TEST REPORT

SUBMITTED MEASURED DATA INDEX

RF Power Output 6A
EIRP 6B
Final Amplifier Voltages and Currents 6C
Radiated Spurious Emission..... 6D
Occupied Bandwidth..... 6E
Conducted Spurious Emissions..... 6F
Frequency Stability 6G

RF Output Power

Exhibit Summary

This exhibit contains both average and peak output powers for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap.7 and is not an FCC requirement).

Contents

Method of Measurement
Measurement limit
Average output powers
EIRP

Method of measurement

1. Setup the mobile station for maximum output power with pseudo random data modulation.

2. Use HP 8991A Peak Power Analyzer to obtain peak and average output power levels.

3. Repeat measurements for carrier frequencies for channel 512, 662 and 810

Measurement Limits

Power Step	Nominal Peak output power(dBm)	Tolerance (dB)
0	30	+/-2

Conducted Power Output

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	0	30.3	21.3
1880.2	0	30.5	21.5
1909.8	0	30.3	21.3

EIRP TEST

Description
This is the test for the maximum radiated power from the phone.

Rule Part 24.232(b) specifies that “Mobile /portable stations are limited to 2 watts e.i.r.p. peak power ..” and 24.232(c) specifies that “Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.”

Method of measurement:

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band is placed et the reference center of the chamber. An RF signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the dipole, and the power received (Pr) at the chamber’s probe antenna is recorded.
2. A “reference path loss” is established as Pin + 2.1 – Pr.
3. The EUT is substituted for the dipole at the reference center of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the coordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (power step 0).
6. “Gated mode “ power measurements are performed with the receiving antenna placed at the coordinates determined in step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The “reference path loss” from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.1dB) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole ,
   ERP = EIRP – 2.1dBi.

EIRP Limits

	EIRP (dBm)
Burst Average	<33

EIRP Measurements

	EIRP (dBm)	ERP (dBm)
Modulation average	19	16.9
Burst Average	30.1	28

Final Amplifier Voltages and Currents

Exhibit contains the voltages and currents applied to the TX Driver and TX Final Power Amplifier for the entire mobile station operating power range.

Power Step	Power Output Spec.(dBm)	Power Output Meas.(dBm)	Vcc Driver (VDC)	Ic Driver (mA)	Vcc Final (VDC)	Ic Final (A)
0	30+/-2	30.49	4.7	22	4.7	0.312
1	28+/-3	28.37	4.7	91	4.7	0.264
2	26+/-3	27.8	4.7	17	4.7	0.225
3	24+/-2	25.72	4.7	15	4.7	0.212
4	22+/-3	23.43	4.7	13	4.7	0.188
5	20+/-3	22.8	4.7	12	4.7	0.178
6	18+/-3	18.89	4.7	10	4.7	0.168
7	16+/-3	17.56	4.7	9	4.7	0.16
8	14+/-3	14	4.7	8	4.7	0.153
9	12+/-4	12.98	4.7	7	4.7	0.147
10	10+/-4	10.05	4.7	4.5	4.7	0.141
11	8+/-4	9.5	4.7	4.4	4.7	0.13
12	6+/-4	6.37	4.7	4.3	4.7	0.118
13	4+/-4	4.86	4.7	4.3	4.7	0.102
14	2+/-4	2.92	4.7	4.3	4.7	0.05
15	0+/-4	1.24	4.7	4.3	4.7	0.03

RADIATED SPURIOUS EMISSION

Exhibit Summary

The data were collected by Elite Electronics Engineering Company at their open field test site located at 1516 Centre Circle , Downers Grove , Illinois . The site is constructed in accordance with ANSI C63 requirements by the FCC to be in compliance with section 2.948 for a 3 meter site .

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment , which is the transmitted carrier that can be as high as 1910 MHz . This was rounded up to 20 GHz . The resolution bandwidth is set as outlined in part 24.238 .

Attached is a copy of test procedure and results as submitted to Motorola by Elite Electronics Engineering ,along with an equipment list . Also attached are plots of the relevant radiated emission spurs that are within 20dB of the FCC limit of 43+10Log(P) or –13dBm .

Elite Electronic Engineering INC.

1516 CENTRE CIRCLE
DOWNERS GROVE, IL 60515-1082
Phone 630-495-9770
Fax 630-495-9785

COMPLETE EMC/ENVIRONMENTAL TESTING AND CONSULTING

November 9, 1999

Motorola, Inc.
600 N. U.S. HWY 45
Mail Stop: AN273
Libertyville, IL 60048-1286

ATTN: Nighet Rahim

SUBJECT: FCC DATA SUMMARY FOR MODEL SHARK PCS 1900 CELLULAR PHONE

Dear Ms. Rahim,

Please find the enclosed data sheets from the tests performed on the model Shark PCS 1900 Cellular Phone. I have also included a short test procedure and test equipment list.

If you need any further information or have questions regarding the test or data, you can reach me at (800) ELITE-11 or 630-495-9770. Our Fax is 630-495-9785.

Best Regards,

Daniel E. Crowder

Member ACIL / NVLAP Accredited FCC Parts 15 & 68 and MIL-STD-462 / NARTE Certified Engineers / DESC Approved

ELITE ELECTRONIC ENGINEERING INCORPORATED
1516 CENTRE CIRCLE
DOWNERS GROVE, ILLINOIS 60515-1082

FIELD STRENGTH OF SPURIOUS EMISSIONS:

RADIATED MEASUREMENTS:

REQUIREMENTS FOR FCC-15: All emanations from a Class B device shall be below the levels shown in the following table.

RADIATION LIMITS FOR UNINTENTIONAL RADIATORS

Frequency MHz	Distance between Test Item and Antenna in Meters	Field Strength uV/m
30-88	3	100
88-216	3	150
216-960	3	200
Above 960	3	500

Note: The tighter limit shall apply at the edge between the two frequency bands.

PROCEDURES FOR FCC-15: All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tiles. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

All preliminary radiated emissions tests were performed with the broadband measuring antenna positioned at a 1 meter distance from the test item. The frequency range from 30MHz to 10GHz was investigated using a peak detector function. The field intensity levels were then plotted.

Final radiated emissions measurement were manually performed over the frequency range of 1GHz to 10GHz. A bilog antenna was used for all measurements below 2GHz and a double ridged waveguide antenna was used for all measurements above 2GHz.

To ensure that maximum emission levels were measured, the following steps were taken:

(a) The test item was rotated so that all of its sides were exposed to the receiving antenna.

(b) Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.

(c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-15: The preliminary plots are presented on data pages 101 through 106. The plots are presented for a reference only, and are not used as official data. The final radiated levels are presented on data page 107. The final emission levels were below the specification requirements.

REQUIREMENTS FOR FCC-24: The radiated emissions outside the authorized bandwidth shall be attenuated by 43 + 10log(P) where P is in watts. This requirement equates to an effective radiated power of -13dBm in a tuned dipole antenna.

PROCEDURES FOR FCC-24: All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tiles. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation. The test was performed at a 3 meter test distance between the test item and the measurement antenna.

The final open field emission test procedure is as follows:

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was not terminated in a 50 ohm load.
c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded.

The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$Pg = E^2 4\pi d^2/120\pi = E^2 d^2/30$$

where
P = power in watts
g = arithmetic gain of transmitting antenna over isotropic radiator.
E = maximum field strength in volts/meter
d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3

meters, this equation reduces to:

P(dBm) = E(dBuV/m) - 97.2dB

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24: The preliminary plots are presented on data pages 108 through 113. The final open field radiated levels are presented on data pages 114 through 116. As can be seen from this data, the emissions from the test item were within the specification limit.

ENGINEERING LETTER REPORT NO. 28216

TABLE I: TEST EQUIPMENT LIST

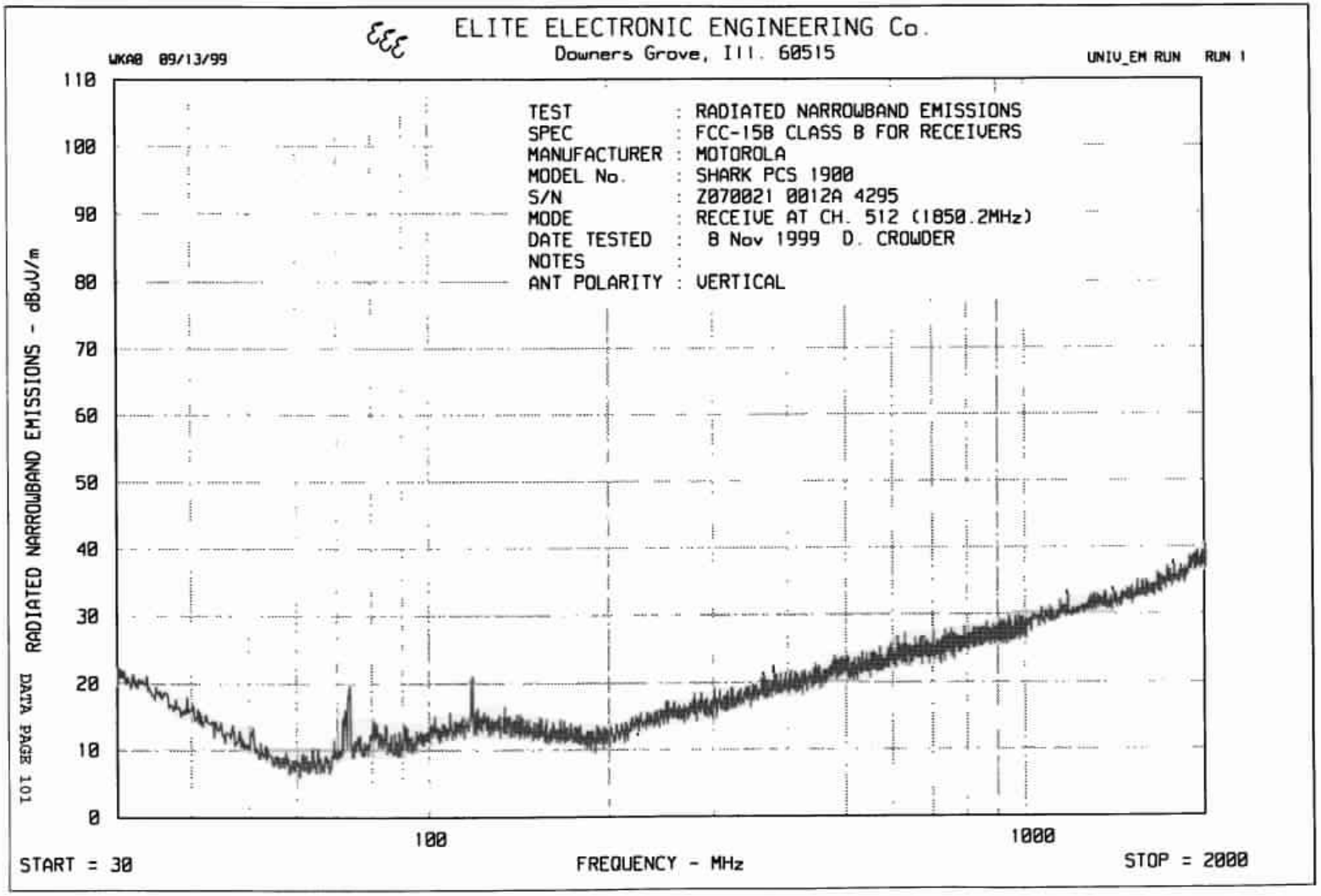
ELITE ELECTRONIC ENG. INC. Page: 1

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XPRD	HIGHPASS FILTER	K&L MICROWAVE	11SH10-4800/	001	4.8-20GHZ	05/14/99	12	05/14/00
XZGD	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3438A02724	---	01/29/99	N/A	
Equipment Type: AMPLIFIERS								
APRD	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	01/29/99	12	01/29/00
Equipment Type: ANTENNAS								
HTA1	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2054	.03-2GHZ	06/02/99	12	06/02/00
HWI1	DOUBLE RIDGED WAVEGUIDE	AEL	H1498	154	2-18GHZ	08/26/99	12	08/26/00
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	3447A08369	100HZ-22GHZ	01/26/99	12	01/26/00
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-26GHZ	01/28/99	12	01/28/00
RAF3	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/28/99	12	01/28/00

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable

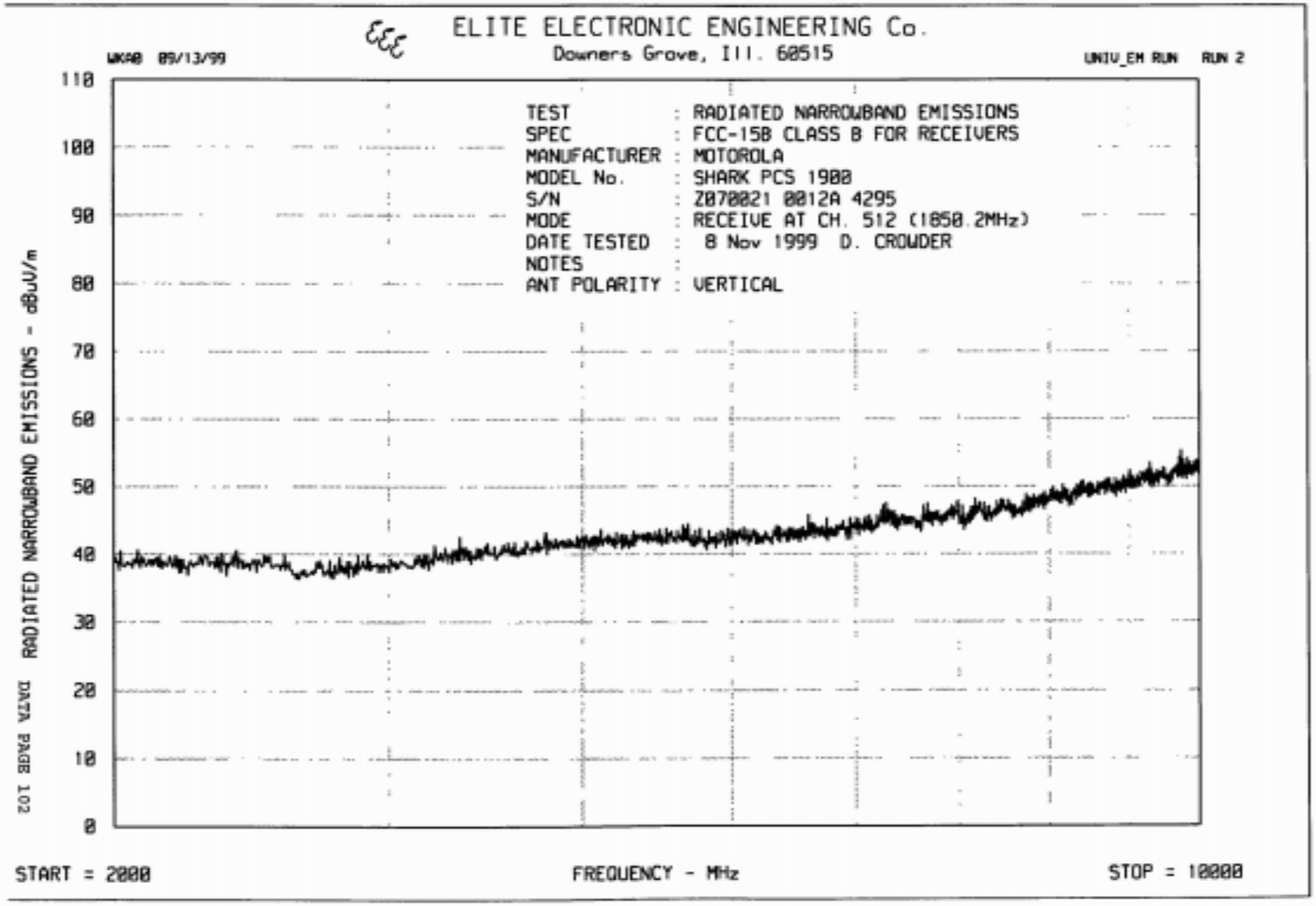
Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

