EMC Test Services
1250 Peterson Drive, Wheeling, Illinois 60090, USA

TEST SPECIFICATION:

FCC "Rules and Regulations", Part 74,
Experimental Radio, Auxiliary, Special Broadcast and Other Program Distribution Services for Operation in the

494 to 608 MHz Band

Subpart H, Low Power Auxiliary Stations
Sections 74.801 to 74.882

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

Formal Name:	Shure Incorporated UT2D Wireless Microphone
Kind of Equipment:	Low Power Transmitter
Test Configuration:	Continuously Transmitting (Tested at 9 vdc)
Emission Designator:	120KF3E
Transmitter FCC ID:	DD4UT2D
Model Number:	UT2D
Serial Number:	NA
Dates of Test:	June 13, 2001
Test Conducted For:	Shure Incorporated
	222 Hartrey Avenue
	Evanston, Illinois 60025-3696

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SIGNATURE PAGE

Report Written By:

Arnom C. Rowe

Test Engineer
EMC-001375-NE

Report Reviewed by:

Jack Prawica
Lab Manager

Report Approved by:

Brian J. Mattson
General Manager

Company Official:

Shure Incorporated

NVLAP Certificate of Accreditation available upon request.

NVLAP Scope of Accreditation available upon request.

TABLE OF CONTENTS

1.0 SUMMARY OF TEST REPORT

It was found that the Shure Incorporated UT2D Wireless Microphone, S/N NA NA **meets** the radio interference emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Sections 74.801 to 74.882 for Low Power Auxiliary Stations operating in the 560 to 599 MHz Frequency Band.

This report contains the following number of pages.

Text, Data Summary & Charts: 67 pages

2.0 INTRODUCTION

On June 13, 2001, a series of radio frequency interference measurements were performed on the Wireless Microphone, S/N NA. The tests were performed according to the procedures of FCC as stated in Part 2 Subpart J, Equipment Authorization Procedures of the Code of Federal Regulations 47, by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Sections 74.801 to 74.882 for Low Power Auxiliary Stations operating in the 560 to 599 MHz Frequency Band.

4.0 TEST SET-UP

All radiated emission tests were performed at D.L.S. Electronic Systems, Inc. The radiated tests were made with the test item placed on a wooden turntable located in the Test Room with the receive antenna placed one meter from the device under test.

5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All data was automatically plotted using peak detector function. This information was then used to determine the frequencies of maximum emissions. Manual measurements were performed on these frequencies using a peak detector function of the Analyzer with the bandwidths specified by the FCC. From 200 MHz to 1000 MHz a bandwidth of 100 kHz was used (except for Occupied Bandwidth), and above 1000 MHz, wide enough bandwidths were used, depending upon the test being made, to ensure proper measurement of the narrowband signal. A list of the equipment used can be found in Table 1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

6.0 RF POWER OUTPUT - PART 2.1046

As stated in PART 74.861 (e-1), the output power should not exceed 250 milliwatts (24 dBm). The Shure Incorporated UT2D Wireless Microphone was tuned according to the tune-up procedures specified in Part 2.1033 (c-9), and adjusted for its maximum output power. The RF output power was measured in the open field, using the following test method:

For this test a conducted measurement was made with the antenna removed and the output of the device connected via a BNC connector to the test equipment.

Actual Measurements Taken in open field:

9.6 dBm measured output of the transmitter

LIMIT:

Manufacturer's rated output power (50 ohm system) = 11±3 dBm

NOTE:

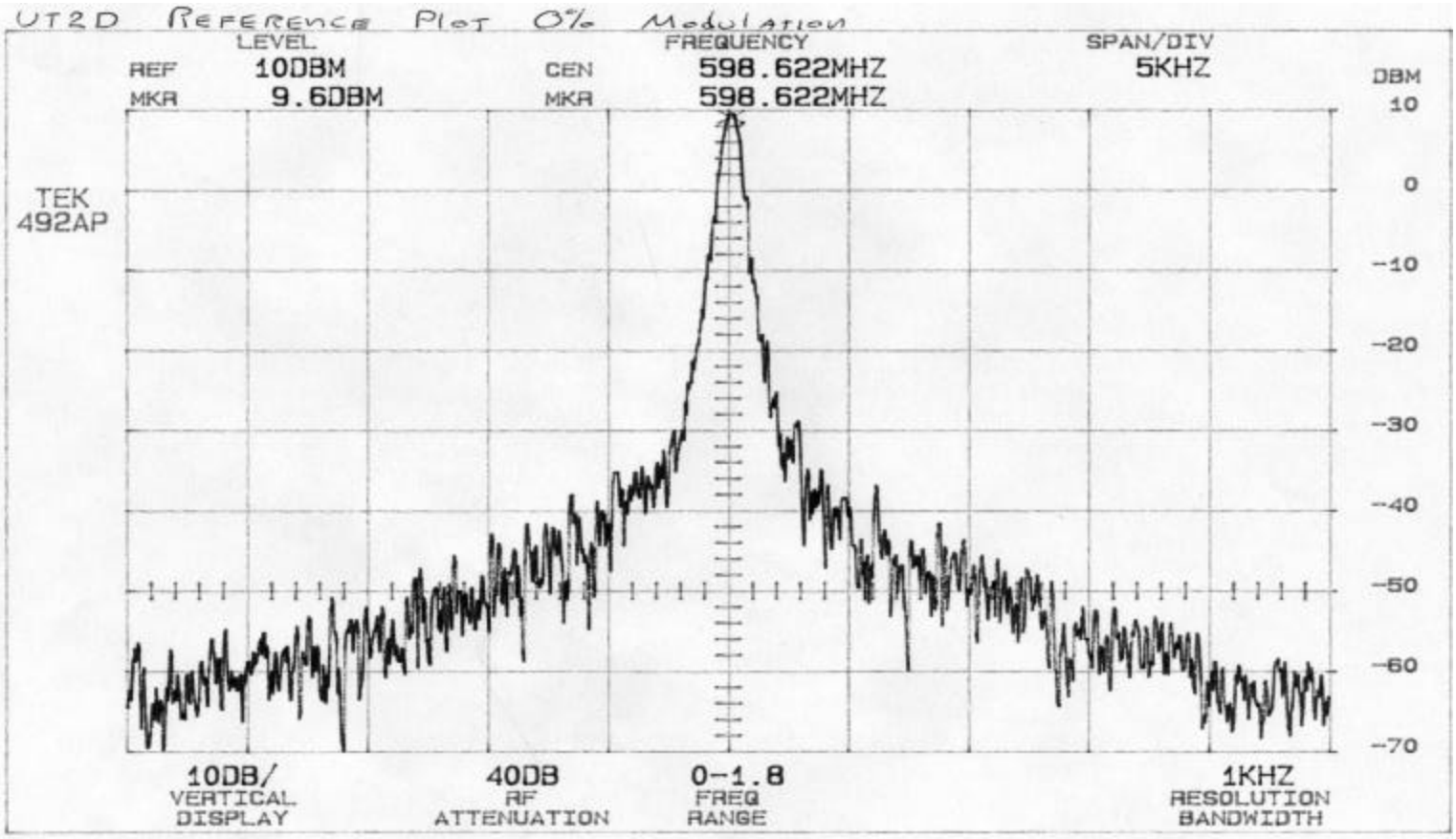
See the following pages for the graphs of the actual measurements made:

GRAPHS TAKEN OF THE RF POWER

OUTPUT MEASUREMENTS

PART 2.1046

UT2D Reference Plot 0% Modulation



7.0 Modulation Characteristics - Part 2.1047

a. Voice modulated communication equipment

A curve showing the frequency response of the audio modulating circuit over a range of 20 to 20000 Hz is submitted with this report.

NOTE: See the following pages for the actual chart made during testing.

b. Equipment which employs modulation limiting

A family of curves showing the percentage of modulation versus the modulation input voltage with sufficient information showing the modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

NOTE:

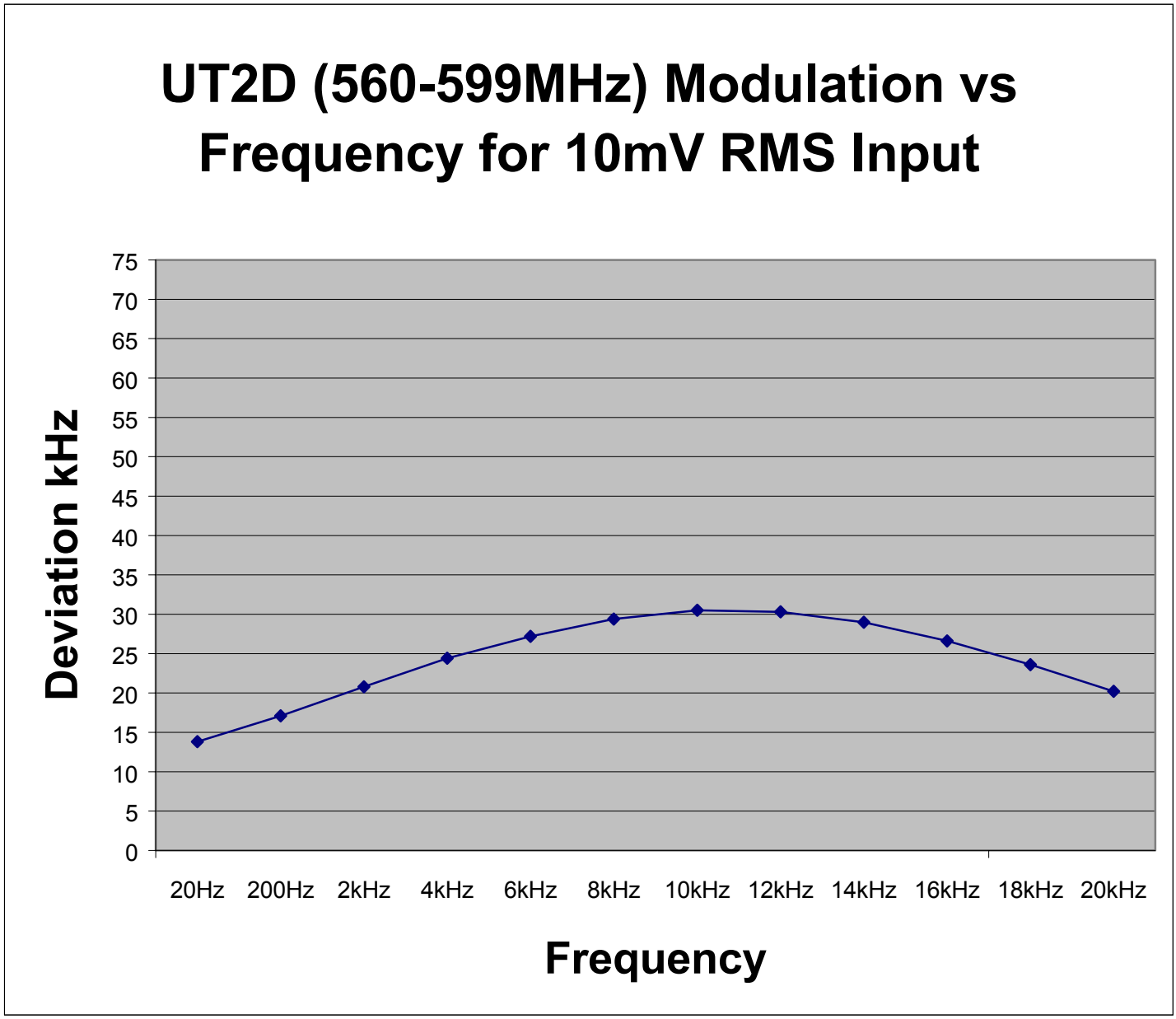
These tests were not run because the UT2D does not use limiting.

GRAPHS TAKEN SHOWING THE FREQUENCY

RESPONSE OF THE

AUDIO MODULATING CIRCUIT

PART 2.1047


UT2D (560-599MHz) Modulation vs Frequency for 10mV RMS Input
Deviation kHz
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
20Hz
200Hz
2kHz
4kHz
6kHz
8kHz
10kHz
12kHz
14kHz
16kHz
18kHz
20kHz
Frequency

8.0 OCCUPIED BANDWIDTH – PART 2.1049

The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to .5% of the total mean power radiated by a given emission.

As stated in Part 2.1049 c-1 the Shure Incorporated UT2D Wireless Microphone was modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. This input level was established at the frequency of maximum response of the audio modulating circuit.

The Shure Incorporated UT2D Wireless Microphone uses the same frequency range as television broadcast monaural transmitters so the test was also run using a 15 kHz input signal modulated by 85% as stated in Part 2.1049 e-6.

Paragraph e-5 states that the maximum authorized bandwidth shall be **200 kHz** for all emissions inside these frequency bands.

