ITS Intertek Testing Services

FCC Part 22 Type Acceptance

Performed on the

Cellular Phone
Model: DMC 201
For
Tottori Sanyo Electric Co., Ltd.
FCC ID: NRNDMC200

Da te of Test: May 27 & 28, 1999 & July 7, 1999

Report #: J99013163

Total No. of Pages Contained in this Report: 18 + data pages

NVLAP®

Intertek Testing Services NA Inc.
1365 Adams Court, Menlo Park, CA 94025
Telephone 650-463-2900 Fax 650-463-2910 Home Page www.worldlab.com

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Tested By: Xi-Ming Yang 7/27/99
Xi-Ming Yang Date

Approved By: 7/27/99
C.K. Li Date

1.2 Product Description

The Tottori Sanyo Electric Co., Ltd. Model DMC 201 is a CDMA Digital/Analog cellular phone.

Use of Product	Portable Cellular Phone
Whether quantity (> 1) production is planned	[X] Yes, [ ] No
Cellular Phone standards	[X] AMPS [ ] NAMPS [ ] CDPD [ ] TDMA [X] CDMA
Type(s) of Emission	40K078W, 40K0F1D, 1M25F9W (CDMA)
Allowed Deviation	12± 10%
Range of RF Output	479 (Mps) 200 mW (CDMA)
The dc voltage applied to and current into the several elements of the final RF amplifying device	*Voltage:* 3.2 - 4.2V *Current:* 900 mA
Frequency Range	824.4 - 848.97 (Amps) 824.7 - 848.3 (CDMA)
Antenna(e) & Gain	0 dBi
Detachable antenna ? Receiver L.O. frequency External input	[ ]Yes [X] No [X] Audio [ ] Digital Data

1.3 Related Submittal(s) Grants

[X] None

[ ] DOC for computer section, a separate DOC is prepared.

6. Specifications

MODEL No. DMC201

SPECIFICASIONS

1,GENERAL

Item	*Spec*
Operating temperature	-30~60℃
Storage temperature	-40~80℃
Supply voltage	3.2~4.2V
Current consumption ①Power switched off ②AMPS at stand by ③CDMA at stand by ④AMPS transmitting at maximum power of 0.6W ⑤CDMA transmitting at maximum power of 0.2W ⑥Weight ⑦Dimensions	 ①Less than 1mA ②About 75mA ③About 110mA (max) ④About 900mA ⑤About 720mA (max) ⑥About 122 (g) ⑦W*H*D= 44.8*129.0*24.6 (mm)

2, ELECTRICAL

[1] AMPS Transceiver features

Item	*Spec*
Transceiver frequency range	824.04~848.97MHz
Receiving frequency range	869.04~893.97MHz
Duplex spacing	45MHz
Channel spacing	30kHz
Rx first IF frequency	85.38MHz
Tx IF frequency	130.38MHz
Number of channels	832 duplex operation

[2] CDMA Transceiver features

Item	*Spec*
Transceiver frequency range	824.70~848.31MHz
Receiving frequency range	869.70~893.31MHz
Duplex spacing	45MHz
Rx first IF frequency	85.38MHz
Tx IF frequency	130.38MHz

[3] AMPS transmitter

Item	*Spec*
RF output power	0.6W~6.3mW(6levels in 4dB steps) tolerance +2, -4dB
Spurious emissions at antenna connector inside cellular band	①Less than -43dBm fc=±90kHz, B=30kHz ②Less than -80dBm f=869~894MHz
Tx on/off delay	Less than 2ms
Modulation distortion	Less than -26dB at 1kHz audio, ±8kHz deviation
Wideband data deviation	±8kHz ±0.8kHz
ST frequency deviation	±8kHz ±0.8kHz
SAT frequency deviation	±2kHz ±0.2kHz
DTMF deviation	4.5peak radians ±10%

[4] CDMA transmitter

Item	*Spec*
Maximum RF output power	0.2W
Minimum RF output power	Less than -50dBm/1.23MHz
Frequency accuracy	±300Hz

[5] AMPS receiver

Item	*Spec*
Sensitivity	Less than -116dBm (12dB SINAD)
Distortion	Less than -26dB
S/N	More than 32dB
Selectivity	More than 65dB fr±60kHz
AM attenuation	More than 26dB
Intermodulation performance	More than 60dB
Spurious supression	More than 60dB
Spurious emissions	Less than -80dB at 869~894MHz
RSSI dynamics	More than 60dB

[6] CDMA receiver

Item	*Spec*
Receiver sensitivity	Less than -104dBm/1.23MHz
Single tone desensitization	Less than -101dBm/1.23MHz
Intermodulation spurious response attenuation	More than 58dB
Conducted spurious emissions	Less than -81dBm at 869~894MHz Less than -61dBm at 824~849MHz Less than -47dBm all other Frequency
Radiated spurious emissions	Less than -45dBm (25~70MHz) Less than -41dBm (70~130MHz) Less than -41dBm (130~174MHz) Less than -32dBm (174~260MHz) Less than -32dBm (260~470MHz) Less than -21dBm (470~1000MHz)

[7] Battery pack

Item	*Spec*
Capacity	1400mAh
Battery Packing	3.6V, 1400mAh, Li-ion Rechargeable

2.0 **RF Power Output**, FCC §2.985(a), §22.913

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. An HP power meter was also used to measure the RF power.