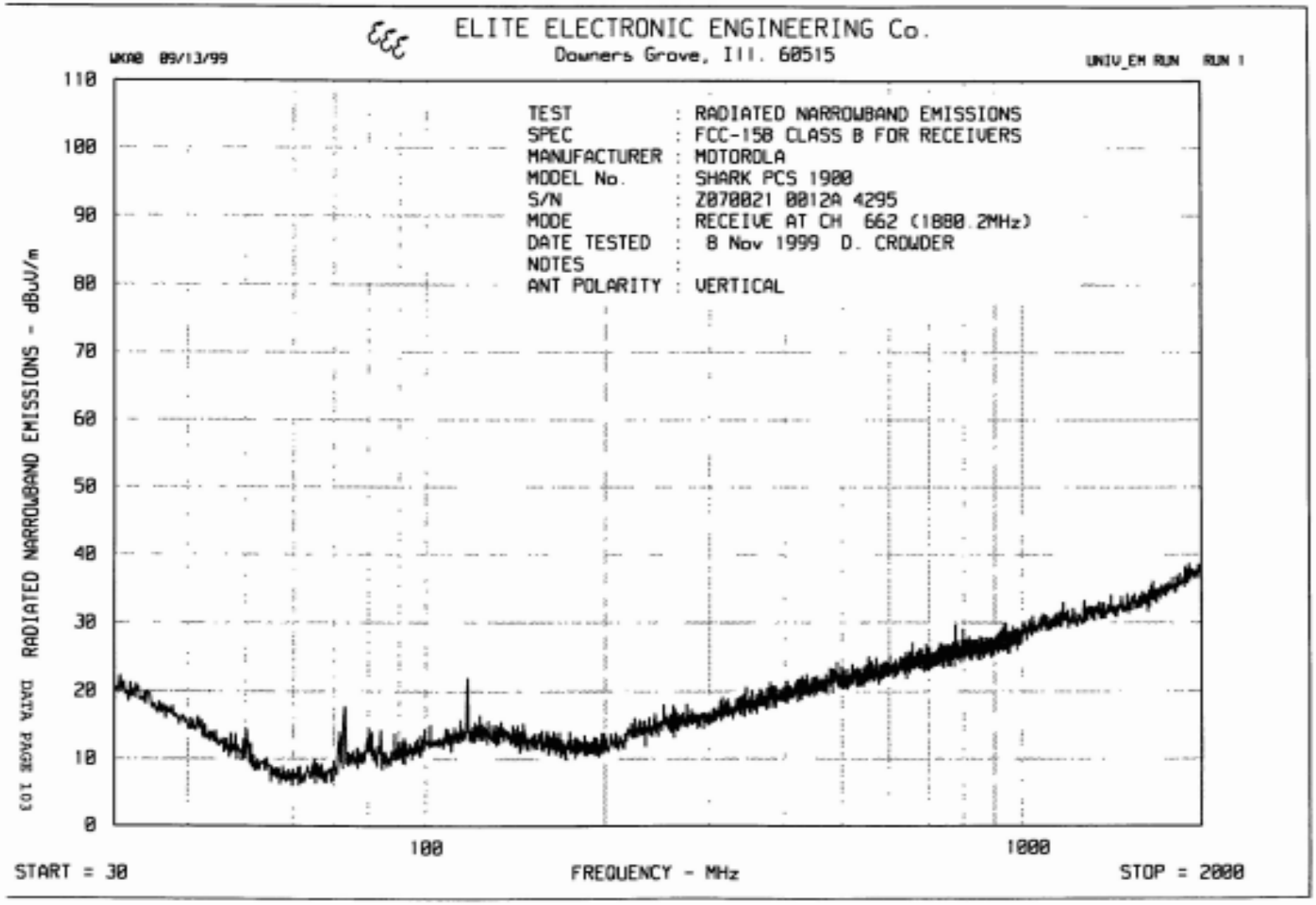
4

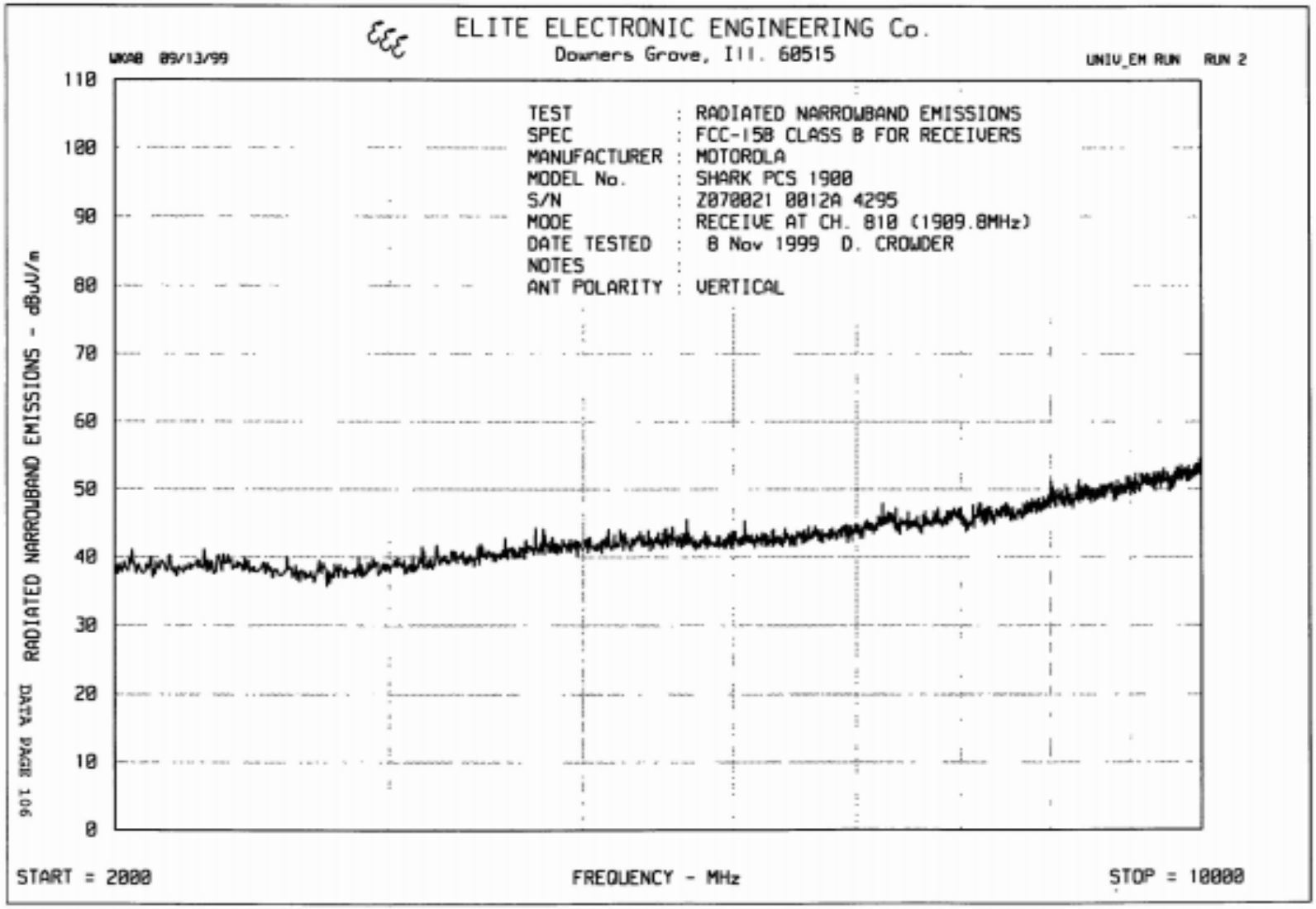


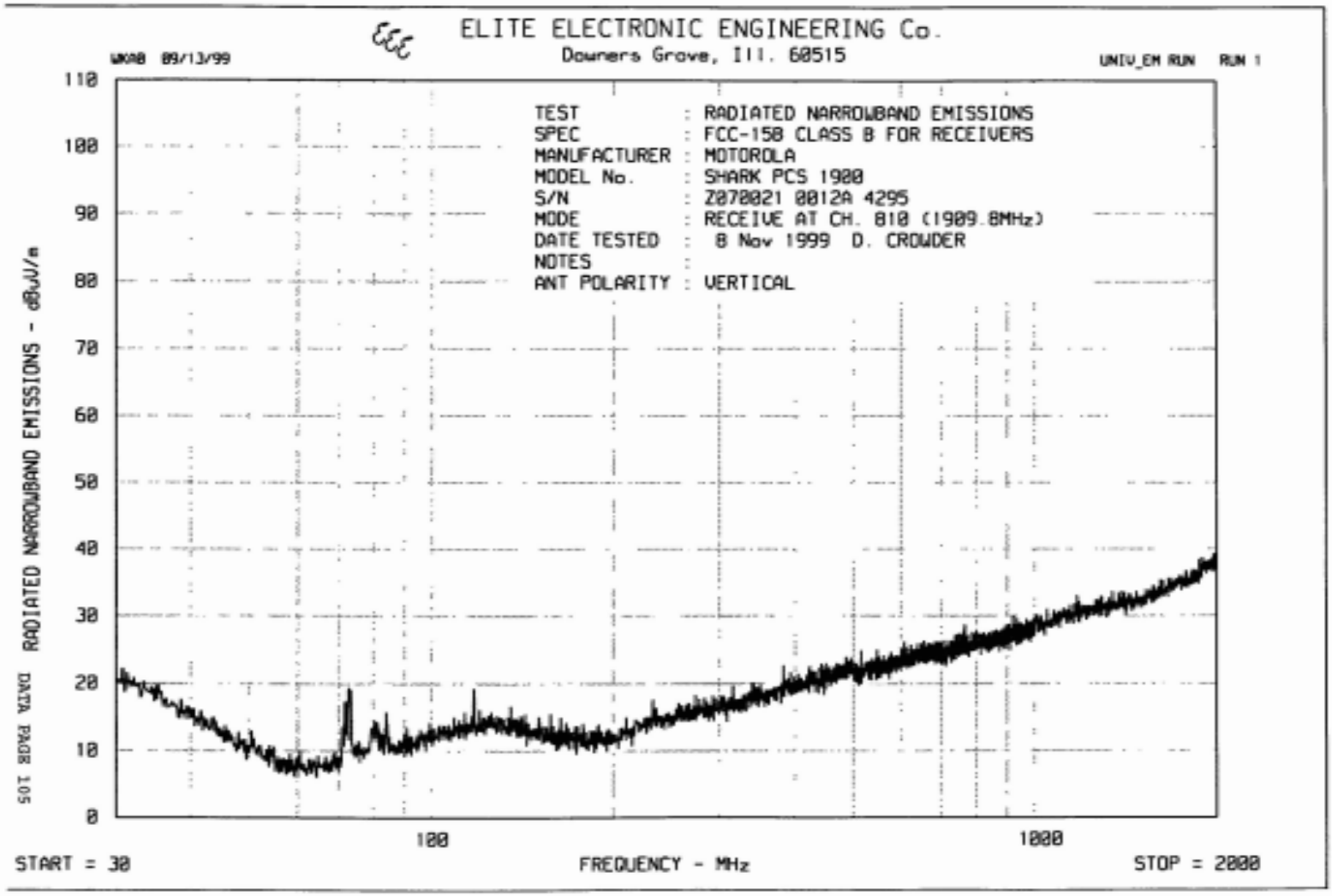
DATA PAGE 101

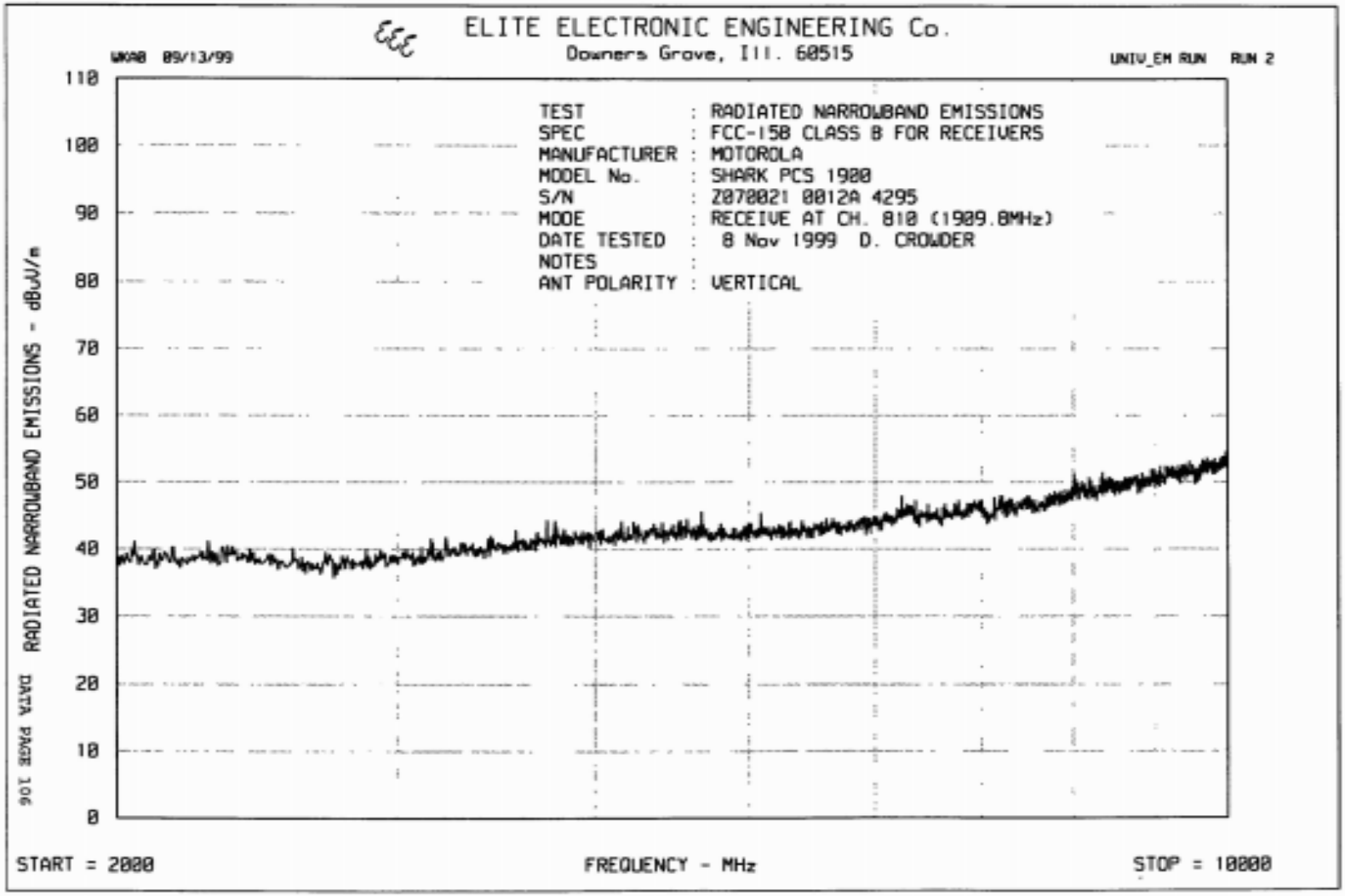
ENGINEERING TEST REPORT NO. 22165


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKA0 09/13/99
UNIV_EM RUN RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC-15B CLASS B FOR RECEIVERS
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : RECEIVE AT CH. 512 (1850.2MHz)
DATE TESTED : 8 Nov 1999 D. CROWDER
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 2000
FREQUENCY - MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC-15B CLASS B FOR RECEIVERS
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : RECEIVE AT CH 662 (1880.2MHz)
DATE TESTED : 8 Nov 1999 D. CROWDER
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
100
1000
START = 30
FREQUENCY - MHz
STOP = 2000
DATA PAGE 103
ENGINEERING TEST REPORT NO. 22165


