SIERRA WIRELESS

HEART OF THE WIRELESS MACHINE™

FCC Part 22 and 24 Class II Permissive Change Test Report

For
800/1900 MHz CDMA DUAL BAND PC CARD

Model: AirCard 555

FCC ID: N7NACRD555

Prepared by
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Test Date(s): May / June 2002

Table of Contents

1 Introduction

1.1 Test Summary

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
2.1046	RF Power Output	Complies	6
22.913, 24.232	ERP, EIRP	Complies	*
2.1049	Occupied Bandwidth Emission Designator	Complies 1M25G7D	15
2.1051, 22.901(d) 22.917(f), 24.238(a)	Out of Band Emissions at Antenna Terminals Mobile Emissions In Base Frequency Range	Complies	18
2.1053	Field Strength of Spurious Radiation	Complies	*
2.1055	Frequency Stability vs Temperature	Complies	44
2.1055	Frequency Stability vs Voltage	Complies	45

* Separate Reports are issued.

The following tests:

- 22.913, 24.232 ERP/EIRP Measurement
- 2.1053 Field Strength of Spurious Radiation

were conducted at

Compliance Certification Services, Inc.
561F Monterey Road
Morgan Hill
CA 95037
USA

The remaining tests described in this report were performed at

Sierra Wireless, Inc.
13811 Wireless Way
Richmond, B.C. V6V 3A4
Canada

1.2 Product Description

The Sierra Wireless Inc. model AirCard 555 (FCC ID: N7NACRD555) is a dual band CDMA PCMCIA Radio Card with removable antenna. It was initially certified by the

Commission on September 25, 2001. The description of all the changes in this Class II Permissive Change application is included in the attached file AC555change.pdf.

EUT Type	Cellular and PCS PCMCIA Card
Whether quantity(>1) production is planned	[X] Yes [ ]No
Standards	CMDA
Types of Emission	1M25F9W
RF Output Power	824.01-848.97 MHz: 23 dBm(Average) 1850.00-1909.95 MHz: 23 dBm(Average)
Frequency Range	Cell Band PCS Band TX 824.01 MHz - 848.97 MHz TX 1850.00 MHz – 1909.95 MHz RX 869.01 MHz - 893.97 MHz RX 1930.00 MHz – 1989.95 MHz
Antenna & Gain	Cell Band PCS Band ½ wavelength Full wavelength Average Gain: -1.0dBi Average Gain: -2.9dBi
Detachable antenna? **Receiver L.O. frequency** **External input**	[X]Yes [ ]No 1052.61 – 1077.57 MHz (Cellular) 2113.6 – 2173.6 MHz (PCS) [X]Audio [ ]Digital Data

1.3 Test Configuration

The radio was tested with radio card installed into laptop.

Item #	Description	Model No.	Serial No.
1	EUT	AC555	E011101002110M4
2	Laptop	IBM ThinkPad iSeries	AA-G2DX7

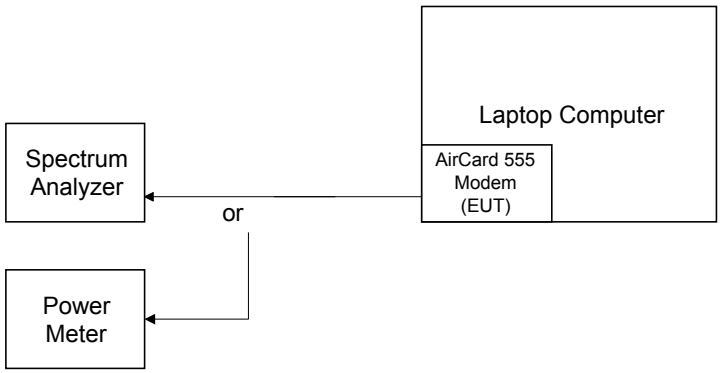
2 RF Power Output

FCC 2.1046

2.1 Test Procedure

The transmitter output was connected to the Average Power Meter. The output power was adjusted to 23 dBm. The transmitter output was then connected to a calibrated coaxial cable, other end of which was connected to a spectrum analyzer. The resolution and video bandwidths of the spectrum analyzer were set up to 10 MHz and 10 MHz respectively. The peak power at the transmitter output was determined by adding the value of the cable loss to the spectrum analyzer reading in the reference offset level. Test were performed at three frequencies (low, middle, and high channels) in Cellular and PCS bands.

Test Setup



2.2 Test Equipment

Instrument List

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Spectrum Analyzer	Rhode & Schwarz	FSP	100060	2003-05-18
Power Meter	Anritsu	ML2408A	00440086	N/A

2.3 Test Results

Frequency (MHz)	Average Power (dBm)	Measured Peak Power (dBm)
825.25	23.0	27.06
836.5	23.0	27.70
847.75	23.0	26.93
1851.25	23.0	26.21
1880.0	23.0	26.81
1908.75	23.0	26.61

For more details refer to the attached plots:

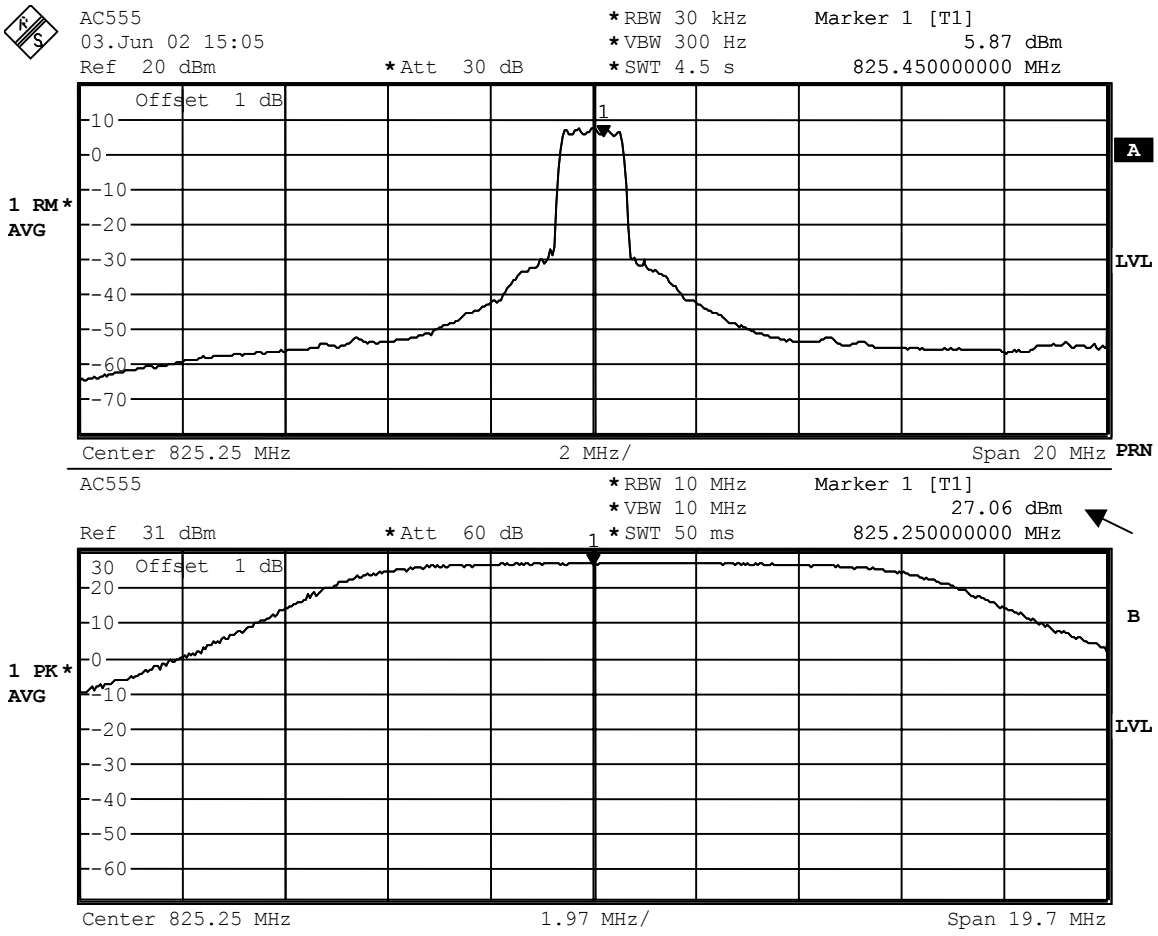
- **Cellular Band (CDMA Mode)**

Plot Number	Description
2.1	Low Channel (Ch 8)
2.2	Middle Channel (Ch 383)
2.3	High Channel (Ch 758)

- **PCS Band (CDMA Mode)**

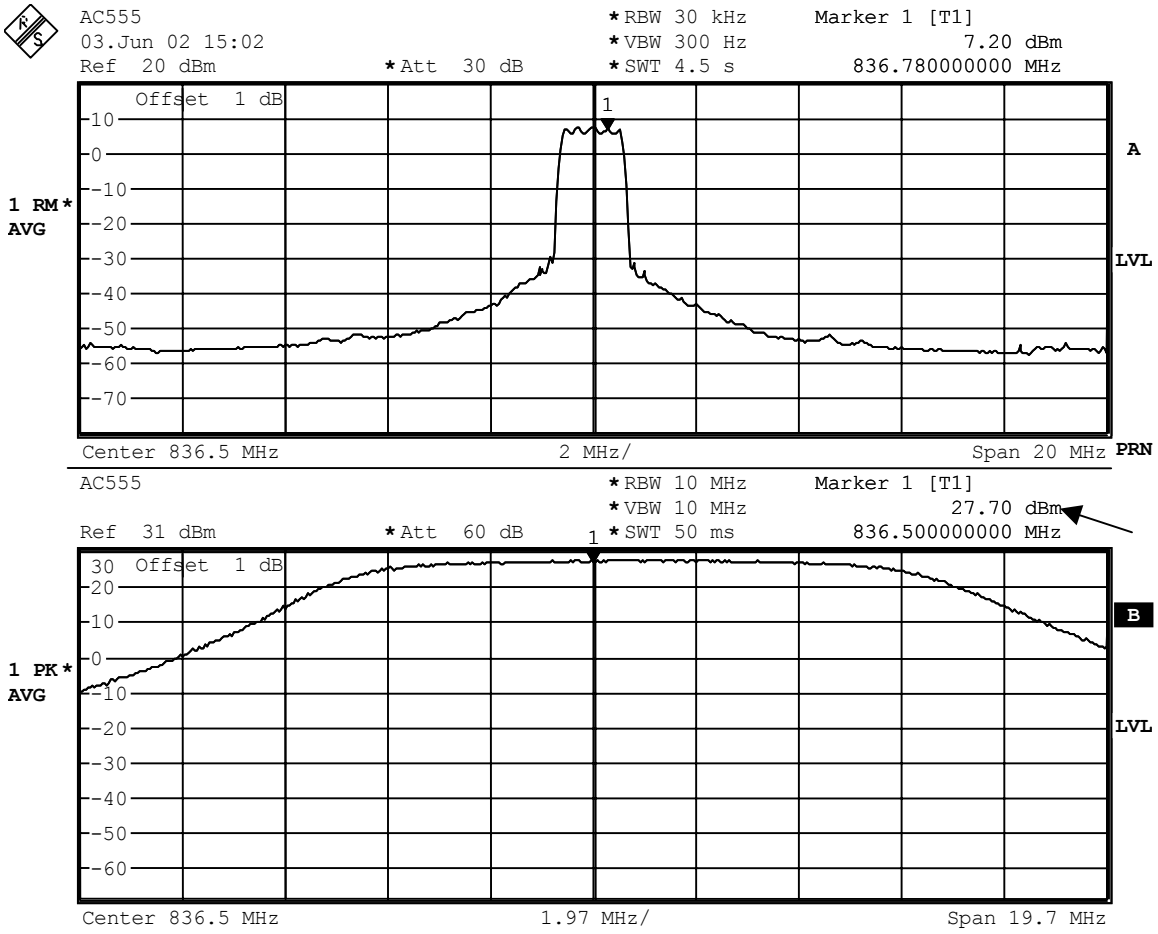
Plot Number	Description
2.4	Low Channel (Ch 25)
2.5	Middle Channel (Ch 600)
2.6	High Channel (Ch 1175)

