MEASUREMENT AND TECHNICAL REPORT

CUBIC COMMUNICATIONS
9535 Waples Street
San Diego, CA 92121

DATE: 18 September 2000

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	MTC-100T/MCPA	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
Company Name **agrees to notify the Commission by:** **of the intended date of announcement of the product so that the grant can be issued on that date.**	N/A	
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; Part 80, Paragraphs 80.205; 80.209(a); 80.211; 80.213(e); 80.215(c)(1)

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

1.1 Product Description

NAME, MODEL, SERIAL # OF EUT:	MTC-100T/MCPA
DESCRIPTION OF EUT:	8-channel transmitter & power ampifier/combiner for maritime band, 150 to 174 MHz

Components of EUT			
Description	Model Number	Serial Number	FCC ID Number
MTC-100T/MCPA Subsystem	N/A	N/A	NVSMTC-100T MCPA
Power Amplifier (2)	Maristar A8H	001, 002	None
Power Combiner	Orion-2500-8H	3025-000719	None
Power Supply (2)	Titan-2500	20F5552, 20F6402	None
Transmitter (8)	MTC-100T	504, 508, 509, 510, 512, 513, 515, 517	None
Rack	Amco	630373	None

OPERATING MODE(S):	
I/O CABLES	
CONNECTION	Control / Maintenance (Transmitter J2)
SHIELD	Double (Foil & Braid) RS-232
CONNECTORS	25-pin D-Sub
TERMINATION TYPE	
LENGTH	N/A
REMOVABLE	yes
CONNECTION	Audio (transmitter J1)
SHIELD	Double (Foil & Braid) RS-232
CONNECTORS	15-pin D-Sub
TERMINATION TYPE	
LENGTH	N/A
REMOVABLE	yes
CONNECTION	Antenna (Combiner Output J9)
SHIELD	Double (Foil & Braid) RF 214/U
CONNECTORS	N-type
TERMINATION TYPE	50-ohms
LENGTH	
REMOVABLE	yes
CONNECTION	Vector Feedback (Transmitter J8 to Power Amp)
SHIELD	Double (Foil & Braid) RG 223
CONNECTORS	SMA
TERMINATION TYPE	50-ohms
LENGTH	
REMOVABLE	yes
CONNECTION	Radio Frequency (Transmitter J5 to Power Amp to Combiner)
SHIELD	Double (Foil & Braid) RG 223
CONNECTORS	N-type
TERMINATION TYPE	50-ohms
LENGTH	
REMOVABLE	yes

POWER INTERFACE	
FREQUENCY/AC/DC VOLTAGE:	47 - 63 Hz / 120 Vac / 220 Vac
PHASES/CURRENT:	Single phase

OSCILLATOR FREQUENCIES		
FREQUENCY	EUT LOCATION	DESCRIPTION OF USE
49.152 MHz	Transmitter	DSP Clock
10.000 MHz	Transmitter	Reference Clock

POWER SUPPLY				
DESCRIPTION	MANUFACTURER	MODEL #	SERIAL #	SWITCHING/LINEAR FREQ.
In Rack				Switching
In MTC-100T				Switching

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:	N/A

INTERFACING AND/OR SIMULATORS PERIPHERAL EQUIPMENT:				
DESCRIPTION	MANUFACTURER	MODEL #	SERIAL #	FCC ID
Audio Signal Generator	Telulex	SG-100A	391CE318F425	
Spectrum Analyzer (TUV)	HP	8566B		
4-way 'D' Switch				
2-way 'D' Switch				
Attenuator, 30 dB	Bird			
Attenuator, 6 dB	Narda	769-6	02237	
Attenuator, 3 dB	Narda	769-3	02287	
Laptop Computer	NEC			

1 GENERAL INFORMATION (continued)

1.2 Related Submittal/Grant

None

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

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

Test Performed:

X 1. Conducted Emissions, FCC Part 2, Paragraphs 2.1046; 2.1047(a); 2.1049; 2.1051 and Part 80, Paragraph 80.215; 80.213(e); 80.205; 80.211; 80.209(a)
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
4. Engineering evaluations
X 5. Frequency Stability, Part 2, Paragraph 2.1053 and Part 80, Paragraph 80.209(a)

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).

1.5 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.

1.6 Part 2 Requirements

DC Voltages / DC Currents

+9.5 V ± 0.5 V / 4 amps maximum
+17.5 V ± 0.5 V / 2 amps maximum
-17.5 V ± 0.5 V / 1 amps maximum
+28 V ± 0.4 V / 0.1 amps maximum

Equipment Specifications

Microprocessor model number: Intel386(TM) EX

TMS320C31 (DSP)

The full name and mailing address of the manufacturer of the device and the applicant for certification.

Applicant for Certification

Cubic Communications Inc.
9535 Waples Street
San Diego CA 92121-2953

MTC-100T Manufacturer

Cubic Communications Inc.
9535 Waples Street
San Diego CA 92121-2953

MCPA

Delta Sigma Inc.
7209 Arlington Ave. Unit G
Riverside, CA 92503

System Integrator

Harris Corporation
1000 Perimeter Road Bldg 21A
Palm Bay, FL 32905

Equipment does not employ digital modulation techniques.
Equipment is not an AM broadcast sterophonic exciter-generator intended for interfacing with existing certified, or formerly type accepted or notified transmitters.

Type of Emission: 13K9F3E.
Frequency Range: 156-162 MHz
Range of operating power values or specific operating power levels: N/A
Maximum power rating 20 W.

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The MTC-100T/MCPA was initially tested for FCC emission in the following configuration:

See Block Diagram.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Modification

None

2.5 Configuration of Tested System

See Block Diagram.

3 RADIATED EMISSION EQUIPMENT/DATA

The following data lists the significant emission frequencies, measured levels, correction factor (which includes cable and antenna corrections), the corrected reading, and the limit.

See following page(s).

See test setup photos for radiated emissions test setup.

REPORT No: S0337 SPEC: FCC Part 2.1053

CUSTOMER: Cubic Communications Inc. TEST DIST: 3 Meters

E U T: Multiple Channel Power Amplifier System TEST SITE: 1

EUT MODE: Transmit Full Power BICONICAL: 738

DATE: 24-Aug-00 TESTED BY: J Owen/J Ayala JCO LOG PERIODIC: 738

NOTES: Quasi-Peak with 120 KHz measurement bandwidth. RCVR: 466

Fully shielded audio and maintenance cables

Temperature: 25 Relative Humidity: 45

EUT MARGI -21.6 dB at 476.93 MHz ver 1.8

FREQUENCY (MHz)	VERTICAL measured (dBuv)	HORIZONTAL measured (dBuV)	CORRECTION FACTOR (dB/m)	MAXIMUM CORRECTED (dBuV/m)	SPECIFIED LIMIT (dBuV/m)	EUT MARGIN (dB)	EUT ROTATION (degrees)	ANTENNA HEIGHT (meters)	NOTE
156.00	46.8	45.8	11.3	**58.1**			0	1	Low Channel
157.97	58.4		11.3	**69.7**			0	1	Mid Channel
162.00	45	47.8	11.5	**59.3**			0	1	High Channel
312.00	36.9	35.5	18.0	**54.9**	82.4	-27.5	336	1.7	Harmonic 156 MHz
317.95	41.2	36.4	18.1	**59.3**	82.4	-23.1	6	1.7	Harmonic 159 MHz
324.00	39.7	29.4	18.3	**58.0**	82.4	-24.4	0	1	Harmonic 162 MHz
468.00	34.1	36.8	22.4	**59.2**	82.4	-23.2	173	1.7	Harmonic 156 MHz
476.93	36.6	38.3	22.5	**60.8**	82.4	-21.6	5	1	Harmonic 159 MHz
486.00	24.6	35.1	23.0	**58.1**	82.4	-24.3	211	1.5	Harmonic 162 MHz
624.00	24.8	29.2	26.0	**55.2**	82.4	-27.2	208	1	Hamonic 156 MHz
635.70	24.5	30.1	26.3	**56.4**	82.4	-26.0	253	1	Harmonic 159 MHz
648.00	26.2	34.1	26.6	**60.7**	82.4	-21.7	96	1	Harmonic 162 MHz
780.00	15.6	13.7	29.0	**44.6**	82.4	-37.8	177	1	Harmonic 156 MHz
810.00	14.3	13.7	29.8	**44.1**	82.4	-38.3	192	1.2	Harmonic 162 MHz
972.00	17.2	18.8	31.0	**49.8**	82.4	-32.6	193	1	Harmonic 162 MHz

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**S0337 Run 01**	Test Area:	Canyon Site 1 3 meters HF	Temperature:	26	°C
Test Method:	Spurious Emissions 2.1053	Test Date:	24-Aug-2000	Relative Humidity:	45	%
EUT Model #:	Multiple Channel Power Amplifier System	EUT Power:	120 Vac/ 208 Vac 60 Hz	Air Pressure:	100.5	kPa
EUT Serial #:				Page:	1 of 3	
Manufacturer:	Cubic Communications Inc.					
EUT Description:						
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 2.1053	N/A
Mid Channel						
1113.00	18.2 Pk	0.0 / 23.9 / 0.0	42.1	V / 1.0 / 161.0	-40.3	N/A
1113.00	11.1 Av	0.0 / 23.9 / 0.0	35.0	V / 1.0 / 161.0	-47.4	N/A
1272.00	12.9 Pk	0.0 / 25.3 / 0.0	38.2	V / 1.0 / 95.0	-44.2	N/A
1272.00	3.9 Av	0.0 / 25.3 / 0.0	29.2	V / 1.0 / 95.0	-53.2	N/A
1431.00	16.7 Pk	0.0 / 26.1 / 0.0	42.8	V / 1.0 / 2.0	-39.6	N/A
1431.00	8.0 Av	0.0 / 26.1 / 0.0	34.1	V / 1.0 / 2.0	-48.3	N/A
1590.00	11.5 Pk	0.0 / 27.0 / 0.0	38.5	V / 1.0 / 134.0	-43.9	N/A
1590.00	1.4 Av	0.0 / 27.0 / 0.0	28.4	V / 1.0 / 134.0	-54.0	N/A
1113.00	16.9 Pk	0.0 / 23.9 / 0.0	40.8	H / 1.0 / 161.0	-41.6	N/A
1113.00	9.5 Av	0.0 / 23.9 / 0.0	33.4	H / 1.0 / 161.0	-49.0	N/A
1272.00	15.6 Pk	0.0 / 25.3 / 0.0	40.9	H / 1.0 / 95.0	-41.5	N/A
1272.00	6.2 Av	0.0 / 25.3 / 0.0	31.5	H / 1.0 / 95.0	-50.9	N/A
1431.00	10.7 Pk	0.0 / 26.1 / 0.0	36.8	H / 1.0 / 2.0	-45.6	N/A
1431.00	1.5 Av	0.0 / 26.1 / 0.0	27.6	H / 1.0 / 2.0	-54.8	N/A
1590.00	10.7 Pk	0.0 / 27.0 / 0.0	37.7	H / 1.0 / 134.0	-44.7	N/A
1590.00	1.2 Av	0.0 / 27.0 / 0.0	28.2	H / 1.0 / 134.0	-54.2	N/A
Low Channel						
1092.00	12.5 Pk	0.0 / 24.1 / 0.0	36.6	H / 1.0 / 158.0	-45.8	N/A
1092.00	5.7 Av	0.0 / 24.1 / 0.0	29.8	H / 1.0 / 158.0	-52.6	N/A
1248.00	14.7 Pk	0.0 / 25.0 / 0.0	39.7	H / 1.0 / 158.0	-42.7	N/A
1248.00	10.5 Av	0.0 / 25.0 / 0.0	35.5	H / 1.0 / 158.0	-46.9	N/A
1560.00	10.5 Pk	0.0 / 26.7 / 0.0	37.2	H / 1.0 / 158.0	-45.2	N/A
1560.00	2.0 Av	0.0 / 26.7 / 0.0	28.7	H / 1.0 / 158.0	-53.7	N/A
1092.00	10.7 Pk	0.0 / 24.1 / 0.0	34.8	V / 1.0 / 158.0	-47.6	N/A
1092.00	3.6 Av	0.0 / 24.1 / 0.0	27.7	V / 1.0 / 158.0	-54.7	N/A
1248.00	10.4 Pk	0.0 / 25.0 / 0.0	35.4	V / 1.0 / 158.0	-47.0	N/A
1248.00	0.7 Av	0.0 / 25.0 / 0.0	25.7	V / 1.0 / 158.0	-56.7	N/A
1404.00	9.9 Pk	0.0 / 25.5 / 0.0	35.4	V / 1.0 / 158.0	-47.0	N/A

