Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94086-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report In Accordance With Industry Canada Radio Standards Specification 133 & FCC Part 24 Subpart E on the PCS Amplifier Model: DPA4040E

APPLICANT:	REMEC 350 West Java Drive Sunnyvale, CA 94089
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	June 03, 2003
FINAL TEST DATE:	May 30, 2003
AUTHORIZED SIGNATORY:	Sr. EMC Engineer

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FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

2.1033(c)(1) Applicant: REMEC
350 West Java Drive
Sunnyvale, CA 94089

2.1033(c)(2) & RSP-100 (4) FCC ID: **I20DPA4040E**

2.1033(c)(3) & RSP-100 (7.2(a)) Instructions/Installation Manual

Please refer to Exhibit 7: User Manual, Theory of Operation

2.1033(c)(4) & RSP-100 (7.2(b)(iii)) Type of emissions

253KGXW (GSM)
266KG7W (EDGE)

2.1033(c)(5) & RSP-100 (7.2(a)) Frequency Range

Forward: 1930.3 – 1989.8 MHz

2.1033(c)(6) & RSP-100 (7.2(a)) Range of Operation Power

Forward: 49.5dBm (Isolated)
Forward: 49dBm (Combined)

2.1033(c)(7) & RSP-100 (7.2(a)) Maximum FCC & IC Allowed Power Level

24.232(a) & RSS-133 (6.2): In no case may the peak output power of a base station transmitter exceed 100 watts.

24.235(b) & RSS-133 (6.2): Mobile/portable stations are limited to 2 watts E.I.R.P. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

2.1033(c)(8) & RSP-100 (7.2(a)) Applied voltage and currents into the final transistor elements

Refer to Exhibit 6. The schematic diagram

2.1033(c)(9) & RSP-100 (7.2(a)) Tune-up Procedure

There are no user tunable components in the design so no Tune-up procedure is required.

2.1033(c)(10) & RSP 100 (7.2(a)) Schematic Diagram of the Transmitter

Refer to Exhibit 6. The schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Frequency Stabilization

Not applicable EUT is an amplifier

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Suppression of Spurious radiation

Refer to Exhibit 6. The schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Modulation

For more information please refer to Exhibit 7: Theory of Operation

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Power

Refer to Exhibit 6. The schematic diagram

2.1033(c)(11) & RSP-100 (7.2(g)) Photographs or Drawing of the Equipment Identification Plate or Label

Refer to Exhibit 4

2.1033(c)(12) & RSP-100 (7.2(c)) Photographs of equipment

Refer to Exhibit 5

2.1033(c)(13) & RSP-100 (7.2(a)) Equipment Employing Digital Modulation

The PCS amplifier does not produce the GSM and EDGE internally. The PCS amplifier will only provide amplification for the transmission of the GSM or EDGE modulation.

2.1033(c)(14) & RSP-100 (7.2(b)(ii)) Data taken per Section 2.1046 to 2.1057 and RSS-133 issue 2, Rev. 1.

Refer to Exhibit 2

SCOPE

FCC Part 24 Subpart E & IC RSS-133 testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rules & in IC RCC-133. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC & RSS performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the FCC Rules part 24 Subpart E & IC RSS-133. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033 & RSP-100.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC & Industry Canada. FCC & Industry Canada issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

EMISSION TEST RESULTS

Section 2.1046: RF Power Output
RSS-133 (6.2): RF Power Output

The RF Power Output was tested to Section 24.213(a) & (b) and RSS-133 (6.2)

The following modulations were tested: GSM & EDGE

Procedure used: **B**

GSM and EDGE Result: 49-dBm Output Power (Combined) and 49.5-dBm (Isolated)

Refer to the test data in Exhibit 2: Test Measurement Data for full details.

SECTION 2.1047: MODULATION CHARACTERISTICS

Section 2.1047 (d) Other types of equipment.

Other types of modulations were tested to Section 24.238 (b).

The following modulations were tested: GSM & EDGE

Procedure used: **H & C**

GSM Result: 253 kHz
EDGE Result: 266 kHz

Refer to the test data in Exhibit 2: Test Measurement Data for full details.

SECTION 2.1049: OCCUPIED BANDWIDTH
RSS-133 (5.6): Definition of Bandwidth

The Occupied Bandwidth was tested to Section 24.238 (b) and RSS-133 (5.6).

The following modulations were tested: GSM & EDGE

Procedure used: **D & C**

GSM Result: 253 kHz
EDGE Result: 266 kHz

Refer to the test data in Exhibit 2: Test Measurement Data for full details.

SECTION 2.1051: SPURIOUS EMISSION AT ANTENNA TERMINAL.
RSS-133 (6.3): Unwanted Emission

The Spurious Emission at the Antenna terminal was tested to Section 24.232(a)(b) & (c) and RSS-133 (6.3)

The following modulations were tested: GSM & EDGE

Procedure used: **I & J**

Worst case Result: -14.69dBm @ 1930 MHz (Bandedge); +6.98 dBm @ 3.95 GHz (2^{nd} Harmonic)

Note: An external filter will be placed at the output of the amplifier to attenuate the second harmonic. The specified minimum filter attenuation should be 20dB or more at the second harmonic.

Refer to the test data in Exhibit 2: Test Measurement Data for full details.

SECTION 2.1053: FIELD STRENGTH OF SPURIOUS RADIATION.
RSS-133 (6.3): FIELD STRENGTH OF SPURIOUS RADIATION.

The Field Strength was tested to Section FCC 24.238(a) and RSS-133 (6.3)

Procedure used: **N**

Result: -1.9dB @ 3866 MHz

Refer to Setup Photo# 1 & 2 in Exhibit 3 and the test data in Exhibit 2: Test Measurement Data for full details.

SECTION 2.1055: FREQUENCY STABILITY
RSS-133 (7): FREQUENCY STABILITY

Not applicable EUT is an amplifier

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on January 30, 2003 at the Elliott Laboratories Open Area Test Site # 4 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into filed strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

PEAK POWER METER

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or EUT and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transmitters and transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

The requirements of ANSI C63.4 were used for configuration of the equipment turntable. It specifies that the test height above ground for table-mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

General: For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

Procedure B – Power Measurement (Conducted Method): The following procedure was used for transmitters that do use external antennas.

1) Set the EUT to maximum power and to the lowest channel.
2) Either a power meter or a spectrum analyzer was used to measure the power output.
3) If a spectrum analyzer was used a resolution and video bandwidth 1MHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure C – Amplifier Bandwidth (Conducted Method): If the EUT is an amplification device the following procedure was performed:

1) Set the EUT to maximum power and to the lowest channel. Set the Resolution and Video Bandwidth to 30 kHz, with no averaging. These settings were used to show the true representation of the signal bandwidth.
2) Made a plot of the EUT output port and label it "Output"
3) With the same setting on the spectrum analyzer connect the cable that was connected to the input port of the amplifier to the analyzer. Made a plot and label it "Input"
4) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure D - Occupied Bandwidth (Conducted Method): Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

1) The built-in 99% function of the spectrum analyzer was used.
2) If the built-in 99% is not available then the following method is used:

   26-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.

3) For the above two methods a resolution and video bandwidth of 30 kHz was used to measure the emission's bandwidth.

Procedure H - Other Types of Equipment: Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

Procedure I – Bandedge: Where Bandedge measurements are specified the following procedure was performed:

1) Set the transmitting signal as close as possible to the edge of the frequency band/block per 24.232(a)(b) & (c). Power is set to maximum
2) Set the spectrum analyzer display line function to –13 dBm.
3) Set the spectrum analyzer bandwidth to 30 kHz. Which is the minimum 1 % of the emission bandwidth. Per FCC, if a resolution, less then the calculate 1% is used, for the Bandedge measurement, and then the following formula is to be used to correct the measured value (10*log (1% RB / RB used)).
4) Set the marker function to the FCC specified frequency band/block.
5) Set the spectrum analyzer span to show any emission within 2 MHz above or below the frequency band/block. All spurious or intermodulation emission must not exceed the –13dBm limit.
6) Steps 1 to 3 were repeated for all modulations and output ports that will be used for transmission.

Procedure J – Antenna Conducted Emissions: For spurious emission measurements at the antenna terminal the following procedure was performed:

1) Set the transmitting signal as close as possible to the edge of the frequency band/block per 24.232(a)(b) & (c). Power is set to maximum
2) Set the spectrum analyzer display line function to –13-dBm.
3) Set the spectrum analyzer bandwidth to 1 MHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to 20 GHz. All spurious or intermodulation emission must not exceed the –13dBm limit.
5) Steps 1 to 3 were repeated for all modulations and output ports that will be used for transmission.

Procedure N - Field Strength Measurement: The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna, which factors can be reference to a half-wave dipole, and with a signal generator. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

RADIATED EMISSIONS SPECIFICATION LIMITS

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m,). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is $43+10\text{Log}_{10}$ (mean output power in watts) dB below the measured amplitude at the operating power.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m
P= Power in Watts (for this example we use 3 watts)
G= Gain of antenna in numeric gain (Assume 1.64 for ERP)
d= distance in meters

$$E(V/m) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

20 * log (4.049 V/m * 1,000,000) = 132.14 dBuV/m @ 3 meters

FCC Rules request an attenuation of 43 + 10 log (3) or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

132.1 dBuV/m – 47.8 dB = 84.3 dBuV/m @ 3 meter.