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC-15B CLASS B FOR RECEIVERS
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : RECEIVE AT CH. 810 (1909.8MHz)
DATE TESTED : 8 Nov 1999 D. CROWDER
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 2000
FREQUENCY - MHz
STOP = 10000
DATA PAGE 106
ENGINEERING TEST REPORT NO. 22165


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC-15B CLASS B FOR RECEIVERS
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : RECEIVE AT CH. 810 (1909.8MHz)
DATE TESTED : 8 Nov 1999 D. CROWDER
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
100
1000
START = 30
FREQUENCY - MHz
STOP = 2000
DATA PAGE 105
ENGINEERING TEST REPORT NO. 22165


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC-15B CLASS B FOR RECEIVERS
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : RECEIVE AT CH. 810 (1989.8MHz)
DATE TESTED : 8 Nov 1999 D. CROWDER
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
START = 2000
FREQUENCY - MHz
STOP = 10000
DATA PAGE 106
ENGINEERING TEST REPORT NO. 22165

ENGINEERING TEST REPORT NO. 22165

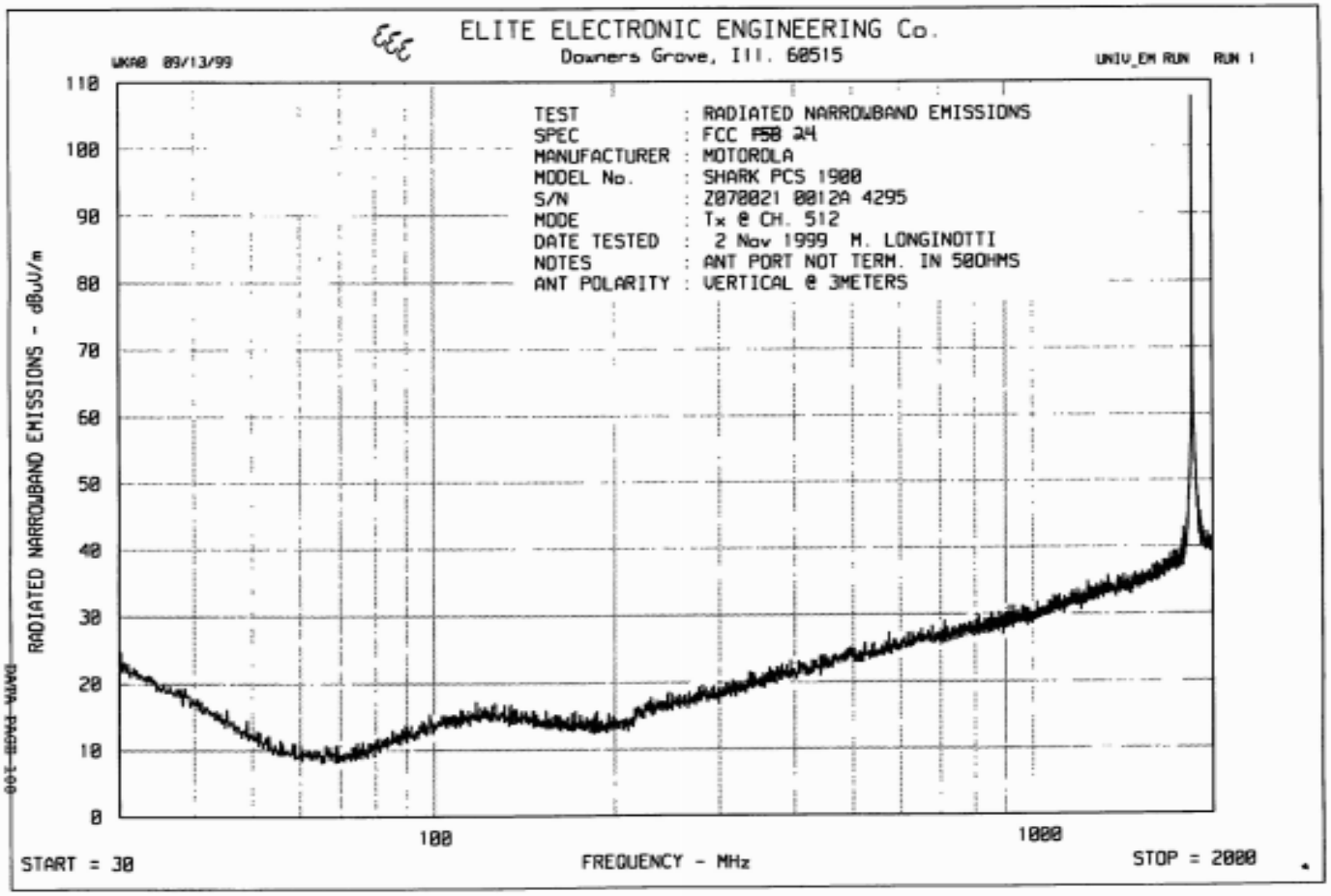
ENGINEERING TEST REPORT NO.

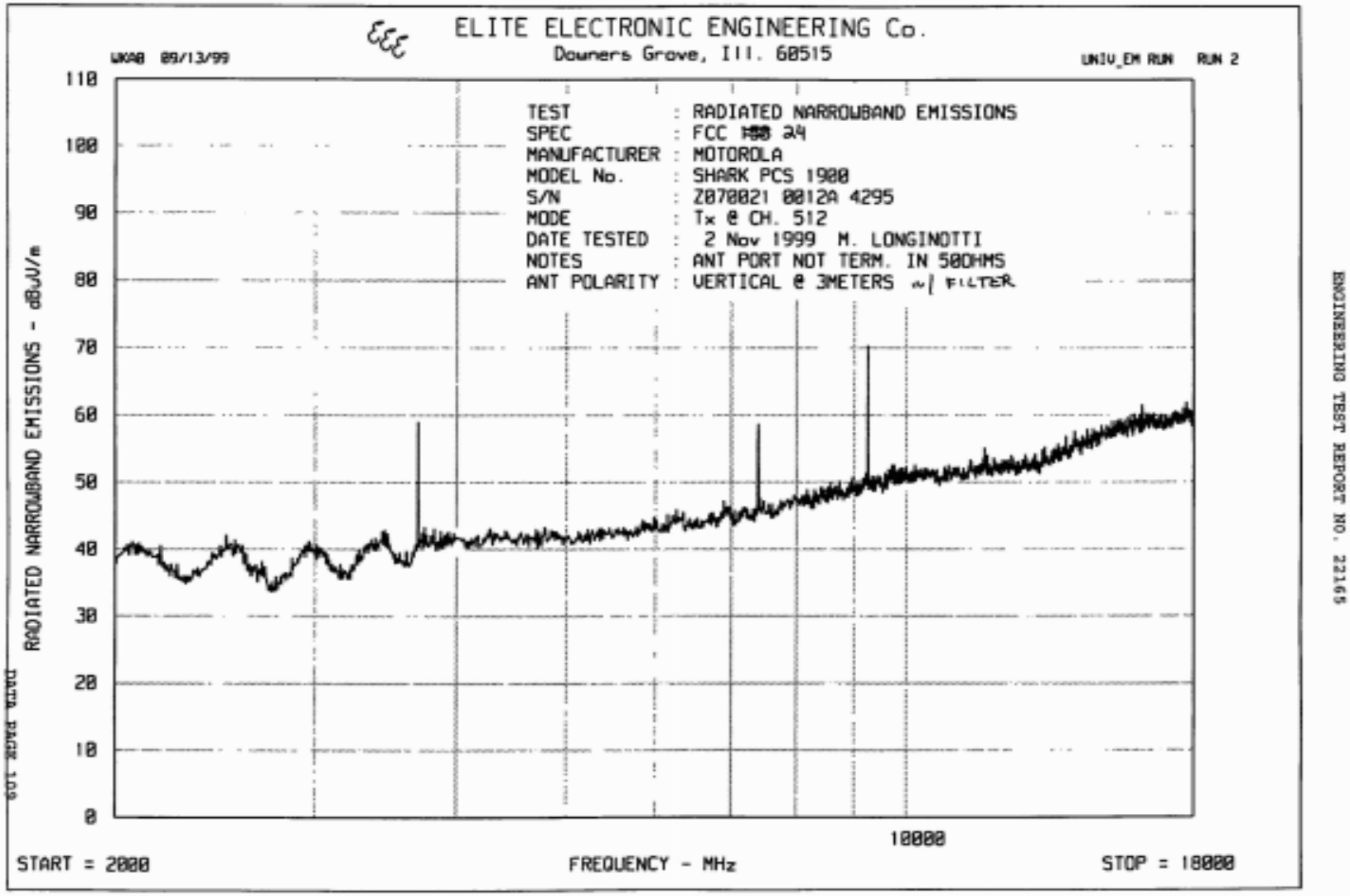
MANUFACTURER : MOTOROLA
MODEL : SHARK PCS 1900 CELLULAR PHONE
S/N : 20700021 0012A 4295
SPECIFICATION : FCC-15B OPEN FIELD RADIATED EMISSIONS FOR RECEIVERS @ 3m
DATE : NOVEMBER 8, 1999
NOTES : PEAK DETECTOR; BW = 1MHz

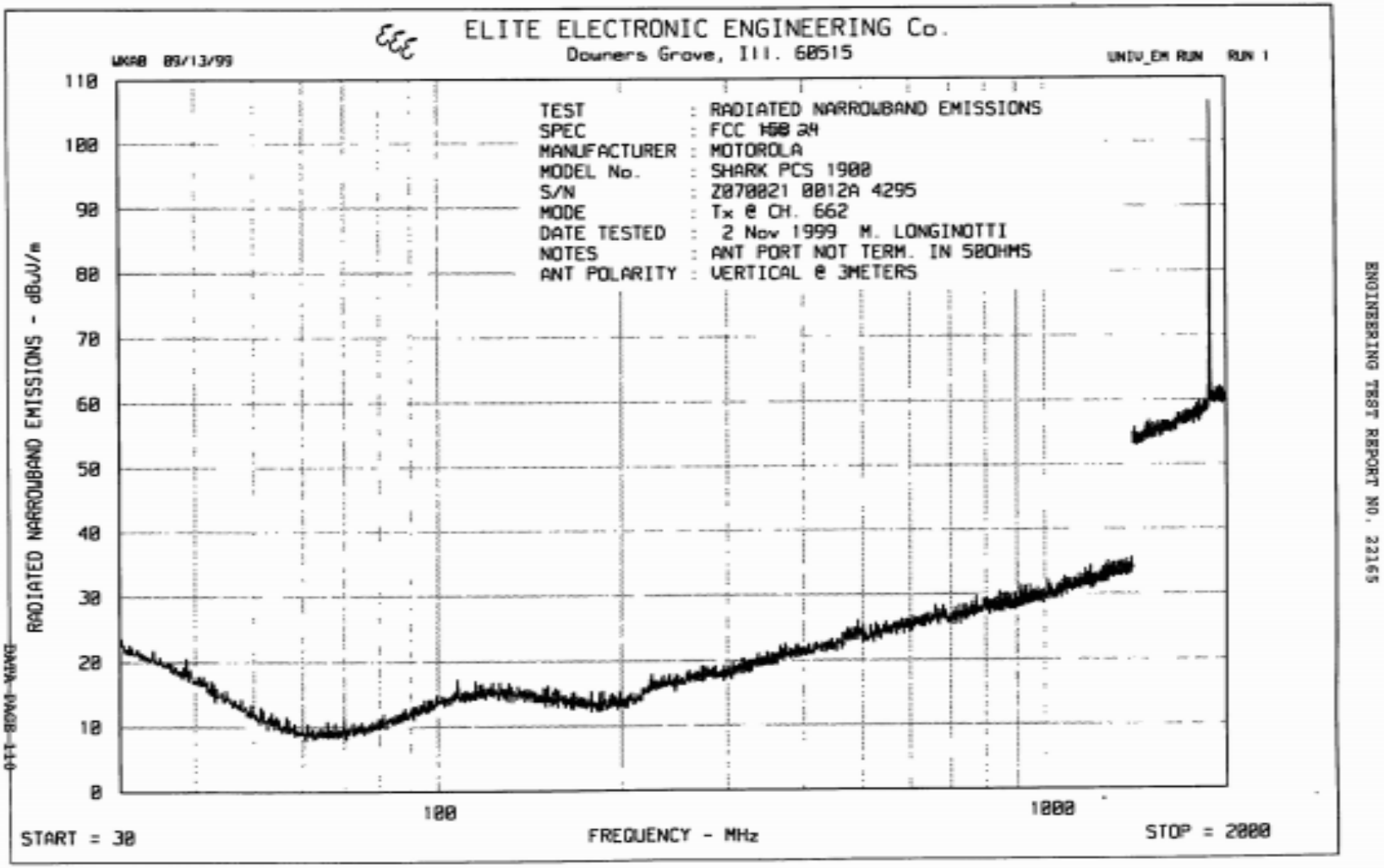
FREQ. (MHz)	ANT POL	MTR RDG (dBuV)	ANT FAC dB	CABLE FAC dB	PRE-AMP GAIN dB	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV/m
RECEIVE AT CH. 512 (LO = 1450.2MHz)								
1450.2	V	13.1	AMB	26.0	3.6	----	42.7	136.5	500
	H	13.7	AMB	26.0	3.6	----	43.3	146.2	500
2900.4	V	31.7	AMB	31.9	5.8	36.0	33.4	46.8	500
	H	32.4	AMB	31.9	5.8	36.0	34.1	50.7	500
4350.6	V	26.8	AMB	35.2	7.9	35.3	34.6	53.7	500
	H	29.0	AMB	35.2	7.9	35.3	36.8	69.2	500
5800.8	V	30.5	AMB	36.8	9.0	35.2	41.1	113.5	500
	H	31.2	AMB	36.8	9.0	35.2	41.8	123.0	500
7251.0	V	32.0	AMB	38.4	9.7	35.6	44.5	167.9	500
	H	32.6	AMB	38.4	9.7	35.6	45.1	179.9	500
RECEIVE AT CH. 662 (LO = 1480.2MHz)								
1480.2	H	12.7	AMB	25.0	2.9	----	40.6	107.2	500
	V	13.1	AMB	25.0	2.9	----	41.0	112.2	500
2960.4	H	31.4	AMB	29.2	4.0	36.0	28.6	26.9	500
	V	31.2	AMB	29.2	4.0	36.0	28.4	26.3	500
4440.6	H	29.3	AMB	33.2	5.3	35.5	32.3	41.2	500
	V	28.6	AMB	33.2	5.3	35.5	31.6	38.0	500
5920.8	H	32.0	AMB	35.2	6.5	35.2	38.5	84.1	500
	V	30.8	AMB	35.2	6.5	35.2	37.3	73.3	500
7401.0	H	31.5	AMB	36.1	8.0	35.2	40.4	104.7	500
	V	31.7	AMB	36.1	8.0	35.2	40.6	107.2	500
RECEIVE AT CH. 810 (LO = 1509.8MHz)								
1509.6	H	14.1	AMB	26.3	2.9	----	43.3	146.2	500
	V	13.6	AMB	26.3	2.9	----	42.8	138.0	500
3019.6	H	31.2	AMB	31.7	4.0	35.9	31.0	35.5	500
	V	31.0	AMB	31.7	4.0	35.9	30.8	34.7	500
4529.4	H	27.7	AMB	35.1	5.6	35.2	33.2	45.7	500
	V	28.7	AMB	35.1	5.6	35.2	34.2	51.3	500
6039.2	H	30.3	AMB	36.2	7.0	35.2	38.3	82.2	500
	V	30.5	AMB	36.2	7.0	35.2	38.5	84.1	500
7549.0	H	31.7	AMB	38.1	8.8	35.7	42.9	139.6	500
	V	31.7	AMB	38.1	8.8	35.7	42.9	139.6	500

