MEASUREMENT AND TECHNICAL REPORT

CUBIC COMMUNICATIONS, INC.

9535 Waples Street
San Digo, CA 92121-2953

DATE: 11 May 1999

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Transceiver, Model ATC-100	
Transition Rules Request per 15.37?	Yes:	*No:

(*) FCC Part 2, Paragraphs 2.1046, 2. 1047(a), 2.1049, 2.1051, 2. 1053, 2.1055(d) and Part 87, Paragraphs 87.131, 87.133, 87.135, 87.139, 87.141

Report Prepared by:

TÜV PRODUCT SERVICE
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 619 546 3999
Fax: 619 546 0364

TABLE OF CONTENTS

1 GENERAL INFORMATION

PRODUCT DESCRIPTION	
NAME, MODEL, SERIAL # OF EUT:	Transceiver, Model ATC-100
DESCRIPTION OF EUT:	Transceiver, 118-138 MHz; Power: 115 Vac, 60 Hz; Output: 25 watts maximum

Components of EUT			
Description	Model Number	Serial Number	FCC ID Number
Transceiver	ATC-100	--	NVSATC-100
OPERATING MODE(S):	A3E		

I/O CABLES				
CONNECTION	Power	Remote control	RX	Audio
SHIELD	--	Yes	Coax	No
CONNECTORS	AC plug	25-pin "D"	"N" type	15-pin "D"
TERMINATION TYPE	--	Female	50 ohm	Female
LENGTH	6'	10 meters	24"	6'
REMOVABLE	Yes	Yes	Yes	Yes

POWER CORDS			
UNIT:	Standard		
MANUFACTURER:	--		
SHIELDED:	No		
LENGTH:	6'		

POWER INTERFACE	
FREQUENCY/AC/DC VOLTAGE:	60 Hz / 120 Vac
PHASES/CURRENT:	1 / --

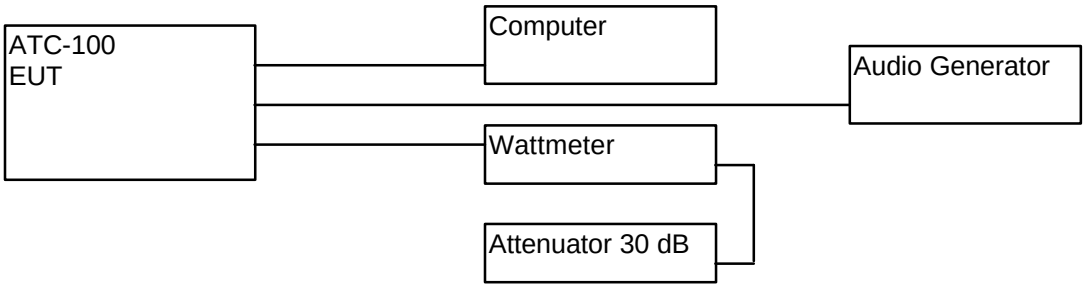
OSCILLATOR FREQUENCIES		
FREQUENCY	EUT LOCATION	DESCRIPTION OF USE
47.152 MHz	--	DSP clock
163-183 MHz	--	1st LO

POWER SUPPLY				
DESCRIPTION	MANUFACTURER	MODEL #	SERIAL #	SWITCHING/LINEAR FREQ.
Internal				

POWER LINE FILTERS			
MANUFACTURER	MODEL NO.	QTY.	LOCATION ON EUT
Internal			

CRITICAL EMI COMPONENTS				
DESCRIPTION	MANUFACTURER	PART # OR VALUE	QTY.	LOCATION ON EUT
--				
DESCRIPTION OF ENCLOSURE:	--			

INTERFACING AND/OR SIMULATORS PERIPHERAL EQUIPMENT:				
DESCRIPTION	MANUFACTURER	MODEL #	SERIAL #	FCC ID
Computer	Toshiba	--	--	--
Wattmeter	Bird	--	--	--
Dummy Load Attenuator	--	--	--	--
2-tone Generator	--	--	--	--
Typical test setup block diagram	See next page.			


ATC-100
EUT
Computer
Audio Generator
Wattmeter
Attenuator 30 dB

1.2 Test Methodology

Purpose of Test: To demonstrate compliance with the ANSI C63.4 setup.

Test Performed:
- X 1. Conducted Emissions, FCC Part 2, Paragraph *2.1046, 2. 1047(a), 2.1049, 2.1051, and Part 87, Paragraphs 87.131, 87.135, 87.141*
- 2. Radiated Emissions EN55022: 1992 Class B limit, 30 - 1,000 MHz, 10 meters
- X 3. Radiated Emission per FCC Part 2, Paragraph 2.1053, Part 87, Paragraph 87.139
- X 4. Frequency Stability Part 2, Paragraph *2.1046 Part 87, Paragraph 87.131*

Both Conducted and radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8 - M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 10 GHz).

1.3 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV PRODUCT SERVICE
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 619 546 3999
Fax: 619 546 0364

The Test Site Data and performance comply with ANSI 63.4 and are registered with the FCC, 7435 Oakland Mills Rd, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

1.4 Part 2 Requirements

See attachments.

A) **Microprocessor Nos. Control: i386**
Digital Signal Processor TMS320C31

B) Type **of emission**.
A3E, manual page 1-3 (AM, mode O)

C) **Frequency Range. Manual page 1-2**
118-136.975 MHz

D) **Range of Operating Power values** or specific operating **power levels**;
and **description** of any means provided for **variation of operating power.**
1 - 25 Watts in 1 W increments, Manual page 1-3.
Page 3-1 Remote control via RS-232.

E) **Maximum power rating**
25 Watts, Manual page 1-3; Frequency Tolerance, 2% 273 Hz, 20 ppm Manual 1-2.

F) **DC voltages** applied to and **dc currents** into the several elements of the final radio frequency amplifying device for normal operation over the power range.
24 - 32 Vdc @ 15 amps, manual page 1-3

G) **Description of the modulation system** to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided
See manual, page 4-1.

H) D**escription of the modulating wavetrain**
AM. It is produced in Digital Signal Processor but the output is amplitude modulation.

I) **The unit is not stereo.**

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The **Transceiver, Model ATC-100** was initially tested for FCC emission in the following configuration:

See Block Diagram attached.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Modification

None

2.5 Configuration of Tested System

See Block Diagram attached.

3 TEST REPORT

3.1 Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, Paragraph 2.1053, Part 87, Paragraph 87.139

The *RADIATED EMISSIONS* measurements were performed at the following test location :

☐ **- Test not applicable**

■ - Roof (Small Open Area Test Site)

Testing was performed at a test distance of:

■- 3 meters

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
3115	453	Antenna, Double Ridge Guide	EMCO	9412-4363	10/99
3104	234	Biconical Antenna	EMCO	3031	08/99
3146	244	Log Periodic Antenna	EMCO	1063	09/99
8566B	720	Spectrum Analyzer	Hewlett Packard	211500842	03/99
8566B	721	Spectrum Analyzer Display	Hewlett Packard	2112A02185	03/99

Remarks: See test setup photos for test setup.

Field Strength Calculation

If a preamplifier was used during the Radiated Emission Testing, it is required that the amplifier gain must be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna , cable used and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the automatic measurement, these considerations are automatically presented as a part of the print out. In the case of manual measurements and for greater efficiency and convenience, instead of using these correlation factors for each meter reading, the specification limit was modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" or simply the CMRL, which is the actual field strength present at the antenna. The quantity can be derived in the following manner:

Corrected Meter Reading Limit (CMRL) = SAR + AF + CL - AG - DC

Where, SAR = Spectrum Analyzer Reading
AF = Antenna Factor
CL = Cable Loss
AG = Amplifier Gain (if any)
DC = Distance Correction (if any)

Assume the following situation: A meter reading of 29.4 dBuV was obtained from a Class A computing device measured at 83 MHz. Assume an antenna factor of 9.2 dB, a cable loss of 1.4 dB and amplifier gain of 20.0 dB at 83 MHz. The final field strength would be determined as follows:

CMRL = 29.4 dBuV + 9.2dB = 1.4 dB - 20 dB/M - 0.0 dB

CMRL = 20.0 dBuV/M

This result is well below the FCC and CSA Class A limit of 29.5 dbuV/m at 83 MHz.

For the manual mode of measurement, a table of corrected meter reading limit was used to permit immediate comparison of the meter reading to determine if the measure emission amplitude exceeded the specification limit at that specific frequency.

REPORT No: 9102 TESTED BY: dm mw

SPEC FCC Part2 para2.1053
FCC Part 87 para. 87.139

CUSTOMER: Cubic communications Inc.

TEST DIST: 1

E U T: ATC-100

TEST SITE: 3

EUT MODE: transmit - AM

BICONICAL: 234

DATE: 29-Mar-99

LOG: 244

NOTES: Duty Cycle= 100%

OTHER: 453

AM w/ internal 1kHz modulation

low channel

internal 10-turn choke on DC power input leads. Steward 28B1142-100 core

v.beta1

FREQ (MHz)	VERTICAL (dBuv) pk	av	HORIZONTAL (dBuv) pk	av	CORRECTION FACTOR (dB/m)	MAX LEVEL (dBuV/m) pk	av	SPEC LIMIT (dBuV/m) pk	av	MARGIN (dB) pk	av	EUT Rotatio	Antenna Height
118.025	56.7		52.8		16.0	**72.7**							
236.05	61.3		58.1		14.1	**75.4**		84.4		-9.02			
354.075	53		46.5		17.7	**70.7**		84.4		-13.7			
472.1	35.3		42.3		20.6	**62.9**		84.4		-21.5			
590.125	19.2		20		22.8	**42.8**		84.4		-41.6			
708.15	22.6		29.1		25.1	**54.2**		84.4		-30.2			
826.175	26.5		31		26.3	**57.3**		84.4		-27.1			
944.2	23.7		22		27.5	**51.2**		84.4		-33.2			
1062.225	4.4		3.6		27.1	**31.5**		84.4		-52.9			
1180.25	3.7		5.2		28.0	**33.2**		84.4		-51.2			

(10)

REPORT No: 9102 TESTED BY: dm MW

SPEC FCC Part2 para2.1053
FCC Part 87 para. 87.139

CUSTOMER: Cubic communications Inc.

