Uppgjord - *Prepared*	Kontr. - *Checked* (Sign)	Datum - *Date*	Rev
Fredrik Hedlund		2003-07-07	TSR-10349-B
Godkänd - *Approved* Martin Lundhagen	Datum/Sign - *Date/Sign*	Tillhör referens - *File / reference*	

FCC Test Report
FCC CFR 47 PART 2 (24)

TMB 1900
LGP011nn

1 Scope

This document present the test results from the FCC certification tests performed on LGP011nn. The “nn” in the type designation denotes a number between 01-99

All tests were performed according to ref. [2] & [3].

1.1 Test Object:

Unit	Frequency range	Product number	Serial number
TMB 1900	1850-1910 / 1930–1990	LGP01101	01101X1A1A03110247

FCC ID.:MKALGP011-nn

2 Summary

The unit passed all performed tests, see table below for details.

CFR 47, Part 24	Compliant	Chapter reference	Remark
RF Output Power	Yes	9.1 & 9.2	
Occupied Bandwidth	Yes	9.3 & 9.4	
Conducted Spurious Emission	Yes	9.7 & 9.8	
Radiated Spurious emission	Yes	See ref [1][1]	Test performed by SP[1]
Two Tone Intermodulation tests	N/A	7.4	

[1] SP – Swedish National Testing & Research Institute

3 Document history

Revision	Comment	author / date
PA1	First issue	FH / 20030404
B	Header updated	MHY/2003-07-07

4 References

[1] Application for Certification: Tower Mounted Booster Draft F24

[2] FCC Code of Federal Regulations (CFR) 47 Telecommunications Part 2

[3] FCC Code of Federal Regulations (CFR) 47 Telecommunications Part 24

5 Test Instruments

Type	Manufacturer	Model	LGP id	Cal due
Power meter	Agilent	E4418B	789	July 2003
Power meter sensor	HP	HP8482B	801	July 2003
30 dB Attenuator Assy	HP	HP8482B	802	July 2003
Spectrum Analyser	HP	HP8593E	038	Sept 2003
Spectrum Analyser	Agilent	E4402B	1416	July 2003
Signal generator	Agilent	E4432B	1383	May 2003
Signal generator	Agilent	E4421B	790	Oct 2003
VSA Transmitter Tester	Agilent	E4406A	1115	Oct 2003
RF Amplifier	Ophir	4003F	950	-
RF Amplifier	MA-Ltd	AM43-1.8-2-40-47	242	-
Load100W, 20 dB 50Ohm Spinner		BN-745357	-	-

6 Description of Test Object

FCC ID.: MKALGP011-nn

The TMB is to be mounted close to the antennas, in order to increase the output power from a BS, and to reduce influence from losses in feeder cables. Alternatively the TMB can be mounted at the bottom of the tower, in order to minimize the feeder losses influence on the up-link, a TMA can be mounted at the top of the tower.

This product can be used as a booster product for all types of Base Stations, either as a “cable compensator” on a macro BS or as a “power enhancer” for a micro/pico BTS.

The TMB is suitable for a BS belonging to the ETSI class normal BS, M1, M2, M3 and P1.

The TMB is designed for the following modulation techniques:
GMSK (GSM) and 8-PSK (EDGE) modulation.

The TMB are designed for co-siting and co-location with GSM (GMSK)850.

The TMB is a linear amplifier and contains no mixers or local oscillators. Hence it acts as a transparent loss inverter or loss compensator.

6.1 Downlink

Frequency	1930 -1990 MHz
Number of carriers	The TMB is designed to handle two single carriers, hence only one TX carrier in each Power Amplifier.
Input power	+28 dBm to +38 dBm
Max output power	43 dBm ± 1 dB
Nominal Gain	The gain is defined between the BTS and ANT port. The gain is variable in 1 dB steps, from 5 to 15 dB.

6.2 Uplink

Frequency	1850-1910 MHz
Nominal Gain	The gain is defined between the ANT and BTS port. The gain is variable in 1 dB steps, from 0 to 12 dB.

6.3 Power Supply

The TMB can be supplied with either 115/230VAC or 48VDC.

AC Supply voltage requirements:

Input voltage: 85 to 265VAC or 115 VAC ± 15%

Frequency: 47 - 63 Hz

Power consumption: 115/230 V/AC: max 375W
(at 2 times 43 dBm)

Power consumption max 150W
(without RF input signal)

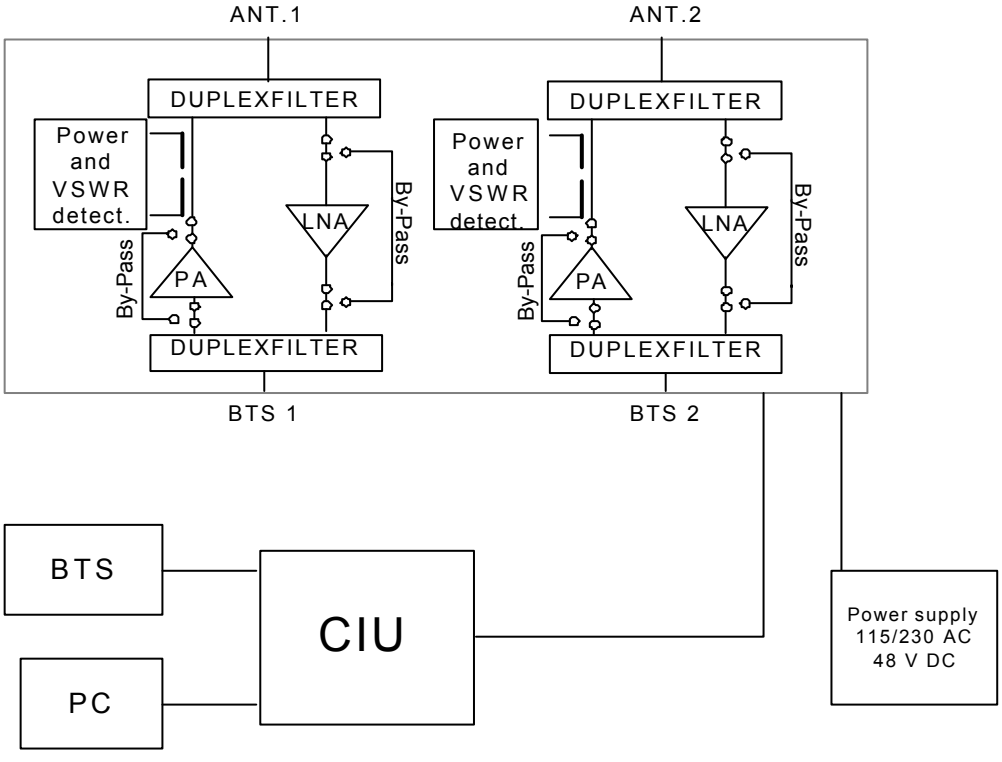
DC Power supply 48 VDC

Input voltage: 36-72 V DC input.

Inputs have no potentials with respect GND.

Power consumption: 115/230 V/AC: max 350W
(at 2 times 43 dBm)

Power consumption: max 140W
(without RF input signal)



7 TESTS

7.1 RF POWER OUTPUT

Test procedure

A modulated (all timeslot activated with PN23 data) signal were applied applicable BTS port.

Modulation: GSM (GMSK)

Output power were set to +43 dBm at applicable Ant port

The output power was measured with a transmitter tester.

Used test set 1

Results :

See appendix A / RF power output

7.2 Occupied bandwidth

Test procedure

A modulated (all timeslot activated with PN23 data) signal were applied applicable BTS port.

Modulation: GSM (GMSK) & EDGE

Output power were set to +43 dBm at applicable Ant port.

The occupied bandwidth was measured with a spectrum analyser.

The occupied bandwidth made from the Signal generator itself was measured to use as a comparison for possible spectral re growth.

Used test set 3

Results:

See appendix A / Occupied bandwidth

7.3 Spurious Emission at Ant ports / Spurious at band edge

Test procedure

A CW signal (1960 MHz) were applied at applicable BTS port

Output power was set to +43 dBm at both Ant port.

The Spurious emission were measured at applicable Ant port between 10kHz to 19900MHz

Spurious at band edge was measured with a spectrum analyser at Ch 513 (B) & Ch 809 (T) at applicable ANT port.

Results :

See appendix A / Spurious Emission at ANT ports / Spurious at band edge

Used test set up 3

Note

The TMB has fixed gain between 1930 -1990 MHz (see chapter 10 for gain plot) therefore spurious at band edge measurements were only performed at Ch 513 (B+1) i.e.1930.4 MHz and Ch 809 (T-1) i.e. 1989.6 MHz. The TMB improves spurious emission performance at band edge. Therefore it is only dependent on the RF signal source if requirements are met at Ch 512 (B) i.e.1930.2 MHz and Ch 810 (T) i.e. 1989.8 MHz.

7.4 Intermodulation characteristics

This test is not applicable for the test object since it is not designed for more than one single carrier through the RF power amplifier.

8 Test Set Ups

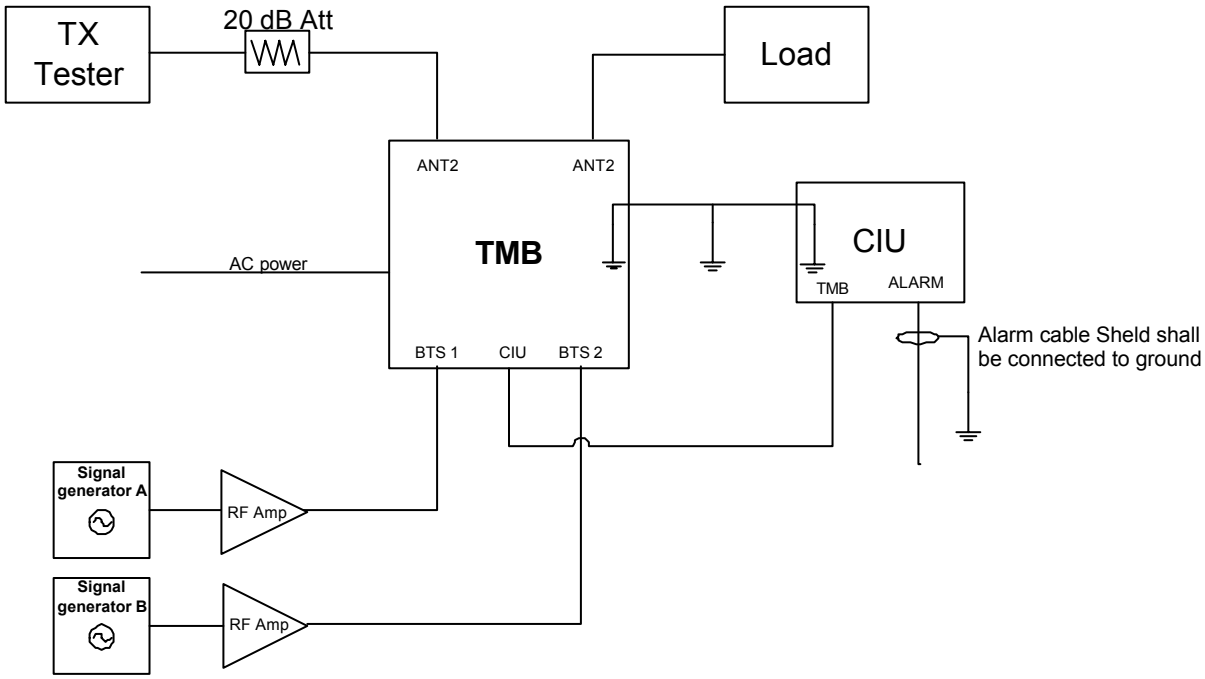


Figure 1: Test Set-up 1

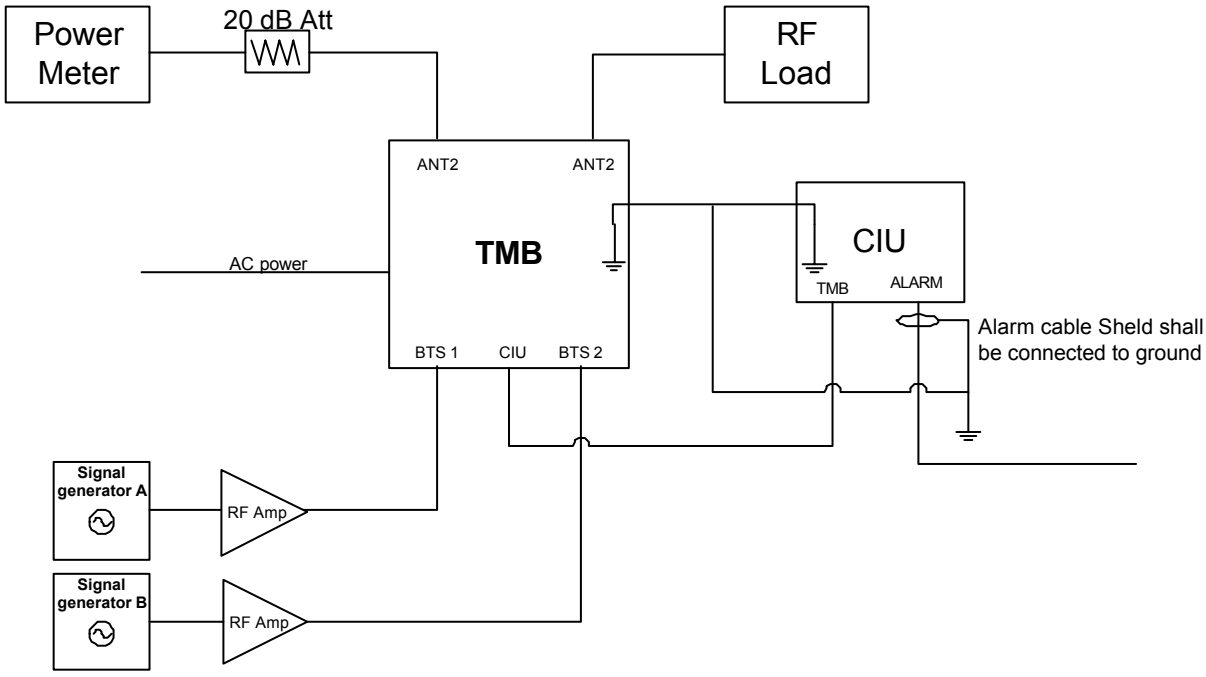


Figure 2: RF Calibration

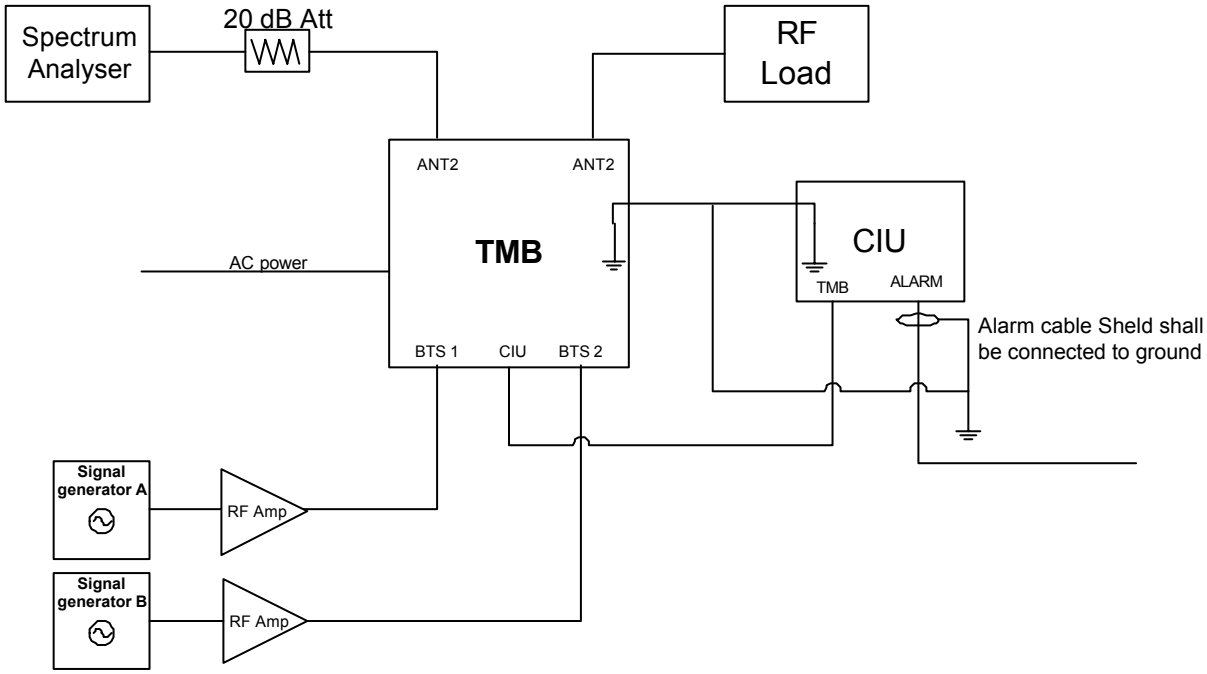


Figure 3: Test Set up 3

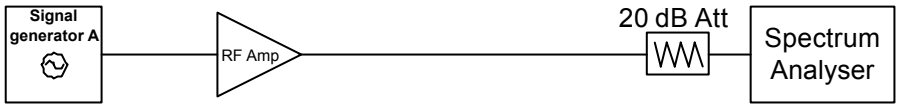
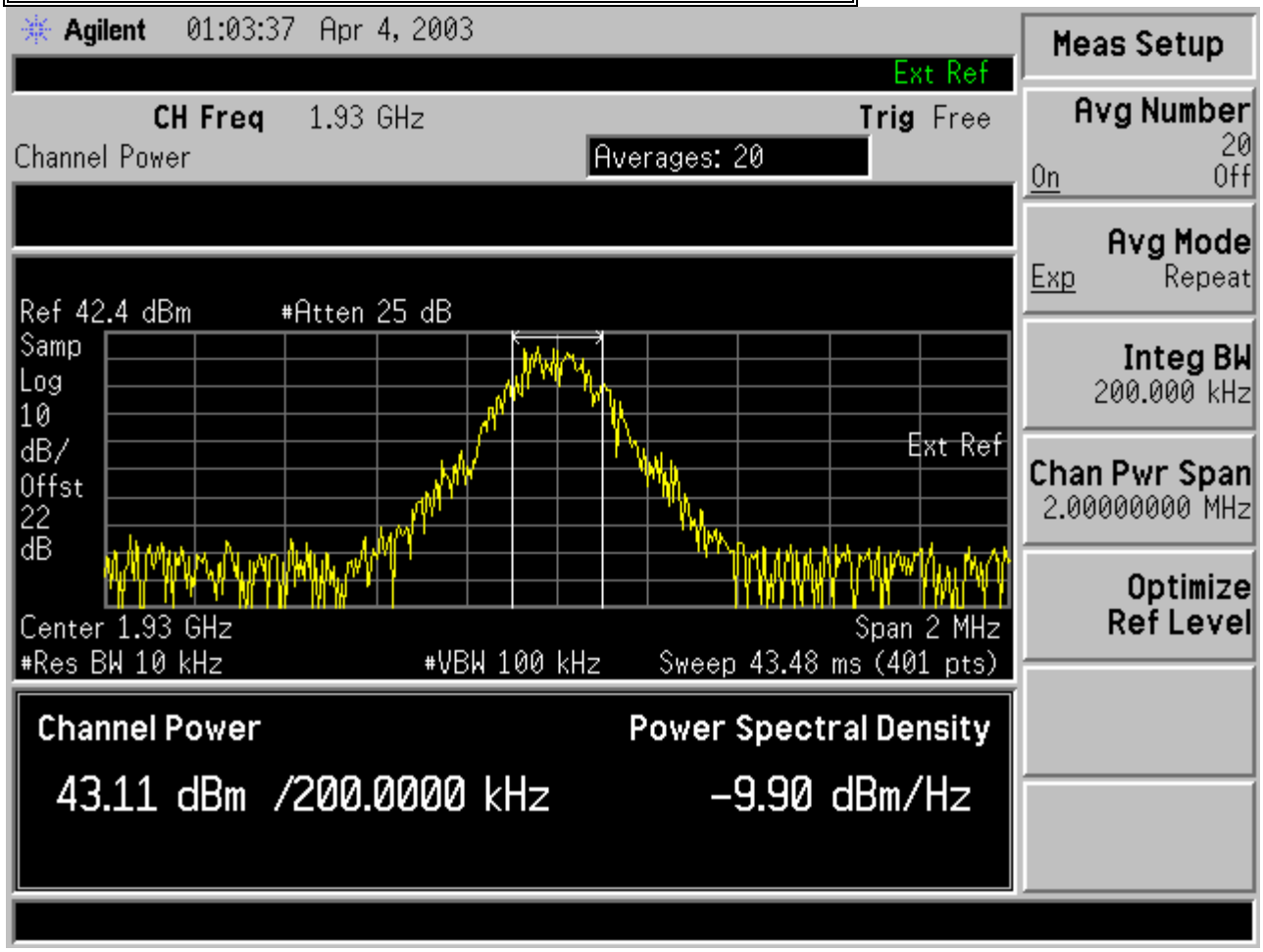


Figure 4: Reference test set-up

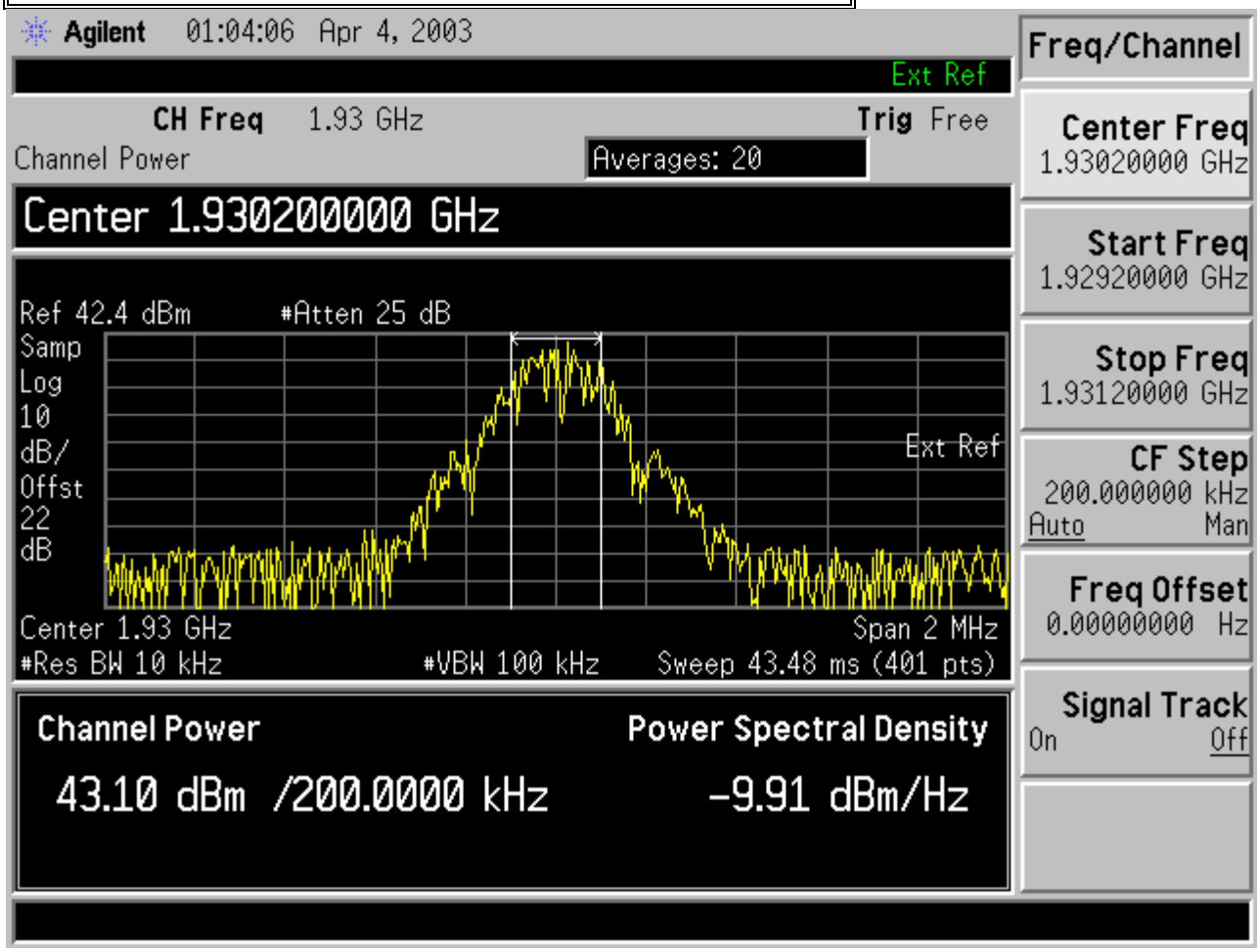
9 Appendix A

9.1 RF POWER OUTPUT ANT 1

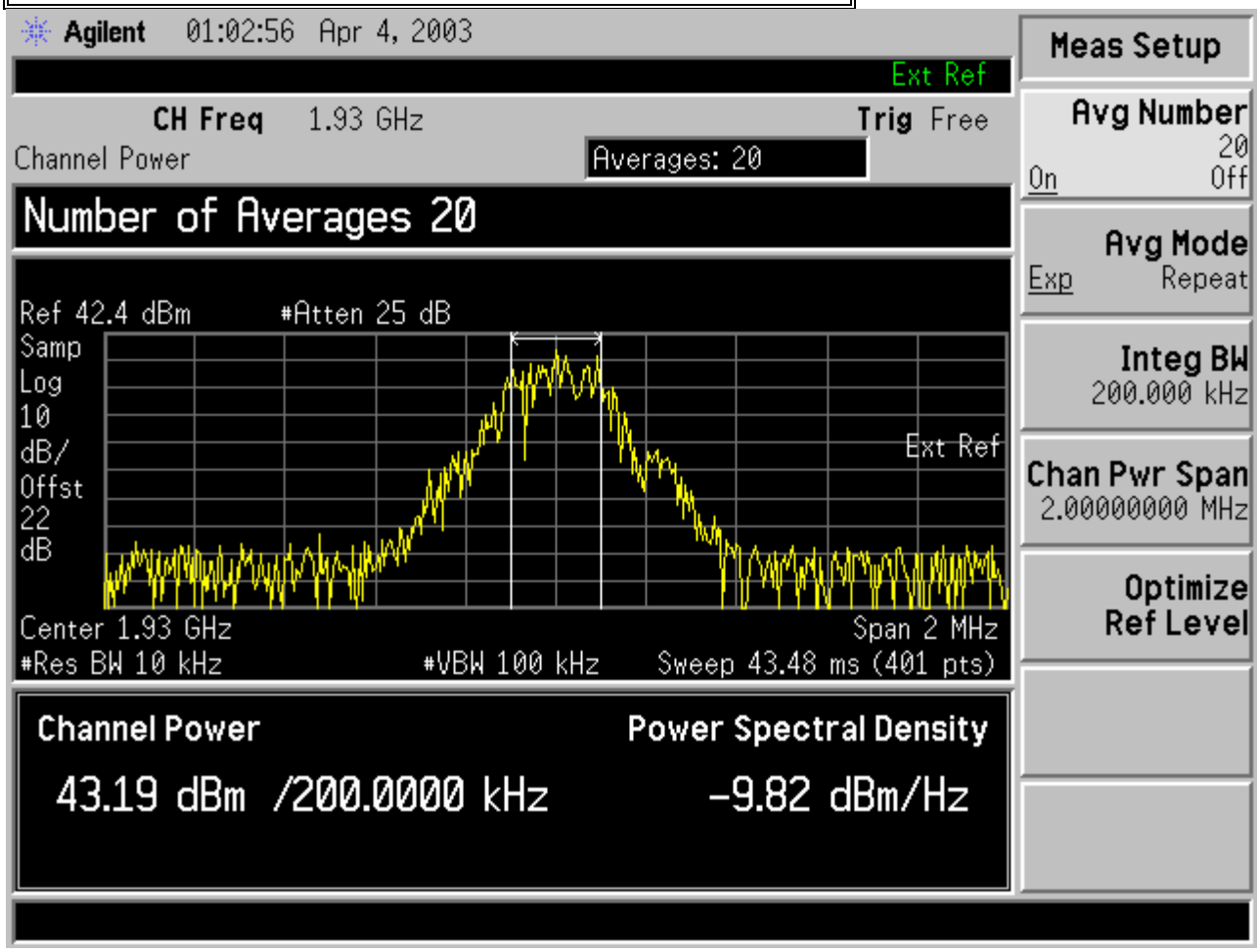
Mean power ANT 1
Channel B 1930.2 MHz
Gain 15 dB
Input voltage 115VAC
Modulation: GSM (GMSK)



