

TEST REPORT

Report Number: 3060564-43-1-0

Project Number: 3060564

June 30, 2004

**Testing performed on the
PCS Band GSM Amplifier
Model Number: PCS120-MCPA
FCCID: HDLUSA-41001-KE-E
to**

**FCC Part 24 Subpart E
RSS-133**

**For
Hitachi Telecom (USA), Inc.**

Test Performed by:

Intertek
1950 Evergreen Blvd, Suite 100
Duluth, GA 30096

Test Authorized by:

Hitachi Telecom (USA), Inc.
3617 Parkway Lane
Norcross, GA 30092

Prepared by



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Reviewed by



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Executive Summary

Testing performed for: Hitachi Telecom (USA), Inc.

Equipment Under Test: PCS120-MCPA, PCS Band GSM Amplifier

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
§2.1046	RF Power Output	Passed	8
§2.1049	Emission Limitation, Occupied Bandwidth	Passed	12
§2.1051 §24.238(a)	Out of Band Emissions at Antenna Terminals	Passed	19
§2.1053	Field Strength of Spurious Radiation	Passed ¹	24
§15.107	Power Line Conducted Emissions	N/A	29
§2.1055, §24.235	Frequency Stability	N/A	29
§2.1091, §2.1093	Specific Absorption Rate	N/S	See Note ²
§15.109	Receiver Spurious Emissions	N/A	29

¹ Modifications required. See Section 1.4 on page 7.

² Specific Absorption Rate testing was not under the scope of this evaluation.

1 JOB DESCRIPTION

1.1 Client information

The PCS Band GSM Amplifier has been tested at the request of

Company: Hitachi Telecom (USA), Inc.
3617 Parkway Lane
Norcross, GA 30092

Name of contact: Ed Holland

Telephone: 770.446.8820

Fax: 770.242.1417

1.2 Test plan reference:

Tests were performed to the following standards:

- FCC Part 24 Subpart E rules for an intentional radiator
- RSS-133 2 GHz Personal Communications Services

1.3 Equipment Under Test (EUT)

Product	PCS Band GSM Amplifier
FCC ID	HDLUSA-41001-KE-E
EUT Model Number	PCS120-MCPA
EUT Serial Number	HK0405004
Whether quantity (>1) production is planned	Quantity production is planned.
Cellular Phone standards	GSM (PCS)
Type(s) of Emission	250KGXW, 250KG7W
RF Output Power	120 Watts
Frequency Range	1930 – 1990 MHz
External input	[] Audio [X] Digital Data

EUT receive date: June 23, 2004

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: June 23, 2004

Test completion date: June 25, 2004

The test results in this report pertain only to the item tested.

The following description of the PCS Band GSM Amplifier was supplied by Hitachi Telecom (USA), Inc.:

EUT is a high-power, high-capacity GSM/PCS digital amplifier for cell tower/communication applications.

1.3.1 System Support Equipment

Table 1-1 contains the details of the support equipment associated with the Equipment Under Test.

Table 1-1: System Support Equipment

Description	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Agilent	E4445A	MY44020478
Power Meter	Agilent	E4418B	GB1340207809
Step Atten 1	Hewlett-Packard	8496B	11716A
Step Atten 2	Hewlett-Packard	8496B	1043482
Signal Generator 1	Agilent	E4438C	MY42080521
Signal Generator 2	Agilent	E4438C	MY42083191
Signal Generator 3	Agilent	E4438C	MY42083194
DC Power Supply 1	Hewlett-Packard	6012B	US35430526
DC Power Supply 2	Hewlett-Packard	6012B	US35430652
Load	Weinshel	53-30-43-LIM	MS739

1.3.2 Cables associated with EUT

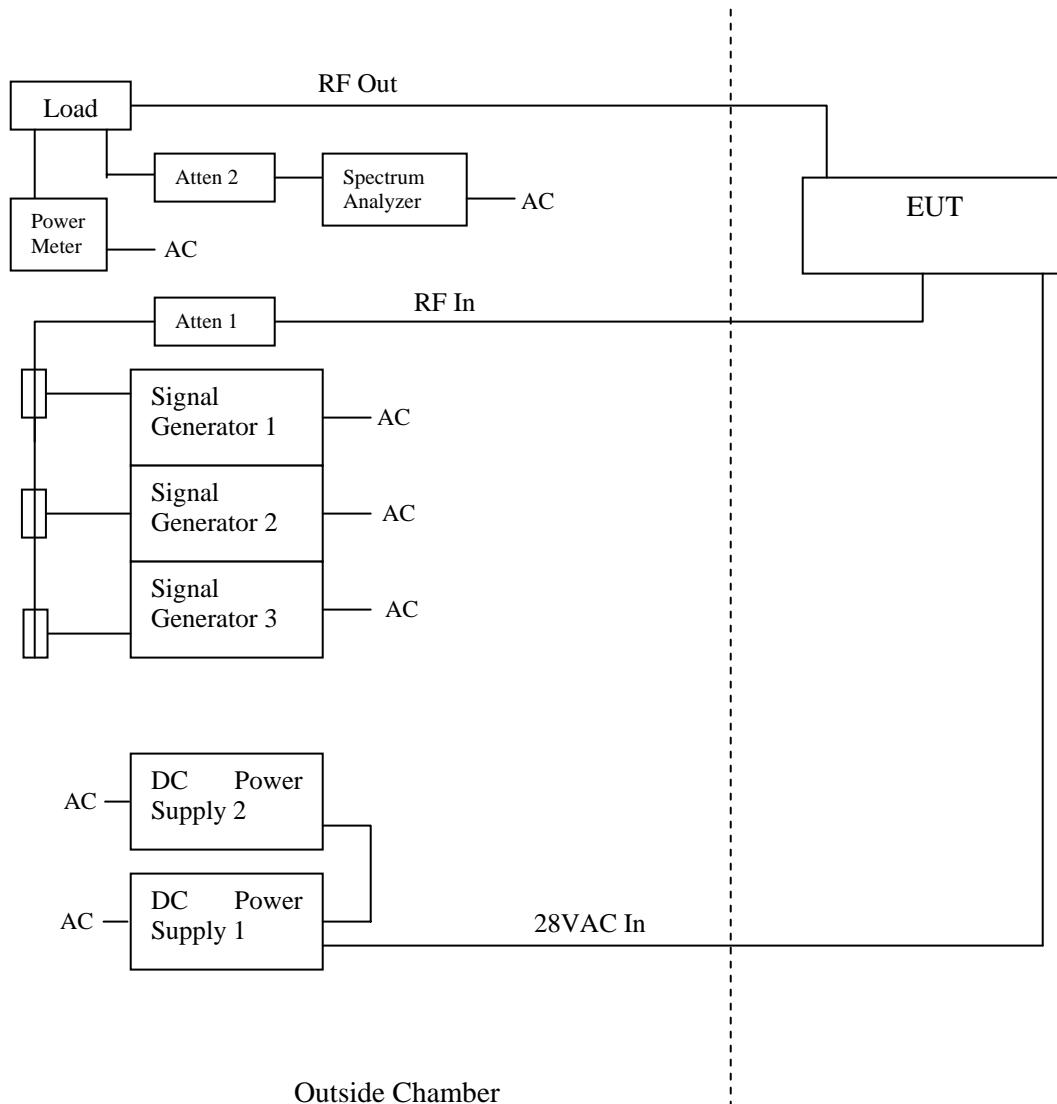
Table 1-2 contains the details of the cables associated with the EUT.

Table 1-2: Interconnecting cables between modules of EUT

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
Power Line	15m	None	None	DC Power Supply	EUT
Coax In	15m	Yes	None	Step Atten	EUT
Coax Out	15m	Yes	None	EUT	Load

1.3.3 System Block Diagram

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



1.3.4 Mode(s) of operation

The EUT was powered from 28VDC.

The EUT was running at maximum power (120 watts), a GSM signal was transmitted to the EUT in hi low and mid channel. Output was terminated into an RF load.

1.4 Modifications required for compliance

The following modifications were implemented to bring the EUT into compliance:

- Made single-point connection between cover and chassis at rear/right corner
- Placed copper screen across the rear radiator opening
- Shielded the output path of the amplifier
- Covered the internal ventilation slots with copper tape

1.5 Related Submittal(s) Grants

There are no known related submittals.

2 TEST FACILITY

The Intertek-Duluth site is located at 1950 Evergreen Blvd., Suite 100, Duluth, Georgia. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of ANSI C63.4: 2003. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

This site is on file with the FCC.

3 RF POWER OUTPUT

CFR 47 §2.1046

3.1 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

Tests were performed at three frequencies (low, middle, and high channels) at the maximum power setting of the amplifier.

The spectrum analyzer bandwidth settings were set to 1 MHz or greater.

