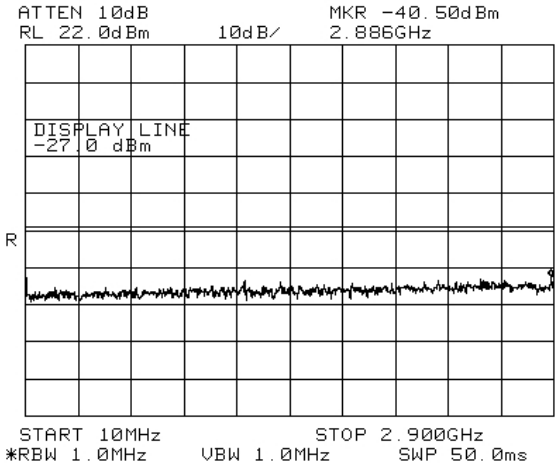


Figure 108 — 64QAM 5765 MHz

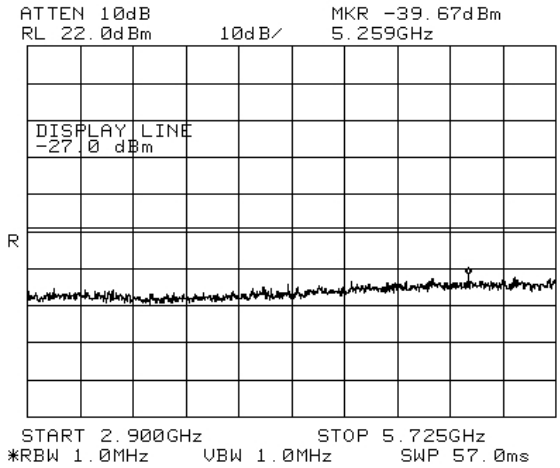


Figure 109 — 64QAM 5765 MHz

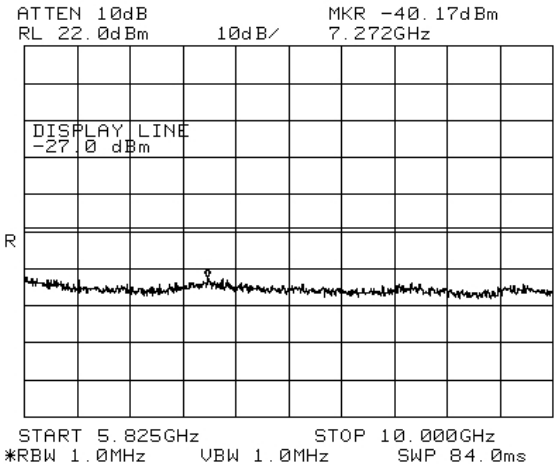


Figure 110 — 64QAM 5765 MHz

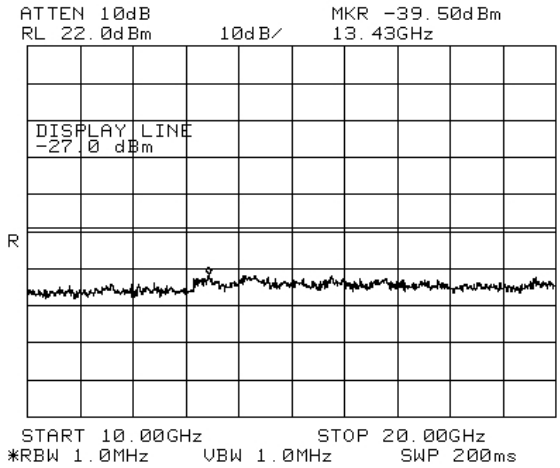


Figure 111 — 64QAM 5765 MHz

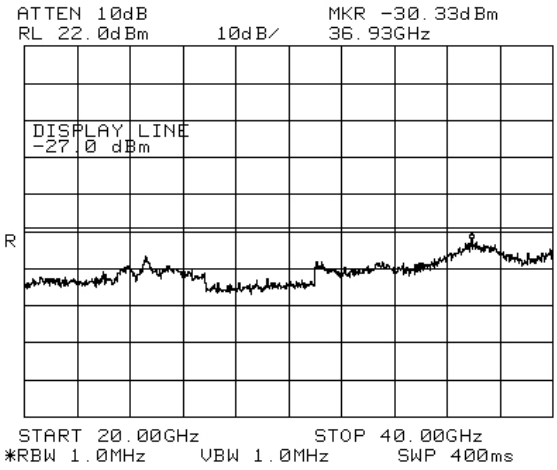


Figure 112 — 64QAM 5765 MHz

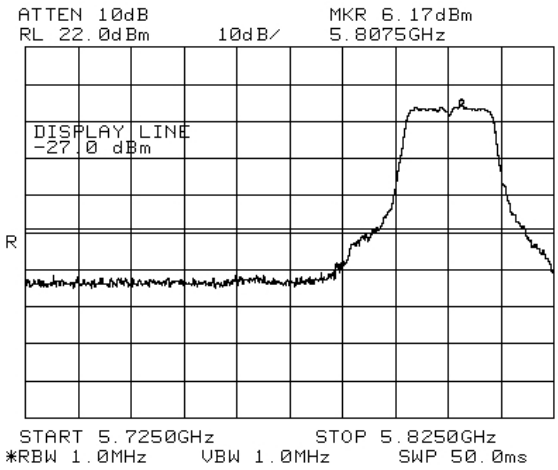


Figure 113 — BPSK 5805 MHz

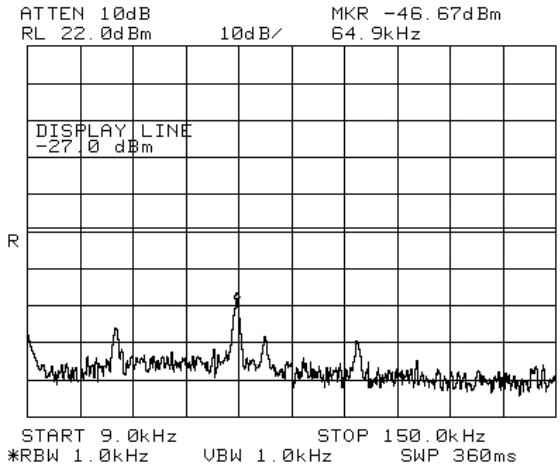


Figure 114 — BPSK 5805 MHz

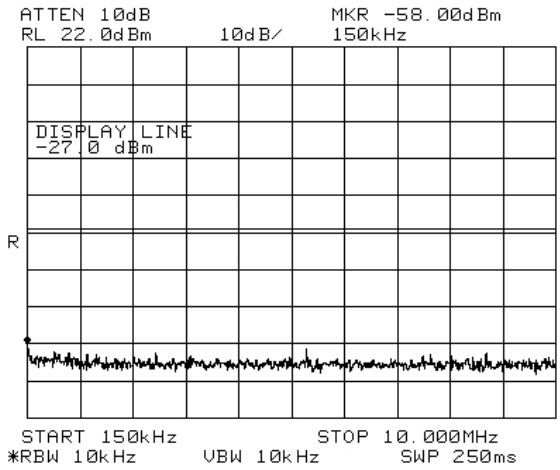


Figure 115 — BPSK 5805 MHz

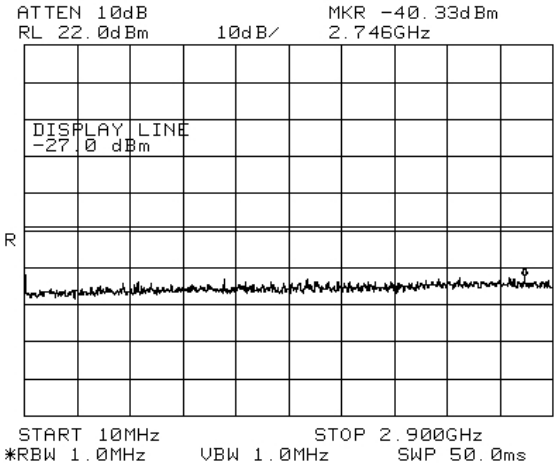


Figure 116 — BPSK 5805 MHz

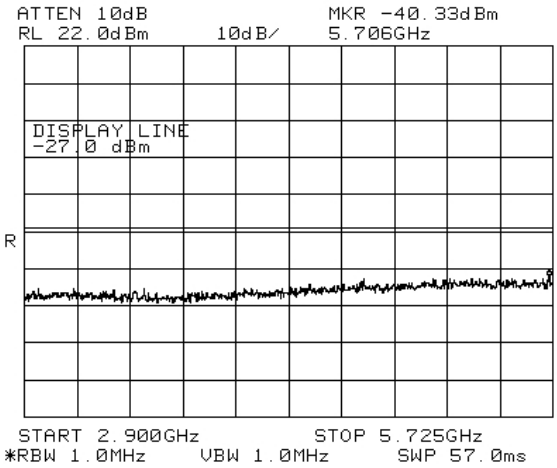


Figure 117 — BPSK 5805 MHz

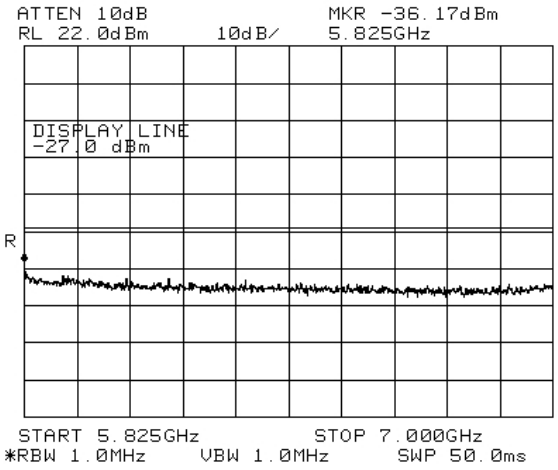


Figure 118 — BPSK 5805 MHz

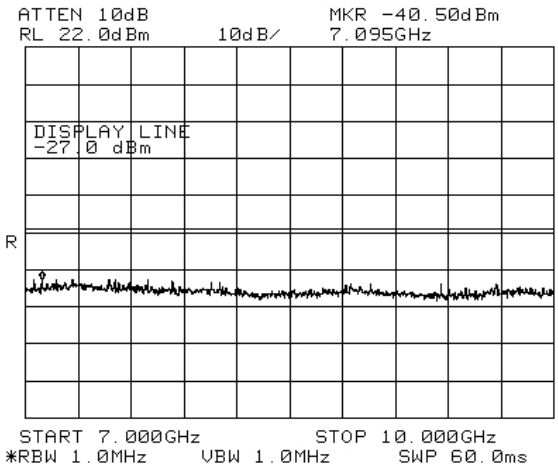


Figure 119 — BPSK 5805 MHz

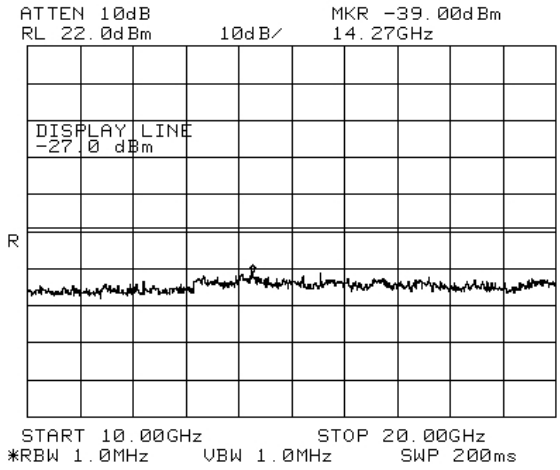


Figure 120 — BPSK 5805 MHz

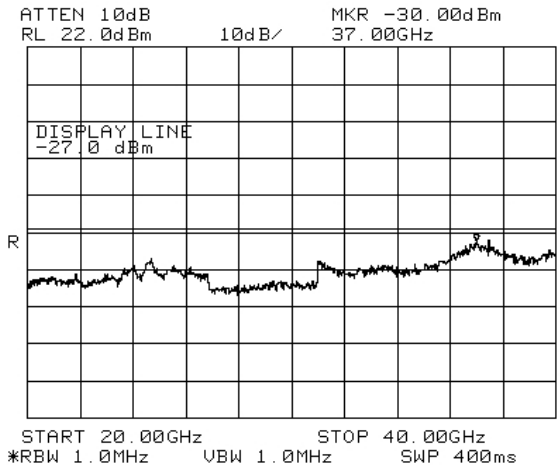


Figure 121 — BPSK 5805 MHz

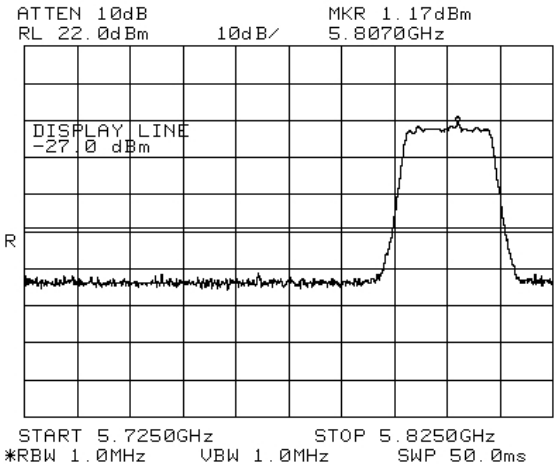


Figure 122 — 64QAM 5805 MHz

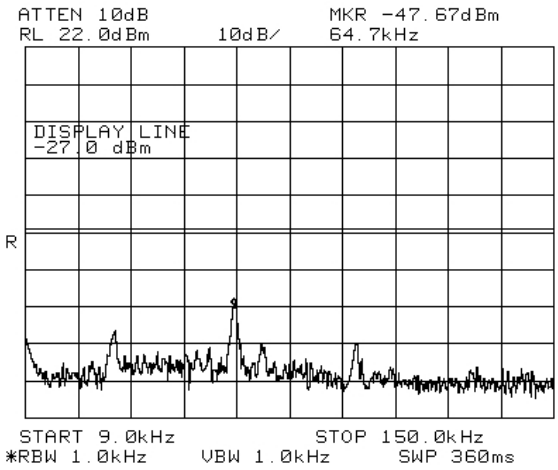


Figure 123 — 64QAM 5805 MHz

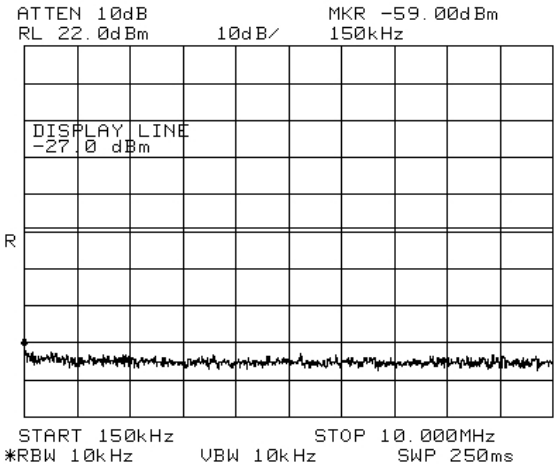


Figure 124 — 64QAM 5805 MHz

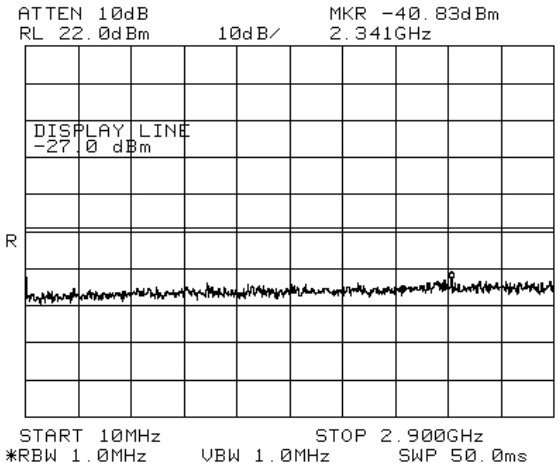


Figure 125 — 64QAM 5805 MHz

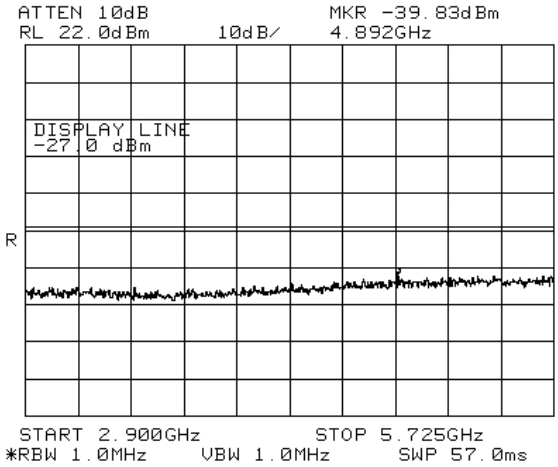


Figure 126 — 64QAM 5805 MHz

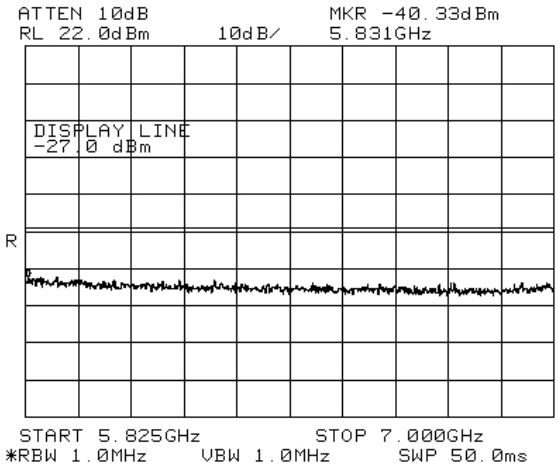


Figure 127 — 64QAM 5805 MHz

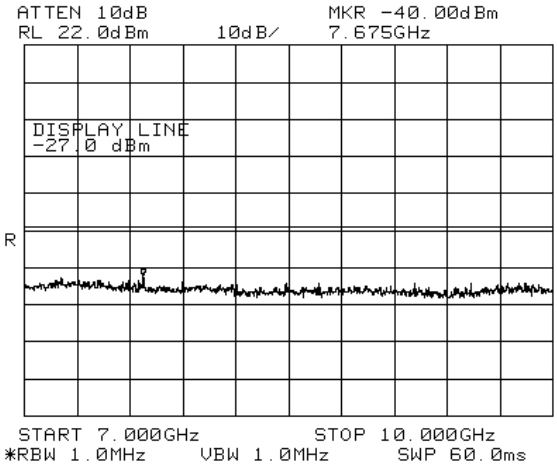