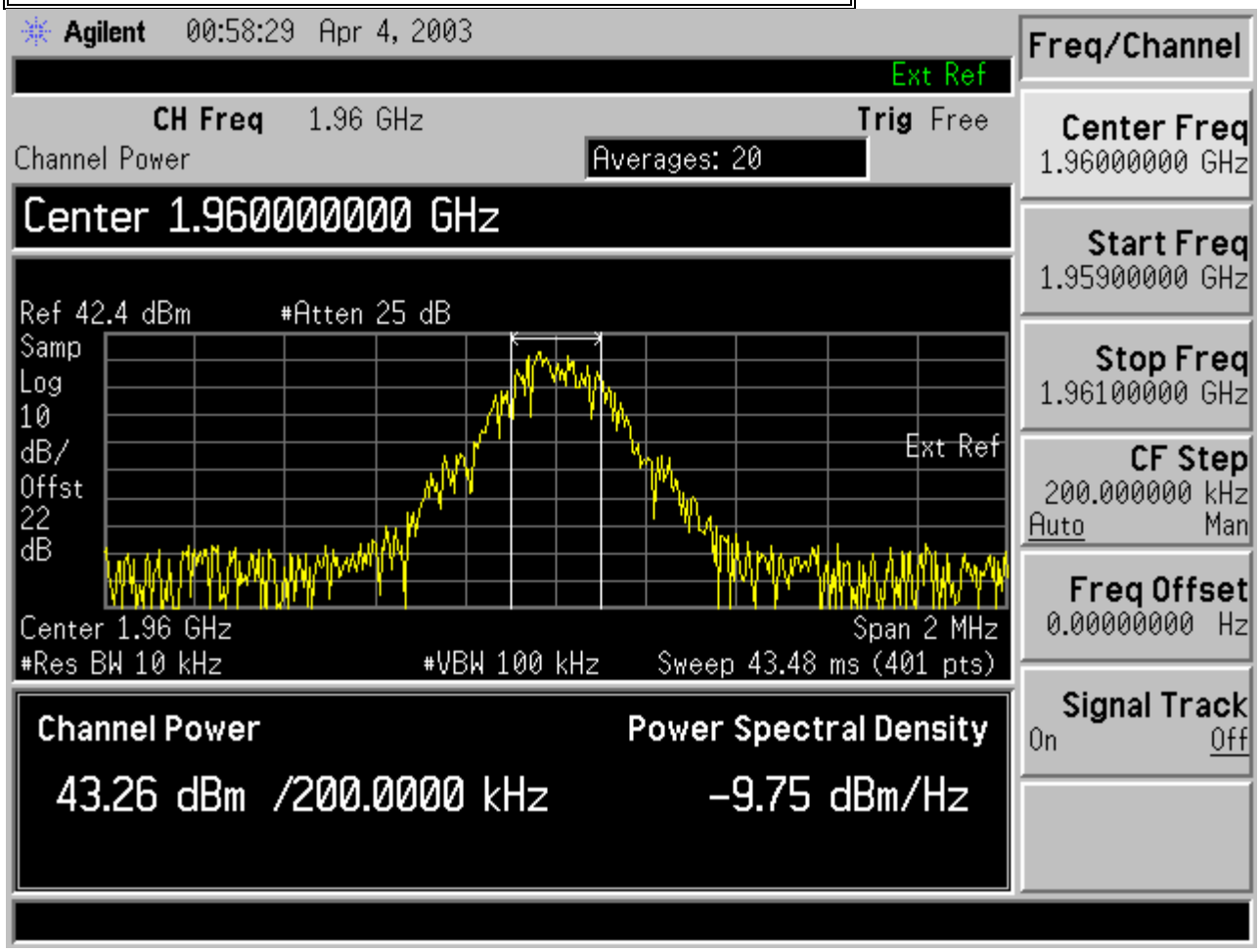
Mean power ANT 1
Channel B 1930.2 MHz
Gain 15 dB
Input voltage 265VAC
Modulation: GSM (GMSK)



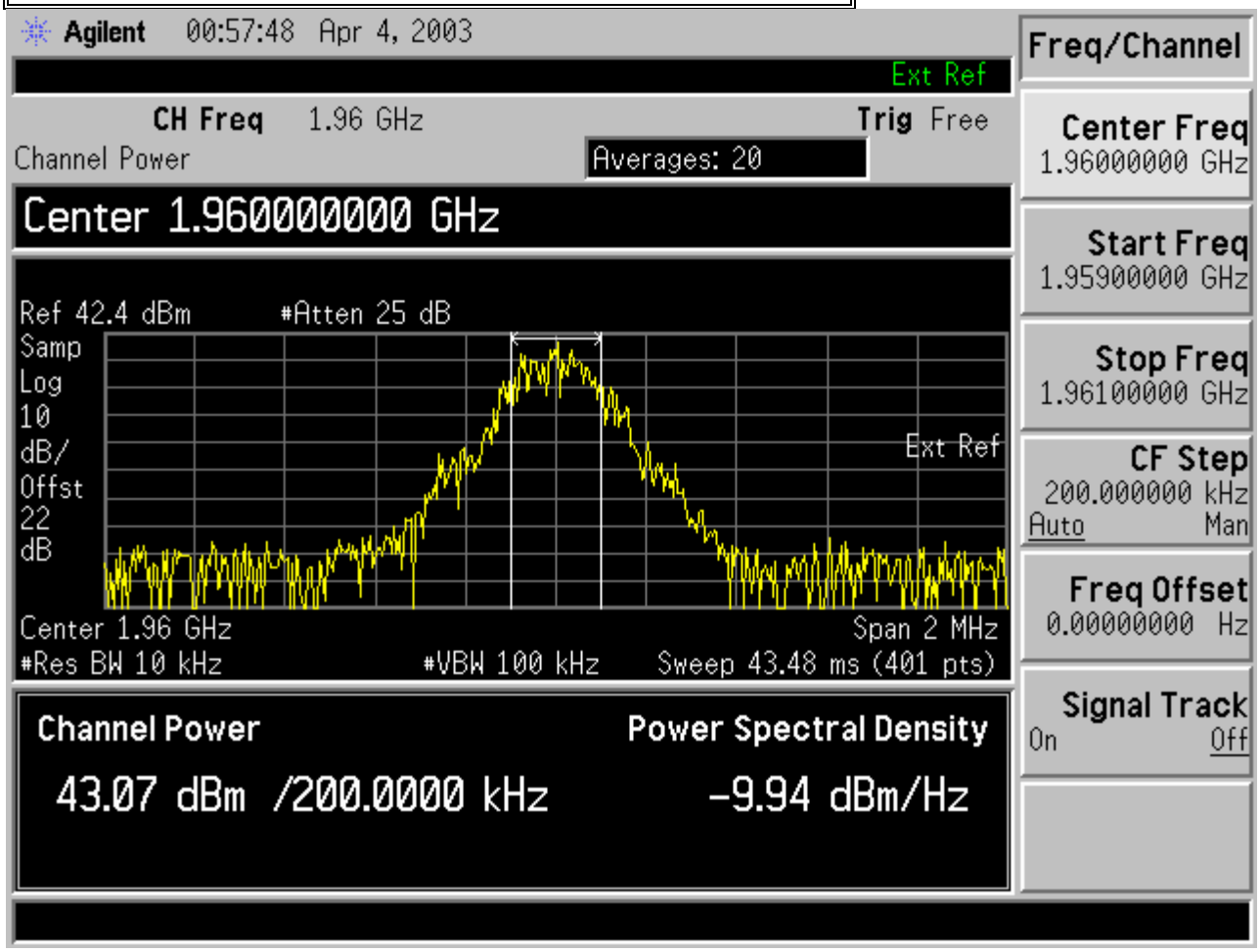
Mean power ANT 1
Channel B 1930.2 MHz
Gain 15 dB
Input voltage 85VAC
Modulation: GSM (GMSK)



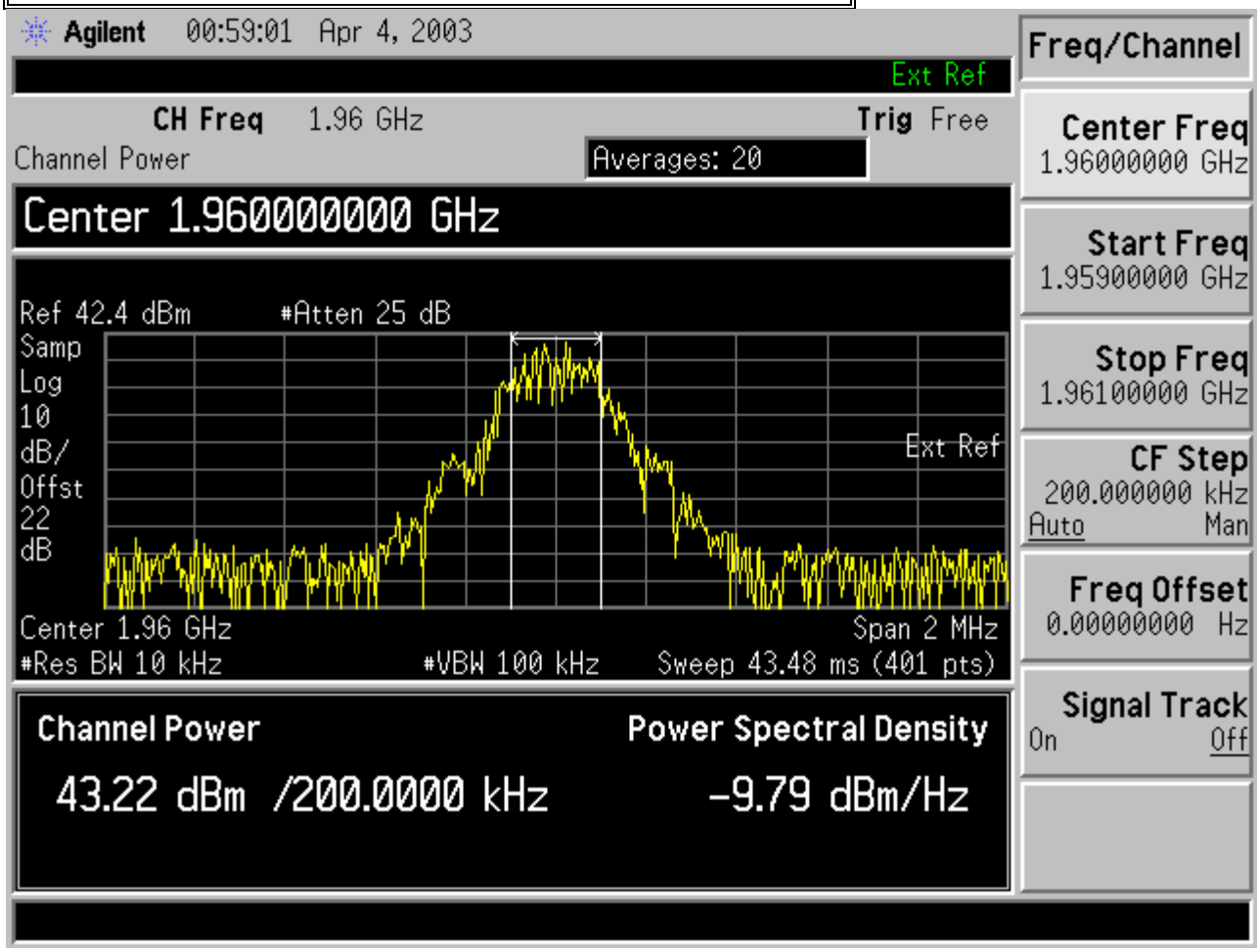
Mean power ANT 1
Channel M 1960 MHz
Gain 15 dB
Input voltage 115VAC
Modulation: GSM (GMSK)



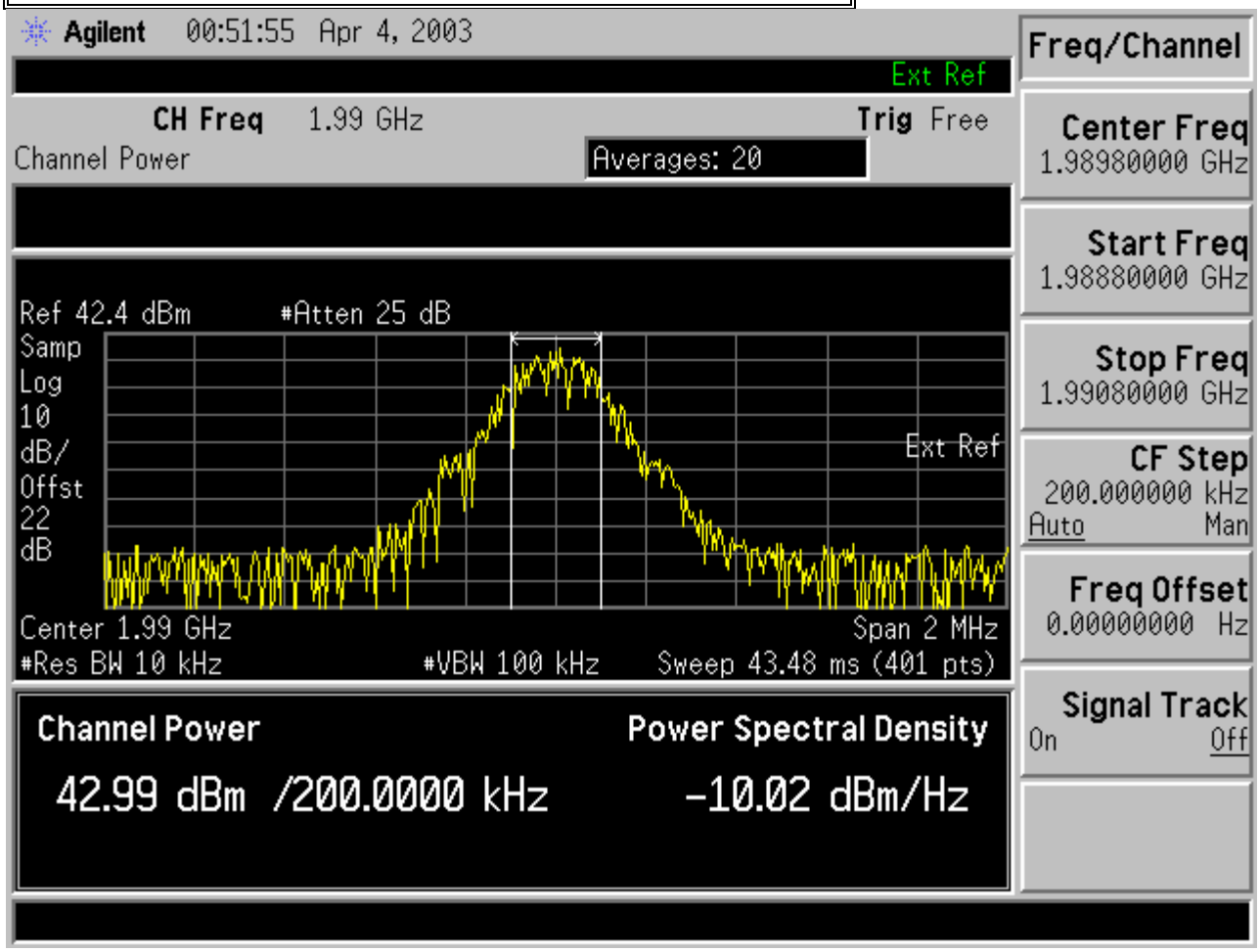
Mean power ANT 1
Channel M 1960 MHz
Gain 15 dB
Input voltage 265 VAC
Modulation: GSM (GMSK)



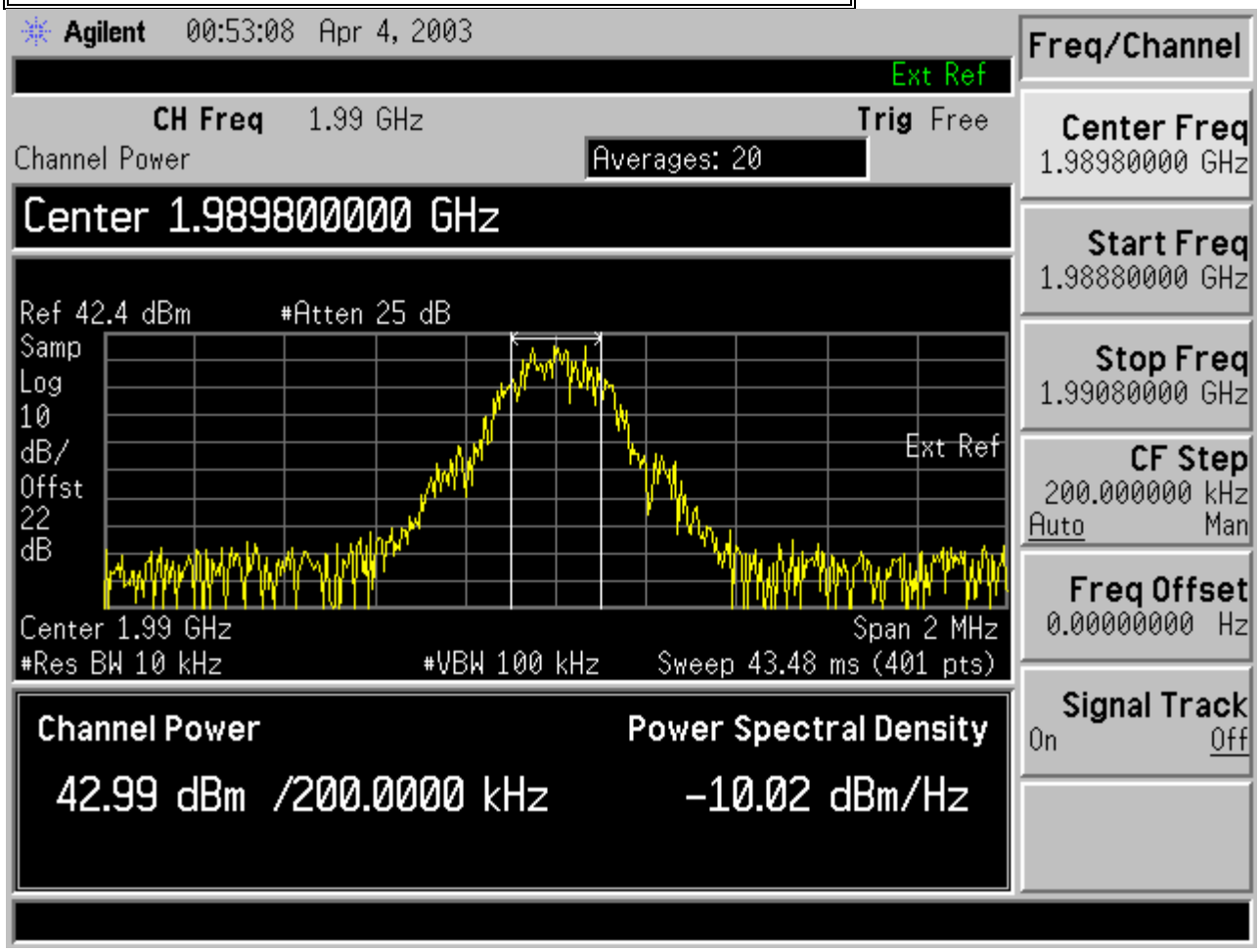
Mean power ANT 1
Channel M 1960 MHz
Gain 15 dB
Input voltage 85 VAC
Modulation: GSM (GMSK)



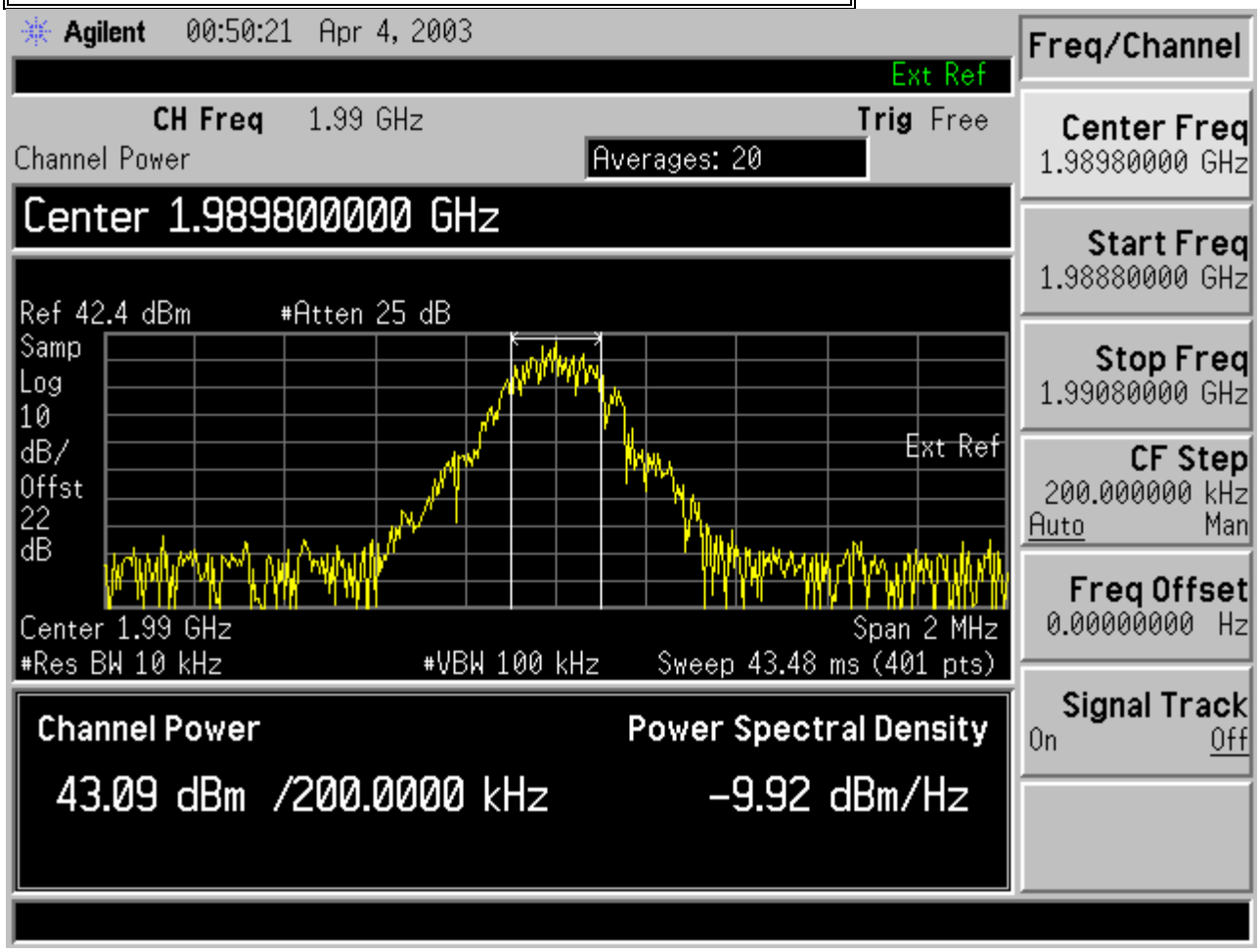
Mean power ANT 1
Channel T 1989.8 MHz
Gain 15 dB
Input voltage 115VAC
Modulation: GSM (GMSK)



Mean power ANT 1
Channel T 1989.8 MHz
Gain 15 dB
Input voltage 265 VAC
Modulation: GSM (GMSK)

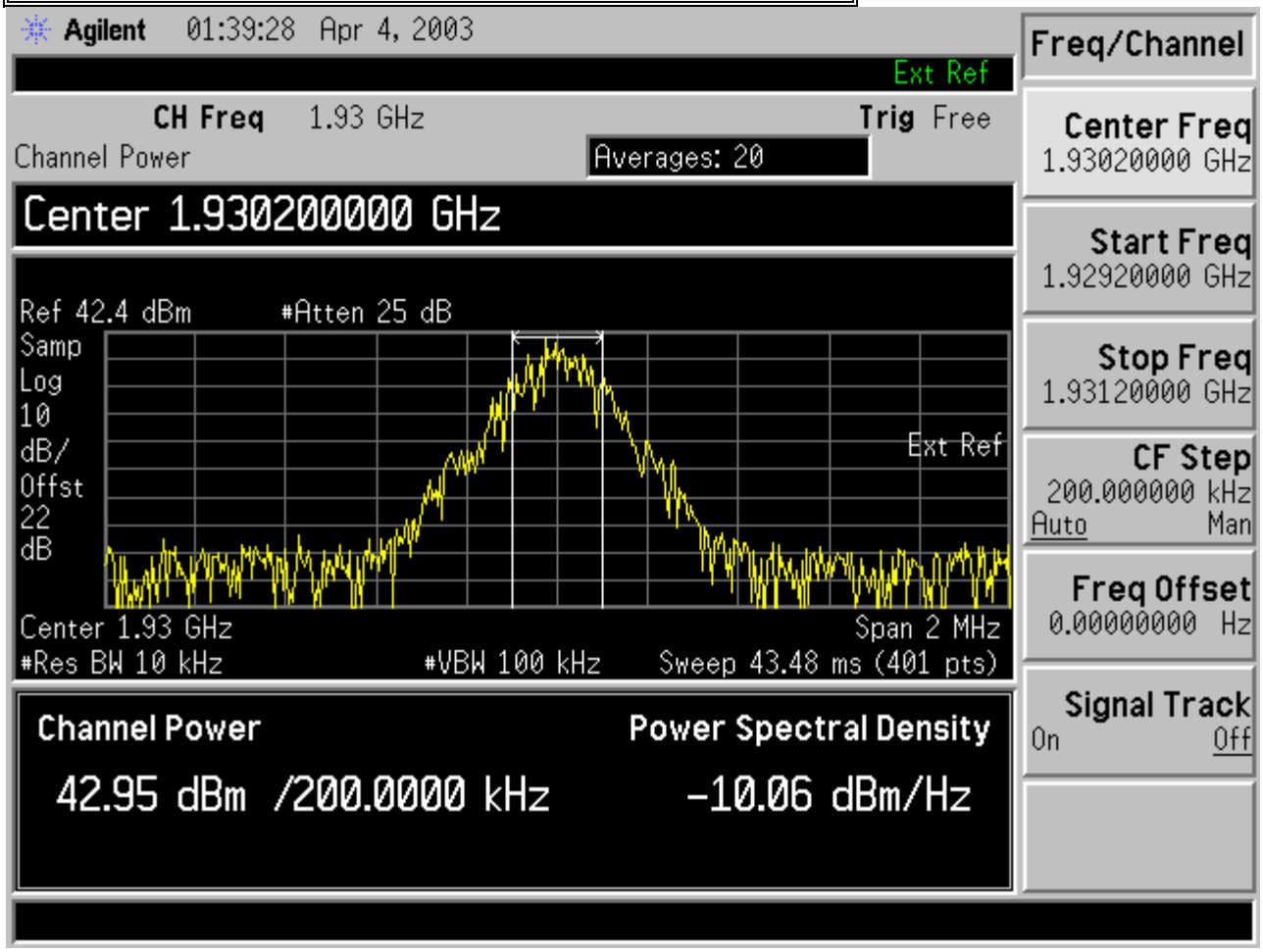


Mean power ANT 1
Channel T 1989.8 MHz
Gain 15 dB
Input voltage 85 VAC
Modulation: GSM (GMSK)

