Test Report

Report Number: 30629481
Project Number: 3062948
July 30, 2004

Testing performed on the

Cellular Phone
Model Number: MTD-3800
FCC ID: NPQMTD3800
to
FCC Part 22 Subpart H and FCC Part 15 Subpart B
for
Telian Corporation

A2LA Certificate Number: 1755-01

Test Performed by:	**Test Authorized by:**
Intertek Testing Services NA, Inc.	Telian Corporation
1365 Adams Court	5th Floor Namjeun Bldg
Menlo Park, CA 94025	53-3 Haan-Dong, Kwangnyung, Kyunggi-D, Korea

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2.1093	Specific Absorption Rate	Complies	A separate report is issued

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

1.2 Product Description

The Telian Corporation Models MTD–3800 is a dual mode, TDMA and AMPS cellular radiotelephone operating in the band 824 – 849 MHz.

For more information, please refer to the attached product description.

Use of Product	Portable Cellular Phone
Whether quantity (>1) production is planned	[X] Yes, [ ] No
Cellular Phone modes	AMPS TDMA
Type(s) of Emission	40K0F8W, 40K0F1D, 30K0DXW
Allowed Deviation	12± 10% (AMPS mode)
RF Output Power	26.6 dBm - AMPS 29.5 dBm - TDMA
Frequency Range	824 - 849 MHz
Antenna (e) & Gain	Monopole, -2 dBd
Detachable antenna?	[ ]Yes [X] No
Receiver L.O. frequency	988.65 – 1013.61 MHz
External input	[X] Audio [ ] Digital Data
DC power into final RF stage	3.5 V, 120 mA quiescent current

EUT receive date:	July 22, 2004
EUT receive condition:	The EUT was received in good condition with no apparent damage.
Test start date:	July 22, 2004
Test completion date:	July 27, 2004

1.3 Related Submittal(s) Grants

None

2.0 RF Power Output,
FCC 2.1046

2.1 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 spectrum analyzer reading. Tests were performed at three frequencies (low, middle, and high channels) in AMPS and TDMA modes.

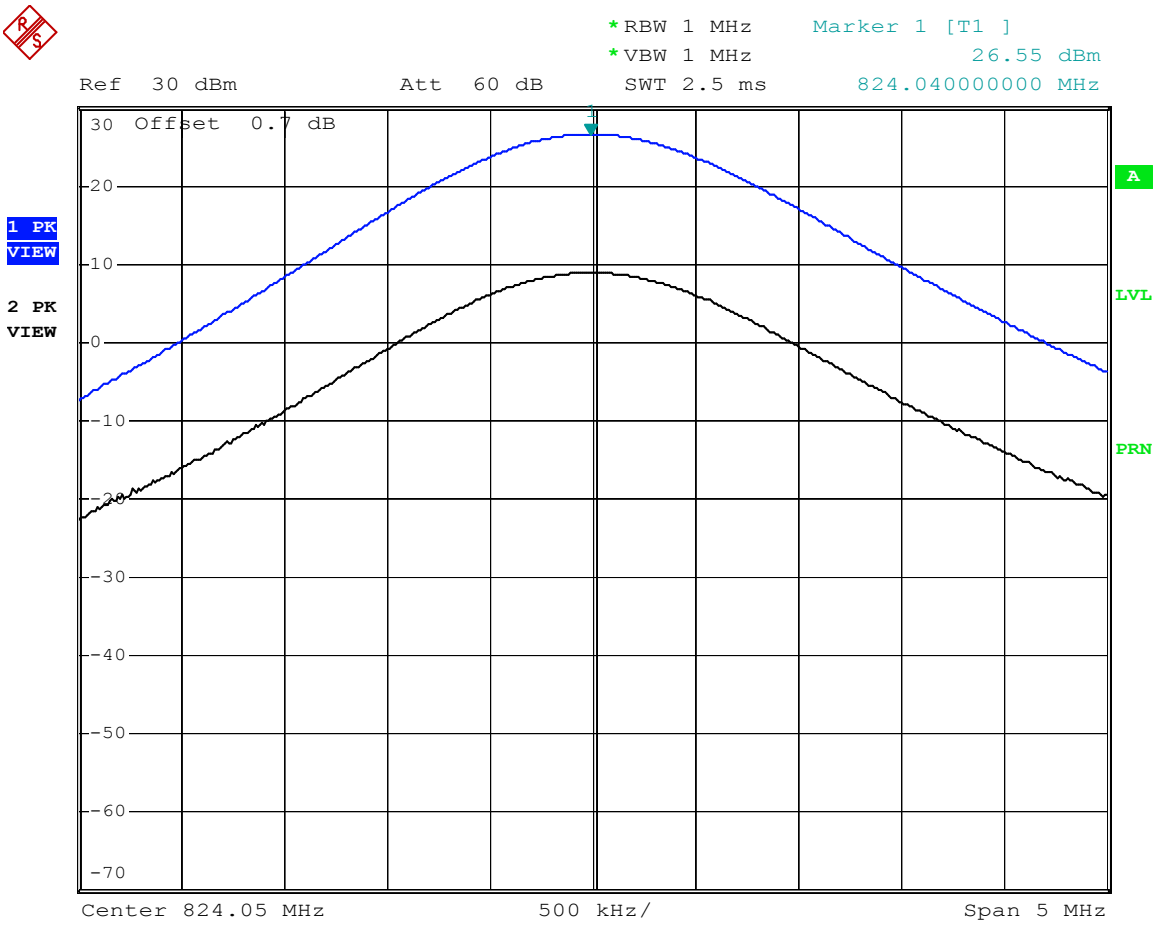
2.2 Test Equipment

R & S FSP40 Spectrum Analyzer

2.3 Test Results

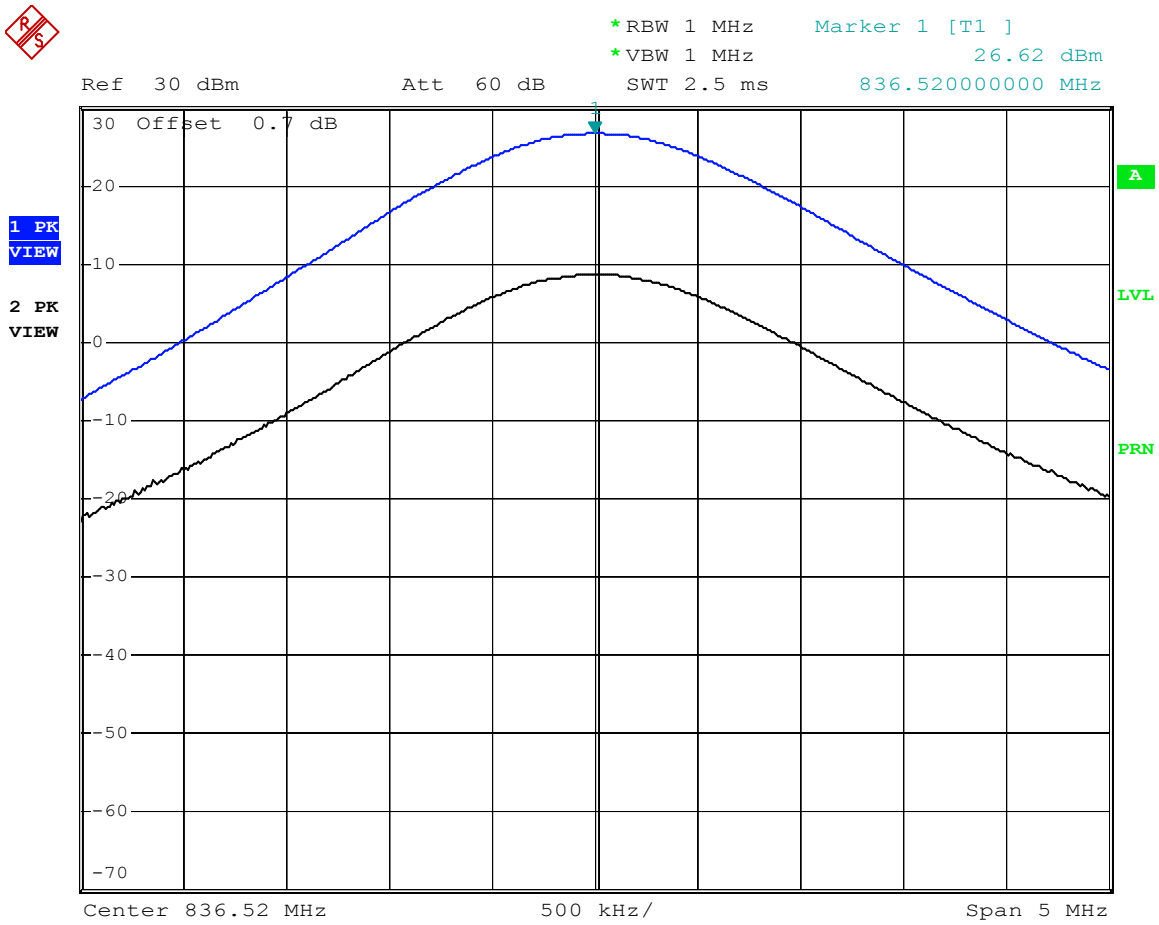
Frequency (MHz)	Mode	Maximum measured Conducted Power (dBm)	Plot
824.04	AMPS	26.6	2.1
	TDMA	29.2	2.4
836.55	AMPS	26.6	2.2
	TDMA	29.5	2.5
848.97	AMPS	26.6	2.3
	TDMA	28.6	2.6

Plot 2.1



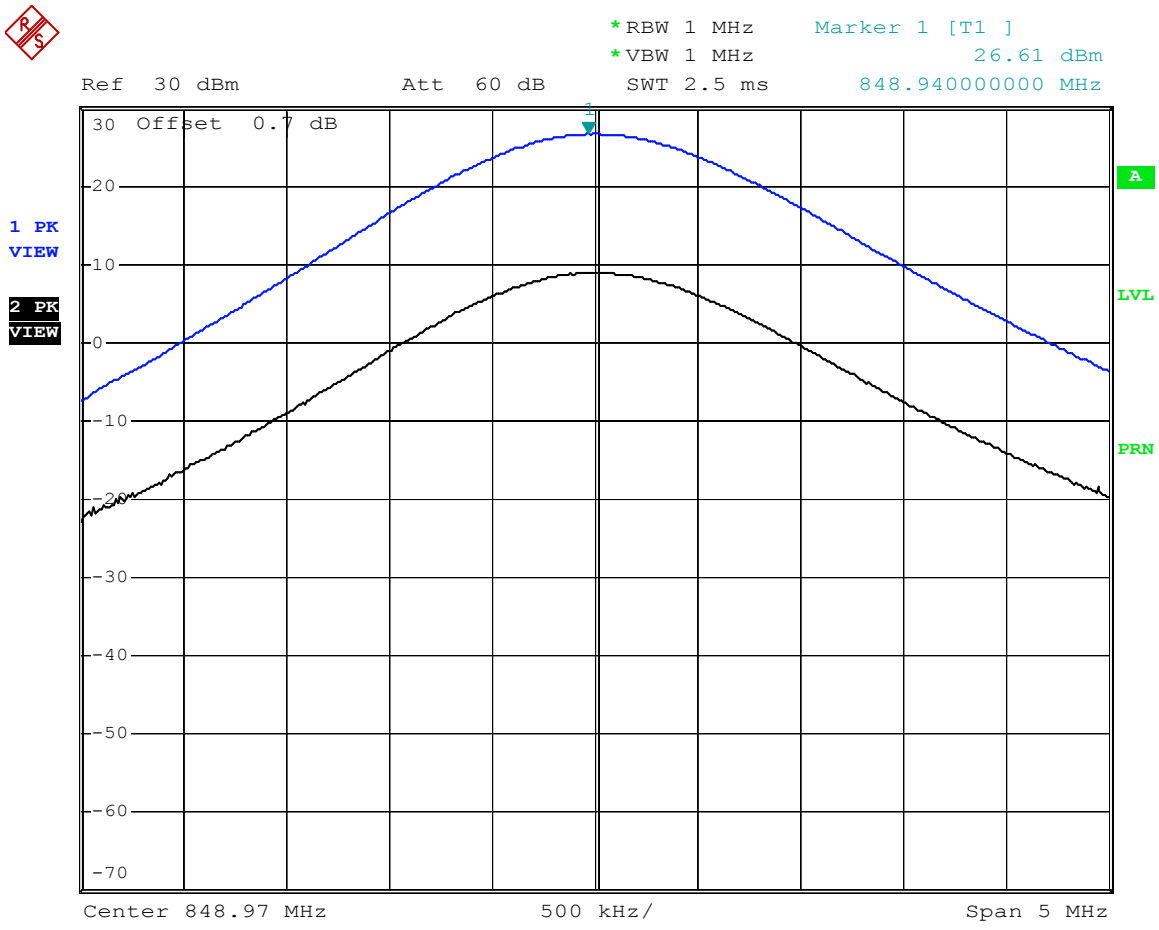
Comment: AMPS Mode, Output Power, Trace 1: Hi power, Trace 2: Low pow
Comment: er
Date: 23.JUL.2004 05:14:55

Plot 2.2



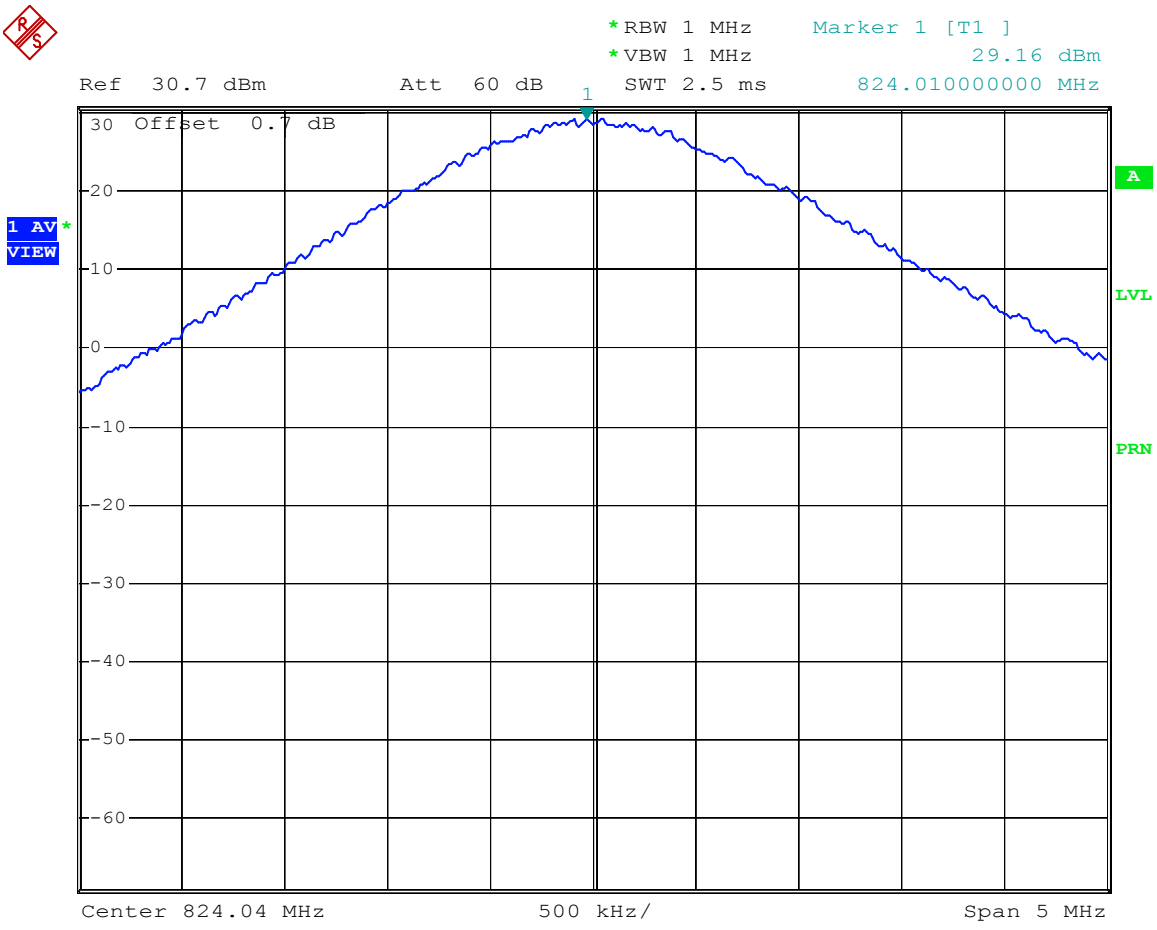
Comment: AMPS Mode, Output Power, Trace 1: Hi power, Trace 2: Low pow
Comment: er
Date: 23.JUL.2004 05:10:34

Plot 2.3



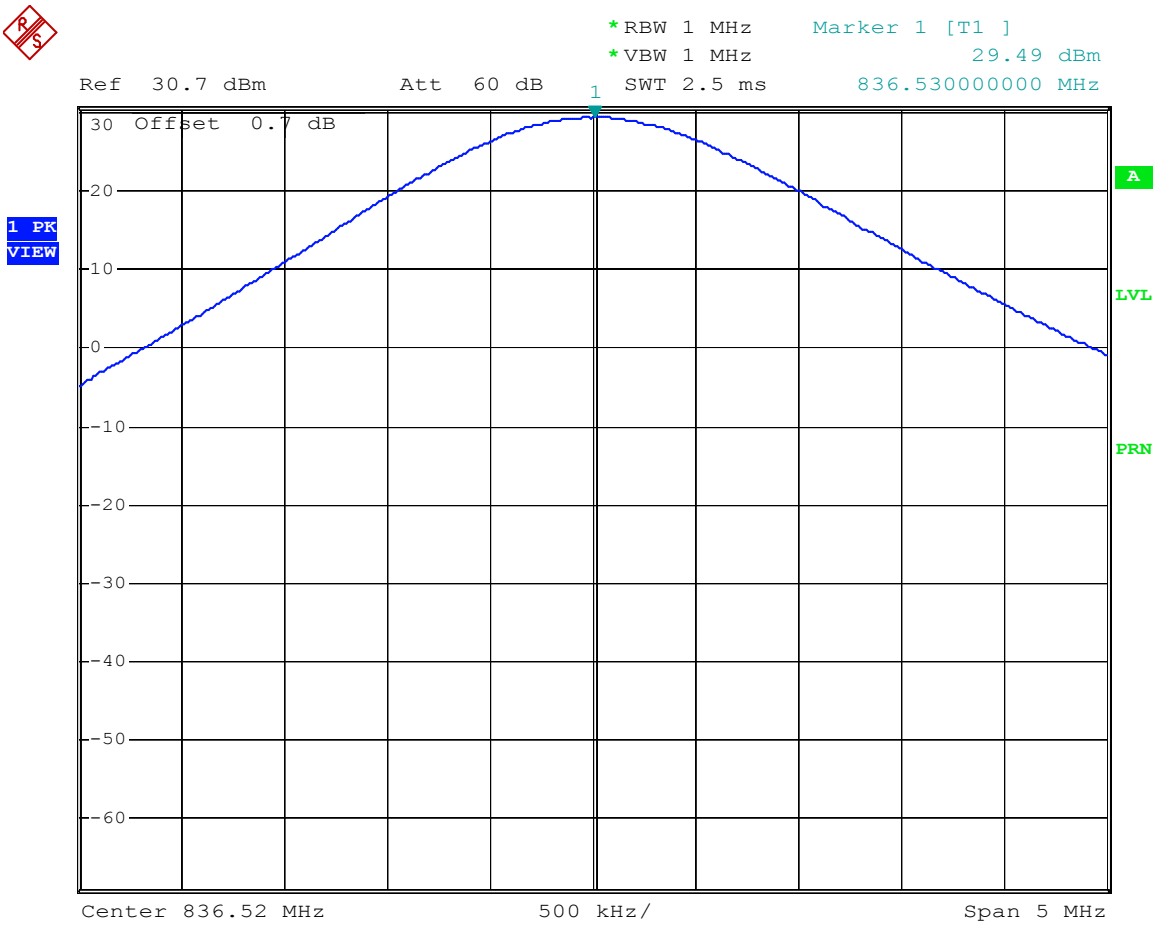
Comment: AMPS Mode, Output Power, Trace 1: Hi power, Trace 2: Low pow
Comment: er
Date: 23.JUL.2004 05:18:25

Plot 2.4



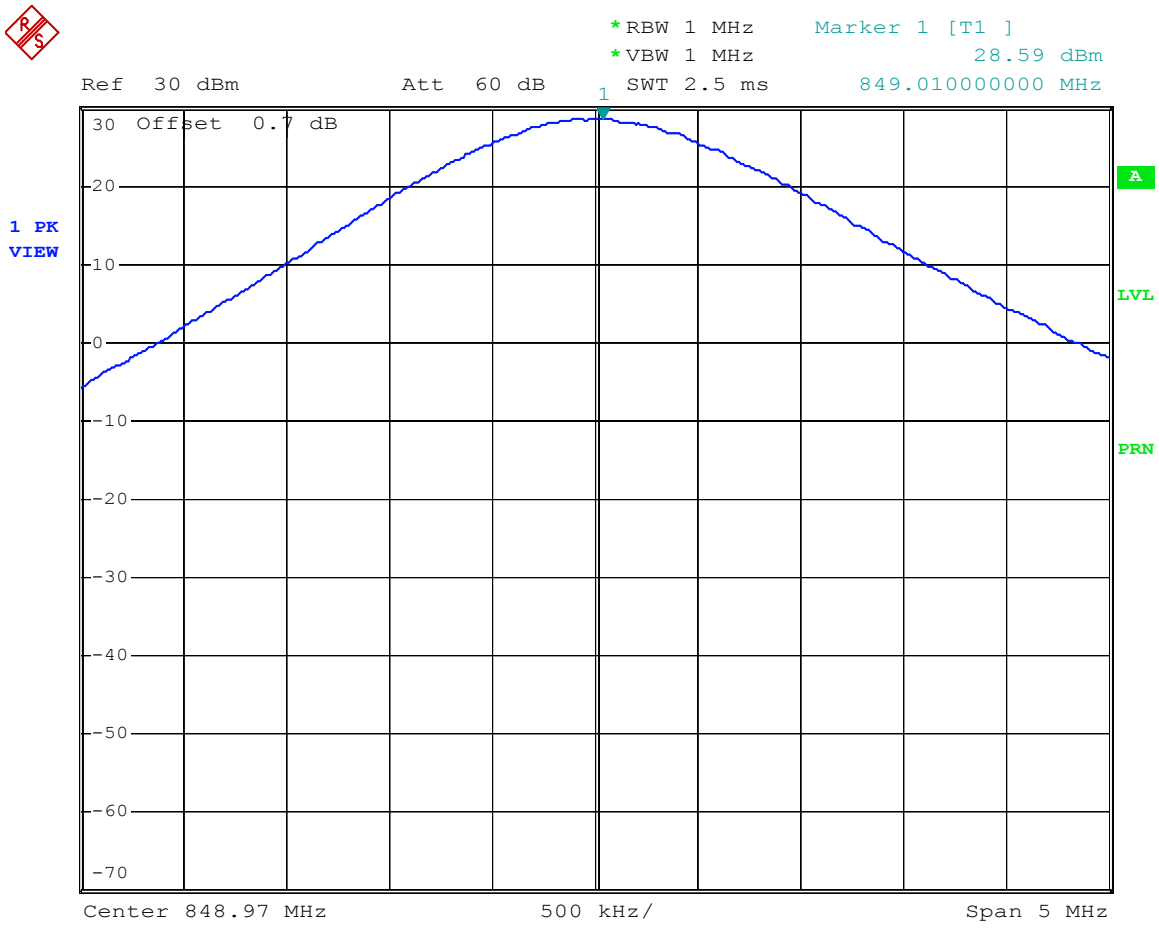
Comment: TDMA Mode, Output Power, Trace 1: Hi power
Date: 23.JUL.2004 05:38:39

Plot 2.5



Comment: TDMA Mode, Output Power, Trace 1: Hi power
Date: 23.JUL.2004 05:35:22

Plot 2.6



Comment: TDMA Mode, Output Power, Trace 1: Hi power
Date: 23.JUL.2004 05:29:43

3.0 Radiated Power

FCC 22.913

The Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

3.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane in a 10m semi-anechoic chamber.
The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidths of the spectrum analyzer were set to 100 kHz.