Tests were performed at three frequencies (low, middle, and high channels) and on all power levels which can be setup on the transmitters.

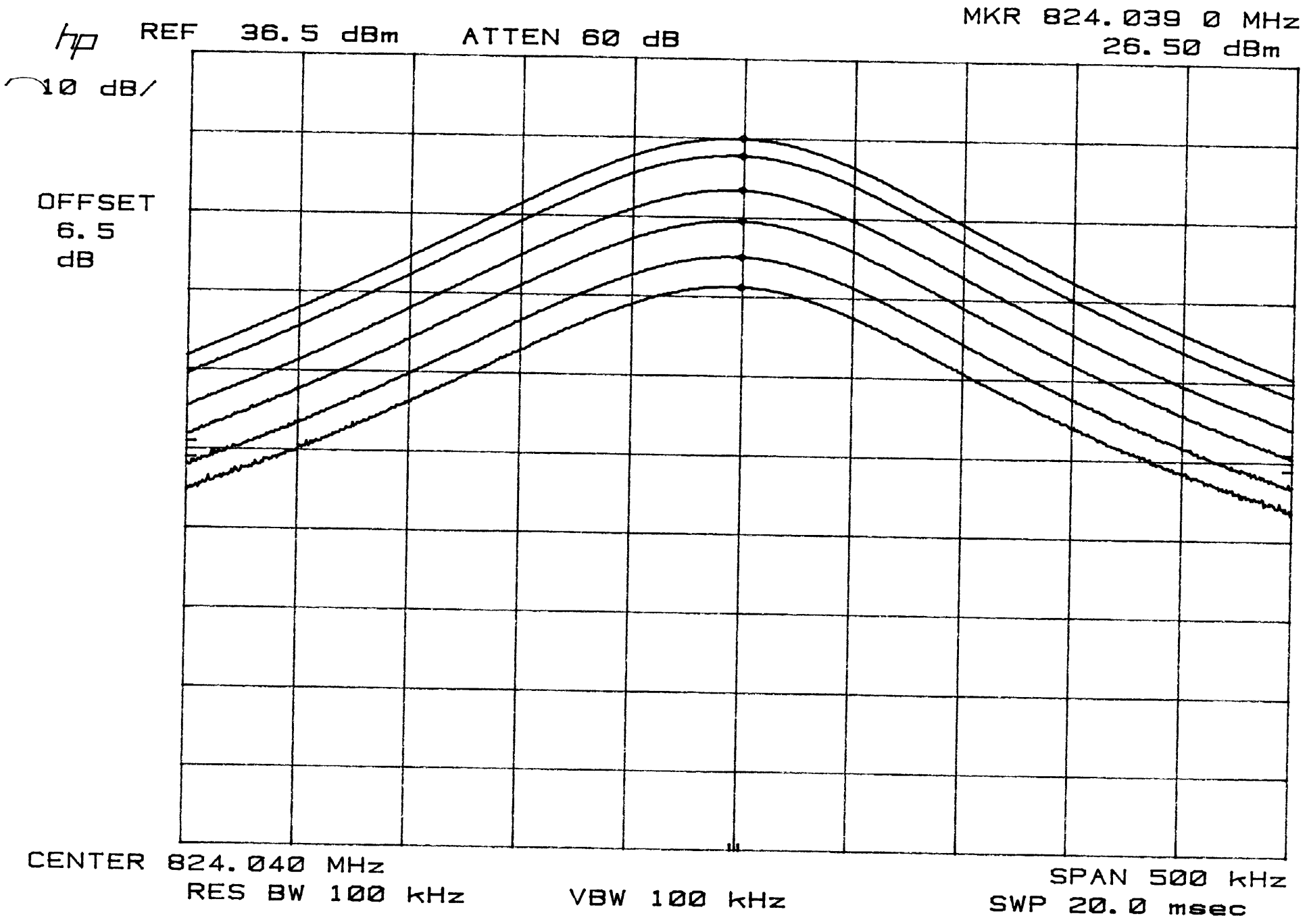
2.2 Test Equipment

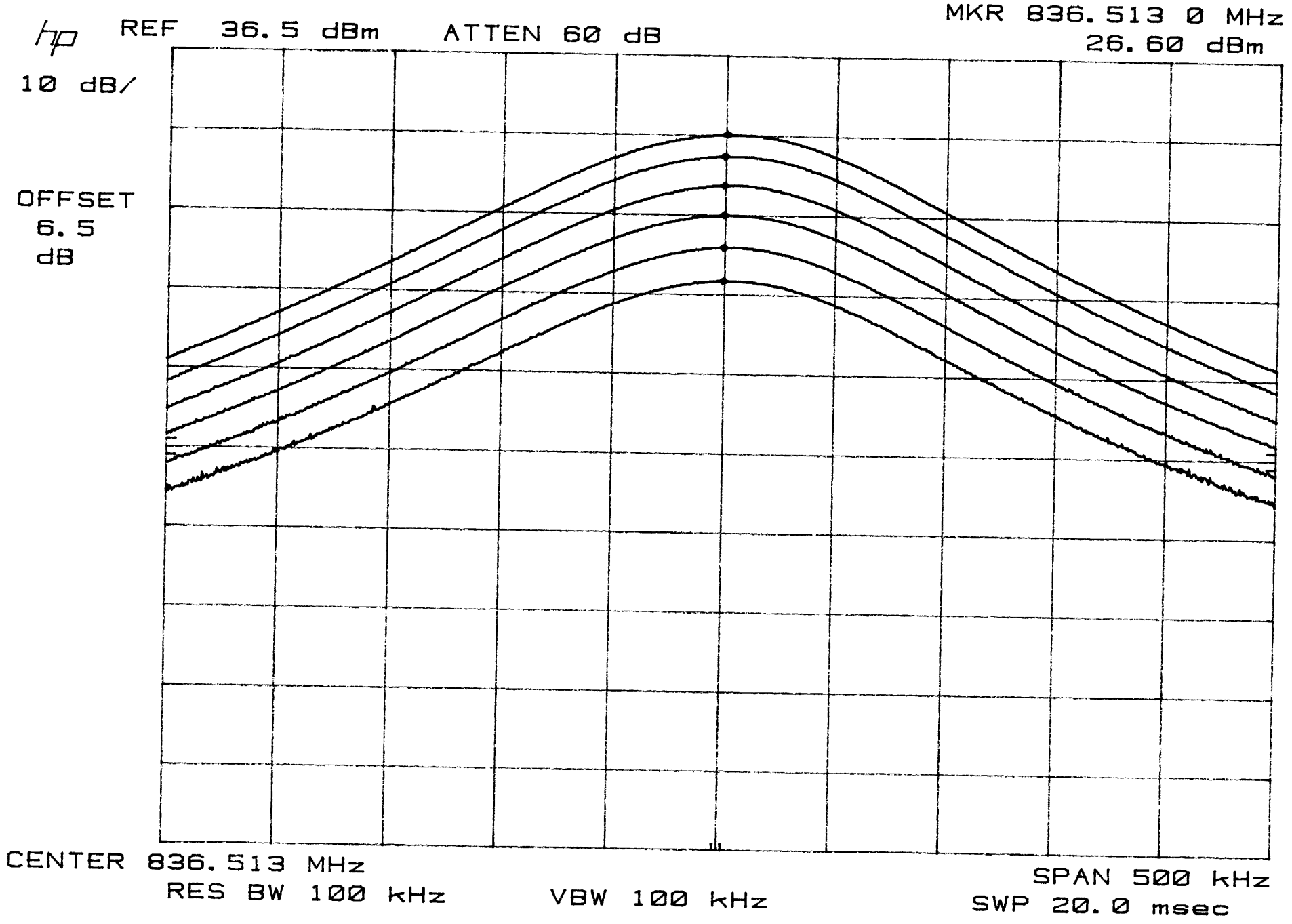
Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782