Tested by: J Owen
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11

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**S0337 Run 01**	Test Area:	Canyon Site 1 3 meters HF	Temperature:	26 °C
Test Method:	Spurious Emissions 2.1053	Test Date:	24-Aug-2000	Relative Humidity:	45 %
EUT Model #:	Multiple Channel Power Amplifier System	EUT Power:	120 Vac/ 208 Vac 60 Hz	Air Pressure:	100.5 kPa
EUT Serial #:				Page:	2 of 3
Manufacturer:	Cubic Communications Inc.				
EUT Description:					
Notes:					

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 2.1053	N/A
1404.00	0.0 Av	0.0 / 25.5 / 0.0	25.5	V / 1.0 / 158.0	-56.9	N/A
1560.00	9.4 Pk	0.0 / 26.7 / 0.0	36.1	V / 1.0 / 158.0	-46.3	N/A
1560.00	-0.2 Av	0.0 / 26.7 / 0.0	26.5	V / 1.0 / 158.0	-55.9	N/A
High Channel						
1134.00	11.3 Pk	0.0 / 24.1 / 0.0	35.4	V / 1.0 / 84.0	-47.0	N/A
1134.00	3.5 Av	0.0 / 24.1 / 0.0	27.6	V / 1.0 / 84.0	-54.8	N/A
1296.00	9.5 Pk	0.0 / 25.4 / 0.0	34.9	V / 1.0 / 67.0	-47.5	N/A
1296.00	0.4 Av	0.0 / 25.4 / 0.0	25.8	V / 1.0 / 67.0	-56.6	N/A
1134.00	14.3 Pk	0.0 / 24.1 / 0.0	38.4	H / 1.0 / 84.0	-44.0	N/A
1134.00	8.8 Av	0.0 / 24.1 / 0.0	32.9	H / 1.0 / 84.0	-49.5	N/A
1296.00	14.0 Pk	0.0 / 25.4 / 0.0	39.4	H / 1.0 / 67.0	-43.0	N/A
1296.00	9.2 Av	0.0 / 25.4 / 0.0	34.6	H / 1.0 / 67.0	-47.8	N/A

Tested by: J Owen
Printed

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**S0337 Run 01**	Test Area:	Canyon Site 1 3 meters HF	Temperature:	26	°C
Test Method:	Spurious Emissions 2.1053	Test Date:	24-Aug-2000	Relative Humidity:	45	%
EUT Model #:	Multiple Channel Power Amplifier System	EUT Power:	120 Vac/ 208 Vac 60 Hz	Air Pressure:	100.5	kPa
EUT Serial #:				Page:	3 of 3	
Manufacturer:	Cubic Communications Inc.					
EUT Description:						
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 2.1053	N/A
********** **Measurement Summary** **********						
1431.00	16.7 Pk	0.0 / 26.1 / 0.0	42.8	V / 1.0 / 2.0	-39.6	N/A
1113.00	18.2 Pk	0.0 / 23.9 / 0.0	42.1	V / 1.0 / 161.0	-40.3	N/A
1272.00	15.6 Pk	0.0 / 25.3 / 0.0	40.9	H / 1.0 / 95.0	-41.5	N/A
1248.00	14.7 Pk	0.0 / 25.0 / 0.0	39.7	H / 1.0 / 158.0	-42.7	N/A
1296.00	14.0 Pk	0.0 / 25.4 / 0.0	39.4	H / 1.0 / 67.0	-43.0	N/A
1590.00	11.5 Pk	0.0 / 27.0 / 0.0	38.5	V / 1.0 / 134.0	-43.9	N/A
1134.00	14.3 Pk	0.0 / 24.1 / 0.0	38.4	H / 1.0 / 84.0	-44.0	N/A
1560.00	10.5 Pk	0.0 / 26.7 / 0.0	37.2	H / 1.0 / 158.0	-45.2	N/A
1092.00	12.5 Pk	0.0 / 24.1 / 0.0	36.6	H / 1.0 / 158.0	-45.8	N/A
1404.00	9.9 Pk	0.0 / 25.5 / 0.0	35.4	V / 1.0 / 158.0	-47.0	N/A

Tested by: J Owen
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Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, Paragraph 2.1053

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

☐ - Test not applicable

■ - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego (Calibration Due Date: 03 September 2003)

Testing was performed at a test distance of:

☐ - 1 meters
■ - 3 meters
☐ - 10 meters

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
8566B	407	Spectrum Analyzer	Hewlett Packard	2311A02209	10/00
85662B	406	Spectrum Analyzer Display	Hewlett Packard	2309A04682	10/00
3115	453	Antenna, Double Ridge Guide	EMCO	9412-4363	10/00
AMF-3D-010180-35-10P752	752	Pre-Amplifier (20 dB gain), 1 to 18 GHz	Miteq, Inc.	614344	*
LPB 2520/A	738	Antenna, LPB	Antenna Research	1169	05/01
ESVS 30	466	Receiver	Rohde & Schwarz	833825/003	12/00

Remarks: (*) Verified internally

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

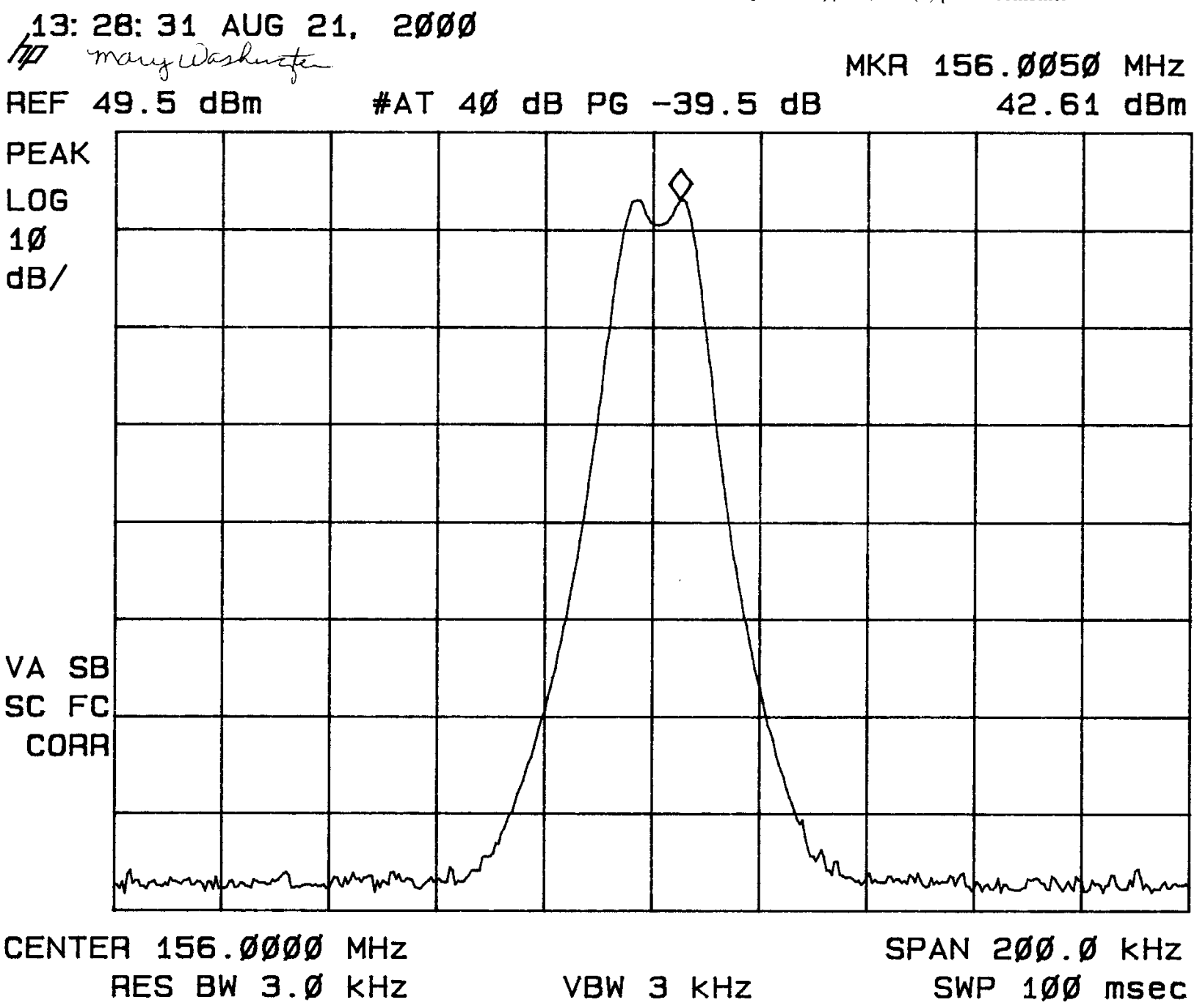
This result is well below the FCC and CSA Class A limit of 29.5 dbuV/m at 83 MHz.

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.