Worst-case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading in dB(μV) was recorded.

ERP was measured using a substitution method. The EUT was replaced by half-wave dipole connected to a signal generator. The spectrum analyzer reading was recorded and ERP was calculated as follows:

$ERP = V_1 - V_2 + V_g$,

Where V_1 & V_2 are spectrum analyzer readings in dB(μV) when measured field strength from EUT & generator accordingly; V_g is the generator output in dBm.

3.2 Test Equipment

R & S FSP40 HP8546A Spectrum Analyzer
EMCO 3148 Log Periodic Antenna
CDI Robert's Antenna
Hewlett Packard HP83732A Signal Generator

3.3 Test Results

Complies	Refer to the attached data sheets.

Effective Radiated Power
(Measured by Substitution Method)

Frequency MHz	Antenna Polariz.	SA Reading (EUT) dB(µV)	SA Reading (Sig. Gen. +Tuned Dipole) dB(µV)	Signal Generator Output dBm	ERP dBm
AMPS Mode					
824.04	H	100.3	77.4	0	22.9
836.55	H	100.4	77.1	0	23.3
848.97	H	100.6	75.6	0	25.0
TDMA Mode					
824.04	H	104.5	77.4	0	27.1
836.55	H	105.2	77.1	0	28.1
848.97	H	103.7	75.6	0	28.1

4.0 Modulation Deviation Limiting

FCC 2.1047, 22.915(b)(c)

4.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

At three different modulating frequencies, the output level of the audio generator was varied and the FM deviation level was recorded (Table 4).

4.2 Test Equipment

HP 8901A Modulation Analyzer

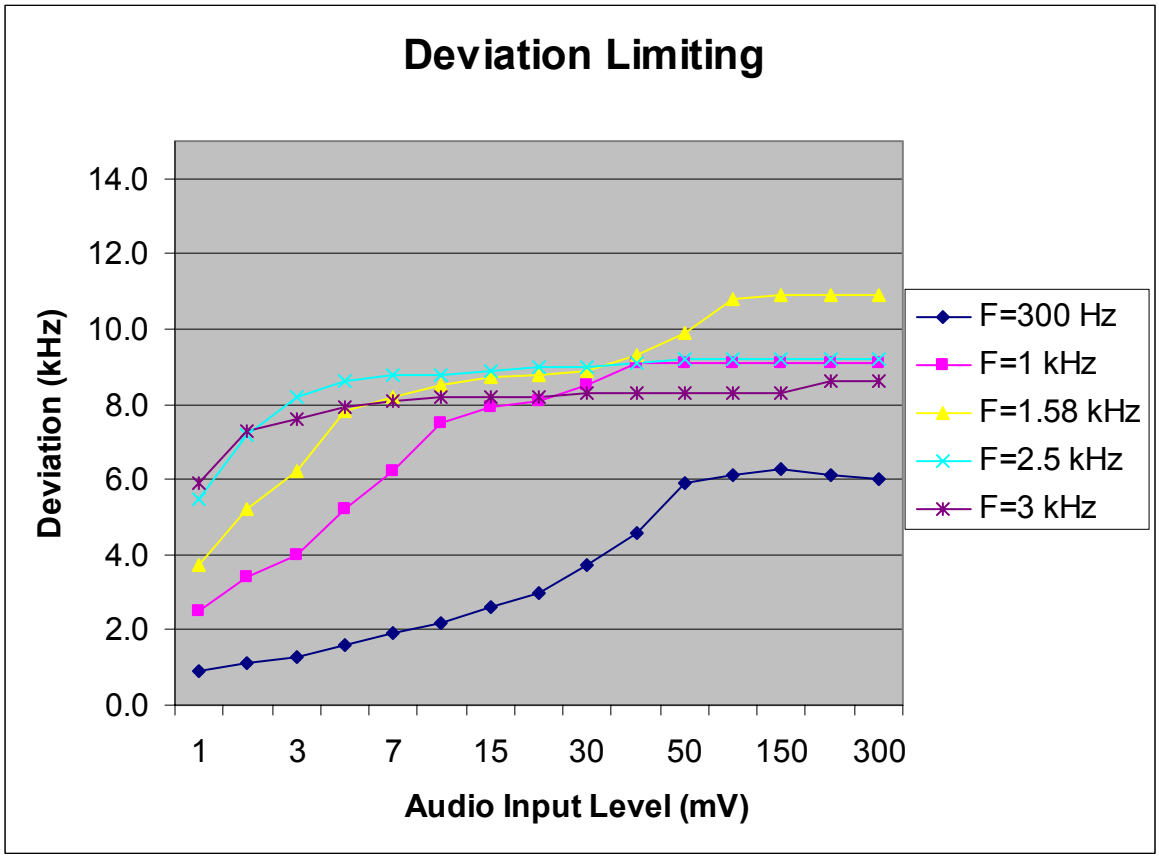
4.3 Test Results

The deviation did not exceed 13.2 kHz.
The EUT passed the test.
See test data in table 4.

Table 4 Modulation Deviation Limiting

Input Level (mV)	FM Deviation in kHz at Indicated Modulating Frequency				
	300 Hz	1 kHz	1.58 kHz	2.5 kHz	3 kHz
1	0.9	2.5	3.7	5.5	5.9
2	1.1	3.4	5.2	7.2	7.3
3	1.3	4.0	6.2	8.2	7.6
5	1.6	5.2	7.8	8.6	7.9
7	1.9	6.2	8.2	8.8	8.1
10	2.2	7.5	8.5	8.8	8.2
15	2.6	7.9	8.7	8.9	8.2
20	3.0	8.1	8.8	9.0	8.2
30	3.7	8.5	8.9	9.0	8.3
40	4.6	9.1	9.3	9.1	8.3
50	5.9	9.1	9.9	9.2	8.3
100	6.1	9.1	10.8	9.2	8.3
150	6.3	9.1	10.9	9.2	8.3
200	6.1	9.1	10.9	9.2	8.6
300	6.0	9.1	10.9	9.2	8.6

Middle Channel: 836.52 MHz


Deviation Limiting
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Deviation (kHz)
1
3
7
15
30
50
150
300
Audio Input Level (mV)
F=300 Hz
F=1 kHz
F=1.58 kHz
F=2.5 kHz
F=3 kHz

5.0 Audio Filter Characteristics

FCC 22.915(d)

For mobile stations, these signals must be attenuated, relative to the level at 1 kHz, as follows:

7.□.□ In the frequency ranges of 3.0 to 5.9 kHz and 6.1 to 15.0 kHz, signals must be attenuated by at least 40 log (f/3) dB, where f is the frequency of the signal in kHz.

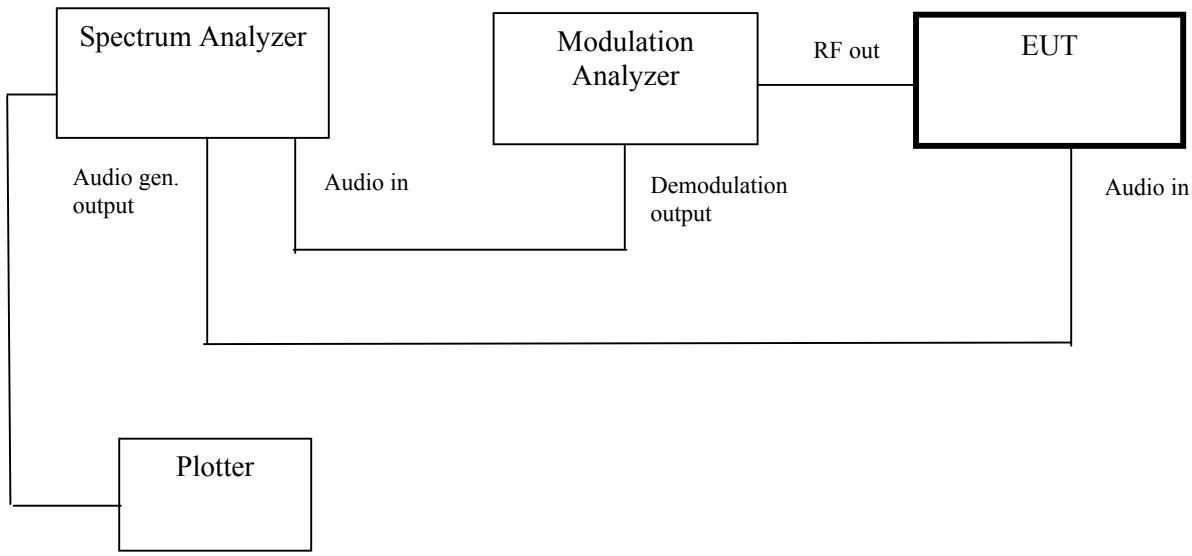
7.□.□ In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.

7.□.□ In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

5.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

The test was performed according to the block diagram shown below.



On that block diagram, the HP 3885A spectrum analyzer having the tracing generator, and the HP 8901A Modulation Analyzer are used. The spectrum analyzer was set to scan the frequency from 300 Hz to 30 kHz, The audio filter response was plotted directly from the spectrum analyzer (Refer to plots 5.1 and 5.2). Using the level measured at 1 kHz as a reference (0 dB), the audio filter response was calculated (See Table 5).

5.2 Test Equipment

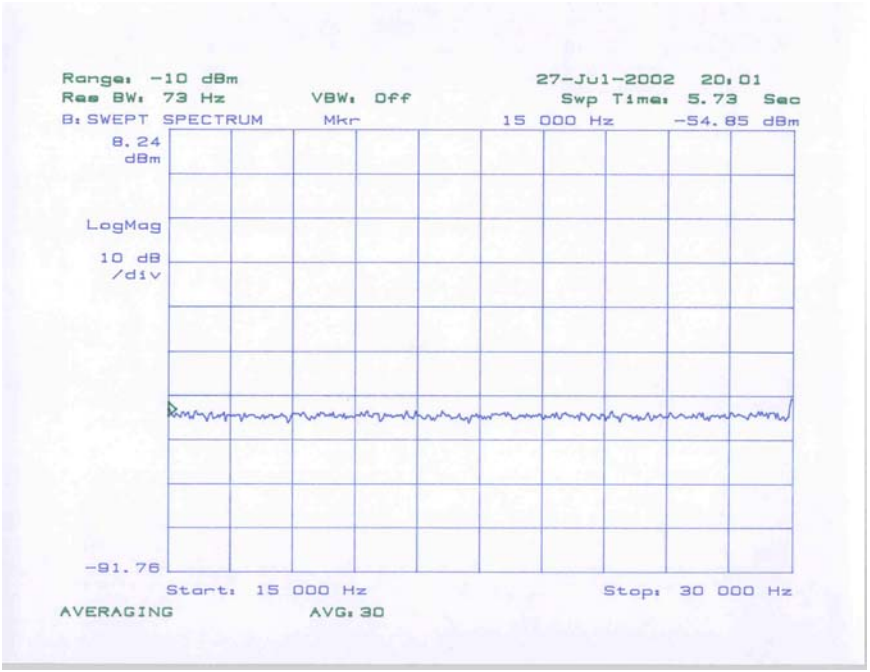
HP 8901A Modulation Analyzer
HP 3588A Spectrum Analyzer
HP 7470A Plotter

5.3 Test Results

Complies, refer to the attached plots and data table.

Audio Filter Characteristics	
Plot Number	**Description**
5.1	300 Hz to 15 kHz
5.2	15 kHz to 30 kHz

Plot 5.1



Plot 5.2

Table 5 Audio Filter Characteristics		
Modulation Frequency kHz	**Relative Level dBm**	**Attenuation**
0.3	-23.4	8.2
0.6	-10.8	5.6
1.0	-15.2	0
1.5	-11.4	-3.8
2.0	-9.6	-5.6
2.5	-8.8	-6.4
3.0	-8.5	-6.7
3.5	-10.5	-4.7
3.8	-27.6	12.4
3.9	-50.8	35.6
4.0	-51.5	36.3
5.9	-53.7	38.5
6.0	-52.7	37.5
6.1	-53.2	38.0
6.5 – 15.0	< -55.0	> 39.8
15 – 30	< - 53.0	> 38.0

6.0 Emission Limitations, Occupied Bandwidth

FCC 2.1049, 22.917(b)(d)

For F3E/F3D emission mask uses with audio filter, the mean power of emissions must be attenuated below the mean power of the unmodulated carrier wave (P) as follows:

7.□.□ On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;

7.□.□ On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency: at least 60 dB or (43 + 10 log P) dB, whichever is the lesser attenuation.

For F1D emission mask, the mean power of emissions must be attenuated below the mean power of the unmodualted carrier (P) as follows:

7.□.□ On any frequency removed from the carrier frequency by more than 20 kHz but no more than 45 kHz: at least 26 dB;

7.□.□ On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;

7.□.□ On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency: at least 60 dB or (43 +10 log P) dB, whichever is the lesser attenuation.

6.1 Test Procedure

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation. The audio generator was connected to the audio input of the transceiver.

The spectrum with no modulation was recorded. The audio input signal was adjusted to obtain the frequencies deviation equal 6 kHz at the audio frequency of maximum response which was determined measuring deviation versus frequency from 300 Hz to 3.5 kHz and was found 1.58 kHz. The audio input level was increased by 16 dB. The audio frequency was set to the frequency 2.5 kHz.

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band ±100 kHz from the carrier frequency. The same plots have been done for wideband emissions, SAT, ST, DTMF, Voice (audio), some of the combinations of these modulating signals and in TDMA mode.

6.2 Test Equipment

R & S FSP Spectrum Analyzer
HP8116A Pulse/Function Generator

6.3 Test Results

Complies	Refer to the attached plots.

Plot Number	Description
6.1	Unmodulated
6.2	ST (10 kHz, 8 kHz deviation)
6.3	SAT (6 kHz, 2 kHz deviation)
6.4	Wideband emissions (0, 1, 0, 1)
6.5	DTMF
6.6	Audio (2.5 kHz)
6.7	Audio (2.5 kHz) & SAT (6 kHz)

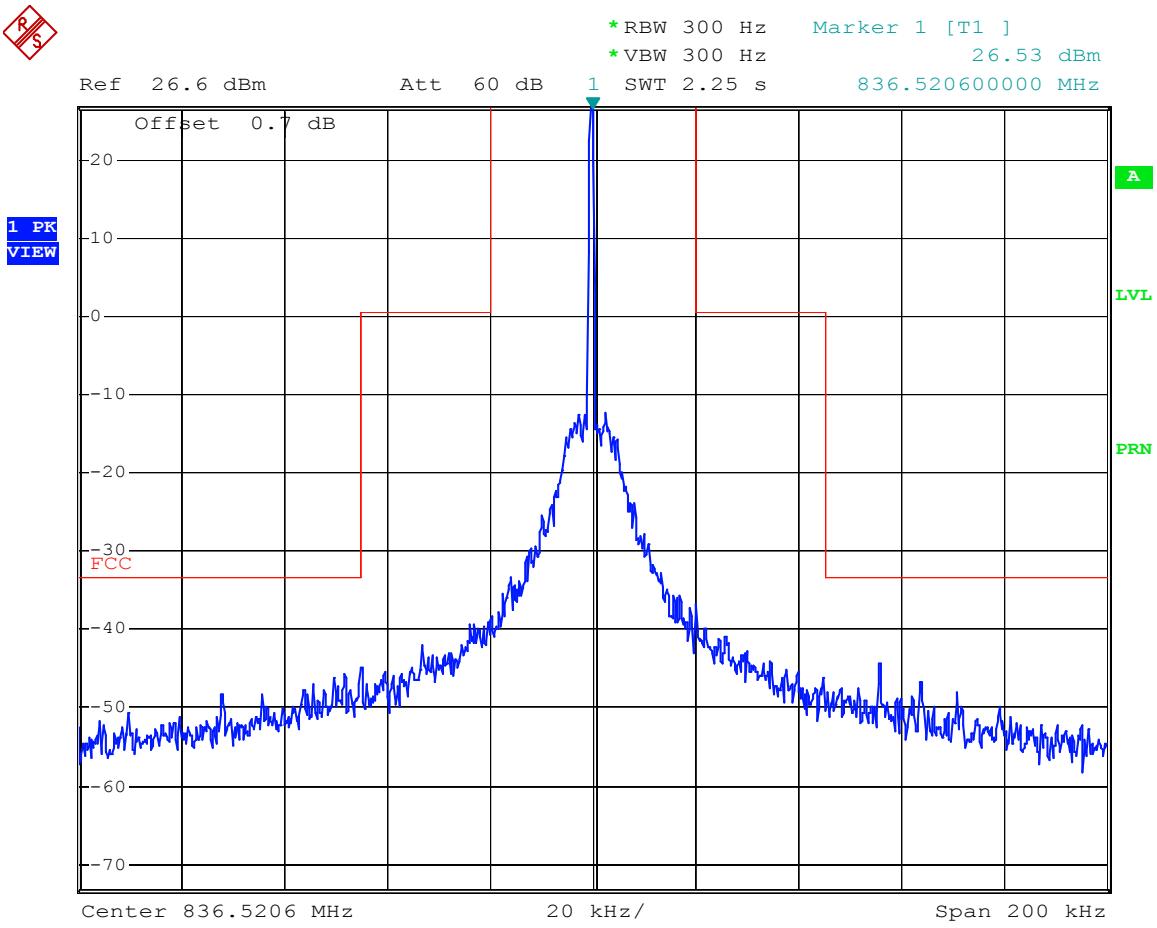
Calculation of the necessary bandwidth (Bn) using the Carson's Rule Bn = 2(M+D):

a) Voice and SAT signals:
Voice (M=2.5 kHz, D=12 kHz)
SAT (M=6 kHz, D=2 kHz)
Bn = 2(6+12+2) = 40 kHz
Emission Designator: 40K0F8W

b) Wideband data:
Data (M=10 kHz, D=8 kHz)
SAT (M=6 kHz, D=2 kHz)
Bn = 2(10+8+2) = 40 kHz
Emission Designator: 40K0F1D

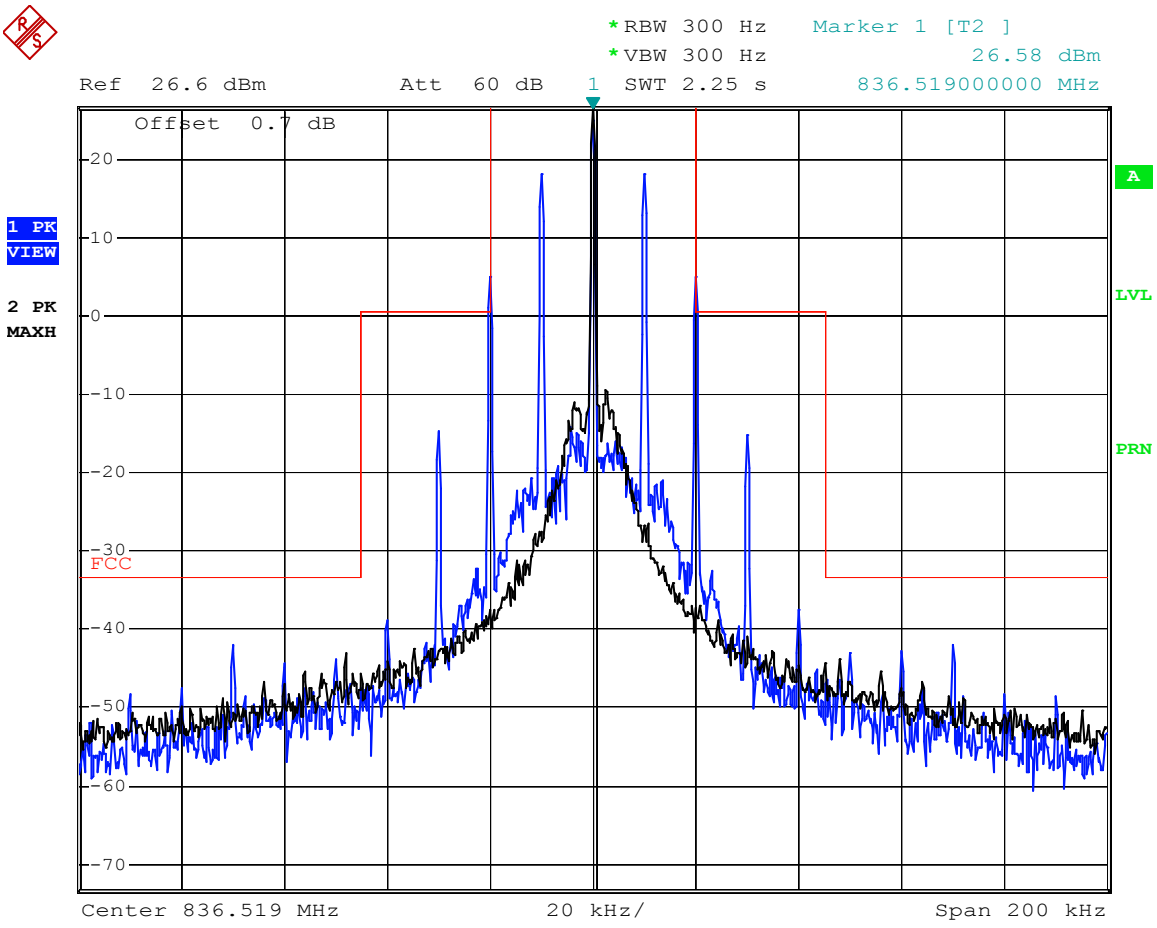
c) TDMA
Emission Designator: 30K0DXW

Plot 6.1



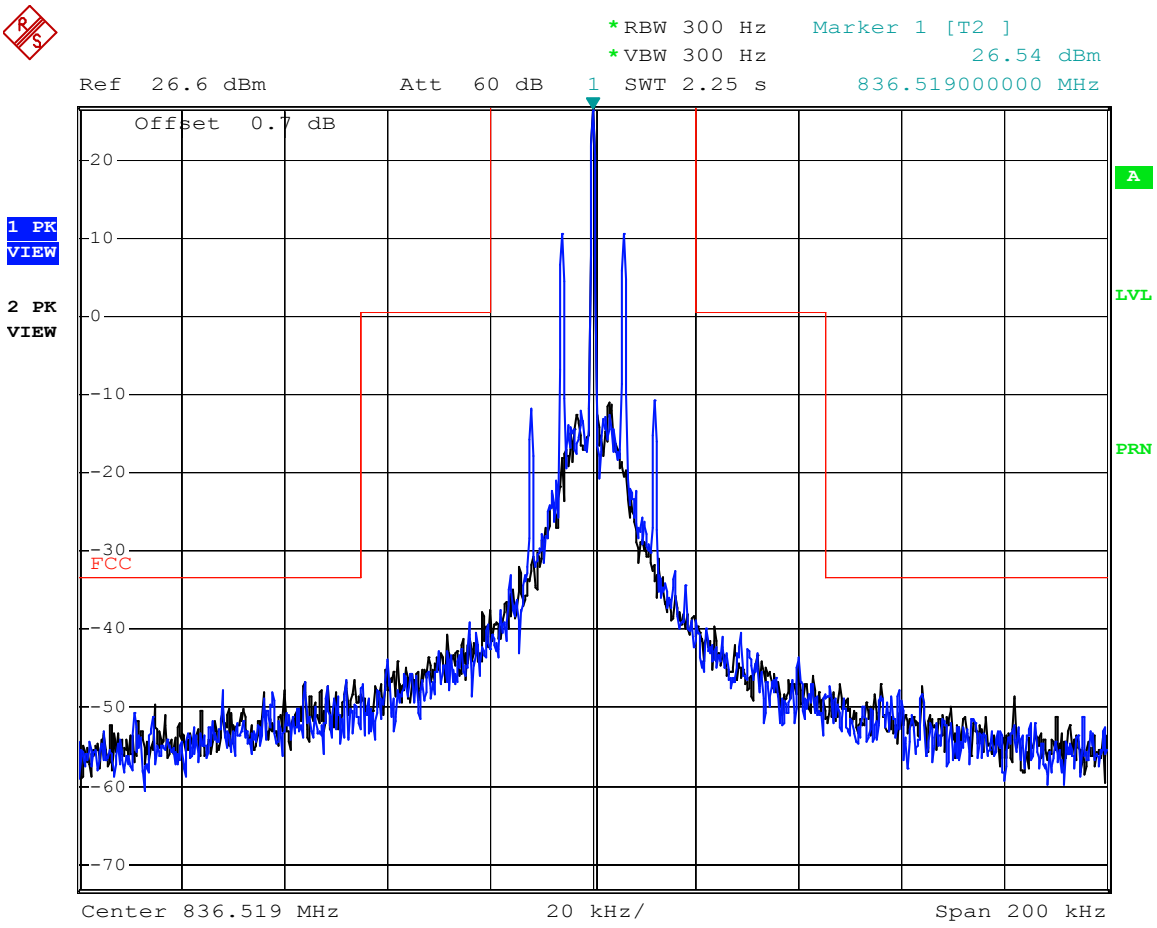
Comment: Emission Mask, unmodulated, AMPS
Date: 24.JUL.2004 00:47:55