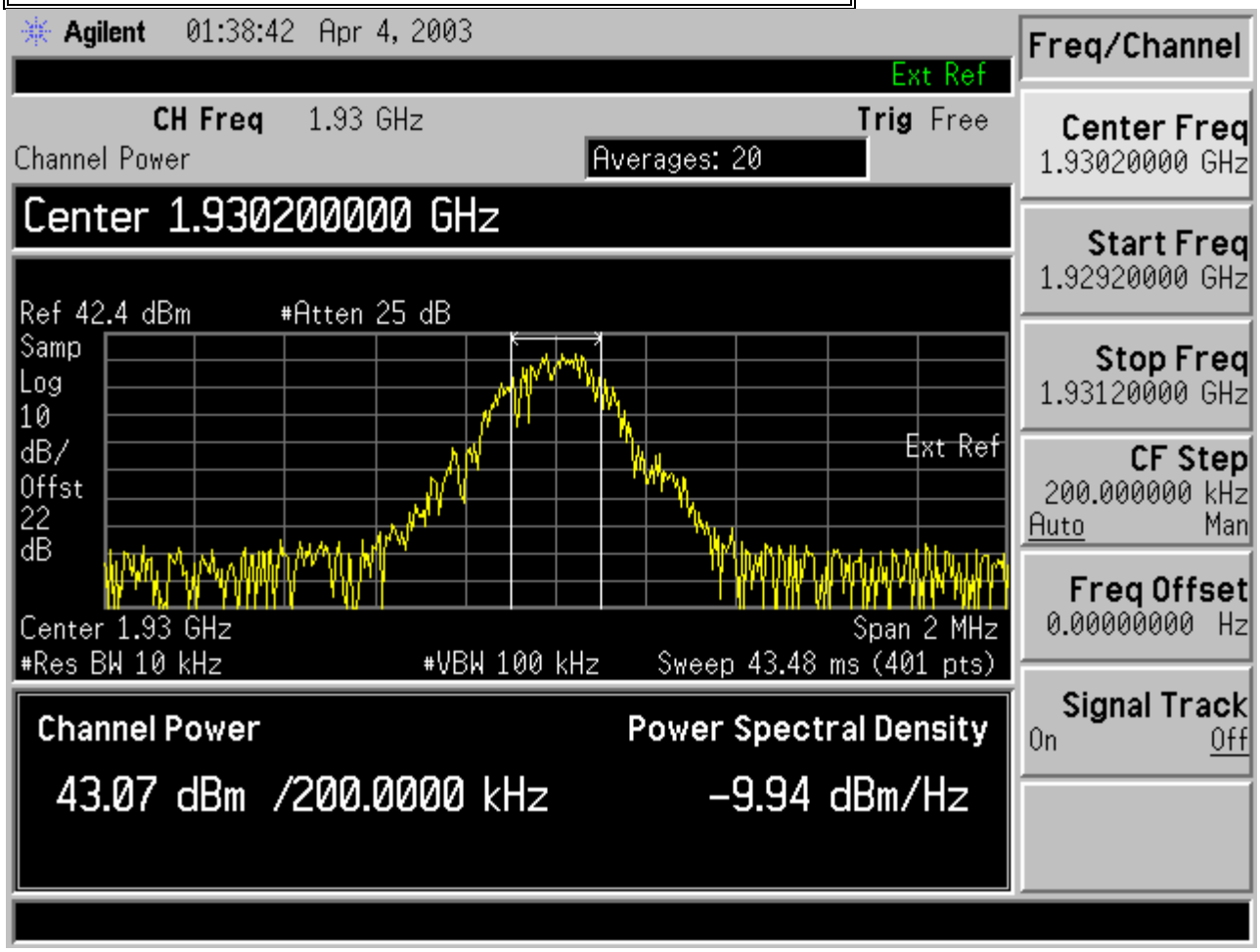


9.2 RF POWER OUTPUT ANT 2

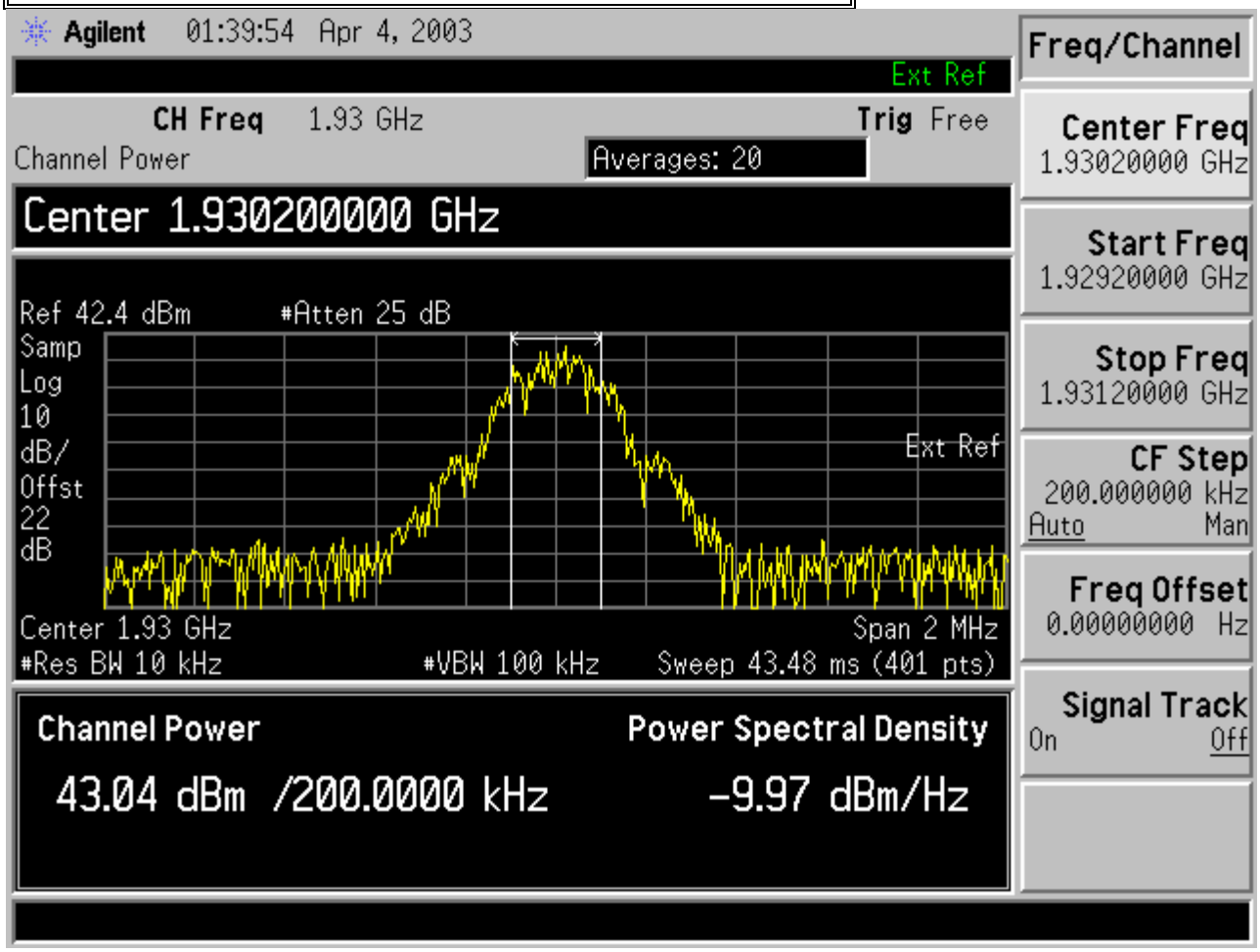
Mean power ANT 2 CH B
Channel B 1930.2 MHz
Gain 15 dB
Input voltage 115VAC
Modulation: GSM (GMSK)



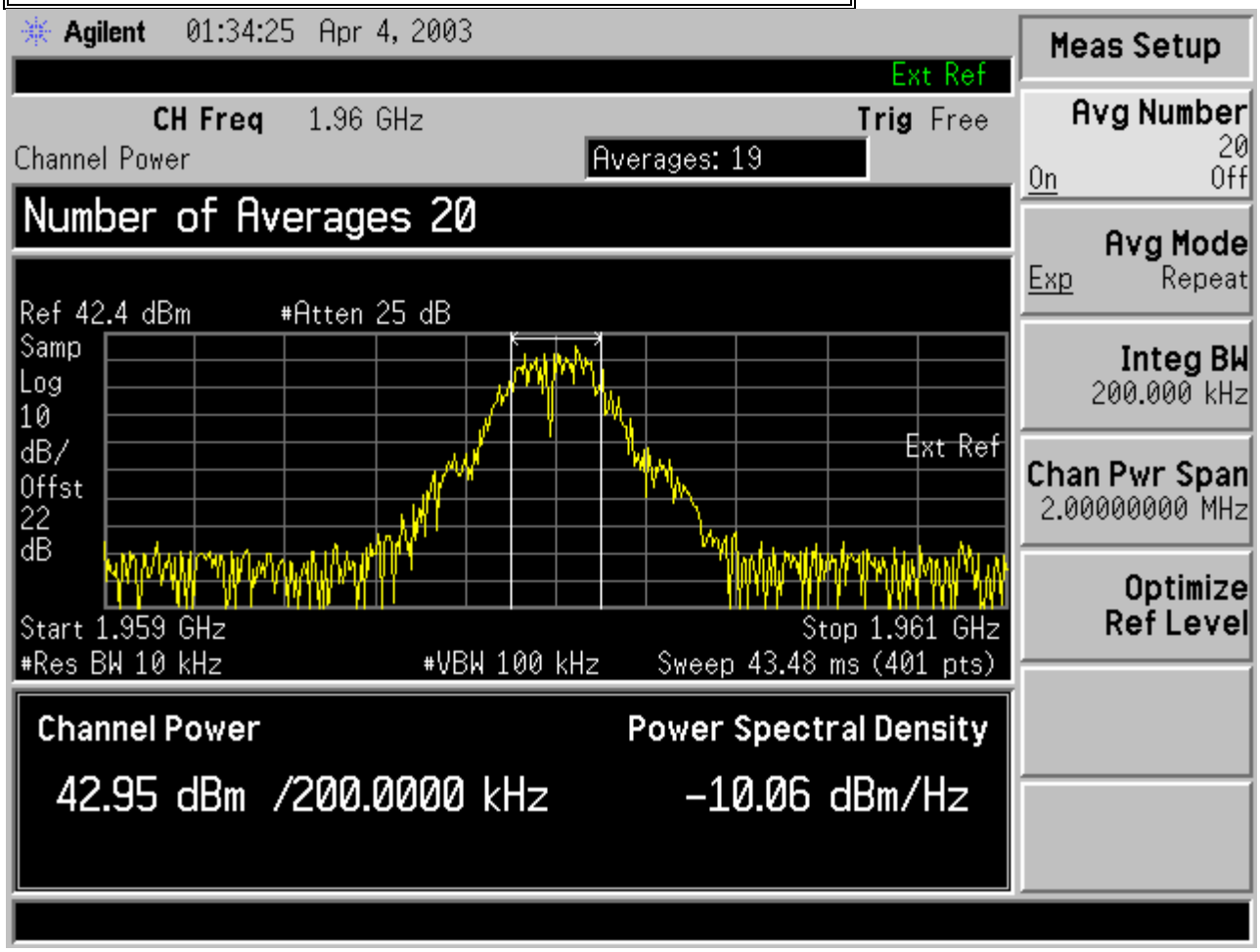
Mean power ANT 2
Channel B 1930.2 MHz
Gain 15 dB
Input voltage 265 VAC
Modulation: GSM (GMSK)



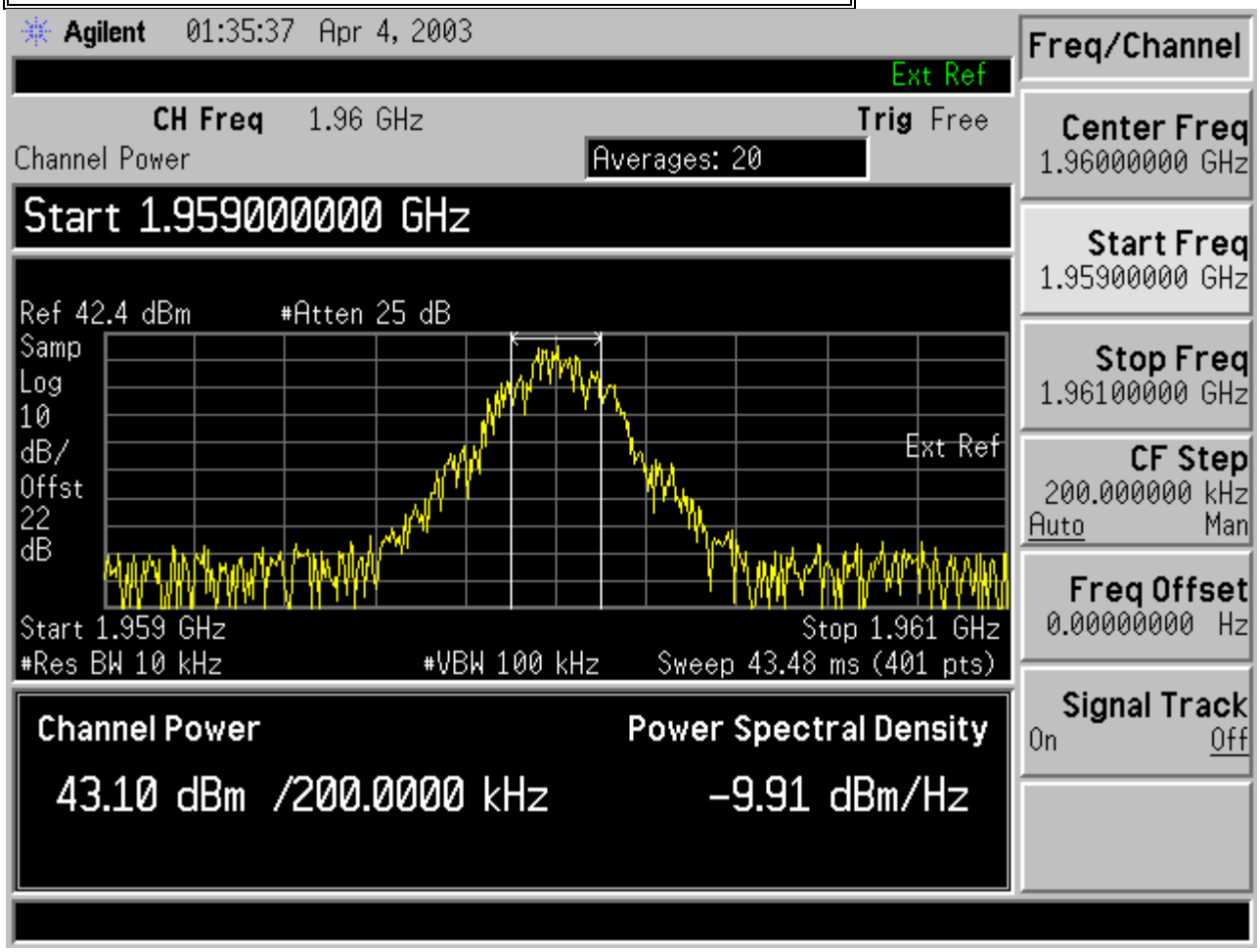
Mean power ANT 2
Channel B 1930.2 MHz
Gain 15 dB
Input voltage 85 VAC
Modulation: GSM (GMSK)



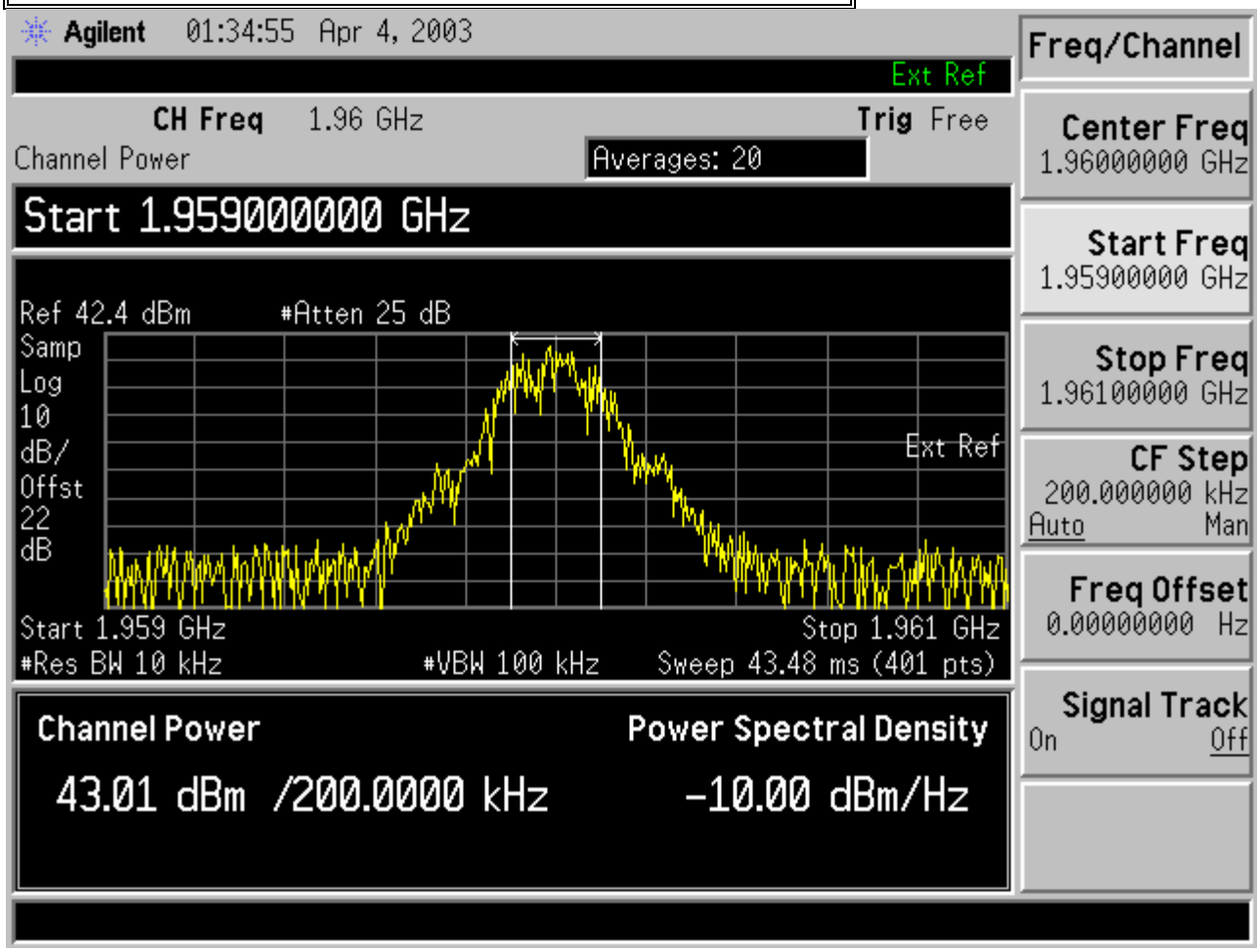
Mean power ANT 2
Channel M 1960 MHz
Gain 15 dB
Input voltage 115 VAC
Modulation: GSM (GMSK)



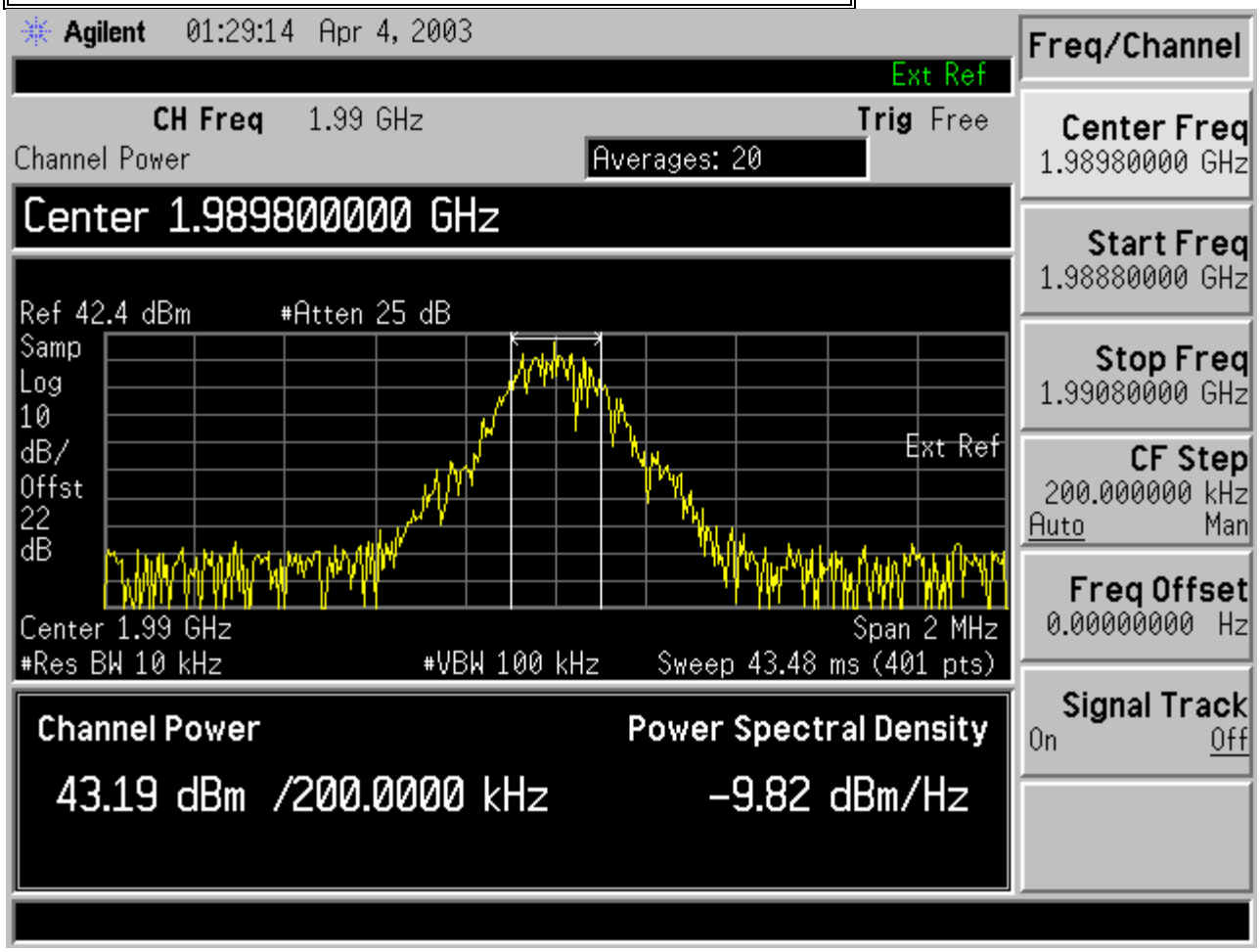
Mean power ANT 2
Channel M 1960 MHz
Gain 15 dB
Input voltage 265 VAC
Modulation: GSM (GMSK)



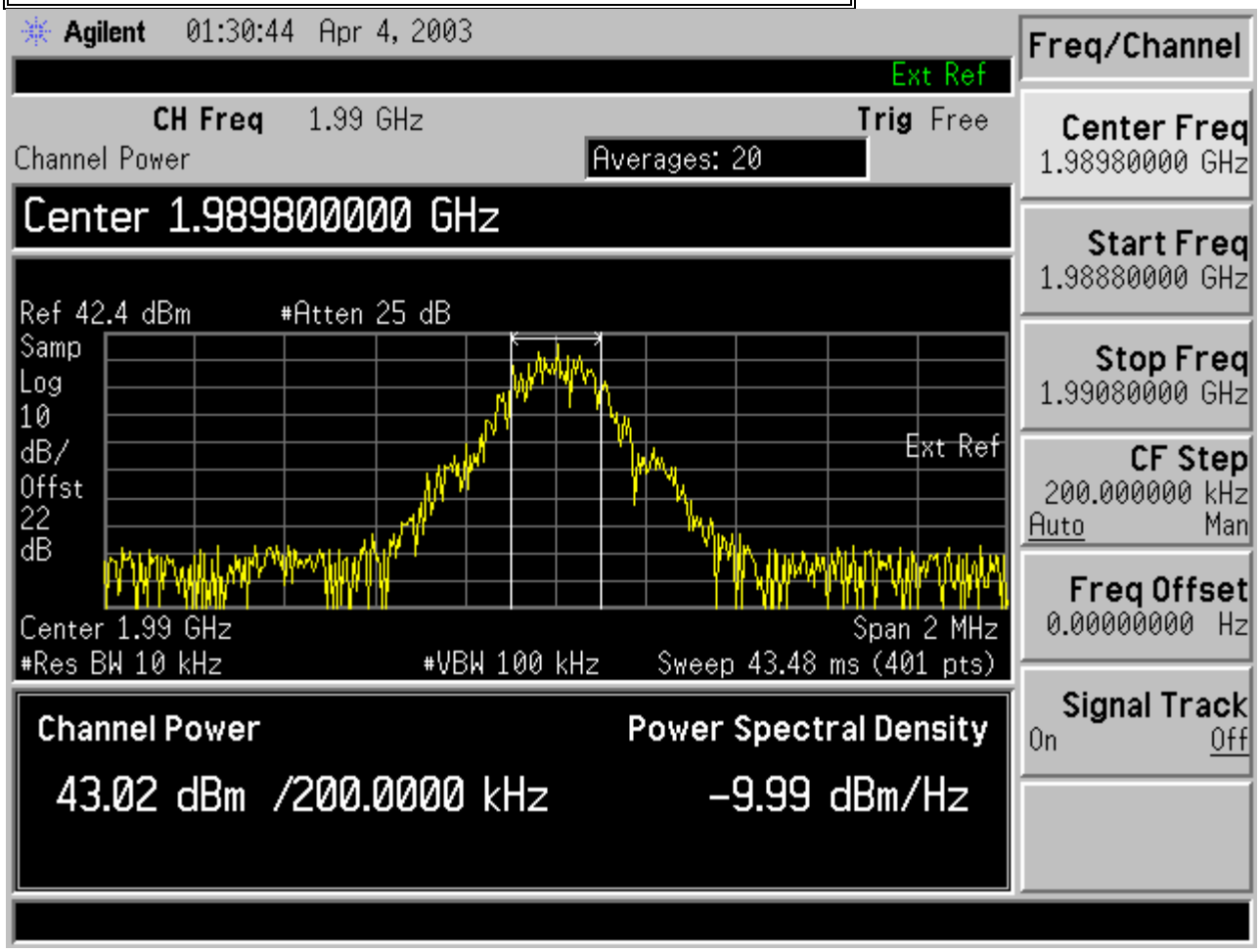
Mean power ANT 2
Channel M 1960 MHz
Gain 15 dB
Input voltage 85 VAC
Modulation: GSM (GMSK)



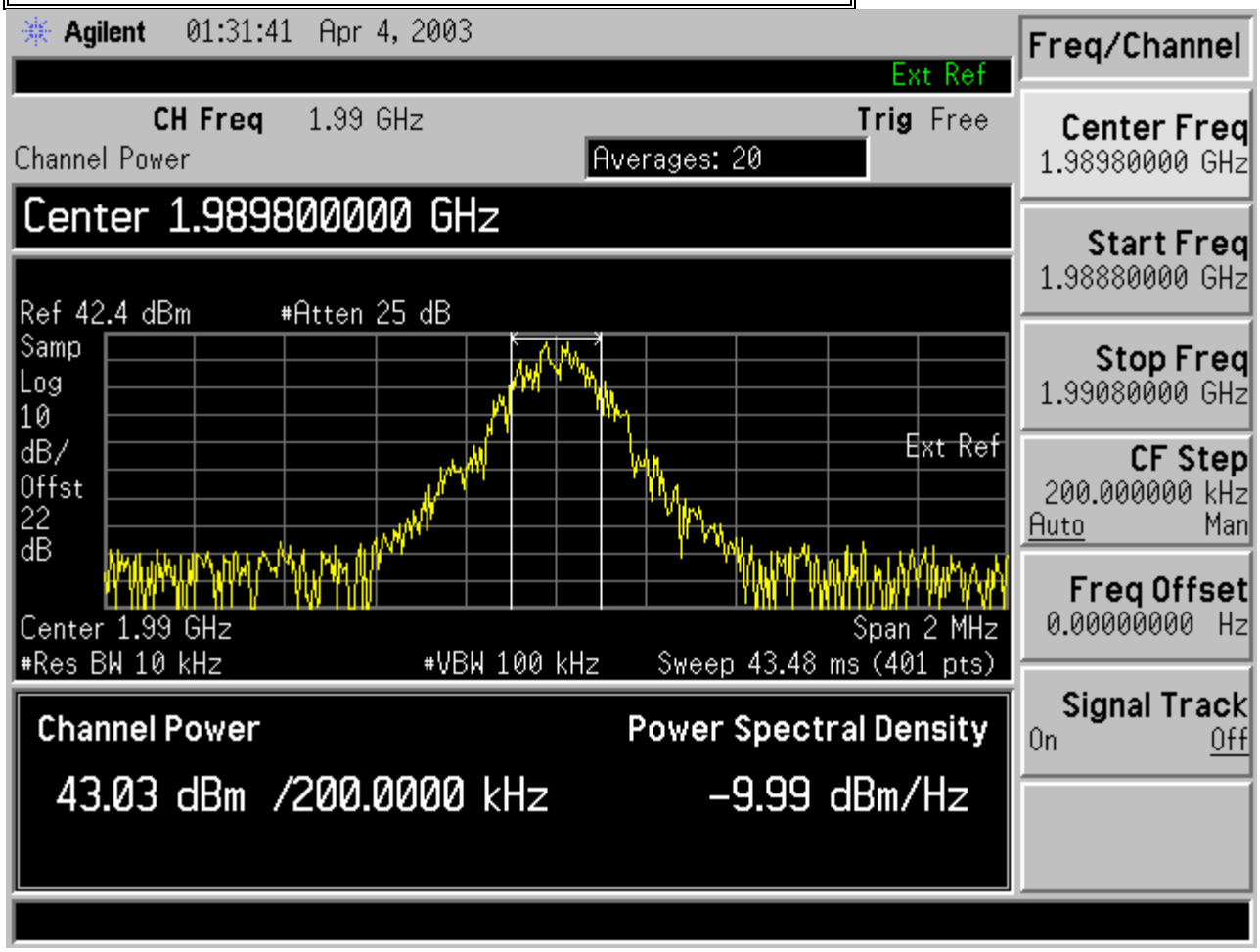
Mean power ANT 2
Channel T 1989.8 MHz
Gain 15 dB
Input voltage 115 VAC
Modulation: GSM (GMSK)



Mean power ANT 2
Channel T 1989.8 MHz
Gain 15 dB
Input voltage 265 VAC*
Modulation: GSM (GMSK)