TEST DIST: 1

E U T: ATC-100

TEST SITE: 3

EUT MODE: transmit - AM

BICONICAL: 234

DATE: 29-Mar-99

LOG: 244

NOTES: Duty cycle 100%

OTHER: 453

AM w/ internal 1kHz modulation

mid channel

tested with 4-turn ferrite on DC power input leads. Steward 28A2024-0A0

v.beta1

FREQ (MHz)	VERTICAL (dBuv) pk	av	HORIZONTAL (dBuv) pk	av	CORRECTION FACTOR (dB/m)	MAX LEVEL (dBuV/m) pk	av	SPEC LIMIT (dBuV/m) pk	av	MARGIN (dB) pk	av	EUT Rotatio	Antenna Height
127.1	65.9		61		14.4	**80.3**							
254.2	56.6		64		15.2	**79.2**		84.4		-5.25		180	1
381.3	52		53.7		18.4	**72.1**		84.4		-12.3			
508.4	29.4		31.5		22.0	**53.5**		84.4		-30.9			
635.5	23		26.4		23.1	**49.5**		84.4		-34.9			
762.6	37.5		40.9		25.4	**66.3**		84.4		-18.1			
889.7	27.2		25.7		27.1	**54.3**		84.4		-30.1			
1016.8	29.1		26.4		26.7	**55.8**		84.4		-28.6			
1143.9	23.8		22.2		27.8	**51.6**		84.4		-32.8			
1271	14.2		15.2		28.8	**44.0**		84.4		-40.4			

REPORT No: 9102 TESTED BY: dm mw

SPEC FCC Part2 para2.1053
FCC Part 87 para. 87.139

CUSTOMER: Cubic communications Inc.

TEST DIST: 1

E U T: ATC-100

TEST SITE: 3

EUT MODE: transmit - AM

BICONICAL: 234

DATE: 29-Mar-99

LOG: 244

NOTES: Duty cycle 100%

OTHER: 453

AM w/ internal 1kHz modulation

mid channel

internal 10-turn choke on DC power input leads. Steward 28B1142-100 core

v.beta1

FREQ (MHz)	VERTICAL (dBuv) pk	av	HORIZONTAL (dBuv) pk	av	CORRECTION FACTOR (dB/m)	MAX LEVEL (dBuV/m) pk	av	SPEC LIMIT (dBuV/m) pk	av	MARGIN (dB) pk	av	EUT Rotatio	Antenna Height
135.4	62		70		13.3	**83.3**							
270.8	57.8		55.2		16.0	**73.8**		84.4		-10.6		180	1
406.2	42.9		51.2		18.9	**70.1**		84.4		-14.3			
541.6	32.7		25.3		22.0	**54.7**		84.4		-29.7			
677	21.9		24.7		24.6	**49.3**		84.4		-35.2			
812.4	51.7		54.9		26.1	**81.0**		84.4		-3.35			
947.8	21.2		26.8		27.7	**54.5**		84.4		-29.9			
1083.2	32.1		20.5		27.3	**59.4**		84.4		-25			
1218.6	17.3		12.3		28.3	**45.6**		84.4		-38.8			
1354	18.4		9.6		29.4	**47.8**		84.4		-36.6			

3.2 CONDUCTED EMISSION DATA

Emissions Test Conditions: CONDUCTED EMISSIONS, FCC Part 2, Paragraphs *2.1046, 2. 1047(a), 2.1049, 2.1051, 2. 1053, 2.1055(d) and Part 87, Paragraphs 87.131, 87.133, 87.135, 87.139, 87.141*

The *RADIATED EMISSIONS* measurements were performed at the following test location :

☐ - Test not applicable

■ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used :

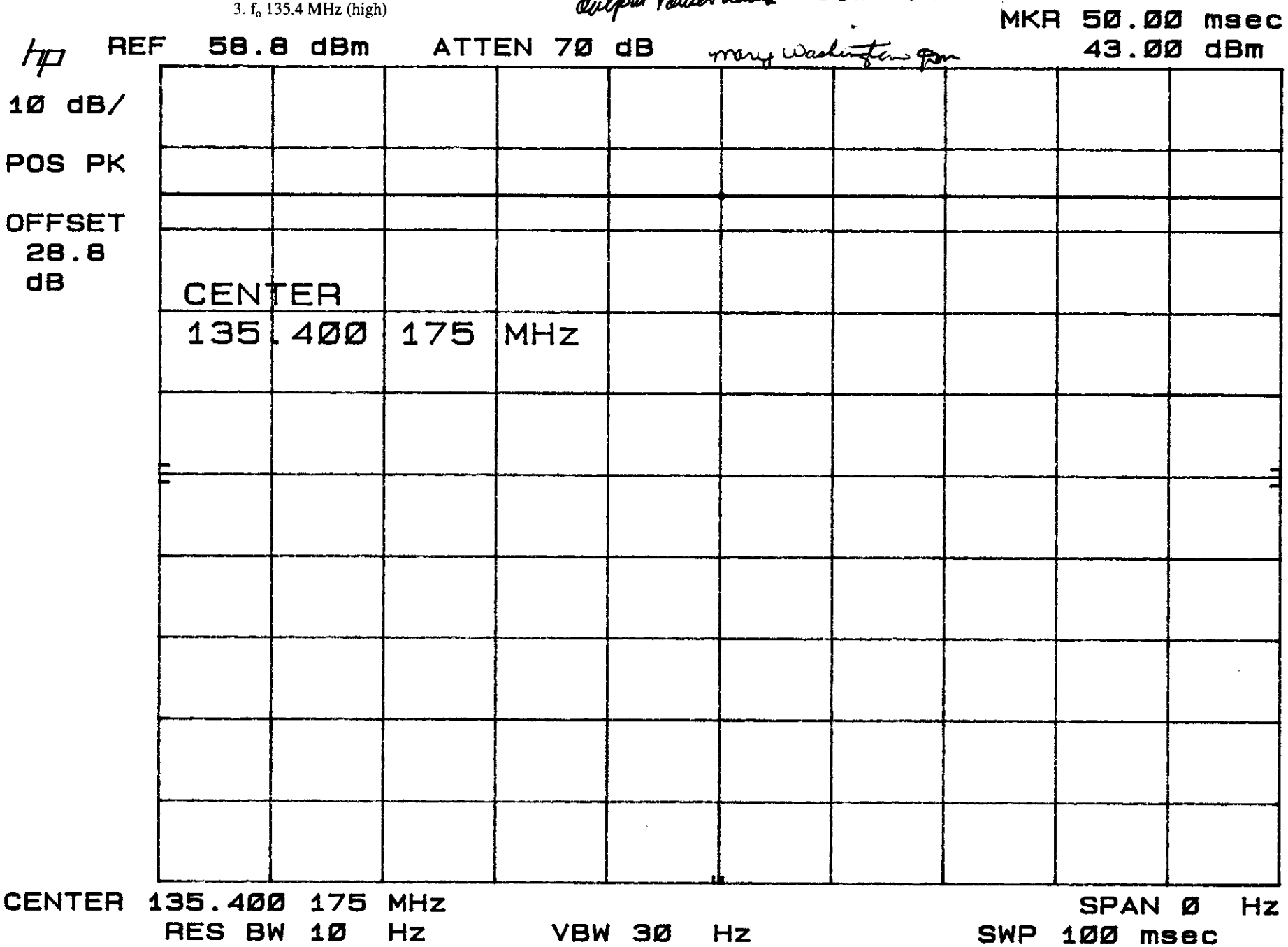
Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
8498A	446	Attenuator	Hewlett Packard	03273	03/99
8566B	744	Spectrum Analyzer	Hewlett Packard	2618A02913	02/00
C3910	638	Directional Coupler	Weralatone	5416	*
43	--	Bird Wattmeter	Bird	166671	11/99
45-20-33	--	20 dB Load	Weinshel	DW445	09/99
3325A	688	Audio Frequency Generator	Hewlett Packard	2512A23803	02/00
XF4-60-20	--	DC Power Supply	Xantrex	28977	NCR
HP5386A	--	Frequency Counter	Hewlett Packard	2621A00303	10/99

Remarks: (*) Verified prior to testing.

Customer: CUBIC COMMUNICAITONS
Test: Output Power
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 135.4 MHz (high)

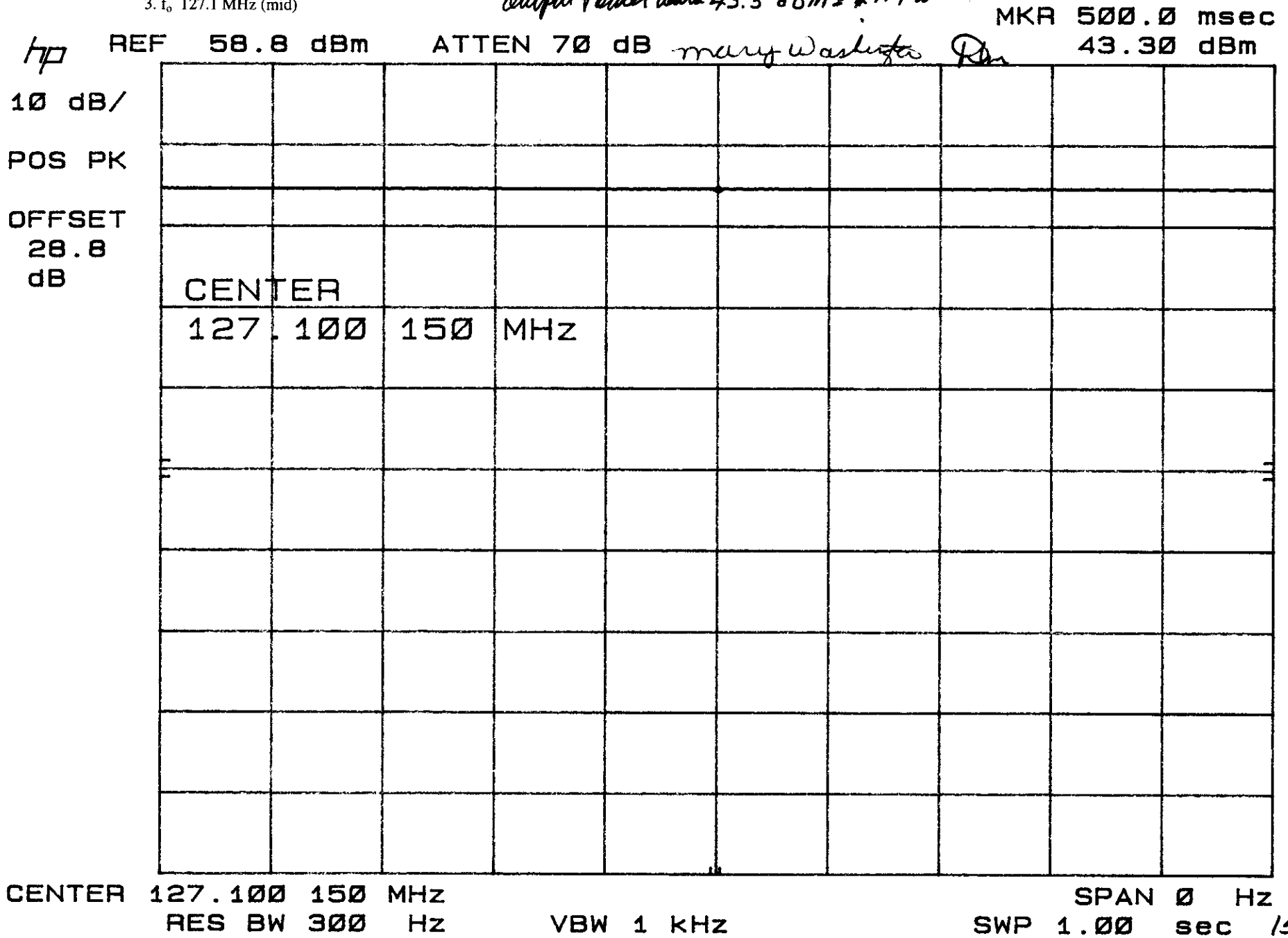
Date: 30 March 1999
Specification: FCC Part 2, Paragraph 2.1046 and Part 87, Paragraph 87.131