Carson's Rule:

Section 2.202 (g)

Bn = 2M_2DK, K=1 Bn = Bandwidth

M = 15 kHz, M = Maximum Modulating Frequency

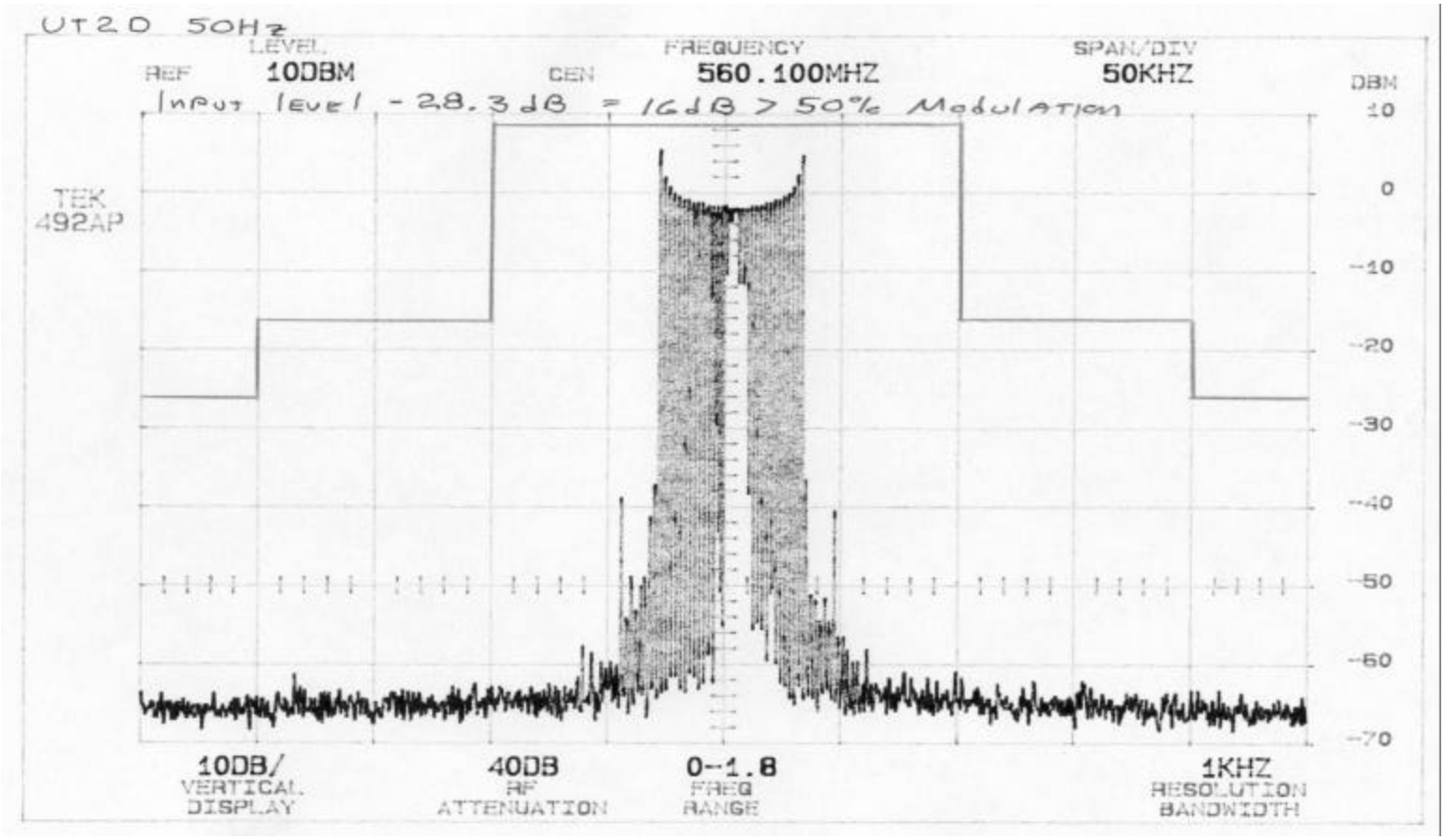
D = 45 kHz, D = Peak Deviation

Bn = 2(15) + 2(45)(1) = **120 kHz**

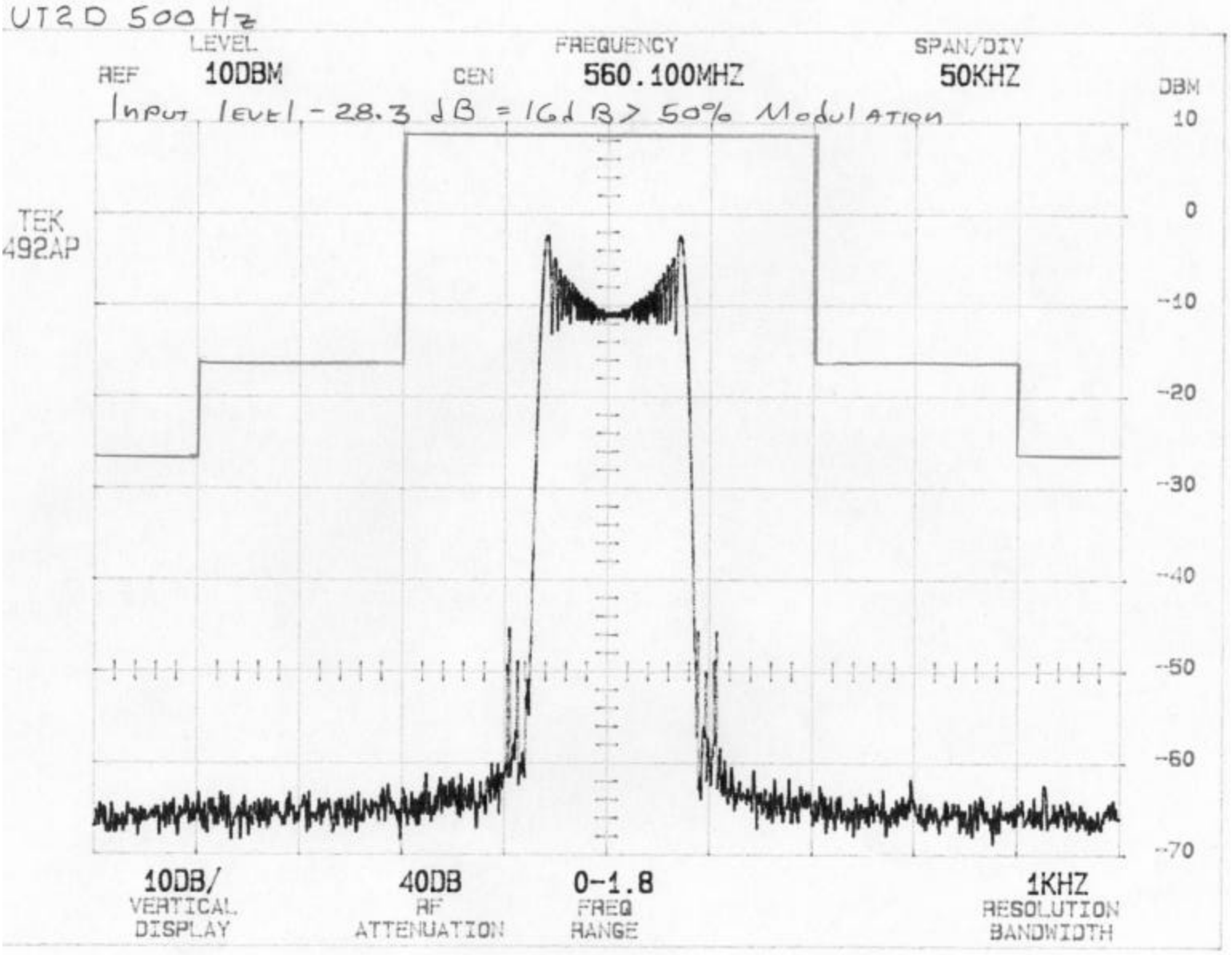
NOTE: See the following pages for the graphs of the actual measurements made:

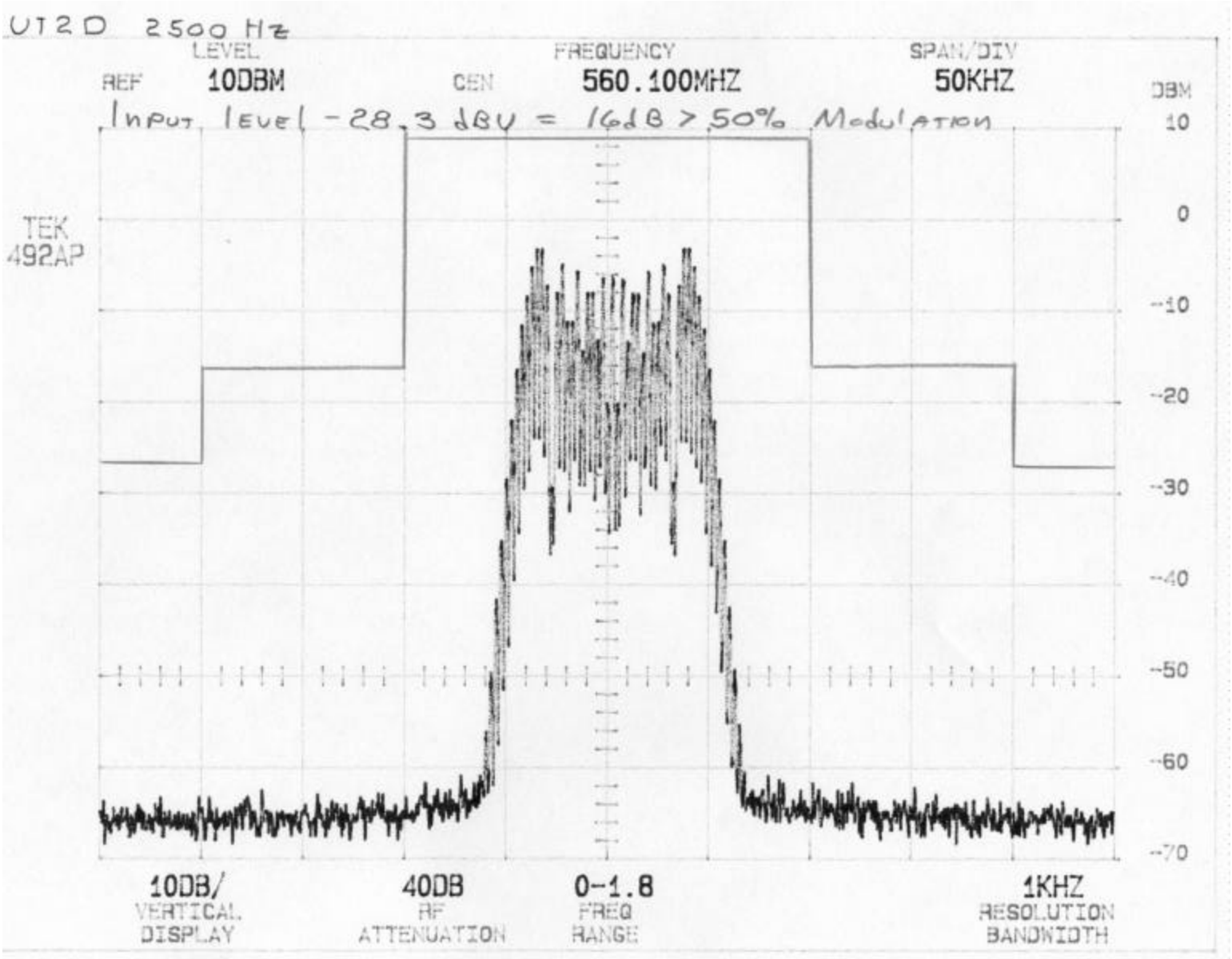
GRAPHS TAKEN OF THE OCCUPIED BANDWIDTH

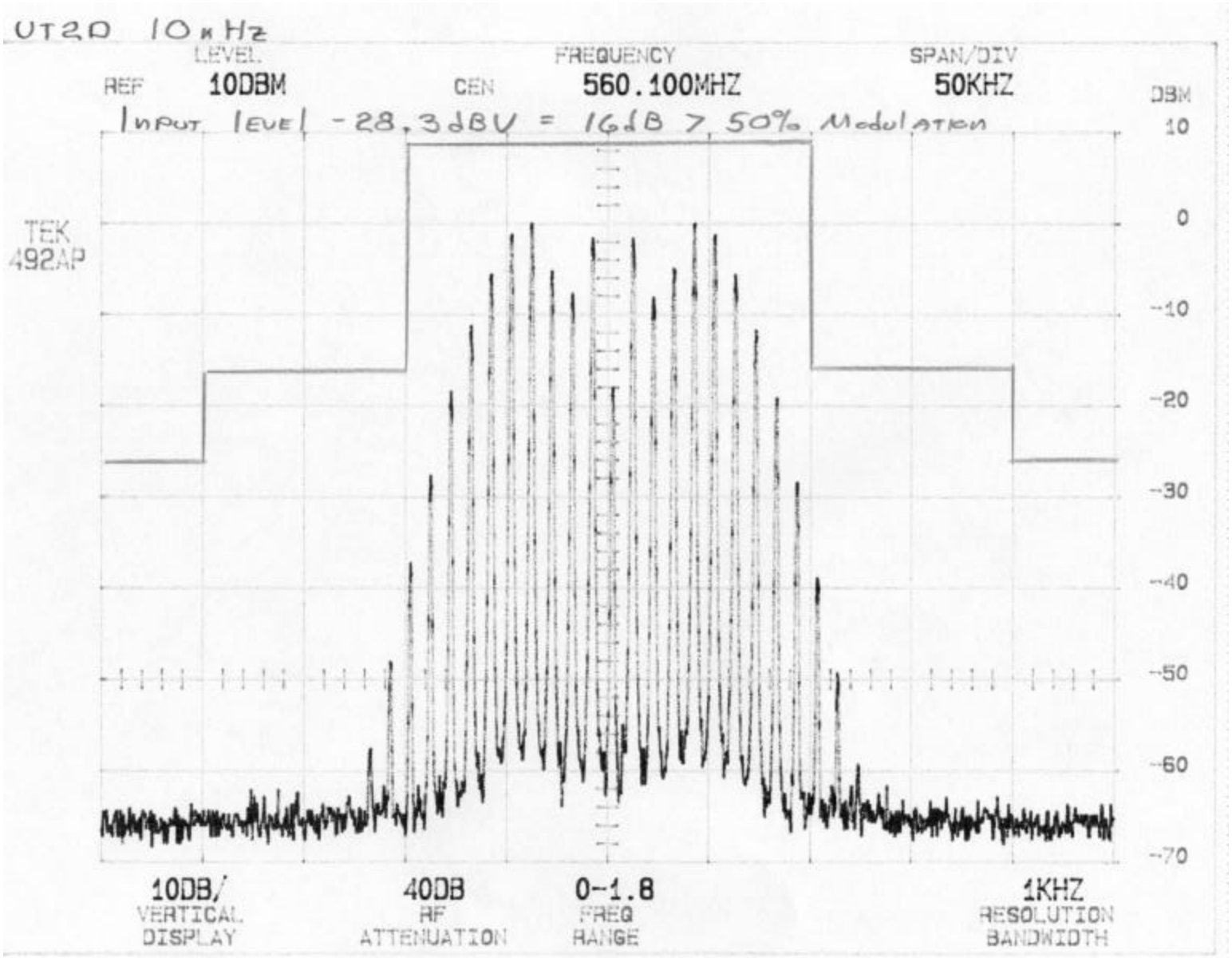
PART 2.1049


UT20 50Hz
LEVEL
REF 10DBM
FREQUENCY
CEN 560.100MHZ
SPAN/DIV
50KHZ
Input level -28.3dB = 16dB > 50% Modulation
DBM
10
0
-10
-20
-30
-40
-50
-60
-70
TEK
492AP
10DB/
VERTICAL
DISPLAY
40DB
RF
ATTENUATION
0-1.8
FREQ
RANGE
1KHZ
RESOLUTION
BANDWIDTH