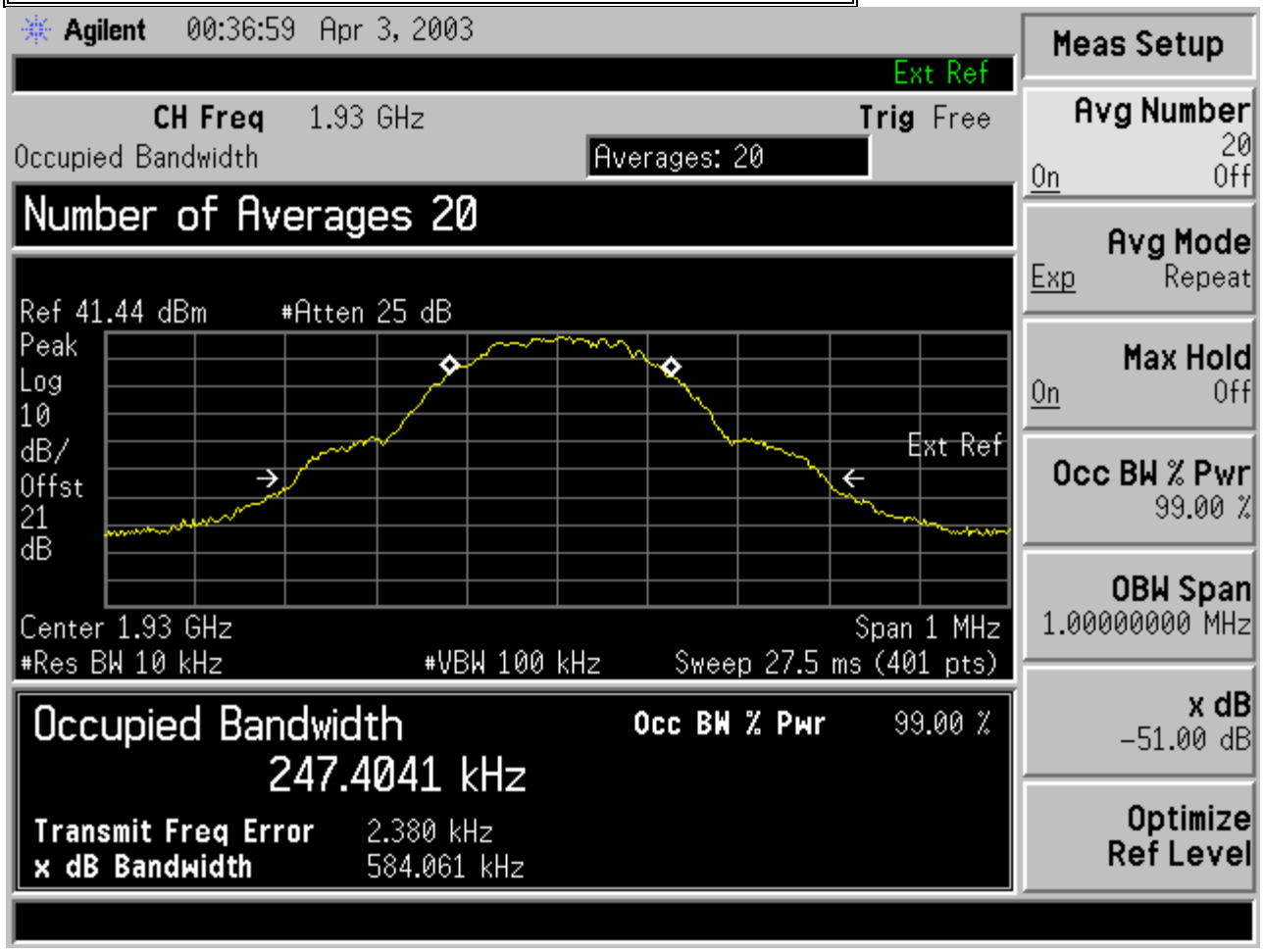


Mean power ANT 2
Channel T 1989.8 MHz
Gain 15 dB
Input voltage 85 VAC
Modulation: GSM (GMSK)

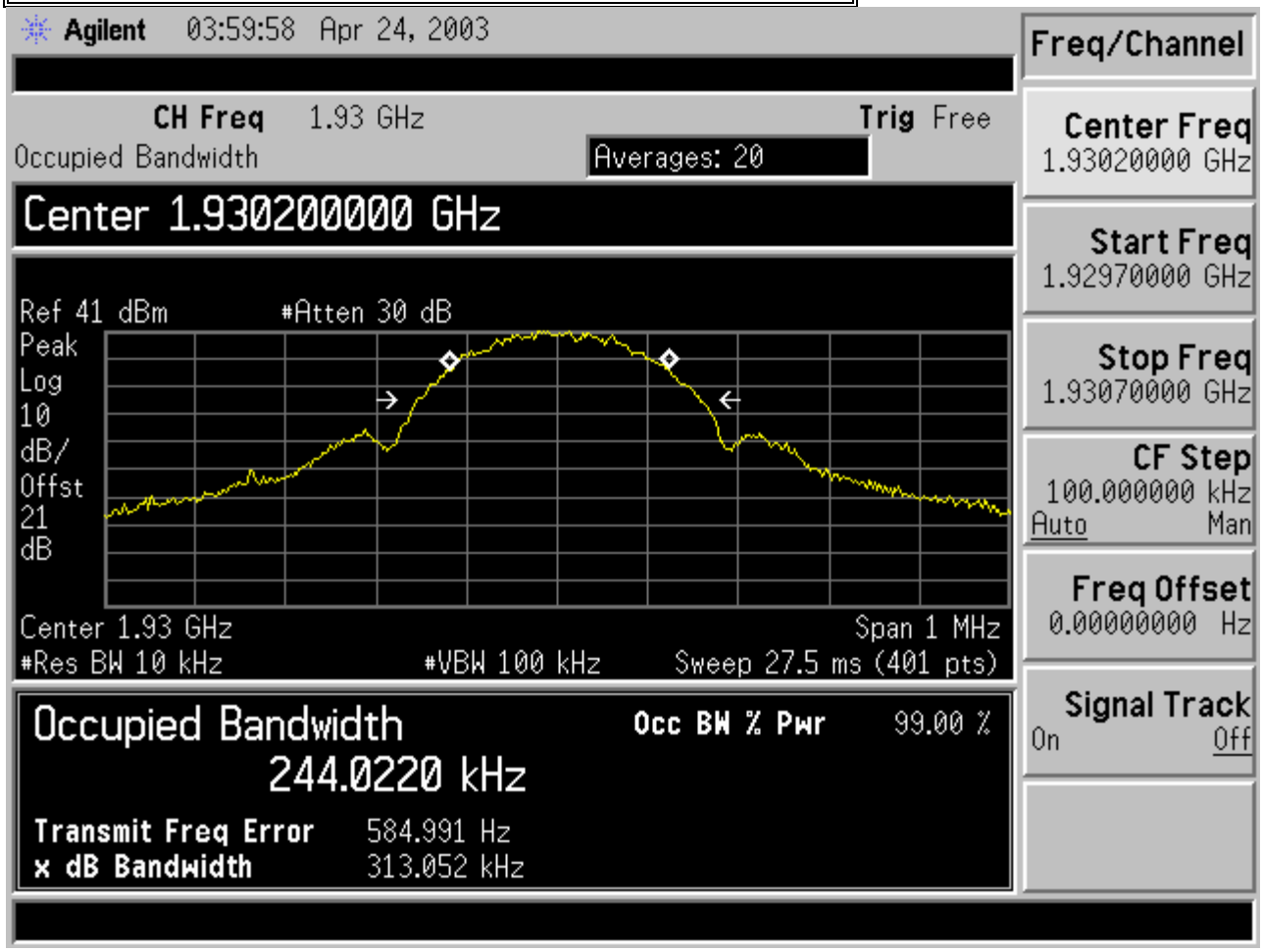


9.3 Occupied band width ANT 1

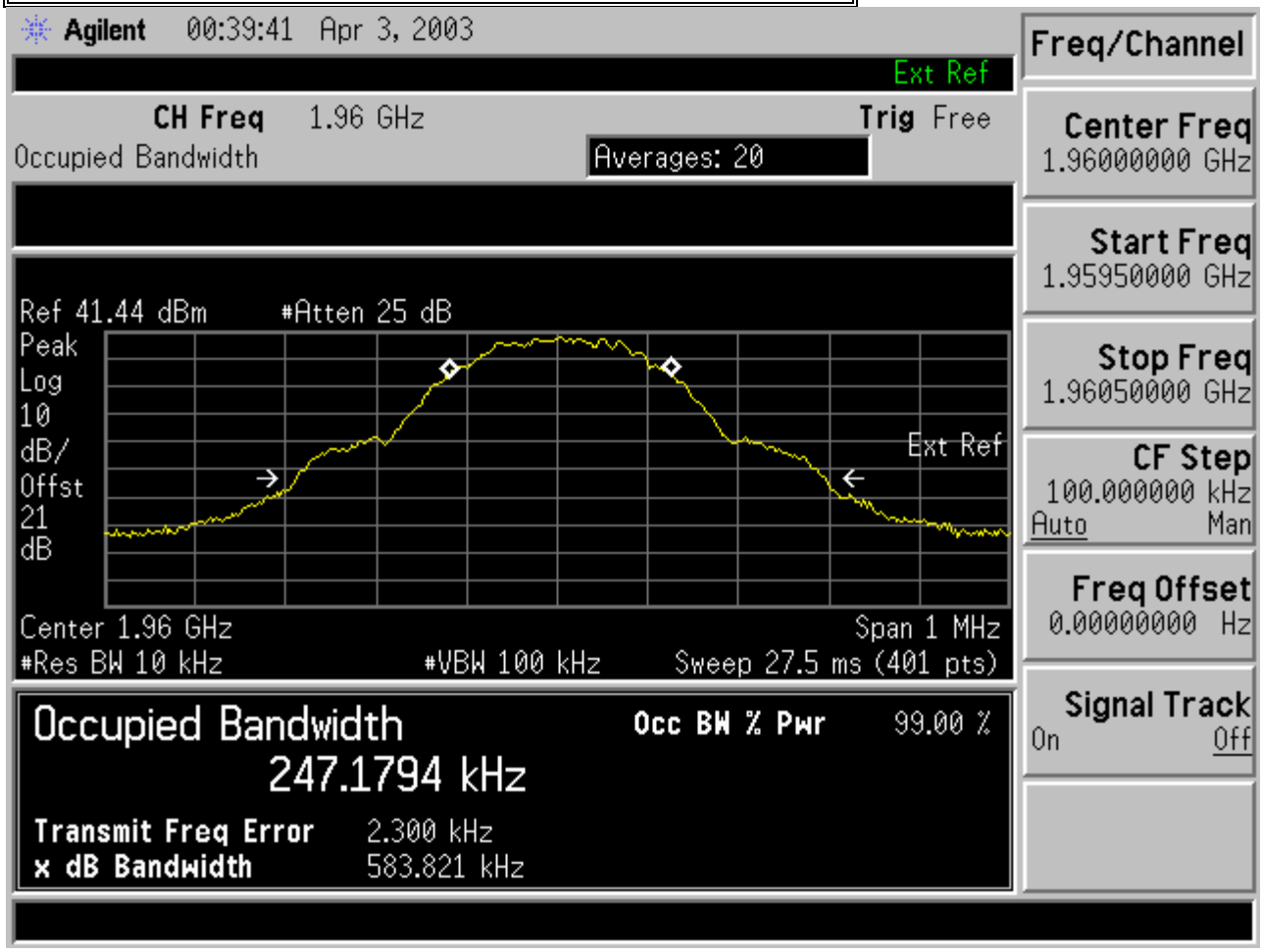
Occupied bandwidth Channel B 1930.2 MHz Modulation: GSM (GMSK)



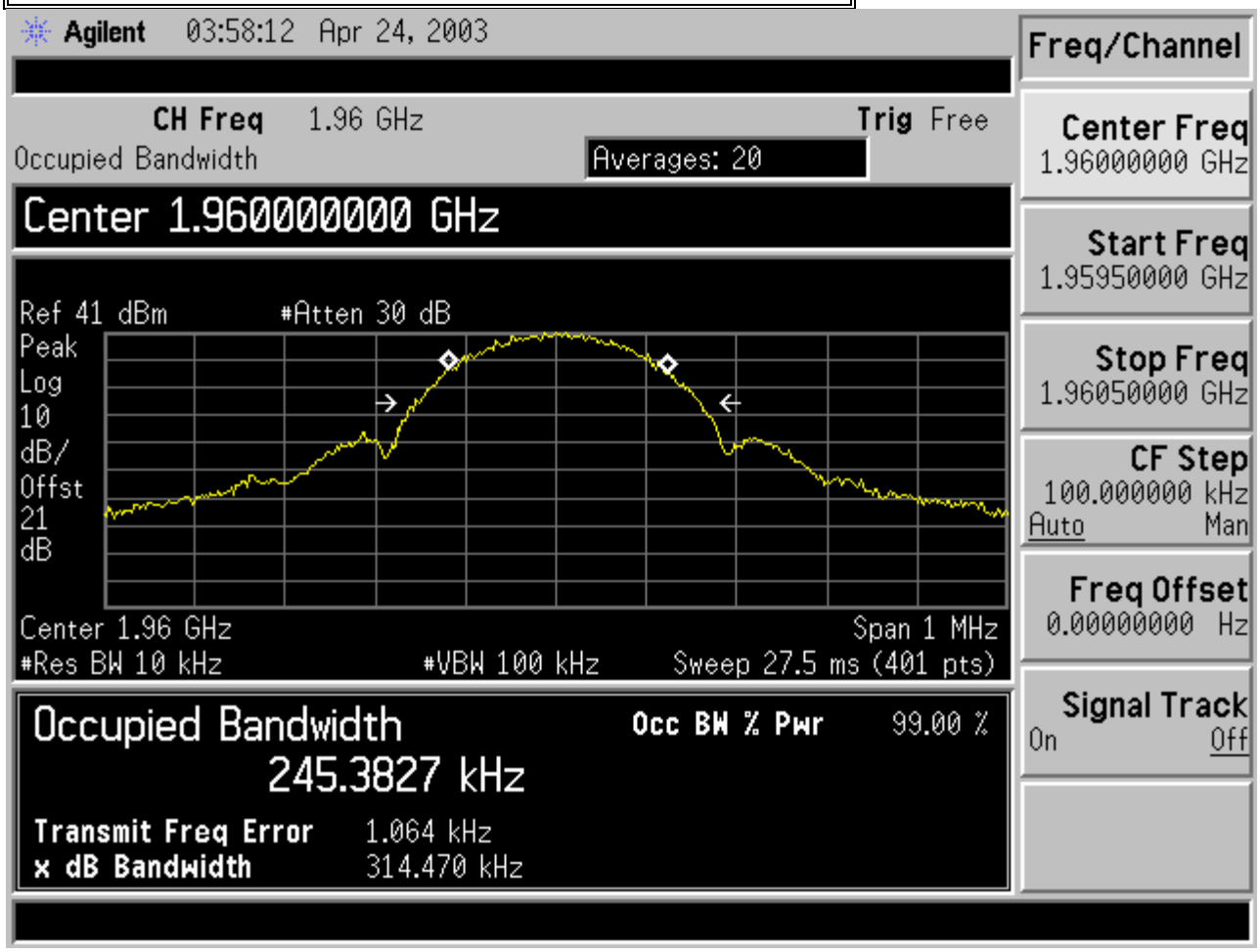
Occupied bandwidth
Channel B 1930.2 MHz
Modulation: EDGE



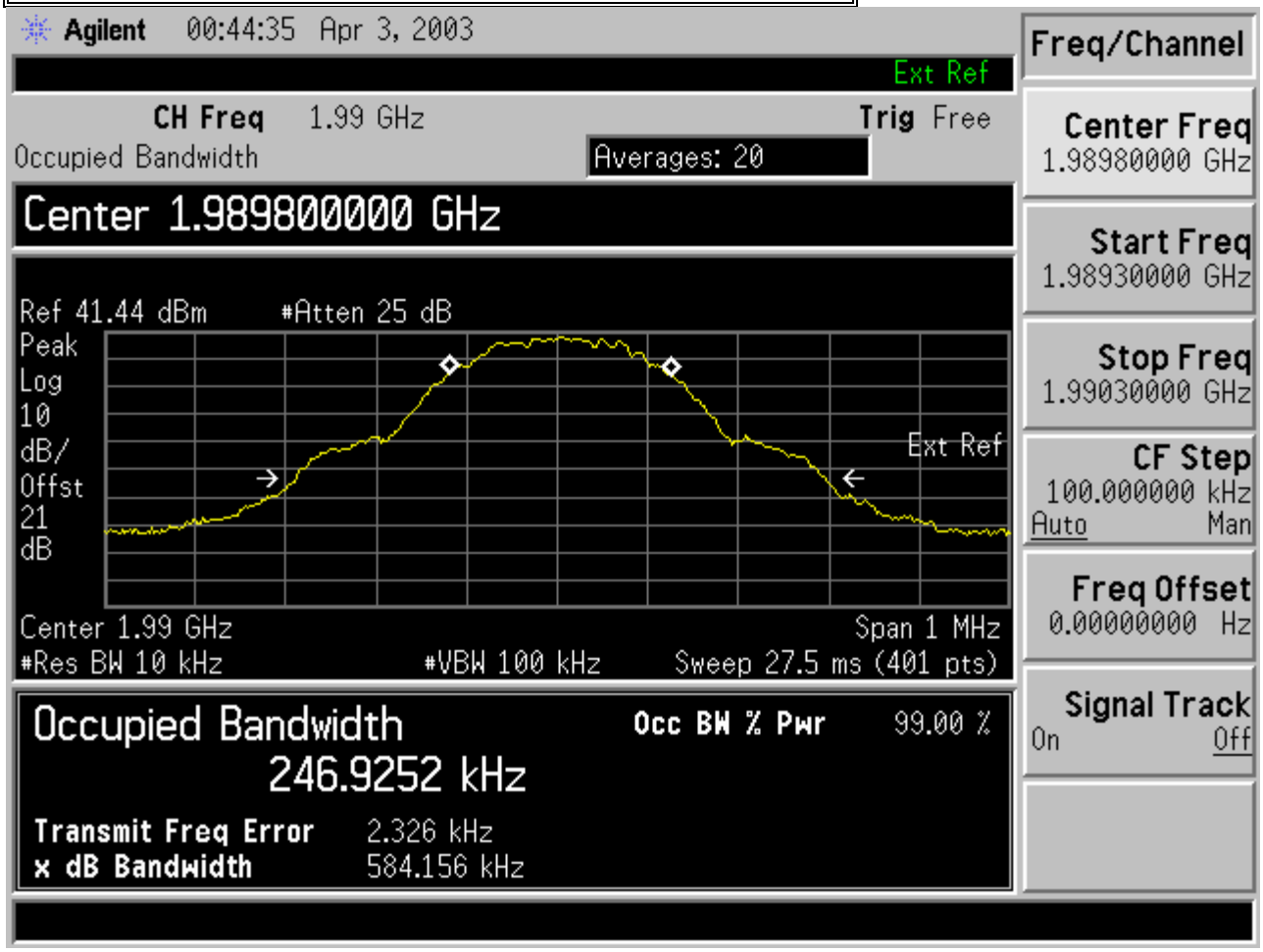
Occupied bandwidth
Channel M 1960 MHz
Modulation: GSM (GMSK)



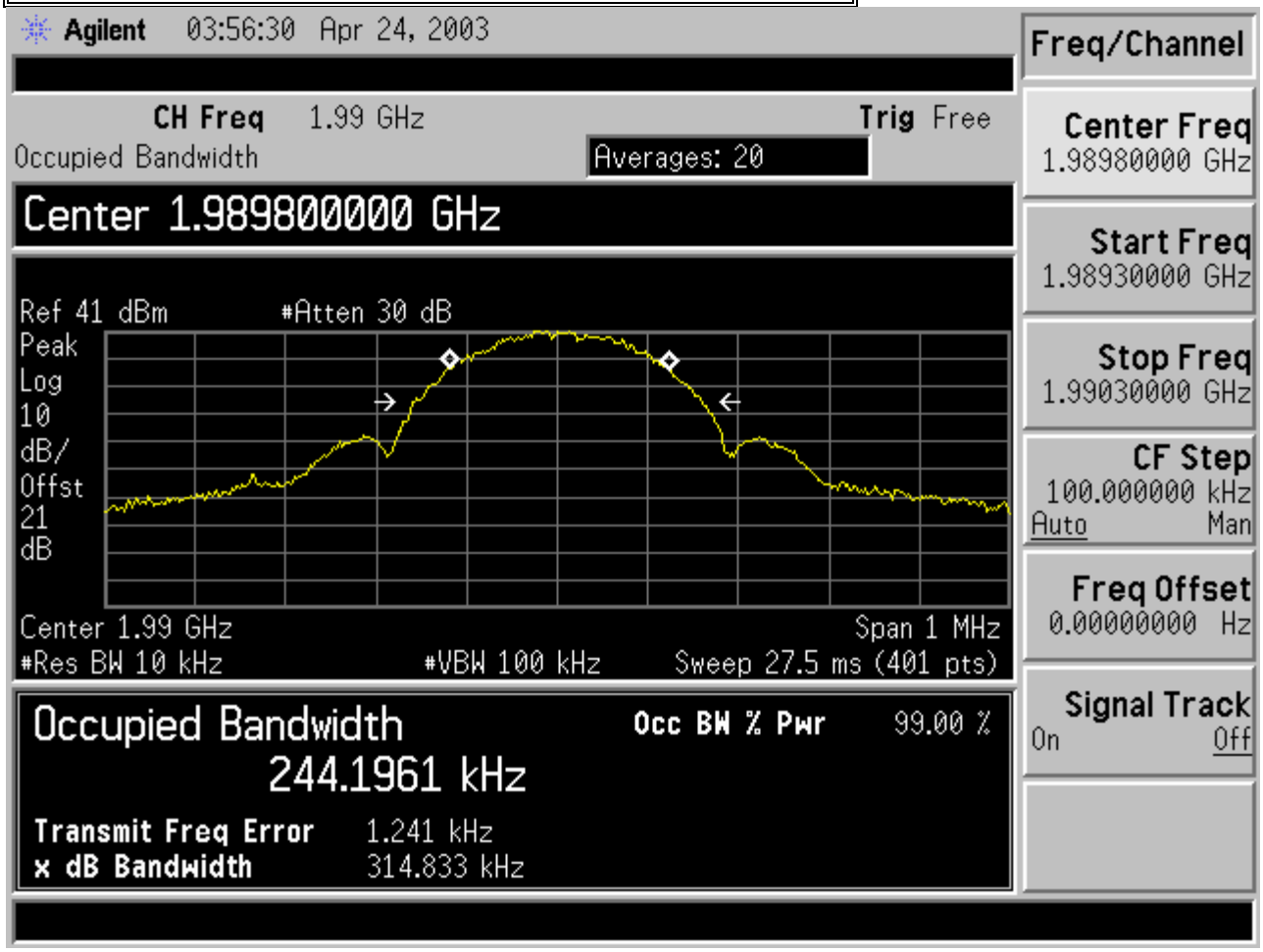
Occupied bandwidth
Channel M 1960 MHz
Modulation: EDGE



Occupied bandwidth
Channel T 1989.8 MHz
Modulation: GSM (GMSK)