Output Power with 43 dBm = 20 W



Customer: CUBIC COMMUNICAITONS
Test: Output Power
Specification: FCC Part 2, Paragraph 2.1046 and Part 87, Paragraph 87.131
Date: 30 March 1999
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 127.1 MHz (mid)

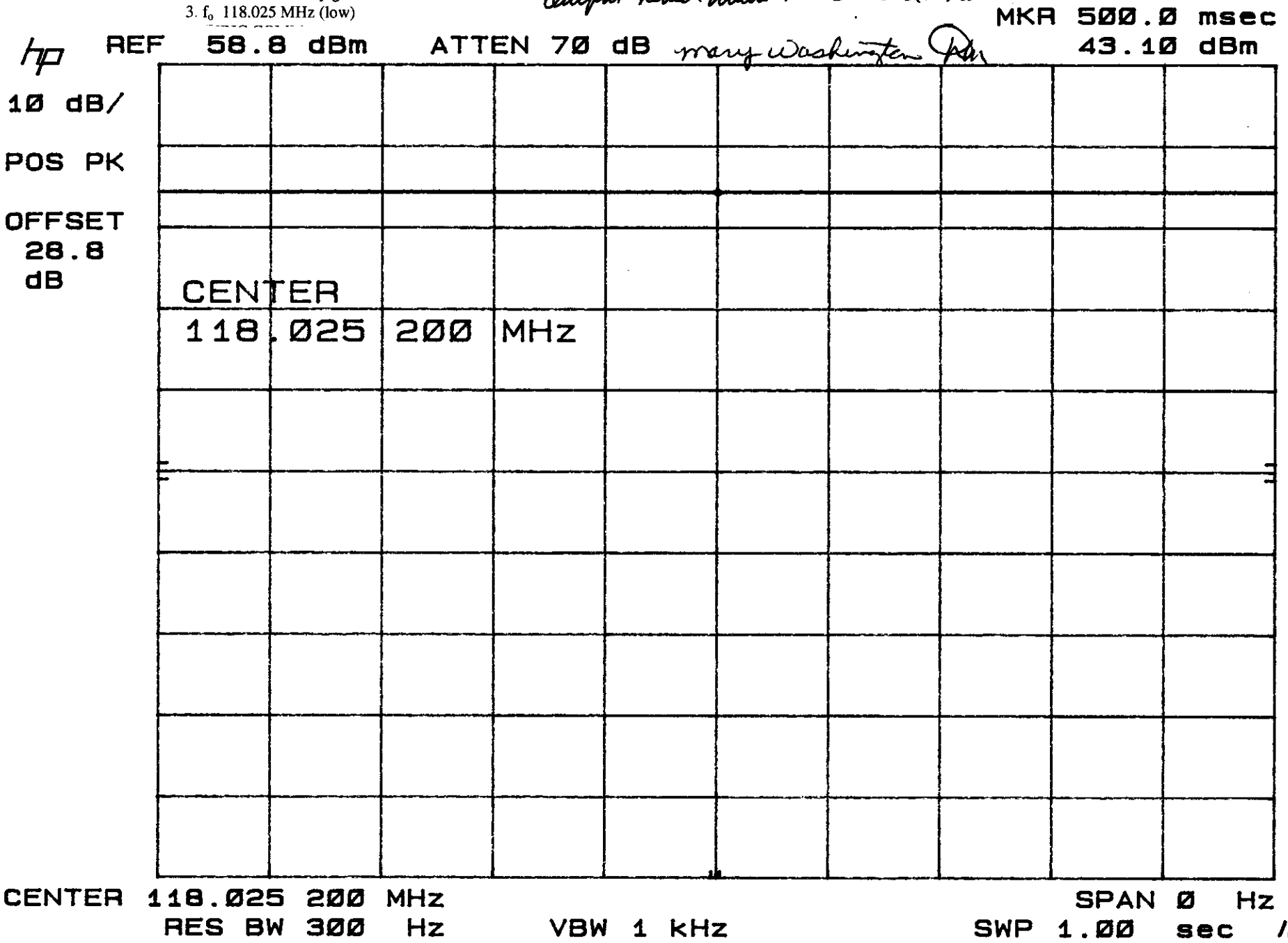
Output Power watts 43.3 dBm = 21.4 W



15

Customer: CUBIC COMMUNICAITONS
Date: 30 March 1999
Test: Output Power
Specification: FCC Part 2, Paragraph 2.1046 and Part 87, Paragraph 87.131
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 118.025 MHz (low)