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

EXHIBIT 1: Test Equipment Calibration Data

Radiated Emissions, 30 - 1000 MHz, 28-May-03
Engineer: volivas

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	12	5/13/2003	5/13/2004
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	9/12/2002	9/12/2003
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12	12/27/2002	12/27/2003

Radiated Emissions, 1 - 20,000 GHz, 09-Jun-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), system 2	84125C	1410	12	4/2/2003	4/2/2004

Antenna Conducted Emissions, 09-Jun-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	Spectrum Analyzer, 9KHz - 26.5GHz	8563E	F1202LB	12	9/27/2002	9/27/2003

Subsitution Method, 09-Jun-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	487	12	4/24/2003	4/24/2004
Hewlett Packard	Signal Generator (sweep) 0.01 - 26.5 GHz	8340A	1244	N/A		

EXHIBIT 2: Test Measurement Data

The following data includes conducted and radiated emission measurements of the REMEC, Model No: DPA4040E.

T51311 33 pages

Elliott

EMC Test Data

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Account Manager:	Christine Vu
Contact:	Mandel Berenberg		
Emissions Spec:	FCC 24E/FCC 15	Class:	Amplifier / B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

REMEC

Model

DPA-4040E

Date of Last Test: 5/30/2003

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Account Manager:	Christine Vu
Contact:	Mandel Berenberg		
Emissions Spec:	FCC 24E/FCC 15	Class:	Amplifier / B
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a PCS amplifier which is designed for base station environments in low signal coverage areas. Normally, the EUT would be placed on a rack during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT is 28Vdc, 20 amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
REMEC	DPA-4040E	PCS Amplifier	N/A	IO2DPA4040E

Other EUT Details

EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 7 cm wide by 12 cm deep by 3 cm high.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Account Manager:	Christine Vu
Contact:	Mandel Berenberg		
Emissions Spec:	FCC 24E/FCC 15	Class:	Amplifier / B
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	438A	Power Meter	3513U04847	-
Instek	-	DC Supply	9566367	-
Agilent	E4432B	Signal Generator	U537231536	-
Agilent	E4432A	Signal Generator	U537231102	-
Generic	-	Driver Amp	5	-
Generic	-	Driver Amp	1	-
Centaur	SA-9-115	Fan Blower	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
none				

EUT Interface Cabling and Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
EUT DC input	DC Supply (x2)	2 wire	Unshielded	5
EUT RF Input	Signal Generator (x2)	Coaxial	Shielded	2
EUT RF Output	power meter	Multiwire	Shielded	1

EUT Operation During Emissions

EUT was set to operate at maximum power at the low and high channel.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Section 2.1046: RF Power

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 1/30/2003
Test Engineer: jmartinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 28Vdc

General Test Configuration

The EUT was located on the turntable for radiated field strength measurements and the local support equipment was located underneath the table.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 19° C
Rel. Humidity: 55%

Summary of Results

Run #	Test Performed	Limit	Result	Measurement
1	Conducted Output Power/GSM/Combine Mode	24.232(b)	Pass	49.0 dBm
2	Conducted Output Power/EDGE/Combine Mode	24.232(b)	Pass	49.0 dBm

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Run #1: Conducted Output Power: GSM Modulation

Output power measured with a HP438A Power Meter and 8481A Sensor Head:

Freq	Mode	Power per carrier	Two carrier composite power	Comments
(MHz)		(dBm)	(dBm)	
1930.00	isolated	49.50	n/a	Power Meter
1990.00	isolated	49.50	n/a	Power Meter
1930.00	combined	46.00	49.00	Power Meter-note 1
1990.00	combined	46.00	49.00	Power Meter-note 1

Attenuator value enter into power meter.

Note 1:	Measurements was in combine mode which was the worst case condition.

Run #2: Conducted Output Power: EDGE Modulation

Output power measured with a HP438A Power Meter and 8481A Sensor Head:

Freq	Mode	Power per carrier	Two carrier composite power	Comments
(MHz)		(dBm)	(dBm)	
1930.00	isolated	49.50	n/a	Power Meter
1990.00	isolated	49.50	n/a	Power Meter
1930.00	combined	46.00	49.00	Power Meter-note 1
1990.00	combined	46.00	49.00	Power Meter-note 1

Attenuator value enter into power meter.

Note 1:	Measurements was in combine mode which was the worst case condition.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Section 2.1049: Occupied Bandwidth

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/28/2003
Test Engineer: jmartinez
Test Location: SVOATS #1

Config. Used: 1
Config Change: None
EUT Voltage: 27Vdc

General Test Configuration

When performing conducted measurements from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected. Modulation must not exceed manufactures stated bandwidth.

For this specific test the occupied bandwidth was measured to provide the correct Resolution bandwidth that will be used for the bandedge measurements. This requirement is specified in 24.238(b).

Because the EUT is an amplifer, input and output plots were made to show that the bandwidth was not altered. By altered we refer to the bandwidth increasing in width.

Ambient Conditions:

Temperature: 19° C
Rel. Humidity: 55%

Summary of Results

Run#	Test Performed	Limit	Result	Comment
1	Occupied Bandwidth / GSM	24.238(b)	Pass	Refer to individual runs
2	Occupied Bandwidth / GSM	24.238(b)	Pass	Refer to individual runs
3	Occupied Bandwidth / EDGE	24.238(b)	Pass	Refer to individual runs
4	Occupied Bandwidth / EDGE	24.238(b)	Pass	Refer to individual runs

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

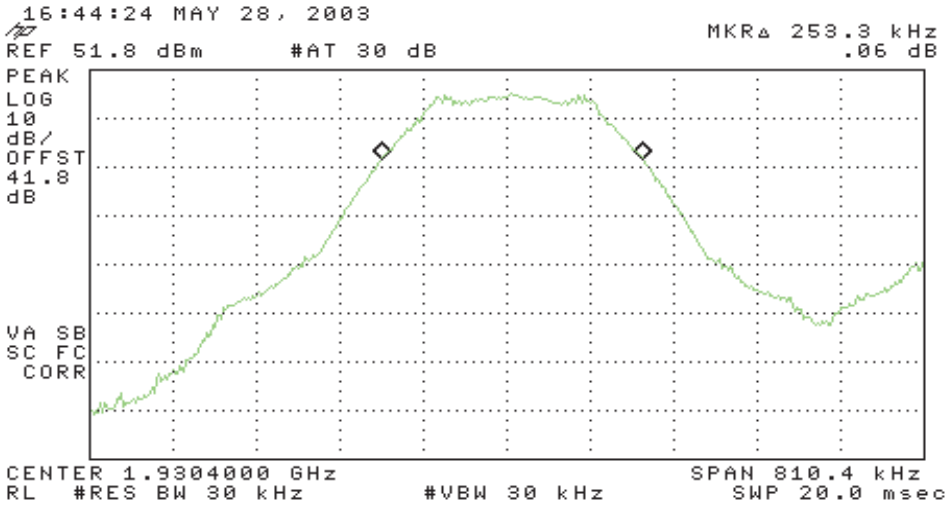
No deviations were made from the requirements of the standard.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

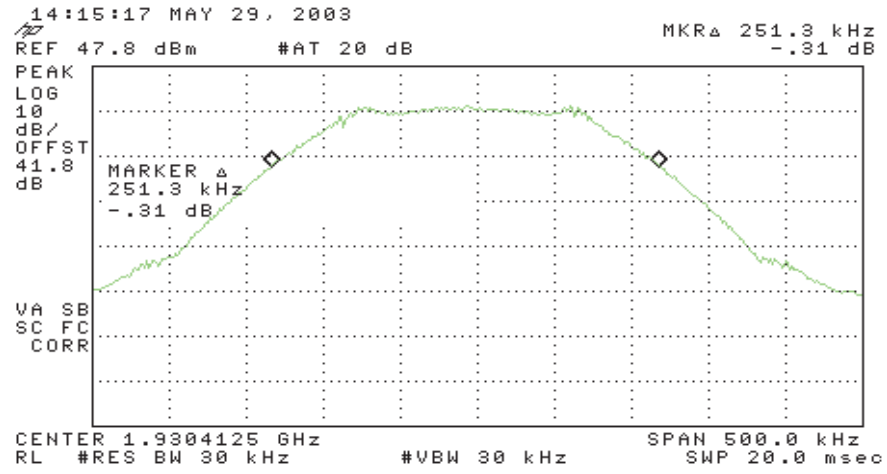
Run #1: Occupied Bandwidth (Base forward); Low Block A; GSM Modulation

Measured Value	Specified Bandwidth	Resolution	Comments
(kHz)	(kHz)	(kHz)	
253.3	30	30	