4 CONDUCTED EMISSION EQUIPMENT/DATA

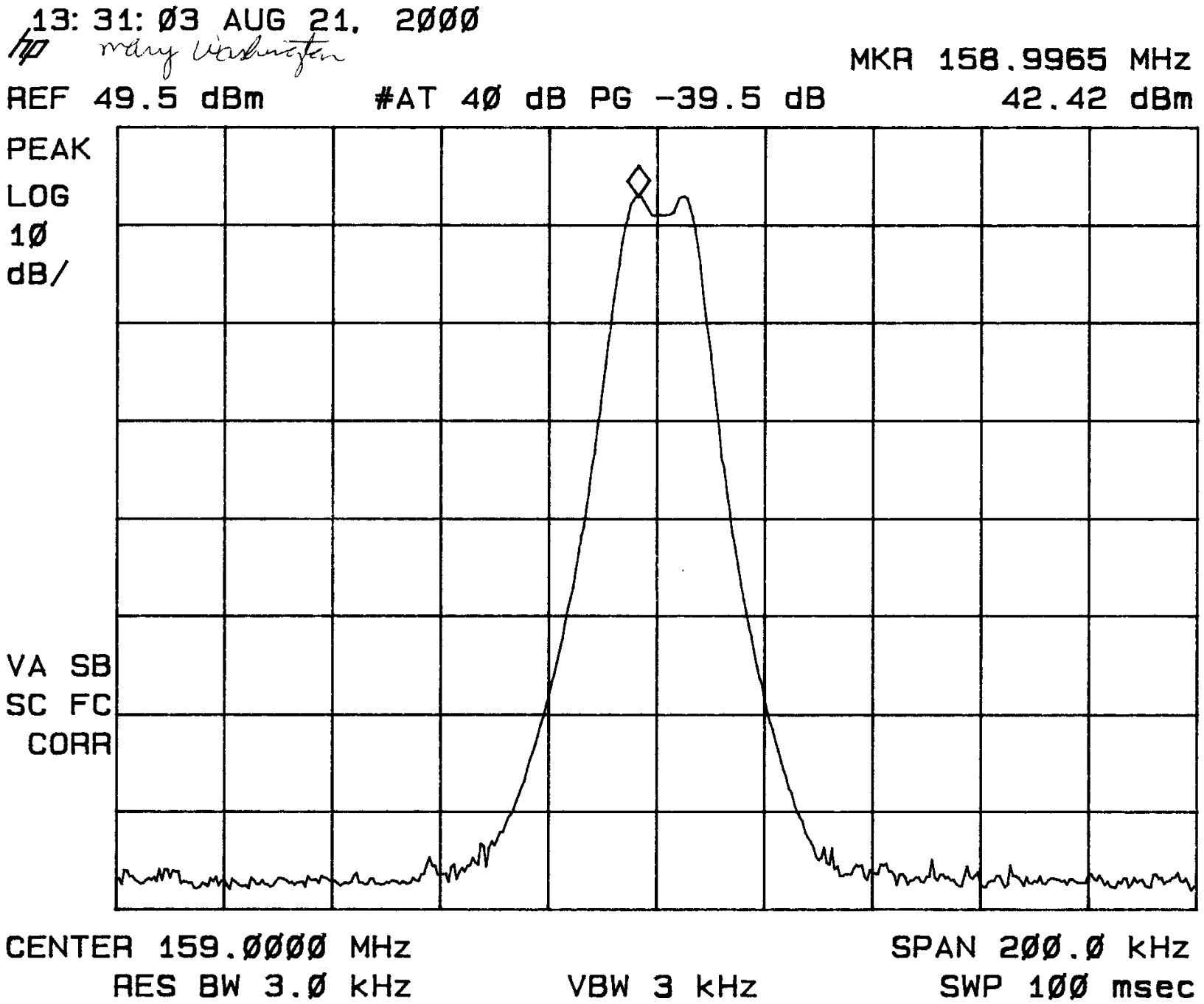
See following page(s).

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1046; Part 80, Paragraph 80.215(c)(1)
NOTE(S): 1. Low channel, 156 MHz (transmitter power)
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



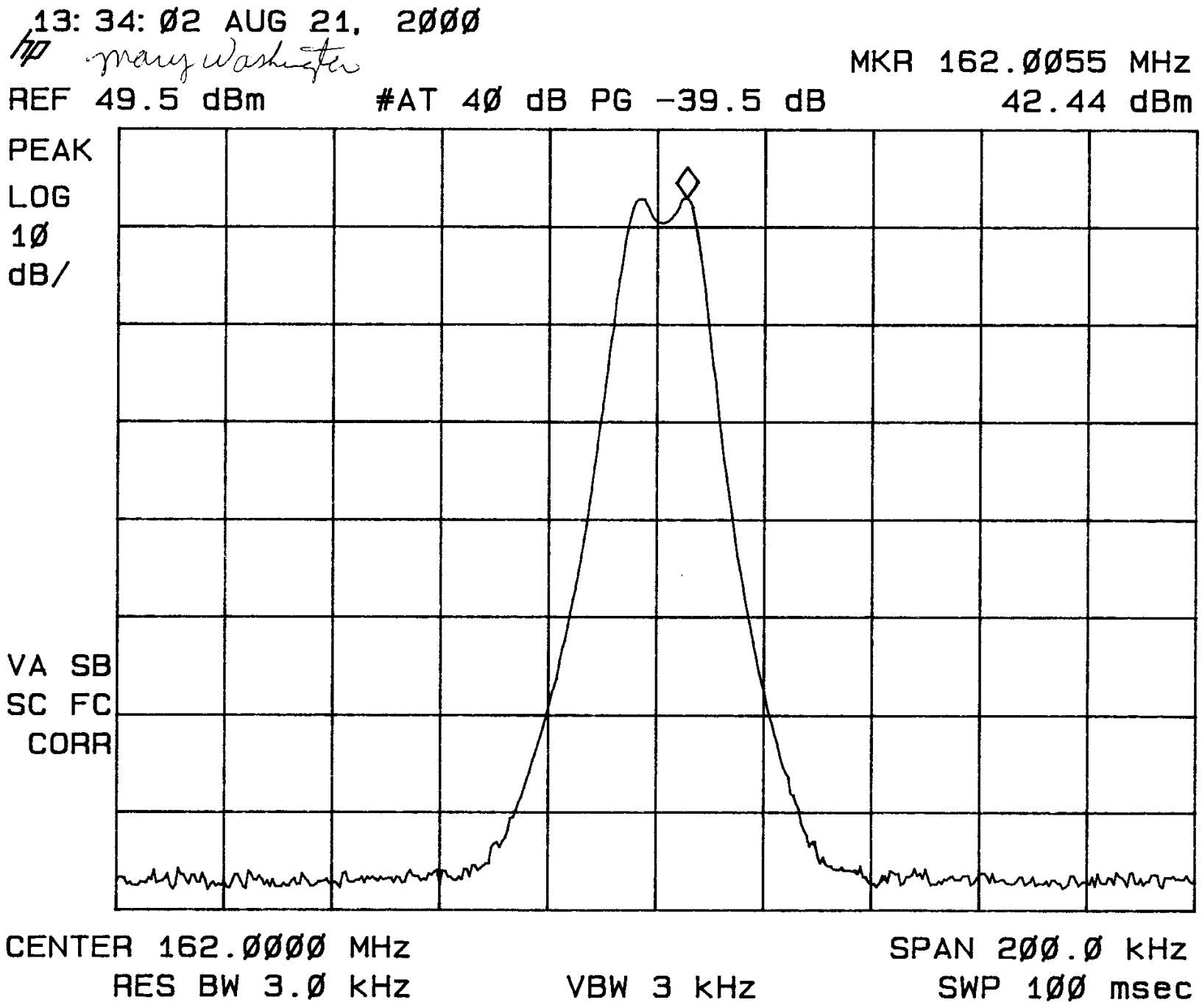
17

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1046; Part 80, Paragraph 80.215(c)(1)
NOTE(S): 1. Mid channel, 156 MHz (transmitter power)
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



18

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1046; Part 80, Paragraph 80.215(c)(1)
NOTE(S): 1. High channel, 162 MHz (transmitter power)
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner

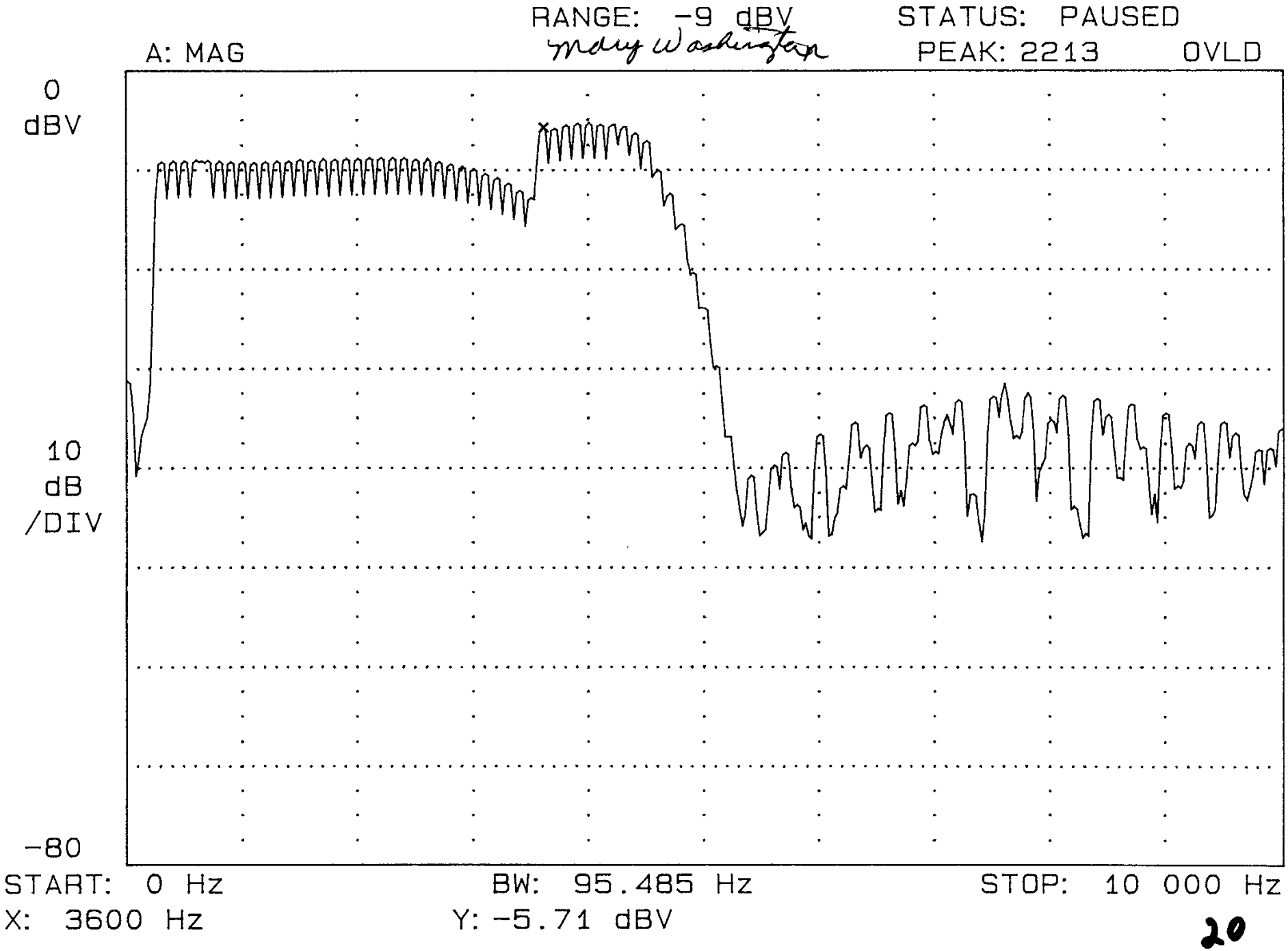


19

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1047; Part 80, Paragraph 80.213(e)