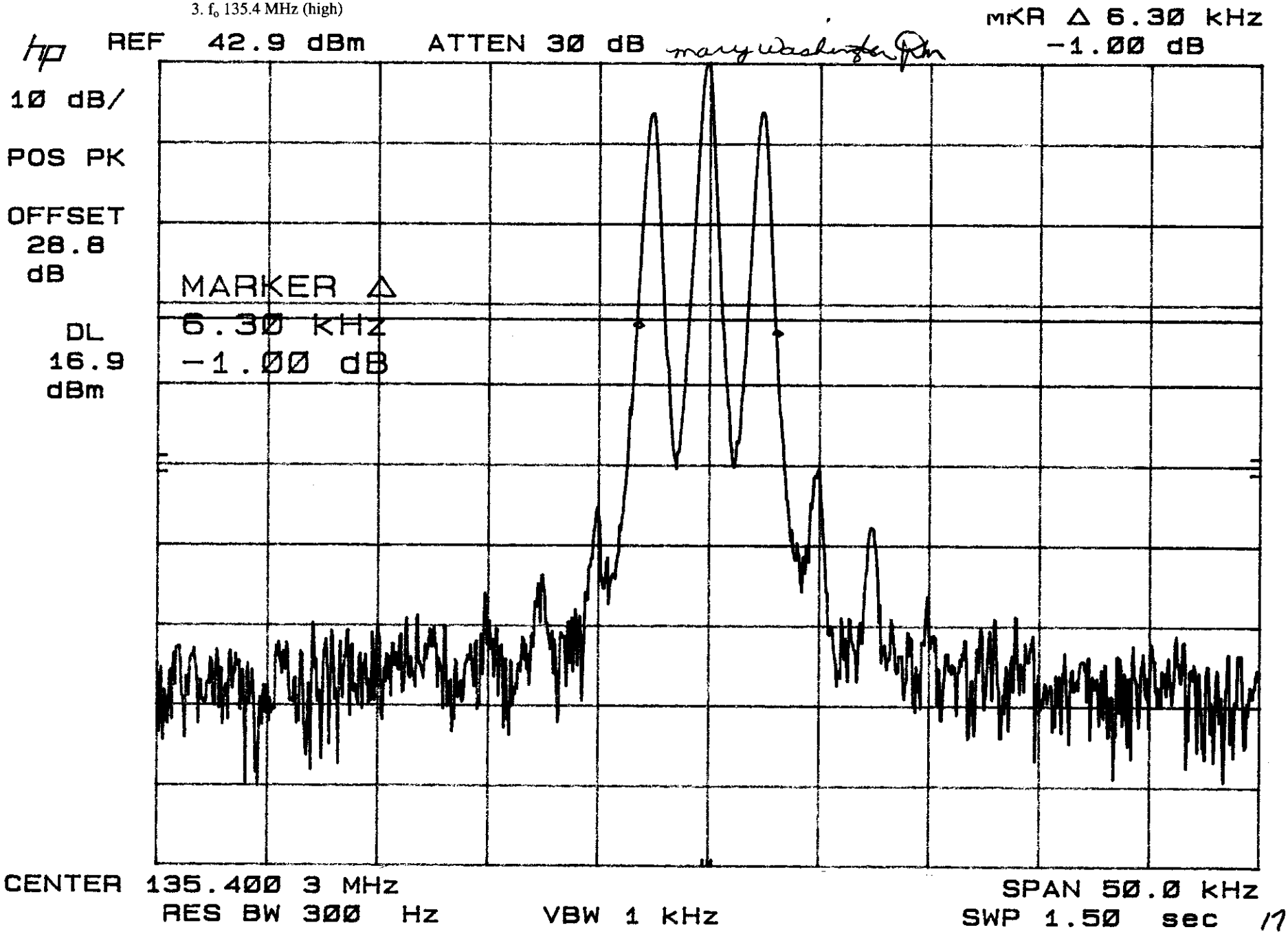
Output Power Watts 43.1 dBm = 20.4 W



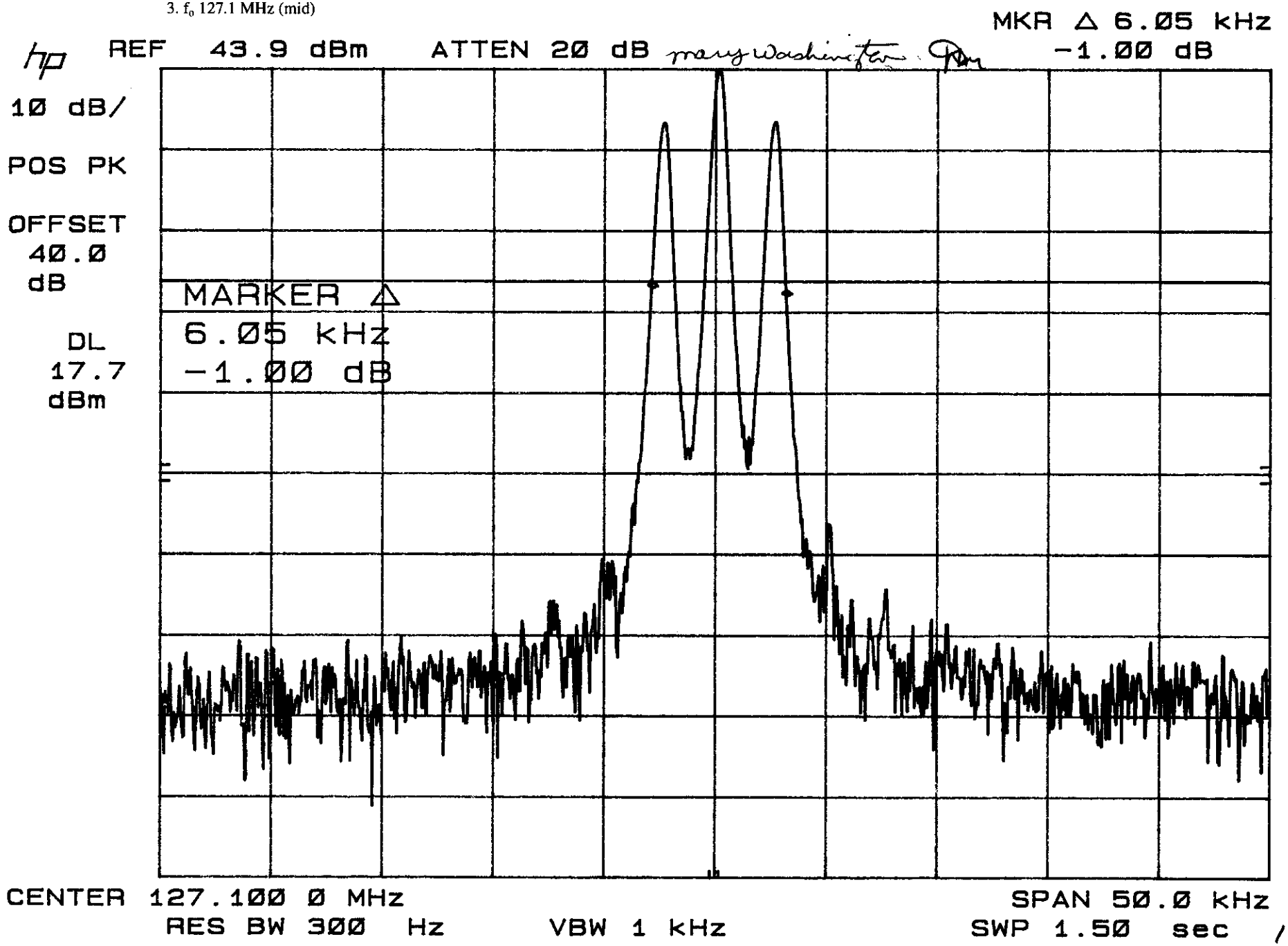
Mary Washington

16

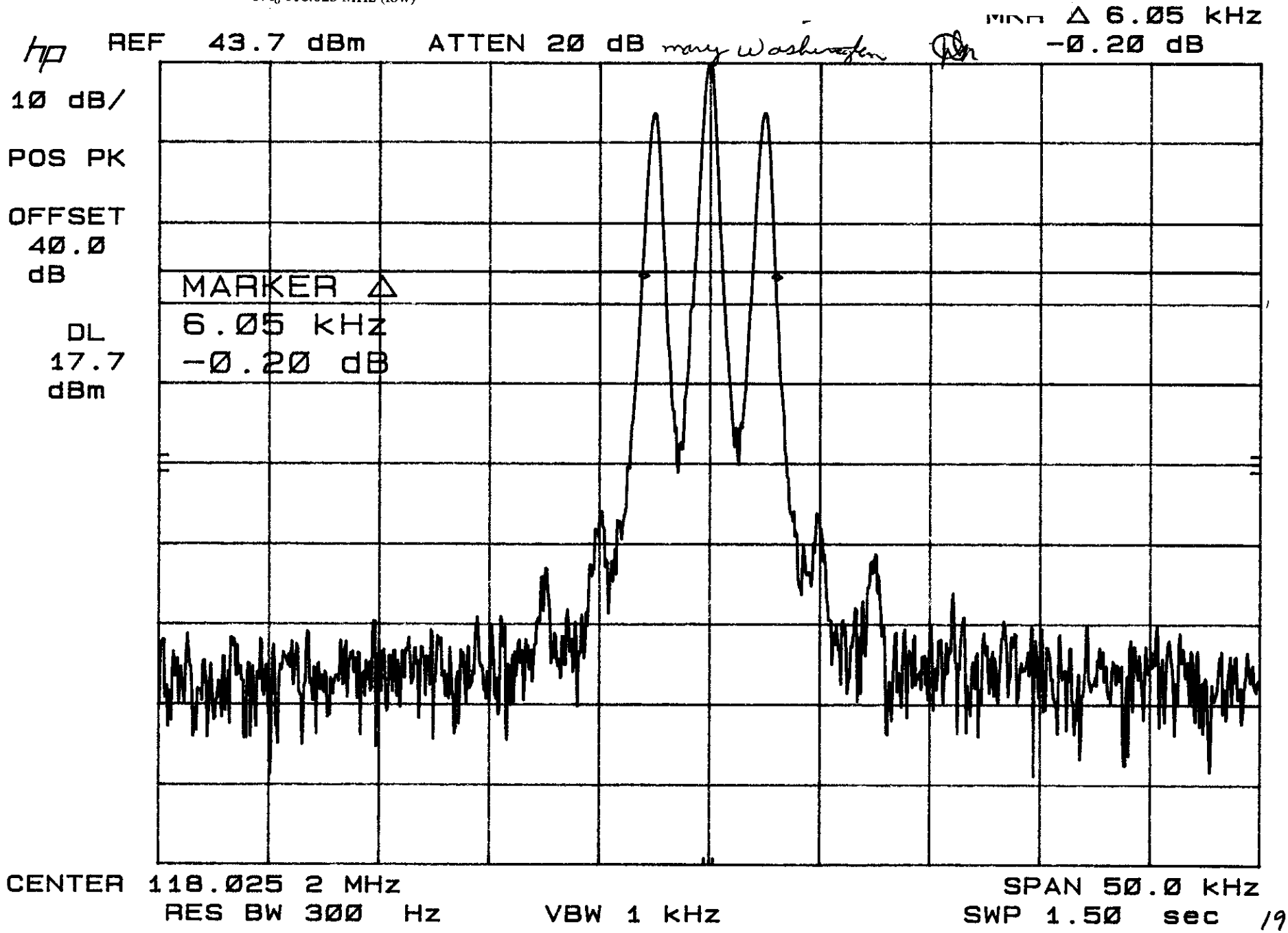
Customer: CUBIC COMMUNICAITONS
Test: Occupied Bandwidth
Specification: FCC Part 2, Paragraph 2.1049 and Part 87, Paragraph 87.135
Date: 30 March 1999
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 135.4 MHz (high)



Customer: CUBIC COMMUNICAITONS
Test: Occupied Bandwidth
Specification: FCC Part 2, Paragraph 2.1049 and Part 87, Paragraph 87.135
Date: 30 March 1999
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_0 127.1 MHz (mid)



Customer: CUBIC COMMUNICAITONS
Test: Occupied Bandwidth
Specification: FCC Part 2, Paragraph 2.1049 and Part 87, Paragraph 87.135
Date: 29 March 1999
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 118.025 MHz (low)



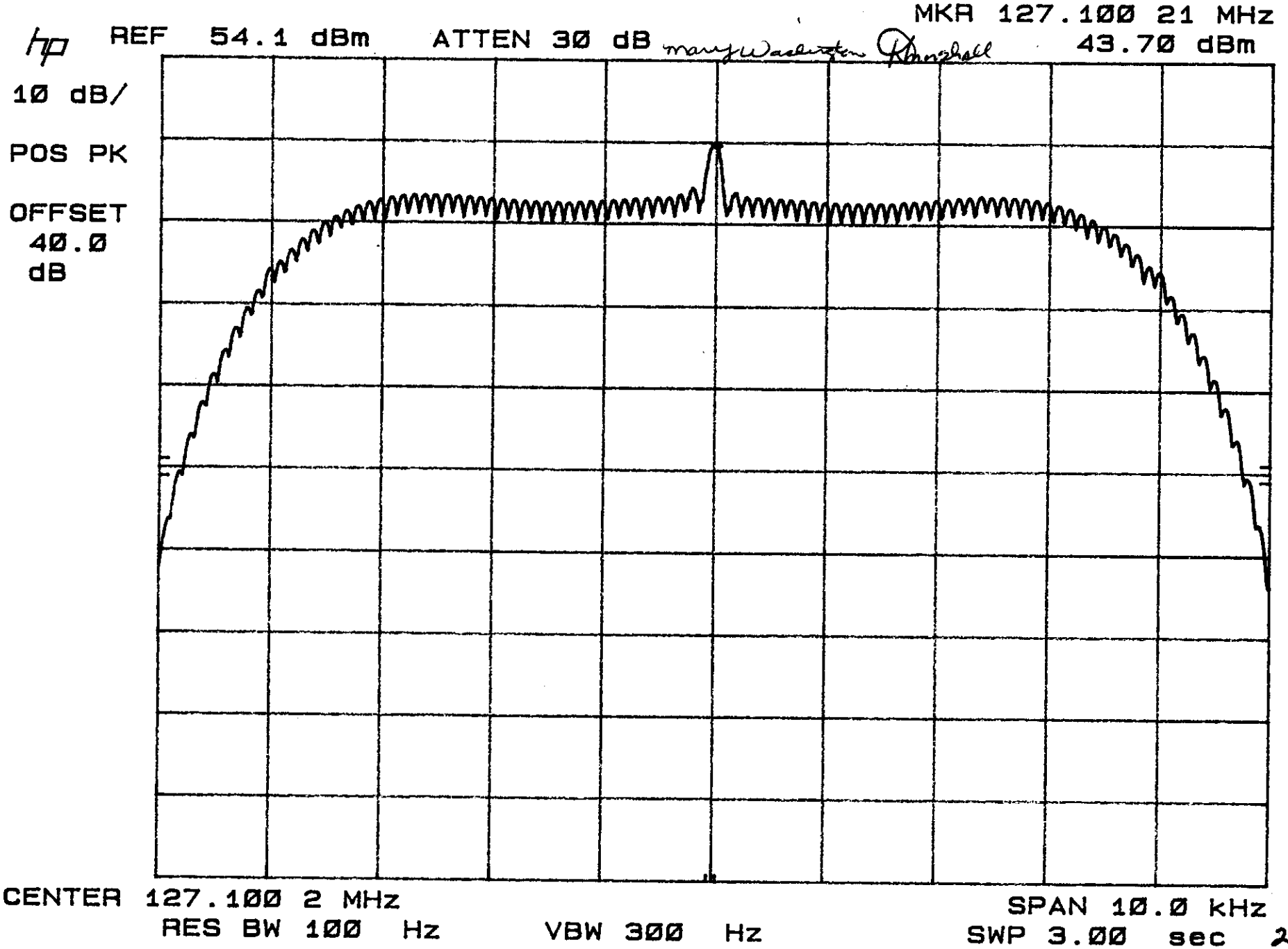
Customer: CUBIC COMMUNICAITONS Date: 30 March 1999