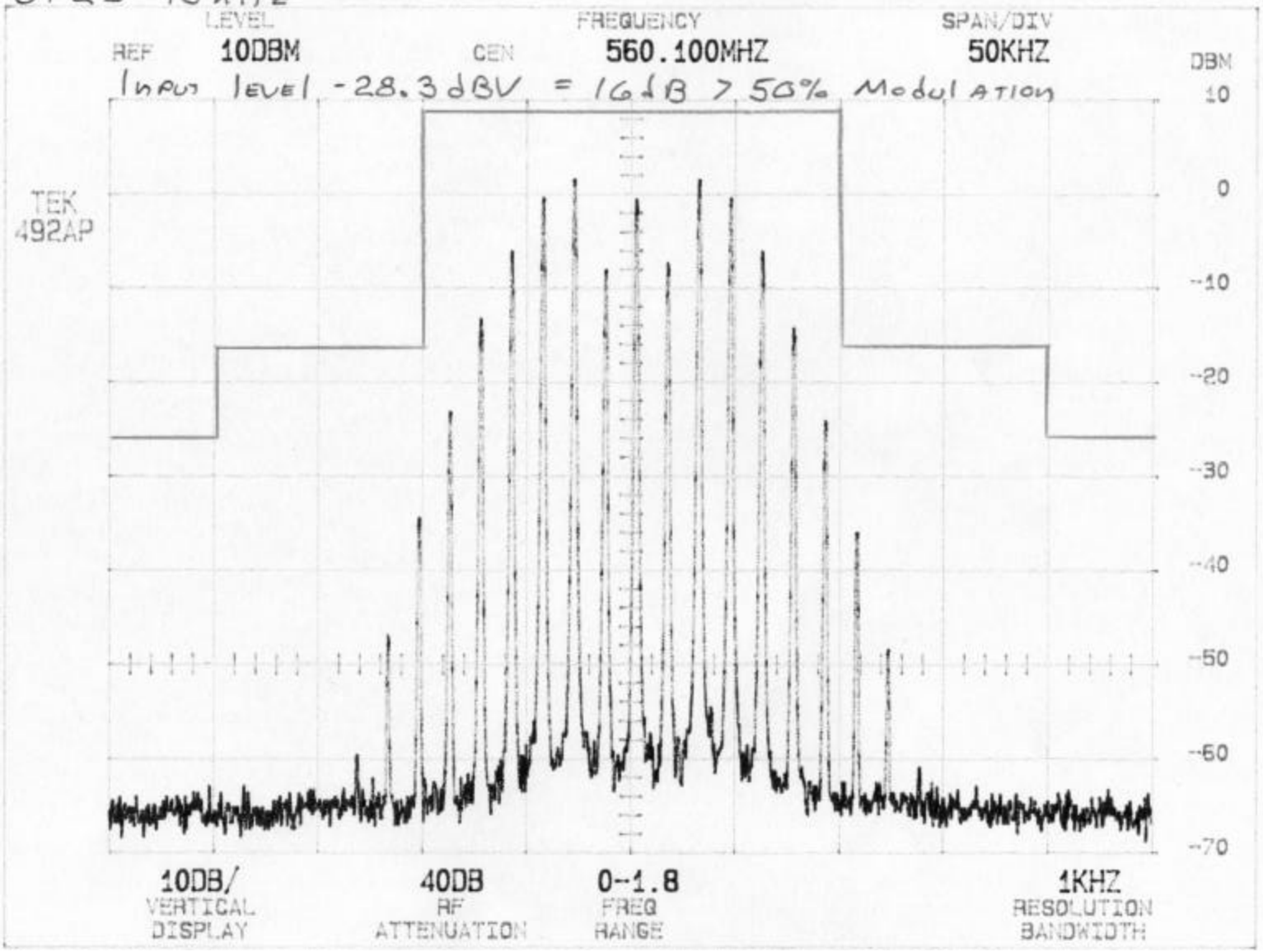
UT2D 500 Hz


LEVEL
REF 10DBM
FREQUENCY
CEN 560.100MHZ
SPAN/DIV
50KHZ
Input level -28.3 dB = 1GdB > 50% Modulation
DBM
10
0
-10
-20
-30
-40
-50
-60
-70
TEK
492AP
10DB/
VERTICAL
DISPLAY
40DB
RF
ATTENUATION
0-1.8
FREQ
RANGE
1KHZ
RESOLUTION
BANDWIDTH

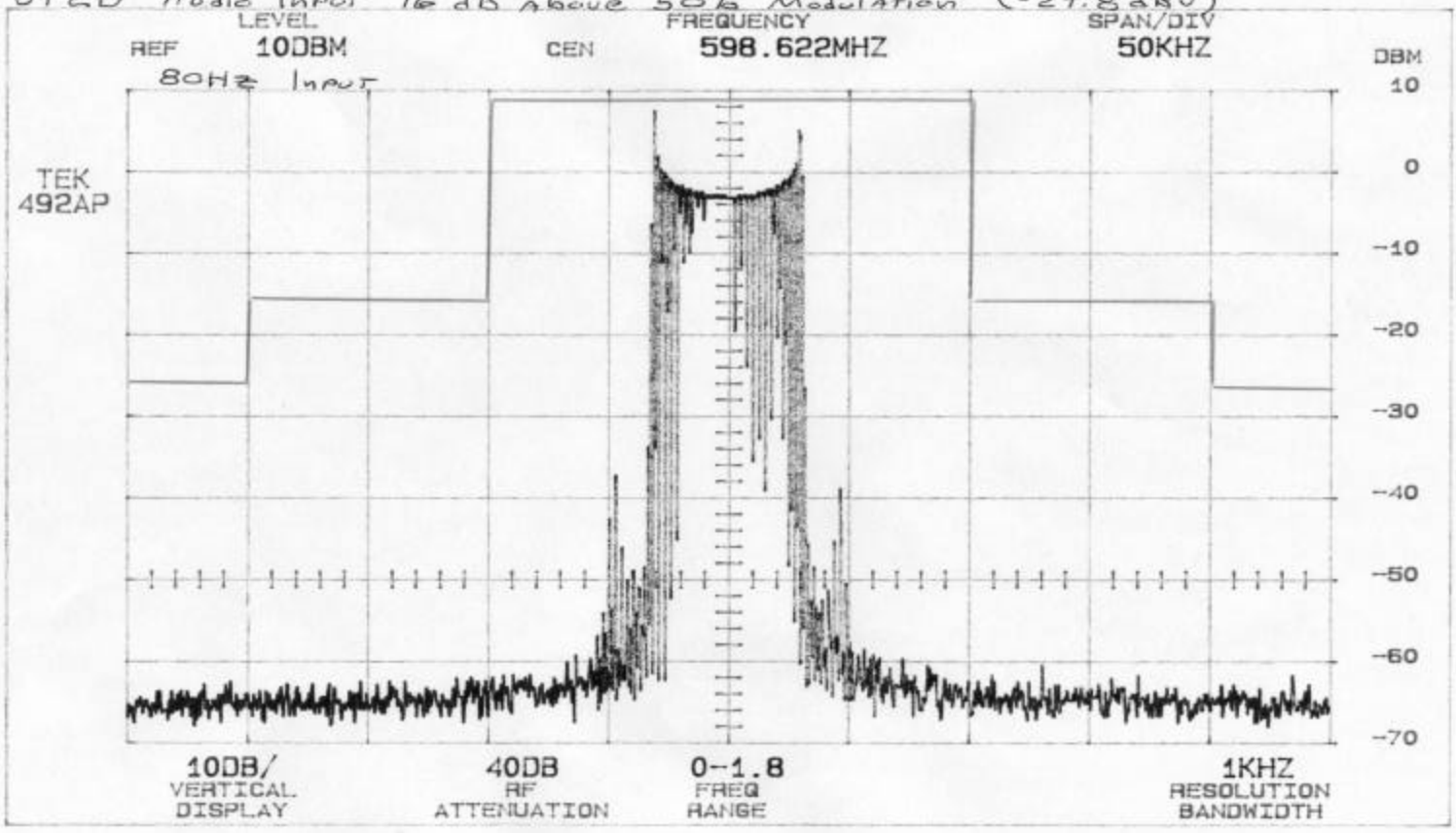

U12D 2500 Hz
LEVEL
REF 10DBM
FREQUENCY
CEN 560.100MHZ
SPAN/DIV
50KHZ
INPUT LEVEL -28.3 dBV = 16dB > 50% MODULATION
DBM
10
0
-10
-20
-30
-40
-50
-60
-70
TEK
492AP
10DB/
VERTICAL
DISPLAY
40DB
RF
ATTENUATION
0-1.8
FREQ
RANGE
1KHZ
RESOLUTION
BANDWIDTH


UT2D 10KHz
LEVEL
FREQUENCY
SPAN/DIV
REF 10DBM
CEN 560.100MHZ
50KHZ
DBM
INPUT LEVEL -28.3dBV = 16dB > 50% Modulation
10
0
-10
-20
-30
-40
-50
-60
-70
TEK
492AP
10DB/
VERTICAL
DISPLAY
40DB
RF
ATTENUATION
0-1.8
FREQ
RANGE
1KHZ
RESOLUTION
BANDWIDTH

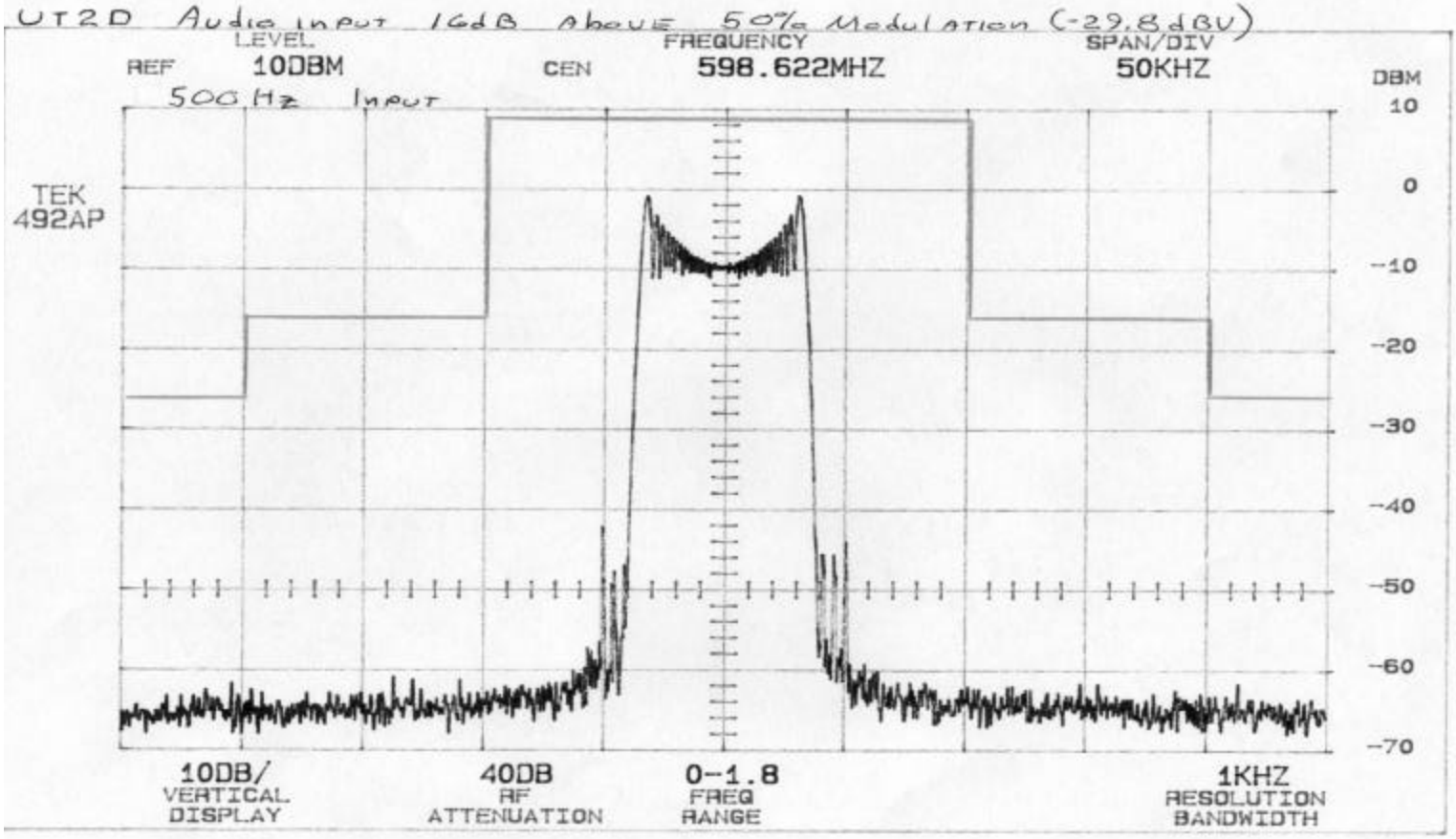
UT2D 15 kHz


LEVEL
FREQUENCY
SPAN/DIV
REF 10DBM
CEN 560.100MHZ
50KHZ
DBM
INPUT LEVEL -28.3 dBV = 16 dB 7 50% MODULATION
TEK 492AP
10
0
-10
-20
-30
-40
-50
-60
-70
10DB/ VERTICAL DISPLAY
40DB RF ATTENUATION
0-1.8 FREQ RANGE
1KHZ RESOLUTION BANDWIDTH