Plot 6.2



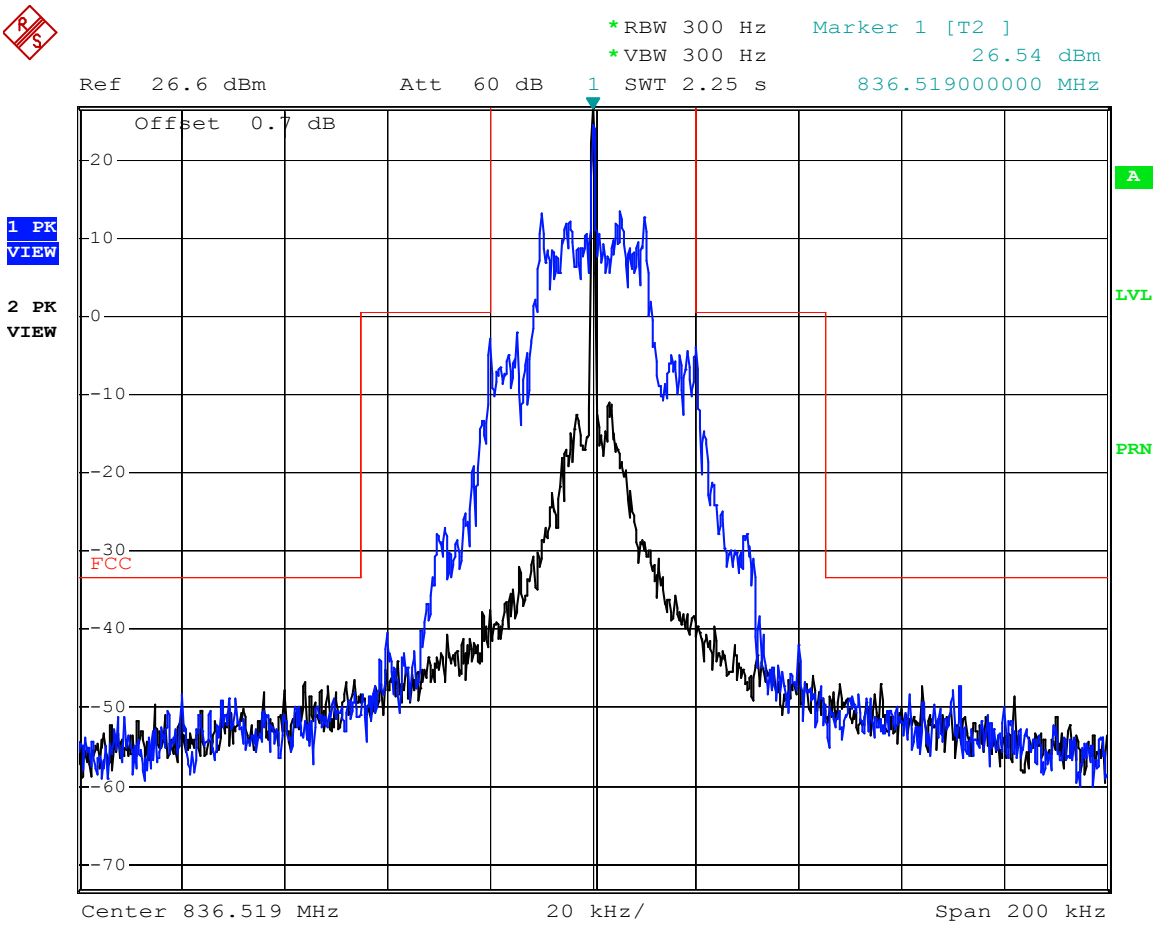
Comment: Emission Mask, ST (f=10 kHz, dev=8 kHz), AMPS
Date: 24.JUL.2004 01:28:59

Plot 6.3



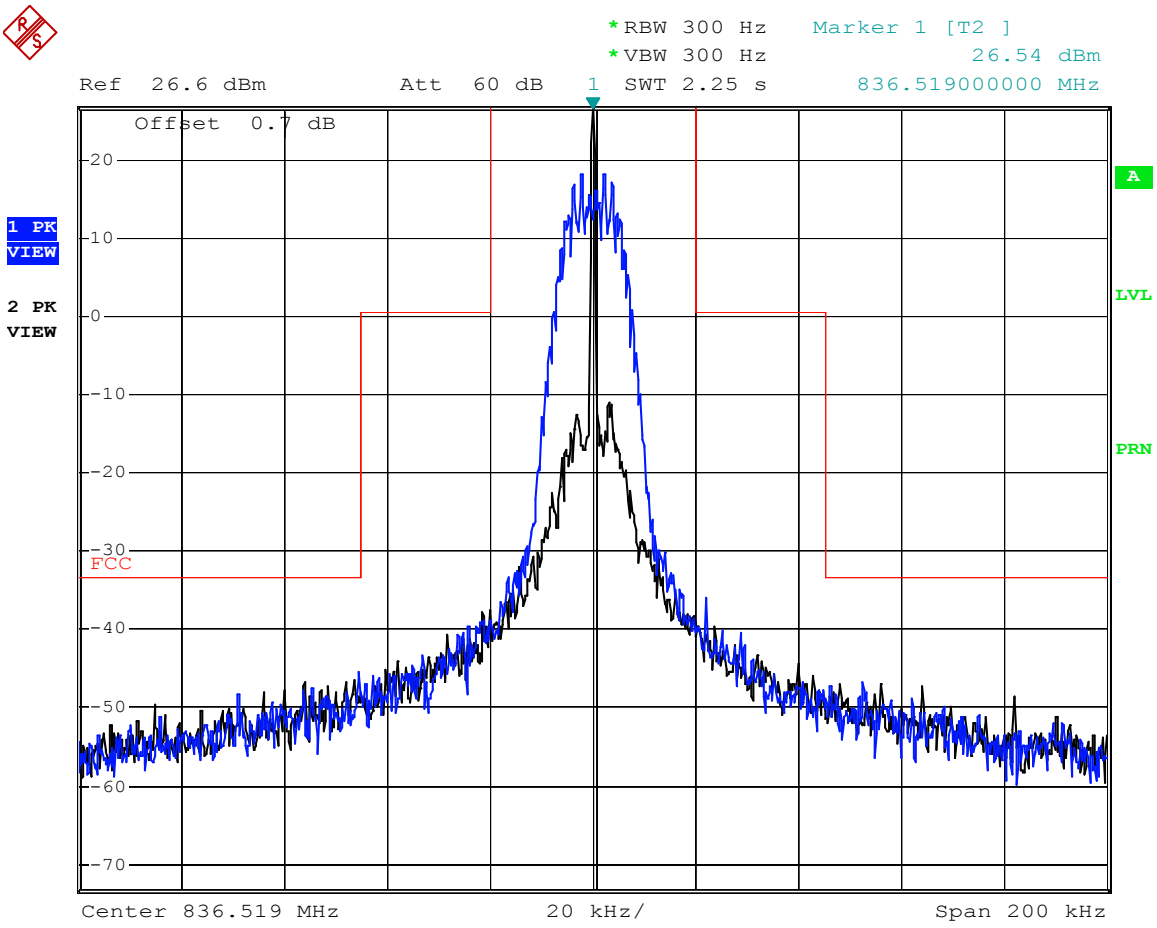
Comment: Emission Mask, SAT (f=6 kHz, dev=2 kHz), AMPS
Date: 24.JUL.2004 01:32:55

Plot 6.4



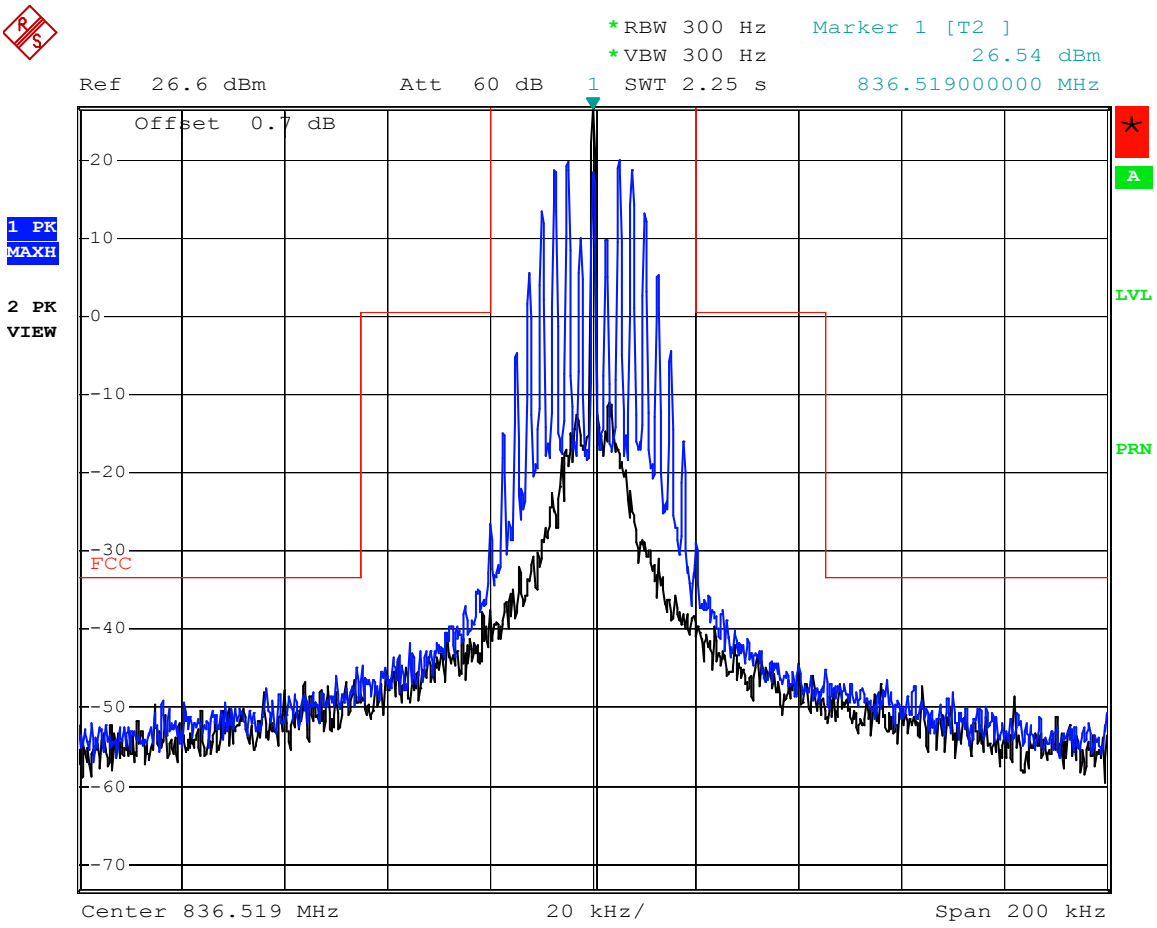
Comment: Emission Mask, Wideband data 10 kbs, AMPS
Date: 24.JUL.2004 01:36:09

Plot 6.5



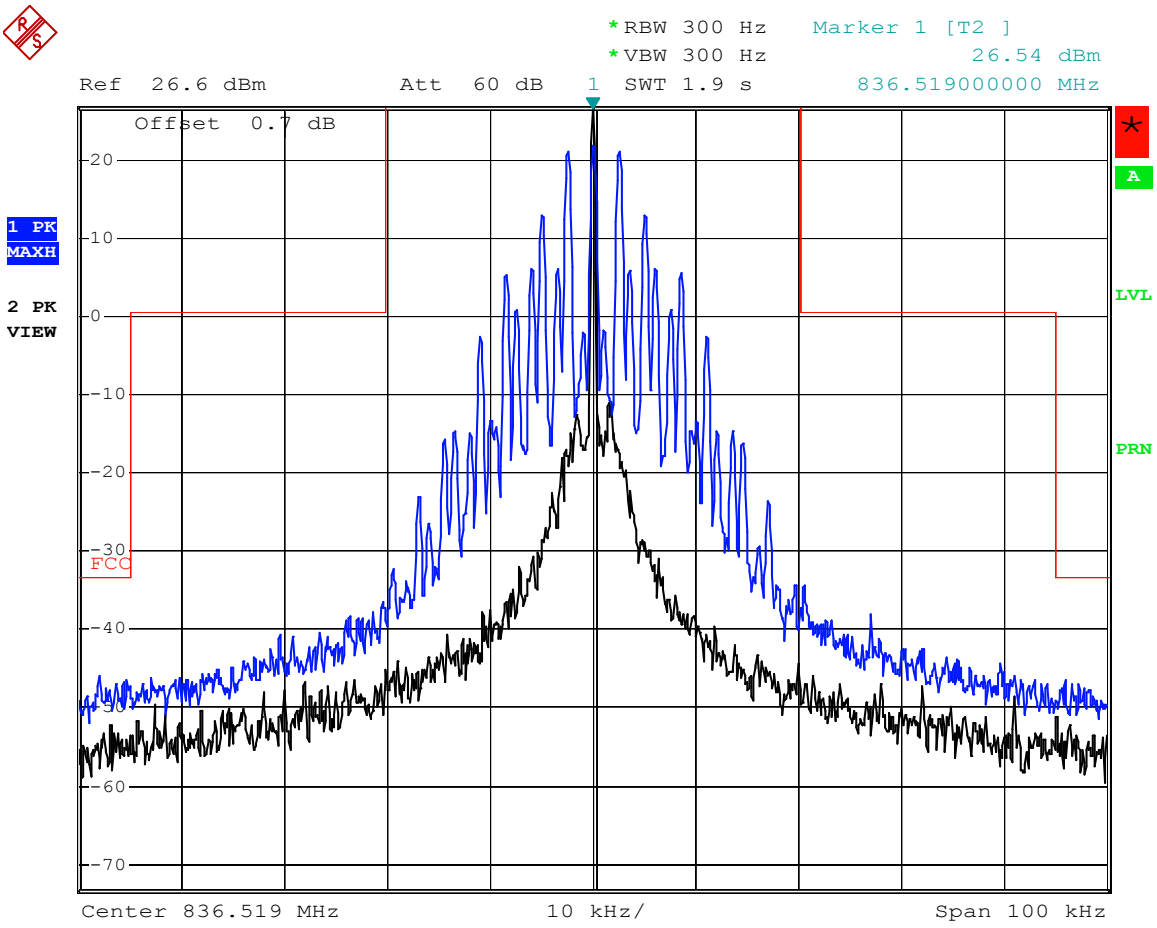
Comment: Emission Mask, DTMF, AMPS
Date: 24.JUL.2004 01:38:23

Plot 6.6



Comment: Emission Mask, Audio 2.5 kHz, AMPS
Date: 24.JUL.2004 01:48:46

Plot 6.7



Comment: Emission Mask, Audio 2.5 kHz and SAT, AMPS
Date: 24.JUL.2004 01:53:08

7.0 Out of Band Emissions at Antenna Terminal

FCC 22.917(e), 22.917(f)

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.

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 to exceed –80 dBm at the transmit antenna connector.

7.1 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.

The resolution bandwidth (RBW) of the spectrum analyzer was set to 300 Hz when measured on frequencies within ±60 kHz from the carrier.

When measured on frequencies removed from the carrier by more then 60 kHz, RBW ≥30 kHz was used. If on some frequencies the reduced resolution bandwidth was used, the bandwidth correction factor BCF = 10Log[RBW/30] was applied.

Measurements were performed with EUT setup in AMPS and TDMA modes for high and low power. Sufficient scans were taken to show the out-of-band emissions up to 10^{th} harmonic, including emissions on the block-edge frequencies.

7.2 Test Equipment

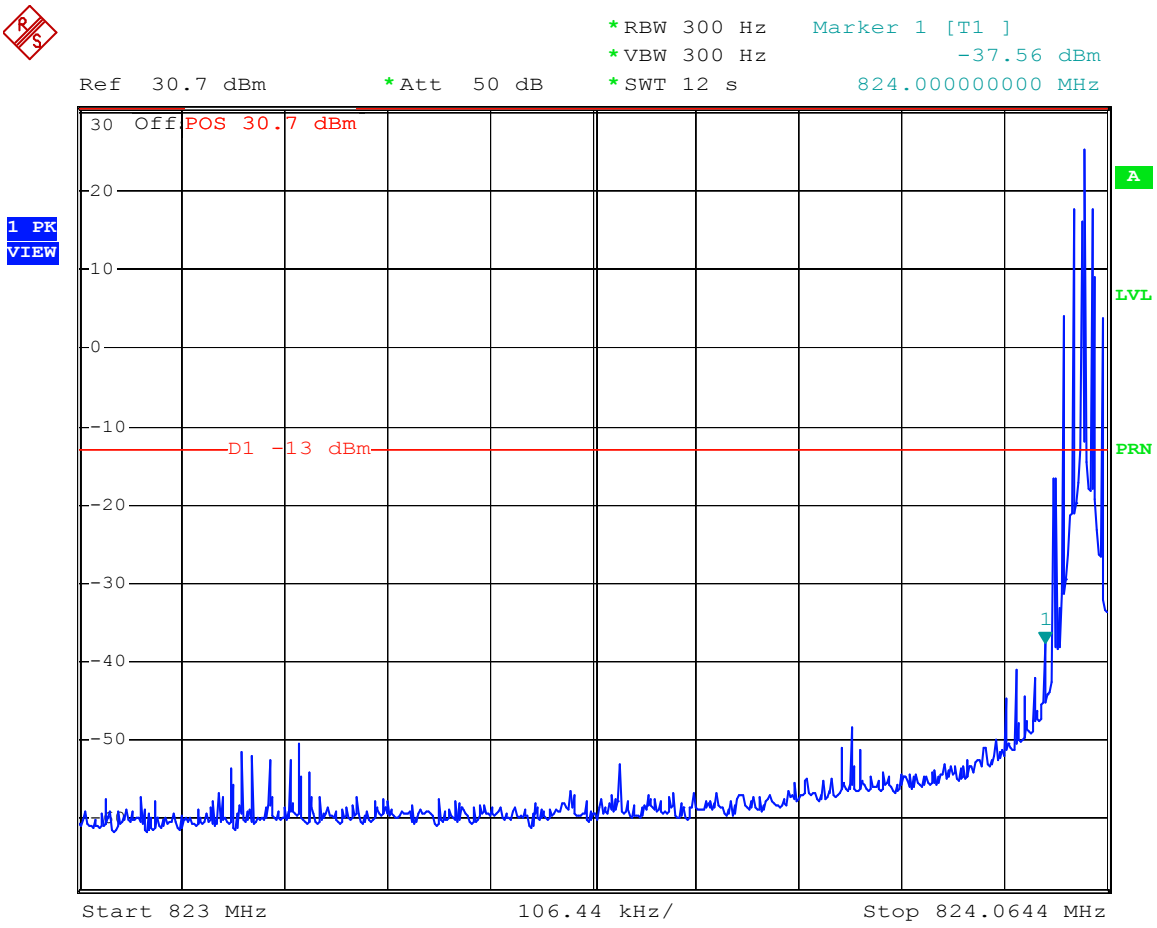
R & S FSP40 Spectrum Analyzer

7.3 Test Results

Complies	Refer to the following plots

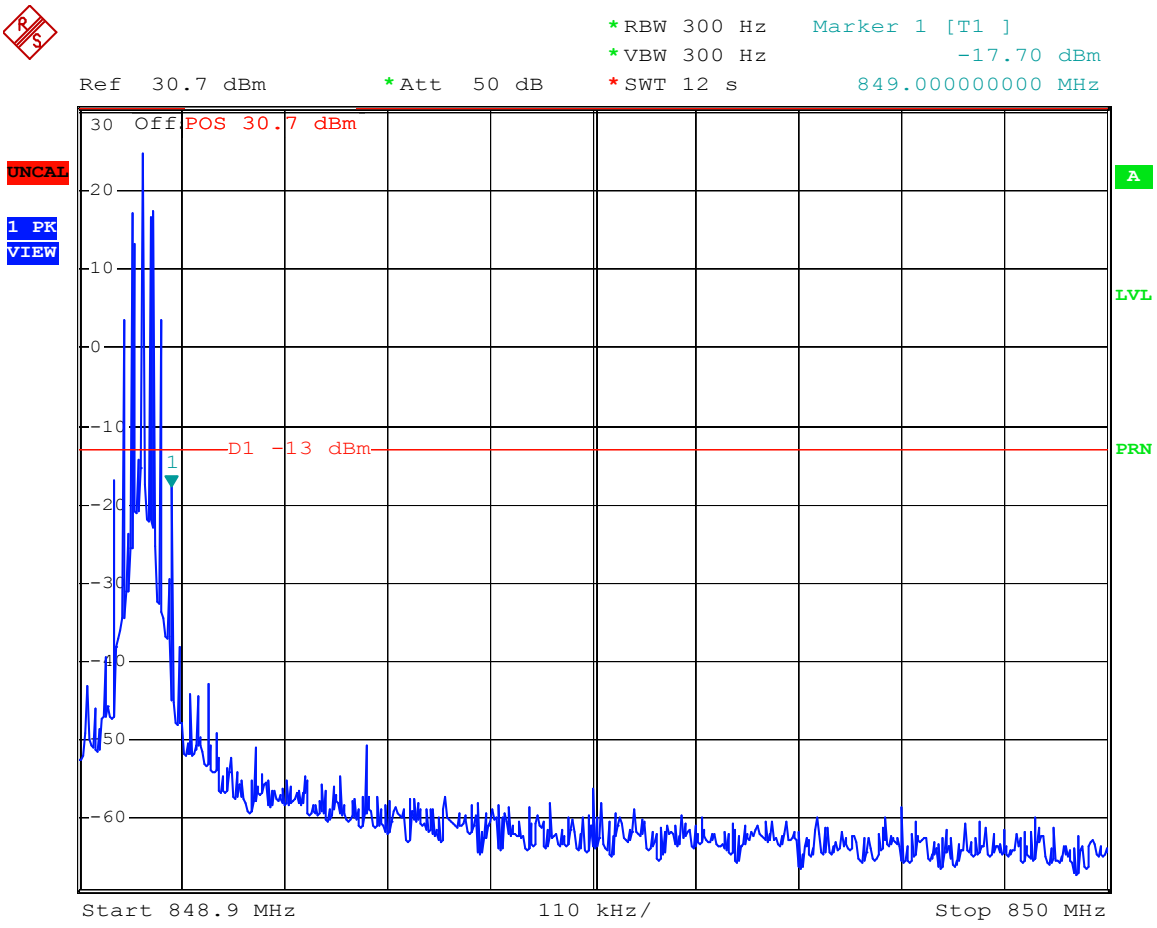
Plot Number	Description
7.1.a	Band-edge, Low channel AMPS
7.1.b	Band-edge, Hi channel AMPS
7.1.c	Band-edge, Low channel TDMA
7.1.d	Band-edge, Hi channel TDMA
7.2.a – 7.2.b	Low Channel, AMPS
7.3.a – 7.3.c	Middle Channel, AMPS
7.4.a – 7.4.c	High Channel, AMPS
7.5.a – 7.5.c	Low Channel, TDMA
7.6.a – 7.6.c	Middle Channel, TDMA
7.7.a – 7.7.c	High Channel, TDMA
7.8.a	Emissions in the receiving band, Low Channel
7.8.b	Emissions in the receiving band, Middle Channel
7.8.c	Emissions in the receiving band, High Channel
7.9.a – 7.9.b	Low Channel, AMPS, low power
7.10.a – 7.10.b	Middle Channel, AMPS, low power
7.11.a – 7.11.b	High Channel, AMPS, low power