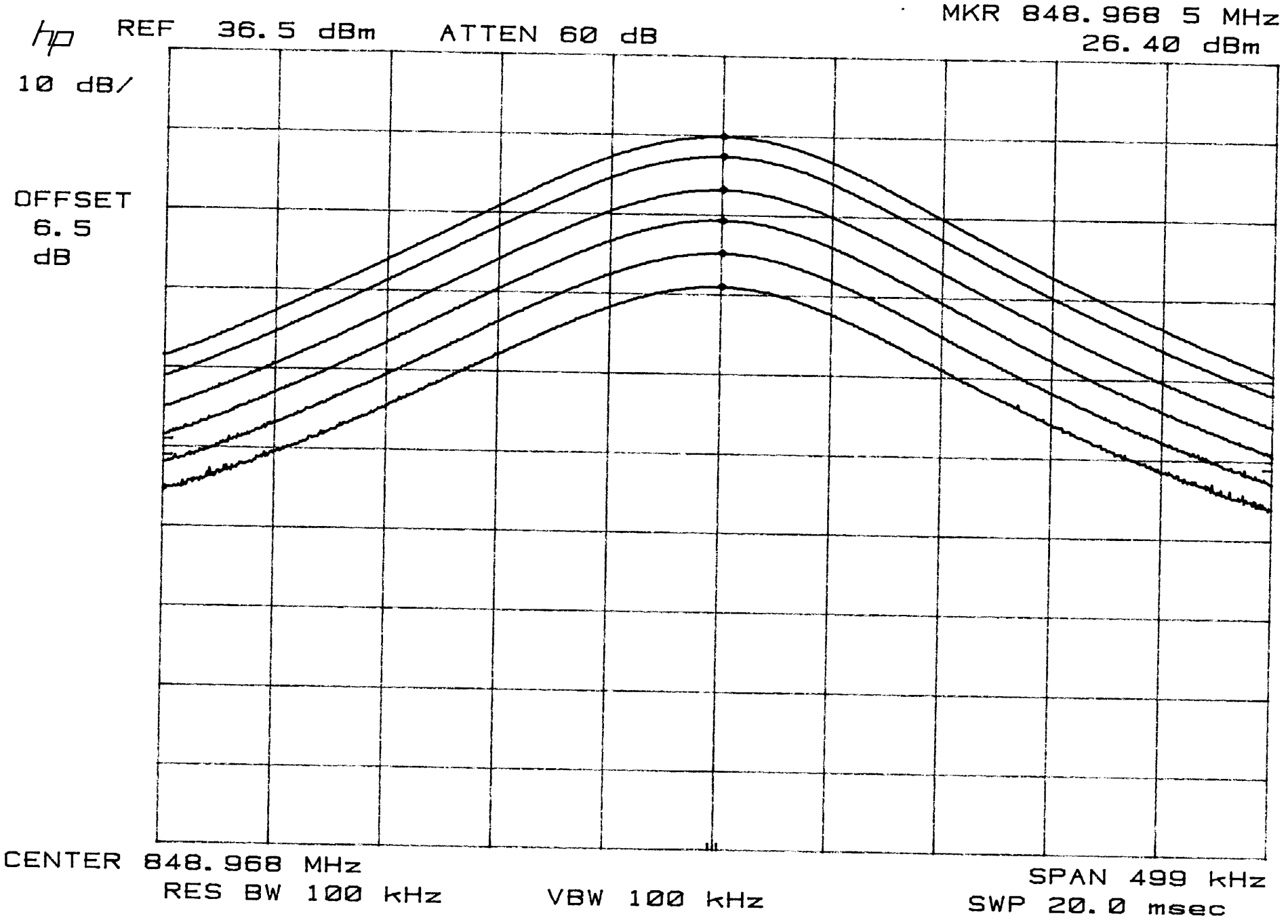
2.3 Test Results

Refer to the attached plots.

Plot Number	Description
2.3.a	Low Channel
2.3.b	Middle Channel
2.3.c	High Channel


REF 36.5 dBm
ATTEN 60 dB
MKR 824.039 0 MHz
26.50 dBm
10 dB/
OFFSET
6.5
dB
CENTER 824.040 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 500 kHz
SWP 20.0 msec


hp
REF 36.5 dBm
ATTEN 60 dB
MKR 836.513 0 MHz
26.60 dBm
10 dB/
OFFSET
6.5
dB
CENTER 836.513 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 500 kHz
SWP 20.0 msec


hp
REF 36.5 dBm
ATTEN 60 dB
MKR 848.968 5 MHz
26.40 dBm
10 dB/
OFFSET
6.5
dB
CENTER 848.968 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 499 kHz
SWP 20.0 msec

3.0 Effective 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 on an open test site.

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 (R_{EUT}) was recorded.

The EUT was replaced by a half-wave tuned dipole connected to a signal generator. The frequency of the signal generator was adjusted to the transmitter frequency.

The test antenna was raised and lowered to ensure that a maximum signal was received. The signal generator output level (P_G) was adjusted to obtain the spectrum analyzer reading (R_G) as close as possible to the previously recorded spctrum analyzer reading (R_{EUT}).

The test was performed at three frequencies (low, middle, and high channels).

In addition, the Equivalent Isotropic Radiated Power (EIRP) in dBpW was calculated as follows:

$$EIRP_{(dBpW)} = ERP_{(dBm)} + 90 + 10 \log 1.64$$

3.2 Test Equipment

Rhode & Schwartz SMH Signal Generator
Hewlett Packard HP8566B Spectrum Analyzer
Attenuator 20 dB

3.3 Test Results

Passes	Refer to the attached data sheet.

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J99013163
Model: DMC201(AMPS mode)
Engineer: Xi-Ming Yang
Date of test: May 27, 1999

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Spec. Analyz	Reading	Antenna Factor	Cable Loss	Corrected Reading	ERP
MHz	H/V	Detector	dB(uV)	dB/m	dB	dB(uV/m)	dBm
824.0	H	Peak	99.8	22.3	2.1	124.2	26.8
836.5	H	Peak	99.5	22.3	2.1	123.9	26.5
849.0	H	Peak	99.4	22.3	2.1	123.8	26.4

Note: 1. All measurement were made at 3 meters.

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J99013163
Model: DMC201(CDMA mode)
Engineer: Xi-Ming Yang
Date of test: May 27, 1999

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Spec. Analyz	Reading	Antenna Factor	Cable Loss	Corrected Reading	ERP
MHz	H/V	Detector	dB(uV)	dB/m	dB	dB(uV/m)	dBm
824.6	H	Peak	97.0	22.3	2.1	121.4	24.0
824.6	H	Average	94.0	22.3	2.1	118.4	21.0
836.5	H	Peak	96.8	22.3	2.1	121.2	23.8
836.5	H	Average	93.7	22.3	2.1	118.1	20.7
848.2	H	Peak	94.0	22.3	2.1	118.4	21.0
848.2	H	Average	91.0	22.3	2.1	115.4	18.0

Note: 1. All measurement were made at 3 meters.