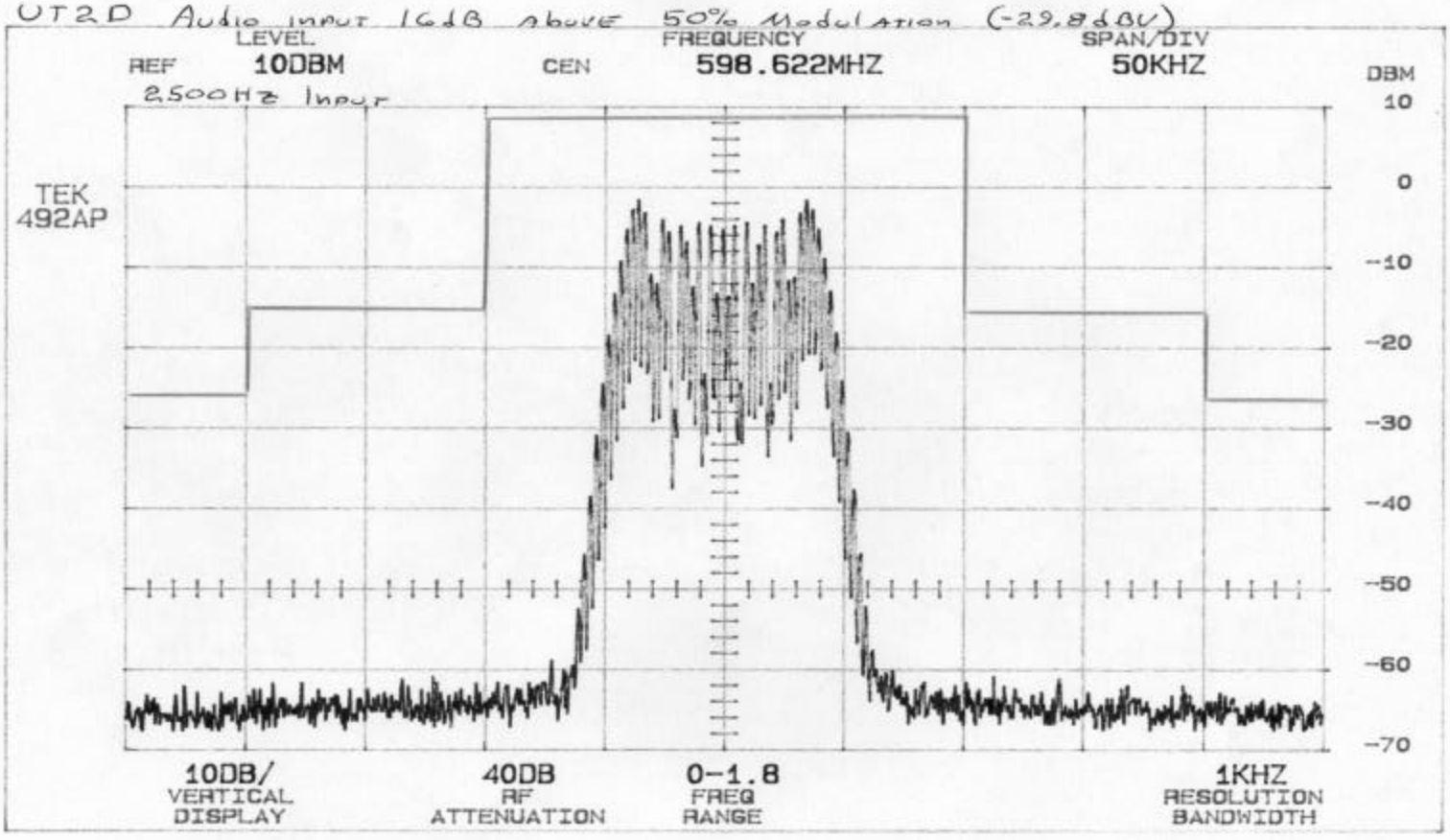
UT2D Audio INPUT 16 dB above 50% Modulation (-29.8 dBV)

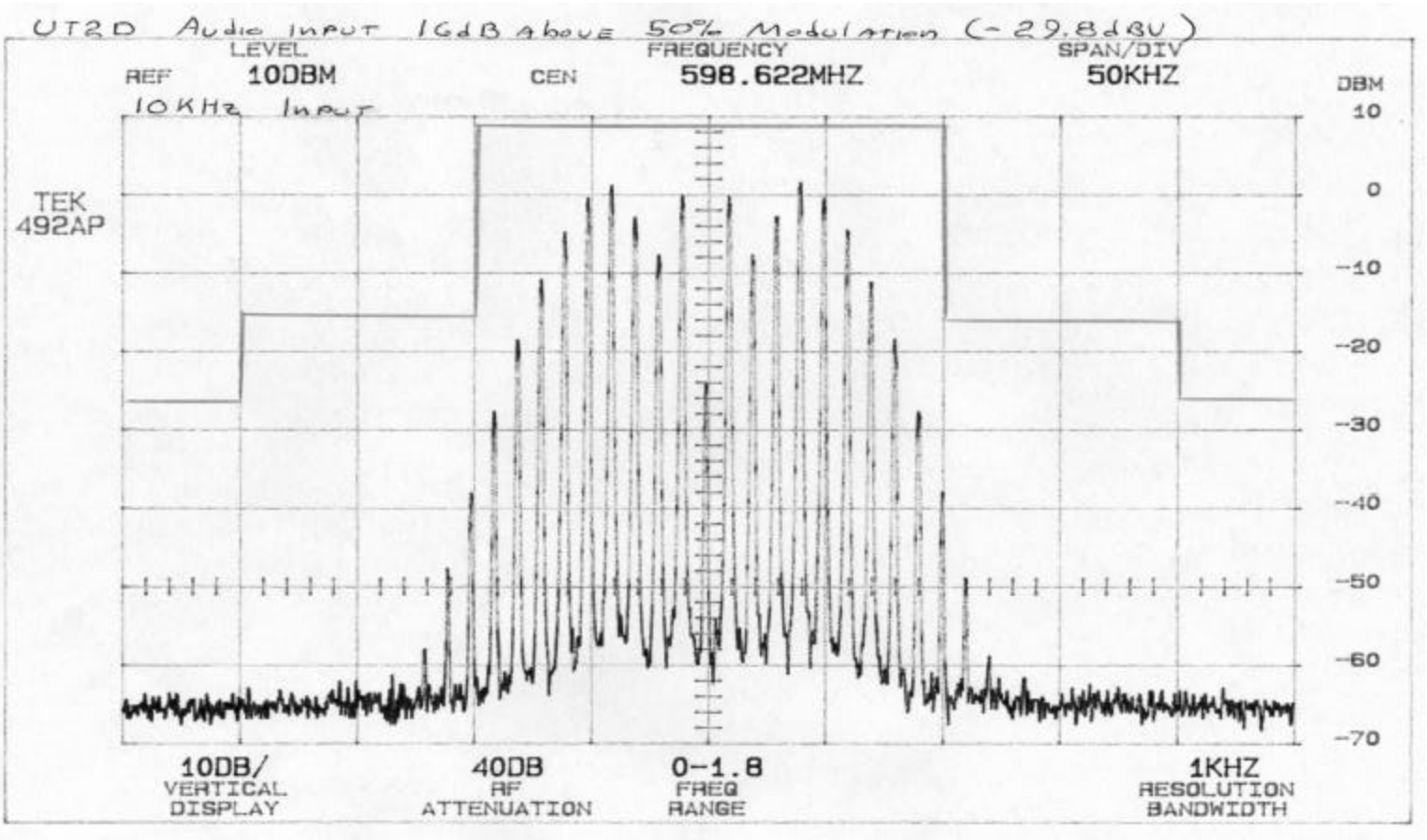


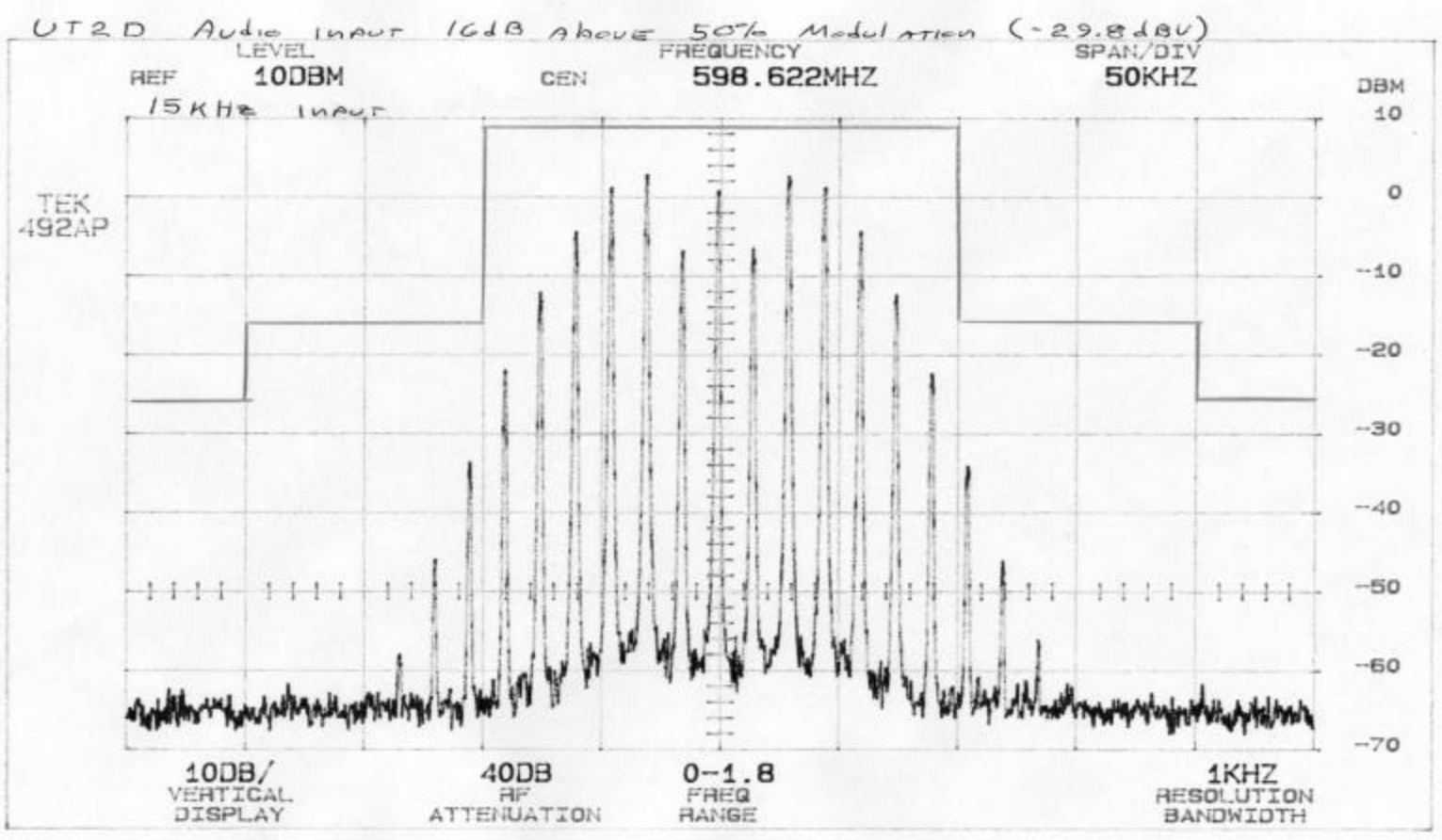
UT2D Audio Input 16dB Above 50% Modulation (-29.8dBV)



UT2D Audio input 16dB above 50% Modulation (-29.8dBV)




UT2D Audio INPUT 16dB above 50% Modulation (-29.8dBV)
LEVEL
REF 10DBM
FREQUENCY
CEN 598.622MHZ
SPAN/DIV
50KHZ
10KHz Input
TEK 492AP
DBM
10
0
-10
-20
-30
-40
-50
-60
-70
10DB/ VERTICAL DISPLAY
40DB RF ATTENUATION
0-1.8 FREQ RANGE
1KHZ RESOLUTION BANDWIDTH


UT2D Audio INPUT 16dB Above 50% Modulation (-29.8dBV)
LEVEL
REF 10DBM
FREQUENCY
CEN 598.622MHZ
SPAN/DIV
50KHZ
15KHz INPUT
TEK
492AP
DBM
10
0
-10
-20
-30
-40
-50
-60
-70
10DB/
VERTICAL
DISPLAY
40DB
RF
ATTENUATION
0-1.8
FREQ
RANGE
1KHZ
RESOLUTION
BANDWIDTH

9.0 Frequency Deviation and Tolerance - PART 74.861

Paragraph e-3 states that the maximum authorized deviation shall be **75 kHz** for all frequency modulation emissions in the frequency bands 560 to 599 MHz.

Frequency Deviation used: **45 kHz**

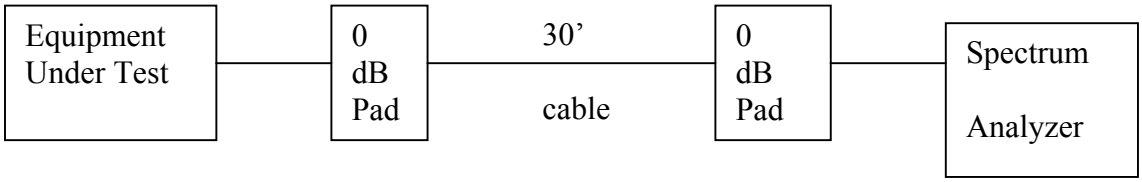
Paragraph e-4 states that the frequency tolerance of the transmitter shall be .005 percent.

NOTE:

See Section 12 of this test report for the frequency tolerance test results.

10.0 SPURIOUS CONDUCTED EMISSION MEASUREMENTS AT ANTENNA TERMINALS PART 2.1051

Spurious conducted emissions were measured at the antenna terminals using an artificial load. Plots were made showing the amplitude of each harmonic emission with the equipment operated as specified in 2.1049. As shown by the radiated charts there was no reason to believe that there were any spurious emissions other than the harmonics that were than individually investigated when doing the conducted test at the antenna terminals. Measurements were made up to the 10th Harmonic of the fundamental. The following setup was used showing placement of the attenuators:



The allowed emissions for transmitters operating in the 560 to 599 MHz bands for Shure Incorporated UT2D Wireless Microphone equipment are found under Part 74, Section 74.861, Paragraph e-6 for Low Power Auxiliary Stations. This paragraph states the mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43+10Log10 (mean output power in watts) dB.

NOTE: See the following pages for the data ad graphs of the actual measurements made:

NOTE: This test was not run because there is no detachable antenna.

CONDUCTED EMISSION DATA TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 2.1051

NOTE: This test was not run because there is no detachable antenna.

CONDUCTED EMISSION GRAPHS TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 2.1051

NOTE: This test was not run because there is no detachable antenna.

11.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS PART 2.1053

Radiated measurements were performed at a 1 or 3 meter test distance automatically scanning the frequency range from 200 MHz to 6000 MHz, depending upon the fundamental frequency.

For the Shure Incorporated UT2D Wireless Microphone, the highest fundamental frequency is 599 MHz so the scans were made up to 6000 MHz, to cover the tenth harmonic.

All signals in the frequency range of 30 MHz to 200 MHz were measured with a Biconical Antenna and from 200 MHz to 1000 MHz a Log Periodic Antenna was used as the pickup devices. From 1000 MHz to 10000 MHz, a Double Ridge Horn Antenna was used. The cables and equipment were placed and moved within the range of positions likely to find their maximum emissions. Tests were made in both the horizontal and vertical planes of polarization.

The allowed emissions for transmitters operating in the 560 to 599 MHz bands for Shure Incorporated UT2D Wireless Microphone equipment are found under Part 74, Section 74.861, Paragraph e-6 for Low Power Auxiliary Stations. This paragraph states the mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43+10Log10 (mean output power in watts) dB.