Test: Modulation Characteristics Specification: FCC Part 2, Paragraph 2.1047(a) and Part 87, Paragraph 87.141

NOTES: 1. A3E emission.

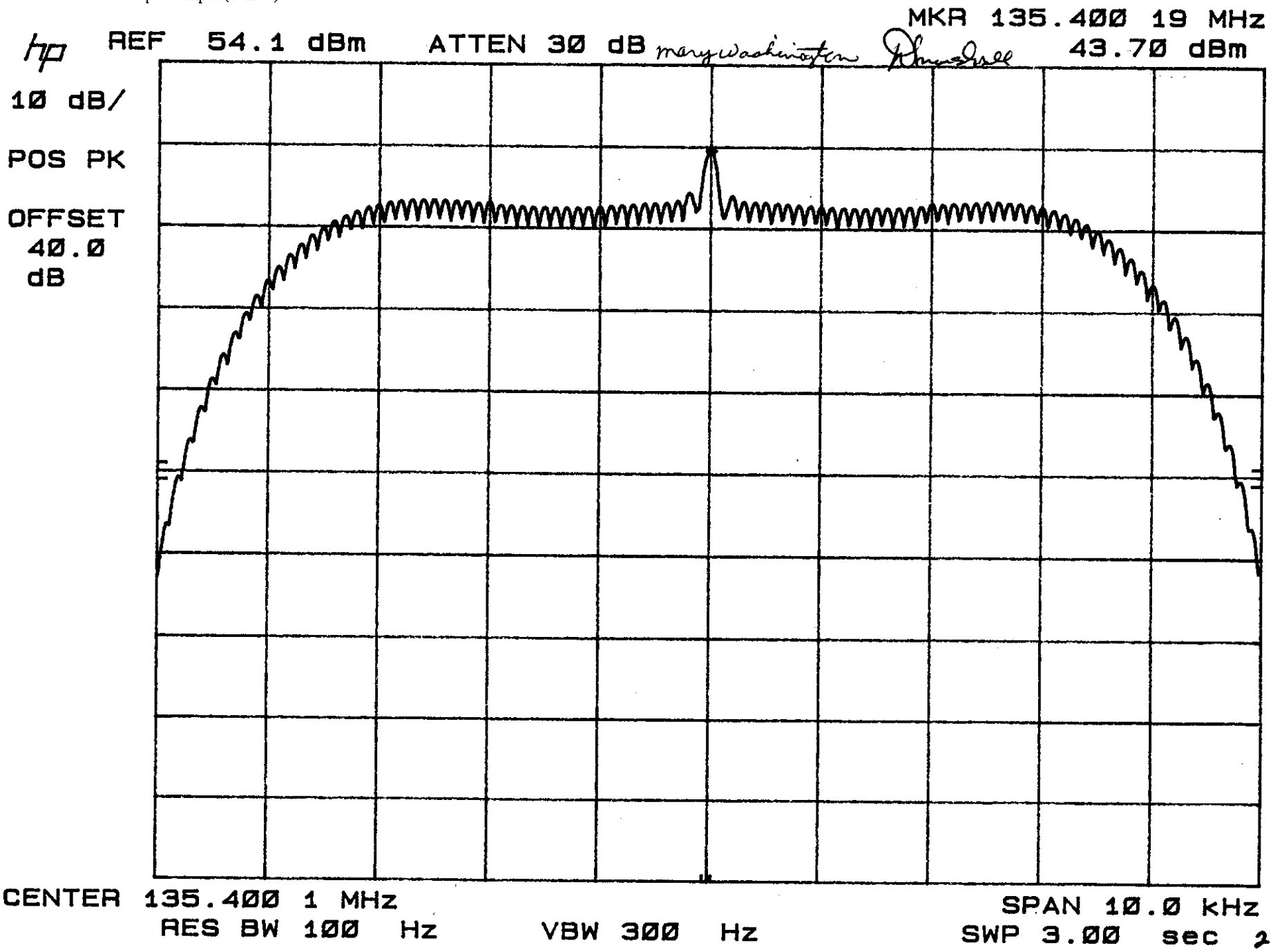
2. RF output with audio single-tone swept input from 100-5000 Hz in 100 Hz steps.