4.0 **Modulation Deviation Limiting**, FCC § 2.987, § 22.915(c)s

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 4.1a).

4.2 Test Equipment

Marconi 2955A Radio Communication Test Set
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

4.3 Test Results

	Not applicable, the unit has no audio port
	There were no change in the schematics and PCB layout of the already granted unit.
X	Passed, see attached pages.

Tottori Sanyo Electric Co., Ltd., Cellular Phone **Date of Test: May 27 & 28, 1999 & July 7, 1999**
FCC ID: NRNDMC200

Table 4.1a Modulation Deviation Limiting				
Ouput Level (mV)	FM Deviation in kHz at Indicated Modulating Frequency			
	3000 Hz	2.7 kHz	1000 Hz	300 Hz
15.0	5.2	5.5	2.5	1.1
20.0	5.7	6.4	2.7	1.2
30.0	6.8	7.5	3.3	1.2
40.0	7.4	8.1	3.7	1.2
50.0	7.8	8.5	3.9	1.2
60.0	8.0	8.8	4.4	1.2
70.0	8.1	9.0	4.6	1.2
80.0	8.2	9.1	4.8	1.2
90.0	8.3	9.1	5.1	1.4
100.0	8.3	9.1	5.3	1.4
110.0	8.4	9.2	5.5	1.4
150.0	8.6	9.2	6.5	1.5
160.0	8.7	9.3	6.6	1.5
170.0	8.7	9.4	6.7	1.5
180.0	8.7	9.4	6.9	1.5
190.0	8.9	9.4	7.1	1.5
200	8.9	9.5	7.2	1.5
250	9.1	9.5	8.0	1.7
300	9.2	9.5	8.6	1.9
400	9.4	9.5	11.1	2.2
450	9.4	9.6	11.4	2.5
500	9.4	9.6	11.6	2.7
600	9.4	9.6	11.6	3.2
650	9.4	9.6	11.6	3.7
700	9.4	9.6	11.6	4.5
800	9.4	9.6	11.6	5.6
900	9.4	9.6	11.6	6.0
1000	9.4	9.6	11.6	6.4

Table 4.1b
Frequency Deviation

Frequency kHz	Initial Deviation	Peak Deviation	Steady State Deviation
0.3	1.7	10.8	10
0.5	3.0	11.2	11.0
0.7	4.9	11.5	11.2
0.9	6.8	11.6	11.2
1.0	8.0	11.6	11.6
1.2	9.6	11.5	11.2
1.4	10.3	11.5	11.3
1.6	10.6	11.2	11.0
1.8	10.6	11.0	10.8
2.0	10.6	10.9	10.6
2.4	10.2	10.6	10.5
2.8	9.5	9.9	9.6
3.0	9.1	9.5	9.4

Initial Input = 0.25V

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:

(i) 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.

(ii) In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.

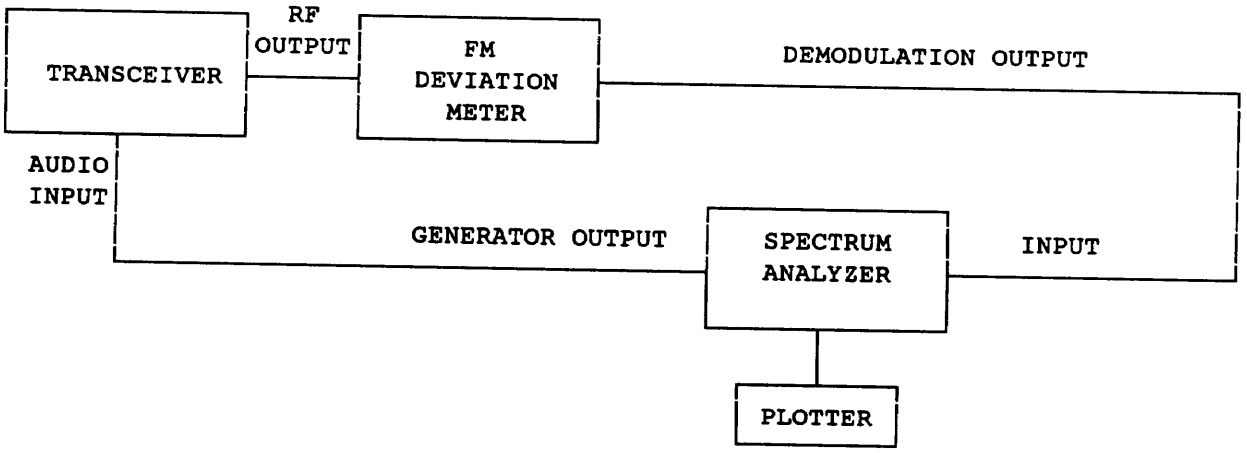
(iii) In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

5.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through suffecient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output was coupledl 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 audio signal at the transceiver audio input was adjusted to obtain 8-9 kHz deviation at the more sensitive modulation frequency (approximately 2.7 kHz). The audio frequency was varied from 300 Hz to 30 kHz and the deviation was measured while maintaining a constant input level. Using the level measured at 1 kHz as a reference (0 dB), the audio filter response was calculated (See Table 5-1).

