NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK THRESHOLD OF VISIBILITY (TOV) AND DATA THRESHOLD (BER) TESTS

Summary of pages 33-39

ATTC Test#	Description	Type	Desired Power (dBm)	Undesired Power (dBm)	Desired to Undesired Ratio (dB)
271	Random Noise	BER	-15.03	-43.11	28.08
290	Co-Channel NTSC into NTSC	TOV	-55	-96.58	41.58
286	Co-Channel NTSC+ into NTSC	TOV	-55	-96.84	41.84
275	Co-Channel NTSC into NTSC+	BER	-55.03	-66.90	11.87
280	Co-Channel NTSC+ into NTSC+	BER	-55.12	-70.09	14.97
288	Upper Adj Ch NTSC into NTSC	TOV	-55	-47.71	-7.29
284	Upper Adj Ch NTSC+ into NTSC	TOV	-55	-47.76	-7.24
276	Upper Adj Ch NTSC into NTSC+	BER	-55.04	-19.90	-35.14
277	Upper Adj Ch NTSC+ into NTSC+	BER	-54.91	-20.01	-34.90
289	Lower Adj Ch NTSC into NTSC	TOV	-55	-63.29	8.29
285	Lower Adj Ch NTSC+ into NTSC	TOV	-55	-61.01	6.01
278	Lower Adj Ch NTSC into NTSC+	BER	-55.01	-33.03	-21.98
279	Lower Adj Ch NTSC+ into NTSC+	BER	-55.11	-33.02	-22.09

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Random Noise into NTSC+
ATTC Test # 271
Strong Desired Signal Level

BER Threshold	1.00E-05
Step Size (dB)	1

Actual Desired Level (dBm)	-15.03
Desired to Undesired Ratio at Threshold (dB)	28.08

	-2 dB	-1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-41.11	-42.11	-43.11	-44.11	-45.11
Bit Error Rate	4.03E-03	2.22E-05	0.00E+00	0.00E+00	0.00E+00
	3.93E-03	2.68E-05	0.00E+00	0.00E+00	0.00E+00
	4.01E-03	2.95E-05	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/14/94 18:27

Notes:

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Co-Channel NTSC into NTSC+
ATTC Test # 275
Weak Desired Signal Level

BER Threshold	1.00E-05
Step Size (dB)	1

Actual Desired Level (dBm)	-55.03
Desired to Undesired Ratio at Threshold (dB)	12.87 *

	-2 dB	-1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-65.9	-66.9	-67.9	-68.9	-69.9
Bit Error Rate	2.19E-05	1.70E-06	0.00E+00	0.00E+00	0.00E+00
	2.19E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2.64E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/15/94 18:13

Notes:

* Upon inspection of the test results and analysis of the computer algorithm, it was determined the threshold should have been reported as -66.9 (D/U = 11.87). This correction is reflected in the data summary table.

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Co-Channel NTSC+ into NTSC+
ATTC Test # 280
Weak Desired Signal Level

BER Threshold	1.00E-05
Step Size (dB)	1

Actual Desired Level (dBm)	-55.12
Desired to Undesired Ratio at Threshold (dB)	14.97

	+2 dB	+1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-68.09	-69.09	-70.09	-71.09	-72.09
Bit Error Rate	3.21E-03	7.29E-05	0.00E+00	0.00E+00	0.00E+00
	3.32E-03	6.48E-05	0.00E+00	0.00E+00	0.00E+00
	3.38E-03	INVALID MEAS.	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/15/94 18:33

Notes:

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Upper Adj Ch NTSC into NTSC+
ATTC Test # 276
Weak Desired Signal Level

BER Threshold	1.00E-05
Step size (dB)	1

Actual Desired Level (dBm)	-55.04
Desired to Undesired Ratio at Threshold (dB)	-35.14

	-2 dB	-1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-17.9	-18.9	-19.9	-20.9	-21.9
Bit Error Rate	8.07E-03	1.07E-04	0.00E+00	0.00E+00	0.00E+00
	8.13E-03	1.07E-04	0.00E+00	0.00E+00	0.00E+00
	8.27E-03	1.01E-04	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/15/94 16:47

Notes:

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Upper Adj Ch NTSC+ into NTSC+
ATTC Test # 277
Weak Desired Signal Level

BER Threshold	1.00E-05
Step Size (dB)	1

Actual Desired Level (dBm)	-54.91
Desired to Undesired Ratio at Threshold (dB)	-34.9

	-2 dB	-1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-18.01	-19.01	-20.01	-21.01	-22.01
Bit Error Rate	2.72E-03	1.20E-05	0.00E+00	0.00E+00	0.00E+00
	2.83E-03	1.44E-05	0.00E+00	0.00E+00	0.00E+00
	2.78E-03	1.67E-05	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/15/94 17:06

Notes:

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Lower Adj Ch NTSC into NTSC+
ATTC Test # 278
Weak Desired Signal Level

BER Threshold	1.00E-05
Step Size (dB)	1

Actual Desired Level (dBm)	-55.01
Desired to Undesired Ratio at Threshold (dB)	-21.98

	-2 dB	-1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-31.03	-32.03	-33.03	-34.03	-35.03
Bit Error Rate	9.74E-04	5.65E-05	0.00E+00	0.00E+00	0.00E+00
	9.59E-04	7.18E-05	0.00E+00	0.00E+00	0.00E+00
	1.00E-03	7.28E-05	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/15/94 17:24

Notes:

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK DATA BIT ERROR RATE TEST

Lower Adj Ch NTSC+ into NTSC+
ATTC Test # 279
Weak Desired Signal Level

BER Threshold	1.00E-05
Step Size (dB)	1

Actual Desired Level (dBm)	-55.11
Desired to Undesired Ratio at Threshold (dB)	-21.09 *

	-2 dB	+1 dB	Threshold	-1 dB	-2 dB
Undesired Power (dBm)	-32.02	-33.02	-34.02	-35.02	-36.02
Bit Error Rate	8.85E-05	6.90E-07	0.00E+00	0.00E+00	0.00E+00
	9.44E-05	9.10E-07	0.00E+00	0.00E+00	0.00E+00
	1.10E-04	1.10E-06	0.00E+00	0.00E+00	0.00E+00

Test Completed: 12/15/94 17:44

Notes:

* Upon inspection of the test results and analysis of the computer algorithm. it was determined the threshold should have been reported as -33.02 (D/U = 22.09). This correction is reflected in the data summary table.

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK AUDIO QUALITY DEGRADATION

Summary of pages 41, 42

ATTC Test#	LEVEL AT WHICH AUDIO DEGRADATION HEARD WITH RESPECT TO VIDEO TOV (dB)	RECEIVER					
		A1	A6	B1	B4	B5	B7
290	Co-Channel NTSC into NTSC	0.04	-3.96	-0.21	0.04	0.04	-1.96
286	Co-Channel NTSC+ into NTSC	-2.08	-4.08	-0.08	-0.08	-0.08	-2.08
288	Upper Adj Ch NTSC into NTSC	18.51	8.51	15.51	23.51	11.51	13.51
284	Upper Adj Ch NTSC+ into NTSC	13.06	11.33	12.33	15.33	4.33	11.33

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK CO-CHANNEL TEST - AUDIO

Weak Desired Signal Level

Video TOV Level	-95.28 dBm	Co-Channel NTSC into NTSC Interference into Audio	
Receiver #	Level at which Audio Degradation heard - dBm	Observations	Agreed by 2 or 3 Experts Enter number 2 or 3
A1	-95.24	APPROXIMATE ONSET OF DISTORTION	2
A6	-99.24	EXTREMELY DIFFICULT TO ESTABLISH DUE TO HUM/BUZZ	2
B1	-95.49		2
B4	-95.24		2
B5	-95.24		2
B7	-97.24		2

Video TOV Level	-95.22 dBm	Co-Channel NTSC+ into NTSC Interference into Audio	
Receiver #	Level at which Audio Degradation heard - dBm	Observations	Agreed by 2 or 3 Experts Enter number 2 or 3
A1	-97.30		2
A6	-99.30	EXTREMELY DIFFICULT TO ESTABLISH DUE TO HUM/BUZZ	2
B1	-95.30		2
B4	-95.30		2
B5	-95.30		2
B7	-97.30		2

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK UPPER ADJACENT TEST - AUDIO

Weak Desired Signal Level

Video TOV Level	-47.71 dBm	Upper Adjacent NTSC into NTSC Interference into Audio	
Receiver #	Level at which Audio Degradation heard - dBm	Observations	Agreed by 2 or 3 Experts Enter number 2 or 3
A1	-29.20	INCREASE IN GENERAL BACKGROUND LEVEL WITH IMPAIRMENT	2
A6	-39.20	BUZZ IN RECEIVER TO START. BUZZ INCREASED WITH IMPAIRMENT	2
B1	-32.20	CLEAN RECEIVER. SLIGHT BUZZ NOTICED WITH IMPAIRMENT	2
B4	-24.20	PRETTY CLEAN TOO.* SLIGHT BUZZ BEFORE IMPAIRMENT WAS ADDED	2
B5	-36.20	QUIET RECEIVER TO START	2
B7	-34.20		2

Video TOV Level	-47.76 dBm	Upper Adjacent NTSC+ into NTSC Interference into Audio	
Receiver #	Level at which Audio Degradation heard - dBm	Observations	Agreed by 2 or 3 Experts Enter number 2 or 3
A1**	-47.43	HEARD BUZZ AT THRESHOLD	2
A1 rerun	-34.70	TURNED RECEIVER ON/OFF AND IT APPEARS TO HAVE MADE THE DIFFERENCE. AT SAME TIME CONTROL ROOM FOUND THE PROPONENTS' SOUND CARRIER MUTED THEN RESTORED AT SAME TIME RECEIVER WAS RESTARTED	2
A6	-36.43	SAME BUZZ AS PREVIOUS TEST*** WITHOUT IMPAIRMENT	2
B1	-35.43		2
B4	-32.43		2
B5	-43.43		2
B7	-36.43		2

* *Receiver B1*

** *The experts thought that the first time the test was run the result was questionable. Therefore , at their request, the test receiver A1 was rerun.*

*** *NTSC into NTSC*

NATIONAL DATA BROADCASTING COMMITTI
DIGIDECK IMPULSE NOISE TEST

Moderate Desired Signal Level

ATTC Test#	Description	Desired Power (dBm)	Noise Attenuation @ TOV (dB)
281	Impulse Noise into NTSC	-35	63.04

ATTC Test#	Description	Actual Desired Level (dBm)
282	Impulse Noise into NTSC+	-35.05

# 282 Impulse Noise into NTSC+	Noise into NTSC TOV	TOV +1	TOV +2	TOV +3	TOV +4	POU *
Noise Attenuation (dB)	63.04	58.54	55.29	51.79	48.54	46.04
Undesired Impulse Noise Level Relative to NTSC TOV (dB)	0	4.5	7.75	11.25	14.5	17
Bit Error Rate	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.160E-05
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.650E-05
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.690E-05

Note:
* " TOV + 4" is highest impairment level called for in Test Plan. Additional data taken at POU since no errors were found at TOV + 4.