NOTE(S): 1. Low channel, 156 MHz

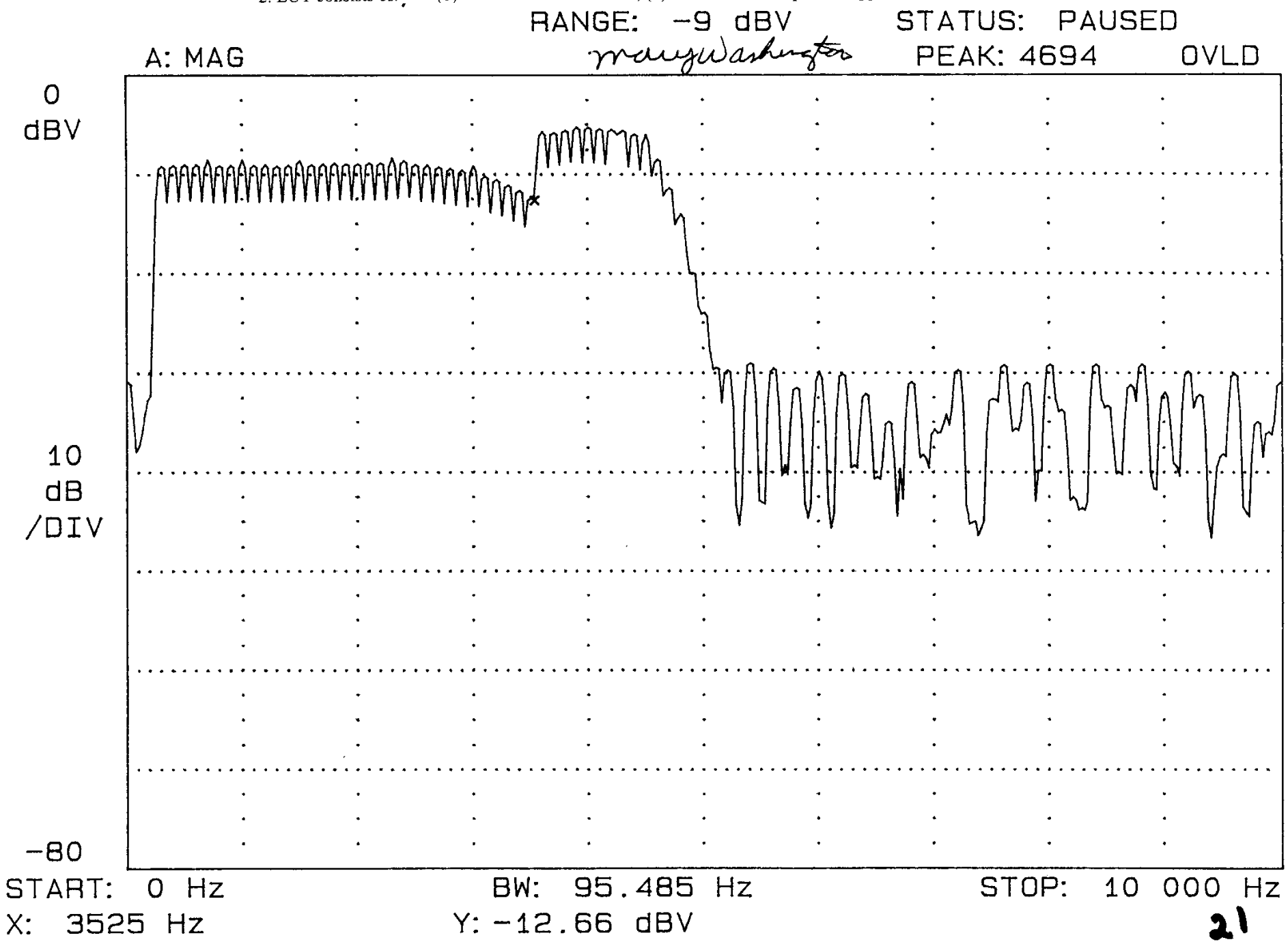
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1047(a); Part 80, Paragraph 80.213(e)

NOTE(S): 1. Mid channel, 156 MHz

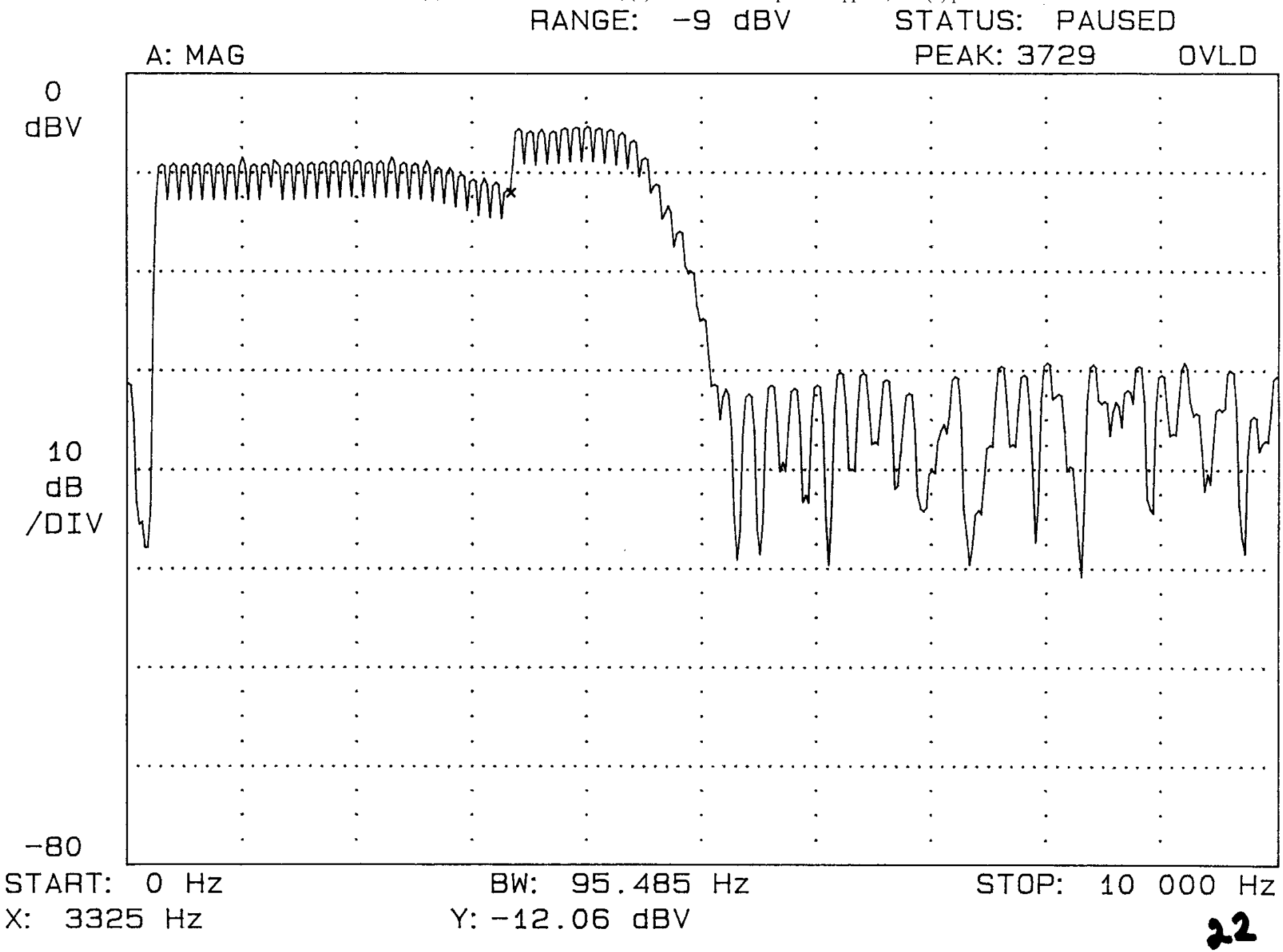
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1047(a); Part 80, Paragraph 80.213(e)