Figure 128 — 64QAM 5805 MHz

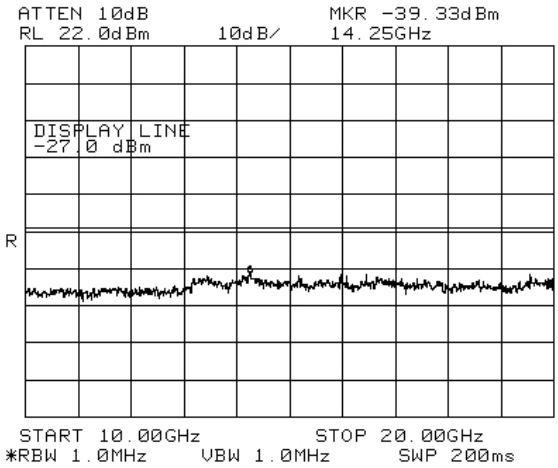


Figure 129 — 64QAM 5805 MHz

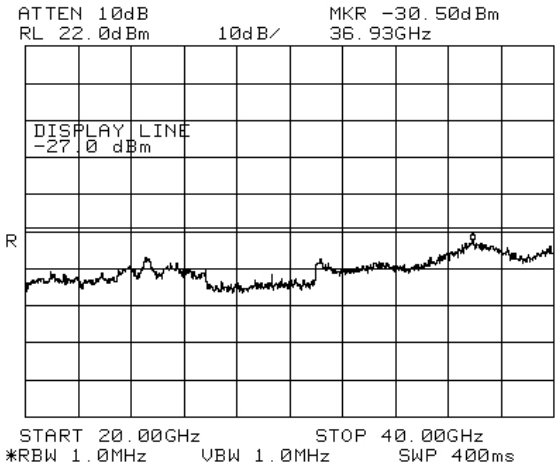


Figure 130 — 64QAM 5805 MHz

7.2 Results table

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

Operation Frequency (MHz)	Modulation	Reading (dBm)	Specification (dBm)	Margin (dB)
5180	BPSK	-30.0	-27.0	-3.0
	64QAM	-30.0	-27.0	-3.0
5200	BPSK	-29.8	-27.0	-2.8
	64QAM	-30.2	-27.0	-3.2
5240	BPSK	-30.3	-27.0	-3.3
	64QAM	-30.5	-27.0	-3.5
5745	BPSK	-30.3	-27.0	-3.3
	64QAM	-29.8	-27.0	-2.8
5765	BPSK	-32.5	-27.0	-5.5
	64QAM	-30.3	-27.0	-3.3
5805	BPSK	-30.0	-27.0	-3.0
	64QAM	-30.5	-27.0	-3.5

Figure 131 Peak Power Output of 5150-5250; 5725-5825 MHz Bands

JUDGEMENT: Passed by 2.8 dB

TEST PERSONNEL:

Tester Signature:  Date: 22.12.08

Typed/Printed Name: A. Sharabi

7.3 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	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 132 Test Equipment Used

8. Band Edge (Conducted)

[In Accordance with section 15.407]

8.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable (cable loss = 2 dB). The spectrum analyzer was set to 1 MHz resolution BW. Maximum power level below 5150 MHz and above 5350 MHz was measured at 5180 MHz and 5240MHz correspondingly. Maximum power level below 5725 MHz and above 5825 MHz was measured at 5745 MHz and 5805 MHz correspondingly.

The E.U.T. was tested at 5180, 5240, 5745, and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

