



Nemko Test Report: 6L0432RUS3

Applicant: Andrew Corporation
108 Rand Park Drive
Garner, NC 27529
USA

**Equipment Under Test:
(E.U.T.)** AMR195

In Accordance With: **CFR 47, Part 24, Subpart E**
Broadband PCS Repeaters

Tested By: Nemko USA, Inc.
802 N. Kealy
Lewisville, TX 75057-3136

TESTED BY:

David Light Wireless Engineer

DATE:

25 September 2006

APPROVED BY:

Kevin Rose Wireless Engineer

DATE:

29 September 2006

Number of Pages: 72

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EQUIPMENT: AMR195

Section 1. Summary of Test Results

Manufacturer Andrew Corporation

Model No.: AMR195

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47, Part 24, Subpart E.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".



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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	100W	Complies
Occupied Bandwidth	2.1049	Input/Output	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235		NA

Footnotes:

(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.

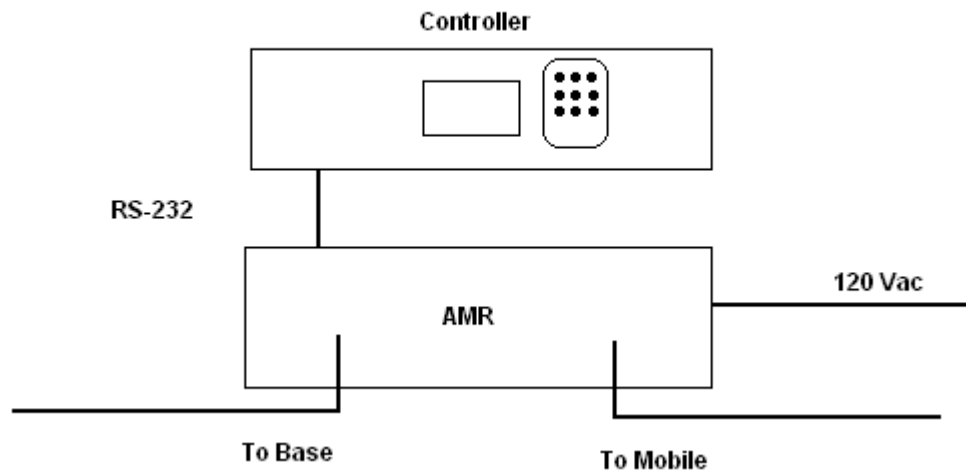
Section 2. General Equipment Specification

Supply Voltage Input:						
Frequency Bands:	Downlink:	☒	Block A :	1930 – 1945 MHz		
		☒	Block D :	1945 – 1950 MHz		
		☒	Block B :	1950 – 1965 MHz		
		☒	Block E :	1965 – 1970 MHz		
		☒	Block F :	1970 – 1975 MHz		
		☒	Block C :	1975 – 1990 MHz		
Frequency Bands:	Uplink:	☒	Block A :	1850 – 1865 MHz		
		☒	Block B :	1865 – 1870 MHz		
		☒	Block C :	1870 – 1885 MHz		
		☒	Block D :	1885 – 1890 MHz		
		☒	Block E :	1890 – 1895 MHz		
		☒	Block F :	1895 – 1910 MHz		
Type of Modulation and Designator:		CDMA (F9W)	GSM (GXW)	NADC (DXW)	W-CDMA (F9W)	EDGE (G7W)
		☒	☒	☒	☒	☒
System Gain:		89 dB Max				
Output Impedance:		50 ohms				
RF Output (Rated):	Uplink	$\frac{0.32}{25} \text{ W}$ dBm				
RF Output (Rated):	Downlink	$\frac{0.50}{27} \text{ W}$ dBm				
Frequency Translation:		F1-F1	F1-F2	N/A		
		☒	☐	☐		
Band Selection:		Software	Duplexer	Fullband		
		☒	☐	☐		

Description of EUT

Bi-directional amplifier used to enhance signals between a mobile and a base station in a wireless network. Typical applications are coverage improvement in small and medium sized environments such as offices, store fronts, underground floors, and small manufacturing facilities. The AMR family will automatically set its gain to maximize performance. However, an alphanumeric interface allows the user to manually set the gain if desired. ALC, Automatic Level Control, is incorporated to prevent overdriving the amplifier.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 24.232
TESTED BY: David Light	DATE: 29 August 2006

Test Results: Complies.**Measurement Data:**

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	CDMA	24.01	27.01	0.50
Downlink	CDMA	22.00	25.00	0.32
Uplink	TDMA	24.03	27.03	0.50
Downlink	TDMA	22.04	25.04	0.32
Uplink	EDGE	24.00	27.00	0.50
Downlink	EDGE	22.01	25.01	0.32
Uplink	GSM	24.00	27.00	0.50
Downlink	GSM	22.04	25.04	0.32
Uplink	W-CDMA	23.99	26.99	0.50
Downlink	W-CDMA	22.01	25.01	0.32

Equipment Used: 1082-1469-1472-1659**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 21 °C**Relative Humidity:** 32 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 29 August 2006

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1082-1469-1472-1659-1036

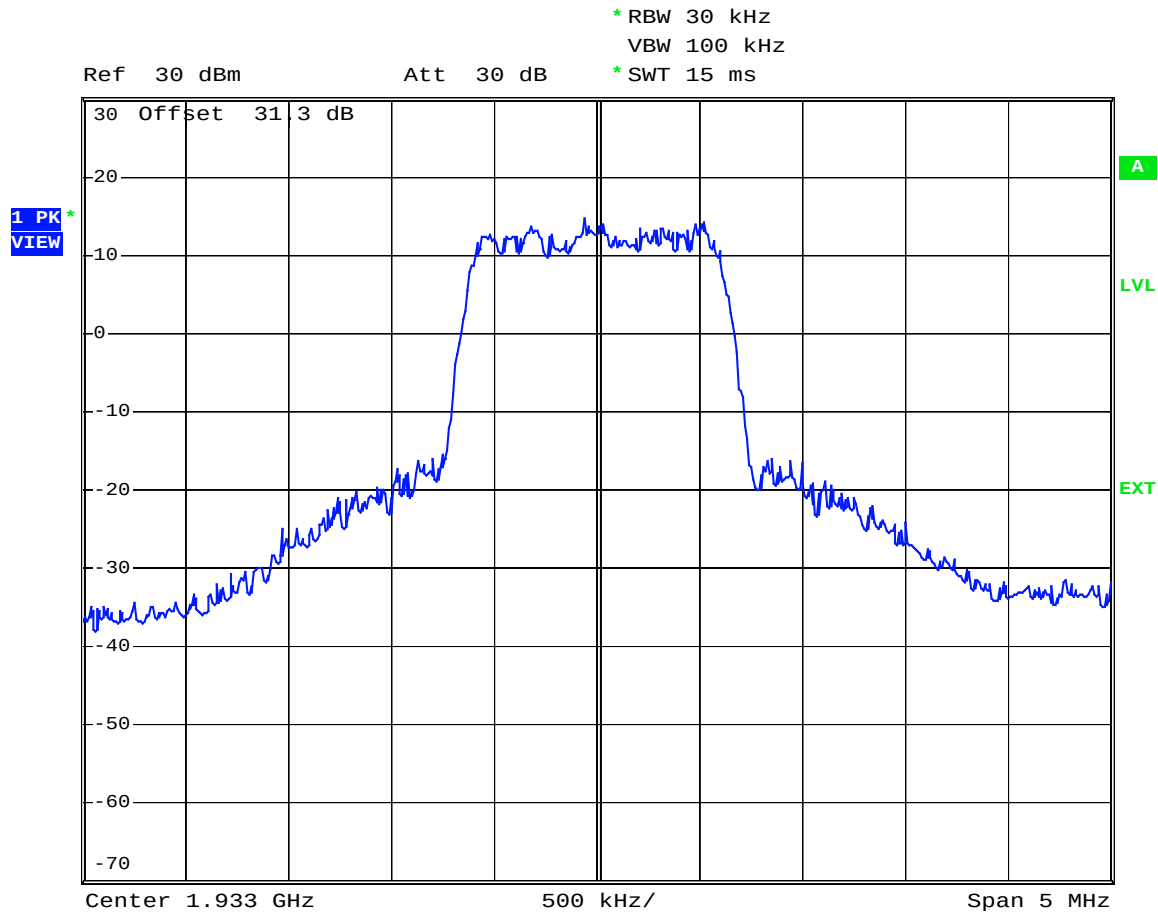
Measurement Uncertainty: 1X10⁻⁷ ppm

Temperature: 21 °C

Relative Humidity: 32 %

Test Data – Occupied Bandwidth

CDMA - Output
Downlink



Date: 29.AUG.2006 14:10:54

EQUIPMENT: AMR195

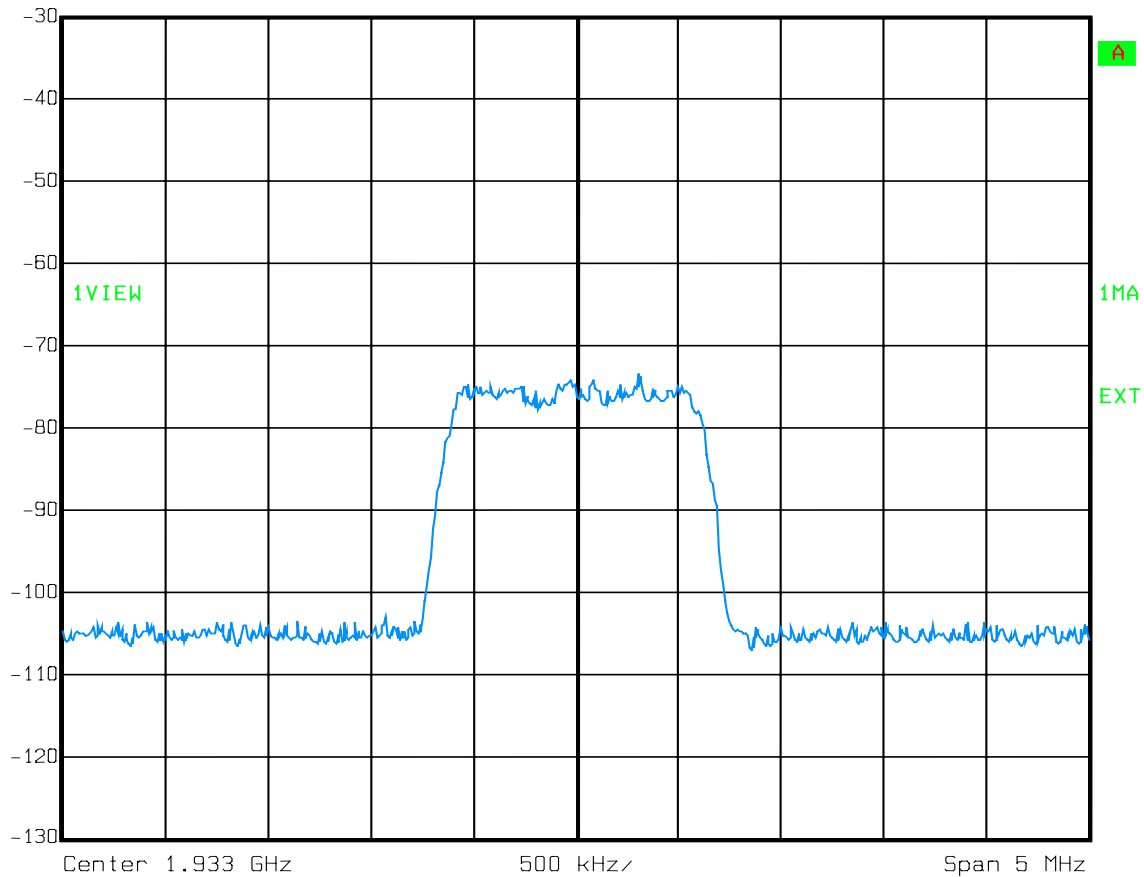
Test Data – Occupied Bandwidth

CDMA – Input
Downlink



Ref Lvl
-30 dBm

RBW	30 kHz	RF Att	0 dB
VBW	100 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm

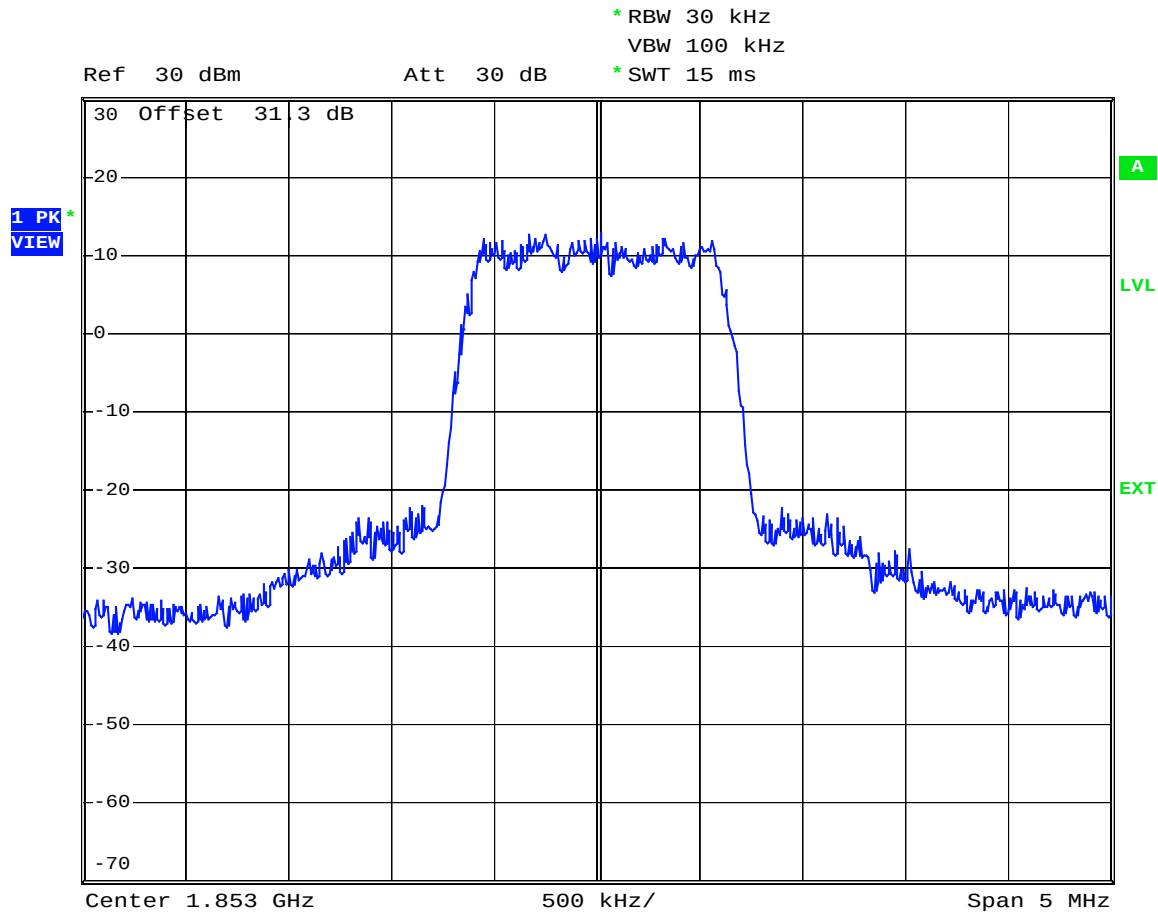


Date: 29.AUG.2006 14:07:11

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

CDMA - Output
Uplink



Date: 29.AUG.2006 14:15:31

EQUIPMENT: AMR195

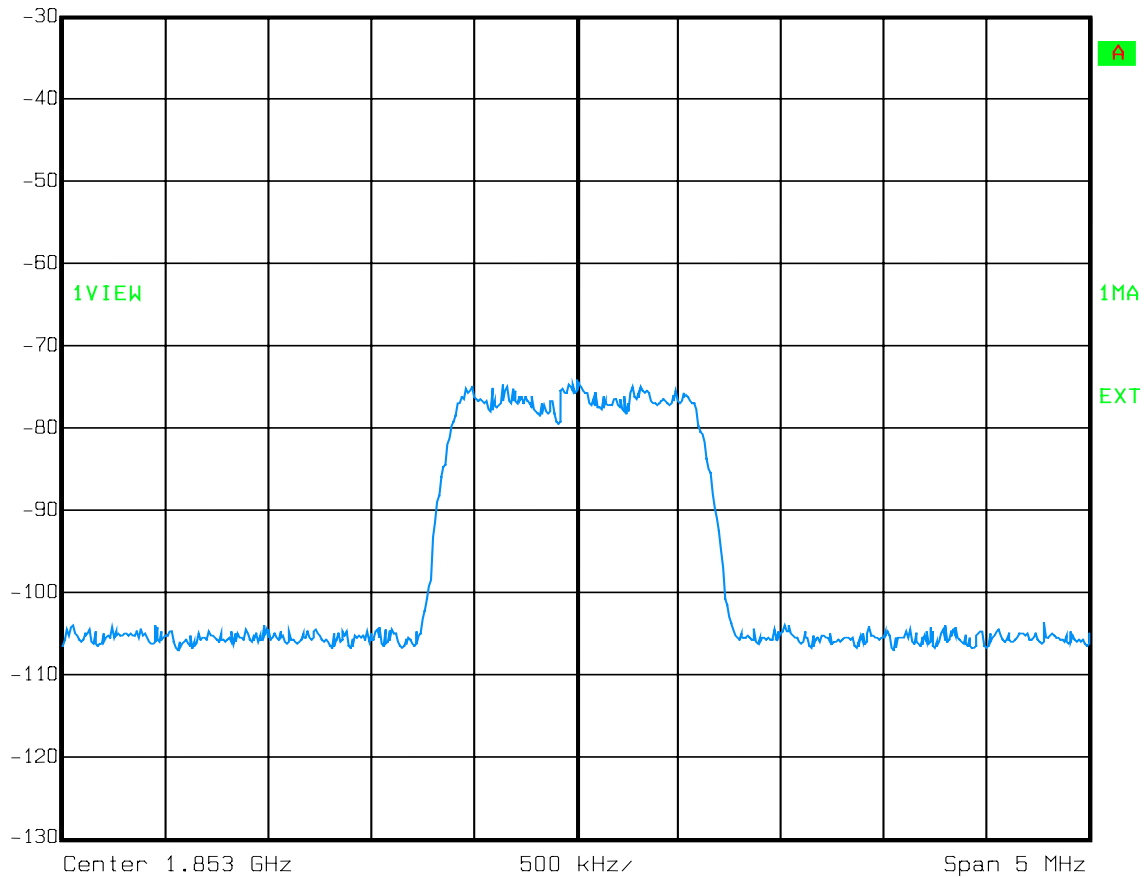
Test Data – Occupied Bandwidth

CDMA - Input
Uplink



Ref Lvl
-30 dBm

RBW	30 kHz	RF Att	0 dB
VBW	100 kHz		
SWT	14 ms	Unit	dBm

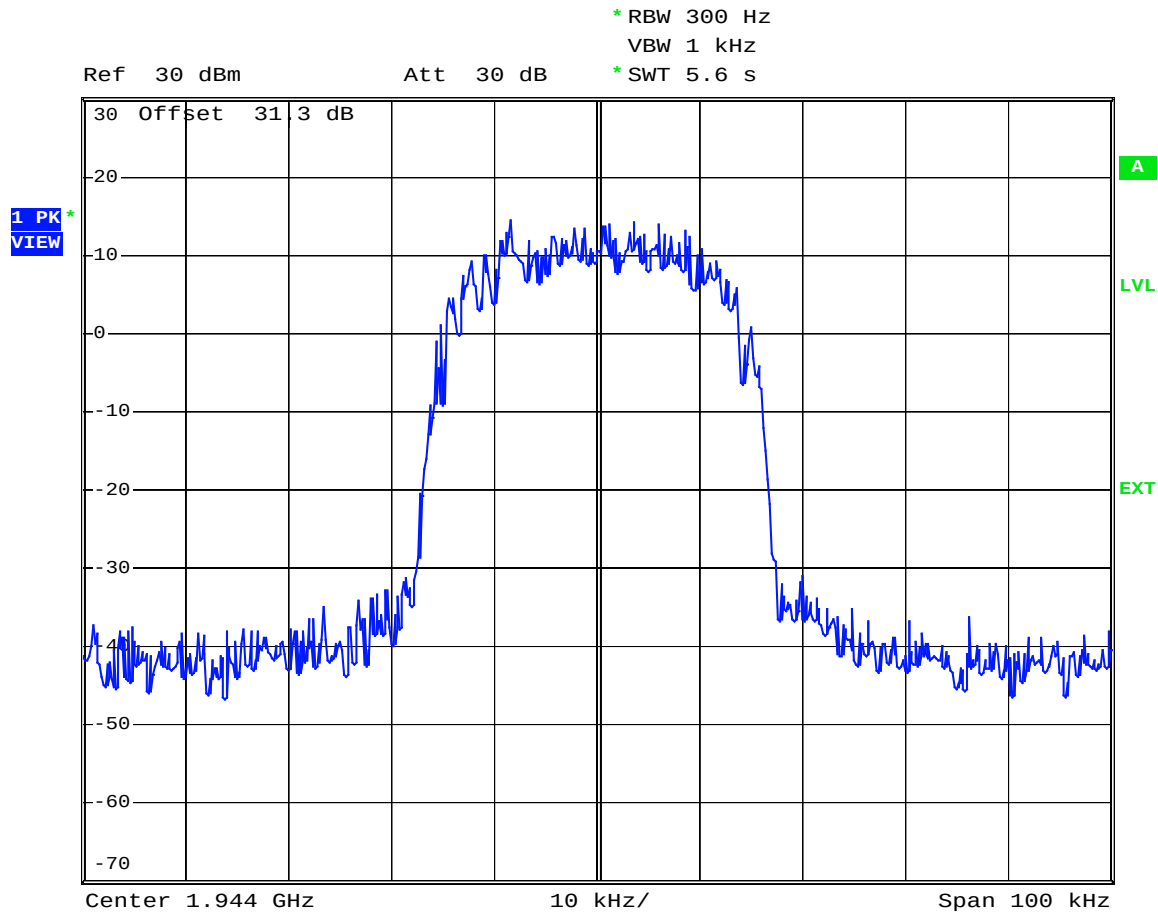


Date: 29.AUG.2006 14:11:08

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

TDMA - Output
Downlink

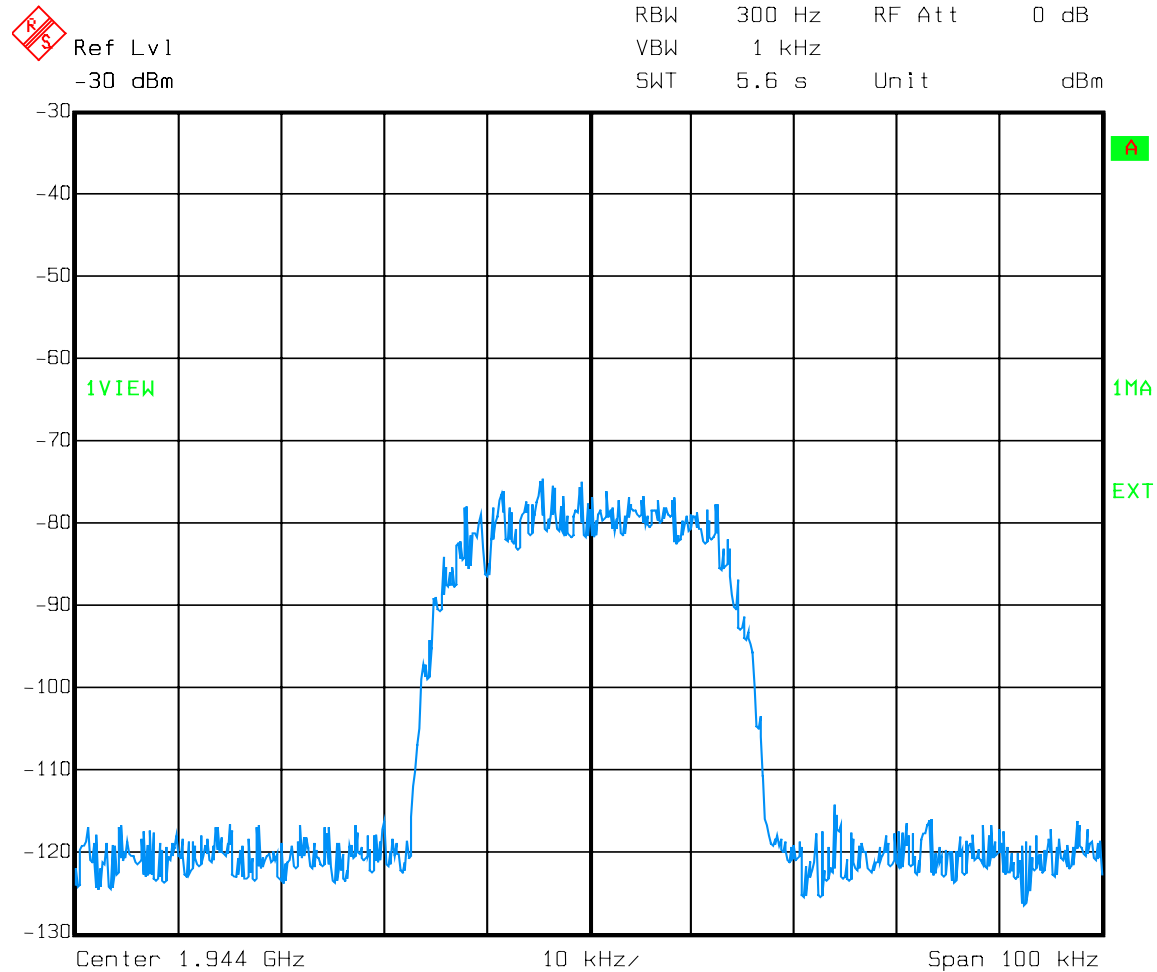


Date: 29.AUG.2006 10:47:48

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

TDMA - Input
Downlink

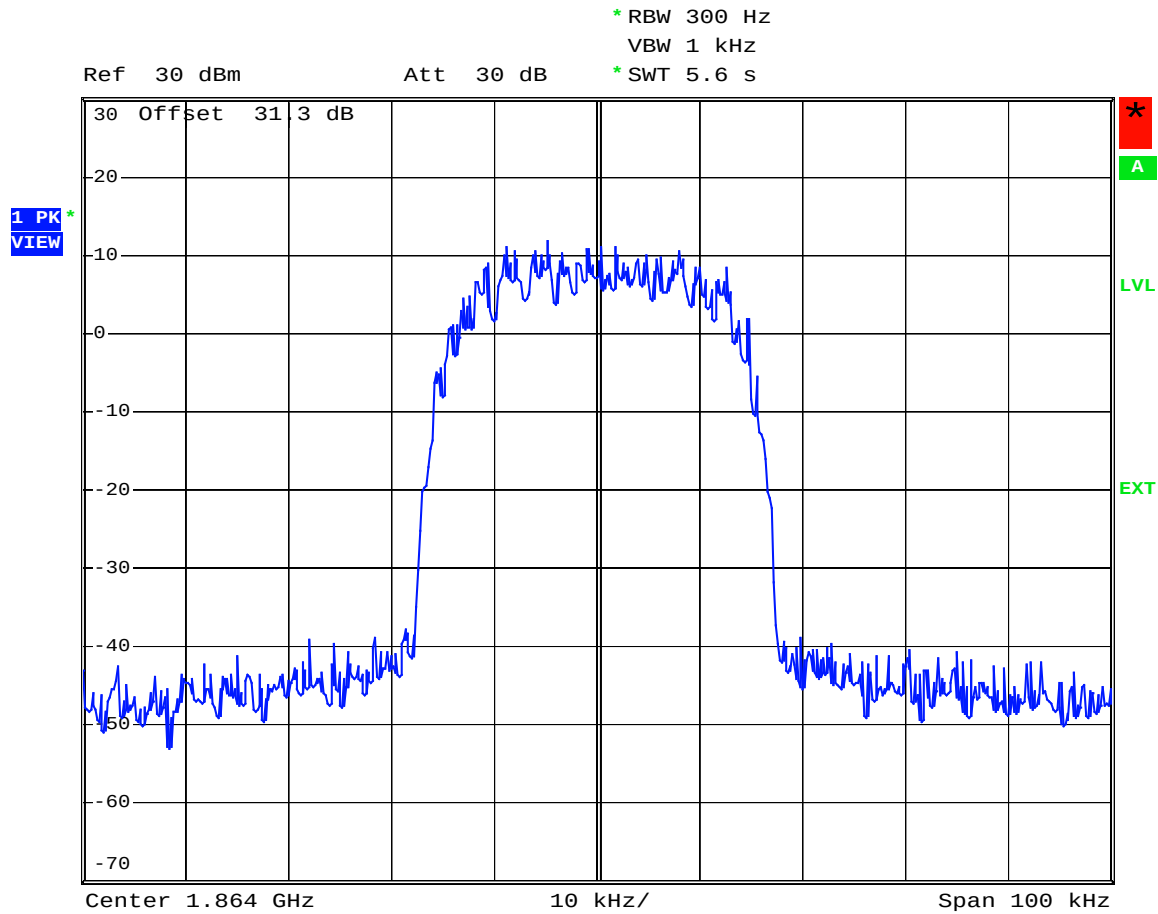


Date: 29.AUG.2006 10:44:34

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

TDMA - Output
Uplink



Date: 29.AUG.2006 10:51:25

EQUIPMENT: AMR195

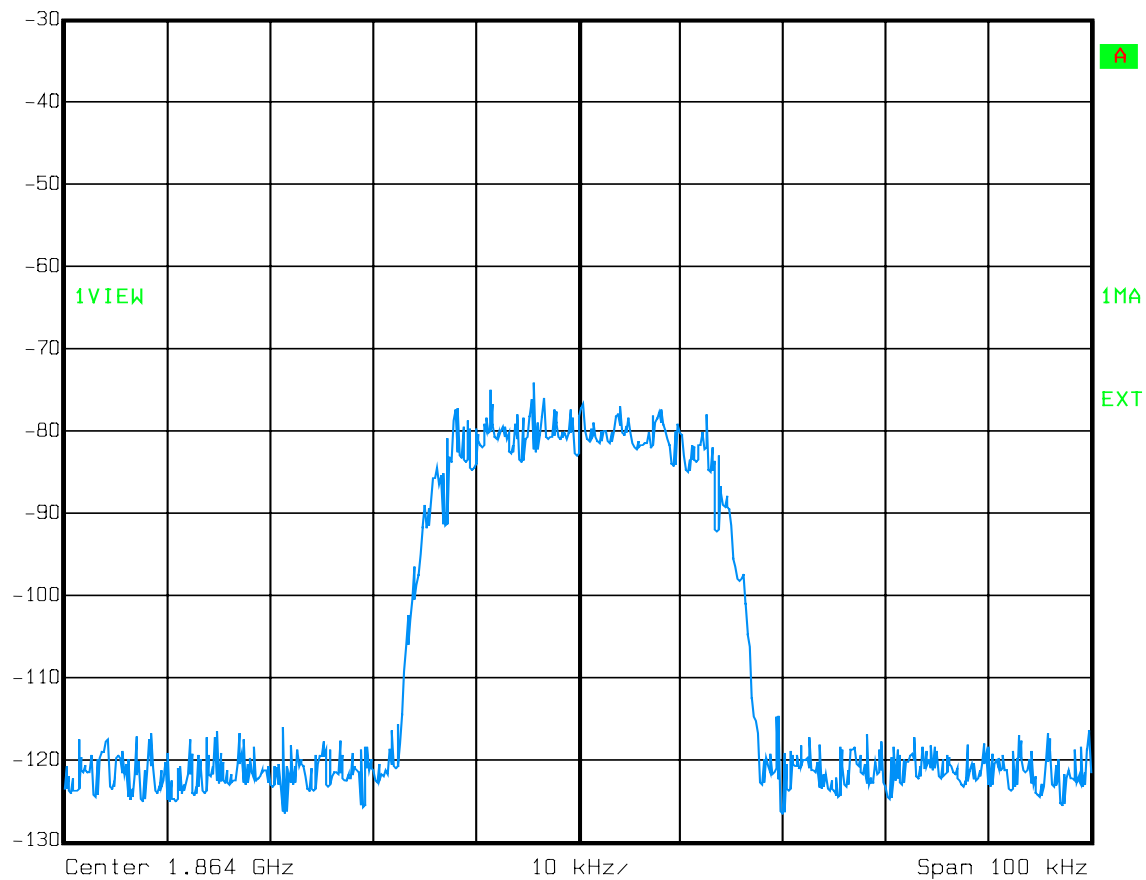
Test Data – Occupied Bandwidth

TDMA - Input
Uplink



Ref Lvl
-30 dBm

RBW 300 Hz RF Att 0 dB
VBW 1 kHz
SWT 5.6 s Unit dBm

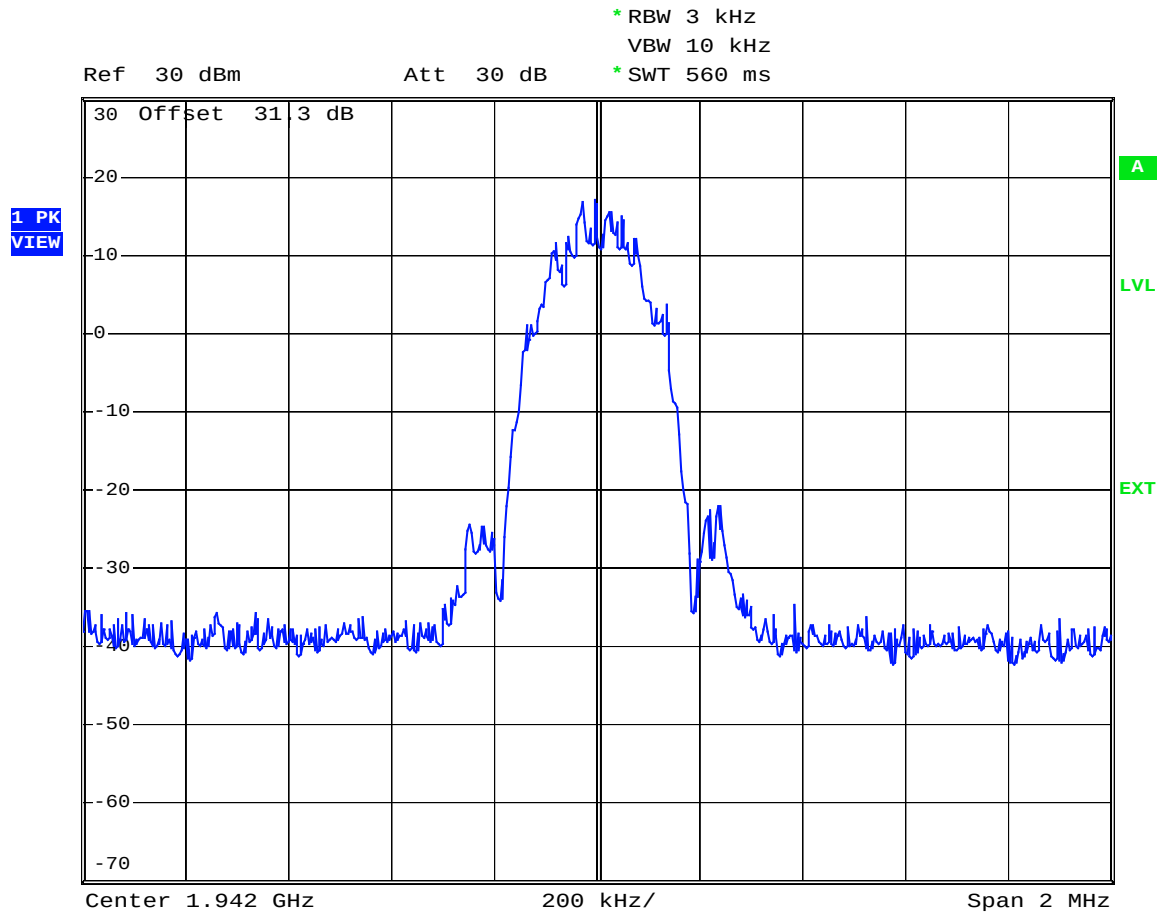


Date: 29.AUG.2006 10:47:02

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

EDGE - Output
Downlink

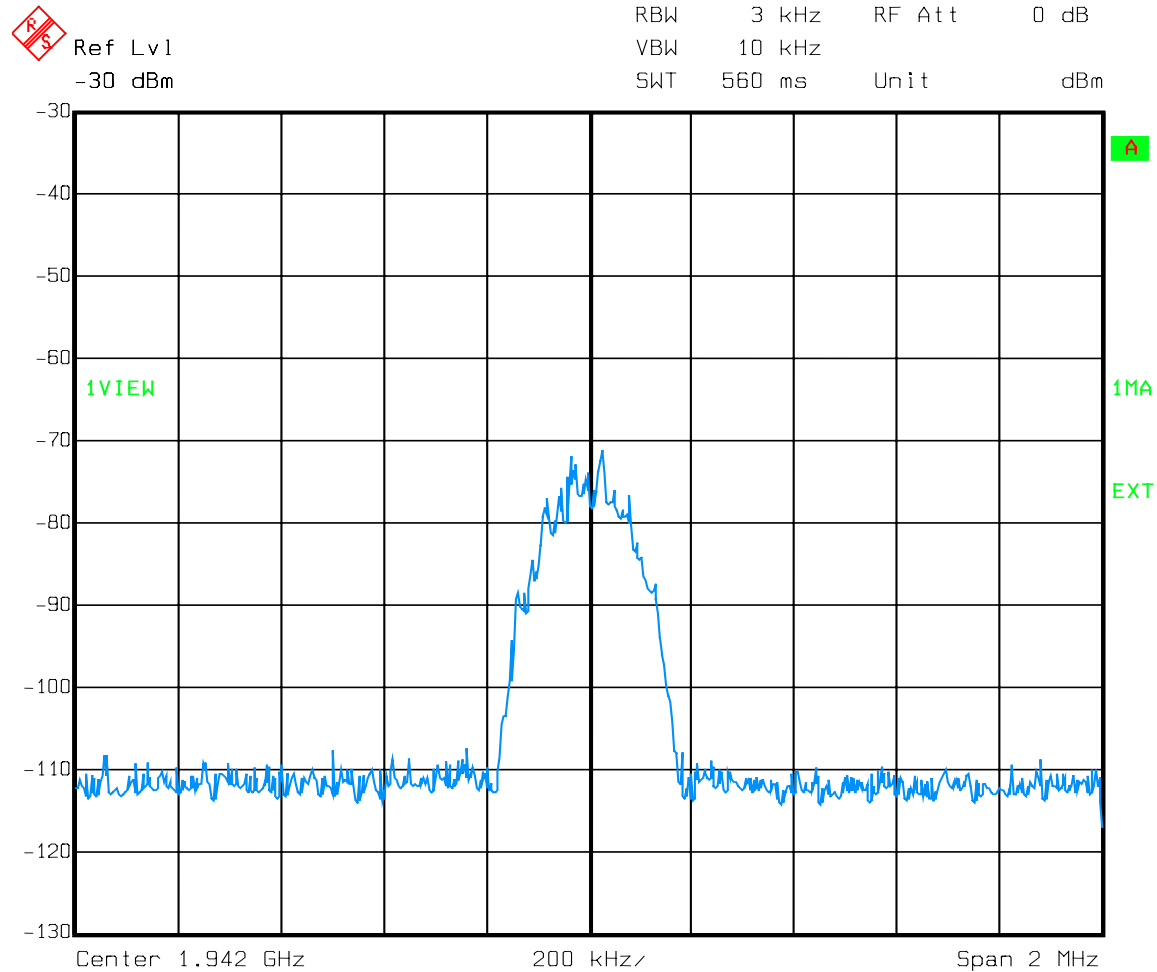


Date: 29.AUG.2006 09:55:14

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