Plot 2.1



Date: 3.JUN.2002 15:05:08

Plot 2.2



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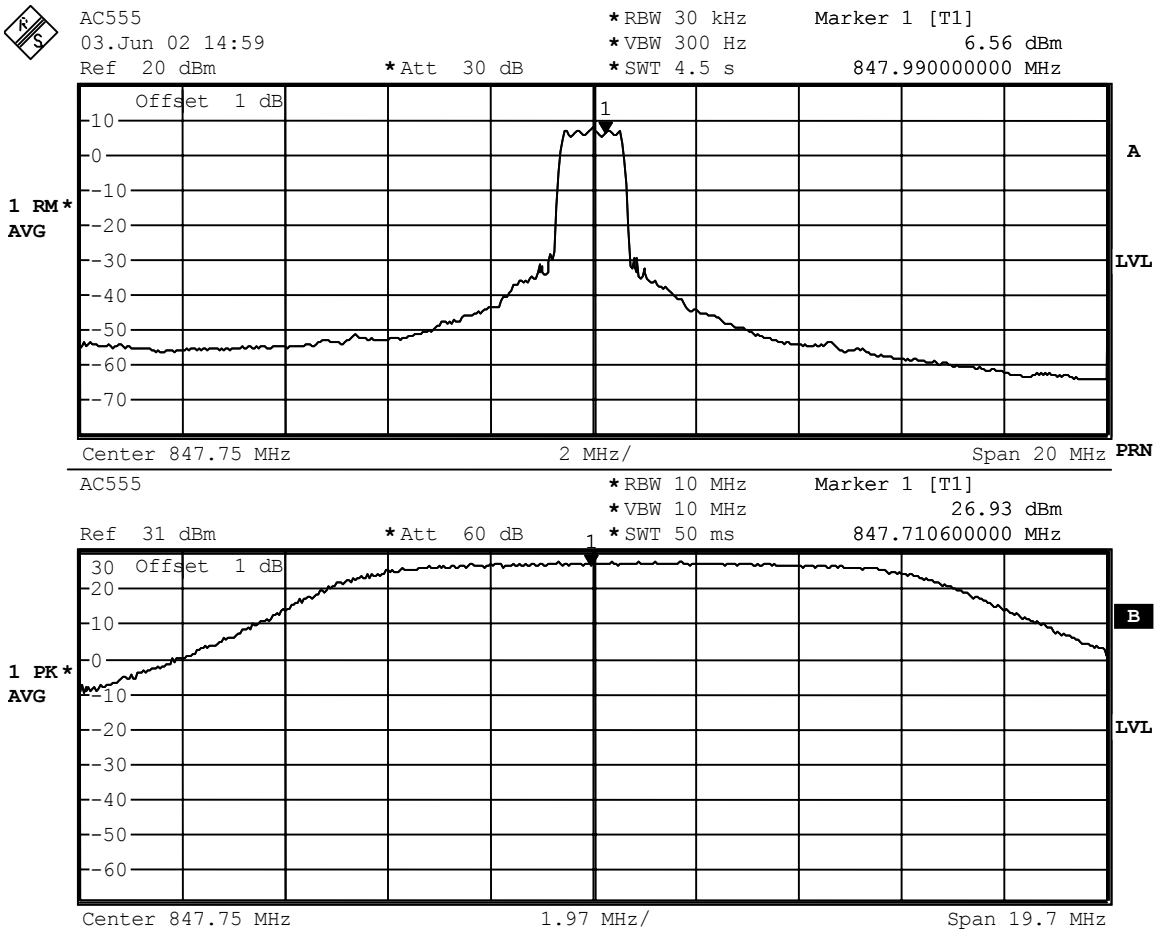
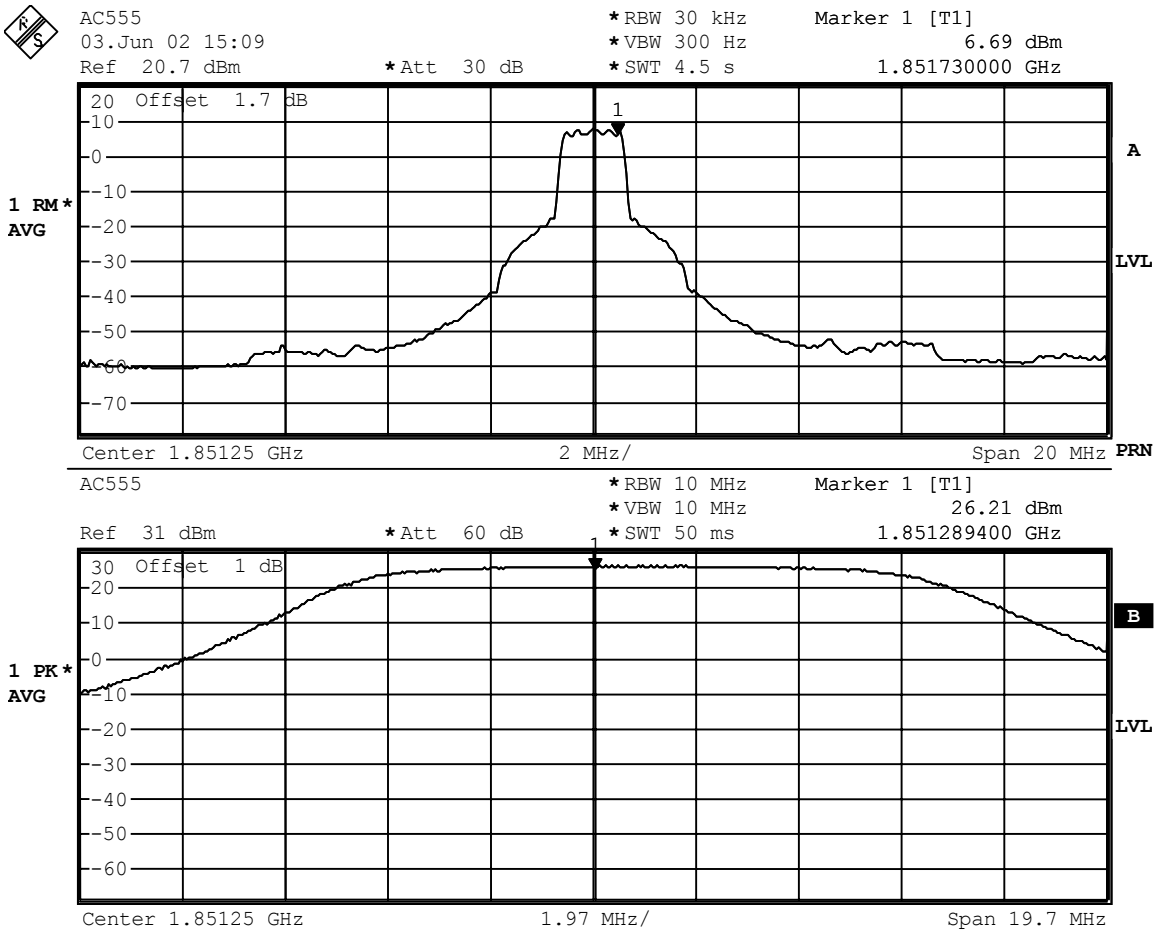
Plot 2.3



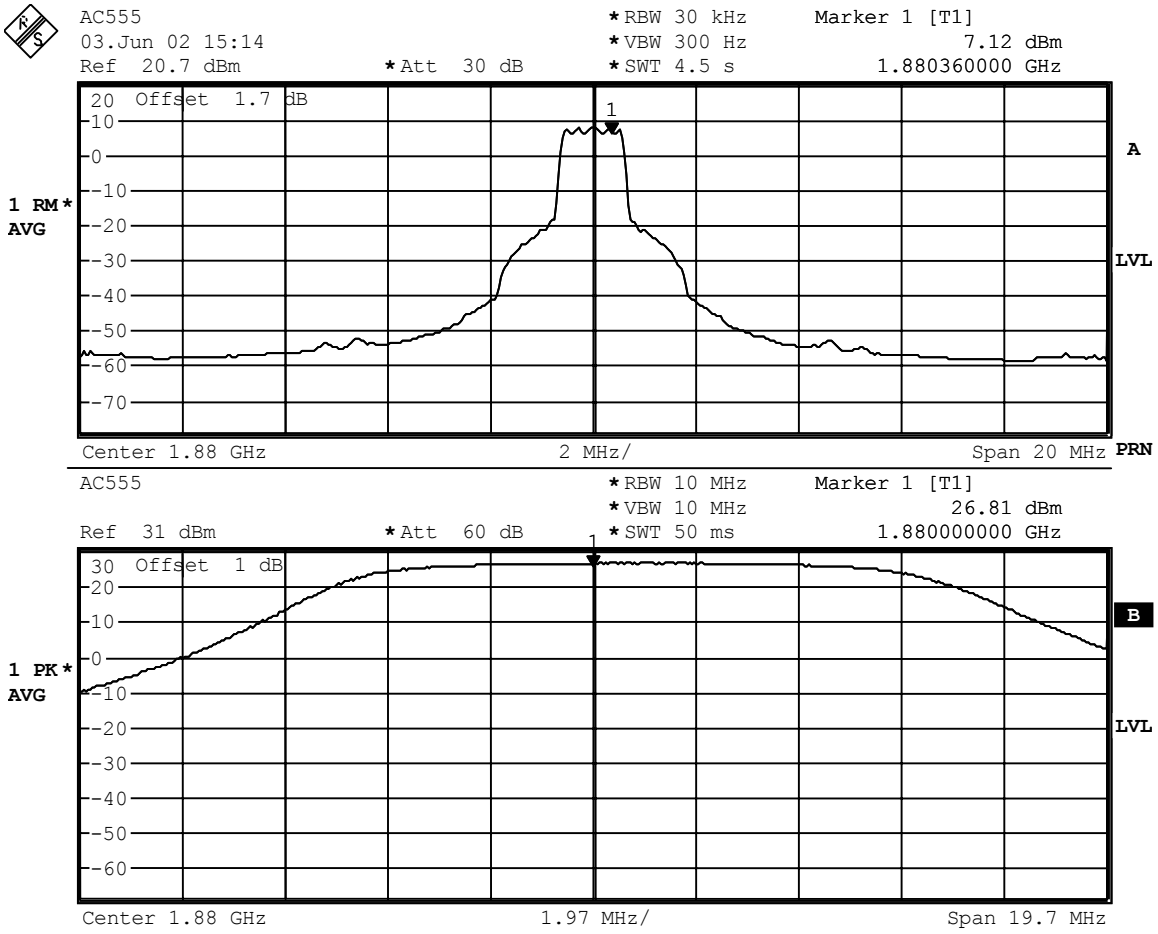
Date: 3.JUN.2002 14:59:40

Plot 2.4



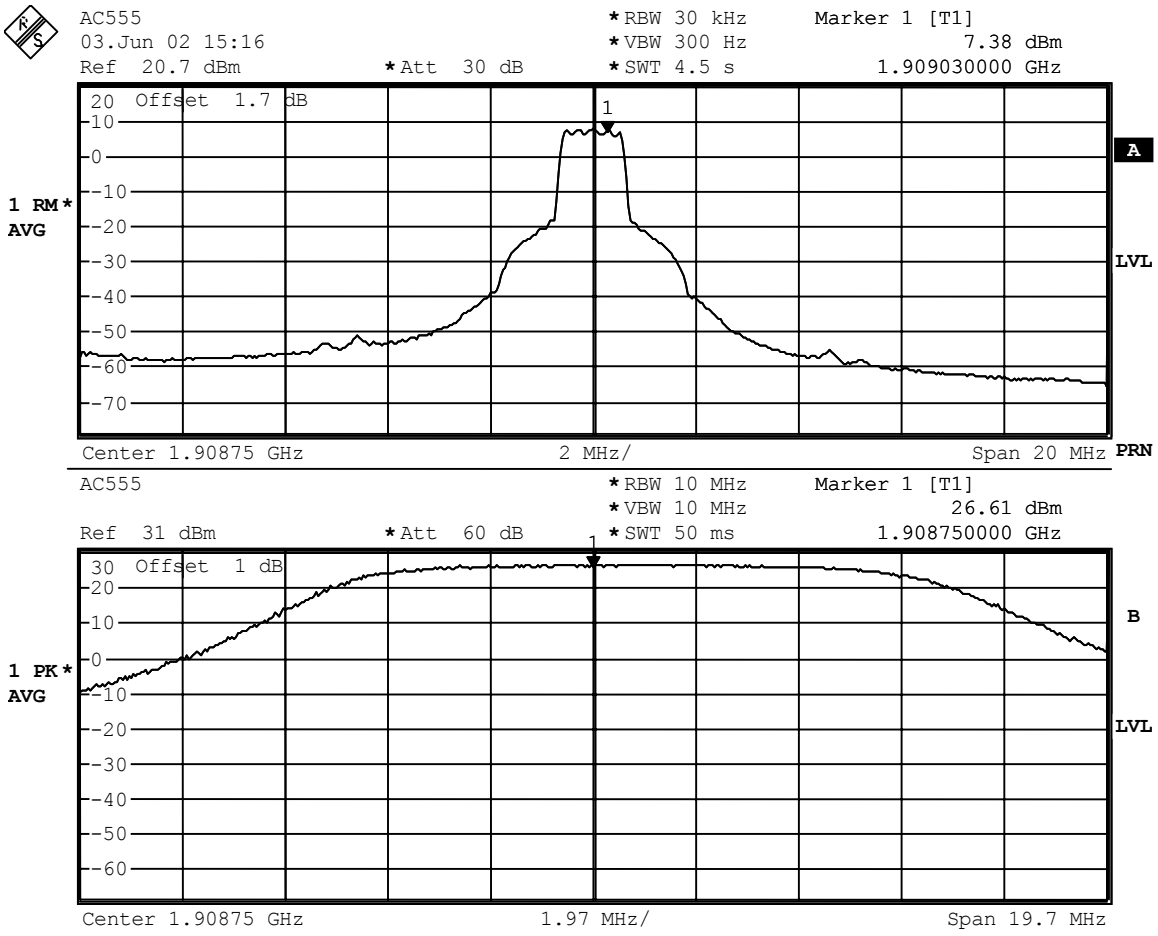
Date: 3.JUN.2002 15:09:46

Plot 2.5



Date: 3.JUN.2002 15:14:19

Plot 2.6



Date: 3.JUN.2002 15:16:36

3 Radiated Power

FCC 22.913 & FCC 24.232

This test was performed at CCS and please refer to the attached CCS Test Report (AC555CCS_report.pdf)

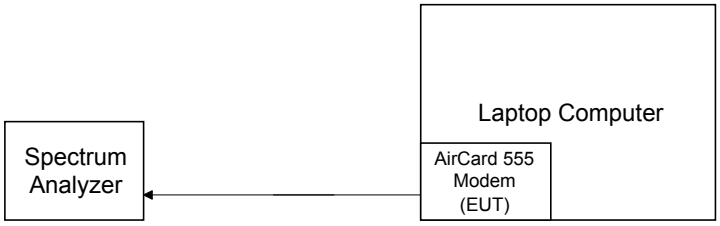
4 Occupied Bandwidth

FCC 2.1049

4.1 Test Procedure

The transmitter output was connected to a calibrated coaxial cable, the other end of which was connected to a spectrum analyzer. The occupied Bandwidth (defined as the 99% Power Bandwidth) was measured with Rohde & Schwarz FSP Spectrum Analyzer.

Test Setup



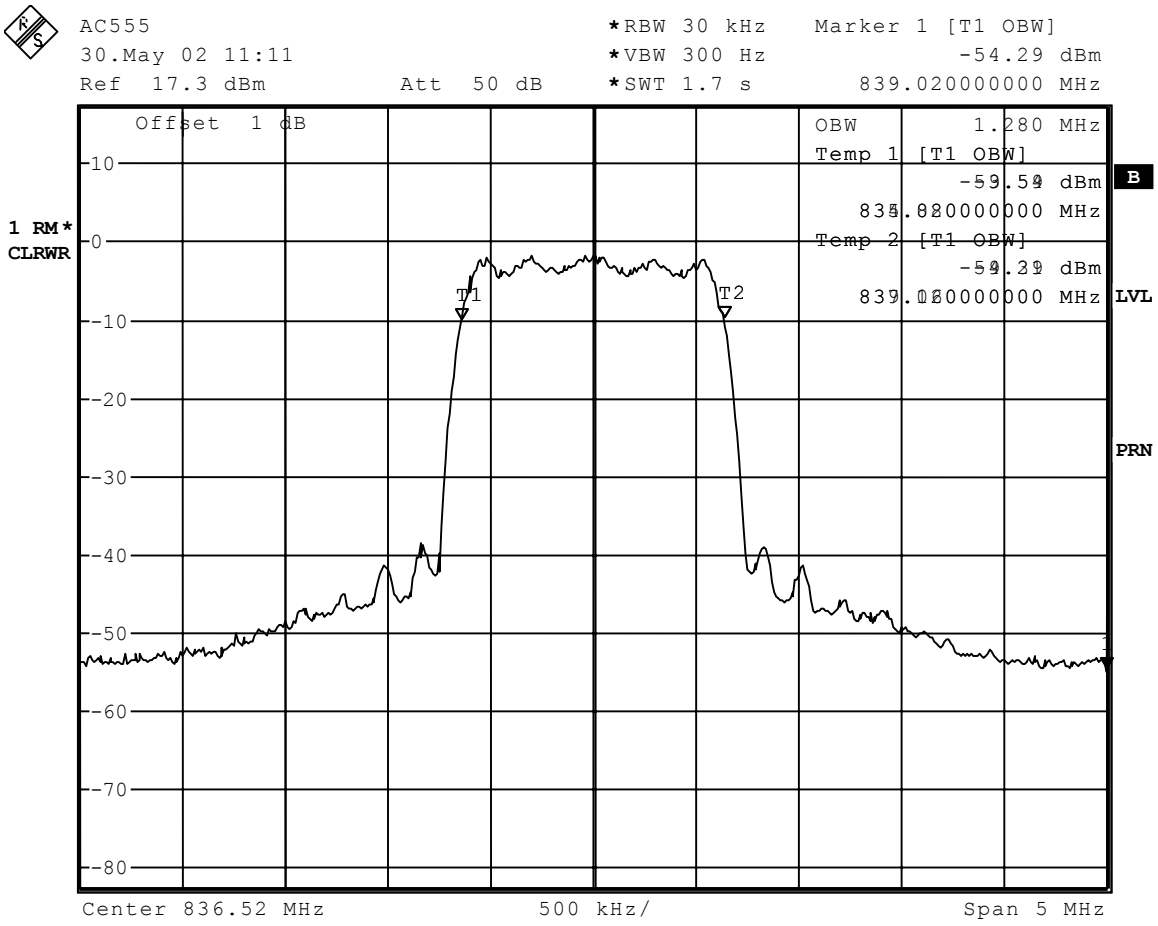
4.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Spectrum Analyzer	Rhode & Schwarz	FSP	100060	2003-05-18