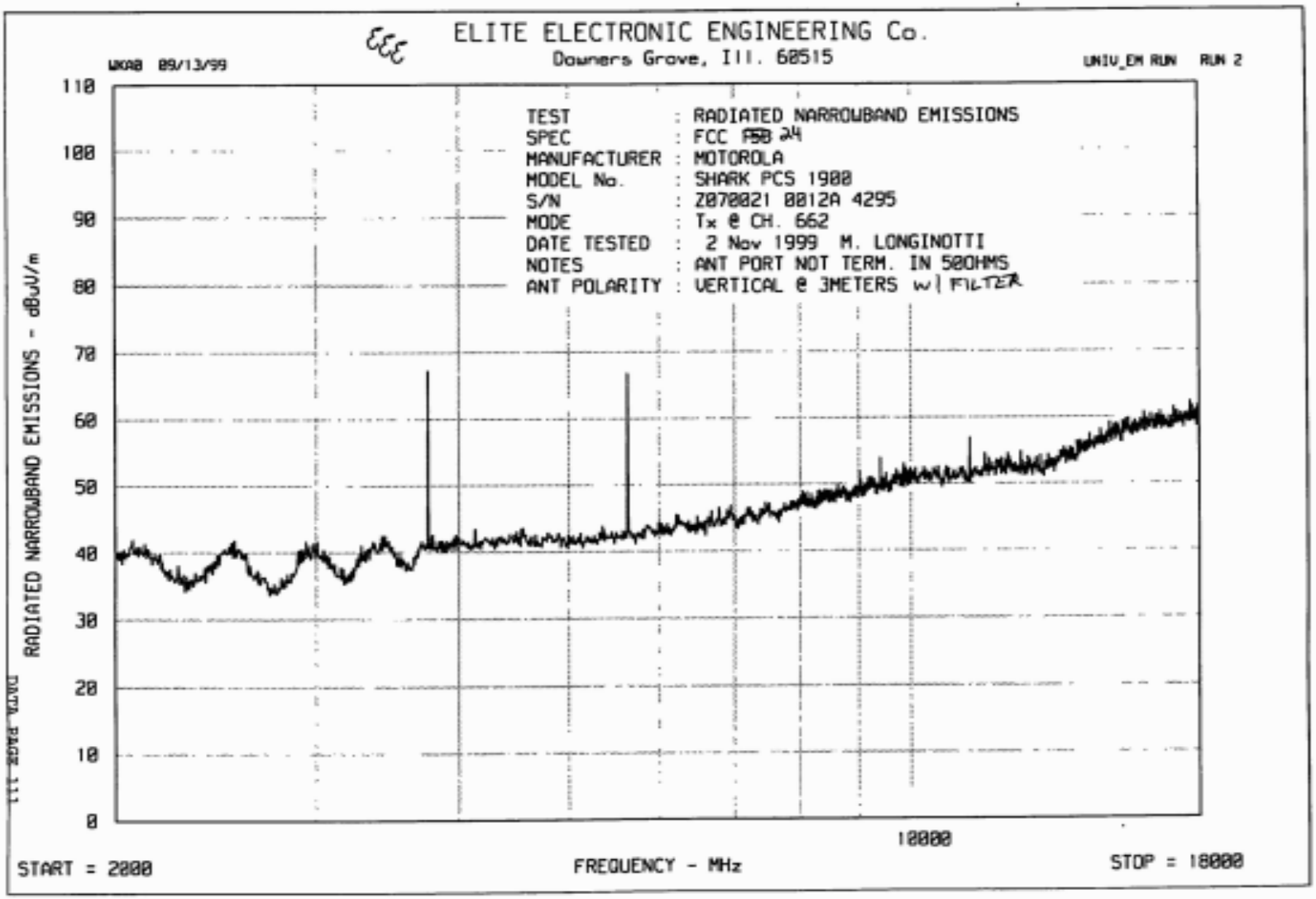
CHECKED BY: DEL

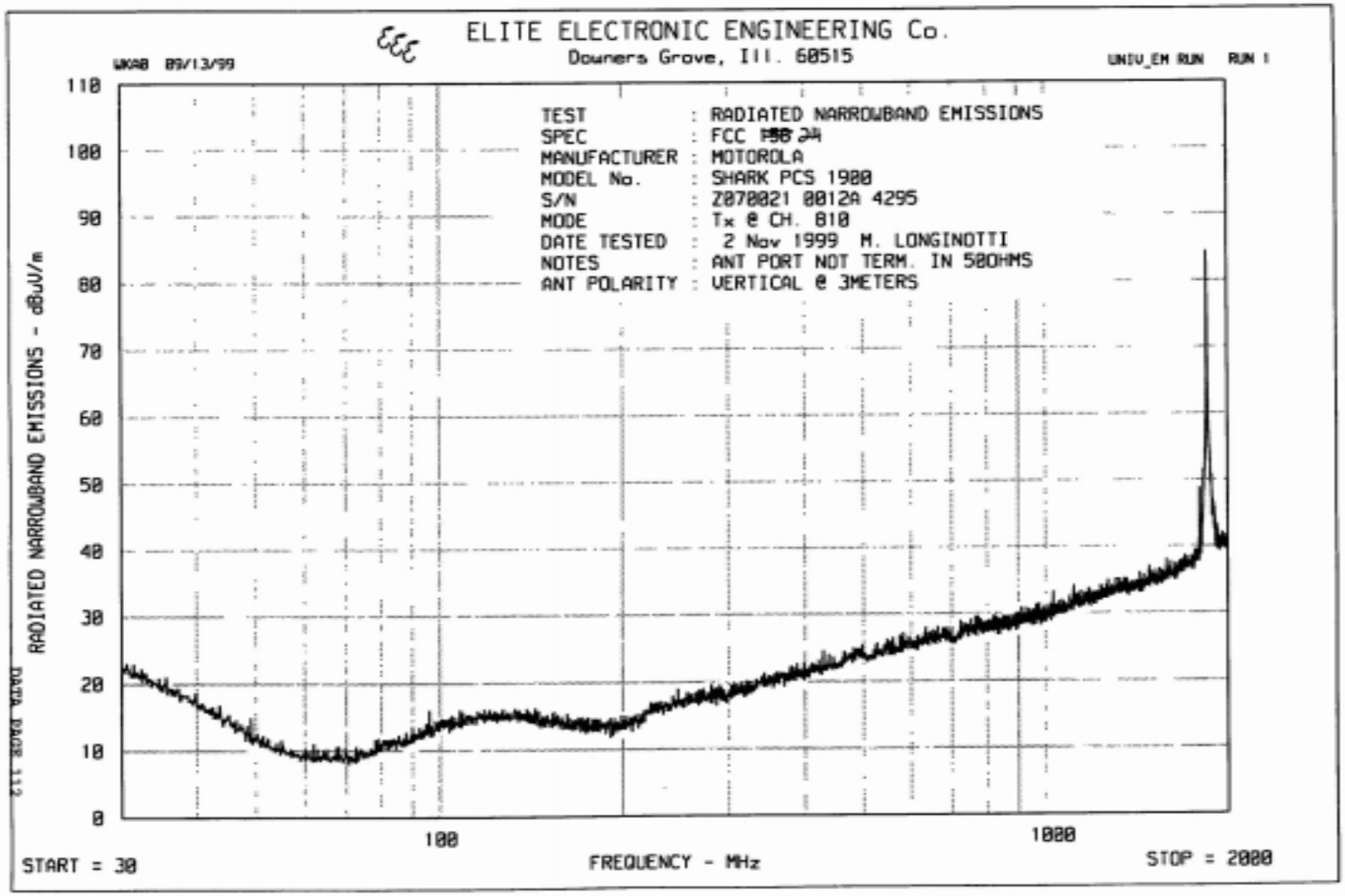
DATA PAGE 107

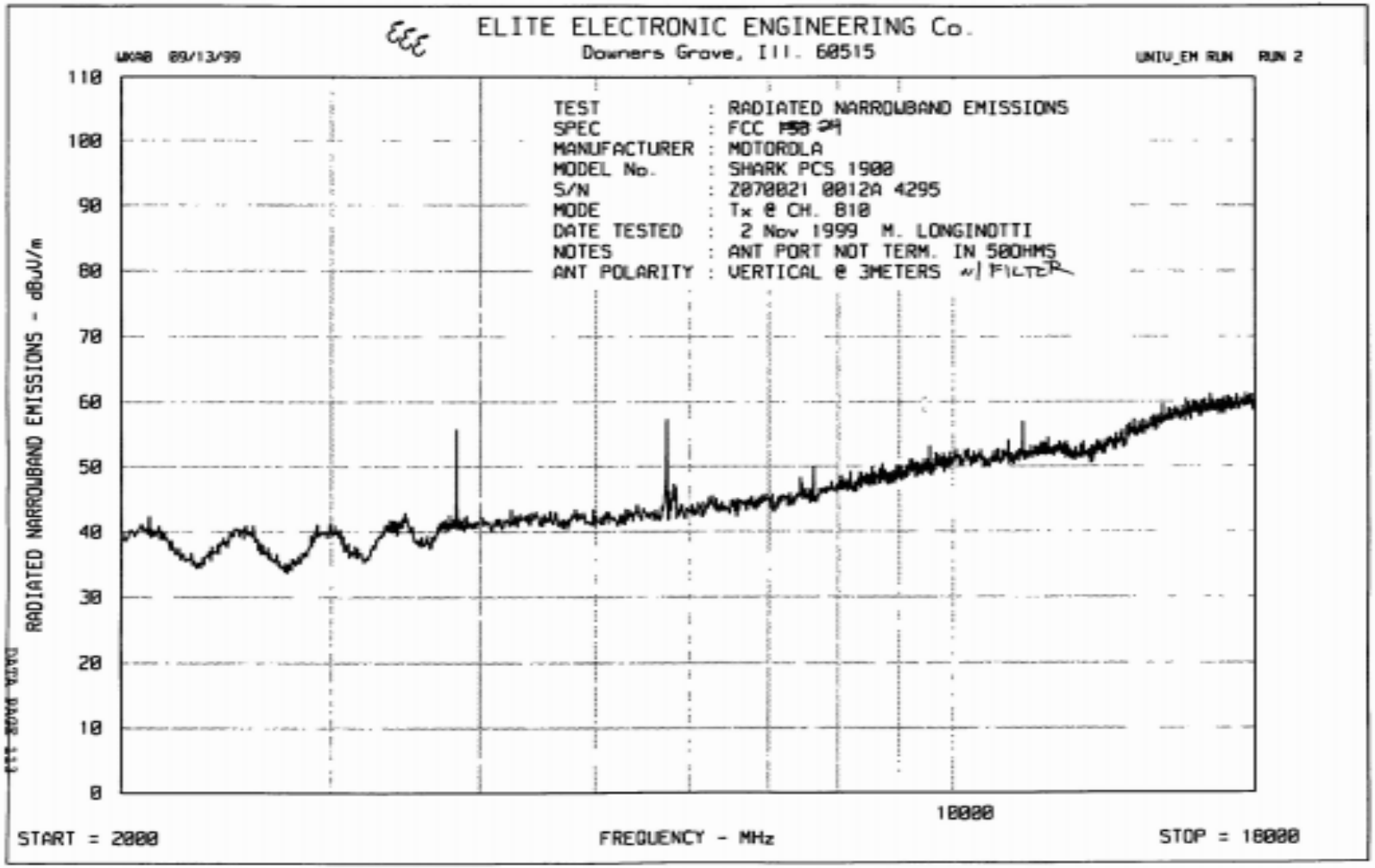

ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKA0 09/13/99
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC F58 24
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : Tx @ CH. 512
DATE TESTED : 2 Nov 1999 M. LONGINOTTI
NOTES : ANT PORT NOT TERM. IN 50OHMS
ANT POLARITY : VERTICAL @ 3METERS
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
100
1000
START = 30
FREQUENCY - MHz
STOP = 2000
ENGINEERING TEST REPORT NO. 22165
DATA PAGE 100