Output Plot



Input Plot

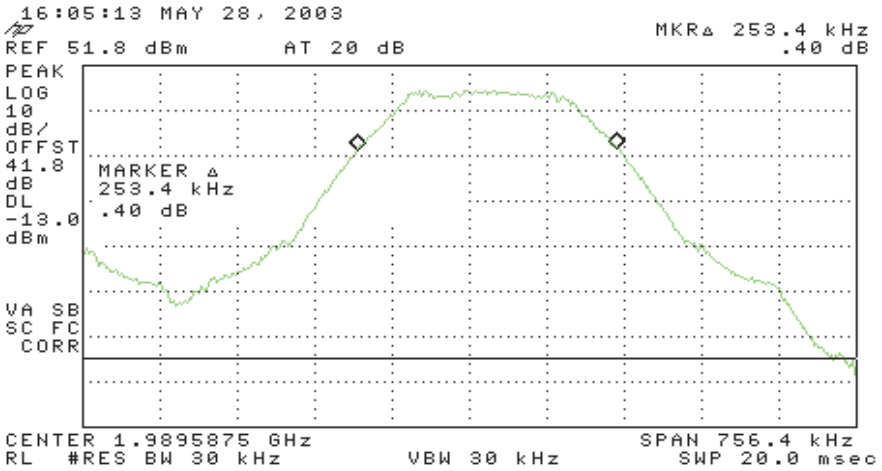


Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

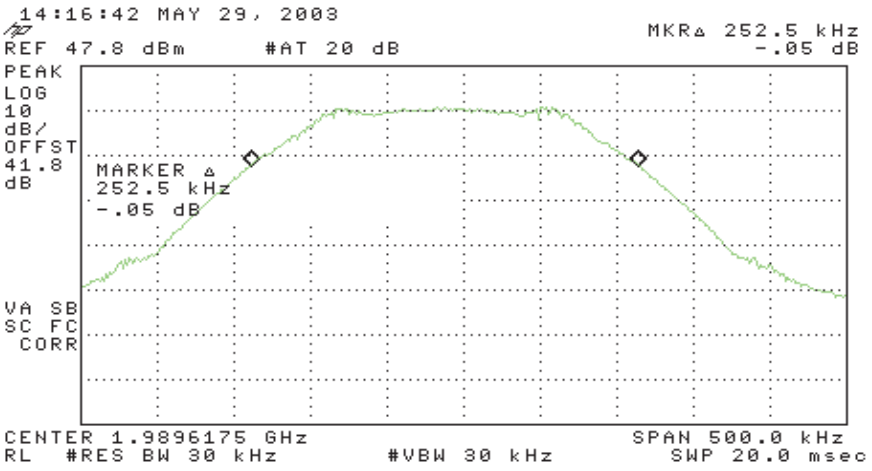
Run #2: Occupied Bandwidth (Base forward); High Block C; GSM Modulation

Measured Value	Specified Bandwidth	Resolution	Comments
(kHz)	(kHz)	(kHz)	
253	30	30	

Output Plot



Input Plot

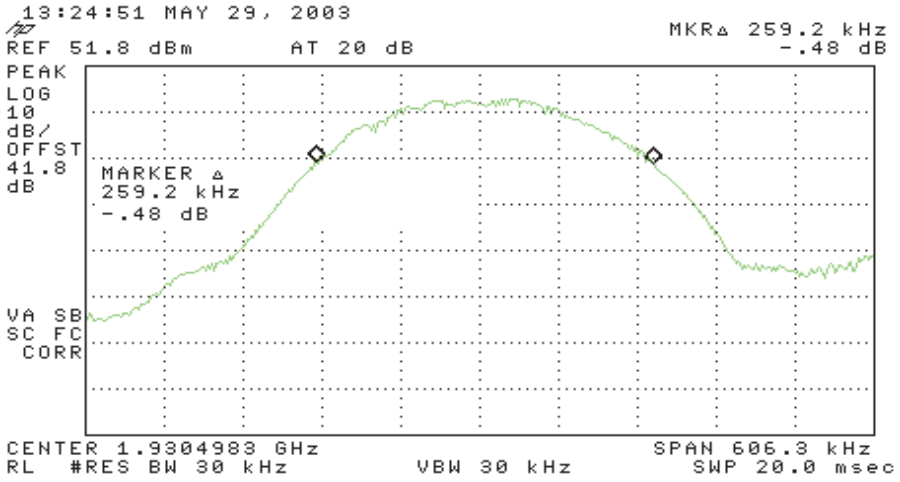


Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

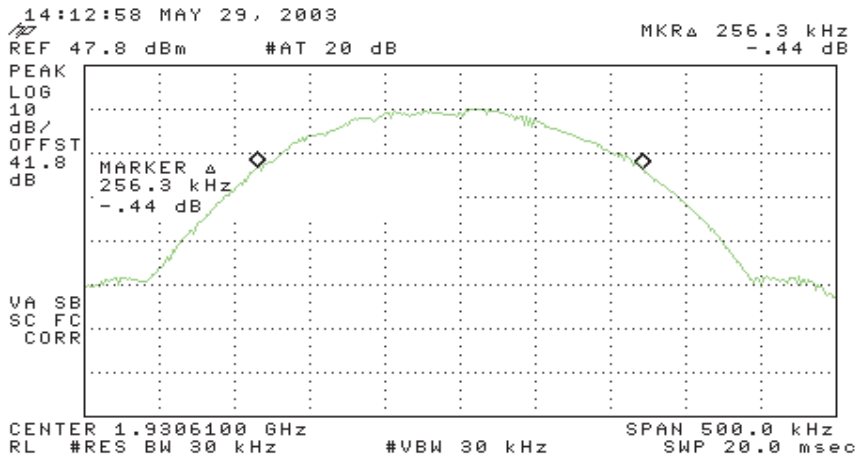
Run #3: Occupied Bandwidth (Base forward); Low Block A; EDGE Modulation

Measured Value	Specified Bandwidth	Resolution	Comments
(kHz)	(kHz)	(kHz)	
259.2	30	30	

Output Plot



Input Plot

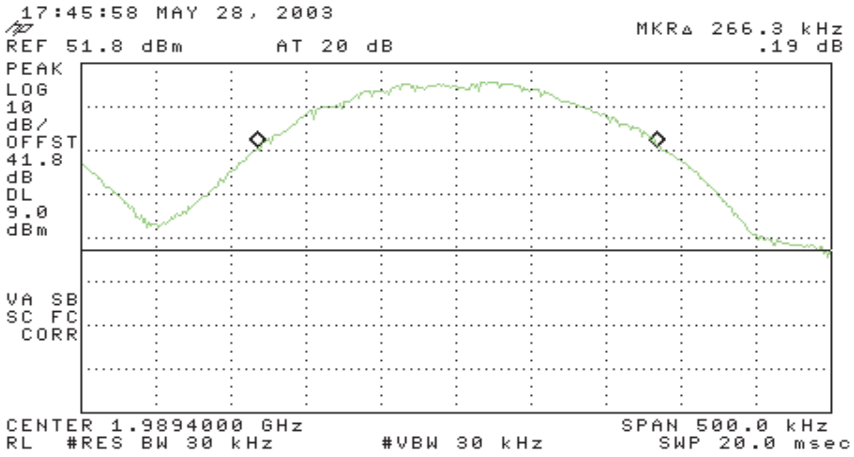


Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

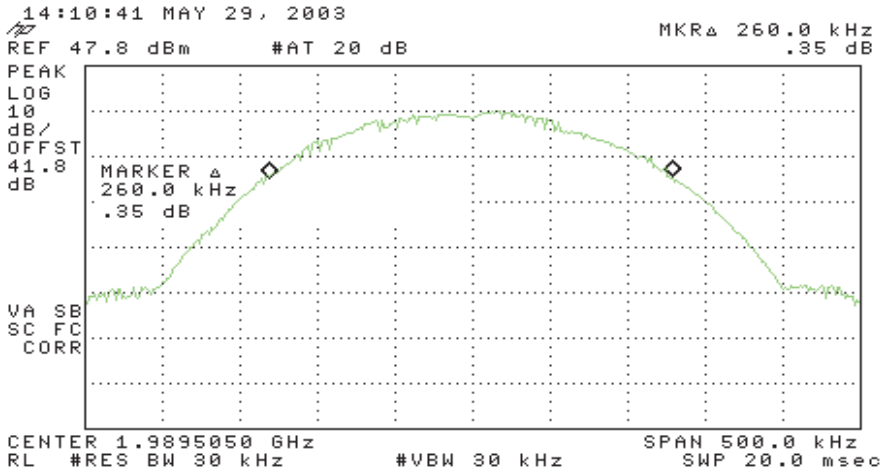
Run # 4: Occupied Bandwidth (Base forward); High Block C; EDGE Modulation

Measured Value	Specified Bandwidth	Resolution	Comments
(kHz)	(kHz)	(kHz)	
266	30	30	

Output Plot



Input Plot



Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Section 2.1051: Spurious emission at the Antenna Terminal

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/28/2003
Test Engineer: jmartinez
Test Location: SVOATS #1

Config. Used: 1
Config Change: None
EUT Voltage: 28Vdc

General Test Configuration

The EUT and all local support equipment were located on the table for testing. The Eut was connected directly to a Test Receiver. An attenuator was used between the EUT and the Test Receiver.

Ambient Conditions:

Temperature: 24 °C
Rel. Humidity: 13 %

Summary of Results

Run#	Plot#	Test Performed	Modulation	Limit	Result	Level
1	N/A	Low Bandedge	GSM	24.238(a)	Pass	-14.69dBm @ 1930MHz
2	1-3 & 4-6	Out-Of-Band	GSM	24.238(a)	Pass	+2.39dBm @ 3.86GHz
3	N/A	High Bandedge	GSM	24.238(a)	Pass	-19.54dBm @ 1990MHz
4	1-3 & 4-5	Out-Of-Band	GSM	24.238(a)	Pass	+1.53dBm @ 3.95GHz
5	N/A	Low Bandedge	EDGE	24.238(a)	Pass	-17.35dBm @ 1930MHz
6	1-3 & 4-5	Out-Of-Band	EDGE	24.238(a)	Pass	+3.15dBm @ 3.86GHz
7	N/A	High Bandedge	EDGE	24.238(a)	Pass	-18.00dBm @ 1990MHz
8	1-3 & 4-5	Out-Of-Band	EDGE	24.238(a)	Pass	+6.98dBm @ 3.95GHz

Modifications Made During Testing:

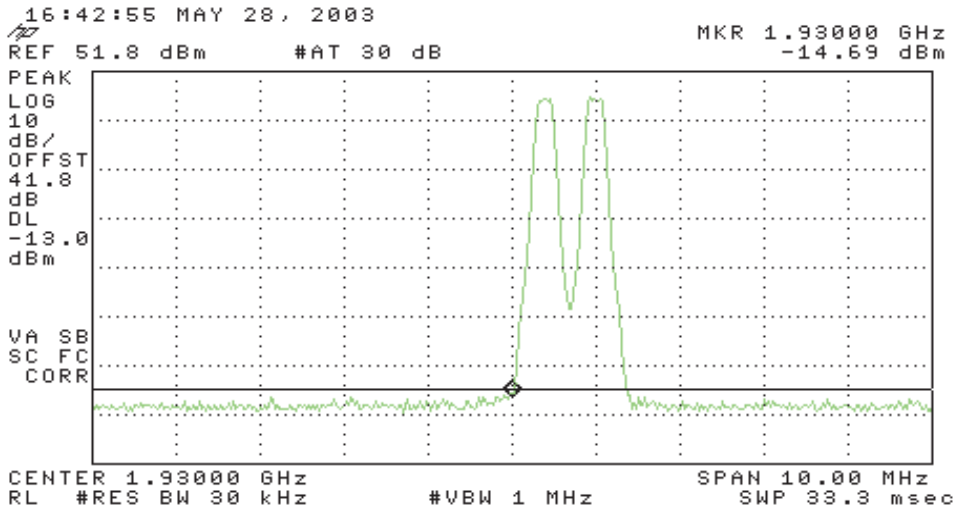
No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

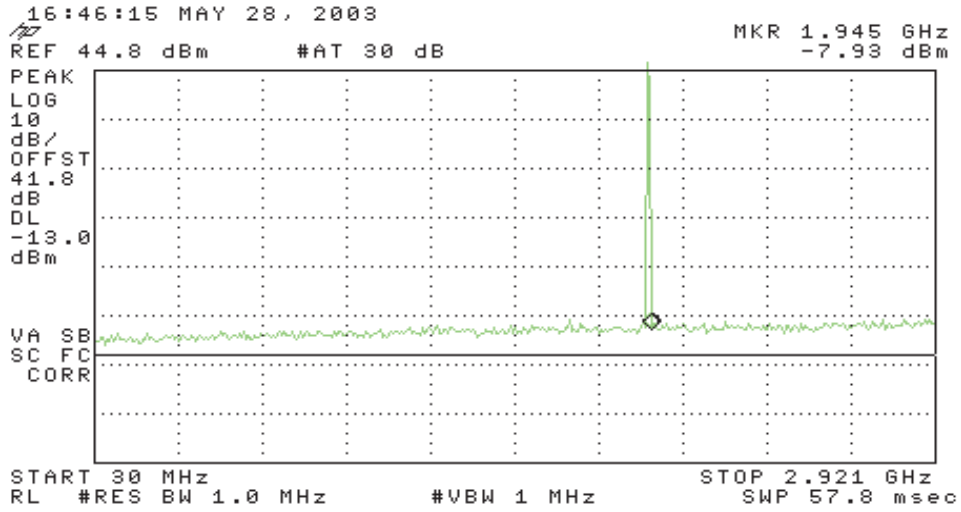
Run #1: Low Channel: 1930 MHz (Bandedge); GSM Modulation



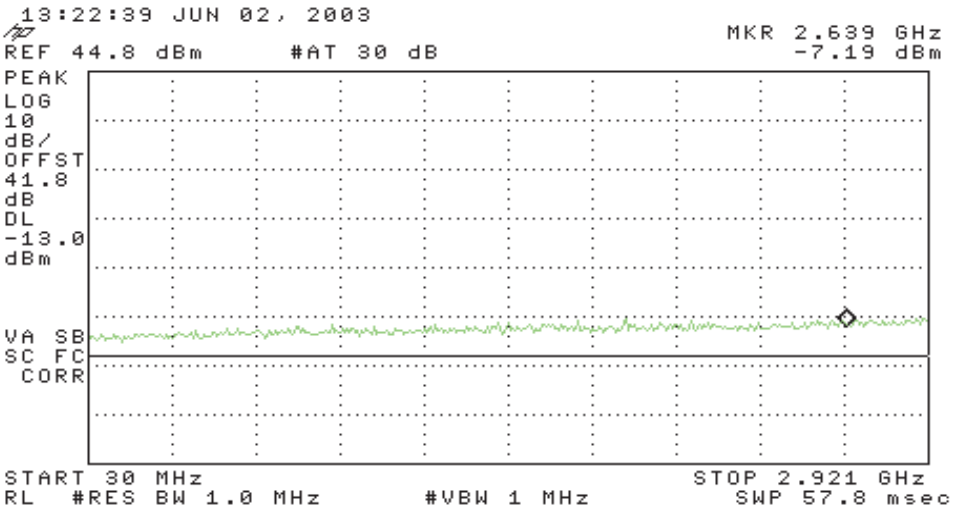
Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Run #2: Low Channel: 1930 MHz (Out of Band); GSM Modulation

Plot# 1

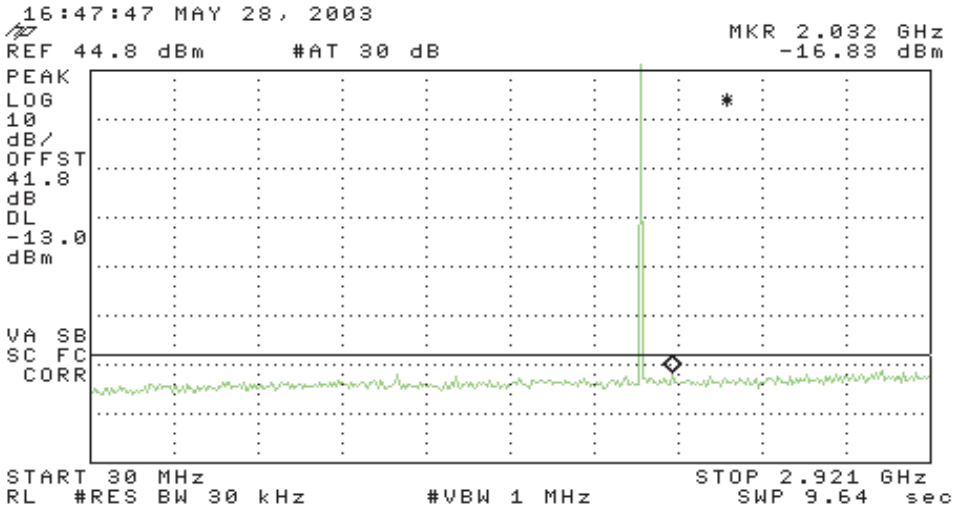


Plot# 2



Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

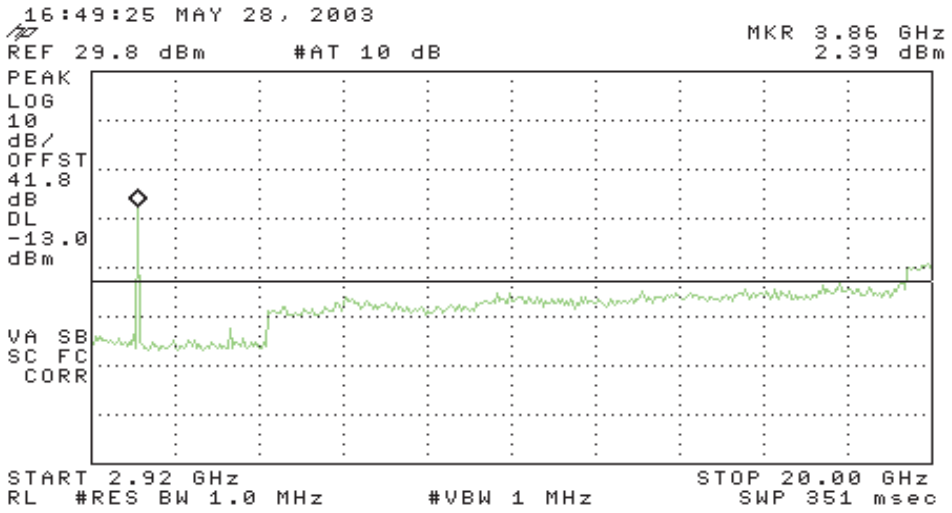
Plot# 3



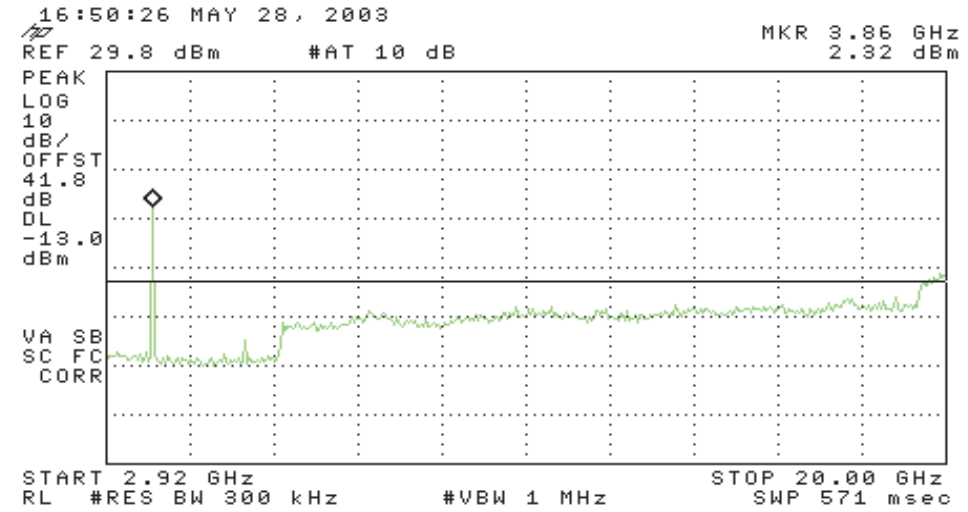
Note 1:	Plot# 1 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 2 is with the amplifier off and will show that the noise floor is due to limited dynamic range of the HP spectrum analzyer. Plot# 3 was set with a RBW of 30 KHz to bring down the analyzer noise floor below the -13dBm limit. All spurs are narrow band in nature and changing the RBW will not affect the spurs levels.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Plot# 4