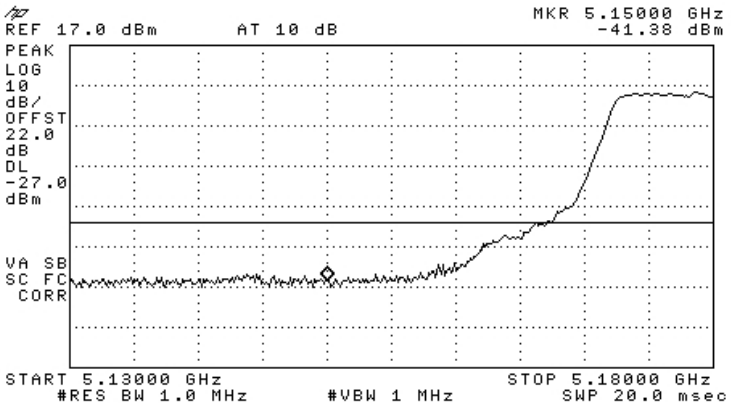


Figure 133 —BPSK 5180 MHz

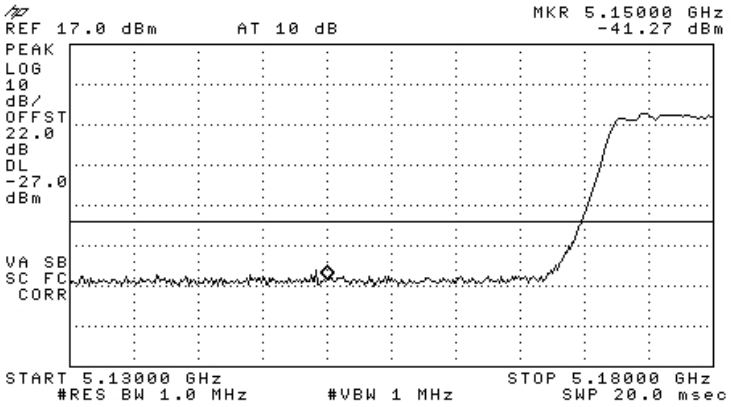


Figure 134 — 64QAM 5180 MHz

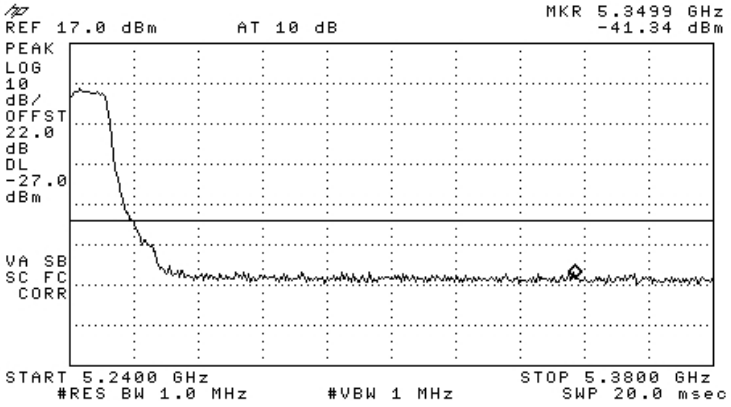


Figure 135 — BPSK 5240 MHz

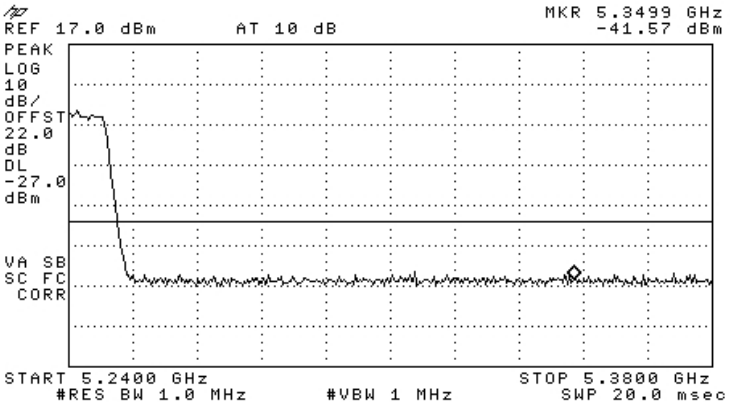


Figure 136 — 64QAM 5240 MHz

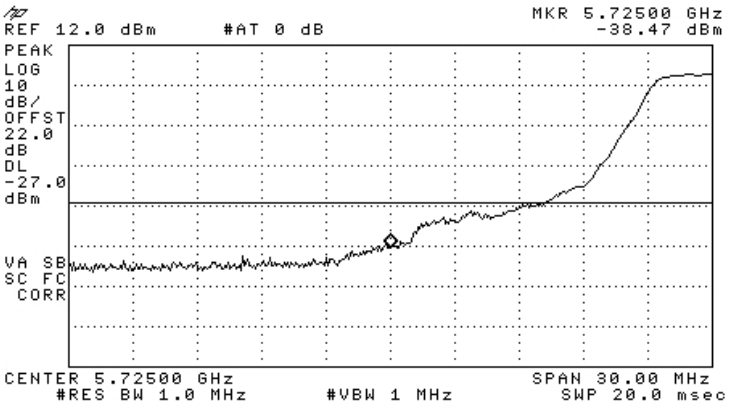


Figure 137 — BPSK 5745 MHz

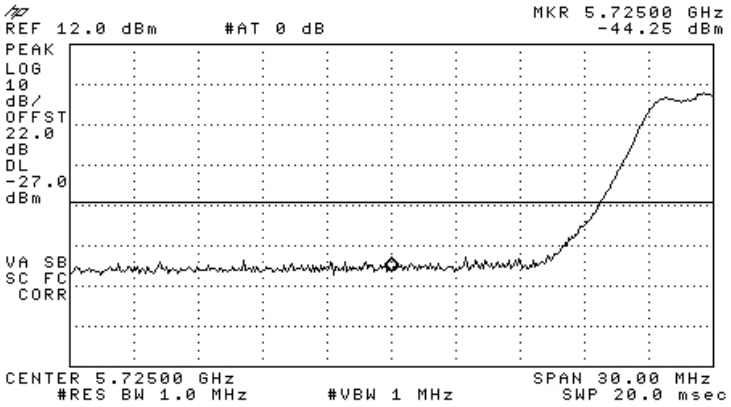


Figure 138 — 64QAM 5745 MHz

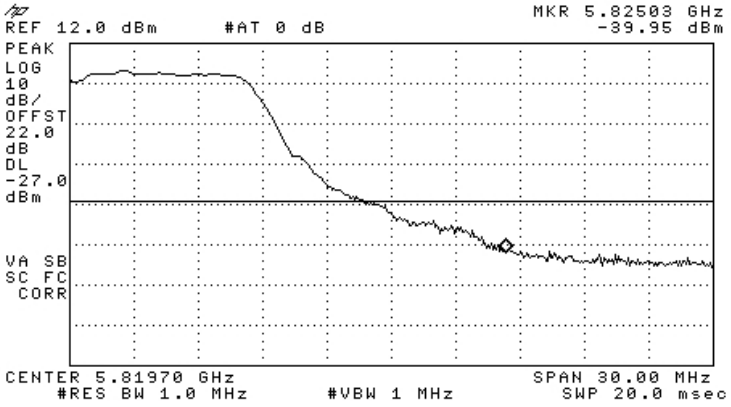


Figure 139 — BPSK 5805 MHz

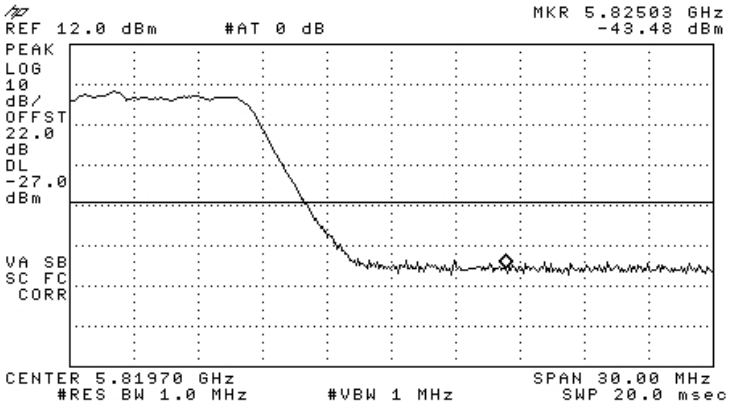


Figure 140 — 64QAM 5805 MHz

8.2 Results table

E.U.T. Description: Exciter
Model No.: EX2000BW
Part Number: 100-2035-0002
Specification: F.C.C. Part 15, Subpart C (15.407)

Operation Frequency	Modulation	Band Edge Frequency	Spectrum Level	Specification	Margin
(MHz)		(MHz)	(dBm)	(dBm)	(dB)
5180	BPSK	5150	-41.4	-27.0	-14.4
	64QAM	5150	-41.3	-27.0	-14.3
5240	BPSK	5350	-41.4	-27.0	-14.4
	64QAM	5350	-41.6	-27.0	-14.6
5745	BPSK	5725	-38.5	-27.0	-11.5
	64QAM	5725	-44.3	-27.0	-17.3
5805	BPSK	5825	-39.9	-27.0	-12.9
	64QAM	5825	-43.5	-27.0	-16.5

Figure 141 Band Edge (Conducted)

JUDGEMENT: Passed by 12.9 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 22.12.08

Typed/Printed Name: A. Sharabi

8.3 Test Equipment Used.

Band Edge (Conducted)

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 142 Test Equipment Used

9. Band Edge (Radiated)

[In Accordance with section 15.247(c)]

9.1 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.

Maximum power level below 5150 MHz and above 5250 MHz was measured relative to power level at 5180 MHz, and 5240 MHz correspondingly and below 5725 MHz and above 5825 MHz was measured relative to power level at 5745 MHz, and 5805 MHz correspondingly.

Special notice was taken for the edges of the following restricted bands: 4150MHz-5150MHz , 5350MHz-5460MHz and 7250MHz-7750MHz

The E.U.T. was tested at 5180, 5240, 5745, and 5805 MHz with maximum output power.

9.2 Test Data

JUDGEMENT: Passed by 13.1 dB

For the operation frequency of 5180 MHz, the margin between the emission level and the specification limit is 13.1 dB in the worst case at the frequency of 5150 MHz, horizontal polarization.

For the operation frequency of 5240 MHz, the margin between the emission level and the specification limit is 14.6 dB in the worst case at the frequency of 5350 MHz, horizontal polarization.

For the operation frequency of 5745 MHz, the margin between the emission level and the specification limit is 15.9 dB in the worst case at the frequency of 5460 MHz, vertical polarization.

For the operation frequency of 5805 MHz, the margin between the emission level and the specification limit is 13.5 dB in the worst case at the frequency of 7250 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 143* to *Figure 144*.

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: Horizontal/Vertical Frequency range: 1.0 GHz to 40.0 GHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 5180; 5240; 5745; 5805 MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
5180	5150	H	52.7	74.0	-21.3
		V	50.0	74.0	-24.0
5240	5350	H	49.2	74.0	-24.8
		V	52.5	74.0	-21.5
5745	5460	H	44.7	74.0	-29.3
		V	50.5	74.0	-23.5
5805	7250	H	51.5	74.0	-22.5
		V	52.1	74.0	-21.9

Figure 143. 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

Band Edge (Radiated)

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 40.0 GHz
Test Distance: 3 meters Detector: Average
Operation Frequency: 5180; 5240; 5745; 5805 MHz

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Average Reading (dBµV/m)	Average Specification (dB µV/m)	Average Margin (dB)
5180	5150	H	40.9	54.0	-13.1
		V	38.8	54.0	-15.2
5240	5350	H	39.4	54.0	-14.6
		V	39.3	54.0	-14.7
5745	5460	H	34.2	54.0	-19.8
		V	38.1	54.0	-15.9
5805	7250	H	38.7	54.0	-15.3
		V	40.5	54.0	-13.5

Figure 144. 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

9.3 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 145 Test Equipment Used

10. Radiated Emission, 9 kHz – 30 MHz

10.1 Test Specification

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

10.2 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 5180, 5200, 5240, 5745, 5765, and 5805 MHz with the following modulations: BPSK (6Mbit/sec) and 64QAM (54Mbit/sec).

10.3 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: 22.12.08

Typed/Printed Name: A. Sharabi

10.4 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

10.5 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 [dBμv/m]
RA: Receiver Amplitude [dBμv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

11. Spurious Radiated Emission 30 – 1000 MHz

11.1 Test Specification

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

11.2 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 at5180, 5200, 5240, 5745, 5765, and 5805 MHz with the following modulations: BPSK (6Mbit/sec) and 64QAM (54Mbit/sec).

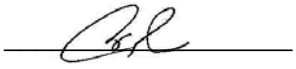
11.3 Test Data

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

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
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

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:

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

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

No external pre-amplifiers are used.