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 24
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : Tx @ CH. 512
DATE TESTED : 2 Nov 1999 M. LONGINOTTI
NOTES : ANT PORT NOT TERM. IN 50OHMS
ANT POLARITY : VERTICAL @ 3METERS w/ FILTER
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
10000
START = 2000
FREQUENCY - MHz
STOP = 18000
ENGINEERING TEST REPORT NO. 22165
DATA PAGE 109


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15B 3A
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : Tx @ CH. 662
DATE TESTED : 2 Nov 1999 M. LONGINOTTI
NOTES : ANT PORT NOT TERM. IN 50OHMS
ANT POLARITY : VERTICAL @ 3METERS
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
100
1000
START = 30
FREQUENCY - MHz
STOP = 2000
ENGINEERING TEST REPORT NO. 22165


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC PSB 24
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : Tx @ CH. 662
DATE TESTED : 2 Nov 1999 M. LONGINOTTI
NOTES : ANT PORT NOT TERM. IN 50OHMS
ANT POLARITY : VERTICAL @ 3METERS w/ FILTER
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
10000
START = 2000
FREQUENCY - MHz
STOP = 18000
ENGINEERING TEST REPORT NO. 22165
DATA PAGE 111


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
WKAB 09/13/99
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : Z070021 0012A 4295
MODE : Tx @ CH. 810
DATE TESTED : 2 Nov 1999 M. LONGINOTTI
NOTES : ANT PORT NOT TERM. IN 50OHMS
ANT POLARITY : VERTICAL @ 3METERS
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
100
1000
START = 30
FREQUENCY - MHz
STOP = 2000
ENGINEERING TEST REPORT NO. 22165
DATA PAGE 112


ELITE ELECTRONIC ENGINEERING Co.
Downers Grove, Ill. 60515
UKAB 09/13/99
UNIV_EM RUN RUN 2
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC
MANUFACTURER : MOTOROLA
MODEL No. : SHARK PCS 1900
S/N : 2070021 0012A 4295
MODE : Tx @ CH. 810
DATE TESTED : 2 Nov 1999 M. LONGINOTTI
NOTES : ANT PORT NOT TERM. IN 50OHMS
ANT POLARITY : VERTICAL @ 3METERS w/ FILTER
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
10000
START = 2000
FREQUENCY - MHz
STOP = 18000
ENGINEERING TEST REPORT NO. 22165

ENGINEERING TEST REPORT NO. 22165

ETR NO.
DATA SHEET

RADIATED EMISSIONS MEASUREMENTS TAKEN AT 3 METERS

MANUFACTURER : MOTOROLA
TEST ITEM : SHARK PCS 1900
MODEL NO. : SUG0012A
SERIAL NO. :
SPECIFICATION : FCC PART 24
TEST PERFORMED :OPEN FIELD RADIATED EMISSIONS
TEST DATE : NOVEMBER 2, 1999
NOTES : 1 MHz BANDWIDTH, PEAK DETECTOR
: ANTENNA PORT NOT TERMINATED IN 50 OHM LOAD

FREQUENCY (MHz)	ANT POL	METER READING (dBuV)	AMBIENT	FILTER FACTOR (dB)	ANTENNA FACTOR (dB)	CABLE LOSS (dB)	PREAMP GAIN (-dB)	FIELD INTENSITY FACTOR (dB)	TOTAL (dBm)	LIMIT (dBm)
Tx @ Ch. 512 (1850.2MHz)										
3700.2	V	68.1		5.9	34.2	5.6	35.5	-97.2	-18.9	-13.0
	H	63.5		5.9	34.2	5.6	35.5	-97.2	-23.5	-13.0
5550.4	V	64.1		0.4	35.9	7.1	35.1	-97.2	-24.8	-13.0
	H	64.6		0.4	35.9	7.1	35.1	-97.2	-24.3	-13.0
7400.9	V	62.8		0.4	38	8.4	35.6	-97.2	-23.2	-13.0
	H	67.1		0.4	38	8.4	35.6	-97.2	-18.9	-13.0
9250.9	V	59.2		0.1	38.8	9.5	35.9	-97.2	-25.5	-13.0
	H	63.0		0.1	38.8	9.5	35.9	-97.2	-21.7	-13.0
11101.1	V	51.1		0.6	41	11.1	34.8	-97.2	-28.2	-13.0
	H	52.3		0.6	41	11.1	34.8	-97.2	-27.0	-13.0
12951.0	V	57.6		0.6	41.4	11.9	33.4	-97.2	-19.1	-13.0
	H	50.4	AMBIENT	0.6	41.4	11.9	33.4	-97.2	-26.3	-13.0
14801.7	V	49.4	AMBIENT	0.6	42.9	12.2	33.9	-97.2	-26.0	-13.0
	H	46.6	AMBIENT	0.6	42.9	12.2	33.9	-97.2	-28.8	-13.0
16651.8	V	49.7	AMBIENT	0.6	44.1	13.3	34	-97.2	-23.5	-13.0
	H	49.1	AMBIENT	0.6	44.1	13.3	34	-97.2	-24.1	-13.0
18502.1	V	48.6	AMBIENT	0.6	43.8	14.0	32.8	-97.2	-23.0	-13.0
	H	48.6	AMBIENT	0.6	43.8	14.0	32.8	-97.2	-23.0	-13.0

Mark E. Longmoth

DATA PAGE 114

ENGINEERING TEST REPORT NO. 22165

ETR NO.
DATA SHEET

RADIATED EMISSIONS MEASUREMENTS TAKEN AT 3 METERS

MANUFACTURER : MOTOROLA
TEST ITEM : SHARK PCS 1900
MODEL NO. : SUG0012A
SERIAL NO. :
SPECIFICATION : FCC PART 24
TEST PERFORMED :OPEN FIELD RADIATED EMISSIONS
TEST DATE : NOVEMBER 2, 1999
NOTES : 1 MHz BANDWIDTH, PEAK DETECTOR
: ANTENNA PORT NOT TERMINATED IN 50 OHM LOAD

FREQUENCY (MHz)	ANT POL	METER READING (dBuV)	AMBIENT	FILTER FACTOR (dB)	ANTENNA FACTOR (dB)	CABLE LOSS (dB)	PREAMP GAIN (-dB)	FIELD INTENSITY FACTOR (dB)	TOTAL (dBm)	LIMIT (dBm)
Tx @ Ch. 662 (1738.2MHz)										
3760.4	V	71.4		1.9	34.4	5.7	35.8	-97.2	-19.6	-13.0
	H	68.1		1.9	34.4	5.7	35.8	-97.2	-22.9	-13.0
5640.6	V	59.8		0.4	36.0	7.2	35.1	-97.2	-28.9	-13.0
	H	63.7		0.4	36.0	7.2	35.1	-97.2	-25.0	-13.0
7520.8	V	58.8		0.4	38.1	8.6	35.6	-97.2	-26.9	-13.0
	H	60.0		0.4	38.1	8.6	35.6	-97.2	-25.7	-13.0
9401.0	V	51.2	AMBIENT	0.1	38.9	9.6	36.0	-97.2	-33.4	-13.0
	H	53.9		0.1	38.9	9.6	36.0	-97.2	-30.7	-13.0
11281.0	V	48.1	AMBIENT	0.6	41.1	11.3	34.8	-97.2	-30.9	-13.0
	H	51.5		0.6	41.1	11.3	34.8	-97.2	-27.5	-13.0
13161.5	V	47.9	AMBIENT	0.6	41.5	11.9	33.4	-97.2	-28.7	-13.0
	H	49.3	AMBIENT	0.6	41.5	11.9	33.4	-97.2	-27.3	-13.0
15041.7	V	50.3	AMBIENT	0.6	43.4	12.5	33.9	-97.2	-24.3	-13.0
	H	49.8	AMBIENT	0.6	43.4	12.5	33.9	-97.2	-24.8	-13.0
16921.9	V	49.0	AMBIENT	0.6	44.2	14.3	33.4	-97.2	-22.5	-13.0
	H	48.6	AMBIENT	0.6	44.2	14.3	33.4	-97.2	-22.9	-13.0
18801.9	V	52.9	AMBIENT	0.6	43.9	13.9	32.6	-97.2	-18.5	-13.0
	H	52.4	AMBIENT	0.6	43.9	13.9	32.6	-97.2	-19.0	-13.0

Mark E. Longinotti

DATA PAGE 115

ENGINEERING TEST REPORT NO. 22165

ETR NO.
DATA SHEET

RADIATED EMISSIONS MEASUREMENTS TAKEN AT 3 METERS

MANUFACTURER : MOTOROLA
TEST ITEM : SHARK PCS 1900
MODEL NO. : SUG0012A
SERIAL NO. :
SPECIFICATION : FCC PART 24
TEST PERFORMED :OPEN FIELD RADIATED EMISSIONS
TEST DATE : NOVEMBER 2, 1999
NOTES : 1 MHz BANDWIDTH, PEAK DETECTOR
: ANTENNA PORT NOT TERMINATED IN 50 OHM LOAD

FREQUENCY (MHz)	ANT POL	METER READING (dBuV)	AMBIENT	FILTER FACTOR (dB)	ANTENNA FACTOR (dB)	CABLE LOSS (dB)	PREAMP GAIN (-dB)	FIELD INTENSITY FACTOR (dB)	TOTAL (dBm)	LIMIT (dBm)
Tx @ Ch. 810 (1909.8MMHz)										
3819.6	V	71.3		1.2	34.6	5.9	35.8	-97.2	-20.0	-13.0
	H	63.8		1.2	34.6	5.9	35.8	-97.2	-27.5	-13.0
5729.4	V	62.0		0.4	36.3	7.2	35.1	-97.2	-26.4	-13.0
	H	63.6		0.4	36.3	7.2	35.1	-97.2	-24.8	-13.0
7639.2	V	60.5		0.4	38.2	8.6	35.6	-97.2	-25.1	-13.0
	H	64.0		0.4	38.2	8.6	35.6	-97.2	-21.6	-13.0
9549.0	V	50.5		0.1	38.9	9.5	36.0	-97.2	-34.2	-13.0
	H	55.7		0.1	38.9	9.5	36.0	-97.2	-29.0	-13.0
11458.8	V	50.3		0.6	41.1	11.3	34.8	-97.2	-28.7	-13.0
	H	53.0		0.6	41.1	11.3	34.8	-97.2	-26.0	-13.0
13368.6	V	48.2	AMBIENT	0.6	41.7	11.9	33.4	-97.2	-28.2	-13.0
	H	47.2	AMBIENT	0.6	41.7	11.9	33.4	-97.2	-29.2	-13.0
15278.4	V	48.3	AMBIENT	0.6	43.4	12.7	33.9	-97.2	-26.1	-13.0
	H	50.2	AMBIENT	0.6	43.4	12.7	33.9	-97.2	-24.2	-13.0
17188.2	V	48.7	AMBIENT	0.6	44.2	14.2	33.4	-97.2	-22.9	-13.0
	H	50.4	AMBIENT	0.6	44.2	14.2	33.4	-97.2	-21.2	-13.0
19098.0	V	52.1	AMBIENT	0.6	44.7	14.0	32.6	-97.2	-18.4	-13.0
	H	52.6	AMBIENT	0.6	44.7	14.0	32.6	-97.2	-17.9	-13.0

Mark E. Longinotti

DATA PAGE 116

OCCUPIED BANDWIDTH

Exhibit Summary:
EXHIBIT 6E contains measurement data pertaining to occupied bandwidth. For each carrier frequency measured the plots show the modulation spectrum of the carrier measured by two methods: the 99% power bandwidth, and the -26 dBC bandwidth. The following figures illustrate the results of both bandwidth definitions as measured using a Hewlett Packard spectrum analyzer.

Contents
Measurement Procedure 2
Occupied Bandwidth Results 3
Occupied Bandwidth Plots
1850.2 MHz 99% Power Bandwidth 4
1880.0 MHz 99% Power Bandwidth 4
1909.8 MHz 99% Power Bandwidth 4
1850.2 MHz -26 dBC Power Bandwidth 5
1880.0 MHz -26 dBC Power Bandwidth 5
1909.8 MHz -26 dBC Power Bandwidth 5

Measurement Procedure
This section describes the procedures used to measure occupied bandwidth. A theoretical occupied bandwidth of approximately 246.0 kHz was determined as described in EXHIBIT 12.

1. Determine the measurement bandwidth: Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For 246.0 kHz, this equates to a resolution bandwidth of at least 2.46 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

2. Outline measurement frequencies: The following table lists the measurement frequencies for the bottom, middle, and top of the PCS frequency band. For each frequency at which an occupied bandwidth measurement is made a transmitter output power was set to Power Step 0 (+30 dBm nominal).

USPCS **Channel**	**Transmitter Frequency**
512	1850.2 MHz
661	1880.0 MHz
810	1909.8 MHz

Occupied bandwidth measurement frequencies.

3. Connect test set-up: Employing a cable and an attenuator, connect the mobile station to a spectrum analyzer (HP 8560E).

4. Configure the mobile station: Set TX frequency, power level and activate internal pseudo random data sequence. The sequence used in the radio is a part of the CCIT sequence defined by GSM recs. The sequence is stored in RAM and each timeslot that a pseudo random modulation stream is desired, a seed is generated for this table that will pick the byte to start with. The next 116 data bits are then used for the data to be transmitted. The bit rate of the internal test signal is equivalent to the GSM specification of 270.833 kBits/s.

5. Use the built in Power Bandwidth function of the spectrum analyzer to create a measured plot of the spectrum yielding the 99% occupied bandwidth.

6. Repeat for all required frequencies adjusting the spectrum analyzer as necessary.

7. Set the markers to the points above and below the carrier frequency that are 26dB down from the peak level and record the bandwidth between the markers.