11.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS (CON'T)
PART 2.1053

To determine the **LIMIT** for Spurious Emissions the following method was used:

Maximum output power in watts:

Maximum Transmitter output power in watts **0.25**
Free Space Formula

Convert to 3 meter test distance using the Free Space Formula

$$\frac{\sqrt{49.2 * \text{rated wattage}}}{\text{Distance}} = \frac{(49.2*0.25)^{.5}}{3} = 1.16904519445001 \text{ volts/meter}$$

1.16904519445001 v/m = 1169045.19 uV/m

20*Log(1169045.19) = 121.36dBuV/m

Spurious emission limit at three meters equals **121.36**

The emissions must be reduced by:

43 + 10*LOG10(0.25) = 36.98 dB

Therefore, the **LIMIT** at three meters equals:

121.36 dBuV/m extrapolated level for 0.25 watts
-36.98 dB required reduction below the unmodulated fundamental
84.38 dBuV/M **spurious emissions limit**

RADIATED DATA TAKEN FOR FIELD STRENGTH

SPURIOUS EMISSION MEASUREMENTS

PART 2.1053

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---		Trace2: FCC74A	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
2 Quasi Peak	373.5000 MHz	43.02	-40.97 FCC -28.97 IC

135° 1.1m

FCC Pt 74 limit = 54 dBµV/m IC RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT2 560 MHz
Comment A: Vertical, 3 Meters
Date: 12.JUN.2001 10:05:58

FINAL CB
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74A
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
Fund.	2 Quasi Peak	560.2600 MHz	106.50	~~-22.49~~ -18.50	180° 1.1m
1)	2 Quasi Peak	684.7600 MHz	44.71	-39.28 FCC	255° 1.2m
2)	2 Quasi Peak	749.0200 MHz	49.03	-34.96 FCC	180° 1m
1)				-27.28 IC	
2)				-22.96 IC	

FCC Pt. 74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m Fund. Limit = 125 dBµV/m

Title: Shure Inc., UT2 560 MHz
Comment A: Vertical, 3 Meters
Date: 12.JUN.2001 10:25:50

FINAL CB
Genoa

EDIT PEAK LIST (Final Measurement Results)

	Trace1: ---		Trace2: FCC74A		
	Trace3: ---		Trace4: ---		
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	1.6808 GHz	69.26	-14.73 FCC	0° 1.3m
2)	2 Average	1.4940 GHz	68.44	-15.55 FCC	90° 1.1m
3)	2 Average	1.3073 GHz	67.45	-16.54 FCC	0° 1.2m
4)	2 Average	1.1205 GHz	65.92	-18.08 FCC	315° 2m
5)	2 Average	1.8675 GHz	59.46	-24.53 FCC	0° 1.2m
1)					
2)				-2.73 IC	
3)				-3.55 IC	
4)				-4.54 IC	
5)				-6.08 IC	
				-12.53 IC	

FCC Pt.74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT1 560 MHz
Comment A: Vertical, 3 meters
Date: 12.JUN.2001 08:39:57

LEGEND: FCC = FEDERAL COMMUNICATIONS COMISSION
IC = INDUSTRY CANADA

FINAL CB
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74B
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	3.9219 GHz	69.29	-24.70 FCC	235° lm
2)	2 Average	2.2411 GHz	69.19	-24.80 FCC	225° lm
3)	2 Average	2.0543 GHz	68.65	-25.34 FCC	225° lm
1)				-12.70 IC	
2)				-12.80 IC	
3)				-13.34 IC	

FCC Pt. 74 limit = 94 dBµV/m IC RSS-123 limit = 82 dBµV/m

Title: Shure Inc, UT2 560 MHz
Comment A: Vertical, 1 meter
Date: 12.JUN.2001 09:37:23

FINAL (CB)
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74A
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Quasi Peak	311.2500 MHz	37.94	-46.05 FCC	180° 1m
2)	2 Quasi Peak	373.5000 MHz	40.16	-43.83 FCC	45° 2.6m
1)				-34.05 Ic	
2)				-31.83 Ic	

FCC Pt. 74 limit = 84 dBµV/m Ic RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT2 560 MHz
Comment A: Horizontal, 3 Meters
Date: 12.JUN.2001 09:56:24

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---		Trace2: FCC74A	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
Fund. 2 Quasi Peak	560.2600 MHz	107.91	~~23.91~~ -17.09

270° 1.2m

Fund. Limit = 125 dBµV/m

Title: Shure Inc., UT2 560 MHz
Comment A: Horizontal, 3 Meters
Date: 12.JUN.2001 10:37:33

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74A
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	1.6808 GHz	69.26	-14.73 Fcc	180° 2m
2)	2 Average	1.4940 GHz	68.44	-15.55 Fcc	180° 1.2m
3)	2 Average	1.3072 GHz	67.44	-16.55 Fcc	135° 2.2m
4)	2 Average	1.1205 GHz	64.99	-19.00 Fcc	45° 1.2m
5)	2 Average	1.8675 GHz	60.25	-23.75 Fcc	180° 1.1m
1)				-2.73 IC	
2)				-3.55 IC	
3)				-4.55 IC	
4)				-7.00 IC	
5)				-11.75 IC	

Fcc Pt. 74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT1 560 MHz
Comment A: Horizontal, 3 meters
Date: 12.JUN.2001 08:58:44

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1:	---		Trace2:	FCC74B	
Trace3:	---		Trace4:	---	
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	2.2411 GHz	75.82	-18.17 FCC	135° 1.1m
2)	2 Average	3.9219 GHz	75.42	-18.57 FCC	135° 2.1m
3)	2 Average	2.0543 GHz	69.64	-24.35 FCC	135° 1m
1)				-6.17 Ic	
2)				-6.57 Ic	
3)				-12.35 Ic	

FCC Pt.74 limit = 94 dBµV/m IC RSS-123 limit = 82 dBµV/m

Title: Shure Inc, UT2 560 MHz
Comment A: Horizontal, 1 meter
Date: 12.JUN.2001 09:24:25

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74A
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Quasi Peak	332.5600 MHz	39.30	-44.69 Fcc	180° 1.6m
2)	2 Quasi Peak	399.0600 MHz	56.02	-27.97 Fcc	225° 1m
1)				-32.69 Ic	
2)				-15.97 Ic	

Fcc Pt. 74 limit = 84 dBµV/m Ic RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT2 598.6 MHz
Comment A: Vertical, 3 Meters
Date: 12.JUN.2001 11:10:01

FINAL CB
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---			Trace2: FCC74A	
Trace3: ---			Trace4: ---	
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
Fund.	2 Quasi Peak	598.6000 MHz	101.09	~~-17.09~~ -23.91 FCC 180° 2m
	2 Quasi Peak	798.1400 MHz	54.83	-29.16 FCC -17.16 IC 180° 1m

FCC Pt.74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m Fund. Limit = 125 dBµV/m

Title: Shure Inc., UT2 598.6 MHz
Comment A: Vertical, 3 Meters
Date: 12.JUN.2001 11:25:38

FINAL (CB)
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1:	---		Trace2:	FCC74A	
Trace3:	---		Trace4:	---	
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	1.1972 GHz	65.78	-18.21 FCC	90° 1.6m
2)	2 Average	1.3968 GHz	60.97	-23.02 FCC	200° 1m
3)	2 Average	1.5963 GHz	63.89	-20.10 FCC	180° 2m
4)	2 Average	1.7955 GHz	62.56	-21.43 FCC	180° 1m
5)	2 Average	1.9954 GHz	58.55	-25.44 FCC	200° 1.2m
1)				-6.21 IC	
2)				-11.02 IC	
3)				-8.10 IC	
4)				-9.43 IC	
5)				-13.44 IC	

FCC Pt.74 limit= 84 dBµV/m IC RSS-123 limit= 72dBµV/m

Title: Shure Inc., UT2 598.6 MHz
Comment A: Vertical, 3 meters
Date: 12.JUN.2001 13:22:48

FINAL CB
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---		Trace2: FCC74B		
Trace3: ---		Trace4: ---		
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1)	2 Average	3.3922 GHz	63.08	-30.91 FCC
2)	2 Average	2.1949 GHz	60.04	-33.96 FCC
1)				-18.91 IC
2)				-21.96 IC

180° 1.1m
180° 1.1m

FCC Pt. 74 limit = 94 dBµV/m IC RSS-123 limit = 82 dBµV/m

Title: Shure Inc, UT2 598.6 MHz
Comment A: Vertical, 1 meter
Date: 12.JUN.2001 13:47:31

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74A
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Quasi Peak	332.5600 MHz	40.47	-43.52 FCC	180° 2.5m
2)	2 Quasi Peak	399.0700 MHz	55.61	-28.39 FCC	180° 2m
1)				-31.52 IC	
2)				-16.39 IC	

FCC Pt. 74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT2 598.6 MHz
Comment A: Horizontal, 3 Meters
Date: 12.JUN.2001 10:59:01

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1:	---		Trace2:	FCC74A	
Trace3:	---		Trace4:	---	
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
Fund.	2 Quasi Peak	598.6000 MHz	104.28	~~-20.27~~ -20.72	180° 1.1m
	2 Quasi Peak	798.1400 MHz	57.14	-26.85 FCC	315° 1.5m
				-14.85 IC	

FCC Pt.74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m Fund. Limit = 125 dBµV/m

Title: Shure Inc., UT2 598.6 MHz
Comment A: Horizontal, 3 Meters
Date: 12.JUN.2001 11:38:59

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1: ---
Trace2: FCC74A
Trace3: ---
Trace4: ---

	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	1.1972 GHz	66.82	-17.17 FCC	45° 1.6m
2)	2 Average	1.3968 GHz	63.26	-20.73 FCC	90° 1.3m
3)	2 Average	1.5963 GHz	66.55	-17.44 FCC	180° 1.5m
4)	2 Average	1.7958 GHz	59.20	-24.80 FCC	135° 1.5m
5)	2 Average	1.9954 GHz	62.45	-21.54 FCC	135° 1.2m
1)				-5.17 IC	
2)				-8.73 IC	
3)				-5.44 IC	
4)				-12.80 IC	
5)				-9.54 IC	

FCC Pt. 74 limit = 84 dBµV/m IC RSS-123 limit = 72 dBµV/m

Title: Shure Inc., UT2 598.6 MHz
Comment A: Horizontal, 3 meters
Date: 12.JUN.2001 13:03:12

FINAL CB
Genoa

EDIT PEAK LIST (Final Measurement Results)

Trace1:	---		Trace2:	FCC74B	
Trace3:	---		Trace4:	---	
	TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
1)	2 Average	2.1949 GHz	68.42	-25.58 FCC	90° 1m
2)	2 Average	2.7936 GHz	65.75	-28.24 FCC	90° 1m
3)	2 Average	2.3945 GHz	62.79	-31.20 FCC	135° 1m
1)				-13.58 IC	
2)				-16.24 IC	
3)				-19.20 IC	

FCC Pt.74 limit= 94 dBµV/m IC RSS-123 limit = 82dBµV/m

Title: Shure Inc, UT2 598.6 MHz
Comment A: Horizontal, 1 meter
Date: 12.JUN.2001 13:36:27

FINAL CB
Genoa

12.0 FREQUENCY STABILITY - PART 2.1055a **(Temperature)**

The frequency stability was measured from -30° to +50° centigrade at intervals of 10° centigrade throughout the range. Prior to each frequency measurement, the equipment was left alone for a sufficient period of time (approximately 30 minutes or more) to allow the components of the Shure Incorporated UT2D Wireless Microphone oscillator circuitry to stabilize. The following information was taken:

FREQUENCY STABILITY FOR TEMPERATURE VARIATION IN MHz:

-30°	560.12307
-20°	560.10765
-10°	0
0°	560.116507
+10°	0
+20°	560.160573
+30°	560.101218
+40°	0
+50°	560.091599

Worst Case Variance:

31471 Hz

As stated in Part 74, Section 74.861 e-4 the Frequency Tolerance and Margin for this range are as follows:

Frequency Tolerance: = **0.00005**

Ambient Frequency: = **560104674 MHz**

560104674 * 0.00005 = 28005.2337 Hz

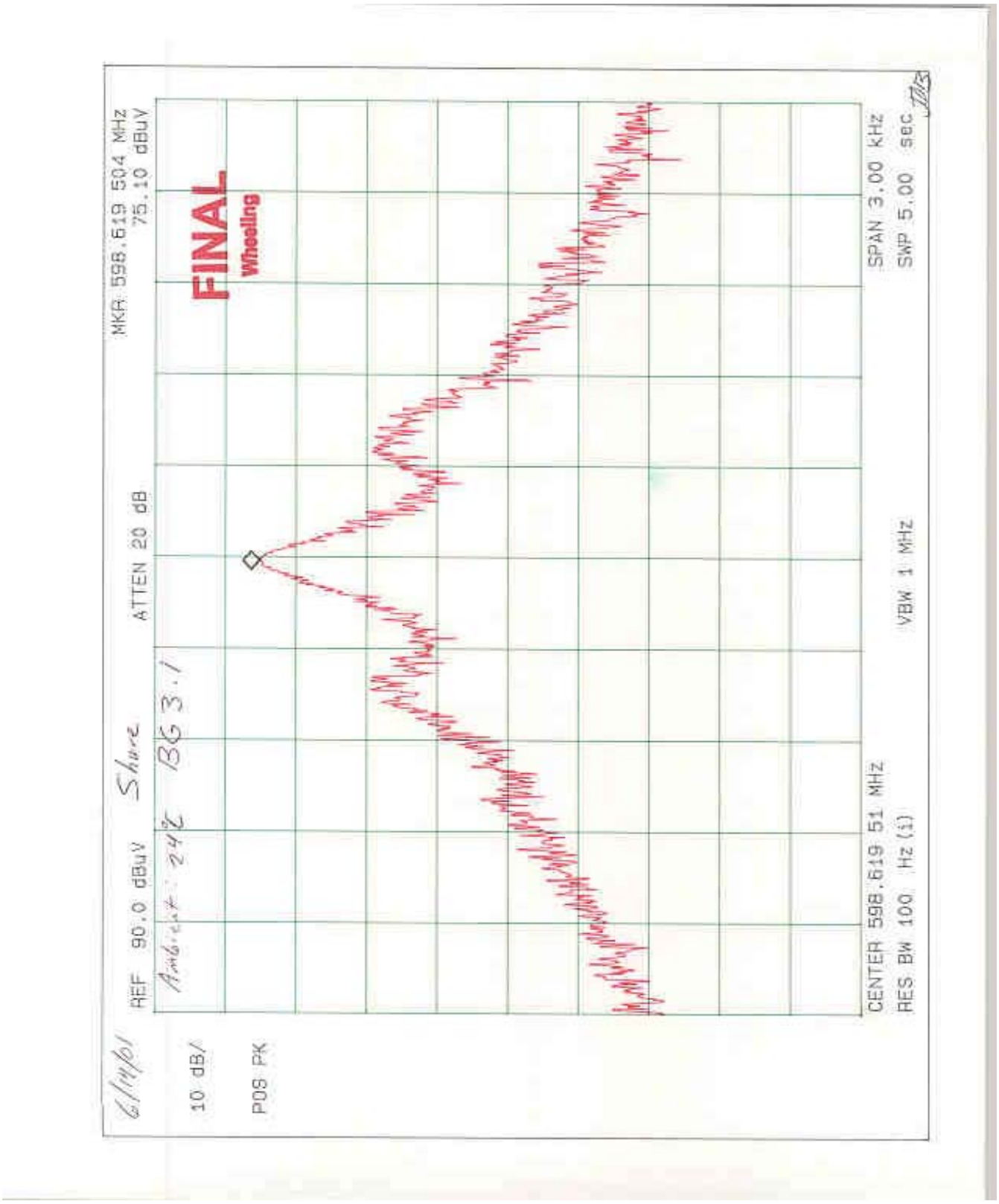
31471 - 28005.2337 = **3465.7663 Hz Margin**