The block diagram of the test setup is shown below.



On that block diagram, the HP 3885A spectrum analyzer having the tracing generator, and the Marconi 2955A Radio Communication Test Set having an output of a demodulator, are used. After the calibration was made (the -20 dBm reading of the spectrum analyzer corresponds to the 9 kHz deviation) the spectrum analyzer was set to scan the frequency from 300 Hz to 30 kHz, with the same audio input level as described above, and with compressor OFF and expander OFF.

The audio filter response was plotted directly from the spectrum analyzer (Refer to Plots # 5.1.a, 5.1.b, & 5.1.c).

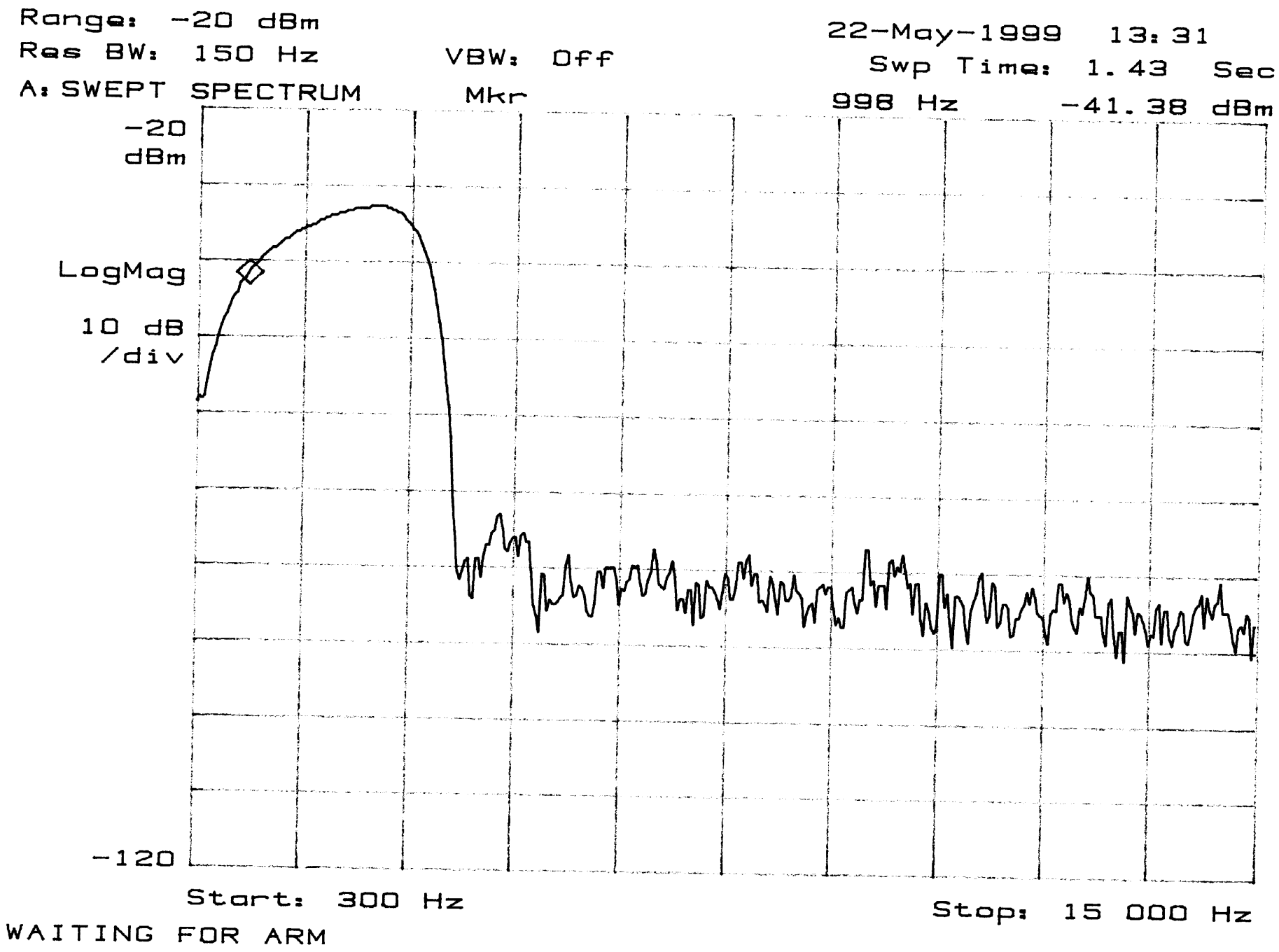
5.2 Test Equipment

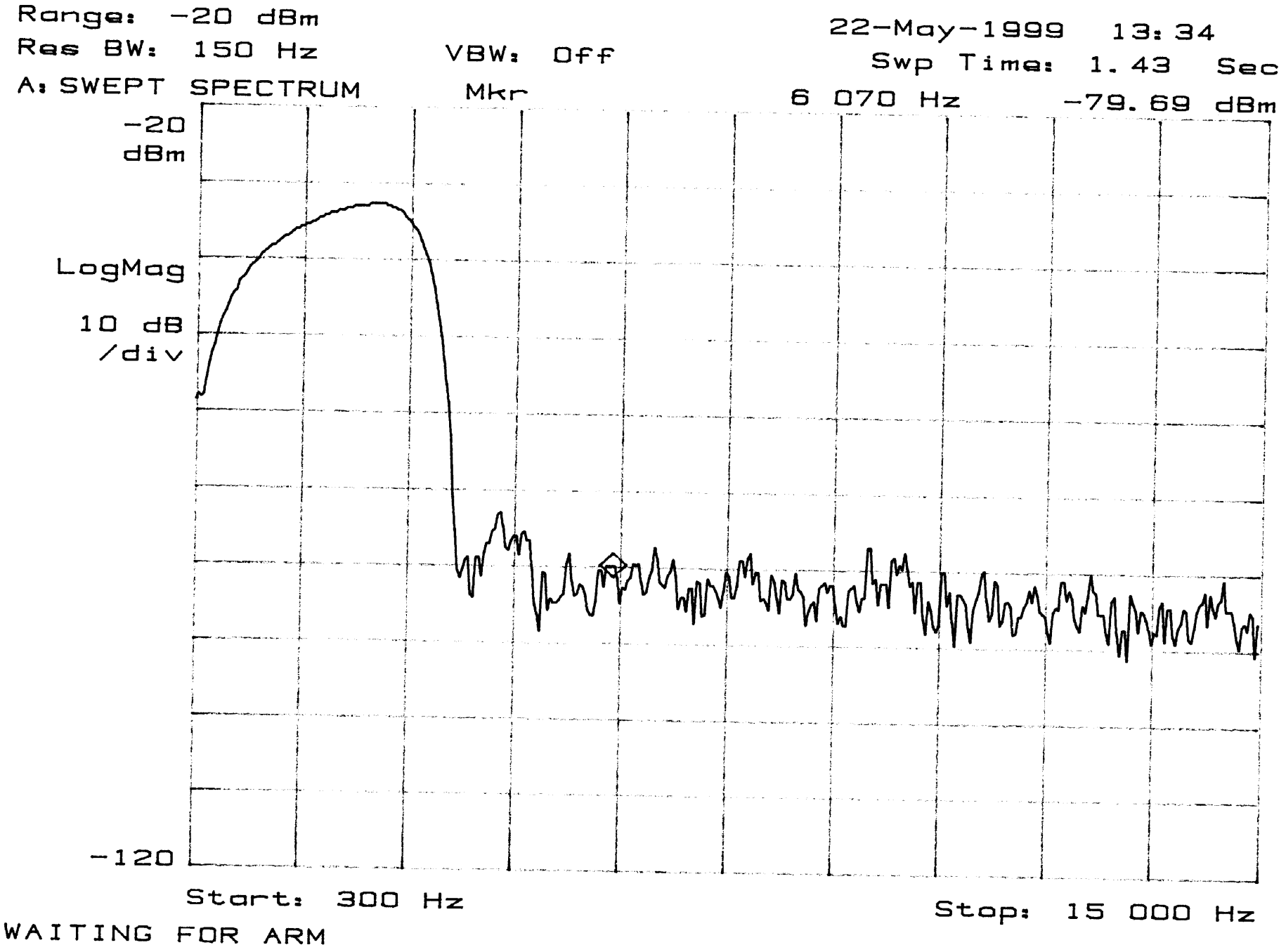
Marconi Instruments 2955A Radio Communications Test Set
HP 3588A Spectrum Analyzer
HP 7470A Plotter
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