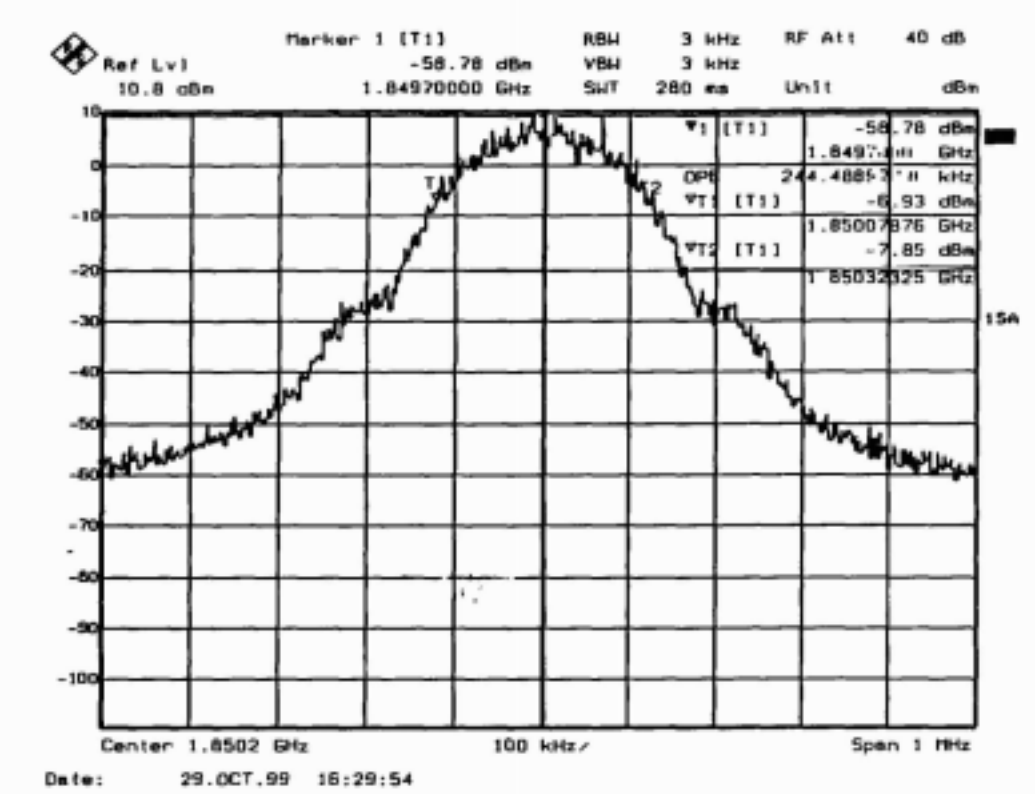
8. Repeat for all required frequencies adjusting the spectrum analyzer as necessary.

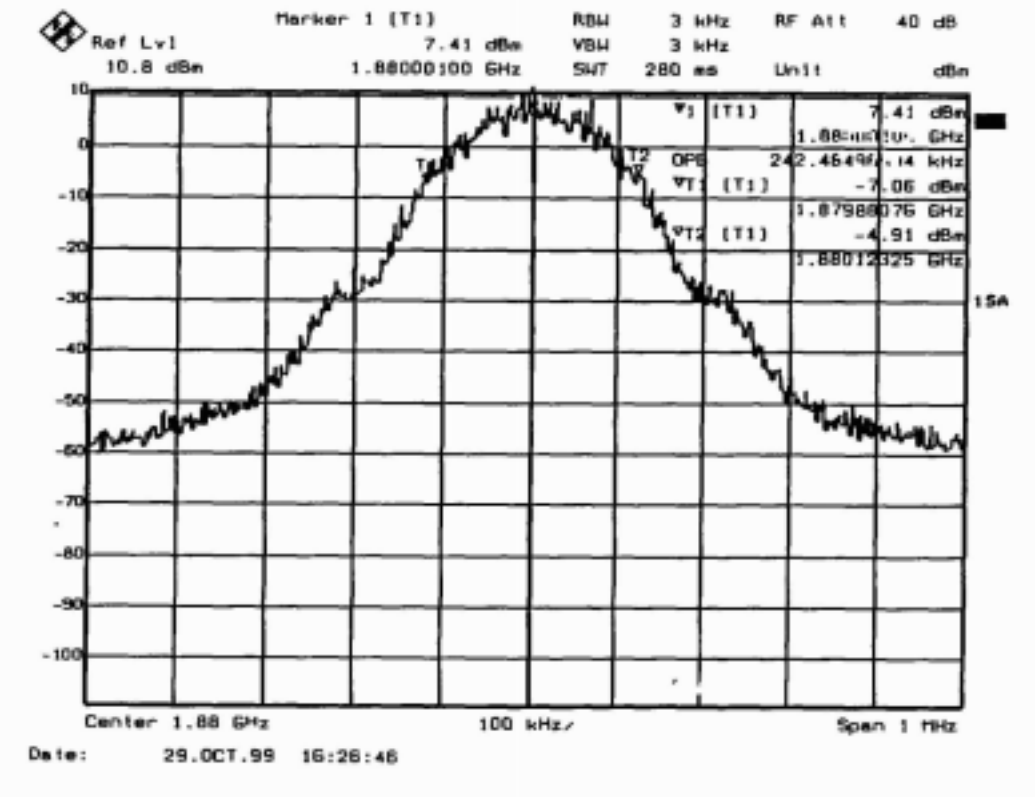
Occupied Bandwidth Results

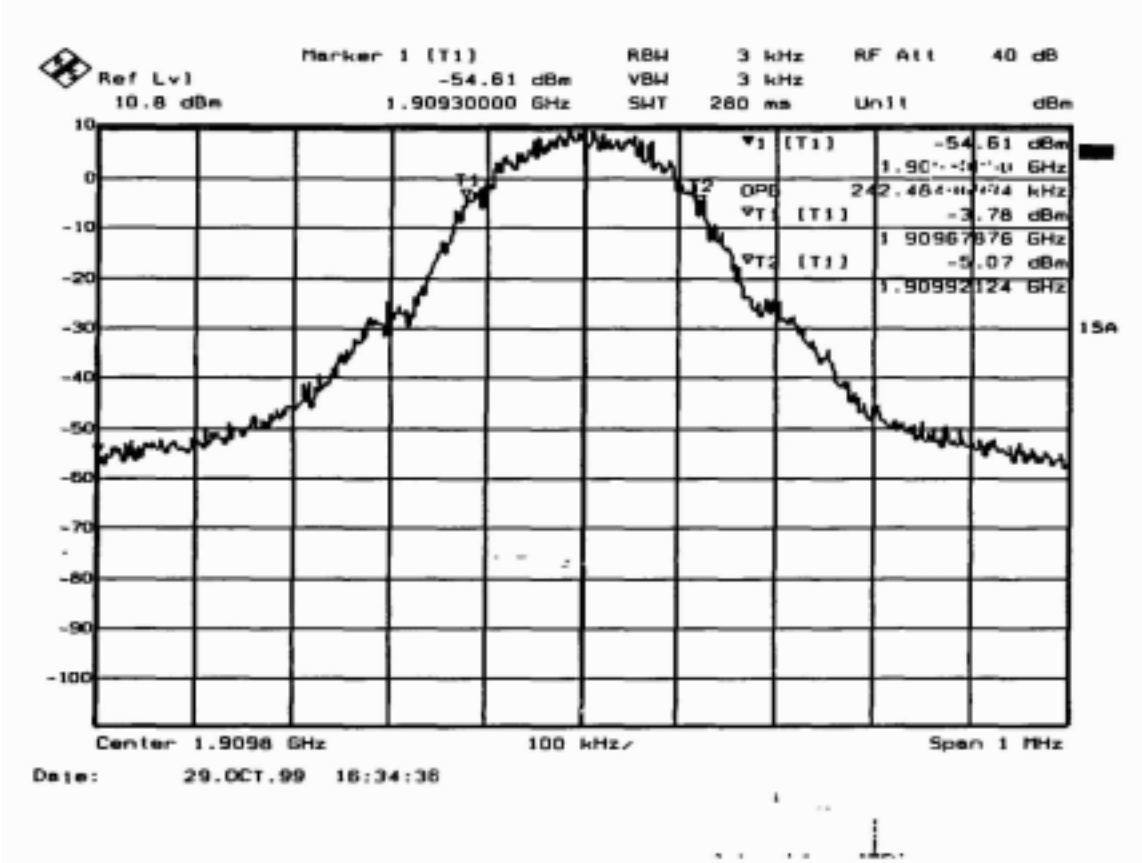
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 6.8 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

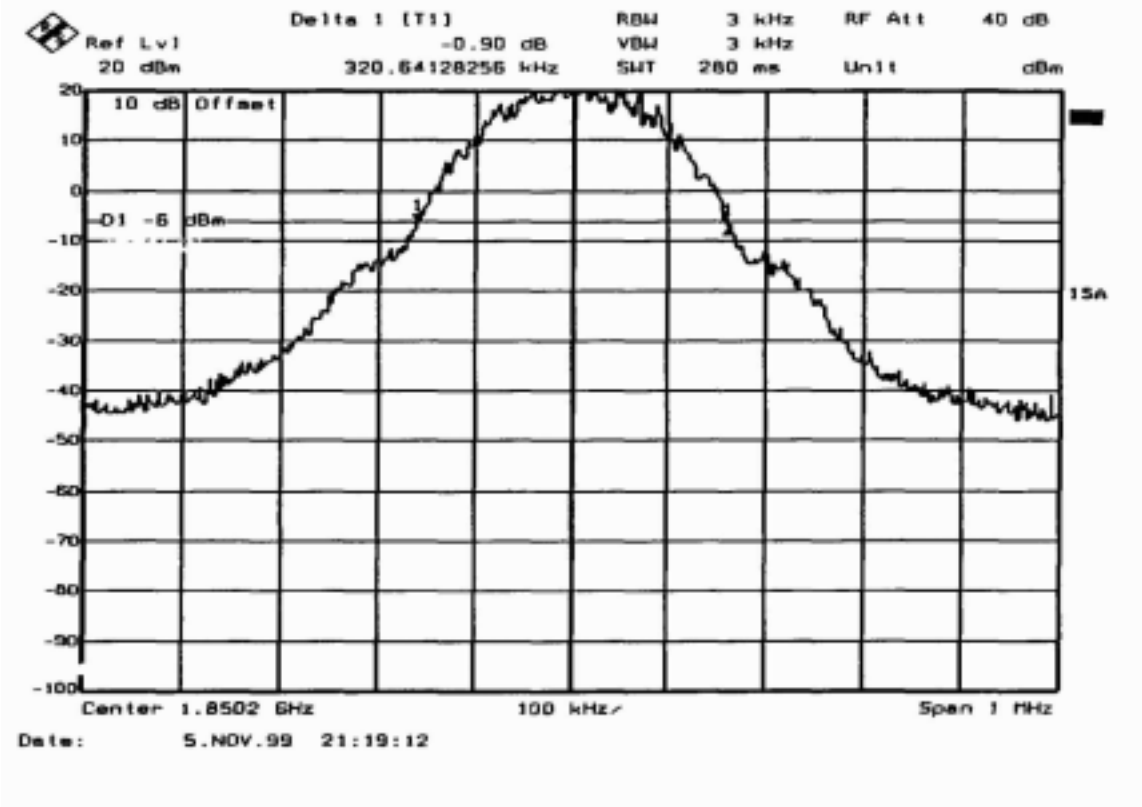
Frequency	99% Occupied BW	-26dBC Bandwidth
1850.2 MHz	244.48 kHz	320.6kHz
1880.0 MHz	242.4 kHz	304.6 kHz
1909.8 MHz	242.48 kHz	300.6kHz

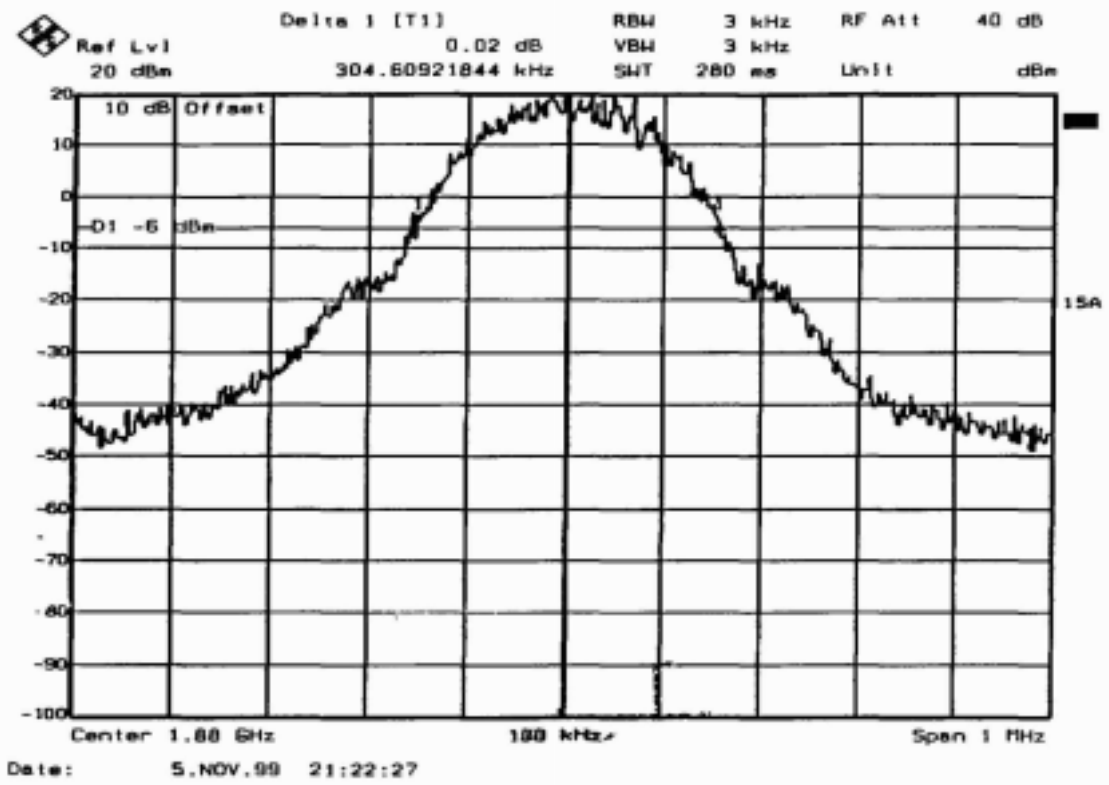
Occupied bandwidth results.