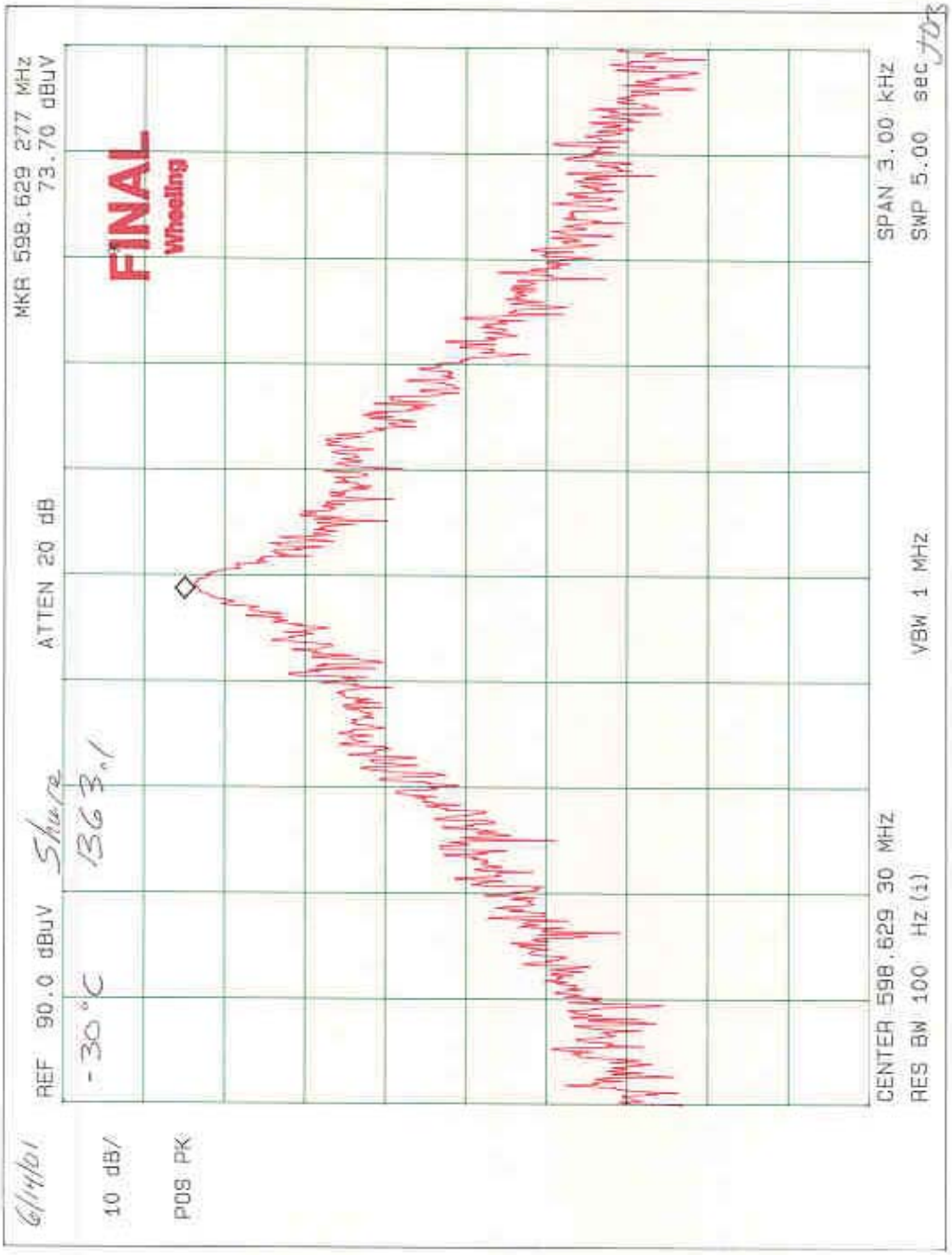
Two frequencies (560.271 & 598.61 MHz) were tested with the worst case being well within the specified limits.