EDGE - Input
Downlink

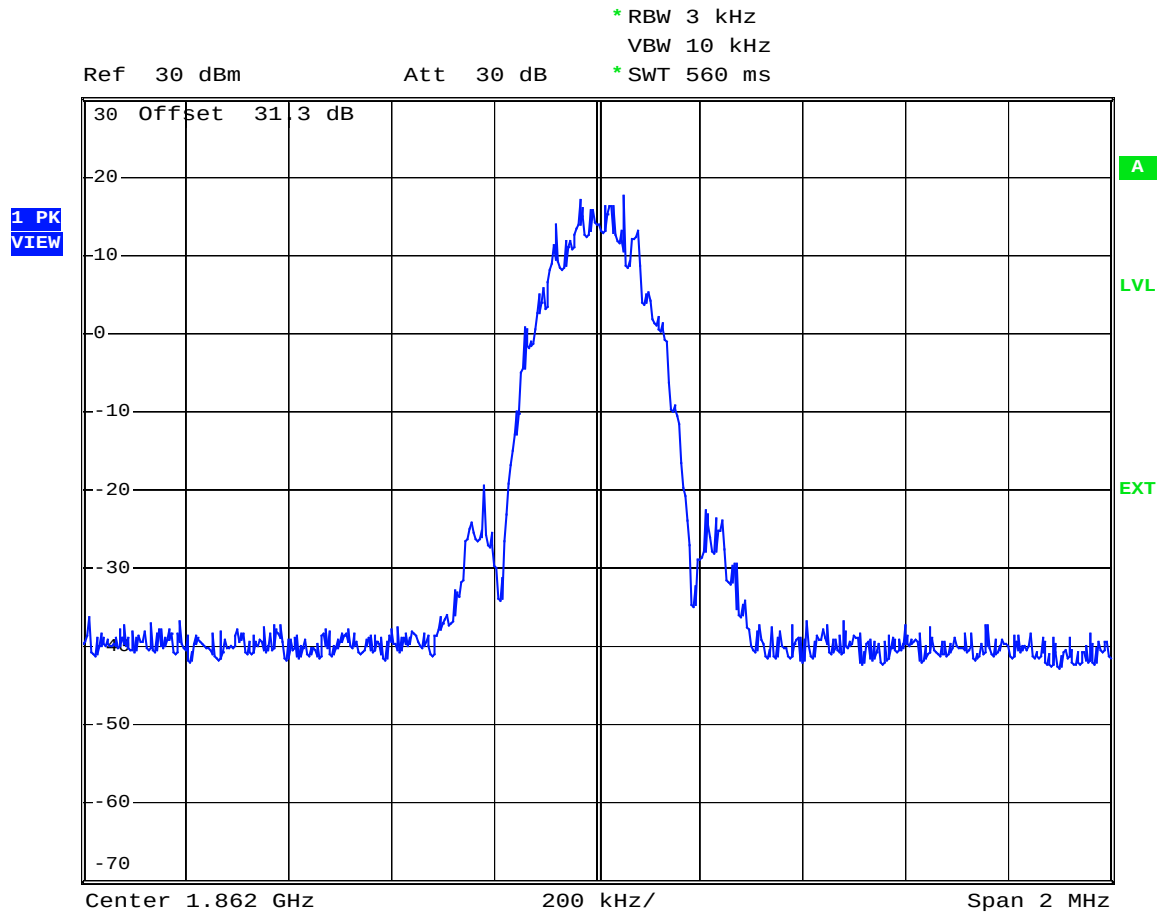


Date: 29.AUG.2006 09:51:54

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

EDGE - Output
Uplink



Date: 29.AUG.2006 09:58:41

EQUIPMENT: AMR195

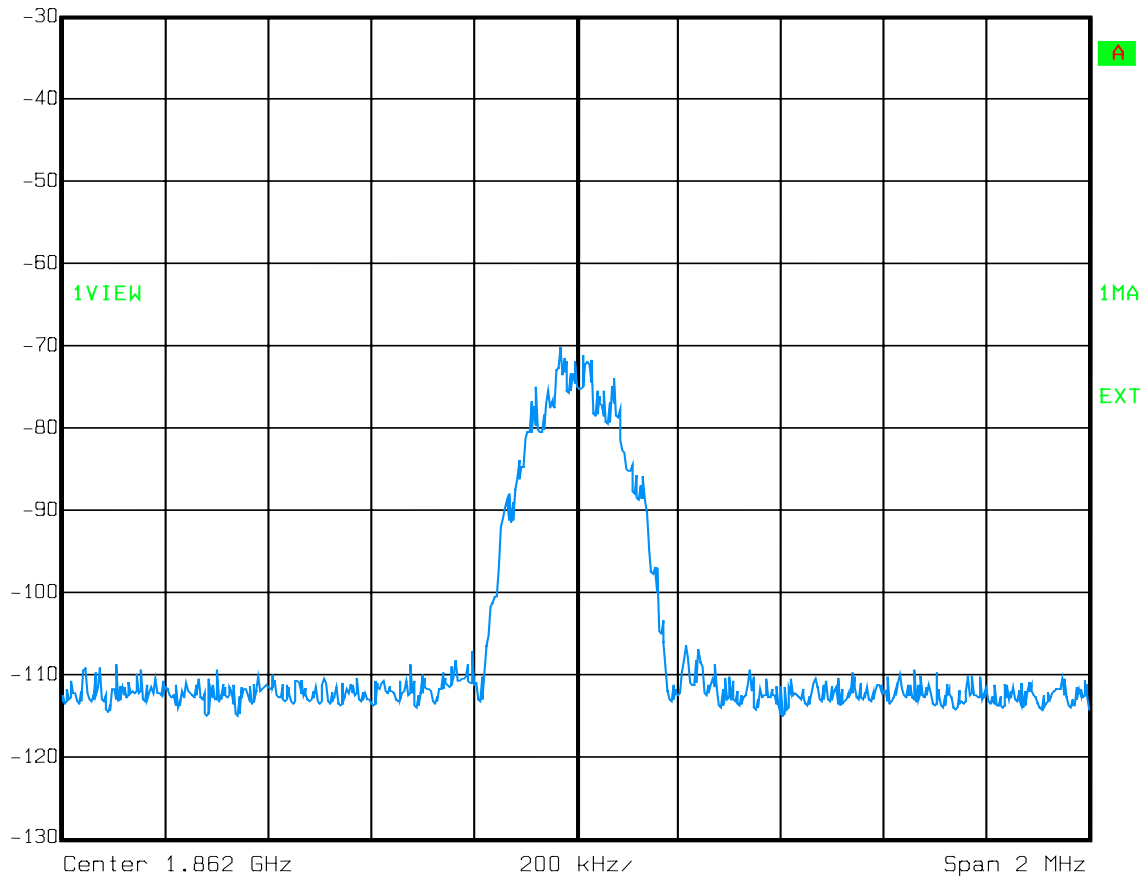
Test Data – Occupied Bandwidth

EDGE - Input
Uplink



Ref Lvl
-30 dBm

RBW 3 kHz RF Att 0 dB
VBW 10 kHz
SWT 560 ms Unit dBm

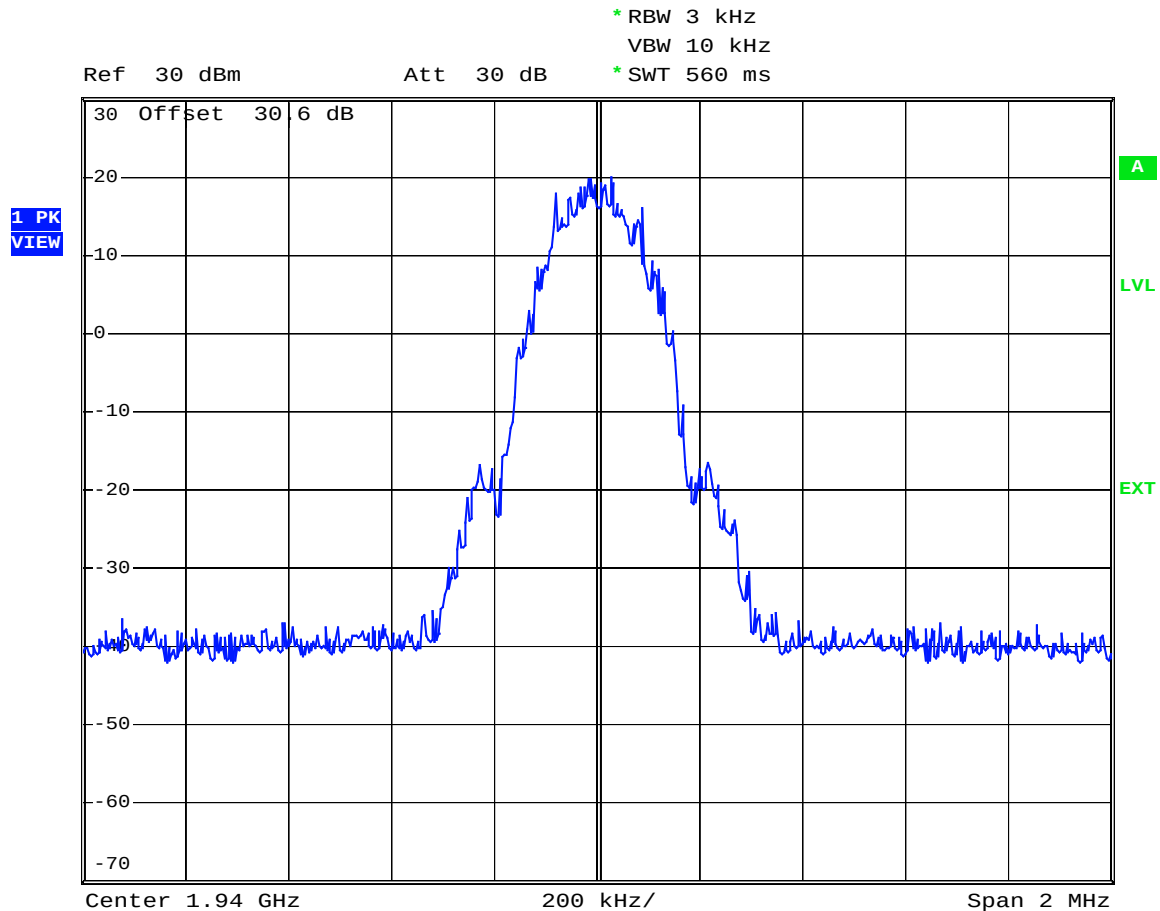


Date: 29.AUG.2006 09:54:15

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

GSM - Output
Downlink

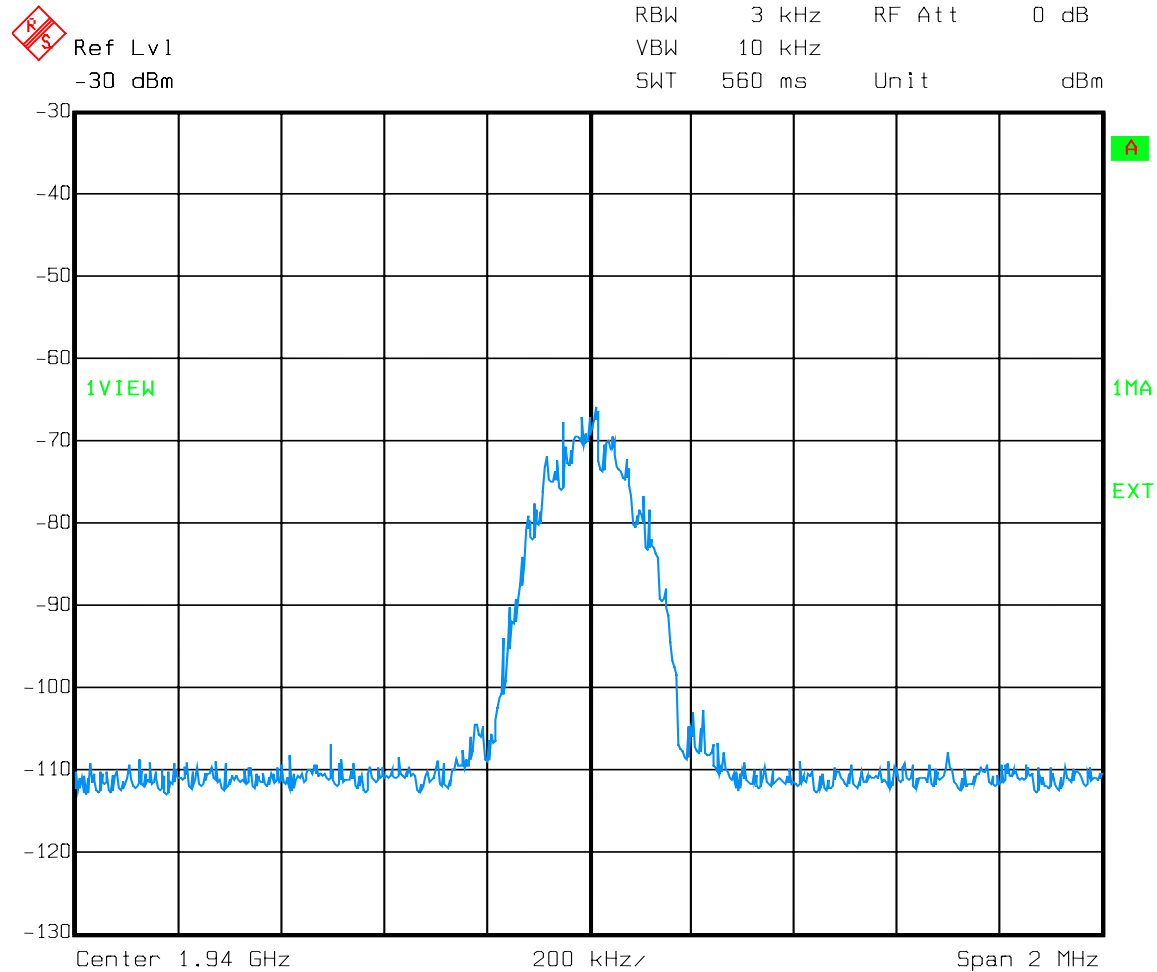


Date: 28.AUG.2006 14:42:17

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

GSM - Input
Downlink

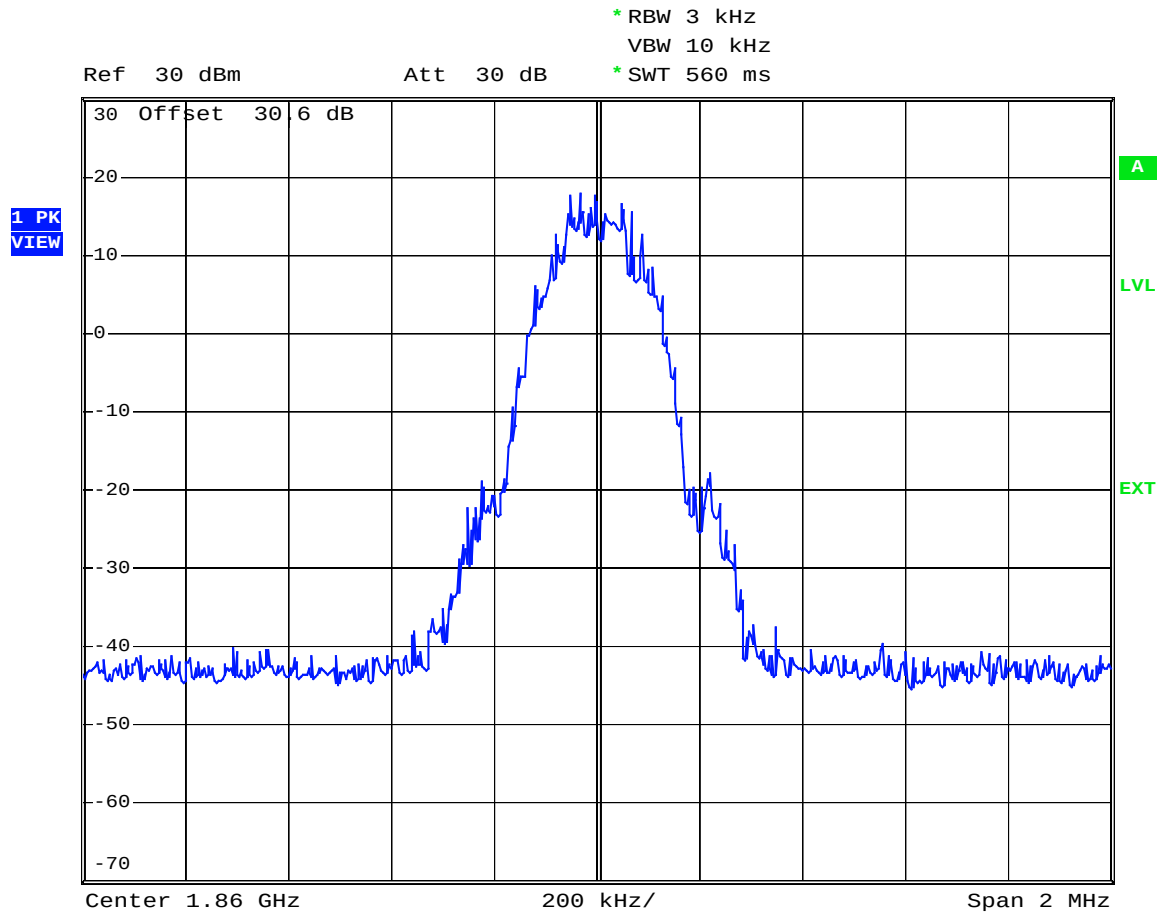


Date: 28.AUG.2006 14:38:38

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

GSM - Output
Uplink

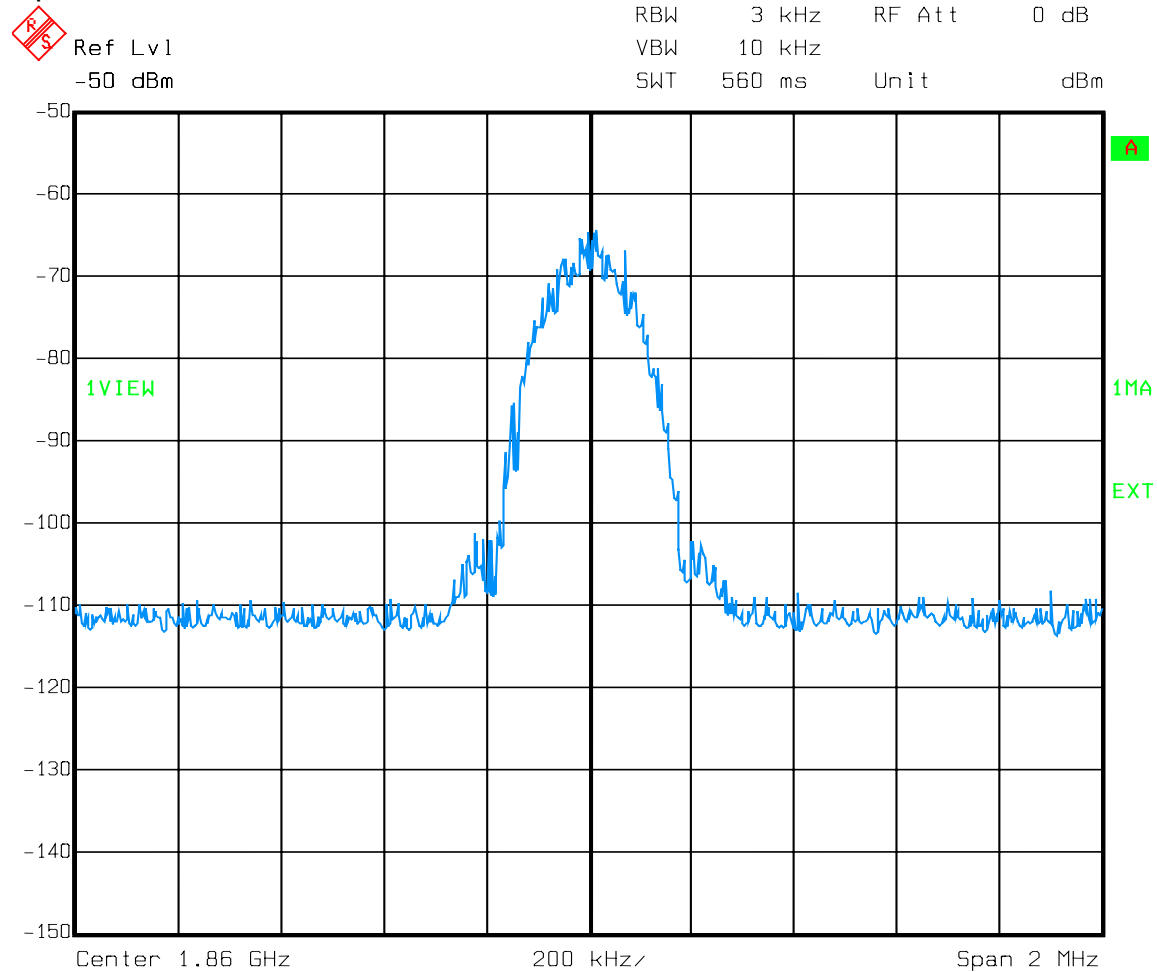


Date: 28.AUG.2006 14:58:44

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

GSM - Input
Uplink

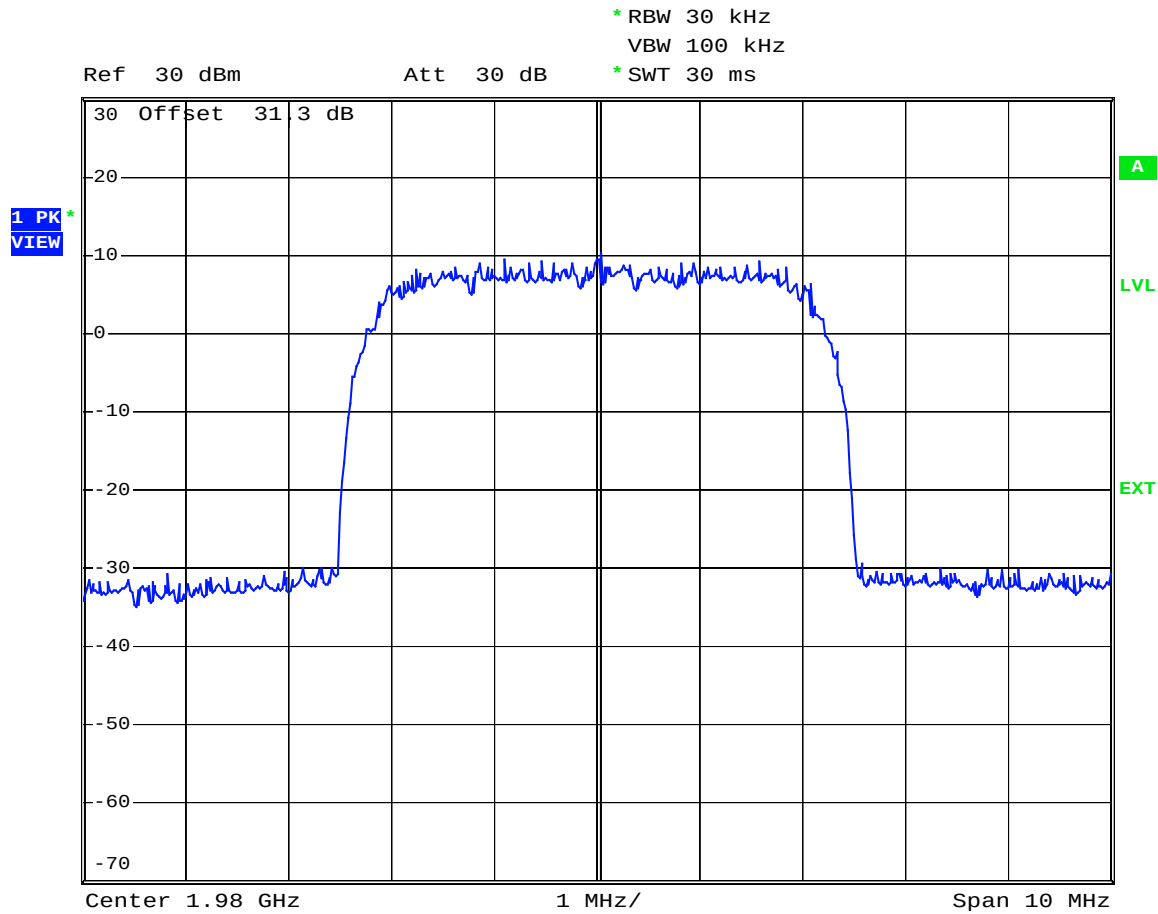


Date: 28.AUG.2006 14:55:08

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

W-CDMA - Output
Downlink



Date: 30.AUG.2006 10:56:27

EQUIPMENT: AMR195

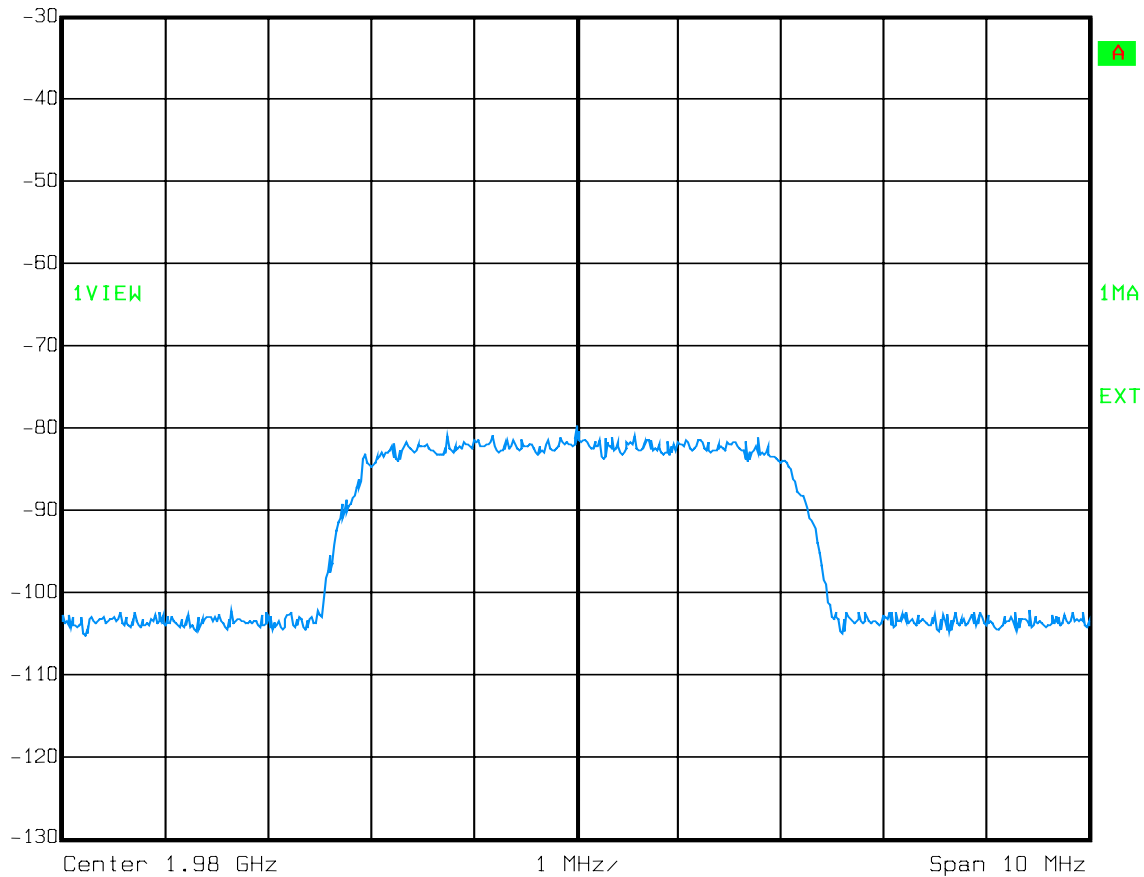
Test Data – Occupied Bandwidth

W-CDMA - Input