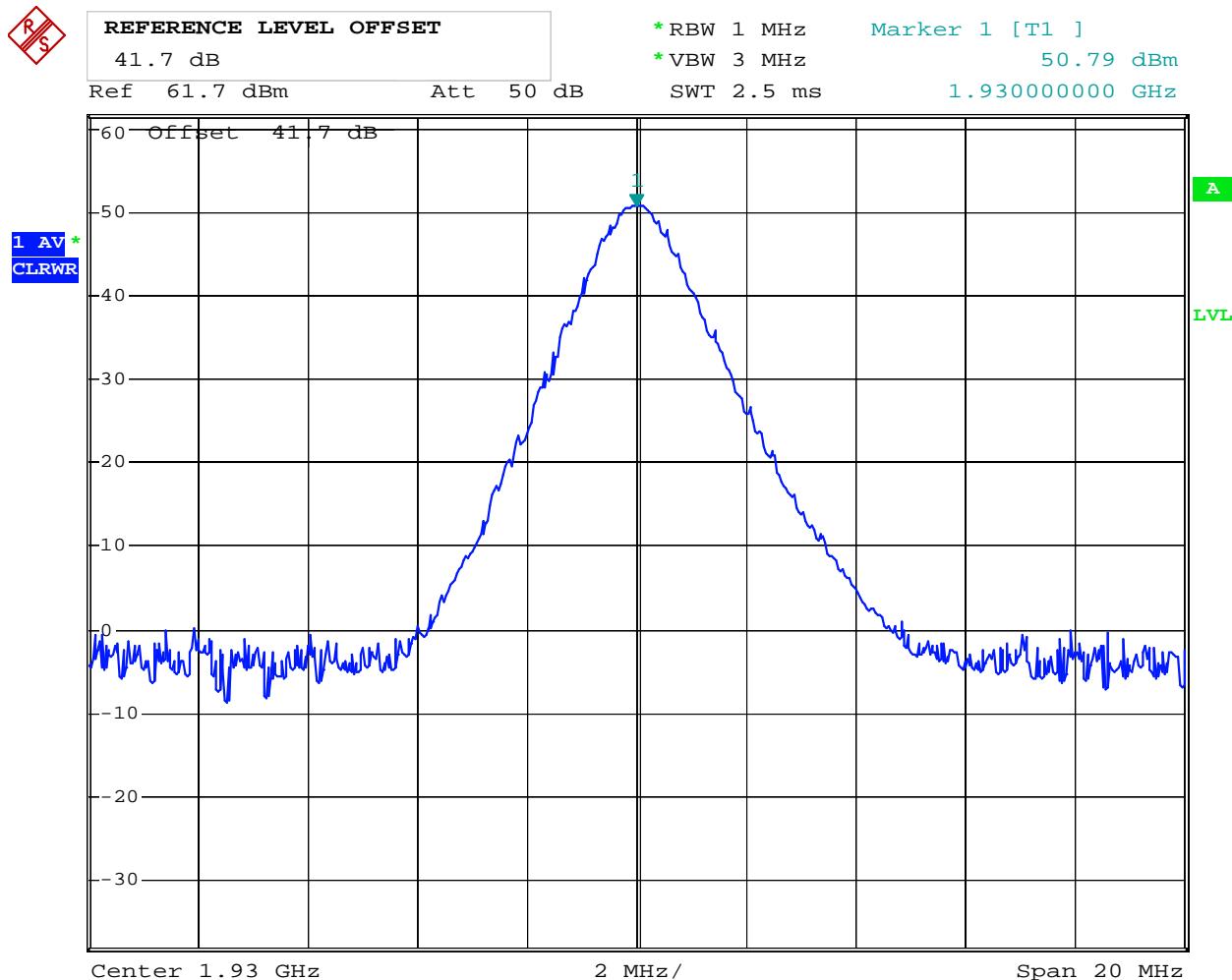
3.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration Due Date
Spectrum Analyzer	Rohde&Schwarz	FSP40	100024	3/18/2005
Attenuator, 10 dB	JFW	50FHAM-010-1000	374476 0411	6/24/2005
Attenuator, 10 dB	Weinschel	47-10-34	BN4815	6/24/2005
Attenuator, 20 dB	Weinschel	2	20001	6/24/2005
Cable	Huber-Suhner	Sucoflex 104PE	24755/4PE	6/22/2005

3.3 Test Results

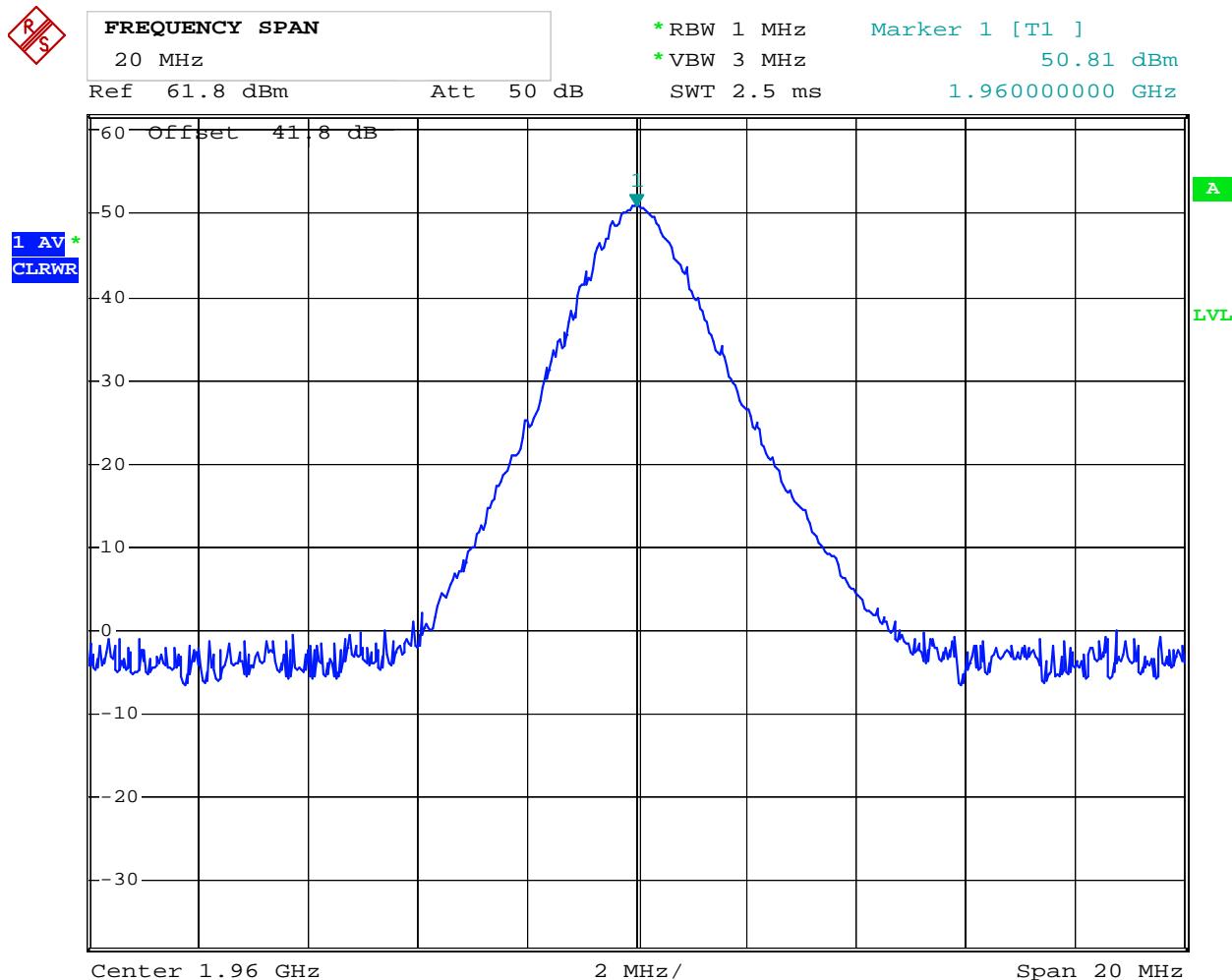
Table 3-1 RF Power Output

EUT Mode	Frequency MHz	Measured Power dBm
GSM PCS	1930	50.79
GSM PCS	1960	50.81
GSM PCS	1990	50.82



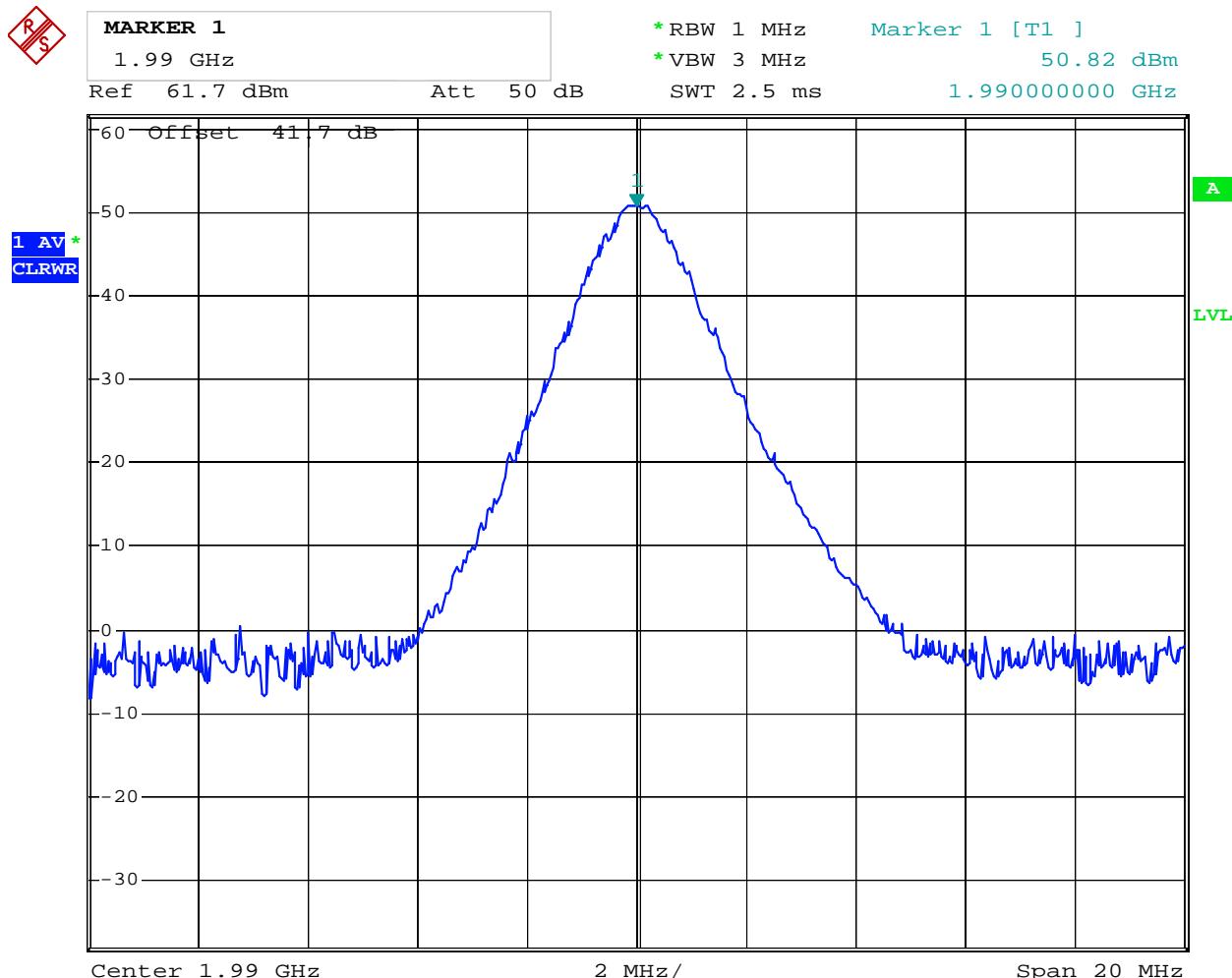
Date: 23.JUN.2004 09:52:58

Figure 3-1: Power measurement at 1930 MHz



Date: 23.JUN.2004 09:50:39

Figure 3-2: Power measurement at 1960 MHz



Date: 23.JUN.2004 09:54:36

Figure 3-3: Power measurement at 1990 MHz

4 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

CFR 47 §2.1049, RSS-133 §5.6

4.1 Test Procedure

The transmitter was connected to a spectrum analyzer. The 99% bandwidth function of the spectrum analyzer was used to measure occupied bandwidth.