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK MULTIPATH BER TEST

Actual Desired Level (dBm)	-38

	ENSEMBLE 1	ENSEMBLE 2	ENSEMBLE 3	ENSEMBLE 4
Bit	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Error	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Rate	0.000E+00	0.000E+00	0.000E+00	0.000E+00

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK MULTIPATH VIDEO TESTS

-38 dBm Desired Signal Level
GHOST CANCELING ON

	IMAGE #1 Buildings	
MULTIPATH ENSEMBLE	Observer #1	Observer #2
#1	4.5	4.0
	4.5	4.5
#2	4.5	4.0
	4.5	4.0
#3	4.5	4.5
	5.0	3.5
#4	4.5	4.5
	5.0	5.0
NO ENSEMBLE	4.5	3.5
	4.5	4.5

Tektronix Demodulator 1450

-38 dBm Desired Signal Level
GHOST CANCELING OFF

	IMAGE #1 Buildings	
MULTIPATH ENSEMBLE	Observer #1	Observer #2
#1	4.5	5.0
	4.5	4.5
#2	4.5	4.0
	4.5	4.0
#3	4.5	4.0
	4.5	4.5
#4	4.5	4.5
	4.5	4.5

Tektronix Demodulator 1450

NATIONAL DATA BROADCASTING COMMITTEE
DIGIDECK MULTIPATH AUDIO TESTS

-38 dBm Desired Signal Level
GHOST CANCELING OFF

	SOUND #1 Male Speech		SOUND #2 Glockenspiel		SOUND #3 Silence	
MULTIPATH ENSEMBLE	Observer #1	Observer #2	Observer #1	Observer #2	Observer #1	Observer #2
#1	5.0	5.0	5.0	5.0	5.0	5.0
	5.0	5.0	5.0	5.0	5.0	4.5
#2	5.0	5.0	5.0	5.0	5.0	5.0
	5.0	5.0	5.0	5.0	5.0	4.5
#3	5.0	5.0	5.0	5.0	5.0	4.5
	5.0	5.0	5.0	5.0	5.0	4.5
#4	5.0	5.0	5.0	5.0	5.0	4.0
	5.0	5.0	5.0	5.0	5.0	4.5

Tektronix Demodulator 1450

Notes:

Less high frequency noise on "test" due to different testbed path probably. True for all audio tests.

The silence level for Reference was higher (more noisy) than the silence through the test system.

OBJECTIVE TESTS

WavePhore System

National Data Broadcasting Committee

3.1.1 Objective Test Results

The objective measurements reported in this section were obtained using a Tektronix VM-700 Video Measurement Set, fed from a Tektronix 1450 precision NTSC demodulator. The objective tests were inadvertently conducted at power levels 11dB lower than those specified in the Test Plan (i.e., Strong level was -26 dBm rather than -15 dBm; Weak level was -66 dBm rather than -55dBm). It was not possible to obtain meaningful data for all tests at the Weak level, due to operation too close to the noise floor of the Tek 1450 demodulator which was used for all tests. Therefore, only results obtained at the Strong level are included in this report.

On each page, the results are presented in the following order: NTSC + (Data broadcasting signal OFF), NTSC Reference, and NTSC + (Data broadcasting signal ON). All measurements were taken on Line 130 (middle of the active field). Each result is identified by the date and time (in 24 hour HH:MM:SS notation) at which it was obtained. The plots have been annotated by ATTC as necessary to explain procedural details.

Unweighted Signal to Noise Ratio = 53.7 dB
Data OFF 14:03:23

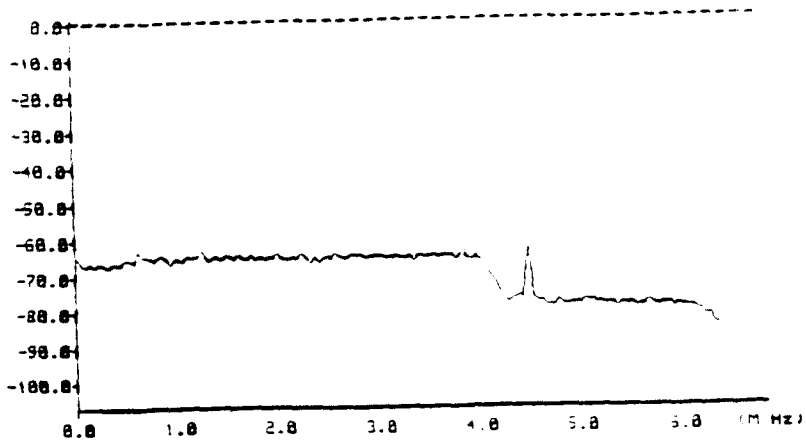
Unweighted Signal to Noise Ratio = 54.8 dB
REFERENCE 13:36:31