Downlink



Ref Lvl
-30 dBm

RBW	30 kHz	RF Att	0 dB
VBW	100 kHz		
SWT	30 ms	Unit	dBm

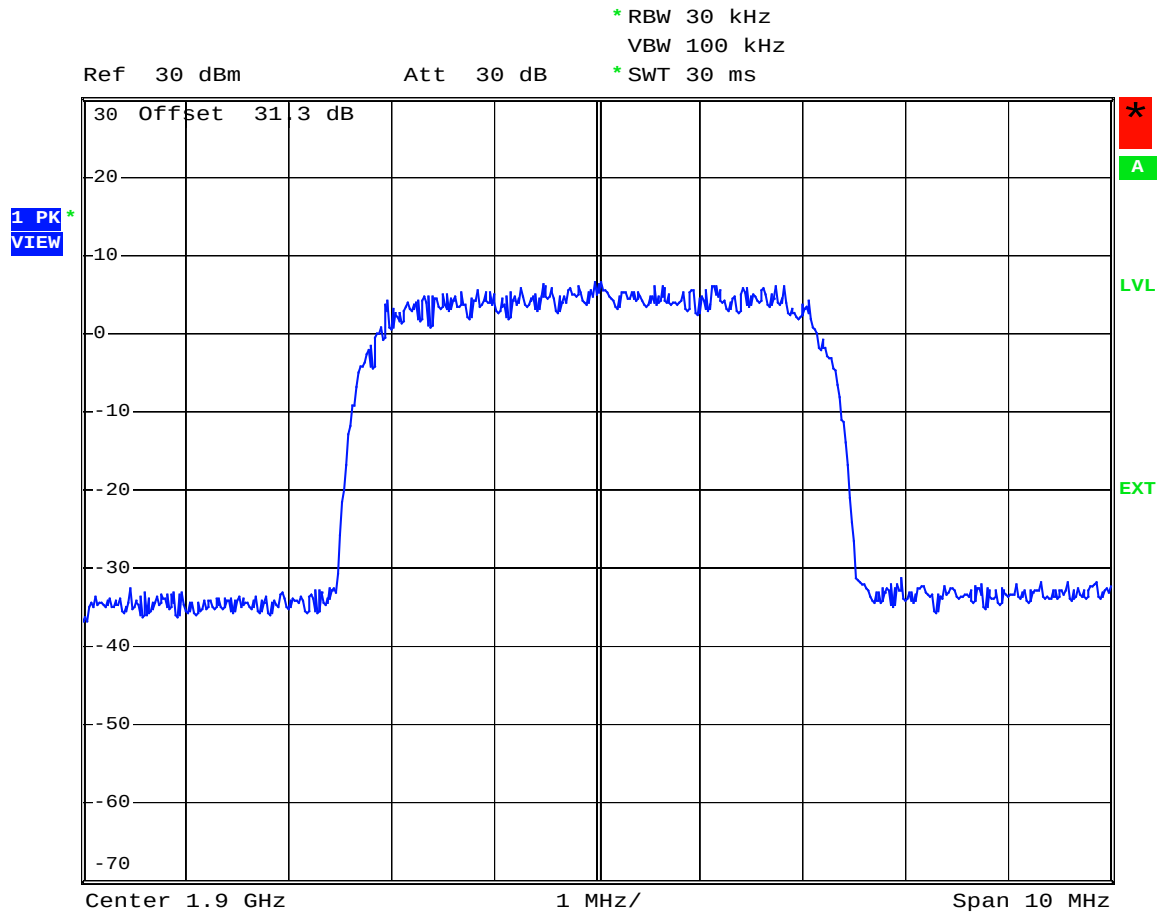


Date: 30.AUG.2006 10:52:01

EQUIPMENT: AMR195

Test Data – Occupied Bandwidth

W-CDMA - Output
Uplink



Date: 30.AUG.2006 10:49:00

EQUIPMENT: AMR195

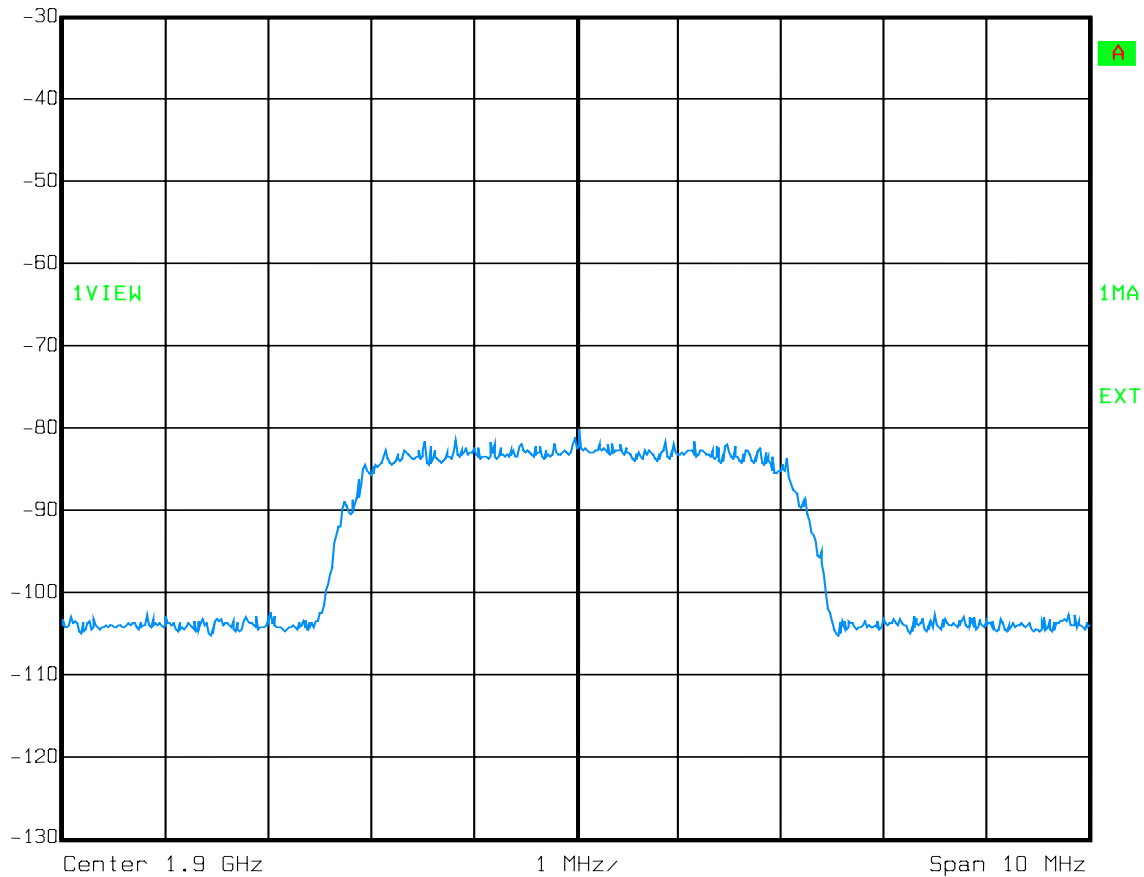
Test Data – Occupied Bandwidth

W-CDMA - Input
Uplink



Ref Lvl
-30 dBm

RBW	30 kHz	RF Att	0 dB
VBW	100 kHz	Mixer	-10 dBm
SWT	30 ms	Unit	dBm



Date: 30.AUG.2006 10:45:19

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals PARA. NO.: 24.238

TESTED BY: David Light DATE: 29 August 2006

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1082-1469-1472-1659-1036

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 32 %

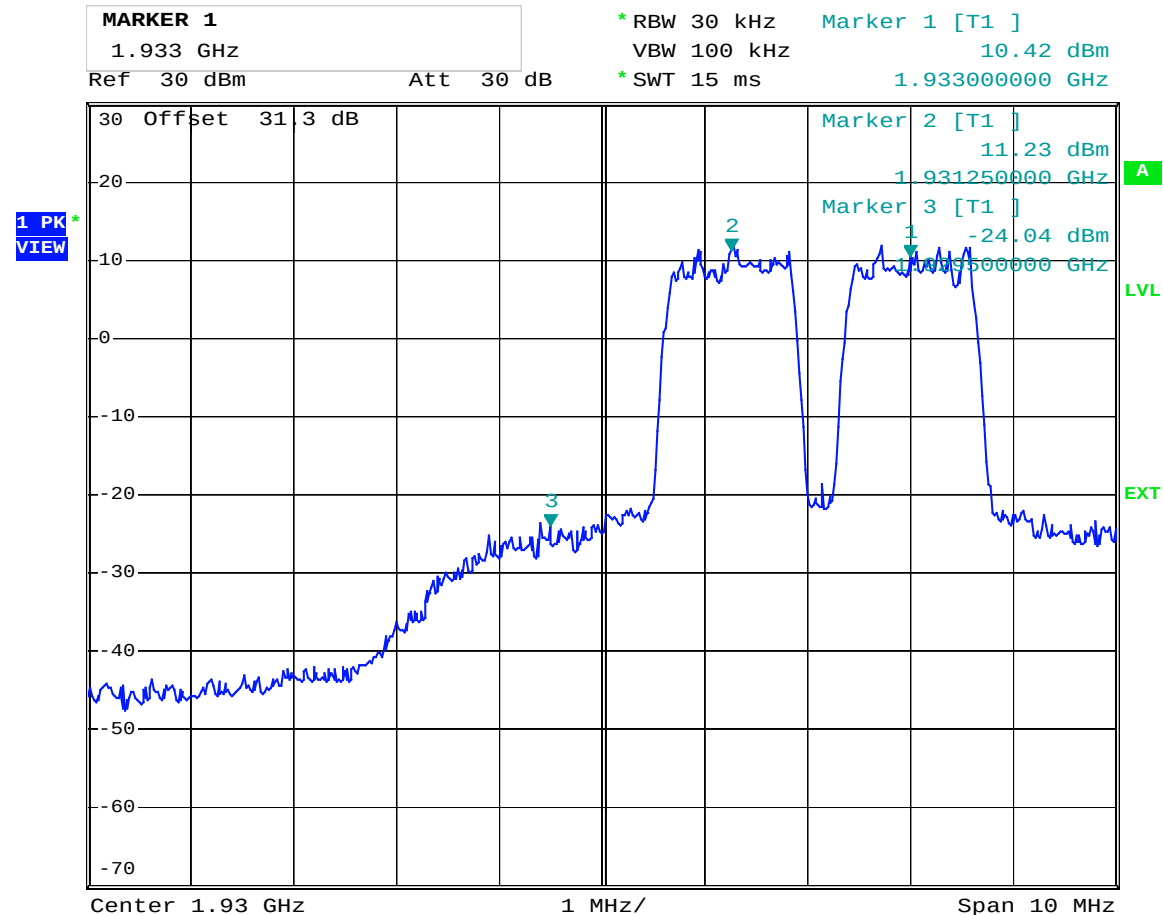
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

CDMA

Downlink



Date: 29.AUG.2006 15:06:08

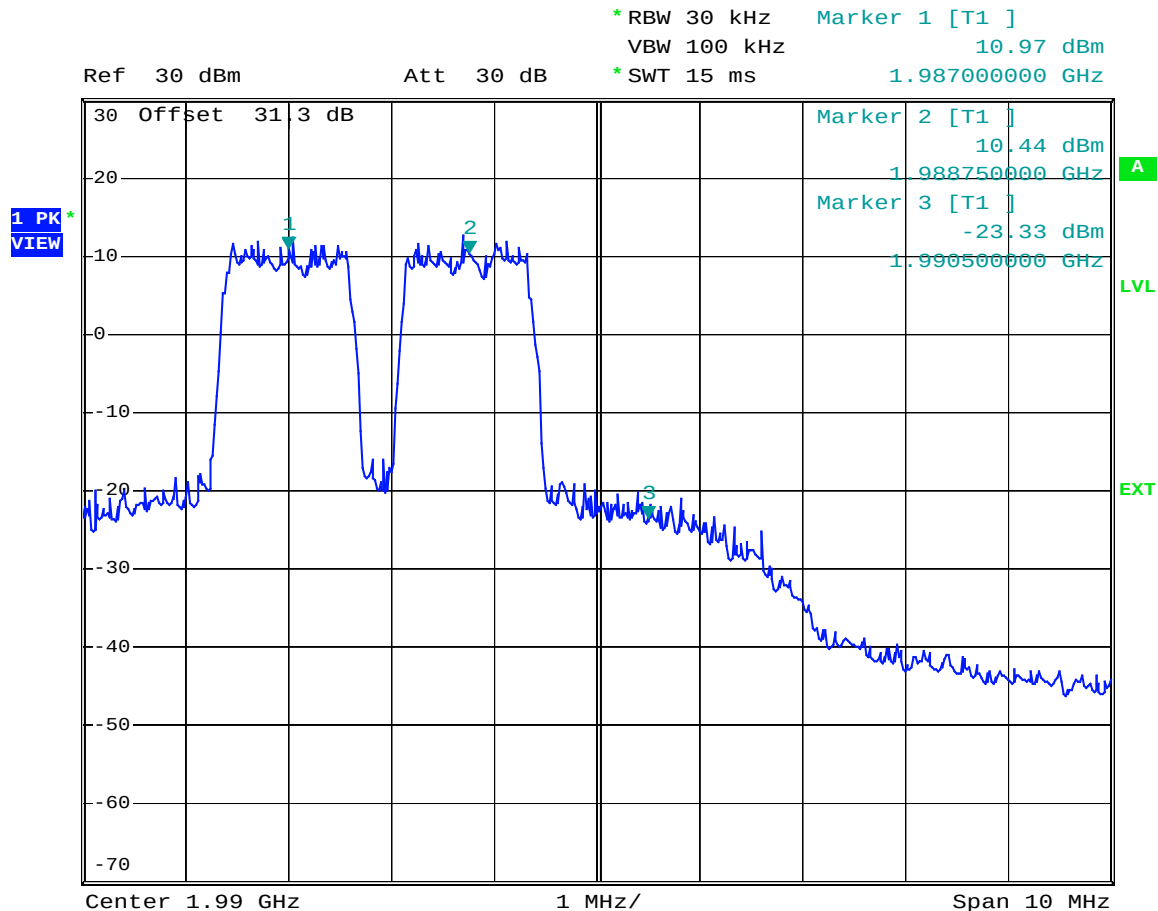
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

CDMA

Downlink



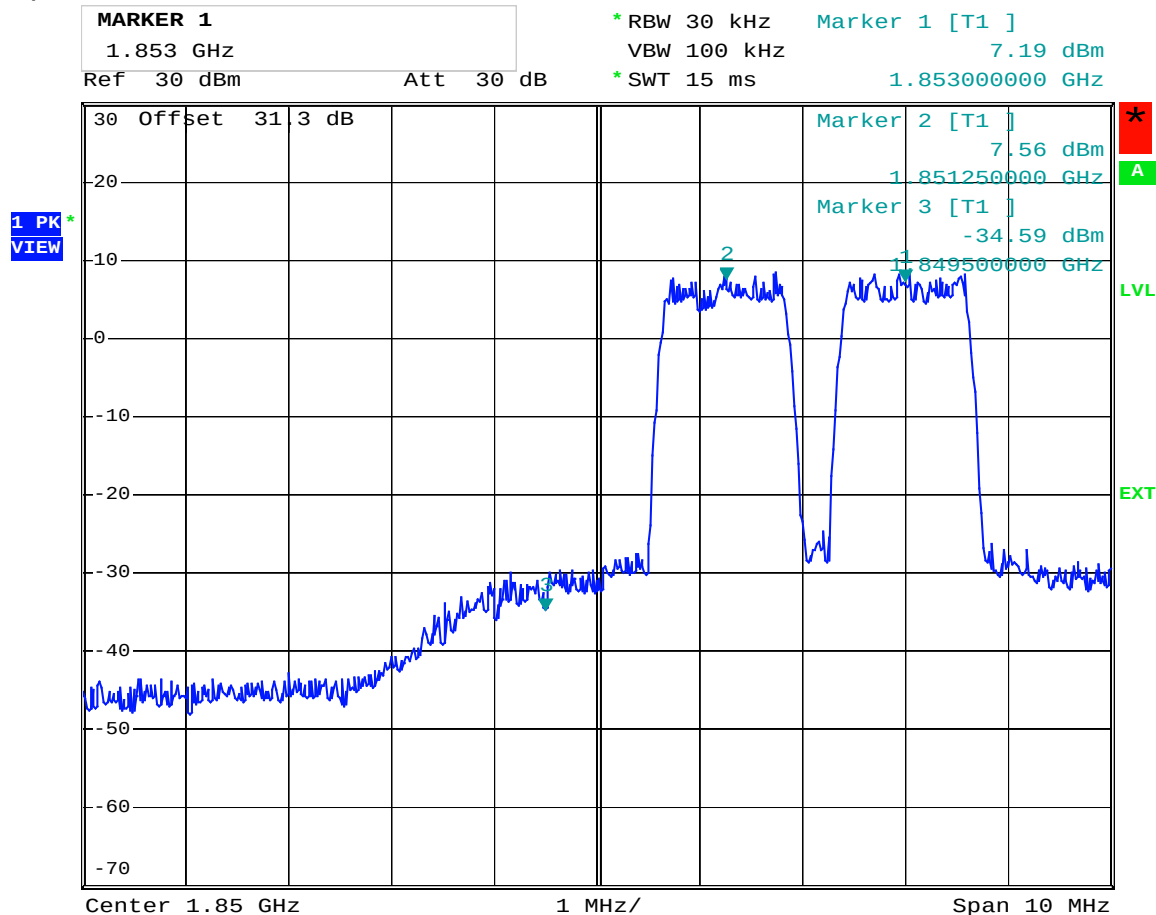
Date: 29.AUG.2006 14:57:09

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

CDMA

Uplink



Date: 29.AUG.2006 15:03:01

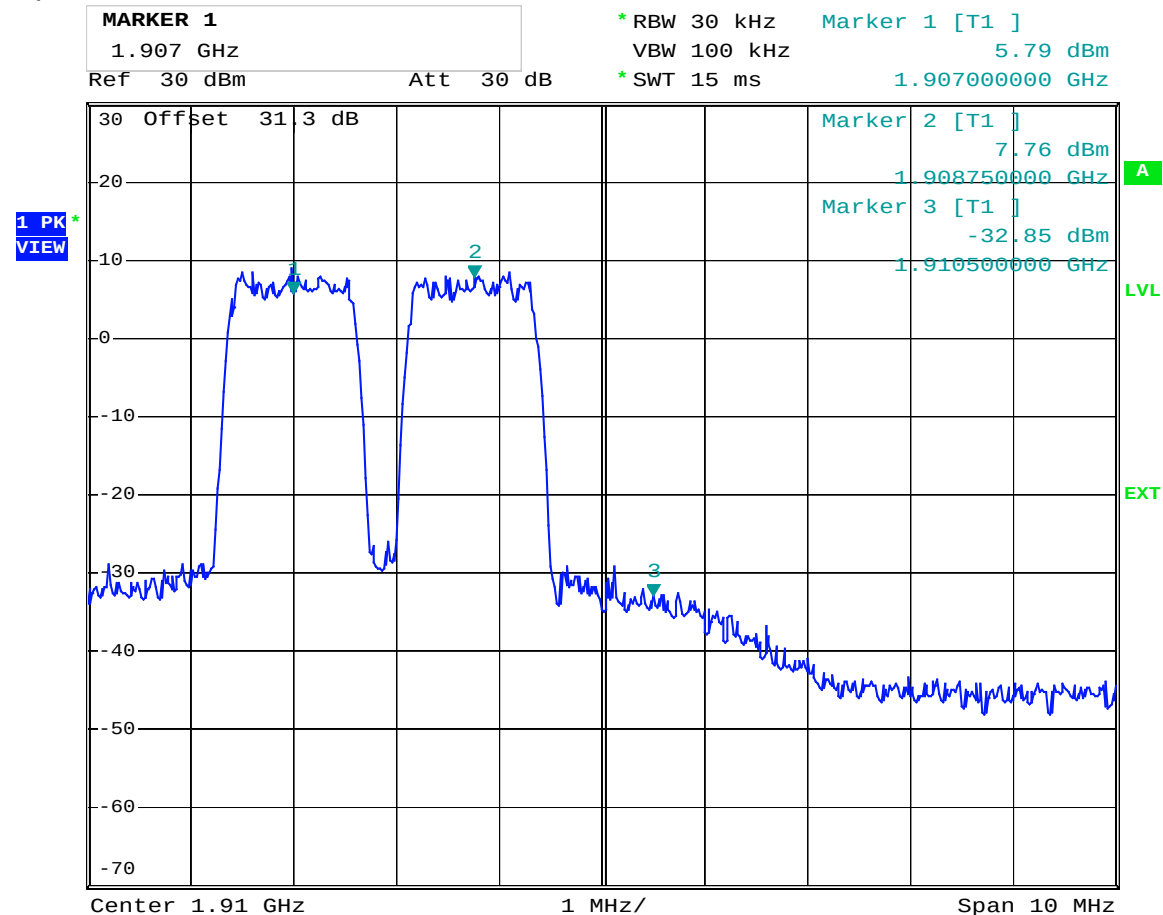
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