3. Rear panel input (0 dBm).

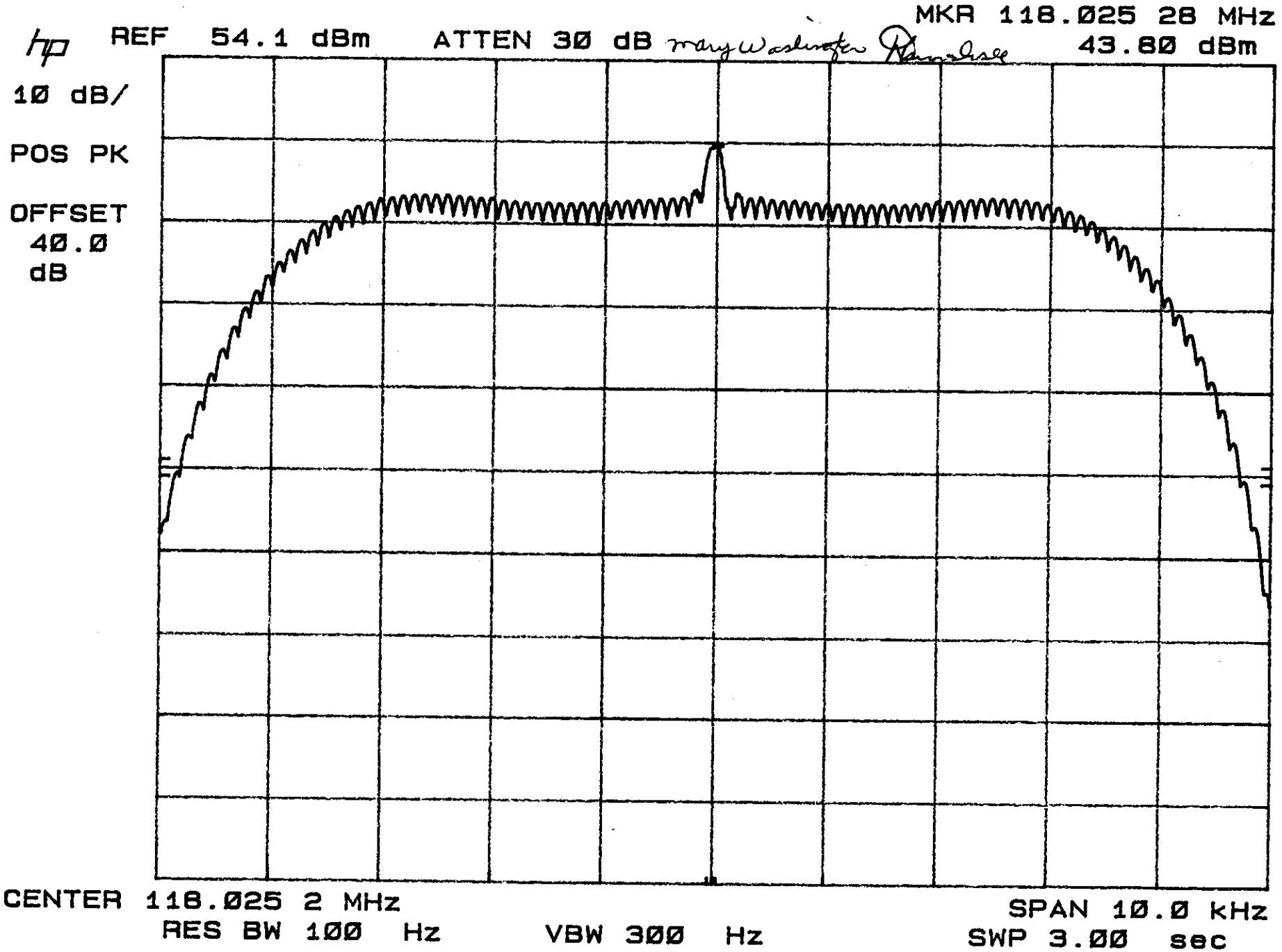


20

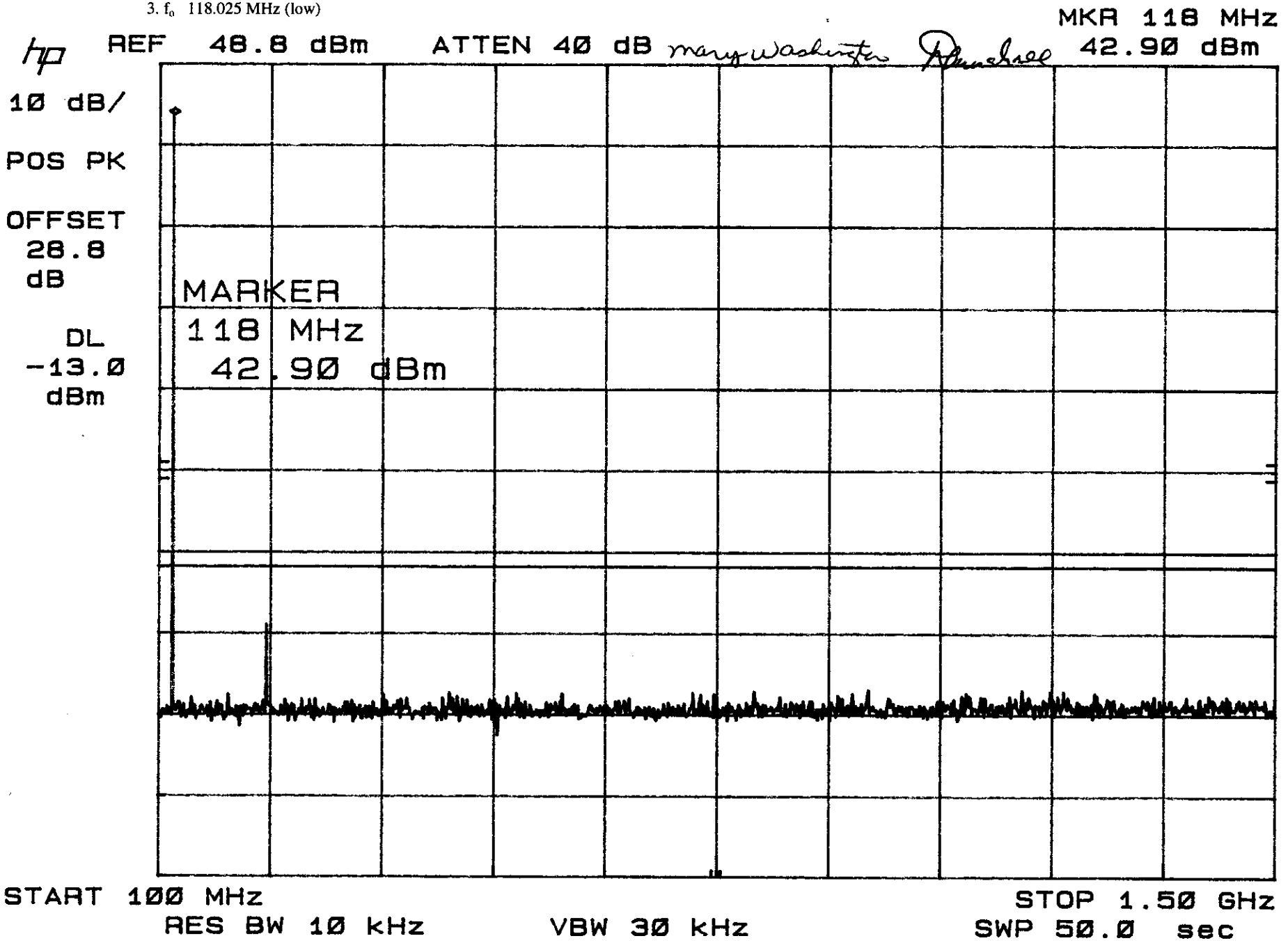
Customer: CUBIC COMMUNICAITONS Date: 30 March 1999
Test: Modulation Characteristics Specification: FCC Part 2, Paragraph 2.1047(a) and Part 87, Paragraph 87.141
NOTES: 1. A3E emission.
2. RF output with audio single-tone swept input from 100-5000 Hz in 100 Hz steps.
3. Rear panel input (0 dBm).



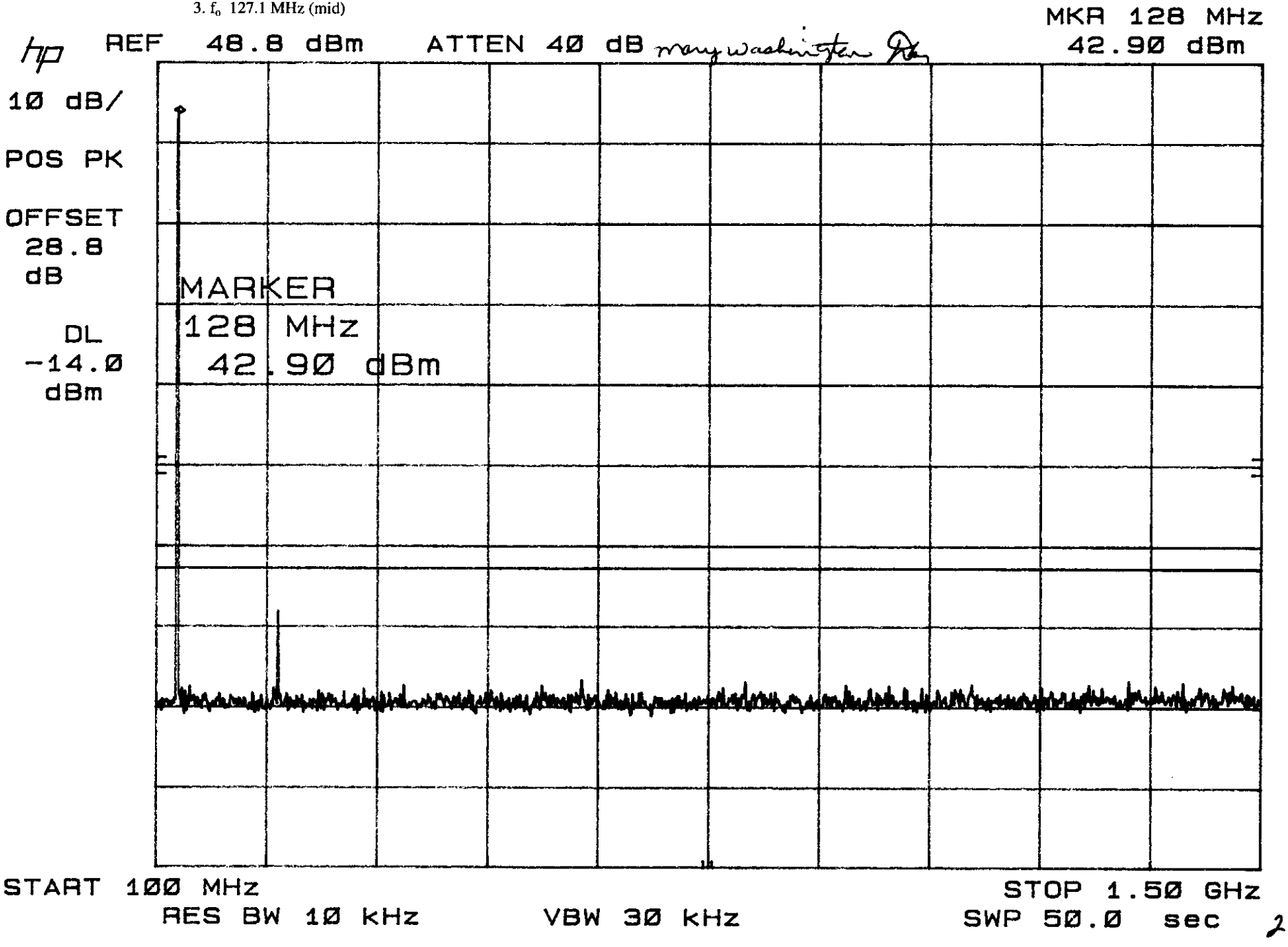
Customer: CUBIC COMMUNICAITONS
Test: Modulation Characteristics
Date: 30 March 1999
Specification: FCC Part 2, Paragraph 2.1047(a) and Part 87, Paragraph 87.141
NOTES: 1. A3E emission.
2. RF output with audio single-tone swept input from 100-5000 Hz in 100 Hz steps.
3. Rear panel input (0 dBm).



Customer: CUBIC COMMUNICAITONS
Date: 30 March 1999
Test: Spurious Emissions
Specification: FCC Part 2, Paragraph 2.1051 and Part 87, Paragraph 87.139
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 118.025 MHz (low)



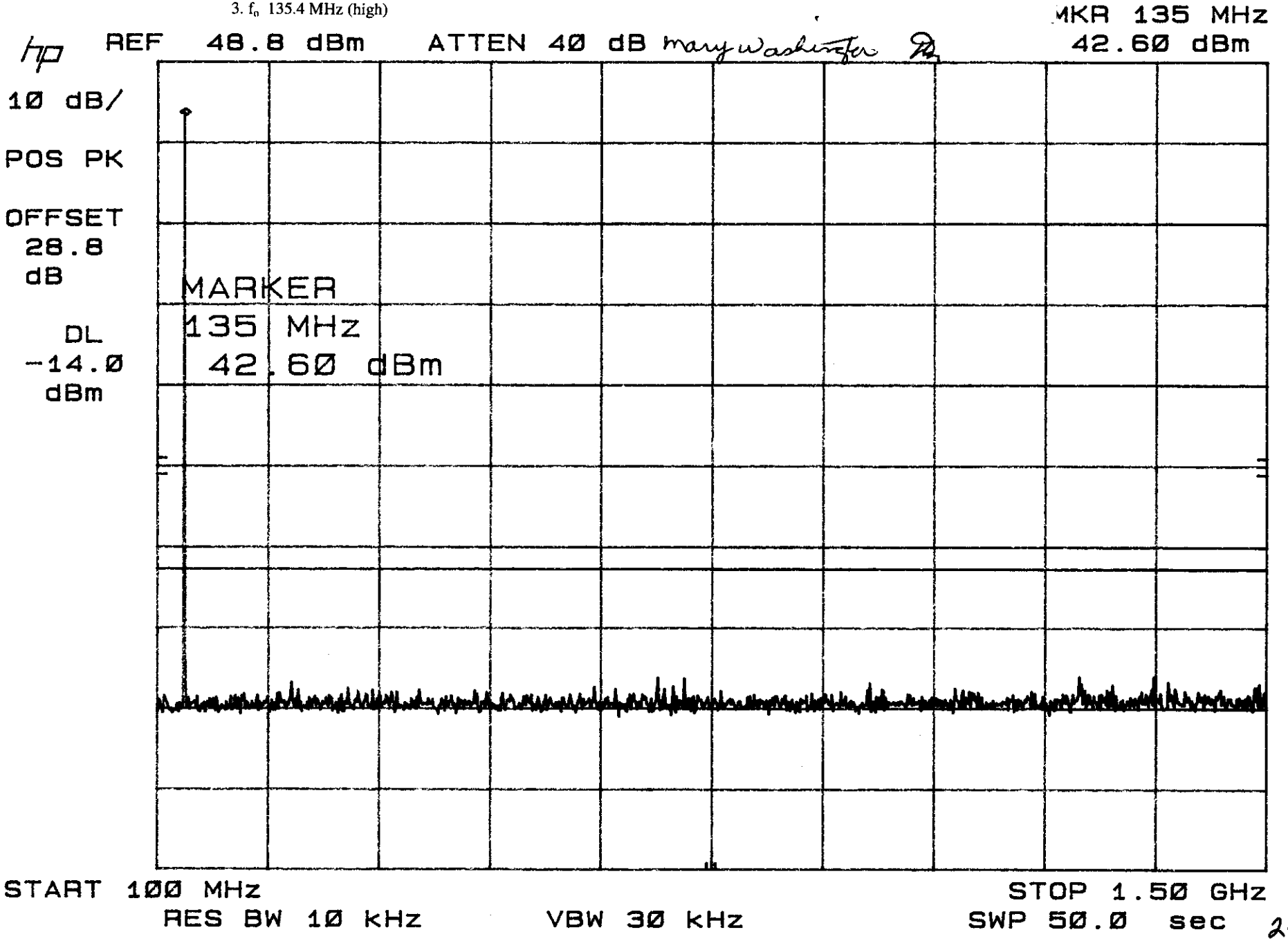
Customer: CUBIC COMMUNICAITONS
Date: 30 March 1999
Test: Spurious Emissions
Specification: FCC Part 2, Paragraph 2.1051 and Part 87, Paragraph 87.139
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 127.1 MHz (mid)