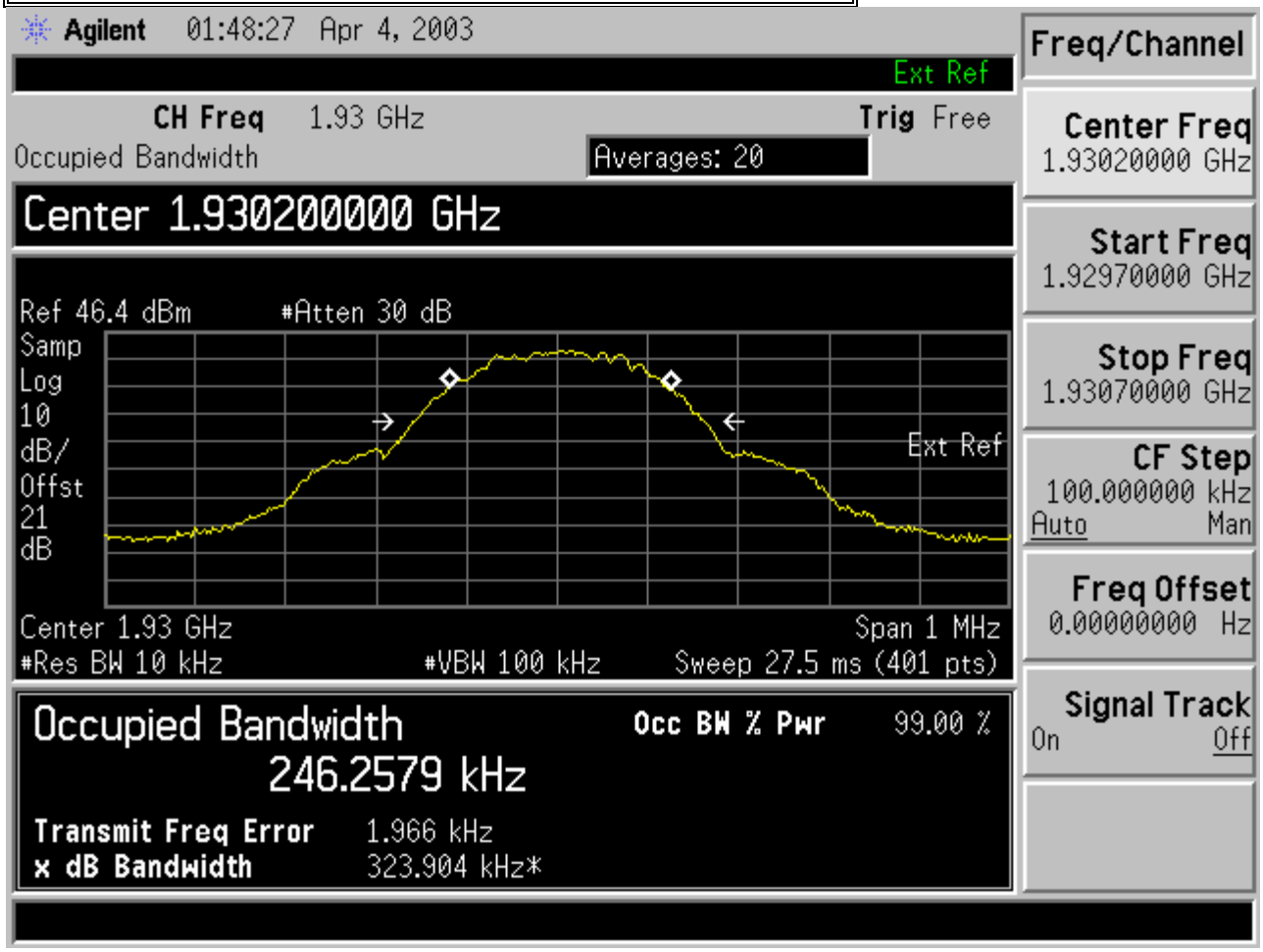


Occupied bandwidth
Channel T 1989.8 MHz
Modulation: EDGE

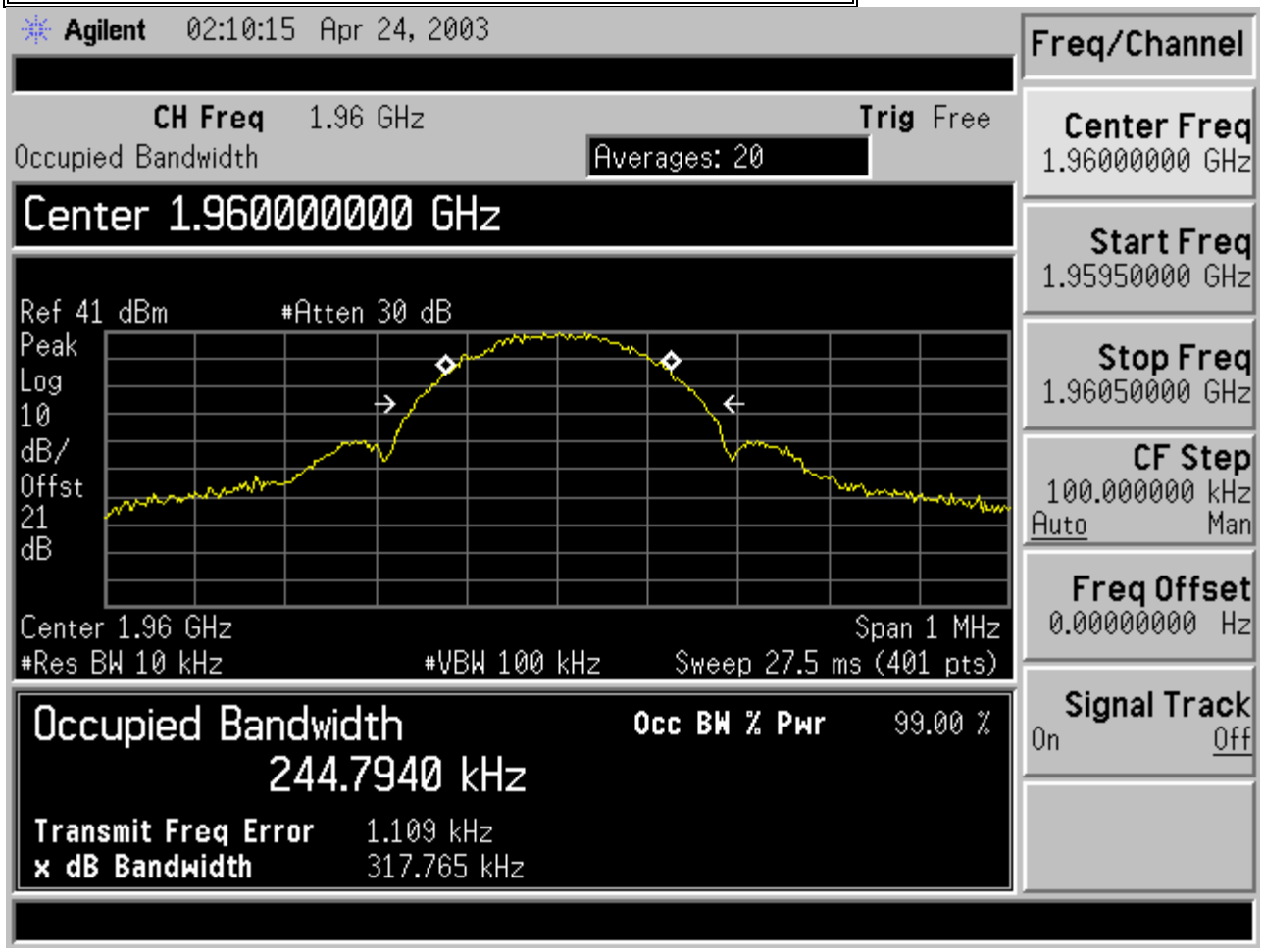


9.4 Occupied band width ANT 2

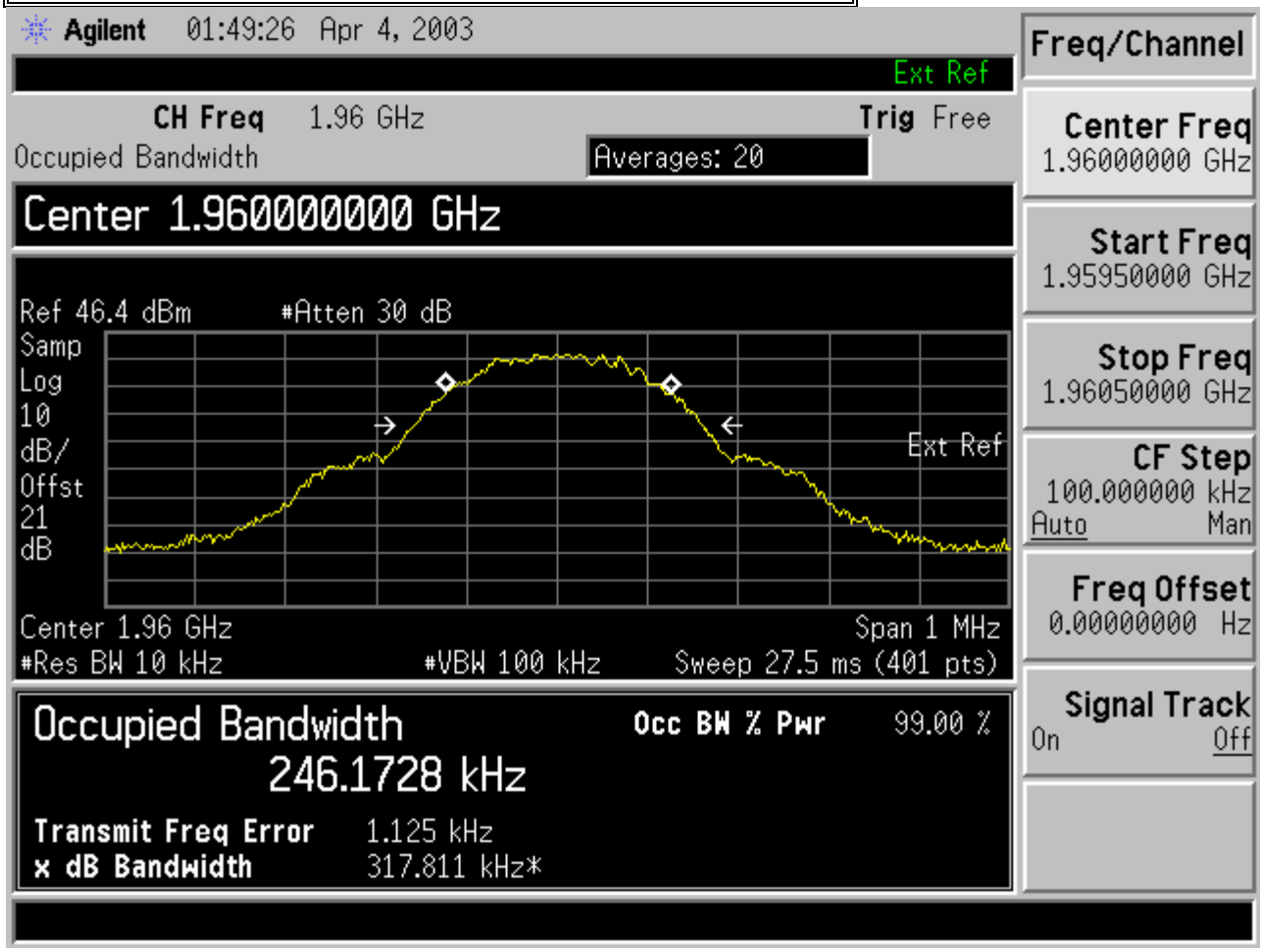
Occupied bandwidth
Channel B 1930.2MH
Modulation: GSM (GMSK)



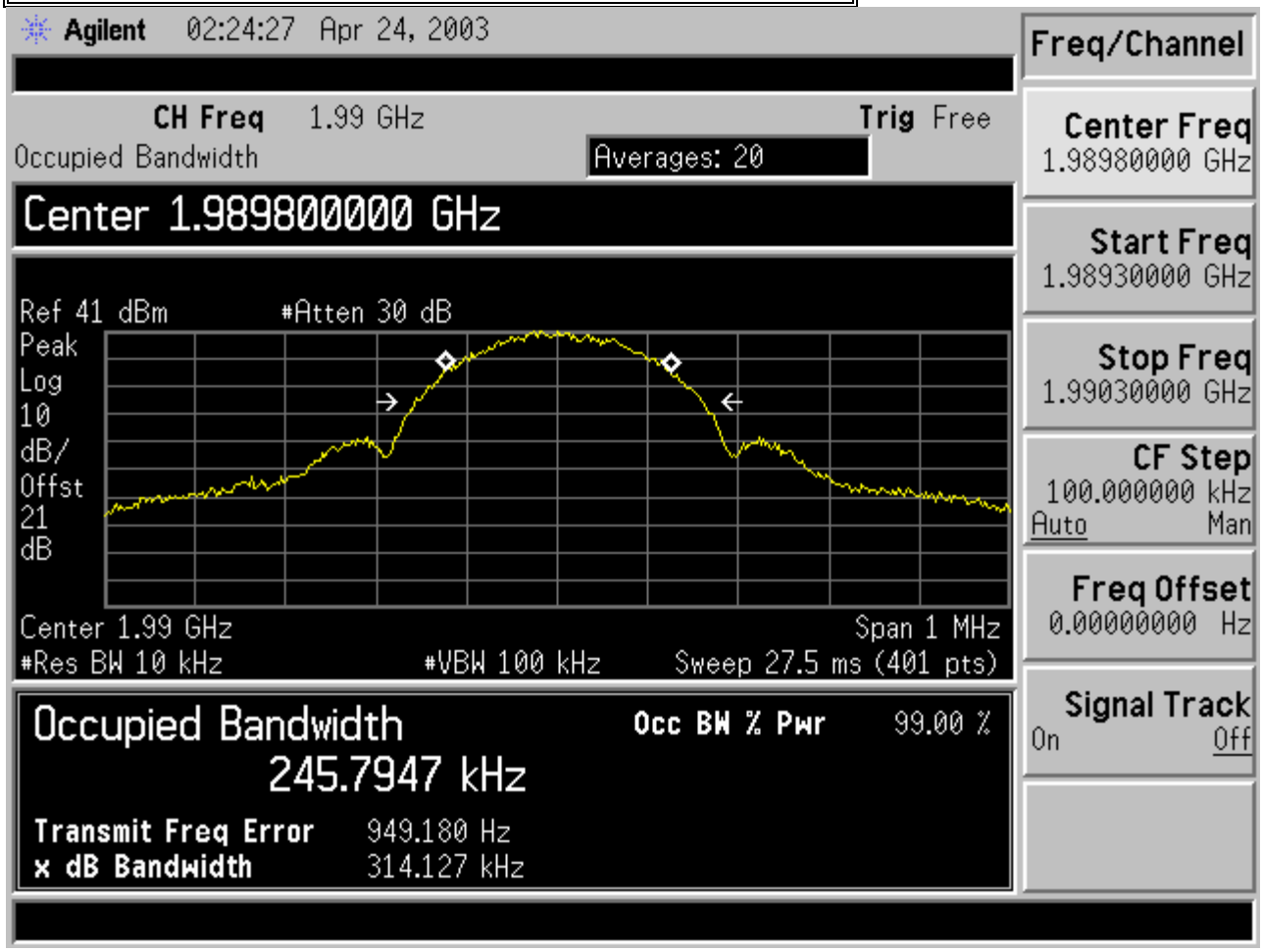
Occupied bandwidth
Channel B 1930.2MH
Modulation: EDGE



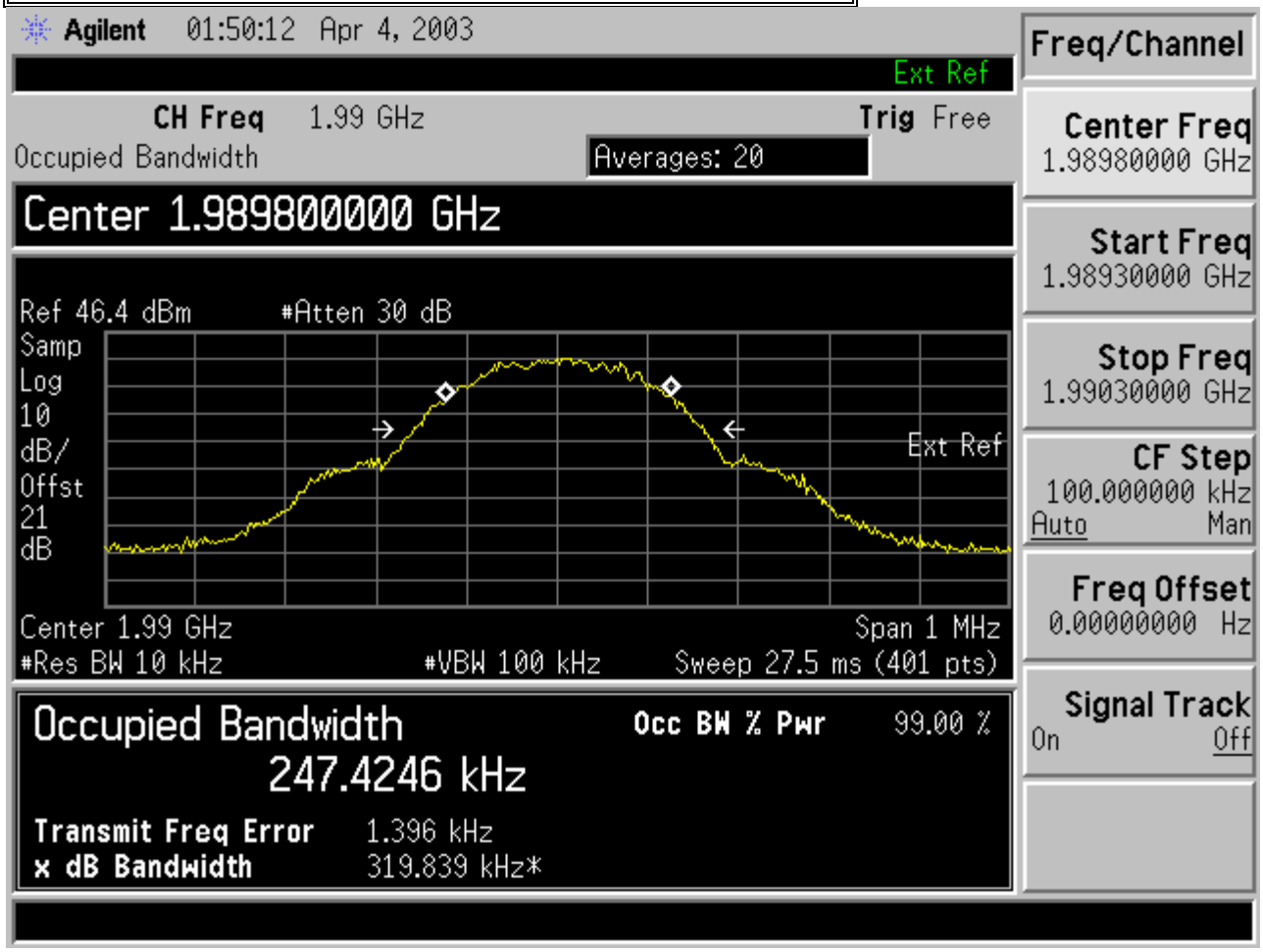
Occupied bandwidth
Channel M 1960MHz
Modulation: GSM (GMSK)



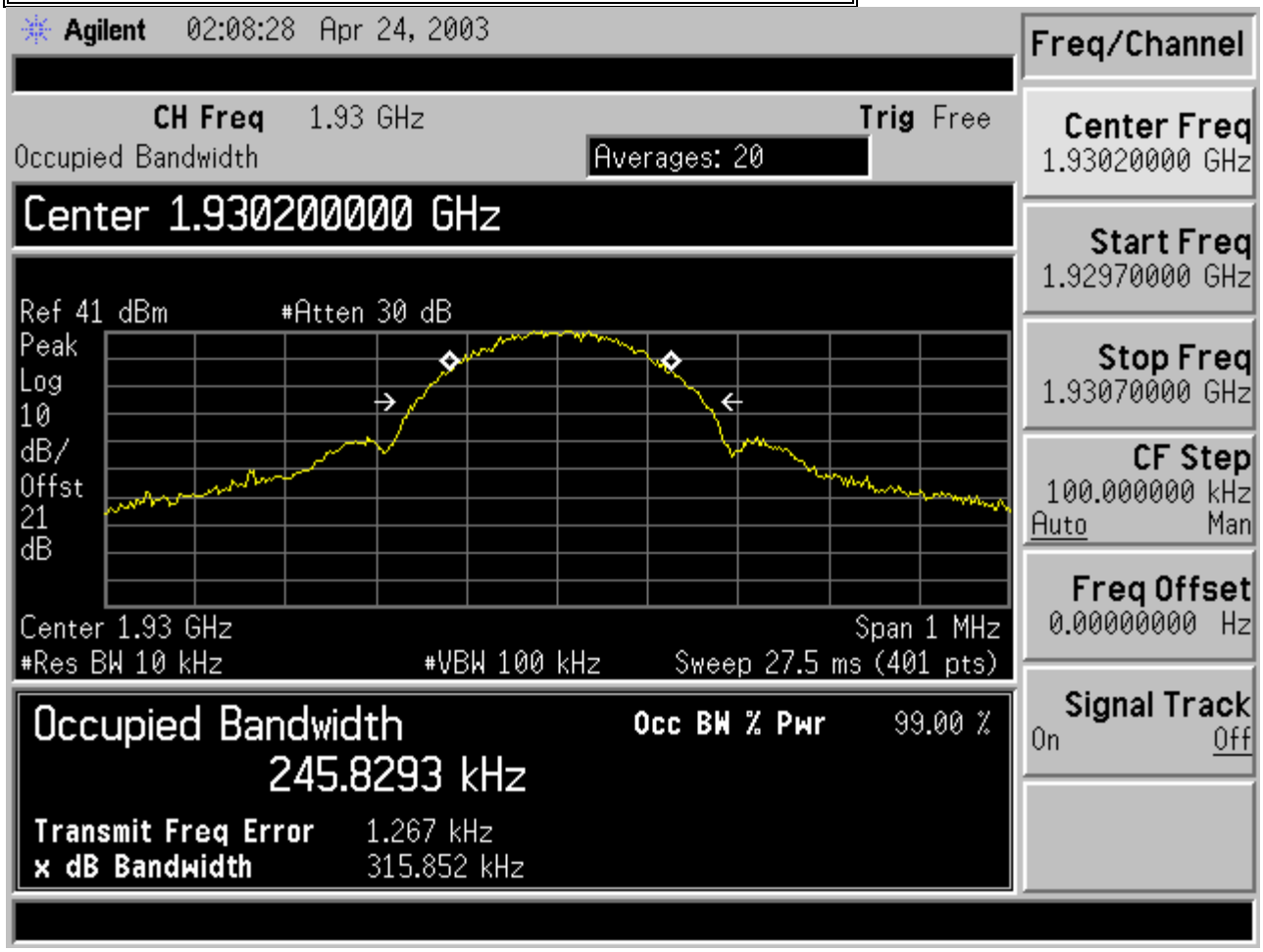
Occupied bandwidth
Channel M 1960MHz
Modulation: EDGE



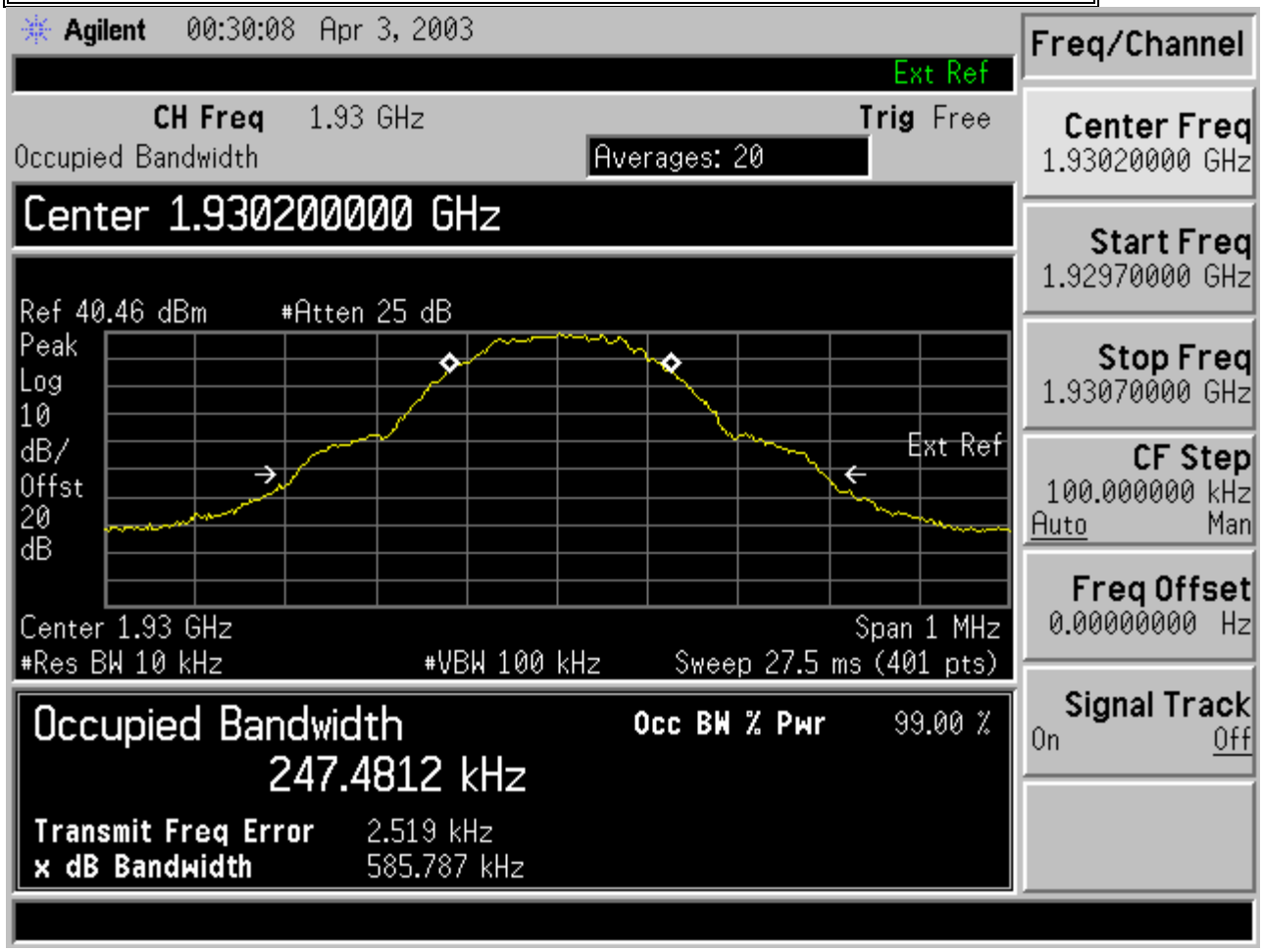
Occupied bandwidth
Channel T 1989.8 MHz
Modulation: GSM (GMSK)



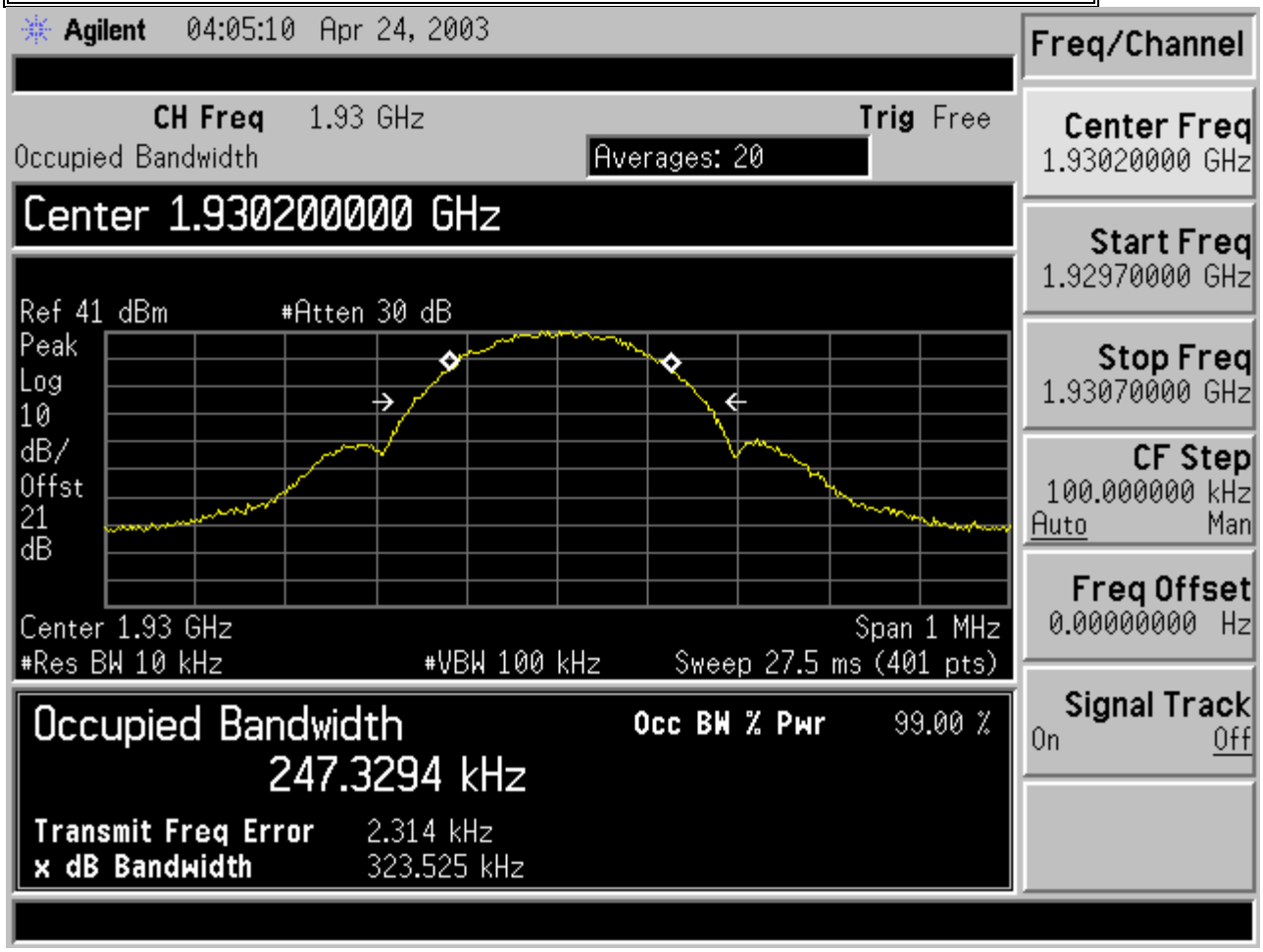
Occupied bandwidth
Channel T 1989.8 MHz
Modulation: EDGE



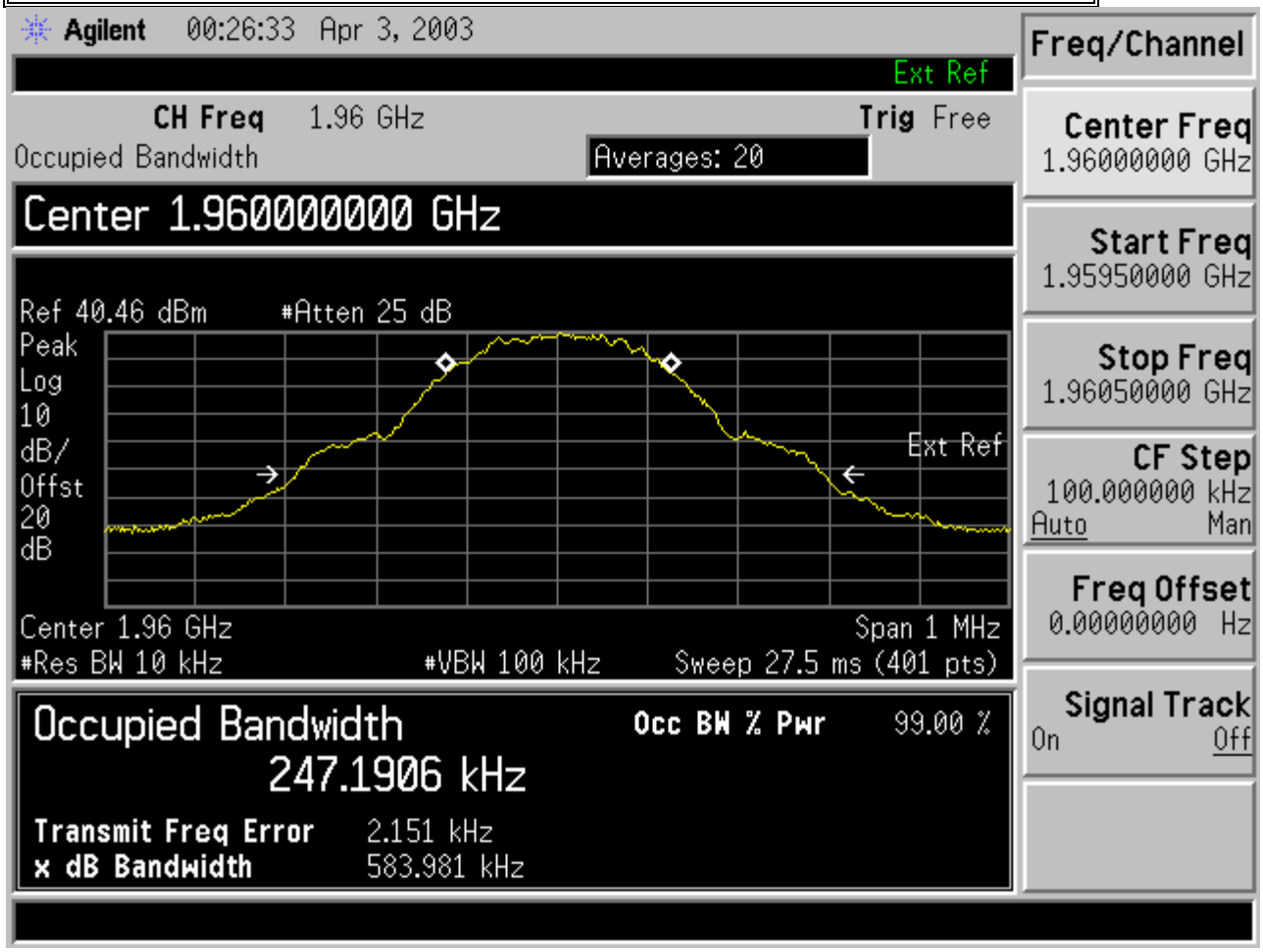
Occupied bandwidth
Channel B 1930.2 MHz
Modulation: GSM (GMSK)
TEST SETUP WITHOUT D.U.T CONNECTED