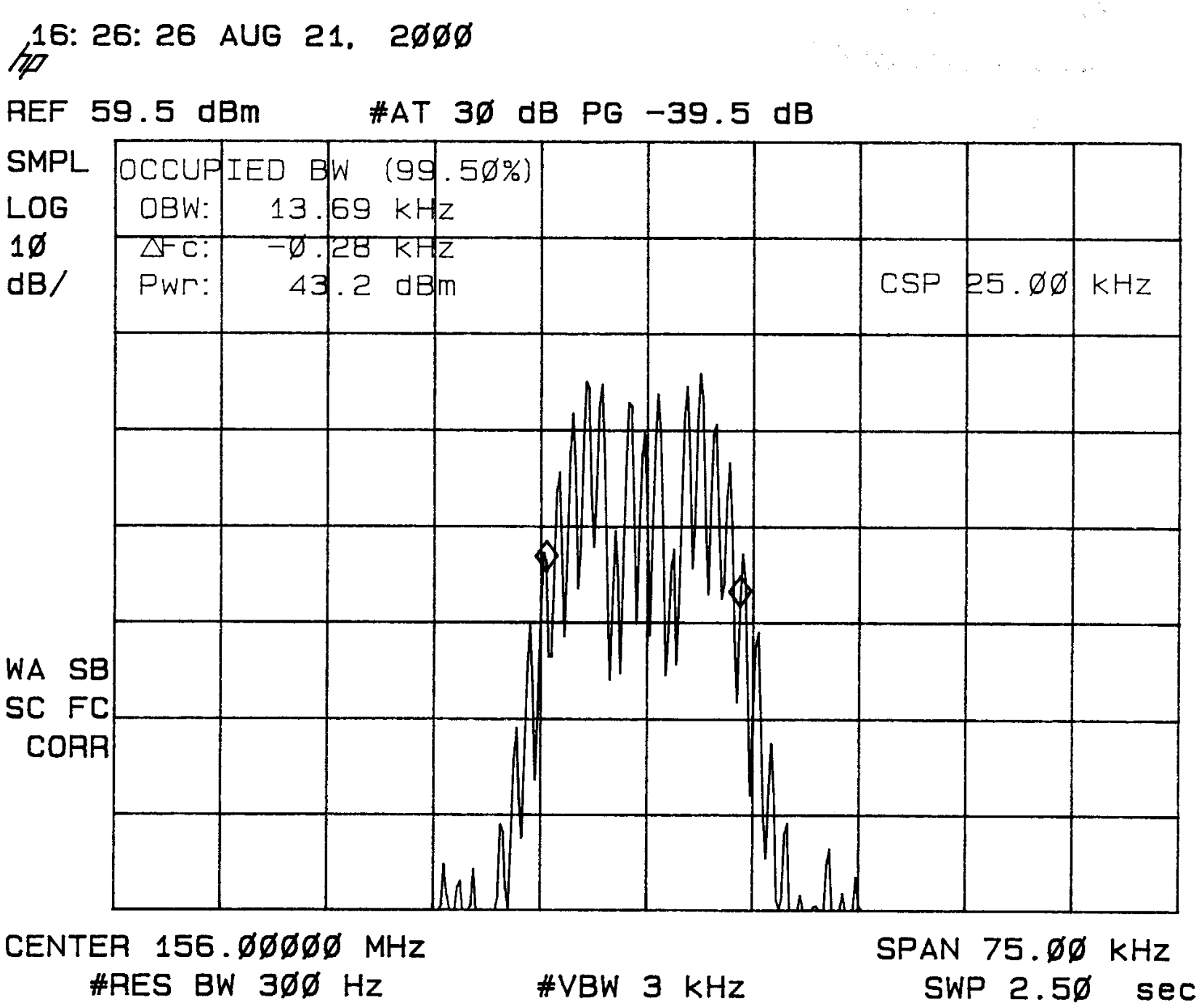
NOTE(S): 1. High channel, 156 MHz

2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



22

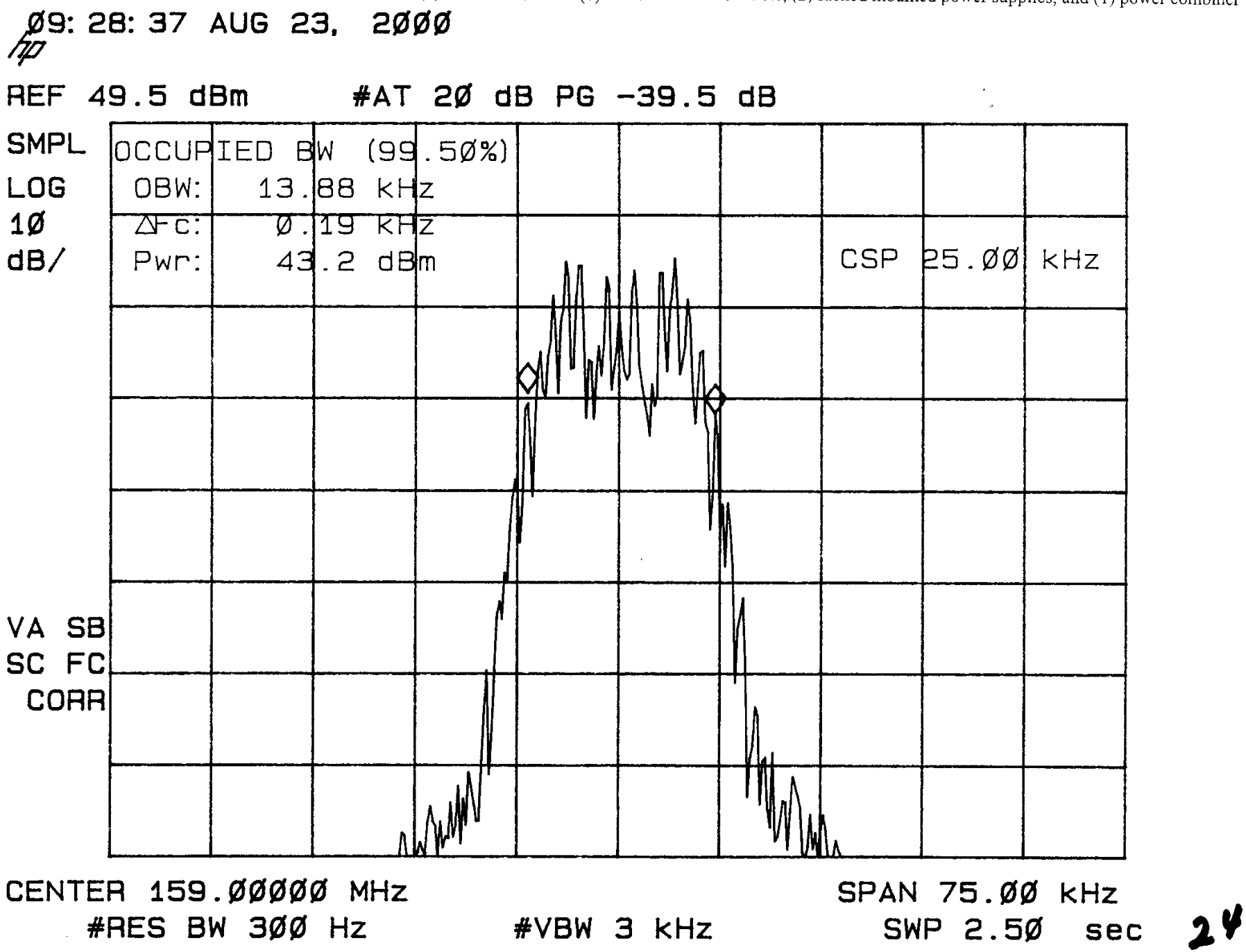
NOTE(S): 1. Low channel (occupied bandwidth)
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1049; Part 80, Paragraph 80.205

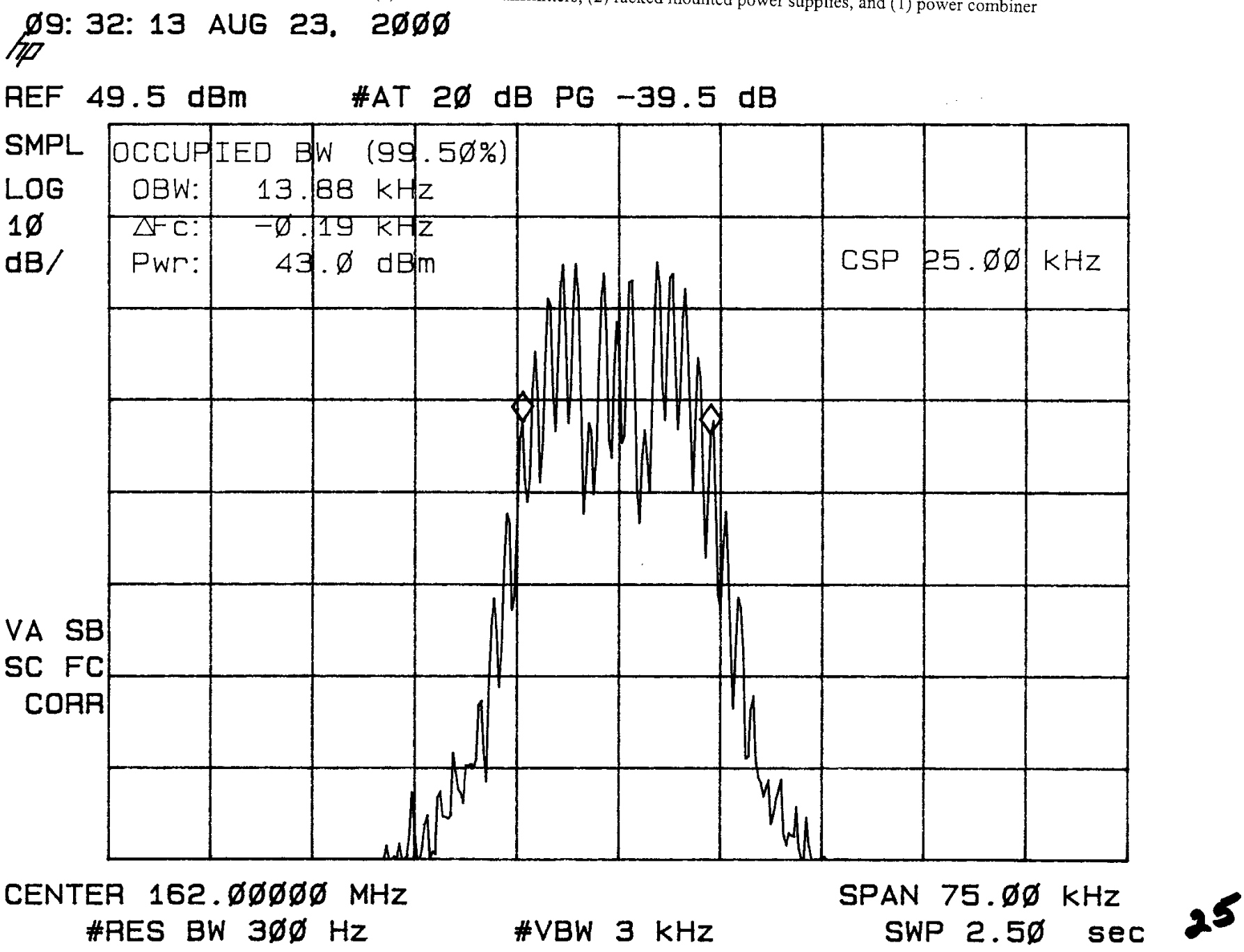
NOTE(S): 1. Mid channel (occupied bandwidth)

2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



24

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1049; Part 80, Paragraph 80.205
NOTE(S): 1. High channel (occupied bandwidth)
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner

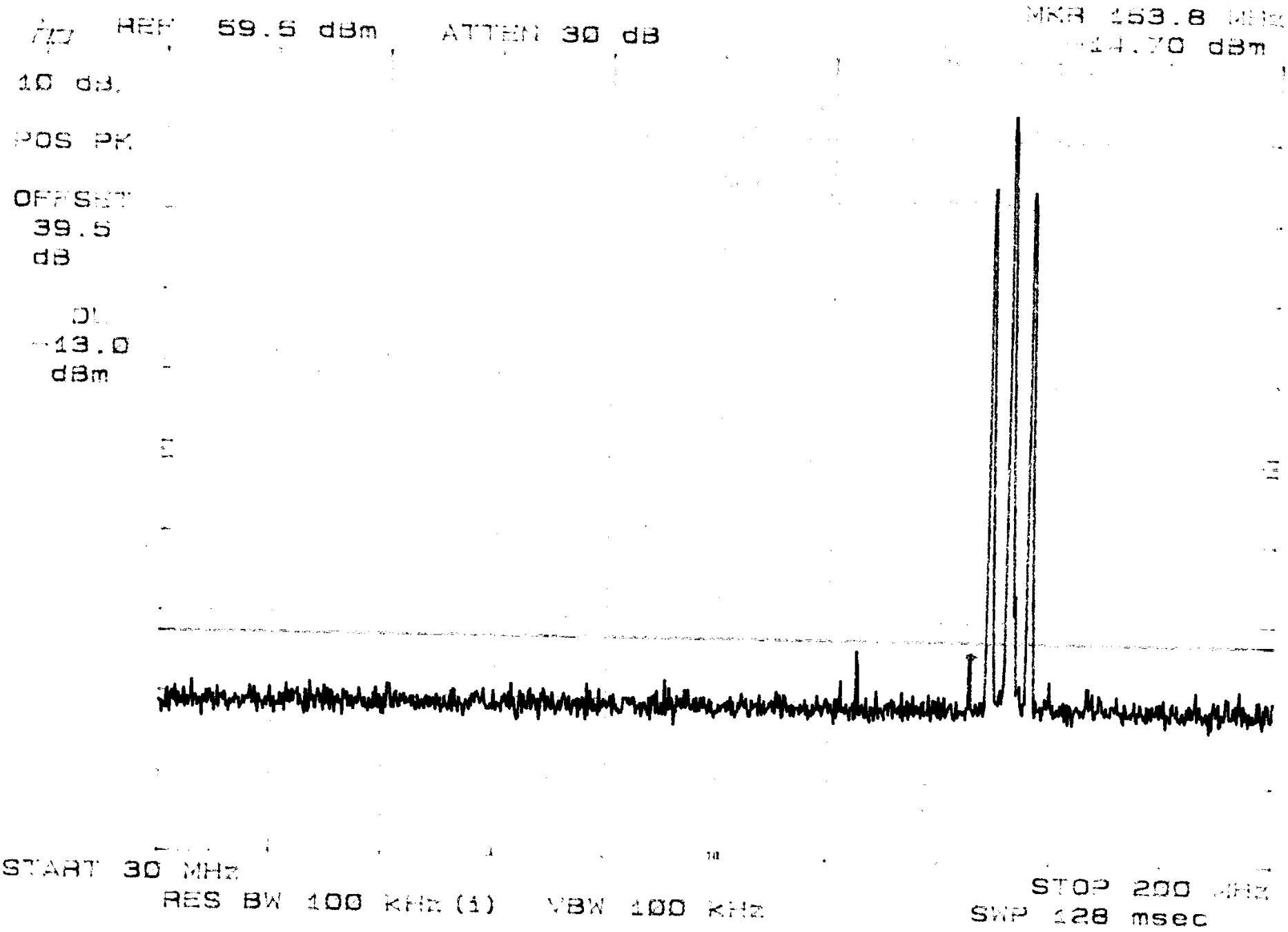


25

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211

NOTE(S): 1. Low channel (conducted spurious)