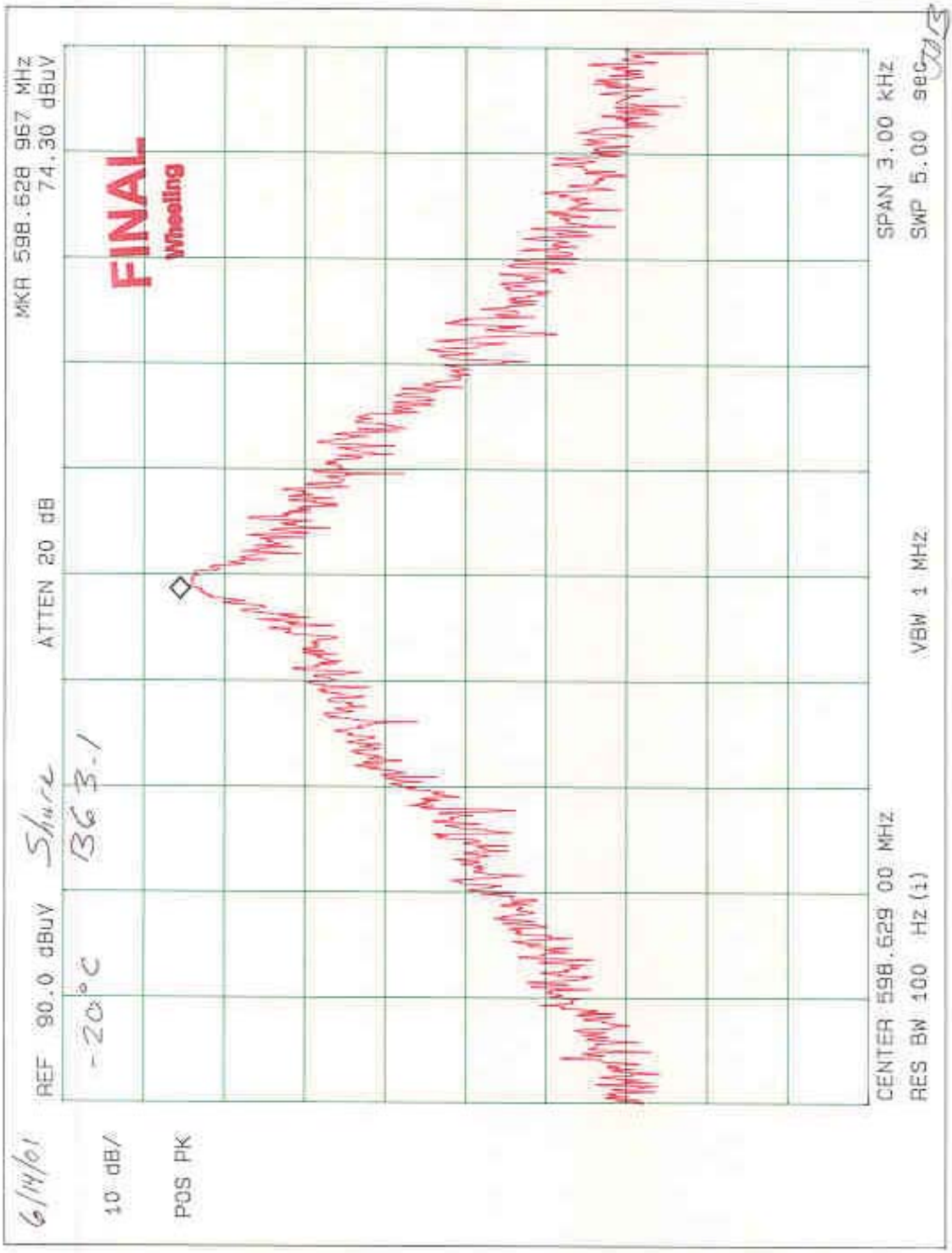
GRAPHS TAKEN FOR FREQUENCY

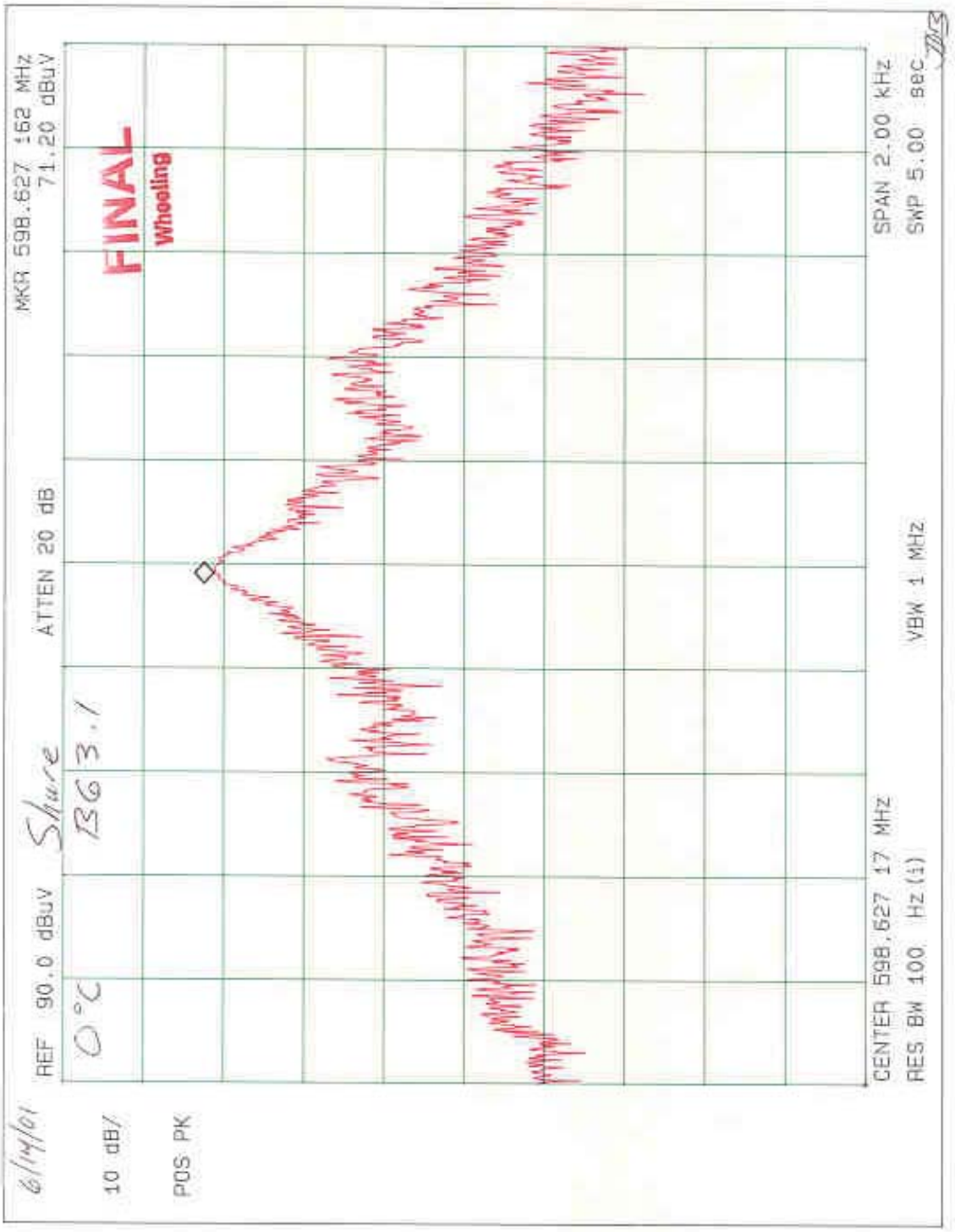
STABILITY WHEN VARYING THE TEMPERATURE

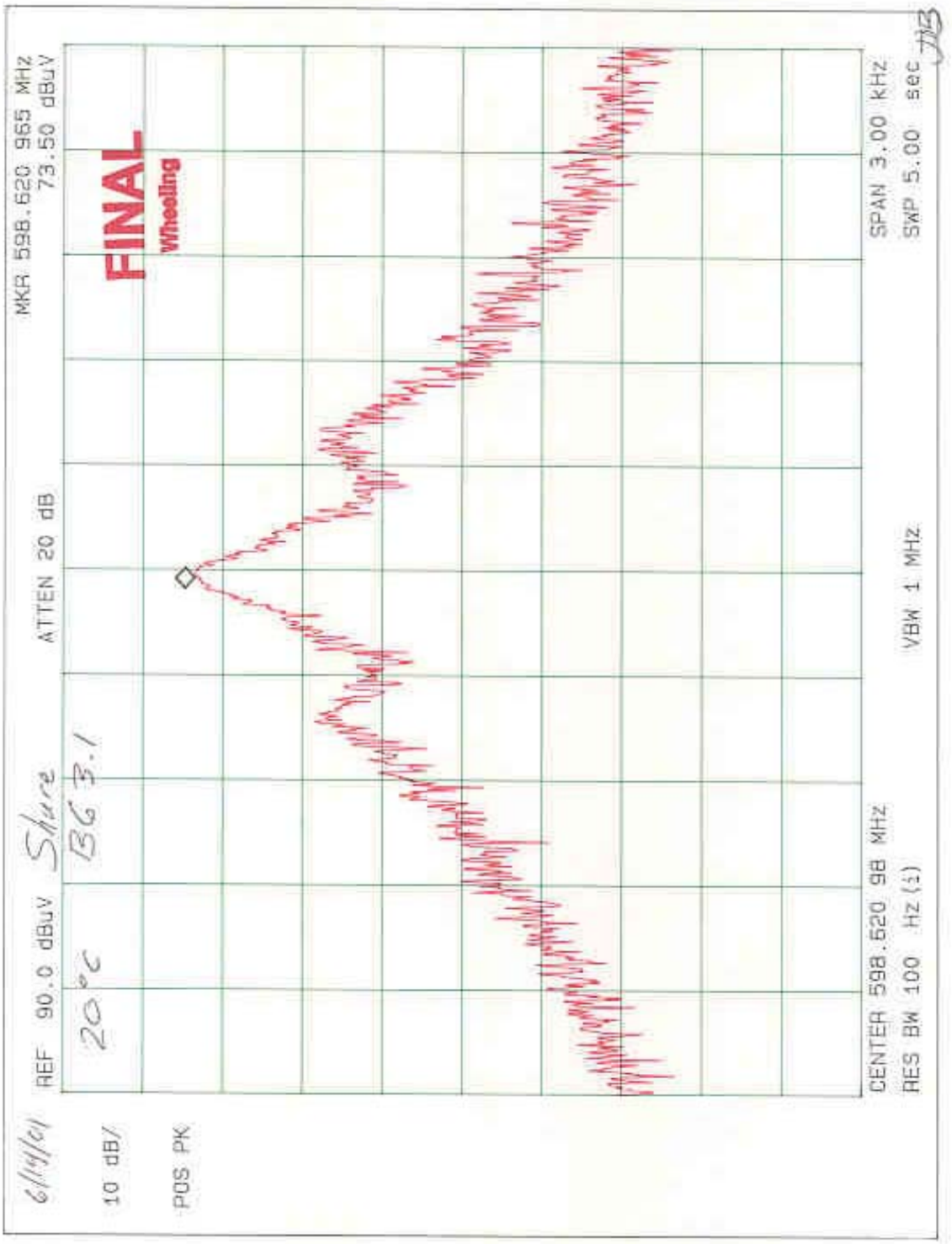
PART 2.1055a

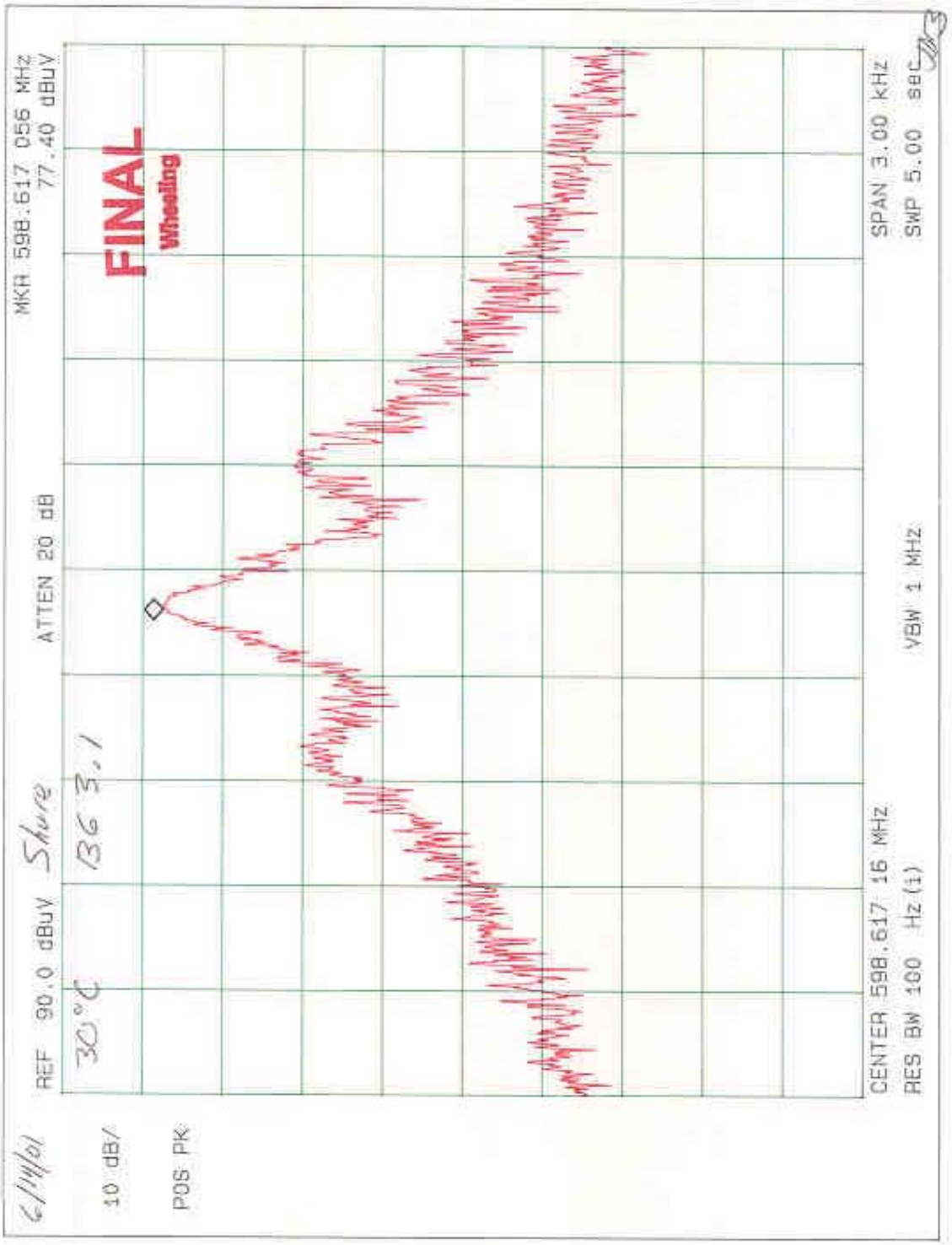

FINAL
Wheeling
MKR 598.619 504 MHz
75.10 dBuV
REF 90.0 dBuV
ATTEN 20 dB
10 dB/
POS PK
SPAN 3.00 kHz
SWP 5.00 sec
VBW 1 MHz
CENTER 598.619 51 MHz
RES BW 100 Hz (i)

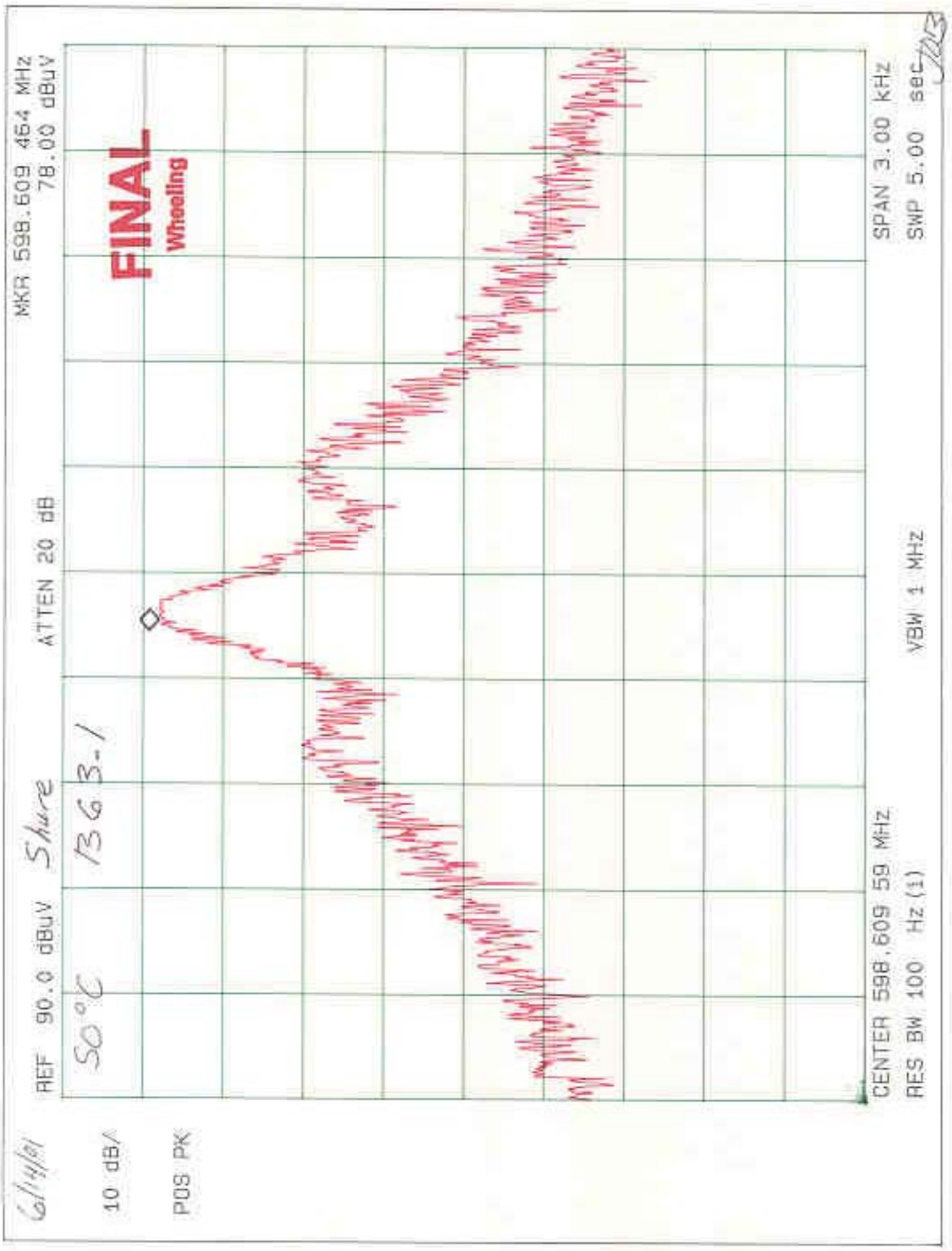

MKR 598.629 277 MHz
73.70 dBuV
FINAL
Wheeling
ATTEN 20 dB
REF 90.0 dBuV
10 dB/
POS PK
- 30 °C
Shure
1363.1
CENTER 598.629 30 MHz
RES BW 100 Hz(i)
VBW 1 MHz
SPAN 3.00 kHz
SWP 5.00 sec


6/14/01
REF 90.0 dBuV
10 dB/
POS PK
-20°C
Shure
BG B.1
ATTEN 20 dB
MKR 598.628 967 MHz
74.30 dBuV
FINAL
Wheeling
CENTER 598.629 00 MHz
RES BW 100 Hz (i)
VBW 1 MHz
SPAN 3.00 kHz
SWP 5.00 sec


6/14/01
REF 90.0 dBuV
10 dB/
POS PK
0°C
BG3.1
Shure
ATTEN 20 dB
MKR 598.627 162 MHz
71.20 dBuV
FINAL
Wheeling
CENTER 598.627 17 MHz
RES BW 100 Hz(i)
VBW 1 MHz
SPAN 2.00 kHz
SWP 5.00 sec


6/19/01
REF 90.0 dBuV
ATTEN 20 dB
MKR 598.620 965 MHz
73.50 dBuV
10 dB/
POS PK
20°C
Shure
BG 3.1
FINAL
Wheeling
CENTER 598.620 98 MHz
RES BW 100 Hz (i)
VBW 1 MHz
SPAN 3.00 kHz
SWP 5.00 sec


FINAL
Wheeling
MKR 598.617 056 MHz
77.40 dBuV
REF 90.0 dBuV
ATTEN 20 dB
10 dB/
POS PK
CENTER 598.617 16 MHz
RES BW 100 Hz(i)
VBW 1 MHz
SPAN 3.00 kHz
SWP 5.00 sec
6/11/01
30°C
Shure
836.1


FINAL
Wheeling
MKR 598.609 464 MHz
78.00 dBuV
REF 90.0 dBuV
ATTEN 20 dB
10 dB/
POS PK
50°C
Shure
1363-1
CENTER 598.609 59 MHz
RES BW 100 Hz(1)
VBW 1 MHz
SPAN 3.00 kHz
SWP 5.00 sec

13.0 FREQUENCY STABILITY - PART 2.1055d **(Voltage)**

The frequency stability of Shure Incorporated UT2D Wireless Microphone was measured by varying the primary supply voltage from 85% to 115% of nominal value for all equipment other than hand carried battery equipment.

FREQUENCY STABILITY FOR VOLTAGE VARIATION:

85%	0
100%	0
115%	0

This test was not run since the device is battery operated.

FREQUENCY STABILITY FOR HAND HELD DEVICES:

For hand carried, battery powered equipment, the supply voltage was reduced to the battery operating end point specified by the manufacturer. Readings were taken at the reduced end point and with a fresh battery:

Fresh Battery verses Battery end point:

Frequency #1 **3206.4 Hz**
Frequency #2 **0 Hz**
Frequency #3 **0 Hz**
Frequency #4 **0 Hz**
Frequency #5 **0 Hz**
Frequency #6 **0 Hz**

As stated in Part 74, Section 74.861 e-4 the Frequency Tolerance and Margin for this range are as follows:

Frequency Tolerance: **0.00005**

Limit: **29.9 kHz**

Margin: **26.7 kHz**

This is well within the specified limits.