CDMA

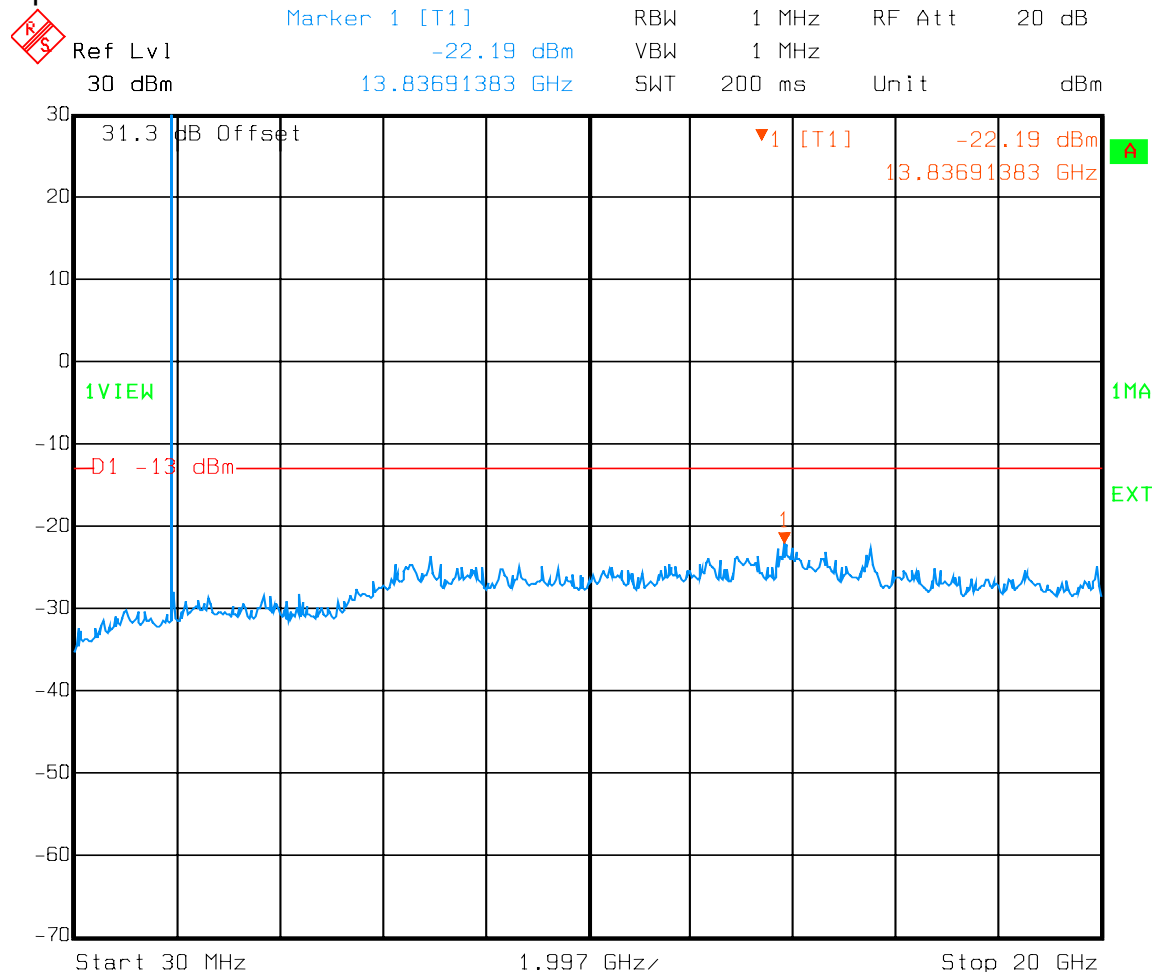
Uplink



Date: 29.AUG.2006 15:00:11

Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA - Downlink

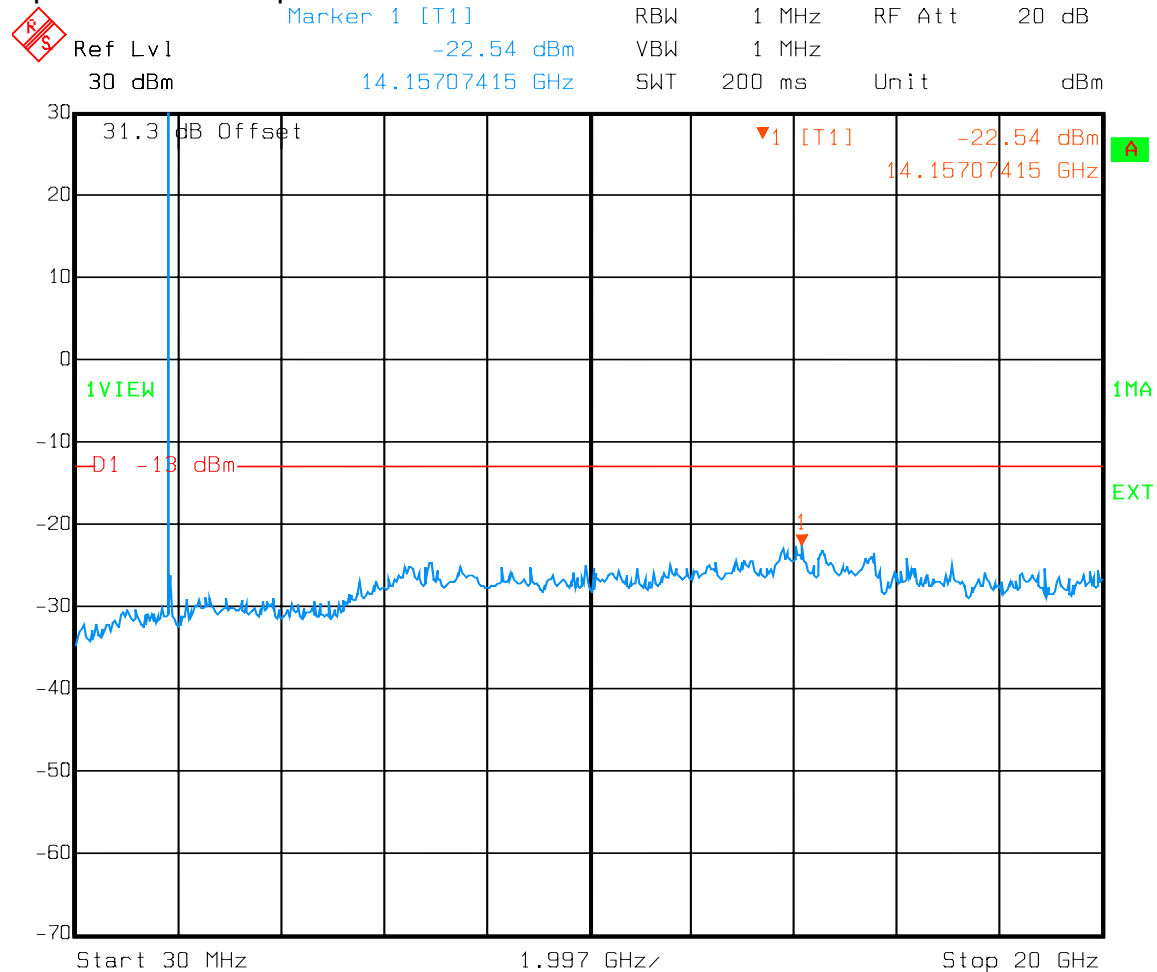


Date: 29.AUG.2006 14:14:20

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA - Uplink



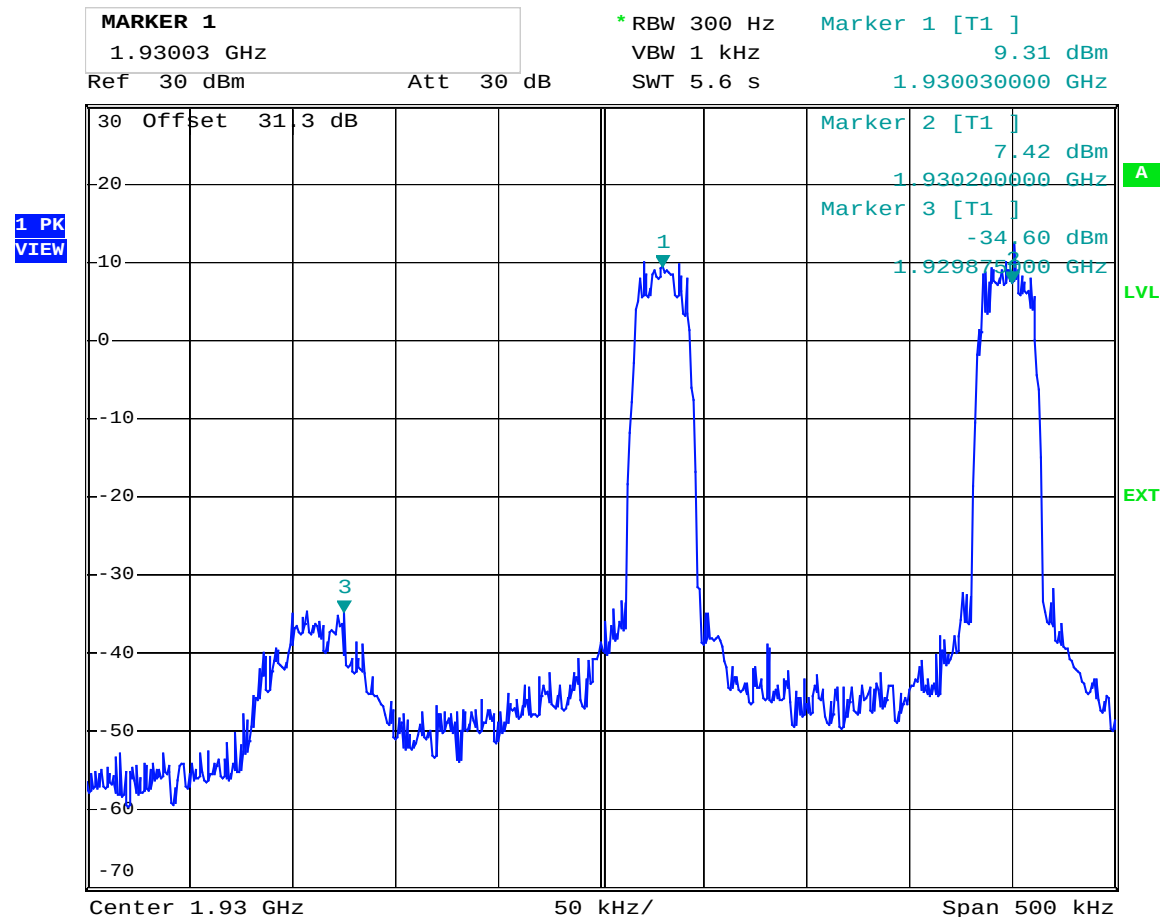
Date: 29.AUG.2006 14:13:26

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

TDMA

Downlink



Date: 29.AUG.2006 13:38:08

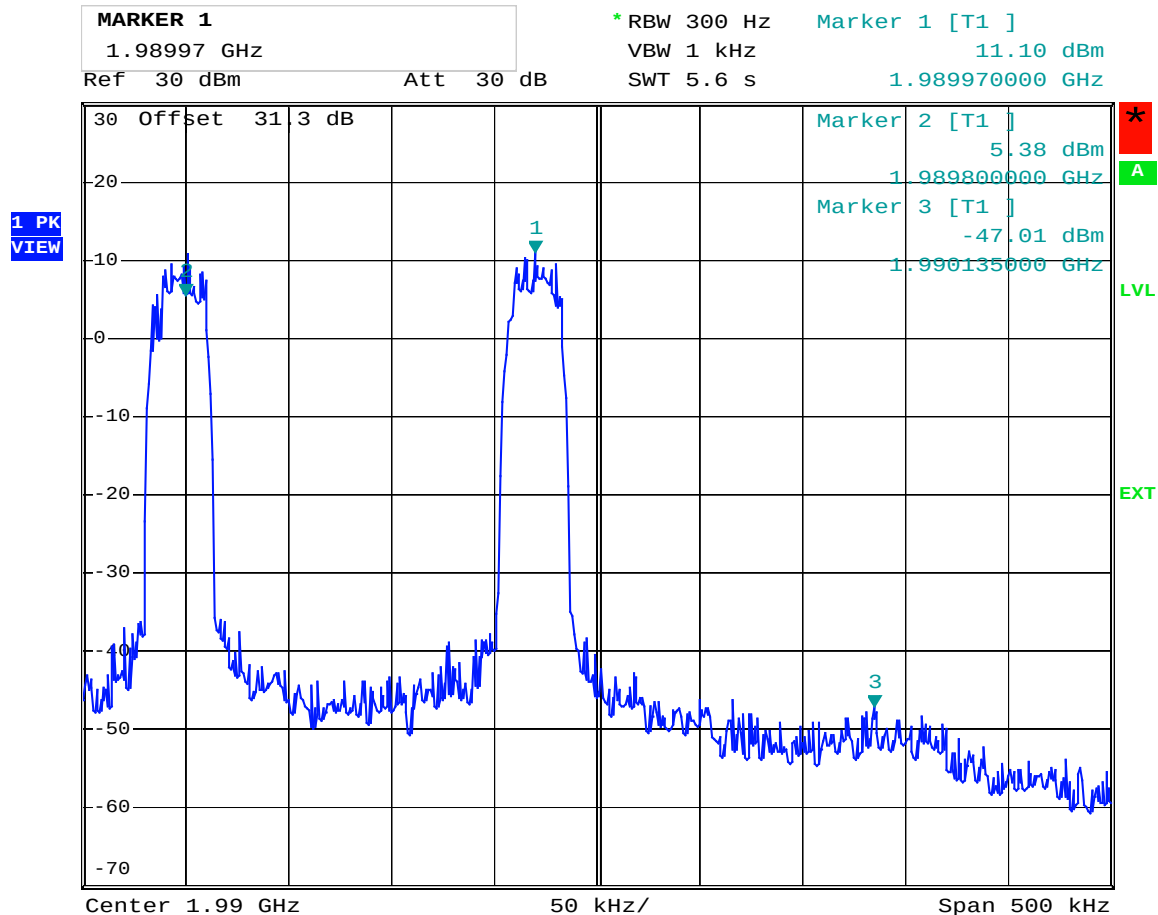
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

TDMA

Downlink



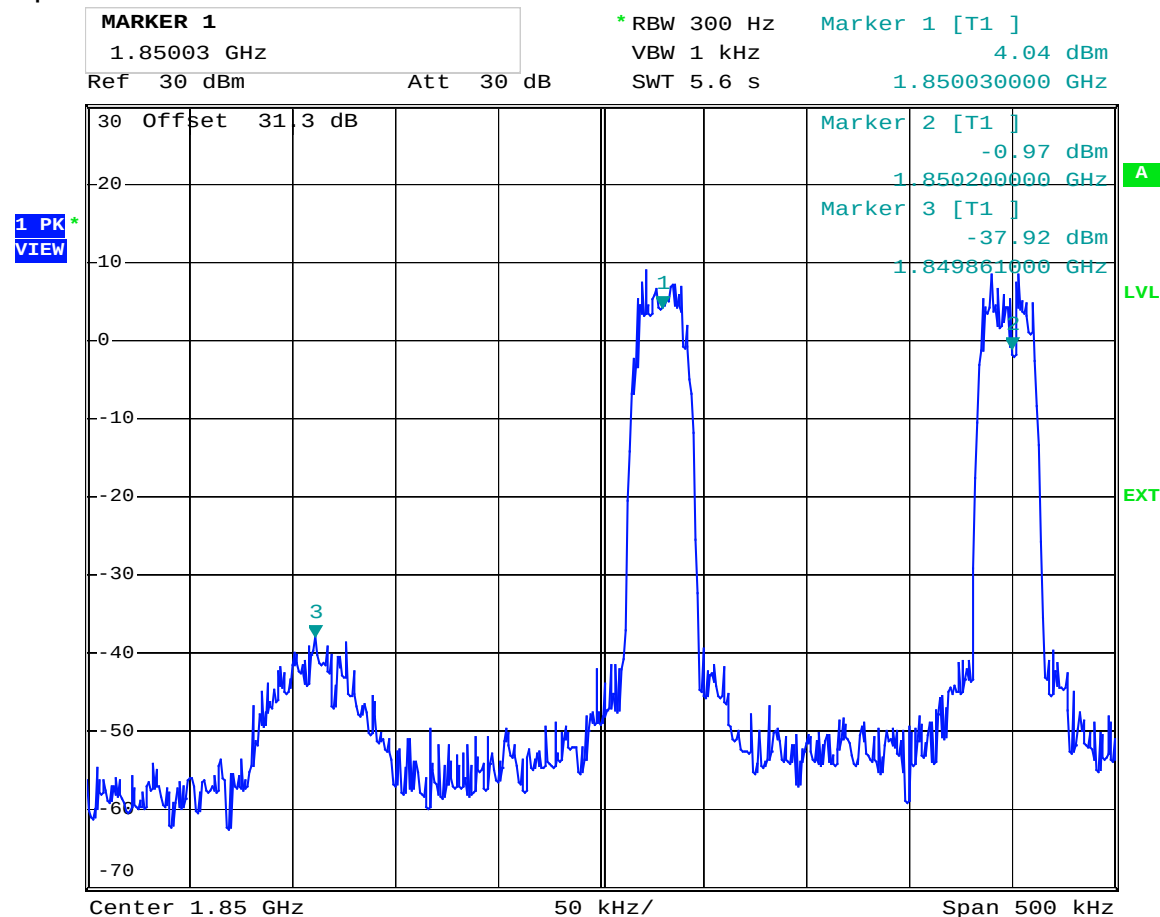
Date: 29.AUG.2006 13:40:25

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

TDMA

Uplink



Date: 29.AUG.2006 13:36:18

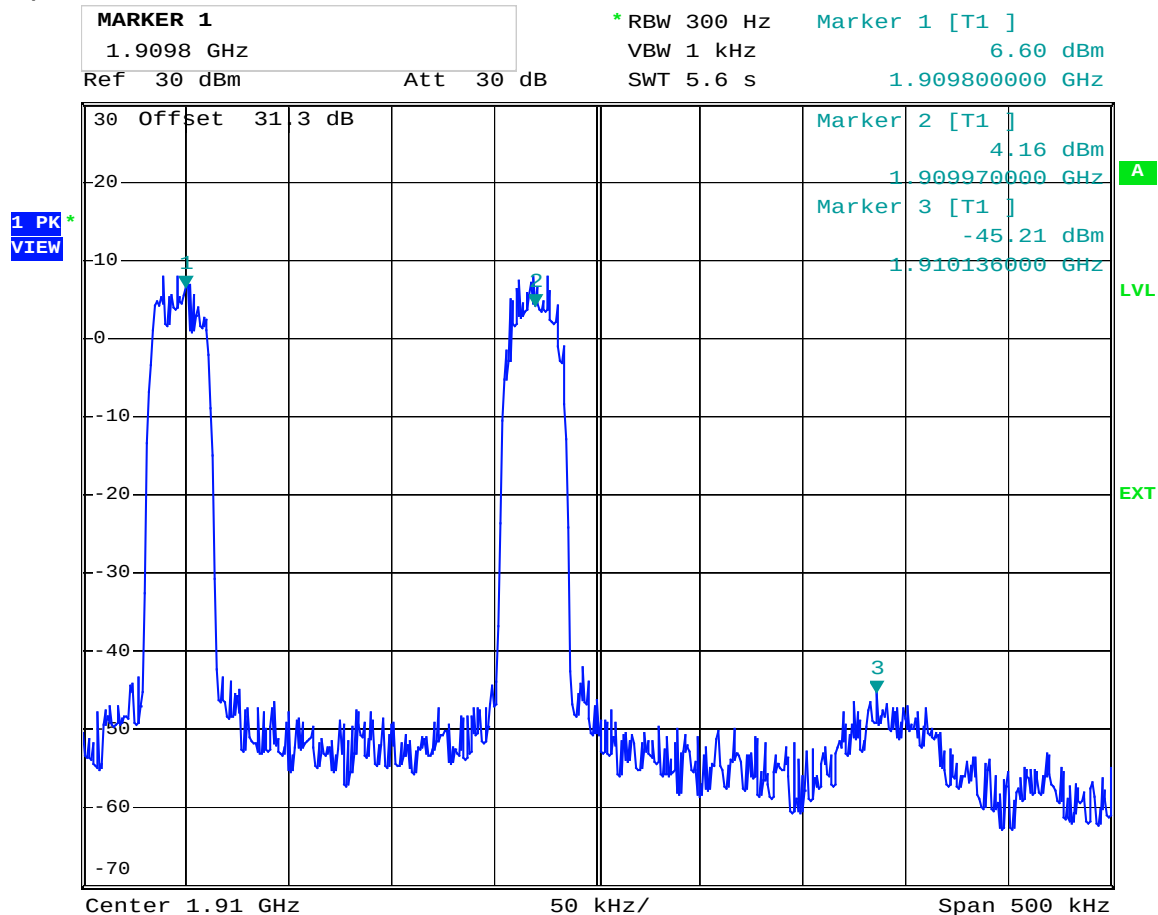
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