Plot 7.1a



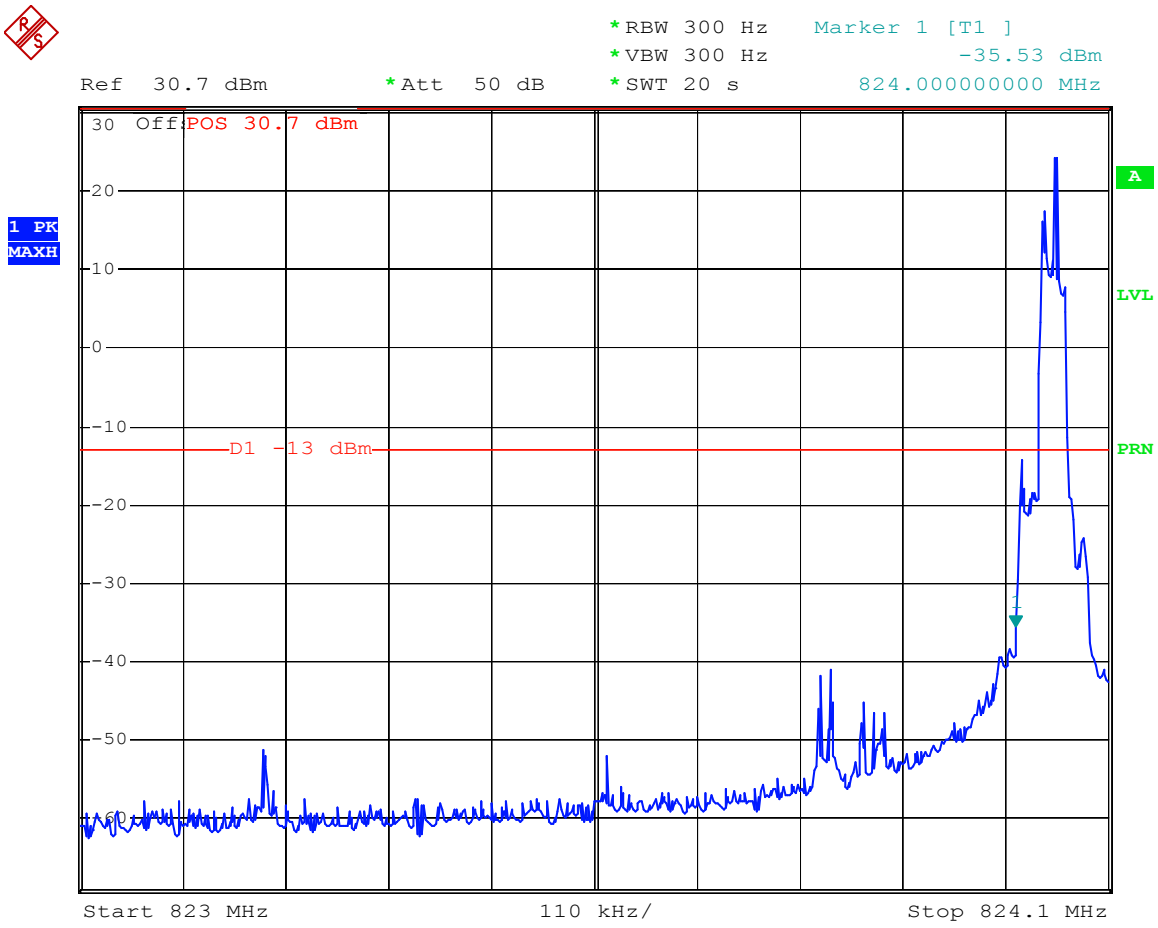
Comment: Low channel, band edge, AMPS
Date: 26.JUL.2004 21:17:56

Plot 7.1b



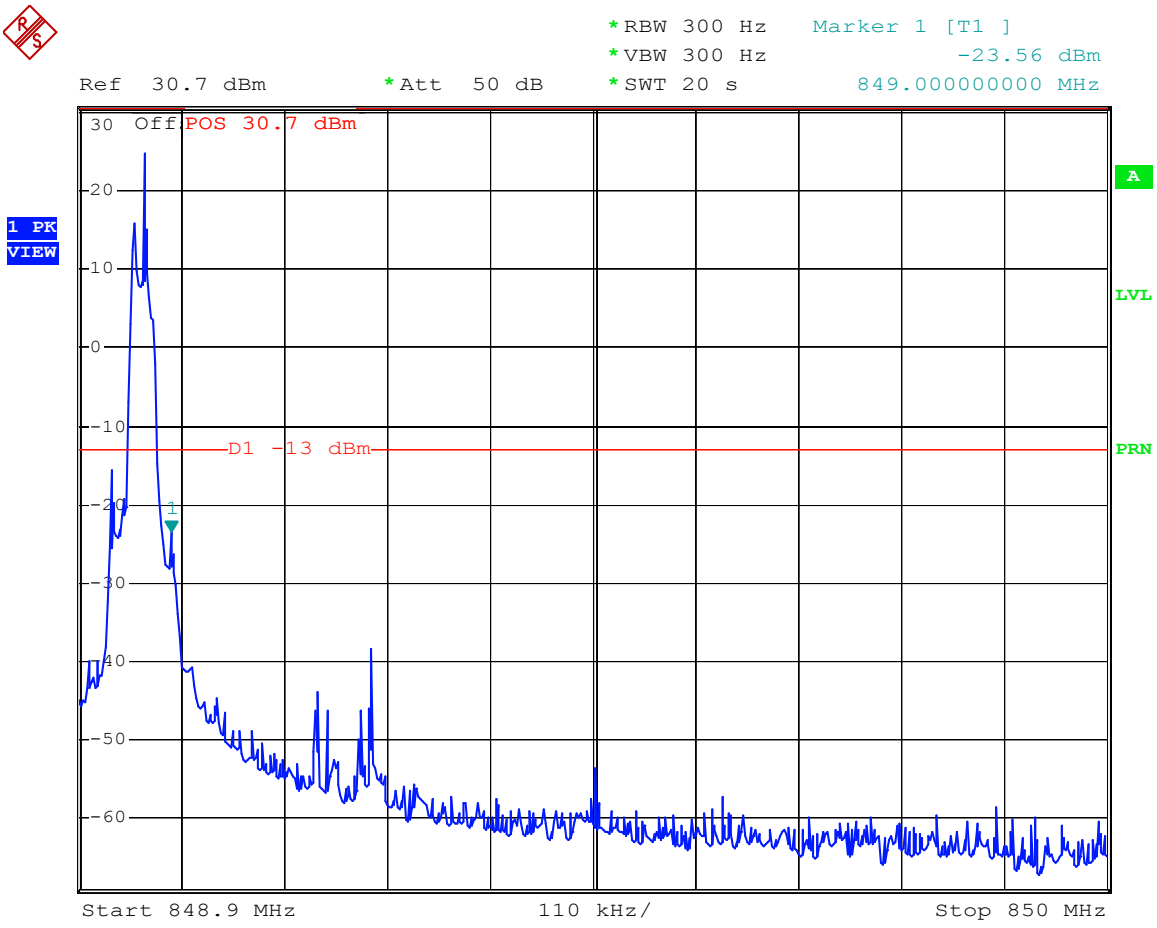
Comment: Hi channel, band edge, AMPS
Date: 26.JUL.2004 21:23:07

Plot 7.1c



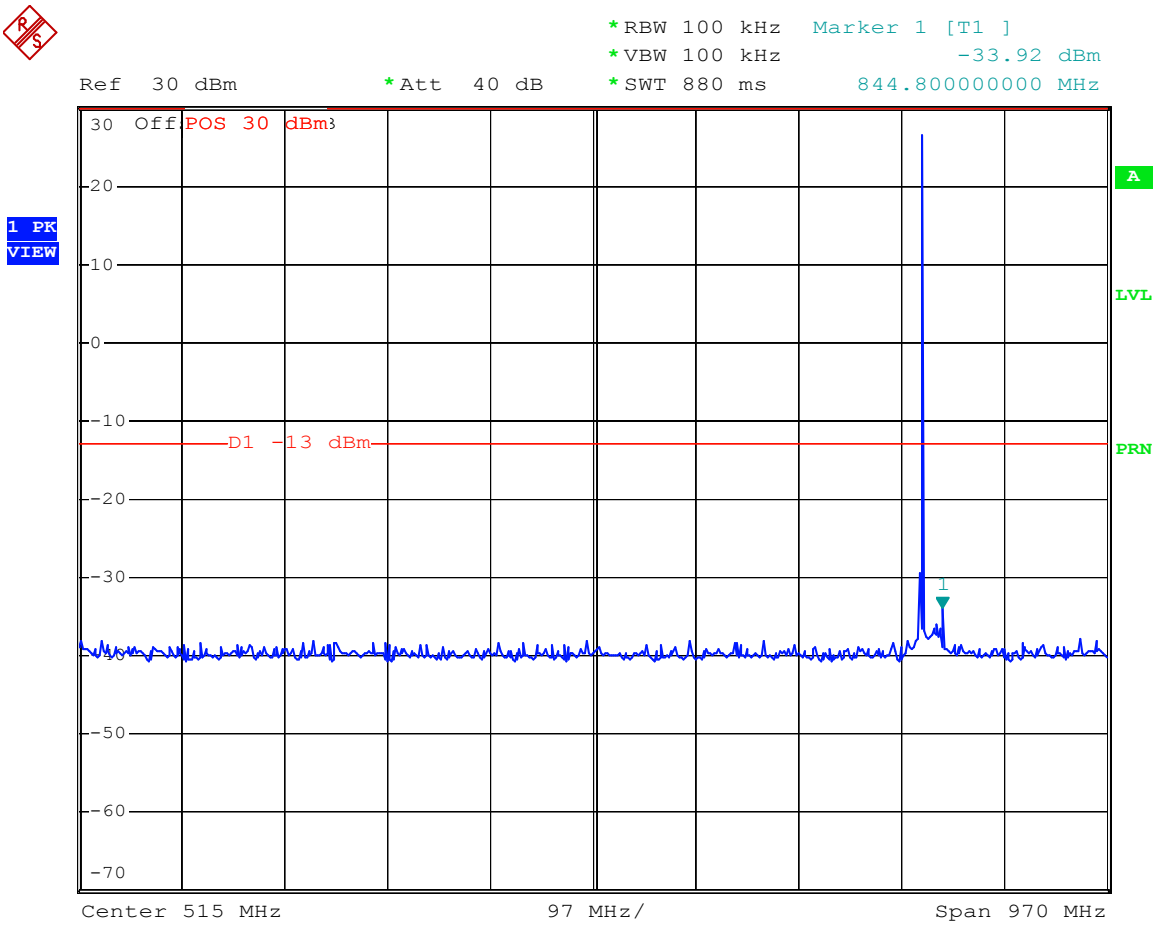
Comment: Low channel, band edge, TDMA
Date: 27.JUL.2004 01:20:21

7.1.d



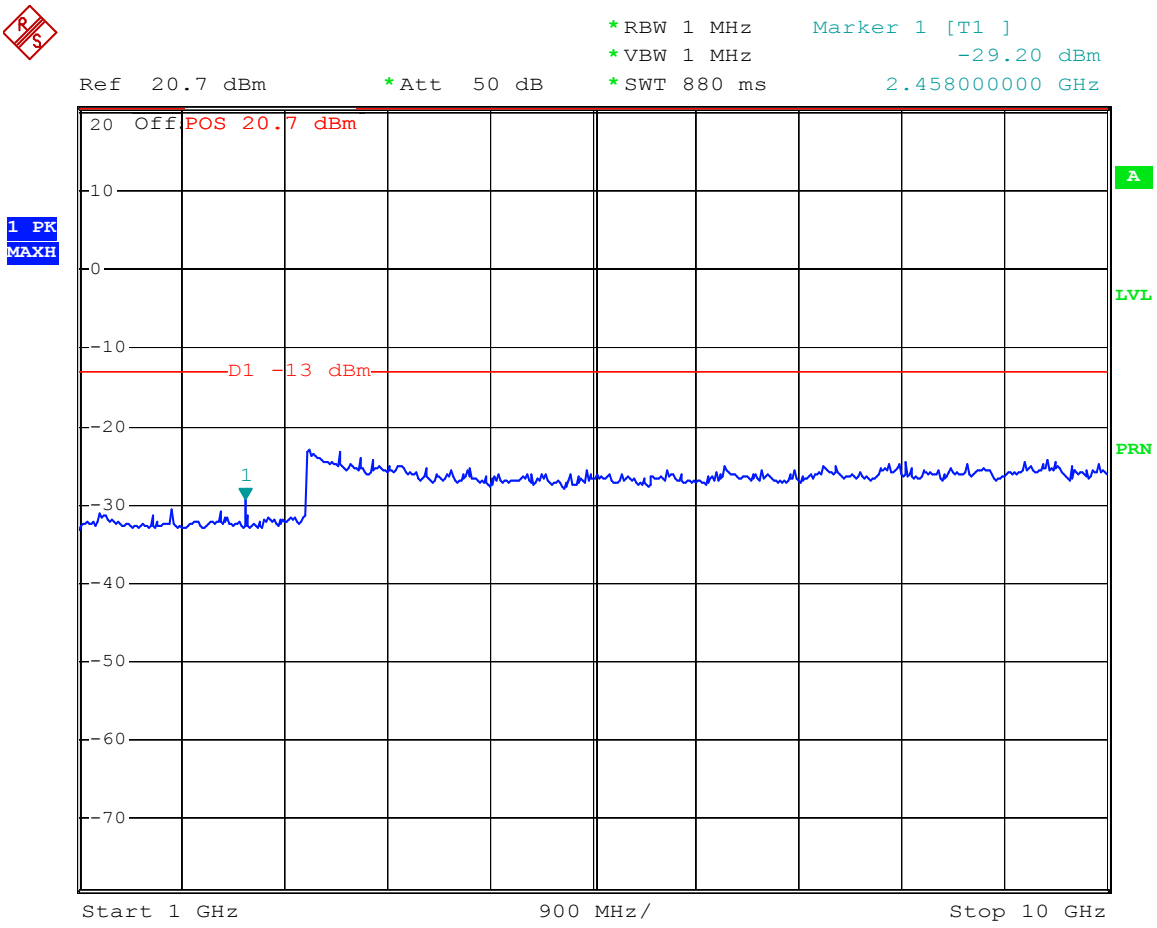
Comment: Hi channel, band edge, TDMA
Date: 26.JUL.2004 21:27:02

7.2.a



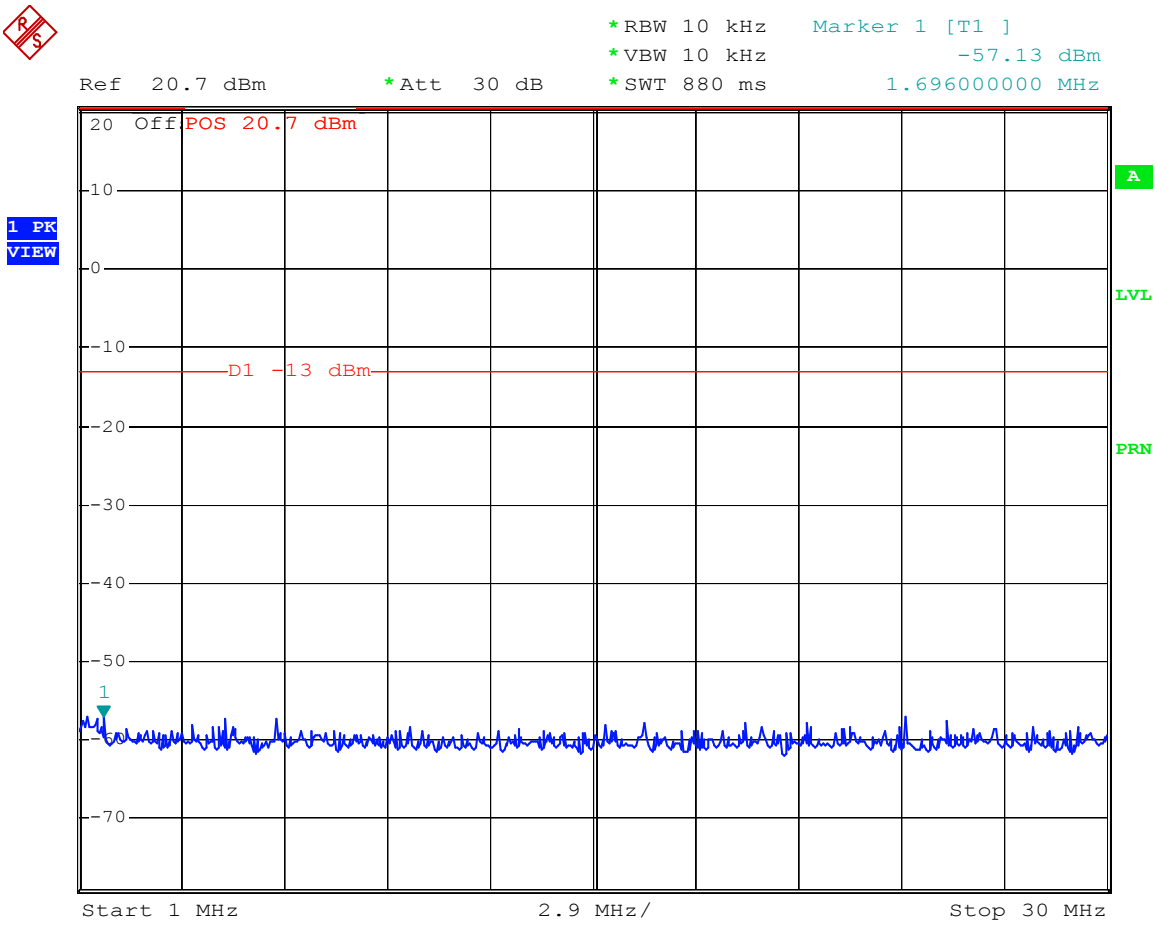
Comment: Low channel, AMPS
Date: 24.JUL.2004 21:44:00

7.2.b



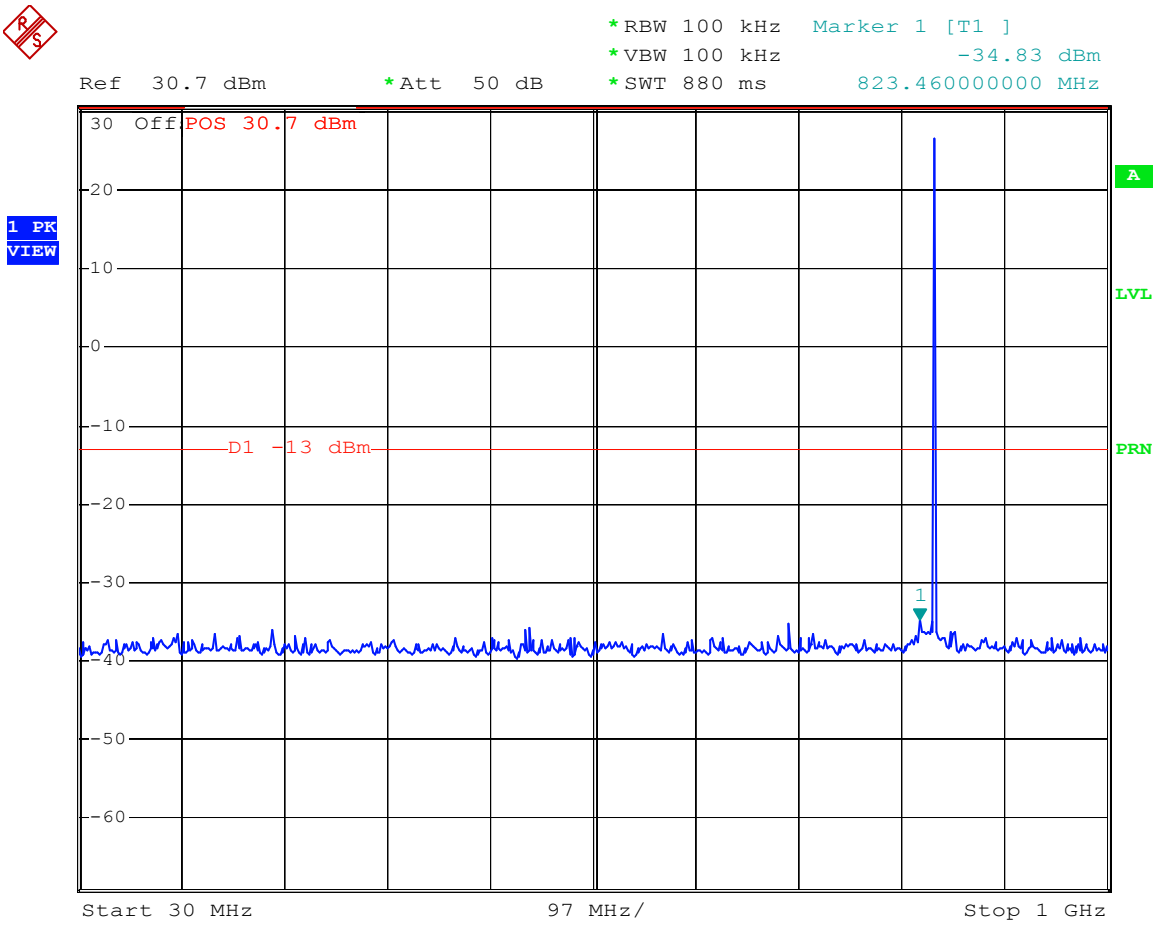
Comment: Low channel, AMPS
Date: 26.JUL.2004 20:47:28