4.3 Test Results

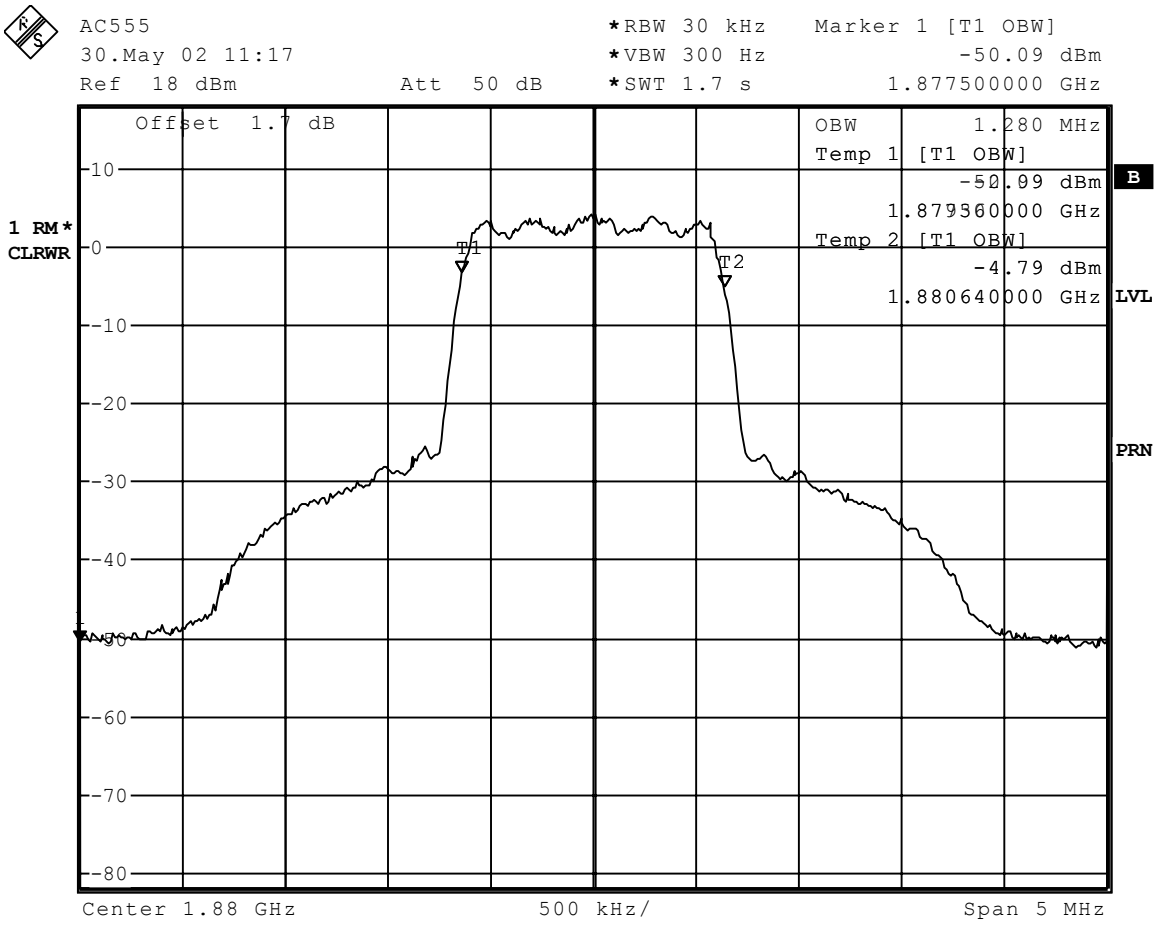
See attached plots 4.1 and 4.2. The test results shows that the bandwidth is 1.280 MHz, which is 2.5% higher than the theoretical bandwidth for CDMA – 1.25 MHz. The Emission Designator was determined as 1M25G7D.

Plot 4.1 Cellular Band (Middle Channel)



Date: 30.MAY.2002 11:12:04

Plot 4.2 PCS Band (Middle Channel)



Date: 30.MAY.2002 11:17:59

5 Out of Band Emissions at Antenna Terminals

FCC 22.901(d), 22.917(f), 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 outside the frequency band by at least (43 + 10 log P) dB, in this case, -13dBm.

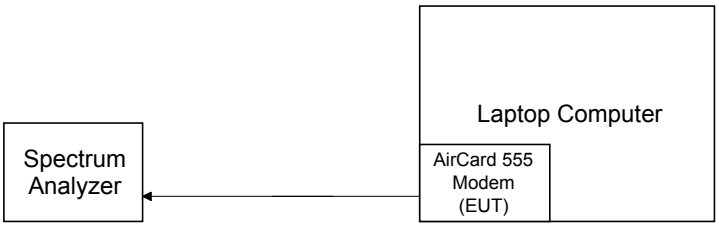
Mobile Emissions in Base Frequency Range:

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not exceed –80 dBm at the transmit antenna connector.

5.1 Test Procedure

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. The EUT was scanned for spurious emissions from 1MHz to 20GHz with sufficient bandwidth and video resolution. Data plots were recorded only for the frequency range where out of band emissions at the antenna terminal were detected.

Test Setup



5.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Spectrum Analyzer	Rhode & Schwarz	FSP	100060	2003-05-18

5.3 Test Results

Refer to the attached plots.

- **Cellular Band**

Plot Number	Description
5.1a – 5.1b	Low Channel, 825.25 MHz
5.2a – 5.2b	Middle Channel, 836.50 MHz
5.3a – 5.3d	High Channel, 847.75 MHz

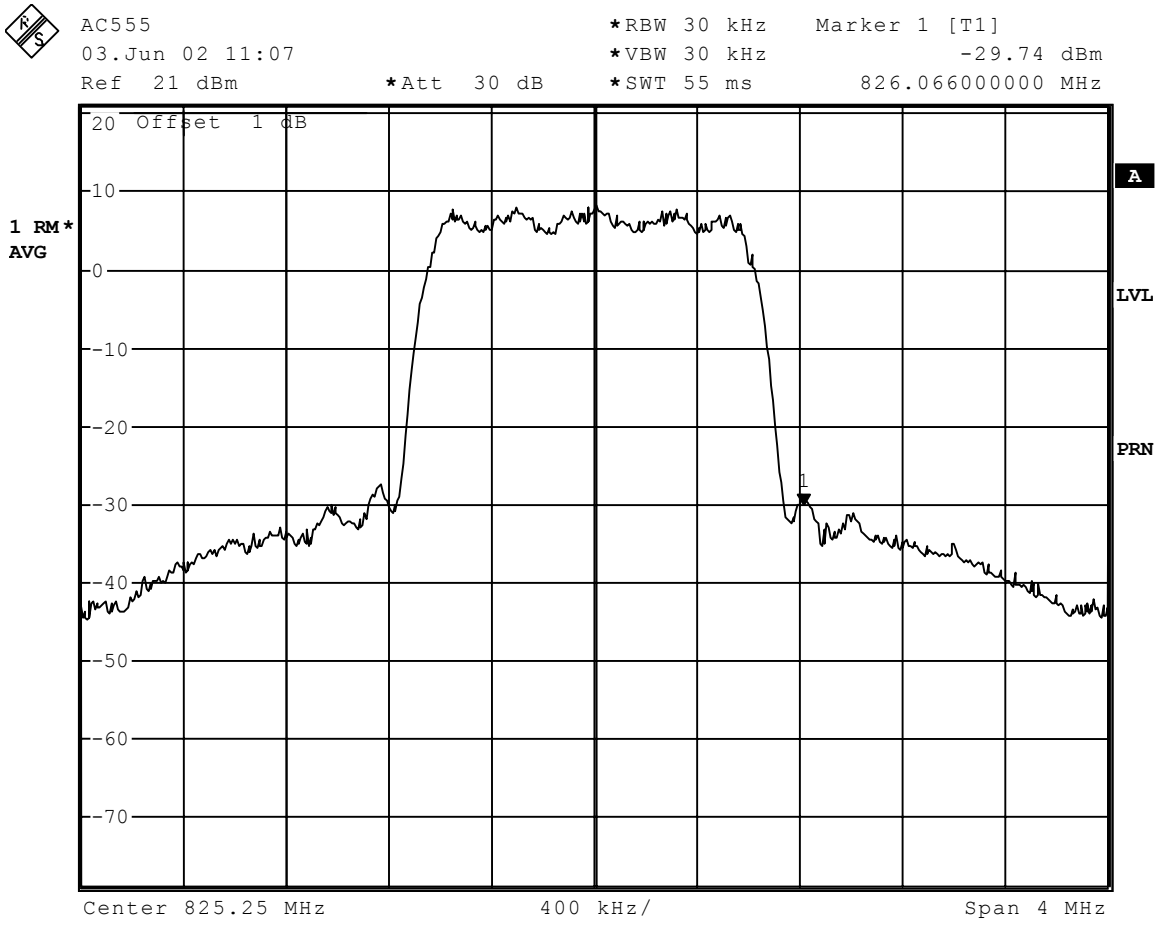
- **PCS Band**

Plot Number	Description
5.4a – 5.4d	Low Channel, 1851.25 MHz
5.5a – 5.5d	Middle Channel, 1880 MHz
5.6a – 5.6d	High Channel, 1908.75 MHz

- **Emission to Base Frequency Range**

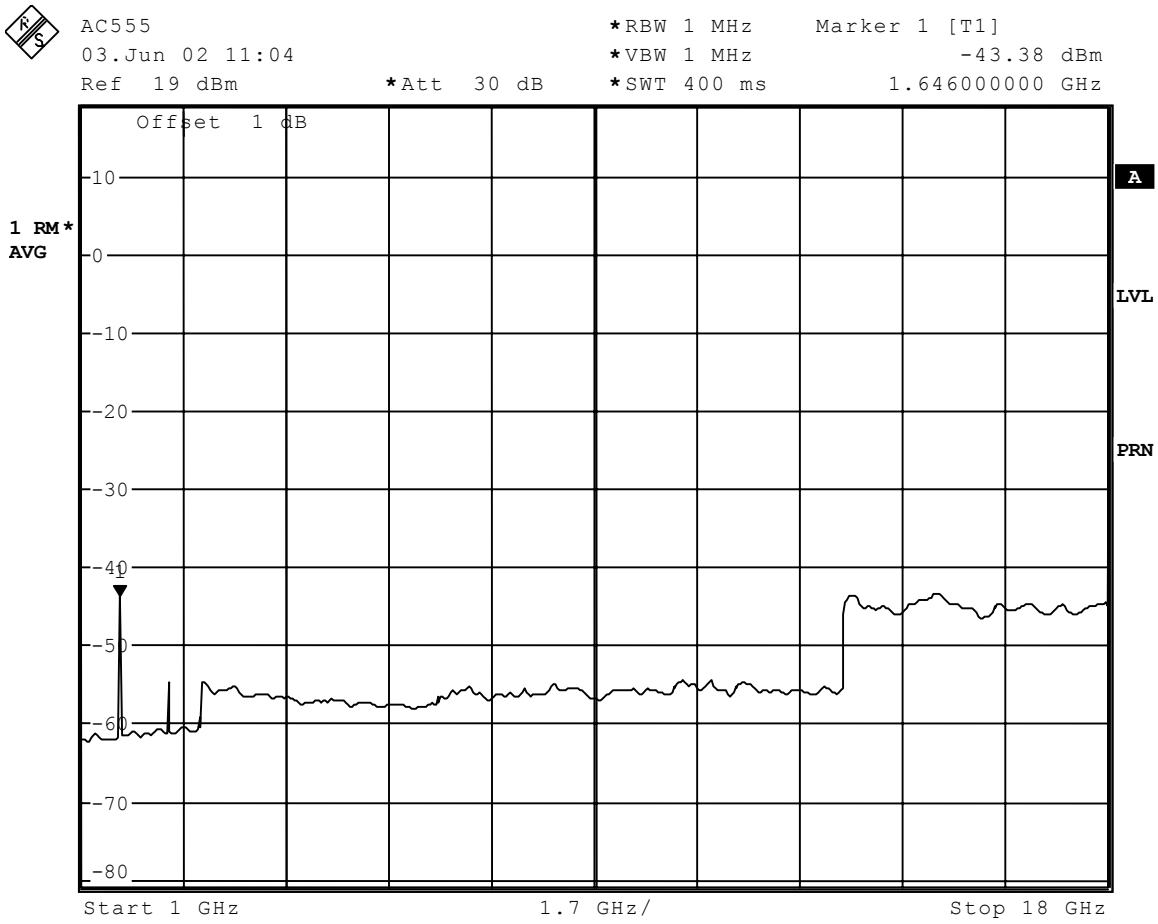
Plot Number	Description
5.7a	Low Channel, 825.25 MHz
5.7b	Middle Channel, 836.50 MHz
5.7c	High Channel, 847.75 MHz