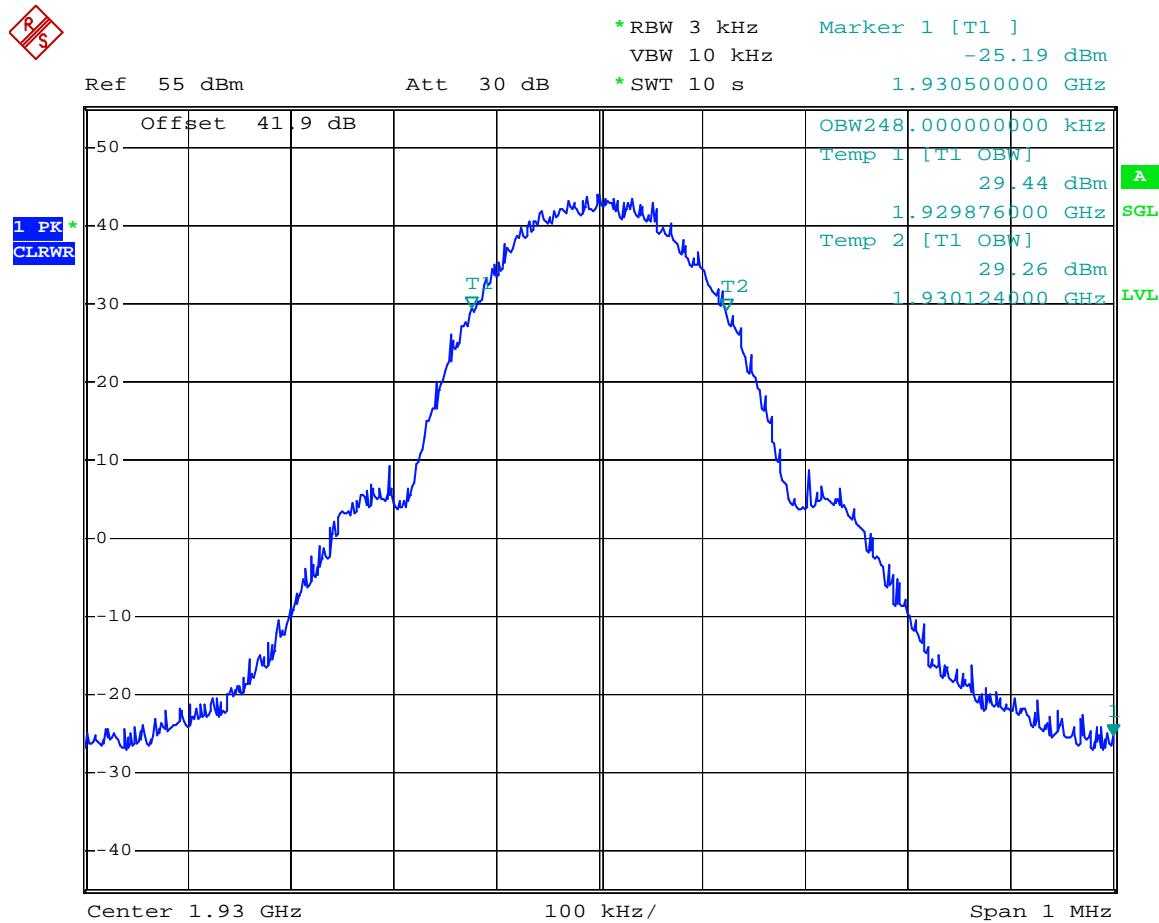
4.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration Due Date
Spectrum Analyzer	Rohde&Schwarz	FSP40	100024	3/18/2005
Attenuator, 10 dB	JFW	50FHAM-010-1000	374476 0411	6/24/2005
Attenuator, 10 dB	Weinschel	47-10-34	BN4815	6/24/2005
Attenuator, 20 dB	Weinschel	2	20001	6/24/2005
Cable	Huber-Suhner	Sucoflex 104PE	24755/4PE	6/22/2005

4.3 Test Results

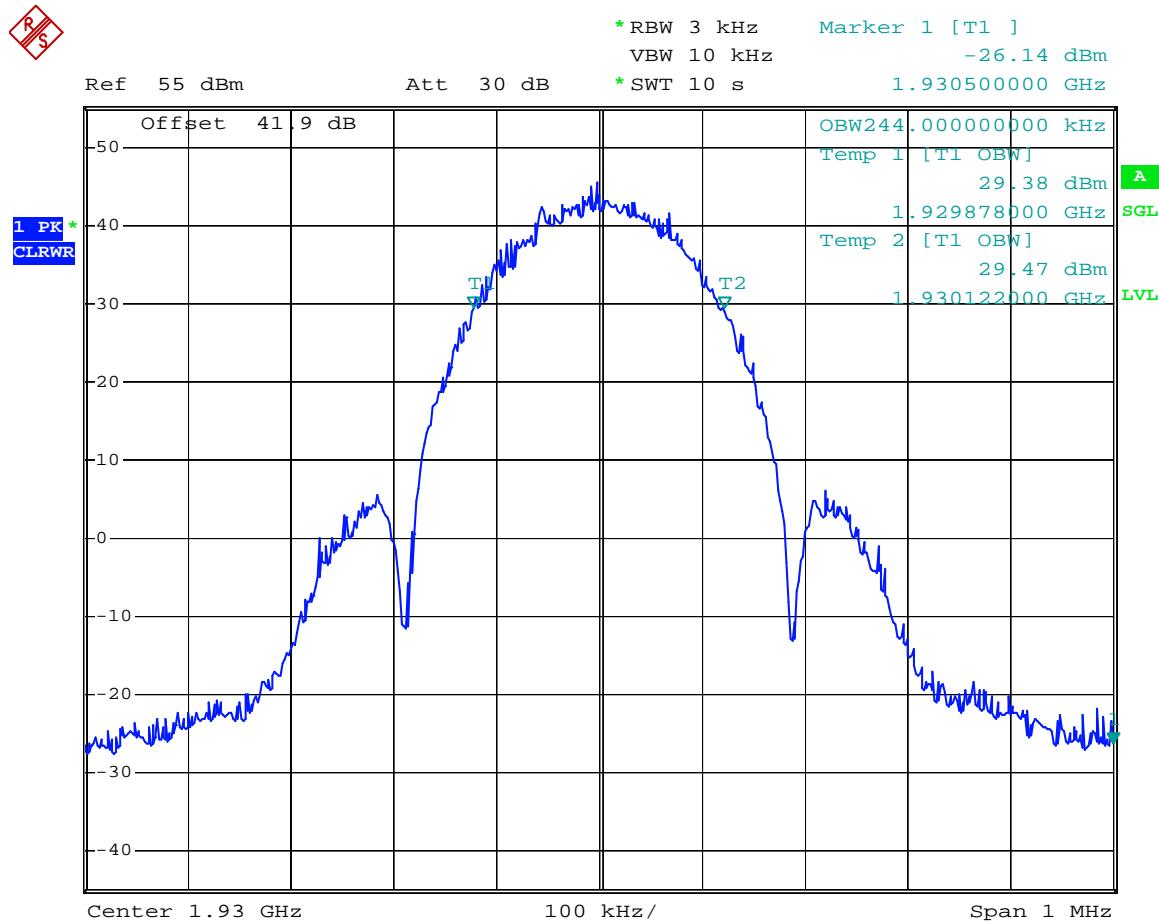
EUT Mode	Frequency MHz	Measured OBW kHz GSM Modulation	Measured OBW kHz Edge Modulation
GSM PCS	1930.00	248	244
GSM PCS	1960.00	248	244
GSM PCS	1990.00	250	244