Customer: CUBIC COMMUNICAITONS
Test: Spurious Emissions
NOTES: 1. A3E emission.
2. 2500 Hz internally generated modulation.
3. f_o 135.4 MHz (high)

Specification: FCC Part 2, Paragraph 2.1051 and Part 87, Paragraph 87.139

Date: 30 March 1999



3.3 Frequency Stability (Voltage Variation)

Emissions Test Conditions: FREQUENCY STABILITY (f_o 136 MHz, Voltage Variation), FCC Part 2, Paragraph *2.1055(d) and Part 87, Paragraph 87.133*

The frequency stability measurements were performed at the following test location :

☐ - Test not applicable

■ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
XF4-60-20	--	DC Power Supply	Xantrex	28977	NCR
C3910	638	Directional Coupler	Weralatone	5416	*
43	--	Bird Wattmeter	Bird	166671	11/99
45-20-33	--	20 dB Load	Weinshel	DW445	09/99
HP5386A	--	Frequency Counter	Hewlett Packard	2621A00303	10/99

Remarks: (*) Verified internally.

REPORT NO: 9102 **DATE**: 30 March 1999

TEST: Frequency Stability

CUSTOMER: CUBIC COMMUNICATIONS, INC.

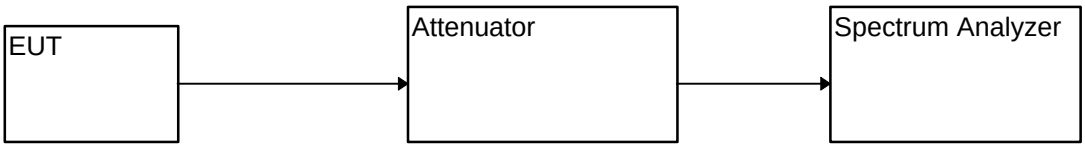
EUT: ATC-100

SPECIFICATION: FCC Part 2, Paragraph 2.1055(d) and Part 87, Paragraph 87.133

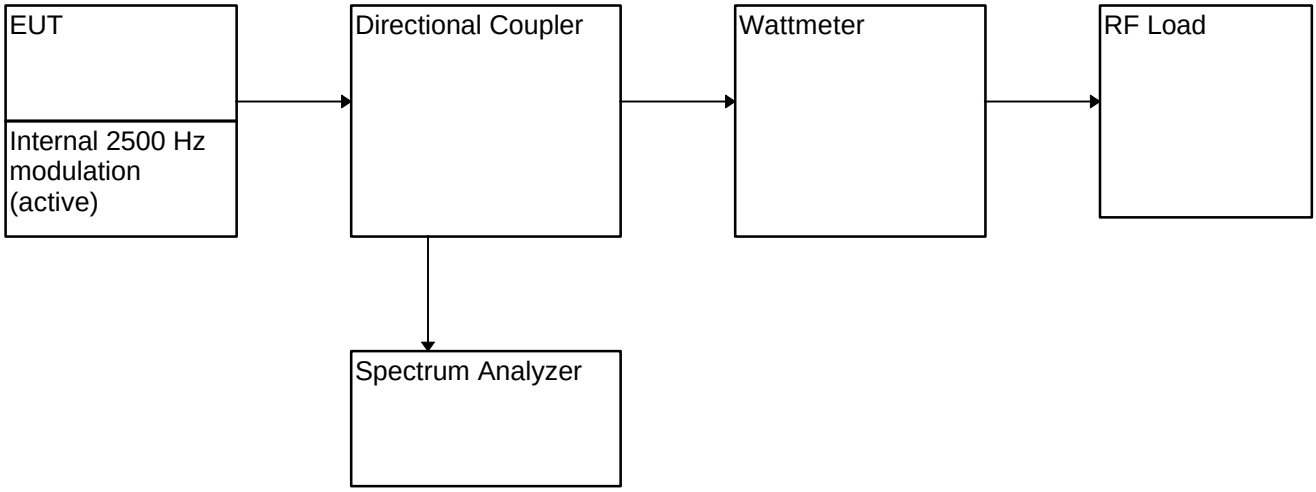
	Vnominal 28 Vdc	Vnominal 28 Vdc	Vnominal 28 Vdc
f_o 136 MHz			
Startup	136.00015 MHz	136.00014 MHz	136.00011 MHz
+2 min	136.00017 MHz	136.00017 MHz	136.00014 MHz
+5 min	136.00020 MHz	136.00019 MHz	136.00018 MHz
+10 min	136.00018 MHz	136.00018 MHz	136.00017 MHz

3.4 TEST SETUPS CONDUCTED EMISSIONS AND FREQUENCY STABILITY (VOLTAGE VARIATION)

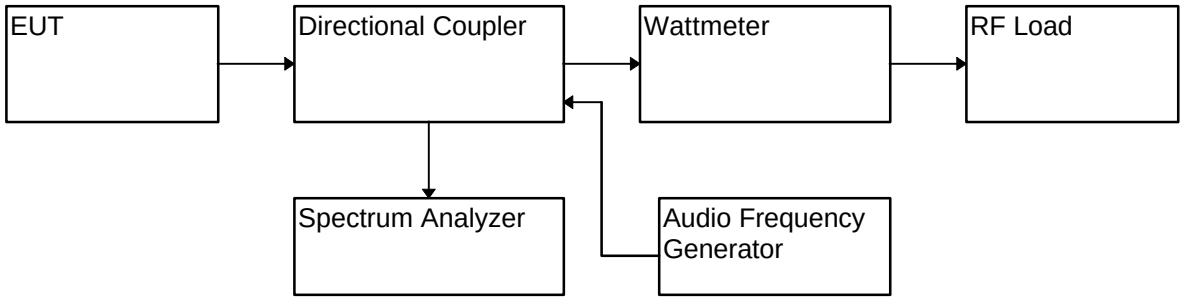
RF OUTPUT POWER TEST SETUP



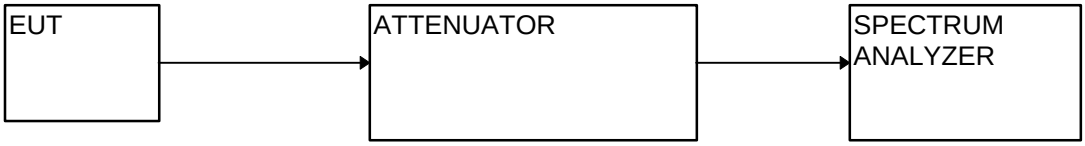
OCCUPIED BANDWIDTH TEST SETUP



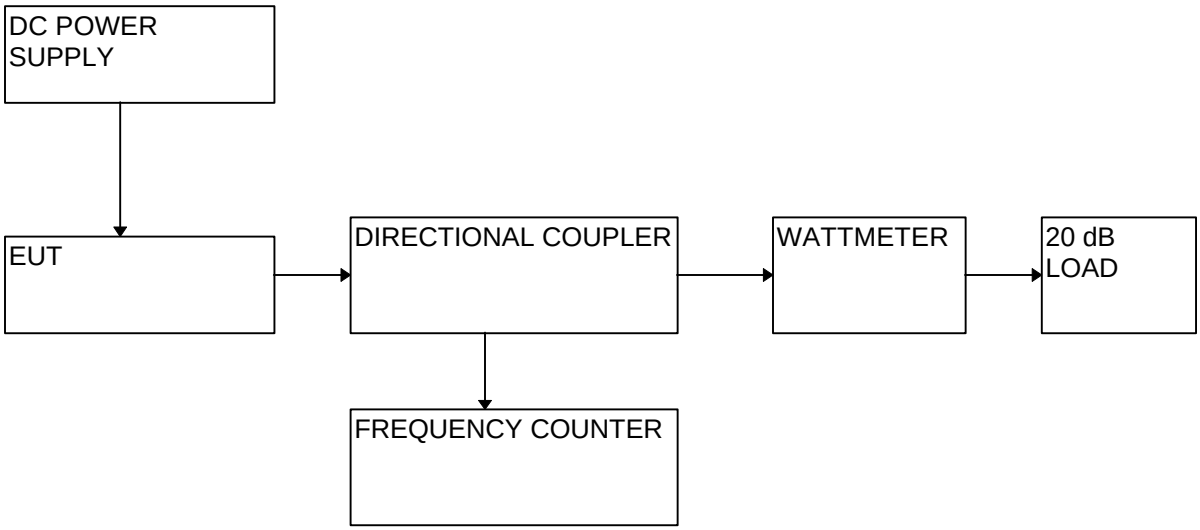
MODULATION CHARACTERISTICS TEST
SETUP



SPURIOUS EMISSIONS TEST
SEUTP



FREQUENCY STABILITY TEST
SETUP



4 SIGNATURE PAGE

GENERAL REMARKS:

SUMMARY:

All tests according to United States Standard 47 CFR *Part 2, Paragraphs 2.1046, 2. 1047(a), 2.1049, 2.1051, 2. 1053, 2.1055(d) and Part 87, Paragraphs 87.131, 87.133, 87.135, 87.139, 87.141*