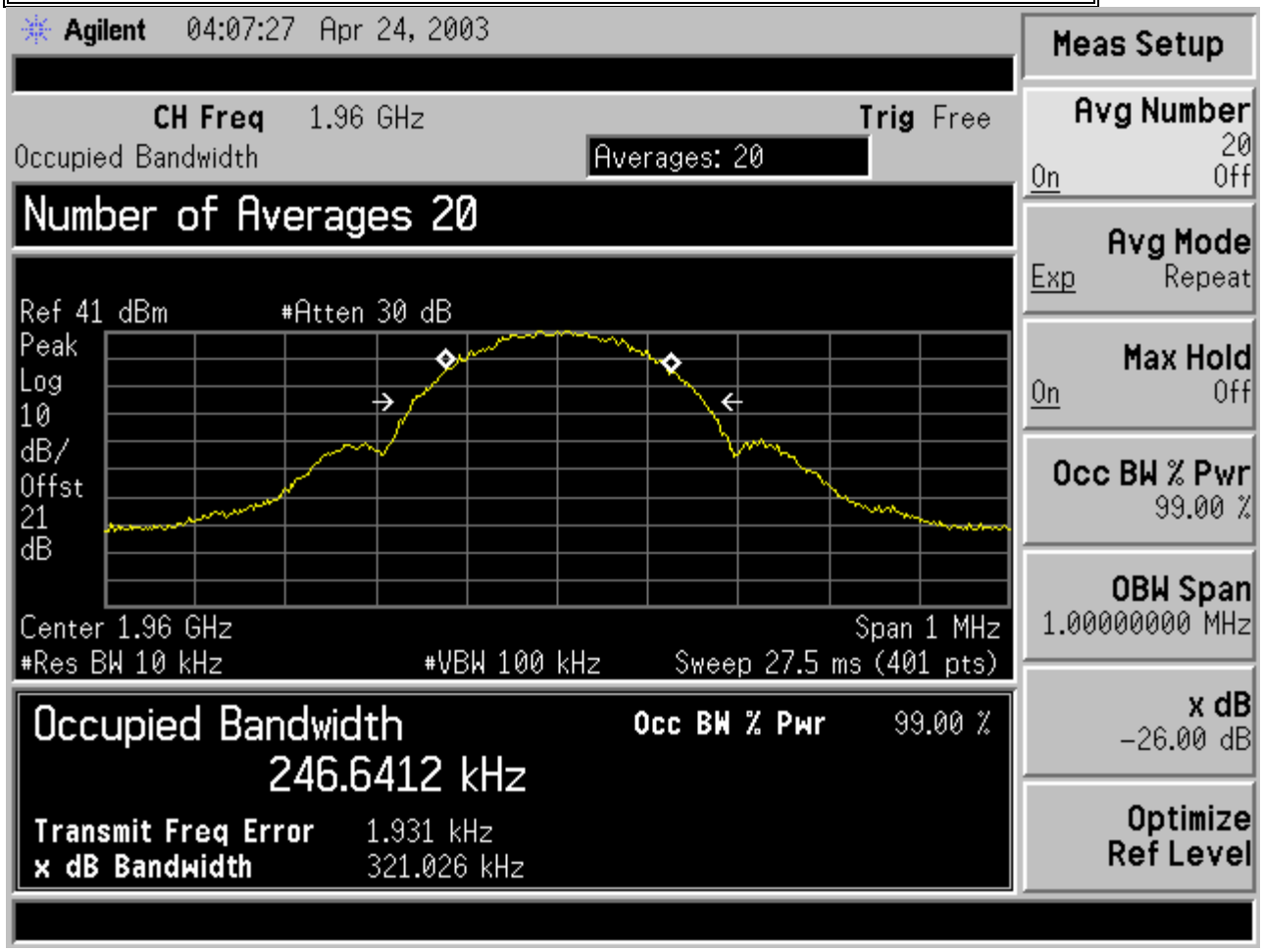
Occupied bandwidth
Channel B 1930.2 MHz
Modulation: EDGE
TEST SETUP WITHOUT D.U.T CONNECTED



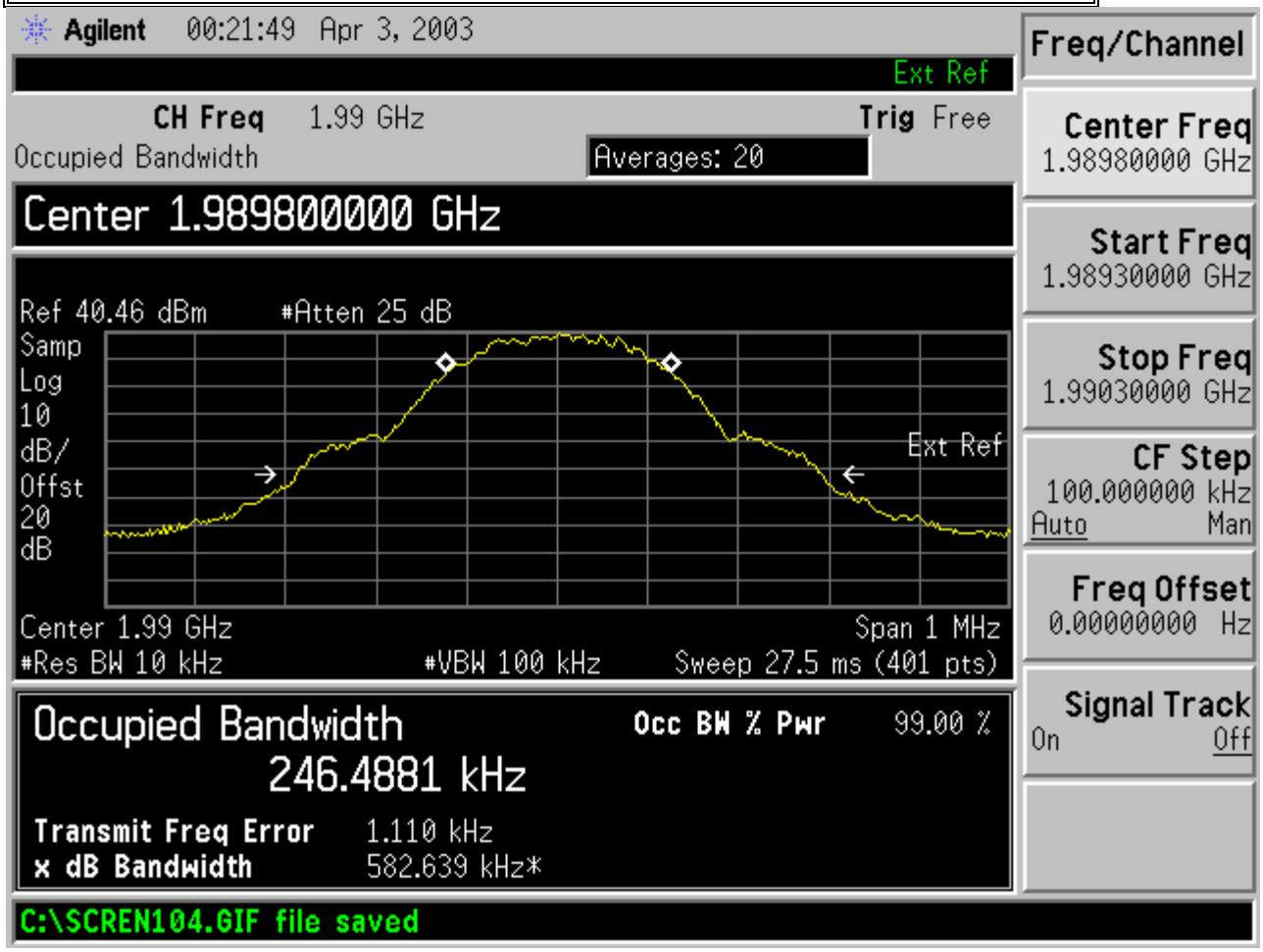
Occupied bandwidth
Channel M 1960 MHz
Modulation: GSM (GMSK)
TEST SETUP WITHOUT D.U.T CONNECTED



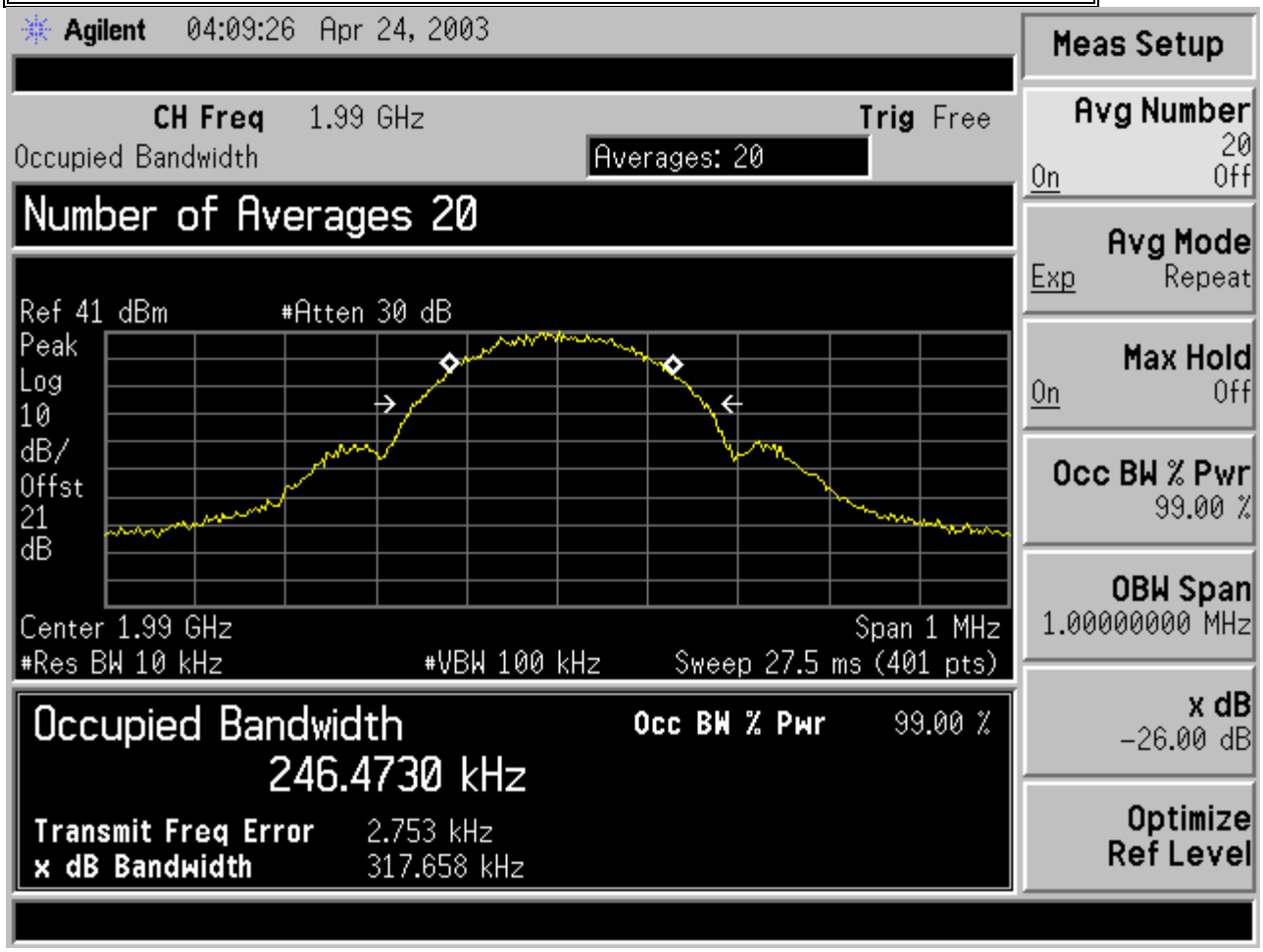
Occupied bandwidth
Channel M 1960 MHz
Modulation: EDGE
TEST SETUP WITHOUT D.U.T CONNECTED



Occupied bandwidth
Channel T 1989.8 MHz
Modulation: GSM (GMSK)
TEST SETUP WITHOUT D.U.T CONNECTED

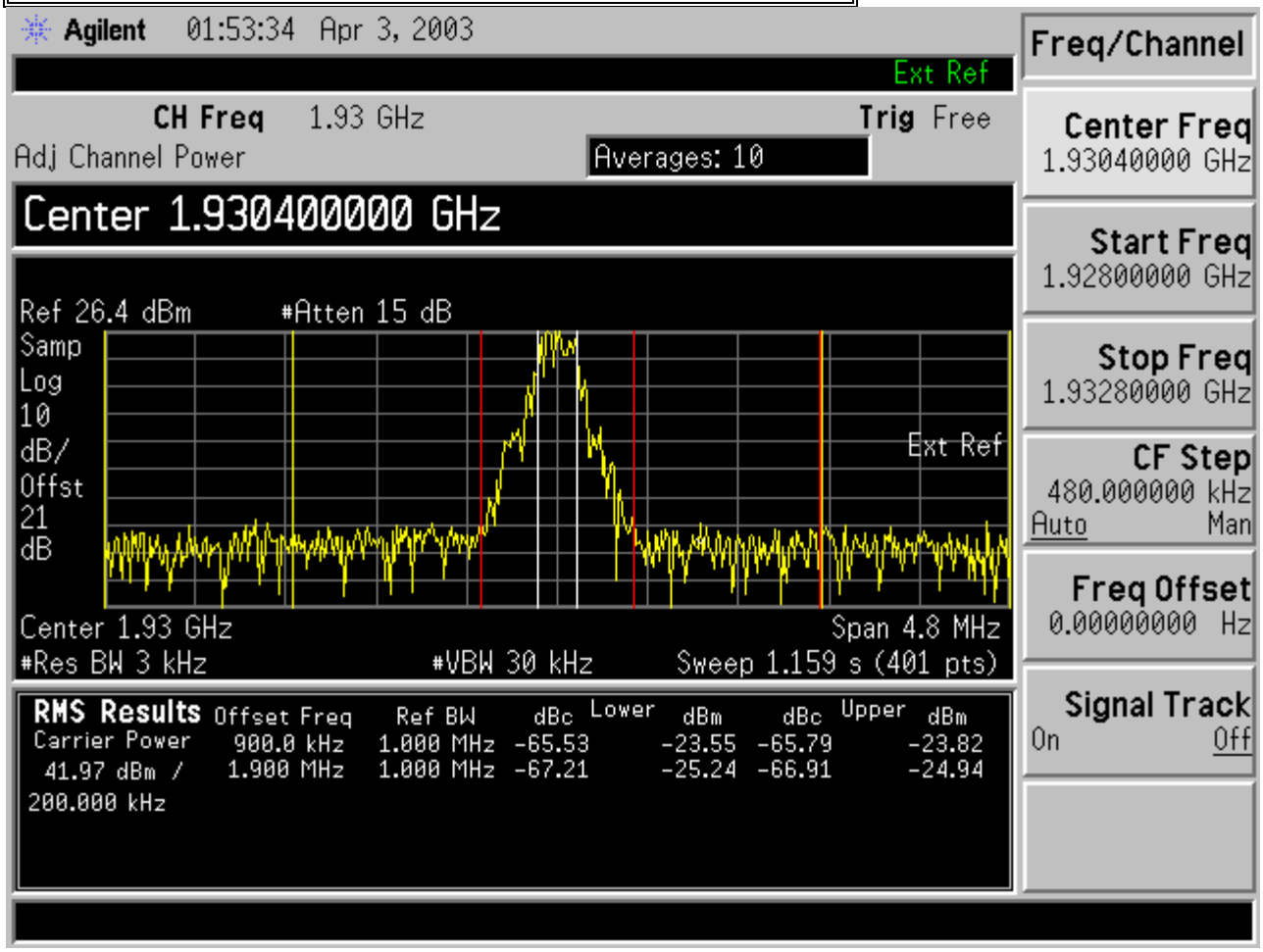


Occupied bandwidth
Channel T 1989.8 MHz
Modulation: EDGE
TEST SETUP WITHOUT D.U.T CONNECTED

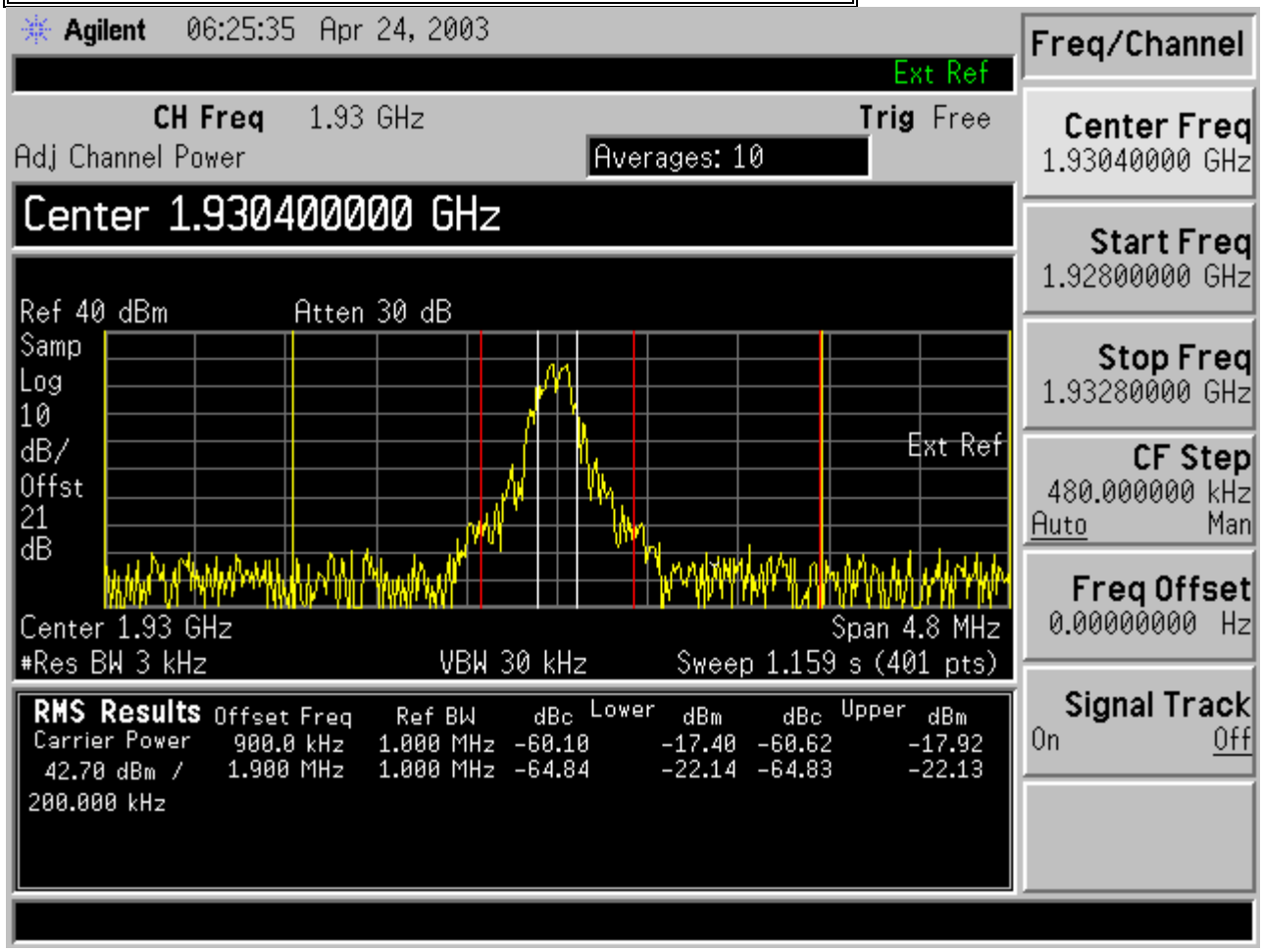


9.5 Spurious at Band edged ANT 1

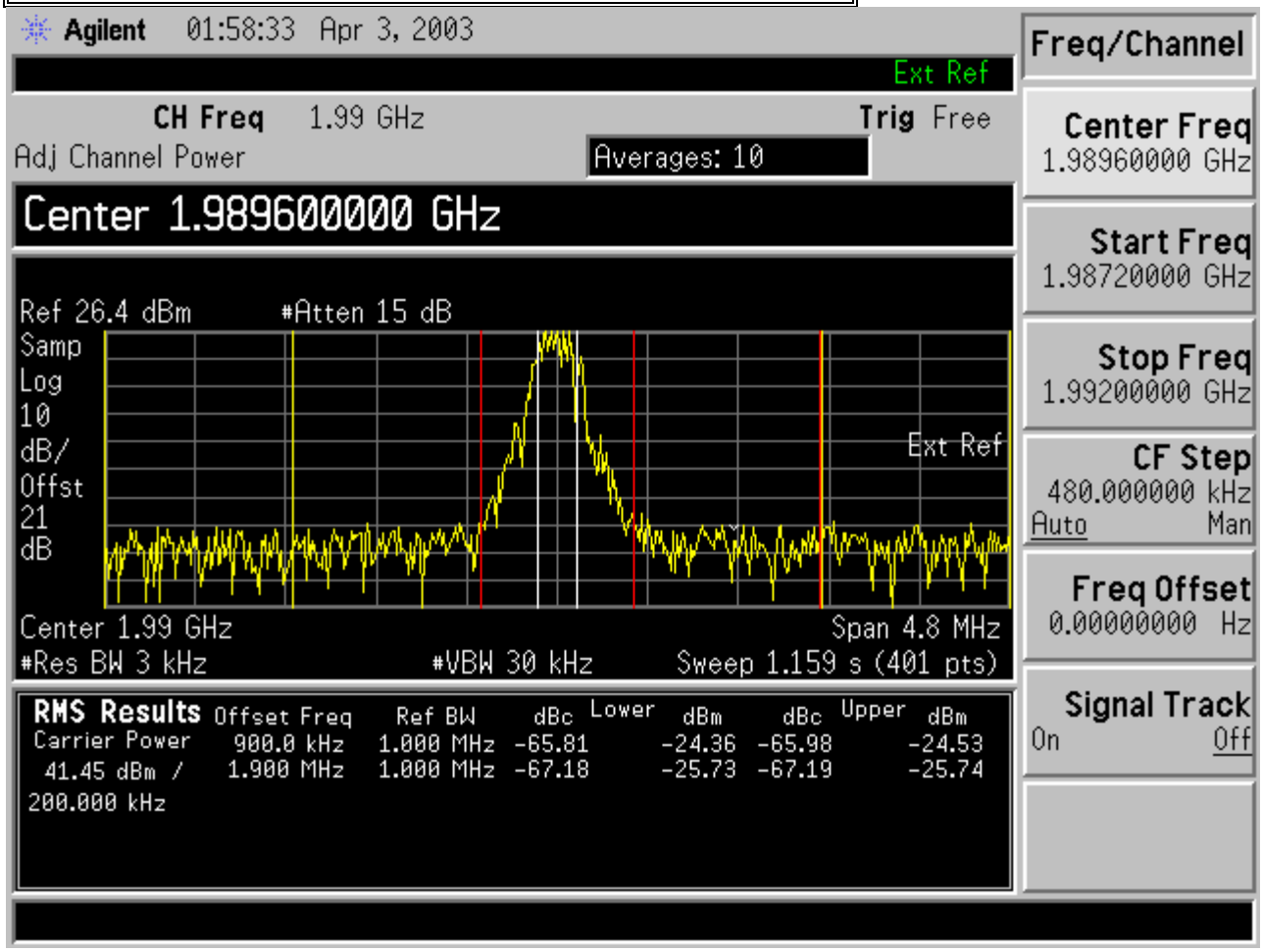
Spurious at Band edge
Channel 513 1930.4 MHz
Modulation: GSM (GMSK)



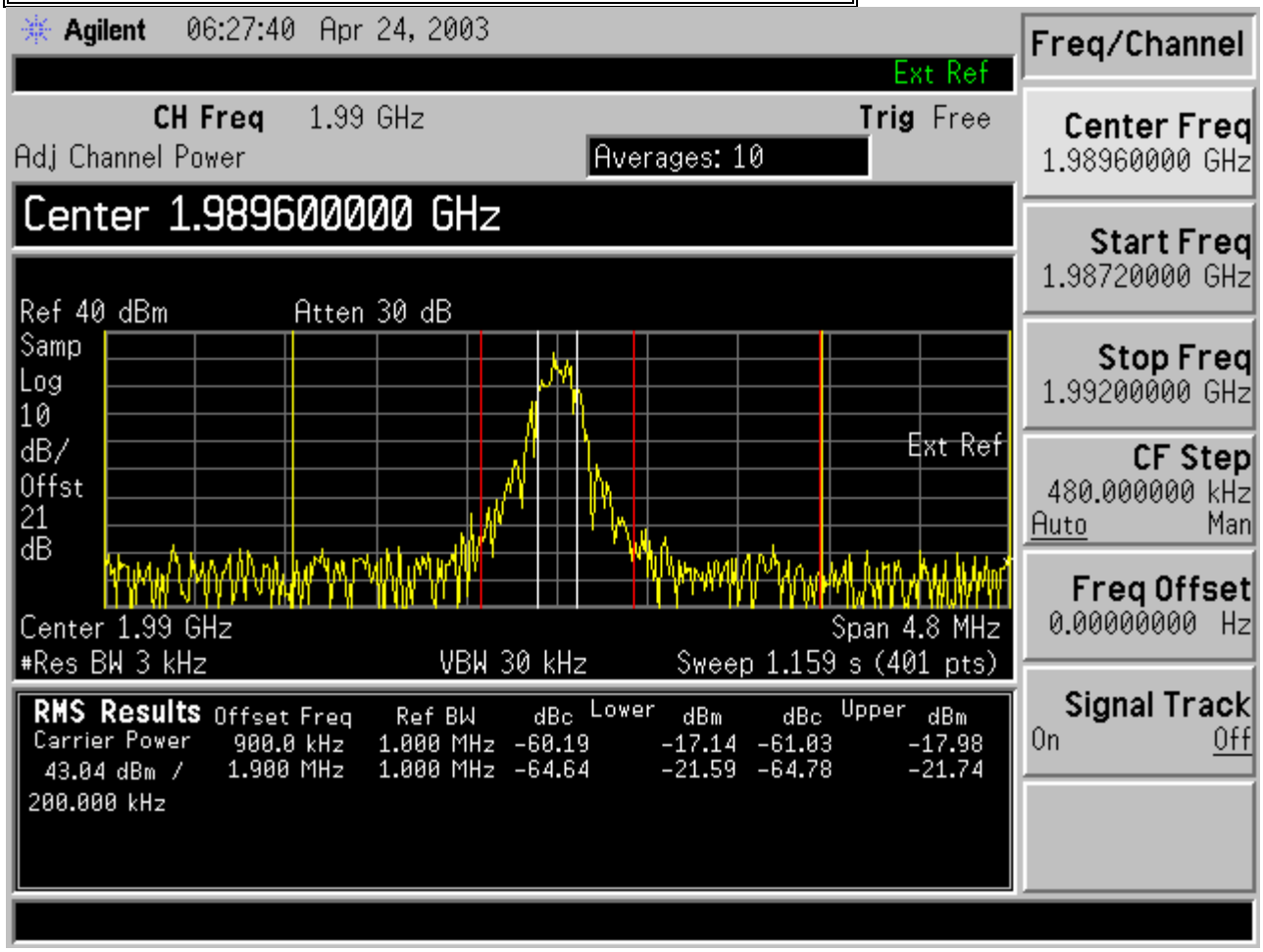
Spurious at Band edge
Channel 513 1930.4 MHz
Modulation: EDGE



Spurious at Band edge
Channel 809 1989.6 MHz
Modulation: GSM (GMSK)