Unweighted Signal to Noise Ratio = 53.7 dB
Data ON 13:56:21

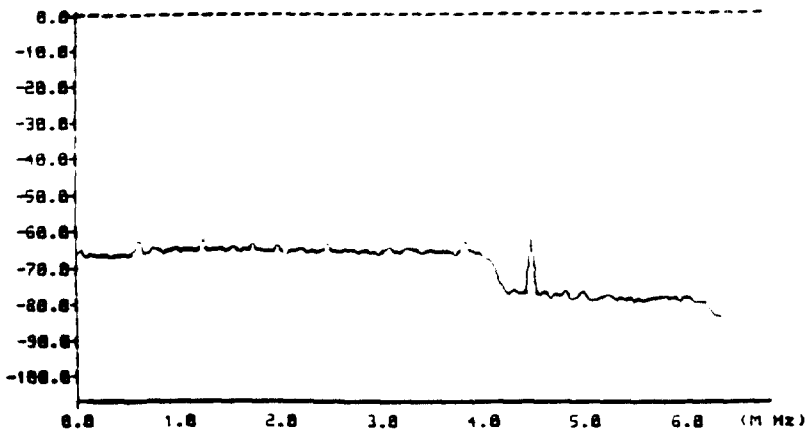
WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

Unweighted Signal to Noise Ratio

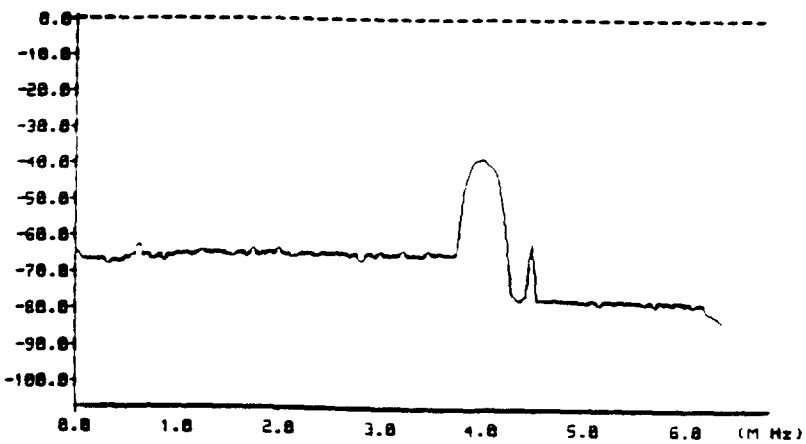


Data OFF 14:03:42



REFERENCE 13:36:49

Exciter: Harris Corp. Demodulator Tektronix 1450. Input to Demodulator -26 dBm. Noise floor of test setup and video bandwidth of Exciter and Demodulator shown.

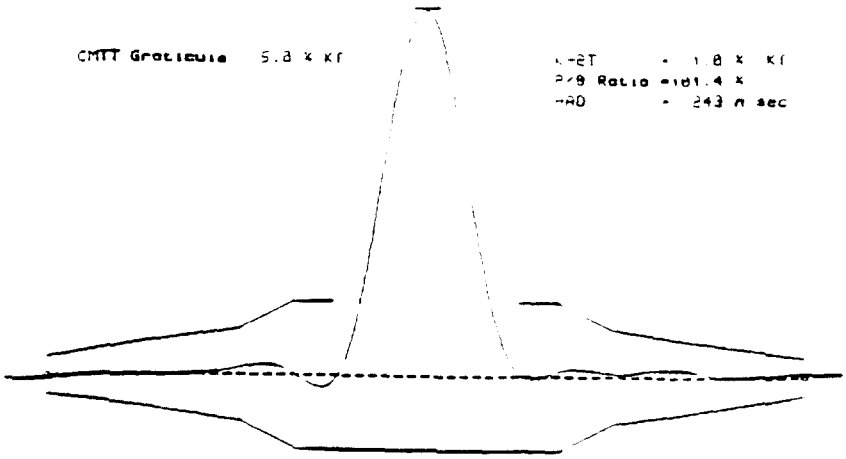


Data ON 13:56:40

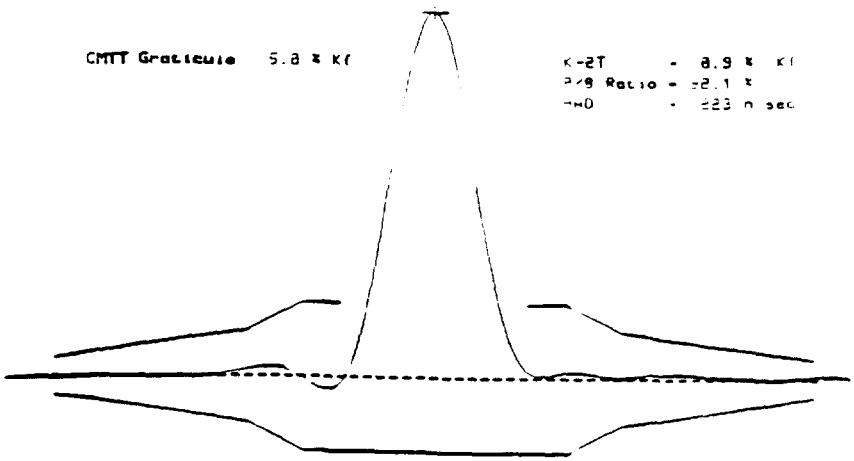
WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