Plot 5.1a



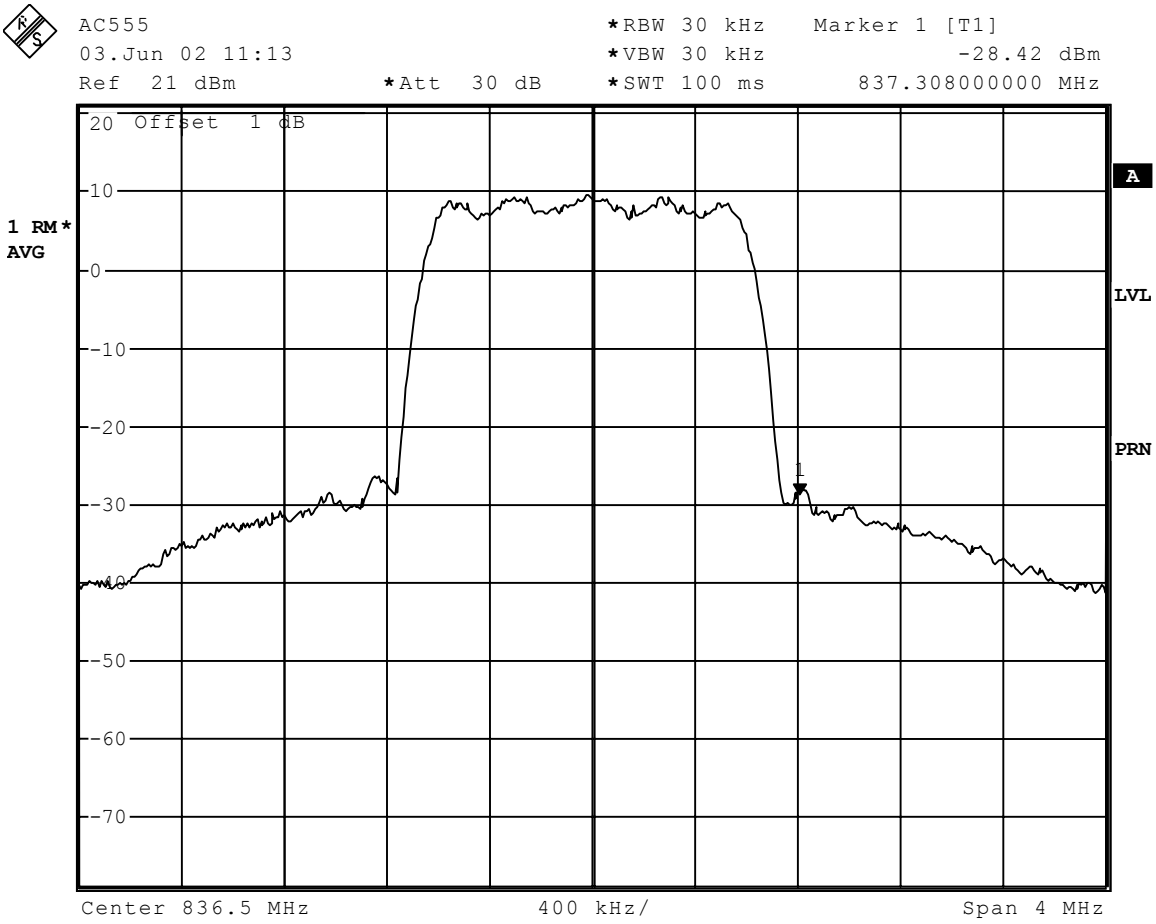
Date: 3.JUN.2002 11:07:22

Plot 5.1b



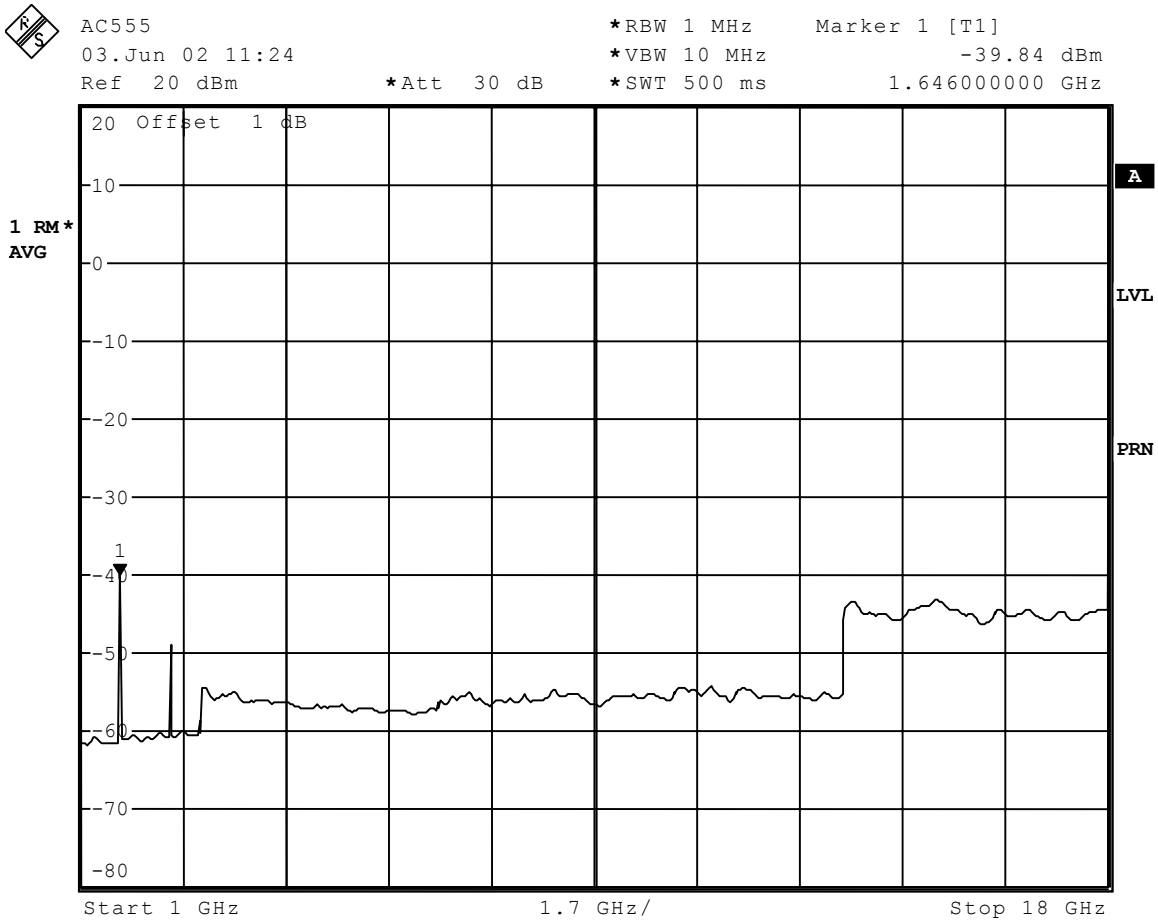
Date: 3.JUN.2002 11:04:49

Plot 5.2a



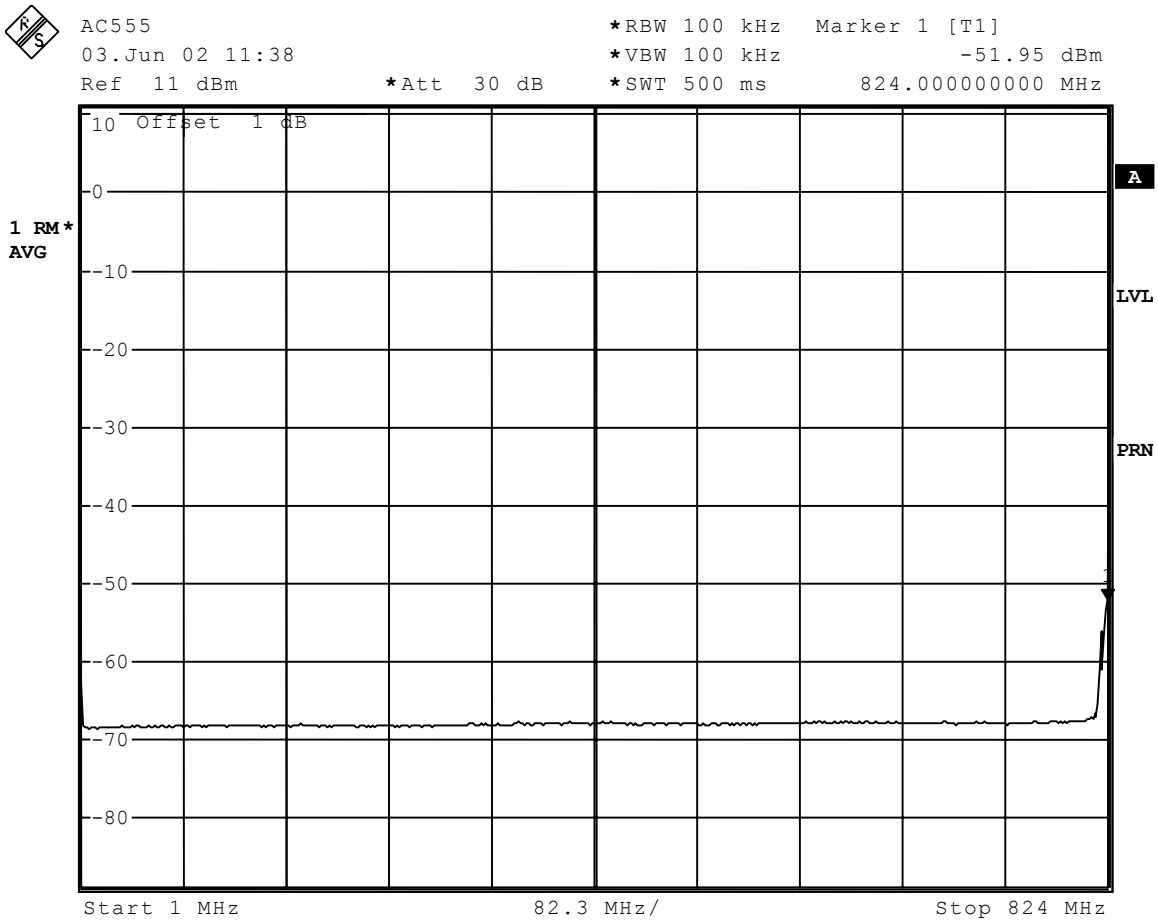
Date: 3.JUN.2002 11:13:12

Plot 5.2b



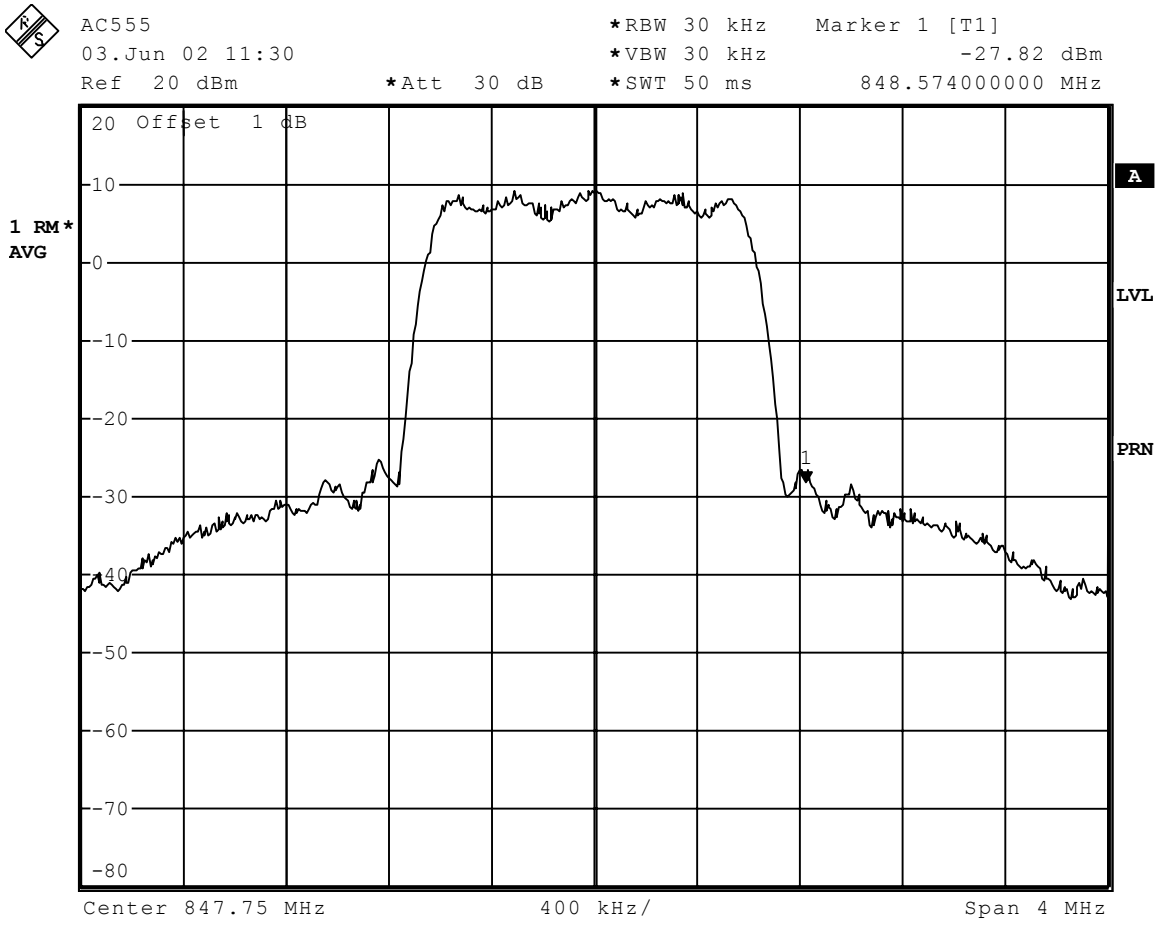
Date: 3.JUN.2002 11:24:23

Plot 5.3a

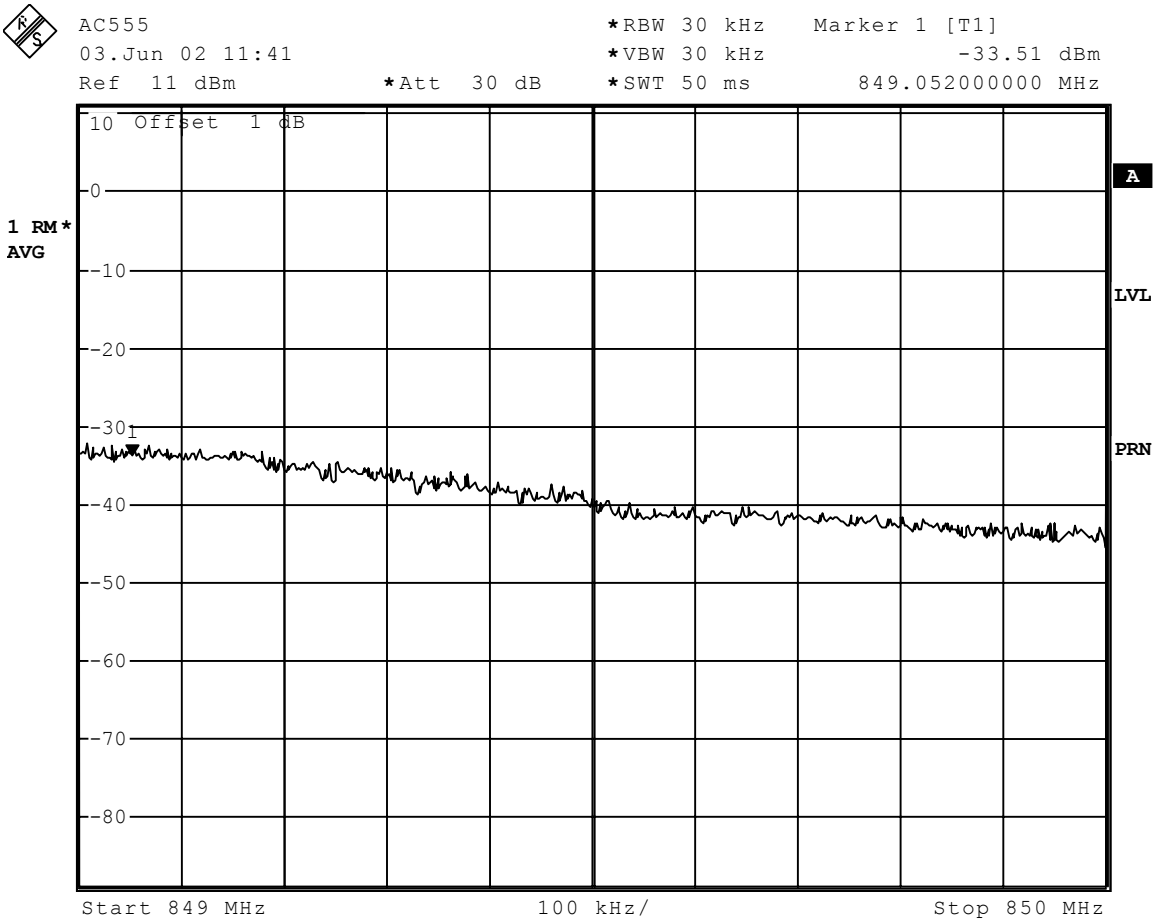


Date: 3.JUN.2002 11:38:21

Plot 5.3b

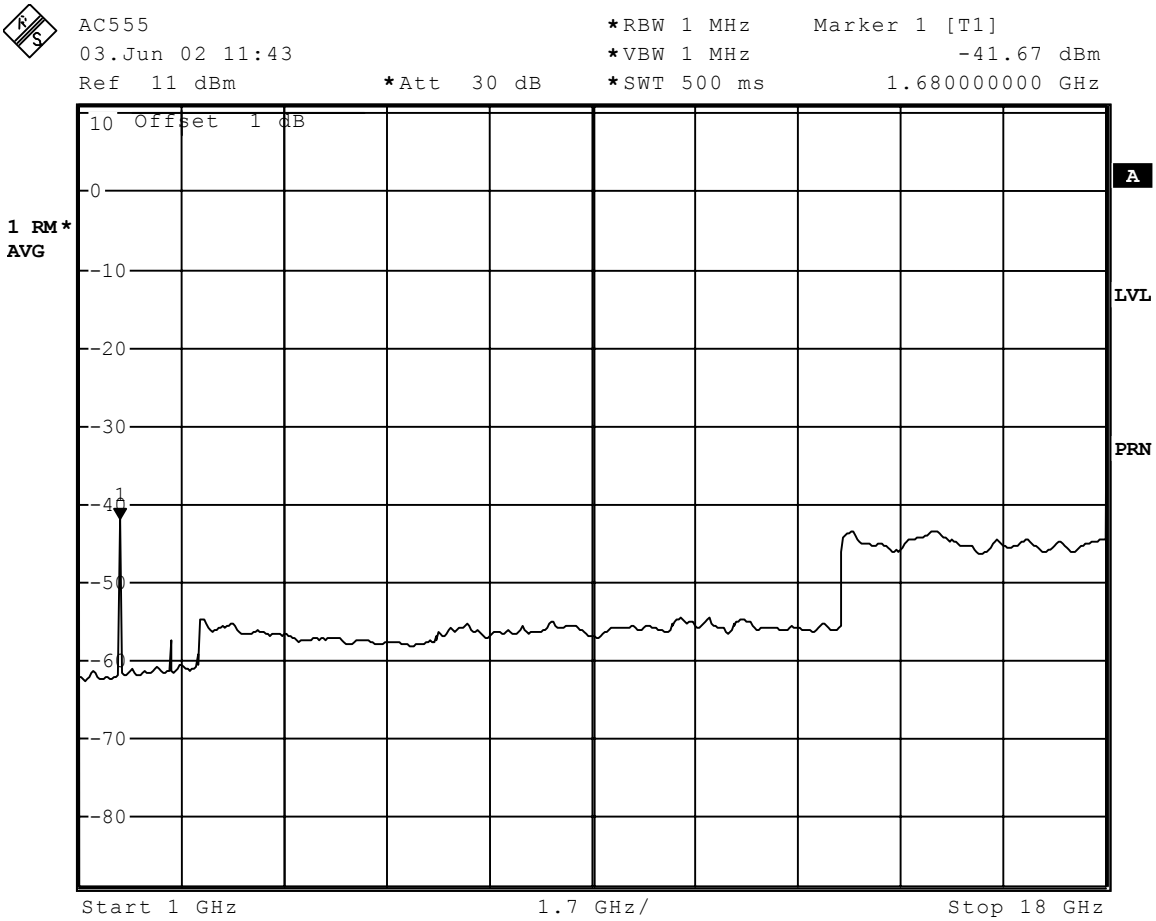


Plot 5.3c



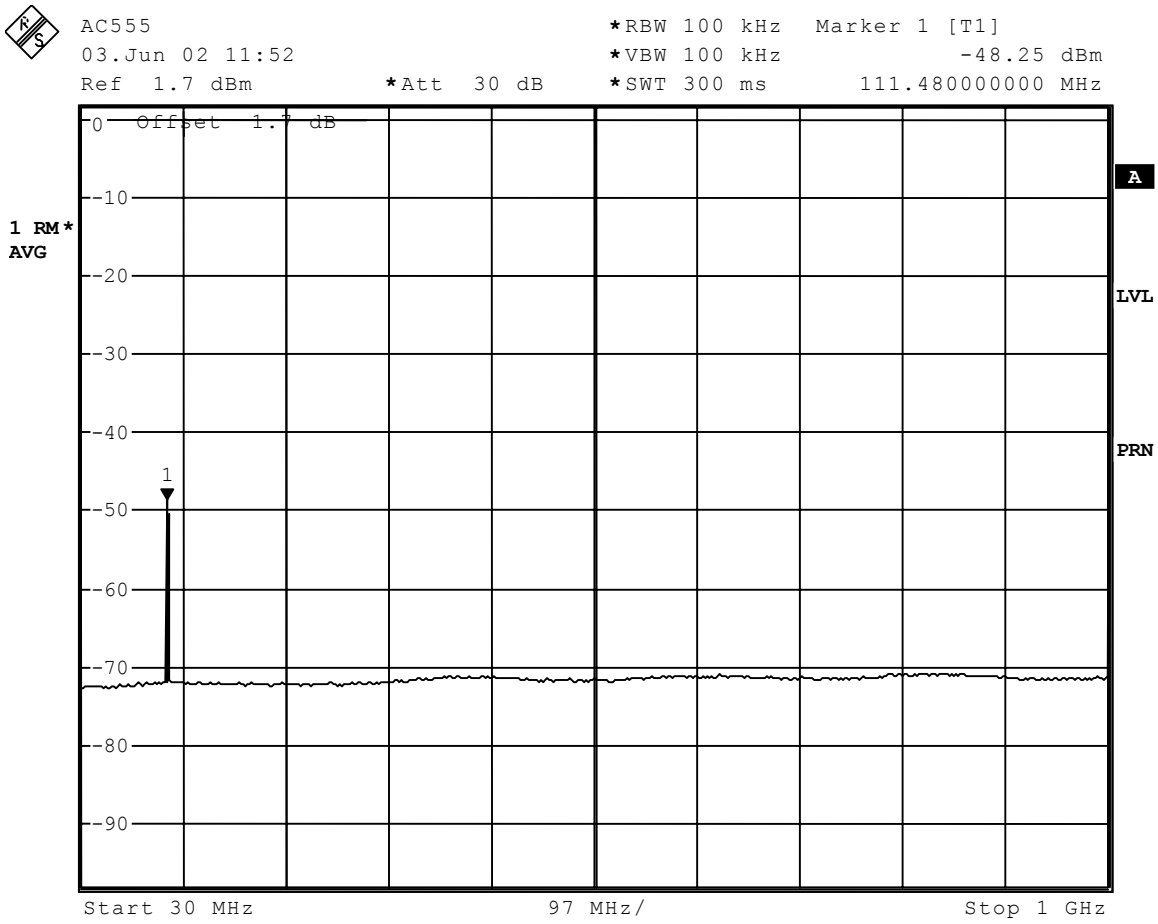
Date: 3.JUN.2002 11:41:54

Plot 5.3d



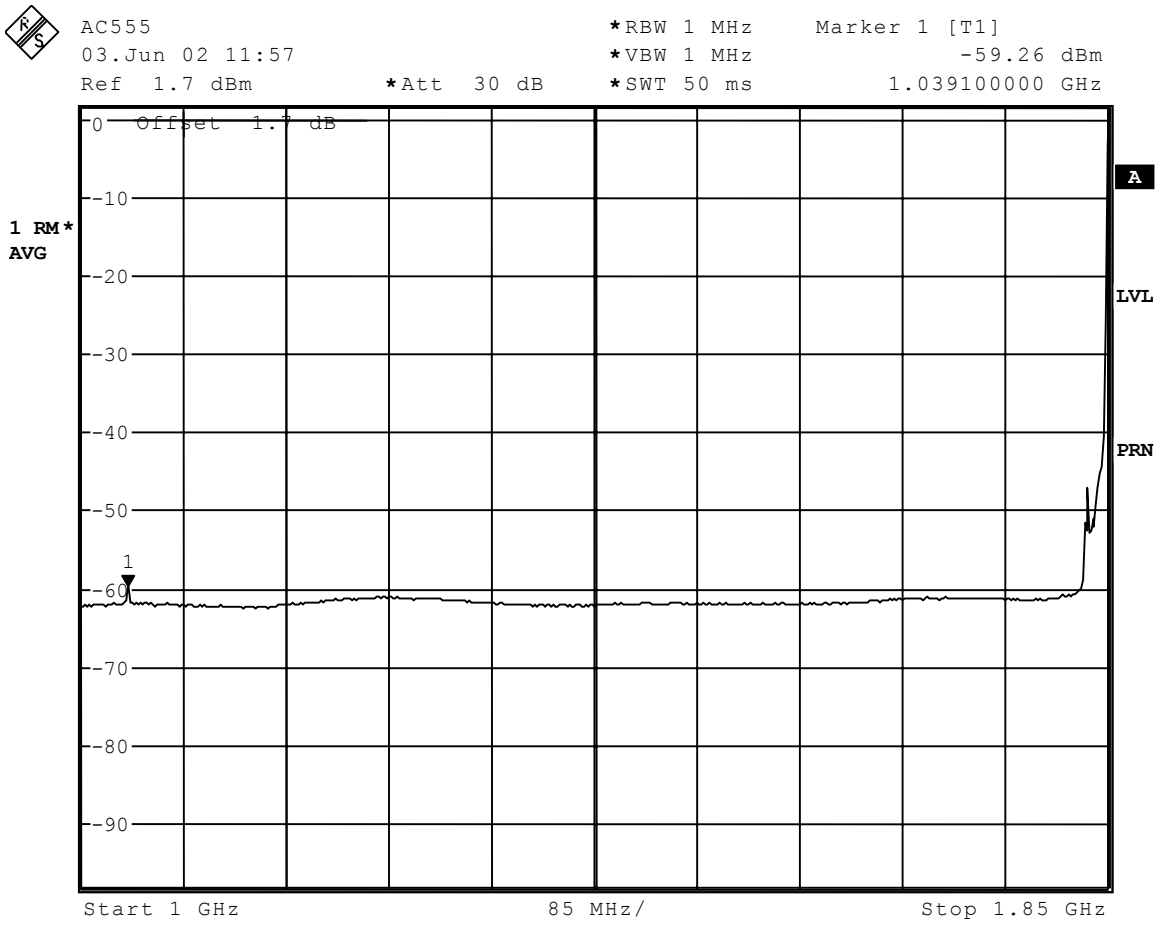
Date: 3.JUN.2002 11:43:53

Plot 5.4a



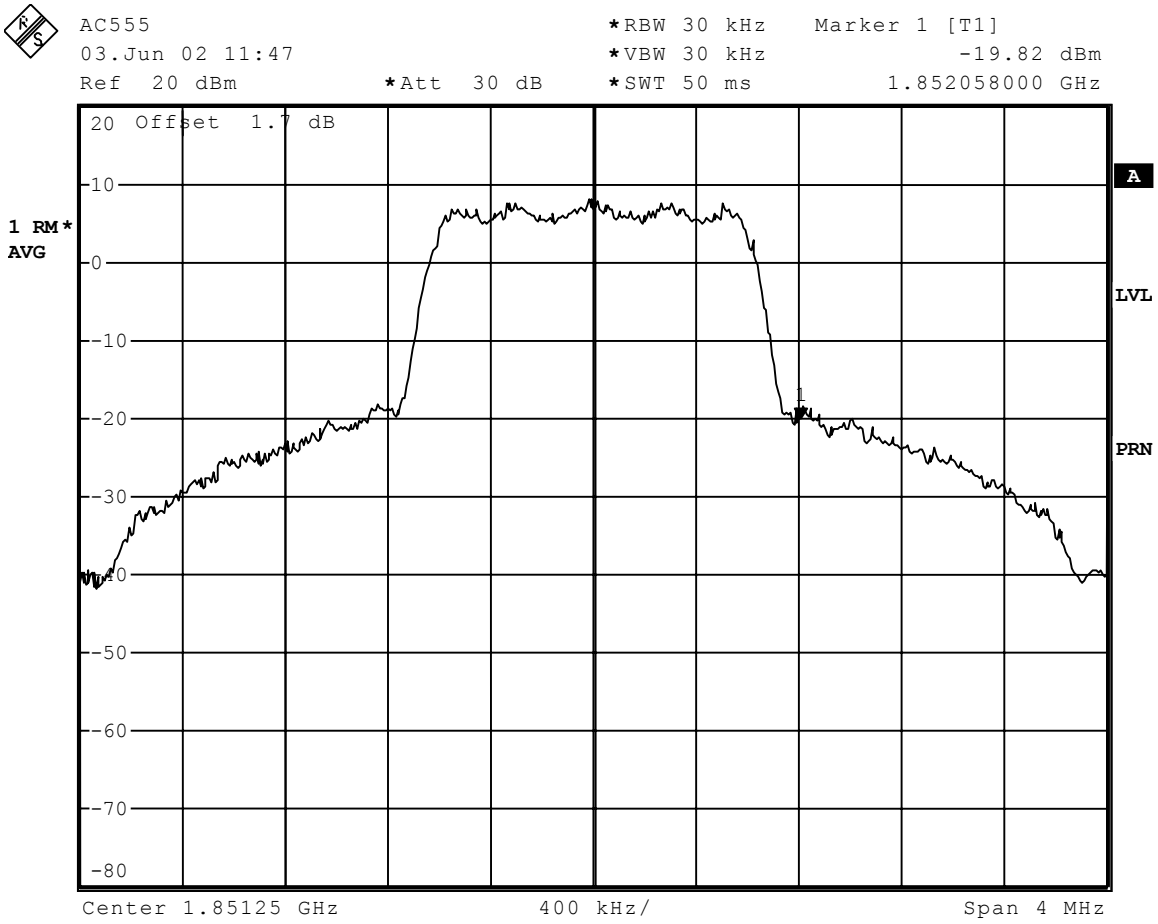
Date: 3.JUN.2002 11:52:43

Plot 5.4b