■- Performed

☐ - **Not** Performed

The Equipment Under Test

■- **Fulfills** the general approval requirements cited above

☐ - **Does not** fulfill the general approval requirements cited above

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:

Mary Washington
(EMC Engineer)

Responsible Test Engineer:

Dave Marshall
(EMC Test Engineer)

5 DATA TESTED BY CUBIC COMMUNICATIONS

5.1 Frequency Stability (over Temperature)

Emissions Test Conditions: FREQUENCY STABILITY (f_o 136 MHz, Voltage Variation), FCC Part 2, Paragraph *2.1055(d) and Part 87, Paragraph 87.133*

The frequency stability measurements were performed at the following test location :

☐ - Test not applicable

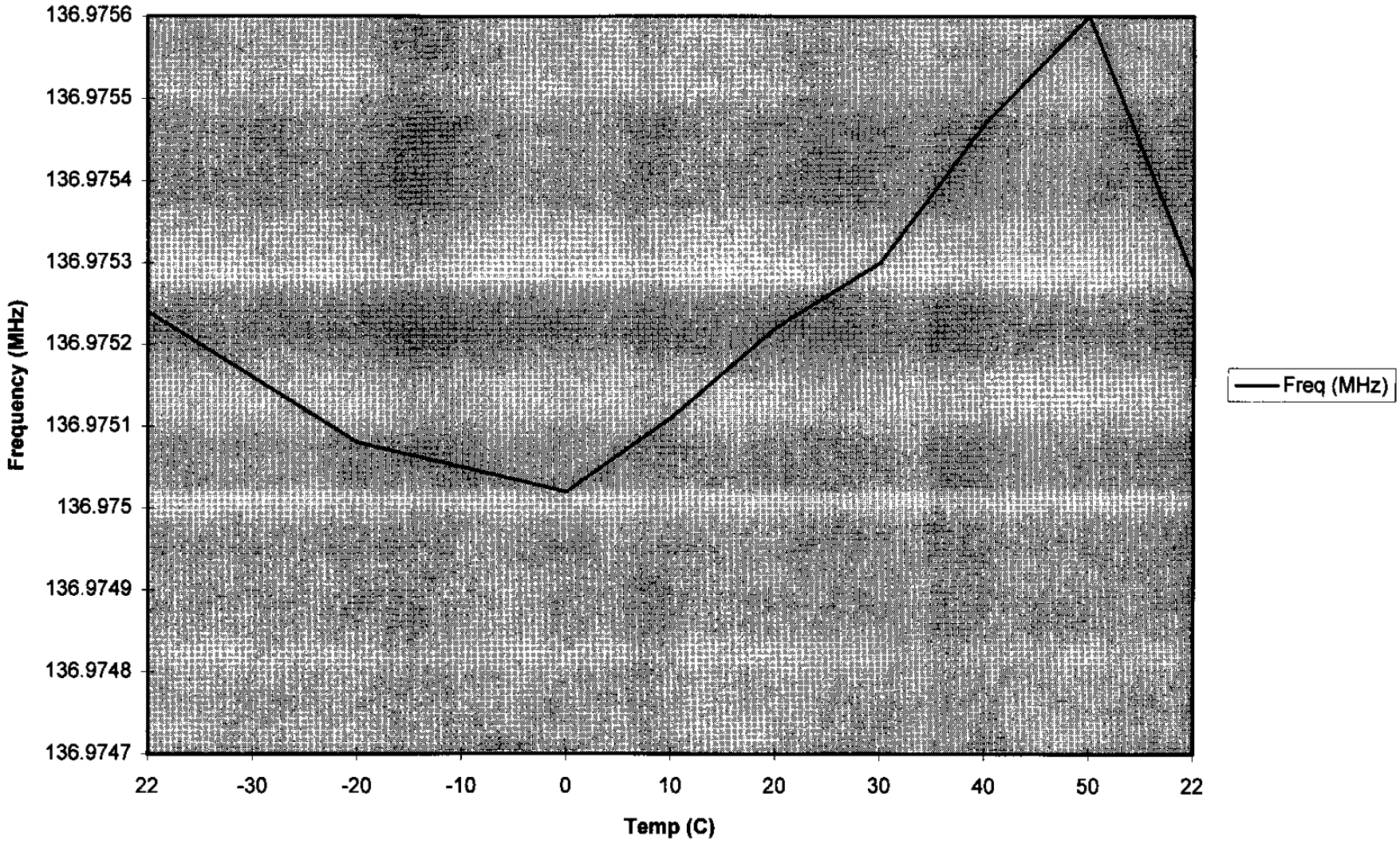
■ - Temperature Chamber

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
XF4-60-20	--	DC Power Supply	Xantrex	28977	NCR
DP 1351	--	Voltmeter	Data Precision	2508	09/99
T4500	--	PC	Toshiba	--	NCR*
510	--	Controller	Systems, Inc.	--	07/99
43	--	Bird Wattmeter	Bird	166671	11/99
45-20-33	--	20 dB Load	Weinshel	DW445	09/99
HP5386A	--	Frequency Counter	Hewlett Packard	2621A00303	10/99

Remarks: (*) Used to control transceiver has no effect on performance.

Frequency Stability



Part 2, Paragraph 2.1046, Part 87, Para. 87.131

fcctemp.atc

Test Procedure for Temperature Stability Test

Mon 4-19-99

A. Description: The requirements are that the "frequency determining unit" be checked from -20° C to +50° C. The unit must "soak" for one hour before the measurement is taken. This means that the test will be 8 hours.

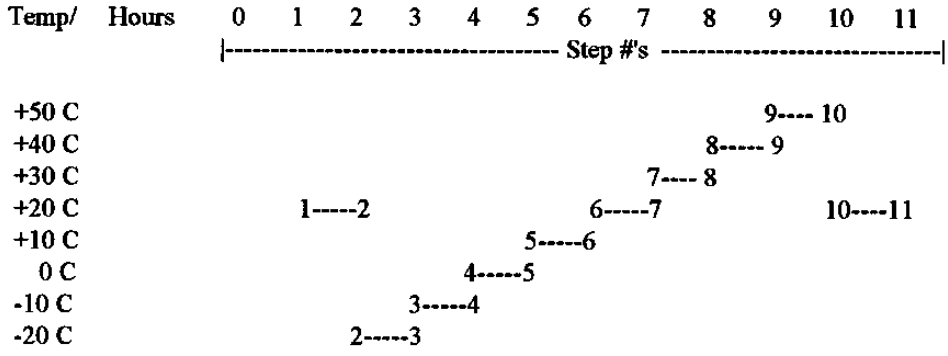
The frequency measurement is taken from the output of the ATC-100 with a frequency counter (HP5386A) through an appropiate amount of attenuation.

The resolution of the frequency counter will be 10 Hz.

B. Procedure:

(Step #)

1. Begin: Put the warmed-up ATC-100, tuned to 136.975 MHz, into the temperature chamber. Make a baseline frequency measurment at ambient temperature (+22° C).
2. Time 0: Turn on the temp chamber and set it to -20 C. Wait 1 hour.
3. Time 1: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to -10 C. Wait one hour.
4. Time 2: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to 0 C. Wait one hour.
5. Time 3: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to+10 C. Wait one hour.
6. Time 4: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to +20 C. Wait one hour.
7. Time 5: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to +30 C. Wait one hour.
8. Time 6: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to +40 C. Wait one hour.
9. Time 7: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to +50 C. Wait one hour.
10. Time 9: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes. Turn off the ATC-100. Set the temperature chamber to +22 C. Wait one hour.
11. Time 10: Turn on the ATC-100. Set the frequency to 136.975 MHz. Key the ATC-100 and make a frequency measurement every minute for 10 minutes.


Temp/ Hours
0 1 2 3 4 5 6 7 8 9 10 11
Step #'s
+50 C
+40 C
+30 C
+20 C
+10 C
0 C
-10 C
-20 C
9---- 10
8----- 9
7---- 8
1-----2
6-----7
10----11
5-----6
4-----5
3-----4
2-----3

TEST DATA SHEET
TEMPERATURE STABILITY TEST
ATC-100
4-20-99

4-28-99

Verify that the output frequency of the ATC-100 remains ±20 PPM from -20° C to +50° C.
(At 136.975 MHz 20 PPM = 2.739 kHz)

	Temp (°C)	Frequency (Hz)	
Step 1	+22°C	136,975,340	
		250	1 min
		260	2 min
		250	3 min
		240	4 min
		240	5 min
		230	6 min
		230	7 min
		220	8 min
		220	9 min
		210	10 min
Step 3	-20°C	136,975,140	
		120	1 min
		110	2 min
		090	3 min
		080	4 min
		070	5 min
		050	6 min
		040	7 min
		030	8 min
		030	9 min
		030	10 min
Step 4	-10°C	136,975,110	
		100	1 min
		080	2 min
		060	3 min
		050	4 min
		040	5 min
		030	6 min
		030	7 min
		020	8 min
		020	9 min
		020	10 min
Step 5	0°C	030	
		020	1 min
		020	2 min
		020	3 min
		020	4 min
		030	5 min
		040	6 min
		050	7 min
		060	8 min
		070	9 min
		080	10 min
Step 6	+10°C	136,975,070	
		070	1 min
		080	2 min
		100	3 min
		110	4 min
		130	5 min
		150	6 min
		170	7 min
		200	8 min
		230	9 min
		250	10 min
Step 7	+20°C	260	
		240	1 min
		230	2 min
		220	3 min
		220	4 min
		220	5 min
		230	6 min
		240	7 min
		250	8 min
		260	9 min
		260	10 min

Step 8 __+30°C___ 136,975,240

250	1 min
270	2 min
290	3 min
300	4 min
300	5 min
300	6 min
300	7 min
300	8 min
300	9 min
310	10 min

Step 9 __+40°C___ 136,975,390

400	1 min
420	2 min
440	3 min
470	4 min
490	5 min
520	6 min
540	7 min
550	8 min
560	9 min
570	10 min

Step 10__+50°C___ 136,975,650

640	1 min
630	2 min
610	3 min
600	4 min
600	5 min
600	6 min
590	7 min
590	8 min
590	9 min
580	10 min

Step 11__ +22°C ___ 136,975,220

230	1 min
240	2 min
260	3 min
280	4 min
290	5 min
320	6 min
310	7 min
300	8 min
290	9 min
280	10 min

Tech Michael E. Norman

Michael Norman 4-28-55

CUBIC COMMUNICATIONS, INC

FREQUENCY STABILITY TEST
SETUP OVER TEMPERATURE