7.3.a

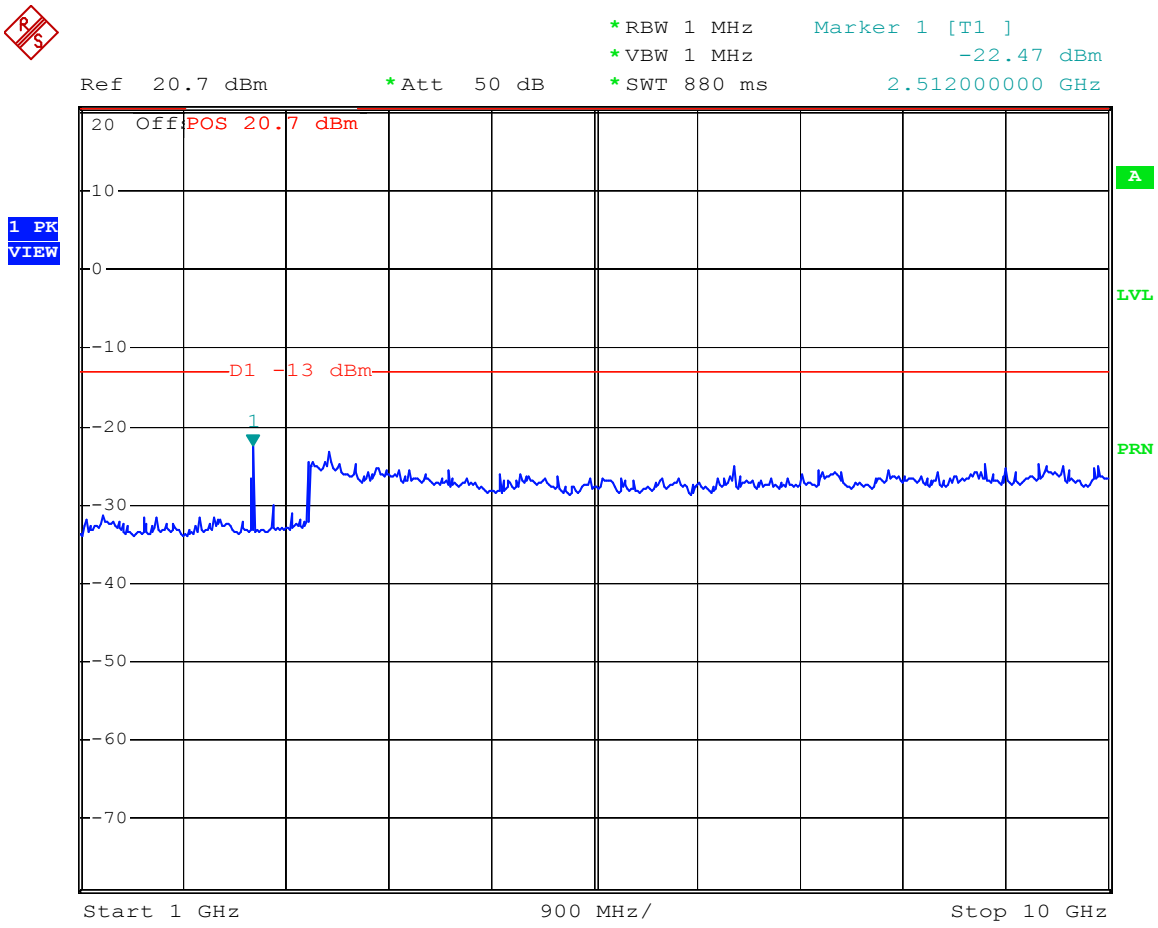


Comment: mid channel, AMPS
Date: 24.JUL.2004 21:56:49

7.3.b

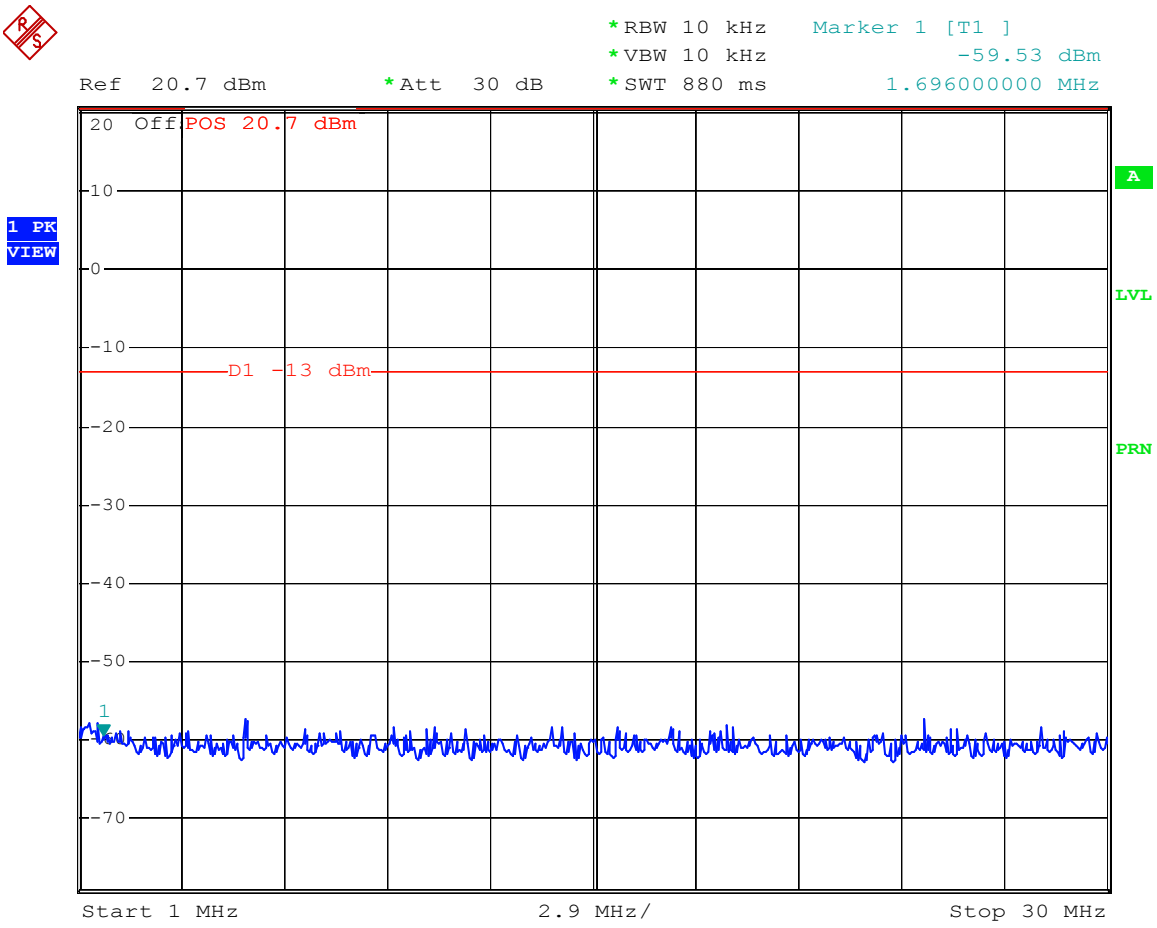


Comment: mid channel, AMPS
Date: 24.JUL.2004 21:53:05



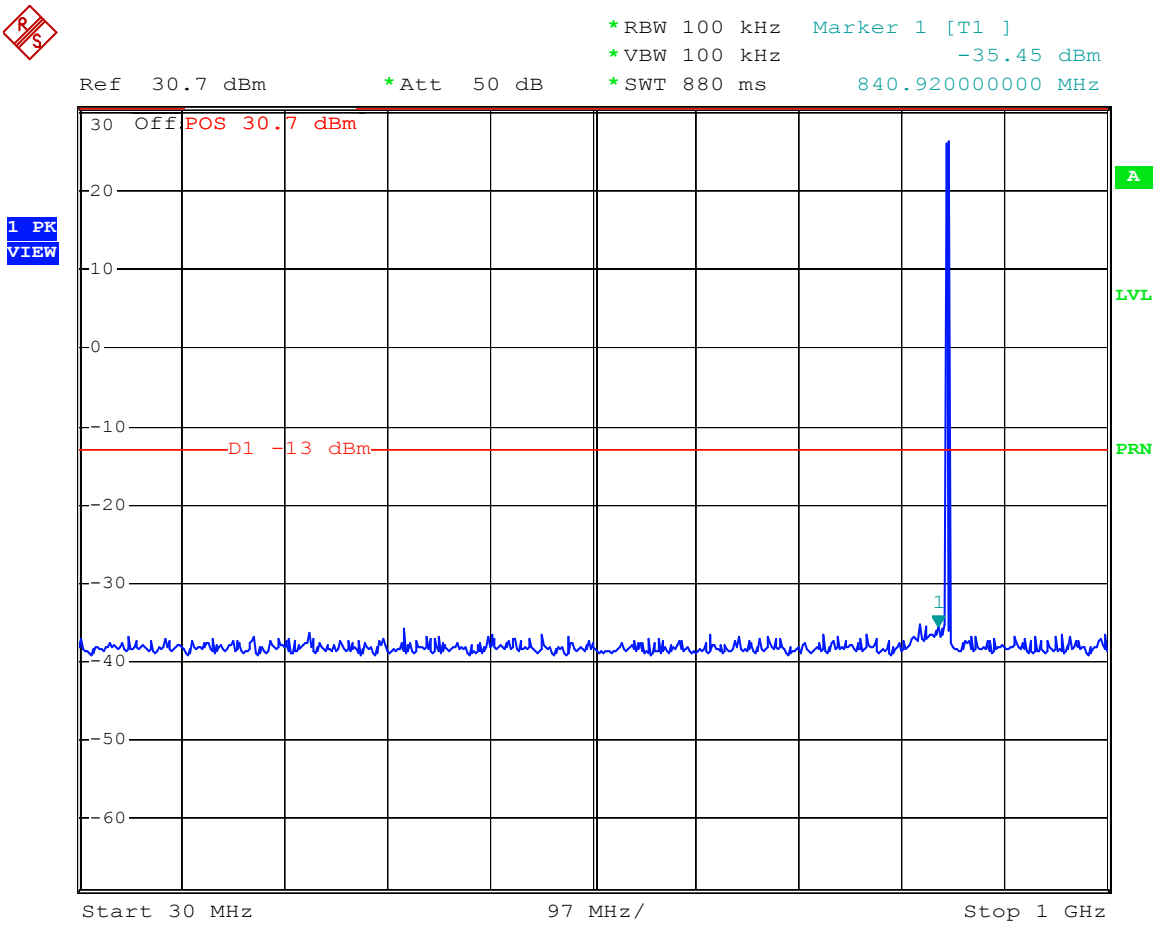
Comment: Mid channel, AMPS
Date: 26.JUL.2004 20:44:46

Plot 7.4.a



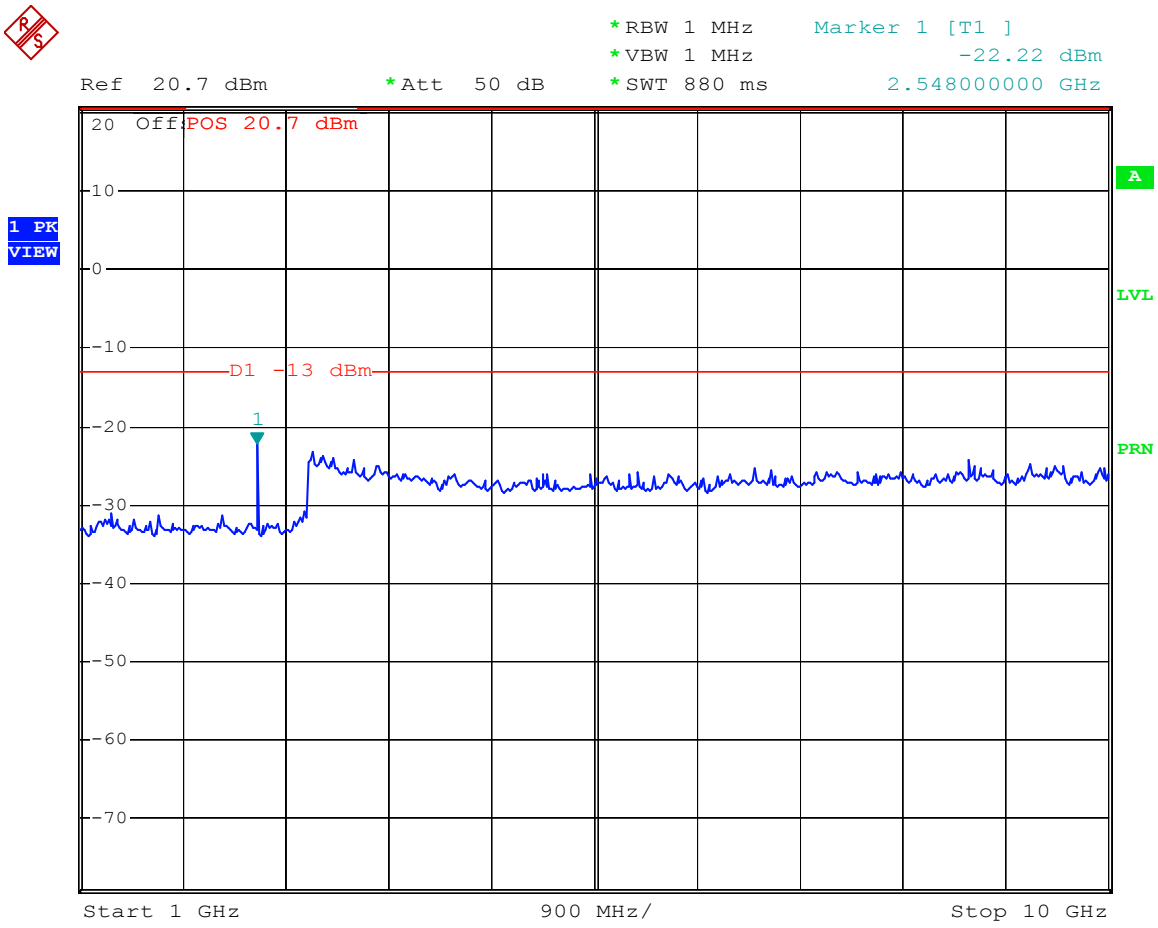
Comment: hi channel, AMPS
Date: 24.JUL.2004 21:58:06

Plot 7.4.b



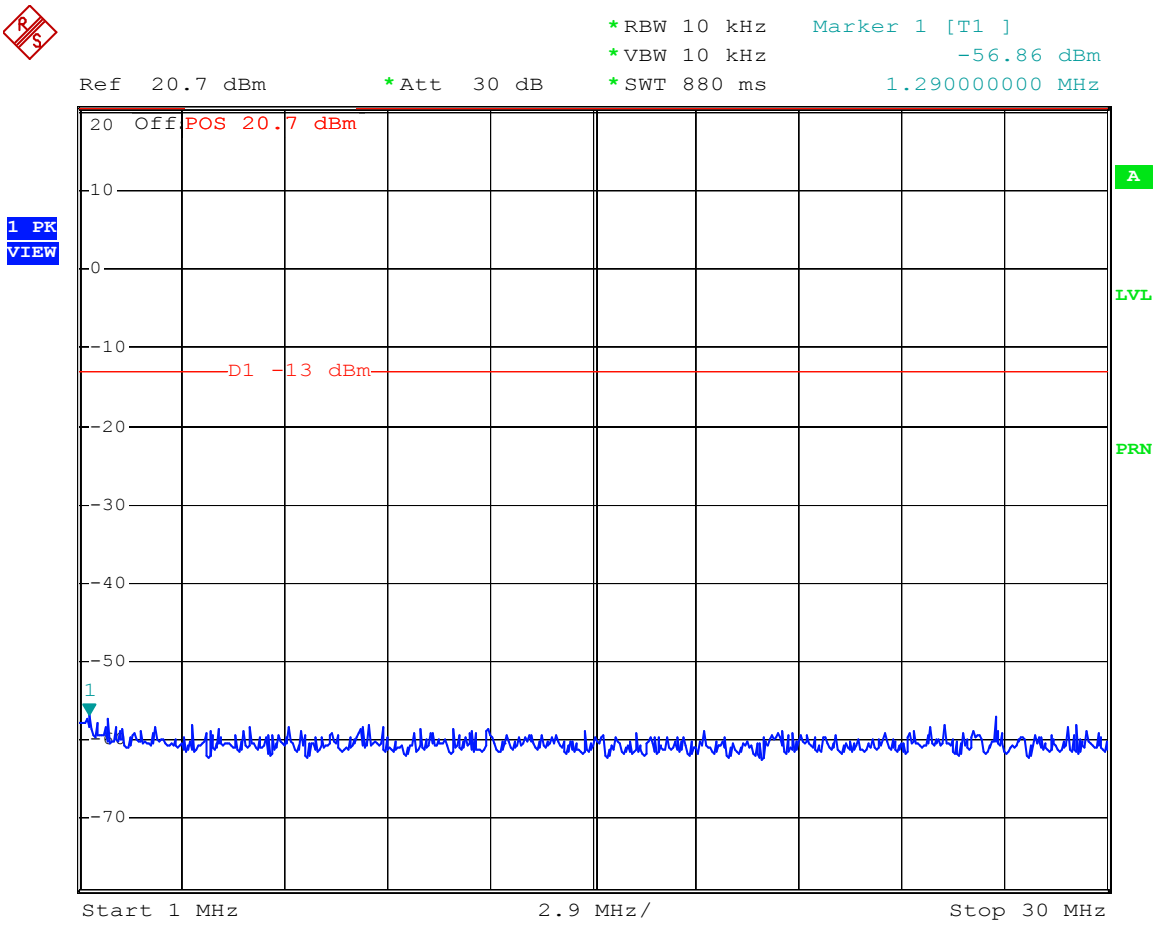
Comment: hi channel, AMPS
Date: 24.JUL.2004 21:59:26

Plot 7.4.c



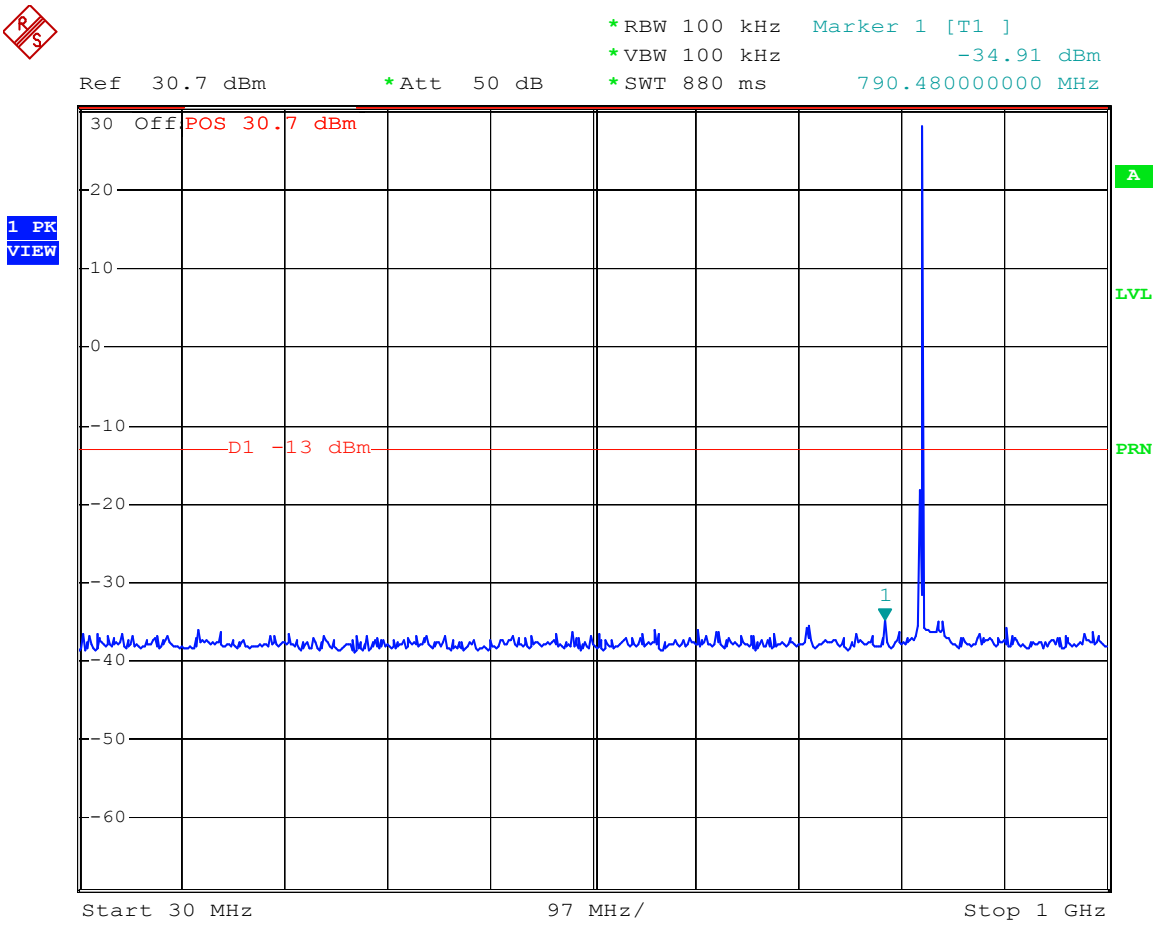
Comment: Hi channel, AMPS
Date: 26.JUL.2004 20:48:27

Plot 7.5.a



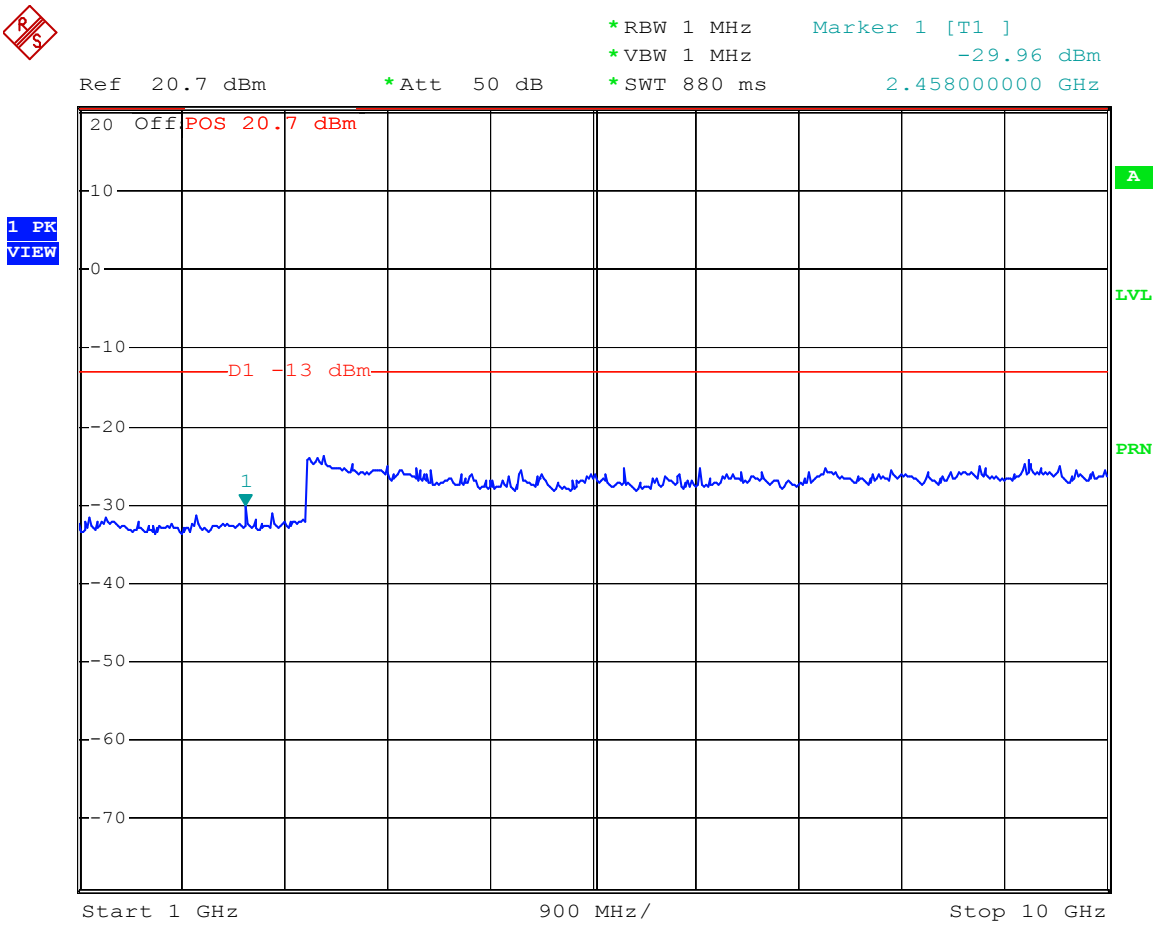
Comment: lo channel, TDMA
Date: 24.JUL.2004 22:24:07