12. Spurious Radiated Emission Above 1 GHz

12.1 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 2.9-40.0 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 5180, 5200, 5240, 5745, 5765, and 5805 MHz with the following modulations: BPSK (6Mbit/sec) and 64QAM (54Mbit/sec).

12.2 Test Data

JUDGEMENT: Passed by 3.5 dB

For the operation frequency of 5180 MHz, the margin between the emission level and the specification limit is 9.0 dB in the worst case at the frequency of 10.358 GHz, vertical polarization.

For the operation frequency of 5200 MHz, the margin between the emission level and the specification limit is 6.8 dB in the worst case at the frequency of 10.400 GHz, horizontal polarization.

For the operation frequency of 5240 MHz, the margin between the emission level and the specification limit is 8.7 dB in the worst case at the frequency of 10.480 GHz, horizontal polarization.

For the operation frequency of 5745 MHz, the margin between the emission level and the specification limit is 7.1 dB in the worst case at the frequency of 11.490 GHz, vertical polarization.

For the operation frequency of 5765 MHz, the margin between the emission level and the specification limit is 3.5 dB in the worst case at the frequency of 11.530 GHz, horizontal polarization.

For the operation frequency of 5805 MHz, the margin between the emission level and the specification limit is 6.8 dB in the worst case at the frequency of 11.604 GHz, vertical 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 146* to *Figure 147*.

TEST PERSONNEL:

Tester Signature: _____ Date: 22.12.08

Typed/Printed Name: A. Sharabi

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 40.0 GHz
Test Distance: 3 meters
Detector: Peak

Operation Frequency (MHz)	Freq. (GHz)	Polarity (H/V)	Peak Reading (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
5180	10.358	H	58.00	74.0	-16.00
		V	55.90	74.0	-18.10
5200	10.400	H	59.13	74.0	-14.87
		V	59.08	74.0	-14.92
5240	10.480	H	58.86	74.0	-15.14
		V	57.86	74.0	-16.40
5745	11.490	H	59.00	74.0	-15.00
		V	59.58	74.0	-14.42
5765	11.530	H	63.67	74.0	-10.33
		V	62.89	74.0	-11.11
5805	11.604	H	63.09	74.0	-10.91
		V	59.88	74.0	-14.12

Figure 146. 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 40.0 GHz
Test Distance: 3 meters
Detector: Average

Operation Frequency (MHz)	Freq. (GHz)	Polarity (H/V)	Average Reading (dBµV/m)	Average Specification (dB µV/m)	Average Margin (dB)
5180	10.358	H	44.97	54.0	-9.03
		V	45.00	54.0	-9.00
5200	10.400	H	47.20	54.0	-6.80
		V	47.18	54.0	-6.82
5240	10.480	H	45.34	54.0	-8.68
		V	45.29	54.0	-8.71
5745	11.490	H	46.66	54.0	-7.34
		V	46.93	54.0	-7.07
5765	11.530	H	50.53	54.0	-3.47
		V	50.42	54.0	-3.58
5805	11.604	H	46.99	54.0	-7.01
		V	47.25	54.0	-6.75

Figure 147. 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

12.3 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	1Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2008	1Year
Antenna Biconical	ARA	BCD 235/B	1041	March 23, 2008	1Year
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	JPKGC19982	N/A	N/A

13. Transmitted Power Density

[In accordance with section 15.247(d)]

13.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20dB) and an appropriate coaxial cable (cable loss = 2dB). The spectrum analyzer was set to 1 MHz resolution BW. and 1 MHz video BW. The spectrum peaks were located at at 5180, 5200, 5240, 5745, 5765 and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