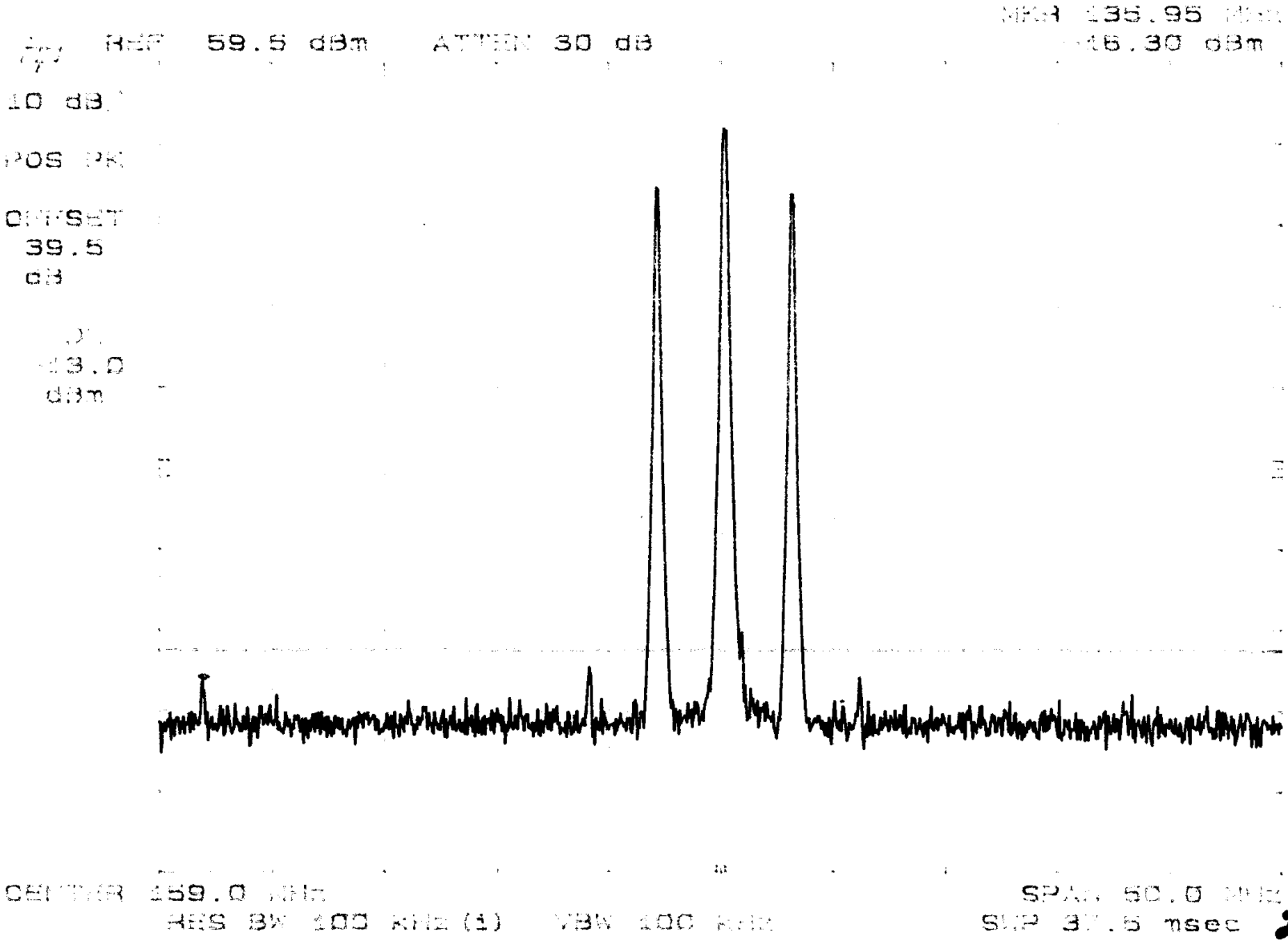
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211

NOTE(S): 1. Low channel (conducted spurious)

2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner

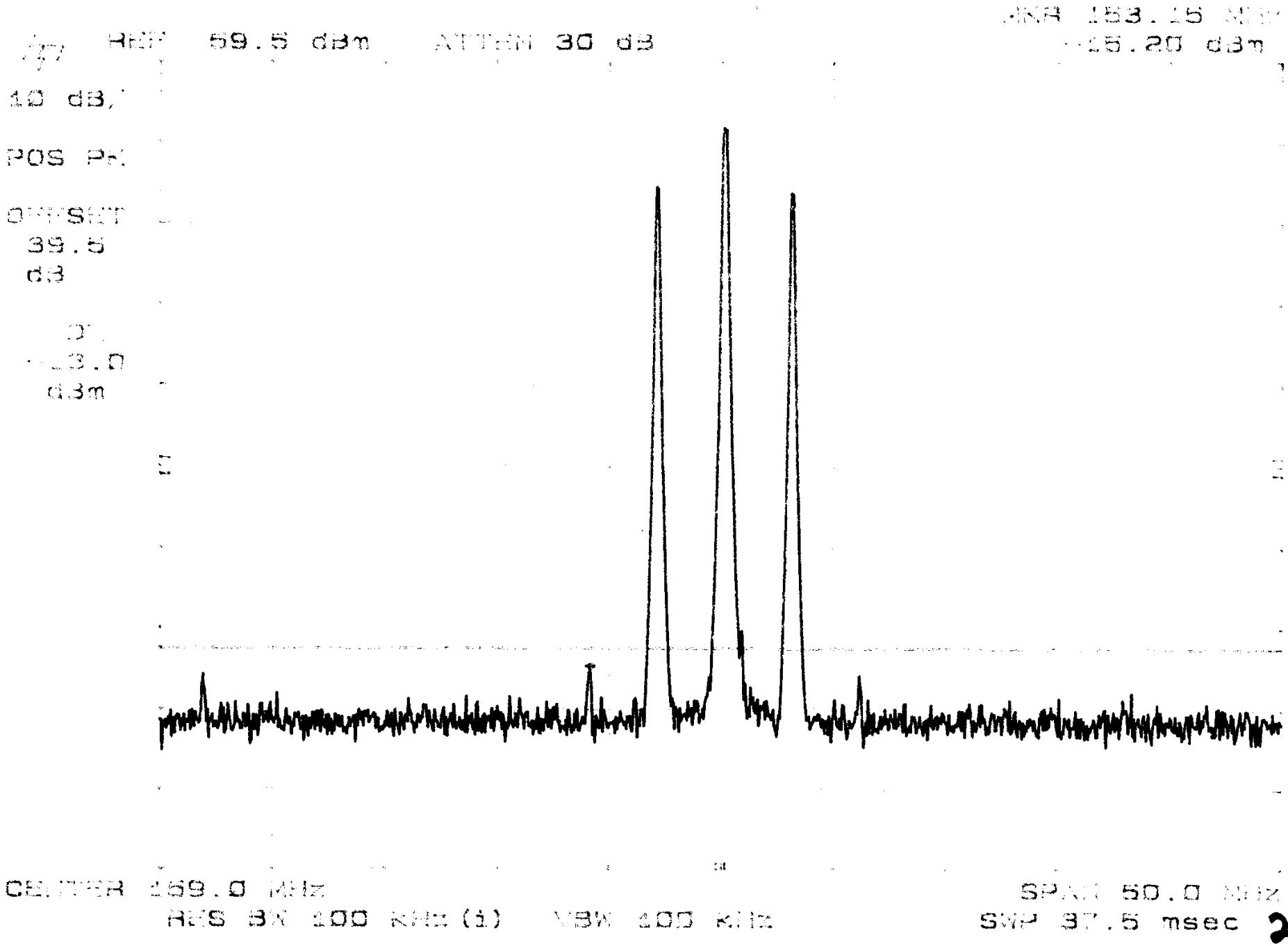


27

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211

NOTE(S): 1. Low channel (conducted suprious)