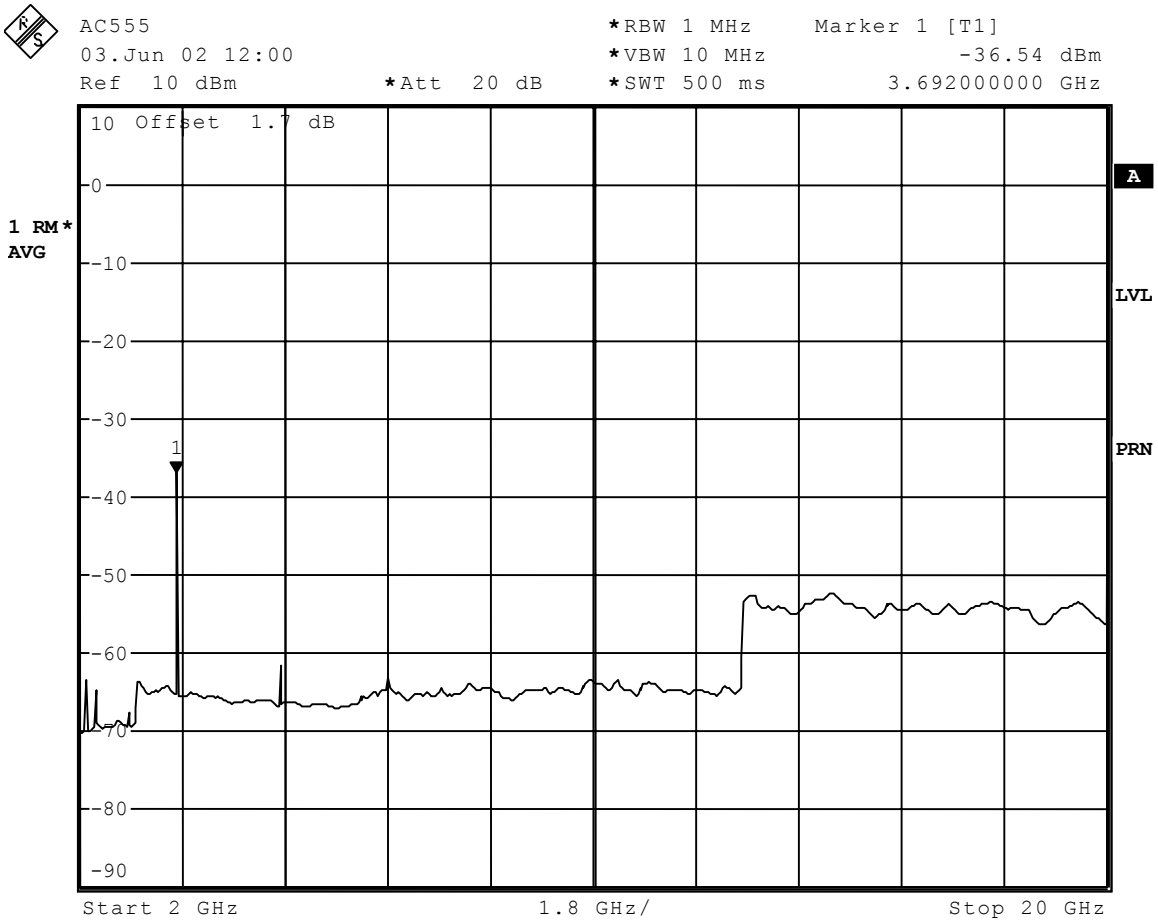


Date: 3.JUN.2002 11:57:26

Plot 5.4c

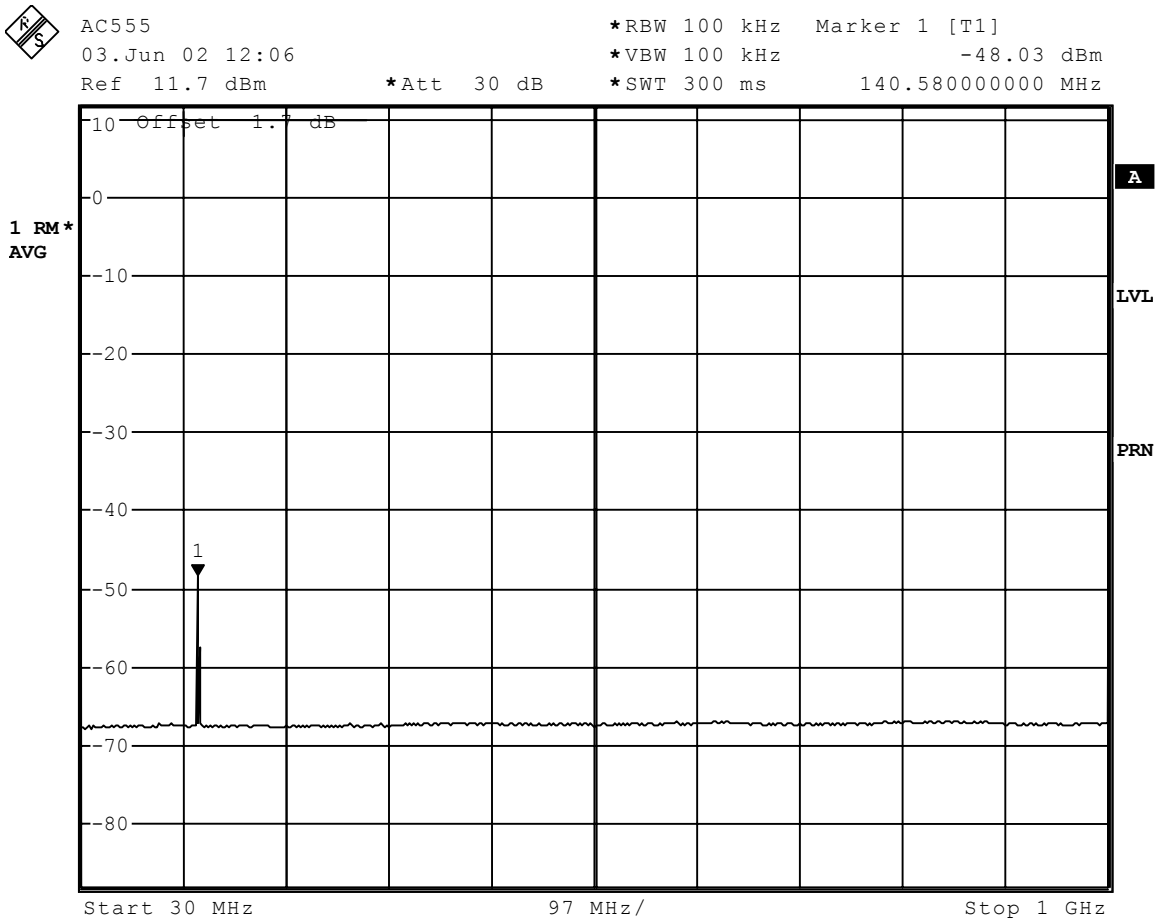


Plot5.4d



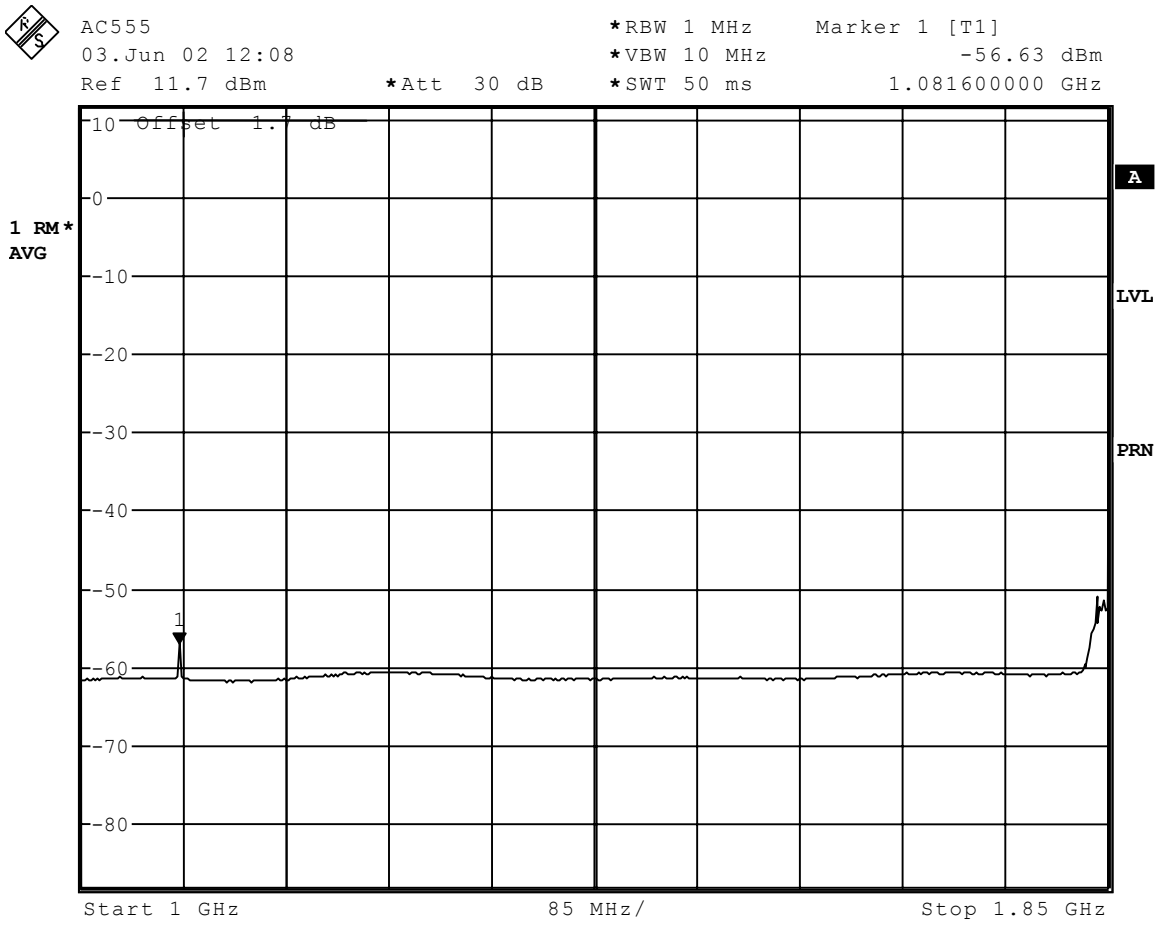
Date: 3.JUN.2002 12:00:44

Plot 5.5a



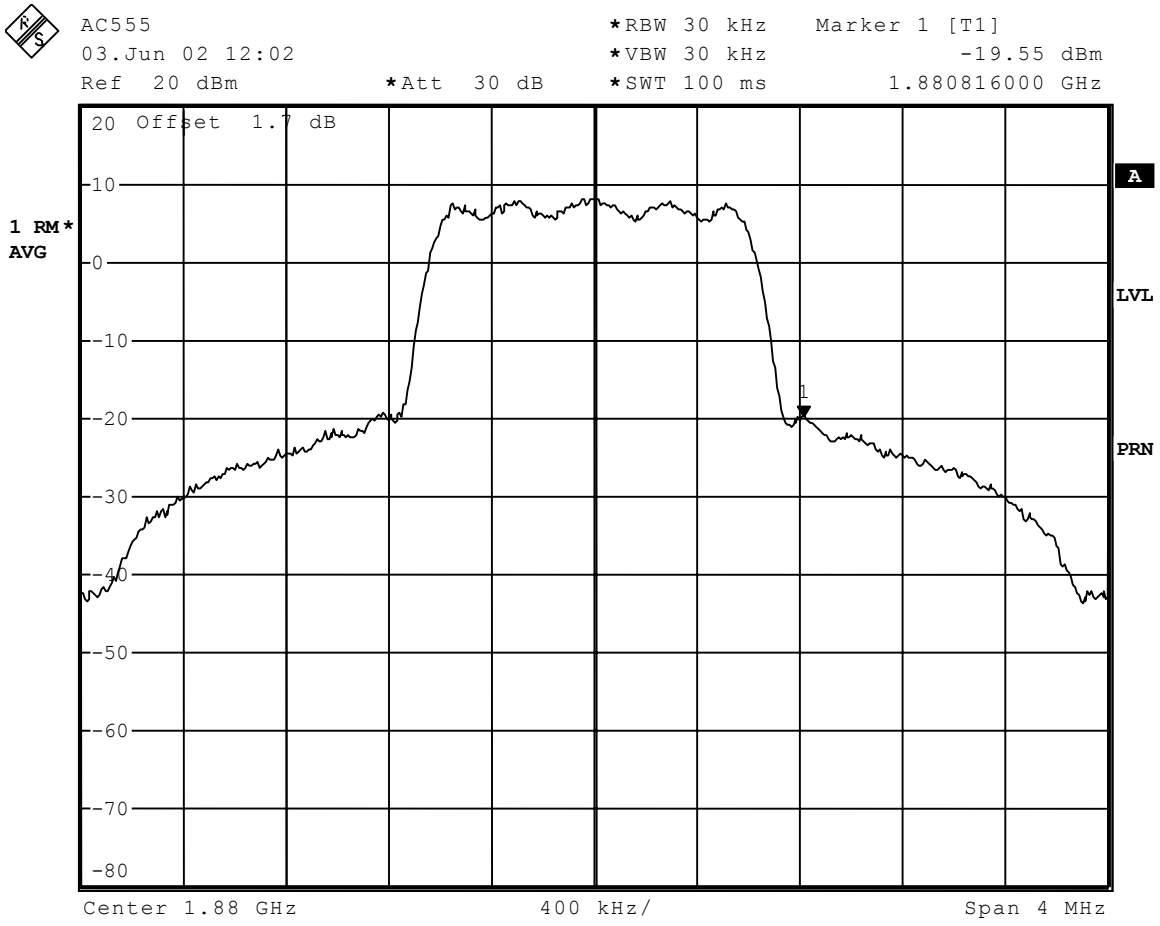
Date: 3.JUN.2002 12:06:29

Plot 5.5b

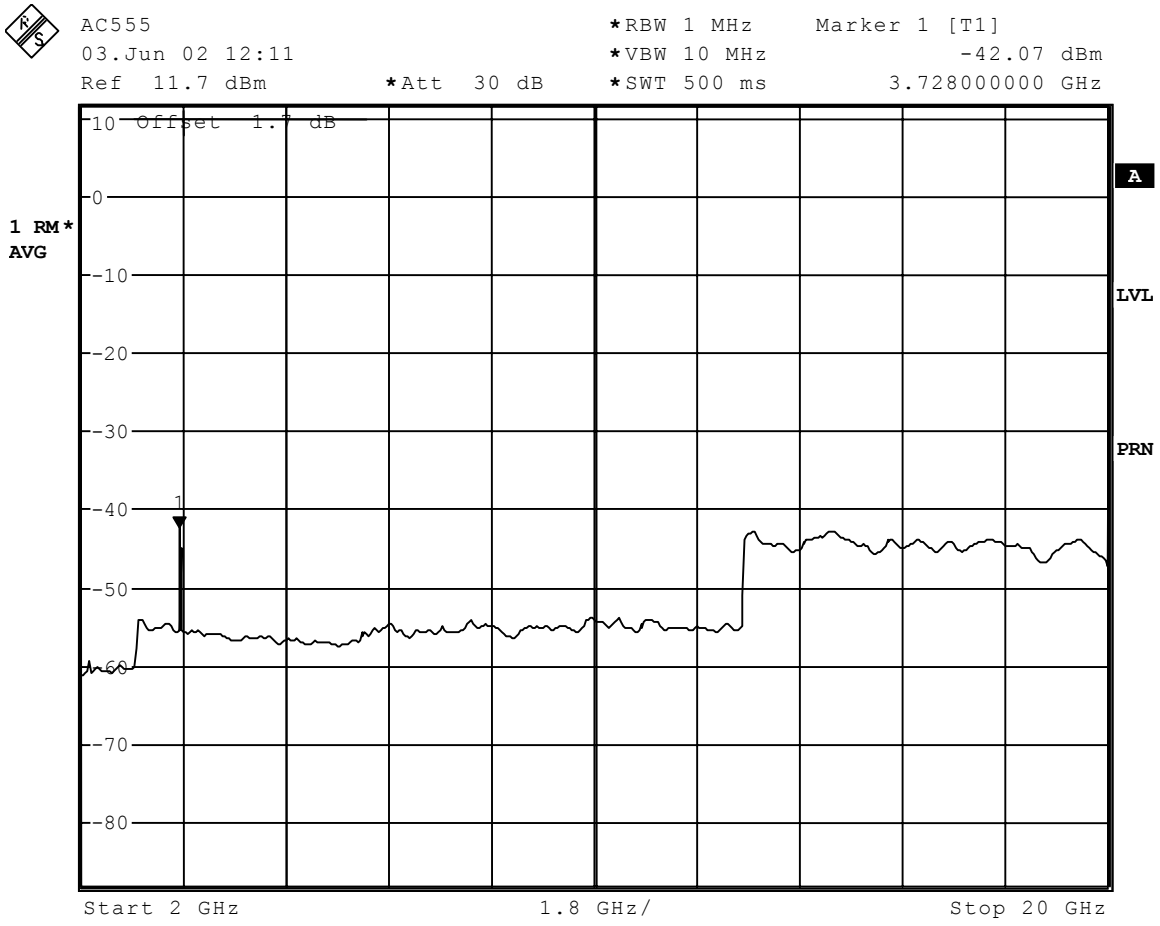


Date: 3.JUN.2002 12:08:43

Plot 5.5c

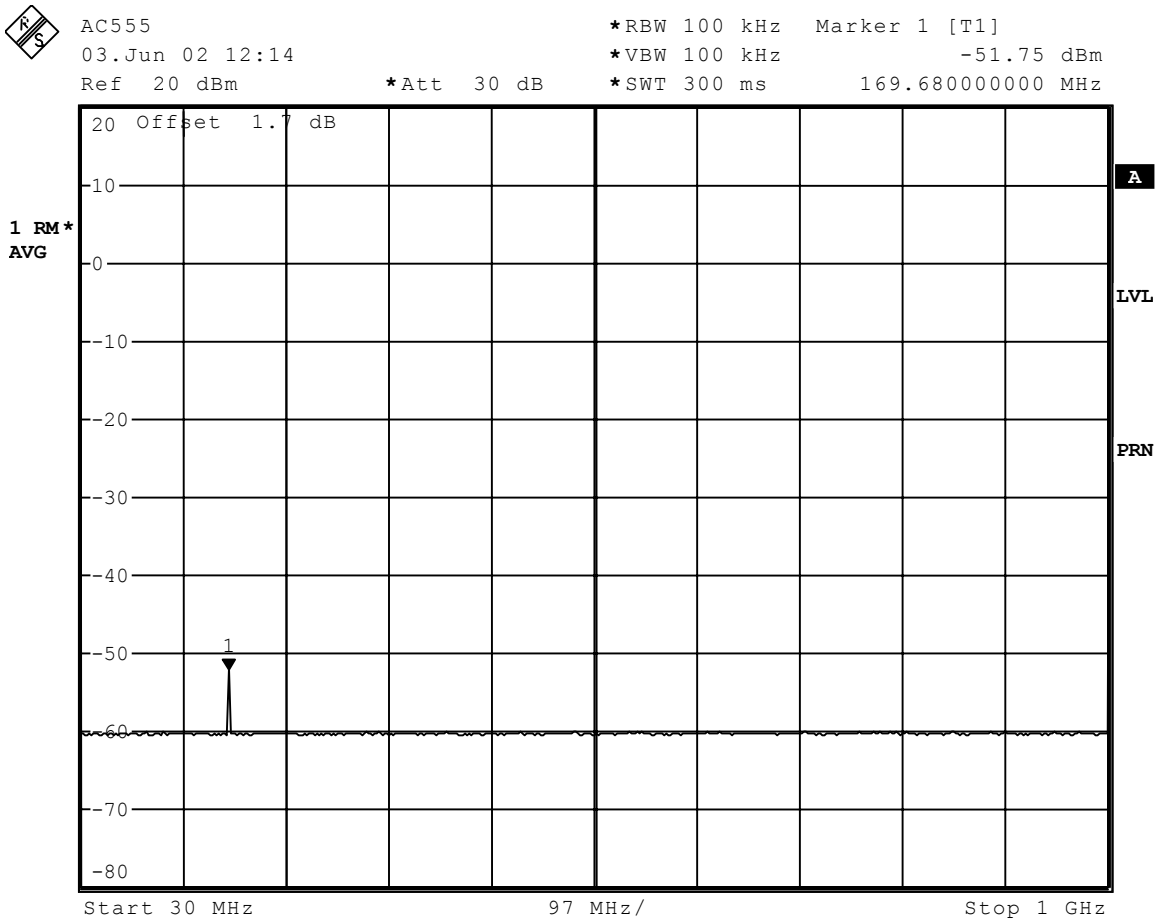


Plot 5.5d



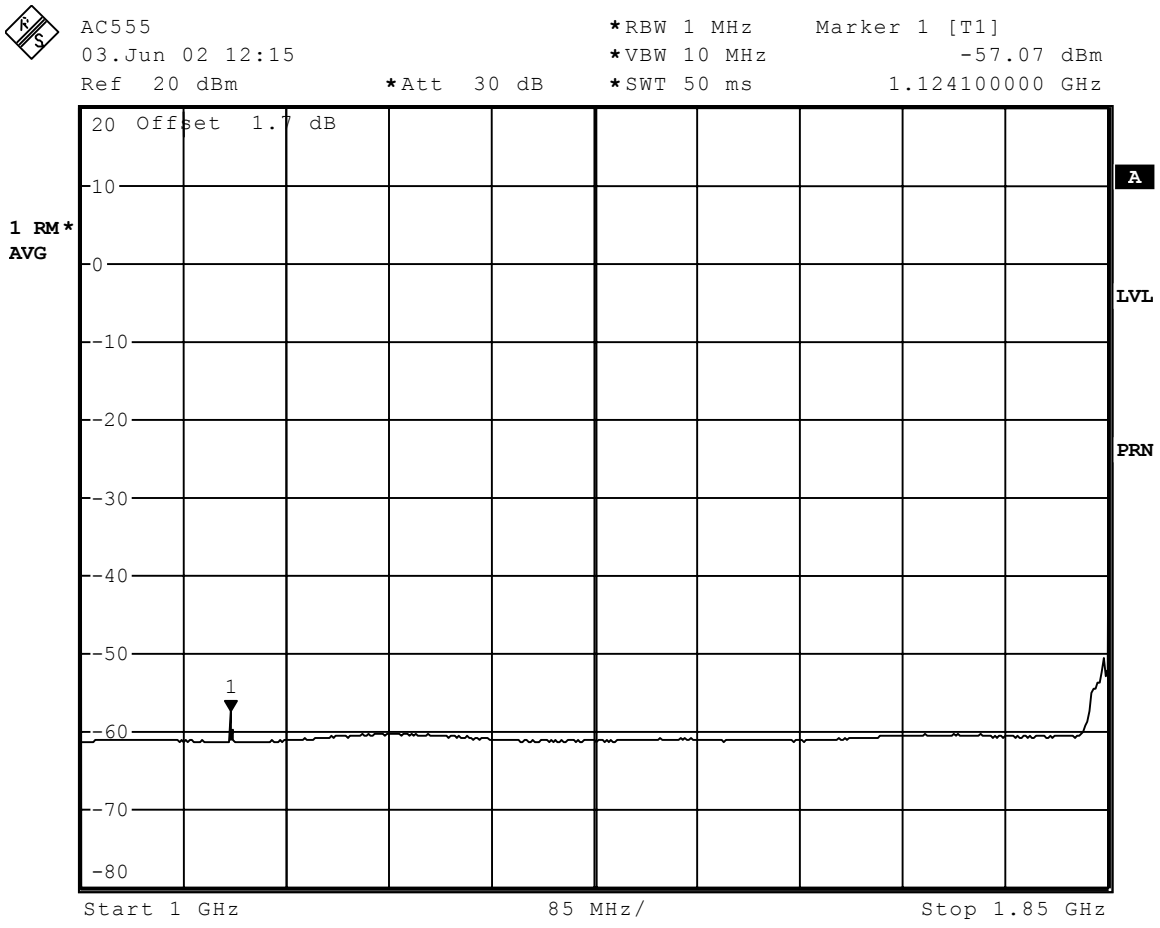
Date: 3.JUN.2002 12:11:18

Plot 5.6a



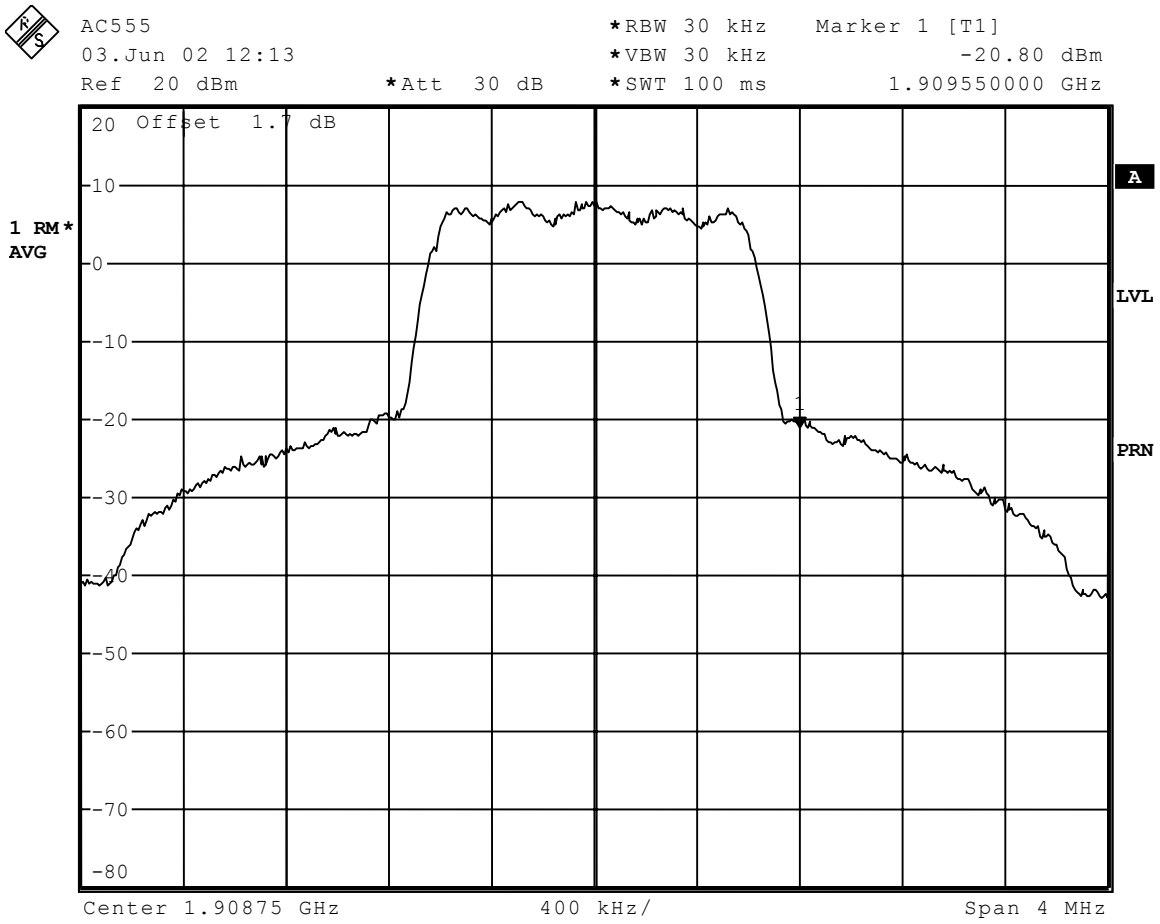
Date: 3.JUN.2002 12:14:38

Plot 5.6b



Date: 3.JUN.2002 12:15:50

Plot 5.6c



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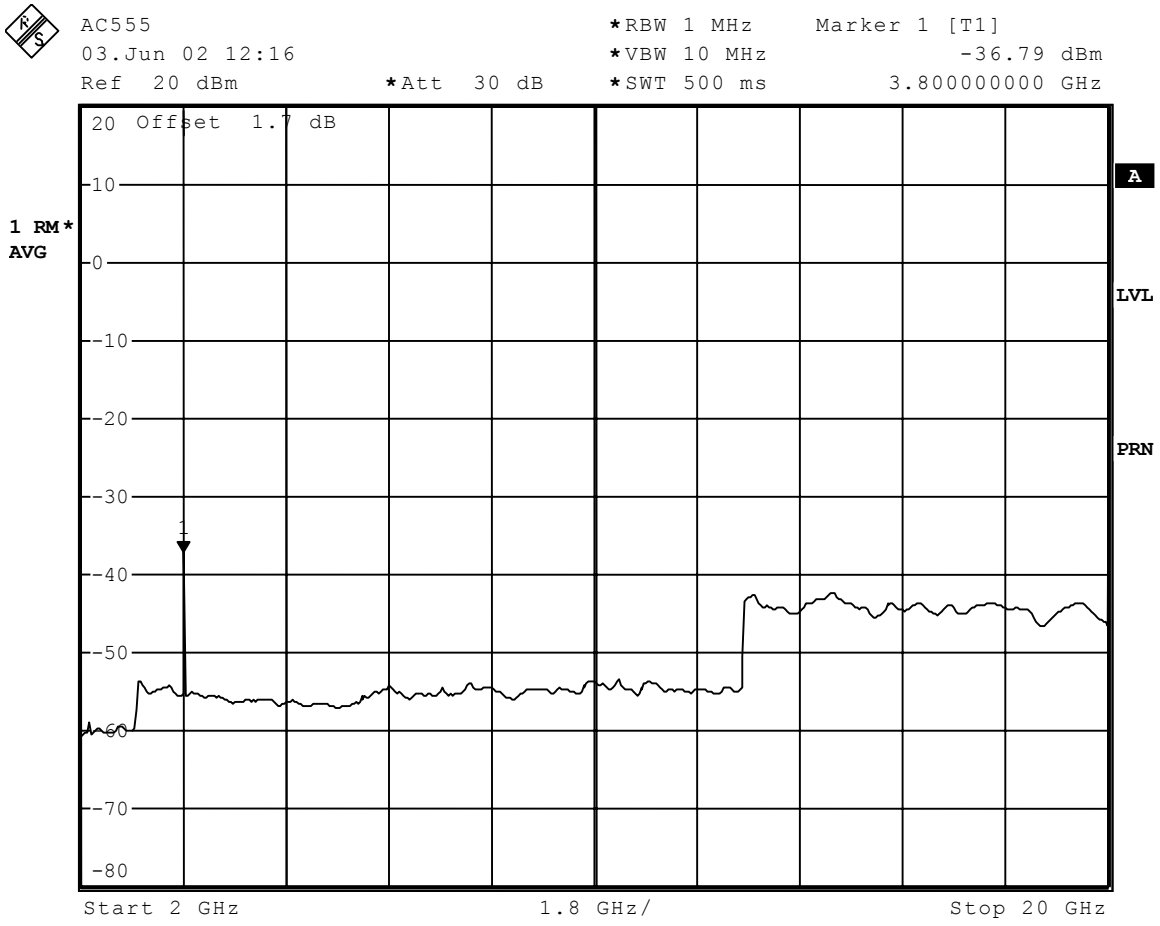