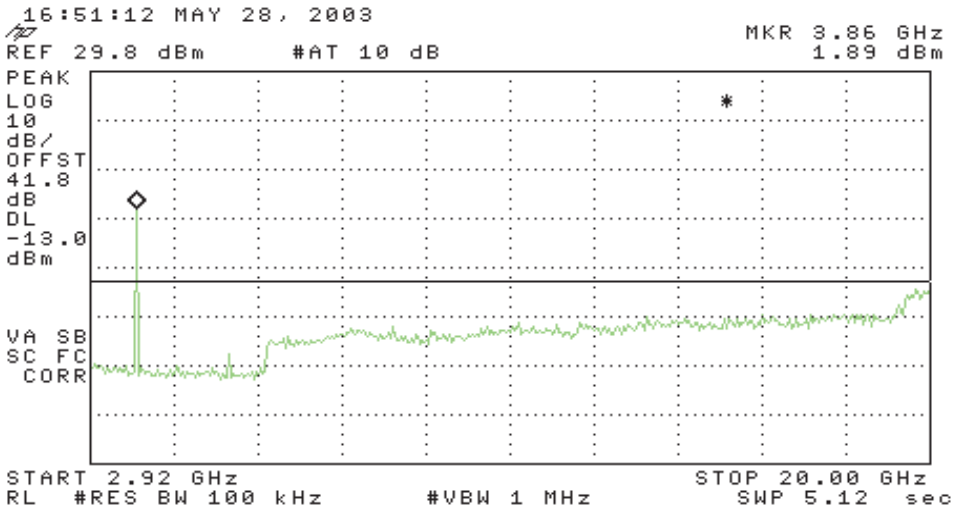


Plot# 5



Plot# 6

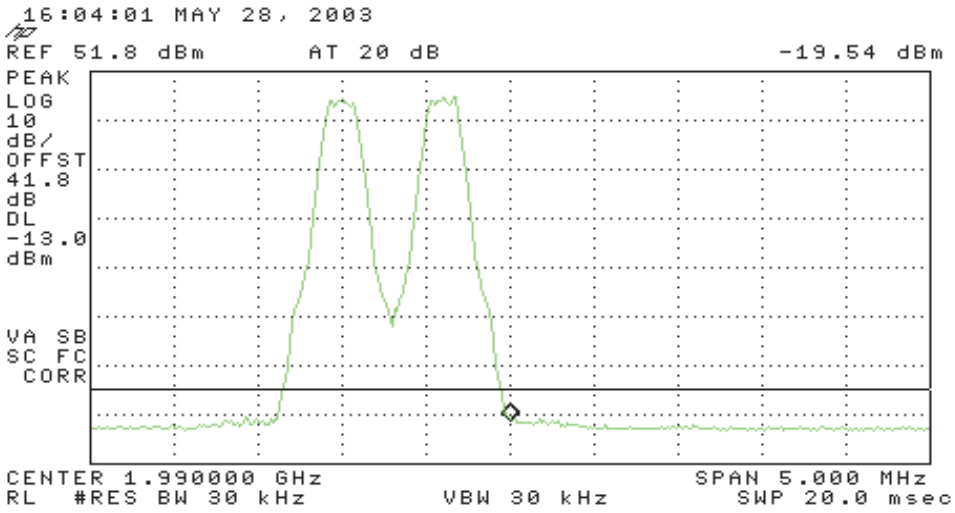
Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B



Note 1:	Plot# 4 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 5-6 were taken with RBW from 300 kHz to 100 KHz to bring down the analyzer noise floor below the -13dBm limit and to also show that the second harmonic is narrow band since changing the RBW did not change the amplitude significantly.
Note 2:	An external filter will be placed at the output of the amplifier to attenuate the second harmonic. The specified minimum filter attenuation should be 20dB or more at the second harmonic.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

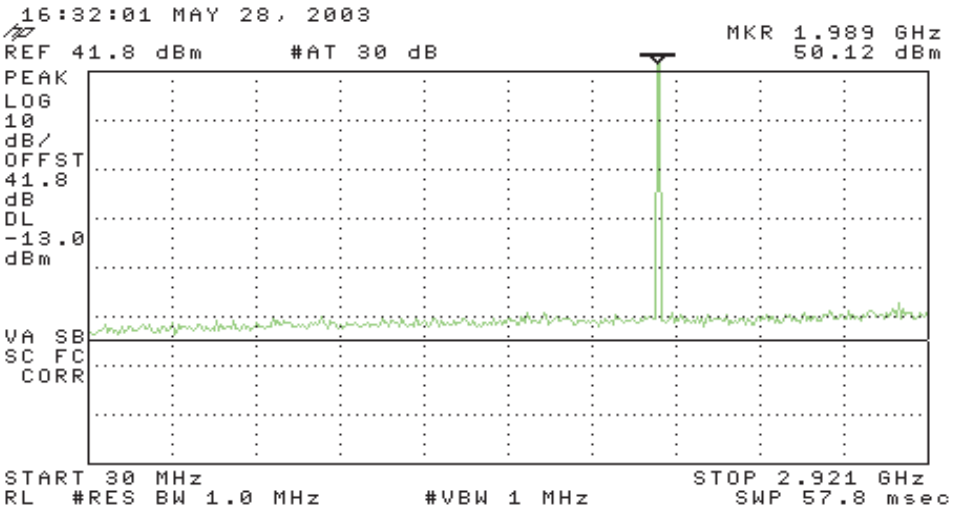
Run #3: High Channel: 1990 MHz (Bandedge); GSM Modulation



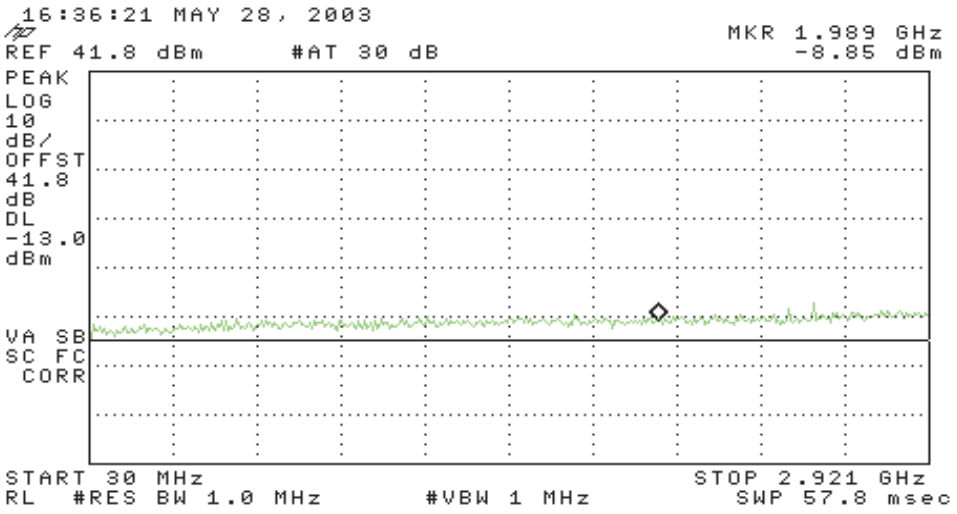
Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Run #4: High Channel: 1990 MHz (Out of Band); GSM Modulation

Plot# 1

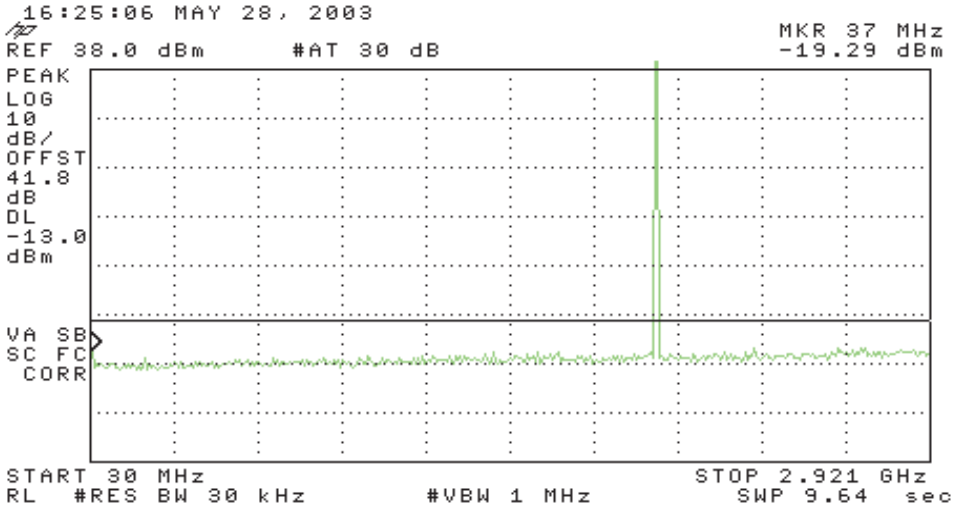


Plot# 2



Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

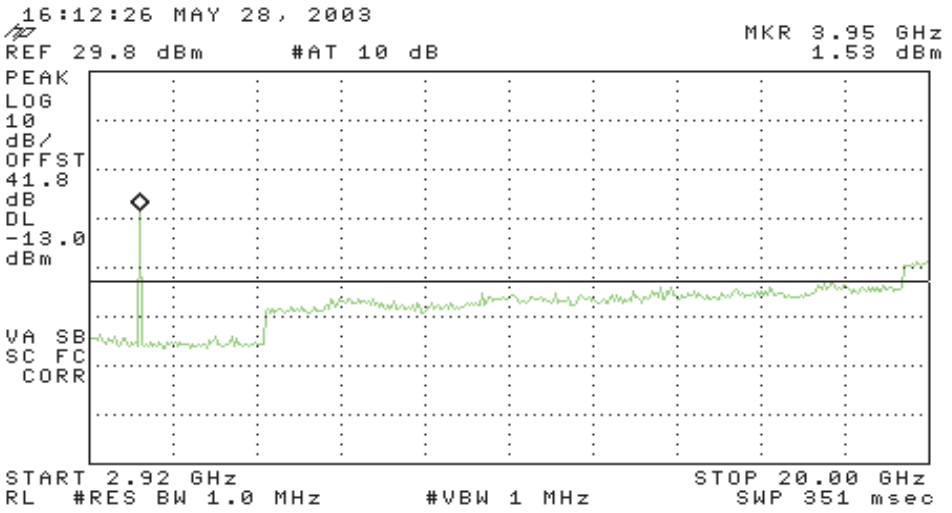
Plot# 3



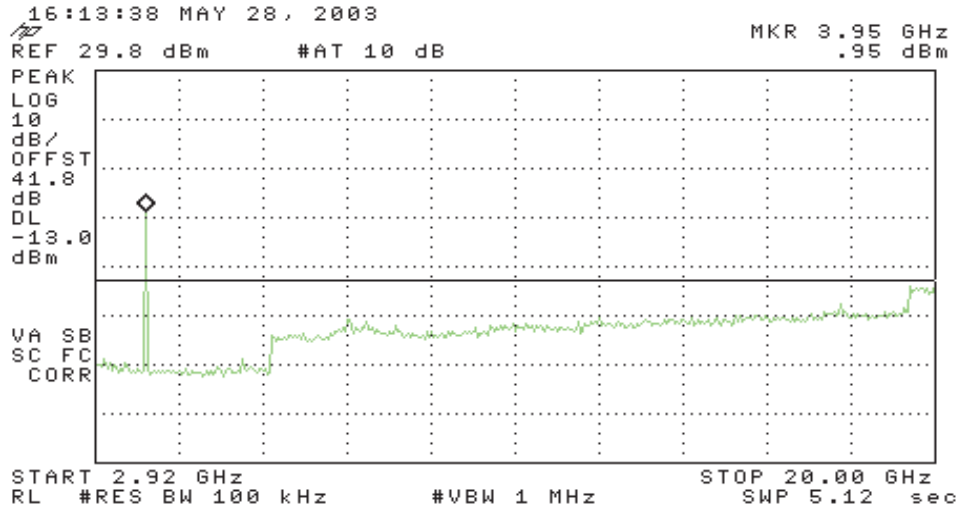
Note 1:	Plot# 1 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 2 is with the amplifier off and will show that the noise floor is due to limited dynamic range of the HP spectrum analzyer. Plot# 3 was set with a RBW of 30 KHz to bring down the analyzer noise floor below the -13dBm limit. All spurs are narrow band in nature and changing the RBW will not affect the spurs levels.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Plot# 4



Plot# 5

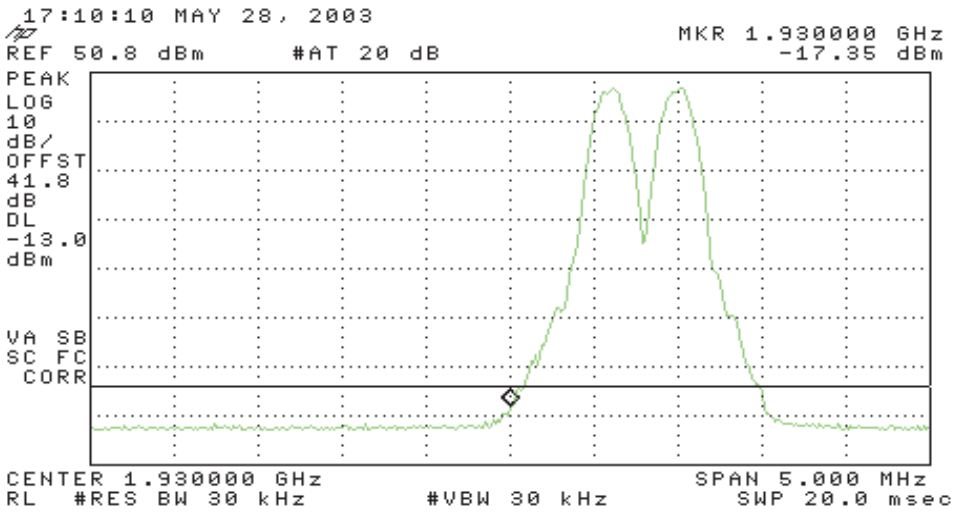


Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Note 1:	Plot# 4 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 5 was taken with RBW of 100 KHz to bring down the analyzer noise floor below the -13dBm limit and to also show that the second harmonic is narrow band since changing the RBW did not change the amplitude significantly.
Note 2:	An external filter will be placed at the output of the amplifier to attenuate the second harmonic. The specified minimum filter attenuation should be 20dB or more at the second harmonic.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

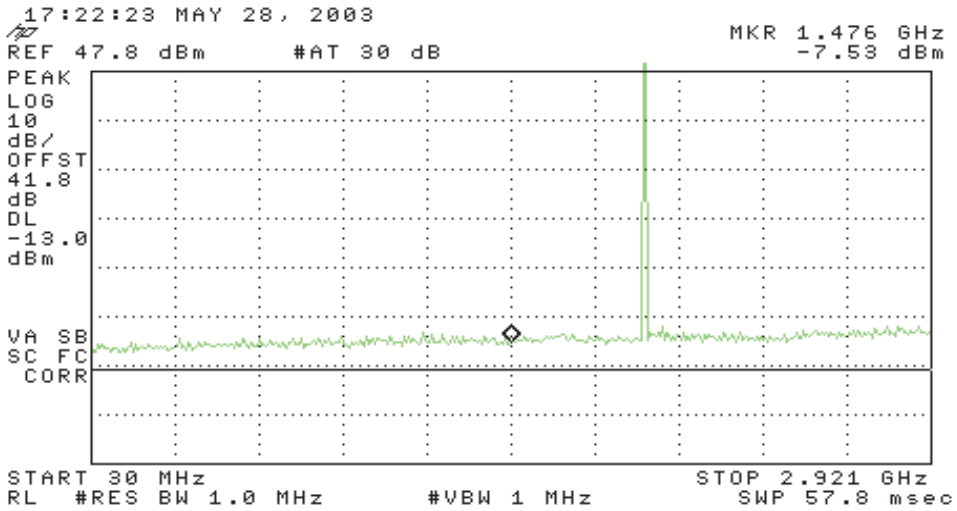
Run #5: Low Channel: 1930 MHz (Bandedge); EDGE Modulation



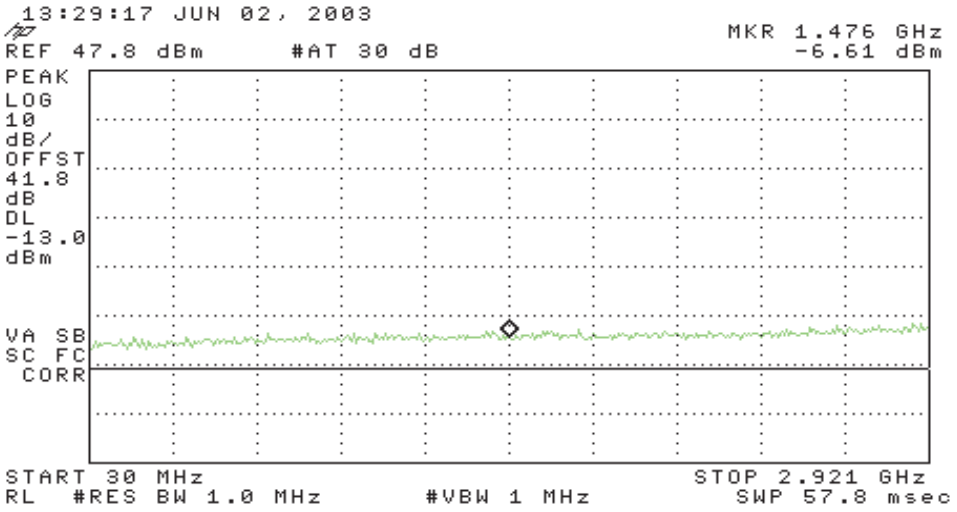
Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Run #6: Low Channel: 1930 MHz (Out of Band); EDGE Modulation

Plot# 1

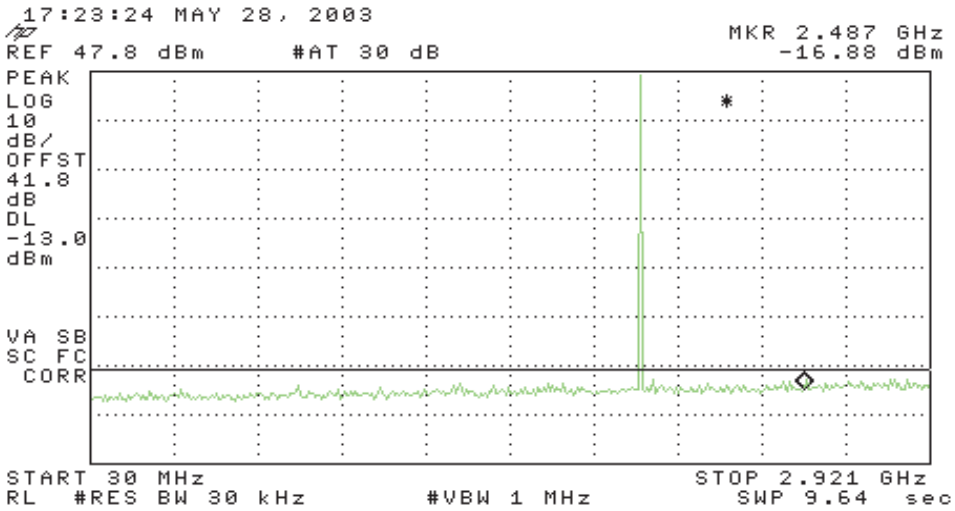


Plot# 2



Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

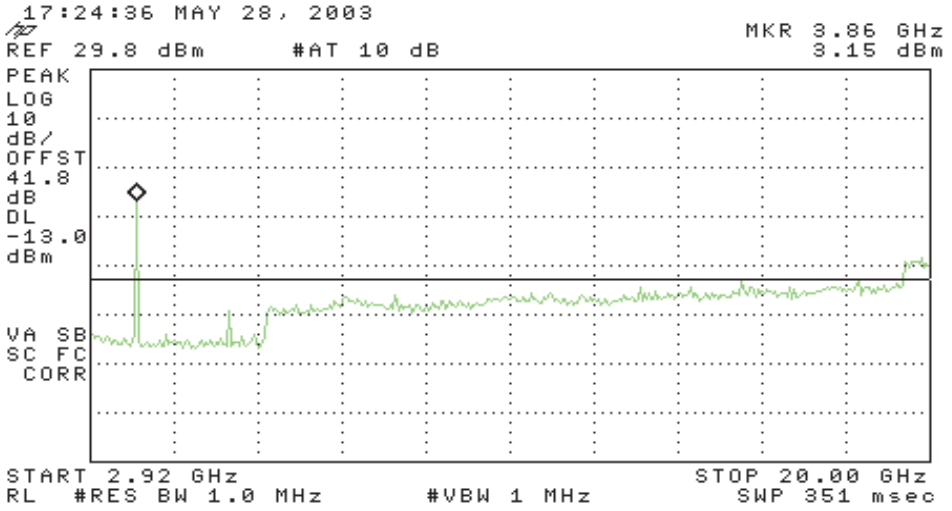
Plot# 3



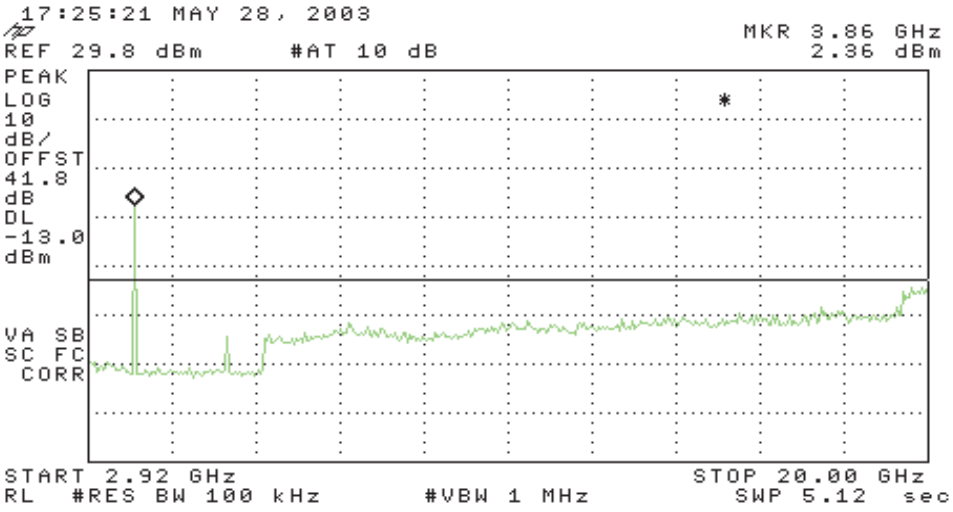
Note 1:	Plot# 1 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 2 is with the amplifier off and will show that the noise floor is due to limited dynamic range of the HP spectrum analzyer. Plot# 3 was set with a RBW of 30 KHz to bring down the analyzer noise floor below the -13dBm limit. All spurs are narrow band in nature and changing the RBW will not affect the spurs levels.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Plot# 4



Plot# 5

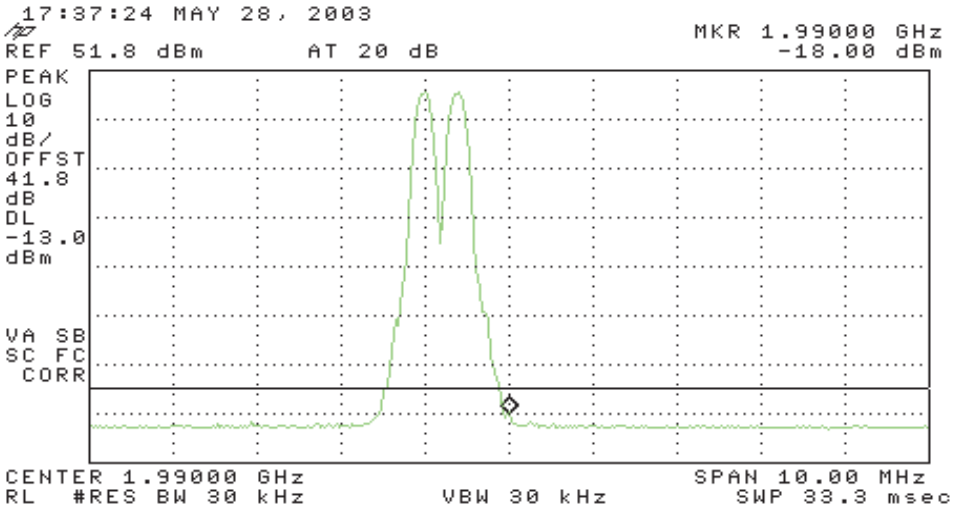


Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Note 1:	Plot# 4 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 5 was taken with RBW of 100 KHz to bring down the analyzer noise floor below the -13dBm limit and to also show that the second harmonic is narrow band since changing the RBW did not change the amplitude significantly.
Note 2:	An external filter will be placed at the output of the amplifier to attenuate the second harmonic. The specified minimum filter attenuation should be 20dB or more at the second harmonic.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

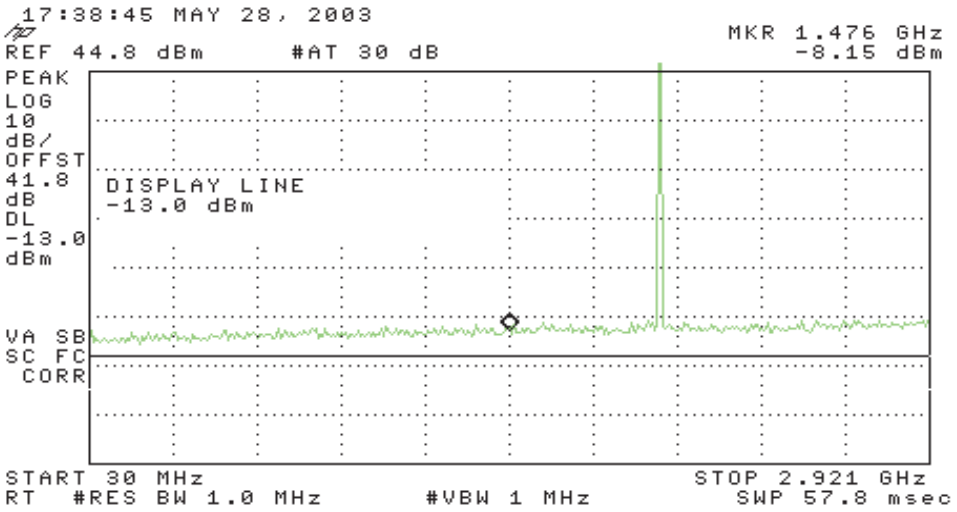
Run #7: High Channel: 1990 MHz (Bandedge); EDGE Modulation



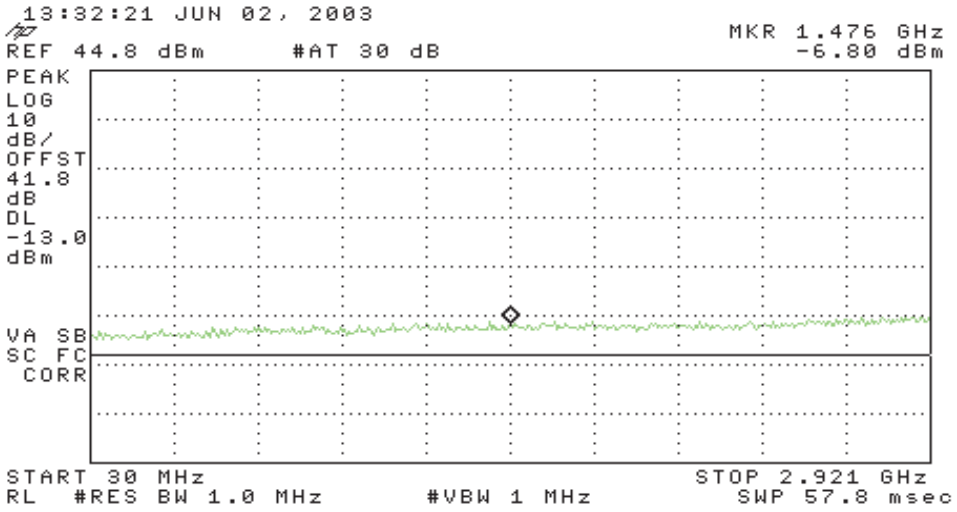
Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Run #8: High Channel: 1990 MHz (Out of Band); EDGE Modulation

Plot# 1

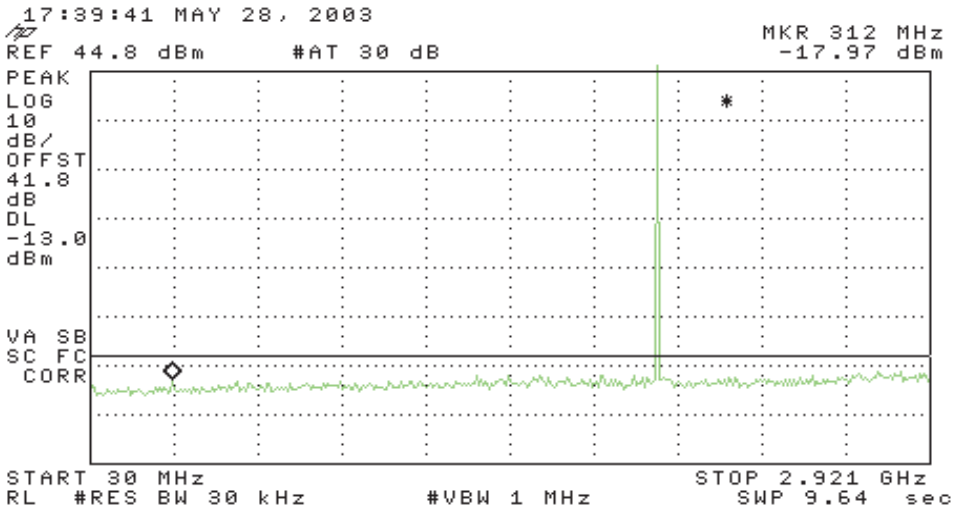


Plot# 2



Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

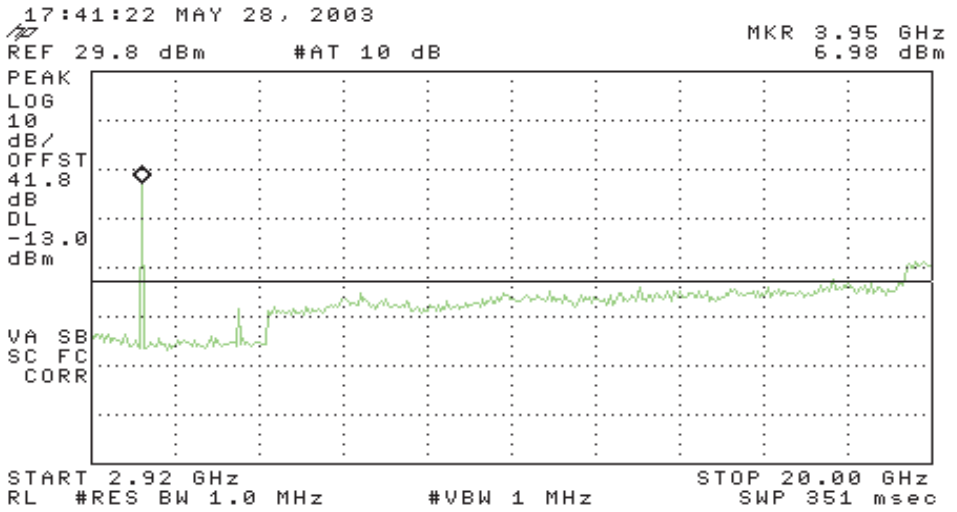
Plot# 3



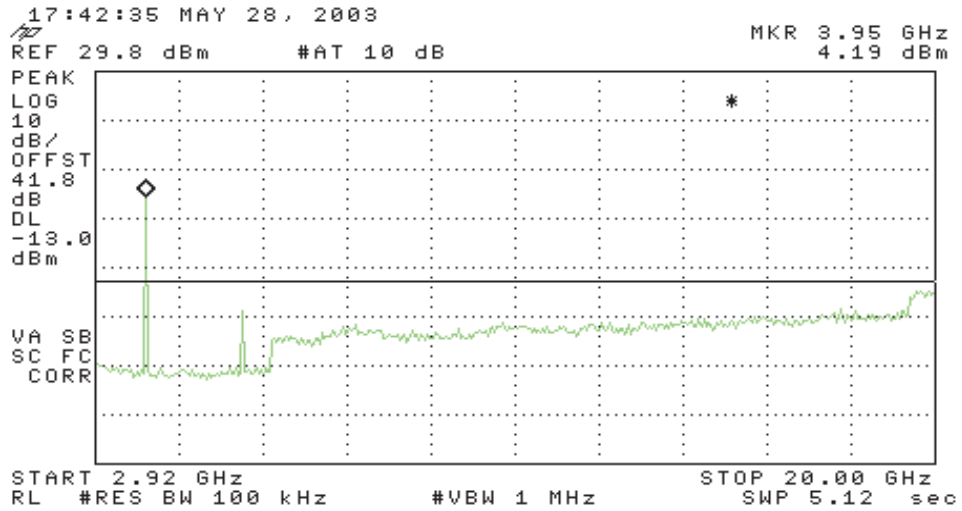
Note 1:	Plot# 1 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 2 is with the amplifier off and will show that the noise floor is due to limited dynamic range of the HP spectrum analzyer. Plot# 3 was set with a RBW of 30 KHz to bring down the analyzer noise floor below the -13dBm limit. All spurs are narrow band in nature and changing the RBW will not affect the spurs levels.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Plot# 4



Plot# 5



Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Note 1:	Plot# 4 was set with a RBW=VBW of 1 MHz and will show that noise floor of analyzer is over the limit. Plot# 5 was taken with RBW of 100 KHz to bring down the analyzer noise floor below the -13dBm limit and to also show that the second harmonic is narrow band since changing the RBW did not change the amplitude significantly.
Note 2:	An external filter will be placed at the output of the amplifier to attenuate the second harmonic. The specified minimum filter attenuation should be 20dB or more at the second harmonic.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Section 2.1053: Field Strength Of Spurious Emission

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/29/2003 & 5/30/2003
Test Engineer: jmartinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 27Vdc

General Test Configuration

The EUT was located on the turntable for radiated emissions testing.
On the OATS, the measurement antenna was located 3m from the EUT for the frequency range 1 - 20 GHz.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT. For any Spurious emission more than 20-dB substitution was performed. Substitution Method is not required for Spurious emissions 20-dB below the calculated field strength limit.

Ambient Conditions:

Temperature: 19° C
Rel. Humidity: 55%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 20,000 MHz Maximized Emissions	24.238(a)	Pass	-1.9dB @ 3866MHz
2	RE, 1000 - 20,000 MHz Maximized Emissions	24.238(a)	Pass	-5.3dB @ 3980MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	REMEC	Job Number:	J51256
Model:	DPA-4040E	T-Log Number:	T51311
		Proj Eng:	Christine Vu
Contact:	Mandel Berenberg		
Spec:	FCC 24E/FCC 15	Class:	Amplifier / B

Run #1: Radiated Emissions, 1000-20,000 MHz (Low Channel: 1930 MHz)
EDGE Modulation; Combine mode, Single Output.
EIRP and ERP measurements

Frequency	Level	Pol	Substitution Note 2					
MHz	dBµV/m	v/h	Pin	Gain	Cable Loss	EIRP	Limit	Margin
			(dBm)	(dBi)	(dB)	(dBm)	(dBm)	(dB)
3866.000	85.7	h	-24.1	9.8	0.6	-14.9	-13	-1.9
5799.000	80.7	h	-27.7	10.4	0.8	-18.1	-13	-5.1
7732.000	77.0	h	-33.2	10.0	0.9	-24.1	-13	-11.1
9653.000	63.7	h	-48.1	11.7	1.0	-37.4	-13	-24.4
11584.00	62.0	h	-48.1	12.1	1.0	-37.0	-13	-24.0
3866.000	83.4	v	-23.5	9.8	0.6	-14.3	-13	-1.3
5799.000	81.1	v	-28.7	10.4	0.8	-19.1	-13	-6.1
7732.000	78.9	v	-30.2	10.0	0.9	-21.1	-13	-8.1
9653.000	61.1	v	-50.3	11.7	1.0	-39.6	-13	-26.6
11584.00	59.1	v	-51.3	12.1	1.0	-40.2	-13	-27.2

Run #2: Radiated Emissions, 1000-20,000 MHz (High Channel: 1990 MHz)
EDGE Modulation; Combine mode, Single Output.
EIRP and ERP measurements

Frequency	Level	Pol	Substitution Note 2					
MHz	dBµV/m	v/h	Pin	Gain	Cable Loss	EIRP	Limit	Margin
			(dBm)	(dBi)	(dB)	(dBm)	(dBm)	(dB)
3980.000	79.6	h	-28.1	9.8	0.6	-18.9	-13	-5.9
5970.000	78.6	h	-31.8	10.4	0.8	-22.2	-13	-9.2
7960.000	79.0	h	-31.2	10.0	0.9	-22.1	-13	-9.1
9945.000	59.6	h	-52.1	11.7	1.0	-41.4	-13	-28.4
11933.00	61.7	h	-49.1	12.1	1.0	-38.0	-13	-25.0
3980.000	80.8	v	-27.5	9.8	0.6	-18.3	-13	-5.3
5970.000	76.4	v	-35.2	10.4	0.8	-25.6	-13	-12.6
7960.000	80.3	v	-30.6	10.0	0.9	-21.5	-13	-8.5
9945.000	57.3	v	-54.2	11.7	1.0	-43.5	-13	-30.5
11933.00	57.0	v	-54.9	12.1	1.0	-43.8	-13	-30.8

Note 1:	