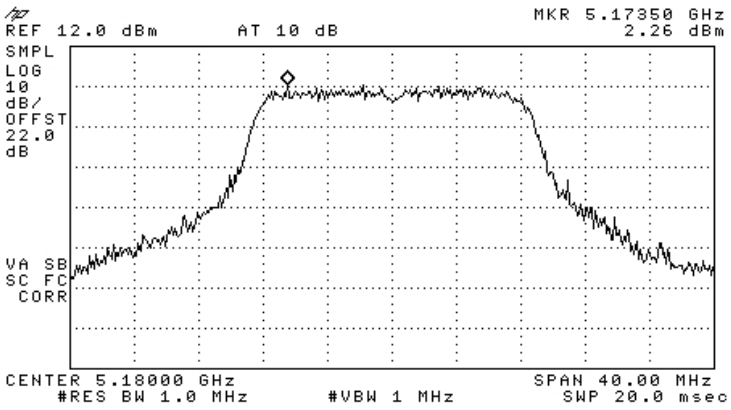


Figure 148 — BPSK 5180 MHz

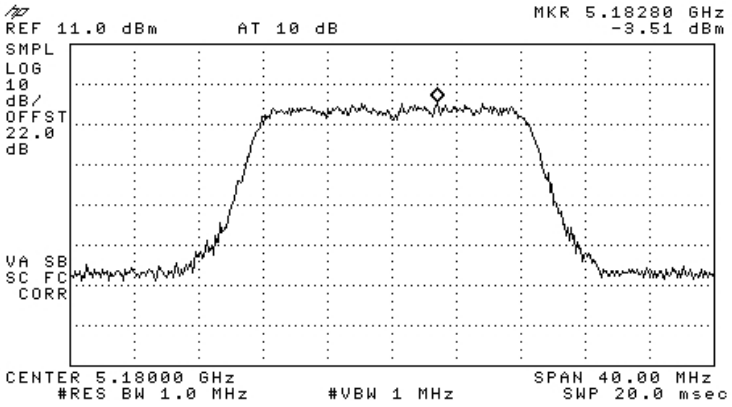


Figure 149 — 64QAM 5180 MHz

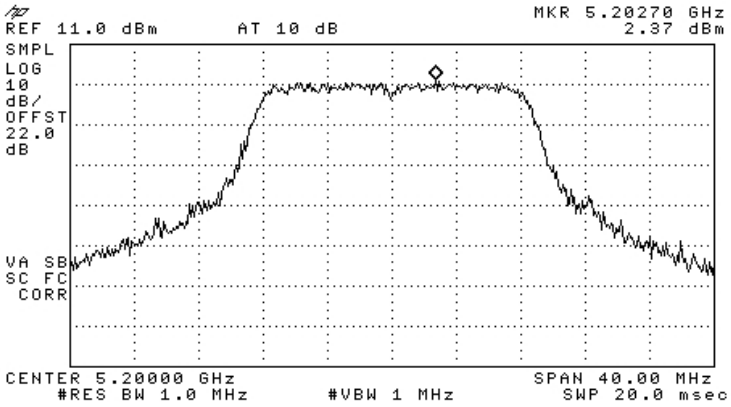


Figure 150 — BPSK 5200 MHz

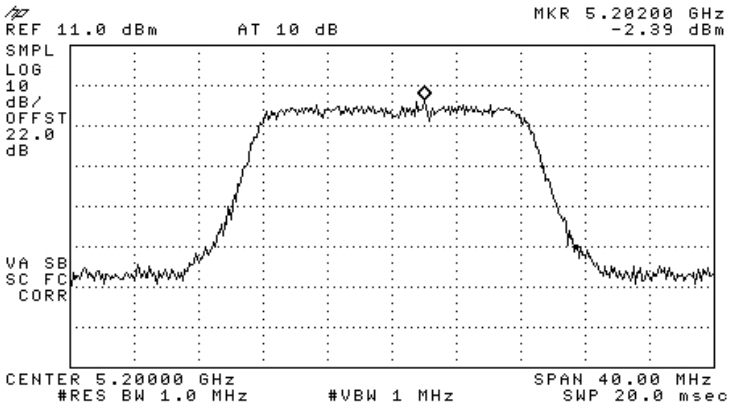


Figure 151 — 64QAM 5200 MHz

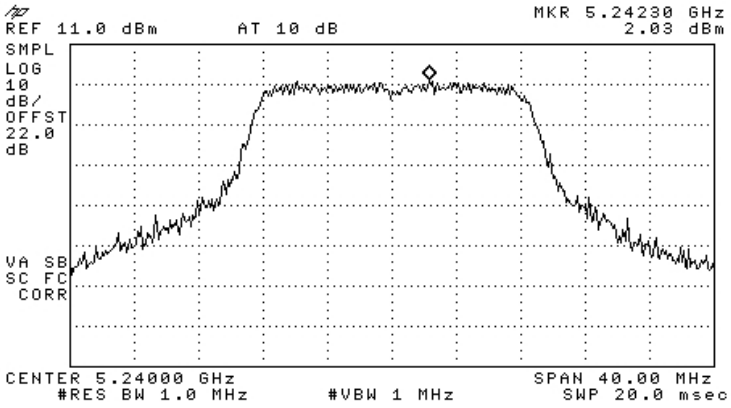


Figure 152 — BPAK 5240 MHz

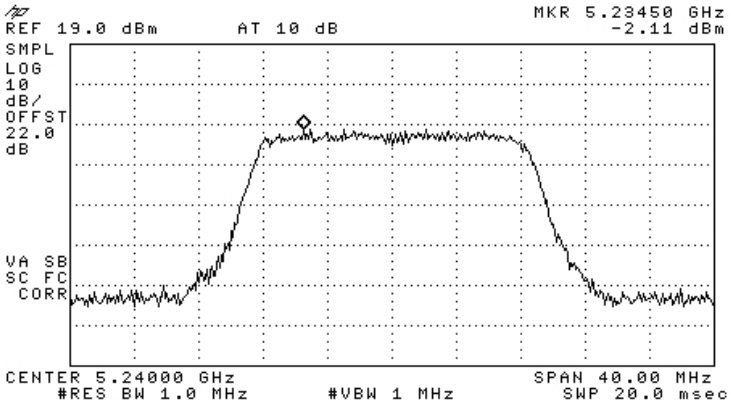


Figure 153 — 64QAM 5240 MHz

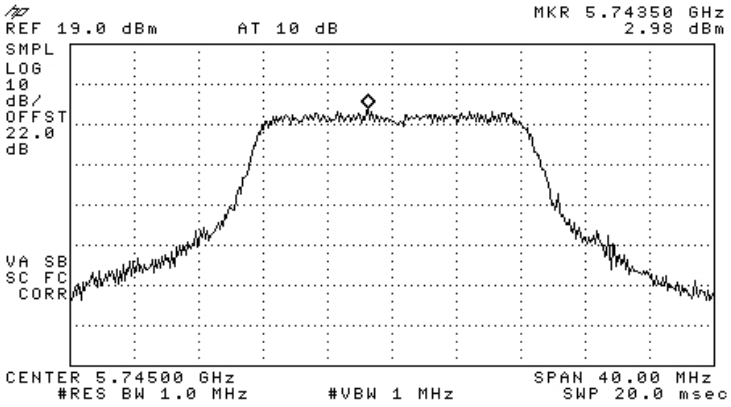


Figure 154 — BPSK 5745 MHz

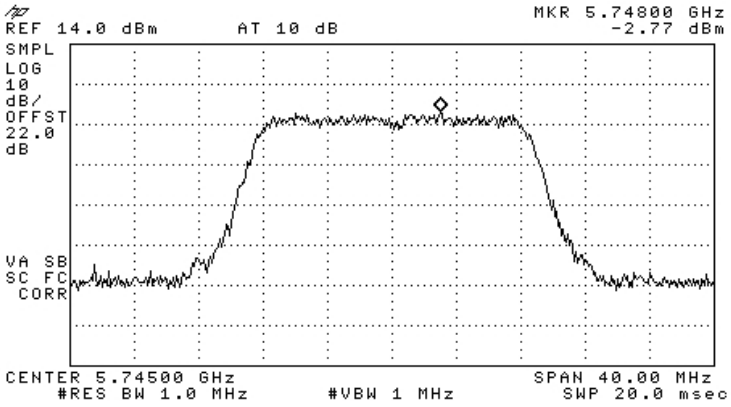


Figure 155 — 654QAM 5745 MHz

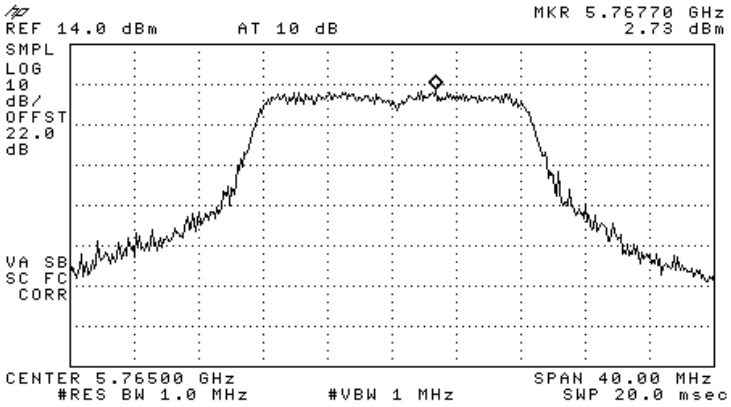


Figure 156 — BPSK 5765 MHz

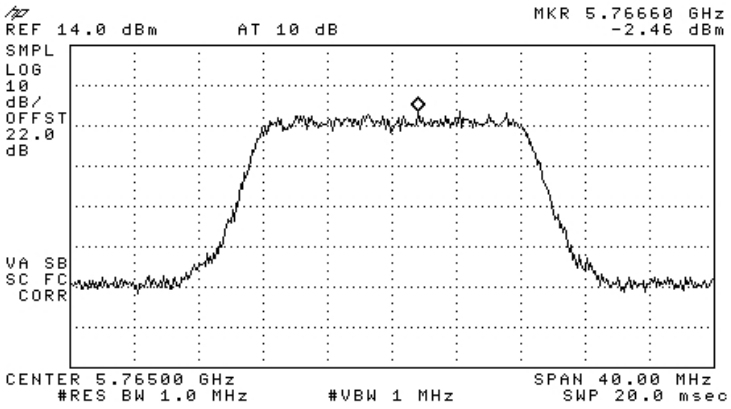


Figure 157 — 64QAM 5765 MHz

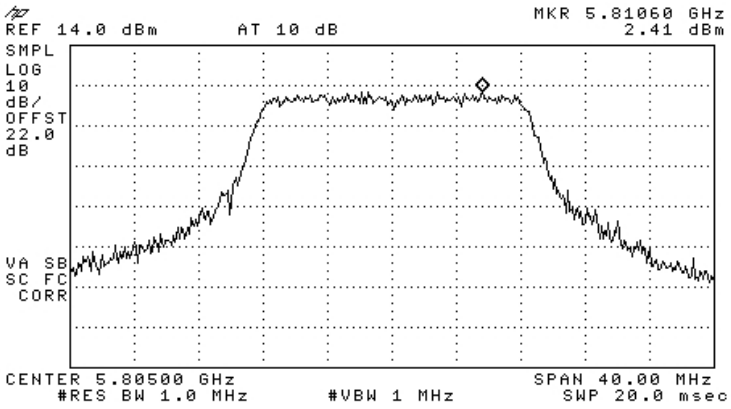


Figure 158 — BPSK 5805 MHz

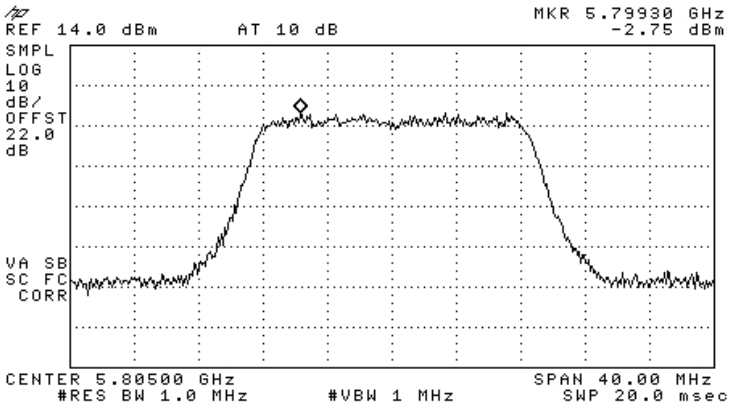


Figure 159 — 64QAM 58045 MHz

13.2 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)
5180	BPSK	2.26	4.0	-1.7
	64QAM	-3.51	4.0	-7.5
5200	BPSK	2.37	4.0	-1.6
	64QAM	-2.39	4.0	-6.4
5240	BPSK	2.03	4.0	-2.0
	64QAM	-2.11	4.0	-6.1
5745	BPSK	2.98	17.0	-14.0
	64QAM	-2.77	17.0	-19.8
5765	BPSK	2.73	17.0	-14.3
	64QAM	-2.46	17.0	-19.5
5805	BPSK	2.41	17.0	-14.6
	64QAM	-2.75	17.0	-19.8

Figure 160 Test Results

JUDGEMENT: Passed by 1.6 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 22.12.08

Typed/Printed Name: A. Sharabi

13.3 Test Equipment Used.

Transmitted Power Density

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 161 Test Equipment Used

14. Ratio of Peak Excursion of Modulation Envelope to Maximum Conducted Output Power

[In accordance with section 15.407(a)(6)]

14.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20dB) and an appropriate coaxial cable (cable loss = 2dB). The spectrum analyzer was set to 1 MHz resolution BW. and 1 MHz video BW.