TDMA

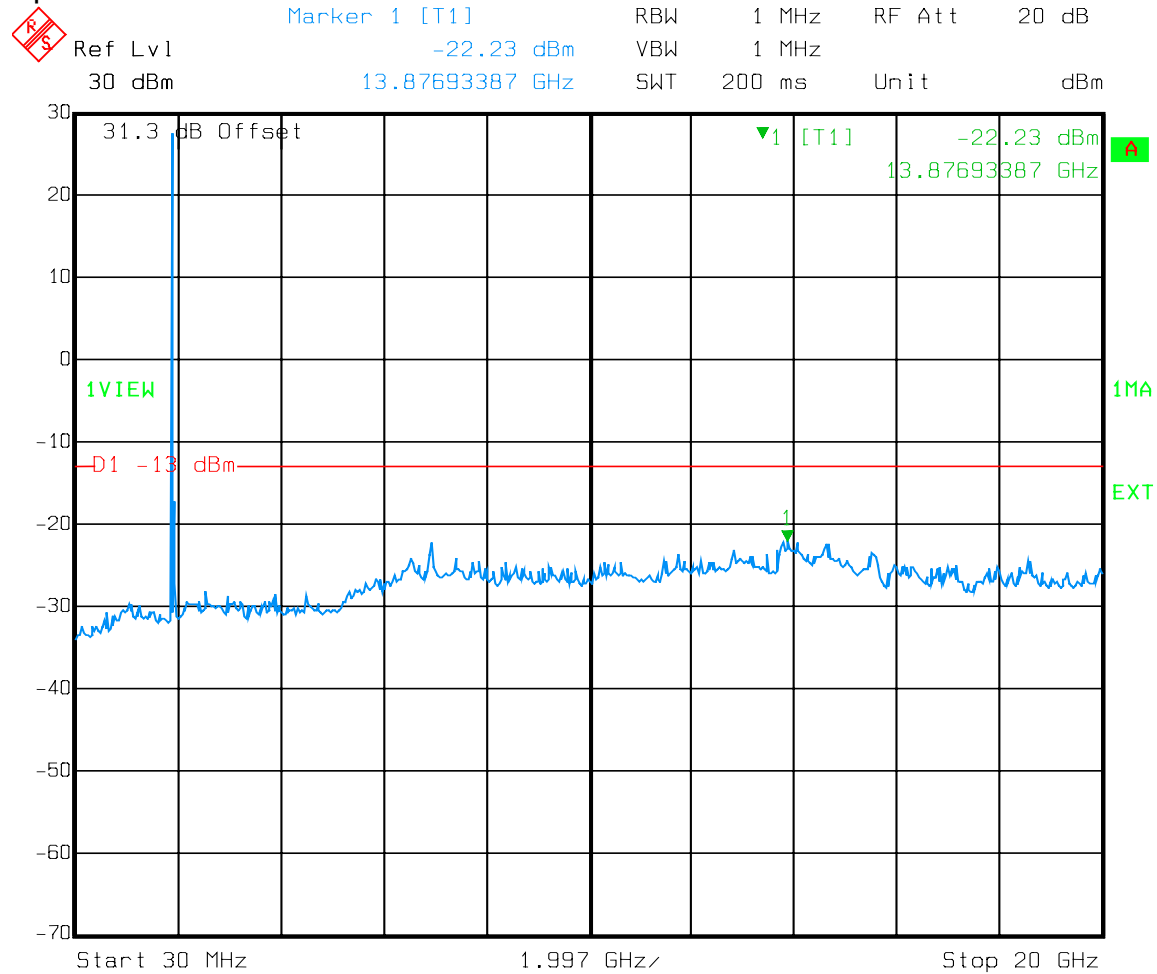
Uplink



Date: 29.AUG.2006 13:42:37

Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA - Downlink

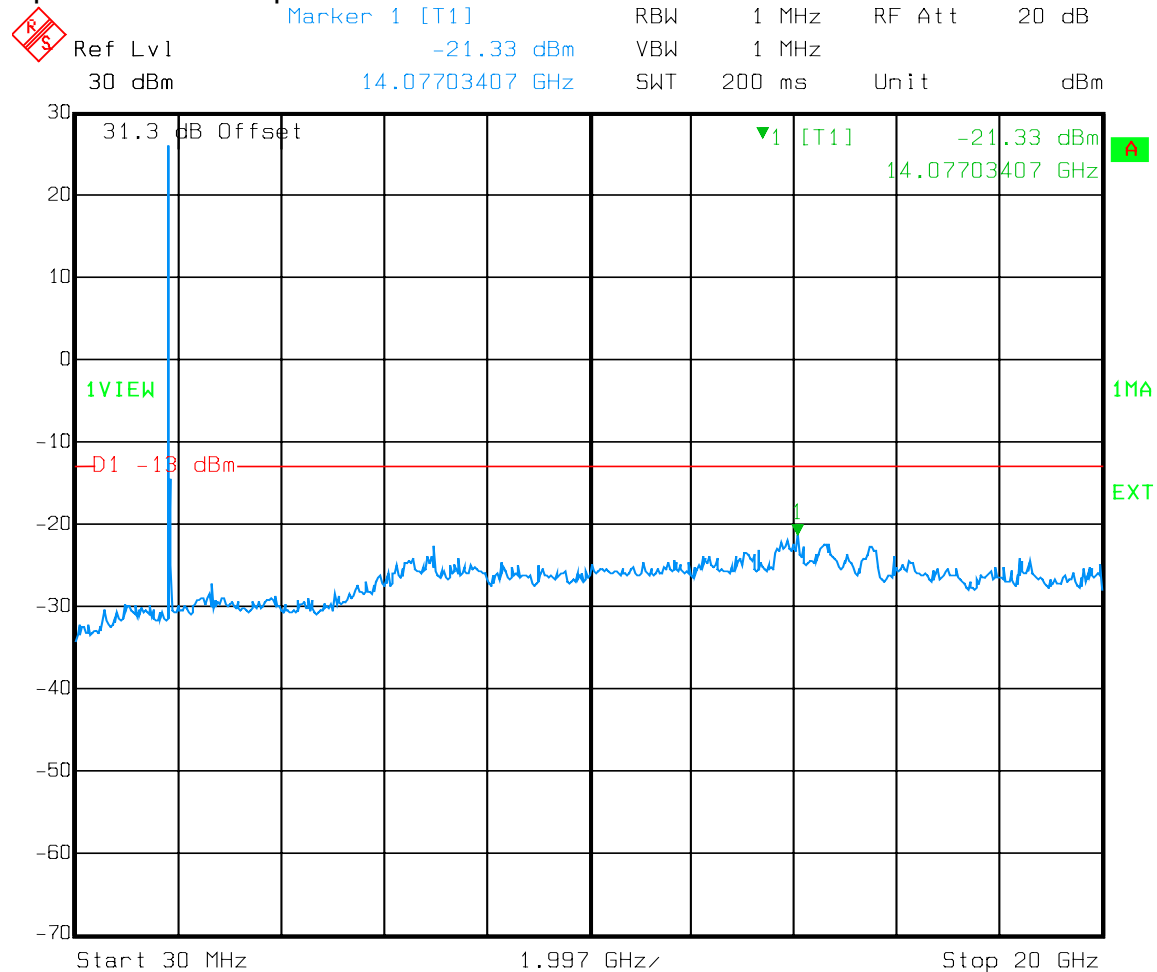


Date: 29.AUG.2006 10:51:17

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA - Uplink



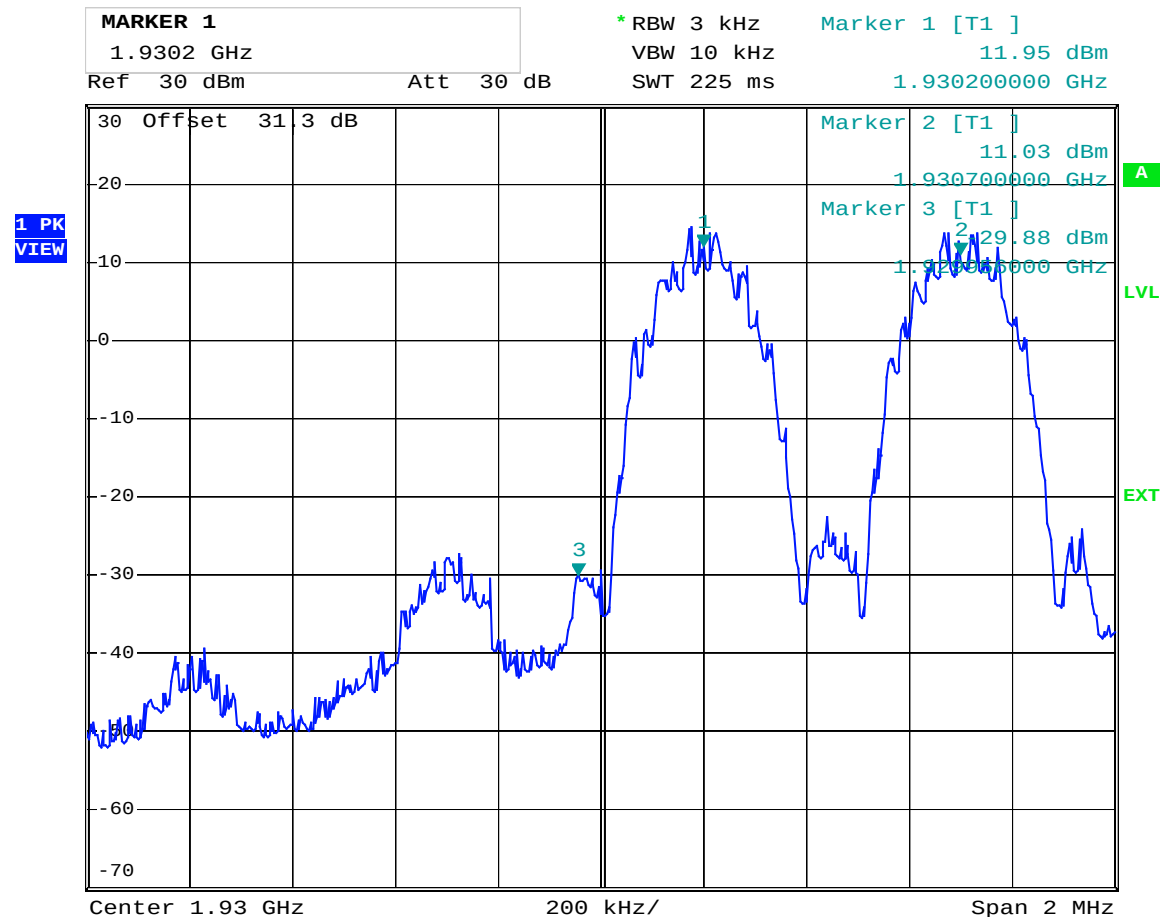
Date: 29.AUG.2006 10:49:20

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

EDGE

Downlink



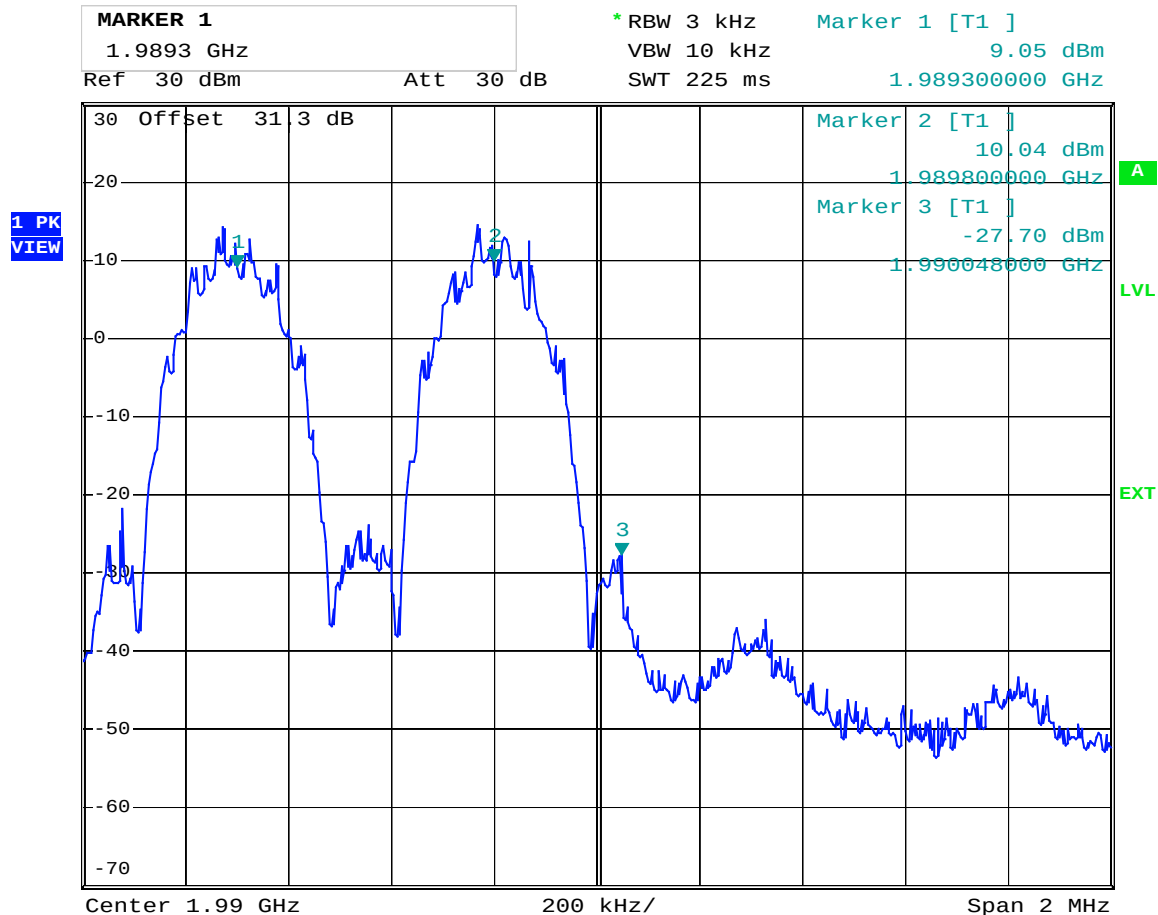
Date: 29.AUG.2006 09:32:55

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

EDGE

Downlink



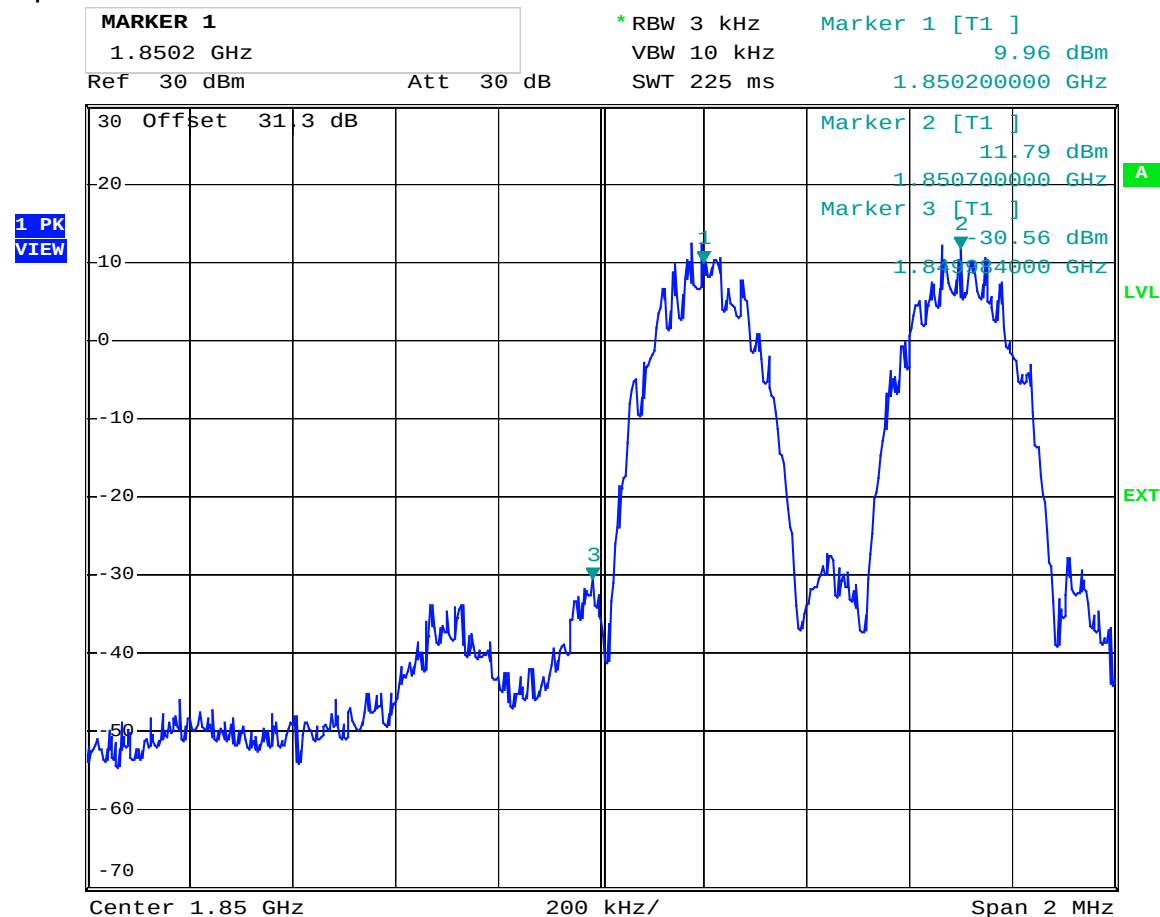
Date: 29.AUG.2006 09:24:19

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

EDGE

Uplink



Date: 29.AUG.2006 09:30:39

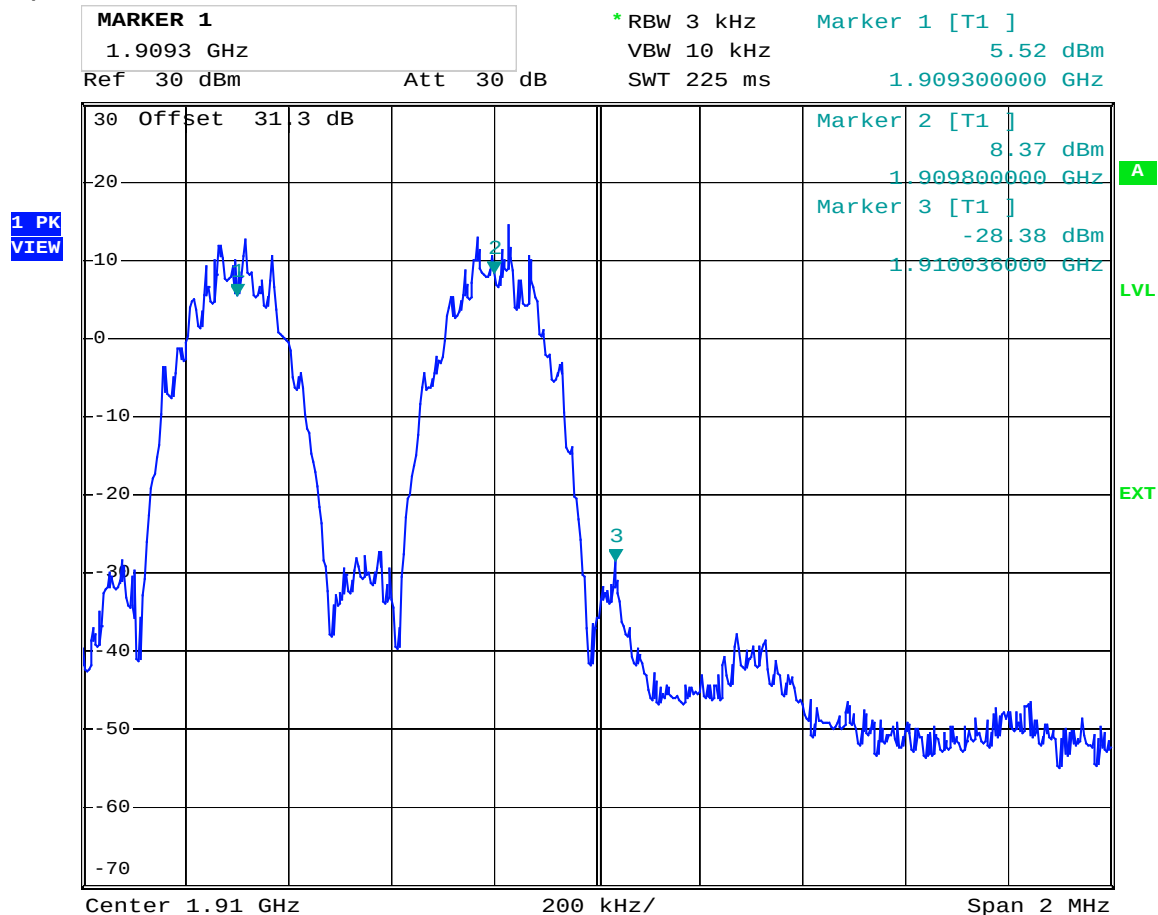
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

EDGE

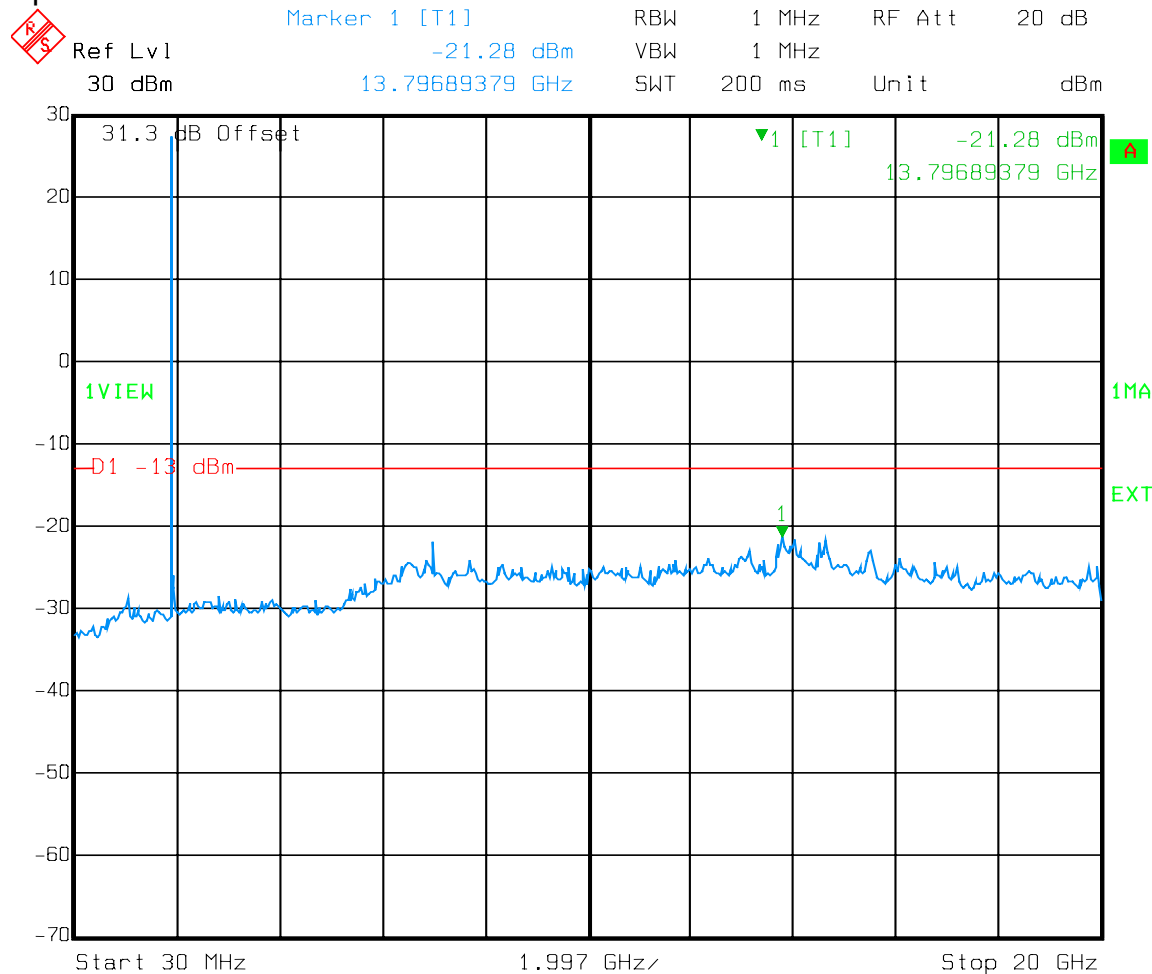
Uplink



Date: 29.AUG.2006 09:27:31

Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE - Downlink

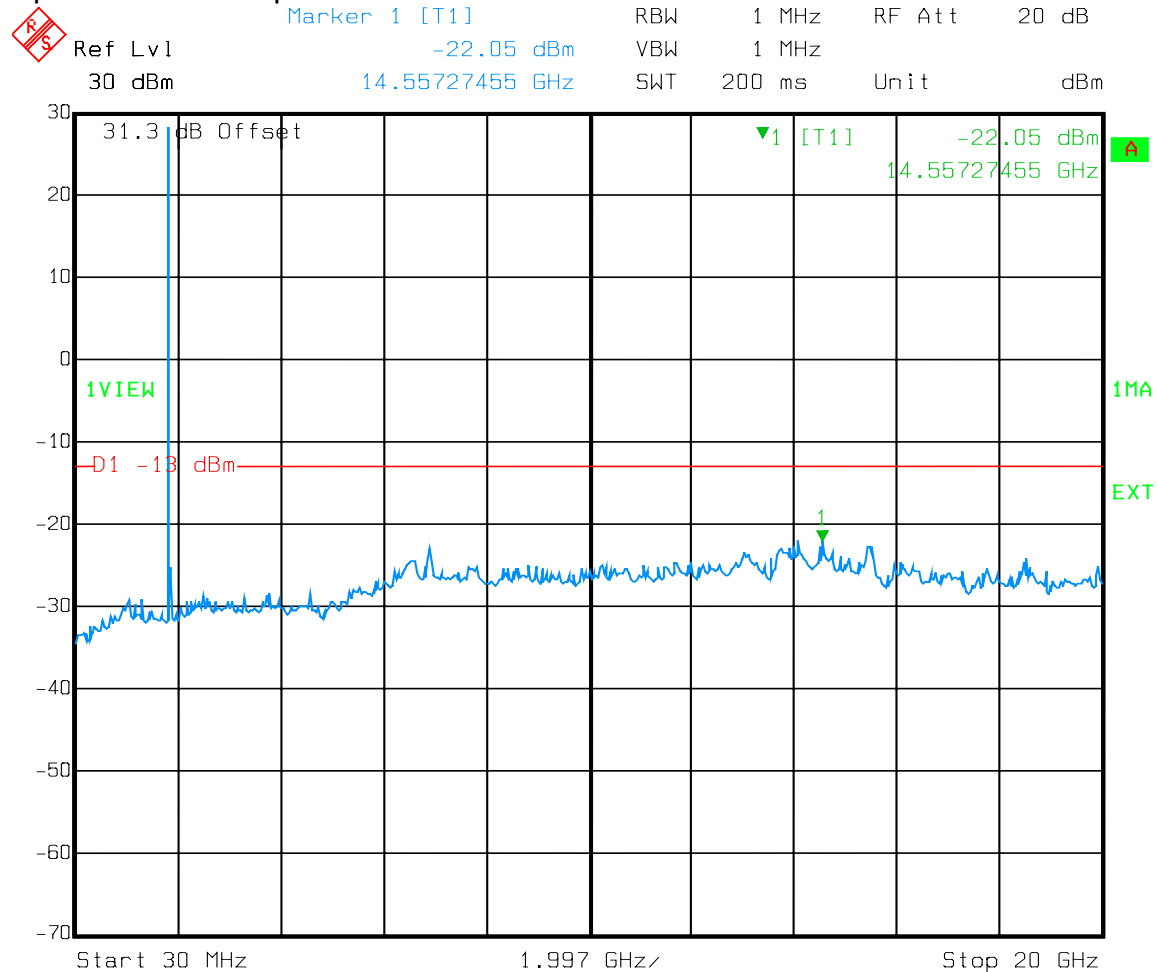


Date: 29.AUG.2006 10:28:41

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE - Uplink



Date: 29.AUG.2006 10:26:33

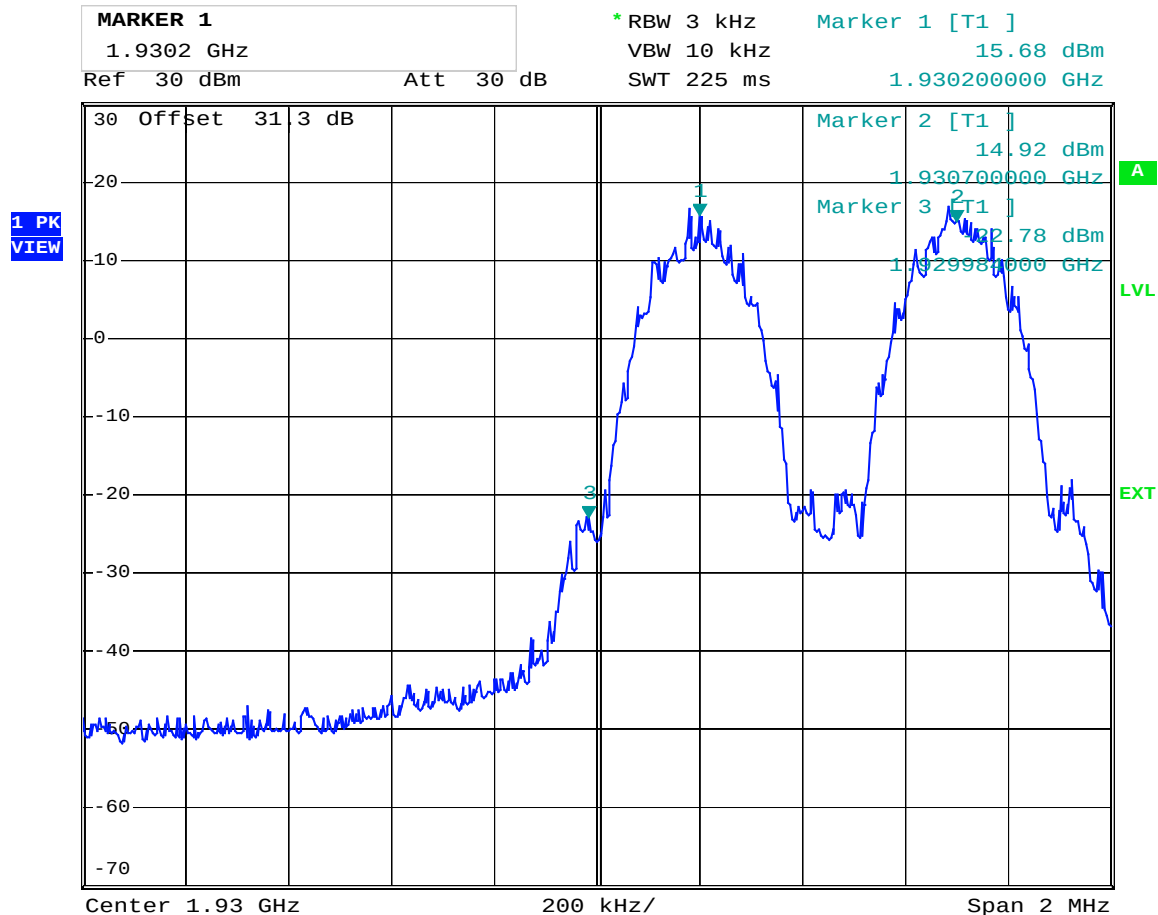
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

GSM

Downlink



Date: 28.AUG.2006 15:33:08

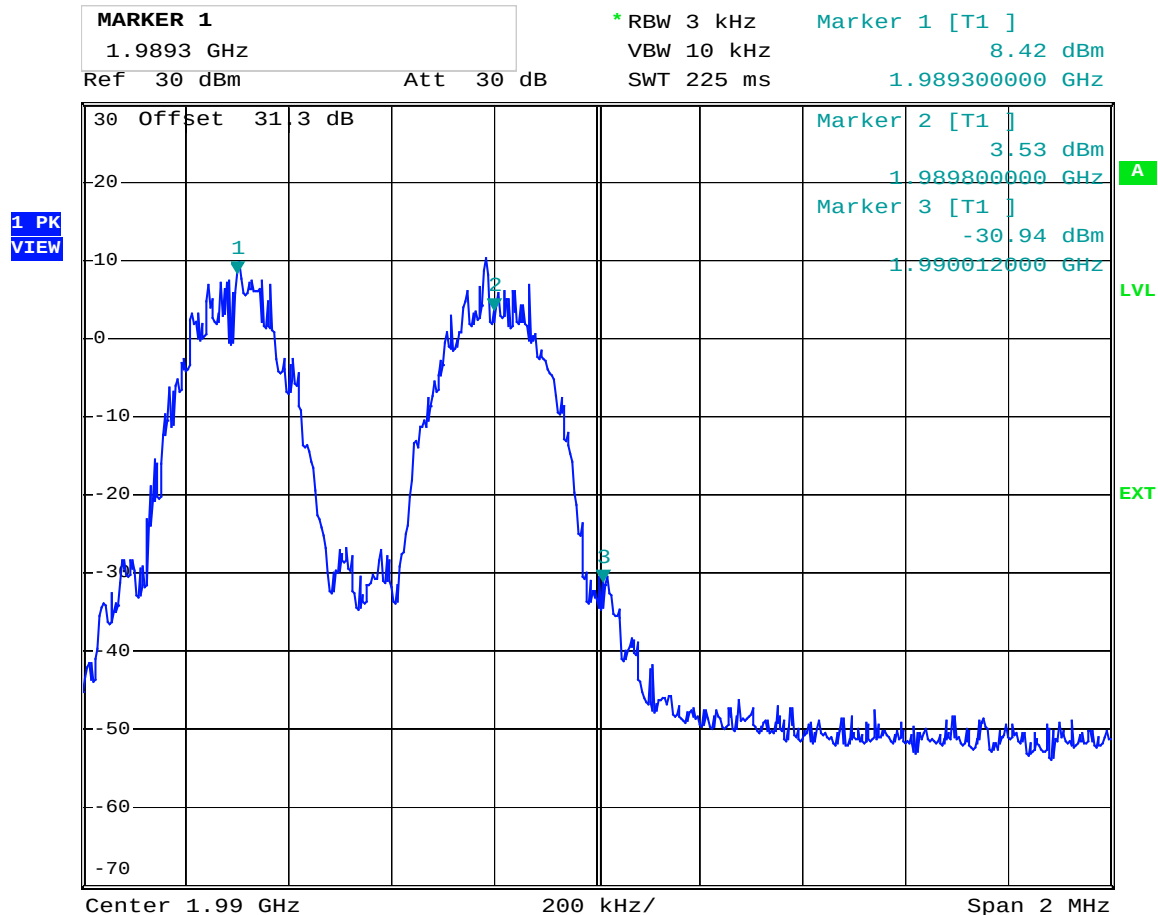
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