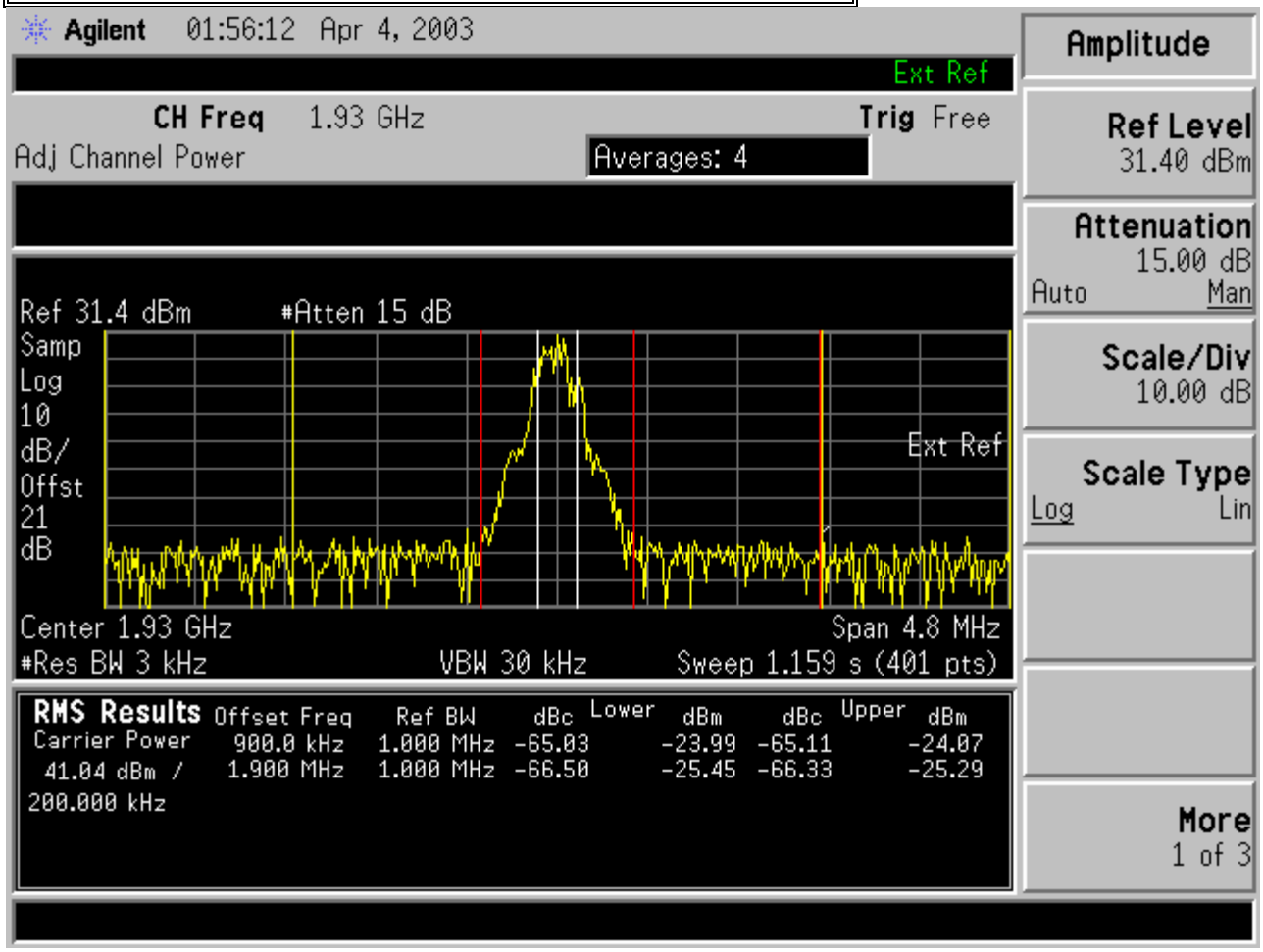


Spurious at Band edge
Channel 809 1989.6 MHz
Modulation: EDGE

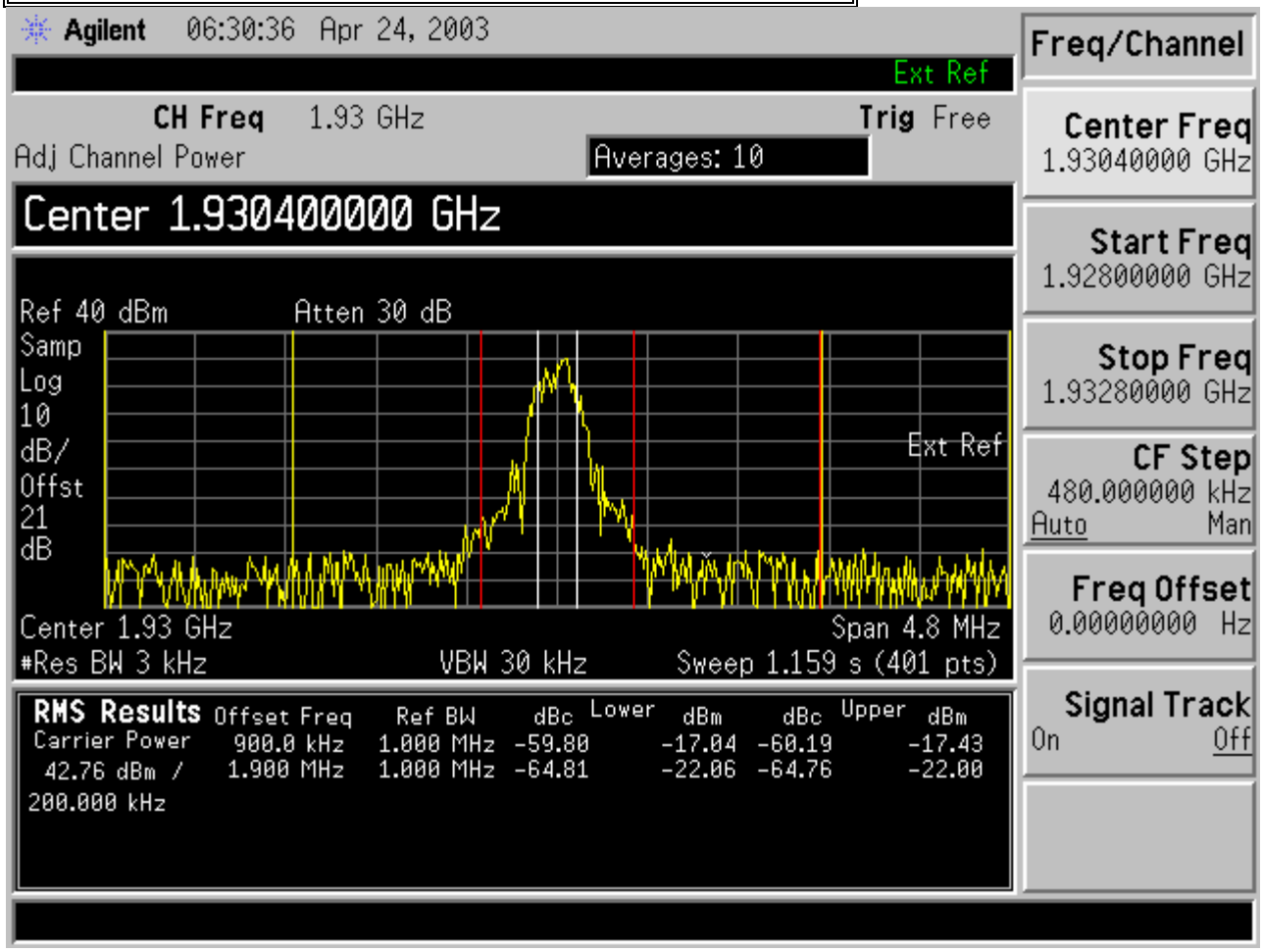


9.6 Spurious at Band edged ANT 2

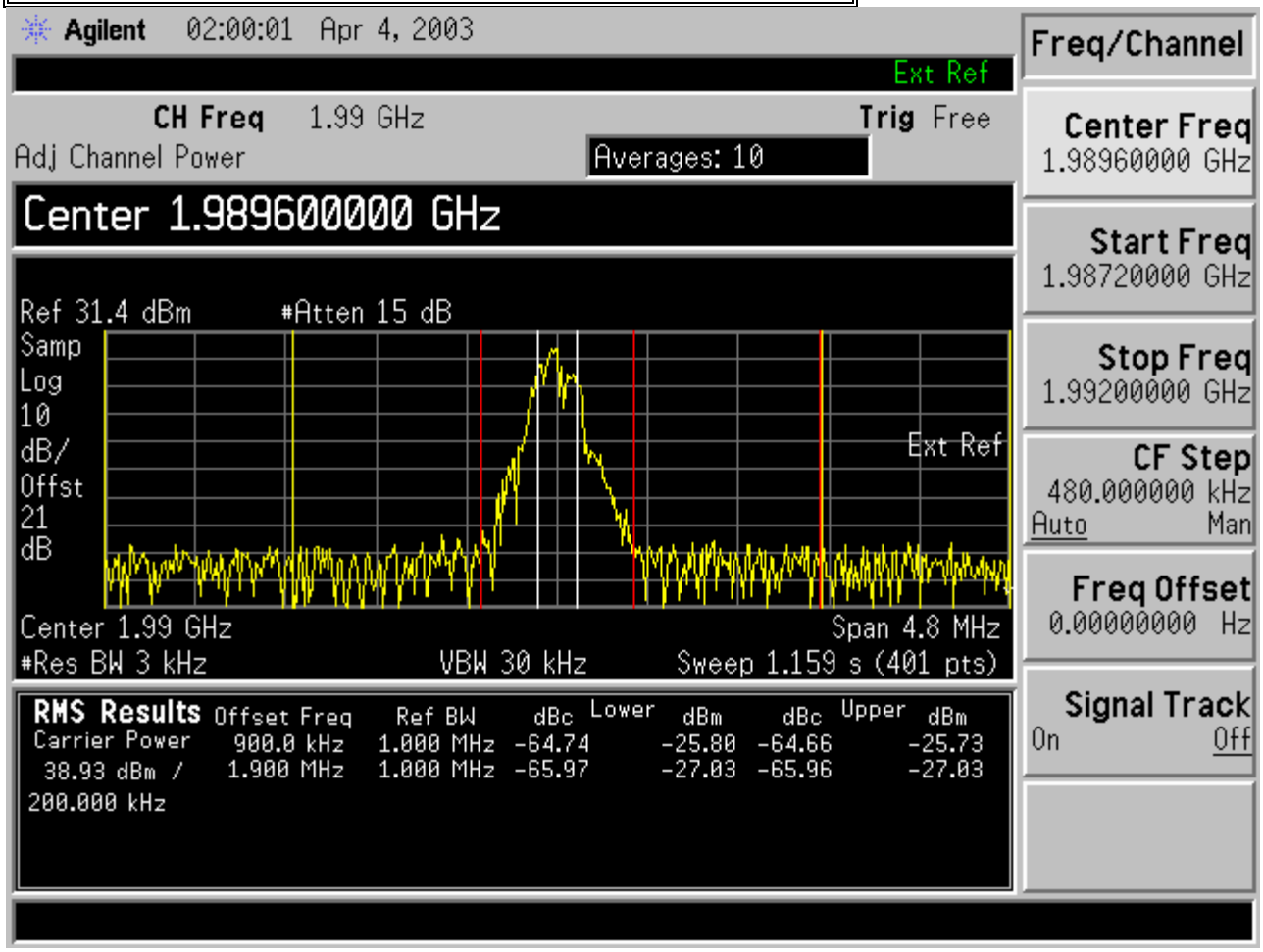
Spurious at Band edge
Channel 513 1930.4 MHz
Modulation: GSM (GMSK)



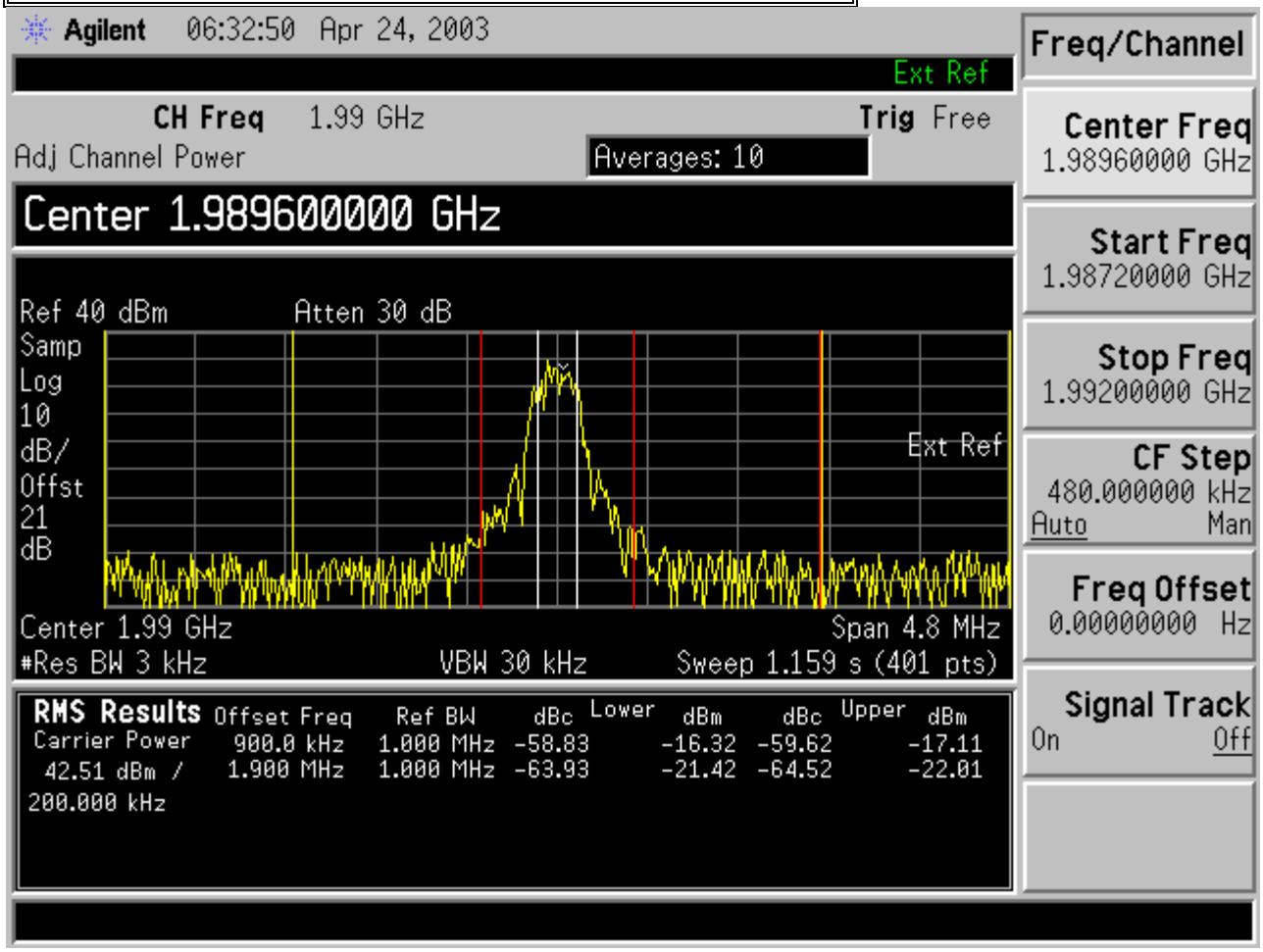
Spurious at Band edge
Channel 513 1930.4 MHz
Modulation: EDGE



Spurious at Band edge
Channel 809 1989.6 MHz
Modulation: GSM (GMSK)



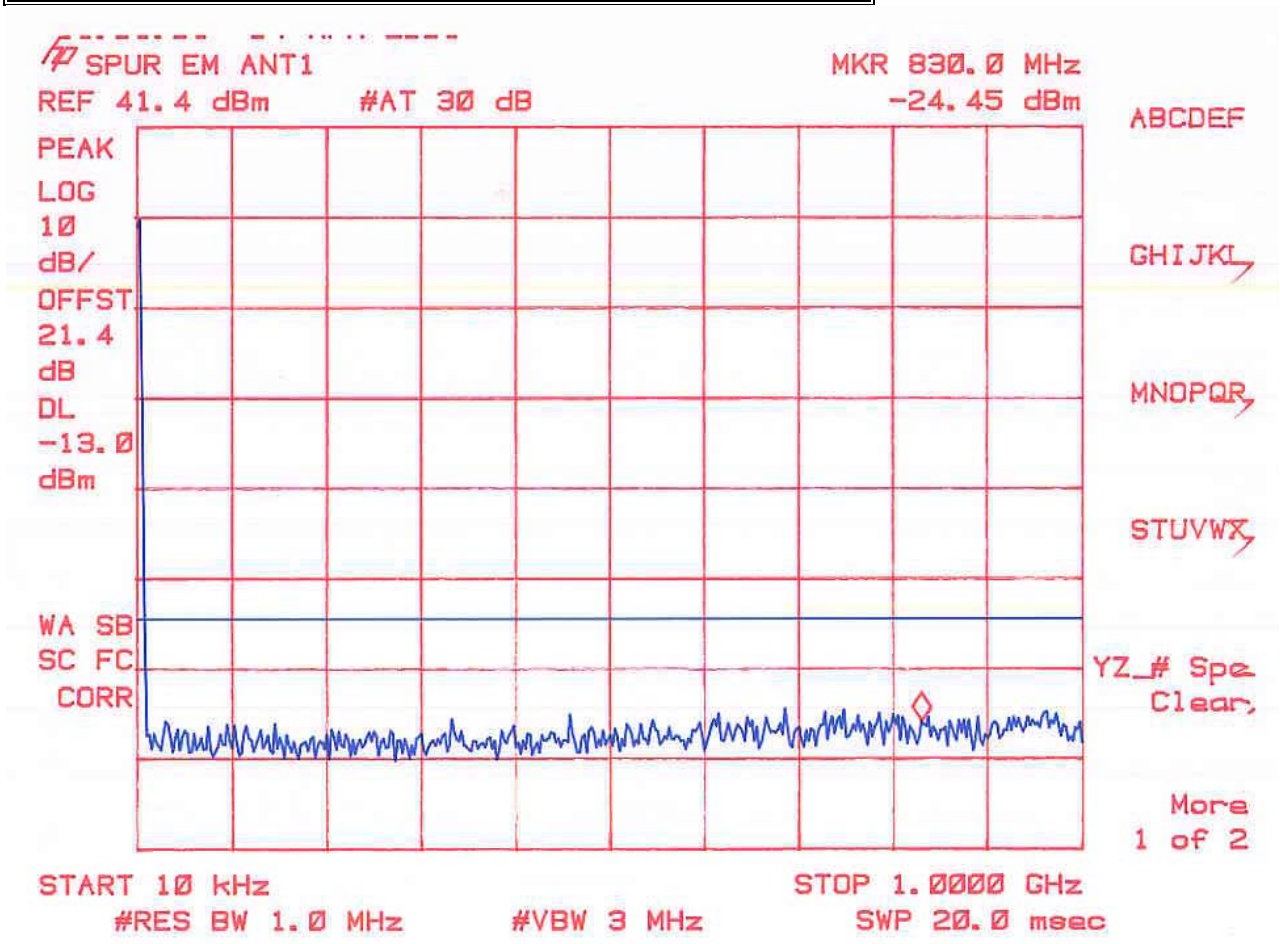
Spurious at Band edge
Channel 809 1989.6 MHz
Modulation: EDGE