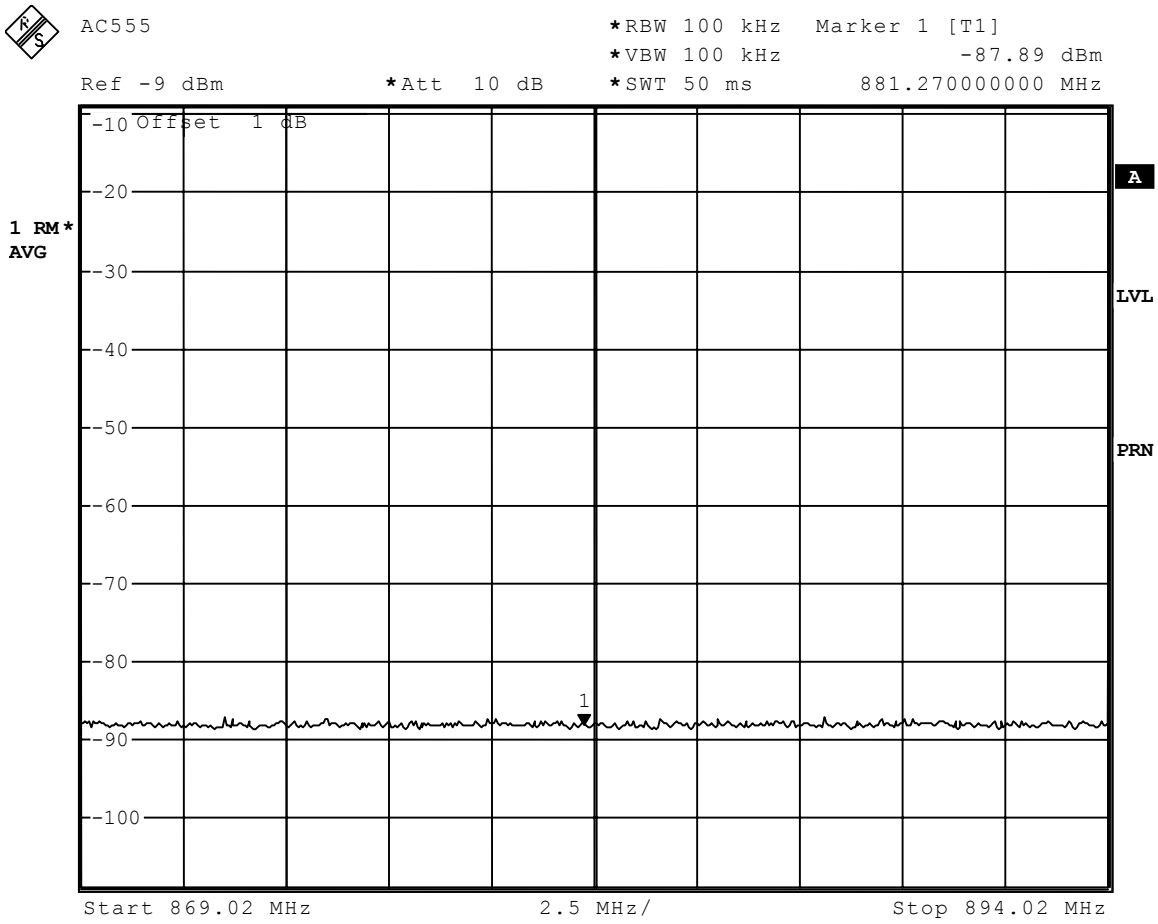
Plot 5.6d



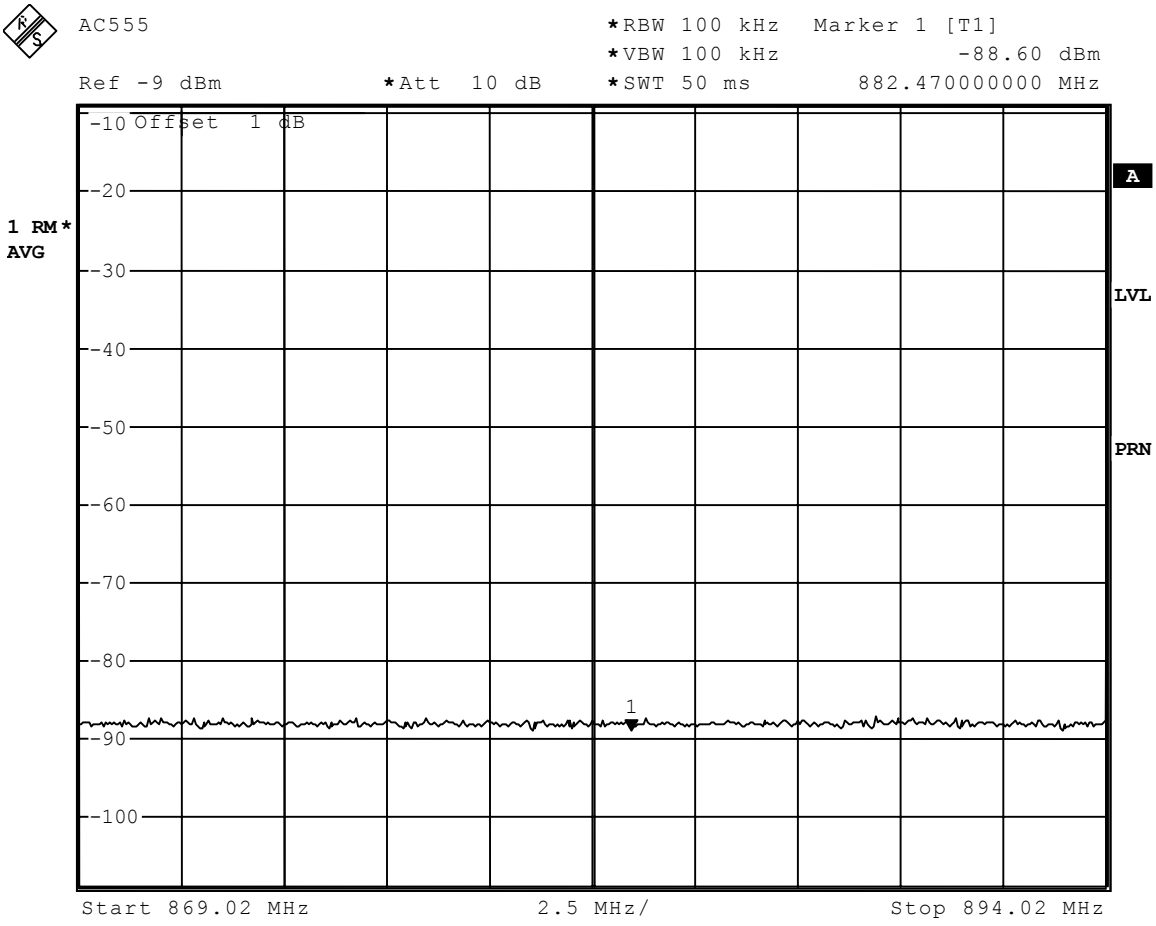
Date: 3.JUN.2002 12:16:47

Plot 5.7a



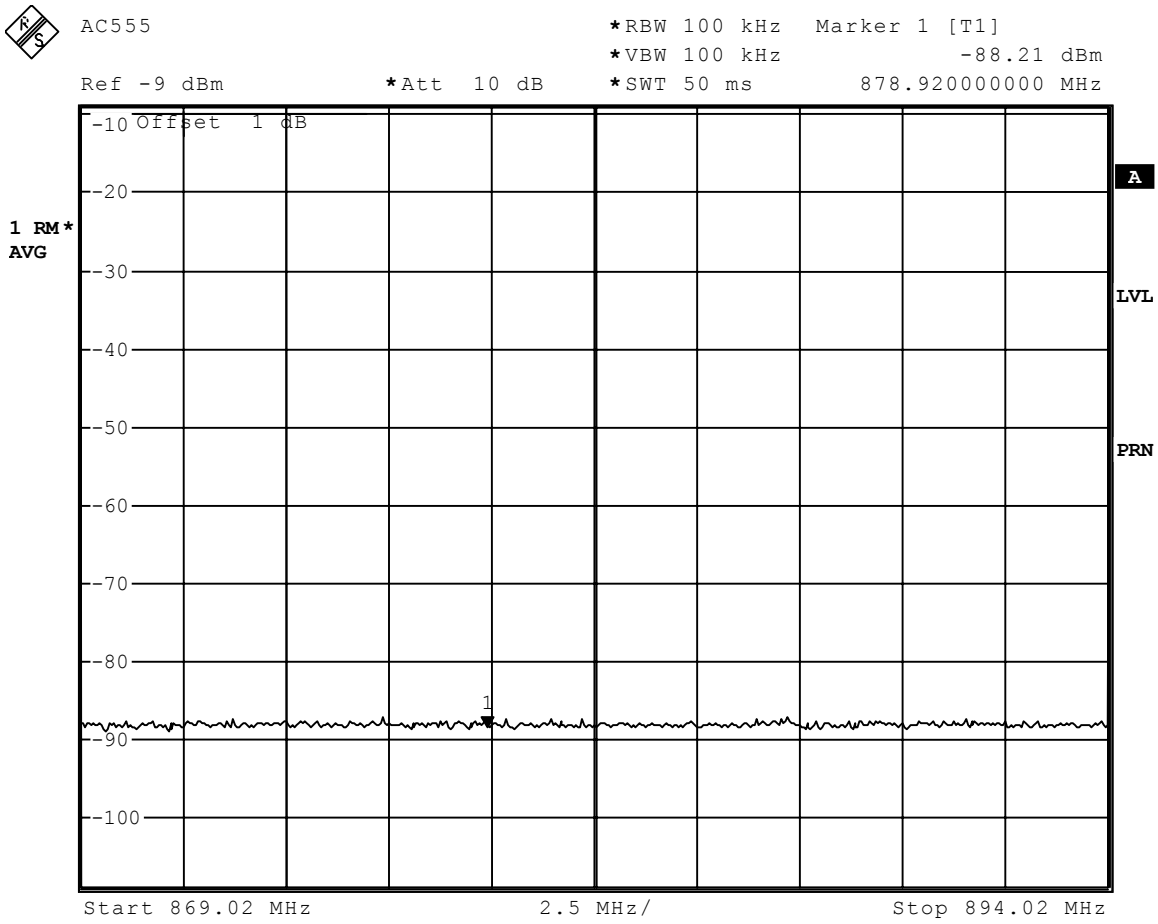
Date: 19.JUN.2002 13:38:18

Plot 5.7b



Date: 19.JUN.2002 13:38:45

Plot 5.7c



Date: 19.JUN.2002 13:39:17

6 Field Strength of Spurious Radiation

FCC 2.1053, 22.901(d), 24.238(a)

This test was performed at CCS and please refer to the attached CCS Test Report (AC555CCS_report.pdf)

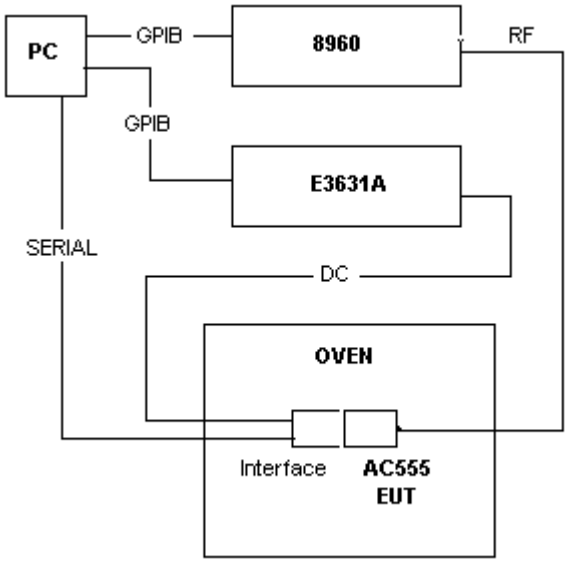
7 Frequency Stability vs Temperature

FCC 2.1055

7.1 Test Procedure

The AC555 was placed inside the temperature chamber. After the temperature stabilized for approximately 20 minutes, the transmitting frequency was recorded.

Test Setup