Plot 7.5.b



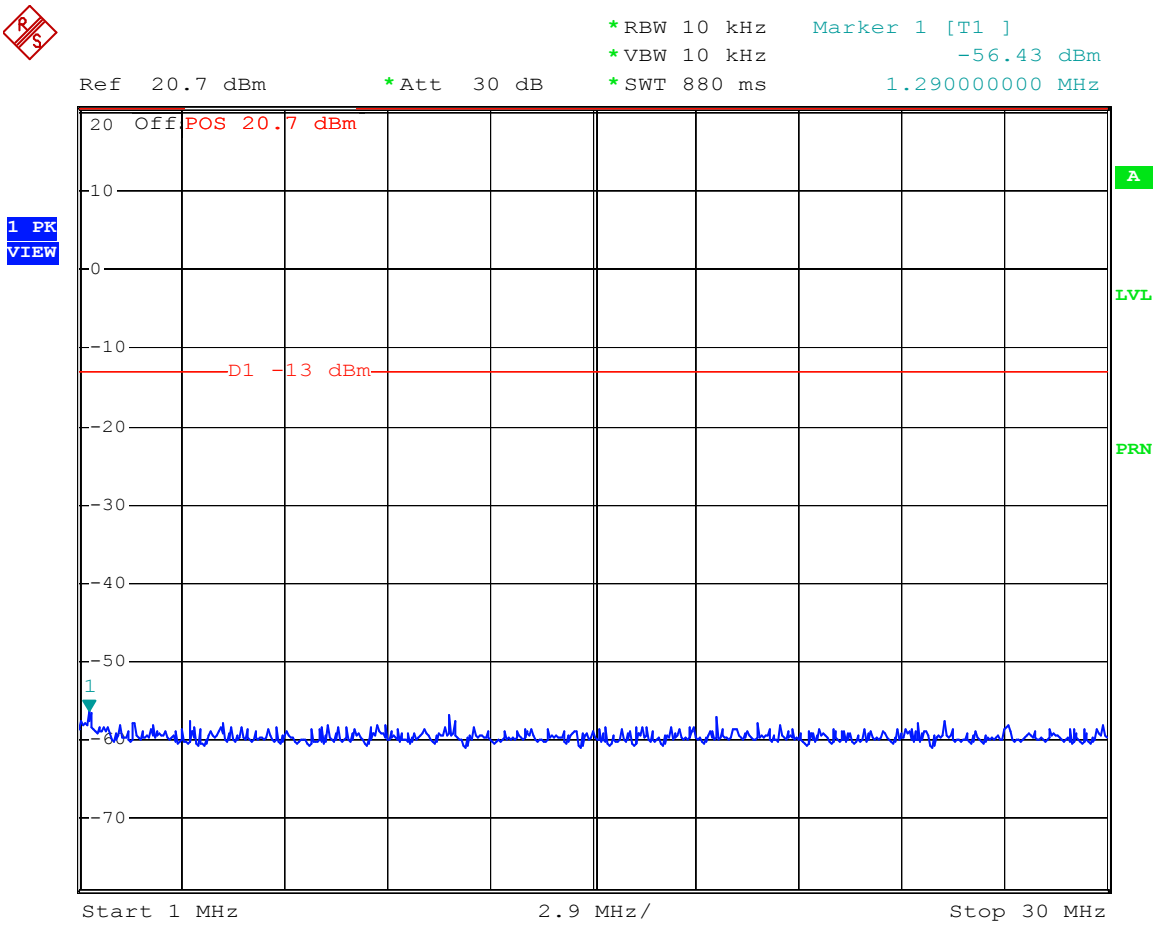
Comment: lo channel, TDMA
Date: 24.JUL.2004 22:19:29

Plot 7.5.c



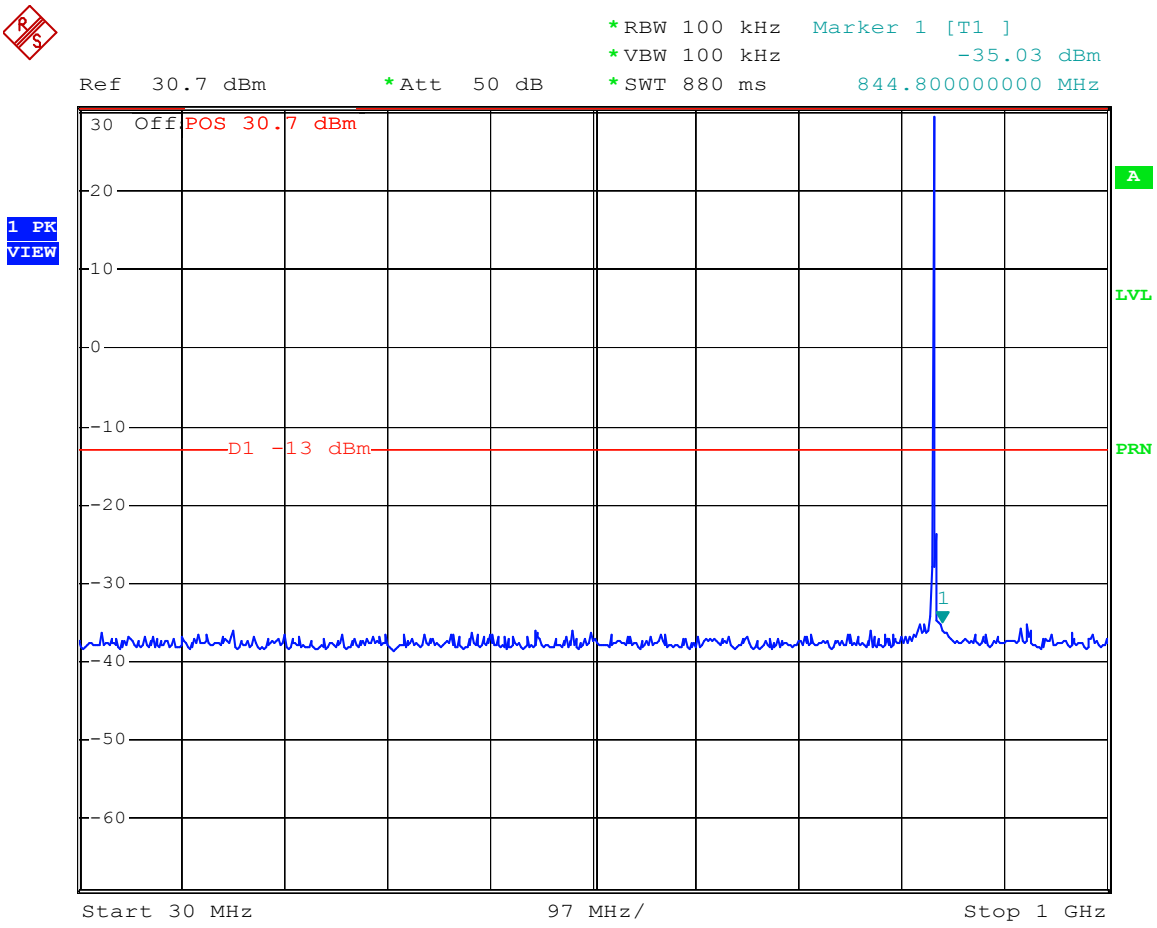
Comment: Low channel, TDMA
Date: 26.JUL.2004 20:53:00

Plot 7.6.a



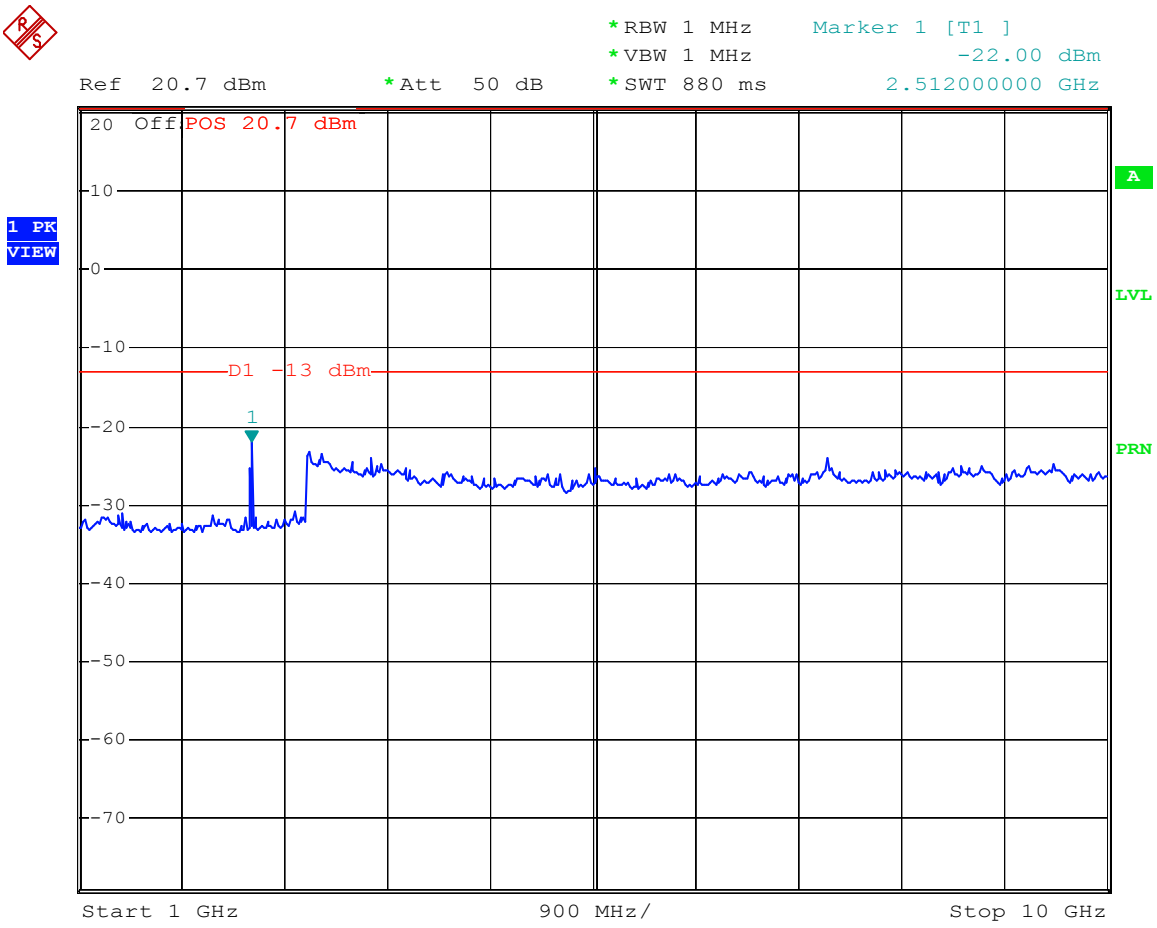
Comment: mid channel, TDMA
Date: 24.JUL.2004 22:25:25

Plot 7.6.b



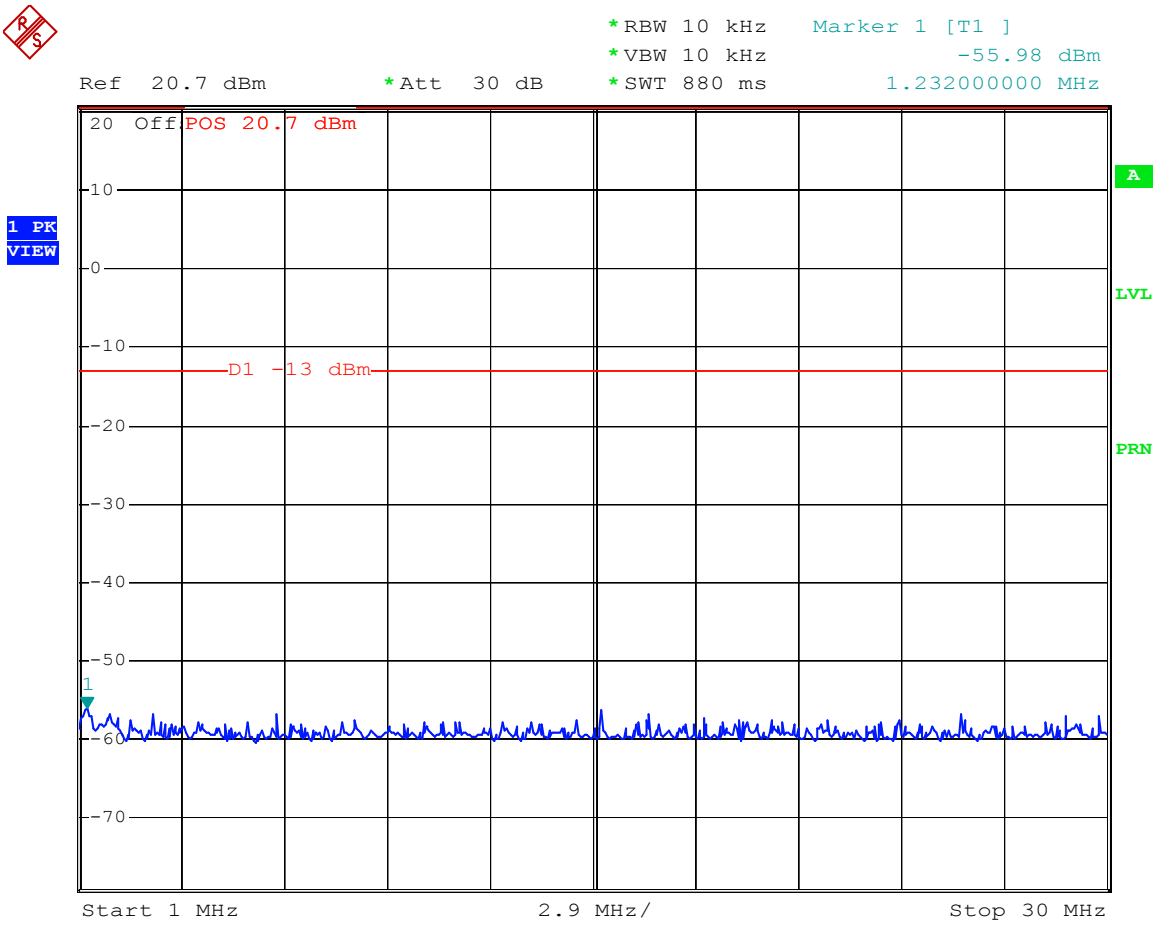
Comment: mid channel, TDMA
Date: 24.JUL.2004 22:26:54

Plot 7.6.c



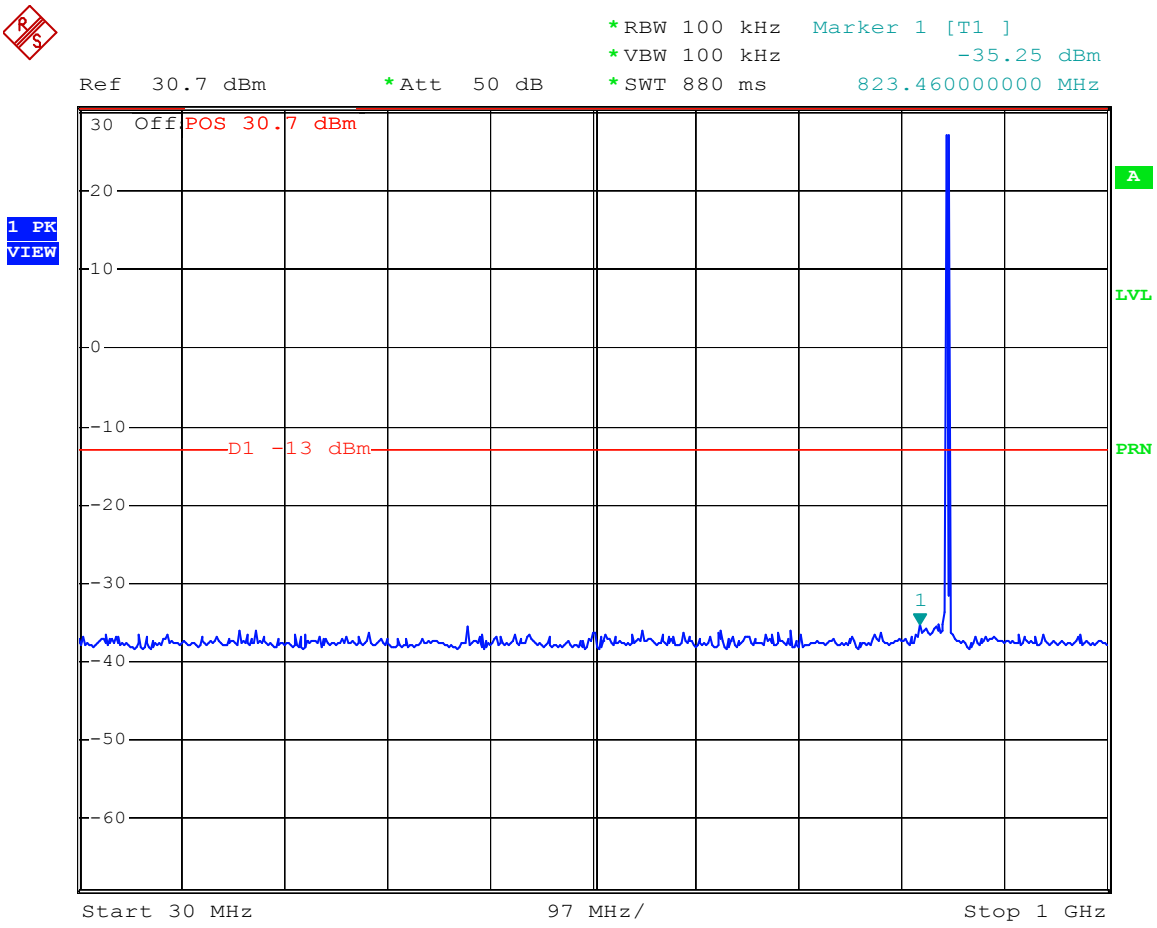
Comment: Mid channel, TDMA
Date: 26.JUL.2004 20:51:04

Plot 7.7.a



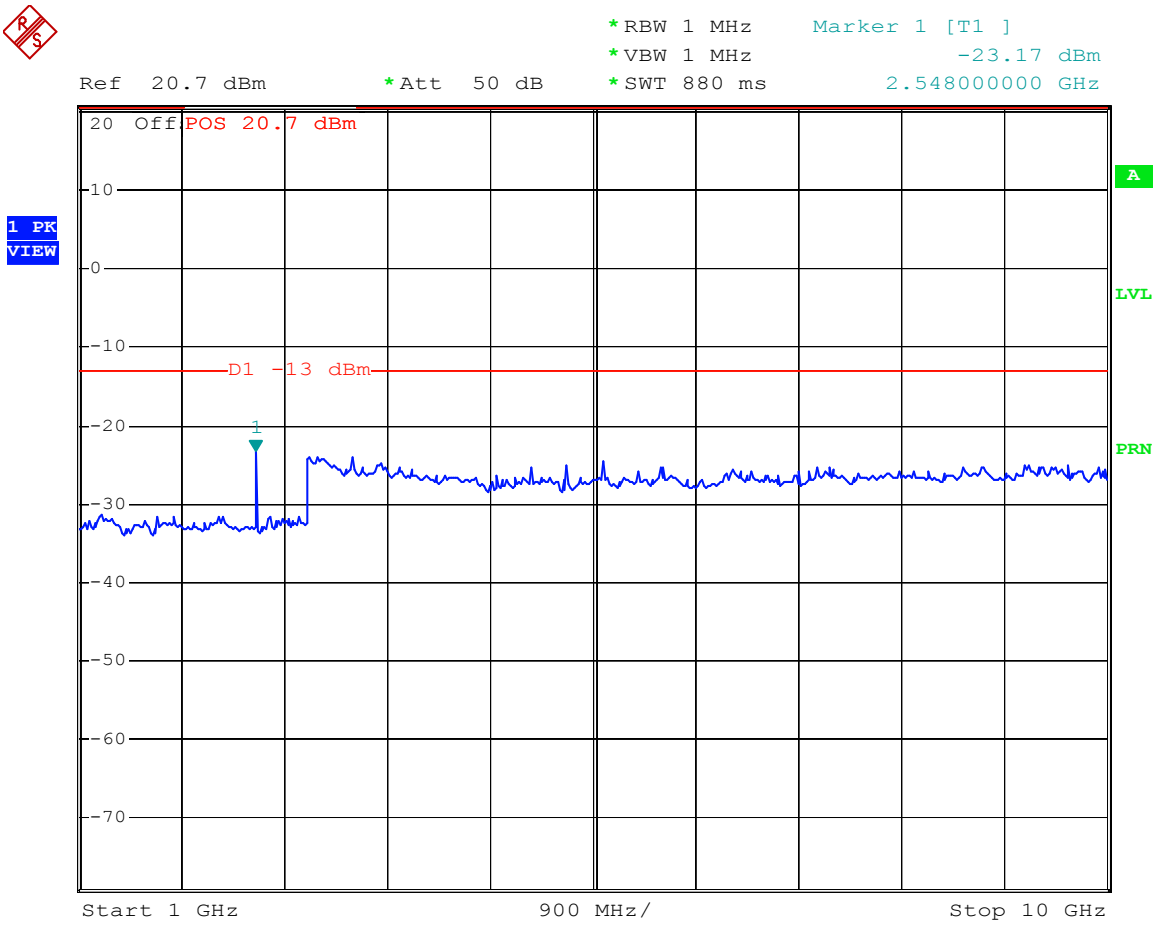
Comment: Hi channel, TDMA
Date: 24.JUL.2004 22:50:44

Plot 7.7.b



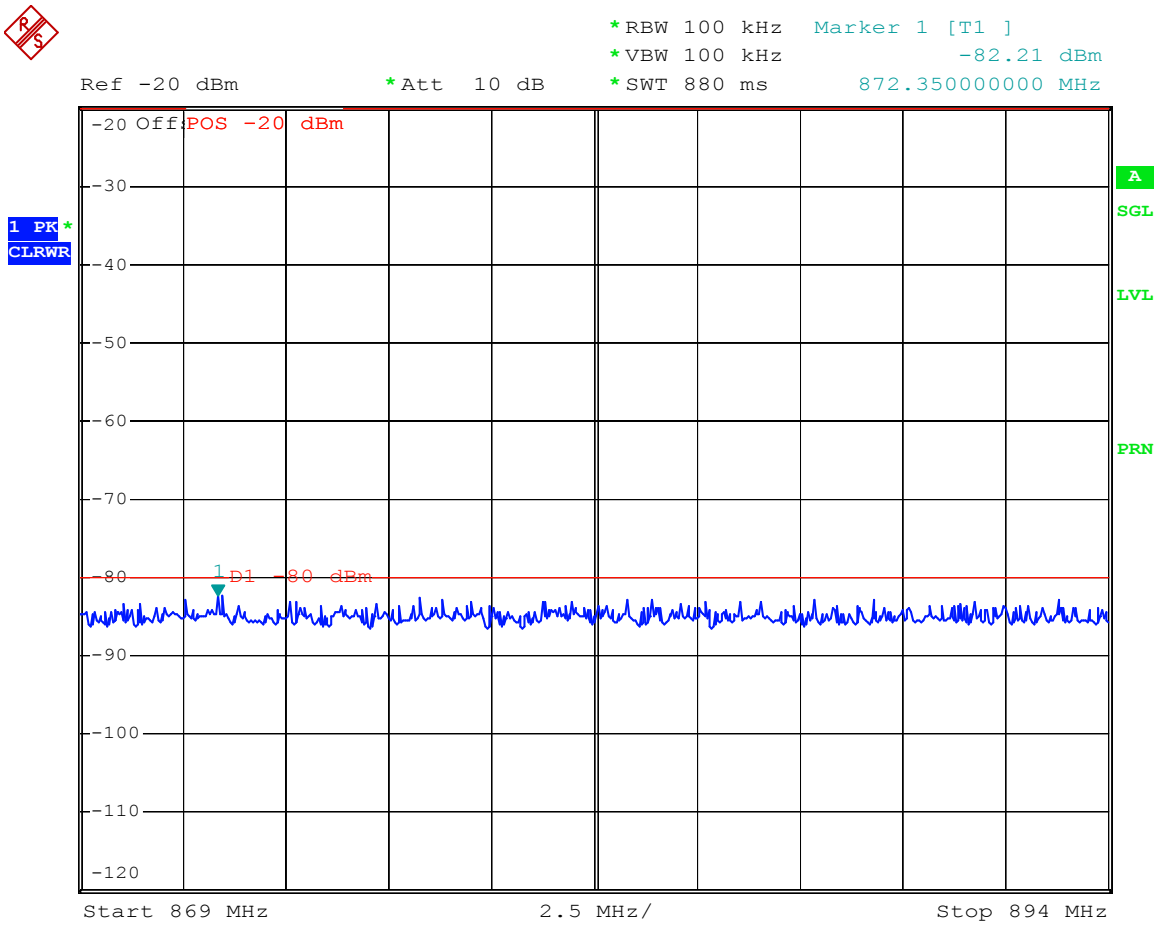
Comment: Hi channel, TDMA
Date: 24.JUL.2004 22:48:15