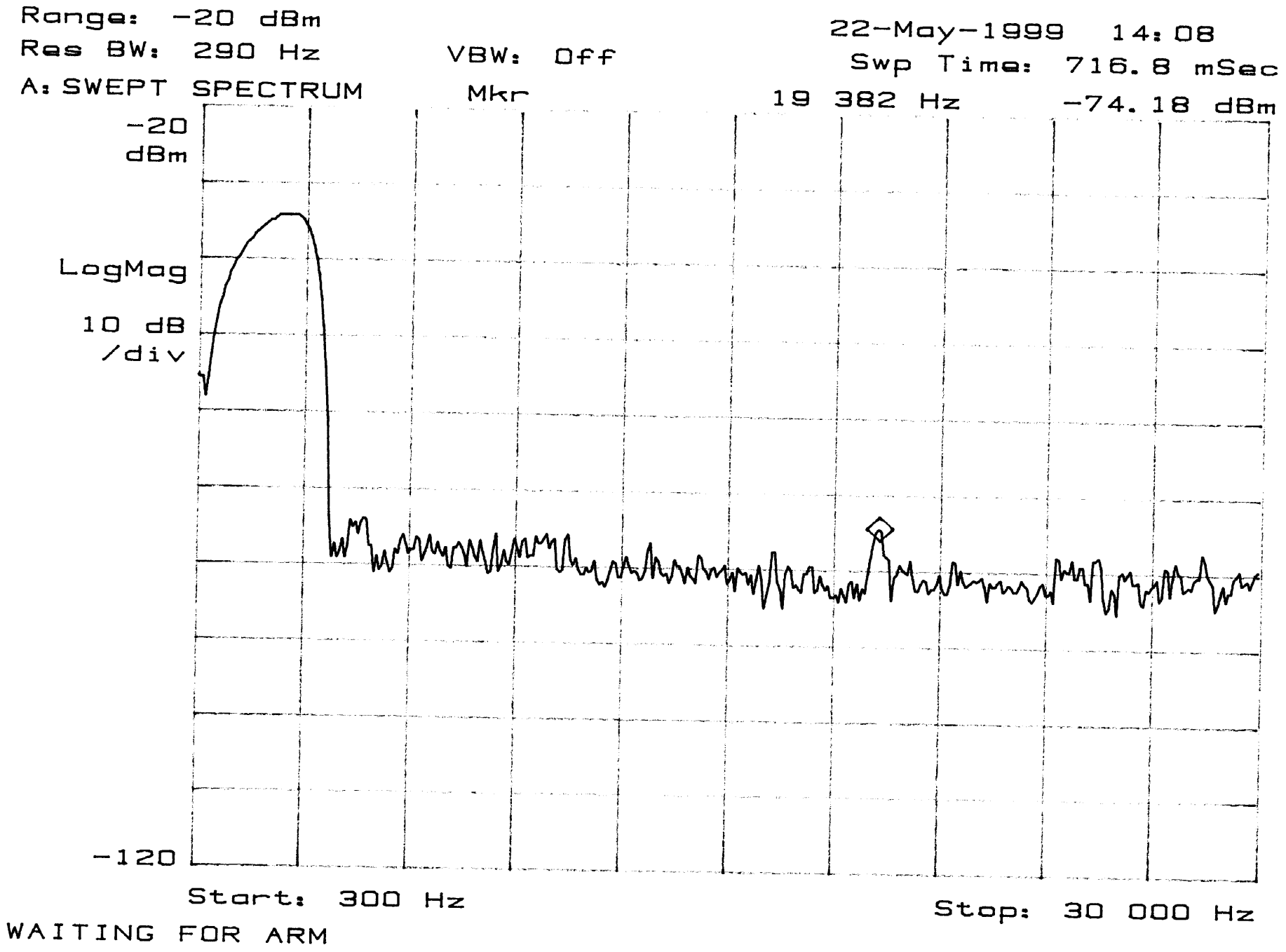
5.3 Test Results

	Not applicable, the unit has no audio port
	There were no change in the schematics and PCB layout of the already granted unit.
X	Passed, refer to the attached plots.

Table 5.1 Audio Filter Characteristics		
Modulation Frequency kHz	Relative Level dBm	Attenuation
0.3	-58.2	16.8
0.4	-57.8	16.4
0.5	-53.4	12.0
0.6	-47.4	8
0.7	-47.2	5.9
0.8	-44.7	3.3
0.9	-42.7	1.3
1.0	-41.4	0.0
1.2	-39.2	-2.2
1.4	-37.8	-3.6
1.6	-36.2	-14.4
1.8	-35.3	-15.6
2.0	-34.2	-16.7
2.2	-33.6	-17.6
2.5	-32.7	-18.7
3.0	-32.7	-19.1
3.5	-40.2	-13.6
4.0	-81.5	40.1
4.5	-72.9	31.5
5.0	-80.3	38.9
5.5	-78.0	36.6
5.9	-80.2	38.8
6.0	-79.7	38.3
6.1	-79.7	38.3
8.0	-77.8	36.2
10.0	-77.9	36.5
15.0	-86.2	44.8


Range: -20 dBm
Res BW: 150 Hz
VBW: Off
A: SWEPT SPECTRUM
Mkr
22-May-1999 13:31
Swp Time: 1.43 Sec
998 Hz
-41.38 dBm
-20
dBm
LogMag
10 dB
/div
-120
Start: 300 Hz
Stop: 15 000 Hz
WAITING FOR ARM


Range: -20 dBm
Res BW: 150 Hz
VBW: Off
A: SWEPT SPECTRUM
Mkr
22-May-1999 13:34
Swp Time: 1.43 Sec
6 070 Hz
-79.69 dBm
-20
dBm
LogMag
10 dB
/div
-120
Start: 300 Hz
Stop: 15 000 Hz
WAITING FOR ARM


Range: -20 dBm
Res BW: 290 Hz
VBW: Off
A: SWEPT SPECTRUM
Mkr
22-May-1999 14:08
Swp Time: 716.8 mSec
19 382 Hz
-74.18 dBm
-20
dBm
LogMag
10 dB
/div
-120
Start: 300 Hz
Stop: 30 000 Hz
WAITING FOR ARM