Noise Spectrum

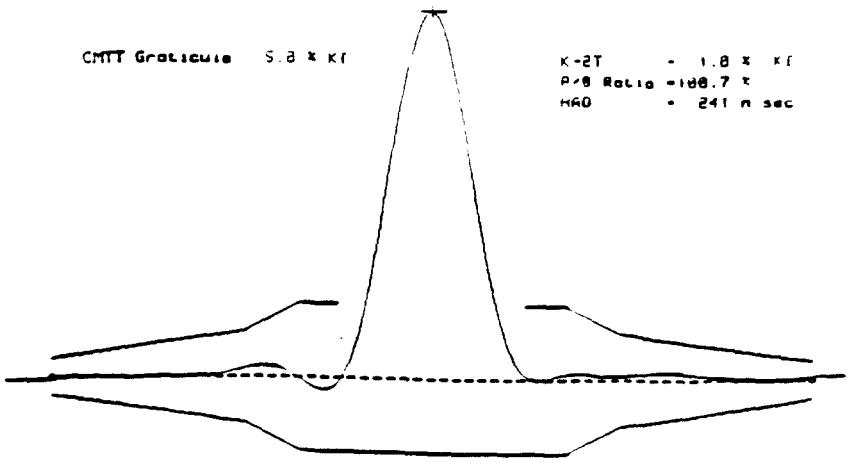


Data OFF 14:04:11



REFERENCE 13:37:47

Tek 700 normalizes gain so that peak of 2T pulse matches graticule. The first zero in the spectrum of 250 µs HAD Sin^2 pulse is 4.0 MHz.

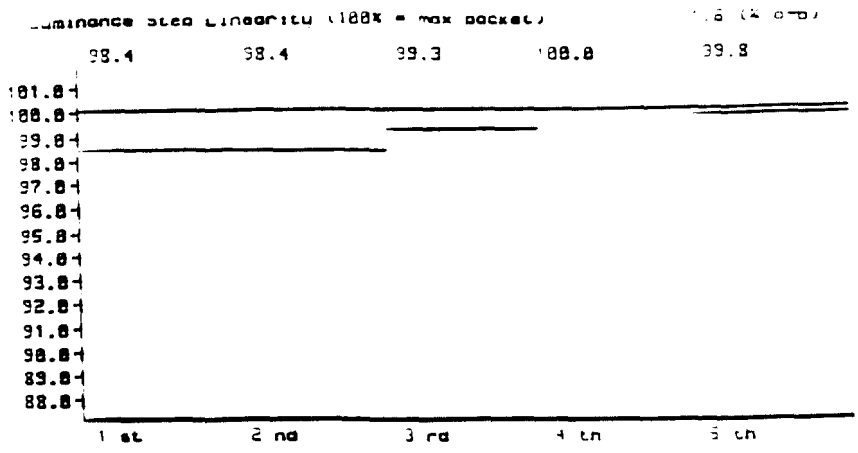


Data ON 13:57:03

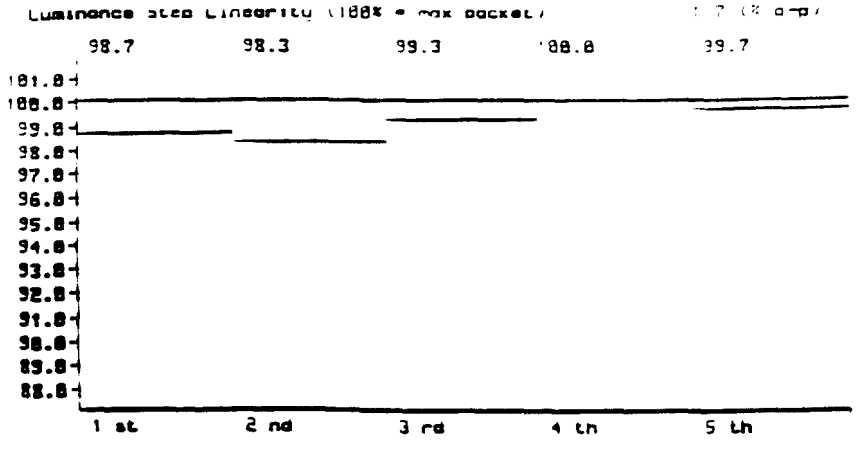
WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

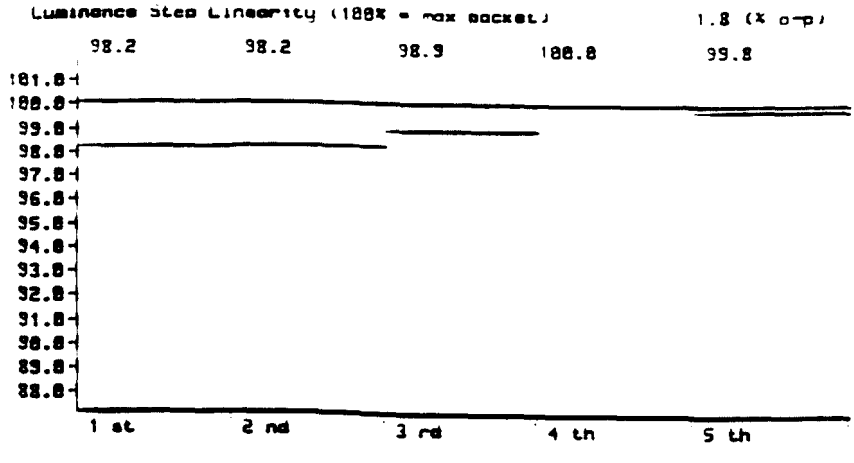
Pulse-to-Bar Ratio and 2T K Factor Measurement