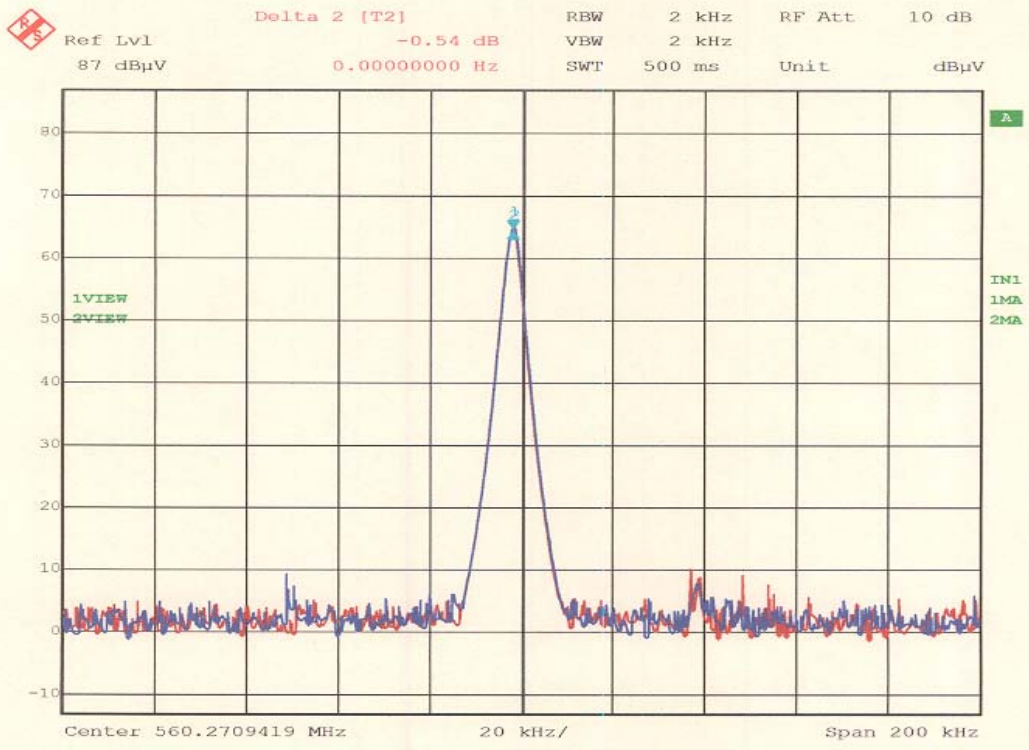
GRAPHS TAKEN FOR FREQUENCY

STABILITY WHEN VARYING THE

PRIMARY SUPPLY VOLTAGE

PART 2.1055d

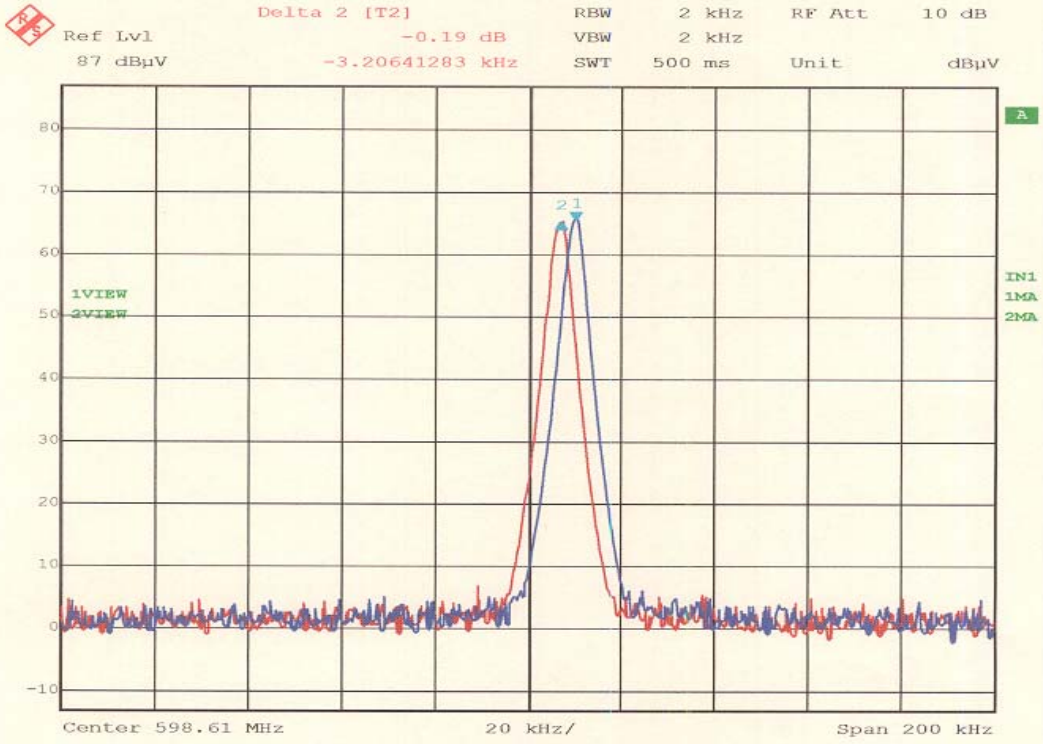
This is well within the specified limits.



Title: Shure Inc., UT2 560 MHz Frequency Stability
Comment A: Blue: Supply Voltage = 9.42 Volts DC
Red: Supply Voltage = 6.98 Volts DC
Date: 13.JUN.2001 10:49:59

Limit = 28 kHz
Margin = 28 kHz

FINAL cB
Genoa



Title: Shure Inc., UT2 598.6 MHz Frequency Stability
Comment A: Blue: Supply Voltage = 9.42 Volts DC
Red: Supply Voltage = 6.94 Volts DC
Date: 13.JUN.2001 10:36:21

limit = 29.9 kHz
margin = 26.7 kHz

FINAL CB
Genoa

14.0 PHOTO INFORMATION AND TEST SET-UP

The test set-up can be seen on the accompanying photo page.

Item 0 Shure Incorporated UT2D Wireless Microphone
FCC ID#: DD4UT2D SN: NA

Item 1

Item 2

Item 3

Item 4

Item 5

Item 6

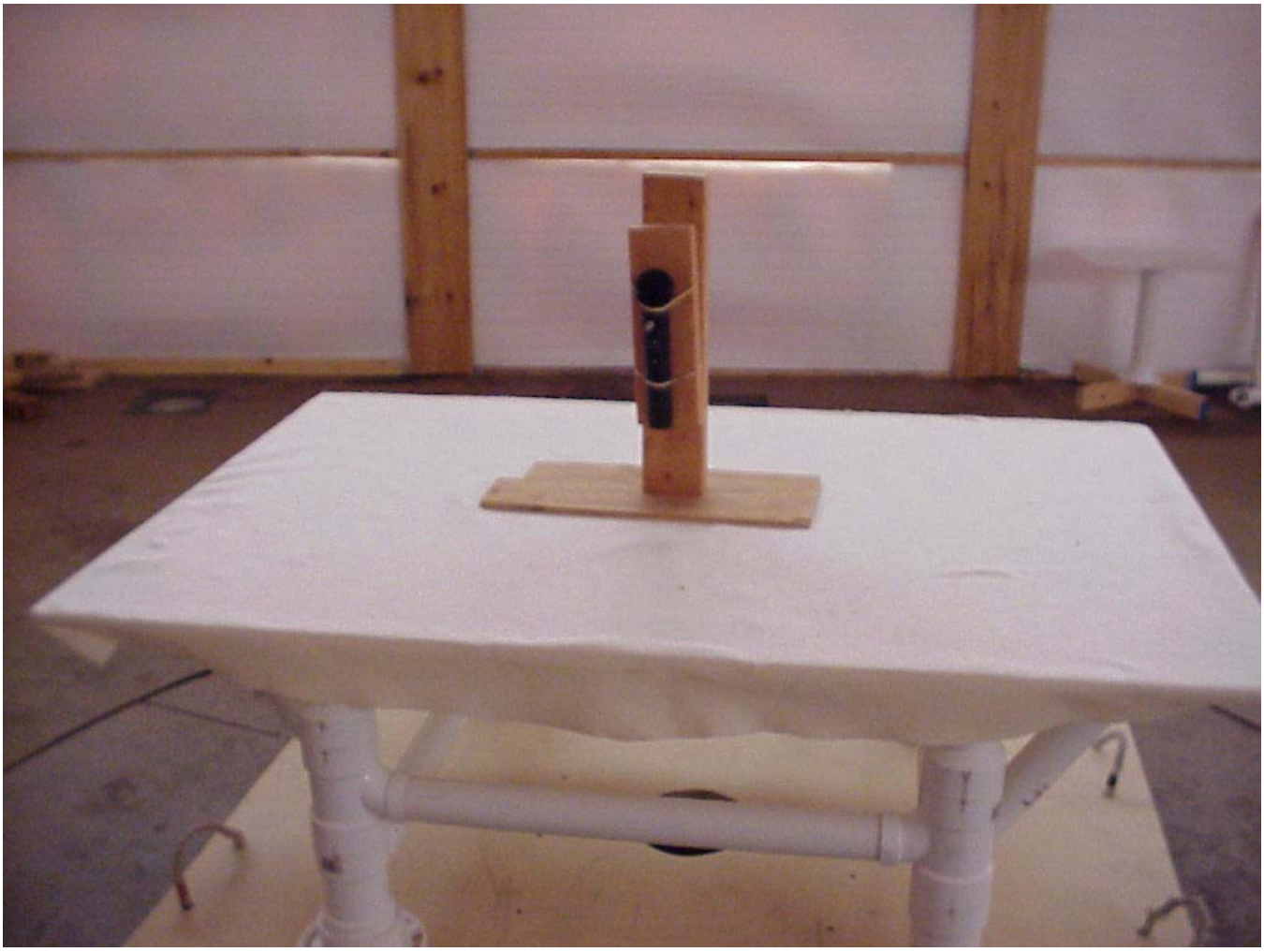
Item 7

Item 8

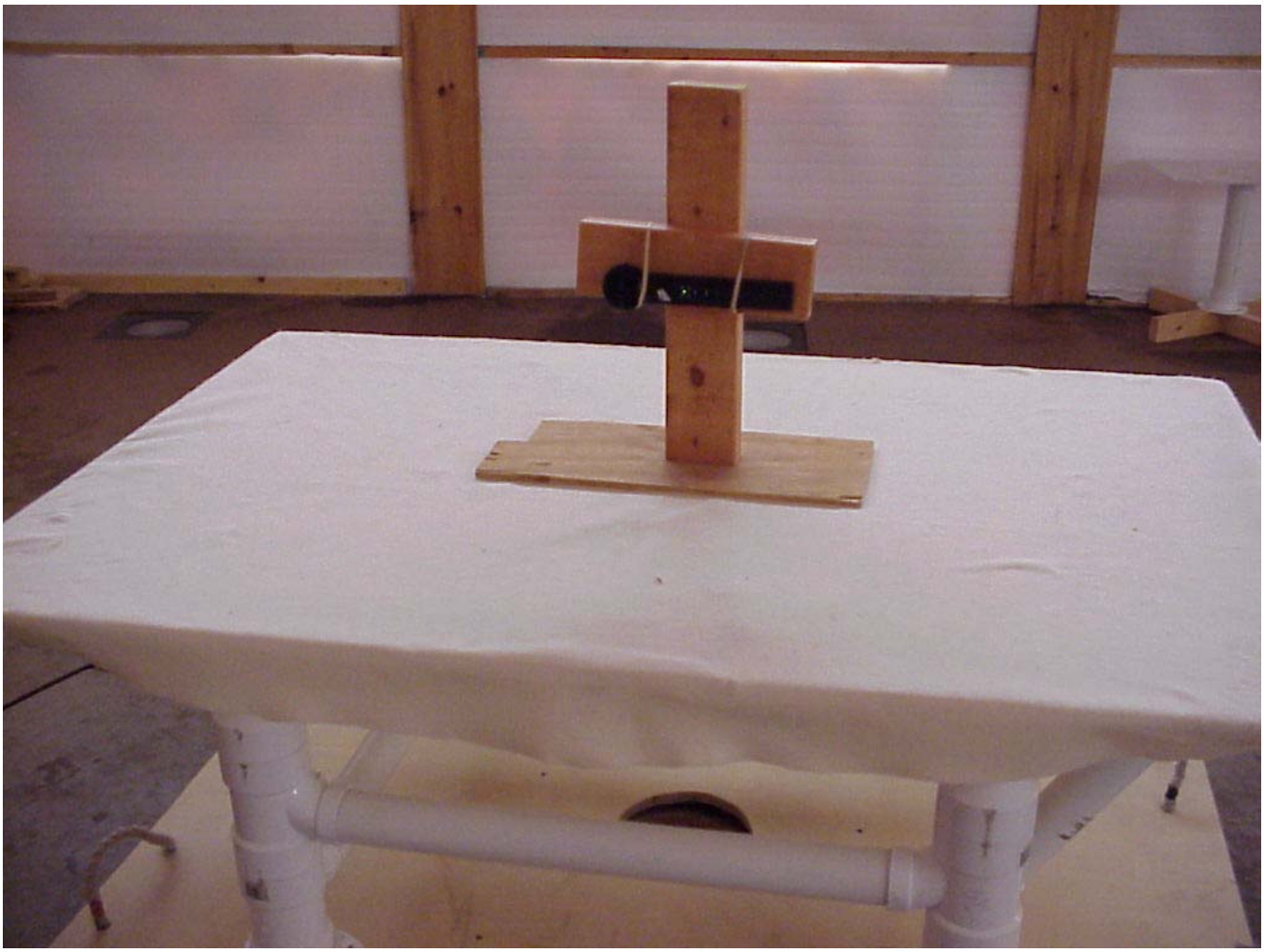
Item 9

Item 10

15.0 RADIATED PHOTOS TAKEN DURING TESTING.



15.0 RADIATED PHOTOS TAKEN DURING TESTING



16.0 CHANGE INFORMATION

The following changes were implemented during the testing and must be incorporated into the production units to ensure compliance.

Change 1. There were no changes made at D.L.S. Electronic Systems, Inc.

Change 2.

Change 3.

Change 4.

Change 5.

16.0 CHANGE INFORMATION (CON'T)

Change 6.

Change 7.

Change 8.

Change 9.

Change 10.

The responsibility of implementing the changes listed in this report is accepted or I certify that no changes were made

by _____ _____
Signature Title

for _____ _____
Company Name Date

17.0 RESULTS OF TESTS

The emission test results can be seen on pages at the end of this report. Data sheets indicating the open field radiated measurements can also be found with this report. Those points on the radiated charts shown with a yellow mark are background frequencies that were verified during the test.

18.0 CONCLUSION

It was found that the Shure Incorporated UT2D Wireless Microphone, Model Number UT2D, S/N **meets** the radio interference emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Sections 74.801 to 74.882 for Low Power Auxiliary Stations operating in the 494 to 608 MHz Frequency Band. This test report relates only to the items tested.

TABLE 1 - EQUIPMENT LIST

Test Equipment	Manufacturer/ Description	Model Number	Serial Number	Frequency Range	Cal Due Date
*Spectrum Analyzer	Hewlett/ Packard	8566B	2240A 02041	25 Hz –22 GHz	10/01
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A 00121	10 kHz – 1 GHz	10/01
***Spectrum Analyzer	Hewlett/ Packard	8591A	3009A 00700	9 kHz- 1.8 GHz	6/02
Receiver	Electrometrics	EMC-25 Mark-III	772	.01-1000 MHz	10/01
Meter Module	Electrometrics	CRM-25	162	.01-1000 MHz	10/01
Receiver	Electrometrics	EMC-25 Mark-III	804	.01-1000 MHz	10/01
Meter Module	Electrometrics	CRM-25	138	.01-1000 MHz	10/01
Receiver	Electrometrics	EMC-25 Mark-III	645	.01-1000 MHz	10/01
Meter Module	Electrometrics	CRM-25	116	.01-1000 MHz	10/01
Receiver	Electrometrics	EMC-30 Mark-III	44168	.01-1000 MHz	9/01
Antenna	Electrometrics	BIA-25	2453	20 - 200 MHz	4/02
Antenna	Electrometrics	LPA-25	1114	200 - 1000 MHz	4/02
Antenna	Electrometrics	BIA-25	2614	20 - 200 MHz	4/02
Antenna	Electrometrics	LPA-25	1205	200 - 1000 MHz	4/02
Antenna	Electrometrics	BIA-25	4785	20 - 200 MHz	4/02
Antenna	Electrometrics	LPA-25	4895	200 - 1000 MHz	4/02
Antenna	EMCO	3115	2479	1 – 18 GHz	3/02

*Firmware Version 29.9.86 Software Version 85864C Rev A
**Firmware Version 14.1.85 Software Version 85864C Rev A
***Firmware Version 5.1.3 Software Version 82301-12029 Rev C

I/O Initial Calibration Only