GSM

Downlink



Date: 28.AUG.2006 15:38:19

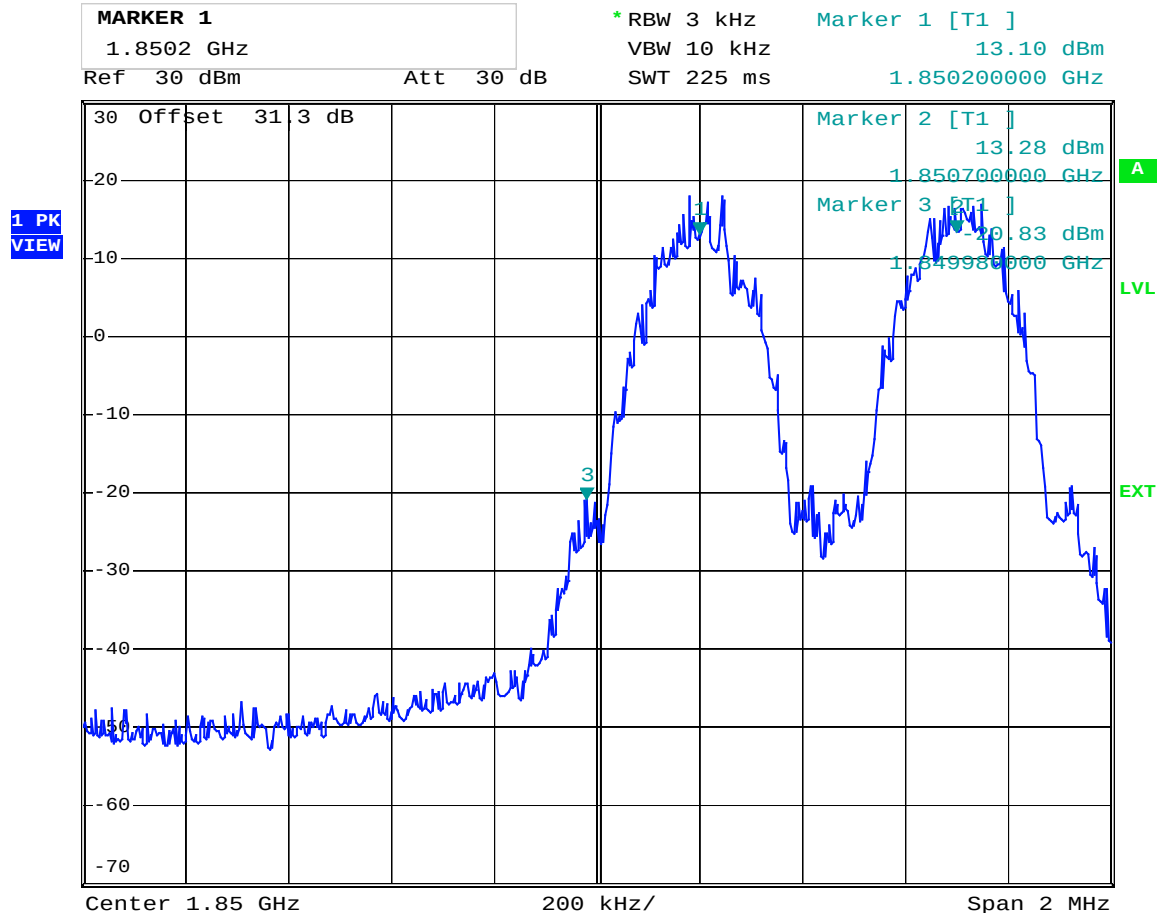
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

GSM

Uplink



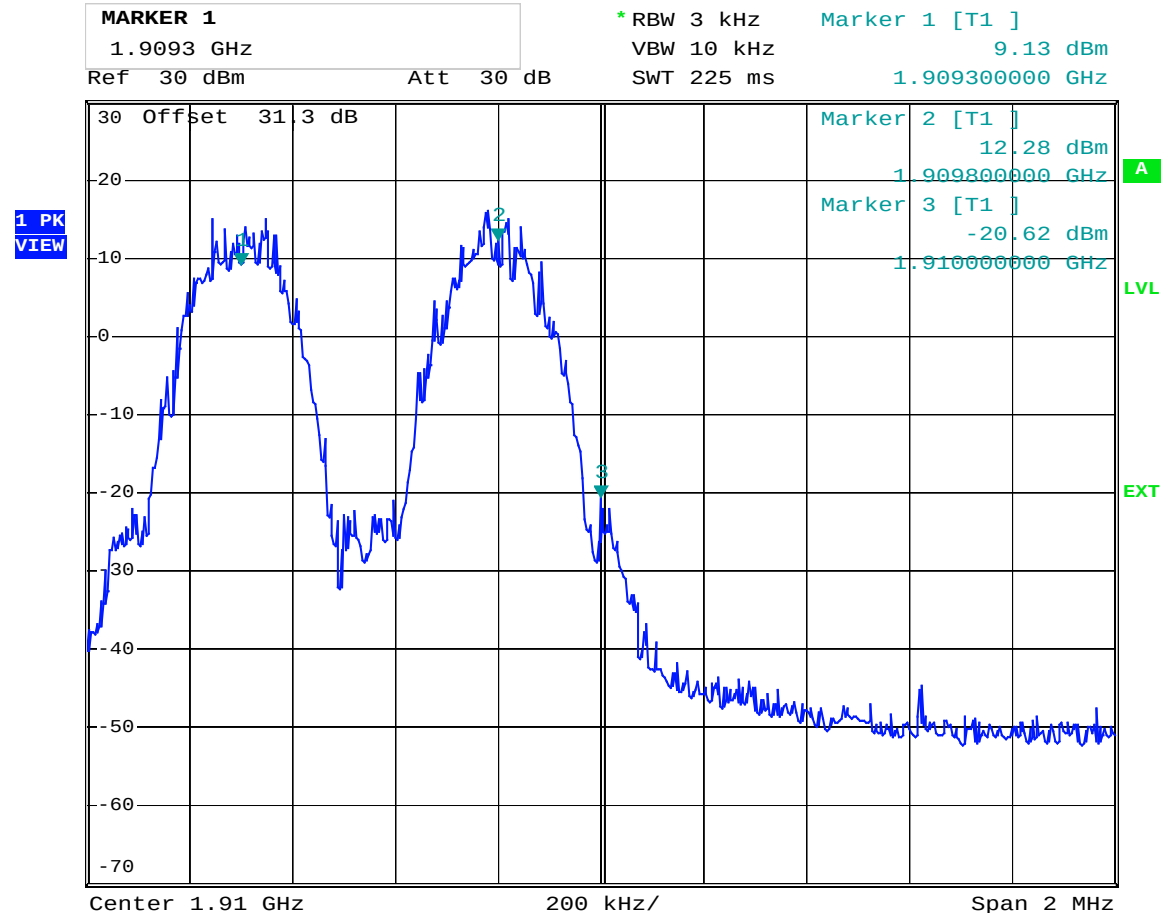
Date: 28.AUG.2006 15:34:34

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

GSM

Uplink

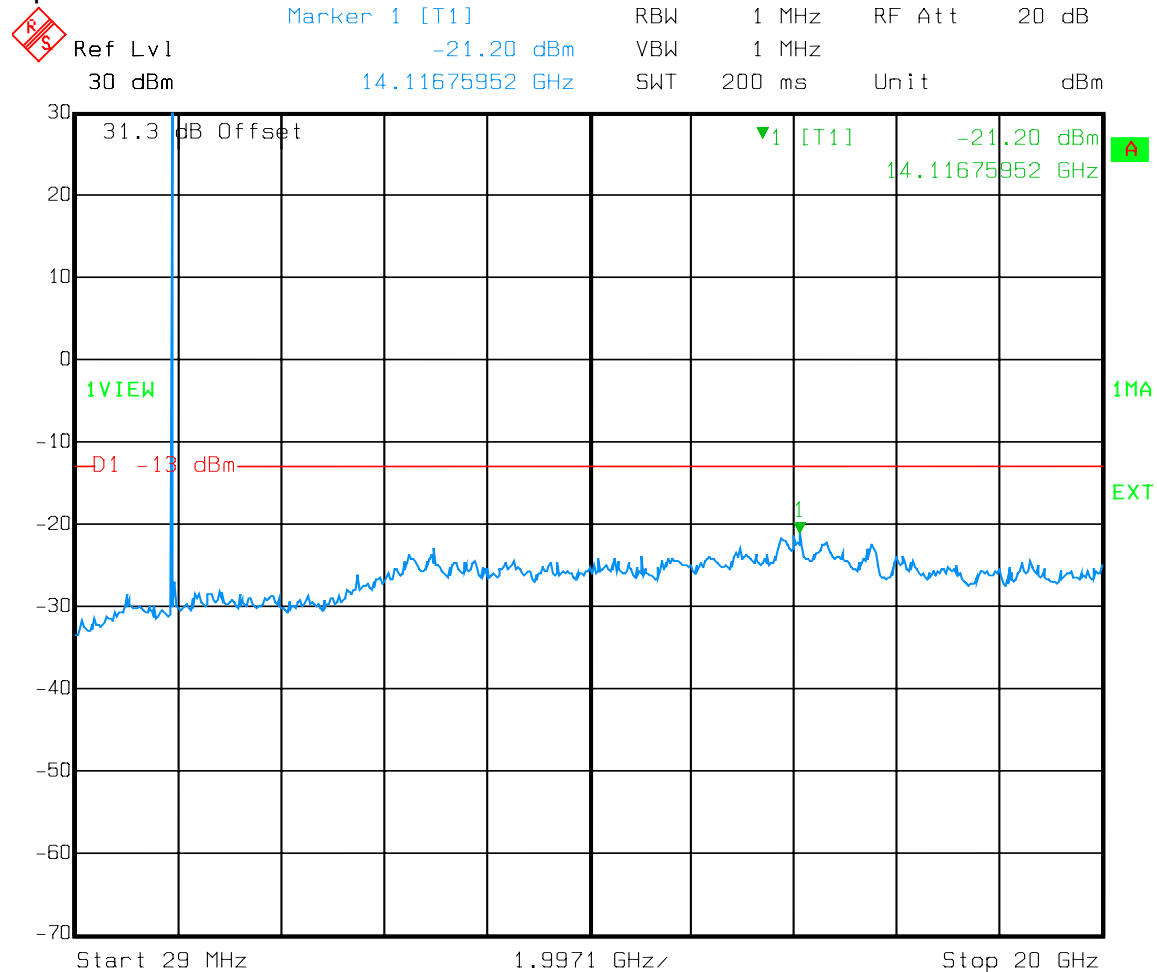


Date: 28.AUG.2006 15:36:53

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM - Downlink

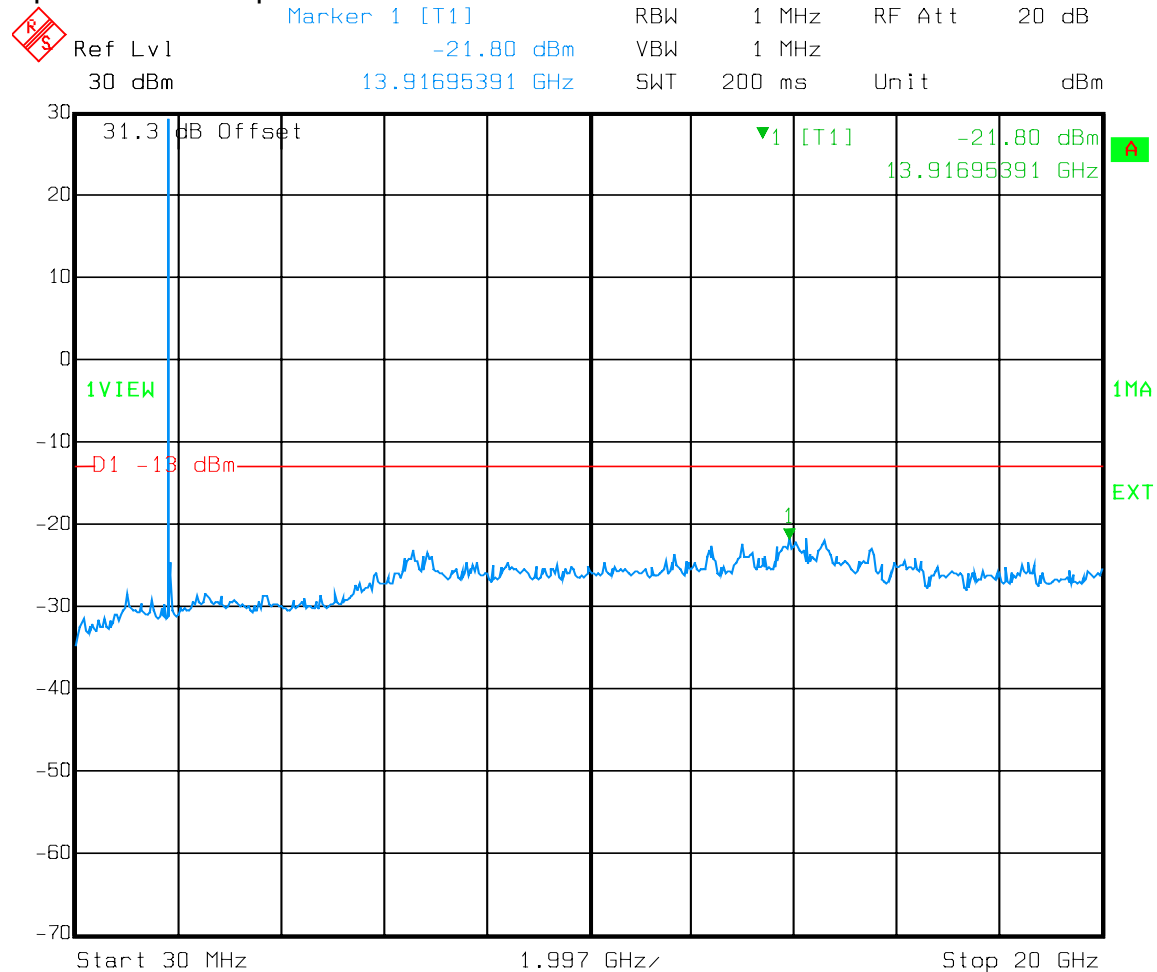


Date: 28.AUG.2006 14:42:56

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM - Uplink



Date: 28.AUG.2006 14:56:46

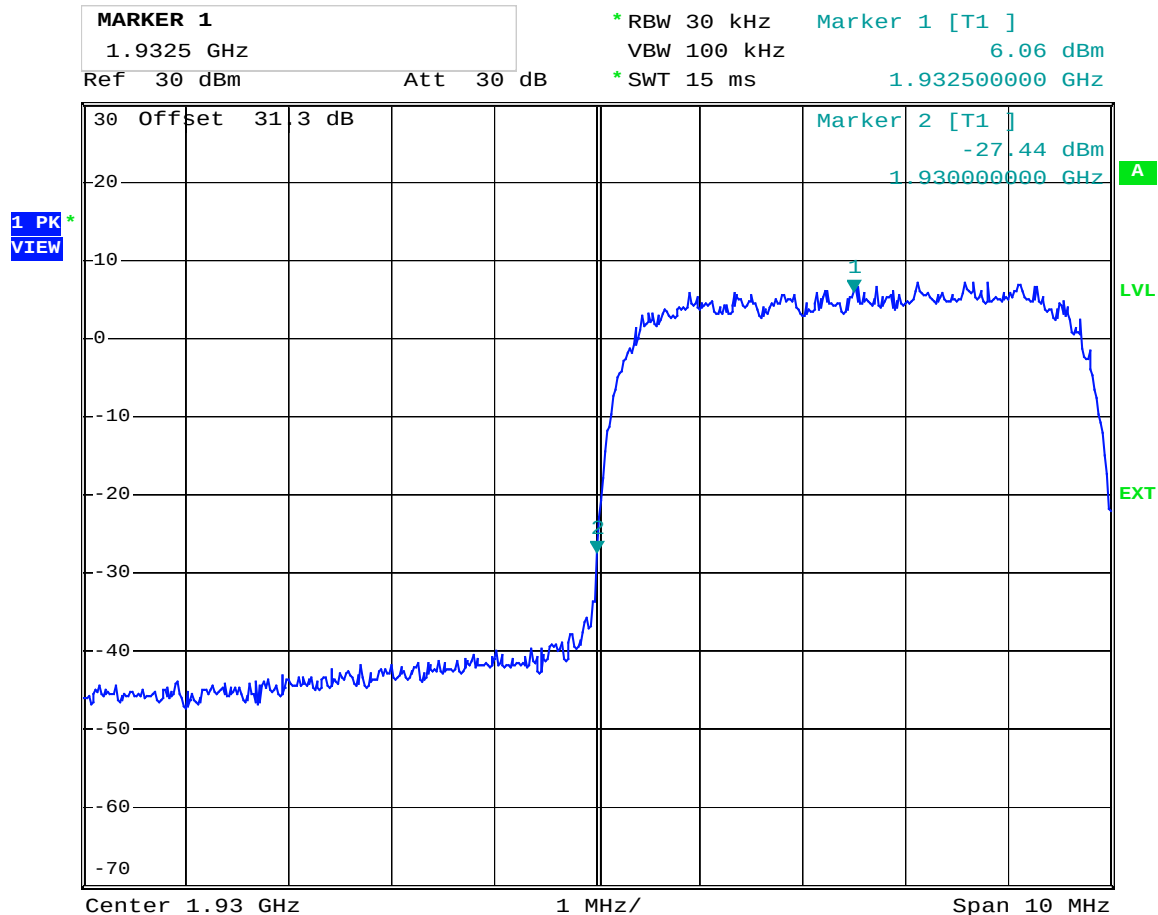
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