Data OFF 14:04:24



REFERENCE 13:38:00

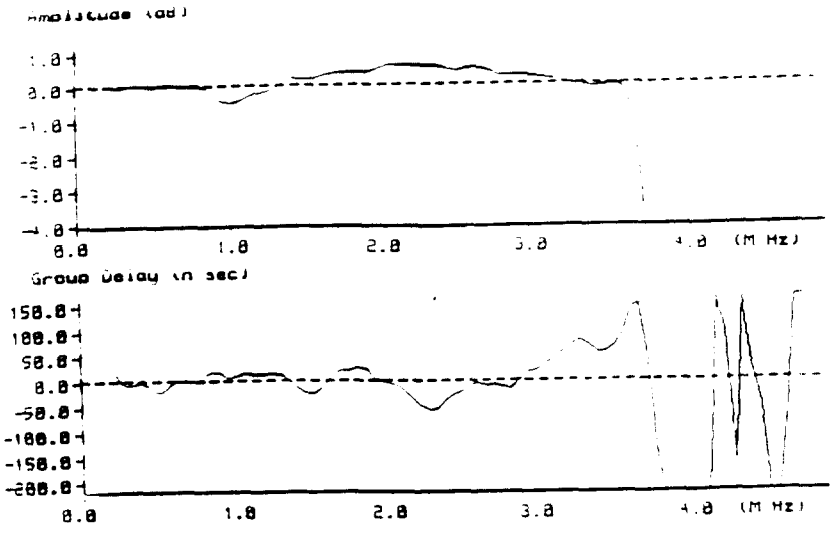


Data ON 13:57:16

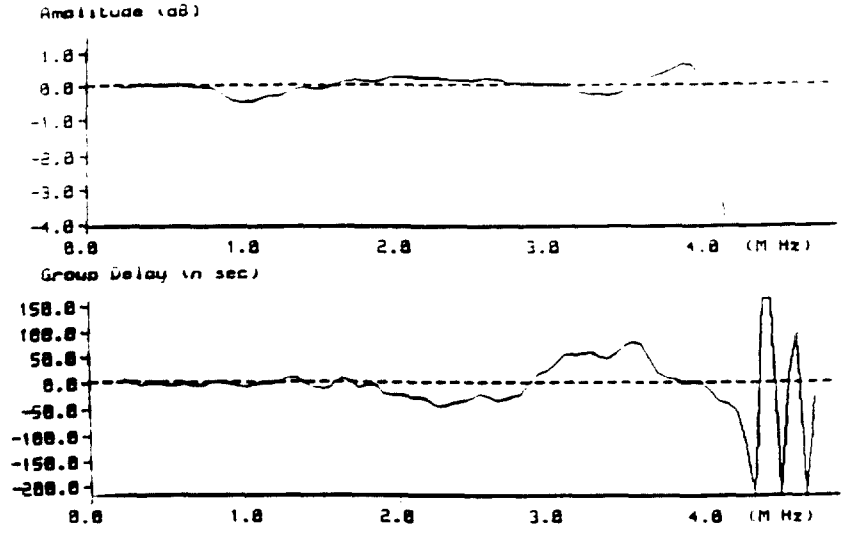
WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

Luminance Non Linearity Measurement

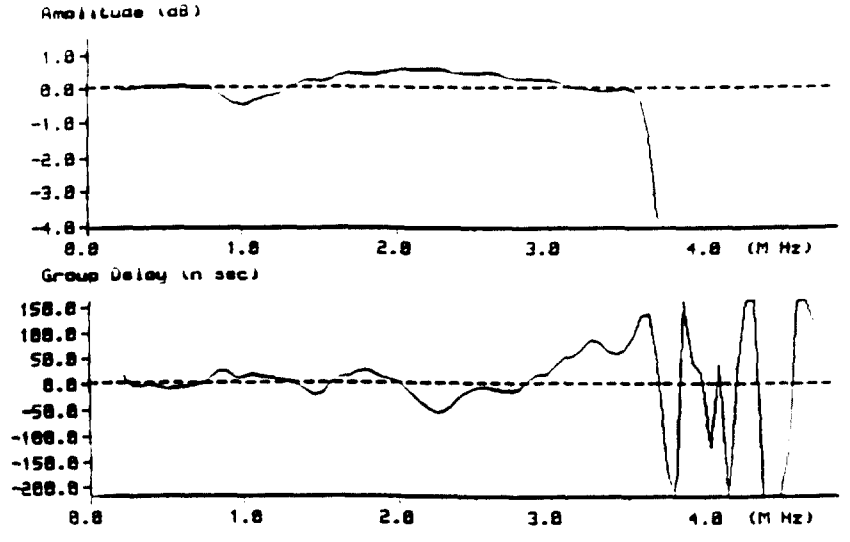


Data OFF 14:05:51



REFERENCE 13:41:25

Video bandwidth is limited by the Exciter and Demodulator as shown. Group delay at frequencies above video passband is due to the filters in Exciter and Demodulator. REFERENCE exciter: Harris Corp., Demodulator: Tektronix 1450.