Plot 7.7.c



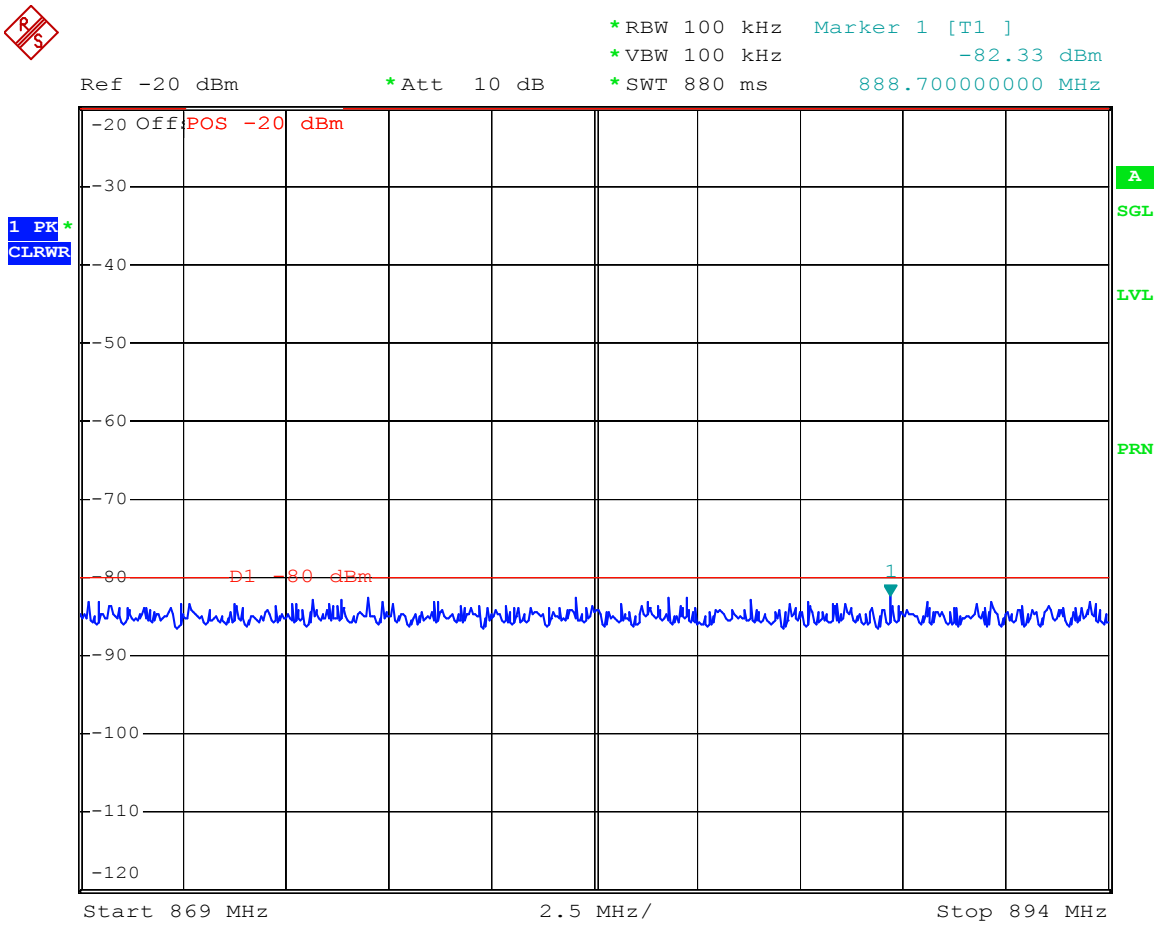
Comment: Hi channel, TDMA
Date: 26.JUL.2004 20:49:50

Plot 7.8.a



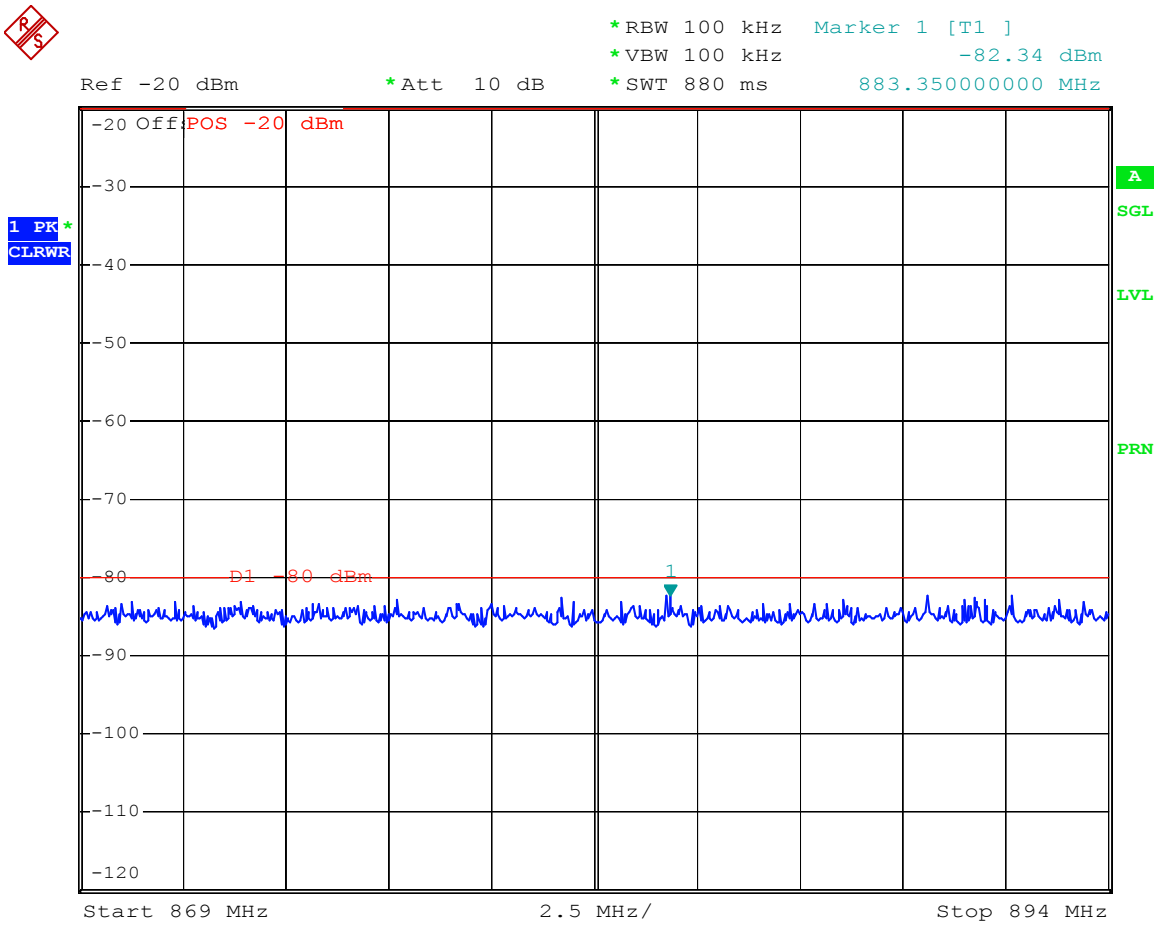
Comment: Low channel, spurious in Rx band
Date: 26.JUL.2004 20:20:59

Plot 7.8.b



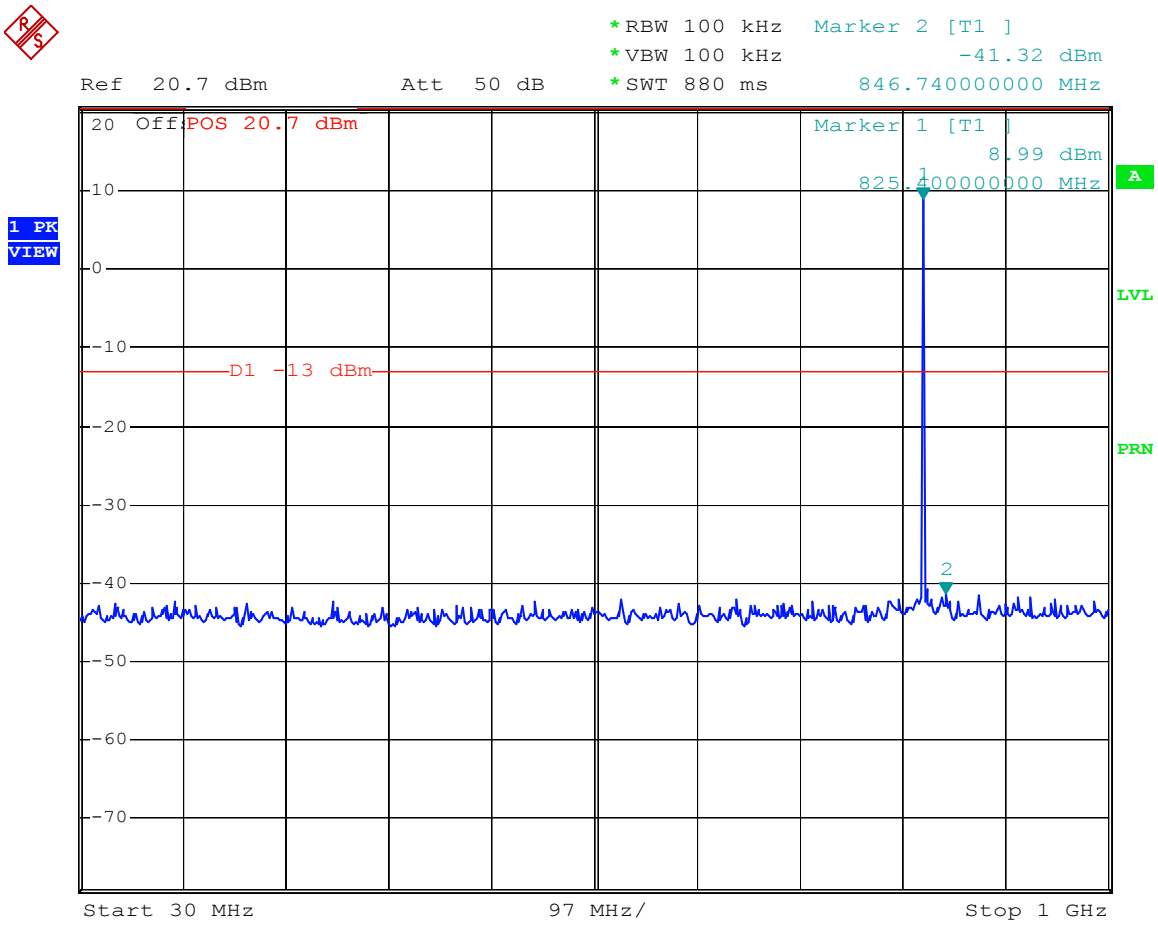
Comment: Mid channel, spurious in Rx band
Date: 26.JUL.2004 20:22:06

Plot 7.8.c



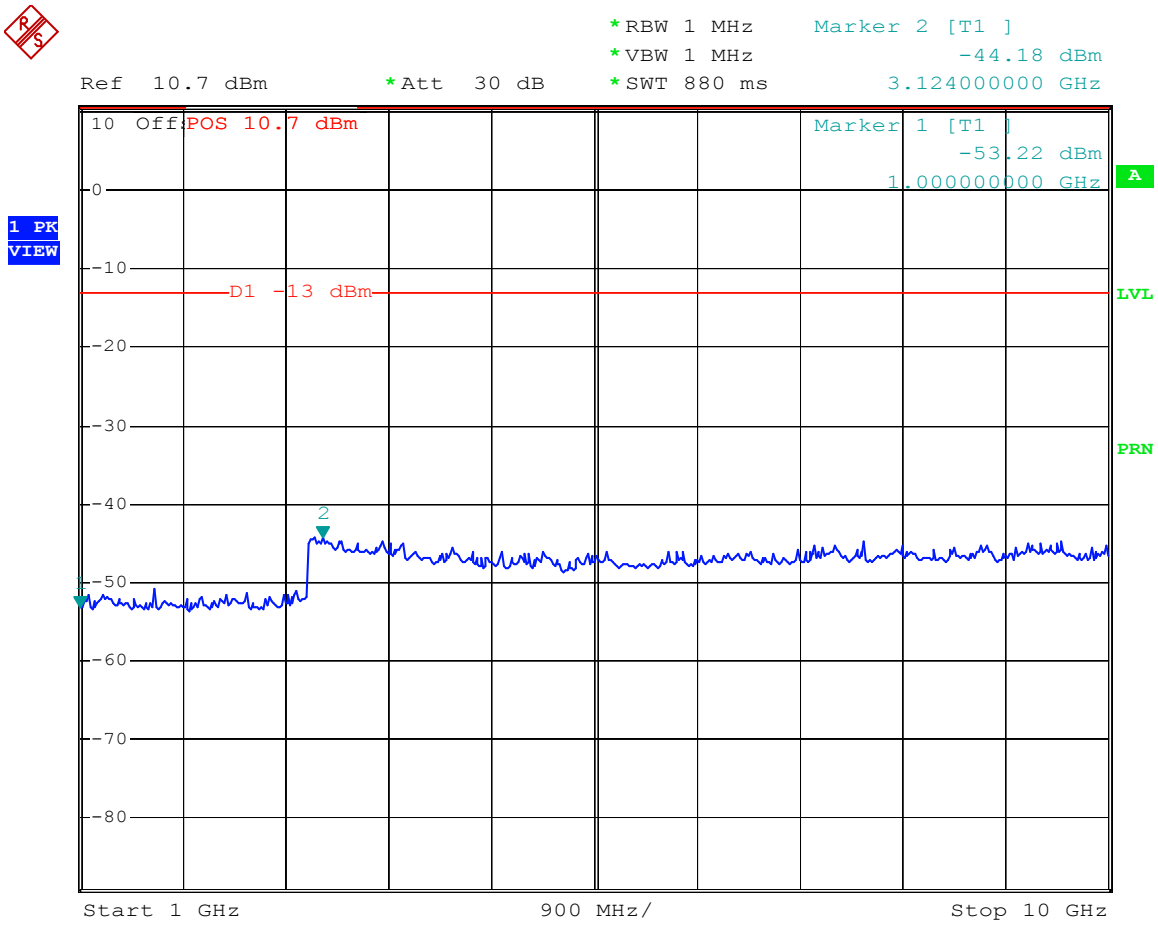
Comment: Hi channel, spurious in Rx band
Date: 26.JUL.2004 20:22:54

Plot 7.9.a



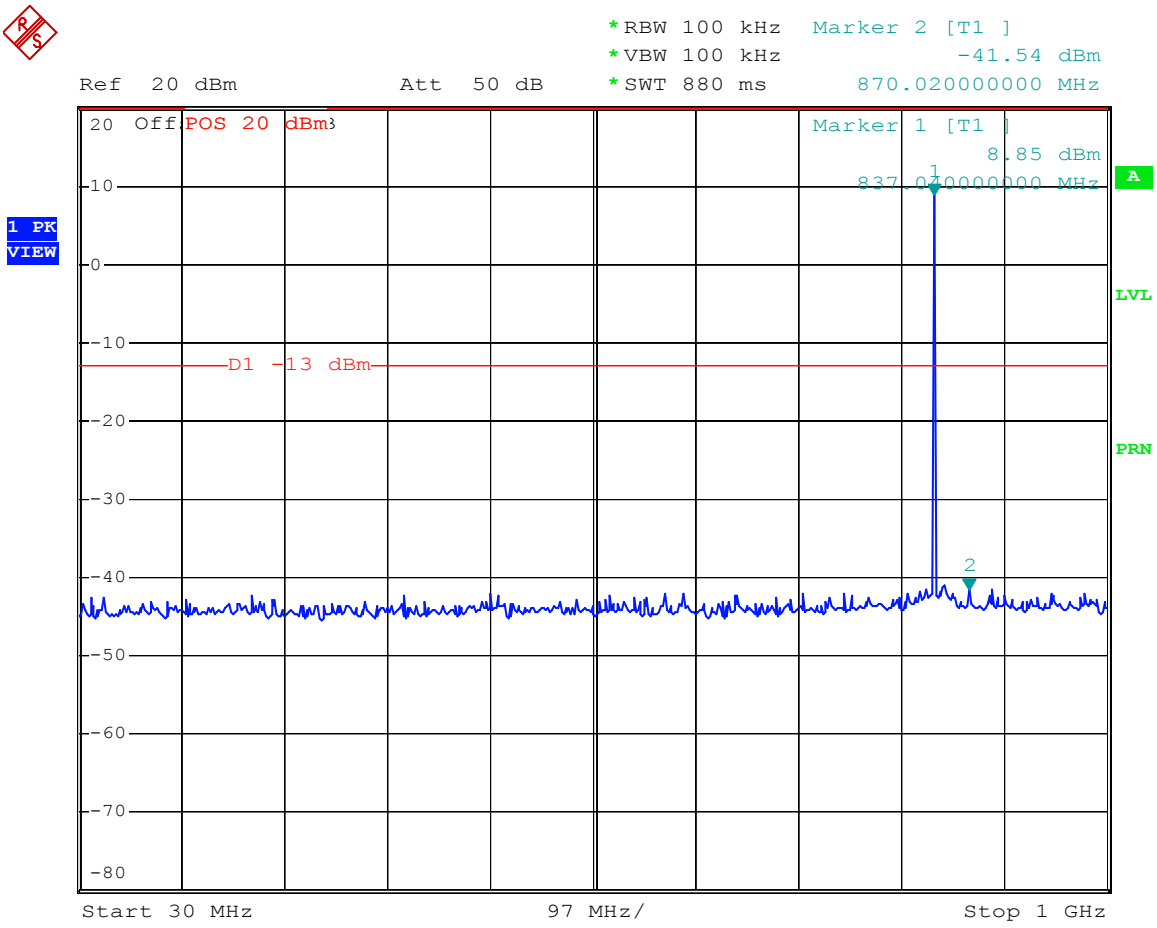
Comment: Low channel, AMPS, low power
Date: 26.JUL.2004 20:30:44

Plot 7.9.b



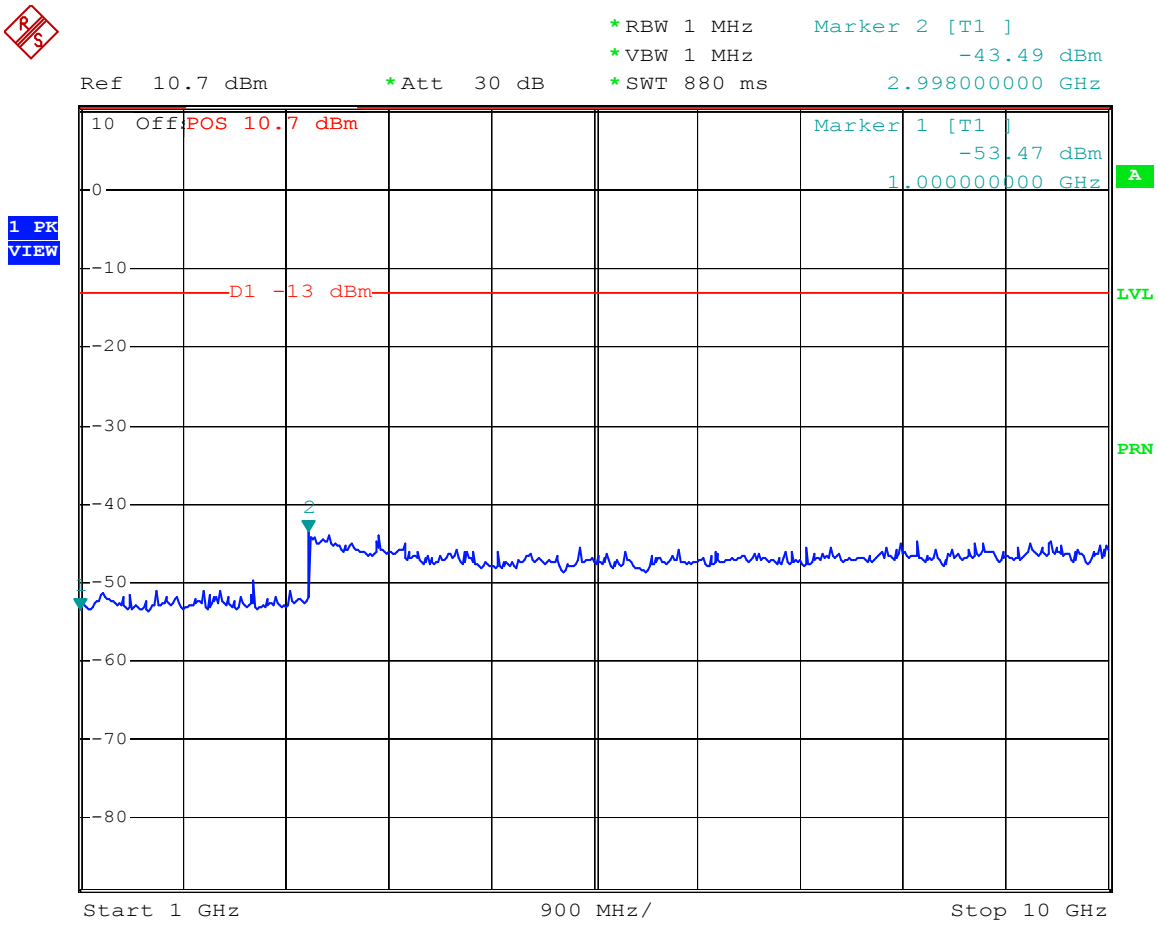
Comment: Low channel, AMPS, low power
Date: 26.JUL.2004 20:32:53

Plot 7.10.a



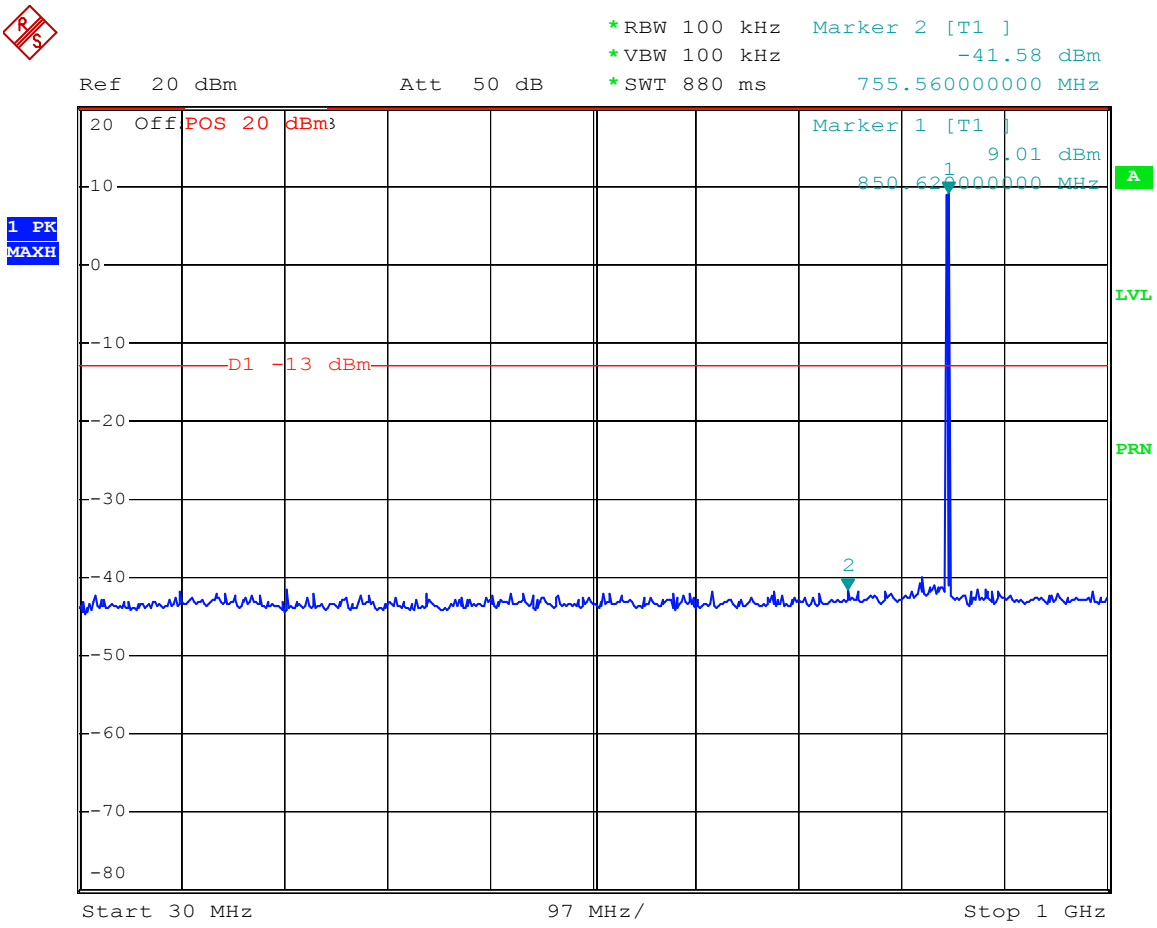
Comment: Mid channel, AMPS, low power
Date: 26.JUL.2004 20:38:49