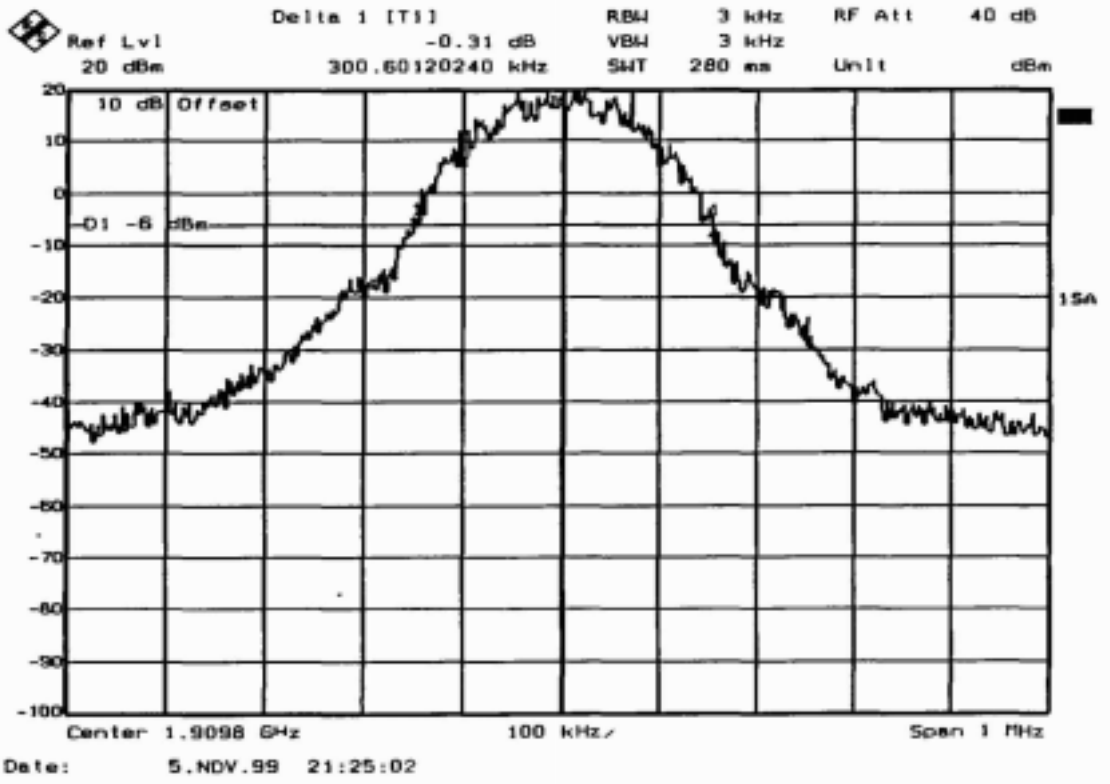

Marker 1 [T1]
Ref Lvl
10.8 dBm
-58.78 dBm
1.84970000 GHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 40 dB
Unit dBm
Center 1.8502 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 16:29:54


Marker 1 [T1]
Ref Lvl
10.8 dBm
7.41 dBm
1.88000100 GHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 40 dB
Unit dBm
Center 1.88 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 16:26:46


Marker 1 [T1]
RBW 3 kHz
RF Att 40 dB
Ref Lvl
-54.61 dBm
VBW 3 kHz
10.8 dBm
1.90930000 GHz
SWT 280 ms
Unit dBm
-54.61 dBm
-3.78 dBm
-5.07 dBm
1.90992124 GHz
15A
Center 1.9098 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 16:34:36


Delta 1 [T1]
RBW 3 kHz
RF Att 40 dB
Ref Lvl
-0.90 dB
VBW 3 kHz
20 dBm
320.64128256 kHz
SWT 280 ms
Unit dBm
10 dB Offset
D1 -6 dBm
15A
Center 1.8502 GHz
100 kHz/
Span 1 MHz
Date: 5.NOV.99 21:19:12


Delta 1 [T1]
0.02 dB
304.60921844 kHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 40 dB
Unit dBm
Ref Lvl
20 dBm
10 dB Offset
D1 -6 dBm
15A
Center 1.88 GHz
100 kHz/
Span 1 MHz
Date: 5.NOV.99 21:22:27


Delta 1 [T1]
-0.31 dB
300.60120240 kHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 40 dB
Unit dBm
Ref Lvl
20 dBm
10 dB Offset
D1 -6 dBm
15A
Center 1.9098 GHz
100 kHz/
Span 1 MHz
Date: 5.NOV.99 21:25:02

CONDUCTED SPURIOUS EMISSION

Exhibit Summary

EXHIBIT 6F contains measurement data pertaining to conducted spurious emissions. As indicated on the chart, some spur levels were reported using a "Brickwall Filter" technique. This measurement method is intended to overcome limitations caused by non-ideal filter roll-off within the measurement equipment (spectrum analyzer). For each spur level reported using this technique, the associated level measured using the FCC method per Part 24.238 is reported in the included table. In addition, at spurs located 1 MHz away from the band edge, the level recorded using the 1% occupied bandwidth or greater requirement is also listed.

Contents

Measurement Procedure
Measurement Limit
Measurement Results and Spectrum Plots
Spectrum Analyzer Filter

Measurement Procedure

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmit frequencies: The Table below outlines the band edge frequencies pertinent to conducted emissions testing.

USPCS Channel	Transmitter Frequency
512	1850.2 MHz
810	1909.8 MHz

Transmit frequencies for conducted emissions testing.

The carrier frequencies for each of the 200 kHz wide channels of the USPCS transmit band (1850 to 1910 MHz) begins with the first channel 0.2 MHz higher than the lower band edge, at 1850.2 MHz for channel number 512, and ends with the last channel 0.2 MHz lower than the upper band edge, at 1909.8 MHz for channel number 810.

3. Measure attenuator and cable losses:

   a) Connect a TX bandpass filter and nominal 20 dB attenuator together, and place cables at input of the filter and output of the attenuator.
   b) Using a signal generator and power meter, calculate the loss through the filter, attenuator and cables at each of the frequencies listed in Table 9.1. Use these measurements to properly set the spectrum analyzer amplitude offset.
   c) Repeat the measurements on the cables and filter only, without the attenuator. This provides the spectrum analyzer offset for the minimum power case.

4. Connect test set-up:

   a) If measuring at max. mobile station output power (Power Step 0, +30 dBm nominal, for the band edge frequencies of interest), connect the filter, attenuator and cable network measured in 3. above from the output of the mobile station to the input of the spectrum analyzer.
   b) If measuring at min. output power (Power Step 15, 0 dBm nominal) connect the filter and cable network (no attenuator) measured in 3. above from the output of the mobile station to the input of the spectrum analyzer.

5. Power up Mobile Station:

   a) Tune to desired frequency.
   b) Set desired output power.
   c) Modulate carrier with the mobile station's internal pseudo random data sequence.

6. Set appropriate spectrum analyzer offset level to account for input attenuator using values measured in 3. above.

7. Measure spectrum:

   a) In the 1st 1 MHz band outside the band edge nearest the channel of interest use a 3 kHz res. BW.
   b) In the 2nd and 3rd 1 MHz bands outside the band edge nearest the channel of interest use the brickwall technique with 3 kHz res. BW and integrate the power in the two 1 MHz bands. The 3 MHz cut-off was determined from the spectrum analyzer filter plot shown on page 12. At 3 MHz from the carrier, the filter attenuation is sufficient enough to guarantee against non-compliance readings.
   c) From 3 MHz outside the band edge nearest the channel of interest to the End use 1 MHz res. BW.

8. Repeat 5. through 7. for each carrier frequency listed in the Table.

9. Repeat procedure for both min. and max. power settings.

Measurement Limit

Sec. 24.238 Emission Limits.

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Measurement Results

Conducted Emissions Measurements were made only at the extreme upper and lower carrier frequencies of the USPCS band. It was decided that measurements at these block edge frequencies would be sufficient to demonstrate compliance with emissions limits. The equipment must still, however, meet emissions requirements at all frequencies over which the equipment is designed to operate and it is the manufacturer's responsibility to verify this.

Measurement results are listed below in the following tables and figures. In each of the following charts the emission level reported is the level of the spurious emission of largest magnitude found within the specified frequency window whether the mobile station was transmitting at either high or low power.

Carrier: 1850.2 MHz (Channel 512)

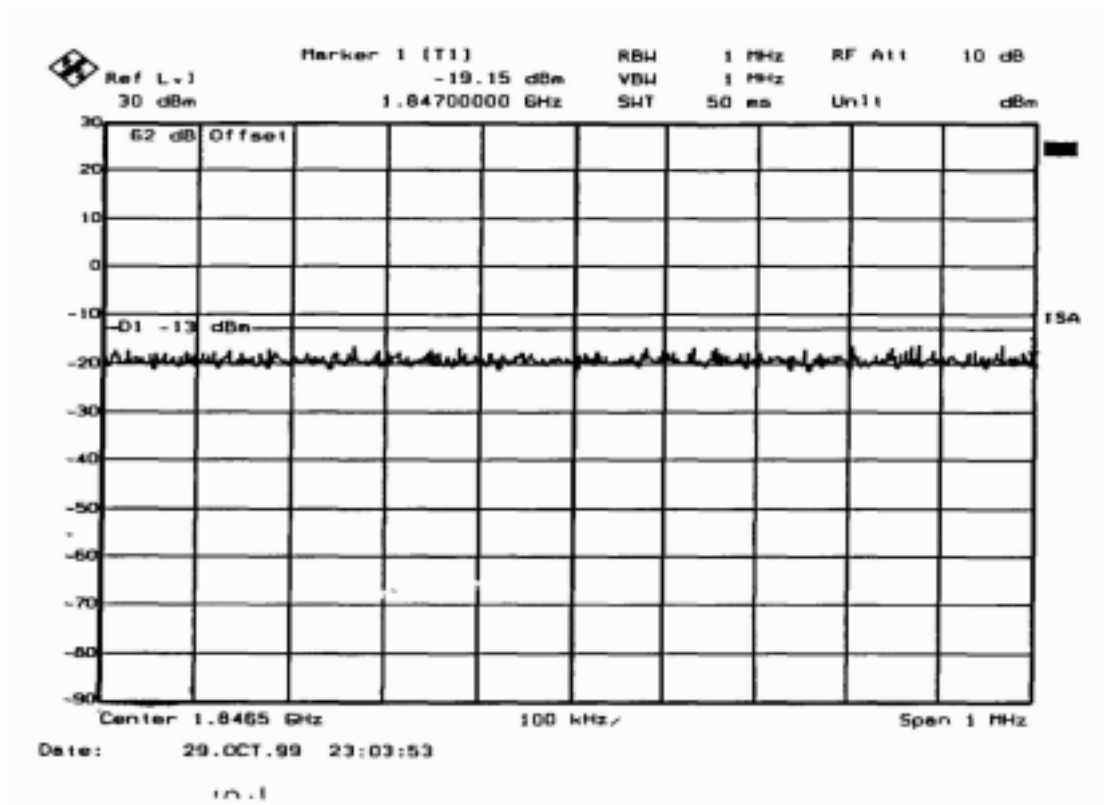
Frequency	Emissions Level	Method Used
10 MHz - 1846 MHz	-27 dBm @ 510MHz	FCC
1846 MHz - 1847 MHz	-19 dBm @ 1.847GHz	FCC
1847 MHz - 1848 MHz	-27dBm @ 1.8476GHz	Brickwall Filter
1848 MHz - 1849 MHz	-28.2dBm @ 1.8487GHz	Brickwall Filter
1849 MHz - 1850 MHz	-16.2dBm @ 1.8499GHz	FCC
1910 MHz - 20 GHz	-27.3dBm @ 3.47GHz	FCC

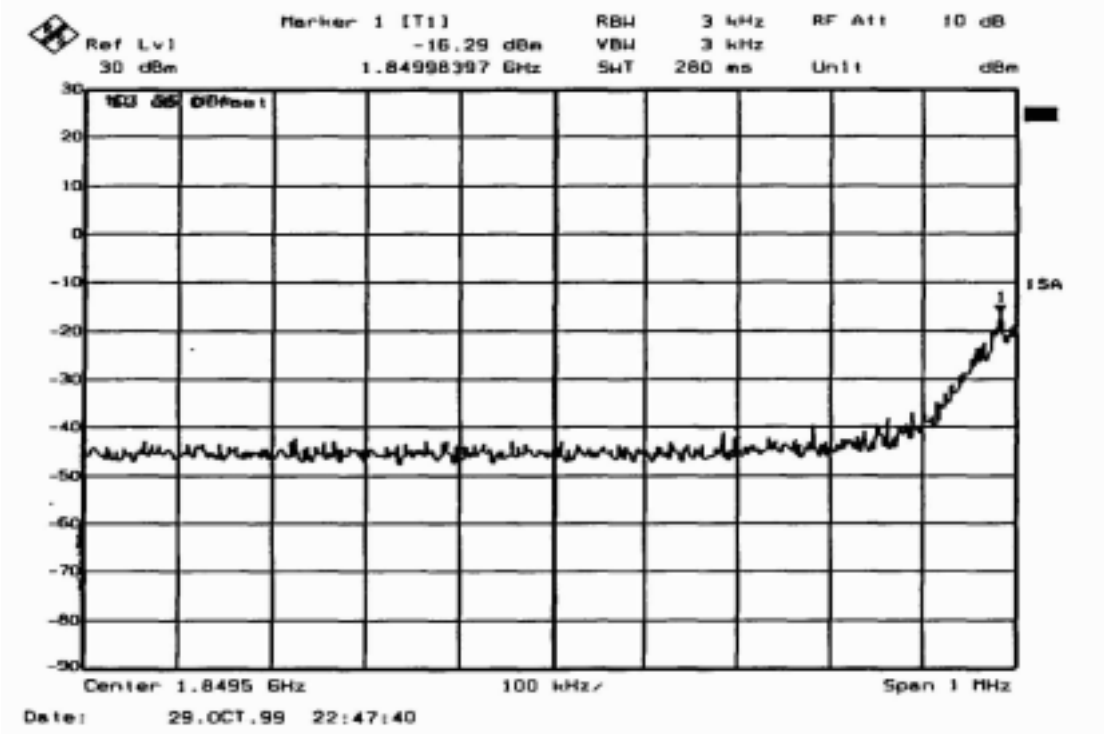
Table 6.10: Conducted emissions results for 1850.2 MHz carrier.