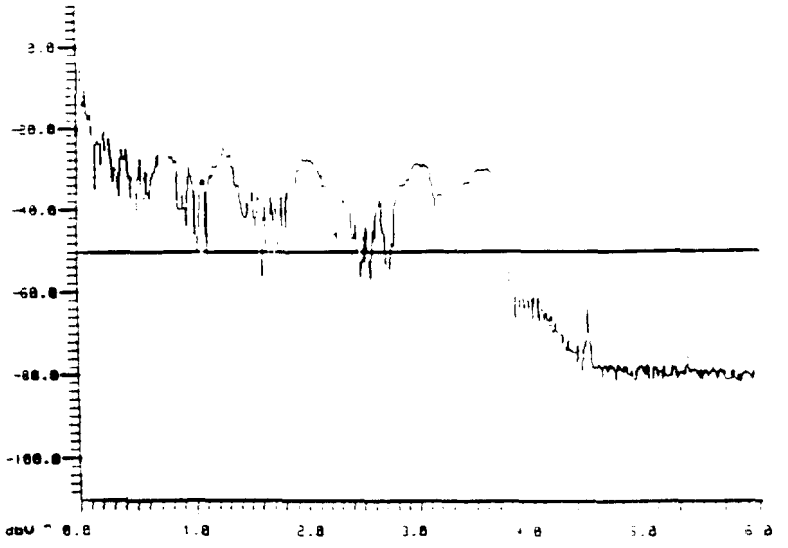


Data ON 13:58:30

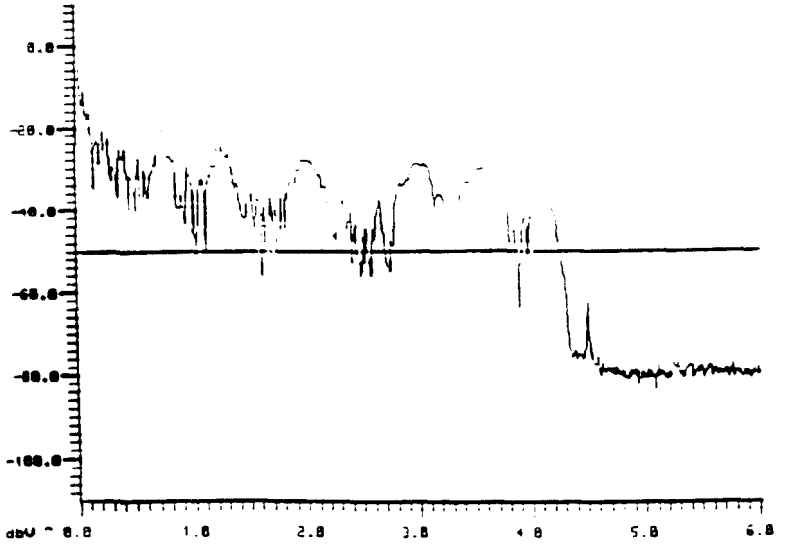
WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

Gain and Group Delay as Function of Frequency

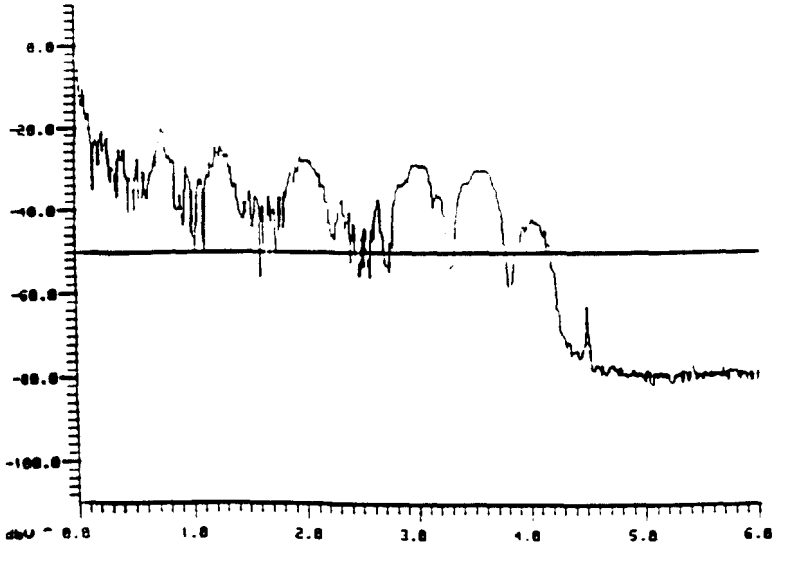


Data OFF 14:06:41



REFERENCE 13:42:20

F.C.C. Multiburst frequencies (Tek 1910); 0.5, 1.25, 2.0, 3.0, 3.58, and 4.1 MHz (per 1910 Manual). Upper sideband components of 4.1 MHz burst are <u>above</u> passband of demodulator.



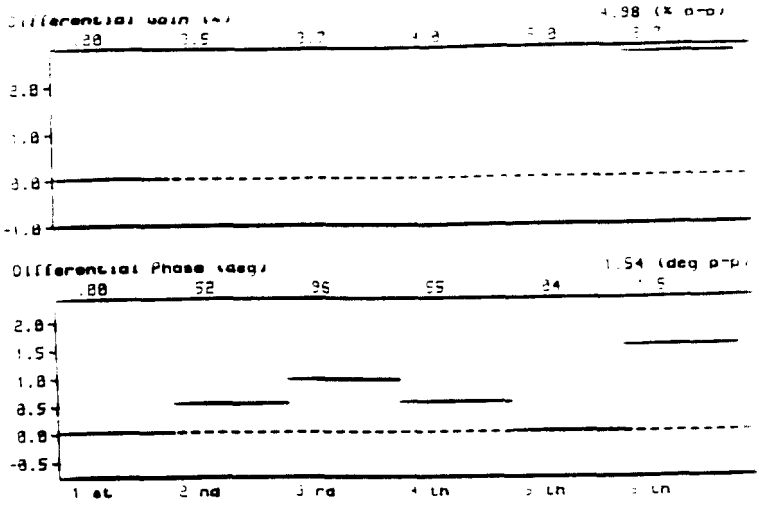
Data ON 13:58:56

Note: Last "burst" is the envelope of the data. (It is absent in data OFF mode)

WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

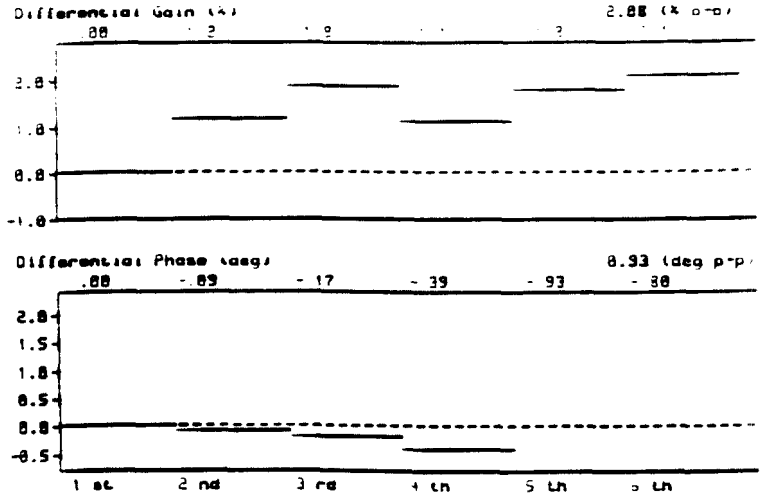
Multiburst Response



Differential Gain measured as 4.98% (off scale).

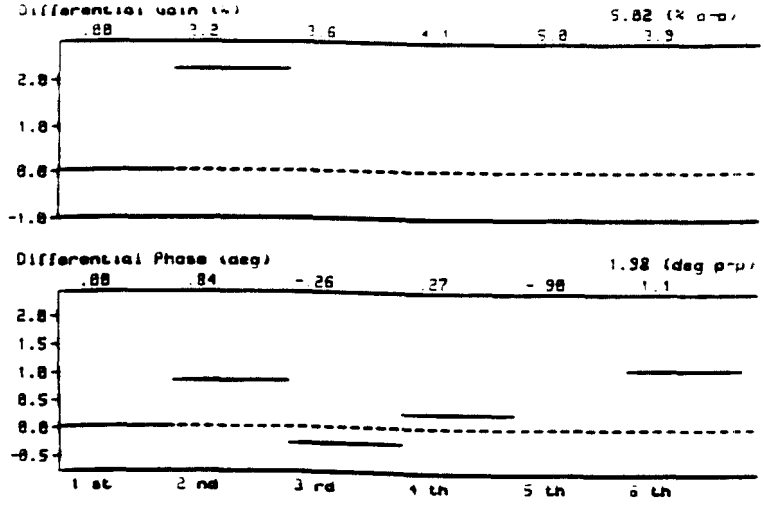
Data OFF 14:04:38

Differential Phase measured as 1.5° (off scale).



REFERENCE 13:38:14

Tek 700 normalizes gain so that 1st step = 0.0% Differential Gain, and 0° Differential Phase.



Differential Gain measured as 5.02% (off scale).

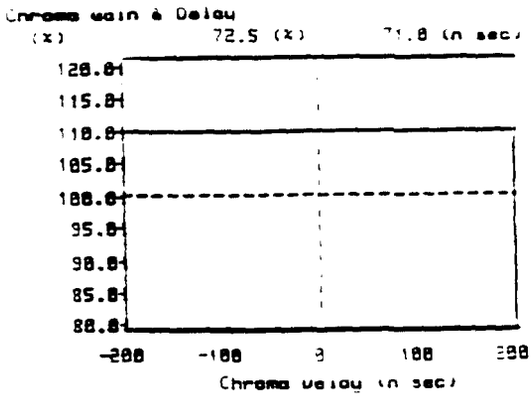
Data ON 13:57:29

Differential Phase measured as 1.98° (off scale).

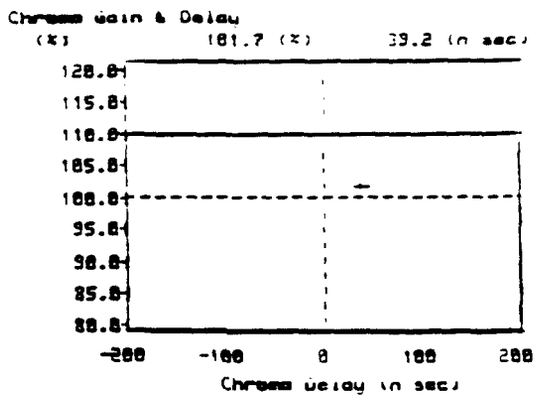
WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

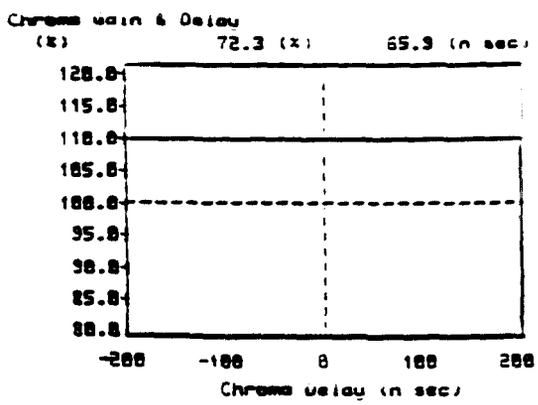
Differential Gain and Phase Measurement



Data OFF 14:04:51



REFERENCE 13:38:26



Data ON 13:57:42

WavePhore 3.1.1 Objective Test Results 29-Nov-94

Strong Power Level -26 dBm

12.5 T Chrominance/Luminance Gain and Delay