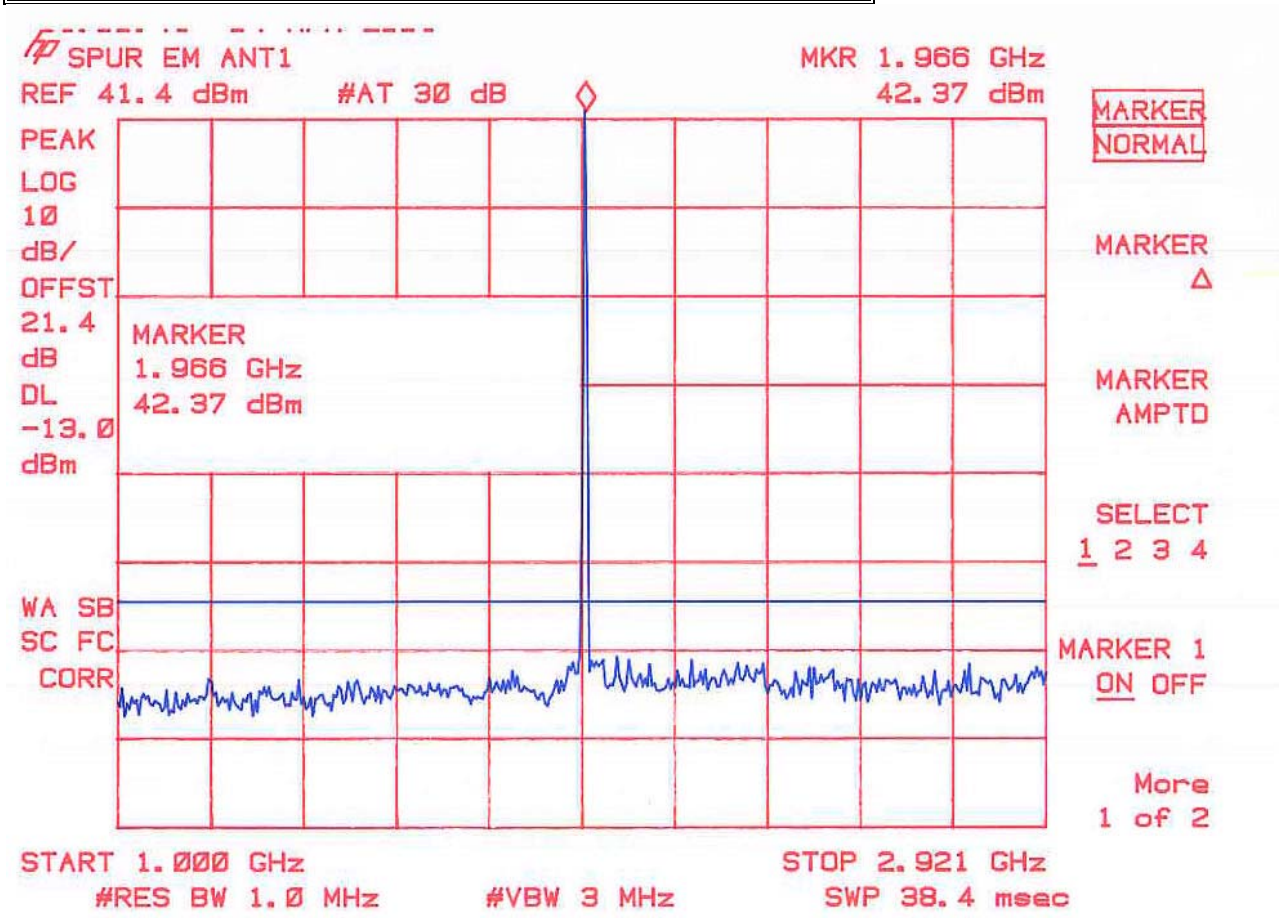
9.7 Spurious emission Ant port 1

Applied CW signal at BTS 1 port: 1960MHz

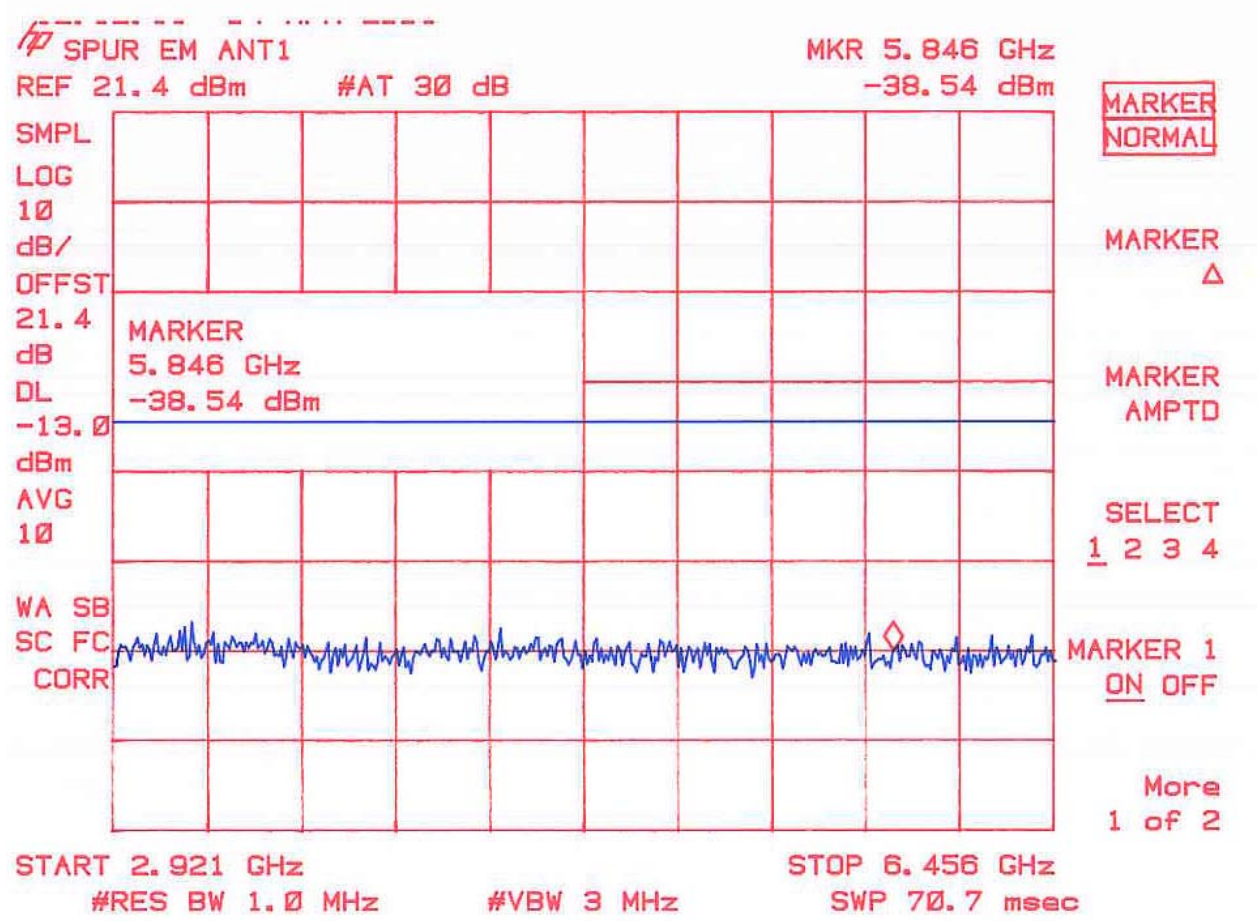
Spurious emission 10kHz-1G



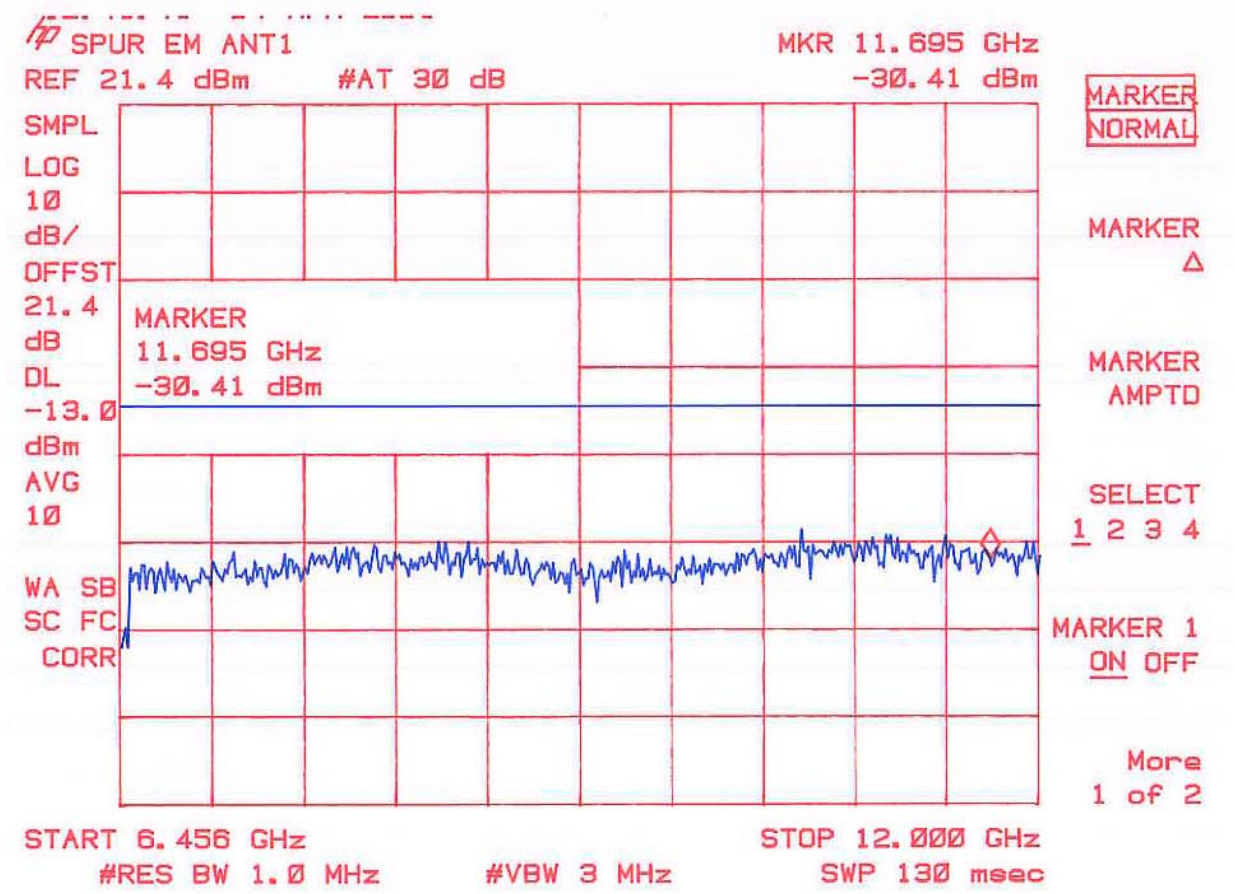
Spurious emission 1G - 2.921G



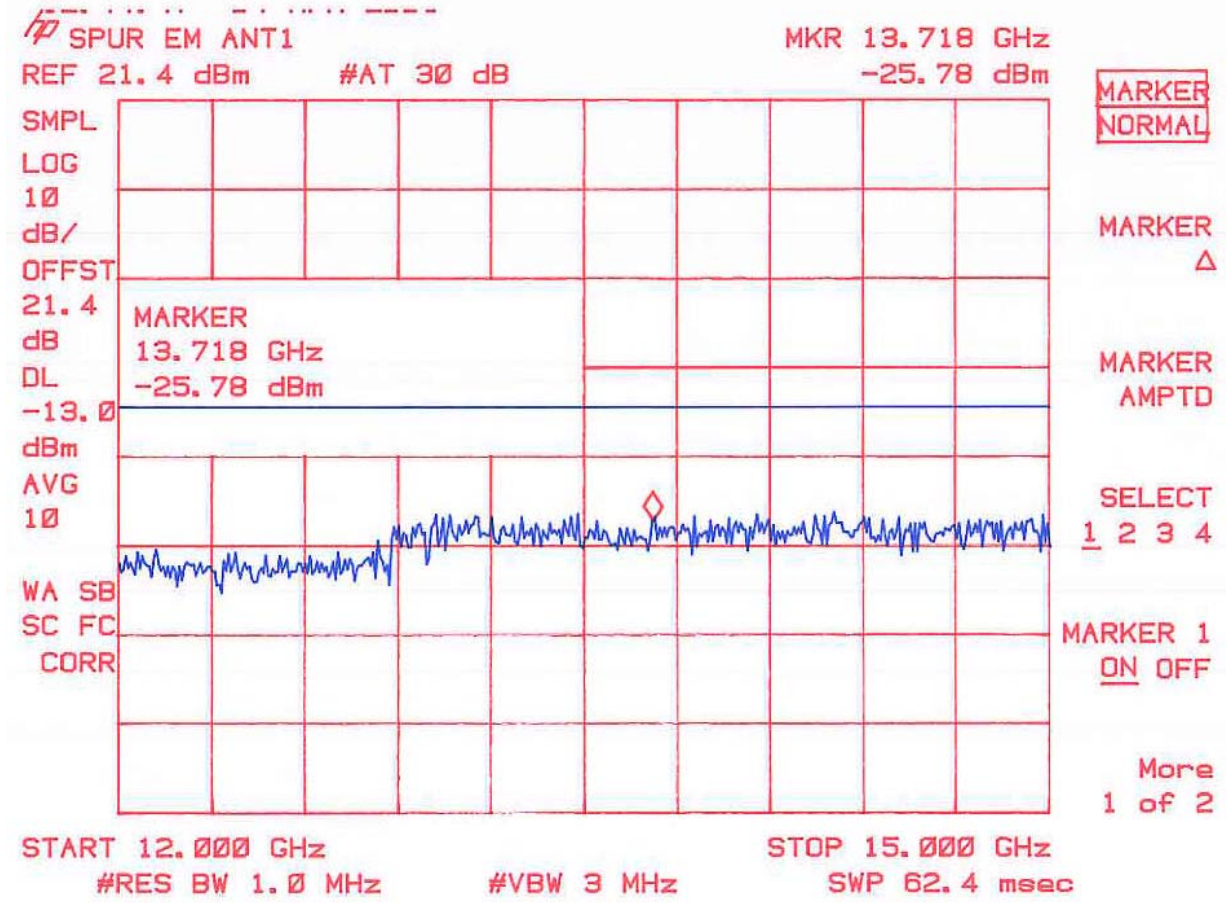
Spurious emission 2.921G – 6.456 G



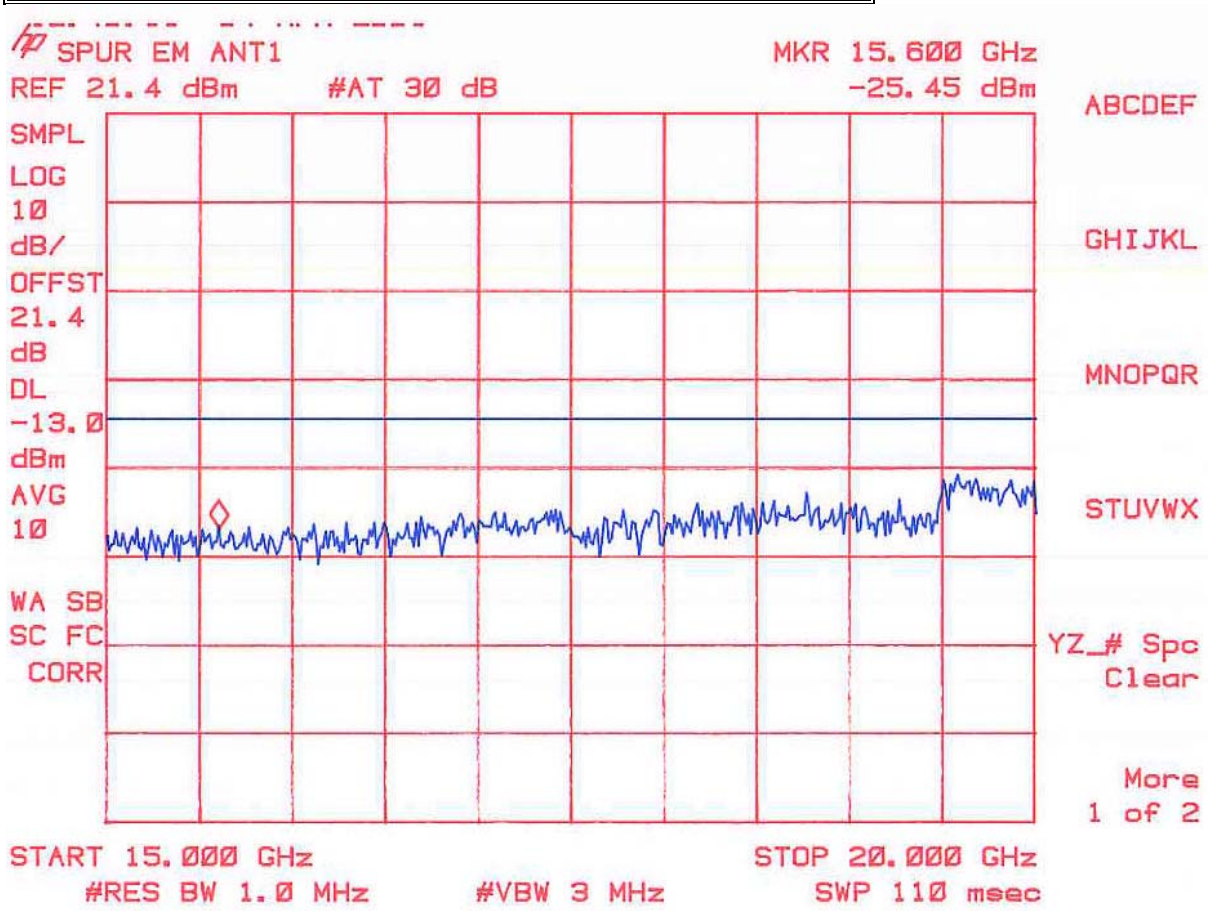
Spurious emission 6.456 G – 12.0 G



Spurious emission 12.0 G – 15.0 G



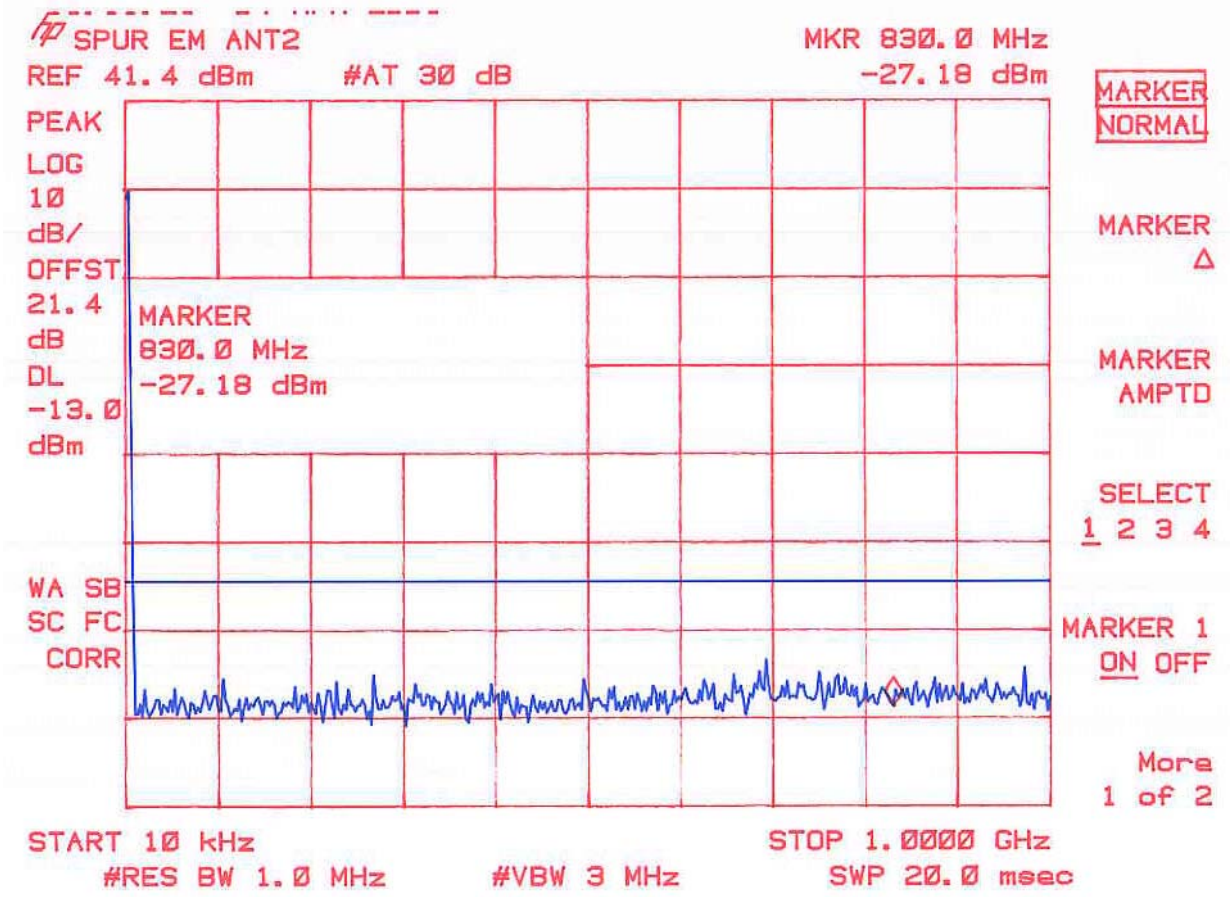
Spurious emission 15.0 G – 20. G



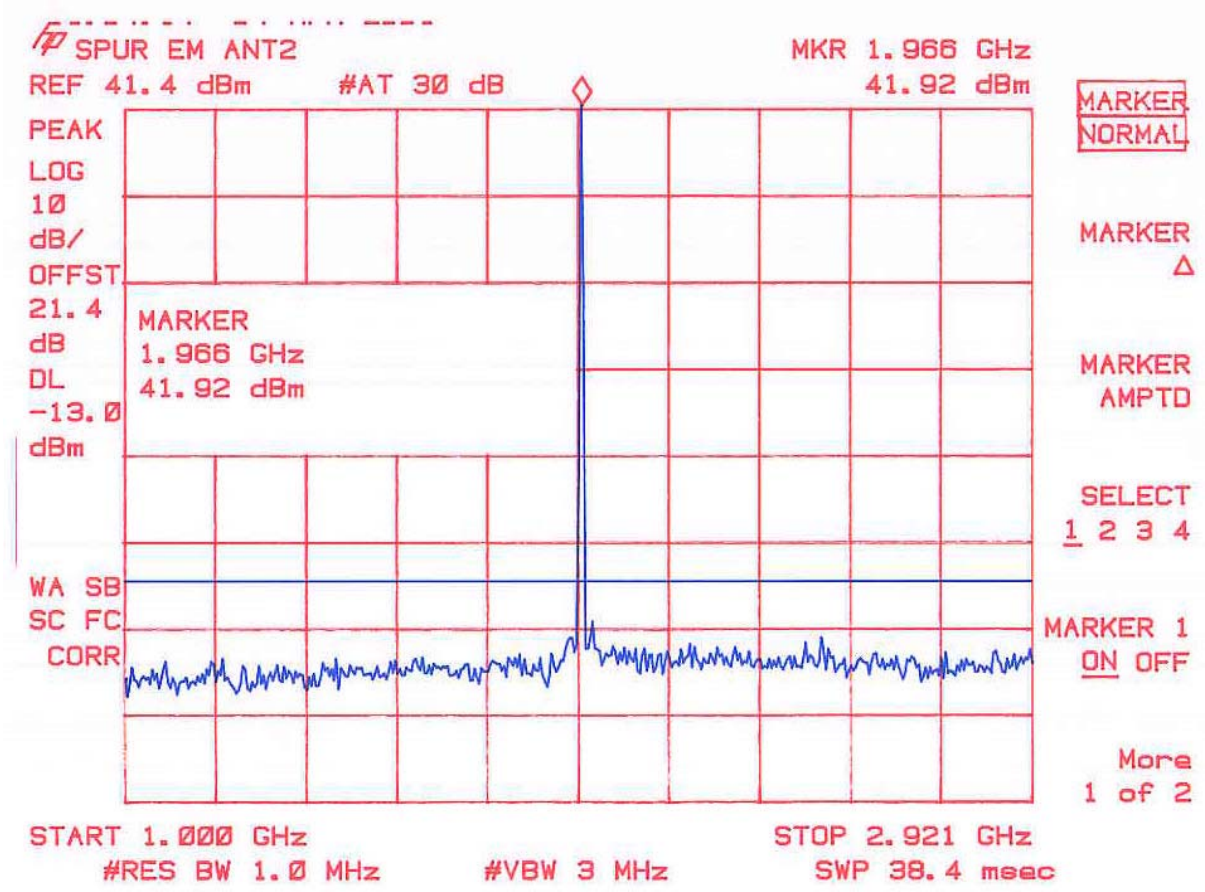
9.8 Spurious emission Ant port 2

Applied CW signal at BTS 2 port: 1960MHz

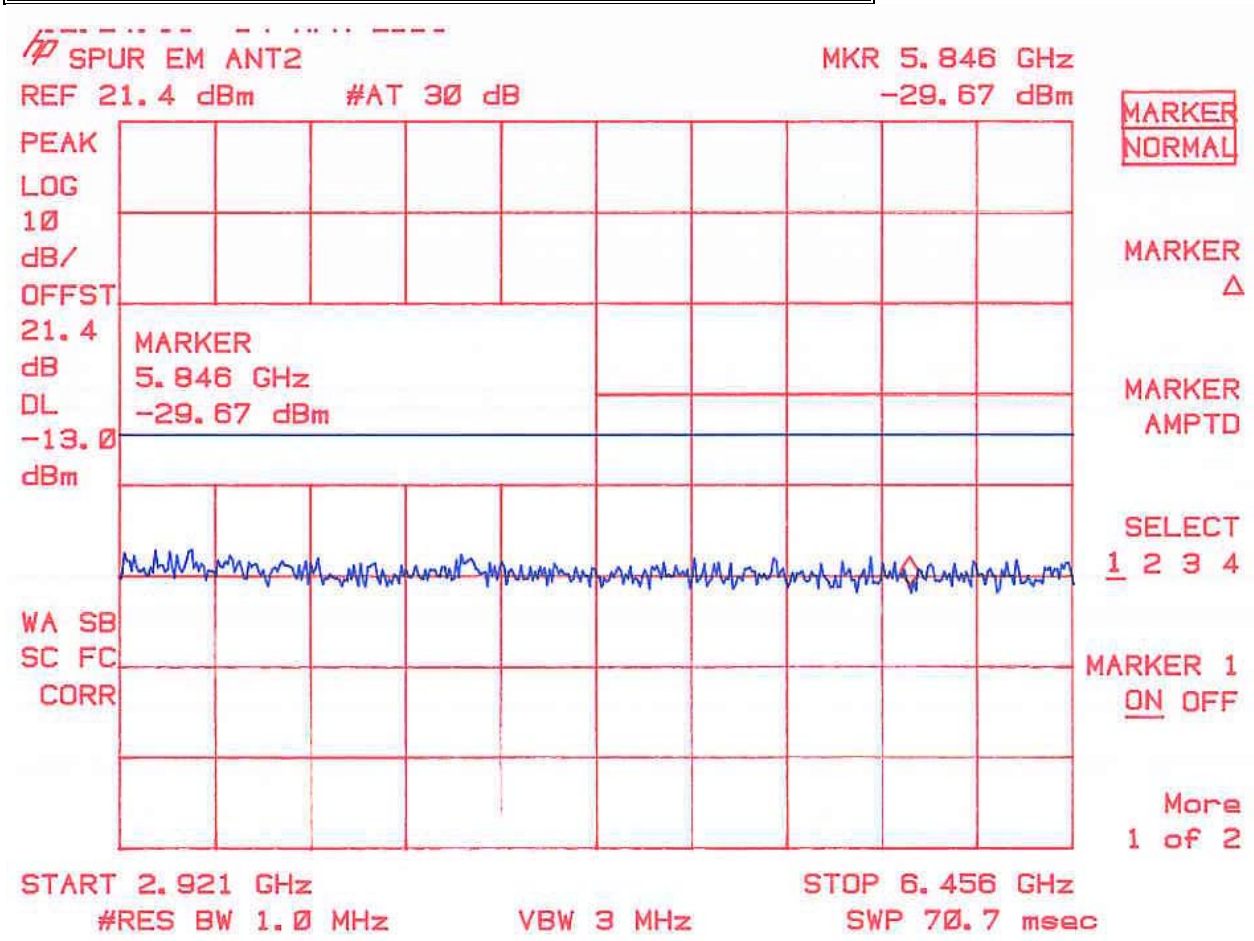
Spurious emission 10KHz – 1.0 G



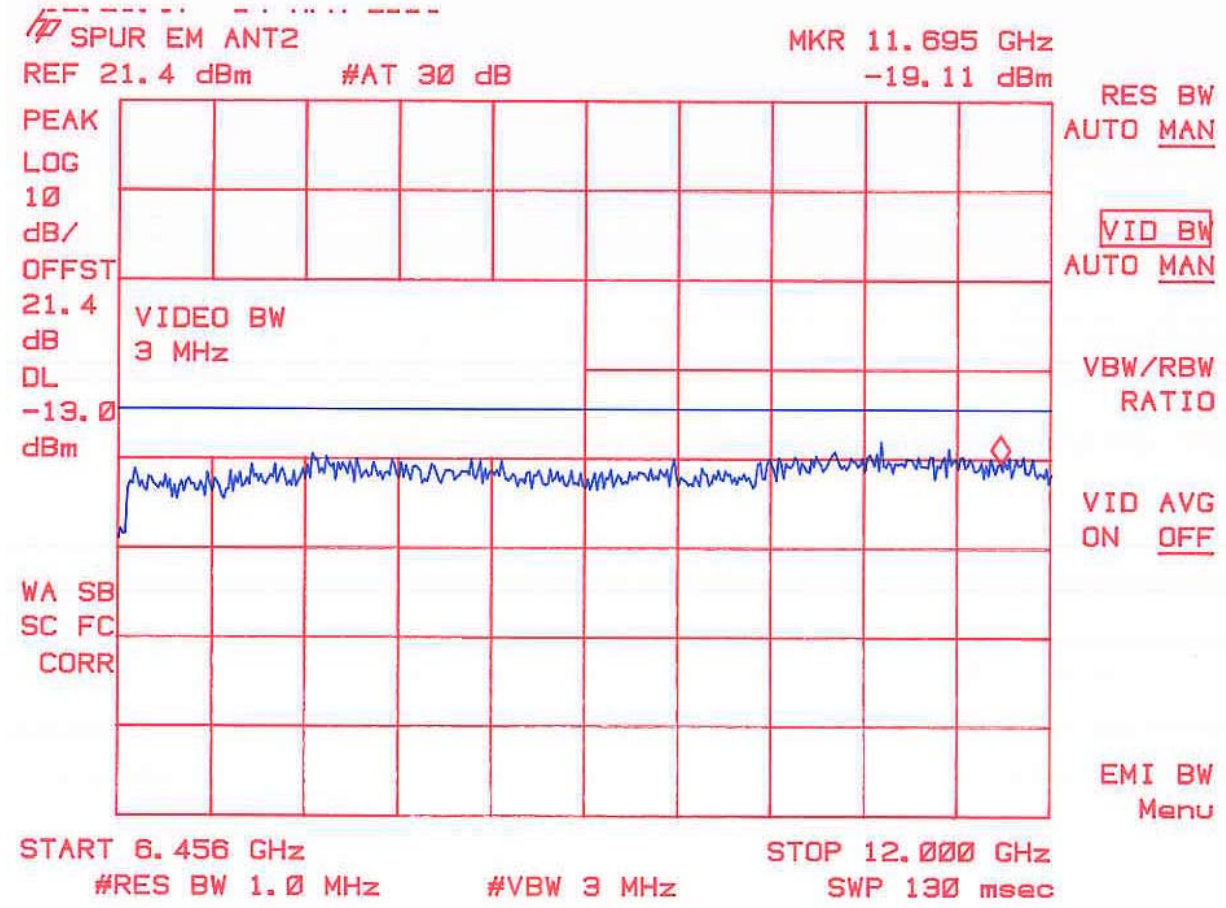
Spurious emission 1.0 G – 2.921 G



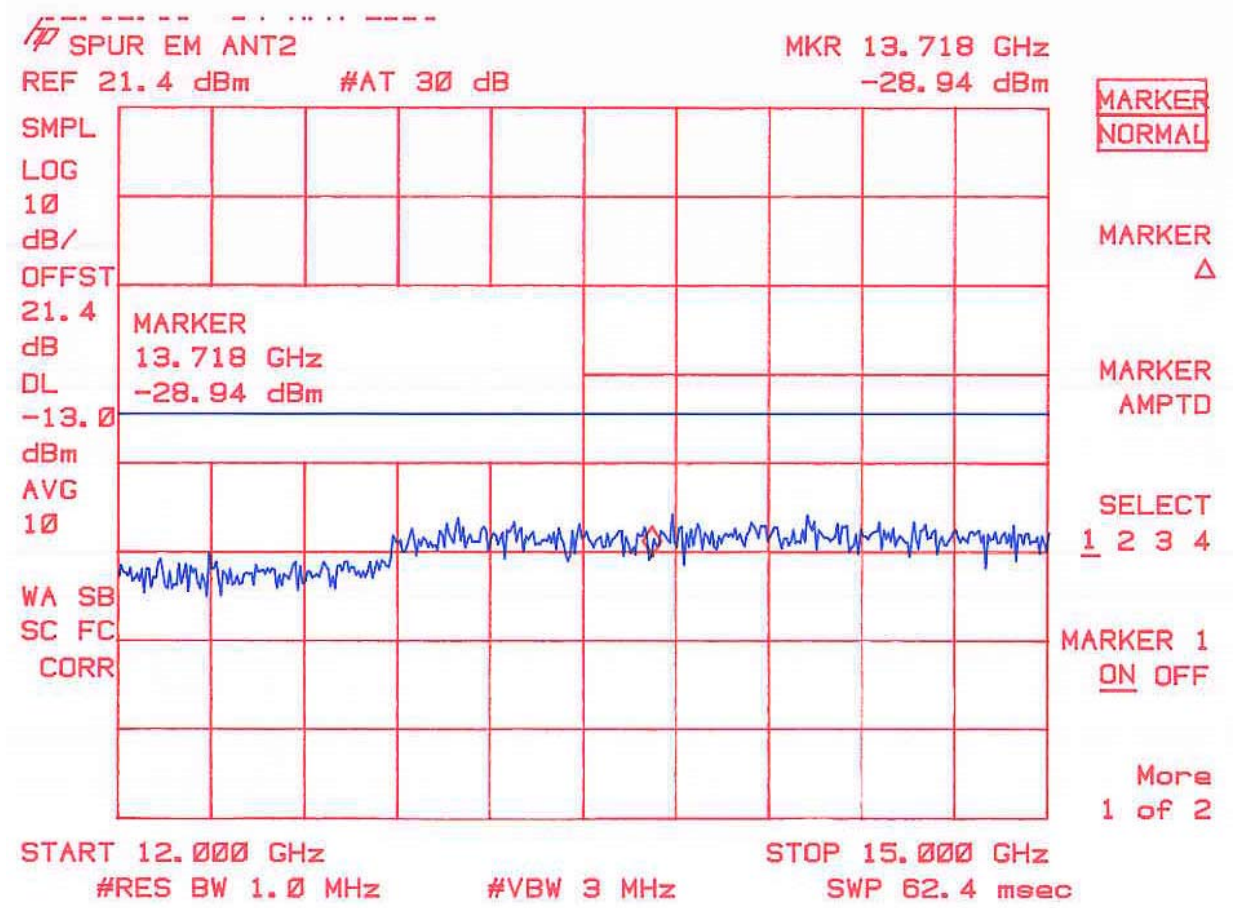
Spurious emission 2.921 G – 6.456 G



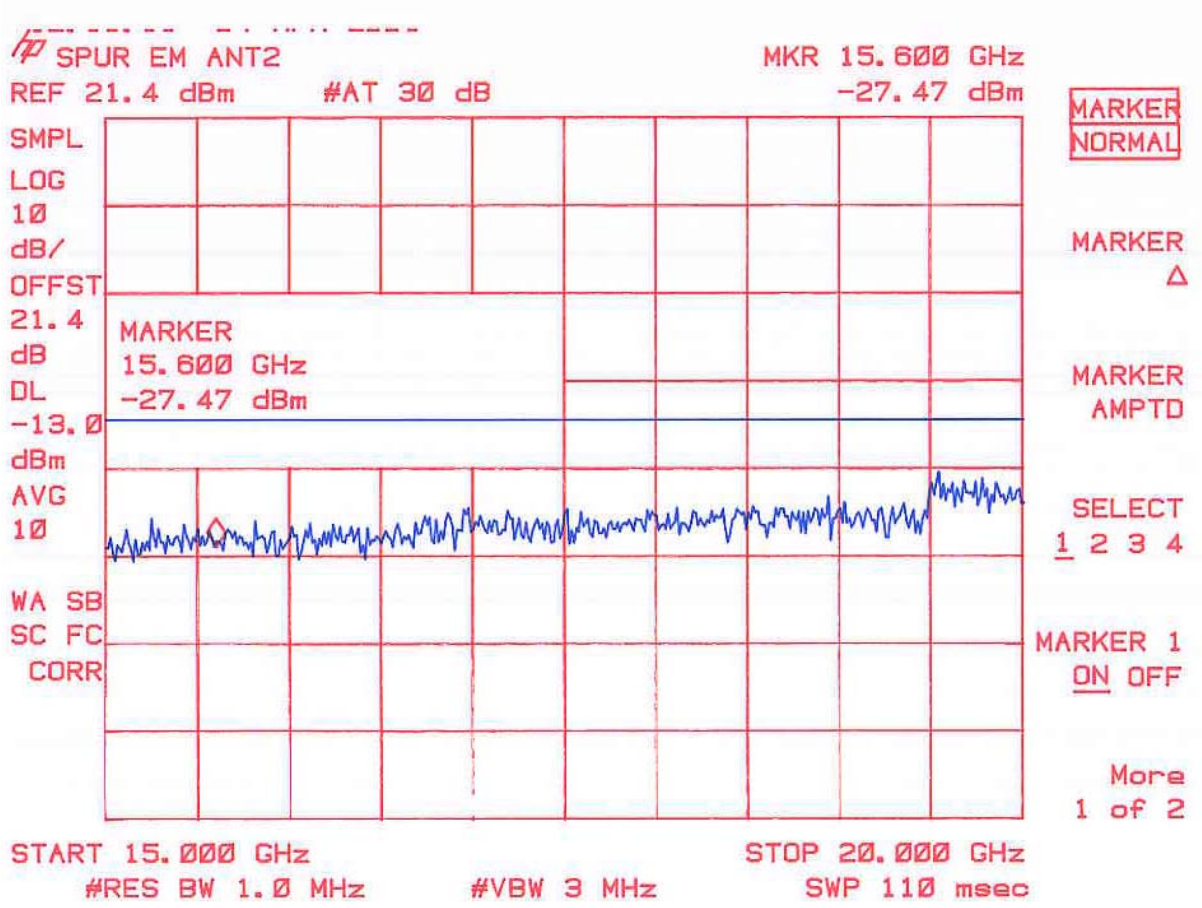
Spurious emission 6.456 G – 12.0 G



Spurious emission 12.0 G.– 15. 0 G



Spurious emission 15. 0 G – 20.0 G



10 Gain Plot 1930-1990 MHz