7.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NO.	CAL. DUE DATE
Wireless Test Set	Agilent	8960	GB41070182	2003-06-27
DC Power Supply	Hewlett Packard	E3631A	KR94624200	N/A
Temperature Chamber	Sigma Systems	M30M	7454	N/N

7.3 Test Results

Transmitting Frequency: 1880 MHz

Temperature (^{o}C)	Frequency (MHz)	Difference (Hz)
-30	1879.995	2.3
-20	1879.994	7.0
-10	1879.995	-6.1
0	1879.994	4.6
10	1879.995	1.2
20	1879.996	3.7
30	1879.995	-2.1
40	1879.994	-5.1
50	1879.994	-3.1

Note: The measured frequency stability vs temperature for the Cellular band is identical (% difference) to the above table since the transmitting frequency is locked to the same oscillator.

8 Frequency Stability vs Voltage

FCC 2.1055

8.1 Test Procedure

The AC555 was connected to a DC Power Supply. The voltage was set to 115% of the nominal voltage and was then decreased to 85% of the nominal value. The output frequency was recorded for each voltage setting.

Test Setup

Refer to Section 8.1

8.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NO.	CAL. DUE DATE
Wireless Test Set	Agilent	8960	GB41070182	2003-06-27
DC Power Supply	Hewlett Packard	E3631A	KR94624200	N/A
Temperature Chamber	Sigma Systems	M30M	7454	N/A

8.3 Test Results

Transmitting Frequency : 837 MHz

Vcc (Volts)	Frequency (MHz)	Difference (Hz)
4.0	836.995	-4.5
6.0	836.993	1.4

Transmitting Frequency: 1880 MHz

Vcc (Volts)	Frequency (MHz)	Difference (Hz)
4.0	1879.994	-6.0
6.0	1879.992	-2.2