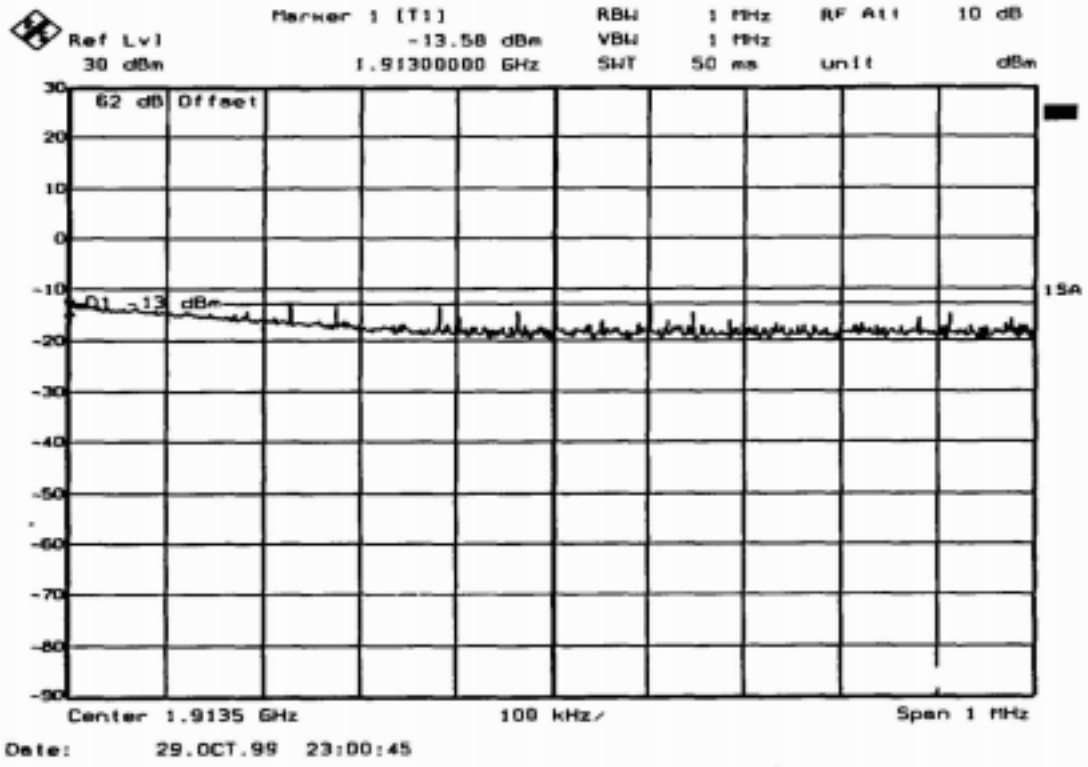
Carrier: 1909.8 MHz (Channel 810)

Frequency	Emissions Level	Method Used
10 MHz - 1850MHz	-28 dBm @ 305MHz	FCC
1910 MHz - 1911 MHz	-17.3 MHz @ 1.91001GHz	FCC
1911 MHz - 1912 MHz	-27.78dBm @ 1.91111GHz	Brickwall Filter
1912 MHz - 1913 MHz	-28.8dBm @ 1.9128GHz	Brickwall Filter
1913 MHz - 1914 MHz	-13.6dBm @ 1.913GHz	FCC
1914 MHz - 20 GHz	-27.1dBm @ 1.9235GHz	FCC

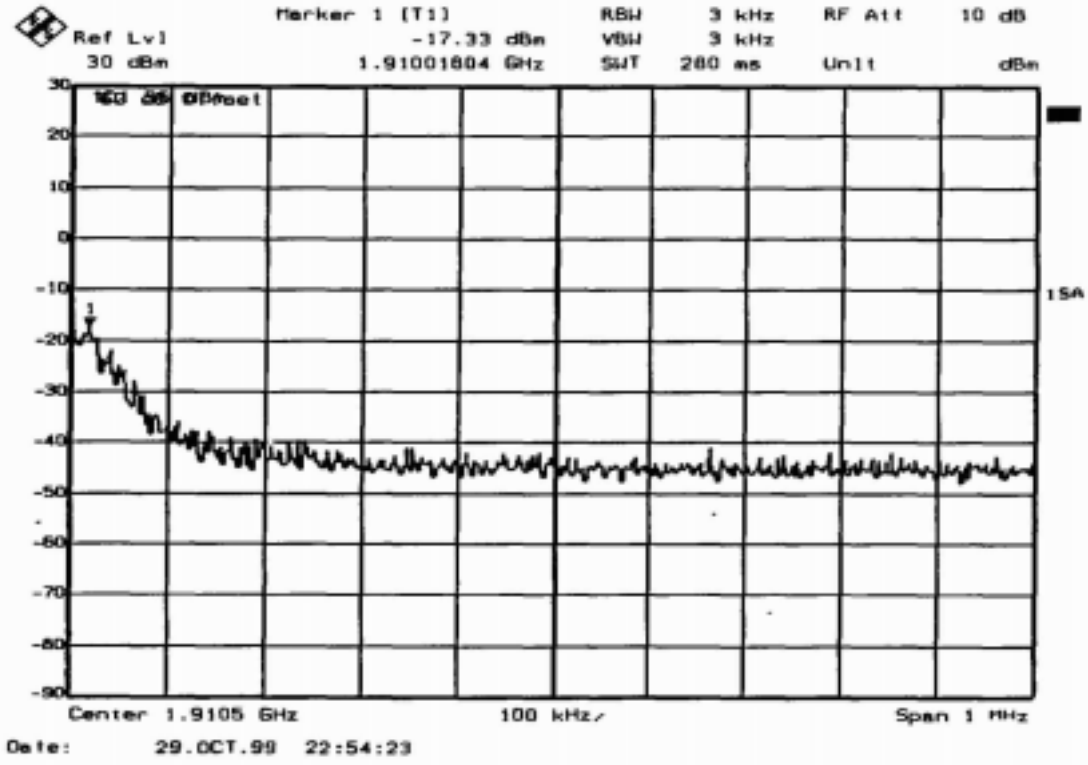
Conducted emissions results for 1909.8 MHz carrier.


Marker 1 [T1]
Ref Lvl
30 dBm
-19.15 dBm
1.84700000 GHz
RBW 1 MHz
VBW 1 MHz
SWT 50 ms
RF Att 10 dB
Unit dBm
62 dB Offset
D1 -13 dBm
1SA
Center 1.8465 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 23:03:53


Marker 1 [T1]
Ref Lvl
30 dBm
-16.29 dBm
1.84998397 GHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 10 dB
Unit dBm
1SA
Center 1.8495 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 22:47:40


Marker 1 [T1]
-13.58 dBm
1.91300000 GHz
RBW 1 MHz
VBW 1 MHz
SWT 50 ms
RF Att 10 dB
Unit dBm
Ref Lvl
30 dBm
62 dB Offset
D1 -13 dBm
15A
Center 1.9135 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 23:00:45

10 4


Marker 1 [T1]
-17.33 dBm
1.91001804 GHz
RBW 3 kHz
VBW 3 kHz
SWT 280 ms
RF Att 10 dB
Unit dBm
Ref Lvl
30 dBm
Offset
15A
Center 1.9105 GHz
100 kHz/
Span 1 MHz
Date: 29.OCT.99 22:54:23

FREQUENCY STABILITY

Exhibit Summary
EXHIBIT 6G contains measurement data pertaining to frequency stability.

Contents

Method of Measurement
Measurement Limit
Frequency Stability Plots
Carrier Stability Over Voltage
Carrier Stability Over Temperature

Method of Measurement:
In order to measure the carrier frequency under the condition of AFC lock, see EXHIBIT 12, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a Hewlett Packard 8922H GSM MS Test Set.

1. Measure the carrier frequency at room temperature.

2. Subject the mobile station to overnight soak at -30 C.

3. With the mobile station, powered via 3.6 Volts, connected to the 8922H and in a simulated call on channel 662 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

5. Remeasure carrier frequency at room temperature with nominal 3.6 Volts. Vary supply voltage from minimum 3.5 Volts to maximum 5.5 Volts, in 0.2 Volt increments remeasuring carrier frequency at each voltage. Pause at 3.6 Volts for 1 1/2 hours unpowered, to allow any self heating to stabilize, before continuing.

6. Subject the mobile station to overnight soak at +60 C.

7. With the mobile station, powered via 3.6 Volts, connected to the 8922H and in a simulated call on channel 662 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.

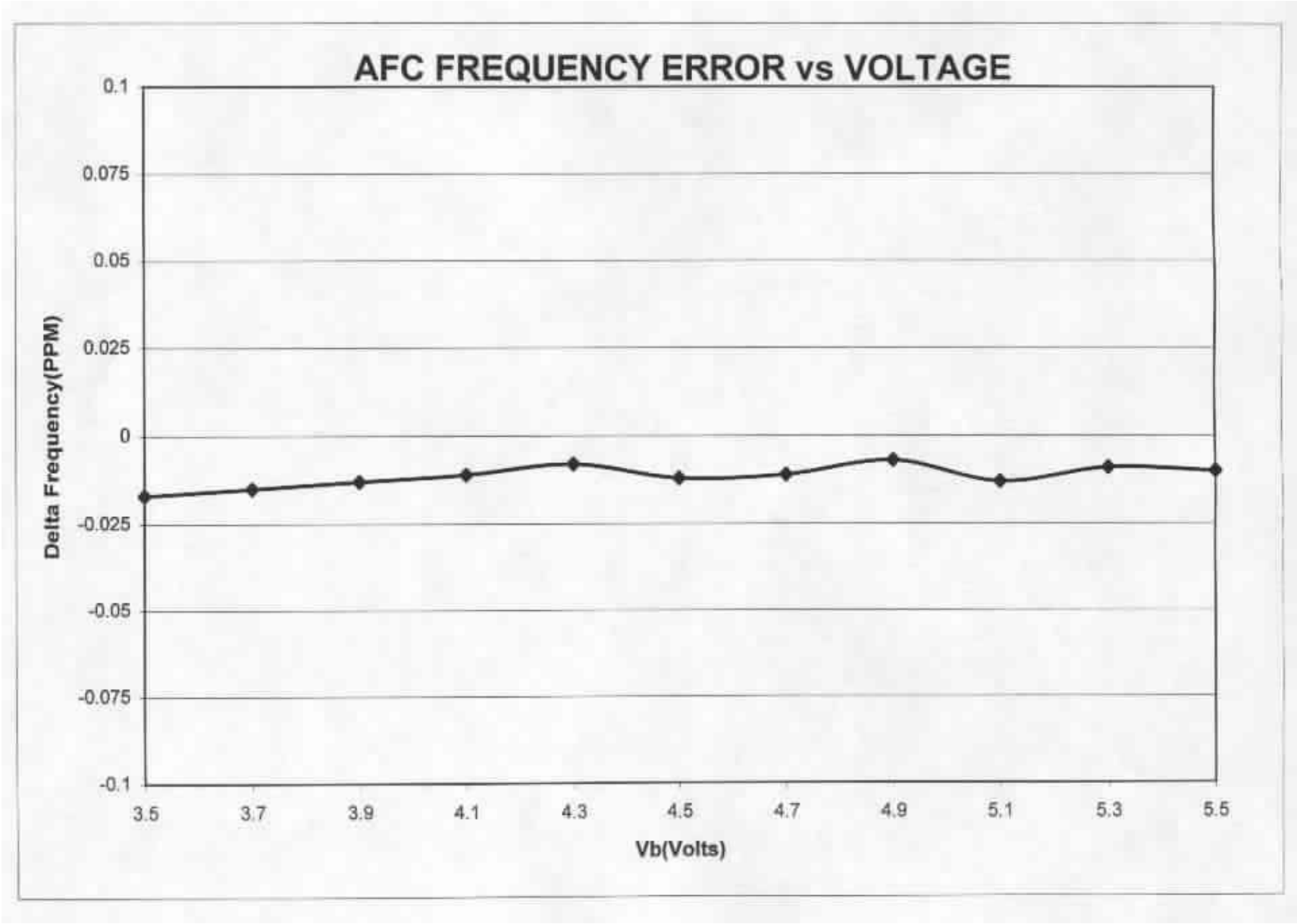
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

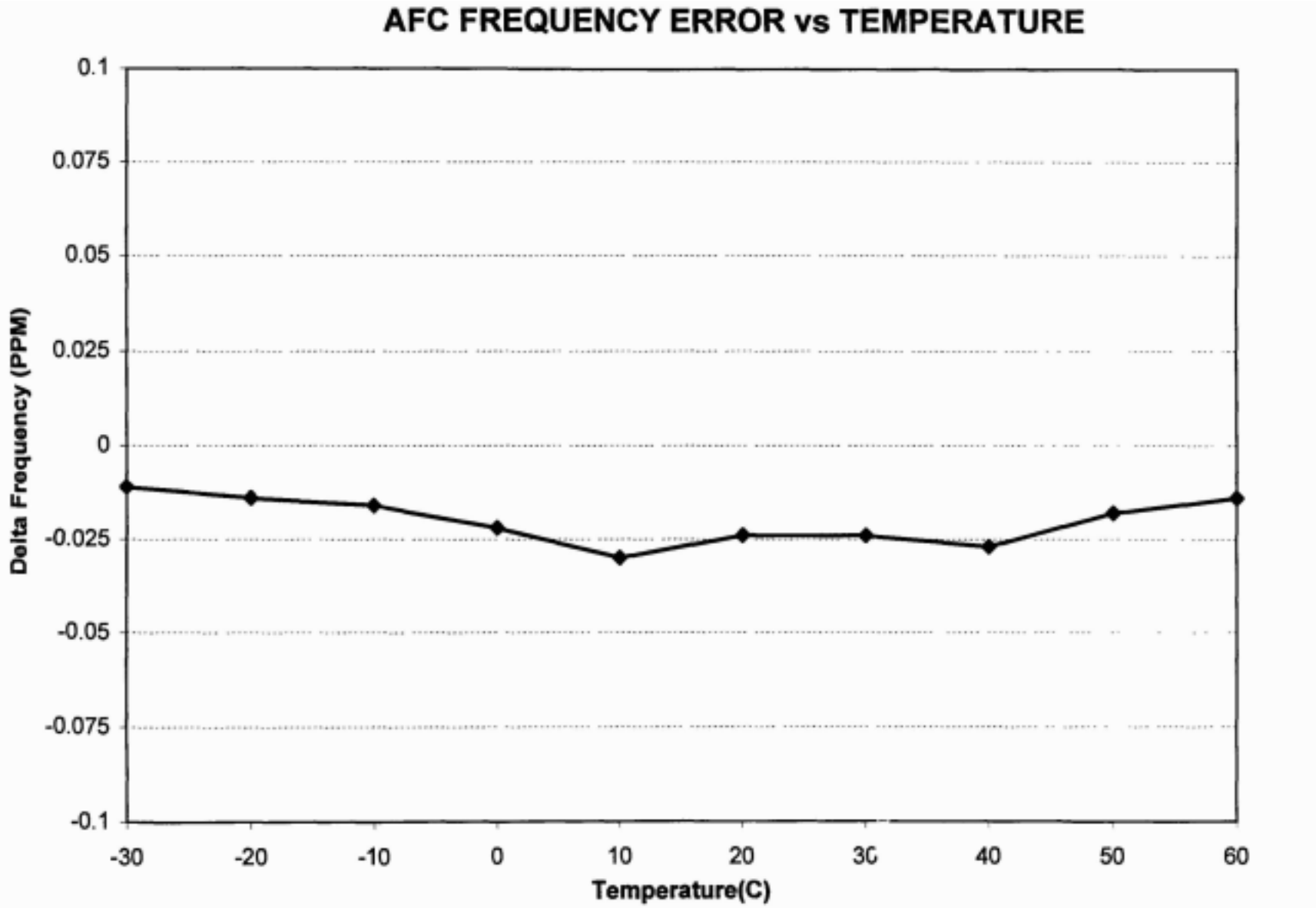
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Limit

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

As this transceiver is considered "Hand carried, battery powered equipment…," Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5 Vdc and 5.5 Vdc, with a nominal voltage of 3.6 Vdc (based on operation off of a 3-cell Nickel-Metal Hydride battery pack). Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of + 25 % and - 18 %. For the purposes of measuring frequency stability these voltage limits are to be used.


AFC FREQUENCY ERROR vs VOLTAGE
0.1
0.075
0.05
0.025
0
-0.025
-0.05
-0.075
-0.1
Delta Frequency(PPM)
3.5
3.7
3.9
4.1
4.3
4.5
4.7
4.9
5.1
5.3
5.5
Vb(Volts)


AFC FREQUENCY ERROR vs TEMPERATURE
Delta Frequency (PPM)
0.1
0.075
0.05
0.025
0
-0.025
-0.05
-0.075
-0.1
-30
-20
-10
0
10
20
30
40
50
60
Temperature(C)