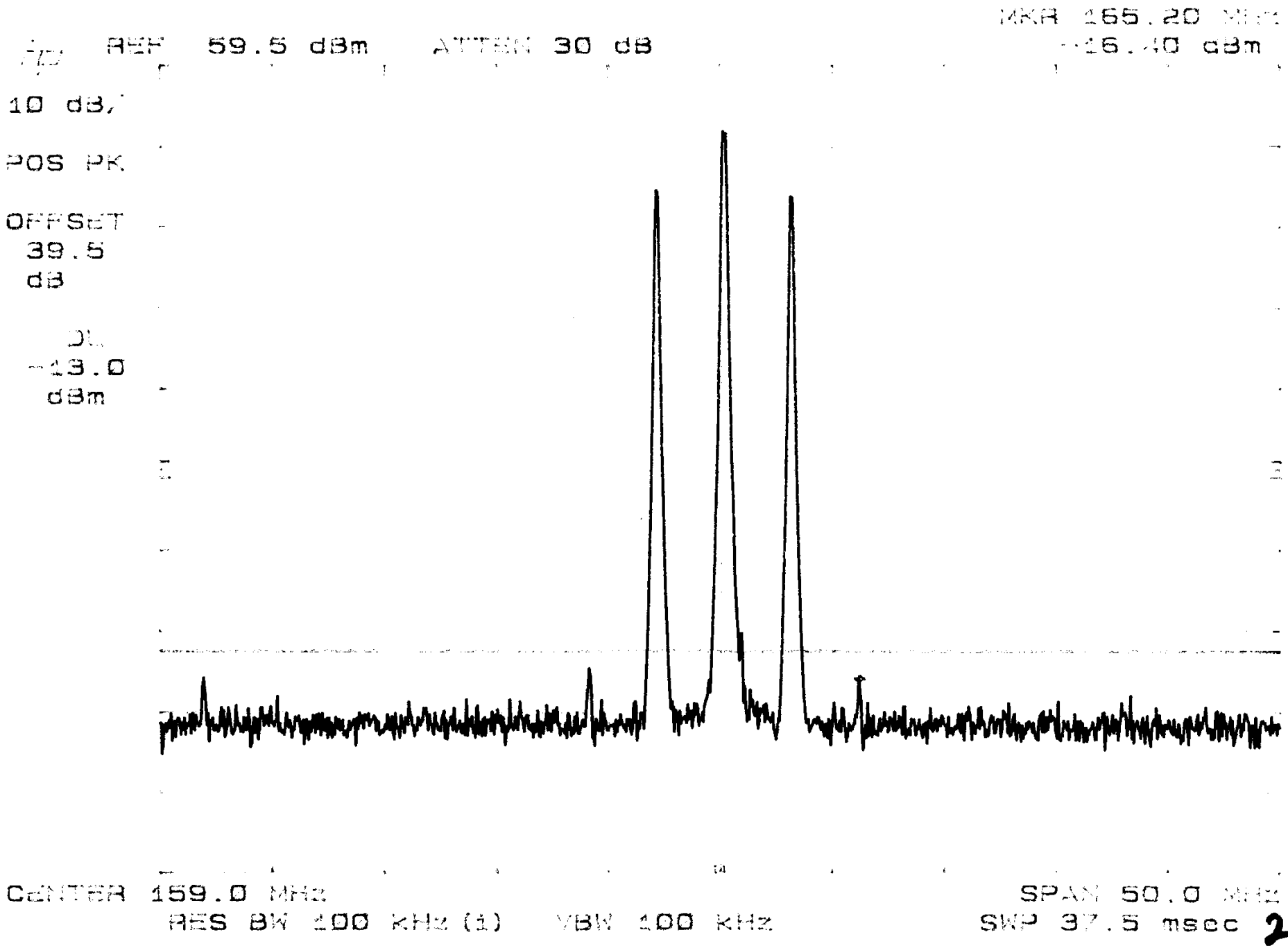
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



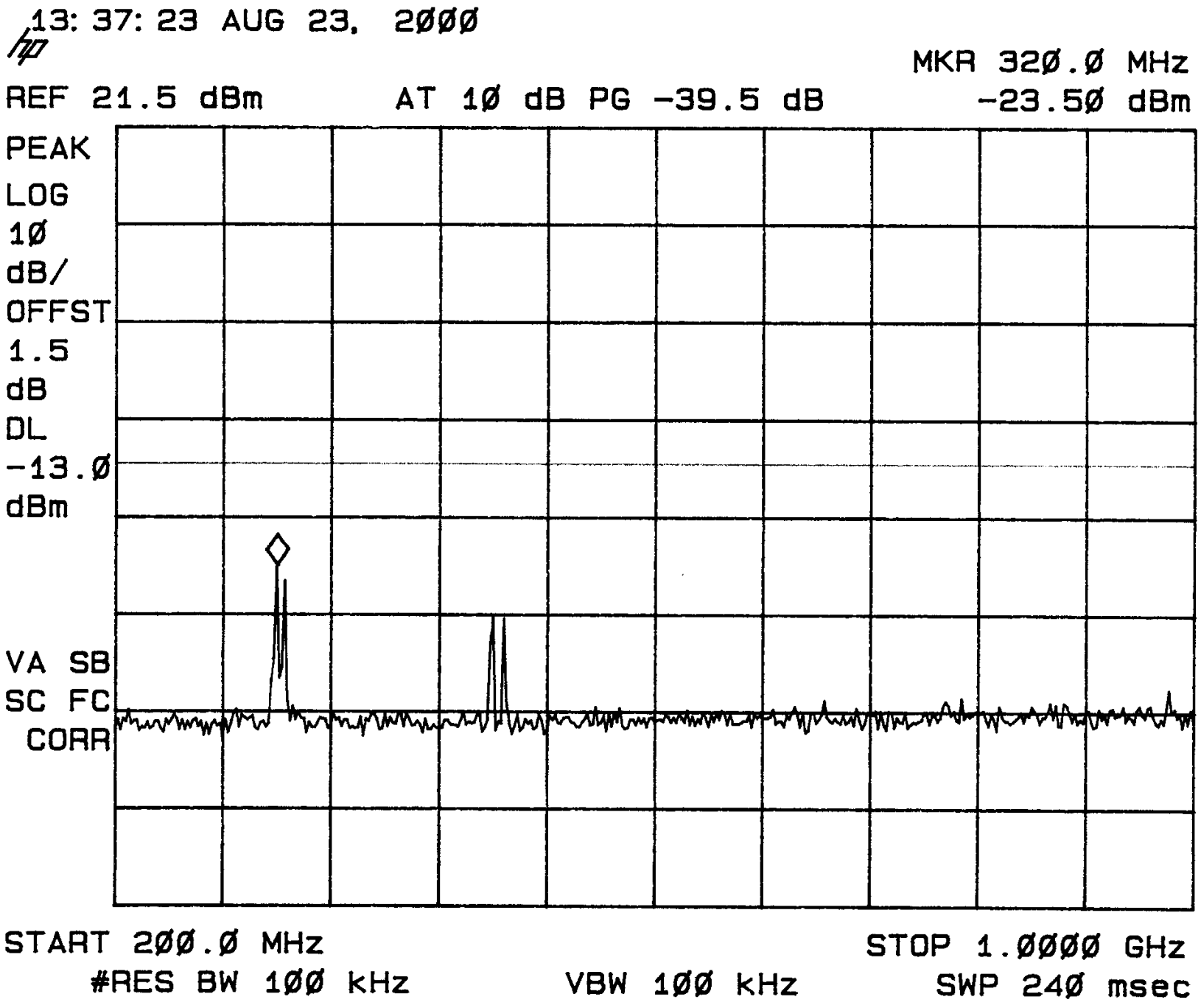
CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211

NOTE(S): 1. Low channel (conducted suprious)

2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211
NOTE(S): 1. Low channel (conducted suprious)
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner

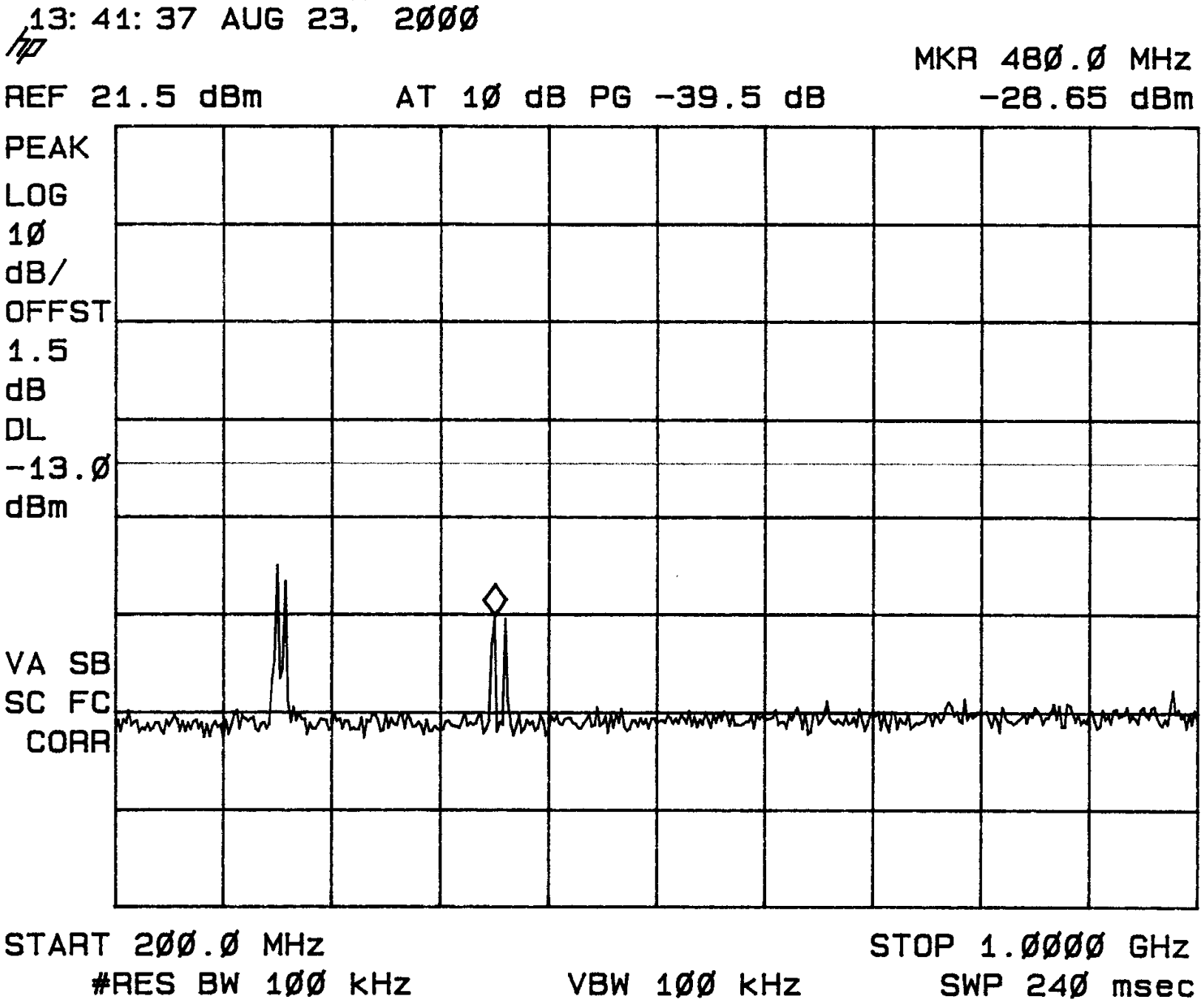


30

CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211

NOTE(S): 1. Low channel (conducted suprious)