Plot 7.10.b



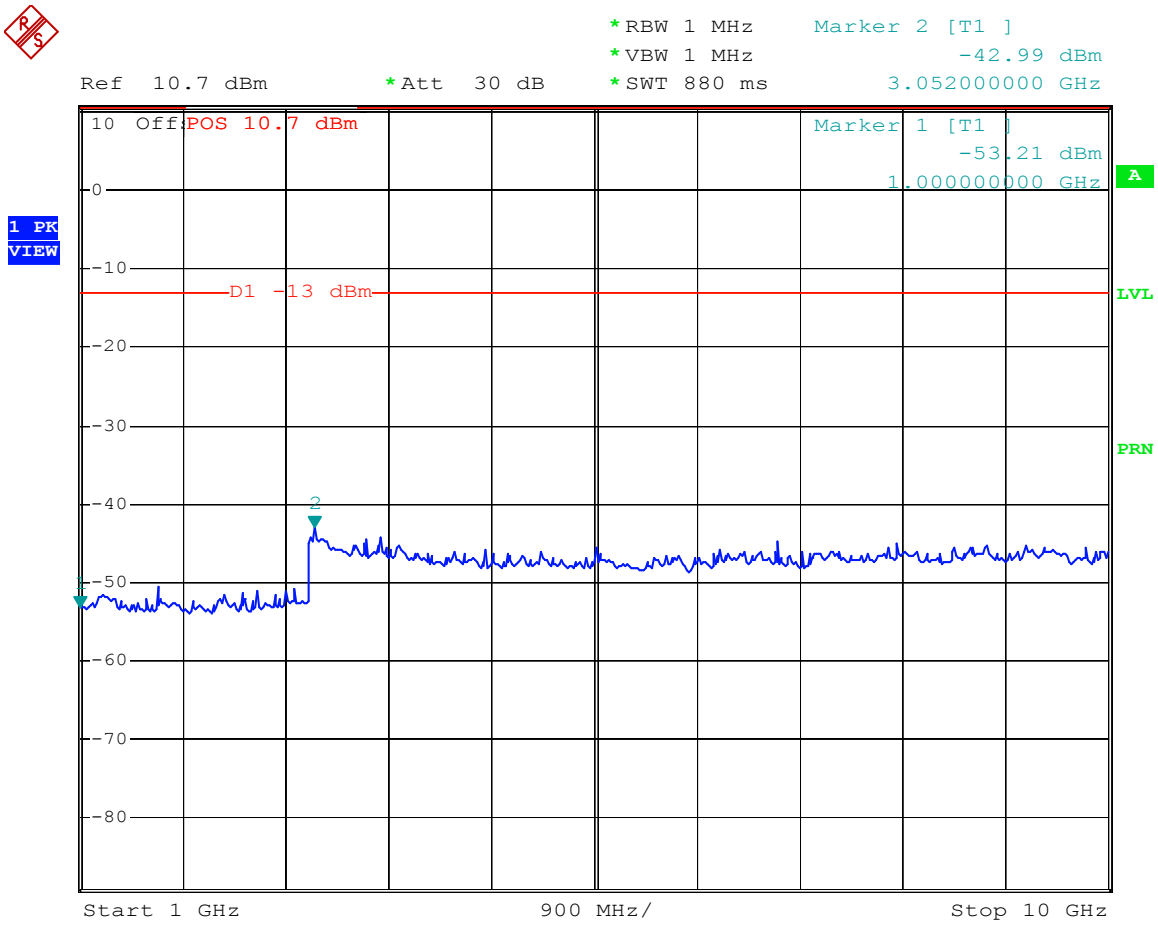
Comment: Mid channel, AMPS, low power
Date: 26.JUL.2004 20:33:56

Plot 7.11.a



Comment: Hi channel, AMPS, low power
Date: 26.JUL.2004 20:37:10

Plot 7.11.b



Comment: Hi channel, AMPS, low power
Date: 26.JUL.2004 20:34:59

8.0 Field Strength of Spurious Radiation

FCC 2.1053

8.1 Test Procedure

The EUT was setup to transmit a maximum power. The accessory headset was connected to the EUT.

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 frequency range up to tenth harmonic of each of the three fundamental frequency (low, middle, and high channels) was investigated. The tests were performed with the EUT placed on three orthogonal axiss; the worst case of emissions was reported.

For spurious emissions attenuation, the substitution method was used. On each frequency where the Field Strength was found above 63.4 dB(μV/m) (which corresponds to ERP = -33 dBm), the EUT was substituted by a reference antenna (half-wave dipole - below 1 GHz, or Horn antenna - above 1GHz), connected to a signal generator. The signal generator output was adjusted to obtain the same reading as from EUT. The ERP at the spurious emissions frequency was calculated as in section 3. The spurious emissions attenuation may be calculated as the difference between ERP at the fundamental frequency and at the spurious emissions frequency.

The emissions from the digital part and receiver of the EUT were measured as well.

8.2 Test Equipment

EMCO 3115 Horn Antennas
R & S FSP40 Spectrum Analyzer
Hewlett Packard HP 83732A Signal Generator
Low Pass Filter
Preamplifier

8.3 Test Results

The test results are reported in the table below. All other emissions not reported are at least v20 dB below the limit.

Effective Radiated Power
(Measured by Substitution Method)

Frequency	Antenna Polariz.	SA Reading (EUT)	Mode	Signal Generator Output required to have the same SA Reading as from EUT	ERP *	ERP Limit
MHz		**dB(µV)**		**V_gdBm**	**dBm**	**dBm**
Channel 824.04 MHz						
1648.1	H	41.3	TDMA	-38.8	-32.4	-13.0
2472.1	H	62.2	TDMA	-46.7	-39.3	-13.0
3296.1	H	59.0	TDMA	-48.0	-40.2	-13.0
4120.2	H	59.5	TDMA	-44.8	-36.8	-13.0
5768.3	H	56.9	TDMA	-42.3	-32.9	-13.0
6592.3	H	57.5	TDMA	-42.6	-32.7	-13.0
Channel 836.52 MHz						
1673.0	H	35.2	TDMA	-44.7	-38.3	-13.0
2509.6	H	69.0	TDMA	-39.8	-32.4	-13.0
3346.1	H	61.8	TDMA	-45.5	-37.7	-13.0
4182.6	H	62.0	TDMA	-42.4	-33.6	-13.0
5019.1	H	53.7	TDMA	-43.3	-34.5	-13.0
5855.6	H	52.0	TDMA	-48.5	-39.1	-13.0
6692.2	H	53.2	TDMA	-46.0	-36.1	-13.0
Channel 848.97 MHz						
1697.9	H	35.7	TDMA	-43.0	-36.6	-13.0
2546.9	H	69.7	TDMA	-39.1	-31.7	-13.0
3395.9	H	67.8	TDMA	-39.3	-31.5	-13.0
4244.9	H	63.9	TDMA	-41.0	-32.2	-13.0
5093.9	H	56.9	TDMA	-41.0	-32.2	-13.0
5942.8	H	54.8	TDMA	-45.8	-36.4	-13.0
6791.8	H	59.5	TDMA	-40.3	-30.4	-13.0

* ERP is calculated as: $ERP_{(dBm)} = V_{g(dBm)} + G_{(dBd)}$

Test Result:	Complies by 18.5 dB

9.0 Radiated Emissions from digital part and receiver

FCC 15.109

9.1 Radiated Emission Limits

The following radiated emission limits apply to Class B unintentional radiators:

Radiated Emissions Limits, Section 15.109

Frequency **(MHz)**	**Class B at 3 m (μV/m)**	**Class B at 10m (dBμV/m)**
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt (dBμV), and microvolts (μV). To convert between them, use the following formulas: 20 LOG_{10} (μV) = dBμV, dBm = dBμV-107.

9.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

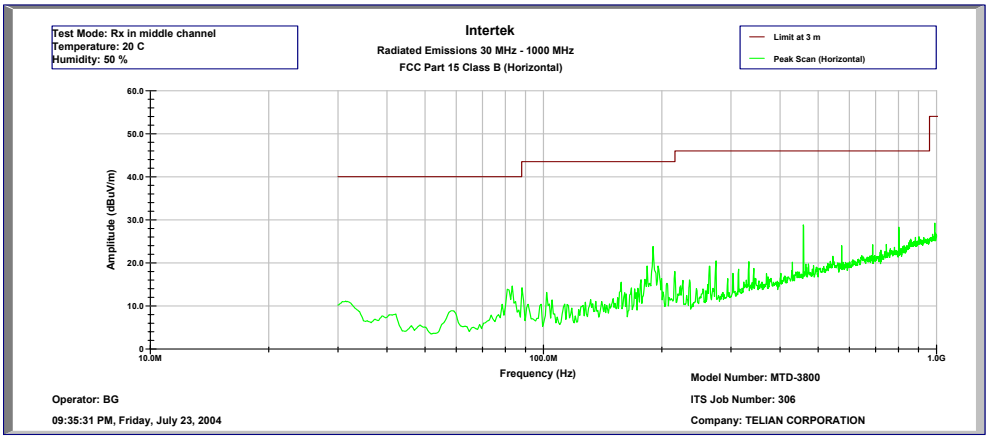
Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m)
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

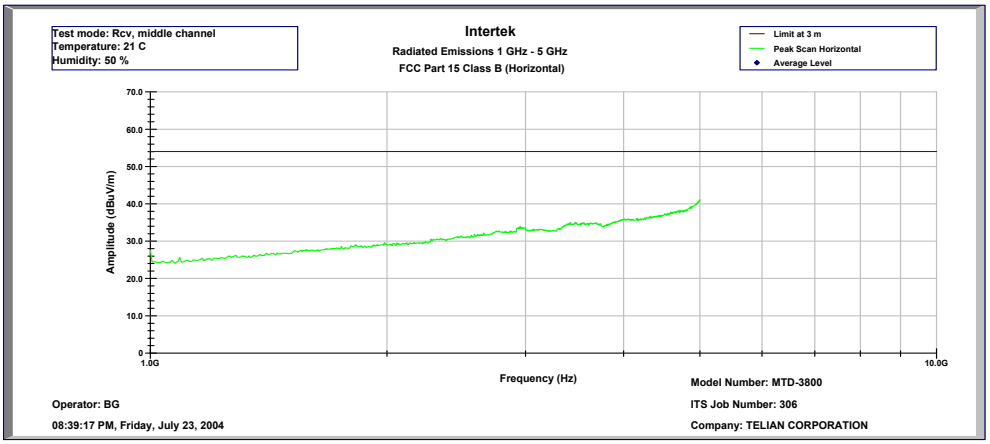
9.3 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in Section 4.

Frequency range investigated is from 30 MHz to 5000 MHz.

Test Result:	Complies by 12.4 dB





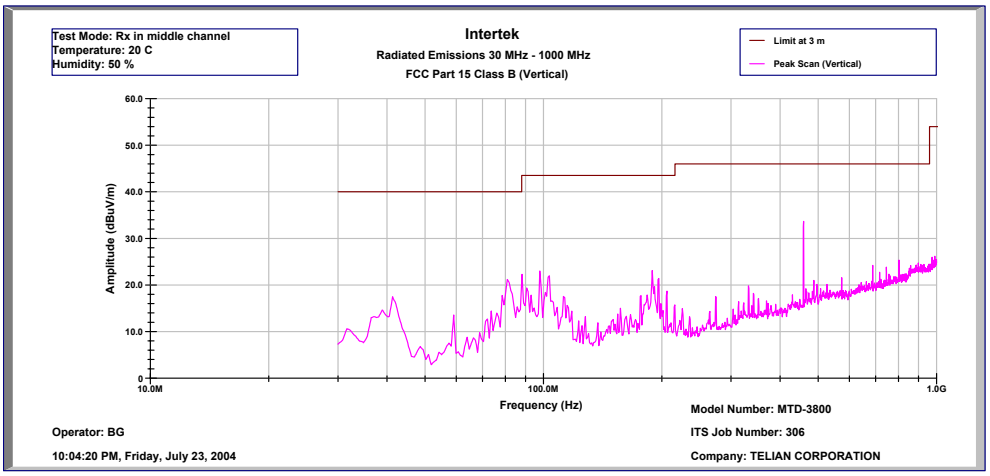
Radiated Emissions 30 MHz – 5000 MHz

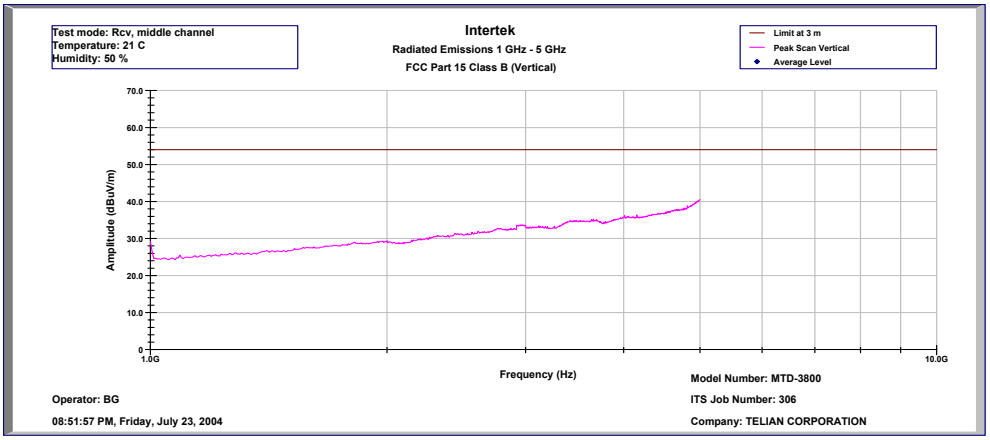
FCC Class B (Horizontal)

EUT Model Number: MTD-3800	ITS Job Number: 3062948
Operator: BG	Test Date: July 23, 2004

Frequency	Pk FS	Limit@3m	Margin	RA	AG	CF	AF
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)
190.05	23.8	43.5	-19.7	41.4	32.3	4.9	9.7
215.92	18.0	43.5	-25.5	33.8	32.2	5.1	11.4
274.93	20.5	46.0	-25.5	34.3	32.2	5.4	12.9
333.13	20.3	46.0	-25.7	31.5	32.2	5.7	15.3
458.42	28.8	46.0	-17.2	37.1	32.3	6.2	17.9
801.96	28.3	46.0	-17.7	31.5	32.4	7.3	21.9
989.49	29.2	54.0	-24.8	28.2	31.2	8.3	23.9

Test Mode: Rx middle ch.	Temperature: 21 C	Humidity: 50%





Radiated Emissions 30 MHz – 5000 MHz

FCC Class B (Vertical)

EUT Model Number: MTD-3800	ITS Job Number: 3062948
Company: Telian Corporation	Test Date: July 23, 2004
Operator: BG	

Frequency	Pk FS	Limit@3m	Margin	RA	AG	CF	AF
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)
80.925	21.2	40.0	-18.8	42.8	32.3	4.2	6.5
88.200	22.3	43.5	-21.2	42.5	32.3	4.3	7.8
97.900	23.0	43.5	-20.5	43.6	32.3	4.4	7.4
103.56	22.0	43.5	-21.5	42.6	32.3	4.4	7.3
189.24	23.1	43.5	-20.4	40.8	32.3	4.9	9.7
459.23	33.6	46.0	-12.4	42.8	32.3	5.2	16.9

Test Mode: Rx middle ch.	Temperature: 21 C	Humidity: 50%

10.0 Line Conducted Emissions, FCC 15.107

10.1 Test Procedure

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to the charger, that was connected to the AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

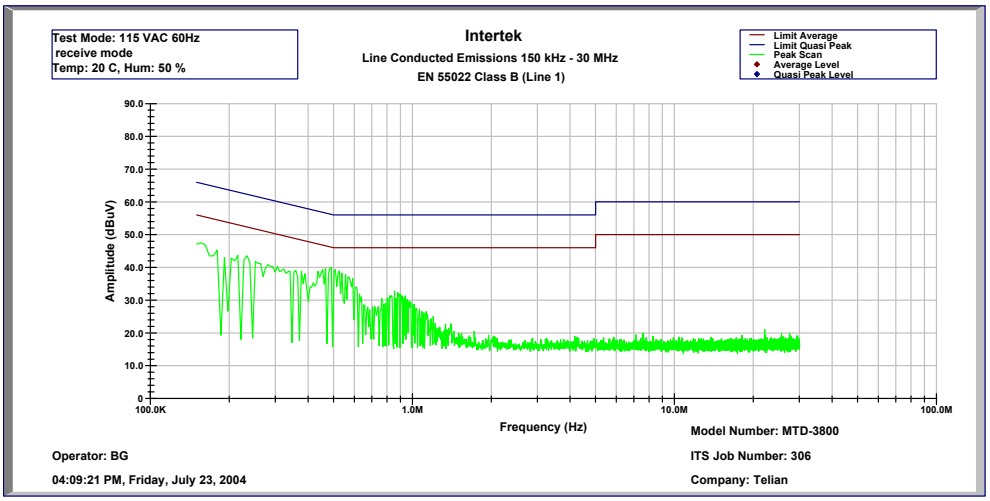
10.2 Test Equipment

HP8568B Spectrum Analyzer
FCC LISN

10.3 Test Results

See the attached plots.

Test Result:	Complies by 4.2 dB



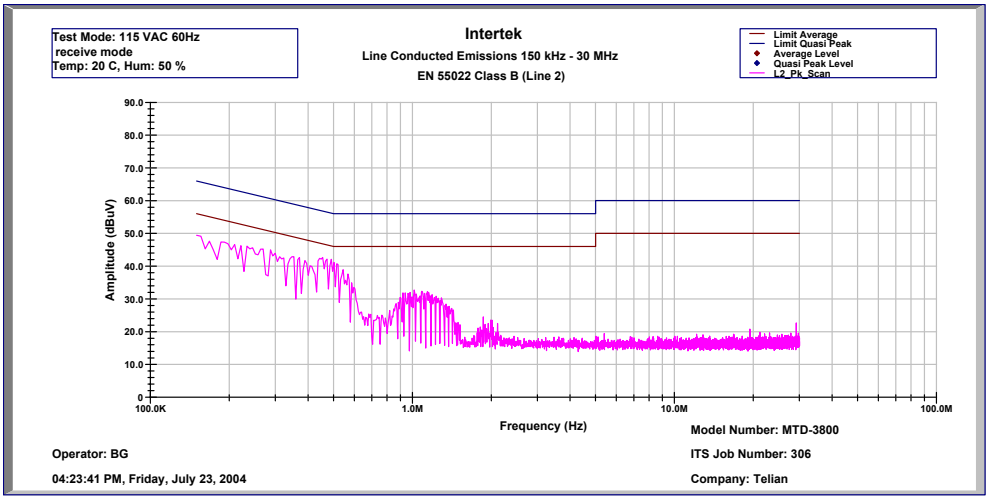
Line Conducted Emissions 150 kHz – 30 MHz

EN55022 Class B (Line 1)

EUT Model Number: MTD-3800	ITS Job Number: 306
Company: Telian Corporation	Test Date: July 23, 2004
Operator: BG	

Frequency	Pk Measurement	Avg Limit	QP Limit	Margin
MHz	dB(uV)	dB(uV)	dB(uV)	dB
0.466410	39.6	47.0	57.0	-7.3
0.490290	39.9	46.3	56.3	-6.4
0.508200	39.3	46.0	56.0	-6.7
0.538050	38.3	46.0	56.0	-7.7
0.555960	37.8	46.0	56.0	-8.2
0.567900	37.1	46.0	56.0	-8.9

Test Mode: Rcv, 115V, 60 Hz	Temperature: 20 C	Humidity: 50%



Line Conducted Emissions 150 kHz – 30 MHz

EN55022 Class B (Line 2)

EUT Model Number: MTD-3800	ITS Job Number: 306
Company: Telian Corporation	Test Date: July 23, 2004
Operator: BG	

Frequency	Pk Measurement	Avg Limit	QP Limit	Margin
MHz	dB(uV)	dB(uV)	dB(uV)	dB
0.233580	46.1	53.6	63.6	-7.5
0.287310	45.0	52.1	62.1	-7.1
0.347010	42.9	50.4	60.4	-7.5
0.370890	42.6	49.7	59.7	-7.1
0.388800	41.7	49.2	59.2	-7.5
0.454470	42.6	47.3	57.3	-4.7
0.490290	42.1	46.3	56.3	-4.2
0.514170	40.7	46.0	56.0	-5.3
0.544020	38.9	46.0	56.0	-7.1

Test Mode: Rcv, 120V, 60 Hz	Temperature: 20 C	Humidity: 50%

11.0 Frequency Stability vs Temperature

FCC 2.1055, 22.355

Frequency Tolerance: 2.5 ppm

11.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

11.2 Test Equipment

Temperature Chamber, -30^0C to $+70^0$C
Leader LDC-825 Frequency Counter
DC Power Supply

11.3 Test Results

Test Result:	Complies

Tx Frequency: 836.520000 MHz
Tolerance: +/- 2091.3 Hz

Temperature (°C)	Measured Frequency (MHz)	Difference (Hz)
50	836.519830	-170
40	836.519870	-130
30	836.520030	30
20	836.520100	100
10	836.520500	500
0	836.520720	720
-10	836.520740	740
-20	836.520650	650
-30	836.520700	700

Maximum variation is 0.43 ppm

12.0 Frequency Stability vs Voltage

FCC 2.1055, 22.355

Frequency Tolerance: 2.5 ppm

12.1 Test Procedure

An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminates; i.e., the battery end point. The output frequency was recorded for each battery voltage.

12.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
DC Power Supply

12.3 Test Results.

Test Result:	Complies

Tx Frequency: 836.52 MHz
Tolerance: +/- 2091.3 Hz

Supply (Battery) Volts	Measured Frequency (MHz)	Difference (Hz)
3.3	836.520280	280
3.8	836.520100	100
4.37	836.520070	70

Maximum variation is 0.43 ppm

13.0 Test Equipment

Measurement equipment used for compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	9/09/04
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	9/08/04
Spectrum Analyzer	Rohde & Schwarz	FSP40	036612004	12	2/04/05
Spectrum Analyzer	Hewlett Packard	3585	-	12	11/17/04
Modulation Analyzer	Hewlett Packard	8901A	3435A06709	12	11/18/04
Dipole Antenna	CDI	Roberts	332	12	9/27/04
BI-Log Antenna	EMCO	3143	9509-1160	12	10/01/04
Double-ridged Horn Antenna	EMCO	3115	9170-3712	12	8/02/04
Double-ridged Horn Antenna	EMCO	3115	8812-3049	12	4/08/05
Pre-Amplifier	Sonoma Inst.	310	185634	12	9/21/04
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	9/06/04
Signal Generator	Hewlett Packard	83732A	3222A00119	12	3/04/05
Pulse/Function generator	Hewlett Packard	HP8116A	-	12	11/05/04
AC Millivoltmeter	Leader	LMV-181A	0037718	12	4/01/05
Frequency Counter	Leader	LDC-825	1010046	12	9/08/04
LISN	FCC	FCC-LISN-50-50-M-H	2012	12	1/23/05

14.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 /3062948	DC	July 30, 2004	Original document