Figure 4-1: 99% Bandwidth measurement, GSM, 1930MHz



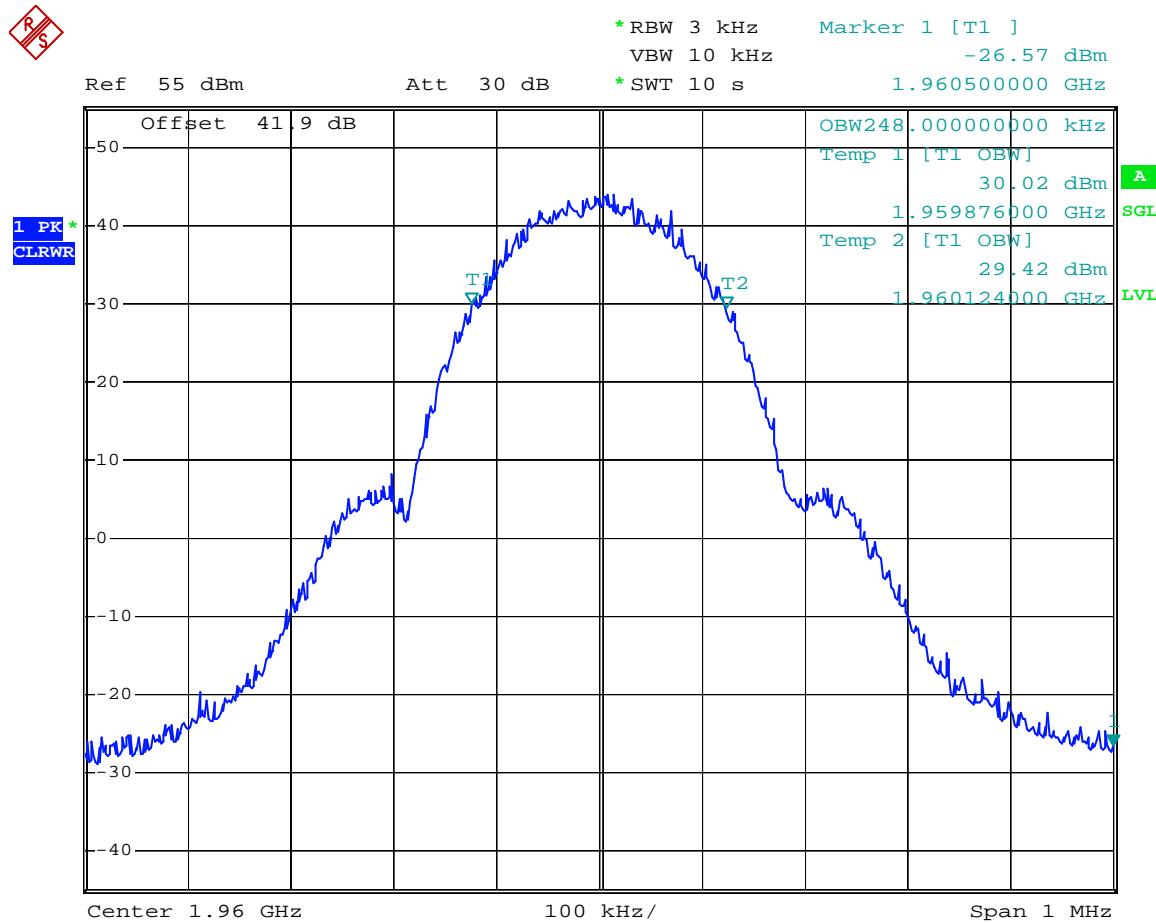
Date: 24.JUN.2004 10:18:45

Figure 4-2: 99% Bandwidth measurement, Edge, 1930MHz



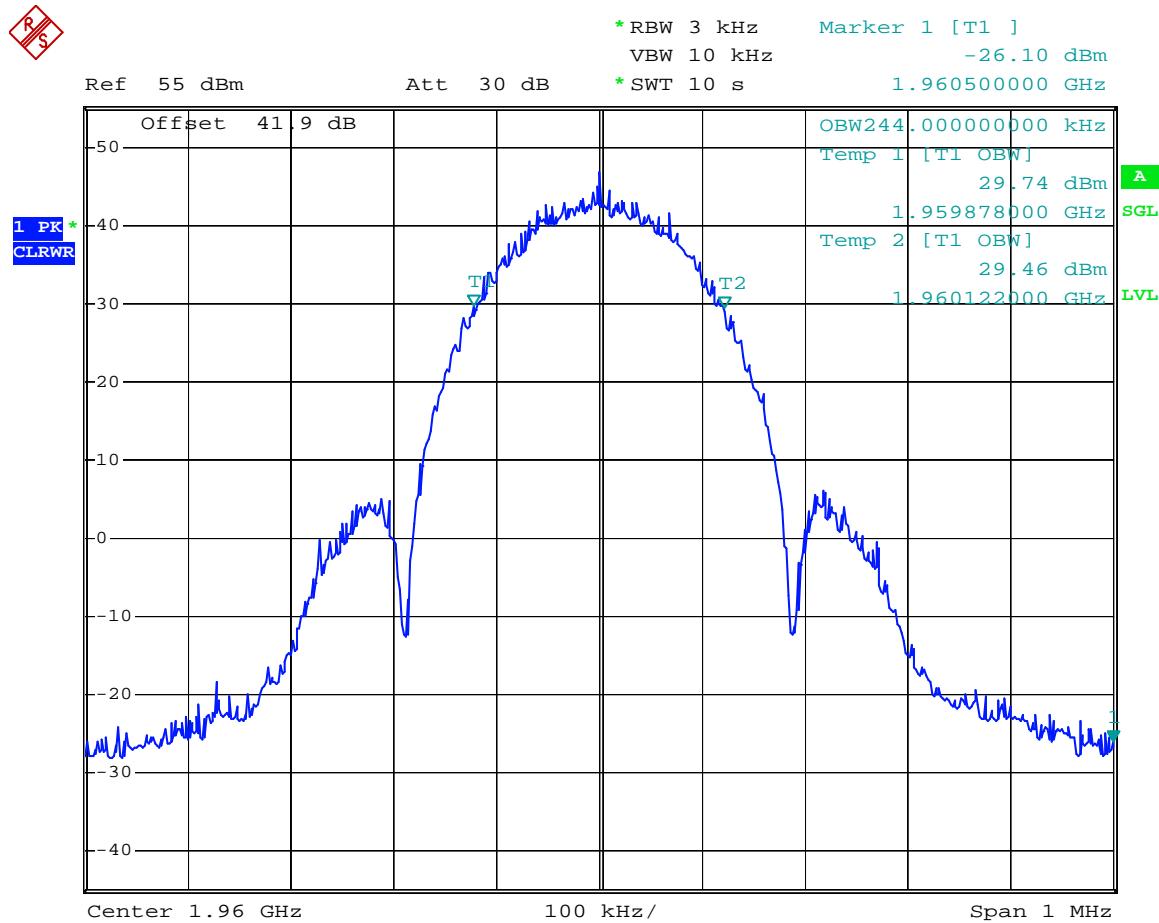
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Figure 4-3: 99% Bandwidth measurement, GSM, 1960MHz