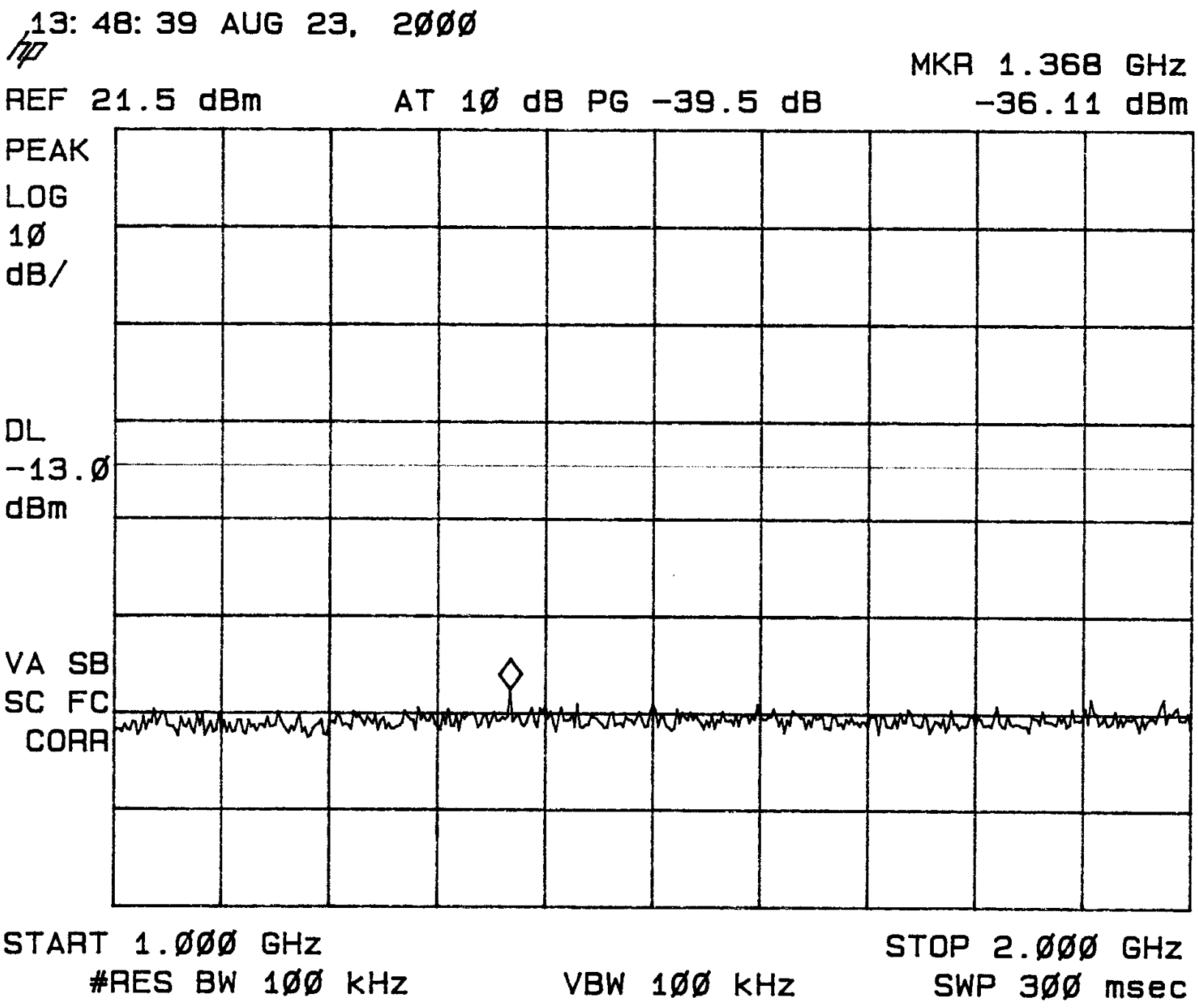
2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



CLIENT: CUBIC COMMUNICATIONS SPECIFICATION: Part 2, Paragraph 2.1051; Part 80, Paragraph 80.211

NOTE(S): 1. Low channel (conducted suprious)

2. EUT consists of: (8) MTC-100T transmitters; (2) racked mounted power supplies, and (1) power combiner



32

Emissions Test Conditions: CONDUCTED EMISSIONS, FCC Part 2, Paragraphs 2.1046; 2.1047; 2.1049; 2.1051 and Part 80, Paragraphs 80.215(c)(1); 80.213(e); 80.205; 80.211

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

☐ - Test not applicable

■ - SR-5, Shielded Room, 16' x 28' x 15', Metal, Semi-Anechoic Chamber

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
8566B	407	Spectrum Analyzer	Hewlett Packard	2311A02209	10/00
85662B	406	Spectrum Analyzer Display	Hewlett Packard	2309A04682	10/00
8594E	430	Spectrum Analyzer	Hewlett Packard	3303A00365	05/01
BHP-100	--	100 MHz High Pass Filter	Minicircuits*	--	*
BHP-150	--	MHz High Pass Filter	Minicircuits*	--	*
BHP-200	--	MHz High Pass Filter	Minicircuits*	--	*
BHP-250	--	MHz High Pass Filter	Minicircuits*	--	*
8329-300	--	Attenuator	Bird	4218	N/A
769-6	--	Attenuator	Narda	02237	*
769-3	--	Attenuator	Narda	02287	*
HP 8901A	--	Modulation Analyzer	Hewlett Packard	--	12/00
3561A	--	Dynamic Signal Analyzer	Hewlett Packard	--	06/01
SG-100/A	--	21.5 MHz Synthesized Function/Arb Generator	Telux	--	04/01
8329-300	--	Coaxial Attenuator, 30 dB	Tenuline	--	*

Remarks: _____

5 FREQUENCY STABILITY EQUIPMENT/DATA

See following page(s).

Emissions Test Conditions: FREQUENCY STABILITY, FCC Part 2, Paragraphs 2.1055 and Part 80, Paragraphs 80.209(a)

The *Frequency Stability* measurements were performed at the following test location :

☐ - Test not applicable

■ - Frequency Stability Chamber

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
769-6	--	Attenuator	Narda	02237	*
769-3	--	Attenuator	Narda	02287	*
3PN1520	6146	Variac	Staco Energy Products Co.	--	**
--	--	Frequency Counter	Hewlett Packard	--	01/01
3478A	800	Multimeter	Hewlett Packard	--	03/03
6843A	580	AC Power Source	Hewlett Packard	3531A00115	08/01
8329-300	--	Coaxial Attenuator, 30 dB	Tenuline	--	*

Remarks: (*) Verified by customer; (**) Verified internally

TUV Product Service, San Diego
Frequency Stability Test Log
Tested 28 August 2000

Measurement Time	Deviation from 159 MHz	Reference Temperature
Ambient Temperature 25C	Deviation in hertz	Chamber indicates +28.3C
"10:17:29"	-352	21.058
"10:18:35"	-352	21.047
"10:19:40"	-352	21.059
"10:20:45"	-368	21.078
"10:21:50"	-352	21.089
"10:22:55"	-400	21.114
"10:24:00"	-352	21.109
"10:25:05"	-368	21.135
"10:26:09"	-352	21.179
"10:27:14"	-352	21.188
Temperature -20C	Deviation in hertz	Chamber indicates -20.6C
"12:00:47"	-848	-22.51
"12:01:52"	-816	-22.441
"12:02:57"	-768	-22.475
"12:04:02"	-800	-22.479
"12:05:07"	-768	-22.445
"12:06:12"	-768	-22.404
"12:07:17"	-800	-22.382
"12:08:22"	-768	-22.347
"12:09:27"	-816	-22.259
"12:10:32"	-752	-22.245
Temperature -10C	Deviation in hertz	Chamber indicates -10.2C
"13:10:47"	-768	-12.7
"13:11:52"	-768	-12.689
"13:12:57"	-752	-12.731
"13:14:02"	-720	-12.671
"13:15:07"	-672	-12.581
"13:16:12"	-672	-12.569
"13:17:17"	-704	-12.512
"13:18:22"	-672	-12.509
"13:19:27"	-672	-12.505
"13:20:32"	-672	-12.506
Temperature 0C	Deviation in hertz	Chamber indicates -0.2C
"14:20:47"	-672	-3.217
"14:21:52"	-672	-3.195
"14:22:57"	-656	-3.151
"14:24:02"	-656	-3.112
"14:25:07"	-624	-3.056
"14:26:12"	-576	-3.044
"14:27:17"	-544	-3.017
"14:28:21"	-512	-2.998
"14:29:26"	-576	-3.021
"14:30:31"	-576	-2.964

TUV Product Service
10040 Mesa Rim Road
San Diego, CA 92121
858/546-3999

Tested by J Owen

TUV Product Service, San Diego
Frequency Stability Test Log
Tested 28 August 2000

Temperature +10C	Deviation in hertz	Chamber indicates +9.7C
"15:30:46"	-512	6.13
"15:31:51"	-512	6.163
"15:32:56"	-512	6.238
"15:34:02"	-512	6.23
"15:35:07"	-496	6.277
"15:36:11"	-496	6.306
"15:37:16"	-464	6.358
"15:38:21"	-464	6.436
"15:39:26"	-464	6.431
"15:40:31"	-496	6.447
Temperature +20C	Deviation in hertz	Chamber indicates +19.7C
"16:40:46"	-464	15.14
"16:41:51"	-496	15.146
"16:42:56"	-464	15.212
"16:44:02"	-464	15.31
"16:45:07"	-416	15.31
"16:46:12"	-448	15.319
"16:47:16"	-448	15.348
"16:48:21"	-448	15.411
"16:49:26"	-448	15.445
"16:50:31"	-416	15.477
Temperature +30C	Deviation in hertz	Chamber indicates +28.8C
"17:50:46"	-448	23.919
"17:51:51"	-464	23.983
"17:52:56"	-464	24.019
"17:54:01"	-448	24.025
"17:55:06"	-400	24.077
"17:56:11"	-448	24.148
"17:57:16"	-448	24.191
"17:58:21"	-448	24.25
"17:59:26"	-416	24.3
"18:00:31"	-416	24.352
Temperature +40C	Deviation in hertz	Chamber indicates 40.1C
"19:00:46"	-496	35.79
"19:01:51"	-512	35.78
"19:02:56"	-496	35.77
"19:04:01"	-496	35.78
"19:05:06"	-512	35.81
"19:06:11"	-512	35.82
"19:07:16"	-512	35.79
"19:08:21"	-496	35.78
"19:09:26"	-512	35.82
"19:10:31"	-512	35.87

TUV Product Service
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858/546-3999

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TUV Product Service, San Diego
Frequency Stability Test Log
Tested 28 August 2000

Temperature +50C	Deviation in hertz	Chamber indicates 50.1C
"20:10:46"	-464	45.35
"20:11:51"	-576	45.35
"20:12:56"	-576	45.39
"20:14:01"	-512	45.41
"20:15:06"	-576	45.39
"20:16:11"	-576	45.44
"20:17:16"	-3072 (device shut down)	45.45 See Note
"20:18:21"	-4720 (device shut down)	45.44 See Note
"20:19:26"	-1312 (device shut down)	45.48 See Note
"20:20:31"	-3808 (device shut down)	45.45 See Note

Note: The EUT is only designed for operation between -20 degree C to +40 degrees C.

TUV Product Service
10040 Mesa Rim Road
San Diego, CA 92121
858/546-3999

Tested by J Owen

Frequency Stability

Minute	Nominal Voltage (Hz)	115% of Nominal (Hz)	85% Nominal (Hz)
Start up	+30	+45	+65
+2	+45	+45	+55
+5	+50	+50	+60
+10	+45	+65	+75

7 SIGNATURE PAGE

GENERAL REMARKS:

SUMMARY:

All tests according to *FCC Part 2, Paragraphs, 2.1046; 2.1047(a); 2.1049; 2.1051; 2.1053; 2.1055; Part 80, Paragraphs 80.205; 80.209(a); 80.211; 80.213(e); 80.215(c)(1)* were.

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** *FCC Part 2, Paragraphs, 2.1046; 2.1047(a); 2.1049; 2.1051; 2.1053; 2.1055; and Part 80, Paragraphs 80.205; 80.209(a); 80.211; 80.213(e); 80.215(c)(1).*

☐ - **Does not** fulfill the general approval requirements cited on page 1.

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:

Jim Owen
(EMC Engineer)