W-CDMA

Downlink



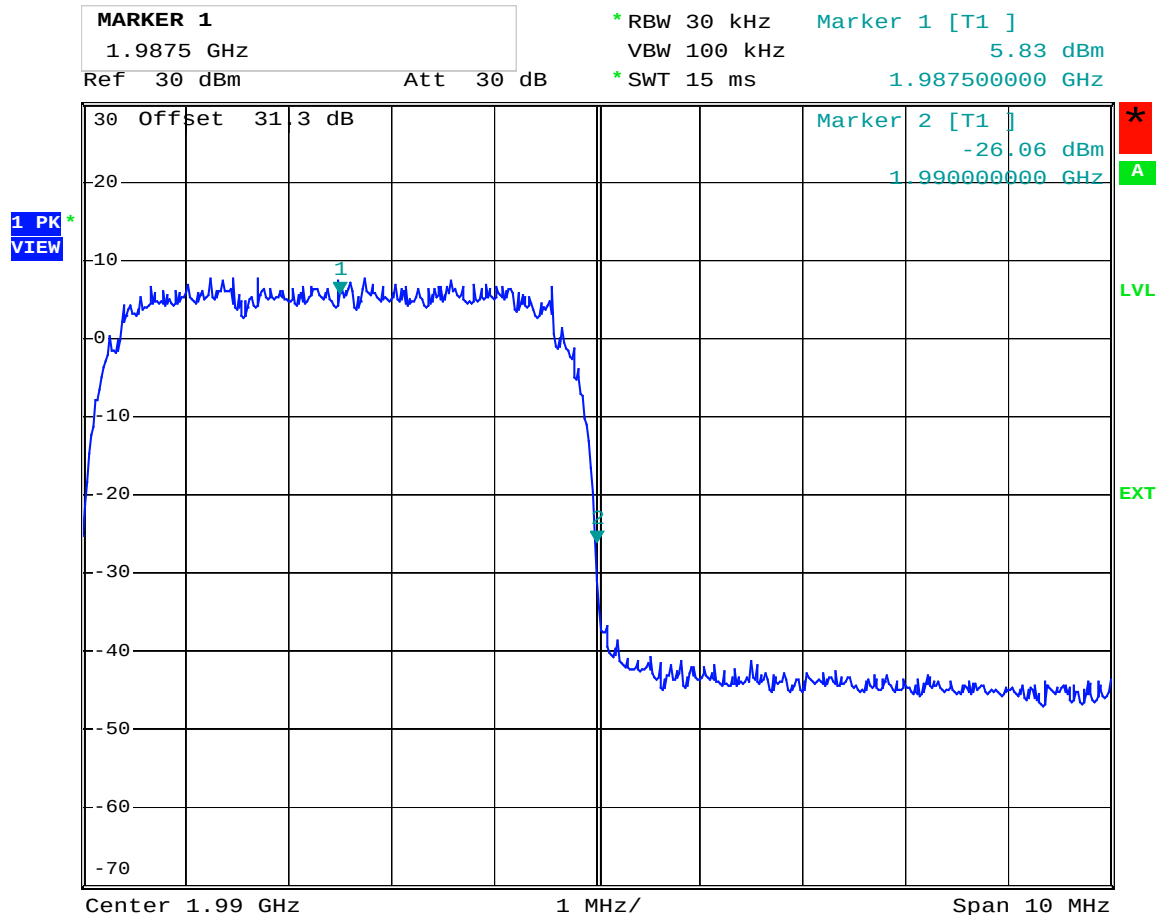
Date: 29.AUG.2006 15:22:21

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

W-CDMA

Downlink



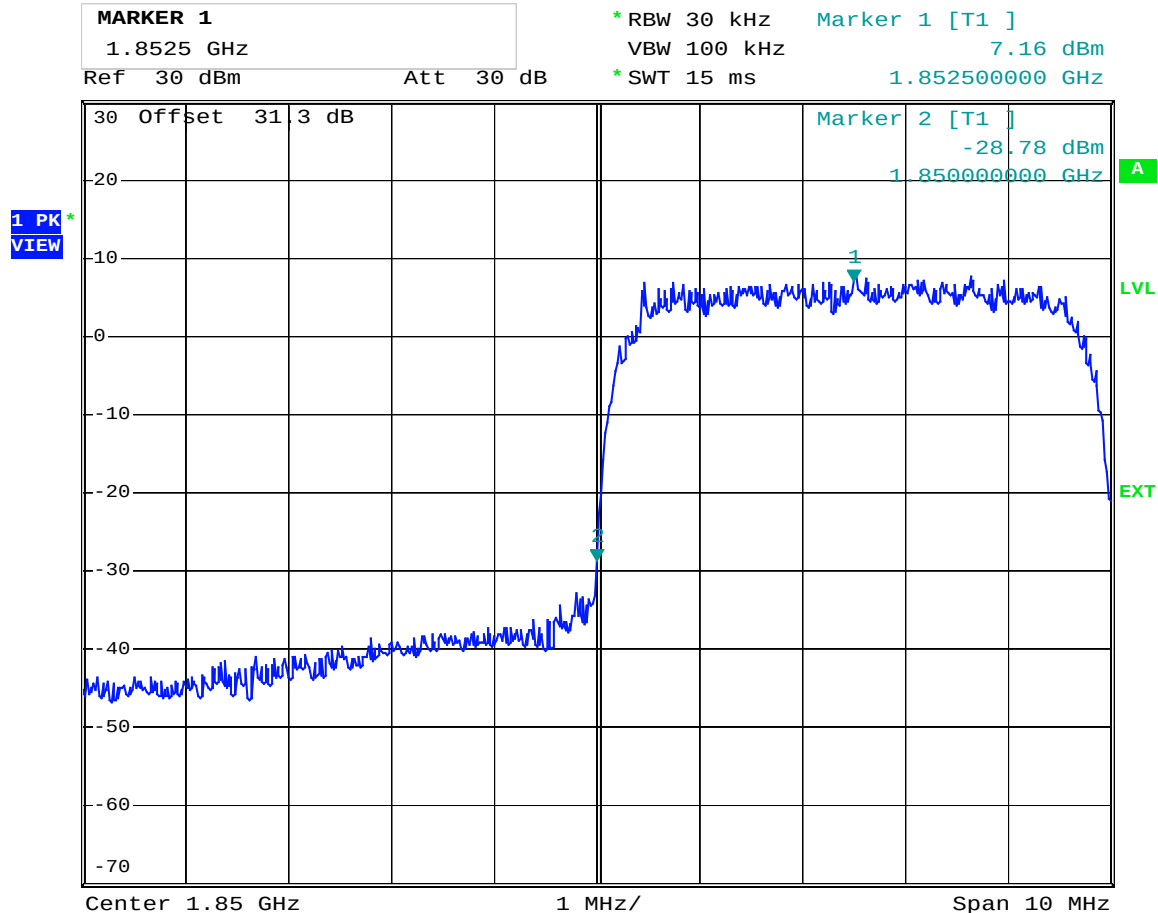
Date: 29.AUG.2006 15:29:20

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

W-CDMA

Uplink



Date: 29.AUG.2006 15:24:18

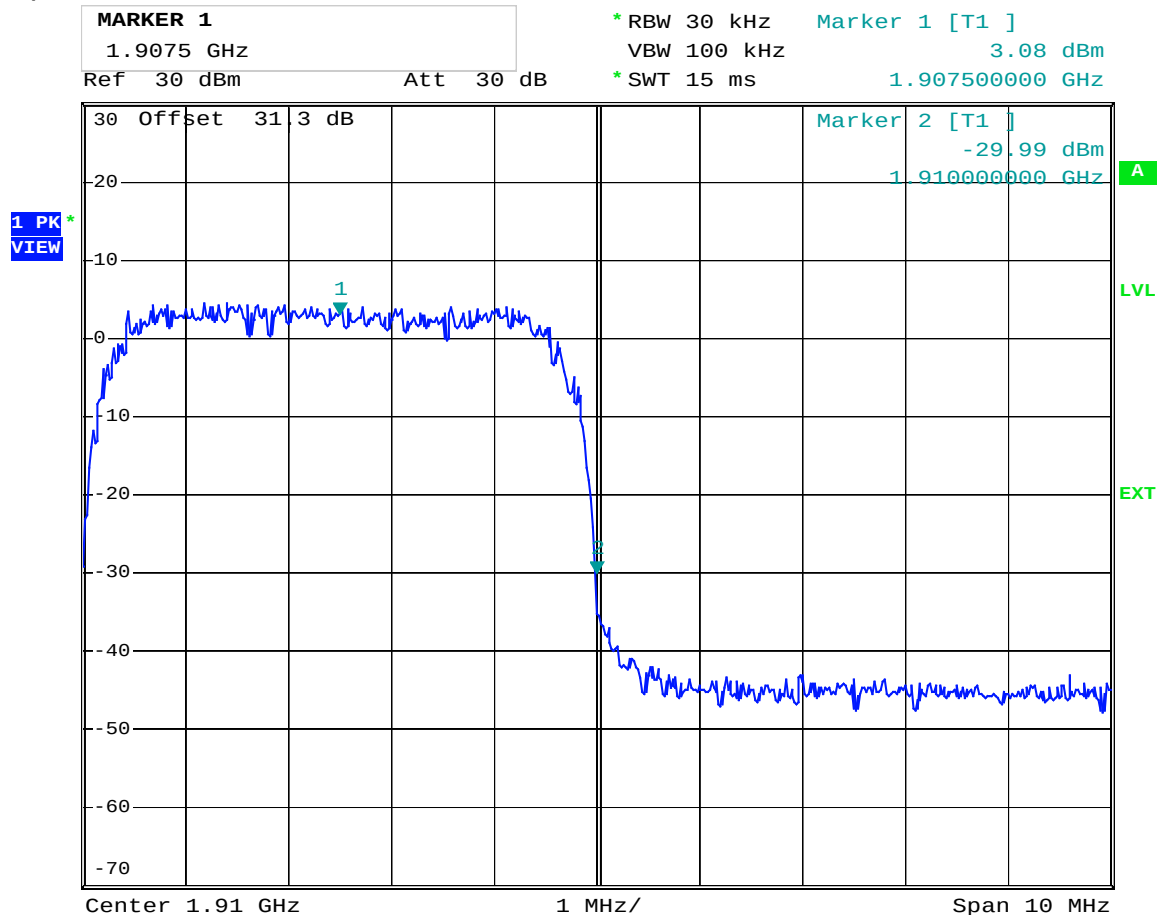
EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

W-CDMA

Uplink

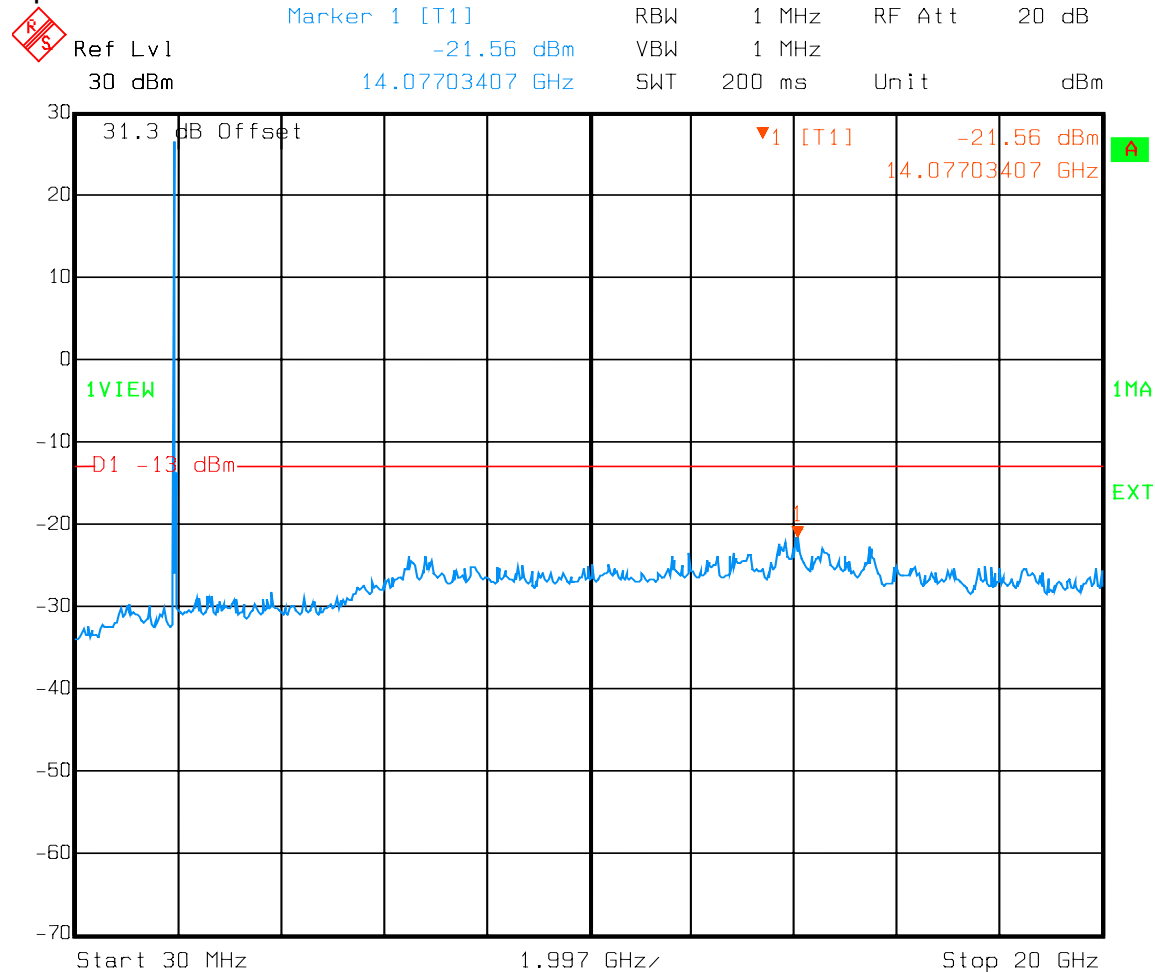


Date: 29.AUG.2006 15:26:25

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA - Downlink

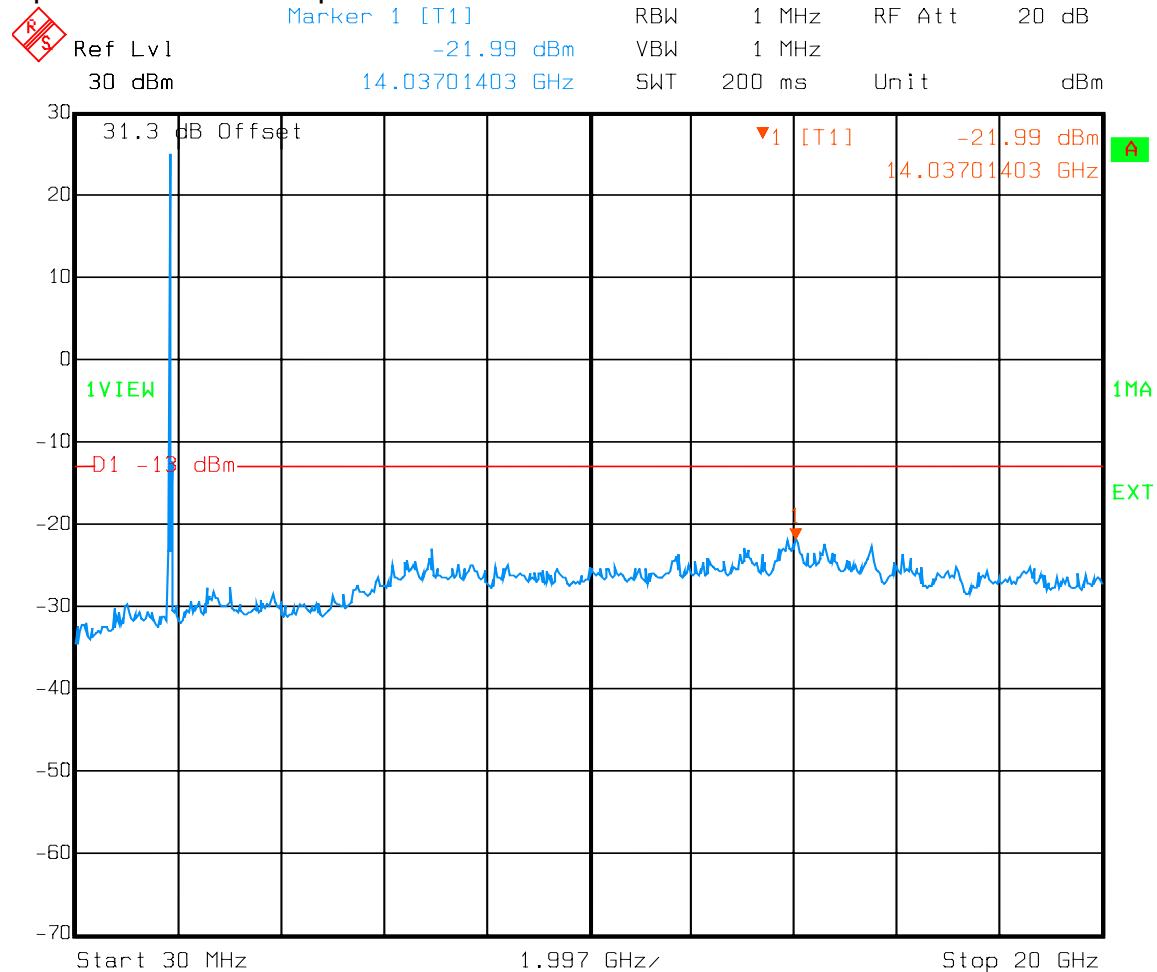


Date: 30.AUG.2006 10:49:56

EQUIPMENT: AMR195

Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA - Uplink



Date: 30.AUG.2006 10:47:04

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 31 August 2006

Test Results: Complies.

Test Data: There were no emissions detected above the noise floor which was at least 20 dB below the specification limit of -13 dBm.

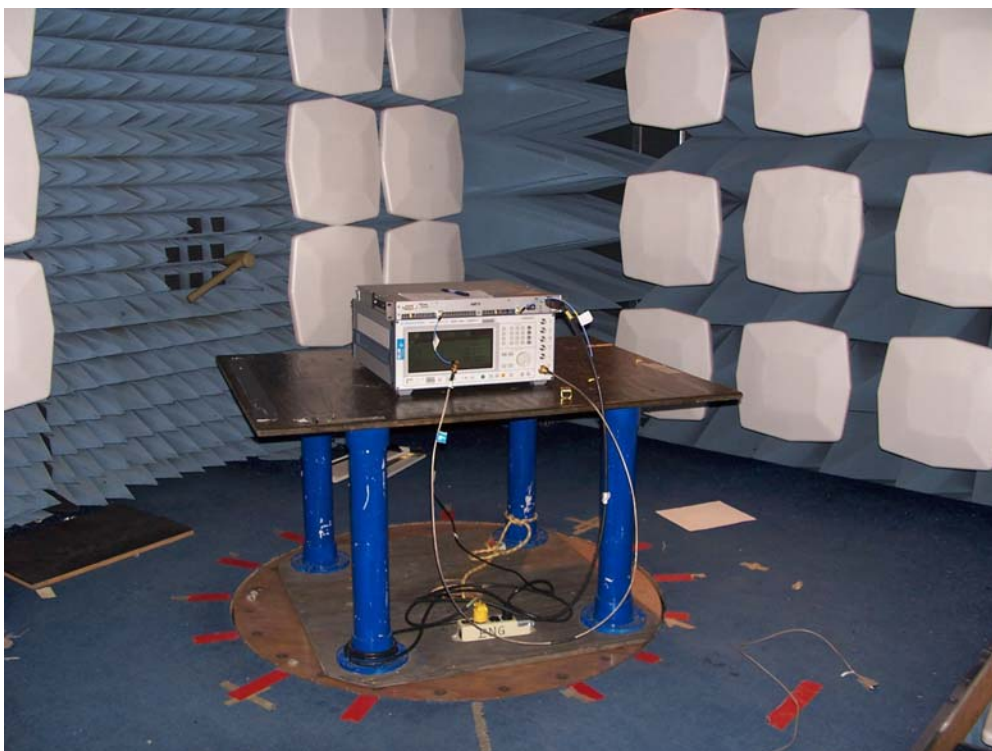
Equipment Used: 1484-1485-1464-1016-791-1306-759

Measurement Uncertainty: +/-1.7 dB

Temperature: 23 °C

Relative Humidity: 40 %

Photographs of Test Setup



Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/10/06	01/10/07
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1484	Cable	Storm PR90-010-072	N/A	08/26/05	08/26/06
1485	Cable	Storm PR90-010-216	N/A	08/26/05	08/26/06
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	04/20/06	04/20/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	04/20/06	04/20/07
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/13/06	02/13/07
1306	Antenna biconical	Nemko USA, Inc. BCON 30300	212	02/10/06	02/10/07

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output**PARA. NO.: 2.1046**

Minimum Standard: Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

Method Of Measurement:Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or spectrum analyzer. Power output is measured with the maximum rated input level.

Integral Antenna:

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: Input/Output

Method Of Measurement:

CDMA

Spectrum analyzer settings:

RBW=VBW=30 kHz

Span: 5 MHz

Sweep: Auto

GSM / EDGE

RBW=VBW= 3 kHz

Span: 1 MHz

Sweep: Auto

TDMA

RBW=VBW= 1 kHz

Span: 1 MHz

Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 24.238**Minimum Standard:**

Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

TDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

EDGE

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 24.238
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Minimum Standard:

Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method of Measurement

TIA/EIA-603-1992

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

NAME OF TEST: Frequency Stability**PARA. NO.: 2.1055**

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:Frequency Stability With Voltage Variation

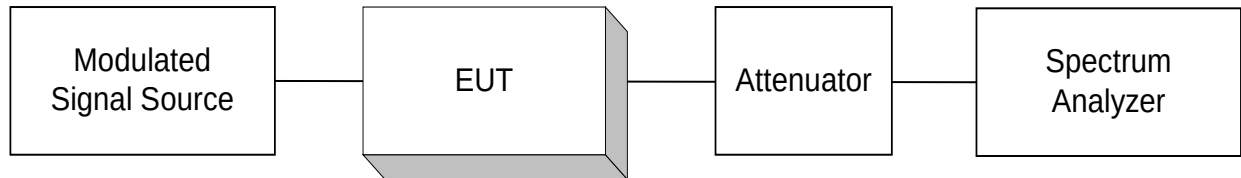
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

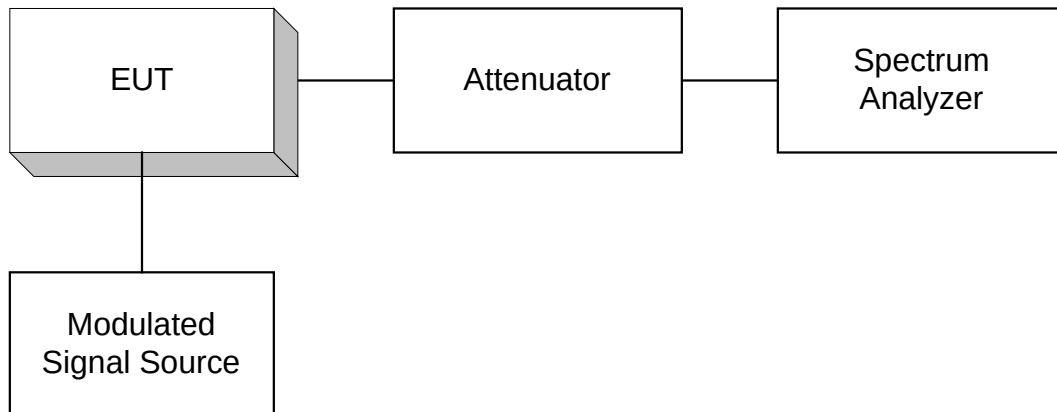
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

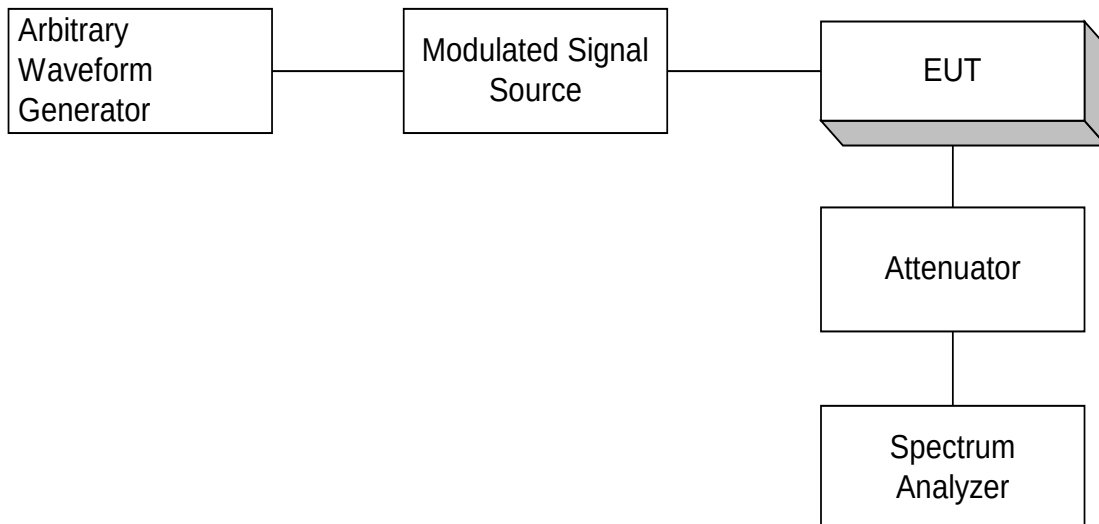
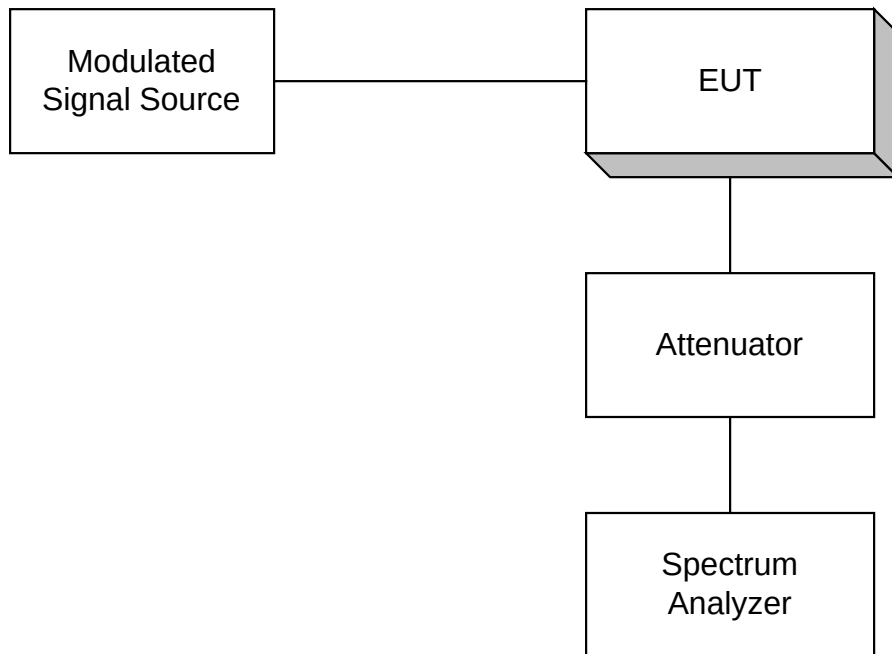
Para. No. 2.1046 - R.F. Power Output



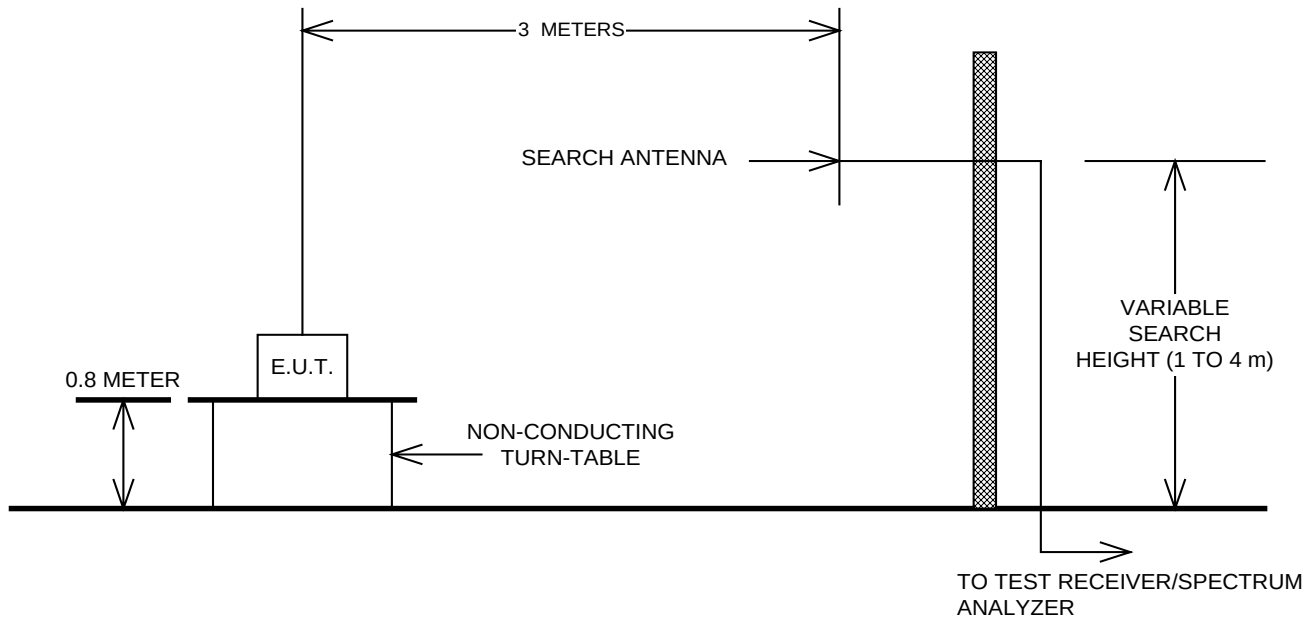
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability