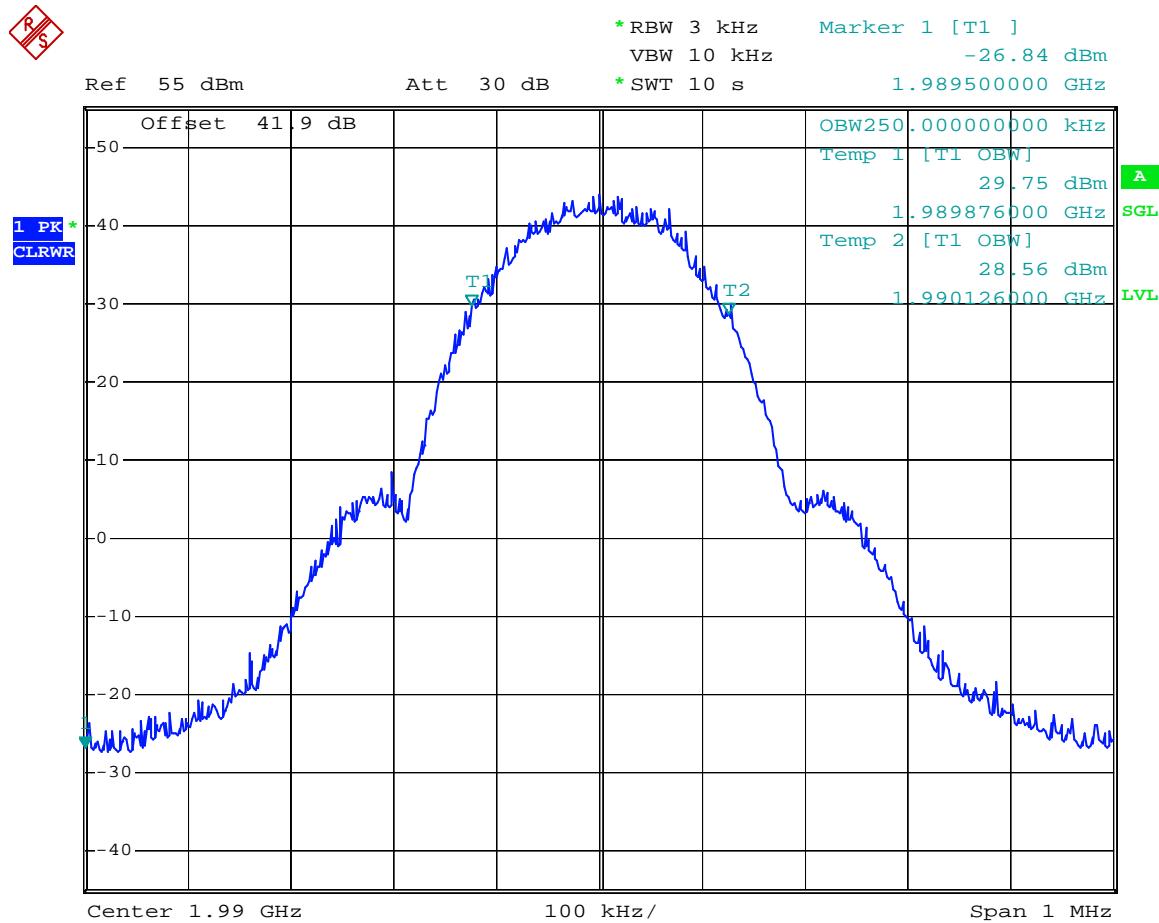
Date: 24.JUN.2004 10:16:46

Figure 4-4: 99% Bandwidth measurement, Edge, 1960MHz



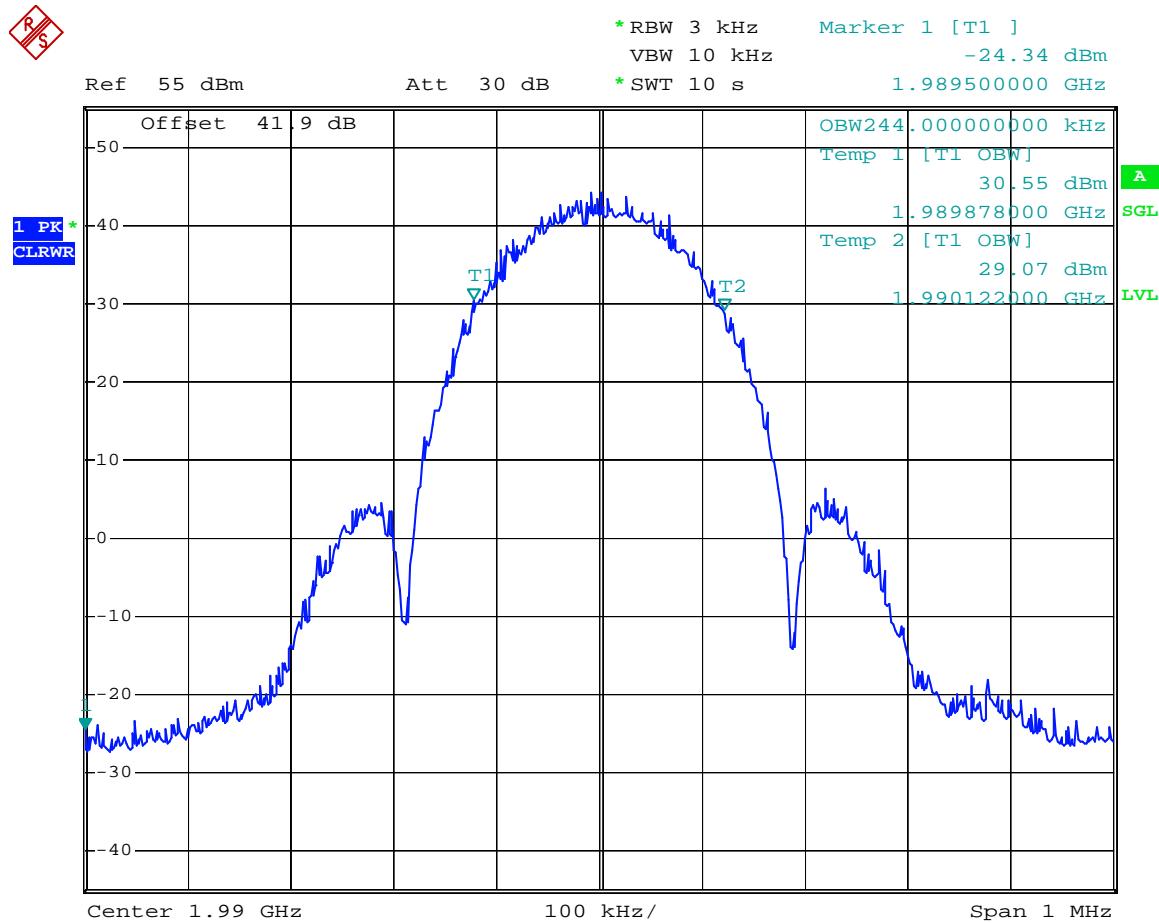
Date: 24.JUN.2004 10:17:19

Figure 4-5: 99% Bandwidth measurement, GSM, 1990MHz



Date: 24.JUN.2004 10:16:01

Figure 4-6: 99% Bandwidth measurement, Edge, 1990MHz



Date: 24.JUN.2004 10:15:21

5 OUT OF BAND EMISSION AT ANTENNA TERMINALS

CFR 47 §2.1047, 24.238(a)

Out of Band Emissions: The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least $43 + 10 \log P$ dB.

5.1 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 1 MHz. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

If the transceiver can transmit simultaneously on multiple channels, an intermodulation test must also be performed. Two carriers are brought up at maximum power at the low end of the band and one is brought up at the maximum power at the high end of the band. Sweeps were taken to show there are no intermodulation products outside the band. Scans were run at both 1 MHz RBW and at 100 kHz RBW.

5.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration Due Date
Spectrum Analyzer	Rohde&Schwarz	FSP40	100024	3/18/2005
Attenuator, 10 dB	JFW	50FHAM-010-1000	374476 0411	6/24/2005
Attenuator, 10 dB	Weinschel	47-10-34	BN4815	6/24/2005
Attenuator, 20 dB	Weinschel	2	20001	6/24/2005
Cable	Huber-Suhner	Sucoflex 104PE	24755/4PE	6/22/2005
Low pass filter	Mini-circuits	NLP-800	9331 12	6/22/2005
Filtek	HP12/3000-5AB	15B57-01	8/21/2004	Filtek

5.3 Test Results

Figure 5-1: Out of band emissions at antenna terminals, 1930 MHz

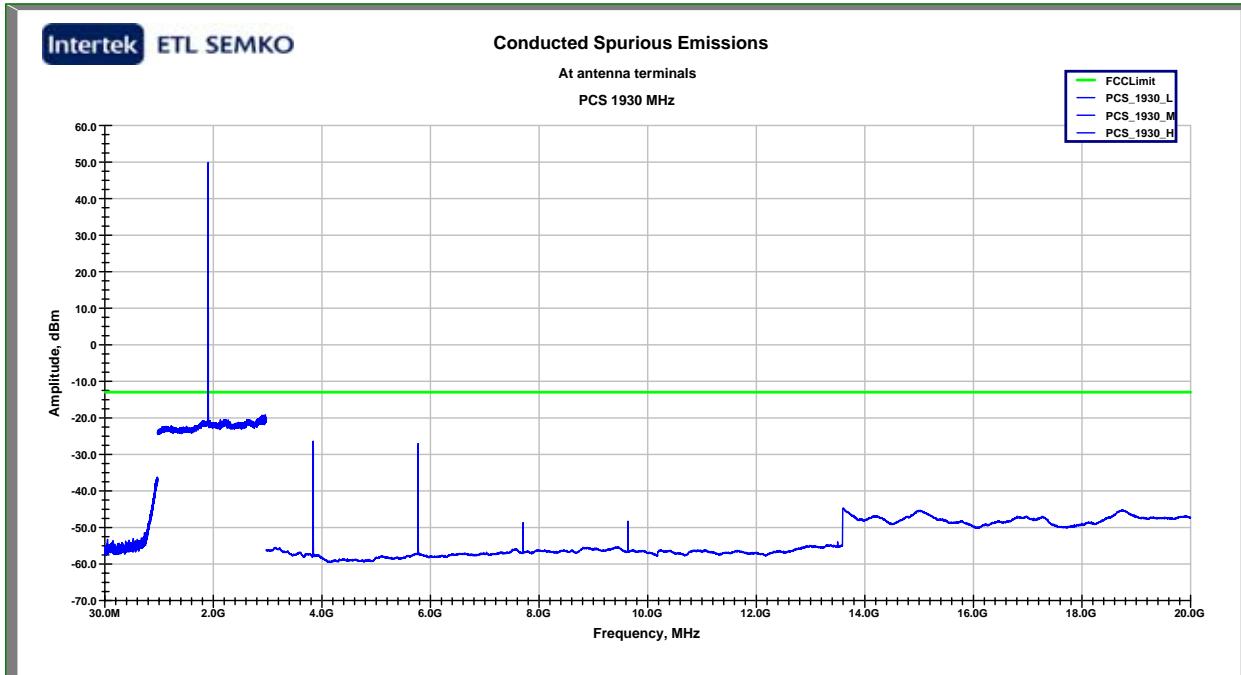


Figure 5-2: Out of band emissions at antenna terminals, 1960 MHz

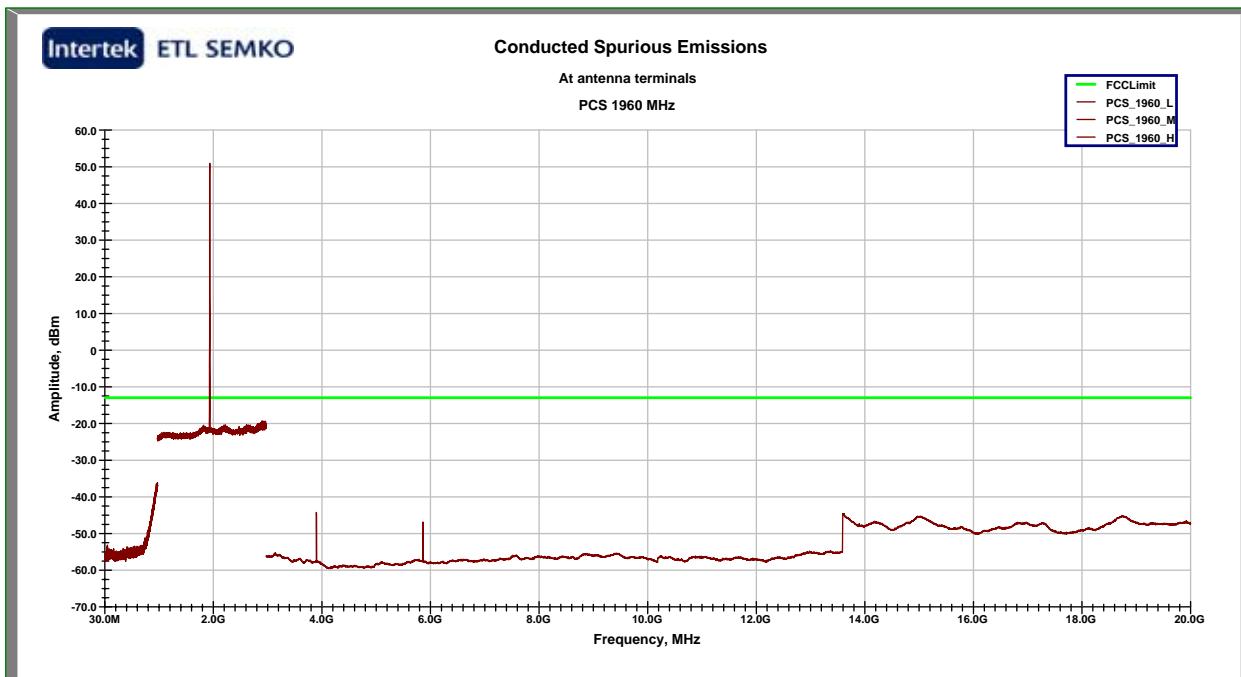


Figure 5-3: Out of band emissions at antenna terminals, 1990

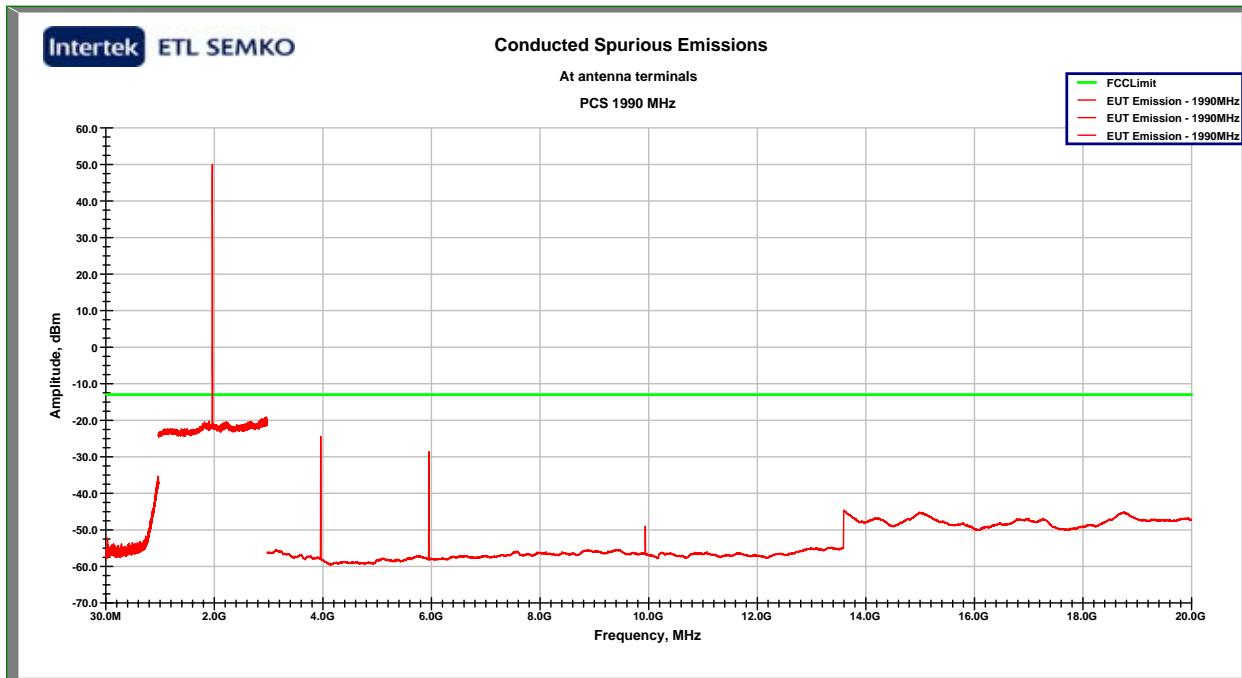
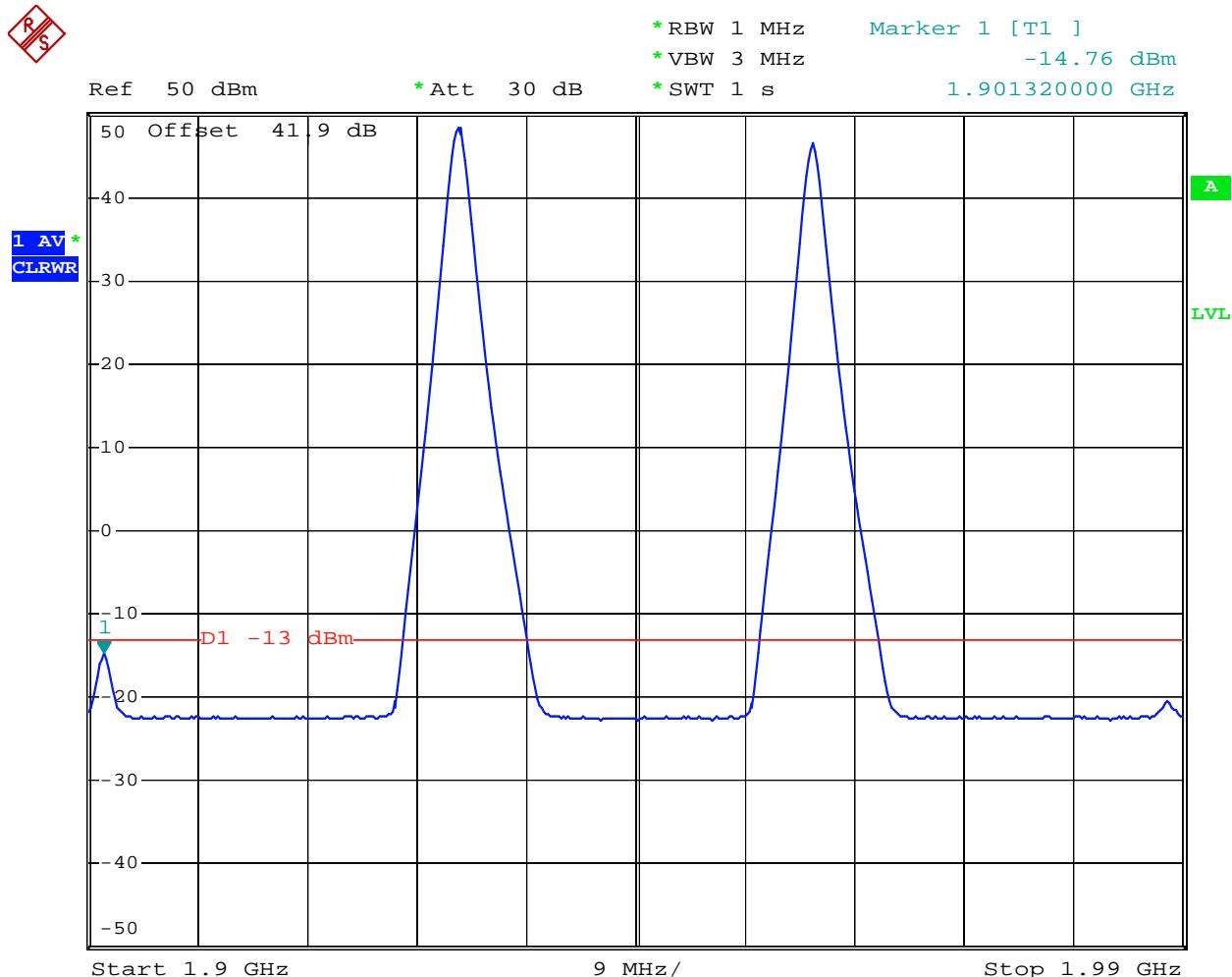


Figure 5-4: Intermodulation products, 1MHz RBW

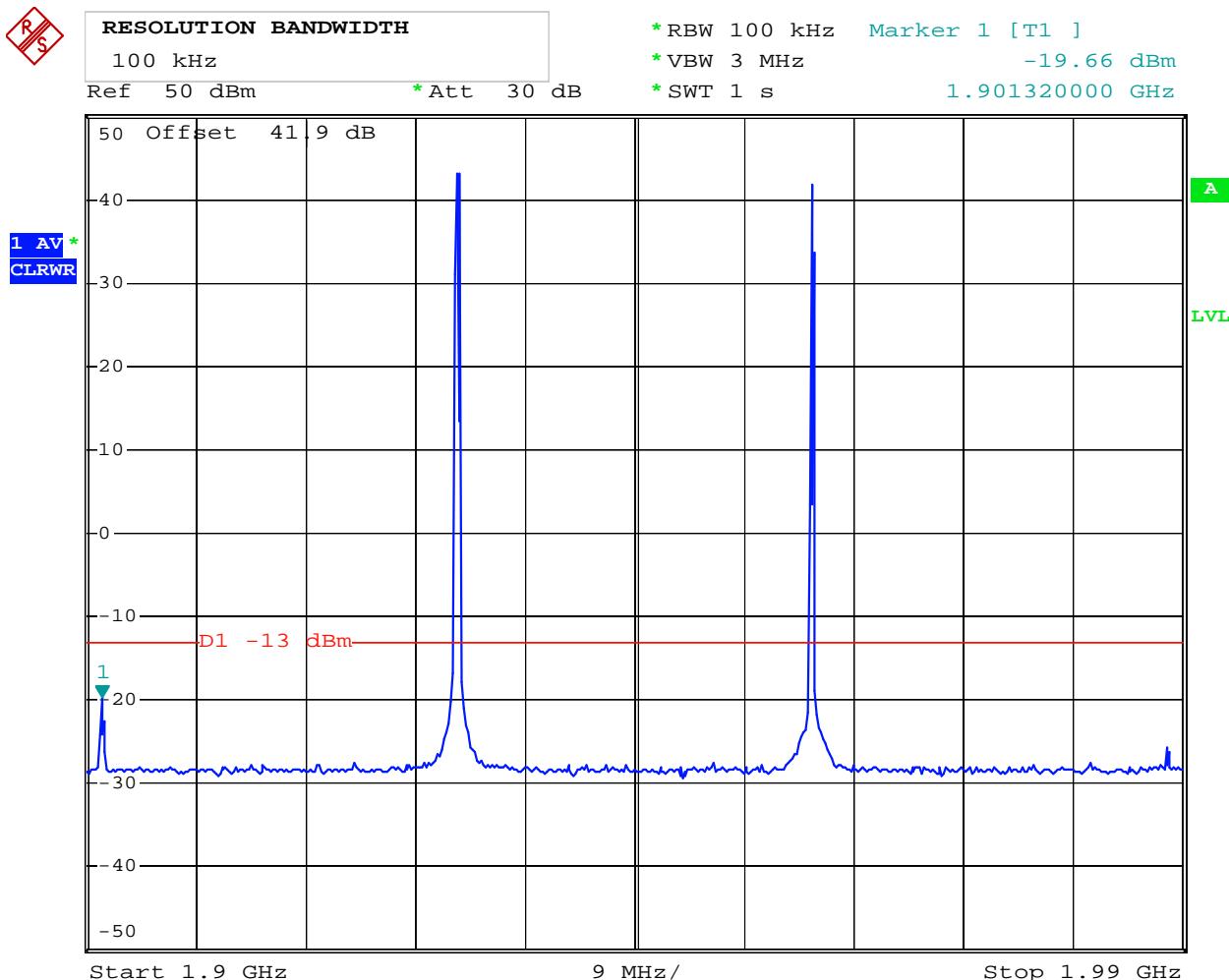
CW Signals – 2 carriers at low end (1930.4 and 1930.8 MHz) and one carrier at high end (1959.6MHz).



Date: 24.JUN.2004 11:54:57

Figure 5-5: Intermodulation products

CW Signals – 2 carriers at low end (1930.4 and 1930.8 MHz) and one carrier at high end (1959.6MHz).



Date: 24.JUN.2004 11:55:52

6 FIELD STRENGTH OF SPURIOUS RADIATION

CFR 47 §2.1053

6.1 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The EUT set to operate at maximum power; was connected through a certified amplifier; and was terminated into a non-radiating coaxial load.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels). Once spurious emissions were identified and within 20 dB of the limit, the power of the emission was determined using the substitution method.

6.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration Due Date
Spectrum Analyzer	Rohde&Schwarz	FSP40	100024	3/18/2005
EMI Receiver	HP	8546A	3410A00173	4/12/2005
EMI Receiver, Preselector section	HP	85460A	3348A00203	4/12/2005
Antenna	Chase	CBL6112B	2622	8/19/2004
Antenna	EMCO	3115	9208-3919	3/8/2005
Antenna	AH Systems	SAS-200/571	246	2/4/2005
Antenna	EMCO	3116	9310-2222	3/10/2005
Preamplifier	Miteq	JS4-00102600-29- 7P	793880	8/19/2004
Preamplifier	HP	8449B	3008A00989	4/19/2005
Cable	Megaphase	TM18 NKNK 394	MP3	5/25/2005
Cable	Pasternack	RG214/U	E01	6/22/2005
Cable	Huber-Suhner	Sucoflex 104PE	24326/4PE	6/22/2005
Cable	Huber-Suhner	Sucoflex 104PE	24755/4PE	6/22/2005
Cable	Huber-Suhner	Sucoflex 104PEA	0582/4PEA	6/22/2005
Cable	Megaphase	TM40 K1K1 80	E404	5/25/2005
High Pass Filter	Filtek	HP12/3000-5AB	15B57-01	8/21/2004

6.3 Test Results

Table 6-1: Radiated spurious emissions data

Company: **Hitachi Telecom (USA)**
 Model: **PCS120-MCPA**
 Project Number: **3060564**
 Date: 06/25/04

Tested by: MVS
 Location: Duluth

1900 MHz band TX Antenna: AH SYS

TX Frequency MHz	Ant. Pol. (V/H)	Frequency MHz	EUT Reading dBuV S1	Reading from Subs Antenna S2	Sig Gen Level dBm SG	Path Loss dB SG-S2	Antenna Gain dBi Horn only	Radiated Power dBm EIRP	Limit dBm EIRP	Margin dB
1930	V	3860.000	65.3	-18.6	-4.1	14.6	11.0	-16.1	-13.0	-3.1
1930	H	3860.000	64.5	-16.6	-4.1	12.5	11.0	-19.0	-13.0	-6.0
1930	V	5790.000	40.3	-21.0	-5.9	15.2	12.0	-39.5	-13.0	-26.5
1930	H	5790.000	36.8	-22.0	-5.9	16.1	12.2	-41.9	-13.0	-28.9
1960	V	3920.000	69.7	-16.2	-4.7	11.5	10.6	-15.2	-13.0	-2.2
1960	H	3920.000	68.9	-17.2	-4.7	12.5	10.6	-15.0	-13.0	-2.0
1960	V	5880.000	43.4	-22.2	-6.2	15.9	12.2	-35.5	-13.0	-22.5
1960	H	5880.000	45.8	-23.3	-6.2	17.1	12.2	-31.9	-13.0	-18.9
1990	V	3980.000	69.1	-16.4	-4.2	12.1	10.6	-15.2	-13.0	-2.2
1990	H	3980.000	67.9	-17.2	-4.2	13.0	10.6	-15.6	-13.0	-2.6
1990	V	5970.000	39.7	-23.4	-6.9	16.6	11.8	-38.9	-13.0	-25.9
1990	H	5970.000	42.0	-24.5	-6.9	17.7	11.6	-35.8	-13.0	-22.8

Figure 6-1: Field strength of spurious radiation, Indoor Enclosure, 1930 MHz

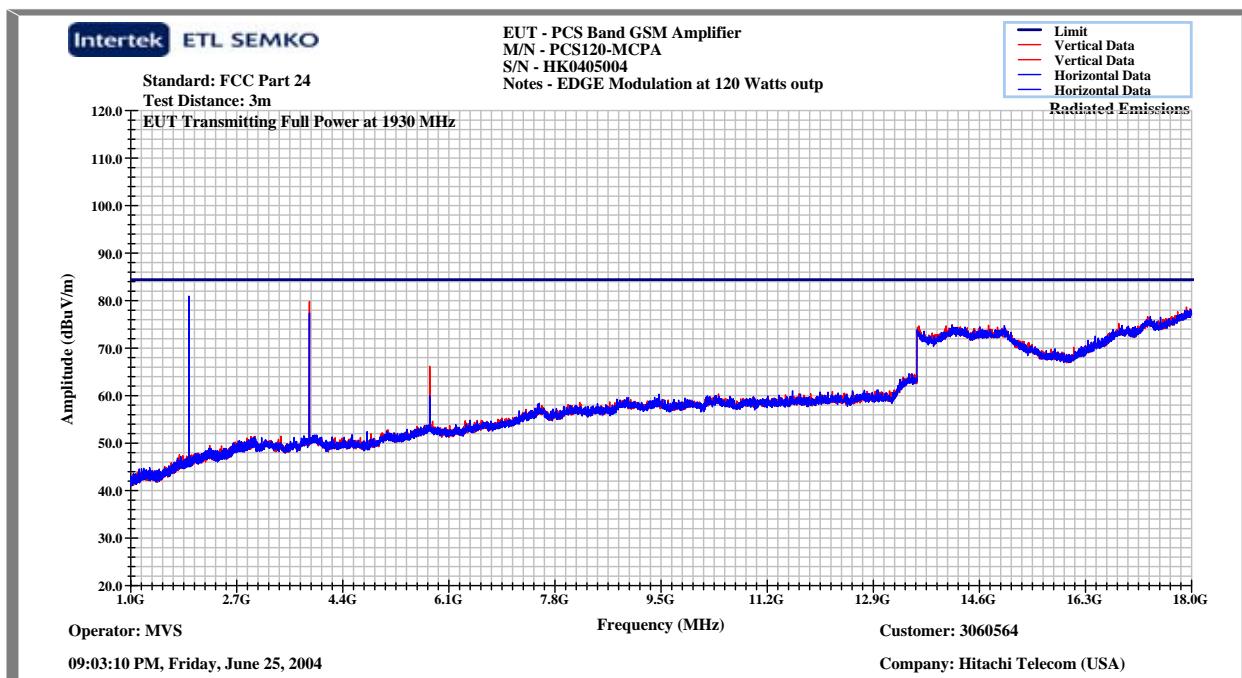
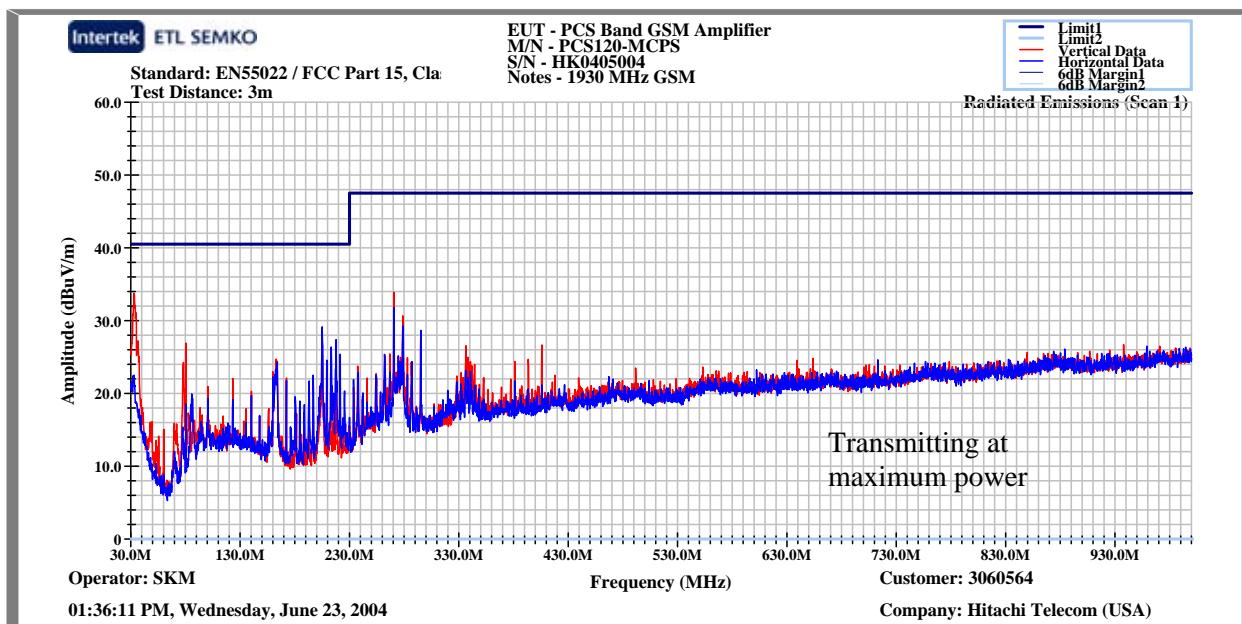


Figure 6-2: Field strength of spurious radiation, Indoor Enclosure, 1960 MHz

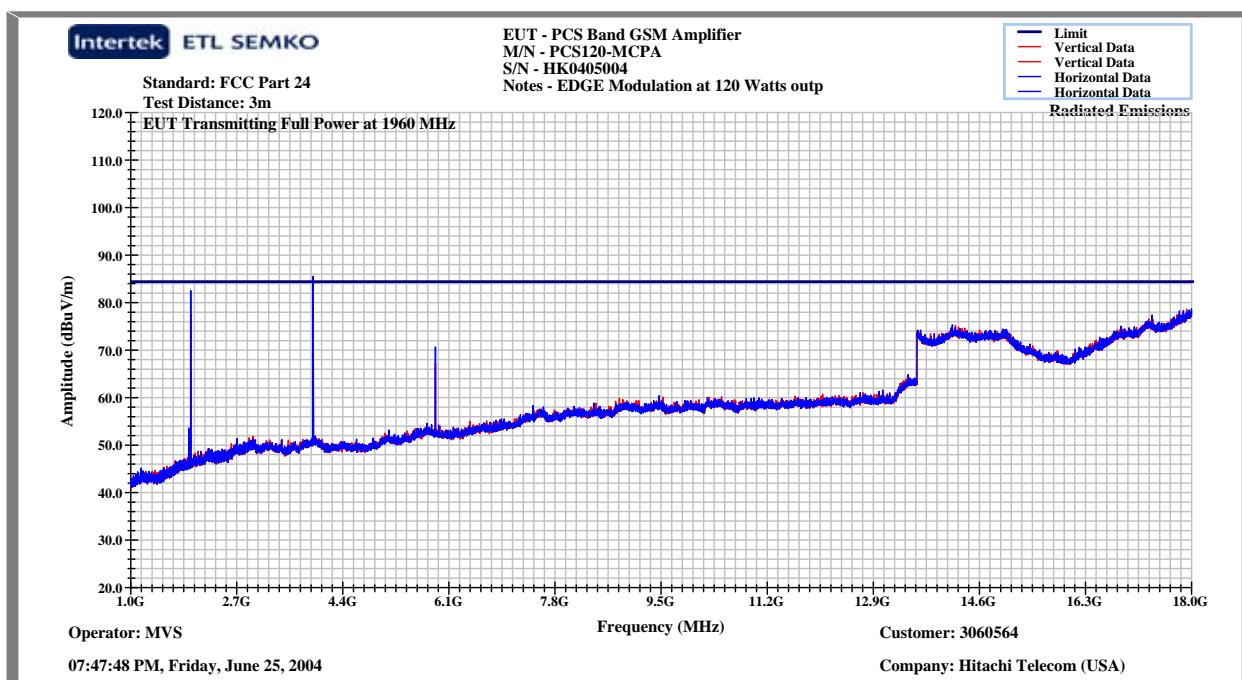
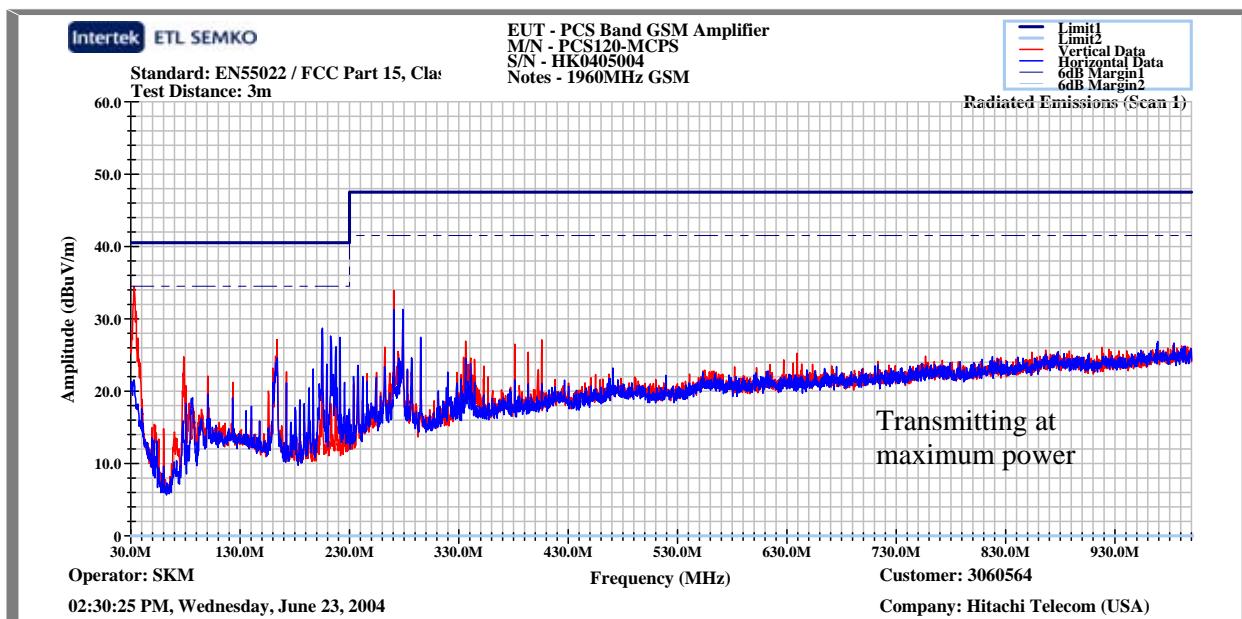
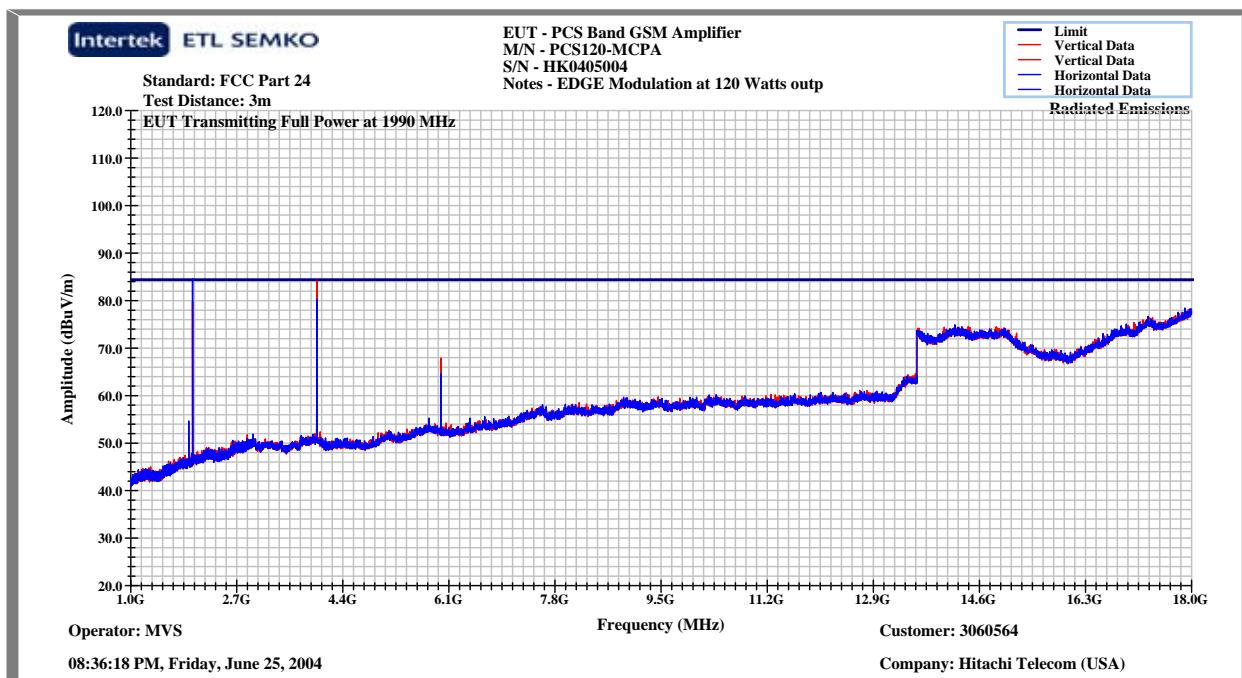
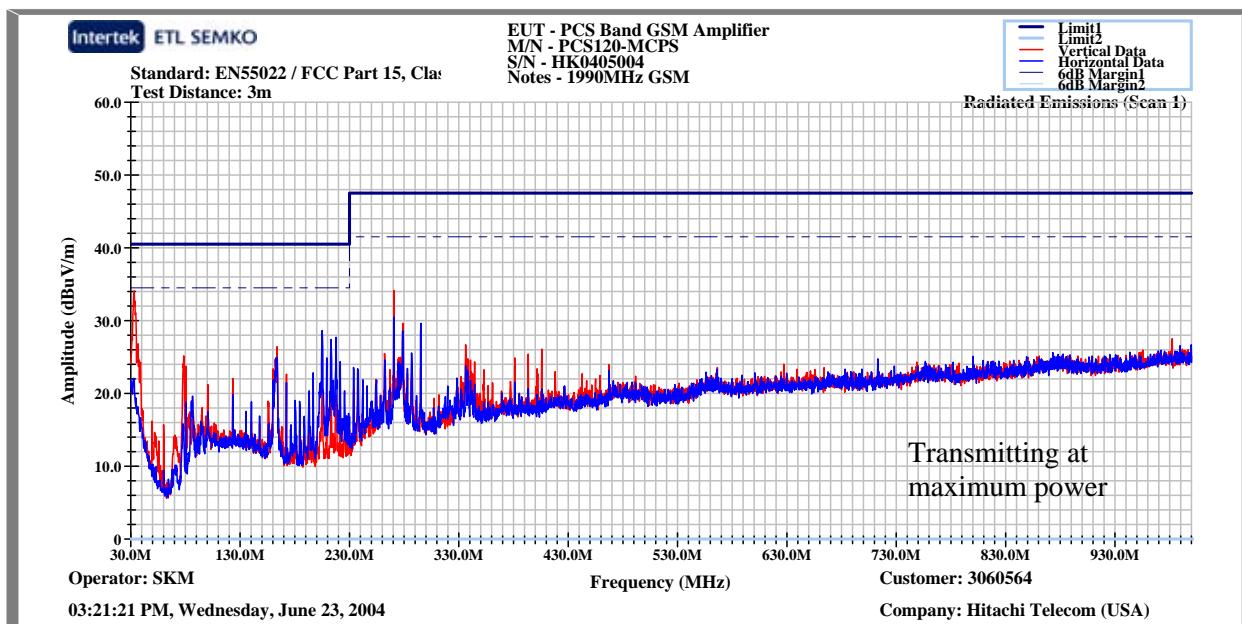


Figure 6-3: Field strength of spurious radiation, Indoor Enclosure, 1990 MHz



7 POWER LINE CONDUCTED EMISSIONS

CFR 47 §15.207

This test was not applicable because the EUT was DC powered

8 FREQUENCY STABILITY

CFR 47 §2.1055

This test was not applicable because the EUT is an amplifier and does not source transmissions.

9 RECEIVER SPURIOUS EMISSIONS

CFR 47 §15.109

This test was not applicable because the EUT is an amplifier and does not contain a receiver.

10 REVISION HISTORY

Revision Level	Date	Report Number	Notes
0	June 30, 2004	3060564-43-1-0	Original issue