Trace A: Sample Detector

Trace B: Peak Detector

The E.U.T. was tested at 5180, 5200, 5240, 5745, 5765 and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

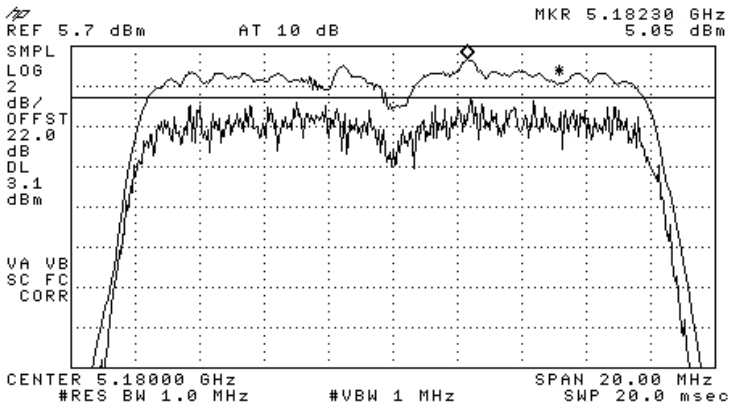


Figure 162 —5180 MHz BPSK

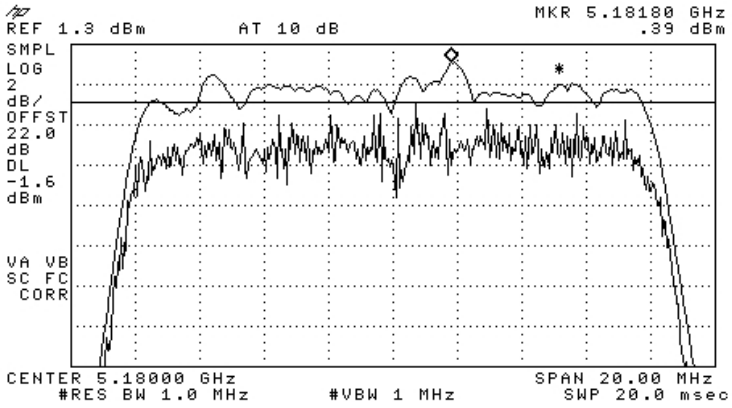


Figure 163 —5180 MHz 64QAM

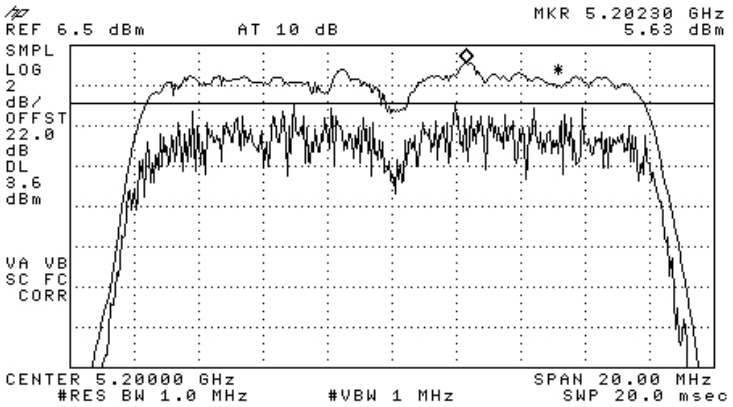


Figure 164 —5200 MHz BPSK

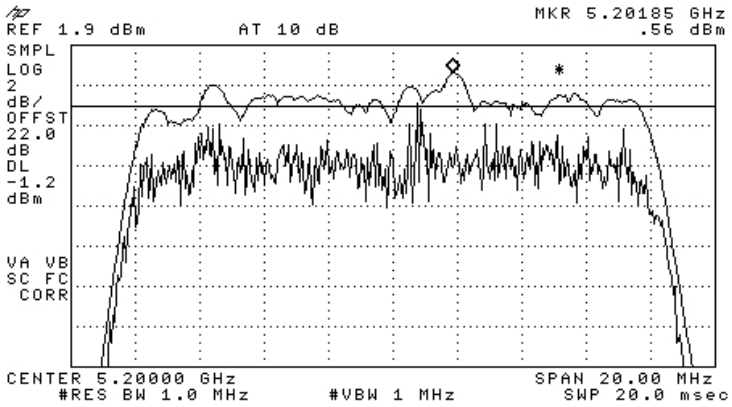


Figure 165 —5200 MHz 64QAM

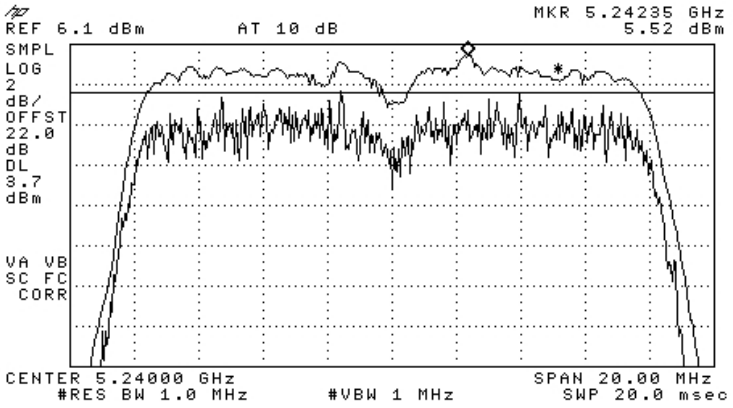


Figure 166 —5240 MHz BPSK

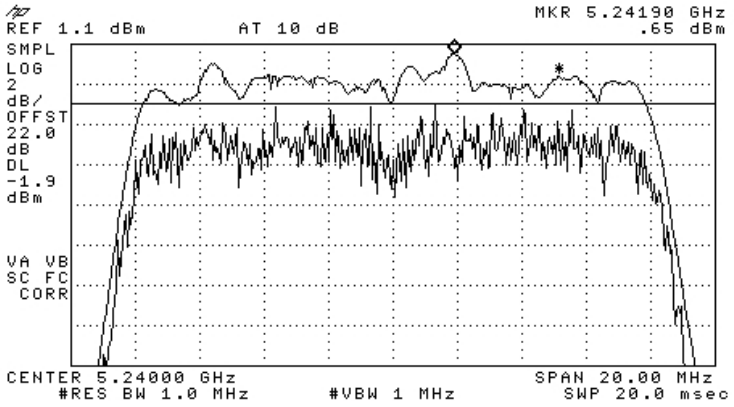


Figure 167 —5240 MHz 64QAM

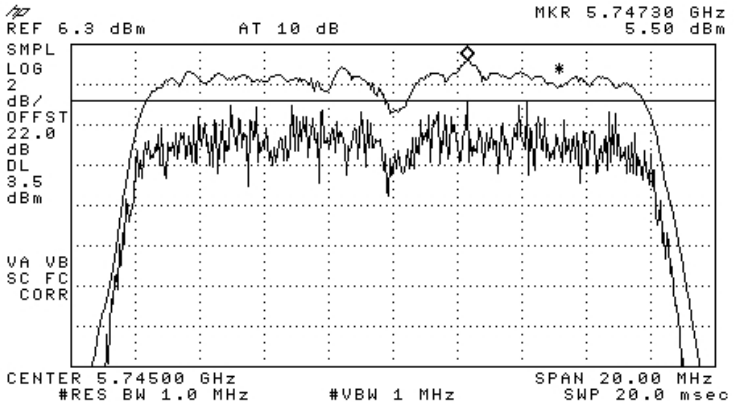


Figure 168 —5745 MHz BPSK

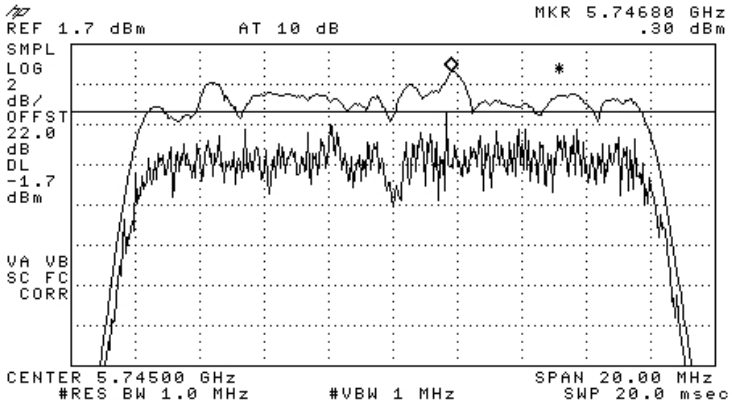


Figure 169 —5745 MHz 64QAM

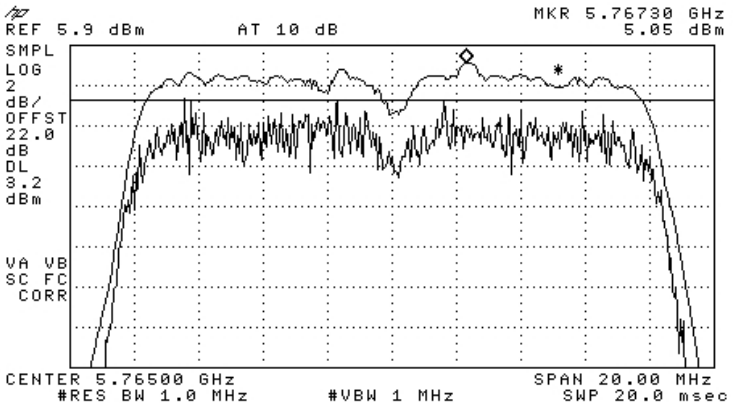


Figure 170 —5765 MHz BPSK

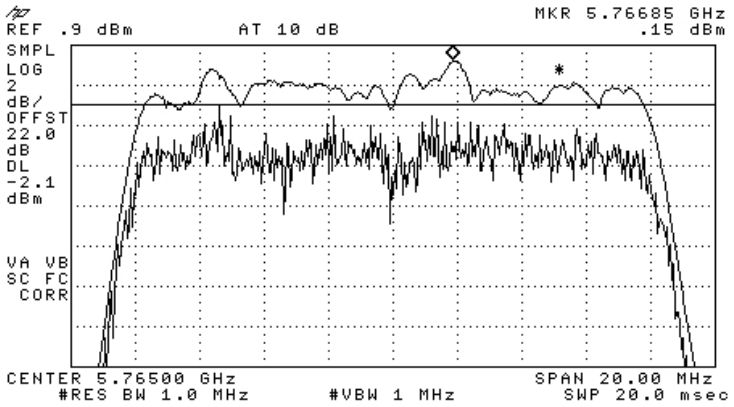


Figure 171 —5765 MHz 64QAM

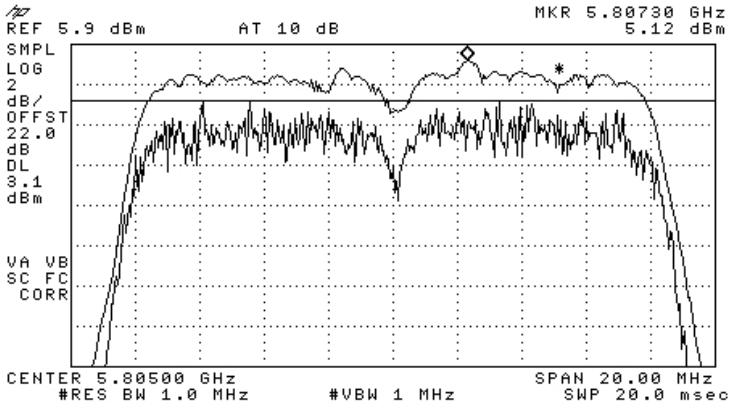


Figure 172 —5805 MHz BPSK

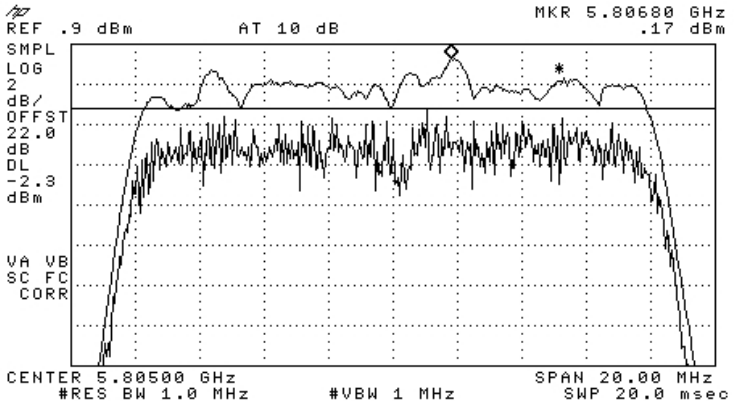


Figure 173 —5805 MHz 64QAM

14.2 Results table

E.U.T. Description: Exciter
Model No.: EX2000BW
Part Number: 100-2035-0002
Specification: F.C.C. Part 15, Subpart E (15.407(a)(6))

Operation Frequency (MHz)	Modulation	Delta (dB)	Specification (dB)	Margin (dB)
5180	BPSK	1.95	13.0	-11.05
	64QAM	1.99	13.0	-11.01
5200	BPSK	2.03	13.0	-10.97
	64QAM	1.76	13.0	-11.24
5240	BPSK	1.82	13.0	-11.18
	64QAM	2.55	13.0	-10.45
5745	BPSK	2.00	13.0	-11.00
	64QAM	2.00	13.0	-11.00
5765	BPSK	1.85	13.0	-11.15
	64QAM	2.25	13.0	-10.75
5805	BPSK	2.02	13.0	-10.98
	64QAM	2.47	13.0	-10.53

Figure 174 Test Results

JUDGEMENT: Passed by 10.45 dB

TEST PERSONNEL:

Tester Signature:  Date: 22.12.08

Typed/Printed Name: A. Sharabi

14.3 Test Equipment Used.

Ratio of Peak Excursion of Modulation Envelope to Maximum Conducted Output Power

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 175 Test Equipment Used

15. Intermodulation (5GHz, 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:

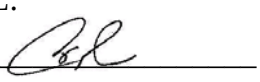
LF Transmitter: 125KHz

WiFi Transmitter: 5200.00 MHz and 5765.00MHz

15.3 Test Data

JUDGEMENT: No 3rd Order Products were detected.

TEST PERSONNEL:

Tester Signature:  Date: 22.12.08

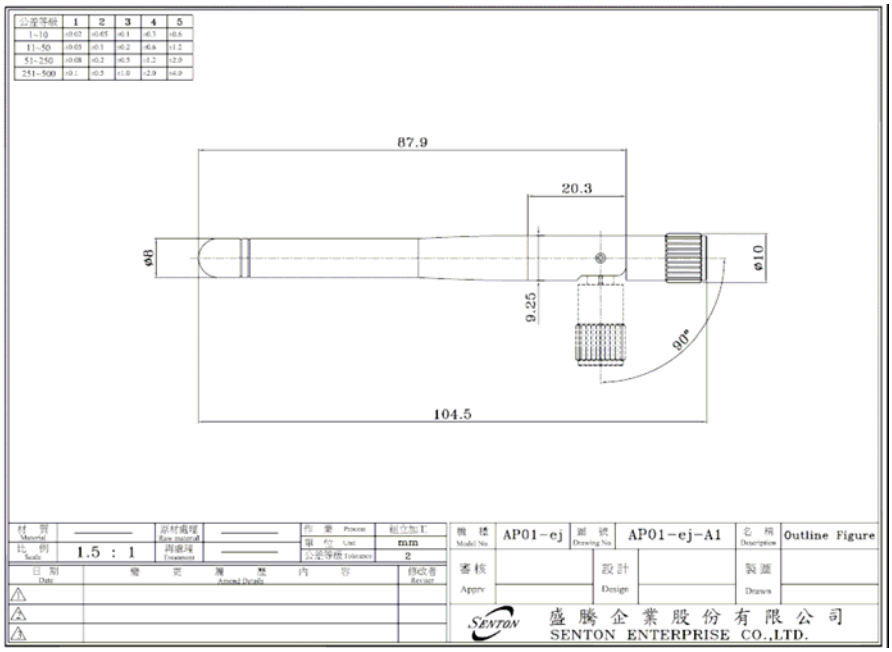
Typed/Printed Name: A. Sharabi

15.4 Test Instrumentation Used, Intermodulation Measurements

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2007	1Year
Antenna Biconical	ARA	BCD 235/B	1041	March 23, 2008	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2007	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	JPKGC19982	N/A	N/A

16. Antenna Gain/Information

The antenna gain is < 0dBi.



■ELECTRICAL SPECIFICATION

1. ANTENNA TYPE	: Dipole Antenna (Swivel Type)	6. ADMITTED POWER RADIATION	: 3W
2. FREQENCY RANGE	: 2.4GHz / 5.8GHz	7. TYPE OF RADIATION	: Omni
3. IMPENDANCE	: 50 Ohms	8. POLARIZATION	: Vertical
4. GAIN	: 2.4GHz < 2.0 dBi	9. ELECTRICAL LENGTH	: 1/4λ Dipole
	: 5.8GHz < 0 dBi		
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 41.68 mw (Peak) = 16.2 dBm

G_T- Antenna Gain, 1 dB

R- Distance from Transmitter using 0.2 m worst case

(c) The peak power density is :

$$S_p = \frac{41.68 \times 1}{4\pi (20)^2} = 82.9 \times 10^{-}3 \frac{mW}{cm^2}$$

(d) This is more than 3 orders 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)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
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

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

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 38M3O.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)	AFE (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